
Muni Guate
CEA
Centro de Educación Ambiental
2285-0099
Con la participación de:
FLAAR MESOAMÉRICA
FUNDAECO
DEFENSORES DE LA NATURALEZA
CONAP
ECOn_ferencias
lunes 4
Biodiversidad que albergan los ecosistemas de humedales y cerros en el municipio de Livingston, Izabal
Dr. Nicholas Hellmuth
Fundador
FLAAR Mesoamérica
martes 5
Cinturón verde de la Metrópolis de Guatemala
Lic. Gabriel Valle
Coordinador del Capítulo Metropolitano
FUNDAECO
miércoles 6
El reto real de los incendios forestales
Ing. Óscar Núñez
Director ejecutivo
Defensores de la Naturaleza
jueves 7
Diversidad biológica de Guatemala: Conceptos, amenazas y tendencias
Lic. José Luis Echeverría
Director de valoración y conservación de biodiversidad
CONAP
viernes 8
Gestión de desechos y residuos sólidos y su relación con la prevención del contagio de COVID-19
Licda. Andrea Díaz
Unidad de Reciclaje
Dirección de Medio Ambiente
Municipalidad de Guatemala
4 al 8 de mayo - de 11 a 12h - vía ZOOM
¡INSCRÍBETE! bit.ly/ECOnferenciasInscripcion
*Participación Libre
Cupo limitado
#QuedateEnCasa
#JuntosLogramosMas

We thank the MUNI Guate for being inviting FLAAR Mesoamerica to their May 2020 lecture series, especially the conference coordinator:
Alejandra Morales
Coordinadora
Centro de Educación Ambiental
Dirección de Medio Ambiente
MuniGuate (Municipio de Guatemala)

To our photography team and designers, specially Alejandra Gutiérrez and David Arrivillaga, we appreciate your finding all the photographs and putting them by topic.

I wish to thank the organizers of this conference series.

I look forward to hearing the other presentations on Tuesday (Lic. Gabriel Valle), Wednesday (Ing. Oscar Núñez), Thursday (Lic. Jose Luis Hecheverría and Friday (Licda. Andrea Díaz).

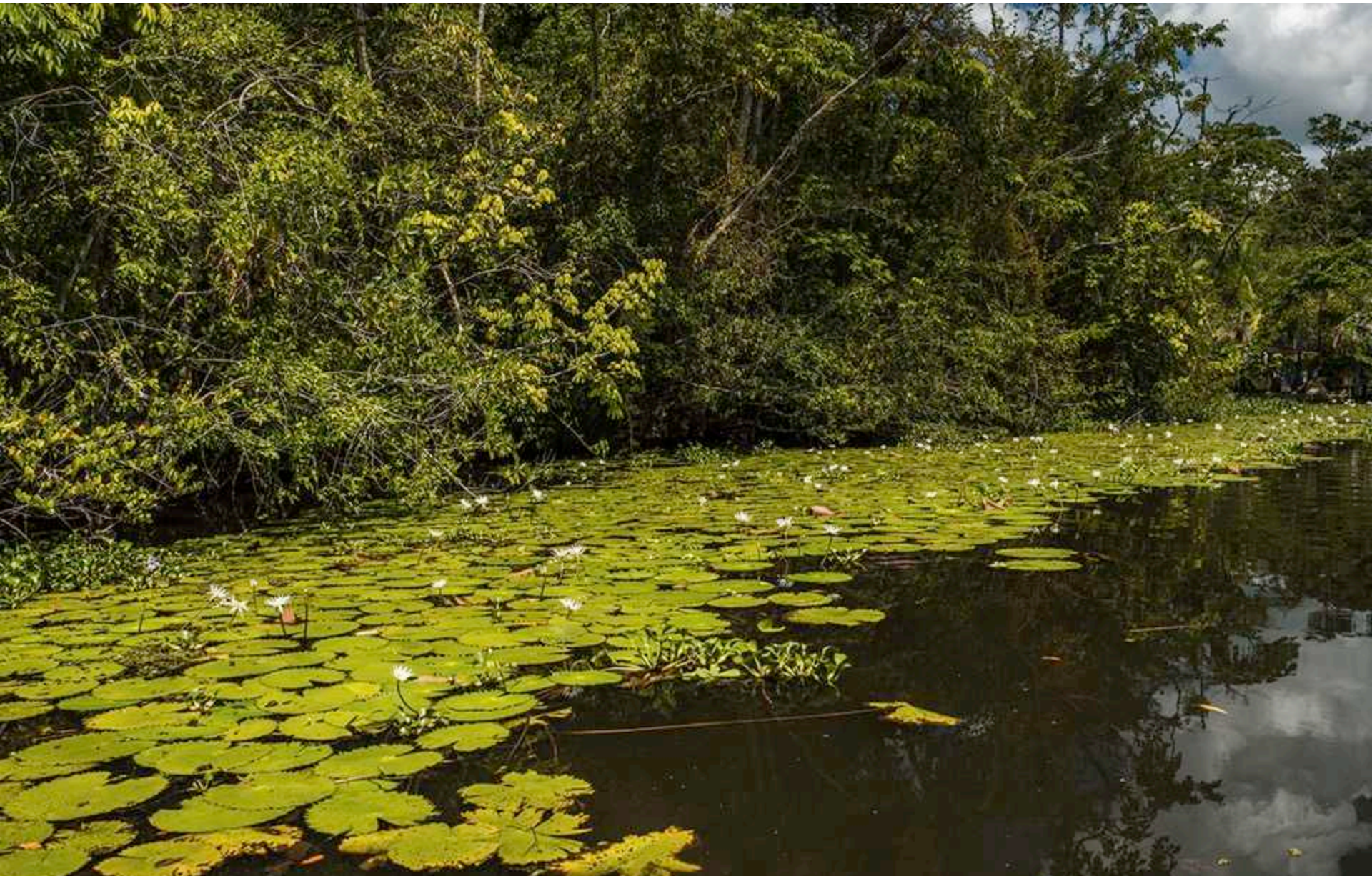
Hopefully they will also be available as a PowerPoint or video.

I thank Victor Mendoza and Vivian Diaz of FLAAR Mesoamerica for networking with lots of capable NGO's and hospitable Guatemalan government organizations so an event such as this today is possible.

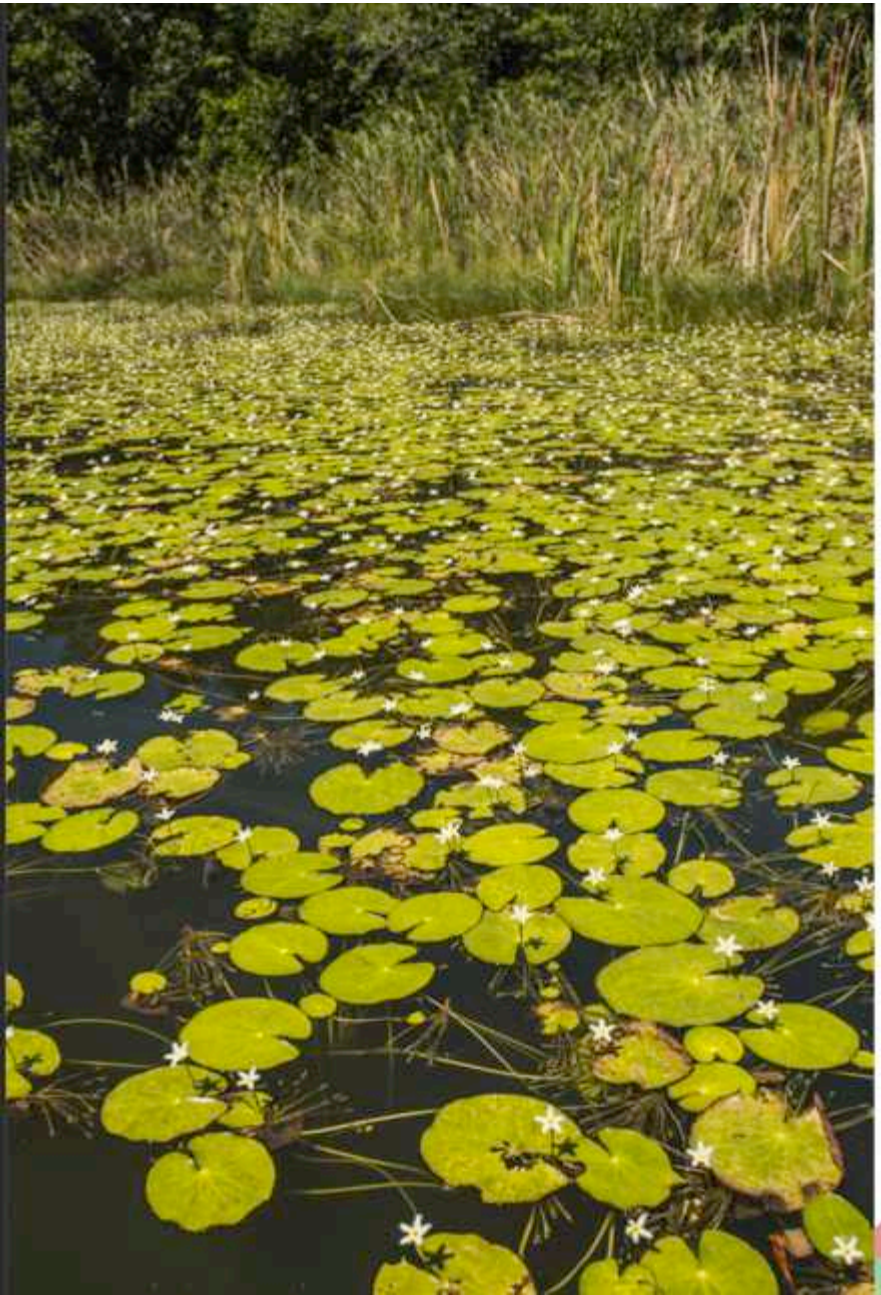
BIODIVERSITY HOSTED IN WETLANDS AND LAND ECOSYSTEMS IN THE MUNICIPALITY OF LIVINGSTON, IZABAL

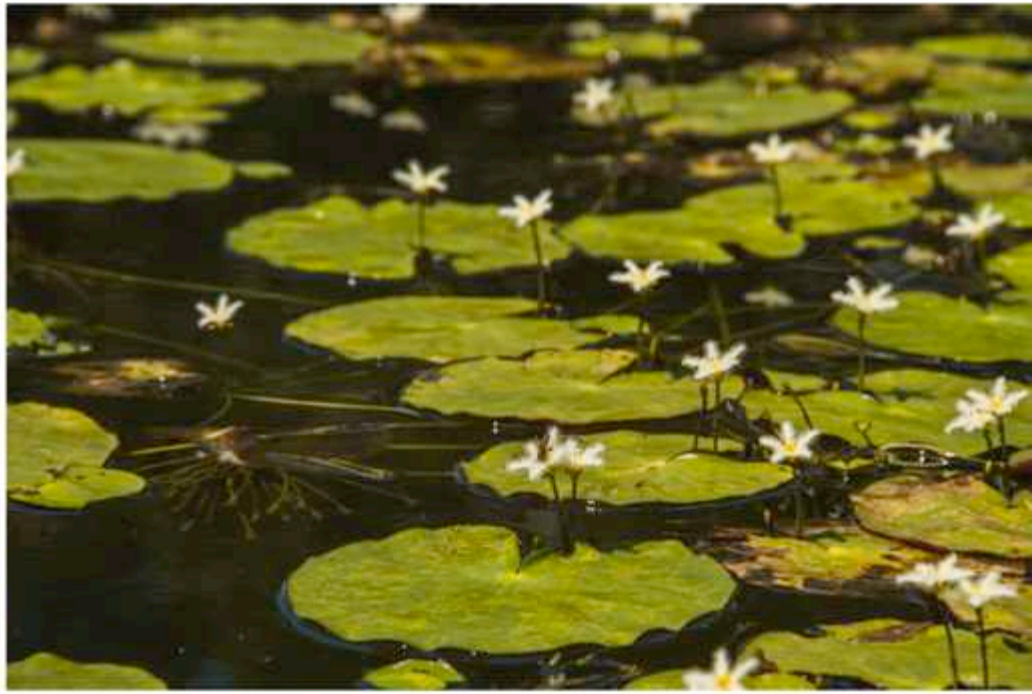
Livingston Municipio has great potential to photograph, document and report biodiversity. Obviously with Amatique Bay, the Rio Dulce canyon, El Golfete and the east side of Lake Izabal, the "best ecosystems", the majority are on the shore of these areas. The FLAAR Mesoamerica team is mainly focused on finding:

"Fields" covered with large waterlily pads and white flowers (*Nymphaea ampla*)



Wide “fields” of pure *Nymphoides indica* waterlilies.





Wide “fields” of these two waterlilies growing together

Many area of grasses (reeds) along the shore need to be studied, each species identified, and photographed in high resolution.

This is a view from Google Maps, satellite view, showing an island at the west end of El Golfete. There are so many MILLIONS of waterlily pads that the fields formed by these masses of waterlilies are visible along the north edge and south edge of this island.

So if you are a botanist or ecologist, we hope this helps you find waterlilies here. And if you plan to visit Guatemala in coming months, now you know where to head to see the same waterlily flowers and pads that are pictured in Classic Maya art of Palenque, Copan, and elsewhere.

Captura de pantalla. Tomada de Google Maps en 13 abril 2020. Al final oeste de El Golfete, hay miles de lirios de agua flotando alrededor de la orilla

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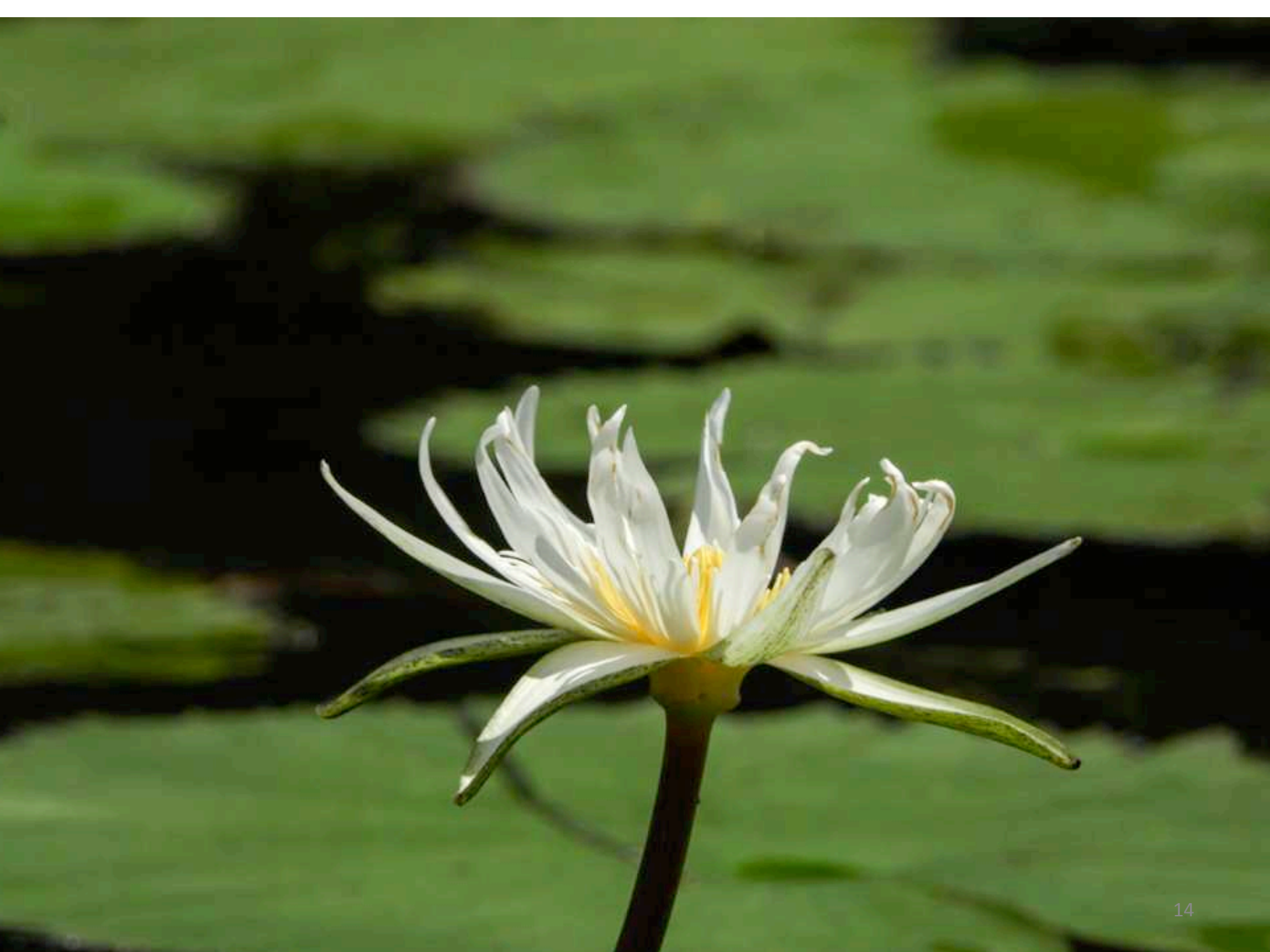
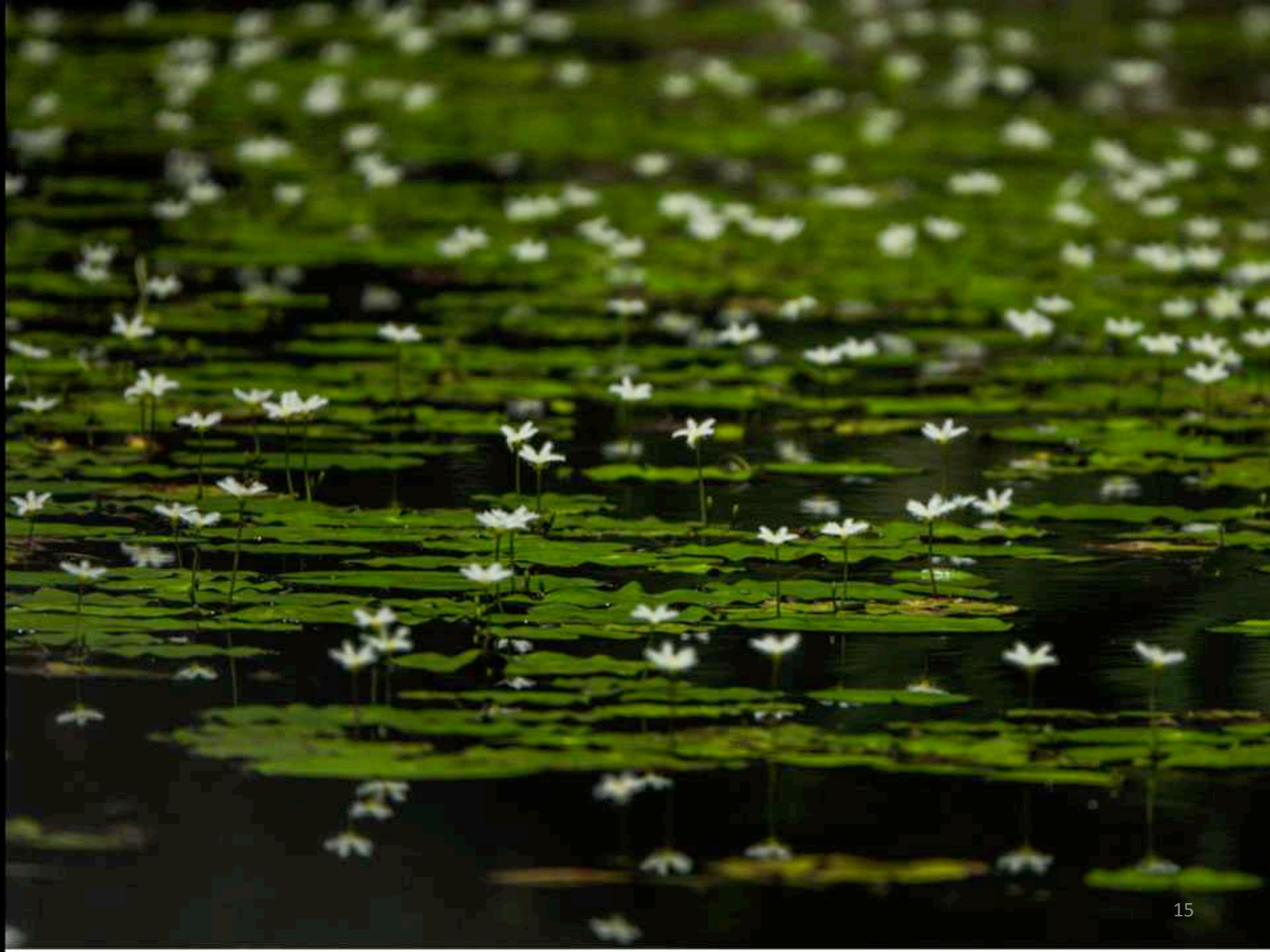


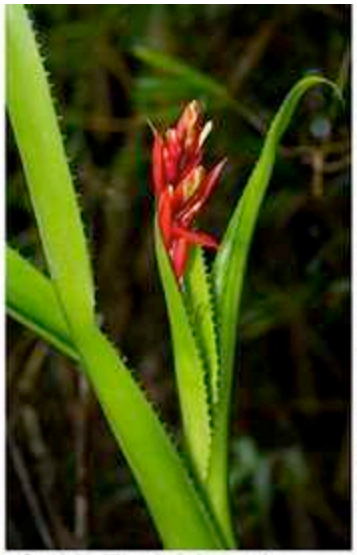


Google Maps, satellite view of the mass of water lilies on the south side of El Golfete, near the eastern end of El Golfete

Captura de pantalla. Tomada de Google Maps en 13 abril 2020. Al final oeste de El Golfete, hay miles de lirios de agua flotando alrededor de la orilla

We are also preparing photo-banners of each area of the Municipio de Livingston which shows the many species we found on each field trip. We donate these banners to the Municipio. These can be used on web sites, by local hotels and restaurants, to attract visitors. And these photo banners can be put on the classroom walls of local schools to help the local children learn about the flora and fauna of their homeland.





CHOCON MACHACAS





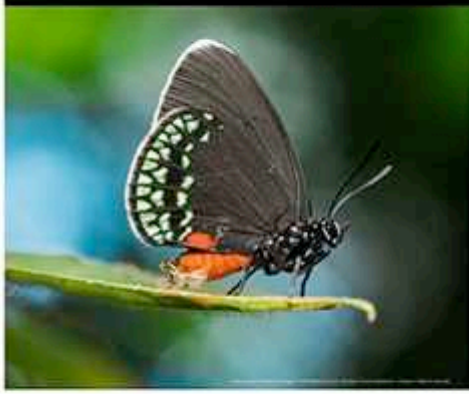


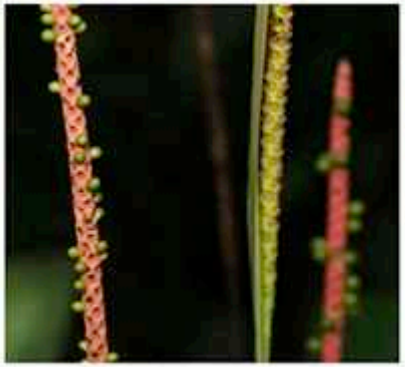




Biodiversidad

Biotopo Chocón Machacas

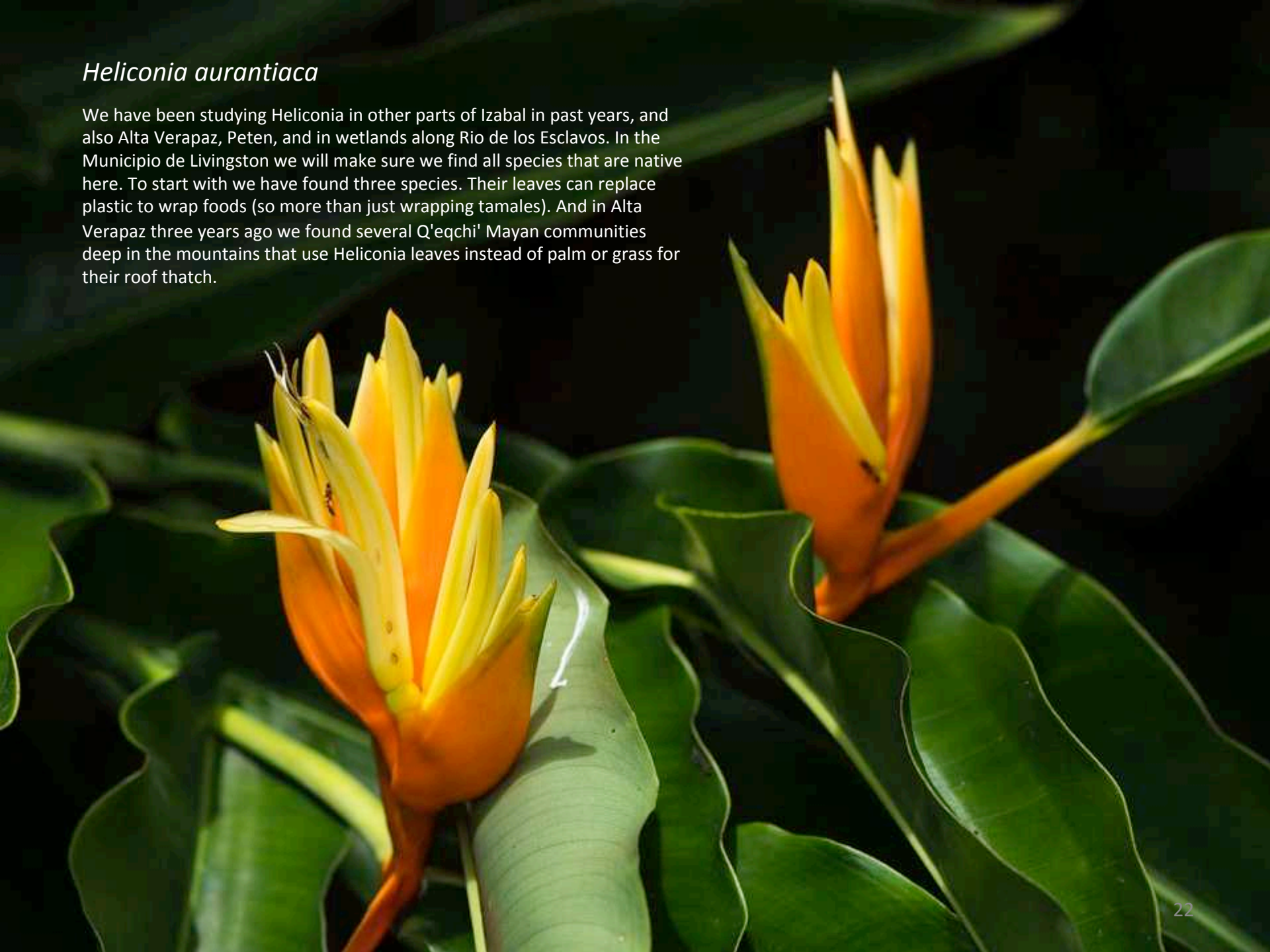




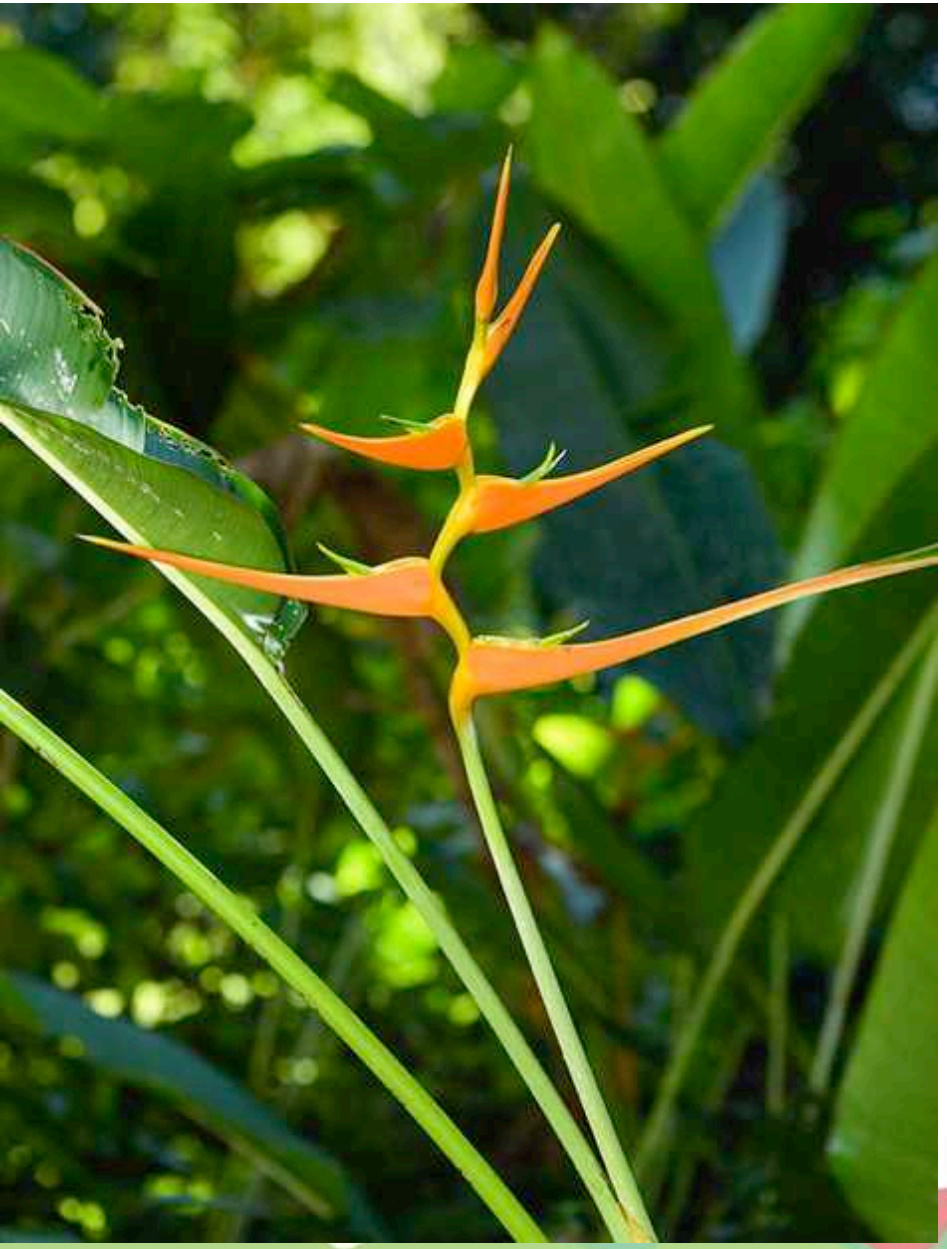
Mushrooms of every size and shape can be found in the Municipio de Livingston, especially in the area of Chocon Machacas (north side of El Golfete).

Heliconia aurantiaca

We have been studying Heliconia in other parts of Izabal in past years, and also Alta Verapaz, Peten, and in wetlands along Rio de los Esclavos. In the Municipio de Livingston we will make sure we find all species that are native here. To start with we have found three species. Their leaves can replace plastic to wrap foods (so more than just wrapping tamales). And in Alta Verapaz three years ago we found several Q'eqchi' Mayan communities deep in the mountains that use Heliconia leaves instead of palm or grass for their roof thatch.

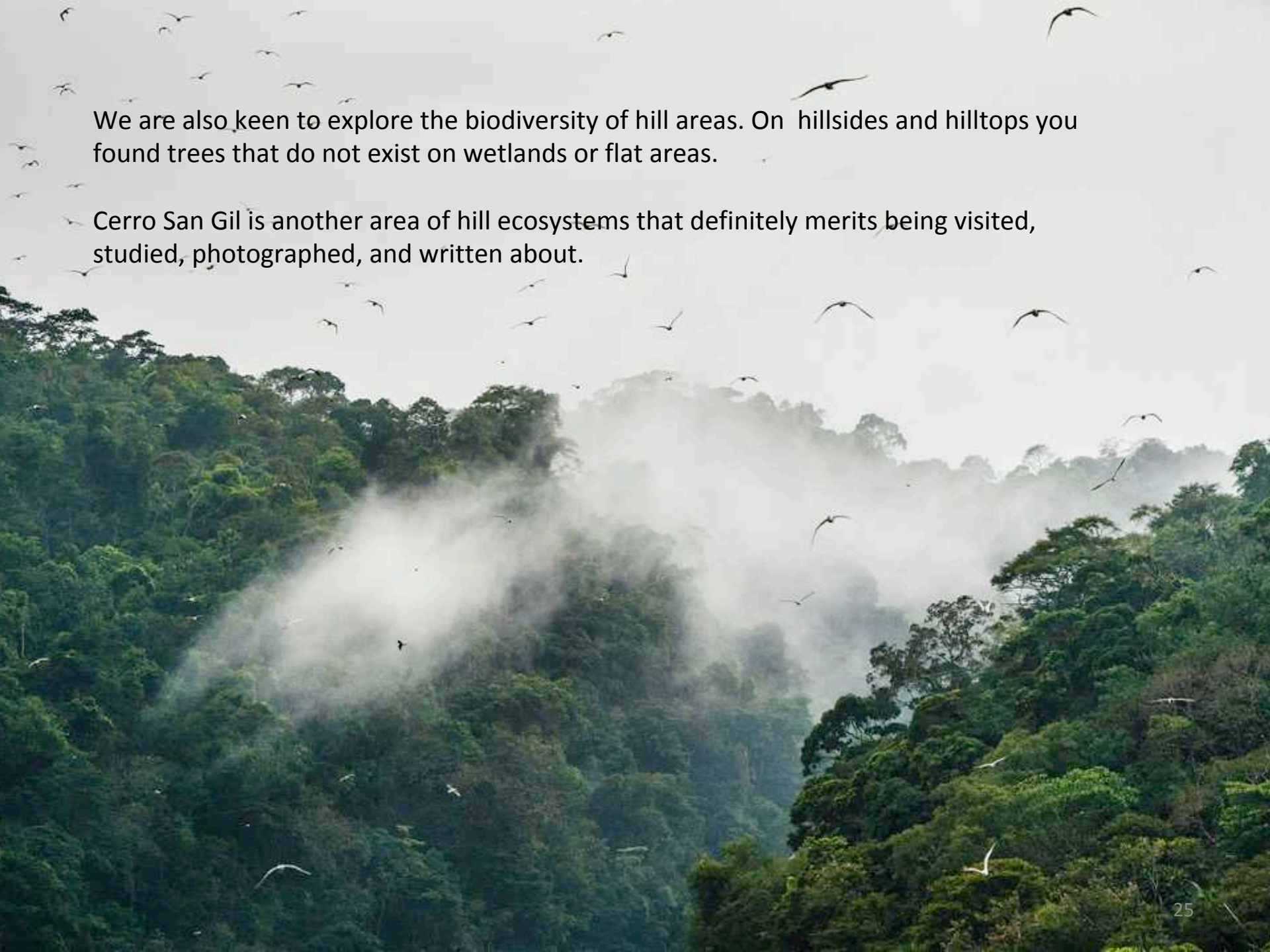


Heliconia latispatha



Heliconia champneiana

The presentation today shows primarily wetlands; but in future field trips we will explore hillsides and hilltops. Hills are home to different species of trees from those of the wetlands around rivers, lagoons, streams, swamps, etc.



We are also keen to explore the biodiversity of hill areas. On hillsides and hilltops you found trees that do not exist on wetlands or flat areas.

Cerro San Gil is another area of hill ecosystems that definitely merits being visited, studied, photographed, and written about.

A major goal is to make a list of all edible flowers, all edible roots, all edible fruits and nuts, all edible seed pod pulp, all edible leaves and shoots of native plants of Livingston.

We want to provide healthier food for local people (and food that is already very happy growing in Livingston areas). So here is an example of this work-in progress:

Healthy edible flowers and inflorescences that are native to Livingston, Izabal, Guatemala

Vivian Hurtado
Nicholas Hellmuth

Nombre científico	Familia	Nombre común	Distribución en Guatemala	Información adicional
Astrocaryum mexicanum Liebm. ex Mart.	Arecaceae	Cocoyol	Alta Verapaz, Izabal y Petén	Las inflorecencias jóvenes son comestibles
Chamaedorea tepejilote Liebm	Arecaceae	Pacaya	La Pacaya es nativa y bajo cultivos en Guatemala en los siguientes departamentos: Alta Verapaz, Baja Verapaz, Izabal y al noreste de Petén y Suchitepéquez, Quetzaltenango, San Marcos y Huehuetenango en las zonas Occidentales del país.	Las inflorescencias se consumen, tienen un sabor amargo característico, se preparan comúnmente envueltas en huevos, otra forma de consumirlas es encurtidos como parte de la preparación de los fiambres (Orellana, 2012).
Desmoncus orthacanthos Mart.	Arecaceae	Bayal	Alta Verapaz, Izabal y Petén	La inflorescencia es consumida cuando está inmadura
Fernaldia pandurata (A. DC.) Woodson	Apocynaceae	Loroco	Izabal, Zacapa, Chiquimula, Jutiapa	Las flores se comen cocidas para estimular la producción de leche materna (Pardo, Burgos y Cruz, 2012).
Galinsoga parviflora (HBK) Benrh	Compositae	Olla nueva, Galinsoga, Mácare, Cunde amor	Se reporta en bosques abiertos de encino, encino-pino, pero principalmente como una maleza, en localidades desde los 250 a 3,800 msnm. Es más frecuente en el altiplano central de Guatemala, en donde se considera una de las principales malezas en los cultivos de la región. Elfriede de Poll menciona su presencia en Izabal en: Plantas silvestres comestibles de Guatemala (1983)	Los espadices (inflorescencias) son comestibles. En San Marcos se cocinan en caldo junto con otras verduras. Su sabor es ligeramente amargo. Las hojas tiernas y las flores se usan en alimentos, ya sea preparadas en caldo con vegetales, con chirmol de tomate, con huevos y en una comida especial típica del municipio de Rabinal, Baja Verapaz, llamada revolcado.
Gliricidia sepium (Jacq.) Steud.	Papilonaceae / Leguminosae	Madre cacao, yaite, cante, cansim	Alta y Baja Verapaz, Chiquimula, Escuintla, Huehuetenango, Izabal, Jalapa, Jutiapa, Petén, Retalhuleu, Sacatepequez, Santa Rosa, Suchitepequez y Zacapa	Crece de manera silvestre y se planta como cerco vivo. Se consumen las flores, se retira el cáliz y se prepara en sopas o se fríen para combinarlo con otros alimentos como huevos o

				frijoles. También se puede preparar con tomate, chile, cebolla, especias y sal al gusto (Chízmar, 2009). En el grupo étnico Quiché, se consume la flor envuelta en huevo (Gisbert et al., 1999).
Cucurbita moschata Duchesne	Cucurbitaceae.	Ayote, cum, cumayote, K´umayote, Calabaza, K'uum, Ayote-calabaza, Ayote-tamath, K'uum	En Guatemala se encuentra mayoritariamente en áreas con clima cálido. También se cultiva en Izabal	Las flores son consumidas como verduras cocidas
Yucca elephantipes Regel	Asparagaceae	Izote, Palmera, Cukil, Quiil, Co'quil (Quecchí), Pasquiy (Chimaltenango), Pasqui (Totonicapán), Espadillo, Gûinte (Standley y Steyermark, 1958; Chizmar, et al, 2009).	En Guatemala está presente en todos los departamentos (Standley y Steyermark, 1958)	Las flores son apreciadas como alimento y se encuentran en muchos mercados durante la temporada. El método más común de preparación es hervirlos o freírlos o usarlos en un batido de huevo. También se pueden usar en guisos y ensaladas. Ambas muestras fueron compradas en el mercado.
Erythrina berteroana Urban	Fabaceae	Árbol de pito, Tzité, Coralilla, Machetillos, Miche, Tzinte	Está ampliamente distribuido en todo el país.	Los brotes y las flores sin abrir se consumen como vegetales con carne, guisos y huevos; se supone que tienen un efecto calmante y producen una sensación de bienestar
Goeppertia macrosepala	Maranthaceae	Chufle, Chekai	Es común en los departamentos de Izabal, Zacapa, Santa Rosa, Escuintla, Sacatepéquez, Suchitepéquez, Huehuetenango.	Los brotes tiernos de las inflorescencias se cocinan y se comen como vegetales, generalmente en sopas y otras recetas.
Spathiphyllum phryniifolium	Araceae	Gusnay, bushnay, busnay, güisnay, huisnay	Más frecuente en la boca costa del pacífico, principalmente a bajas elevaciones alcanzando hasta los 1400 msnm en Quetzaltenango, Santa Rosa, Escuintla, Suchitepéquez, San Marcos, pero también se puede encontrar en Izabal	Las inflorescencias jóvenes se usan en sopas o se fríen con huevos (Williams, 1981). En las poblaciones étnicas quiché, las inflorescencias tiernas se comen fritas con tomate y cebolla (Gisbert et al., 1999). También en la costa sur de Guatemala es común comer inflorescencias tiernas en la

				sopa. Entre sus propiedades nutricionales tiene zinc, magnesio y hierro.
Bromelia pinguin	Bromeliaceae	Muta, piñuela, ixchuu	Distribuida en todo el país	La inflorescencia joven se llama muta, es comestible y tiene un rico sabor; Las inflorescencias tiernas están formadas por capas de hojas blancas y carnosas que se comen de diferentes maneras, especialmente cocinadas como vegetales.
Carludovica utilis	Cyclanthaceae	Tepejilote, cuajiote	Alta Verapaz, Izabal, Sololá, Suchitepéqez, Quetzaltenango, San Marcos y Huehuetenango	Las inflorescencias masculinas se cocinan en agua; la primera y segunda vez se descarta el agua; mientras que durante la tercera ocasión de cocción, se agregan tomate, sal y cebolla; después de hervir, se consume la inflorescencia y el caldo resultante. (Azurdia, 2016) Actualmente, es más difícil encontrarlo en los mercados, mientras que su precio es mucho más alto; porque hay menos disponibilidad en el bosque y también, porque se dice que su cosecha es peligrosa ya que su hábitat se comparte con las serpientes venenosas. Chízmar (2009)

Camote is an example of a native Guatemalan food that is popular around the world. But we want to find all the other underutilized roots, tubers, and rhizomes that are edible (and that are native and growing in the forests or other ecosystems of the Municipio de Livingston).

Nicholas Hellmuth
FLAAR Mesoamerica

Nombre cietífico	Familia	Nombre común	Reserva natural en la que posiblemente encontremos esta planta	FLAAR list
Antigonon leptopus	Polygonaceae	Coralita	Found in Izabal (Standley, P. C. & J. A. Steyermark 1946) tropicos.org	
Bomarea acutifolia	Alstroemeriaceae			
Bomarea edulis	Alstroemeriaceae	coyolxochitl		
Canna indica synonym *Canna edulis*	Cannaceae			yes
Calathea allouia	Marantaceae	Leren, lirén	Biotopo Chocón Machacas Río Dulce	
Carica papaya	Caricaceae	papaya de monte	Cerro San Gil	yes
Chenopodium ambrosioides	Amaranthaceae	Epazote, Apazote		
Cucurbita moschata	Cucurbitaceae	Ayote		
Cyperus esculentus	Cyperaceae	Cebollín, cebolla de río, sivac, suchipaite	Biotopo Chocón Machacas	
Dahlia imperialis	Asteraceae			
Dioscorea convolvulacea	Dioscoreaceae	barbasquillo, madre de maiz	Cerro San Gil	
Eleocharis caribaea	Cyperaceae	Tule, sintule	Biotopo Chocón Machacas Río Dulce	
Ipomoea tiliacea	Convolvulaceae	Saqi (Q'eqchi')		
Maranta arundinacea	Marantaceae	Maranta, azafrán	Biotopo Chocón Machacas	
other *Maranta* species	Marantaceae		Río Dulce	
Marattia interposita	Marattiaceae	Maratia		
Marattia laxa	Marattiaceae	Maratia		
Nymphoides indica	Menyanthaceae	Estrella del agua		yes
Oxalis deppei	Oxalidaceae	Trébol de cuatro hojas		
Phragmites australis	Poaceae	Carrizo		
Piper auritum	Piperaceae	Hoja de Santa Maria, Hoja Santa	Biotopo Chocón Machacas, Río Dulce	

Solanum cardiophyllum	Solanaceae	Papa de tierra	Biotopo Chocón Machacas	
Solanum ehrenbergii	Solanaceae	Papa silvestre	Biotopo Chocón Machacas	
Typha latifolia	Typhaceae	Enea		
Xanthosoma species	Araceae			
Xanthosoma species	Araceae			
Xanthosoma violaceum	Araceae	Mafafa morada	Cerro San Gil	
		Tonton citam, ix tonton citam		

PARQUE NACIONAL YAXHA-NAKUM-NARANJO

PNYNN

In addition to doing field research in the Municipio de Livingston, we are also interested in cooperating with the park administrators of Parque Nacional Yaxha Nakum Naranjo (PNYNN).

We have learned a lot about biodiversity of ecosystems of this area of central Peten during 2018-2019. We would like to show some examples, since every part of Guatemala is unique.

Acknowledgements:

For cooperation, hospitality, and assistance at Parque Nacional Yaxha, we thank
Lic. Jorge Mario Vazquez (CONAP, Santa Elena, Peten)
Arq. Jose Leonel Ziesse (IDAEH, Santa Elena, Peten)
Biolg. Lorena Lobos (CONAP)

For the Naranjo sector of PNYNN, we thank
Arqueologa Vilma Fialko
Arquitecto Raul Noriega
Naranjo project person who knows local plants, Horacio Palacios

and all the helpful and knowledgeable guides of IDAEH CONAP who accompanied us each day. It is essential to have either an IDAEH and/or CONAP guardabosque or comparable when doing flora and fauna research.

We appreciate the over 16 years of knowledge of birds and plants of “Teco” (Moises Daniel Pérez Díaz). We also appreciate the assistance of park ranger Ricardo Herrera and all the other park rangers who accompanied us on individual hikes. It is essential to have either an IDAEH and/or CONAP guardabosque or comparable when doing flora and fauna research in a Parque Nacional.

We have found wetland ecosystems not necessarily on the banks of water bodies. It would not surprise us if we find this type of ecosystem, or similar, in Izabal. In the Yaxha Nakum Naranjo National Park, in a previous project, using aerial photos from the IGN (Instituto Geográfico Nacional) we identified several “wetland” ecosystems within the mainland, within the protected area.

(We had the help of Leonel Ziesse, park administrator, Mario Vásquez, and biologist Lorena Lobos. Also sector Naranjo team).

This Savanna East of Nakum is one of the largest virgin un-farmed natural savannas yet documented for Central Peten. 2019 was a very very dry year but in a normal year there is standing water several centimeters deep over the entire area in the wet season.

Savanna East of Nakum

Aguada Maya, Poza Maya, has been known to Guatemalan archaeologists and ecologists for many years. This area is humid all year round (as you can see from the bright green vegetation).
This ecosystem is partially Maya-made (several thousand years ago).

Aguada Maya, Poza Maya: If you have a licensed local guide he or she can guide you here and you can stand on the edge of this remarkable wetlands area. To see the entire area best to look at it from Google maps, satellite view. It is to the right side (east side) of the dirt road from Yaxha to Nakum sectors of Parque Nacional Yaxha Nakum Naranjo.

The tapir love the wet muddy areas (and I bet peccary do also).

The team of FLAAR Mesoamerica has the option of iPhone Xs in pano mode or Google Pixel 3XL in pano mode, plus Nikon with panorama tripod head system.

Aguada Maya, Poza Maya

We hope to assist PNYNN and other national park areas in Guatemala once the Coronavirus pandemic has toned down. The operating budget of each park depends on entrance fees from visitors. It helps to have awesome photographs to show tourists from around the world what awaits them here in Peten.

Savanna West of Naranjo, found in aerial maps and already known by the Naranjo sector team (since their camp is less than 1 km away). There is a bajo (tintal) to the south; and a cibal and then a jimbal to the north. So all together this Naranjo sector of PNYNN is a remarkable location to do ecological studies because every 100 meters the ecosystem changes and transitions into another kind of vegetation.

We thank the team of Naranjo for guiding us to this wonderful area to study. This photograph is not an aerial view: we are accomplishing the photography from the top of a pyramid at the Naranjo Maya ruins.

Savanna, Naranjo 2019. Found in aerial maps and already known by the Naranjo sector team (since their camp is less than 1 km away). There is a bajo (tintal) to the south; and a cibal and then a jimbal to the north. So all together this Naranjo sector of PNYNN is a remarkable location to do ecological studies because every 100 meters the ecosystem changes and transitions into another kind of vegetation. We thank the team of Naranjo for guiding us to this wonderful area to study.

Savanna, Naranjo 2019

It is essential to have panorama capability with your recording crew. This is one reason different entities in Guatemala invite the team of FLAAR Mesoamerica to assist them in recording the biodiverse ecosystems of their part of Guatemala.

So in 2018-2019 we worked one-week-per-month for 12 months in Parque Nacional Yaxha Nakum Naranjo (PNYNN); starting in 2020 we began doing field work in Livingston area of Izabal. Once the pandemic wanes down we of course will continue in Rio Dulce, El Golfete, Lago Izabal, Tapin Creek, Lagunita Creek, Cerro San Gil, but we also look forward to cooperating with other entities elsewhere in Peten and northern Alta Verapaz.

Savanna of three fern species, west of west end of Lago Yaxha, about a 30 minute hike uphill from Laguna Lankaja and is a few dozen meters south of Laguna Perdida. I discovered this from the aerial photographs of IGN. This area of PNYNN is one of the most remarkable ecosystems I have seen or heard of in the Maya Lowlands: every 20 or 40 meters there is a new habitat with completely different plants. Since it takes about 5 hours to get here and back from the main camp, it will help to have future field trips to record all the plant species that we experienced here.

With the assistance of the boat of the PNYNN and when occasionally it was in use, with the assistance of the boat from Ecolodge El Sombrero, we found over 20 locations around Lago Yaxha with an aquatic orchid: *Bletia purpurea*.

Bletia purpurea

75% of the maps of the Municipio de Livingston on the Internet, show that the south border is Canyon Rio Dulce and El Golfete. That the entire area on the southern shores of Canyon Rio Dulce and El Golfete is part of Municipio de Puerto Barrios.

So, Very few maps show that the main section of Cerro San Gil is in Muni Livingston.

And this bizarre map shows a “Municipio?” of San Luis between Livingston and Puerto Barrios.

So, to help research teams and tourists who want to visit Municipio de Livingston, would be helpful if “www.mapsOfworld.com had correct borders for Livingston.

This is one of the very few maps that shows the Municipio de Livingston on the south side of the Canyon.

This is less distorted. But this is not the map that tourists find; they find the ones that show Muni Livingston only on the north side.

Haematoxylum campechianum, palo de tinto, palo de Campeche, is common at Tikal, PNYNN, when you hike by foot to El Mirador in northern Peten, along Rio San Pedro tributaries, etc.

We would like to find *Haematoxylum campechianum*, palo de tinto, palo de Campeche along the creeks and rivers of Izabal. So far you find mainly mangrove trees and other trees that have adapted to survive a bit of sea water from the Caribbean Sea.

So it will help to ask local people who live in Izabal if they know of *Haematoxylum campechianum*, palo de tinto, palo de Campeche in their areas.

Haematoxylum campechianum

Flowers of *Haematoxylum campechianum*

All these photographs of palo de tinto are from Peten. We have not yet noticed this tree in the eastern (brackish water) area of the Rio Dulce or El Golfete.

Flowers of *Haematoxylum campechianum*

Courtesy of park ranger Teco.
These photos by Teco are better
than any photo I have taken of
the flowers of this tree in Peten
in the last 15 years.

In the myth of the Popol Vuh, the mother of the Hero Twins made a heart out of the latex of a "blood sap tree."

There are many trees native to Guatemala whose sap is red-as-blood. But the one that coagulates the best is the red sap of the *Pterocarpus officinalis*.

Pterocarpus rohrii is also found in Izabal (synonym is *Pterocarpus hayesii*; that's the name in most botanical reports of past years).

With the help of the author of many books on trees of Guatemala, Regina de Riojas, we found several *Pterocarpus* trees on her property near the edge of Rio Dulce.

There are many more *Pterocarpus* trees away from the shore in Rio Dulce; often they are almost their own islands out in the water.

Now that we are working together with the Municipio de Livingston, I look forward to finding the trees when they are flowering. Then we would like to find a heart surgeon who can come with us and make an actual human heart out of the sap (just like was done by the owls who were supposed to sacrifice the mother of the Hero Twins, Hunahpu and Xbalanque.

Pterocarpus officinalis

Pterocarpus officinalis

That is Shaila, daughter of Gaby. Gaby is one of the helpful Q'eqchi' Mayan assistants on our field trips. We allow members of our team to bring their children on the field trip (so the kids can learn new things, and because it is nice when mothers can be with their children instead of the kids being with a babysitter far away).

We appreciate the assistance of tree research specialist Regina de Riojas for access to this palo de sangre de drago on her property, inland from Rio Dulce.

I am also interested in finding and photographing the Snake Hawk (the Laughing Falcon, the bird described in the saga of the Popol Vuh).

And would like to find as many of the trees, mammals, fish, and reptiles mentioned in the Popol Vuh that occur in Izabal. Although the only surviving copy of the Popol Vuh is in the K'iche' Mayan language, 2000 years ago every village, every city, every area of both the Highlands and the Lowlands had their own version. You know this because 90% of the plants and animals associated with the Hero Twins and their mother and grandmother are all from Lowland ecosystems: not from the cold Highlands. The Highland chapters of the Popol Vuh are the historical aspects of the actual highlands. But the Hero Twins part, that originated in the Lowland ecosystems.

Would be great if the shuttle boat tour guides could add all this to their information they provide to the tourists in their boat: every tree along the shore that is not just mentioned, but literally featured in the Popol Vuh.

For example, the head of Hunahpu was a seed pod on the gourd tree (also called Calabash Tree). This is one of the two species of *Crescentia* that are found in savannas.

Frutos del árbol de hule

Castilla elastica is the rubber tree native to the Mayan areas and the Olmec areas of Mesoamerica. All the peoples of Mesoamerica made their rubber game balls from the latex of *Castilla elastica*.

This tree is native to Guatemala: common in the Costa Sur, and also can be found in Peten. There are many *Castilla elastica* trees near Tucuru, Alta Verapaz. Would be great to find native wild *Castilla elastica* trees in the forests of the Municipio de Livingston.

Latex by itself will not bounce. Thomas Goodyear had to add sulfur chemicals to volcanize the latex; but he was using the Brazilian rubber tree. The Olmecs and Maya had the local rubber tree; they coagulated the latex with sap squeezed from vines. So far, with the help of Lacandon ethnobotanist Suzanne Cook, we have learned that two different *Merremia* vines can help coagulate latex. *Ipomoea alba* has been studied by MIT chemical expert Michael L. Tarkanian, working together with colleagues MIT professor Dorothy Hosler.

The team of FLAAR Mesoamerica, once we realized that two species of *Merremia* could also coagulate latex, Senaida Ba found *Merremia tuberosa* in several locations en route to her home in Alta Verapaz. We showed the park rangers of PNYNN the photos of the two species, and between Teco, Senaida, and Dr Nicholas we found actually all three species: *Ipomoea alba*, *Merremia tuberosa* and *Merremia umbellata* inside PNYNN.

Now we are curious to find these species in Municipio de Livingston.

Plus there are other native plants of Guatemala that can produce rubber, and there are other native plants of Guatemala that can coagulate it. So a lot of future field work to find these remarkable plants, heritage of the Mayan people.

Ipomoea alba

Ipomoea alba


Merremia tuberosa

Merremia tuberosa

Wild papaya, *Carica papaya* is found throughout Guatemala. We have found it at Parque Nacional Yaxha Nakum Naranjo, and in March, along the road from Livingston to Plan Grande Tatin (en route to Cueva del Tigre). So this “wild” native relative is well known and easy to spot.


Carica papaya

But what we really want to find, in Peten, Alta Verapaz, and Izabal, are the wild relatives of "millions of years ago." Relatives so old that their fruits do not look like modern papayas.

Horovitzia cnidoscoloides (Lorence & R. Torres) V. M. Badillo

Jarilla caudata (Brandegee) Standl.

Jarilla chocola Standl.

Jarilla heterophylla (Cerv. ex La Llave) Rusby

Are there any savannas in the Municipio de Livingston?

Are there grassland areas with *Crescentia cujete* (jicaro), nance fruit trees, and *Acoelorrhaphe wrightii* palms (tasiste in Peten; pimintilla in Izabal)? These three plants are indicators of seasonally inundated savannas.

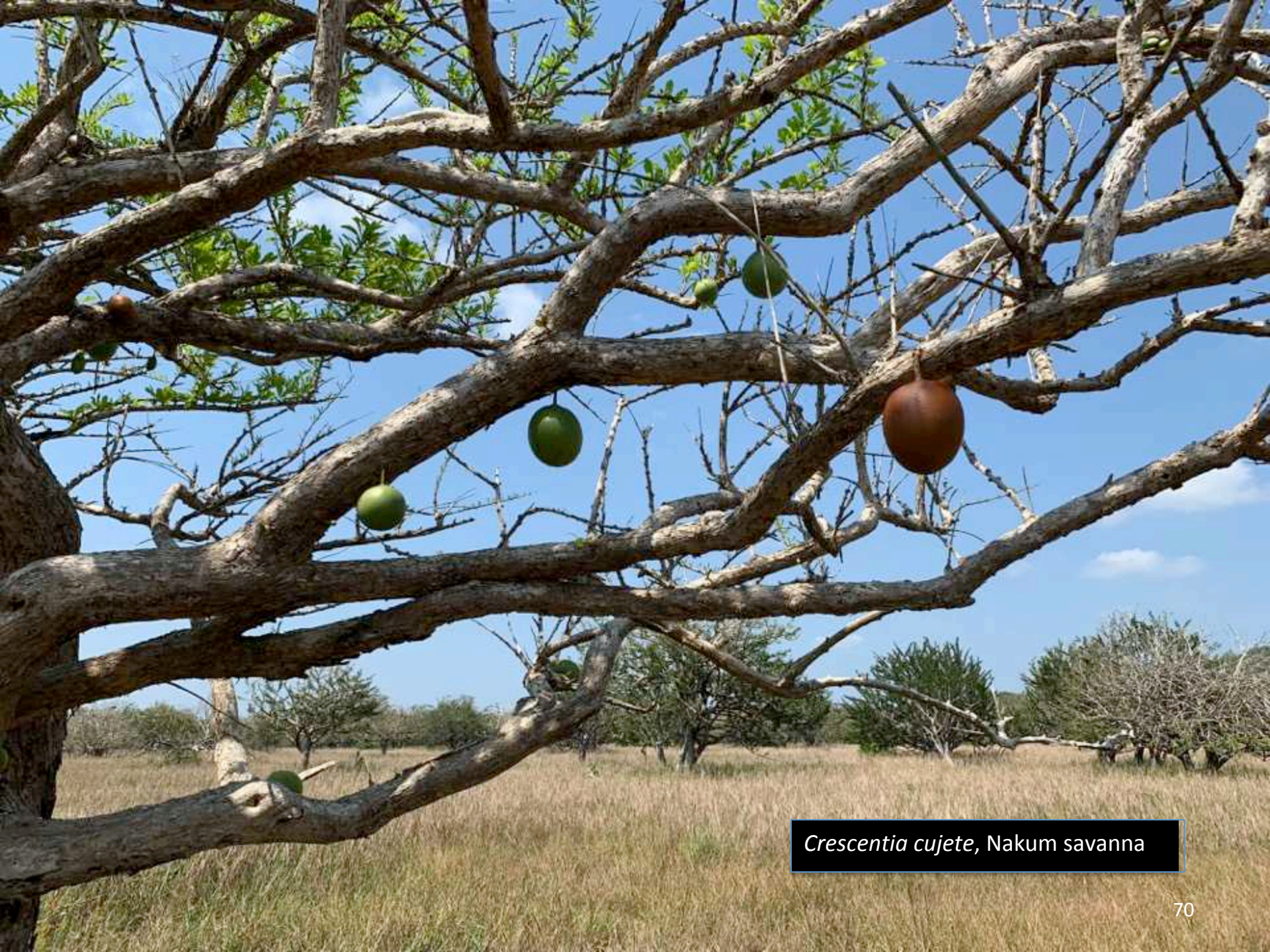
Nothing will surprise us, since pine savannas are all over central Peten (especially around Poptun and La Libertad). Plus lots of Belize is pine-oak savanna. And 3 km outside the northeast corner of parque Nacional Tikal there is a pine savanna.

But there is not one single solitary pine tree yet found in Parque Nacional Yaxha, Nakum, Naranjo. We would not be surprised to find *Curatella americana* (another savanna indicator of Belize) but so far have not noticed it in PNYNN).

I doubt there are pine forests in Livingston, in a savanna. Maybe high in hills, but not in any lowland savanna.

So our primary focus will be to learn whether there are any kind of natural savanna anywhere in the area of the Municipio de Livingston.


Tasistal, *Acoelorraphe wrightii,*
Near Arroyo Petexbatún Petén



Crescentia cujete, Nakum savanna

Nance flowers, a representative tree species that is an indicator of a seasonally inundated savanna.

During the recent two decades I have done field trips all over Guatemala to find and photograph the various trees that provided flavoring for cacao (cocoa, chocolate) drinks for the Maya, Aztecs, Mixtecs, Zapotecs and their neighbors.

Muc was one of the literally #1 flavorings a thousand years ago. Would be great to find this tree in Izabal, though normally this tree prefers much higher altitudes.

Nutmeg has been planted in Guatemala since the 1880's. So non-native nutmeg can be found in Izabal. But *Virola guatemalensis and Virola koschnyi* are native and have very similar potential as flavorings.

This seed has the most photogenic arial of any plant that I know of.

At least one of the two species of this *Virola* tree should be findable in the Municipio de Livingston.

Let's work together to find all the trees that can provide useful products without having to chop down the entire tree.

Cymbopetalum penduliflorum

Virola guatemalensis

Guazuma ulmifolia

Vainilla silvestre

Clerodendrum ligustrinum is a bush or vine that grows along the edges of Arroyo Petexbatun and Rio San Pedro (both in Peten). This plant provided a flavoring for cacao 2000 years ago. Would be nice to find it along the creeks and rivers of Municipio de Livingston.

We of FLAAR Mesoamerica would like to work together with cacao growers to create new recipes so cacao growers can market “Mayan Cacao” to clients around the world: with authentic ancient ingrediants.

Clerodendrum ligustrinum
Itzimte

Quararibea funerbris

Guatemalan botanists Mario Veliz has found a second species of *Quararibe*a in three places in Muni Livingston. There could potentially be two species of *Quararibea* in these areas.

The flowers of these two *Quararibea* trees were one of the top 10 flavorings for cacao 2000 years ago (and is the #1 flavoring for cacao drinks in Oaxaca still today).

So let's find both species *of Quararibe*a and let the guides and boat capitans know where they are located and in what months they flower.

Our photos are of *Quararibea funebris* that we found at Tikal and near the Naranjo sector of PNYNN.

Thanks to botanist Mario Veliz we know that these trees are in Livingston; the challenge is to find them today and work to preserve them from being chopped down.

Xylopia frutesens

We are also keen to find additional flavorings which were not included in Michael Coe and Sophie Coe's three editions of Chocolate of the Aztec and Maya of Mesoamerica. I had been a Post Graduate Research Fellow at Yale University since the late 1960's (actually over a decade with several different research fellowships at Yale). So I cooperated with Professor Coe on several topics. But I found out about the potential of *Xylopia frutescens* only recently so now we are doing research on the potential of this tree of Municipio de Livingston as an unprecidented underutilized flavoring for foods (we need to check all the chemicals first).

Xylopia frutescens, malagueta, malaqueta, is a small tree that I first learned about by someone that Senaida Ba knows. Then Pedro, one of our several helpful knowledgeable plant scouts, found *Xylopia frutescens* with seeds in the remote mountains of Alta Verapaz.

We have found *Xylopia frutescens* in the Municipio de Livingston already. This small tree has huge potential to have the flowers or other parts harvested to sell to tourists. Plus, to have the tourists pay local guides and local boat capitans to take them to the areas that we have found *Xylopia frutescens* growing in Izabal.

There are an estimated 150 to 200 species of trees in an area the size of the Municipio de Livingston. There are a lot of species that we know from other parts of Guatemala that we will be looking for:

- *Croton draco*, sangre de dragón
- *Enterolobium cyclocarpum*
- *Sterculia apetala*
- *Vochysia guatemalensis*

All tourists, from every country in the world, love to see palms.

So we at FLAAR Mesoamerica would like to find every single palm in this area and eventually, with the help of a donation of a fundacion or company or individual, to do a book on *Palmas de Municipio de Livingston, Izabal, Guatemala.*

There are two palms that grow primarily adjacent to salt water (so more sea-like than brackish water of Rio Dulce):

- *Schippia concolor*

- *Thrinax radiata*

But so far these palms have been found only facing the Caribbean, outside of Guatemala. I would like to find these palms in Guatemala, in Municipio de Livingston, if they do grow here. Chance is 50:50, since no other botanist has yet found them along Río Dulce.

But we need to visit the herbaria of Guatemalan universities to know whether any of these "saltwater palms" has been found in Izabal, and if so, where.

Especies de palmeras de Livingston

Genus species	Family	Common name(s)	Comments and References
Acoelorrhaphe wrightii	Arecaceae		
Acrocomia aculeata	Arecaceae		
Astrocaryum mexicanum	Arecaceae		
Asterogyne martiana	Arecaceae		
Attalea butyraces	Arecaceae		
Attalea cohune	Arecaceae		
Bactris gasipaes	Arecaceae		
Bactris major	Arecaceae		
Bactris mexicana	Arecaceae		
Brahea dulce	Arecaceae		
Calyptrogyne ghiesbreghtiana	Arecaceae		75% of other species of this genus are only in Panama; 3 in Costa Rica, one in Columbia. Only this one species in Mexico, Belize, Guatemala.
Chamaedorea brachypoda	Arecaceae		
Chamaedorea Castillo-montii	Arecaceae		
Chamaedorea elegans	Arecaceae		Possible
Chamaedorea ernesti-augustii	Arecaceae		Synonym ??
Chamaedorea geonomiformis	Arecaceae		
Chamaedorea graminiflora	Arecaceae		Synonym ??ongata
Chamaedorea oblongata	Arecaceae		
Chamaedorea pinnatifrons	Arecaceae		Synonym ??
Chamaedorea	Arecaceae		Possible

pygmaea			
Chamaedorea seifrtizii	Arecaceae		
Chamaedorea tepejilote	Arecaceae		
Chamaedorea woodsoniana	Arecaceae		
Cocos nucifera			
Cryosophia stauracantha	Arecaceae		
Euterpe precatoria	Arecaceae		
Gassia maya			
Geonoma deversa	Arecaceae		
Geonoma interrupta	Arecaceae		
Geonoma undata	Arecaceae		
Prescoea acuminata	*Geonoma undata*	Arecaceae	
Sabal	Arecaceae		
Sabal	Arecaceae		
Sabal	Arecaceae		
Synechanthus fibrosos			
Reinhardtia gracelis	Arecaceae		
Schippia concolor	Arecaceae		Noted for nearby Belize

¿Pendant nests of orioles and oropendolas?

So far we have not seen pendant nests of orioles or oropendolas. But in past years we found oriole pendant nests and both of the two species of oropendola pendant nests near Macho Creek, Izabal. So these birds should also be near El Golfete, and in the ecosystems.

FLAAR (USA) and FLAAR Mesoamerica (Guatemala) have specialized digital cameras and prime telephoto lenses to capture birds (and flowers and fruits) high in trees. This equipment, and the in-house photographers on our team, enable us to capture crisp digital images of flora and fauna high in a tree. We look forward to doing additional photography projects to assist parks, nature reserves and Municipio de Livingston.

Trees important for birds and mammals:
One of our long-range goals for Municipio de Livingston is to make a list of all the trees that birds, monkeys, and other arboreal creatures depend on.

Guarumo, *Cecropia obtusifolia*, is usually considered a weed, but in fact it produces edible parts that help DOZENS of bird species plus several mammals.

Ochroma pyramidale and/or seed pods with fluff

Ochroma pyramidale flowers provide tasty nectar for oropendola birds and for micoleon mammals.

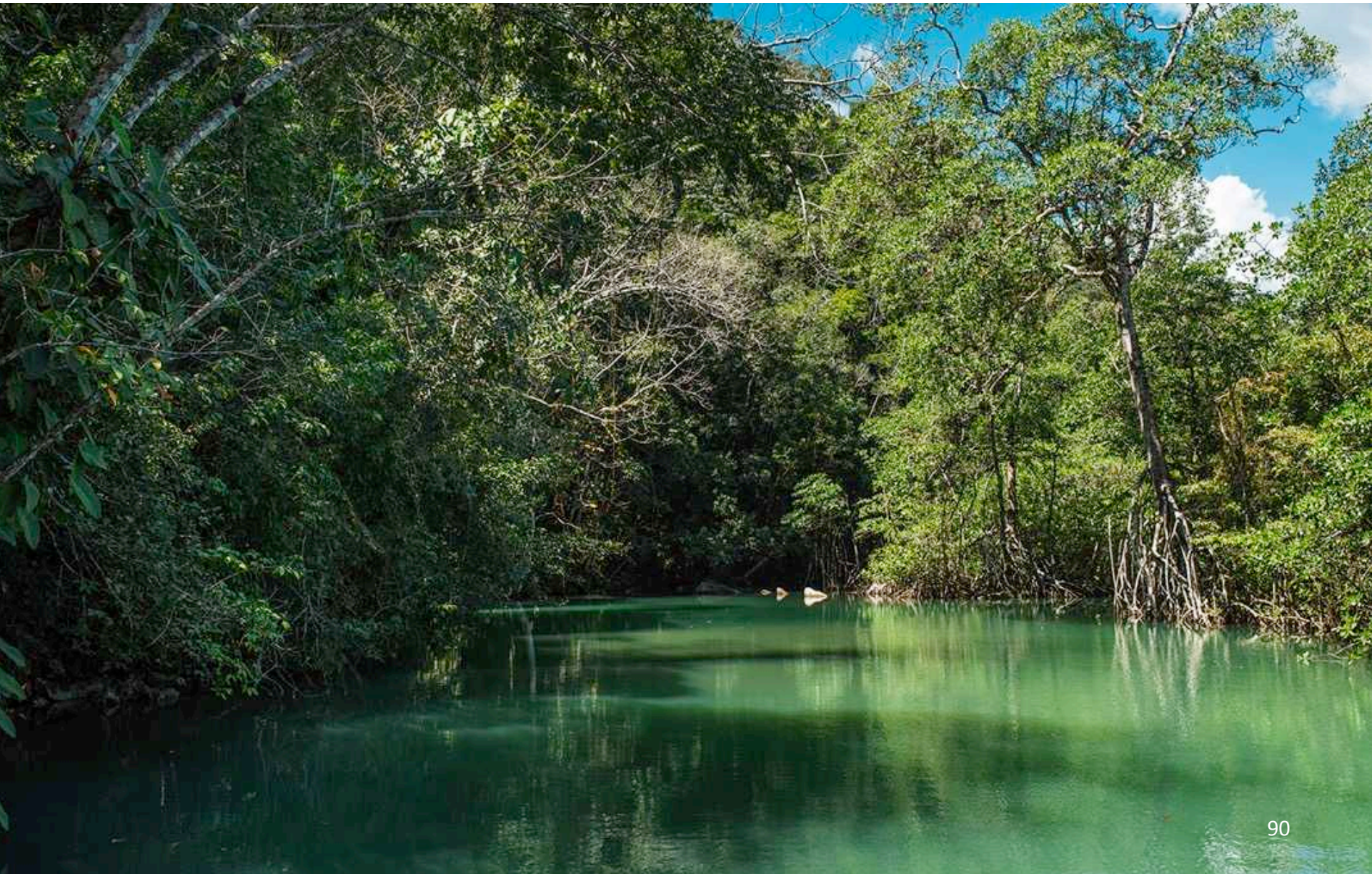
Ochroma pyramidale is also a helpful tree to entertain tourists, especially when it is flowering or its fluffy Ceiba-like kapok is floating the seeds away.


Ochroma Pyramidale

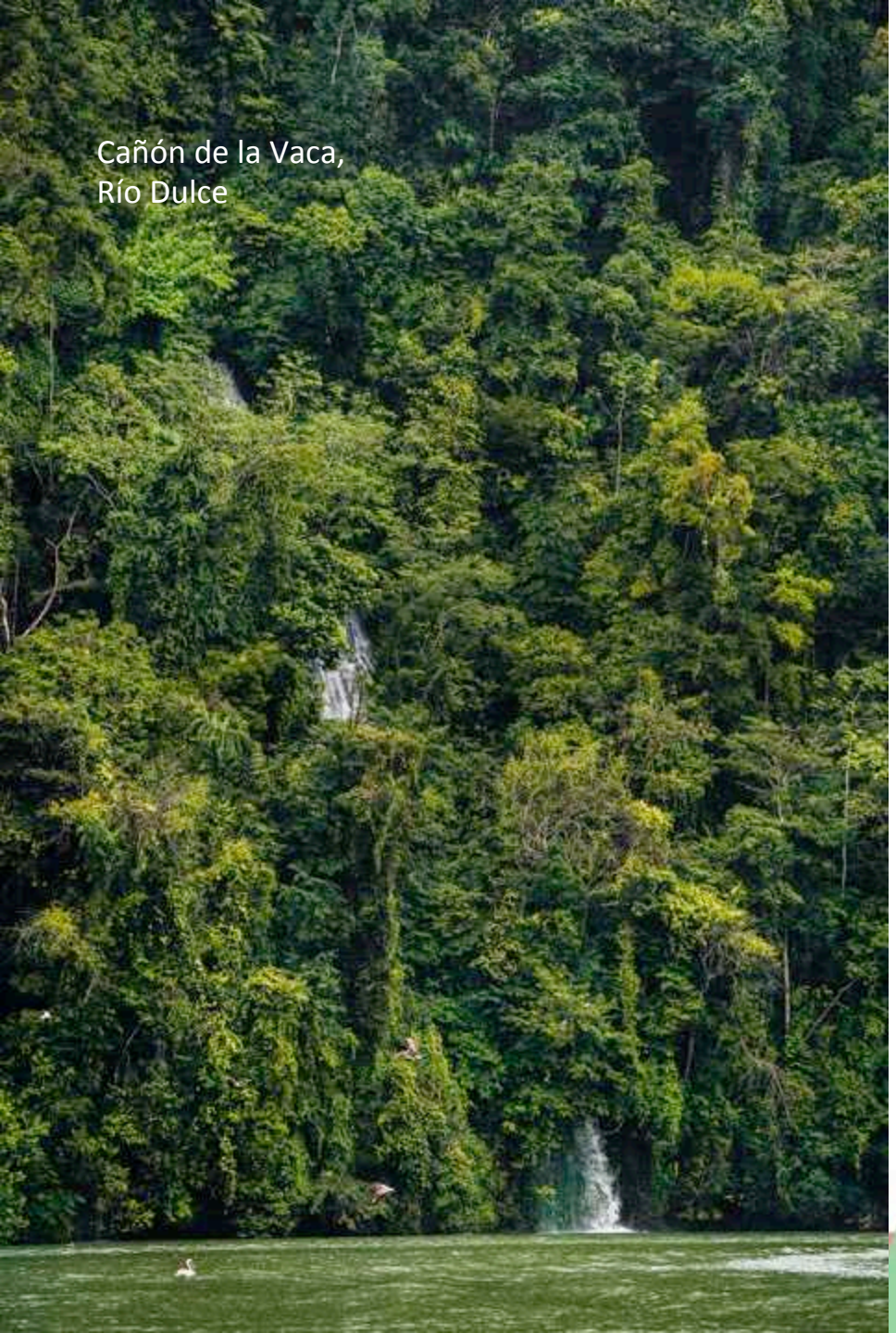
In addition to finding, photographing, documenting, and publishing flora and fauna, we are also dedicated to helping schools in rural and remote areas of Guatemala. Here is the team of FLAAR Mesoamerica donating educational material to the school of Plan Grande Tatin.

Our educational material is already available in Spanish, Q'eqchi' Mayan, and English. We would like to add Garifuna as well.

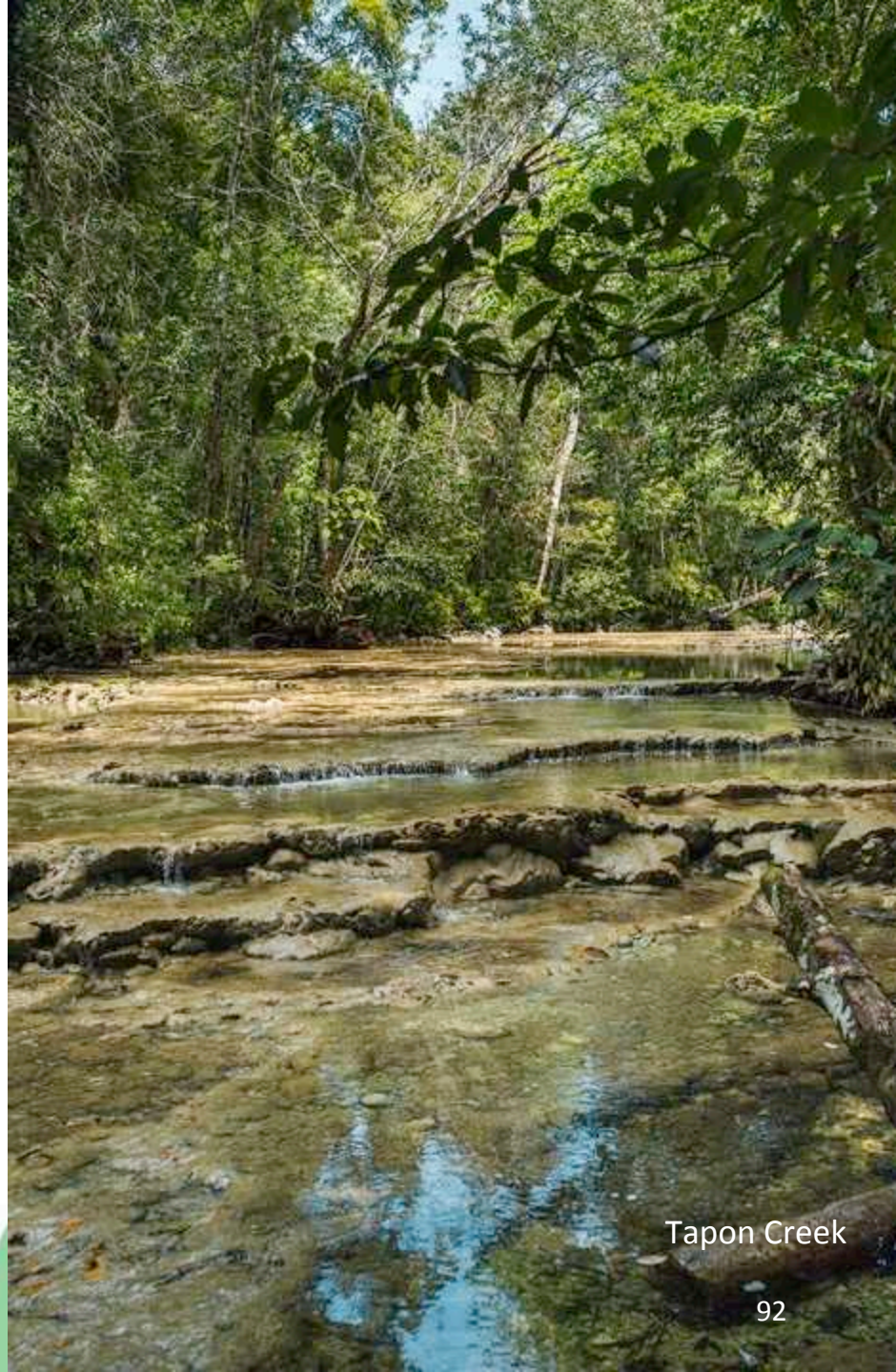
We close this presentation with some photos of the awesome ecosystems of the Municipio de Livingston. Here is Lagunita Creek, near Rio Sarstun.



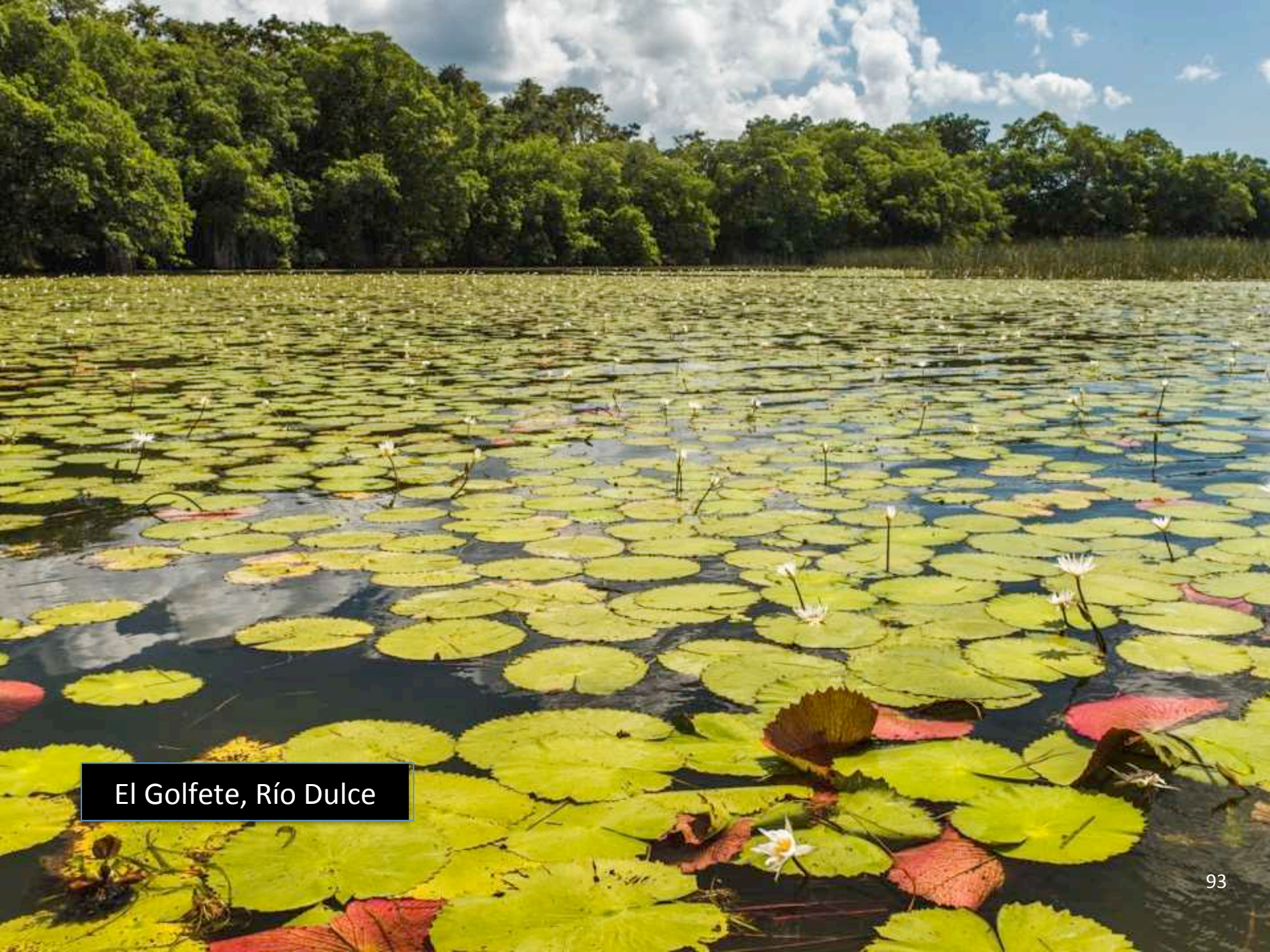
River at the entrance of
Tapon Creek



Cañón de la Vaca,
Río Dulce



Tapon Creek



El Golfete, Río Dulce

There are two places in the world where I am totally emotional. One is when I am deep in the rain forests of Guatemala. Or in a savanna, or in a swamp.

This photo shows me about 10 years ago, somewhere in Peten or Izabal. I am studying a Palo de Sangre tree. There are 12 different species of trees in Guatemale with the name "sangre" in the local common name (and we hope to find many of these trees in the Muni Livingston).

The second place in the world where I feel totally happy is in the schools in rural areas, making a donation of educational material. I feel totally emotional because both the students and the teachers express their appreciation for us coming to their school.

My objective is to continue to do research and field work on flora and fauna and put this information into scientific reports for botanists, zoologists, and ecologists, but also to adapt this knowledge of local plants and animals to create educational infographic posters, banners for the classroom walls, and books for the Q'eqchi' and Garifuna students of Izabal.

The school here is in Plan Grande Tatin, Municipio de Livingston, 13 March 2020.

Assistance for local access, Municipio de Livingston

Daniel Esaú Pinto Peña, Alcalde of Livingston (Izabal, Guatemala).

Edwin Mármol Quiñonez, Coordinación de Cooperación de Livingston (Izabal, Guatemala).

Juana Lourdes Wallace Ramírez, Asistente Administrativo,
Coordinación de Cooperación de Livingston.

Livingston: the Caribbean biodiversity wonderland of Guatemala

Izabal, one of the regional departments of Guatemala that offers a variety of recreational activities, is home to numerous nature parks and diverse natural landscapes. There are white sandy beaches a short boat trip away, with tall jungle-covered mountains in the background, and the Mesoamerican Reef System in the Caribbean Sea on the horizon in front of you. Mangrove swamps, seagrass, islands, cenotes, caves, karst geology canyons and streams of crystal clear water abound along the Rio Dulce and Lake Izabal coast or inland. All this together makes Livingston one of the destinations for tourists wanting to do bird-watching, explore caves, get healthy exercise hiking through trails in the rainforest. In addition to the incredible flora and fauna that the municipality offers, three different cultures coexist in the ecosystem (Mayan Q'eqchi ', Garifuna and Ladinos).

In order to conserve the biodiversity found in the municipality and that continues to be of benefit to the ecosystem, it is necessary to have an updated record of the species that inhabit here and thus be able to detect changes in the species population. Thanks to the efforts of different institutions focused on environmental improvement projects at various sites in Livingston (FUNDAECO (Río Sarstun), CONAP (Río Dulce), CECON-USAC (Chocón-Machacas), ARNPG (more than ten private reserves), among many others) there are records of species of flora, fauna and ecosystems of this municipality of Izabal.

Egretta Thula
Parque Nacional Yaxha Nakum Naranjo

Nycticorax nicticorax
Livingston, Izabal

Using this information in the most efficient way and using the potential of digital technology, the database for the municipality can be supplemented with photographic records of flora, fauna, and ecosystems. The FLAAR Mesoamerica team, in cooperation with the municipal authorities, have begun to produce this educational material using the photographic records generated during the cooperation project to account for the flora, fauna and ecosystems that can be seen in Livingston. This will be accomplished in order to provide information to the schools, families and institutions already working to protect the environment.

We hope to attract the attention of professors, botanical garden clubs, orchid and bromeliad societies, students, tourists, experts, explorers, photographers and nature lovers who want to get closer, to marvel at the species of flowering plants, mushrooms and lichen that FLAAR Mesoamerica finds during each field trip each month.


Muni Guate
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FUNDAECO
DEFENSORES DE LA NATURALEZA
CONAP
ECOn_feren__cias
lunes 4
Biodiversidad que albergan los ecosistemas de humedales y cerros en el municipio de Livingston, Izabal
Dr. Nicholas Hellmuth
Fundador
FLAAR Mesoamérica
martes 5
Cinturón verde de la Metrópolis de Guatemala
Lic. Gabriel Valle
Coordinador del Capítulo Metropolitano
FUNDAECO
miércoles 6
El reto real de los incendios forestales
Ing. Óscar Núñez
Director ejecutivo
Defensores de la Naturaleza
jueves 7
Diversidad biológica de Guatemala: Conceptos, amenazas y tendencias
Lic. José Luis Echeverría
Director de valoración y conservación de biodiversidad
CONAP
viernes 8
Gestión de desechos y residuos sólidos y su relación con la prevención del contagio de COVID-19
Licda. Andrea Díaz
Unidad de Reciclaje
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Thank you all