OTS 2021 Annual Report

Elizabeth Braker, President and CEO
George Middendorf, Chair, Board of Directors

Setting the context

At the OTS Annual meeting in March 2020, realizing that the global Covid-19 pandemic would impose unprecedented logistical, health, management, and financial challenges, the Board of Directors and President/CEO recognized the need to examine current research and educational programs, to adjust basic financial and administrative structures, and to propose innovative solutions to these challenges. This report will examine some of those challenges, outline how we addressed them, restate our core operating principles, and propose a vision for OTS' near-future/immediate future. This report provides an opportunity to add detail here for those who were present and to inform those who were unable to attend the July 29th online meeting. We hope that after you have read through, you will aid us by providing both your suggestions and your support as we shift to a vibrant future for OTS.

Beginning in March 2020, OTS, along with the rest of the world, faced an unprecedented situation with health concerns, economic constraints, and travel restrictions imposed to deal with the pandemic. Health concerns led to the imposition of strict testing, the need to increase spacing, and limitations on meetings and attendance at all OTS offices and stations. Economic constraints reduced the ability of many of our member institutions to pay their 2021 dues. Fundraising slowed as philanthropists and foundations re-evaluated their priorities. Travel restrictions resulted in the cancellation of field classes and halting of research in protected areas, leading to a 90% decline in the use of OTS research stations by outside educational groups, our own courses, researchers, and natural history visitors. In addition, because work on programs for which we had earlier received funding had to be postponed, we were unable to book those revenues into our operating budget. OTS, like many, many other organizations, reluctantly shifted into survival mode.

Our starting principles

Faced with an uncertain future, with little hope of increasing revenues in the short term, and with the need to dramatically reduce expenses, we set the following priorities for OTS as we navigated the crisis:

- committing to health and safety of OTS personnel and facility users;
- protecting OTS research stations and conservation reserves;
- pivoting OTS education programs to deliver online content consistent with our mission;
- protecting the livelihoods of OTS employees and viewing them as essential workers;
- committing to accurate financial reporting and transparency; and
- enacting a vision of "One OTS"—unifying operations in South Africa, Costa Rica, and the U.S.

Covid-19 protocols

Our immediate priority in March 2020 was to respond to the public health crisis by developing organization-wide Covid protocols. OTS staff worked with occupational health and safety consultants to create a unified OTS approach that was responsive to local, national, and

international situations. Our protocols were effective in preventing community spread within our facilities; the numbers of infected staff and visitors were few and severity was limited.

Financial picture

Following identification and discussion of likely impacts of Covid-19 by the Board in March, OTS staff immediately developed a revised FY2021 operating budget that, within the principles outline above, addressed these impacts. Aspects of the budget were adjusted during the first year of the pandemic as the Board and staff addressed issues of health, examined office and staffing needs, developed new research and educational approaches and offerings that reflected pandemic constraints, and expanded fundraising efforts.

Since 2018, OTS reduced total annual operational expenses from $6.9M to $2.5M. Most of the cost savings were achieved by changes in staffing levels, especially of senior personnel. OTS staff was reduced by 44% -- from 158 in 2019 to the present 88.

OTS redoubled its fundraising efforts to offset loss of other revenues. For example, during the first quarter of FY21, total funds raised were $38,395 compared to $184,015 raised in the same period in FY22.

In July 2021, reflecting these operational changes, the Board approved the proposed FY2022 (July 2021-June 2022) operating budget that projected an operating deficit an order of magnitude smaller than that in recent years.

FY2022 approved total revenues budget of ~$4.5M includes two major components: an operating budget of $3.6M and transfers from earnings on OTS endowments of $0.9M. The operating revenues derive from 37% from education revenues, 36% from development (fundraising), and 22% from station fees (about half of which is expected to come from use fees for visiting classes). The rest of OTS' projected revenues are a result of member dues (3%), indirect costs on grants managed by OTS (1.35%), and other activities (1.5%). Endowment transfers from spendable earnings on restricted and unrestricted funds accounts amount to approximately $0.9M, yielding a total revenues budget of $4.5M. As education programs and station use increase during the first six months of 2022 and international travel resumes, we anticipate higher revenue in the second semester of the fiscal year.

In FY21, we reduced nonessential services and, in the first half of the FY22 fiscal year, have continued to keep expenses like international travel by staff to a minimum. Despite severe staffing reductions, personnel costs represent over half of our annual expenses (56%). Total projected expenses for OTS in FY22 are estimated at $4.5M.

Based on expected revenue and expenses, we anticipate deficit spending in FY2022 to be only ~$0.036M ($36K) -- an order of magnitude lower than any budget over the past decade.

Proposal to use unexpected earnings to build OTS' future – Strong market performance during 2021 resulted in unanticipated earnings for our unrestricted and restricted endowments. OTS senior staff have developed plans to use these funds **to build the OTS of the future by invigorating OTS' leadership in tropical science, education, and capacity building.** Programmatic plans for each of these areas are currently being evaluated by the Board of Directors prior to full implementation. All funds will be used within the guidelines established for

each endowed fund and will leave a balance in reserves (accrued interest) on the OTS endowment of ~$3.1M.

Partnerships & Memberships

For the past several years, the University of Connecticut (UConn) has been OTS' partner for awarding credit for our undergraduate semester program in South Africa. The OTS Education Team has been working closely with UConn to 1) ensure that all OTS undergraduate programs meet the highest standards of best practices in international education and 2) expand undergraduate for-credit programs to include those in Costa Rica. With UConn's International Office, we are planning an undergraduate tropical biology-focused program in Costa Rica with a target start date of January 2023.

In May of 2021, OTS and the University of Costa Rica formally renewed our cooperation agreement. This revised arrangement has already brought many benefits to OTS (see below). OTS is in the process of developing similar renewed agreements with other important Costa Rican institutions, such as the National University of Costa Rica (UNA) and the Technological Institute of Costa Ria (ITCR).

To celebrate the International Day of the Tropics in 2021, and in partnership with the Association for Tropical Biology, OTS held a special event featuring Carlos Manuel Rodriguez, CEO and Chair of the Global Environment Facility and former Minister of the Environment and Energy. Mr. Rodriguez' presentation on "Reaching Nature and Climate-Positive Goals by 2030: Narrowing the Gaps and Upscaling Networks," was attended by over 200 people from over 50 different countries.

OTS has a large number of institutional members and a variety of membership types, e.g. in-kind memberships (for institutions from our host regions) and annual vs. permanent. Each of these come with a different set of benefits. Staff is currently examining membership types in terms of costs and benefits for member institutions but also from an OTS perspective with regard to budget and on-the-ground implementation.

Education

Dr. Nora Bynum has joined OTS staff as Dean of Academic Programs. Bynum will coordinate the efforts of the Education Team and lead development of OTS programs accredited by UConn. In addition, Bynum will lead the restarting of our Environmental Policy and Capacity Building program to offer short courses and field workshops.

Following the pandemic shutdown, the Education Team reacted swiftly by cancelling in-person programs and establishing virtual replacements. Offerings included *Bioacoustic Analysis in R*, *Google Earth Engine for Conservation Science*, *Plant-People Interactions: Ethnobotany in the 21st Century*, *Science Communication*, and *Veterinary Practicum*, plus five other virtual courses. These served over 300 participants from 43 countries. As local conditions permitted and travel became possible, our team ran seven field courses (five in in South Africa and two in Costa Rica). Despite maintaining small class sizes to accommodate pandemic-related restrictions on housing and transportation density, 35 students in Costa Rica and 25 in South Africa participated in OTS field courses in 2021. These courses included *Disease Ecology* and *Women in Science* in South Africa, and *Ecología Tropical y Conservación*, *Fundamentals of*

Tropical Biology, and *Quantitative and Computational Techniques in Animal Behavior* in Costa Rica. OTS scholarships supported over 200 students in calendar year 2021. Scholarships, funded by earnings on ten different endowed funds established specifically for this purpose, offset costs of participation for students and enabled OTS to attract students from a diverse group of universities and countries.

As an illustration of how we responded to the challenges imposed on field programs by the pandemic, OTS-South Africa developed a new course designed to drive research into the consequences of land use change and carbon sequestration in open ecosystems. The design of the course used a hybrid model that paired an in-person *Women in Science* course that collected baseline biodiversity data with a virtual disease ecology practicum focused on pre- and first year veterinary students. One of the key challenges in the broader region of the Kruger National Park is rapidly increasing land use change. To contribute to understanding the long-term effects of land use change, we assessed 24 sites differing in land use history and management, inside and outside the national park. The WIS course collected vegetation, soil, bird, small and large mammal data, as well as ticks and blood samples from small mammals. The data were then used by five *Disease Ecology Practicum* students for their independent research projects. Lisa Nupen and Tino Pori ran a fabulous 8-week course, including visiting faculty from the State and SANParks Veterinary services, Italian Development agency, and PhD students from University of Florida and University of Mpumalanga to give the online students an incredible window into the world of veterinary scientists and disease ecologists. The data collected in these efforts are shared with long term data repositories (South African Environmental Observation Network (SAEON) and SANParks) as well in our collaboration with a NASA-funded project with the University of British Columbia. OTS plans to conduct this effort as a field course in 2022.

Despite pandemic constraints, OTS was able to host thirteen visiting academic groups at our facilities in South Africa and Costa Rica, including 51 students and scientists and six honors students in writing workshops.

OTS' annual REU program (funded by the NSF Louis Stokes Alliance for Minority Participation) presented a special challenge this year resulting from the prohibition on using NSF funds for travel to Costa Rica. We offered a hybrid program in 2021, which gave 31 students from LSAMP institutions the opportunity to engage in mentored research by 18 OTS researchers with projects at La Selva and Las Cruces stations. Some of the projects incorporated Costa Rican students, supported by OTS research fellowships, to conduct field sampling. The participants present their work at a virtual symposium on July 30th and will participate in a field-intensive experience in Costa Rica in January 2022.

OTS staff and scientists continue strong involvement with two NSF-sponsored RCN grants on virtual learning in the field. These grants are "Broadening student access to field experiences using the Virtual Field Platform" (awarded to OBFS; Dr. Sarah Oktay PI) and "Ocelots: A platform for facilitating online content for experiential learning of tropical systems" (Drs. Ann Russell and Suzanne Masey, PIs). OTS staff and scientists are contributing learning modules, attending workshops, and serving on key committees of both projects.

With donor support, OTS staff conducted an updated naturalist guide course in early 2021. Twelve student-participants completed the course and are now certified guides.

OTS looks forward to resuming our full range of courses in 2022. Going forward, we plan a robust mix of virtual, field, and hybrid courses. As always, the latest updates on new course offerings is found on the Education area of the OTS website.

Operations

To improve integration of operations across the organization, Miguel Mendez was designated as Chief Operating Officer. Mendez is now responsible for oversight of finances, IT, and operations for the organization, as well as legal representation and staff oversight in Costa Rica.

As mentioned above, in May 2021 the University of Costa Rica and OTS announced an updated and expanded partnership. Implementation of the expanded agreement joins OTS' library holdings with UCR's digital library information system. Two UCR librarians have started the process of cataloguing all our books, journals, and scientific papers. The UCR community will have access to OTS' collection; and OTS staff, students, and researchers will have access to the full range of UCR's library collections. We anticipate that the upgraded and connected library will provide a calm and welcoming work environment to attract students and researchers.

The updated agreement with UCR will also result in OTS' IT Department receiving technical support, as well as allowing OTS to join UCR's internet and telephone network. This will provide outstanding increased cyber security, along with improved control and monitoring of our systems. UCR has already provided advanced technical support in telecommunications, and we will soon migrate our IP phone system to the latest technology. All these upgrades will mean better service as well as cost savings to OTS.

One unanticipated benefit of reduced visitation during 2020-21 was an opportunity for operations teams to focus on infrastructure maintenance and improvements with attention to sustainability. At **La Selva**, funding from the USAID-American Schools and Hospitals Abroad grants provided an opportunity for much-needed energy upgrades such as solar water heaters, updated air conditioners, and insulation. Dorms were remodeled for improved ventilation and the addition of bathrooms for each room. A complete remodel of the reception building with an associated visitor center is currently underway. Renovations to the Orquidea building, which houses the La Selva herbarium, are almost complete. OTS staff in South Africa successfully completed four new purpose-built accommodations for researchers at the SSLI Campus with funding support from the NSF Field Stations and Marine Laboratories. The beautiful Science Center at **Skukuza** received an AfriSam-SAIA Sustainable Design commendation. Palo Verde (along with its location in Palo Verde National Park), Las Cruces, and La Selva were recognized for their efforts to promote sustainable operations and conservation by the Costa Rican "Ecological Blue Flag" program.

Despite the constraints imposed during the pandemic, community engagement activities served to maintain OTS' connections with surrounding communities. Around **Las Cruces**, OTS staff are working with the Costa Rican Institute of Aqueducts and Sewers to conserve and potentially use waters from the Java River to provide potable water storage for the San Vito population in water emergencies. **Las Cruces** staff (aided by OTS researchers) grew and gifted 3800 native tree seedlings to the community in support of reforestation efforts. Las Cruces staff participated in the launch of the San Vito Environment Committee, working with the municipality of San Vito to create and support a group focused on regional environmental education. The OTS **Costa Rica Office,** with the participation of Dr. Mahmood Sasa, concluded the project, "Baseline studies of

biodiversity to support environmental compensation in the Costa Rica-Nicaragua Frontier Corridor". **La Selva** staff worked with community groups to establish the Sarapiqui Cultural Center in an OTS building. This project will support artisans and will transmit art and culture to the community. A donor gift enabled the re-establishment of a native plants nursery and to create a landscaping plan for public-facing areas of **La Selva** and for the Centro Cultural.

Science highlights

Even with the inability of international researchers to use our stations, restrictions on travel, and prohibition on entry into entering protected areas during several months by the Costa Rican government, OTS worked to support existing research projects and to attract new projects through the use of research fellowships. Fellowships, supported by interest on endowments created specifically for this purpose, were awarded to cover the recipients' station fees at OTS stations. Due to the pandemic, most of the individuals whose projects were supported in 2020-21 were Costa Rican or South African residents, or those whose universities allowed international travel. In FY 21 OTS awarded a total of **$98,565** to **35 individual research fellowship recipients.**

OTS staff made use of their time during this period of low station visitation to complete several key projects. Station scientific staff participated in an online course focused on creating strategic plans for biological collections. Strategic plans for the OTS herbaria at La Selva and Las Cruces will allow OTS to make full use of the newly remodeled Orquidea building at La Selva to take advantage of a newly established endowment to support the herbarium and to develop research on plant ecology and systematics.

During 2021, work was completed to rebuild the research towers at La Selva (damaged in a series of extreme weather events) and to install and test data loggers, internet connections, and other instrumentation.

With donor support, OTS organized and hosted the 36th annual Christmas Bird Count at La Selva. The CBC provides valuable long term, systematically collected data on bird species composition at La Selva and in the surrounding areas. Seventy-five observers, including La Selva staff, local naturalist guides, professional ornithologists, and community scientists fanned out by foot, car, and boat to cover 324 km in 204 hours. The counters recorded 342 species and 10,729 individuals, including two species new to the list for this count. Data from the CBC are archived on the OTS website.

This year, OTS was able to implement the first CBC in the Arenal-Tempisque Conservation Area (ACAT). The CBC Palo Verde-Ramsar welcomed participation of 28 observers, including OTS staff, officials from the Guanacaste Conservation Area, naturalist guides, and ornithologists. After 52 hours of observation and 160 km, 5280 individuals of 182 species were registered. A highlight was provided by sighting of a burrowing owl (*Athene cuniculuaria*). It was only the second sighting of this species in 120 years in Costa Rica. We look forward to CBCs at all three OTS Costa Rica stations in 2021.

We made progress this year on an ambitious project to retrieve and archive important legacy data sets from OTS research stations from the 60s, 70s, 80s, and 90s. OTS formed a highly productive alliance with Environmental Data Initiative (EDI) to advance this goal. To data, EDI awarded OTS three Fellowships—two in 2020 to publish original data from the La Selva TRIALS

project* and one in 2021 to publish 30 years of pesticide data collected by Dr. Luisa Castillo at water sampling sites in the Palo Verde wetlands. OTS will partner with EDI on training sessions to OTS scientists and scientific staff who are interested in publishing station data or their own data in the EDI repository. EDI is NSF-funded and closely allied with LTER, DataONE, and OBFS. OTS scientific staff have collaborated with EDI Fellows and former PIs for the organization of TRIALS (published), PLOTS (about to be published), and pesticide (to be published next year) data. EDI Fellows at La Selva have been hired part-time with OTS donations to continue past their fellowship period. A donation at Palo Verde was used to support a Ph.D. and a M.A. student at UNA to work with the Palo Verde EDI Fellow. As for any legacy project, station fees can be covered by existing OTS fellowship money when students work at the stations. There are at least a dozen important data sets at each of the OTS stations (La Selva, Palo Verde, Las Cruces, and Skukuza) that could be retrieved, published, and made available.

Every two years, OTS hosts the Bond Review: Ecological Workshop Series gathering in Skukuza with our SSLI partners. It is a product-driven workshop, engaging in a knowledge review of a key conservation or ecological subject but also aiming to establish collaborations between global experts and their students. In 2020, we published the findings of a workshop that focused on a global assessment of plant traits in open ecosystems. Open ecosystems, i.e. disturbance driven systems, have only recently received global attention in understanding their dynamics, threats, and conservation. This trait handbook, co-authored by 23 researchers from the Americas, China, Europe, and Africa, is the culmination of three successful workshops held at the SSLI and represents an important milestone in understanding open ecosystems.

OTS supports three major research themes in South Africa, combining high quality science leadership training with critically important long-term biodiversity data. In partnership with University of Florida, Nsasani Trust, SANParks, and University of Eswatini, we conduct biannual biodiversity surveys assess changes in savanna heterogeneity due to elephants and fire. Key to the work is understanding the trophic cascade consequences of the change in vegetation structure. We have collected these data since 2013. As part of a larger network of research affiliates (SANParks, EFTEON, University of Witwatersrand, and NASA), OTS started a research program assessing the consequences of land use change for biodiversity, ecosystem services (including carbon sequestration), and emerging Zoonotic diseases. As part of OTS' *Women in Science* training program, we collect annual data on the impact of alien invasive species on freshwater systems in the Kruger National Park.

Communications

Over the past 18 months, the Communication Committee of the OTS Board of Directors and OTS staff have worked together to enhance communications with our community. These efforts have resulted in an enhanced social media presence and regular, informative editions of the *eCanopy* newsletter.

OTS rejoined the Organization of Biological Field Stations (OBFS) and has had a significant presence in the last two OBFS annual meetings. OTS has been working consistently with others in the field station community to raise awareness of field stations issues. Three recent publications highlight these efforts. Gene Likens and Dave Wagner (from OTS permanent member UConn) published a letter in *Science* that addressed the global scientific legacy of field stations. An opinion piece in *Bioscience* (Swing et al. 2020) and a petition sent to members of

Congress was signed by over 2000 individuals and organizations echoed the Likens-Wagner piece.

Development and Stewardship Highlights

In the 2021 fiscal year, OTS reached our fundraising goal of $1.2M in unrestricted support – one of the highest amounts ever raised and a dramatic increase over past years. Fundraising now represents about a third of OTS revenue even though the team has been reduced to one full time position and two part time positions. We were able to secure funding for key projects such as *Women in Science* program, herbarium improvements at La Selva and Las Cruces, renewed research projects at Palo Verde, and a new program to support early career researchers. Ongoing improvements at La Selva included upgrades to cabins, new visitor center, additional solar panels, and septic tank replacement. With help from staff and board volunteers, we continued our program of outreach to supporters through thank you calls and cards from staff and board volunteers.

Over the last year, fundraising efforts included increasing support from major donors, launching a comprehensive direct mail campaign, stewardship of federal grants, developing an expanded corporate giving program, and implementing additional special events such as *TropTalks*.

OTS of the future

Despite unanticipated and unprecedented health, economic, and visitation conditions since March 2020, OTS has weathered the pandemic. We have had to make difficult decisions regarding staffing, planning, teaching, and research. Having made it through a contraction of programs, staffing, and funding, OTS is now positioned to move forward into a new era with a strong commitment to preserve all four OTS research stations, to engage and support research, and to offer innovative and timely educational programs for diverse future biologists, decision-makers, and the broader community.