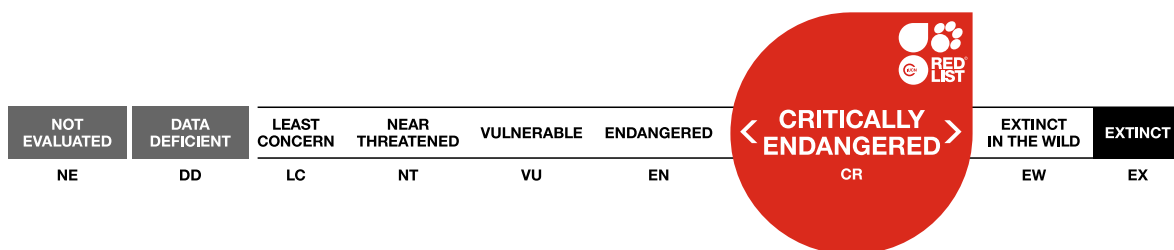


## *Iguana iguana* Saba subpopulation, Saba Green Iguana

Assessment by: van den Burg, M.P. & Debrot, A.O.



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**Citation:** van den Burg, M.P. & Debrot, A.O. 2022. *Iguana iguana* (Saba subpopulation). The IUCN Red List of Threatened Species 2022: e.T220903552A220903555.

<https://dx.doi.org/10.2305/IUCN.UK.2022-2.RLTS.T220903552A220903555.en>

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## Taxonomy

Kingdom	Phylum	Class	Order	Family
Animalia	Chordata	Reptilia	Squamata	Iguanidae

**Scientific Name:** *Iguana iguana Saba subpopulation* (Linnaeus, 1758)

### Synonym(s):

- *Iguana melanoderma* Breuil, Schikorski, Vuillaume, Krauss, Morton, Corry, Bech, Jelić & Grandjean, 2020
- *Lacerta iguana* Linnaeus, 1758

**Parent Species:** See [Iguana iguana](#)

### Common Name(s):

- English: Saba Green Iguana, Common Green Iguana, Saban Black Iguana

### Taxonomic Source(s):

Iguana Taxonomy Working Group (ITWG) [Buckley, L.J., de Queiroz, K., Grant, T.D, Hollingsworth, B.D., Malone, C.L., Pasachnik, S.A., Reynolds, R.G. and Zarza, E.]. 2022. A Checklist of the Iguanas of the World (Iguanidae; Iguaninae). 2022 Supplement to: 2016 *Herpetological Conservation and Biology* 11(Monograph 6): 4–46. Available at: [https://www.iucn-isg.org/wp-content/uploads/2022/05/ITWG\\_Checklist\\_2022\\_Supplement.pdf](https://www.iucn-isg.org/wp-content/uploads/2022/05/ITWG_Checklist_2022_Supplement.pdf).

### Taxonomic Notes:

This subpopulation belongs to a larger subset of *Iguana iguana* that was proposed as a new species (*Iguana melanoderma*) by Breuil *et al.* 2020. This group of iguanas include those found on Saba, Montserrat, coastal islets of Venezuela, as well as a mainland Venezuelan area in the vicinity of Cumaná. No precise mainland range, nor a list of island absence/presence for this taxon was described. Due to limited genetic and morphological data presented, this species proposal is not recognized by the Iguana Taxonomy Working Group (ITWG 2022) at this time, and these subpopulations remain part of *Iguana iguana iguana*.

## Assessment Information

**Red List Category & Criteria:** Critically Endangered A3ce; B1ab(iii,v) [ver 3.1](#)

**Year Published:** 2022

**Date Assessed:** July 27, 2022

### Justification:

The Saba Green Iguana subpopulation is a taxon of conservation concern, found only on the island of Saba, and has an adjusted extent of occurrence of 24 km<sup>2</sup> to match the area of occupancy. The habitat is degraded by feral goats and the iguana is threatened by hybridisation with the invasive Common Green Iguana originating from Central America and island populations north of Venezuela. Based on observed rapid rates of decline for other native *Iguana* populations in the Lesser Antilles when invaded by non-

native iguanas, the predicted future decline of the Saba population is more than 80% within three generations (33–42 years).

The current population size is estimated at 6,000–10,000 individuals. Knowledge about past population sizes is absent, but is expected to have been significantly affected during years with high-intensity hurricane seasons, as well as by agricultural activity and deforestation, particularly during the 18th and 19th centuries when agriculture was much more prevalent on Saba.

## Geographic Range

### Range Description:

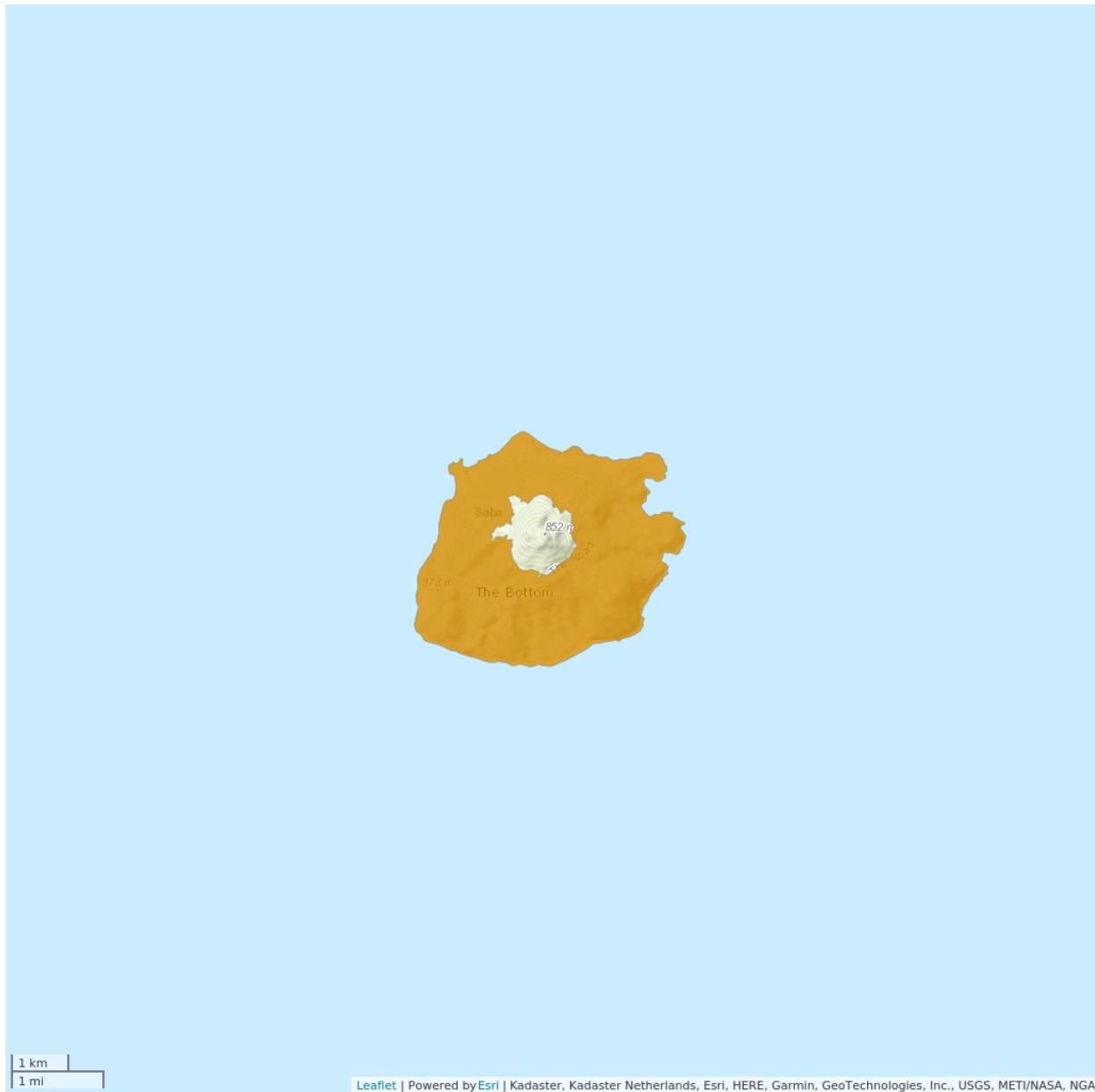
The Saba Green Iguana is believed to mainly occur between sea level and *ca* 530 m elevation, though higher elevations might be inhabited by low numbers of iguanas (van den Burg *et al.* submitted b). Elevations of 400–500 m and above are dominated by dense tropical forest that can obscure iguana sightings. Additionally, these forests are often covered in clouds that are entrapped by the 887 m peak of Mount Scenery, and therefore not likely to be ideal iguana habitat. This iguana has a total area of occupancy (AOO) of 24 km<sup>2</sup>, using a 2x2 km grid overlaid across the entire island, although the exact distribution is not known and very unlikely to be continuous. The estimated extent of occurrence by minimum convex polygon encompassing Saba is 14.5 km<sup>2</sup> and adjusted to 24 km<sup>2</sup> to align with the definition of AOO.

Lazell (1973) noted that the population occurred island-wide, including up to the summit of Mount Scenery. However, during a recent population assessment no iguanas were observed higher than 530 m along the volcano's slopes (van den Burg *et al.* submitted b). This discrepancy is likely the result of forest regeneration at higher elevation, as this area was previously within the former Dinzey Plantation, which was the largest plantation by the mid-19th century and the only one above *ca* 400 m (Espersen 2017, van den Burg *et al.* submitted b). In general, higher-elevated regions of the island were formerly used for agriculture (De Palm 1985), and therefore were likely to have been better suited to thermoregulation for large herpetofauna. Detecting iguanas would have also been easier in open canopy plantations.

### Country Occurrence:

**Native, Extant (resident):** Bonaire, Sint Eustatius and Saba (Saba)

# Distribution Map

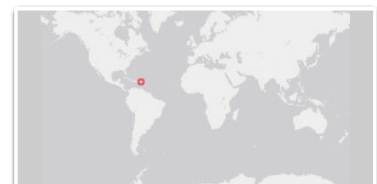
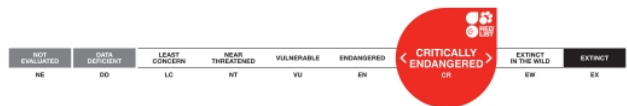


## Legend

■ EXTANT (RESIDENT)

## Compiled by:

van den Burg, M.P. and Debrot, A.O. (IUCN SSC Iguana Specialist Group) 2022



The boundaries and names shown and the designations used on this map do not imply any official endorsement, acceptance or opinion by IUCN.

## Population

The Saba Green Iguana population is currently estimated to be  $8,233 \pm 2,205$  iguanas, of which the majority occurs on the southern and eastern sides of the island (van den Burg *et al.* submitted b). Although non-native Common Green Iguanas are present at two sites in mixed species groups (van den Burg *et al.* submitted a,b), these have not yet replaced the native population. However, since hybridisation is believed to have already occurred, population decline is likely to follow a similar pattern with a high replacement rate, as has been observed in the region with the Lesser Antillean Iguana (*Iguana delicatissima*; van den Burg *et al.* 2018a). Between hybridisation and competitive displacement by non-native iguanas, the Saba Green Iguana population is projected to decline by more than 80% within the next 33–42 years (three generations).

Potential significant changes in recent past population sizes are also suspected, aligning with hurricane-associated population declines observed in the neighbouring *Iguana delicatissima* population on Sint Eustatius (van den Burg *et al.* 2022c). On Sint Eustatius, the *I. delicatissima* population decreased by 25% during the high-intensity hurricane year of 2017. Although population data is not available for Saba pre-2017, a similar impact on total population size is likely.

Early Caribbean inhabitants are believed to be responsible for originally translocating Common Green Iguanas to Saba and Montserrat, given the large geographical over-water distance to their closest genetic relatives within Venezuela (Breuil *et al.* 2019, van den Burg *et al.* submitted b). As with other insular iguanid populations that extended over water (either naturally or with human aid), the initial population size is suspected to have been small but the timing of its arrival on Saba is unknown.

**Current Population Trend:** Decreasing

## Habitat and Ecology (see Appendix for additional information)

The Saba Green Iguana occupies xeric and tropical dry scrub and woodland, littoral woodland, and mid-altitude (transitional) rainforest, as well as rocky slopes. Across Saba, the quality of the habitats vary. The majority of the iguana population occurs between 180–390 m in two natural habitat types, as well as in residential areas (van den Burg *et al.* submitted b). The Saba Green Iguana subpopulation is uncommonly terrestrial among *Iguana* sp. and can be found at sites with few trees if there are large boulders for burrowing; highest local densities are found within the *Aristida-Bothriochloa* grassland habitat type (de Freitas *et al.* 2016). Research is needed to describe differences in habitat occurrence among life stages, and where hatchlings and juveniles remain during their first year.

Like other *Iguana iguana*, the Saba subpopulation is a generalist herbivore, with a diet that includes leaves, fruits, and flowers. Seasonal variation in the species consumed is expected, as well as the iguana's presumed role in dispersing seeds and elevating the rate of seed germination (de A. Moura *et al.* 2015). Research assessing the iguana's specific diet on Saba is needed.

Data on sexual maturity for this subpopulation is absent, but presumed to be comparable to other *Iguana iguana* populations and may begin at 2–3 years. This also holds for longevity and generation length, with the latter estimated at 11–14 years (Bock *et al.* 2020, van den Burg *et al.* 2018a).

Little data on clutch size has been collected, though it is believed to be correlated with body size as in

other *Iguana iguana* populations (Bock *et al.* 2020). For the Montserrat subpopulation, Blankenship (1990) indicated a range of 15–30 eggs, although no sample size is given on which this range was based. Only a single 32.5 cm snout-to-vent length female was studied on Saba, which had 29 developed eggs. Given that females on Saba are known to reach larger body sizes than on Montserrat, maximum clutch size is also expected to be higher (van den Burg *et al.* submitted b). Less than five nest sites have been found to date, all of which contained nests of multiple females (range 2–15; van den Burg *et al.* submitted b). Juveniles measuring 9.1 cm snout-to-vent length have been observed during August, suggesting the hatching season takes place roughly July to early August (van den Burg *et al.* submitted b).

**Systems:** Terrestrial

## Use and Trade

Similar to other Lesser Antillean iguanids, the Saba subpopulation was impacted from hunting for human consumption by Amerindians (Bochaton *et al.* 2016, Bochaton 2022), as bones have been excavated in soil layers dating to at least 800–1400 AD when Amerindians were present (M. Hoogland pers. comm. 2022).

The Saba Green Iguana population is included under *Iguana iguana* in Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), as well as on Appendix III of the UNEP Specially Protected Areas and Wildlife (SPA) protocol.

Interest from the international pet trade has recently focussed on the Saba Green Iguana. Online surveys, both of social media and the CITES-database, show that melanistic iguanas are sold in the pet trade despite an absence of CITES export permits from native range countries. Those surveys highlighted how iguanas from Saba were illegally transported to neighbouring Sint Maarten, from where either wild-captured or subsequent captive-bred individuals were sold to numerous countries across the globe (Noseworthy 2017, van den Burg and Weissgold 2020). This trade has been confirmed by genetic analyses of two pet-trade iguanas held by a USA-based breeder (Mitchell *et al.* in review). Complete knowledge on the total number of animals taken is absent, as is the frequency of this illegal practice currently.

## Threats (see Appendix for additional information)

The main threat to the Saba Green Iguana subpopulation is the presence of non-native Common Green Iguanas that have recently arrived, presumably by cargo shipments from neighbouring Sint Maarten (van den Burg *et al.* submitted a). Genetic and morphological data provide preliminary evidence that hybridisation has already occurred. However, based on genetic data, some Saba Green Iguanas were/are present within the non-native population on Sint Maarten (van den Burg *et al.* 2018b), which highlights that the presence of hybridisation is challenging to confirm during early phases of introduction. Non-native Common Green Iguanas are currently present at two sites on Saba, at minimum: 1) near the harbour closest to the presumed main point of incursion, and 2) just north of the Windwardside settlement near the centre of the island (van den Burg *et al.* submitted a).

Although the effect of non-native iguana presence and hybridisation has yet to be thoroughly assessed for the native Saba population, insights from other regional native iguana populations highlight a

predicted major negative impact (Morton and Krauss 2011, Knapp *et al.* 2014, van den Burg *et al.* 2018a, Breuil *et al.* 2019). Non-native iguanas in the Caribbean tend to originate from the Central and South American mainland, where iguanas have larger clutch sizes (see Fitch and Henderson 1977). On Saba, genetic analysis of the current non-native iguanas revealed origins from Central America and the island group of Aruba, Bonaire, and Curaçao (van den Burg *et al.* submitted a). Although fecundity in hybrids is poorly studied, preliminary evidence suggests hybrids also have a higher fecundity compared to native insular iguana populations (van Wagensveld and van den Burg 2018). Additionally, non-native and hybrid iguanas attain larger body sizes and are behaviourally more aggressive than native iguanas (Vuillaume *et al.* 2015). These differences have typically led to competitive replacement of native iguanas by non-native invasive and hybrid iguanas, and eventual loss of genetically pure native iguana populations. Failure to install local measures to prevent further incursions, as well as act quickly to cull and remove non-native invasive iguanas when present, has led to extirpation of native iguana populations across the Lesser Antilles, often within several decades (van den Burg *et al.* 2018a).

Saba is occupied by a large feral goat population (*Capra hircus*), though recently an eradication effort has started. The population size is unknown, but it is believed to be several thousand goats. Native species and habitats are heavily affected and degraded by feral goat overgrazing. Goats are mainly present in the arid coastal areas along the southern and eastern regions of the island, where both goat abundance and density peak (de Freitas *et al.* 2016), whereas in the northern areas of the island goats appears to be less. This distribution is similar to that of the iguana population, and is also where the known iguana nesting sites are found (van den Burg *et al.* submitted b). Goats are known to physically destroy iguana nests by trampling (Garcia *et al.* 2020), and they also cause soil erosion (de Freitas *et al.* 2016) which is particularly concerning within nesting areas.

A study on the occurrence and seasonal changes in traffic mortality remains pending. Data from other regional iguana populations highlights a surge in road-kill numbers during the nesting season as female iguanas migrate to and from nesting sites (Knapp *et al.* 2016). During a one-month survey period, four iguanas were sighted or reported as having been killed in traffic (van den Burg *et al.* 2022a). On Saba, roads lie largely at mid- to higher-island elevations, whereas known suitable nesting sites are principally found at lower elevations. Hence, iguanas living above the main road system and those living within residential areas would be especially prone to road mortality. Construction of additional roads to link a proposed new harbour to other parts of the road system could lead to increased mortality, as these would be constructed mainly at lower elevations.

There are advanced plans for the construction of a new harbour to the east of the current Fort Bay Harbour. Although an ecological and impact assessment for the harbour was prepared and focussed on several species, iguanas were not included. Given the potential presence of important nesting sites at these low elevations, inclusion of iguanas into the impact assessment report should receive high priority.

Mining for guano and sulphur formerly took place on Saba, along the northeast coast of the island (Westermann 1949). Today, mining for rock occurs at a large quarry just east of Fort Bay Harbour. While this degrades local habitat and may endanger iguanas in several ways (e.g., road mortality and rock collision), its potential impact remains unknown.

## **Conservation Actions (see Appendix for additional information)**

On Saba, there is no current national legislation or legal protective status for the iguana population, which is sorely needed. The population is also not protected under European law given the status of Saba as a 'special municipality' within the Kingdom of the Netherlands. Saba has a single terrestrial national park, Saba National Land Park (43 hectares), that lies on the north-eastern side of the island and is an area with a generally low density of iguanas. Regulations in the park have not been publicised; visitor rules are stipulated by the Saba Conservation Foundation but are not laws. The taxon is included in CITES Appendix II (see Use and Trade section above).

A rapid response action to remove non-native iguanas, similar to recent efforts on Sint Eustatius (Debrot *et al.* 2022), is planned for late 2022 and early 2023. Additional genetic and bacterial samples will be collected and analysed to assess the further presence of non-native iguanas and possibly introduced pathogens.

An ongoing effort to eradicate the feral goat population is expected to bring beneficial effects to ecosystem quality and thereby both directly and indirectly benefit the iguana population.

## Credits

**Assessor(s):** van den Burg, M.P. & Debrot, A.O.

**Reviewer(s):** Grant, T.D.

**Authority/Authorities:** IUCN SSC Iguana Specialist Group



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## Citation

van den Burg, M.P. & Debrot, A.O. 2022. *Iguana iguana* (Saba subpopulation). *The IUCN Red List of Threatened Species* 2022: e.T220903552A220903555. <https://dx.doi.org/10.2305/IUCN.UK.2022-2.RLTS.T220903552A220903555.en>

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## Appendix

### Habitats

(<http://www.iucnredlist.org/technical-documents/classification-schemes>)

Habitat	Season	Suitability	Major Importance?
1. Forest -> 1.5. Forest - Subtropical/Tropical Dry	Resident	Suitable	Yes
3. Shrubland -> 3.5. Shrubland - Subtropical/Tropical Dry	Resident	Suitable	Yes
4. Grassland -> 4.5. Grassland - Subtropical/Tropical Dry	Resident	Suitable	Yes
6. Rocky areas (eg. inland cliffs, mountain peaks)	-	-	-
13. Marine Coastal/Supratidal -> 13.1. Marine Coastal/Supratidal - Sea Cliffs and Rocky Offshore Islands	Resident	Suitable	No
14. Artificial/Terrestrial -> 14.4. Artificial/Terrestrial - Rural Gardens	Resident	Suitable	Yes
14. Artificial/Terrestrial -> 14.5. Artificial/Terrestrial - Urban Areas	Resident	Suitable	No
14. Artificial/Terrestrial -> 14.6. Artificial/Terrestrial - Subtropical/Tropical Heavily Degraded Former Forest	Resident	Suitable	Yes

### Use and Trade

(<http://www.iucnredlist.org/technical-documents/classification-schemes>)

End Use	Local	National	International
13. Pets/display animals, horticulture	No	No	Yes

### Threats

(<http://www.iucnredlist.org/technical-documents/classification-schemes>)

Threat	Timing	Scope	Severity	Impact Score
1. Residential & commercial development -> 1.2. Commercial & industrial areas	Future	Unknown	Negligible declines	Unknown
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 2. Species Stresses -> 2.1. Species mortality 2. Species Stresses -> 2.3. Indirect species effects -> 2.3.7. Reduced reproductive success		
2. Agriculture & aquaculture -> 2.3. Livestock farming & ranching -> 2.3.1. Nomadic grazing	Ongoing	Majority (50-90%)	Slow, significant declines	Medium impact: 6
	Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.3. Indirect species effects -> 2.3.7. Reduced reproductive success		
3. Energy production & mining -> 3.2. Mining & quarrying	Ongoing	Minority (<50%)	Unknown	Unknown
	Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation		

		2. Species Stresses -> 2.1. Species mortality		
4. Transportation & service corridors -> 4.1. Roads & railroads	Ongoing	Unknown	Slow, significant declines	Unknown
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 2. Species Stresses -> 2.1. Species mortality 2. Species Stresses -> 2.3. Indirect species effects -> 2.3.7. Reduced reproductive success		
5. Biological resource use -> 5.1. Hunting & trapping terrestrial animals -> 5.1.1. Intentional use (species is the target)	Past, likely to return	Minority (<50%)	Unknown	Past impact
	Stresses:	2. Species Stresses -> 2.1. Species mortality 2. Species Stresses -> 2.3. Indirect species effects -> 2.3.7. Reduced reproductive success		
8. Invasive and other problematic species, genes & diseases -> 8.1. Invasive non-native/alien species/diseases -> 8.1.2. Named species (Iguana iguana)	Ongoing	Whole (>90%)	Rapid declines	High impact: 8
	Stresses:	2. Species Stresses -> 2.3. Indirect species effects -> 2.3.1. Hybridisation -> 2.3.2. Competition		
8. Invasive and other problematic species, genes & diseases -> 8.1. Invasive non-native/alien species/diseases -> 8.1.2. Named species (Capra hircus)	Ongoing	Majority (50-90%)	Slow, significant declines	Medium impact: 6
	Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.3. Indirect species effects -> 2.3.7. Reduced reproductive success		

## Conservation Actions in Place

(<http://www.iucnredlist.org/technical-documents/classification-schemes>)

Conservation Action in Place
In-place research and monitoring
Action Recovery Plan: No
Systematic monitoring scheme: No
In-place land/water protection
Conservation sites identified: No
Percentage of population protected by PAs: 1-10
Area based regional management plan: No
Occurs in at least one protected area: Yes
Invasive species control or prevention: Yes
In-place species management
Harvest management plan: No
Successfully reintroduced or introduced benignly: No

<b>Conservation Action in Place</b>
Subject to ex-situ conservation: No
In-place education
Subject to recent education and awareness programmes: No
Included in international legislation: Yes
Subject to any international management / trade controls: Yes

## Conservation Actions Needed

(<http://www.iucnredlist.org/technical-documents/classification-schemes>)

<b>Conservation Action Needed</b>
1. Land/water protection -> 1.1. Site/area protection
2. Land/water management -> 2.2. Invasive/problematic species control
5. Law & policy -> 5.1. Legislation -> 5.1.2. National level

## Research Needed

(<http://www.iucnredlist.org/technical-documents/classification-schemes>)

<b>Research Needed</b>
1. Research -> 1.3. Life history & ecology
2. Conservation Planning -> 2.1. Species Action/Recovery Plan
3. Monitoring -> 3.1. Population trends

## Additional Data Fields

<b>Distribution</b>
Estimated area of occupancy (AOO) (km <sup>2</sup> ): 24
Continuing decline in area of occupancy (AOO): Unknown
Extreme fluctuations in area of occupancy (AOO): Unknown
Estimated extent of occurrence (EOO) (km <sup>2</sup> ): 24
Continuing decline in extent of occurrence (EOO): Unknown
Extreme fluctuations in extent of occurrence (EOO): No
Number of Locations: 1
Continuing decline in number of locations: No
Extreme fluctuations in the number of locations: No

<b>Distribution</b>
Lower elevation limit (m): 0
Upper elevation limit (m): 530
<b>Population</b>
Number of mature individuals: 6028-10438, 8233
Continuing decline of mature individuals: Yes
Extreme fluctuations: Unknown
Population severely fragmented: No
No. of subpopulations: 1
Continuing decline in subpopulations: No
Extreme fluctuations in subpopulations: No
All individuals in one subpopulation: Yes
No. of individuals in largest subpopulation: 6028-10438,8233
<b>Habitats and Ecology</b>
Continuing decline in area, extent and/or quality of habitat: Yes
Generation Length (years): 11-14
Movement patterns: Not a Migrant

## The IUCN Red List Partnership



The IUCN Red List of Threatened Species™ is produced and managed by the [IUCN Global Species Programme](#), the [IUCN Species Survival Commission \(SSC\)](#) and [The IUCN Red List Partnership](#).

The IUCN Red List Partners are: [ABQ BioPark](#); [Arizona State University](#); [BirdLife International](#); [Botanic Gardens Conservation International](#); [Conservation International](#); [Missouri Botanical Garden](#); [NatureServe](#); [Re:wild](#); [Royal Botanic Gardens, Kew](#); [Sapienza University of Rome](#); [Texas A&M University](#); and [Zoological Society of London](#).