

REFORESTATION PROJECT



Final Report

November 2019



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Introduction

Bonaire has never recovered from the historic felling of its trees. The strong influence of feral goats prevents rejuvenation in those parts where a plant cover is still present, thereby reducing the biodiversity of plant and tree species. In addition to these pressures, the habitat of the Yellow-shouldered Amazon parrot is under continual threat from commercial and residential development. Herbivore free enclosures as well as reforestation is a proven solution for the habitat degradation of the island. Due to the relatively harsh climatic conditions on Bonaire, natural development of the vegetation is often slow. Exclusion of exotic herbivores and reforestation can be effective tools in order to add significantly to the biomass and vegetation development as well as other positive ecosystem services (Coolen, 2015; DCNA, 2013). Erosion control by the increased root development, soil and litter build up, carbon sequestration and eventually canopy recovery are examples of these possible trade-offs. An important notice on the forest rehabilitation management is the absence of any scientific documentation about the original forest ecosystem present on the island before human impact. As the current vegetation of Bonaire is impacted and shaped by the presence of exotic herbivores, the current ecosystem is in a clearly degraded state. Forest restoration efforts by Echo are aimed at improving the biomass and biodiversity in order to rehabilitate the degraded vegetation, but the reforestation goals are always based on an estimation of the potential natural vegetation.

The main reforestation objective for Echo is forest restoration and creating awareness about the importance, degradation and vulnerability of the dry forest on Bonaire. This is done by involving the local community in the management and results of these reforestation areas. The scientific documentation of the vegetation within these reforestation enclosures by Echo can expand our knowledge about this important ecosystem. This can support future research on conservation and plant biodiversity on Bonaire. Current experiences with these 10 reforestation sites can furthermore add to the knowledge and sustainable management of plant resources of the island. As a result Bonaire can be the ideal springboard for environmental innovation/restoration to be replicated and scaled once successful.

Result Summary

The Reforestation project had 6 proposed results to be accomplished:

Result 1 Team of three habitat restoration wardens

Result 2 Network of restoration areas located across Bonaire

Result 3 Native plant nursery with 20,000 plant capacity and empowered local - growers

Result 4 Trees established in restoration areas

Result 5 Local communities engaged in restoration process and valuing dry-forest habitat

Result 6 Project generating sustainable revenue

All of the results have been completed with the project time. Result 6 has not been as successful completed as planned and is ongoing to secure maintenance of the other 5 project results. A check list on the project result can be found as appendix 1. In this summary it's mentioned how each proposed activity was completed but in the main activities chapter we will go over the main activities in logical sequence of the project.

Result 1 Team of three habitat restoration wardens

Recruit local plant experts as wardens and a trainee warden was completed in 2017 although practical training (for trainee in particular) including: species identification, collection of seeds, plant propagation and care, monitoring of restoration areas, maintenance of fences is something that our plant specialist have dedicated himself to do ongoing till the end of the project. In the course of 3 years 4 local community liaison have been trained on understanding ecosystem services, communicating and working with multiple stakeholders, group management and continue as Ambassadors who creates awareness and education on Echo's work. The ambassadors gave also guide training to MBO leisure and hospitality and Bonaire's official tour guiding course covering so the tourist market, bird identification. During weekly tours on Dos Pos experimental enclosure and markets the guide have improved public speaking in English and Dutch. The presentation techniques and social media use for fundraising has been part of the general manager and director role as an ongoing activity to be further used to create financial sustainability for the organization.

Result 2 Network of restoration areas located across Bonaire

We have chosen not to do big workshops but still have work closely with stakeholders and specific local groups to determine the 10 restoration areas. Most of the fencing work was completed by a permanent volunteer team resident to the island but whenever possible have use help of the Royal Marines and other international community groups including Bonaire breakers, The road less traveled and other volunteer tourists. In the early phase of the project it was not so easy but with more understanding and know-how of fencing we have been able to recruit help from local groups for each restoration area and more generally promote fence construction among local staff including an open event for the community at Jankok. The team have installed security cameras on the outlying restoration areas specially to detect goat activity and maintain installed fences. With security cameras not being installed in areas of high activity we have had fence broken and stolen but thankfully reported by visitors of the areas.

Result 3 Native plant nursery with 20,000 plant capacity and empowered local - growers

One of the first activities to be completed was the preparation of site to install infrastructure and secure materials including soil excavated from gullies and/or compost for our native plant nursery. We have installed a 4 nursery at the Conservation center for two years, while they were in the making the project relied on existing and prospective local growers interested in rare tree propagation. Through our babysitting campaign were unlimited to our own nurseries and so have increase capacity not only in space but also care for the seedlings. Ambassadors together with our knowledgeable plant nursery we were able to consolidate existing knowledge of rare trees and their ecology growing 56 native species including very rare ones like Sabal Antellensis. The team of habitat restoration warden and volunteers lead by the nursery manager have made seed collection trips across the island to later propagate seeds and manage to have enough plants ready to plant from the nursery.

Result 4 Trees established in restoration areas

The strength of the project relies in the local groups we have work with the Echo team to prepare restoration areas and plant plants with local support during community events. In 2017 we establish monitoring protocols to detect problems (e.g. poor survival) and appropriate response protocols with help of interns. Based on the protocols we initiated assessment of effectiveness for adaptive management which is still ongoing specifically in the area of Kach'i Baka.

Result 5 Local communities engaged in restoration process and valuing dry-forest habitat

Echo will continue to raise awareness of the project among the local community, through both local tv and newspaper and social media. This helps secure involvement of local groups in restoration area construction, planting, watering and monitoring of the restoration sites. In all the areas walking paths have been installed and other infrastructure have been taking into account and used to connect people more to nature. Through the adoption programs, OLB healthy campaigns and making native plants available even at greenery in town we have helped encourage planting in household gardens.

Result 6 Project generating sustainable revenue

Our tree adoption fundraising platforms was launched in April 2019 leaving us only a half year in the project to build online presence and work with partners to promote the project locally and internationally. The baseline is set there and now we are working indispensable on fundraising for maintenance of reforestation sites. The Dos Pos Conservation experimental enclosure site is a well developed tour including opportunities for project merchandise sales. The sales nursery was officially opened in end of 2017 and contribute direct income for reforestation purpose.

Hosted by Echo Bonaire

Invitation!

Healthy native plants for Sale!

**GRAND OPENING
Sales Nursery**

It's time to plant some native Bonerian trees on your property!

We are having a Grand Opening for our Brand New Sales Nursery.

Come and see which plant is right for you. We'll also provide you information on our reforestation projects.

DECEMBER 22
10am - 12pm
Echo Conservation Centre

RSVP on FB event or email: info@echobonaire.org
facebook.com/echobonaire.org

Main activities

During the reforestation project Echo have build 10 exclusore reforestation site in the northern half of the island and planted a total of 14.523 trees together with the community as part of the reforestation project. The total fenced use to exclude the 10 reforestation area is 4550 meter to accumulate a total of 11.44 protected hectares for reforestation purpose. Followed the main activities completed to execute the project. Most of the activities done in the project are ongoing through maintenance and further development of new reforestation sites.

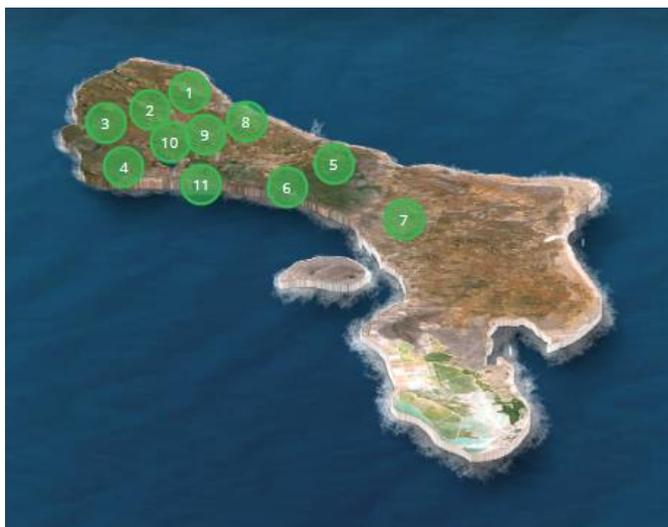
Selection of locations for restoration areas

The process of selecting and planning the restoration areas was based on a theoretical area pre-selection, followed by the on-site check. This was done in corporation with Policy Advisors of the Island Government (OLB) of Bonaire – Directorate of Spatial Planning and Development and by using scientific publicationsⁱⁱⁱⁱⁱⁱ. Furthermore, a theoretical and field-tested inventory of the proposed exclosure was performed and a proposal was written for each of the sites.

These sites are located within the following areas: Washington, Slagbaai, Tolo, Brasil and Seru Largu, Saliña Tam, Kach'i Baka (Fontein), Kunuku Yerba di Seru (North Rincon), Morotín and Jankok (Near Goto Lake from in the WSNP).

To view the specific proposed areas, please see Annex 1, which includes the proposed and the actual perimeters of the 10 reforestation sites.

Early in the selection process, we identified a few sites that fit our criteria which were private areas including some under long-lease with local families/individuals. For fear of creating conflicts of interest, we decided only to work in areas which were explicitly government owned and managed. Furthermore, due to certain political difficulties/contentions, one of the Government owned pre-selected sites in the vicinity of "Saliña de Vlijt," had to be canceled. Furthermore, some sites had their names changed, for example Kunuku Rincon has been renamed Kunuku Yerba di Seru and previously LVV Kunuku at Fontein is now officially called Kach'i Baka. This in order to contribute to the heritage of the island by using locally more recognizable names/areas.



- 1) Slagbaai
- 2) Washington
- 3) Brasil
- 4) Saliña Tam
- 5) Kach'i Baka
- 6) Tolo
- 7) Seru Largu
- 8) Morotin
- 9) Kunuku Yerba di Seru
- 10) Jankok
- 11) Roi Sangu

The process of selecting and planning the restoration areas was based on a theoretical area pre-selection, followed by the on-site check. Furthermore, a theoretical and field-tested inventory of the proposed enclosure was performed and a proposal was written for each of the sites.

Criteria for the pre-selection of sites included: availability of fresh water (streams, groundwater, wells, watersheds); existing vegetation (biodiversity, presence of rare trees); extent of habitat degradation (eroded hillsides, barren landscapes); practicality (ability to fence, feasibility for watering planted trees), visibility and accessibility for visitors and residents (for education and engagement efforts); presence of recognized Important Bird Areas; and zoning of the area (government land, zoned 'Natuur'). Although none of these factors were regarded as "hard" requirements, the overall results from this check decided if the particular site was found suitable for an enclosure area.

For the on-site check, such factors as the following determined the final perimeter and shape of the restoration area: vegetation cover (percentage of bare soil, density of the canopy); species diversity (presence of rare species, available seed trees); soil characteristics (elevation difference, erosion, presence of (bed)-rock); and vegetation health (potential, uniformity/diversity, canopy height/cover). If the results of the on-site check were found satisfactory, the final enclosure area was defined. The boundary of the enclosure was defined using a GPS, after which the vegetation inventory was performed right away.

To secure permission for each site full proposals and reforestation plans were submitted to the respective authorities responsible for the management of the land in most cases the local government (OLB). *Proposals are available on request.*

In the case of Washington, Slagbaai and Jankok, proposals and requests were written and submitted with the OLB – Directorate of Spatial Planning as well as with STINAPA. Furthermore, a MOU (Memorandum of Understanding) was agreed upon with the Managers of the Washington-Slagbaai National Park (WSNP) on behalf of STINAPA.

Construction and development of restoration areas

Prior to fence construction at sites located near residential areas (Seru Largu, Brasil, Yerba Di Seru) Echo's community liaisons and Project Manager, visited homeowners and landowners in close proximity to the proposed sites. Only in Seru Largu the families were unable to be reached, despite multiple efforts so they were contacted by written letter delivered to their mailbox prior to the start of work in the specific area. This caused some rejection and disturbance of the work including fencing being stolen. The personal visits were the best approach in order to warn the community that an area previously accessible to grazing would now be closed off to any goats they may own and allow to wander freely. Kunuku owners (near Kunuku Yerba di Seru and Seru Largu) were at first unhappy about the project but were later pleased. Another challenge was dispute over whether the site at Yerba di Seru included a portion of private lands. This was resolved by a visit to DRO and the Land Registry (Kadaster) to review the property lines and affirm that Echo had only selected land which was allocated as "Nature" and property of the government. For most cases after personal conversations with members of the Echo team,

farmers came to better understanding and support the project and even came out to tree planting days.

Construction

Fence construction began in mid-June 2016 after the first sites had been selected, the necessary permission requests were approved, and the required materials were shipped to Bonaire. The first two sites selected to be fenced were located within the WSNP. This was for three reasons, 1) The WSNP is located in close proximity to the Echo Dos Pos Conservation Centre making material and team transport easier; 2) the Park is already a protected area and thus the construction materials were at lower risk of theft; and 3) the sites within the WSNP are less visible and less frequented by tourists and residents allowing the Echo team the opportunity to master fencing and planting techniques without being closely evaluated or scrutinized by the public. This final reason is contrary to what was initially proposed, but the Echo team felt it was best to not work in the public eye until we could relatively guarantee that we were using best practices and most successful approaches.

In fencing the first enclosure, Washington site, mesquite trees (*Prosopis juliflora*) and Palu di Boneiru (*Casearia tremula*) were selected and cut down for corner posts.



For the other sites we adapted our method to purchased 4x4 lumber posts to use as corner posts. Not only will the treated wood last longer under the natural elements; it also has saved a significant amount of time in completing the work required to build and install the fence. Work on fencing the Slagbaai enclosure was limited to 2 months demonstrating that our techniques and efficiency were improving with experience. Concurrent to the start of work at Slagbaai, the Echo team - with tremendous assistance from the Dutch army - also initiated work at the Tolo site. All corner posts were completed on that site during the Dutch army's training visit to Bonaire in mid-September. For the Tolo site a stretch of limestone cliff, which was thought to be sheer enough to prevent the movement of goats, was used as a natural border for the enclosed area leading to repair of some openings but still can use a full perimeter fence.

The first site to be completed in 2017 was in the area of Brasil near Saliña Frans. Work immediately commenced on the next area in Seru Largu which took a little bit longer to be completed due to the hard limestone substrate. Next areas of enclosures were Saliña Tam followed by Kach'i Baka. Fence construction continues in early 2018 starting with Morotin and Yerba di Seru. Due to changes and approval of the latter site by the Park Manager, we spread out our work to conclude with the enclosure at Jankok, this together with the local community.

Actual sites by completed date and measurement

Sites	Completed	proposed size	Fencing	Measurement
Washington	June -September 2016	1.49	574m	1.39ha
Slagbaai	September – November 2016	0.85	382m	0.91ha
Tolo	September-December 2016	1.1	464m	1.22ha
Brasil	January – February 2017	1.1	411m	0.95ha.
Seru Langu	February – April 2017	1	413m	0.95ha
Saliña Tam	May – July 2017	1	403m	1 ha
Kach'i Baka	July – September 2017	1	499	1.15ha
Morotin	February - April 2018	1	433m	1.1ha
Yerba di Seru	April and June 2018	1	422m	0.93ha
Jankok	April 2019 – October 2019	2	549m	1.84ha

After 2017 the team constructed all of the fenced areas during the dry season so that they were ready to be planted out as soon as the rainy season would begin. The benefits are that Echo team could focus all of its efforts just on planting out trees into the reforestation sites during the rainy season.

While we have had difficulty in recruiting large groups from the community to come out and assist with fence construction and site preparation prior to tree planting, we have been fortunate to



work with a group of three ex-pat residents who joined us on a weekly basis to help with these more challenging and labour-intensive tasks from 2016 to 2018. For one year we had help of a bigger group to build fences and prepare tree-planting holes. The group includes CIEE, The Road Less Travelled study abroad programs and the Dutch Army; these volunteers together have donated more than 560 hours of their time to this work over the course of the year 2017.

Trails

After securing fencing, trees were planted along walking trails that the Echo team developed. Trail development took into account the natural contours of the land, ideal placement of trees and scenic values available throughout the site (e.g. old trees, waterways, etcetera). Each main trail has several side trails that have been cleared to facilitate tree planting and watering. We have built more than 15 km of trails divided in the 10 areas.

Holes for Tree planting

In the beginning we had not been able to recruit many local volunteers who were willing to help with site preparation for tree planting, thus leaving the Echo team to manually dig thousands of holes themselves. This work would have been much faster if we were able to make use of a bobcat with an auger attachment installed, however a request to use this heavy machinery for our sites within the WSNP was denied by its Manager. Although initial cost of local contractor to dig holes professionally, were estimated \$7/hole. Therefore, the Echo team and community volunteers saved the project over \$30,000 by volunteering their time to dig the holes by hand. The Kach'i Baka site is one notable exception, because the site was relatively flat, easily accessible from the road and already had a vehicle entrance, we hired a bobcat to come in and dig the holes for us. In 2018 we finally decided to purchase an auger, to facilitate the work. Initially receiving support from STINAPA through the loan of their auger for testing purposes until one arrived purchased by Echo. This saved the team many hours of work to dig the hole when compared with manual labour.



Development of nursery and plant propagation

Seed collection for establishing the native tree nursery has taken place on an ad hoc basis when environmental conditions produced the desired seedpods, fruits or soils from which viable seeds could be collected. Our Nursery manager, Johan van Blerk, primarily led these efforts using data collected by the Echo team in 2013-2014 as well as personal observations and prior knowledge.

Much of the work has been a process of trial and error, some highlight and achievement of the desired targets started with our native plant nursery being expanded to twice its original size to accommodate up to 10,000 plants. Echo has been tremendously successful in collecting seeds and propagating plants to meet the site proposals for each of the planned reforestation areas. During 2016 we were able to increase the number of trees by approximately 9000, covering 45 different species, filling up both greenhouses. Another 3.500 - 4.000 seedlings were ready for potting once pots and nursery space become available.

By 2017, our nurseries included roughly 3000 seedlings, 14,150 trees. Focussing more on collecting and cultivating rare species, bringing the total species count to over 50 different species of plants. By the beginning of 2019 our nurseries held roughly 2000 seedlings, 9200 trees of which all but 4800 were ready to be planted out.

In addition to Echo's paid staff, we have been fortunate to have daytime volunteers who donated one morning a week to work with our team in the nurseries. These individuals donated over 2000 hours in the course of 3 years of their time to help us increase and maintain our nursery stock.

List of nursery stock included different 53 different species.

Species Name	Local Name	Species Name	Local Name
<i>Amyris ignea</i>		<i>Haematoxylum brasiletto</i>	Brasil, Brasia
<i>Bontia daphnoides</i>	Oleifi	<i>Jacquinia arborea</i>	Mata Piská
<i>Bourreria succulenta</i>	Watakeli	<i>Krugiodendron ferreum</i>	
<i>Bursera karsteniana</i>	Palu di Sia Blanku	<i>Malpighia emarginata</i>	Shimaruku
<i>Bursera simaruba</i>	Palu di Sia Kora	<i>Malpighia glabra</i>	Shimaruku machu
<i>Bursera tomentosa</i>	Palu di Sia Krus	<i>Manihot carthagenensis</i>	Kasabi di mondi
<i>Caesalpinia coriaria</i>	Watapana/Divi divi	<i>Maytenus tetragona</i>	Dakawa
<i>Casearia tremula</i>	Palu di Bonairu	<i>Maytenus versluisii</i>	
<i>Celtis iguanaea</i>	Beshi di Yuana	<i>Melicoccus bijugatus</i>	Kenepa, Knippa
<i>Coccoloba swartzii</i>	Kamari	<i>Metopium brownei</i>	Manzalina (bobo)
<i>Coccoloba uvifera</i>	Druifi	<i>Myrcia curassavica</i>	
<i>Condalia henriquezii</i>	Palu di Beshi	<i>Pithecellobium unguis-cati</i>	Unguis di pushi
<i>Conocarpus erectus</i>	Mangel blanku	<i>Quadrella indica</i>	Oliba machu
<i>Cordia curassavica</i>	Basora pretu	<i>Quadrella odoratissima</i>	Oliba
<i>Cordia dentata</i>	Kohara	<i>Randia aculeata</i>	Inkberry/ Palu di Lele
<i>Crateva tapia</i>	Surun di mondi	<i>Sabal antillensis</i>	Sabal / Kabana
<i>Crescentia cujete</i>	Kalbas	<i>Samyda dodecandra</i>	Bara-tai
<i>Crossopetalum rhacoma</i>	Beishi	<i>Schoepfia schreberi</i>	Mata kombles
<i>Cynophalla flexuosa</i>	Stoki	<i>Senna bicapsularis</i>	Bruska
<i>Cynophalla hastata</i>	Palu di Lora	<i>Sideroxylon obovatum</i>	Palu di Lechi
<i>Cyrtocarpa velutinifolia</i>	-	<i>Sophora tomentosa</i>	Strena di kantu di Laman
<i>Geoffroea spinosa</i>	Taki	<i>Spondias mombin</i>	Hoba
<i>Guaiacum officinale</i>	Wayaka	<i>Stenostomum acutatum</i>	Plaka chikitu
<i>Guaiacum sanctum</i>	Wayaka shimaron	<i>Tabebuia billbergii</i>	Kibrahacha
<i>Guapira fragrans</i>		<i>Ximenia americana</i>	Ishiri, KASHU di mondi
<i>Guapira pacurero</i>	Mushibari	<i>Zanthoxylum flavum</i>	Kalabri
		<i>Zanthoxylum monophyllum</i>	Koubati

Establishing plants and monitoring



The types of trees that were planted in each area was determined by our Habitat Restoration Warden as a part of the development of his proposal for each reforestation site. Specific locations for tree planting are based on the development of the trail system within the area, the local soil and sun conditions, and the accessibility for supplemental watering and monitoring. The Habitat Restoration Warden also determines the species of tree that will be planted in each hole that is dug based on local conditions and available nursery stock (including species type and size). Even though our nursingery stock was raised to satisfy the proposed quantities and composition of plants for our first reforestation areas, we intended to plant out each site in phases. By planting out in phases, we allowed for some natural mortality and replacement, as well as having incremental growth throughout the site.

Tree Planting

Tree planting began yearly in early October after the first rainfall of the rainy season and once the site was completely enclosed. Community tree-planting days were organized during the rainy seasons from 2016 to end of the project in September 2019. The biggest volunteer appearance of the community Tree Planting Event was at Yerba di Seru and Seru Largu in the rainy season 2018/2019.

While no community tree-planting events were scheduled for the Tolo site, the Echo team experimented with seeds rather than larger, more established plants.

The speed with which we are able to plant out into reforestation areas and the number of trees that we are able to plant were predominantly the result of community volunteer efforts.

The school tree planting events were organized starting from 2018 at the Kach'i Baka site directly with San Luis Beltran (Rincon, 36 children) and Trai Merdia in Nort di Saliña and Nikiboko (108 children participated). While no community tree-planting events were scheduled before 2018 for the Seru Largu site, we started with school kids of Klub Di Lora and in 2019 we concentrated the educational engagement in Jankok.

Table 4: Tree planting days

Site	Date	# Volunteers	Special groups
Washington	8 October 2016		
Washington	19 November 20 16		

Slagbaai	15 December 2016	12	Digicel
Slagbaai	17 December 2016	40	Junior Rangers
Slagbaai	21 January 2017		
Tolo	December 2016	-	Echo Team
Brasil	7 Oct 2017	20	
Saliña Tam	21 Oct 2017	46	Junior Rangers
Saliña Tam	4 Nov 2017	20	CIEE
Kach'i Baka	18 Nov 2017	40	Scouts
Washington	2December 2017	-	Echo Team
Kach'i Baka	20 Oct 2018	18	Blue Destination
Kach'i Baka	26 Oct 2018	144	School children
Brasil	3 Nov 2018	34	Iglesia Universal
Yerba di Seru	17 Nov 2018	79	Scout, Junior Ranger, Jong Bonaire
Yerba di Seru	1 Dec 2018	26	Junior Rangers
Morotin	15 Dec 2018	12	Woman making waves
Seru Largu	11 januari 2019	26	NSO Nort Saliña
Seru Largu	12 januari 2019	74	Junior Rangers
Saliña Tam	10 august 2019	20	
Morotin	24 august 2019	17	Animal Shelter
Jankok	8 september 2019	12	Animal Shelter
Jankok	22 septs 2019	21	Stinapa
Jankok	Oktober 2019	45	SGB Pro and NSO Rincon

Echo has registered more than 700 volunteers helping on community events to plant almost 12.000 native trees.

*The table does not include trees that have been sold or donated to private landowners. When those numbers are considered more than 4000 trees have been sold and 2000 trees were donated. An addition 1600 trees have been planted in the exclusion area of Roi Sangu.

Tree Tagging:

To monitor the success of the trees post-planting, all plants have been scientifically documented and tracked. Each plant is marked with a uniquely numbered metal tree tag that is linked to corresponding baseline data including: GPS location, species type, height at planting, date of planting, and any pertinent notes about the plant.



Monitoring:

A two-student team from University of Wageningen conducted yearly research. A second inventory involved the documentation of planted trees that have died during the initial planting out stage. Results were used for improving planting methods for the future planting out events. While trees were monitored we anticipate an over 80% survival rate of all trees planted based on preliminary observations in 2017. Our estimate of an over 80% survival rate for all trees planted

was confirmed by a study conducted by a two-student team from University of Wageningen who compared Year 1 and Year 2 growth and survival rates of trees planted in 2016-17 (so comparing values collected in 2018 with those same values collected in 2017). The study found that we had an overall survival rate of approximately 70-80% but that this number was brought down by a single outlier – exclosure area Fontein – whose dramatically lower survival rates (45%) brought down the average for all sites. When looking at survival rates per site we found that in fact we’ve had great success in survival post-planting: Washington - 99%; Slagbaai - 96%. In 2019 our numbers have remained successful.

Checks

Completed restoration areas are checked minimally once a week. A perimeter check is performed to look for fallen branches and water damage on the fence, as well as overall plant health/growth and extent of damage by iguanas and/or insects.

The Morotin site suffered some devastation following the tree planting event when donkeys broke through the fence and entered the reforestation area. While we were able to quickly respond, remove the donkeys and repair the fencing, in the end only 429 of the 500 trees planted survived to be tagged.

Watering

After each planting event, a supplemental watering regime has been put in place which occurs twice a week, after initial planting and once a week for up to one year after planted trees show new growth. On weeks where we receive significant rainfall, supplemental watering was suspended. The sources of supplemental watering brought us the biggest challenges in this project.



Prior to the start of the reforestation project, Echo moved from Fontein to Dos Pos. While access to a free freshwater source was limited to withdrawals from the Dos Pos wells, Echo had obtained permission from WEB to receive treated wastewater which initially helped keeping watering costs low. At first, we were using the treated wastewater on all nursery plants but found that the seedlings were “burning” and dying. This water did not have the same effect on older, more established plants. But since 2017 we had on-going problems with accessing wastewater during; the truck from WEB was constantly broken, and then eventually the service of distributing this water was taken over by Fundashon Krusada in 2018 who then increased prices from \$1.50 to \$7.15. After meetings and publications about water distribution by WEB, we waited on approval from the government to be able to go to the wastewater treatment facility to get water for

ourselves for almost a year, which was approved in August 2019. We wanted to use treated wastewater exclusively on plants that have been planted out into reforestation areas. For later being informed that for healthy and hygienic reason people are not allowed to get in contact with the water. It's only to be used through irrigation system (drip lines) making it impossible to use in water cans which is the method we used through community events especially with children.

Echo's first solution was to install a solar-powered submersible pump in the well that is located on the Dos Pos site and to use a combination of normal WEB drinkingwater on seedlings and in the mist bed and well water on the older plants that are in the nurseries. The well water is monitored for salinity. When the salinity levels are too high, the well water is mixed with WEB water in order to dilute it. Well water helped to lower costs, but once the freshwater layer was drained, the remaining water was too brackish to be used on nursery plants. With the need for fresh water being critical, Echo was awarded an in-kind donation by Contour Global (an energy production company on Bonaire) of a reverse osmosis system for the well that is located on the property. Disappointingly, the reverse osmosis (RO) system granted by Contour Global is still not up and running. The reverse osmosis system was installed but never used. The main reason is the well was cleaned and drained by the end of 2018. This still needs to be investigated since study presented to Echo has shown enough water capacity and never expected to deplete the water supply nor damage the surrounding area.

Although in the beginning of the project we were not able to depend on the wells for water because they were regularly not functioning, or when working, they were too salty. The solution came in 2019 when the Dos Pos well was repaired under the nature project: Erosiebestrijding en Natuurherstel.

While we had hoped to recruit a team of community volunteers to take care of the supplemental watering, in 2017 the Junior Rangers incorporated it as part of their program to create awareness for the dry forest. Community engagement has grown thanks to outreach activities for watering the plants with schools, scouts, Junior rangers and intern from Pro who started volunteering in 2018. Understanding that education of the local community starts basically and participating to learn uses and recognize the native trees that Echo plants.

Transferring skills and building local capacity

In 2016 we had successfully recruited Johan van Blerk who remains primarily responsible for the development and management of the nurseries and has far exceeded expectations. When possible, Johan would involve members of the Echo team, a trial Assistant Reforestation Warden, and members of the community in collecting seeds.

Echo's Paid Staff who worked on Reforestation Project

Title	Employee Name	Contracted
Nursery Manager *Contractor	Johan Van Blerk	2016 – To date
General Manager	Lauren Schmaltz	2016 – 2018
Community Liaison	Edshel Martha	2016 -2017
Habitat restoration warden	Quirijn Coolen	2016- 2017
General Manager	Quirijn Coolen	2017- 2018
Habitat Restoration Warden	Nick Verhey	2017- 2018
Community Liaison	Julianka Clarenda	2017 - 2018
Assitant Habitat Restoration Warden	Gunther Seraus	2018 - 2019
Education and Outreach Coordinator	Danique Trenidad	2018 – 2019
Hab Rest. Junior Warden	Reuel Trenidad	2018 – 2019
Director	Julianka Clarenda	2018 – To date
Invasive Species Controller	Benito Koffie	2017 – To date
Habitat Restoration Warden	Danielo Trenidad	2018 – To date
Admin. and Comm. Assistant	Gregoria Geerman	2019 – To date
General Manager	Euverick Martis	2019 – To date



In addition to paid staff, we have successfully recruited a dedicated and skilled team of international volunteers who have an interest in plants, habitat restoration and conservation. At the Dos Pos Conservation Centre we were able to accommodate a team of up to six people and have increased that number to eight by 2017. Over 60 people have provided an in kind 40hours a week to this project in the course of the project. Our team have also counted 12 intern from Wageningen University, Van Hal en Larenstein University, Has university of of applied sience from the Netherlands. Locally supported by students from MBO Bonaire, SGB Pro and residents who volunteered each Tuesday and Friday mornings.

Building local support

Stakeholders have been involved in determining the locations of reforestation sites, the planting out of those sites and the continued management and care of those sites. For example, for the last reforestation site in Washington Park we have worked closely with Park Manager Albert

Crestiaan and Chief Ranger George Kultura Thode for choosing the site and the development of trails to create a park that meets the requirements for public use on a higher level than any of the other sites in the park.

Local grower program

In 2017, we also successfully partnered with four local grower organizations who have agreed to look after young trees on Echo’s behalf until they are ready to be planted out. What initially started with the option of receiving monetary compensation for their work was adapted to receive a donation of mature plants for their own planting purposes. The participating entities are: Red Palm Village, Krusada, SGB and Cocari (Table 3).

Table 3: distribution of local growers and trees being cared for off-site

Participant	# Trees	Compensation
Red Palm Village	600	Monetary \$ 900
Red Palm Village	300	In-kind donation of 45 plants
Krusada	140	Monetary
Cocari	300	In-kind donation of 45 plants
SGB	200	No compensation

SGB was unable to care for the plants, so Echo had to intervene and take them back, they also later realized that they didn’t have an appropriate place to plant the trees or care for them, so they forfeited their right to have trees donated in return for the care they provided. Instead SGB been sending PRO students to Dos Pos to volunteer at Echo. In groups of 5 students and sometimes a full class Pro have contributed 6000 hours to the reforestation project.

Starting work with the afterschool programs on reforestation was also a way of getting much work done with the small team (especially in the dry season when we had less International volunteers) This started with the Club di Lora group on Seru Largu. Kids from NSO have given us 1 hour each weekday since January 2018, they especially liked the tree planting but have developed ownership and are happy to return watering the sites where they have planted native trees.

On top of all of that in 2018 a new study MBO1 Groen started at Forma. Echo worked closely in giving education the class of JICN (prisoners) and open internship for the class at Forma.

We have donated trees to a mine restoration nature project for the protected area LVV, which is planned to become a restored wetland.

The team of Cargill who helped during one of the first tree planting days, was a call to action and something of a competition for other community groups and local businesses. It has proven successful in that we also had a group from Digicel, a telecommunications business, Tourism Corporation Bonaire, Scouts, Football clubs come out for a morning to help us plant trees.

Tours

In 2017 we began efforts to develop experiential nature tours in the reforestation areas by organizing special guided tours for specific stakeholder groups. The first of these events was in the Washington Slagbaai National Park enclosure area for employees of STINAPA. In 2019 a tour about reforestation in the park was repeated.

Other events were held in early 2018 (14 January) and involved taking the Scout group to the completed Salina Tam site so that they could work on their plant and bird identification skills. We did two nature tours at Tolo with SGB on 15 and 22 of May; these tours helped the students learn about the reforestation project and how they could participate in these efforts. They visited a site where little to no planting had taken place (Tolo) to see the effect that just a fence can have on the restoration of vegetation. Then, they also visited sites that had been planted. At these sites, Brasil and Saliña di Tam, visited on 5 and 12 June, they helped with watering the plants and were able to see sites that have begun the process of being restored through re-planting.

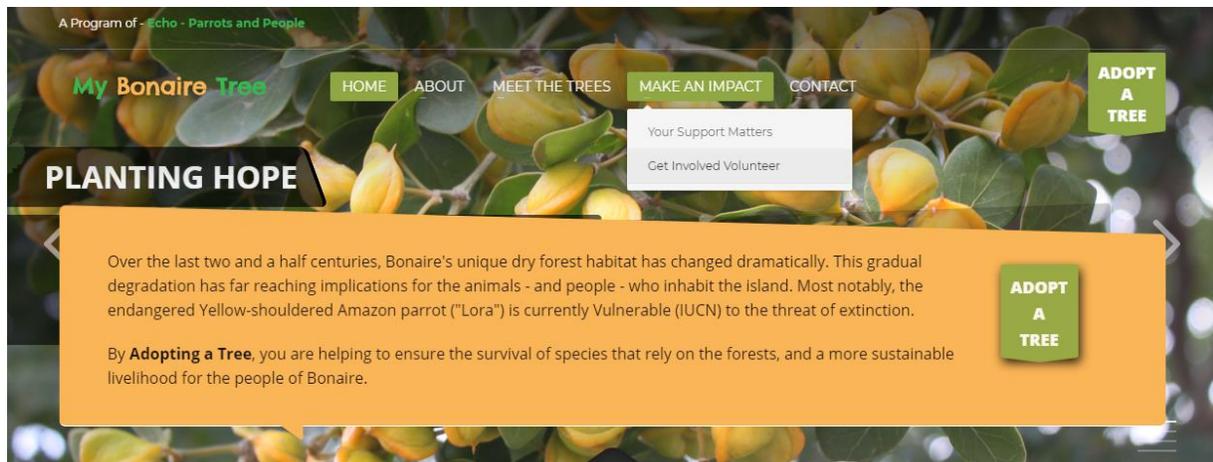
We also made a visit to Yerba di Seru with a Scouts group on 24 November between tree planting events. This was a visit for them to learn about the trees that had been planted and how to identify the different trees, as well as some help with watering any trees that looked like they needed it. We are forced to start asking for a tour fee to at least cover cost of the tour guide so we can continue with this activity outside of a funded project.

Additionally, through this project, a group of residents from El Pueblo (near Caribbean Club and the STINAPA headquarters) reached out to us after having decided to adopt Karpata. They worked in partnership with Echo to clean up the Karpata dive site and plant out 17 trees of different native species. This group has committed itself to the care and watering of the trees planted at this site.

Tree adoption

In 2017, the Echo team successfully built a Tree Sales Nursery; that serve as an outlet where mature trees can be sold to members of the public for use in private properties. The nursery also serves an educational purpose by highlighting more easily recognized trees. Since then the Tree Sales nursery is operational with members of the public being invited after every Wednesday public tours and during special events to buy native plants. At the end of the project we expanded our opening hours to Friday and Saturday morning making our effort in getting more financially sustainable from plant sales.

Adoption of trees is one way in getting additional funding to maintain our reforestation efforts. The development of an online platform about our reforestation project and adoption website was suspended for a time causing us to generate less money over the course of the project. The financial aspect of the platform took us more than expected to get organised, since Echo have been doing all fundraisers through other organization bank account we have tried to work on a personal Paypal without success we decided to accept our donation through the DCNA Paypal for the mybonairetree.org



Although the www.mybonairetree.org was not active till April 2019, in 2017 we already had a number of individuals adopting trees in the existing reforestation areas. Since May 2019 we have 4 monthly donation of \$5 covering watering of maximum 500 trees a month. But a bigger one-time donation has helped to cover cost of maintenance of our bigger exclusion area Roi Sangu.

Communication

Throughout the project we have been issuing press releases to inform the community of our actions and to invite them to participate. This has proven to be highly successful with a number of positive responses including requests for TV and radio interviews on popular local channels and additional media coverage in the local and national papers. To raise awareness of our work and share news locally, we have been regularly using our Facebook pages as well as those of other Bonaire-based organizations. We have also been posting our events on local events calendars such as with Info Bonaire, Bonaire Reporter and the Tourism Corporation Bonaire. We have reached an international audience with the newsletter article of the Society of Ecological Restoration (<http://ser-insr.org/news/2016/12/22/restoring-the-dry-forest-ecosystem-of-bonaire>) and for the Dutch Caribbean Nature Alliance's monthly *BioNews* newsletters. Since 2018, we were featured on the formal communications about the Nature Money projects especially on the dedicated Facebook page: Nos ta Biba di Naturalesa. We are so honored that Julianka Clarendra was the host of series of the regular TV program of Nos ta Biba di Naturalesa that were filmed for each of the Nature Money projects. Later in 2019 she presented the results of the Nature Money projects in the Safeguarding Nature – Bonaire edition commissioned by DCNA. Next to the info graphic used in video and on the mybonairetree website we have secure to mark the exclusion areas on different maps including the Skyview that is available on the airport and all hotels for visitor to know how to find the exclusion areas.



Impact

Echo has established 10 enclosure on natural reserved government land. Fencing in a total of 11.44 hectares and planting 14523 trees during Tree planting days with help of volunteers. The least we are required to do is basic maintenance of the 10 areas and 15 thousand trees and maintain the efforts as we primarily build a foundation for island-wide habitat restoration by excluding herbivores. To achieve the overall goal, this project remains dependent on the control of numbers of feral goats, donkeys and pigs. A sustainable goat management proposal has been approved by the local government witch we hope can be put into effect. Additionally, 3 areas in the park helped us build a stronger partnership for restoration of the national park and together have created more reforestation areas, Bronswinkel and entrance of the Park. Accordingly, we have been working on the goat control project in the Park and have kept our Reforestation areas goat free even when the goat eradication WSNP project was suspended.

Secondly Echo has installed more than 4550 meter of fence in order to prevent unwanted grazing and destruction of trees. Making fencing (materials and labor) our biggest cost for (continuation) of reforestation around the island. Fencing and establishing exclosure areas is a key requirement for the success of everything else ECHO aims to achieve. What's more, as an island it is imperative that Bonaire takes a much firmer approach towards locking down if not prohibiting outright the free roaming of goats in particular as they have by far the most destructive grazing pattern. But till they are taking care of this sides need to remain intact, to secure long term success maintenance to the reforestation site is unmissable. Basic maintenance includes monthly checks to anticipate and prevent breakage of fences by cactus branches and floods. Whenever necessary, fallen cacti or branches need to be removed and fences would need to be repaired. We developed a monitoring protocol to identify and implement appropriate response mechanisms for the most commonly anticipated issues; e.g.

fallen limbs, erosion, and plant predation. Only with structural funding can this be implemented after the termination of the project. In addition, all the reforestation areas are public and need maintenance of the trails to remain accessible for visitors.

We have built up expertise in Habitat Restoration especially by engaging with the local community and all the attempts to share the knowledge to create value for Bonaire's dry forest and use of native plants. We have established work agreements with community groups including schools and afterschool programs on the island to donate their time to take care of more than 20.000 native trees. This is important to secure survival of introduced non endemic plants. As mention above the biggest barrier throughout the project has been and remains the lack of sufficient rain/water. Although manually watering has been proven to keep most trees alive, significant growth is only observed after rain. The amount of water delivered by manual watering is only a fraction of the quantity delivered by a single shower of rain. Although this risk has been identified, we are mainly depending on climate and weather conditions.

Most of the risk and scenarios have been investigated by interns, leaving us with good conclusions and lesson learned for adaptive management, especially for the area of Kach'i Baka where we will need to continue our efforts to show better results.

During the project local staff has learned how to plan and develop reforestation areas, including spatial planning for the planting of trees; conduct vegetation inventories; how to recognize in detail over 50 different species of plants; make measurements of perimeters and areas; use of GPS; technical skills relating to the fencing of sites; horticultural skills relating to the planting and maintenance of trees; to assess the ecological suitability of selected trees within a reforestation area (knowing where to plant certain trees based on local environmental conditions); as well as public relations skills relating to the work with members of the community during tree planting events and guided tours; and human resources management relating to the work of managing an international team of volunteers out in the field. All this knowledge can now be shared. For people on island this can be done through tours, presentations, workshops, visiting our sales nursery and more. Our only source of sustainable income to date is the Tree Sales nursery, operational with members of the public being invited not only after every Wednesday public tours and during special events. Prior to opening the Tree Sales outlet, we agreed with the two principal commercial growers to avoid potential conflict and competition with their businesses during the project. Now at the end of the project we expanded our opening hours to Friday and Saturday morning. The www.bonairetree.org is the online platform that give chance to learn and support Echo's efforts 24 hours a day.

We are have had different meetings with funders and partners including the Minister Schouten. Other island and nature organizations that want to start reforestation are discussing the best practice with us. With the expertise we are regional partner in different project in the Caribbean where we share our project results for creation of another project as for example Reforestatia by Mac and Field.

Financial report

The total budget for the project was proposed to be \$473,331 and started in December of 2015. We have allocated all of the proposed budget and recorded this in a quarterly financial report. The changes made into the allocation and usage of the project budget are explained further on.

Part of the project was 20,000 for the mine restoration project which was frozen for 3 years for that purpose. The \$20,000 that had been allocated from the mine restoration project at LVV has given us the source and extra money to facilitate the reforestation work. In the beginning of the project we saved much money on digging holes by hand. The mine restoration project budget was used for the investment in much needed equipment such as the auger and update for container and solar system. This was done with prior permission from DRO and ministry of LNV in July 2018. Before purchasing the auger, we have spent some money on actual digging for the area of Kach'i Baka. This came to a cost of just over \$1000; at this site 1,000 holes were dug and thus, this was a reduced cost of just \$1/hole. For this reason, it was deemed economically and physically efficient compared to initial quote of \$7 per hole.

Next to large investments in machinery, a vehicle, to make the project more sustainable our biggest cost in the project, after salary and actual labor costs, was the materials for fencing. This was projected in any case, but in conversation and plans for other projects and partners we realize that most of the nature money was spent on fencing which is a big portion than can be used for other things if the (sustainable) goat management project will be more effective.

For the last reforestation site in the park we have worked with a professional fence builder. We see this as an investment in our current team who have just moved in this year and did not have enough experience to do the fencing on their own or with help of international volunteers.

The project management and plant specialist are indispensable in the execution of the project. We have gone over budget there. As for the other labor we have relied on volunteers to assist in habitat restoration and community engagement. We have kept the latter expenses within budget.

The fuel and running cost for the whole project was less than budgeted, especially in the beginning when we have been working on less areas most in the National park and RAMSAR area of Playa Frans. With the raise of fuel and petrol in 2019 the cost where higher but we were also having more drives to the different exclusion areas over each month including Seru Largu. The complete overview and financial report on budget and actual use is covered in Appendix 2.

Sustainability

Plants and trees are directly dependent on the quality of the soil and in some areas such as Kachi baka, the soil is all but sterile. Keeping water from evaporating and/or flowing out to sea, trenching in combination with water absorption and retention would ensure the survival rate of trees goes up markedly. This is not a structural intervention but only a momentary kick-start as nature needs the gap bridged that was left after LVV destroyed the soil. Most other areas would

similarly benefit from such treatment and it ensures the survival rate of the trees will most likely improve substantially.

Within our nurseries we continue to grow native trees and activities which, beside the cost of labor, is almost free. A good example is building compost from waste products with the aim to sell or initiate new projects. To make compost, the team relies on a mixture of chicken-, goat- and cow manure in addition to leaf litter, ash, and other natural materials.

Collection of seeds with community groups and school kids is a way of giving back to the community and building a seed storage for future projects.

The good relationship with other projects and initiative is something we hope to continue. We have already had promising discussions with key partners such as STINAPA, this with plans to provide consultation in the selection and quantity of trees for the park restoration as well as assistance (when/if needed) in the procurement of making the park goat free.

Our initial focus is on government lands, which contain at least a part of a large watershed. This in order to protect the area against erosion and sedimentation through the preservation of existing vegetation and the deliberate reintroduction of other native vegetation.

Early in the selection process, we identified a few sites that fit our criteria, but upon investigating the designation of the land, the sites were found to be under long-lease with private families/individuals. For fear of creating conflicts of interest, we decided only to work in areas which were explicitly government owned and managed. This has somewhat changed our selection process and narrowed the availability of land where we could work. Now, as awareness has increased, we can expand our efforts wider through the whole island also on private lands when funded.

Most interested local growers are businesses and organizations with the capacity to care for plants in a protected space, however we continue to seek private individuals to also become involved, but they don't have the funds. We are seeking international funding for projects for local farmers to grow native trees. Working more aligned with our goal of creating a balance between parrots and people. Also, the creation of a native tree book for Bonaire is something we would like to produce as we have gained the relevant knowledge through the projects. We will need to secure funding to assess such a book.

The area of Kachi baka, kunuku LVV requires further attention. We have already created a plan including adaptive management conclusions. The history and circumstances are from all the other 9 areas. With no vegetation, in the middle of pollution and a salty wind breeze it is critical to adapt a strategy for this area. Highlights Adaptive management in Kach'i Baka, after suffering high mortality rates of trees planted in the 2016-2017 rainy season, our team developed three rows following a 'castle and moat' -like design for planting where the trees were planted into raised beds and surrounded by shallow ditches that could better catch and retain water. In those rows we also planted trees that are hardier against extreme elements (full sun, salty air) such as Palu di Sia and Huku (Mata Piska). The results were better, and it proved that in certain areas it is

essential to conduct extreme landscape water management and erosion control by making trenches.

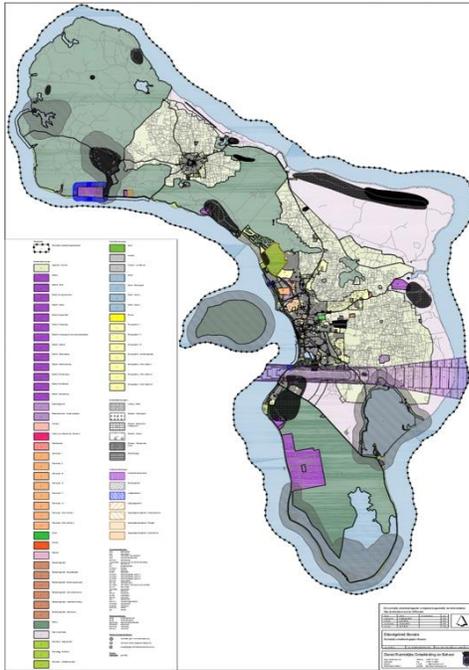
Planting of trees in the rainy season will continue. Although the site selection, nursery management, site preparation and planting methods all benefitted a healthy start and initial growth for the reforestation trees, the eventual survival of the trees is (although somewhat dependent on professional aftercare) mostly influenced by sufficient precipitation in the preceding year(s). Although this risk has been identified, we are mainly depending on climate and weather conditions. For plants that through study have been detected dead, after 2 rainy season we can only bring in new trees in the same spot

The launch of the website was scheduled to coincide with a campaign for Bonaire to elect a national tree. This was in the end was not possible, but Echo would like to initiate such campaign, to bring more awareness and pride about the native plants and dry-forest ecosystem. By having a national tree on the island, we can further work on having the community engage on higher levels by planting together on the national tree planting days etc.

In 2018 we started talks with members of Tourism Corporation Bonaire who are exploring adoption of native trees as a gift for future Ambassadors (visitors who have been coming to Bonaire for 10+ consecutive years).



Structural funding



For the 10 reforest areas we will need a maintenance contract with the OLB and recognition for all sites in the island ROB. Echo Foundation aim to conserve the dry-forest habitat for the parrots through management of not only the 11 areas reforest by the foundation. Zoning Reforestation areas would be the kick-start for management of Bonaire Dry Forest primarily the conservation of plant species and the island biodiversity by Echo. Investment in Bonaire's dry forest should be made now since there is still some high Biodiversity areas that are intact without any protection or fencing. Enclosing the high and middle Terraces designated as nature starting from Seru Largu all the way to Tolo is crucial if we want to conserve the rare species that are still present in these areas. This requires only fencing and managed and minimum reforestation as natural regeneration will get a chance in protected areas

For funding we like to refer to investors/investments rather than Donors!

On Bonaire, Nature is a primary driver for the overall wellbeing of the island. A healthy, vibrant, robust Ecology ensures a healthy, vibrant, robust society where the economy also benefits since eco-tourism to a designated Blue Destination will only grow when that destination merits such a visit. Most important is the need for structural funding for maintenance and creating of more reforestation sites. At least yearly funding for nature conservation programs within a financially sustainable and efficient way. A solution could be to allocate the tree funds (collected through the tree felling permits scheme) to Echo instead of STINAPA. This includes raising awareness of Deforestation and creating more value for Bonaire's dry-forest.

Next to the reforestation fee, the protected and rare plant species legislation needs to be adequately enforced, possibly by a nature taskforce. Working together with nature conservation organizations, the island- and national government as well as the EU should be given priority.

The budget of \$150K is a minimal, annually recurring budget and for our work to create a lasting impact, having ongoing investment (annual repeat from 2020 to 2025) throughout the years to maintain the finished projects whilst expanding them in number, must be one of the prime objectives.

For the further success of reforestation and exclusion in the coming year our predicted budget is \$150,000 from which we hope to cover 10% by our fundraising campaign:

Project Management	20 hours a week at \$15/h	\$ 15,600.00
Community Liaison	24 hours a week at \$12/h	\$ 14,976.00
Plant Specialist	4 hours a week at \$ 40/h	\$ 8320.00
Habitat Restoration Warden	30 hours a week at \$8/h	\$ 12,480.00
Rent for Dos Pos site	450 a month	\$ 5,400.00
Tools for Site maintenance	\$100 a month for additional materials	\$ 1,200.00
Adaptive Management: Kach'I Baka	Tools for trenching and recovering soil	\$ 3,000.00
Fence Materials (New Enclosures)	*replace fence in 5 years: 2021	\$ 15,000.00
Covert & Overt security cameras	\$500 for 1 censor camera for each site	\$ 5,000.00
Project Vehicle for reforestation areas	Replace to 4x4 drive vehicle	\$ 12,500.00
Fuel & Running Costs for maintenance	\$180 a week	\$ 9,360.00
Nursery Materials	\$100 a month for additional materials	\$ 1,200.00
Nursery Vehicle	Trailer	\$ 2,000.00
Fuel & Running Costs for Nursery	\$90 a week	\$ 4,680.00
Water for plants	6 cube a week @ \$6 a cube	\$ 2,000.00
Fuel & Running Costs for watering	\$90 a week	\$ 4,680.00
Events	50 events in a year \$100	\$ 5,000.00
Visitor Transportation	50 events in a year \$140	\$ 7,000.00
Fuel & Running Costs for Outreach	\$90 a week	\$ 4,680.00
Tree adoption site	Maintenance of Mybonairetree.org	\$ 1,000.00
Develop Native Tree Book		\$ 2,500.00
Tree sale outlet	\$25 a week cost for Sales nursery	\$ 1,300.00
Fuel & Running Costs for Sustainability	\$90 a week	\$ 4,680.00
Project Ownership		\$ 1,000
Administrative Costs	Accountant, Tax, Insurance	\$ 6,000.00
	Total Budget	\$ 150,556.00

Appendix 1: Reforestation project result and activities checklist

Result 1 Team of three habitat restoration wardens

Activity 1.1 Recruit local plant experts as wardens and a trainee warden – completed in 2017

Activity 1.2 Practical training (for trainee in particular) including: species identification, collection of seeds, plant propagation and care, monitoring of restoration areas, maintenance of fences – completed in 2017

Activity 1.3 Ambassador training including: understanding ecosystem services, communicating and working with multiple stakeholders, group management – completed but ongoing as needed

Activity 1.4 Guide training including: Understanding the tourist market, bird identification, public speaking in English and Dutch, presentation techniques, social media for fundraising – completed ongoing as needed

Result 2 Network of restoration areas located across Bonaire

Activity 2.1 Hold workshops with stakeholders and specific local groups to determine restoration area locations – completed

Activity 2.2 Plan fence construction dates to coincide with the availability of the Royal Marines and/or volunteer tourists – completed

Activity 2.3 Recruit help from local groups for each restoration area and more generally promote fence construction events – completed for each site

Activity 2.4 Install security cameras and maintain fences – completed but ongoing as needed

Result 3 Native plant nursery with 20,000 plant capacity and empowered local - growers

Activity 3.1 Prepare site, install infrastructure and secure materials including soil excavated from gullies and/or compost – completed

Activity 3.2 Work with existing and prospective local growers interested in rare tree propagation to increase capacity – completed in 2018

Activity 3.3 Consolidate existing knowledge of rare trees and their ecology – ongoing

Activity 3.4 Make seed collection trips across the island – completed

Activity 3.5 Propagate seeds and manage nursery – completed

Result 4 Trees established in restoration areas

Activity 4.1 Work with local groups to prepare restoration areas, (e.g. digging holes or building sediment traps on barren slopes) prior to planting – completed for 9 sites (except Tolo)

Activity 4.2 Plant plants with local support – completed for 9 sites (except Tolo)

Activity 4.3 Establish monitoring protocols to detect problems (e.g. poor survival) and appropriate response protocols – ongoing

Activity 4.4 Assessment of effectiveness for adaptive management – completed in 2017

Result 5 Local communities engaged in restoration process and valuing dry-forest habitat

Activity 5.1 Raise awareness of the project among the local community – completed but ongoing as needed

Activity 5.2 Involve local groups in restoration area construction, planting and monitoring – completed

Activity 5.3 Install walking paths and other infrastructure – completed

Activity 5.4 Develop programs to encourage planting in household gardens – completed in 2018 ongoing as needed

Result 6 Project generating sustainable revenue

Activity 6.1 Develop the tree adoption fundraising platforms – launched in April 2019

Activity 6.2 Build online presence and work with partners to promote the project locally and internationally – completed on going as needed

Activity 6.3 Develop tours and create opportunities for project merchandise sales – completed but ongoing as needed

Activity 6.4 Build an outlet for tree sales – completed 2017

Appendix 2: Google Earth images of reforestation area sites

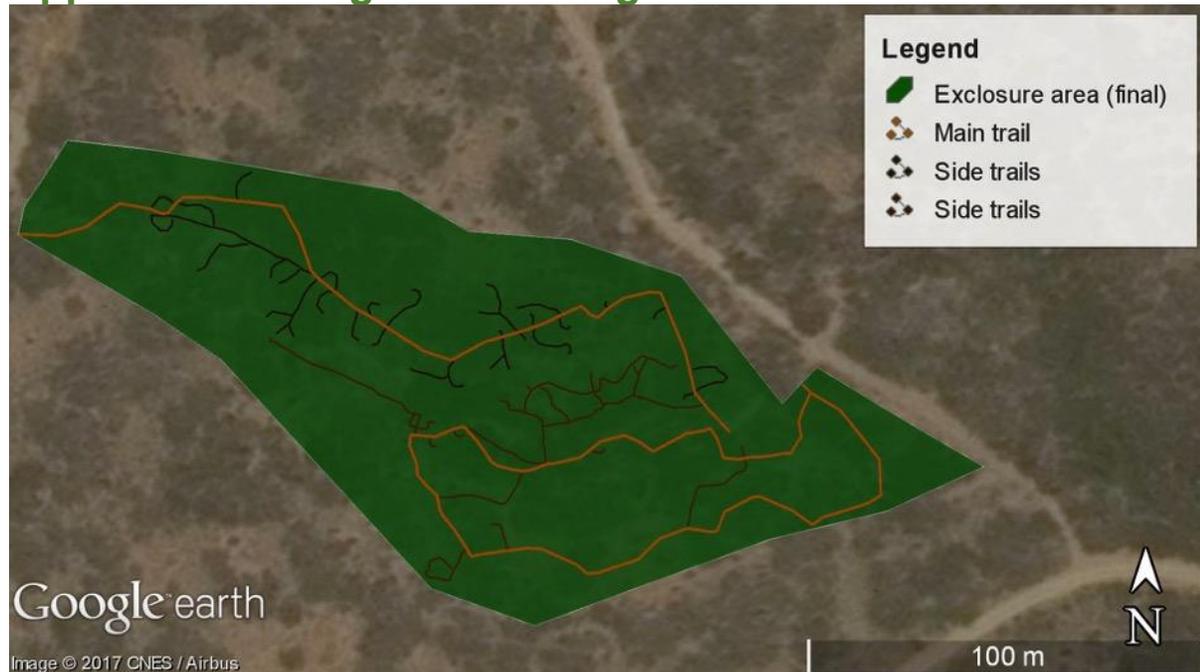


Figure 1: Washington exclosure with trails marked (1.39ha in area with a perimeter of 574m)

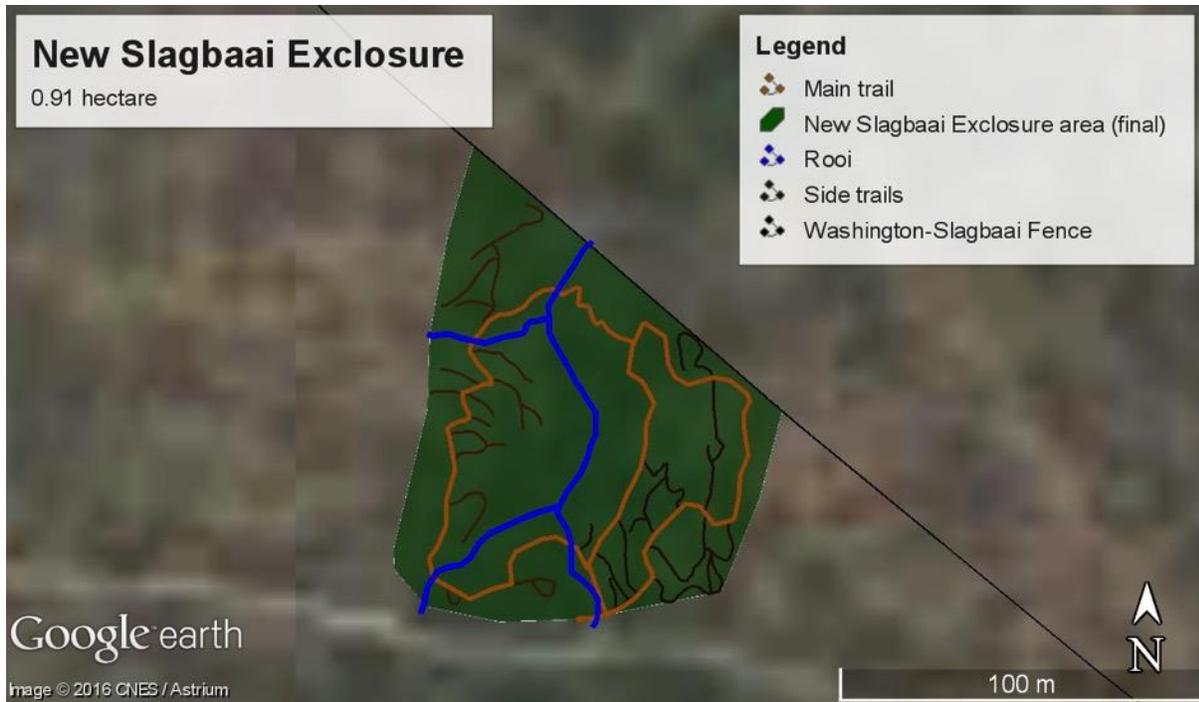


Figure 2: Slagbaai exclosure with trails marked (0.91ha in area with a perimeter of 382m)



Figure 32: Tolo exclosure (1.1ha with a perimeter of 453m)



Figure 4: Brasil enclosure (0.95ha with a perimeter of 411m)



Figure 53: Saliña Tam enclosure (1ha with a perimeter of 403m)



Figure 6: Yerba di Seru enclosure (0.93ha with a perimeter of 422m)



Figure 7: Morotín enclosure (1.1ha with a perimeter of 433m)



Figure 84: Seru Largu enclosure (0.95ha with a perimeter of 413m)



Figure 9: Kach'i Baka enclosure (1.15ha with a perimeter of 499m)



Figure 10: Jankok enclosure (1.84ha with a perimeter of 549m)

ⁱ de Freitas et al. 2005

ⁱⁱ de Freitas 2008

ⁱⁱⁱ de Freitas et al. 2013 Rapportnummer: BON-201203-01.