WeForest
Making Earth Cooler

Tietê Forests

Protecting water resources
& connecting forest remnants

Yearly Update 2021

Summary

No other large tropical forest ecosystem has suffered as much loss as the Atlantic Forest, one of the most threatened biomes in the world.

Many plant and animal species in this biodiversity hotspot are endangered, vulnerable or threatened. Rivers suffer from poor water quality, affecting biodiversity and communities; trees filter water and stop soil erosion, and without them the herbicides, pesticides and soils from surrounding farmlands make their way into water sources.

Our Tietê Forests collaboration with energy company AES Brasil is restoring riparian forests along the Tietê River. With restoration taking place in AES landholdings and private properties, there is the potential to scale up to more than 2000 ha over the next 8 to 10 years.

100ha was planted during the first planting season of 2020-2021 with 189 072 native seedlings. In September, the first vegetation assessment of these restored areas was carried out; unfortunately, unprecedented frosts, combined with the worst drought in almost a century, meant that the survival rate of our first planting season's seedlings was not as high as we had hoped, and we are replanting approximately 45% of the area.

The second planting season began with the rains in November 2021, and 140 ha is currently being planted and due to be completed in April 2022.

We are striving for an ambitious goal to reforest organically yet we face challenging field conditions – invasive grasses and ant infestations – that threaten seedling growth. Next season, we plan to use low levels of herbicide to remove invasive grasses, and, in emergency situations, a low level of conventional ant control.

This year the Tiête Forests project enjoyed worldwide attention when it was featured in the SER Conference's

2021 in numbers

In 2021:

The 2020-2021 planting season covered **100ha**

61 native tree species (planting groups: 21 filling species; 40 diversity species)

189 072 tree seedlings (planting groups: 122 376 filling; 66 696 diversity)

In 2021 and 2022:

The 2021-2022 planting season will cover **140ha**

61 native tree species (planting groups: 21 filling species; 40 diversity species)

75 000 tree seedlings (planting groups: 49 500 filling; 25 500 diversity)

45% of the previous 100ha will be replanted because of frosts.

"Field Trip Fridays" (watch part 1 here and part 2 here), and our camera traps captured some amazing footage of giant anteaters, pumas and a family of capybaras! Check them out on Flickr here.

This report shares an update of our progress during 2021. Thank you for your support!

Restoration

170 hectares planted with native tree seedlings

The first (2020-2021) planting season of the Tietê Forests projects covered 100 ha, while the second (2021-2022), which is still ongoing since November 2021, will eventually cover 140 ha. So far, at the time of writing, the restoration of 170 ha (with the planting of 264 072 seedlings) across this total of 240 ha has been completed to date. In this phase, our restored lands are all on AES Brasil landholdings.

Following the main planting season, April to December was spent on maintenance activities including the control of ants and invasive grasses and mulching as well as replanting seedlings on the 45 ha with high mortality after unprecedented frosts (see below).

Preparation for the current planting season – which began in November 2021 – was already underway early in 2021. In February the native tree species selection was made, based on seed availability in the nursery and/or expected seed harvesting periods, as well as their performance in the field. 61 different native species have been raised in nurseries for both planting seasons, of which 21 are fast-growing filling species that promote fast soil coverage and shade and suppress invasive grasses, therefore accelerating succession. The remaining 40 are diversity species that are either slow-growing or, if they are also fast-growing, have narrow canopies. In this group, species that are attractive to animal species like the tapir were prioritized.

In September, the first vegetation assessment was carried out by WeForest/AES Brasil/CEIBA, and showed that while 80% survival was our target, there was a 55% survival rate.

Fires occurred in four of our planting areas (polygons) in June and July, with a total area of 0.56 ha affected. There's no clear proof or evidence for the cause of the fire, and the most likely is to create access routes for fishermen to the river.

Local gardeners

Our restoration projects in Brazil are given a helping hand by tapirs, whose grazing – and what they leave behind – helps to transport and fertilise seeds that support regeneration. Trees sprout naturally from seeds left behind in this endangered herbivore's droppings!

The region was affected by the worst drought in central and southern Brazil in almost a century (more details from Brazilian government agencies; NASA Earth Observatory).

In July a polar air mass hit south and southeast Brazil, resulting in severe, atypical frosts that affected several crops, natural areas and restoration sites in many Brazilian states, including Sao Paulo. These frosts occurred three times: on week 26 (1 day), 29 (~2 days) and 30 (~3 or 4 days).

Lessons learned from the first planting season

We were also able to make several observations after the first planting season that formed a set of lessons learned:

- The native tree species are growing very slowly; even when the invasive grasses are mowed regularly, the seedlings still have to compete with grass for water and nutrients.

- Severe infestations of leaf-cutting ants are a problem. The organic insecticide we used, BIOISCA, wasn't effective on areas severely infested by ants, resulting in significant damage to both the guandu (green manure) and the native tree seedlings' performance.

- The green manure (*Cajanus cajan*, or guandu, below) had trouble germinating and growing due to the lack of rain and attacks from leaf-cutting ants. This meant that there wasn't enough green manure to suppress the invasive grasses around the native tree seedlings.

- Fencing off restoration areas and preparing soil can start earlier, and create more time focused on planting during the rainy season.

These lessons, along with the findings of the vegetation assessment, allowed us to make adjustments for the current

Planning for a changing climate

The changing climate means we need to future-proof our restoration approaches. We are conducting two experiments to prepare for changes in restoration methods because of the changing climate in this region.

- To identify species that can withstand dry or freezing conditions and are therefore most suitable to be used in future plantings to enhance species richness. If long-lived species do not regenerate spontaneously in our restored areas, enrichment planting will be needed, and direct seeding of such species might be the less expensive approach.

- Inoculation with AURAS® (bacteria *Bacillus aryabhattai*), a microbe extracted from Mandacaru (*Cereus jamacaru*), a cactus native to central and eastern Brazil, where drought is a predominant climatic condition. The commercial product was developed by EMBRAPA (a Brazilian public agricultural research corporation), and has been applied into corn seeds and sugarcane seedlings to improve drought resistance. Our field partner CEIBA is looking into obtaining this product and developing a method to bathe native tree species before planting.

planting season. While the the organic insecticide BIOISCA will continue to be used, where severe infestation by leaf-cutting ants is detected (around 20% of the planted areas), emergency use of non-organic control (sulfluramid baits) will be used in as low volumes as possible alongside BIOISCA. Without this, the trees and green manure will not survive.

Other adjustments will be to start fencing and soil preparation earlier, and to sow the guandu seeds for green manure earlier and with a higher sowing density. We anticipate that these measures will result in better performance for both native seedlings and the green manure.

A reduced herbicide approach is the most effective way forward

Invasive grasses are a huge problem for reforestation in this region – they grow faster than seedlings and compete for water and nutrients. We have several experimental plots to identify how to successfully reduce or eliminate herbicides alongside a control experiment of standard use. The organic approach is to regularly mow and create green manure to suppress the grasses. It is significantly more expensive compared to one-off herbicide use. The results to date show that despite regular mowing, seedlings in conventional herbicide (glyphosate) still have a much faster growth; their average height is 2.4 times taller (pictured right) than those in the herbicide-free approach. After almost one

year, the production of biomass and mulch in the organic approach was not sufficient to suppress the invasive grasses around the native tree seedlings (pictured below left).

Based on these results, the conclusion is that the herbicide-free approach not only is more expensive (approx. 35% more) than the conventional approach, but it will also demand more time to develop an adequate vegetation cover of at least 70% of the area. That also means that additional post-implementation maintenance will be needed for an estimated two extra years, adding 70% over the initial estimated costs.

A reduced herbicide approach – rather than an organic approach – is the most effective solution going forward. The reduced approach will be carried out over 82ha of the 100ha already planted (applied in ~40% of the surface), with 18ha left under the herbicide-free approach to continue to monitor the differences. In the second planting season, all 140ha will be treated with the reduced herbicide approach (also applied in ~40% of the surface).

While the herbicide application area is reduced, the number of applications will also be reduced to 2-3 times instead of 8 times which is normally the case over a two year period. We estimate that this approach will reduce 73% of the herbicides in comparison to the conventional approaches.
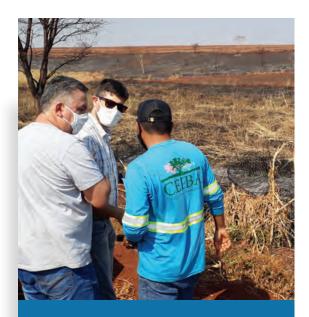
20 hectares of agroforestry systems to be established

Paulo) members to discuss the programme and assess suitable field conditions. As a result, 20 producers are willing to participate in implementing 20ha of agroforestry, 1ha per family.

The third planting season in 2022/2023 will also see the beginning of the agroforestry programme with farming families.

Agroforestry is a system in which specific trees or woody shrubs are mixed with crops on agricultural land. It is one of the most sustainable and profitable ways for smallholder farmers to grow cash crops for food security, nutrition and consistent income while natural resources such as soil and water are improved by the presence of the trees, which also sequester carbon as they grow. In agroforestry plots some trees such as timber are harvested and ideally replaced. Others, such as fruit and nitrogen-fixing trees, which are often used for soil fertilization and animal fodder, are pruned year after year providing food, soil fertility and numerous other benefits.

The programme will be launched in Dandara Rural Settlement (above), 18km from Promissão. 350 families live here (approximately 1400 people) and have an average farm size of 14.5ha.

The project will work with Dandara's Cooperative of Farmers Producers, COPROCAM, composed of 47 families with a board composed mostly of women. In 2021 WeForest and CEIBA visited the Dandara Rural Settlement to meet COPROCAM and NACE-PTECA (a Culture and Extension Center of the University of São

Who works for the Tietê Forests project?

Field workers: Approximately 40 employees in 2021 (100% men) from the local Ibitinga municipality.

Nursery workers: AES Brazil plant nursery employed 12 people in 2022, of which five (42%) were women, including plant nursery coordinator Flavia. 83.4% of employees are from surrounding Rural Settlements.

NACE/PTECA has strong expertise on educational processes and agroforestry and will provide all capacity training related to the implementation of the agroforestry systems, including selection of species and support on merchandising planning.

Dandara is also surrounded by two other Rural Settlements, Promissãozinha and Reunidas, which combined have 800 families in 25 000ha; if the agroforestry model is successful, we expect to have more interested farmers to establish agroforestry plots.

Early discussions are underway on another project in Dandara. The number of species available for good quality ecological restoration and quality of seeds is a challenge in this region, so the goal of AES Brasil and Araribá Institute is to support the development of a seed supply network with the farmers in Dandara and at the same time create an additional income stream for them.

AES Brasil Plant nursery

Located at Promissão, the AES Brasil Plant nursery produces a million high quality seedlings per year of approximately 200 native species. The nursery's organization allows a precise record of the species produced and shipped for the project. WeForest, AES Brasil and CEIBA have selected 61 species that our combined experience showed were the best field performers for fast soil recovery.

Fauna in Tietê

The Tiete Forests project is taking place in Brazil's interior Atlantic Forest (*Mata Atlântica* in Portuguese), which supports more than 100 mammal species, 400 bird species and 40 amphibian species. The animals under threat that have been registered along the Tietê Forests' landscape are:

Critically Endangered:
- *Anhima cornuta* (bird; Anhuma or Horned Screamer (below))

- *Busarellus nigricollis* (bird; Gavião-belo or Black collared hawk)
- *Circus buffoni* (bird; Gavião-do-banhado, or Long-winged harrier)
- *Suiriri suiriri* (bird; Suiriri cinzento or flycatcher)

Endangered:
- *Chrysocyon brachyurus* (mammal; maned wolf (below))

- *Tapirus terrestris* (mammal; tapir)
- *Eucometis penicillata* (bird; Pipira-da-taoca)
- *Herpsilochmus longirostris* (bird; Chorozinho de bico comprido)

What's Next?

- Develop a plan to foster a seed supply chain by involving small farmers from the Dandara Rural Settlement, near AES Brasil's plant nursery.
- Define monitoring methodologies for impacts on fauna.
- Vegetation assessment from planting seasons I and II.
- Follow up on replanting of seedlings after frosts.
- NACE-PTECA and COPROCAM to launch the agroforestry programme for the 2022-2023 season with selection of farmers, capacity training and agroforestry planning, implementation and maintenance.
- Capacity training and workshops for small farmers on Environmental and Socio-economic Assessment (February-May) and Agroecology and Agroforestry Systems Capacity Training (June-August).

How do we know our restored forests are growing and making an impact?

Every hectare under restoration is mapped with GPS points to generate polygons (areas on a map) that are assigned to sponsors. Permanent monitoring plots are established in our sites and our forestry and science teams conduct surveys to monitor progress of biomass growth, tree density, survival rate and species diversity, among other indicators. Where social impacts are also critical, we measure socio-economic indicators such as the number of beneficiaries, people trained, and income generated from forest-friendly livelihood activities.

Please visit our **Why and How** webpage for more information.

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Stay up-to-date with your interactive **Tietê Forests map**, and check out the **photo album** of the project on Flickr.

Thank you for supporting the Tietê Forests project!