Strategy for the global conservation of the Red Siskin (*Spinus cucullatus)* 2015-2035

Written for the Red Siskin Initiative/Iniciativa Cardenalito (www.redsiskin.org) by

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1. Foreword

We know how to save species. It takes time, people, creativity, perseverance and money. But it is possible. Two recent books – *Second Nature: Changing the Future for Endangered Species*[i] and *Back from the Brink*[ii] – tell us about conservation success stories, where dedicated, multidisciplinary, multicultural teams worked together to address the drivers of population decline, and to reverse the trend. We know how to do it. We just need to do a lot more of it.

A key lesson that we have learned is that there is no silver bullet. A deep understanding of a species' natural history and threats is key. Engagement of stakeholders at every scale, from local communities to national governments, as well as integration of scientific with traditional knowledge, increases likelihood of success. Interventions must be tailored to each particular situation, but must draw widely from natural and social sciences, and include a communication strategy that spans from scientific publications to social media. Ability to adapt to changing conditions is fundamental. A species' status might change positively or negatively in response to an intervention or to preexisting threats – contingency plans and alternative scenarios can make the difference between survival and extinction.

The Red Siskin (*Spinus cucullatus*) is probably Venezuela's most threatened bird. Decades of overexploitation, plus association with one of the country's most threatened ecosystems, have resulted in a severe decline in abundance and fragmentation into a few isolated populations. Recovery of this species will require a multi-pronged approach ranging from scientific research, to protected area design, changing agricultural practices, controlling unsustainable harvest, strengthening public awareness, establishing *ex situ* populations, experimenting with reintroductions, and building a solid financial base for future sustainability.

The *Strategy for the global conservation of the Red Siskin (Spinus cucullatus) 2015-203*5 offers us a vision that combines all these dimensions in order to achieve self-sustaining wild populations, and to serve as a model for species conservation in Venezuela. The Red Siskin Initiative proposes to achieve this in twenty years. I look forward to seeing them succeed and to writing the foreword in the book that will tell the story of how the they saved this unique bird.

Jon Paul Rodríguez

President, Provita
Professor, Instituto Venezolano de Investigaciones Científicas
Chair, IUCN Species Survival Commission

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[1] CBSG (2017) *Second Nature: Changing the Future for Endangered Species*. Conservation Breeding Specialist Group (CBSG), St. Paul, Minnesota. 85 pp.

[1] Mittermeier, R. A., A. B. Rylands, W. Sechrest, P. F. Langhammer, J. C. Mittermeier, M. J. Parr, W. R. Konstant and R. B. Mast (2017) *Back from the Brink*. CEMEX & Earth in Focus, Inc., Qualicum Beach, British Columbia, Canada. 273 pp.

2. Executive summary

The Red Siskin (*Spinus cucullatus*) is a small Neotropical bird that once ranged across northern South American premontane tropical dry and moist forests, from Cucuta, Colombia through northern Venezuela, to Trinidad. Currently, this species is Endangered, persisting in just three small populations in Venezuela and one in Guyana, threatened by trapping for the illegal pet trade, and by habitat loss.

In 2016 The Red Siskin Initiative (RSI, www.redsiskin.org) began development of a draft internal action plan to recover Red Siskins based on the new One Plan Approach of the International Union for Conservation of Nature (IUCN). RSI envisions self-sustaining populations of Red Siskins across their natural historical distribution as an important model for conservation success in Venezuela, one of the world's top ten megadiverse countries. RSI aims to achieve this vision using a transparent, multi-stakeholder approach, involving all who care about and interact with the Red Siskin in some way, using creative partnerships and the latest scientific tools. The present draft plan recognizes the fundamental value of the assess-plan-act-repeat management cycle promoted by IUCN, and identifies six core strategies: 1) Understanding red siskins, 2) Connecting with people, 3) Expanding safe habitats, 4) Reducing unsustainable harvest, 5) Rescuing, raising and reintroducing more siskins, and 6) Sustaining the Red Siskin Initiative. These main strategies comprise 24 specific objectives and 122 activities. The immediate actions to implement before 2020 include research on the species' natural and evolutionary history, reassessment of its conservation status according to IUCN protocols, identification of stakeholders, implementation of outreach and education programs, and establishment of captive conservation centers in Venezuela and the US. RSI also seeks to improve the understanding of unsustainable Red Siskin harvest, and to implement bird-friendly coffee certification as a way to protect and expand Red Siskin habitat. Longer-term actions include the development and successful implementation of breeding and reintroduction protocols within the species' historic distribution, and to guarantee the human, economic, and institutional resources needed to secure Red Siskin recovery, through training, supporting and organizing the talent required in countries where the species is native and where demand is high for harvested siskins.

3. Introduction

Description and natural history

The Red Siskin (*Spinus cucullatus*) is a small (~10cm) Neotropical finch with striking sexual dimorphism (Figure 1). The only red and black species in a recent evolutionary radiation of 12 Neotropical siskins, all other species in the group are yellow and black (Beckman & Witt 2015). The male's head, wings and tail are black, the body and bars on the wing are vermillion red, and the center of its belly is white. The female only has light red on the chest, a wing bar, and at the base of the tail, while the rest of the body is dark gray on the back and lighter gray on the belly. Males have a yellowish-orange stripe on the wings which is visible in flight (Rodríguez and Rojas-Suárez, 2008).

Figure 1. Red Siskin male (left) and female (right), from Audubon de Venezuela (2016)

In 2016, the South American Classification Committee of the American Ornithologists Union voted to accept a recommendation to denominate this species *Spinus cucullatus*, based on recent molecular studies (Remsen, 2016). Synonyms include *Carduelis cucullata* and *Sporagra cucullatus* (Swainson, 1820; Phelps and Meyer de Schauensee, 1979; Hilty, 2003).

The species was historically found mainly in Venezuela (Collar *et al*., 1992; Figure 2), although this wide distribution has been reduced to just a handful of relict populations today (Sánchez-Mercado *et al.*, 2017). Originally distributed across the north of the country, only a few isolated populations survive across several states (Collar *et al.*, 1992; BirdLife International, 2017b). A small population may persist in Colombia, near Cúcuta (López-

Lanús, 2000), but its current status is unknown. In Puerto Rico, a presumably introduced population persisted until approximately 1970 (Raffaele, 1983), though recent reports hint it may still exist. In Trinidad and the associated islands of Monos and Gaspar, Red Siskins were always rare, may have been introduced, and have been considered extinct since 1960 (French, 1973). The few specimens collected in Cuba may also have escaped from captivity, and no recent reports indicate it persists there (Collar *et al.*, 1992). The largest known extant population lives in southwestern Guyana (Robbins *et al.*, 2003). Recent molecular genetic studies are consistent with this being a natural population (Rodríguez-Clark *et al*, in press).

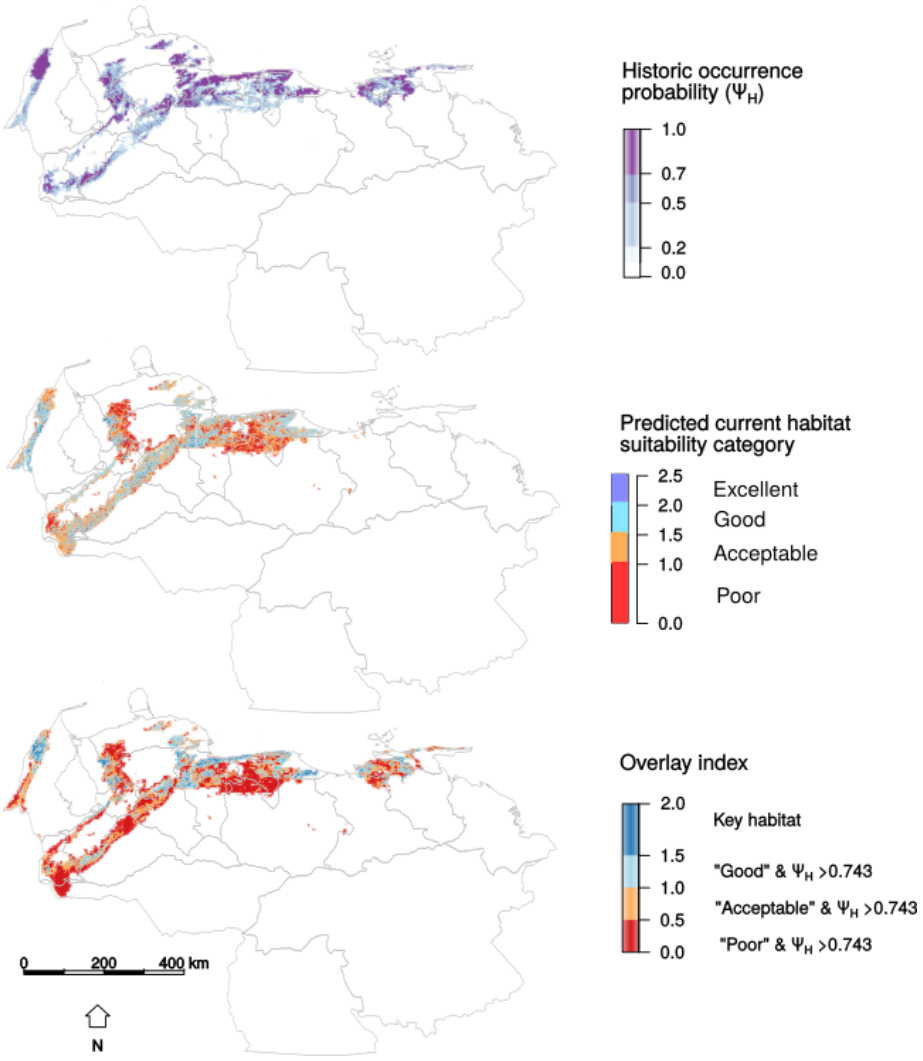

Figure 2. Historic occurrence and habitats for Red Siskin conservation in Venezuela. a) Probability of historical presence in Venezuela based on species distribution models.b) Current habitat suitability based on ground-truthing and vegetation changes since 2000. c) Overlap between the probabilities of historical presence and the suitability of current habitat. Gray lines represent state boundaries within Venezuela. Adapted from Sanchez-Mercado et al., 2017.

Red Siskins use various habitats, ranging from 100 to 1400 m, including moist montane tropical evergreen forests, tropical dry/deciduous forests, and agricultural/agroforestry mosaics embedded in any of these (J. Miranda, unpublished data). However, in Venezuela, relatively dry, open forests at intermediate altitudes appear to be particularly attractive to Red Siskins, with habitat use governed by the availability of water, food, and nesting trees (J. Miranda, A. Sánchez-Mercado, unpublished data). The species may migrate altitudinally (Hilty, 2003), though seasonal and daily movements are poorly understood. In Guyana, the species appears to favor lower-altitude, drier, and more open areas (Robbins *et al*., 2003).

Like many others in the family *Fringillidae*, the Red Siskin feeds primarily on seeds from a wide variety of grasses and flowering plants, although small insects may be consumed during the reproductive season (Coats & Phelps, 1985; Esuperani, 2008). Other food sources include the leaves, flowers, and fruits of *Wedelia calycina, Lagascea mollis*, *Cordia curassavica*, and *Erythrina poeppigian* (Rivero Mendoza, 2004). There are no exclusive food sources for the Red Siskin; all are shared with other bird species, which suggests that competition for food may arise, especially with honeycreepers and other Fringilids (Coats and Phelps 1985). The Red Siskin also has no confirmed predators; however, the American kestrel (*Falco sparverius)* and the Grey-lined hawk (*Buteo nitidus)* are potential predators, as they share the same habitat (Coats and Phelps 1985; Rivero Mendoza (2004). The Chicken snake (*Spilotes pullatus*) and the Common opossum (*Didephis marsupialis*) may also be potential predators of eggs and fledglings (Rivero Mendoza, 2004).

In the wild, Red Siskin reproduction appears to be influenced by precipitation, temperature, light, and food availability. Courtship is marked by males defending females with long, intricate and melodious songs, and frequent interactions with other males, followed by males feeding the females and joint care of the nestlings. Males also feed chicks throughout their development (J. Miranda, unpublished data). In captivity, clutches of 2-4 eggs are typical (P. Hansen, S. Davis, unpublished data). In Venezuela, reproduction appears to peak in both April-May and November-December (Hilty, 2003), although reproductive activity has been observed in Venezuela in all months except January (J. Miranda, unpublished data). In Guyana, nesting activity appears to be more clustered than in Venezuela, with frequent female-female interaction particularly during nest building (Robbins *et al*., 2003). Similar competition between females has been observed *ex situ* (E. Royer, unpublished data). In captivity, Red Siskins cross readily with several other species

(McCarthy, 2006) and hybridization could occur in the wild with other species, including the Hooded Siskin (*Spinus magellanicus*) and the Yellow-bellied Siskin (*Spinus xanthogastrus*), with which they share habitat in Venezuela (Hilty, 2003).

Biological and cultural importance

Although indigenous communities and early colonizers may have appreciated this species, the first records of cultural appreciation for this species come from the late 19th and early 20th centuries, when feathers and whole specimens were used as hat ornaments (Birkhead, 2003). Successive waves of European immigrants brought aviculture to Venezuela, and they appreciated Red Siskins for their beautiful color and songs, lively interactions, ability to hybridize, and relatively easy adaptation to captivity (Coats & Phelps, 1985). To supply urban immigrants with Red Siskins, rural families specialized in catching Red Siskins as a family business, teaching new generations how to find, trap and sell these birds (Sanchez-Mercado et al, unpublished data). The red canary produced by crosses with Red Siskins also has been greatly valued internationally by aviculturists (Rivero Mendoza, 2004, Birkhead, 2003).

Presently, this cultural importance persists in Venezuela. The Red Siskin is the official bird of Lara State, at the heart of the species' historic distribution. There, Parque Jardín Botánico "El Cardenalito" is named for the species (Palencia, 2013). It is also the mascot of the junior baseball team mentored by the wildly popular Lara Cardenales (Figure 3), and it adorns signs on roads welcoming visitors to this state capital. Moreover, its image over the main highway to Barquisimeto welcomes visitors to the city.

Figure 3: The Venezuelan little-league team the Cardenalitos is sponsored by the Lara Cardenales in the capital city of Lara state where the Red Siskin is the official bird.

At a national level, Red Siskins are held in high esteem as part of the country's cultural heritage. In recent years, its image has bolstered environmental activism focused on

preventing the extinction of threatened species in the country. A national education initiative created a textbook entitled "El Cardenalito" for language arts classes, promoting writing and reading, as well as conservation of Venezuela's endangered species (Barreto *et al.*, 2014, Figure 4a). An image of the Red Siskin represents the plight of all of Venezuela's endangered species on the cover of the "Libro Rojo", a national assessment of threat status of all of Venezuela's vertebrates (Rodríguez y Rojas-Suárez, 2008). Moreover, most prominently, in 2008, the Venezuelan Central Bank elected to celebrate the Red Siskin on the Venezuelan Bs. 100 bank note, with an illustration by a nationally famous artist, Mercedes Madriz. This selection maintaining the species on the highest value banknote has been maintained in new 20,000 and then 100,000 Bs. banknotes brought into circulation to deal with hyperinflation (Figure 4c).

Figure 4: a. *El Cardenalito* Language Arts book (Barreto *et al.*, 2014)
b. El Libro Rojo de la Fauna Venezolana (Rodríguez & Rojas-Suárez 2008).
c. Venezuelan 20,000 *bolívares* bank note.

The cultural value of the Red Siskin is evident in a variety of media. In music, for example, Reynaldo Armas, one of the most important interpreters of traditional Venezuelan music, released a record titled "*Aquí está el Cardenalito*" (Here is the Red Siskin, 1994), with an eponymous song (Agobian, 2013). A popular traditional Christmas carol, or "gaita" also

purports to explain that this species' red breast is due to drops of Christ's blood, which fell on it while it sang to him on the cross. In painting, the renowned Venezuelan artist Arturo Michelena focused on the Red Siskin in his work "*El Cardenalito*" in 1884 (Figure 5a; Calzadilla, 2013). In traditional dance festivals and contests, it is common to see performers dressed in costumes inspired by the Red Siskin, particularly when portraying dancers from Lara state (Figure 5b).

a **b**

Figure 5: a. Painting, *El Cardenalito*, by Arturo Michelena (1884).
b. Dancer in Lara state dressed in a Red Siskin costume.

4. Current conservation status

Venezuelan National Red List Critically Endangered A4cd

International Red List Endangered A2bcd+3bcd (BirdLife International, 2017b).

The Red Siskin has appeared on IUCN Red Lists of threatened birds since 1952 and is presently Endangered at a global level (BirdLife International, 2017b). In Venezuela, it is Critically Endangered and considered among the most threatened birds in the country: most populations are extinct and the present Area of Occupancy is less than 20% of the original (Rodríguez and Rojas Suárez, 2008; Rodríguez *et al.*, 2004). Based on data from the 1980s, preliminary studies in Venezuela suggested a total population between several hundred and a few thousand, with approximately half in the west, half in the central region, and regional extinction in the east. More optimistic studies estimated 6,000 wild specimens at that time, though this represented a clear decline from the historical population size (Coats and Phelps, 1985; Rivero Mendoza, 1986; Collar *et al.*, 1992; Patterson, 1994; Rivero Mendoza, 2004).

Furthermore, it can be inferred that the number of individuals has decreased even more since then: a resurvey of locations where the species persisted until the 1980s yielded no observations (J. Miranda, 2012, unpublished data). Nevertheless, the species can be hard to detect even for experienced observers, and it may be shy in areas where it is trapped. An increase in sightings since 2008 is likely the result of increased observation efforts rather than a true increase in Red Siskin population sizes or distribution. In Guyana, there is one population that appears to be robust at the moment, with few threats, although reports of poaching attempts have increased recently (L. Ignacio, unpublished data).

5. Threat analysis

Of the multiple threats to Red Siskin persistence (Figure 6), the most important historically has been trapping for human use (BirdLife International, 2017b).

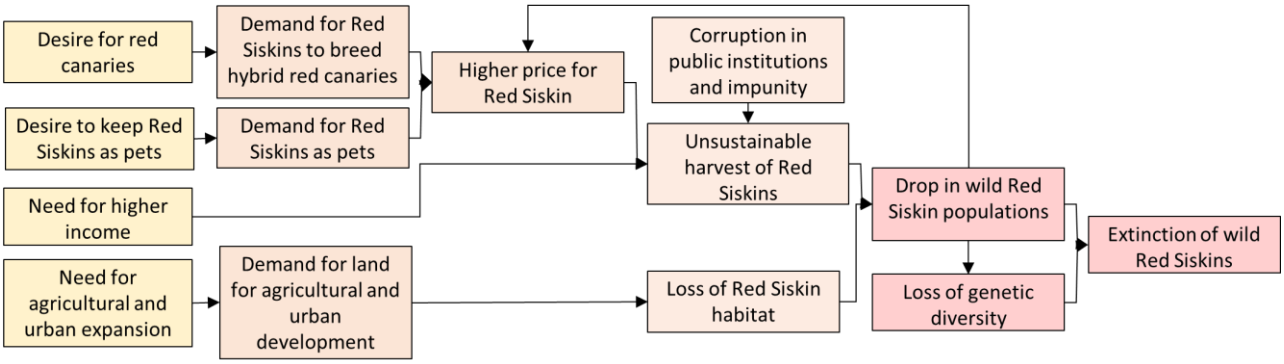

Figure 6. Social, environmental, economic, and legal threats affecting Red Siskin populations in Venezuela. Threats are indicated according to their proximity to population declines, including direct and indirect links.

The primary use for Red Siskins has been in the national and international pet trade, which has been active at least since the 19th century, with a secondary use as hat ornaments (BirdLife International, 2017b). Aviculturists appear to have caused the most dramatic decline in the early 20th century, with their demand for Red Siskins to produce red canaries through hybridization (Birkhead, 2003; Yong, 2016). Once hybridization between Red Siskins and canaries began, canary breeding widened the range of colors (Cuevas Martínez, 2005; Giraldo *et al*., 2009; Yong, 2016). This boosted national and international interest in hybridizing Red Siskins with other species, including *Sporagra atrata*, *S. carduelis*, *S. flammea*, *S. magellanica*, *S. spinus*, and *S. xanthogastra* (McCarthy 2006; La Confédération Ornithologique Mondiale, 2011).

Although historical international demand has been high, and recent evaluations (which include conducting interviews and monitoring online social networks), indicate that international demand is still high relative to wild population sizes, current domestic trade of Red Siskins is at least four times greater than international trade. In 2017, at least 1600 individuals were traded within Venezuela, while 300 individuals were trafficked internationally (Sanchez-Mercado *et al*, unpublished data). Trade in Red Siskins is not open in Venezuela, unlike even illegal trade in other species; they are not sold in pet shops or on roadsides. Trafficking is clandestine, apparently conducted through close personal relationships and online channels (Asmüssen, 2009), which is common practice for other Venezuelan birds of interest for specialists.

Recently concluded research indicates that the trade network is composed of: A) "trappers," people who capture birds in the wild, B) "commercial middlemen," people who are directly involved in the purchase/sale of Red Siskins, but have no knowledge of the species' captive breeding, C) "avicultural middlemen," people who trade in Red Siskins specimens either captured in the wild and tamed or bred in captivity, and D) "aviculturists," people who keep Red Siskins as pets for exhibition or breeding (Sanchez-Mercado *et al*, unpublished data). Although research in other countries suggests that high-value, illegal wildlife may be trafficked the the same networks as drugs, arms, and humans, data to date suggest that Red Siskin trade networks are highly specialized and not connected with other trafficking networks.

Captures are made by both trappers and commercial middlemen. Although trappers largely come from communities near Red Siskin habitat, they are not highly themselves specialized: the economic benefit that they receive for the sale of specimens represents less than 25% of their monthly income. On the contrary, commercial and avicultural middlemen are more focused; they live in regional cities and travel to locations where they can find Red Siskins, either through trappers or using their own equipment and vehicles during 1-2 week field trips, and may earn between 50 and 90% of their monthly income in this way (Sanchez-Mercado *et al*, unpublished data).

Habitat loss appears to be another important threat to the Red Siskin. The Red Siskin habitat used to cover 90,060 km² in northern Venezuela; however, current species distribution models predict that the area with high presence probabilities (greater than 0.743) covers 20,696 km² focused in the central-northern region of the country, with only 24% within a protected area. In the western part of the country, smaller fragments exist north of the *Sierra*

de Perijá and on the northern slope of the *Cordillera* de Mérida and Portuguesa, again with just 23% of current Red Siskin habitat within a protected area. Much of the unprotected habitat is located north of the *Sierra de Perijá*, in the lower areas of the western coast of Lake Maracaibo and in the mountain range system of Lara and Falcón (Sánchez-Mercado *et al*., 2017).

Small population size also poses a series of problems for Red Siskins. This increased probability of crossing between close relatives brings with it the risk of inbreeding depression (Keller & Waller, 2002). So-called "alee" effects in the wild may also reduce reproduction when a species accustomed to large social groupings no longer has the stimulation required for breeding. A host of other density-dependent effects could also exist; for example, without readily available conspecifics, Red Siskins may also mate more frequently with other, more common species, creating hybrids with reduced fertility (Todesco *et al*., 2016).

6. Past conservation efforts, and the Red Siskin Initiative/Iniciativa Cardenalito

Internationally, Red Siskins have been included in Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora since 1975 (CITES, 2013) and in the United States' Endangered Species Act since 1976 (USFWS, 2013). The 1992 Wild Bird Conservation Act (WBCA), combined with subsequent enforcement lawsuits, resulted in an effective ban on US imports of certain families of birds, as well as all CITES-listed species (American Federation of Aviculture, 2017). Imports to Europe have also declined, apparently due to strict disease prevention measures imposed on bird imports since late 2000 (Commission of European Communities, 2007). In Australia, the last known importation of Red Siskins was in 1949 (Davis, 2015). Import of Red Siskins was formally banned in 1962 and reinforced by the Environmental Protection and Biodiversity Conservation Act in 1992 (Government of Australia, 1999). The Avicultural Federation of Australia and American Federation of Aviculture each had separate conservation programs in the 1990s aimed at reintroduction of the Red Siskin to Colombia and Trinidad, respectively, but neither proceeded to release (Collar *et al*., 1992).

In Venezuela, threats to Red Siskins have been recognized since at least 1944, when the Ministry of Agriculture (MAC) banned its hunting and sale. Unfortunately, due to enforcement challenges, this measure boosted the bird's market value abroad (Coats and Phelps, 1985; Rivero Mendoza, 2004). The IUCN's Species Survival Commission visited Caracas in 1952 to assess the status of Red Siskins in Venezuela, leading to its inclusion in

subsequent IUCN Red Lists (Coats and Phelps, 1985). In the 1990s, protection in Venezuela was established through a permanent hunting ban and its official designation as an "Endangered Species" (Venezuela, 1996a; Venezuela, 1996b). The few known wild populations in Venezuela are found on protected as well as private lands (Lentino and Esclasans, 2005), and several protected areas have been identified as key for its conservation (Lentino and Esclasans, 2005; Oficina Nacional de Diversidad Biologica, 2013).

In more recent years in Venezuela, conservation work has been sporadic on behalf of the Red Siskin. It is the focus of an official state-level conservation program in Lara, led by Parque Zoológico y Botánico Barárida, in Barquisimeto (Gobernación del Estado Lara, 2005). This program has included a citywide parade on International Wildlife Day, and the summer day camp, *Alito, mi amigo el Cardenalito*, (Alito, my friend the Red Siskin), in which children learned about this and other endangered birds (Figure 7; Prensa del PZBB, 2013). Efforts also included the environmental campaign "Lara 2014", which proposed the that those holding illegal captive Red Siskins could hand them over in an amnesty.

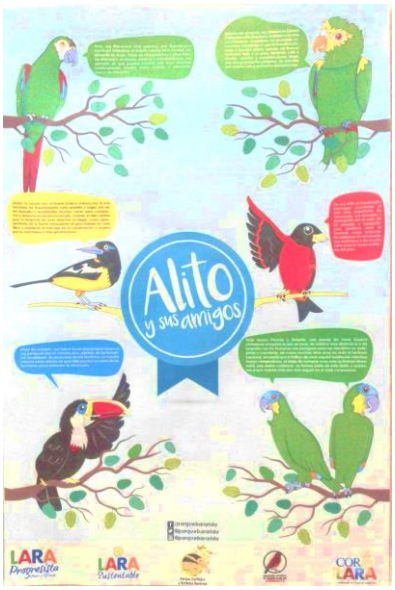

Figure 7: Educational poster from the summer day camp *Alito el Cardenalito* sponsored by the Government of the State of Lara at Parque Zoológico y Botánico Barárida (Barquisimeto, Venezuela).

Modern conservation theory recognizes that protecting a single species in isolation is rarely successful or efficient (Groom *et al.*, 2006; Primack & Sher, 2016). However, focusing on larger problems through the lens of a single species can empower stakeholders to act locally while thinking globally, allow work on a tractable scale, and connect species-specific efforts to the conservation of other species and ecosystems. As an umbrella species, the Red

Siskin could benefit a wide variety of other endangered endemic and migratory bird species, as well as ecosystems, across a landscape that is vitally important to many Venezuelans (Roberge & Angelstam, 2004).

For example, efforts focused on Red Siskin habitat are a step toward conserving and retaining the carbon stocks of tropical dry forests. Red Siskin conservation could aid cultural conservation and promote sustainable livelihoods, including farmers and entire agricultural communities that grow shade coffee, which preserves habitat for Red Siskins and other species. Traditional shade coffee farming has defined the socio-economic context for settlements across many thousands of acres in northern Venezuela for generations (Price, 1994). This way of life is now threatened by national price controls, which make coffee production unprofitable, spurring farmers to cut down their trees to grow unregulated, moderately more profitable sun crops, such as eggplants (Baumhardt, 2015; L. Arrieta, unpublished data). This also creates treeless areas that Red Siskins cannot use, decreasing available habitat.

However, most traditional shade coffee plantations meet Smithsonian "Bird Friendly" certification criteria, which include standards for organic production and tree diversity, among other factors (Migratory Bird Center 2017). Such certification in Venezuela qualifies coffee as "gourmet," and thus exempt from price controls, allowing farmers to sell it at a fair price while conserving habitat and heritage. Bird-friendly shade coffee certification thus is an entrée to the larger issue of biodiversity-friendly agriculture (Tscharntke *et al*., 2012), an approach to ameliorating the effects of the single largest human driver of habitat destruction, and a necessary innovation in a world where protected natural areas alone will never be large enough to conserve critical biodiversity (Rodrigues *et al*., 2004).

Conserving Red Siskins in Guyana also promotes ecotourism, which is important for the conservation of other attractive species such as the Sun Parakeet (or Conure, *Aratinga solstitialis*) and the jaguar (*Panthera onca*). Expanding secure Red Siskin habitat also protects key habitat for threatened Neotropical migrant birds, including the Cerulean Warbler (*Setophaga cerulea*), Golden-Winged Warbler (*Vermivora chrysoptera*) and the Connecticut Warbler (*Oporornis agilis*). Finally, efforts to study and reduce unsustainable harvest of Red Siskins will help reduce overexploitation in all Venezuelan species, a major threat that has been shown to increase in the face of economic crises such as the country is currently facing (Rodríguez, 2000). On a global scale, outreach to large avicultural communities to understand poaching patterns is part of the international effort to fight unsustainable harvests and the

associated illegal wildlife trafficking, which has recently been targeted by the US and other governments as a priority for concerted reduction (USAID, 2017).

In addition to the above factors, another compelling element in Red Siskin conservation is the logistical, biological, and economic ease with which it can be reared in captivity and restored in the wild. A small-bodied species, it is inexpensive to maintain, and its popularity as a cage bird means that a large number already in captivity may be available to help restore wild populations. Aviculturists have developed reliable techniques for maintaining and reproducing Red Siskins, and the establishment of possible feral populations in Puerto Rico and Cuba may indicate that reintroductions can succeed. Moreover, the present economic situation in Venezuela allows for investments from other countries to produce tremendous benefits at low cost.

Finally, the cultural relevance of the Red Siskin facilitates success in cooperation between Venezuelan and international institutions. Local Venezuelan governments, communities and institutions have welcomed partnerships with US institutions around Red Siskin conservation (Sánchez, 2014). In a nation that is facing political and economic challenges, such partnerships provide crucial support for maintaining conservation capacity and scientific expertise in one of the top ten most diverse countries on the planet (Mittermeier *et al*., 1997).

To promote the conservation of the Red Siskin, in 2015 the Red Siskin Initiative (RSI) was founded out of work that was formerly known as the Red Siskin Recovery Project. The RSI is an international group of public and private institutions, as well as communities and individuals who work to understand, protect, and restore this iconic endangered bird across its historical range through research, threat reduction, captive breeding, reintroduction, and habitat protection and restoration, including biodiversity-friendly agroforestry, such as shade coffee and cacao (Red Siskin Initiative, 2017). Members include The Instituto Venezolano de Investigaciones Cientificas (IVIC – a research institute in Caracas), Parque Zoológico y Botánico Bararida (PZBB – a zoo in Lara state), Provita (an NGO in Caracas), the Smithsonian Institution, Miami Zoo, and the South Rupununi Conservation Society (an NGO in Guyana). These members rely on the support and collaboration of many other crucial partners (listed in the Acknowledgements).

7. Conservation strategies and actions

Vision

RSI envisions self-sustaining populations of Red Siskins across their natural historical distribution as an important model of success for conservation in Venezuela, one of the world's top ten megadiverse countries. We envision the Red Siskin as a source of local and national pride in all range countries, as well as a symbol of commitment to the preservation of their natural heritage.

Core values

RSI aims to achieve this vision using a transparent, multi-stakeholder approach, involving all who care about and interact with the Red Siskin in some way, using creative partnerships and the latest scientific, management, and planning tools, but also incorporating low-tech, well-established approaches such as alternative livelihoods, environmental education, economic development, and cultural preservation.

Goals for 2020

- Understand the Red Siskin's ecology, distribution, evolutionary history, and threats (unsustainable harvest, habitat loss) sufficiently to develop a monitoring and conservation program.
- Identify stakeholders and implement outreach programs to engage them in the Red Siskin's future.
- Establish a captive conservation center for Red Siskins in Venezuela and two in the US supporting rescue, conservation, education, outreach, research and reintroduction efforts.
- Declare a protected area for the Red Siskin in Guyana.
- Implement bird-friendly coffee certification emphasizing the Red Siskin on multiple coffee farms in the species' historical distribution in Venezuela, with benefits flowing to families that live in Red Siskin habitat.
- Build a detailed comprehension on how the Red Siskin illegal trade operates
- Encourage public servants to improve law enforcement against illegal activities.

Goals for 2025

- Measurably reduce human threats in areas where wild Red Siskins persist.
- Initiate a breeding and reintroduction plan for Red Siskins in five locations within the species' historic distribution.
- Measurably increase awareness and sympathy in stakeholders, including human communities near Red Siskin populations about their situation, and active participation in their conservation.

Goals for 2035

- Increase awareness and pride in human communities near Red Siskin populations about their situation, encouraging active participation in their conservation.
- Develop two Red Siskin populations in captivity for rescue of individuals from the illegal trade, education, fundraising, long-term insurance and to supply individuals for reintroductions.
- Develop a successful breeding and reintroduction plan for Red Siskins in 15 locations within the species' historical distribution area.
- Measurably reduce human threats to Red Siskins in the wild, from both trade and habitat loss.

Conservation strategies and actions

1. **Understanding the Red Siskin.**

   General objective: Use interdisciplinary, collaborative science to reach an integral understanding of the Red Siskin's biology, including its natural and evolutionary history, status/distribution, threats, and husbandry.

   Specific objective 1.1.: Research on natural history.

   By 2020 understand aspects of the Red Siskin's natural history that remain poorly understood such as: habitat/food requirements, home range/seasonal movements, demographics/reproduction, behavior, optimal distribution density, and unknown potential threats.

   Actions:

1.1.1. Collect relevant observations and other data from at least two different wild Red Siskin populations.

1.1.2. Estimate parameters and identify the biotic interactions most relevant to population dynamics (fecundity, mortality, density-dependence, catastrophes, competition, predation, parasitism, etc.)

1.1.3. Evaluate additional possible threats to the species' natural recovery not considered to date (disease, reproduction/alee effects, or food limitation, etc).

Specific objective 1.2.: Research on evolutionary history

By 2020, understand the genomic and population structure of wild Red Siskins, as a crucial basis to manage and monitor populations *ex situ* and *in situ*.

Actions:

1.2.1. Carry out phylogeographical studies of the species.

1.2.2. Compare historical genetic diversity in wild populations.

1.2.3. Develop tools and methods to detect and minimize hybrid ancestry in captive individuals.

1.2.4. Develop tools and methods to measure and optimize genetic diversity and inbreeding.

1.2.5. Identify local adaptations requiring some populations to be managed separately from others.

1.2.6. Propose a strategy of genetic management *ex situ* and *in situ*.

Specific objective 1.3.: Conservation status of populations.

By 2021, locate wild Red Siskin populations and estimate their size or other correlates allowing the assessment of conservation status according to IUCN protocols, both across their historical distribution and in areas where they may have been introduced.

Actions:

1.3.1. Develop a spatial habitat model to identify areas where populations might exist.

1.3.2. Develop a strategy and a monitoring protocol to determine presence and relative abundance.

1.3.3. Estimate presence and relative abundance as well as seasonal variation in regions of potential interest, as a means of estimating Area of Occupancy, Extent of Occurrence, and/or trends in these or other indicators.

1.3.4. Estimate the carrying capacity of areas with Red Siskin presence.

1.3.5. Evaluate the advantages and drawbacks of areas of interest for reintroductions.

1.3.6. Evaluate the presence or absence of Red Siskin populations outside Venezuela and Guyana, in Puerto Rico, Colombia, Cuba, Trinidad, or any other locations where presence is suspected.

Specific objective 1.4: Threats

By 2023, understand the present-day causes for declining abundance and distribution of wild Red Siskins.

Actions:

1.4.1. Evaluate social-economic drivers of supply and demand influencing unsustainable extraction.

1.4.2. Estimate Red Siskin extraction rates by location.

1.4.3. Understand the structure of the trade in Red Siskins, from capture to final buyer/user.

1.4.4. Understand national and international Red Siskin trafficking routes and rates.

1.4.5. Develop a spatial model of the risk of Red Siskin extraction.

1.4.6. Evaluate drivers and mechanisms of habitat loss, and a spatial model of Red Siskin habitat loss.

Specific objective 1.5.: Development of management protocols *ex situ* and *in situ.*

By 2022, develop protocols for captive management and reintroduction for conservation purposes.

Actions:

1.5.1. Develop a protocol for management of confiscated specimens.

1.5.2 Propose a set of strategies for genetic and demographic management *ex situ* and *in situ,* depending on population goals.

1.5.3. Develop protocols for captive breeding in compliance with the objectives proposed in the *ex situ* management program.1.5.3. Develop a protocol to obtain proper founding specimens for *ex situ* and *in situ* populations.

1.5.4. Develop protocols for reintroduction into natural areas.

2. Connecting with people

General objective: Connect stakeholders and the public with the Red Siskin's plight and encourage individual actions to improve its conservation status. Stakeholders include aviculturists, farmers, participants in the unsustainable harvest, the Venezuelan and Guyanan public and policy-makers/wildlife managers, and the US/European/Australian/consuming public. Connecting with people includes marketing, communications, outreach and educational efforts.

Specific objective 2.1.: Social research.

By 2019, evaluate the knowledge, attitudes and actions of the different stakeholders that directly affect the Red Siskin and its threats, and identify the strategies to create change in favor of the species' conservation.

Actions:

2.1.1. Identify the stakeholders relevant to Red Siskin conservation.

2.1.2. Evaluate the current knowledge, attitudes and actions that the various actors have and take with respect to the Red Siskin and its threats (Baseline).

2.1.3. Evaluate the current attitudes, intentions and actions of the various actors for engaging in unsustainable harvest in Venezuela, setting intentional fires in Guyana, and participating in other factors contributing to the destruction of Red Siskin habitat (Baseline).

2.1.4. Evaluate the current attitudes and intentions of people regarding buying and keeping Red Siskins (Baseline).

2.1.5. Develop a social marketing/communications/education strategy designed to change the intentions and actions of the various actors.

Specific objective 2.2.: Education to reduce unsustainable harvest.

By 2019, develop and apply a marketing/communications/educational strategy focused on rural populations in the Red Siskin's current distribution to reduce unsustainable harvest.

Actions:

2.2.1. Identify communities and actors within them, which are involved in unsustainable harvest of Red Siskins and the destruction of its habitat.

2.2.2. Evaluate baseline status of undesirable action.

2.2.3. Develop and apply a marketing/communications/educational strategy.

2.2.4. Develop a safe monitoring program to encourage the participation of the community.

2.2.5. Evaluate changes in actions of the various stakeholders involved in unsustainable harvest and habitat destruction, after the implementation of the educational strategy.

Specific objective 2.3.: Connect to reduce national and international demand for wild Red Siskins.

Develop and apply face-to-face and digital promotional strategies addressed to the general public in order to increase knowledge of threats faced by the Red Siskin and to reduce their purchase.

Actions

2.3.1. Develop and apply the content of the information program and the personal and digital promotion strategies.

2.3.2. Evaluate differences in the target audience level of knowledge and action, once the information program has been applied.

Specific objective 2.4.: Connect with aviculturists and conservation NGOs.

By 2019, develop and apply a strategy to promote NGO/GO collaboration with aviculturists and change the actions of bird breeders that negatively impact Red Siskin conservation.

Actions:

2.4.1. Identify the main groups of aviculturists both within Venezuela and abroad linked with Red Siskin use.

2.4.2. Develop and implement a marketing/communications/educational strategy to encourage aviculturists and their groups to participate and spread information in their community.

2.4.3. Evaluate differences in bird breeders' attitudes and actions regarding the Red Siskin's situation, before and after the strategy has been applied.

2.4.4 Promote donation of individual birds, knowledge, and data, while sharing knowledge of Red Siskin husbandry, diet, reproduction, to improve husbandry, and genetic and demographic analysis and management in private flocks.

2.4.5 Create alliances with aviculture organizations that advocate, strongly and frequently, for responsible pet ownership and against illegal trade, creating an explicit code of ethics guiding the acquisition and rearing of bird species.

2.4.6 Provide scientific input in regulatory processes to ensure that permitting requirements truly fulfill the protective role intended, without becoming onerous, including support for establishing a "Cooperative Breeding Program" or CBP.

3. Guaranteeing more safe habitats.

General Objective: Identify and encourage the creation of public and private spaces that can serve as safe habitats for the Red Siskin and other species. This implies a review of existing protected areas, establishing new ones, partnering with private landholders, facilitating Smithsonian bird-friendly coffee and cacao certification, supporting ecotourism and other alternative livelihoods based on the continued survival of Red Siskins, as well as active ecosystem restoration.

Specific objective 3.1.: Creating new protected areas.

By 2020, securing the legal protection of the Red Siskin's natural habitat.

Actions:

3.1.1. Evaluate what percentage of the Red Siskin's estimated historic distribution is found within protected areas, and has been lost to anthropogenic causes such as agricultural expansion or urbanization.

3.1.2. Identify Red Siskin populations in non-protected areas that may be key to guaranteeing geographic connectivity between populations and the species' long-term persistence.

3.1.3. Evaluate the potential of private and public areas as reservations for the protection of Red Siskin populations.

3.1.4. Promote the creation of new public and/or private protected areas when needed.

3.1.5. Promote the creation of a protected area for the Red Siskin in Guyana.

Specific objective 3.2.: Encouraging the creation of bird-friendly agroforestry plantations.

Involve coffee and chocolate farmers in the Red Siskin's historical distribution area as allies of the project to create "safe areas" for future release of Red Siskins, after 2020.

Actions:

3.2.1. Identify coffee farms with the potential to support Red Siskin populations.

3.2.2. Establish alliances with coffee farmers by creating economic incentives through certifications: "organic", and/or "Bird-friendly coffee."

3.2.3. Coordinate logistics and support from coffee farmers and INPARQUES to establish release sites in natural areas.

3.2.4. Establish "win-win" agreements between coffee farmers and the project to declare "safe areas" for the Red Siskin.

3.2.5. Create awareness campaigns for communities surrounding release sites to create support and recruit monitoring staff.

4. Fighting unsustainable harvest.

General objective: Propose and execute actions to counter the unsustainable harvest of Red Siskins, once this threat is better understood. This may include both demand reduction, via alternative market strategies and education, as well as supply reduction, via alternative livelihoods, law enforcement and legal reform.

Specific objective 4.1.: Creating alternatives for the demand. 13

Evaluate the feasibility of either feeding present demand by alternative means (for example, the development of a legal market for Red Siskins and their hybrids), shifting the demand to an alternative (such as other birds or pets whose use can be sustainable) or by reducing present demand (by linking with education/outreach efforts to aviculture groups).

Specific objective 4.2.: Creating alternatives for the supply.

Evaluate the feasibility of reducing supply by understanding the incentives and pressures on Red Siskin trappers and developing pathways for reducing trapping, including alternative productive activities such as ecotourism or bird-friendly coffee production.

Specific objective 4.3.: Improving legal enforcement activities.

In 2020, develop an education/outreach program for public servants (National Guard and Prosecutor's Office environmental department) to identify Red Siskins and follow protocols for confiscation of wild birds, as well as influencing the update of laws regarding the issue.

Actions:

4.3.1. Develop and execute an educational/outreach strategy for public servants charged with safeguarding wild fauna, focused on identifying birds in general, and the Red Siskin in particular, and on taking proper action during confiscations.

4.3.2. Create a network with the help of digital tools to allow the various actors involved access to more precise, updated information about confiscation procedures, and to coordinate effective action.

4.3.3. Promote updates of current legislation.

4.3.4. Inform all actors about current legislation related to unsustainable Red Siskin harvest.

4.3.4.1 Collect information.

4.3.4.2 Communication with stakeholders.

4.3.5. Cooperate with national, regional and local governments to improve the law enforcement and reduce environmental crimes.

4.3.6. Promote the declaration of the current Red Siskin Conservation Strategy as a "National Program".

5. Breeding and reintroducing Red Siskins.

General objective: Carry out *in situ* and *ex situ* interventions such as captive breeding and reintroduction in safe habitats to guarantee the viability of wild populations. This includes rescuing and rehabilitating trafficked birds, improving captive husbandry and reproduction, implementing a detailed genetic/demographic management plan, and implementing strategies for releasing individual birds so that they may successfully reproduce in the wild.

Specific objective 5.1.: Develop *ex situ* populations.

By 2020, maintain Red Siskin populations in captivity for research, education, fundraising, rescue/rehabilitation, long-term insurance, and to produce individuals for eventual reintroduction.

Actions:

5.1.1. Found a Red Siskin colony in the Smithsonian's National Zoological Park and Conservation Biology Institute for research and fundraising, to develop protocols for successful captive management and support research in the wild.

5.1.2. Develop an Integrated Conservation Center at Caracas, Venezuela to receive confiscated birds, and for research, fundraising and education.

5.1.3. Develop an Integrated Conservation Center in Parque Zoológico y Botánico Bararida (Barquisimeto, Venezuela) to receive confiscated birds, and for education, research, fundraising, long-term insurance, and to produce individuals for eventual reintroduction.

5.1.4. Encourage the foundation of new colonies in other zoos around the world for conservation purposes.

Specific objective 5.2.: Reintroduce Red Siskins to the wild.

Develop a reintroduction and monitoring program for captive-bred birds in ecologically appropriate, secure, threat-free habitats.

Actions

5.2.1. Study and model the growth of populations under different environmental conditions to determine the number and characteristics of individuals that must be released, on what schedule, and over what time period.

5.2.2. Select appropriate release areas within the Red Siskin's historical distribution area (meet ecological requirements, protected, threats controlled).

5.2.3. Evaluate whether release of captive-bred specimens will have a positive impact on the species.

5.2.4. Develop a reintroduction plan for the Red Siskin with the advice of experts in the area and considering the parameters established by protocols used with similar species.

5.2.5. Develop and implement a reintroduction protocol including transportation, a hacking-out process and supportive feeding during prolonged seasons of rain or extreme drought.

5.2.6. Develop and apply monitoring programs before and after each release to evaluate reintroduction methods and individual status (movements, reproduction, mortality).

5.2.7. Evaluate cost-effectiveness of reintroduction methods and optimize where possible.

6. Collect the resources for Red Siskin conservation.

General objective: Guarantee the human, economic, and institutional resources needed to secure Red Siskin recovery, through training, supporting and organizing the talent required in range and recipient countries, non-profit fundraising efforts, and strengthening institutional resources and connections to support project execution.

Specific objective 6.1.: Fundraising for conservation.

Submit proposals for funding for project components throughout the course of the project.

Specific objective 6.2.: Crowdfunding.

Develop a wide crowdfunding base through digital platforms throughout the course of the project.

Specific objective 6.3.: Private financing.

Encourage the involvement of individuals and private institutions as funders, fulfilling expectations regarding contribution impacts.

Actions:

6.3.1. Identify and create alliances with nearby aviculture clubs to encourage them to get involved with the project involvement as funders.

Specific objective 6.4.: Direct income.

Detect opportunities and develop business strategies such as selling POP material about the project, offering advisory services by project staffers or selling bird-friendly coffee to consumers.

6.4.1 Chocolate.

6.4.2 Other products.

Specific objective 6.5 Conservation strategy

6.5.1 Local and national governments in Venezuela and Guyana.

6.5.1.1 Promote this Action Plan among local governments with the purpose of declaring Regional Programs for the Red Siskin conservation.

6.5.1.2 Promote the present Red Siskin Conservation Plan as "National Program".

6.5.2 Validate the Action Plan for the Red Siskin conservation before international institutions.

6.5.2.1 Birdlife-SSC

6.5.2.2 CPG

Specific objective 6.6 Management of partners and alliances

Actions:

6.6.1 Maintenance.

6.6.2 New partners.

6.6.2.1 Strategy.

6.6.2.1.1 List of potential partners and benefits for the project.

6.6.2.1.2 Development of the strategy.

6.6.2.2 Implementation of the strategy.

Specific objective 6.7.: Program for volunteers and interns.

Encourage the involvement of professionals or training technicians who are willing to offer their services to the project as volunteers.

Specific objective 6.8.: Coordination

Actions:

6.8.1 Guarantee coordinators by country.

6.8.1.1 United States

6.8.1.2 Venezuela

6.8.1.3 Guyana

6.8.2 Promote the formation of local capacities of the Red Siskin Initiative.

6.8.3 Conservation strategy management.

6.8.3.1 Promote Red Siskin members meeting within the frame of scientific congresses every 3 years.

6.8.3.2 Monitoring and control

6.8.3.2.1 Annual reviewing of the Red Siskin Conservation Strategy.

6.8.3.2.2 Semi-annual update of action's progress.

6.8.3.2.3 Semi-annual newsletter publication.

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