The long-term protection of the Galapagos Islands and its flora and fauna depends upon the restoration of healthy natural ecosystems. The balance among the plants and animals that evolved in Galapagos was damaged long ago by pirates, whalers, settlers, and others, as well as the many invasive species that arrived with them. Recent increases in development and human activity and the proliferating impacts of aggressive, introduced species have continued to disrupt many fundamental natural processes involving interactions among native plants, animals, microorganisms, and their environment. If left unchecked, the Galapagos Islands will eventually suffer irreversible losses of native and endemic flora and fauna.

In our program area of Wildlife and Ecosystem Conservation, our primary focus is the Giant Tortoise Restoration Initiative (GTRI), carried out in collaboration with the Galapagos National Park Directorate (GNPD) and a group of international scientists. We also work closely with the Charles Darwin Foundation (CDF), local and international NGOs, Ecuadorian governmental agencies, and various individual scientists from US and Ecuadorian universities to protect, conserve, and restore healthy, balanced plant and animal communities, both terrestrial and marine, and establish effective science-based management strategies to ensure the sustainability of these communities in perpetuity. Through our projects, we encourage the development of effective and efficient knowledge management systems that are easily accessible and user-friendly, and strive to develop enhanced capacities in all fields at the local level.
Two centuries ago, the Galapagos Islands were home to more than 200,000 giant tortoises; today only 10% remain. Their dramatic decline was due primarily to overexploitation by whalers who used them for food on their long voyages in the 1800s. In more recent years, Galapagos tortoises have been and continue to be threatened by predation and habitat destruction from invasive species like rats and goats. These gentle giants were decimated, with much greater destruction of populations on the smaller arid islands.

It was on these islands that the saddleback tortoises evolved — with their smaller body size, longer legs and neck, and the front of their shell raised, which allowed them to reach higher for food, primarily cactus pads. Contrary to the huge domed-carapace tortoises of the wet highland regions of the larger islands of Galapagos, the saddlebacks’ physical characteristics were ideally suited to the arid islands. All four of the extinct tortoise species (Pinta, Floreana, Santa Fe, and Fernandina) and the two most threatened species (Pinzón and Española) are all saddlebacks. Recovering these populations and their islands is vital to restoring Galapagos.

Giant tortoises have played a natural and essential role as ecosystem engineers in the Galapagos Islands for more than one million years, profoundly shaping the biological landscape to the benefit of the islands’ other extraordinary creatures and plants. In addition to their crucial ecological role, giant tortoises play an important economic role as the Galapagos Islands’ greatest eco-tourism attraction.

The long-term goal of the Giant Tortoise Restoration Initiative is to restore tortoise populations throughout the archipelago to their historical numbers. While achieving this vision is far in the future, the first steps have been taken and the process is well underway.
The Giant Tortoise Restoration Initiative builds on decades of tortoise research and management. Notable past events and accomplishments provided the foundation for the more recent accomplishments and those yet to come.

1965 – PRESENT
The world-class tortoise breeding and repatriation program of the Galapagos National Park Directorate and the Charles Darwin Foundation was established in 1965. Since then, this program has repatriated more than 4,000 young tortoises to their islands of origin.

1972 – 2012
Lonesome George (pictured below), the last Pinta Island tortoise, was discovered and taken into captivity where he lived out his life as a conservation icon at the Tortoise Center on Santa Cruz Island. He passed away in June 2012 at about 100 years old.

2009 – PRESENT
Major advances are being made in understanding tortoise movement and the technology to study it via support from the U.S. National Science Foundation.

2014 – PRESENT
The Giant Tortoise Restoration Initiative was launched with defined goals for every species of Galapagos tortoise.

1994 – PRESENT
Genetic studies of Galapagos giant tortoises were initiated at Yale University. Results from this ever-expanding work inform research and management strategies for all populations. Genetic testing of more than 1,600 tortoise blood samples collected on Wolf Volcano in 2008 identified numerous tortoises with partial ancestry from Floreana (extinct since the 1850s) and Pinta (extinct since the death of Lonesome George in 2012). We now have the opportunity to recover these lost lineages to their original islands.

1997 – 2006
Project Isabela, the largest ecosystem restoration initiative ever carried out in a protected area, successfully eliminated introduced goats — one of the biggest threats to giant tortoises — from northern Isabela, Santiago, and Pinta Islands. Many said the task was impossible. Project Isabela proved otherwise, with ecosystems now rapidly recovering on these islands.

2010
Tortoises were returned to Pinta Island. 39 sterilized hybrid adult tortoises were released and are now thriving and exerting a significant ecological impact on the island and modifying the habitat to facilitate future tortoise releases.

2010 – PRESENT
A major survey of tortoises, cacti, and woody vegetation conducted on Española Island in 2010 revealed that the Española tortoise, nearly extinct 40 years ago, is now secure with about 1,000 tortoises breeding on the island. Monitoring continues.

JULY 2012
An international workshop in Galapagos, Giant Tortoise Recovery through Integrated Research and Management, generated the priorities and strategies for the GTRI.

DECEMBER 2012
A rat eradication campaign was carried out on Pinzón Island. The absence of the introduced black rat will allow natural recruitment into the tortoise population.

2014 – PRESENT
The Giant Tortoise Restoration Initiative was launched with defined goals for every species of Galapagos tortoise.

NOVEMBER 2014
The first in-depth review of the three Galapagos National Park tortoise breeding and rearing centers resulted in improvements and plans for data management, tortoise care, infrastructure, and long-term maintenance.

DECEMBER 2014
The first in situ hatchling tortoises to survive in over a century were found on Pinzón Island — a result of the successful rat eradication two years before.

JUNE 2015
The first 201 juvenile Española tortoises were released on Santa Fe Island to begin the repopulation of that island with tortoises genetically close to the original species.

OCTOBER 2015
The identification of a new species of Galapagos tortoise — Chelonoidis donfaustoi or the Eastern Santa Cruz Tortoise — was announced.

NOVEMBER 2015
Scientists and park rangers embarked on a major expedition to Wolf Volcano on northern Isabela Island to collect hybrid tortoises with partial Pinta and Floreana tortoise ancestry to initiate breeding programs for the two islands.
Returning Giant Tortoises to Santa Fe Island

The Santa Fe tortoise went extinct sometime in the mid 1800s. No complete specimen exists, but Yale University geneticists have used fragments available in museums to determine that the Española tortoise is the species most closely related to the extinct Santa Fe tortoise. Española tortoises reared in the Santa Cruz Tortoise Center are being used to reestablish a tortoise population on Santa Fe. The first 201 juvenile Española tortoises were released there in June 2015. Monitoring and additional releases are planned for the next ten years.

Total funding needed: $100,000
$20,000/year for international and interisland travel, equipment, and personnel

Reestablishing Tortoise Populations on Floreana and Pinta Islands

Tortoise extinctions occurred on Floreana in the mid 1800s and on Pinta in 2012, with the death of Lonesome George. Over the last two decades, genetic analyses of Galapagos giant tortoises (wild tortoises and museum specimens) have opened a window of opportunity for restoring these populations using hybrids found on Wolf Volcano (northern Isabela), which have partial ancestry from either Floreana or Pinta tortoises. Breeding programs for both populations will begin in 2017. Thirty-two adult tortoises (some known to have partial Pinta or Floreana tortoise ancestry and the rest with similar morphology) were taken from Wolf Volcano to the Tortoise Center on Santa Cruz in November 2015. Genetic analyses will determine their potential for the breeding programs. More tortoises may be collected in the future. Offspring from the breeding groups will be released onto Pinta and Floreana over the next two decades.

Total funding needed: $150,000
$30,000/year for international and interisland travel, equipment, and personnel

Improving the Tortoise Breeding and Rearing Centers

The Tortoise Breeding and Rearing Centers of the Galapagos National Park Directorate are an integral part of tortoise conservation and restoration. Providing scientific advice and supporting the GNPD in its efforts to ensure that the Centers are operating efficiently and effectively is a core part of the GTRI. Current work focuses on improving data management and establishing adequate facilities for the Pinta and Floreana breeding programs.

Total funding needed: $100,000
$20,000/year for international and interisland travel, equipment, and personnel

Understanding Tortoise-Cactus-Woody Vegetation Interactions and the Role of Tortoises as Ecosystem Engineers

A survey of tortoises, cactus, and woody plants was carried out on Española in 2010, and is repeated annually. Similar work is currently carried out on Santa Fe Island. A larger, archipelago-wide research project will help determine interactions among these groups and implications for many other Galapagos species that depend on them. Of particular importance is the status of cactus populations on the arid islands.

Total funding needed: $125,000
$25,000/year for international and interisland travel, equipment, and personnel

Population Surveys of Tortoises on San Cristóbal, Santa Cruz (Eastern Santa Cruz Tortoise), Southern Isabela, and Santiago

During the tortoise workshop in 2012, Galapagos National Park personnel and international experts identified several tortoise populations with major knowledge gaps related to tortoise distribution, genetic relationships among tortoises, and genetic diversity in repatriated tortoises. For example, much of the tortoise habitat on San Cristóbal Island has never been comprehensively surveyed and the genetics of the tortoise populations on southern
Isabela are poorly understood. More intensive surveys of these populations are needed. Modern genetic analysis combined with intensive field work, including tracking tortoise movements with cutting-edge GPS technology, can help resolve the many unknowns and provide for more effective conservation measures.

**Total funding needed: $175,000**

- $35,000/year for international and interisland travel, equipment, and personnel

**Fernandina Island**

Only one giant tortoise has ever been seen on Fernandina Island, and it was collected by the California Academy of Sciences during their 1905-06 expedition. Since then, tortoises have been considered extinct, most likely due to volcanic activity. However, tortoise scat was found in 1964, a possible sighting of a giant tortoise was documented during an aerial survey in recent years, and additional scat and tracks were observed on a recent botanical expedition. A search is needed to determine if these sightings are in fact evidence of a Fernandina tortoise population.

**Total funding needed (one year only): $30,000**

**Genetic Analyses of Tortoises**

During the international tortoise workshop in 2012, tortoise genetics played an important role in determining research and management needs for the different populations. Ongoing analyses are needed as we move forward with the Pinta and Floreana tortoise breeding programs. In addition, knowledge gaps in tortoise genetics must be filled to improve tortoise restoration efforts. Priority populations include Pinzón, San Cristóbal, and southern Isabela tortoises. Some of this work has been initiated but additional analyses are needed. GC covers only a portion of the funding requirements.

**Total funding needed: $150,000**

- $30,000/year to help support the genetics analyses

**Evaluation and Mitigation of Human Interactions with and Impact on Giant Tortoises**

Giant tortoises were a traditional part of the diet of settlers in Galapagos. When the GNP was established in 1959, efforts to curb the hunting of tortoises were generally successful. However, killing tortoises underwent a resurgence in the 1990s and has become a serious concern on southern Isabela. In addition to poaching, increased development in the highlands of the inhabited islands has resulted in a network of road systems and infrastructure that impacts tortoise movements. A series of mitigation strategies will be developed including education, community outreach, and enforcement actions.

**Total funding needed: $100,000**

- $20,000/year for international and interisland travel, equipment, and personnel
Over the past 25 years, Galapagos Conservancy has helped to restore many threatened animal populations and to reduce the impact of invasive species with an unprecedented commitment of personnel, resources, and expertise. Between 2016 and 2020, GC seeks to invest more than $3 million in wildlife and ecosystem conservation projects, in addition to our work restoring giant tortoises. Our overarching goals are:

- Reducing impacts from introduced species and improving quarantine systems
- Restoring threatened wildlife populations
- Restoring islands closer to their historical condition

In recent years, conservation efforts have shifted from a species-specific approach to focusing on the restoration of island ecosystems, building on the successful eradication of introduced species, such as feral goats and rats, that dramatically altered the natural systems. GC supports this work primarily through funding high priority projects and partnering with other institutions.

Saving the Land Birds

Several iconic land bird populations are in a spiraling decline. Mangrove and medium tree finches, as well as the Floreana mockingbird, are all critically endangered. The first extinction of a land bird species — the San Cristóbal vermilion flycatcher — was recently detected. Timely studies of all land birds may help prevent future extinctions. With the focus on the inhabited islands of Santa Cruz, San Cristóbal, Isabela, and Floreana, the goal is to develop management strategies to ensure the survival of these rare Galapagos birds. Galapagos Conservancy will continue to fund the lead scientists in this research.

Combatting Invasive Species

Galapagos ecosystems suffer due to the harmful effects of aggressive introduced plants, animals, and micro-organisms. Invasive species alter habitats, crowd out or replace native species, and affect human activities. Developing management tools to combat the most destructive of these invaders is vital, as well as improving methods to identify and prevent new introductions.

Parasitic Flies:

Our top priority is the introduced parasitic bot fly, Philornis downsi. Additional research and management are needed to control this fly, which is having a devastating impact on finch and other small land bird populations. Current investigation is focused on avian-safe insecticides, mass-trapping with pheremones, sterile male release, and biological control using natural enemies. Galapagos Conservancy will continue to fund the lead scientists in this crucial effort.
GALAPAGOS CONSERVANCY WILL INVEST MORE THAN $3,000,000 OVER 5 YEARS

WILDLIFE CONSERVATION IN ACTION

on Galapagos, as well as long-term monitoring of the vital signs of

those responsible for human welfare, urgently need scientifically-
determined information on the potential impacts of global climate change

Changes to our planet’s climate as a result of human activities could

be more rapid than has been observed in many thousands of years.

Invasive ants prey on both native invertebrates and vertebrates,

including giant tortoise hatchlings, while their mutualistic

relationship with introduced scale insects and aphids can seriously
debilitate plants. Controlling the tropical fire ant (Solenopsis
geminata) is high priority due, in part, to its capacity to disperse

naturally between islands and its negative impact on humans

and native biodiversity. Galapagos Conservancy will continue to

fund scientists researching potential biological control species

(decapitating flies!) to control these and other invasive ants.

Invasive Plants:
The Scalesia forest on Santa Cruz, dominated by the giant daisy-
tree Scalesia pedunculata, is now estimated to cover less than 1%
of its original distribution. While habitat alteration in farmlands
caused the initial decline, invasive plants, blackberry (Rubus niveus)
and the quinine tree (Cinchona pubescens), are largely to blame
for the more recent steep decline of the remaining Scalesia forest.
Galapagos Conservancy will support efforts to develop control
methods to reduce the impact of these invasive plants and restore
the most heavily invaded ecosystems. Upcoming activities include
determining the current distribution of these invasive plants,
monitoring native plant communities in experimental plots and
adding new plots, assessing the impact of plant control programs
on native wildlife, and searching for natural enemies to be used in a
potential biological control program.

Marine Invasives:
Efforts are already in progress to prevent the arrival and spread of
marine invasive species in the Galapagos Marine Reserve (GMR)
and to investigate possible vectors that can transport these species,
such as marine traffic and warmer ocean currents resulting from

Climate Change Implications for Galapagos

and Measuring Vital Signs

Changes to our planet’s climate as a result of human activities could

be more rapid than has been observed in many thousands of years.

In the islands famous as the world’s “laboratory of evolution,” the
unique flora and fauna may not be able to adapt quickly enough.

Decision-makers in all sectors, from natural resource managers to
those responsible for human welfare, urgently need scientifically-
based information on the potential impacts of global climate change
on Galapagos, as well as long-term monitoring of the vital signs of

Galapagos in order to detect even small changes as they happen. A
one-year expert-in-residence is needed to evaluate climate change
implications and adapt global-scale oceanic and atmospheric
processes to the Eastern Tropical Pacific zone, within which the
Galapagos Islands are located. Establishing a Vital Signs monitoring
program will enhance this effort by detecting, in real time, changes
as they occur. Galapagos Conservancy will support the one-year
analysis and the establishment of a Vital Signs Monitoring Program.

Dogs as Conservationists

Due to their keen sense of smell, dogs have been used around
the world to help with a variety of important “detection” jobs.
Galapagos Conservancy recently funded two teams of dogs for use
in Galapagos to:

- Detect already-established, highly invasive Giant African Land
  Snails in Santa Cruz before they spread, or even worse, disperse
to other islands
- Prevent the arrival of new invasive species by sniffing incoming
cargo to detect banned products

Galapagos Biosecurity Agency (ABG)
The ABG controls, regulates, prevents, and reduces the risk of
introduction and dispersal of exotic organisms that put at risk the
native and endemic biodiversity of the Galapagos Islands, human
health, and the local economy. ABG’s work includes: 1) control
and inspection at ports and airports; 2) monitoring pests and
epidemiological surveillance for early detection of new invasives;
and 3) emergency and rapid response actions to eliminate threats
to Galapagos before they become long-term problems. Galapagos
Conservancy supports ABG in implementing new effective
techniques already proven in other countries, including:

- Establishment of new methods for collection and control of
  exotic species in points of embarkation/debarkation
- Investigating the behavior and host preferences of fruit flies on
  Santa Cruz Island
- Developing a baseline for swine diseases to enable decision-making
- Improving food quality and safety of locally-produced dairy
  products through microbiological analysis
- Education and involvement of the community in helping to
detect and notify the ABG of the presence of new introduced
species

Total funding needed: $50,000
$10,000 per year for five years
Partners in Conservation

Galapagos National Park Directorate. The GNPD has its headquarters in Puerto Ayora, Santa Cruz Island, Galapagos and is the Ecuadorian governmental institution responsible for the administration and management of the protected areas of Galapagos. Galapagos Conservancy has worked with the Park for over two decades, providing annual support for projects. Since 2014, the GNPD and GC have been the two lead organizations for the Giant Tortoise Restoration Initiative.

Galapagos Biosecurity Agency. The ABG (Spanish acronym), created in October 2012 as a public institution working within the Ministry of the Environment, has its headquarters in Puerto Ayora, Santa Cruz Island, Galapagos. Its mission is to control, regulate, impede and reduce the risk of introduction, movement, and dispersal of exotic species, which threaten human health and the ecological integrity of Galapagos marine and terrestrial ecosystems. Galapagos Conservancy began supporting ABG in 2014 through the Dogs for Conservation program to control the Giant African Land Snail. Since then, GC has supported their dog and cat clinic as well as further development of their quarantine and control methodologies.

Charles Darwin Foundation. The CDF, an international non-profit organization registered in Belgium, operates the Charles Darwin Research Station in Puerto Ayora, Santa Cruz Island, Galapagos. The CDF’s mission is to provide knowledge and assistance through scientific research and complementary action to ensure the conservation of the environment and biodiversity in the Galapagos Archipelago. Galapagos Conservancy has been a major funder to the CDF since GC’s establishment in 1992; GC primarily supports research aimed at solving some of the highest priority issues in the Islands, as well as the library.

Island Conservation. IC is headquartered in Santa Cruz, California, and has a small staff working in Galapagos. IC’s mission is to prevent extinctions by removing invasive species from islands. This work is tied very closely to much of GC’s work in Wildlife and Ecosystem Conservation. We have supported several projects of IC in the last several years and collaborate with them on projects closely tied to the GTRI.

Total funding needed: $750,000
$150,000 per year for five years

Questions or comments?
Contact comments@galapagos.org or 703-383-0077

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