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ABSTRACT

Galápagos Verde 2050 is a large scale and widespread conservation project that began in January of 2014 through the Charles Darwin Research Station. The two goals of the project include restoring degraded ecosystems, and teaching citizens of the Galápagos Islands sustainable farming techniques. These goals are achieved by planting endemic and native vegetation while applying a wide variety of water saving technologies. The project is being implemented in three distinct phases with each phase addressing a specific group of islands. As of 2018, 72 species have been planted over 71 sites across the archipelago. Since Galápagos Verde 2050's inception, it has been executed by a diverse group of individuals, ranging from professional biologists to both international and local volunteers.

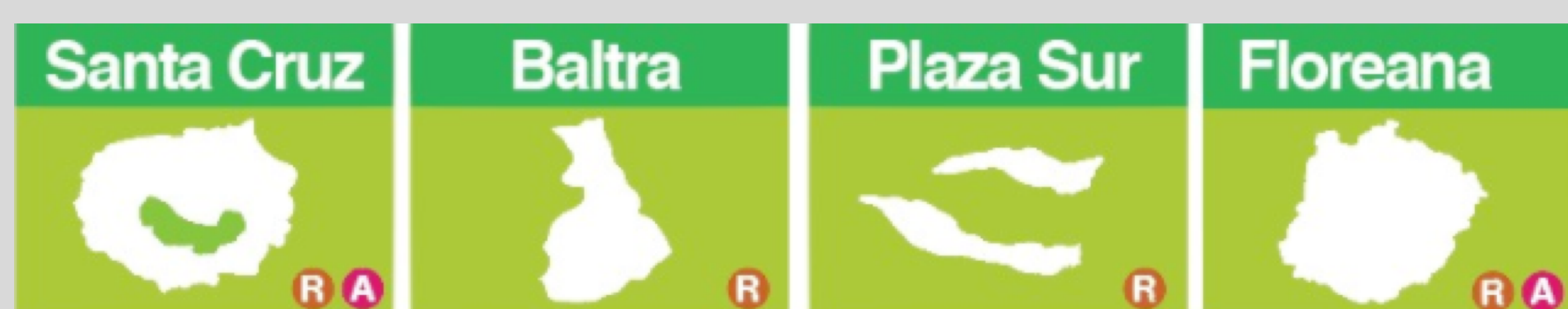


The Galápagos Verde team with tourists at the research station

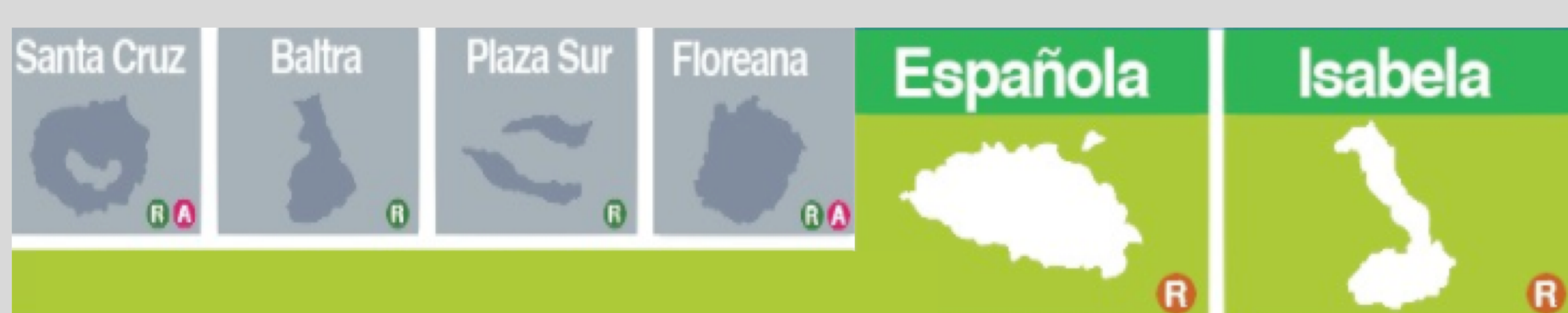
INTRODUCTION

The primary goals of Galápagos Verde 2050 are ecological restoration (R) and implementation of sustainable agriculture (A) on the Galápagos islands through 3 phases.

Phase 1 (2014-2017)



Phase 2 (2017-2027)



Phase 3 (2027-2050)



MATERIALS & METHODS

The primary water saving technology used for Galápagos Verde 2050 was the Groasis Waterboxx® (Fig. 1). This is set up as follows:

- A 15 cm hole is dug and the seedling is planted with a cardboard evaporation cover over the roots to prevent water loss.
- The green basin of the Waterboxx® is filled with water and placed over the plant while a rope wick is placed under the evaporation cover to provide constant moisture to the roots.
- The top is then placed which has channels leading to the basin, allowing the apparatus to collect rainwater so the bin does not have to be refilled as frequently.

For some species an additional protective sleeve was placed around the seedling for upward stability in primary growth and protection from herbivory.

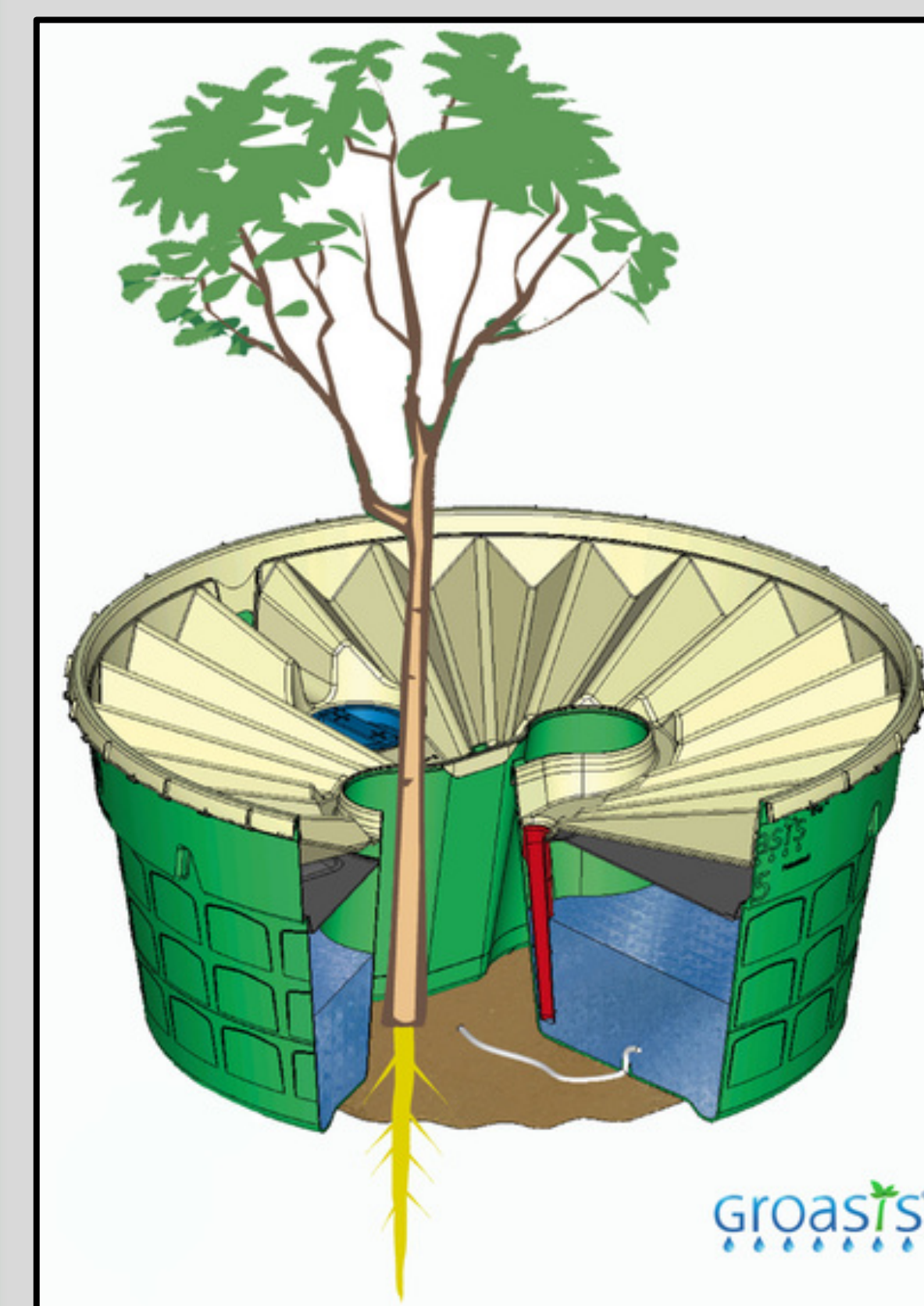


Fig. 1- A Waterboxx® with a cross-section showing the interior components



Fig. 2- Jandry Vasquez monitoring a Waterboxx® on the island of Baltra

- After a seedling is planted it is given a tracking number and the exact coordinates are measured.
- Approximately every three months the plants are revisited and monitored for height (Fig. 2), the presence of leaves or flowers, whether there are signs of herbivory, and then a picture is taken of the plant. If some individuals are dead, they are noted and replaced the following monitoring session.
- These data are entered in an online database, immediately following collection and can be viewed by the public on www.galapagosverde2050.com. On the website you can compare growth and success rates of plants using the technology with control plants that have no Waterboxx®.

RESULTS & DISCUSSION

Galápagos Verde 2050 has planted over 72 species since the beginning of the project in 2014, but one of the most planted species has been *Opuntia echios* var. *echios* (Fig. 3). Also known as the Galápagos prickly pear, it is one of the most recognizable plants on the islands due to its massive size and unique shape.

The island of Plaza Sur has always had a large population of *O. echios*. They are a vital part of the ecosystem as they are the primary food source for the Galápagos land iguana (*Conolophus subcristatus*) (Fig. 3). Unfortunately, due to severe El Niño storms and the introduction of the house mouse (*Mus musculus*) which destroy the cacti roots' system, there has been a steep decline in the *O. echios* population. Thankfully, Plaza Sur is a focal point for the project's goal of ecological restoration. With the help of the Galápagos National Parks System, *M. musculus* was eradicated from the island in 2013 eliminating unwanted herbivory on the cacti. Since then, the Galápagos Verde 2050 team has planted over 300 *O. echios* across the island, and thanks to the Waterboxx® the success rates for the cacti are increasing.



Fig. 3- A large specimen of *Opuntia echios* var. *echios* (above), *C. subcristatus* relaxing in the sun on Plaza Sur (below)

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