FLAAR
MESOAMÉRICA

WETLANDS #21

PALO DE JAHUILLO

Grias cauliflora

Municipio de Livingston, Izabal, Guatemala

NICHOLAS HELLMUTH, VIVIAN HURTADO & PEDRO PABLO MARROQUÍN

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— Grias cauliflora —

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NOVEMBER **2022**

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FRONT COVER PHOTOGRAPH
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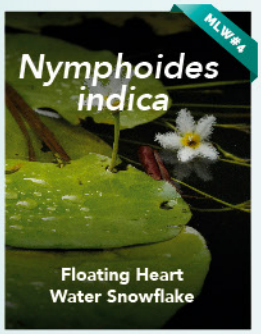

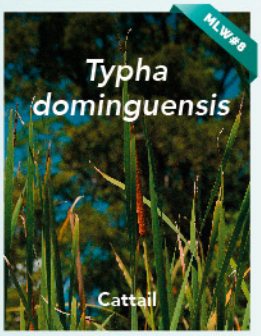

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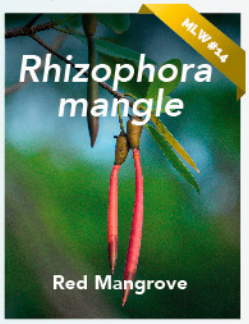

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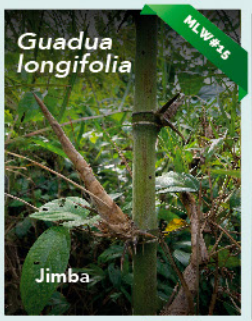

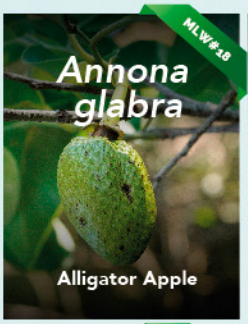

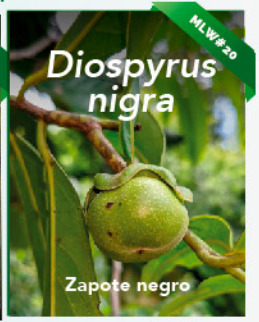

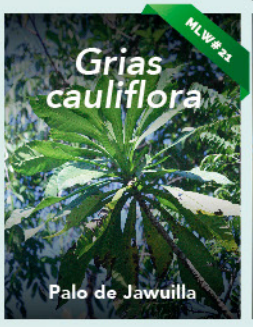

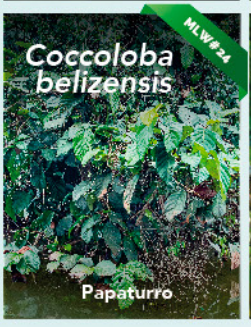

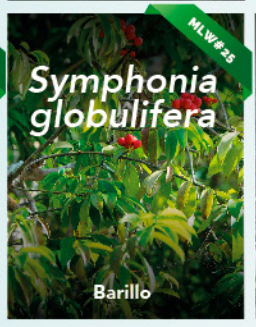

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GLOSSARY

Bajo: is a low forest over totally flat land. Bajos often have a few centimeters of standing water in the wet season. In the dry season they are dry to the point that the ground has the typical surface fissures of completely dried mud. So a bajo is a seasonally inundated wetland. If the bajo has palo de tinto it is called a tintal. But there are lots of bajos with few and often no logwood whatsoever. Bajos occupy a lot of the land of Petén (the rest are hills that have different vegetation, usually with taller trees). That said, some bajos do have occasional tall trees.

Ciénaga: area swampy, soft mud, wet, and often a bog or swamp or marsh.

Ferns: (class Polypodiopsida), are a class of nonflowering yet vascular plants that possess true roots, stems, and complex leaves (but they have no flowers or seeds). Ferns reproduce by spores.

Manglar: is Spanish for mangrove swamp. Each area of each coast has slightly different mangrove species. In the Municipio de Livingston the most common mangrove is the mangle rojo. Black mangrove is also present in Izabal coastal areas. Rio San Pedro (Petén) is an inland area that surprises us all with its mangrove trees.

Marsh: usually has water all year but has no total tree cover. Grasses, reeds and low plants are more common; plus, underwater plants and floating plants. If there are trees everywhere, then I consider it a swamp.

Pantano: could be considered a Spanish translation of marsh, so lots of reeds and grasses (but not many trees). If the area is a forest with water at the foot of every tree, then it is a swamp. The definition of each of these words depends a bit whether you are in the wetlands of Tabasco, or Rio San Pedro, or near Monterrico (inland from Pacific Ocean coast of Guatemala) or in the Municipio de Livingston or in Petén.

Life on land is the Sustainable Development Goal (number 15 of the United Nations propossal) which claims to ensure the conservation of terrestrial and freshwater ecosystems. Municipio de Livingston has multiple natural protected areas that includes tropical rain forests and species associated to rivers.

GLOSSARY

Plants: any of a kingdom Plantae of multicellular eukaryotic, mostly photosynthetic organisms typically lacking locomotive movement or obvious nervous or sensory organs and possessing cellulose cell walls.

Riperian: the bank of a river or stream. In a location such as the Municipio de Livingston, it would help to have a single word for the bank of a river, stream, and lagoon. I will use shoreline or comparable.

Swamp: usually has water all year but has lots of trees. During the rainy season the water simply gets deeper. Petén has more marshes than swamps; Izabal has both. You get mangrove swamps all around the Caribbean coast and parallel to the Pacific Ocean coast (several impressive mangrove swamp areas inland from the Pacific coast of Guatemala).

Swampo: is the way this is pronounced in the Caribbean area of Guatemala.

Wetlands or Wetland: to me is a generic word to cover swamps, marshes, rivers, lakes, lagoons and seasonally inundated areas (including bajos, savannas, cibales, etc.). Each ecologist geographer and botanist use their own academic terms. But, Holdridge (initiator of life zone systems concept) never hiked through the Savanna of 3 Fern Species nor the Savanna East of Nakum (PNYNN) nor took a boat up all the rivers entering into El Golfete. And if he cruised up Arroyo Petexbatún, he (and Lundell and all other capable scholars who accomplished fieldwork in Petén) did not get out of their seats on the lancha to hike through the tintal swamps to see what was 100 to 200 meters inland (namely the two tasistal areas that FLAAR has documented).

Life on land is the Sustainable Development Goal (number 15 of the United Nations propossal) which claims to ensure the conservation of terrestrial and freshwater ecosystems. Municipio de Livingston has multiple natural protected areas that includes tropical rain forests and species associated to rivers.

Grias cauliflora

Photo by: Nicholas Hellmuth, FLAAR Mesoamérica. Río Dulce, Izabal.. Mar. 24, 2021.
Camera: iPhone 12 Pro Max.Camera: iPhone 12 Pro Max.

INTRODUCTION TO ***GRIAS CAULIFLORA***

Grias cauliflora trees are potentially one of the more numerous trees in the Municipio de Livingston in thickets along the edges of rivers, streams, and lagoons. They can also be solitary but there are usually a group of them in a thicket.

These trees have edible parts available to the Classic Maya. But most general books on the Maya do not mention this tree probably because this tree is not common around Tikal, Uaxactun, etc. (though if it is present, it would not be noticeable unless you knew what you were looking for).

The purpose of the present FLAAR report is to put this on the map of edible fruits available to the Classic Maya and available to people still today, though it is rarely eaten in the modern world of apples and oranges.

Balick, Nee and Atha are one of the best original sources for edible plants of an entire area of Mesoamerica. That kind of botanical and ethnobotanical list is needed for El Salvador and for Honduras (since the Classic Maya lived and traded with these areas also. Fedick has an outstanding list of all edible plants of the Maya. What we at FLAAR are working on is to find and photograph as many of these edible plants as we can.

Grias cauliflora
Photo by: David Arrivillaga, FLAAR Mesoamérica. Livingston. Mar. 23, 2021.
Camera: Sony Alpha A7R IV. Settings: 1/160; sec; f/8; ISO 1,600

MY PERSONAL EXPERIENCE WITH *GRIAS CAULIFLORA* **(BY NICHOLAS HELLMUTH)**

I had never seen or heard of this tree before seeing one near the base camp for one of our autumn months of field trips in the El Golfete area of Municipio de Livingston. We rented the CESIDE facilities for a week (now is owned by FUNDAECO after being flooded by one of the hurricanes later that month). There was this strange tree: tiny thin trunk but quite tall and then splay after splay of large leaves (some almost a meter long).

We noticed this tree had giant radiating leaves. This mid-height tree was behind the house where we had rented for 8 days for our fieldtrip to this part of Rio Dulce (1 km east of the mouth of Rio Tatin that empties into the west end of Canyon de Rio Dulce; El Golfete starts in less than 2 km to the west).

I had no idea what this tree was; never paid attention to it before. But the leaves were so long, and they radiated out around each twig or branch.

Then we saw more and more of the identical almost every hour along the swamps that are the sides of most of the rivers that flow into El Golfete. The leaves were huge (long) and stuck out and hung down from the tops of each branch and twig. What was also noticeable is that the trunks were never very thick.

Day after day we tried to figure out the plant family, genus and species. But the name we thought our local guide was using, zapote de suampo (swamp zapote) turned out was for nearby Pachira aquatica trees (zapoton).

But after five days we were able to get more accurate local names and once I figured out how many different ways to spell a rural Spanish word, I finally found the identification of genus species and plant family.

So I asked about the tree and soon learned that when young it bloomed and fruited from the trunk. This was a pleasant surprise, so I began to learn that their flowers bloomed straight from the trunk and branches, just like cacao. If the tree was old, the flowers were mainly from the branches, directly, like several other native fruits. I love all cauliflorous trees of Guatemala.

I also discovered that botanists already over a century ago had documented that the fruits are edible in Jamaica. So now we have a potentially edible fruit of a tree common to wetlands and swamps; in other words, this tree can grow in areas with too much water for most other edible plants (though wild annona also grows in same areas). So here are fruits for swamps; fruits for Maya food: far more than just ramon nuts from the hillsides and hilltops.

Day by day as we went up and down each river that feeds into the north and south sides of El Golfete, we saw these trees literally everywhere; often in thickets. Turns out it is one of the more common riberian trees of this area. Then while doing library research I learned the fruits were edible.

I have never paid attention to this tree until we noticed thousands of them along the shore of literally most rivers feeding into Rio Dulce and feeding into El Golfete, Municipio de Livingston, Departamento de Izabal, Guatemala, Central America. Red mangrove trees were the absolutely most common tree around the edge of lagoons and many of these rivers, but hour by hour we kept seeing these very thin-trunked trees with radiating masses of giant meter-long leaves. They came in every height from 1 meter high to over a dozen meters high.

FULL BOTANICAL **NAME**

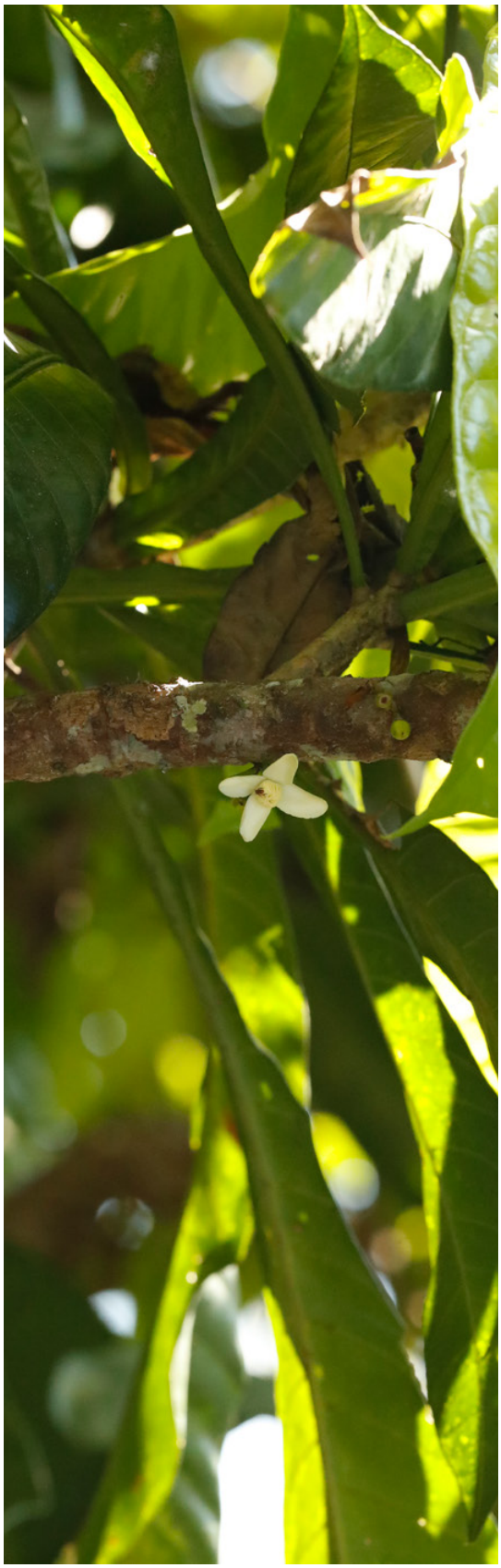
Grias cauliflora (L.) L. is the accepted name. Family Lecythidaceae.

HERE ARE SYNONYMS FOR ***GRIAS CAULIFLORA***

www.tropicos.org mentions the following synonyms:

- *Grias dariensis* Dwyer
- *Grias dukei* Dwyer
- *Grias fendleri* Seem.
- *Grias gentlei* Lundell
- *Grias integrifolia* (Standl.) R.Knuth
- *Grias pittieri* R.Knuth
- *Grias sternii* Dwyer
- *Gustavia integrifolia* Standl.

Click here to read more



Grias cauliflora
Photo by: María Alejandra Gutiérrez, FLAAR Mesoamérica.
Black Creek, Livingston. Mar. 24, 2021.
Camera: Canon 1D X Mark II. Settings: 1/500; sec; f/7,1;
ISO 8,000

LOCAL NAMES **FOR *GRIAS CAULIFLORA***

We asked local people and were told:

- Jawillo
- Huevo de burro
- Cojolillo

But with decades of experience, I realized that everyone would spell the local Spanish tree name differently. The helpful local people never had a chance to attend school when they were young, so we have to do our best to figure out how to spell the tree names.

With many years of experience searching for local names on the Internet I realized that to find the name on the Internet you would need to spell it many different ways. So I started with Jawillo. Based on 50+ years of speaking Spanish and Spanglish, I estimated I should also try searching for jauillo on the Internet (since no returns for jawillo). And I found the report on the Rio Sarstoon area (which is on the northeast corner of Izabal, facing the Caribbean). It gave the name as Grias integrifolia.

If you spend time doing more research you find additional local names for this tree in Jamaica:

- Anchovy pear
- Jobillo (Fundación Defensores de la Naturaleza 2003: Anexo 2, page 81)
- Jaguay, jaguillo (Mermath, Bennett and Pulsipher 2013: 352).

So, jawillo, jaguay, jaguillo. Depends on what part of a country you are in; what local slang is used.

HOW MANY OTHER PLANTS OF GUATEMALA HAVE **THE SAME SPANISH NAME?**

According to Standley and Williams (1962) "Genipa" and "Irayol" are common names for *Grias cauliflora,* but they are also the common names of the tree *Genipa americana*, which is often found in the Departments of Santa Rosa and Huehuetenango. *Grias cauliflora* grows in swampy ecosystems, unlike *Genipa americana*, which is found in high evergreen forests, deciduous forests and sub-deciduous dry forests. Therefore, it is important to recognize the habitat of the tree that the locals call "Irayol" or "Genipa", since depending on where we are, they will be referring to a different species.

Grias cauliflora
Photo by: David Arrivillaga, FLAAR Mesoamérica. Livingston. Mar. 23, 2021.
Camera: Sony Alpha A7R IV. Settings: 1/160; sec; f/8; ISO 1,600

Grias cauliflora
Photo by: Roxana Leal, FLAAR Mesoamérica.
Río Chocon Machacas, Izabal. Mar. 24, 2021.
Camera: Google Pixel 4A.

MAYAN NAMES FOR ***GRIAS CAULIFLORA***

We need to do more linguistic research.

HABIT FOR ***GRIAS CAULIFLORA***

Tree, medium size, about 4-10 meters.

HABITAT FOR ***GRIAS CAULIFLORA***

Wet mixed forest, often in wooded swamps, at or a little above sea level. This tree is common in the swampy forests of the north coast of Guatemala (Standley & Williams, 1962).

The FLAAR (USA) and FLAAR Mesoamerica (Guatemala) team found *Grias cauliflora* along the shores of swamps and riverside forests.

WHAT OTHER TREES OR PLANTS ARE OFTEN FOUND **IN THE SAME HABITAT?**

According to the "the Master Plan 2002-2006" of "El Refugio de Vida Silvestre Punta de Manabique", these are the trees of plants that are often found in the same habitat as *Diospyros nigra:*

- *Cyperus haspan* L.
- *Heliconia latispatha* Benth.
- *Brosimum costaricanum* Liebn.
- *Lonchocarpus castilloi* Standl.
- *Peltostigma guatemalense* (Standl. & Steyerm.) Gereau (Sinónimo: Galipea guatemalensis

BOTANICAL DESCRIPTION OF *GRIAS CAULIFLORA* IN STANDLEY **AND CO-AUTHORS CHICAGO BOTANICAL MONOGRAPHS**

Standley and Williams described this plant under the synonym name "*Grias intergrifolia*".

Grias integrifolia (Standl.) Knuth, Pflanzenreich IV. 219a: 30. 1939. *Gustavia integrifolia* Standl. Field Mus. Bot. 4: 240. 1929. Wet mixed forest, often in wooded swamps, at or little above sea level; Izabal. Mexico; British Honduras; Honduras; Nicaragua (type from Bragman's Bluff, Englesing 225).

A tree 4-10 meters, with few thick branches, or sometimes unbranched, the trunk 15 cm. or more in diameter; bark light brown or greenish gray, rather smooth, separating in thin flakes; plants glabrous throughout, the young branches very thick, densely leafy at the ends; leaves huge, sometimes a meter long and 35 cm. broad, oblong-oblanceolate or somewhat spatulate, acuminate or almost rounded and abruptly acuminate, long-attenuate to the base, sessile or nearly so, entire or obscurely undulate, subcoriaceous, the lateral nerves as many as 40 pairs; inflorescences short, umbelliform, 3-5-flowered, the pedicels 1 cm. long; flowers 3 cm. broad, the receptacle turbinate, 5 mm. long; calyx lobes 2, broadly rounded at the apex, 5 mm. long; petals 4, creamy white, obovate-oblong; fruits large, yellowish green, fleshy.

Called "genip" in British Honduras; "jaguillo," "irayol" (Honduras); "morro cimarron" (Oaxaca). It is rather strange that in British Honduras and Honduras the tree is associated or confused with Genipa, and in Oaxaca with Crescentia, neither of which it much resembles. The tree is a conspicuous one because of its great bunches of huge leaves. The youngest ones often or usually are deep purplish red. It is stated that the Lecythidaceae do not have stipules. In this tree the new leaves are subtended by stipule-like, deep red organs that are oblong or lance-oblong, as much as 15 cm. long, and caducous. If these are not stipules, we do not know what they should be called.

The North American trees of this genus are represented by few specimens, and the status of the various species is rather uncertain. It is not yet established that *G. integrifolia* is distinct from *G. fendleri* Seem, of Panama and Costa Rica, or they from *G. cauliflora* L. of Jamaica. This tree is common in the swampy forests of the north coast of Guatemala.

(Standley and Williams 1962: 263, Vol. 24, part VII, No. 2).

"The north coast of Guatemala" means the part of the Municipio de Livingston that is facing the Amatique Bay, which is a part of the Caribbean Sea. What is notable is that not many (or any) botanists in the previous century visited any of the swamp areas that we of FLAAR (USA) and FLAAR Mesoamerica (Guatemala) explored in 2021.

Both names *Grias gentlei* and *Grias integrifolia* of the 1930's-1950's is now recognized to be the same plant; whose modern accepted name is *Grias cauliflora.* So. you also need to research *Grias gentlei:*

> ***Grias Gentlei*** Lundell, Wrightia 2: 122. 1961. Bombowood; Wild mammy.
> Known only from the type collection from British Honduras, Gentle 5194. Tree, 20 cm. in diam., glabrous. Leaves large, sessile, narrowly oblanceolate, up to 80 cm. long, 20 cm. wide, with glands along the subentire margin, these becoming reddish-black with age; apex attenuate-acuminate, base attenuate and cuneate with age, essentially spathulate, the midrib thick and prominent on both surfaces, the lateral nerves 20 to 30. Flowers usually 3 to 7, fasciculate on old wood, the basal bracts ovate-deltoid, 2 to 3 mm. long, acute. Pedicels, including hypanthium, scarcely 1 cm. long, glabrous. Calyx entire, or essentially so in bud, splitting at anthesis into two or more segments 3 to 4 mm. long. Petals 4, sometimes 5, thick, glabrous, pellucid-punctate, inaequilateral, asymmetrically elliptical, up to 18 mm. long, 12 mm. wide, rounded at apex. Androecium about 8 mm. long, the stamens numerous, the anthers about 0.5 mm. long, longitudinally dehiscent, scarcely thicker than the filaments. Ovary 4-celled, stigma 4-lobed."
>
> We have not seen material of this species. Dr. Lundell, whose description appears above, separates it from G. integrifolia on the basis of its "smaller calyx and receptacle, long acuminate leaf blades and glandular margins, fewer leaf veins."

(Standley and rmSteyeark 1962: 262)

Grias cauliflora

Photo by: Nicholas Hellmuth, FLAAR Mesoamérica. Río Dulce, Izabal.. Mar. 24, 2021.

Camera: iPhone 12 Pro Max.

GRIAS CAULIFLORA TREES IN BELIZE: **STANDLEY AND RECORD**

Not reported in the 1930's by them because the name back then was Gustavia integrifolia Standl.:

> **GUSTAVIA L.** (classified in the LECYTHIDACEAE "Brazil-nut" family)
>
> ***Gustavia integrifolia*** Standl. Genip. Jagüillo (Honduras). Temash River; Río Grande; also in Honduras and Nicaragua. A tree of 10 meters, the trunk 25 cm. in diameter, with few branches; leaves very large, mostly clustered near the ends of the branches, alternate, elongate-spatulate, acute, entire, long-tapering toward the sessile base, glabrous or nearly so; flowers about 3cm. broad, white, in short racemes, with 4 petals and numerous stamens. Wood yellow, rather light, fairly hard, coarse-textured. The flowers and the fleshy fruits are clustered along the trunk and larger branches. This tree is the most northern representative of its family, whose center of distribution is the Amazon Valley.

(Standley & Record 1936: 275)

Grias cauliflora
Photo by: David Arrivillaga, FLAAR Mesoamérica. Livingston. Mar. 23, 2021.
Camera: Sony Alpha A7R IV. Settings: 1/160; sec; f/10; ISO 1,000

GRIAS CAULIFLORA TREES IN BELIZE **(BALICK, NEE AND ATHA 2000: 71)**

Grias cauliflora L. — **Syn:** *Grias gentlei* Lundell; *Grias integrifolia* (Standl.) R. Knuth —**Reg Use:** FOOD. — **Nv:** bombowood, genip, warreewood, wild mammy. — **Habit:** Tree.

BOTANICAL DESCRIPTION OF THE ***GRIAS CAULIFLORA* BY STANDLEY FOR YUCATÁN**

Total surprise, no *Grias* listed for Mexico whatsoever in Checklist of the native vascular plants of Mexico by José Luis Villaseñor. *No Grias in Trees and Shrubs of Mexico* by Paul C. Standley.

It is highly unlikely that such a common tree in Izabal is not in Mexico.

Grias cauliflora

Photo by: Nicholas Hellmuth, FLAAR Mesoamérica. Río Dulce, Izabal.. Mar. 24, 2021.
Camera: iPhone 12 Pro Max.Camera: iPhone 12 Pro Max.

CLOSE RELATIVE(S) ***GRIAS CAULIFLORA***

Grias cauliflora is often confused and related with *Gustavia superba* and *Gustavia fosteri*, but the difference is that the leaves have serrated edges, the flowers are pink and the fruits are globose and larger (Smithsonian, n.d.).

Balick, Nee and Atha list for plant family LECYTHIDACEAE only one species for Belize, *Grias cauliflora* (2000: 71).

If you look for "edible" "Grias" most of the results are for a *Grias peruviana* in the Amazonian rain forests. There are dozens of citations possible, but since we are focused on Guatemala, here I show just one for Peru. *Grias peruviana* is not a synonym; it is the Peruvian relative of *Grias cauliflora* of Mesoamerica.

> The people were all employed in collecting the fruit of the "sacha mangua" (Grias peruviana), which is eaten as a vegetable cheese. To my palate this vegetable cheese is of a rich flavour and is the best cheese I have ever tasted apart from cow's milk" (Levistre 1982).

(Ruiz Murrieta 1992: 119).

The genus Grias is listed in the book on African *NEGLECTED AND UNDERUTILIZED SPECIES (NUS) MANUAL*

Click here to read more

Also check *Gustavia macarenensis* for being eaten in South America. If you Google *Grias neuberthii* you find that it is also edible. You find so many ethnobotanical articles on *Grias neuberthii* you wonder "why has no one written anything on *Grias cauliflora* of Guatemala and Belize." Yes, it is mentioned, in passing, in lists, but not discussed.

WHERE HAS *GRIAS CAULIFLORA* BEEN **FOUND IN THE MUNICIPIO OF LIVINGSTON?**

Grias cauliflora is reported in Livingston in the flora list included in the Portal de Biodiversidad de Guatemala.

- Is *Grias cauliflora* listed for Biotopo Protegido Chocón Machacas, CECON/USAC?
  Not reported.

- Is *Grias cauliflora* listed for Tapón Creek Nature Reserve (including Taponcito Creek), FUNDAECO?
  Not reported.

- Is *Grias cauliflora* listed for Buena Vista Tapón Creek Nature Reserve?
  Not reported.

- Is *Grias cauliflora* listed for Cerro San Gil (south side of Río Dulce)?
  Not reported.

- Is *Grias cauliflora* listed for El Refugio de Vida Silvestre Punta de Manabique?
  Grias cauliflora is reported in the flora list included in the Master Plan 2002-2006, but appears under its synonym *Grias integrifolia*.

- Is *Grias cauliflora* listed for Ecoalbergue Lagunita Creek (Área de Usos Múltiples Río Sarstún)?
  FUNDAECO mentions *Grias cauliflora* in the Proposal for Incorporation to the Ramsar Convention of the protected area "Reserva de usos multiples Río Sarstún". This area includes Lagunita Creek, so it's very probable to find it there.

- Is *Grias cauliflora* listed for Sarstoon-Temash National Park (northern side of Río Sarstún)?
  Grias cauliflora is mentioned in the flora in the Rapid Ecological Assessment Sarstoon Temash National Park Toledo District, Belize under the common name "Bongo Wood".

- Is *Grias cauliflora* listed for Bocas de Polochic?
  It's mentioned in the II Master Plan 2003-2007 of the natural reserve but under its synonym Grias integrifolia.

Grias cauliflora
Photo by: Nicholas Hellmuth, FLAAR Mesoamérica, Hotel Tortugal, Río Dulce. Jun. 26, 2021.
Camera: iPhone 12 Pro Max.

IS *GRIAS CAULIFLORA* FROM THE HIGHLANDS **OR FROM THE LOWLANDS (OR BOTH)?**

A plant of the hot, humid, tropical lowlands. Plants succeed in swampy soils according to Standley and Williams (1962).

WORLD RANGE FOR ***GRIAS CAULIFLORA***

This tree has a natural range distribution from Central America and Jamaica to northern South America (Tropical Plants Database, n.d.).

DOES *GRIAS CAULIFLORA* **ALSO GROW IN HOME GARDENS?**

Not Reported.

Grias cauliflora

Photo by: María Alejandra Gutiérrez, FLAAR Mesoamérica. Black Creek, Livingston. Mar. 24, 2021.
Camera: Canon 1D X Mark II. Settings: 1/500; sec; f/7,1; ISO 8,000

USES OF ***GRIAS CAULIFLORA***

The pulp of the fruit is edible when fully ripe. Immature fruits are pickled and have a mango-like flavor. The large, yellowish-green, pear-shaped fruit is fleshy (Tropical Plants Database, n.d.: Sunders, 1891).

> The mesocarps of *Grias haughtii* (Romero-Castafieda, 1961), *G. neuberthii* (fide label data), *G. peruviana* (fide label data), and *G. cauliflora* (Sloane, 1725) are edible. Romero-Castaneda (1961) reported that the pulp of *G. haughtii* is eaten raw or cooked in syrup and suggests that its exploitation should be studied because it appears to be rich in vitamins and is not difficult to transport.
>
> (Prance and Mori 1979: 111)..

The wood is easy to work and is used on a smaller scale for home and handy-work timber. The wood is of medium weight and density; moderately hard; not strong; brittle; not durable.

So far the documentation by Prance and Mori has more ethnobotanical info than Standley:

> Ecology. *Grias cauliflora* is an understory tree most commonly found in swampy areas or in riverbottom forests. In Jamaica, according to Guppy (1917), this species "is one of the most picturesque trees in the river scenery of Jamaica," and Adams (1972) reports that it is "rather local and gregarious near streams and in marsh forest." My observations of *G. cauliflora* in Panama and Costa Rica demonstrate that it is found in the same habitat in Central America.
>
> In Central America its peak blooming period is from February through April. Because of its riverine habitat the fruits of *G. cauliflora* often drop into the water where the seeds germinate. However, once they are carried into salt water they die (Guppy, 1917). Old fruits have been collected in the beach drift of San Jose Island, Panama (Plate 12, fig 4 as unidentified "seed" Johnston, 1949). The disjunct distribution of this species between Jamaica and Central America may be the result of a successful long range dispersal over water.
>
> (...).

Sloane (1725, vol. 2, p 123) reports that the Spaniards used to eat the pickled fruits as a substitute for mangos, which may account for the Jamaican common name of the tree, Anchovy Pear. He adds that it is "sent from the Spanish West Indies to Old Spain, as the greatest rarity." Schomburgk (1922, vol. 1, p 33) states that the fruits of *G. cauliflora* are sold in the markets of Georgetown. However, I have no collections to document the natural occurence of this species in the Guianas. The *Grias tetrapetala* of Aublet is actually *Gustavia augusta* and therefore can not be the source of the fruits Schomburgk saw in Georgetown.

Local names. JAMAICA. Anchovy Pear (Prior sn; Sloane, Hist. Jam. 1725; Guppy, Plants, Seeds, and Currents, 1917); Wild Tobaco (Britton 902).

BELIZE. Bombowood (Gentle 5194, 5350); Genip (Schipp 1151); Wild Mammy (Gentle 5194). GUATEMALA. Cayhilla (Record 48). HONDURAS. Irayol (Record & Kuylen H. 10); Jaguillo (Standley 54469). NICARAGUA. Papallon (Englesing 225). COSTA RICA. Tabaco (Allen 5216). PANAMA. Jaguey (Cooper & Slater 228); Madre de Cocoa (Cowell 355); Membrillo (Cooper & Slater 228, Duke 9678, Standley 31404).

(Prance and Mori 1979: 201).

Grias cauliflora

Photo by: Nicholas Hellmuth, FLAAR Mesoamérica. Río Chocon Machacas, Izabal. Mar. 21, 2021.
Camera: iPhone 12 Pro Max.

IS THERE POTENTIAL MEDICINAL USAGE **OF *GRIAS CAULIFLORA* BY LOCAL PEOPLE?**

We have not yet found documentation on medicinal usage of *Grias cauliflora.*

ARE ANY PARTS OF *GRIAS CAULIFLORA* **EATEN BY MAMMALS?**

Not reported; nonetheless, the fleshy, edible, large-sized fruits of this and other species of *Grias* suggests dispersal by mammals. However, individuals that grow along river banks may drop into the water where the pulp may be eaten by mammals and then the endocarp, containing the single seed, may be dispersed by water. The endocarps of this species have been collected on the beaches of Florida and San José Island, Costa Rica---both places where the species does not occur (Gunn & Dennis, 1976; Johnston, 1949; Ridley, 1930).

Photo by: David Arrivillaga, FLAAR Mesoamérica. Livingston, Izabal. Mar. 21, 2021.
Camera: Sony Alpha A7R IV. Settings: 1/14; sec; f/14; ISO 1,000.

WHAT ARE THE PRIMARY POLLINATORS OF *GRIAS CAULIFLORA* FLOWERS?

There are no published pollination studies of *Grias cauliflora*. However, Knudsen and Mori (1996) have reported that the floral aroma of *Grias peruviana* is dominated by a fatty acid derived ester which is often found in species pollinated by beetles. This, on top of the fleshy nature of the flowers of the genus, suggests the possibility of beetle pollination. We interpret the red ring surrounding the outer part of the apex of the ovary as a nectary suggesting that nectar is at least a partial reward for pollinators.

Grias cauliflora

Photo by: María Alejandra Gutiérrez, FLAAR Mesoamérica. Black Creek, Izabal. Mar. 24, 2021.
Camera: Canon 1D X Mark II. Settings: 1/800; sec; f/8; ISO 8,000

CONCLUDING DISCUSSION
AND SUMMARY ON *GRIAS CAULIFLORA* TREES

Grias cauliflora is a tree 4 to 10 meters high, often found near rivers and lakes. Native to Mesoamerica and the Caribbean. The fruit is edible when fully ripe. The wood is easy to work and is used for furniture. It is often confused and related with *Gustavia superba* and *Gustavia fosteri*, but you can difference *Grias caulifora* by its leaves with serrated edges, pink flowers and globose and larger fruits. This plant has been reported in different areas of Izabal, but more research is needed to determine other areas of Guatemala where it can be found. Its distribution range occurs in Central America, Jamaica and northern South America.

To research where a species is found, is very helpful to use all the herbaria database web sites or visit in person the herbaria collections. And, very crucial: cooperate with local people. Share with them what you have learned in the field and from library research. If have spent days or weeks on-line and in your library: summarize this for the local people.

To realize that the fruits are edible and potentially high in vitamins and grows on the edges of swamps, rivers, lagoons, raises the question of why all these wetlands plants have not been featured? One reason is that the Carnegie Institution of Washington was more focused on carved stone stelae and monumental architecture, and not what fed the Maya. Maize, beans, and squash were enough for CIW authors. Then root crops were added by Bronson and Lundell's 1938 emphasis on ramon was promoted worldwide through the work of archaeologist Dennis Puleston. Maya research was focused in Peten, Chiapas, Yucantan: The Classic and Post Classic Maya surely existed in Izabal but the focus of the field work from 1880 through the 1960's was: monumental sculpture (stelae, lintels, altars, zoomorphs) and monumental architecture. All this reality is one of many reasons why FLAAR (USA) and FLAAR Mesoamérica (Guatemala) undertook a project of flora, fauna and ecosystem research one-week-each month for 17 months. This was a project of coordination and cooperation with the Alcalde of Livingston, Daniel Esaú Pinto Peña, and his team. We feel proud that this documentation project has resulted in more photographs of *Grias cauliflora* and other important plants.

The cauliflorous characteristic is almost never mentioned for any tree by Standley, Steyermark, Williams, etc. (other than the obvious Theobroma cacao perhaps). Yet we are finding an unexpected variety of trees in the Municipio de Livingston that fruit from the trunk and/or branches,

- *Grias cauliflora*
- *Zygia gigantifoliola*

or flower and fruit from the branches

- *Bellucia pentamera*

Grias cauliflora
Photo by: Nicholas Hellmuth, FLAAR Mesoamérica. Río Chocon Machacas, Izabal. Mar. 21, 2021.
Camera: iPhone 12 Pro Max.

APPENDIX A:
WHERE FLAAR TEAMS FOUND AND PHOTOGRAPHED *GRIAS CAULIFLORA* IN IZABAL AND IN PETÉN

When we make lists of edible plants of the Classic Maya, it helps for archaeologists, botanists and ethnobotanists to know where these plants grow in the wild. Obviously, all the herbaria online list precisely where this plant has been collected in the last two centuries. Plus, the herbaria of the universities of Guatemala also have helpful plant collections, but are not yet scanned and on-line. Would be interesting to see whether the FLAAR teams have found more locations for *Grias cauliflora* in the rivers and creeks flowing in to Rio Dulce, El Golfete and Canyon Rio Dulce than are in all herbaria in US, UK, and EU put together. We show the trees alive, full-color, full-size and most importantly, where these trees can be found. We also have aerial photos from our DJI Mavic 2 Pro drone of at least half these ecosystems.

Grias cauliflora records by FLAAR Mesoamérica

PLACE	DATE	PHOTOGRAPHER
Taponcito Creek	Dec 3 2020	Nicholas Hellmuth
Río Lámpara	Jan 25 2021	Nicholas Hellmuth
Río Sarstún	Feb 26 2021	Victor Mendoza
Black Creek	Mar 24 2021	Nicholas Hellmuth
Río Taméja	Mar 24 2021	Roxana Leal
Río Cáliz	Mar 22 2021	David Arrivillaga
Reserva Mirador del Cañón	Mar 21 2021	Nicholas Hellmuth
Río Cáliz	Mar 22 2021	Alejandra Gutiérrez
Río Chocón Machacas	Mar 21 2021	Roxana Leal
Creek Muerto	Mar 24 2021	Nicholas Hellmuth
Black Creek	Mar 24 2021	Alejandra Gutiérrez
Río Taméja	Mar 24 2021	Alejandra Gutiérrez
Río Muerto	Mar 24 2021	David Arrivillaga
Reserva Mirador del Cañón	Mar 23 2021	David Arrivillaga
Reserva Mirador del Cañón	Mar 23 2021	Nicholas Hellmuth
Río Chocón Machacas	Mar 21 2021	David Arrivillaga
Río Chocón Machacas	Mar 21 2021	Nicholas Hellmuth
Río Chocón Machacas	Mar 21 2021	Alejandra Gutiérrez
Río Chocón Machacas	Mar 21 2021	Nicholas Hellmuth
Hotel El Tortugal	Jun 19 2021	Nicholas Hellmuth
Río Creek de León	Jun 19 2021	David Arrivillaga
Sarstún Creek	Dec 14 2021	Victor Mendoza
Río Blanco	Dec 12 2021	Nicholas Hellmuth
Río Chocón Machacas	Dec 11 2021	Nicholas Hellmuth

Tabulation prepared by Victor Mendoza, researcher and digital photo library manager of FLAAR Mesoamérica.

Neotropical Flora website (Neotropical Plant Portal) has the herbaria documentation from MOBOT, New York Botanical Garden and the botanical gardens of comparable status around the world. For *Grias cauliflora* they have two entries.

Dataset: All Collections
Taxa: *Grias cauliflora* (*Grias dariensis, Grias dukei, Grias fendleri, Grias pittieri, Grias sternii*)
Search Criteria: Guatemala; excluding cultivated/captive occurrences

Missouri Botanical Garden

Grias cauliflora L.
3296434 Julian A. Steyermark 396811940-04-19.
Guatemala, Izabal, Shores of Lago Izabal, opposite San Felipe, between San Felipe and mouth of Rio Juan Vicente., 15.67 -88.99, 50m

Full Record Details

New York Botanical Garden

Grias cauliflora L.
728232G. C. Jones 31461966-04-27.

Guatemala, Izabal, Lower course of Río Oscuro, SW of Lake Izabal, 15.37 -89.35

Full Record Details

We found THOUSANDS of this tree in dozens of locations in the east half of Izabal. We found so many we did not even stop to photograph more than 10%; we stopped only about 21 times. We went to these remote rivers and creeks MONTH AFTER MONTH AFTER MONTH to find when they flowered. And finally got several photos of them in flower. If funding were available, we have access to this area, we have local plant scouts that have assisted us for years. FLAAR (USA) and FLAAR Mesoamérica (Guatemala) has a team to find whatever other plants are of interest. In the meantime, we now are in the middle of a 2021-2025 five-year project of coordination and cooperation with CONAP to find ecosystems in areas so remote that no professor has ever visited these areas. In Peten we are focusing on wetlands since these ecosystems have not been well studied and never with a good-quality drone aerial photography. In addition, we have high-quality digital cameras (Canon, two Nikon cameras and four models of mirror-less Sony digital cameras). Plus, most important, we have a team that is ready, willing, and able to hike through seasonally inundated bajos many kilometers each day to reach these remote areas. And we camp in tents since all previous research by scholars is understandably accomplished near a hotel or base-camp such as the super-comfortable Las Guacamayas on the Rio San Pedro. We too used that as a base camp for four previous field trips in the previous decade. But now we have learned that it is more helpful to study and publish areas that no botanist, ethnobotanist, ecologist or geographer has yet studied.

APPENDIX B:
IT HELPS TO TABULATE HERBARIA DOCUMENTATION

As a suggestion, if you want to learn about any tree in Guatemala:
Learn about it also in:

- Chiapas
- Tabasco
- Campeche
- Yucatán
- Quintana Roo
- Belize

There are more botanical and ethnobotanical reports on these areas than for adjacent Honduras and El Salvador. Obviously not all plants of the Caribbean area will be found in-land but Chiapas faces the Pacific Ocean and Tabasco, Campeche, Yucatan, and Quintana Roo have various areas reaching the Caribbean. Belize obviously faces the Caribbean and southern Belize is near Amatique Bay area of Izabal.

Since we have thousands of plant that we have to find-photograph-research-and-publish, we do not put a tabulation of international herbaria specimens. Anyone can do that by themselves on-line. Plus due to COVID most of the herbaria in Guatemala were closed in past years. But Chloe (FLAAR Mesoamerica) did provide the following:

LOCATION	Puerto Morelos, Quintana Roo, MX
DATE	Nov, 1980
IDENTIFIED BY	
COLLECTED BY	E. Cabrera, L. Cortés y H. Álvarez
INSTITUTION	Herbario Nacional de México, Universidad Autónoma de México
LINK	Click here to read

LOCATION	Cuyamel, Honduras
DATE	03/02/1927
IDENTIFIED BY	S.J. Record & H. Kuylen
REGISTERED BY	S.J. Record & H. Kuylen
INSTITUTION	Preserved specimen from National Museum of Natural History, Smithsonian Institution
LINK	Click here to read

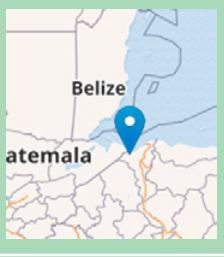
LOCATION	Los Andes entre Ríos, Guatemala
DATE	03/02/1926
IDENTIFIED BY	S. J. Record
REGISTERED BY	S. J. Record
INSTITUTION	National Museum of Natural History, Smithsonian Institute
LINK	Click here to read

LOCATION	Mexico, Quintana Roo, Benito Juárez (21.1N, 86.8W) 
DATE	Jan, 2019
IDENTIFIED BY	William Terry Hunefeld
REGISTERED BY	William Terry Hunefeld
INSTITUTION	iNaturalist
LINK	Click here to read

LOCATION	Belize (16.0 N, 89.0W) Close to the Guatemalan border) 
DATE	April, 2016
IDENTIFIED BY	Steven W. Brewer
REGISTERED BY	Steven W. Brewer
INSTITUTION	Missouri Botanical Garden
DATA COLLECTION	Tropicos Specimen Data
LINK	Click here to read

LOCATION	Belize (16.4N, 88.5W) 
ELEVATION	6m
DATE	Feb, 2011
IDENTIFIED BY	Steven W. Brewer
REGISTERED BY	Steven W. Brewer
INSTITUTION	Missouri Botanical Garden
LINK	Click here to read

LOCATION	Guatemala 15.7N, 89.0W 
ELEVATION	50m
DATE	April, 1940
IDENTIFIED BY	Julian A. Steyermark
REGISTERED BY	Julian A. Steyermark
INSTITUTION	Missouri Botanical Garden
LINK	Click here to read

LOCATION	Cuyamel, Honduras (15.63N, 88.2 W) 
DATE	15/02/1927
IDENTIFIED BY	S. A. Mori
REGISTERED BY	S. J. Record
INSTITUTION	The New York Botanical Garden
LINK	Click here to read

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2007 Trees in the Life of the Maya World. BRIT PRESS, Botanical Research Institute of Texas. 206 pages.

Note: Regina de Riojas has dedicated much of her life to trees of the Maya and trees of Guatemala. Elfriede de Pöll has likewise dedicated her life to biology of Guatemala, at Universidad del Valle de Guatemala.

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Note: I was pleasantly surprised to find this volume of Flora Neotropica as such an easy download. I thank the NYBG.

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STANDLEY, Paul C.

1923 Trees and Shrubs of Mexico. Contributions from the United States National Herbarium, Volume 23, Part 3. Smithsonian Institution.

Note: In this one monograph the species are not listed in alphabetical order, so it's a mental adventure finding the species you are looking for.

All monographs by Standley and co-authors can be easily found and downloaded. I would recommend finding the .pdf versions as they are easier to store, easier to copy, and easier to share with students and colleagues.

STANDLEY, Paul C. and **Louis O. WILLIAMS**

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HELPFUL WEB SITES FOR **ANY AND ALL PLANTS**

There are several web sites that are helpful even though not of a university or botanical garden or government institute.

However, most popular web sites are copy-and-paste (a polite way of saying that their authors do not work out in the field, or even in a botanical garden). Many of these web sites are click bait (they make money when you buy stuff in the advertisements that are all along the sides and in wide banners also. Therefore, we prefer to focus on web sites that have reliable information.

https://serv.biokic.asu.edu/neotrop/plantae/
Neotropical Flora data base. To start your search click on this page:
https://serv.biokic.asu.edu/neotrop/plantae/collections/harvestparams.php

http://legacy.tropicos.org/NameSearch.aspx?projectid=3
This is the main SEARCH page.

https://plantidtools.fieldmuseum.org/pt/rrc/5582
SEARCH page, but only for collection of the Field Museum herbarium, Chicago.

https://fieldguides.fieldmuseum.org/guides?category=37
These field guides are very helpful. Put in the Country (Guatemala) and you get eight photo albums.

http://enciclovida.mx
CONABIO. The video they show on their home page shows a wide range of flowers pollinators, a snake and animals. The videos of the insects are great.

www.kew.org/science/tropamerica/imagedatabase/index.html
Kew gardens in the UK is one of several botanical gardens that I have visited (also New York Botanical Gardens and Missouri Botanical Gardens (MOBOT), in St Louis. Also the botanical garden in Singapore and El Jardín Botánico, the open forest botanical garden in Guatemala City).

www.ThePlantList.org
This is the most reliable botanical web site to find synonyms. In the recent year, only one plant had more synonyms on another botanical web site.

WEBSITES SPECIFICALLY ON ***GRIAS CAULIFLORA***

www.naturalista.mx/taxa/495664-Grias-cauliflora
Photos and distribution map

sura.ots.ac.cr/local/florula4/find_sp.php?key_species_family=Lecythidaceae&key_genus=Grias
Information

stricollections.org/portal/taxa/index.php?taxon=65143&clid=64
Information and photos

tropical.theferns.info/viewtropical.php?id=Grias+cauliflora
Information and nice photos

ACKNOWLEDGEMENTS TO FLAAR MESOAMÉRICA

Flor de María Setina is the office manager, overseeing all the diverse projects around the world. We also utilize the inkjet prints to produce educational banners to donate to schools.

Vivian Hurtado is the actual project manager for FLAAR's divisions: Flora & Fauna and MayanToons. She is also environmental engineer and passionate researcher

Victor Mendoza environmental engineer, is in charge of the photographic database of FLAAR Mesoamerica and its taxonomic identification. He also supports as a research assistant.

Sergio Jerez He is involved with plant identification, bibliographic research and map design for the trails explored on each expedition.

Belén Chacón her work includes ordering, tabulating, and updating our ethnobotanical list.

Diana Sandoval her work consists of the recompilation of scientific information, which later is transformed into the FLAAR reports that are published on our websites.

María José Toralla she gathers information and bibliographies that are added to our Flora & Fauna electronic library and also make part of the information found in research, reports and websites.

Samuel Herrera is in charge of processing maps of our field trips and helping with species identification and research.

Pedro Pablo Marroquín he is part of the editing team, reviews and adds information to our photographic reports

Alejandra Valenzuela biology student is now part of Flora y Fauna's photographic report and educational material editing team since September 2020.

Maria José Rabanales she is part of the photographic report editing team.

Senaida Ba has been our photography assistant for several years. Now, she puts together PowerPoint presentations for students and teachers to learn about several subjects like Flora, Fauna and Mayan Iconography.

Byron Pacay he is our assistant during field trips.

Norma Cho is our assistant during field trips.

Roxana Leal major in Communication who manages all our social media and digital community.

Isabel Rodriguez Paiz is in charge of the fundrasing.

Edwin Solares environmental engineering. He is a photographer and videographer during our expeditions and later edits this content to be able to use it in the materials we generate.

Pedro Pablo Ranero is in charge of editing videos of flora and fauna to create content on our sites

Andrea de la Paz designer who helps prepare the master-plan for aspects of our publications. She is our editorial art director.

Jaqueline González designer who puts together the text and photographs to create the actual report.

Heidy Alejandra Galindo Setina designer who puts together the text and photographs to create the actual report.

Alexander Gudiel designer who puts together the text and photographs to create the actual report.

Cristina Ríos designer who puts together the text and photographs to create the actual report.

David Arrivillaga experienced photographer and graphic designer. Sometimes he is a photographer during our expeditions, but he is also a designer of our flora and fauna reports.

María Alejandra Gutiérrez is an experienced photographer who now prepares all the Photography Catalogs for the project we're currently working on the RBM.

Juan Carlos Hernández takes the material that we write and places it into the pertinent modern Internet software to produce our web pages.

Paulo Núñez is a webmaster, overlooking the multitude of web sites. Internet SEO changes every year, so we work together to evolve the format of our web sites.

María José García is part of the web team. Receive the material we produce to place on our sites.

Andrés Fernández is in charge of keeping our websites updated and making them more efficient for the user.

Valeria Áviles graphic designer and illustrator. She is in charge of coordinating the activities of MayanToons, as well as making illustrations for the different materials that we prepare.

Laura Morales digital content engineer He is in charge of directing the animation area of our MayanToons project.

Paula García is part of our MayanToons Animation team. His job is to bring our favorite characters to life.

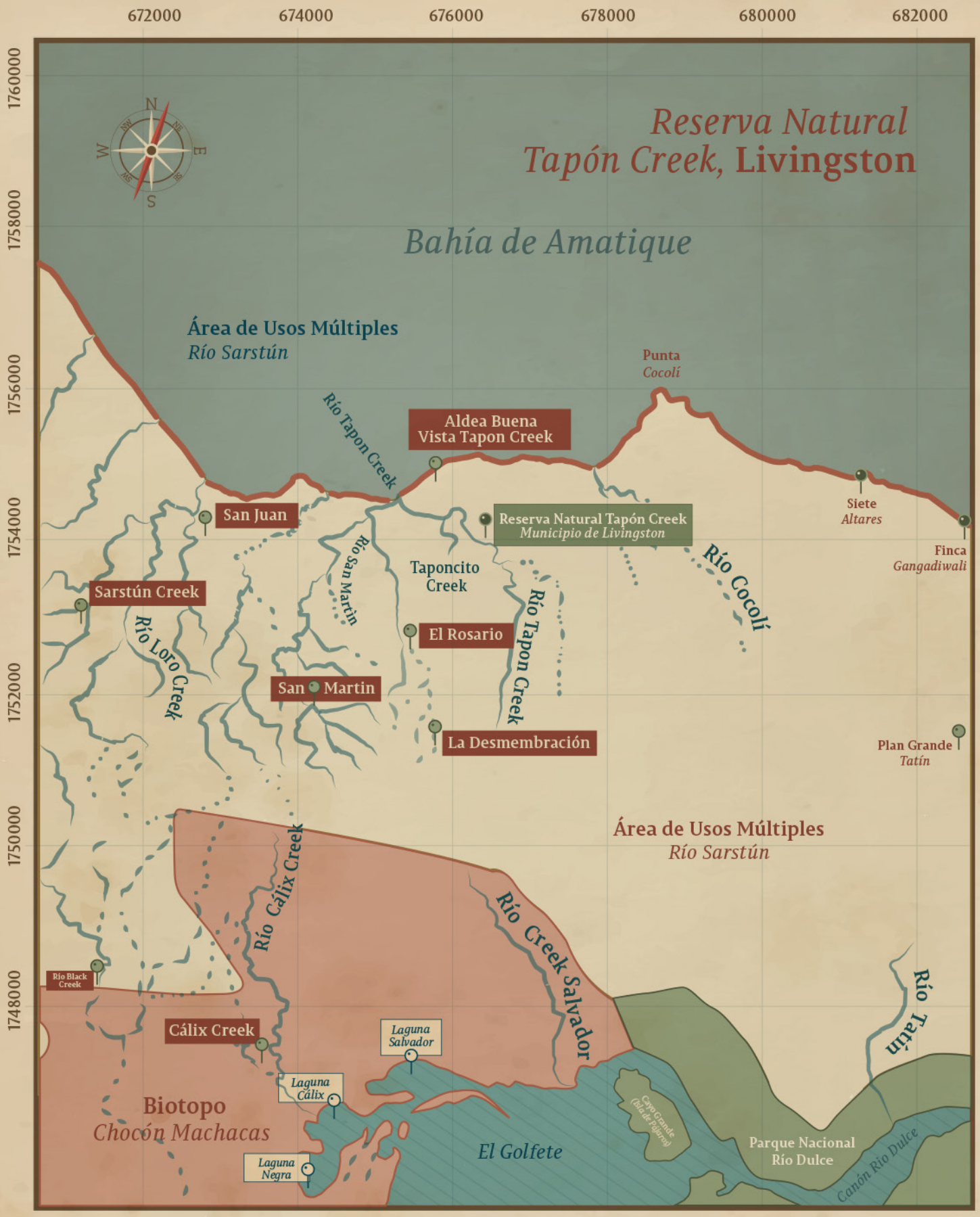
Niza Franco is part of our MayanToons Animation team. His job is to bring our favorite characters to life.

Isabel Trejo graphic designer and illustrator for MayanToons.

Rosa Sequén is an illustrator for MayanToons

Josefina Sequén is an illustrator for MayanToons

Elaborado por: Andrea de la Paz; Amanda Estrada Rodas. FLAAR Mesoamerica 2020



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Información de referencia:

- Limites departamentales de Guatemala. (IGN)
- Instituto Geográfico Nacional (IGN) (Hojas 2463 IV y 2463 III)
- Google Map data 2020. Shapes: Sistema Guatemalteco de Áreas Protegidas 2017.
- Cuerpos de agua. Ministerio de Agricultura Ganadería y Alimentación (MAGA)
- Dirección de Análisis Geoespacial del (CONAP), Marzo/2017.

Elaborado por: Andrea de la Paz; Amanda Estrada Rodas. FLAAR Mesoamerica 2020

FLAAR MESOAMÉRICA

WETLANDS

Edible Wetlands Plants of Municipio de Livingston, Izabal

Wetland Series 1: from Swamps, Marshes and Seasonally Inundated Flatlands of Izabal

Cyperus esculentus Chufa, Yellow Nutsedge, Earth Almond MLW#1	***Eleocharis geniculata*** ***Eleocharis caribaea*** Caribbean Spike-Rush MLW#2	***Montrichardia arborescens*** Camotillo Water Chestnut MLW#3	***Nymphoides indica*** Floating Heart Water Snowflake MLW#4
Pachira aquatica Zapoton MLW#5	***Pontederia cordata*** Pickerel Weed MLW#6	***Sagittaria latifolia*** Water Potatoes MLW#7	***Typha dominguensis*** Cattail MLW#8

Wetland Series 2: plants that grow along the beach shore of Amatique Bay

Amphitecna latifolia Black calabash MLW#9	***Coccoloba uvifera*** Uva del mar MLW#10	***Manicaria saccifera*** Confra, Manaca MLW#11	***Chrysobalanus icaco*** Coco Plum MLW#12	***Avicennia germinans*** Black Mangrove MLW#13	***Rhizophora mangle*** Red Mangrove MLW#14

Wetland Series 3: plants that grow alongside water: rivers, lagoons, swamps, or ocean

Guadua longifolia Jimba MLW#15	***Acoelorrhaphe wrightii*** Pimientillo, Tasiste, Palmetto Palm MLW#16	***Acrostichum aureum*** Mangrove Fern MLW#17	***Annona glabra*** Alligator Apple MLW#18	***Bactris major*** Huiscoyol Palm MLW#19	***Diospyros nigra*** Zapote negro MLW#20
Grias cauliflora Palo de Jawuilla MLW#21	***Inga vera*** ***Inga multijuga*** ***Inga thibaudiana*** River Koko MLW#22	***Pithecellobium lanceolatum*** Bastard Bully Tree Chucum Red Fowl MLW#23	***Coccoloba belizensis*** Papaturro MLW#24	***Symphonia globulifera*** Barillo MLW#25	***Lacmellea standleyi*** Lechemiel MLW#26

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OTHER PUBLICATIONS OF **LIVINGSTON PROJECT**

Jacaratia dolichaula, Jacaratia mexinaca
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Toxic Root (Tuber), Arrowleaf Elephant Ear, *Xanthosoma robustum*
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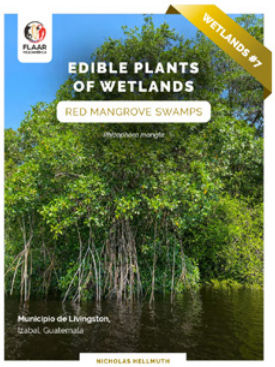

Red Mangrove Swamps, *Rhizophora Mangle*
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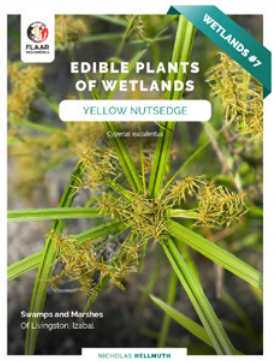

Yellow Nutsedge, *Cyperus esculentus*
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Lechemiel, Leche de Vaca Tree, *Lacmellea standley*
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Coccoloba uvifera
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Jimba, Bamboo. *Guadua longifolia*
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https://flaar-mesoamerica.org/product-category/livingston-project/

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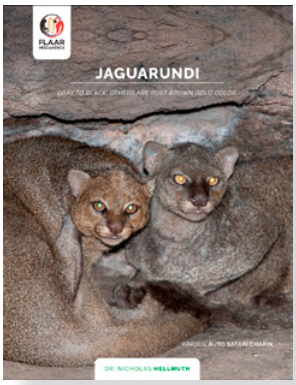

Jaguarundi, Gray to Black; Others are Rust Brown Gold Color
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Mantled Howler Monkeys, Alouatta palliata, Annotated Bibliography
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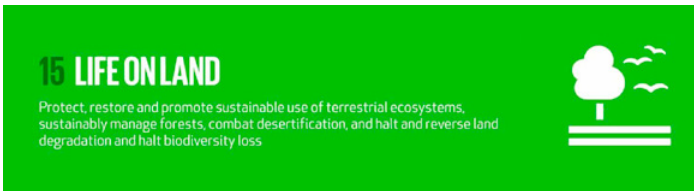

The current Alcalde of Livingston, Mr. Daniel Pinto, together with his team on the Division of International Cooperation, has set the goal of achieving the municipality development in the years 2020-2024 based on the goals and indicators proposed by the 2030 Agenda for Sustainable Development. In this regard, bot FLAAR (USA) and FLAAR Mesoamerica (Guatemala) will collaborate whit this Municipality achieve the Sustainable Development Goal (SDG), number 15 "Life on Land".

Throughout this cooperation project, different materials will be and publishes prepared, as this Photo Essay. These will help to collect information on species, different ecosystems (terrestrial, wetlands and fresh water asociated) and biodiversity. This information will also be useful as it is considered in various conservation estrategies to protect threatened species and prevent their extinction. Moreover, the municipality goals also look forward to promote the sustainable use, conservation and research of the flora and animal species of all terrestrial, wetlands, aquatic shore and coastal associated ecosystems of the Guatemalan Caribbean region. You can learn more about this project and the SDG indicators wich are being pursued at:

https://flaar-mesoamerica.org/rain-forests-rivers-lakes-bays-ocean-caves-canyons-livingston-the-caribbean-biodiversity-wonderland-of-guatemala/

SERIES OF MUNICIPIO OF LIVINGSTON

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www.maya-ethnobotany.org
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www.digital-photography.org
www.FLAAR-Mesoamerica.org

This report may be cited with this information:

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Palo de jahuillo. *Grias cauliflora*, Municipio de Livingston, Izabal, Guatemala. FLAAR (USA) and FLAAR Mesoamérica (Guatemala). Wetlands series 3: rivers, lagoons, swamps, or ocean, Wetlands #21

BACK COVER PHOTO

Photo by: Nicholas Hellmuth, FLAAR Mesoamerica.
Río Chocon Machacas, Izabal. Mar. 21, 2021.
Camera: iPhone 12 Pro Max.

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