



FLAAR  
MESOAMÉRICA

WETLANDS #6

# EDIBLE PLANTS OF WETLANDS

PROVIDED FOOD FOR  
THE CLASSIC MAYA

*Pontederia cordata*

Municipio de Livingston  
Izabal, Guatemala,  
Central America

NICHOLAS HELLMUTH

# EDIBLE PLANTS OF WETLANDS

PROVIDED FOOD FOR  
THE CLASSIC MAYA

*Pontederia cordata*





MUNICIPALIDAD DE  
**Livingston**



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The helpful individuals listed below are all part of the FLAAR Mesoamerica research and field work team. The office research team, webmaster, and web designers are additional individuals in the main office in Guatemala City. Since each report is a different plant or animal, the individuals who assist in preparing the bibliography, species identification and botanical information category are not the same for each report.

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### PHOTO FROM FRONT COVER

#### ***Pontederia cordata***

Photo by: David Arrivillaga, FLAAR Mesoamerica, Feb. 15, 2020, 2:14 pm. Lagunita, Morales, Izabal.

Camera: Sony Alpha A9 II. Lens: Sony FE 90mm Macro G OSS. Settings: 1/250 sec; f/11; ISO 250.

Camera: Nikon D5. Lens: Nikon AF-S VR Micro-NIKKOR 105mm IF-ED. Settings: 1/400 sec; f/14; ISO 1,250.

### PHOTO FROM TITLE PAGE

#### ***Pontederia cordata***

Photo by: David Arrivillaga, FLAAR Mesoamerica, Mar. 22, 2021, 11:26 am. Río Lámpara, Livingston, Izabal, Guatemala.

Camera: Nikon D810. Lens: Nikon 200mm AF-D Tele-Macro. Settings: 1/320 sec; f/10; ISO 1,000.

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## Edible Wetlands Plants of Municipio de Livingston, Izabal

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



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



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





## GLOSSARY

**Bog:** I thought these were primarily in Ireland, but I hiked through a bog within the Savanna “of 3 Fern Species” in Parque Nacional Yaxha, Nakum and Naranjo (PNYNN), Petén. I estimate there were areas of bog within the Savanna “East of Nakum” as well. We (Teco, Lorena, and I) even found “bog moss” all over the ground in one area of the Savanna “of 3 Fern Species”, a savanna I discovered from aerial photographs of IGN.

**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.

**Seasonally inundated:** for Petén, Alta Verapaz, Izabal and nearby areas of Mesoamérica means a flatland, usually in the lowlands, that has standing water either several centimeters or up to a meter during the local rainy season. But such areas may have no standing water whatsoever in a really dry year. Yet “underground” there is still enough moisture for the plants to survive.

**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:** literally, this is the spelling and pronunciation of the English word “swamp” by the locals in Izabal area of Guatemala, and I would estimate in adjacent Belize as well.

**Pantano:** mixture of a marsh and a swamp; so primarily grasses and underwater plants, but a few trees here and there. Obviously will differ depending on size, geology, etc.

**Wetland:** to me is a generic word to cover swamps, marshes, and seasonally inundated areas. Each ecologist and geographer and botanist use their own academic terms. But, Holdridge (life zone systems) never hiked through the Savanna “of 3 Fern Species” nor the Savanna “East of Nakum” 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 swamps to see what was 100 to 200 meters inland.



**Life of Land:** is the Sustainable Development Goal (number 15 from the United Nations goals) which is focused on the conservation the conservation of terrestrial and fresh water ecosystems. Municipio de Livingston has multiple natural areas associated to rivers and wetlands for example.



***Pontederia cordata***

Photo by: David Arrivillaga, FLAAR Mesoamerica, Feb. 15, 2020, 2:14 pm. Lagunita, Morales, Izabal.  
Camera: Sony Alpha A9 II. Lens: Sony FE 90mm Macro G OSS. Settings: 1/250 sec; f/11; ISO 250.



## INTRODUCTION TO *PONTERERIA CORDATA*

*Pontederia* is a genus of several edible plants that I estimate are missing from 90% of articles and monographs on what the Classic Maya had available to eat. Knowledge of this plant and that it is native to the Maya Lowlands, and that it is edible is totally missing from my recent decades of work on what the Classic Maya had available to eat (Hellmuth 2014). Yet, in essence, “the whole plant is edible.”

Seed - raw, cooked like rice or dried and ground into a powder [55, 62, 106, 183].

A very acceptable nutty flavour and texture when raw, they are said to be excellent if the seed is lightly roasted in an oven [183]. Young leafstalks - raw or cooked [62].

The whole plant is edible cooked or raw [106]. It can be added to salads, cooked like spinach or added to soups [183].

<https://pfaf.org/user/plant.aspx?latinname=Pontederia+cordata#:~:text=Edible%20Uses&text=A%20very%20acceptable%20nutty%20flavour,added%20to%20soups%5B183%5D>



One of several reasons why this plant is not listed or mentioned is that most of us Mayanists study the hilltop forests, the hillside forests, and the *tinto bajos* (*tintal*). We rarely hike or swim into marshes or swamps.

Most studies of the Classic Maya of the Carnegie Institution of Washington era were in Petén or in the dry lowlands of Yucatán. The capable breakthrough discoveries of recent decades have been in Petén (San Bartolo murals (reminding us of Olmec heritage for rulers), Holmul murals (showing Teotihuacan influence), plus Calakmul (murals). I worked in Yaxha and Nakum areas for many years in the 1970's but did hike into the swamps near these monumental sites until 2018-2019.

Now that we were invited by the alcalde and team of coordination and cooperation

of the Municipio de Livingston (Izabal) to visit their part of Guatemala to undertake studies of flora, fauna, ecology, and to provide material for educational programs, we are getting more experience in marshes, swamps, and other wetlands. Once we are dedicating day-after-day, month after month, to explore the wetlands of Izabal, we are learning how many of the plants inside and around the edges of these wetlands are native and edible.

Also, the studies, the documentation, the research done by FLAAR Mesoamerica team throughout 2021, will leave the municipality with the bases to achieve the goals of the Sustainable Development Goals (SDG) proposed by the United Nations (UN). Specifically, the goals of SDG number 15: Life on land.

<https://sdgs.un.org/goals/goal15>

So, we are preparing one research report for each of these unexpected food plants of the Classic Maya. Edible *Annona* are well known but I had no idea they grew wild in swamps. *Pachira aquatica* ("zapontón") I knew for decades, specifically as a tree growing on the edge of streams and swamps, but I was not completely aware of how edible its giant seeds are. "*Grias*" is a tree I had never seen or heard of before. So, here is our starting list for trees of swamps:

*Annona glabra* L. Annonaceae, anonillo

*Grias cauliflora* L., Lecythidaceae, bombowood, genip, warreewood, wild mammy.

*Manicaria saccifera* Gaertn., family Arecaceae, manaco, palma de confra

*Pachira aquatica* food, medicine, dye colorant (Balick, Nee, and Atha 2000)

In addition to trees of the wetlands, there are several plants that are even less well known. *Sagittaria latifolia* is in The Maya Forest Garden by Ford and Nigh (2015: 184), but not many other books or articles. We are estimating that the botanical name may be *Sagittaria latifolia* for the ones we found in heliconia marsh areas. Two other edible plants are even more conspicuously missing in my earlier reports and those of over 90% of other Mayanists working on these topics.

*Montrichardia arborescens*, Araceae, camotillo, frequent in swamps especially on edges (where there is more sunlight).

*Pontederia cordata*, Pontederiaceae, en masse in marshes and edge of swamps

*Sagittaria latifolia*, Alismataceae, white petals bright yellow center

My point is that what if swamps and marshes produce diverse edible foods without having to drain them, without having to create raised-field agriculture, and without having to create floating gardens (of the Aztecs)? LiDAR allows ecologists, archaeologists, botanists, geologists, and geographers to see how many swamps and marshes were indeed engineered by the Classic Maya. Actually, Aguada Maya is a wetland only about 3 to 4 km north of Yaxha that was discovered without LiDAR (since LiDAR is totally missing, completely absent for Yaxha, Nakum, and Naranjo areas of Petén). The Naranjo archaeology project team has suggested that the Classic Maya prepared aspects of the savanna and seasonally inundated cibal, jimbál and drainage area at the immediate west of the edge of Naranjo's monumental architecture.

So yes, lots of wetlands were engineered by the Classic Maya to produce what they preferred. And LiDAR in the future can tell us the full story of the Savanna East of Nakum, the savanna, cibal, and jimbál west of Naranjo ruins and all the marshes and swamps of Izabal. But I estimate that in Izabal, far from major city-states, that lots of these wetlands were harvested but not farmed (so not manipulated to the extent of raised fields). I suggest this because all the edible plants grow perfectly well still today, with no recent agricultural manipulation of the wetland areas.



***Pontederia cordata***, inflorescence.

Photo by: David Arrivillaga, FLAAR Mesoamerica, Jan. 26, 2021, 11:16 am. Golfete Rio Caliz, Livingston.  
Camera: Sony Alpha A7R IV. Lens: Sony FE 200-600mm G OSS. Settings: 1/2,000 sec; f/13; ISO 1,250.



Before we jump into the edible potential of *Pontederia cordata*, I would also like to bring up the other edible plants that we did document for the Savanna East of Nakum, PNYNN, Petén:

*Calathea* species

*Maranta arundinacea*, near Laguna la Perdida, March 26, 2019. Camotillo, wild arrowroot,

*Passiflora* species

*Thalia geniculata* L., family Marantaceae, bent alligator flag, popal, wet ground, low water, pantano

In other words: swamps, bogs, marshes of Petén, Alta Verapaz, Izabal, Chiapas, Tabasco, Campeche, Quintana Roo, and potentially even Yucatán, had lots of edible plants for the Classic Maya, especially in the Preclassic (when the people were probably more accustomed to gathering and eating wild plants) and in the Post Classic when survivors had to forage for eating wild plants.



Photograph 1



Photograph 2



Photograph 3



Photograph 4



***Pontederia cordata***, literature implies that "the whole plant" can be eaten, stem, flowers, leaves and seeds.

Photo by: Nicholas Helmuth, FLAAR Mesoamerica, Jan. 26, 2020, 12:33 am. Río Calix, Livingston.  
Camera: Nikon D5. Lens: Nikon AF-S VR Micro-NIKKOR 105mm IF-ED. Settings: 1/500 sec; f/11; ISO 1,000.



**Environment**, where *P. cordata* grows happily. On the front, you can see little white flowers of *Nymphoides indica*.

Photo by: Nicholas Hellmuth, FLAAR Mesoamerica, Mar. 14, 2020, 10:40 am. El Golfete, Livingston.  
Camera: Nikon D810. Lens: Nikon 200mm AF-D Tele-Macro. Settings: 1/400 sec; f/14; ISO 500.





***Pontederia cordata***, is called "pickerel weed"

Photo by: David Arivillaga, FLAAR Mesoamerica, Feb. 15, 2020, 2:34 pm. Lagunita, Morales, Izabal, Guatemala.  
Camera: Canon 1D X Mark II. Lens: Canon EF 100MM Macro USM. Settings: 1/60 sec; f/14; ISO 640.



***P. cordata***, belongs to the Pontederiaceae family plant.

Photo by: David Arrivillaga, FLAAR Mesoamerica, Feb 15, 2020, 2:14 pm. Lagunita, Morales, Izabal.  
Camera: Sony Alpha A9 II. Lens: Sony FE 90mm Macro G OSS. Settings: 1/250 sec; f/11; ISO 250.

## MY PERSONAL EXPERIENCE *PONTEDERIA CORDATA*

I first noticed *Pontederia cordata* on a day when we had been asked to help a cave exploration entity to photograph Cueva de Silvino cave and associated bats.

The cave and the lagoons in front of it are along highway CA9, circa kilometer 260 in the Municipio de Morales, adjacent to the south side of Municipio de Livingston. The cave entrance is within 3 meters of the north side of the highway. The ponds and marshes are down on the south side. There were so many thousands of a lavender-purple spire of flowers that I absolutely wanted to get closer to learn more about this plant.

So we drove down a few hundred meters and hiked along the west side. Then I noticed there were “millions” in a marsh area near a newly constructed house, so we asked permission to enter the swamp (because with a 1:1 macro lens I prefer to be face-to-face with the flowers, to achieve a good photo). So, I hiked into the swamp.

The entire team told me “NO! No Nicholas, don’t go in, it’s dangerous; you have no idea what’s out there!” But precisely because I had no idea what was in this swamp was the reason, I wanted to enter it. I waded in. Of course, it got deeper and deeper (both the water and the mud at the bottom). But I noticed some really beautiful swamp flowers so I decided to hike there to do a close-up. BOOM, I went straight down a hole in the swamp; not falling forward or backward, but

straight down. Thump, part of my leg hit the edge of the hole (I was in the Emergency Room of a hospital in St. Louis, Missouri within a few days to repair that festering injury; getting injured surrounded by swamp water is not a clever idea).

Same thing happened while I was exploring the newly discovered Savanna of 3 Fern Species. This is really a bog that in some parts is a savanna but in most is a marsh or swamp (the ecosystem changes every 50 or 70 meters). My entire body went straight down a hole; at first no one could pull me out since they tried to do this diagonally. Lorena and Teco (biologist and park ranger at PNYNN) soon realized they would have to get adjacent to me and lift my body straight up. Same for the Morales area *Pontederia* swamp: my team came rushing into the swamp to lift me straight up.

In Izabal we enter the marshes, swamps, and other wetlands in a lancha, though rather obviously I am often motivated to get out of the boat in order to be closer to a plant in order to accomplish better photographs.

Let’s now look at our photographs of *Pontederia cordata* flower towers and the eco-systems where we have noticed them so far in the Municipio de Livingston. We have a lot more rivers, creeks, and wetlands to explore. I am especially keen to find edible hornworts or other edible aquatic plants here in the Municipio de Livingston.



## FULL BOTANICAL NAME

*Pontederia cordata* L. is the accepted name, family Pontederiaceae

## HERE ARE SYNONYMS FOR **PONTERERIA CORDATA**

- *Narukila cordata* (L.) Nieuwl.
- *Narukila cordata* var. *lancifolia* (Muhl.) Nieuwl.
- *Pontederia angustifolia* Pursh
- *Pontederia cordata* f. *albiflora* House
- *Pontederia cordata* var. *albiflora* Short
- *Pontederia cordata* var. *angustifolia* (Pursh) Torr.
- *Pontederia cordata* f. *angustifolia* (Pursh) Solms
- *Pontederia cordata* f. *bernardii* Lepage
- *Pontederia cordata* f. *brasiliensis* Solms
- *Pontederia cordata* f. *cordata*
- *Pontederia cordata* var. *cordata*
- *Pontederia cordata* var. *lanceolata* (Nutt.) Griseb.
- *Pontederia cordata* var. *lancifolia* (Muhl.) Torr.
- *Pontederia cordata* f. *latifolia* House
- *Pontederia cordata* var. *ovalis* (Mart. ex Schult. & Schult.f.) Solms
- *Pontederia cordata* f. *ovalis* (Mart.) A. Cast.
- *Pontederia cordata* f. *taenia* Fassett
- *Pontederia lanceolata* Nutt.
- *Pontederia lanceolata* f. *brasiliensis* (Solms) Fernald S
- *Pontederia lanceolata* f. *ovalis* (Mart. ex Schult. & Schult.f.) A.Cast.
- *Pontederia lanceolata* f. *trullifolia* Fernald
- *Pontederia lanceolata* var. *vichadensis* F.J.Herm. S
- *Pontederia lancifolia* Muhl.
- *Pontederia maculata* Donn
- *Pontederia mucronata* Raf. ex Torr.
- *Pontederia nymphaeifolia* Kunth
- *Pontederia obtusifolia* (Raf.) A.DC.
- *Pontederia ovalis* Mart. ex Schult. & Schult.f.
- *Pontederia rotundifolia* var. *nymphaeifolia* (Kunth) Solms
- *Sagittaria cerulea* Raf.
- *Umsema mucronata* Raf.
- *Umsema obtusifolia* Raf.
- *Unisema acutifolia* Raf.
- *Unisema cordata* (L.) Farw.
- *Unisema cordata* f. *angustifolia* (Pursh) Farw.
- *Unisema cordata* f. *latifolia* (Muhl.) Farw.
- *Unisema deltifolia* Raf.
- *Unisema heterophylla* Raf.
- *Unisema lancifolia* Raf.
- *Unisema lancifolia* f. *trullifolia* Farw.
- *Unisema latifolia* Raf.
- *Unisema media* Raf.
- *Unisema media* var. *albiflora* Raf.
- *Unisema mucronata* Raf.
- *Unisema obliquata* Raf.
- *Unisema obtusifolia* (Raf.) Raf.
- *Unisema peduncularis* Raf.
- *Unisema purshiana* Raf.
- *Unisema rotundifolia* Raf.

[www.theplantlist.org/tpl1.1/record/kew-259449](http://www.theplantlist.org/tpl1.1/record/kew-259449)

So, the two species that Lundell (1937) mentions for wetlands of Petén, *Pontederia lanceolata* Nutt. and *Pontederia rotundifolia* L. are probably both simply old names for what today should be *Pontederia cordata*.

## LOCAL NAMES FOR ***PONTEDERIA CORDATA***

Espiga de agua, Camalote grande.

Common name in English is “pickerel weed”. Also spelled as one word: pickerelweed

## HABIT FOR ***PONTEDERIA CORDATA***

PFAF plant database says marshes and borders of muddy ponds.

In the marsh about 300 meters from the mouth of Cueva de Silvino, Izabal, Guatemala, are solid *Pontederia cordata*.

Needs standing water, so this is not a plant of seasonally inundated savannas such as the Savanna East of Nakum (PNYNN). We need to check to see whether *Pontederia cordata* is in the water-retaining areas of the Savanna of 3 Fern Species (northwest area of PNYNN). So far, all our

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

In Spain the name “espiga de agua” is also used for the plants *Potamogeton natans* and *Potamogeton polygonifolius*.

photography of *Pontederia cordata* is in the Morales and Livingston areas of Izabal, Guatemala.

When you are in a lancha motoring up the creeks and rivers that flow into El Golfete part of Rio Dulce, you see along the sides of the river. In these marsh and swamp areas it is not realistic to get into the marsh by foot, so on our next field trip(s) we will bring a drone. Our swamp river field trip was the only time it was not possible for Haniel (the drone pilot) to be with us.

*Pontederia* plants prefer lots of sun.

## BOTANICAL DESCRIPTION **PONTERERIA CORDATA**

In Standley and co-authors Chicago botanical monographs

In the 1950's the plant name was named *Pontederia lanceolata*. But today *Pontederia cordata* is the accepted name for synonym *Pontederia lanceolata*.

**Pontederia lanceolata** Nutt. Gen. PL 1: 216. 1818.

In marshes, at or little above sea level; Peten; Izabal. Eastern and southern United States; Mexico; British Honduras; Honduras; Cuba; South America.

Plants stout, usually a meter high or less, with thick creeping rootstocks; leaves erect, the blades variable in shape and size, lanceolate to cordate or hastate, 18 cm. long or usually smaller; stipules truncate, the costa produced into a mucro; lower spathe valve leaf-like, the upper one loosely vaginate, more or less recurved, 3-6 cm. long, caudate; inflorescence glabrate or hirtellous, the flowering portion 5-15 cm. long; perianth glabrate to densely glandular-pilose, violet-blue or white, the tube 5-7 mm. long; fruit 5-6 mm. long, broadly ovoid, the ridges of the crests with angular obtuse divisions.

**Pontederia rotundifolia** L. f. Suppl. PL 192. 1781. Lechuga de agua.

In marshes and borders of slow streams, 1,300 meters or lower; Alta Verapaz; Izabal. Honduras to Panama; South America.

Plants large and coarse, sometimes floating, usually creeping in mud, the stems branched, erect, a meter high or lower; leaf blades ovate to rounded-sagittate or reniform-cordate, as much as 12 cm. long and 18 cm. wide, obtuse or rounded at the apex, the basal lobes rounded; stipules truncate; lower spathe valve similar to the leaves, the upper one obovate, acute, erect-spreading; inflorescence shortspicate, the rachis pilose with long crispate hairs; perianth lilac, pilose outside, the tube 6-8 mm. long, the lobes 9-12 mm. long; fruit ovoid, rostrate, 7 mm. long, with spinose-cristate ridges. (Fig. 13.)

Called "balsa" in Salvador. Material of this species, as well as of the others known from Central America, has often been referred to *P. cordata* L., a plant of the United States and Canada. All the species are large and showy plants with handsome flowers, often forming large colonies in marshes or along the borders of slow streams. *P. rotundifolia* is especially plentiful in ditches and marshes about Coban and in the North Coast.

**Pontederia sagittata** Presl, Rel. Haenk. 1: 116. 1827.

Swamps or marshes, usually in open places, sometimes about the borders of lakes, 500 meters or lower; Alta Verapaz; Izabal; Zacapa; San Marcos. Southern Mexico; Honduras. Plants erect, frequently a meter high or more; leaf blades sagittate, often broadly so, as much as 24 cm. long and 15 cm. wide, mostly smaller, obtuse, the basal auricles usually long and narrow, directed downward; upper spathe valve laxly vaginate, the upper portion spreading, 5-9 cm. long, abruptly caudate; inflorescence glabrous to pilose, the flowering portion 5-15 cm. long; perianth lilac, sparsely glandular-pilose or glabrate, the tube 6-7 mm. long, the lobes spreading, 8-10 mm. long, broadly elliptic to ovate, with resinous streaks outside, the upper middle one with a large yellow blotch; filaments glabrous, the anthers ovate-sagittate; stigma 3-6-fid.

(Standley and Steyermark 1952: 50-52).

## CLOSE RELATIVE (S) OF ***PONTEDERIA CORDATA***

### PONTEDERIACEAE

***Eichhornia crassipes*** (Mart.) Solms **Loc Use:** FOOD, MED. — **Nv:** water hyacinth, water lily. — **Habit:** Herb, aquatic. This plant is not native; it is an invasive weed from South America.

***Pontederia cordata*** L. var. *cordata* — **Loc Use:** MED. — **Habit:** Herb, aquatic.

***Pontederia rotundifolia*** L. f. — **Nv:** water lily. — **Habit:** Herb, aquatic

*Pontederia sagittata* is listed for Tikal (Neotropical flora search list).



## WHERE HAS *PONTEDERIA CORDATA* BEEN FOUND IN THE MUNICIPIO OF LIVINGSTON?

- Is *Pontederia cordata* listed for Biotopo Protegido Chocón Machacas, CECON/USAC?  
Not Mentioned
- Is *Pontederia cordata* listed for Tapón Creek Nature Reserve (including Taponcito Creek), FUNDAECO?  
Not Mentioned
- Is *Pontederia cordata* listed for Buena Vista Tapón Creek Nature Reserve?  
Not Mentioned
- Is *Pontederia cordata* listed for Cerro San Gil (south side of Río Dulce)?  
Not Mentioned
- Is *Pontederia cordata* listed for El Refugio de Vida Silvestre Punta de Manabique?  
Not Mentioned
- Is *Pontederia cordata* listed for Ecoalbergue Lagunita Creek (Área de Usos Múltiples Río Sarstún)?  
Not Mentioned
- Is *Pontederia cordata* listed for Sarstoon-Temash National Park (northern side of Río Sarstún)?  
Not Mentioned

## Edible Plants of Municipio de Livingston from

Swamps, Marshes, and Seasonally Inundated Flatlands of Izabal

I would informally suggest that *Pontederia sagittata* and *Pontederia cordata* must be pretty similar to each other if botanists in past decades have “joined” them with a variety name.

(Villaseñor 2016: 862)

<i>PONTERERIA ROTUNDIFOLIA</i> L.F.	<i>PONTERERIA SAGGITATA</i> C. PRES1
	CAM
	CHIS
GRO	GRO
	JAL
	MICH
MOR	
OAX	OAX
	PUE
	QROO
TAB	TAB
VER	VER





***P. cordata***, belongs to the Pontederiaceae family plant.

Photo by: Nicholas Hellmuth, FLAAR Mesoamerica, Jan. 24, 2021, 1:54 pm. Río Chocon Machacas, Livingston.  
Camera: Sony Alpha A7R IV. Lens: Sony FE 50mm Macro. Settings: 1/1,600 sec; f/3.5; ISO 1,000.

## WORLD RANGE FOR *PONTEDERIA CORDATA*

Our focus is Mesoamerica in general but clearly, we state our fieldwork in present decades is in Guatemala. But we list where else a plant can be found (when native to that area). Thus I was surprised to find a university website that mentions only USA locations for *Pontederia cordata*:

### Distribution:

Common throughout the Eastern United States, from Nova Scotia southward to Florida and Texas and also reported from western parts of the United States, but it's less commonly found west of the Mississippi.

We have found *Pontederia cordata* in two areas of Izabal and estimate we can find it in other parts of Guatemala.

Standley and Steyermark list *Pontederia lanceolata* for Honduras, Cuba, South America; they list for Honduras to Panama; South America (in addition to specific areas of Guatemala, since their monographs are on Flora of Guatemala (1952: 50 -52)).

The easiest way to summarize the actual native range is to go to a respected botanical research garden website: "its native range is E. Canada to N. Venezuela, Cuba, Brazil to N. Argentina."

(<http://web.fscj.edu/David.Byres/flora/pick.htm>)

([www.plantsoftheworldonline.org](http://www.plantsoftheworldonline.org))

## *PONTEDERIA CORDATA* IN MEXICO

Villaseñor 2016

*Pontederia sagittata* is an accepted name that has often been confused with *P. cordata*. For example, the two synonyms of *Pontederia sagittata* are:

*Pontederia cordata* var. *sagittata* (C.Presl) Schery

*Pontederia cordata* f. *sagittata* (C.Presl) Solms

([www.theplantlist.org/tpl1.1/record/kew-259507](http://www.theplantlist.org/tpl1.1/record/kew-259507)).

*Pontederia cordata* \_\_\_\_\_.





***Pontederia cordata***

Photo by: Nicholas Hellmuth, FLAAR Mesoamerica, Jan. 26, 2021, 11:07 am. Río Caliz, Livingston, Izabal.  
Camera: Nikon D5. Lens: Nikon AF-S VR Micro-NIKKOR 105mm IF-ED. Settings: 1/320 sec; f/13; ISO 2,500.



***Pontederia cordata***

Photo by: David Arrivillaga, FLAAR Mesoamerica, Mar. 22, 2021, 12:04 am. Río Caliz, Livingston, Izabal.  
Camera: Sony Alpha A7R IV. Lens: Sony FE 50mm Macro. Settings: 1/250 sec; f/9; ISO 1,000.

## DOES *PONTERDERIA CORDATA* ALSO GROW IN HOME GARDENS?

Yes, this is a garden plant if you live adjacent to a marsh.

## IS THERE POTENCIAL MEDICINAL USAGE OF *PONTERDERIA CORDATA* BY LOCAL PEOPLE?

Yes.

## ARE ANY PARTS OF *PONTERDERIA CORDATA* EATEN BY MAMMALS?

Edible parts for waterbirds are mentioned for USA:

Seeds are eaten by several different kinds of animals including ducks and other waterfowl and deer.

Leaves, rhizomes and roots are eaten by geese and muskrats.

Thus we can estimate that waterbirds and water mammals of Izabal, Belize, and other parts of Mesoamerica also eat seeds, rhizomes, and roots. Eattheweeds.com also mentions deer being fond of pickerelweed, but provides no citation and no bibliography. [www.eattheweeds.com/pontederia-cordata-in-a-pr-pickerel-2/](http://www.eattheweeds.com/pontederia-cordata-in-a-pr-pickerel-2/)

The same species of Virginia deer of USA (white-tailed deer, *Odocoileus virginianus*) inhabit the forests and savannas of Mesoamerica, especially in the national parks of Peten.

## WHAT ARE THE PRIMARY POLLINATORS OF *PONTERDERIA CORDATA* FLOWERS

Need to check whether this bee occurs in Guatemala:

There is a species of bee (*Dufourea novae-angliae*) which visits this plant for nectar and pollen and does not visit any other species of plant [103].

Hayword, V. H., Flowering Plants of the World, Oxford University Press.

More focused on pollinators of *Pontederia* in Mesoamerica is an opus by Lutz and Cockerell (1920). Their page 493 mentions *Melipona* as pollinators of *Pontederia* in Gualan and Quirigua. Camargo and Pedro (2013) provide additional information on bee pollinators.







***Pontederia cordata***, Marsh-swamp edible water plant.

Photo by: Nicholas Hellmuth, FLAAR Mesoamerica, Jan. 26, 2021, 11:07 am. Rio Calix, Livingston, Izabal.  
Camera: Nikon D5. Lens: Nikon AF-S VR Micro-NIKKOR 105mm IF-ED. Settings: 1/320 sec; f/13; ISO 2,500.



## CONCLUDING DISCUSSION AND SUMMARY ON *PONTEDERIA CORDATA*

If cooked, most of *Pontederia* is edible. *Pontederia* species grow en-masse in marshes. You also find thick areas of *Pontederia* thriving around the edges of swamps.

*Pontederia cordata* is listed for Petén, Izabal and Belize. The plant name *Pontederia cordata* is not included by Villaseñor; he uses the name *Pontederia sagittata*.

*Pontederia lanceolata* is a synonym of accepted name *Pontederia cordata* so, Petén and Izabal belong for *Pontederia cordata*.

*Pontederia rotundifolia*: Tabasco is the closest area of Mexico to Guatemala so, this species is not as common in Mexico as is *Pontederia sagittata*. Not listed for Petén (Standley and Steyermark 1952: 50-52).

*Pontederia sagittata* is an accepted name that has often been confused with *P. cordata*. Campeche, Chiapas, Quintana Roo, and Tabasco are the areas adjacent to Petén; so surely this plant or its close relatives are in the marshes along the edge of Rio San Pedro. However, Standley and Steyermark list *Pontederia sagittata* only for Alta Verapaz, Izabal, Zacapa, San Marcos, Southern Mexico and Honduras (1952: 50-52).

### PHOTO CAPTION FROM PAGE 32

#### ***Pontederia cordata***

Photo by: David Arrivillaga, FLAAR Mesoamerica, Mar. 22, 2021, 11:26 am. Río Lámpara, Livingston, Izabal, Guatemala.

Camera: Nikon D810. Lens: Nikon 200mm AF-D Tele-Macro. Settings: 1/320 sec; f/10; ISO 1,000.



Let's recommend searching for pollen of *Pontederia* in Maya middens. But even if not found, now we know that this edible plant was in many of the wetlands of the Lowland Maya.



***Pontederia cordata***

Photo by: David Arrivillaga, FLAAR Mesoamerica, Feb. 15, 2020, 2:00 pm. Lagunita, Morales, Izabal.  
Camera: Sony Alpha A9 II. Lens: Sony FE 90mm Macro G OSS. Settings: 1/250 sec; f/11; ISO 250.



***Pontederia cordata***, light purple inflorescence

Photo by: David Arrivillaga, FLAAR Mesoamerica, Mar. 22, 2021, 12:04 pm. Río Caliz, Livingston.  
Camera: Sony Alpha A7R IV. Lens: Sony FE 50mm Macro. Settings: 1/250 sec; f/9; ISO 1,000.



***Pontederia cordata***, light purple inflorescence

Photo by: David Arrivillaga, FLAAR Mesoamerica, Mar 22, 2021, 12:23 pm. Río Caliz, Livingston.  
Camera: Sony Alpha A7R IV. Lens: Sony FE 50mm Macro. Settings: 1/250 sec; f/10; ISO 2,000.



***Pontederia cordata***, light purple inflorescence

Photo by: David Arrivillaga, FLAAR Mesoamerica, Mar 22, 2021, 12:23 pm. Río Caliz, Livingston.  
Camera: Sony Alpha A7R IV. Lens: Sony FE 90mm Macro G OSS. Settings: 1/250 sec; f/10; ISO 2,000.

## REFERENCES CITED AND SUGGESTED READING ON **PONTEDERIA CORDATA**

### Most helpful monographs on this plant:

There is no monograph on Genus *Pontederia* that we have yet found. These plants certainly deserve more attention in Guatemala and adjacent countries.

**Note: since the present edition is a work-in-progress  
this bibliography also is a work-in-progress**

We start our references cited section mentioning the references used by <https://pfaf.org> for the text at the introduction. This text is comparable to the info on the webpage <http://tropical.theferns.info/viewtropical.php?id=Pontederia+cordata> Ferns's book(s) are cited by pfaf.org but since the original sources are the four books, these four books are utilized by [pfaf.org](https://pfaf.org).

### **Coon, N.**

1975 The Dictionary of Useful Plants. Rodale Press. 290 pages.

### **Elias, T. and Dykeman, P.**

1982 Edible Wild Plants: A North American Field Guide to Over 200 Natural Foods. Sterling. 286 pages.

### **Harris, B. C.**

1973 Eat the Weeds. Keats pub. 259 pages.

### **Facciola, S.**

1990 Cornucopia - A Source Book of Edible Plants. Kampong Publications. 677 pages.

Now, we start our style of bibliography, the references cited and additional reports that we recommend, and primarily on Mesoamérica, especially Guatemala and surrounding areas.



**ACEVEDO-Olvera, G., DELGADO-Estrella, A. BARRETO-Castro, M. del R., and NÚÑEZ-Lara, E.**

2015 Environmental Characterization Of A Fluvian Lagoon Ecosystem (Pom-Atasta, Campeche, Mexico) As A Critical Manatee Habitat. Sustainable Development, Vol. 1, pages 407-413.

Downloadable online: [www.witpress.com/elibrary/wit-transactions-on-the-built-environment/168/34781](http://www.witpress.com/elibrary/wit-transactions-on-the-built-environment/168/34781)

**ATRAN, Scott, LOIS, Mimena and Edilberto UCAN Ek'**

2004 Plants of the Peten Itza' Maya. Museum of Anthropology, Memoirs, Number 38, University of Michigan. 248 pages.

Very helpful and nice collaboration with local Itza' Maya people. But would help in the future to have a single index that has all Latin, Spanish, and English plant names so that you can find plants more easily. Suzanne Cook's Lacandon ethnobotany index is significantly easier to use.

Not available as a download.

**BALICK, Michael J., NEE, Michael H. and Daniel E. ATHA**

2000 Checklist of the Vascular Plants of Belize: With Common Names and Uses. Memoirs of the New York Botanical Garden Vol. 85. 246 pages.

**BALICK, Michael J. and Rosita ARVIGO**

2015 Messages from the Gods: A Guide to the Useful Plants of Belize. The New York Botanical Garden, Oxford University Press.

**CAMARGO, J. M. F. and S. R. M. PEDRO**

2013 Meliponini Lepeletier, 1836. In Moure, J. S., Urban, D. & Melo, G. A. R. (Orgs). Catalogue of Bees (Hymenoptera, Apoidea) in the Neotropical Region - online version.

Available at: <http://www.moure.cria.org.br/catalogue>

**DEBUSK, Thomas A., PETERSON, James E., and RAMESH, K.**

1995 Use of aquatic and terrestrial plants for removing phosphorus from dairy wastewaters. *Ecological Engineering*, Volume 5, Issues 2–3, Pages 371-390.

Available online: [www.sciencedirect.com/science/article/abs/pii/S0925585749500033X](http://www.sciencedirect.com/science/article/abs/pii/S0925585749500033X)

**GOODWIN, Z. A., LÓPEZ, G. N., STUART, N., BRIDGEWATER, G. M., HANSTON, E. M., CAMERON, I. D., MICHELAKIS, D., RATTER, J. A., FURLEY, P. A., KAY, E., WHITEFOORD, C., SOLOMON, J. LLOYD, A. J. and D. J. HARRIS**

2013 A checklist of the vascular plants of the lowland savannas of Belize, Central America. *Phytotaxa* 101 (1): 1–119.

Download: [www.eeo.ed.ac.uk/sea-belize/outputs/Papers/goodwin.pdf](http://www.eeo.ed.ac.uk/sea-belize/outputs/Papers/goodwin.pdf)

**GU, Durang, XU, Huan, HE, Yan, ZHAO, Feng and Minsheng HUANG**

2015 Remediation of Urban River Water by *Pontederia Cordata* Combined with Artificial Aeration: Organic Matter and Nutrients Removal and Root-Adhered Bacterial Communities. *International Journal of Phytoremediation* Volume 17, 2015 - Issue 11.

Available online: [www.tandfonline.com/doi/abs/10.1080/15226514.2015.1045121](http://www.tandfonline.com/doi/abs/10.1080/15226514.2015.1045121)

**HELLMUTH, Nicholas**

2014 Maya Fruits, nuts, root crops, grains, construction materials, utilitarian uses, sacred plants, sacred flowers Guatemala, Mexico, Belize, Honduras, El Salvador. Multiple editions with updates and added photos. FLAAR (USA) and FLAAR Mesoamerica (Guatemala). 107 pages.

2013 and 2014 editions are both downloadable.

**LOT, Antonio, MEDINA Lemos, Rosalinda and Fernando CHIANG (editors)**

2013 Plantas acuáticas mexicanas una contribución a la Flora de México. Volumen 1, Monocotiledoneas. Instituto de Biología, Universidad Nacional Autónoma de México.

Have to register but available is better than not:

[www.scribd.com/document/339545708/Antonio-Lot-Plantas-Acuaticas-Mexicanas-vol-1](http://www.scribd.com/document/339545708/Antonio-Lot-Plantas-Acuaticas-Mexicanas-vol-1)

**LOT, Antonio**

n.d. Flora and vegetation of Freshwater wetlands in the Coastal Zone of the Gulf of Mexico. 26 pages.

Downloadable online: <https://www.harte.org/sites/default/files/inline-files/16.pdf>

**LOWDEN, Richard Max**

1971 Revisionary and population studies in The American Aquatic Plant Genus *Pontederia* L. PhD dissertation, Ohio State University. 291 pages.

Available as download.

**LOWDEN, Richard Max**

1973 Revision of the genus *Pontederia* L. New England Botanical Club, Inc. Vol. 75, No. 803, pages 426-487.

Available online: [www.jstor.org/stable/23311253?seq=1](http://www.jstor.org/stable/23311253?seq=1)

**LUNDELL, Cyrus L.**

1937 The Vegetation of Peten. Carnegie Institution of Washington, Publ. 478. Washington. 244 pages.

**LUNDELL, Cyrus L.**

1938 Plants Probably Utilized by the Old Empire Maya of Peten and Adjacent Lowlands. Papers of the Michigan Academy of Sciences, Arts and Letters 24, Part I:37-59.

Downloadable online: [www.botanicalsciences.com.mx/index.php/botanicalSciences/article/download/1660/1309/](http://www.botanicalsciences.com.mx/index.php/botanicalSciences/article/download/1660/1309/)

**LUTZ, Frank E. and T. D. A. COCKERELL**

1920 Notes on the Distribution and bibliography of North American Bees of the families Apidae, Meliponina, Bombidae, Euglossidae and Anthophoridae. Bulletin American Museum of Natural History, Vol. XLII, pp. 491-641.

Available online: <https://core.ac.uk/download/pdf/18223456.pdf>

**STANDLEY, Paul C.**

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

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 **Samuel J. RECORD**

1936 The Forests and Flora of British Honduras. Field Museum of Natural History. Publication 350, Botanical Series Volume XII. 432 pages plus photographs.

**SUCHINI Farfan, Aura Elena et al.**

2000 Endemismo florístico en la reserva de la biosfera Sierra de las Minas. USAC. Unfortunately the PDF is locked, so no way to show the information without having to hand type each letter, each word, each list.

Free download:

<http://glifos.concyt.gob.gt/digital/fodecyt/fodecyt%201999.69.pdf>

**VILLASEÑOR, José Luis**

2016 Checklist of the native vascular plants of Mexico. Catálogo de las plantas vasculares nativas de México. Revista Mexicana de Biodiversidad 87 (2016) 559–902.

Downloadable online: <http://revista.ib.unam.mx/index.php/bio/article/view/1638/1296>

**PHOTO CREDITS FROM PAGE 9**

***Pontederia cordata***, is called “pickerel weed”

Photo by: David Arivillaga, FLAAR Mesoamerica, Feb. 15, 2020, 2:34 pm. Lagunita, Morales, Izabal, Guatemala.

Camera: Canon 1D X Mark II. Lens: Canon EF 100MM Macro USM. Settings: 1/60 sec; f/14; ISO 640.

**PHOTO CREDITS FROM PAGE 13**

***P. cordata***, belongs to the Pontederiaceae family plant.

Photo by: David Arrivillaga, FLAAR Mesoamerica, Feb. 15, 2020, 2:14 pm. Lagunita, Morales, Izabal.

Camera: Sony Alpha A9 II. Lens: Sony FE 90mm Macro G OSS. Settings: 1/250 sec; f/11; ISO 250.

**PHOTO CREDITS #1 FROM PAGE 14**

***Calathea***, Species.

Photo by: David Arrivillaga, FLAAR Mesoamerica, Jun. 4, 2019, 12:42 am. Yaxha Savana of the 3 ferns.

Camera: Nikon D5. Lens: Nikon AF-S VR Micro-NIKKOR 105mm IF-ED.

**PHOTO CREDITS #2 FROM PAGE 14**

***Maranta arundinacea***, Near Laguna la Perdida.

Photo by: David Arrivillaga, FLAAR Mesoamerica, Mar. 26, 2019, 12:33 am. Near la Laguna Perdida

Camera: iPhone XS

**PHOTO CREDITS #3 FROM PAGE 14**

***Passiflora***, Species.

Photo by: Nicholas Hellmuth, FLAAR Mesoamerica, May. 5, 2019, 11:01 am. Nakum savanna east.

Camera: Nikon D5. Lens: Nikon 200mm AF-D Tele-Macro.

**PHOTO CREDITS FROM PAGE 20**

***Pontederia cordata***

Photo by: Nicholas Hellmuth, FLAAR Mesoamerica, Jan. 26, 2021, 11:07 am. Marsh swamp water plant parallel to Río Calix, Livingston, Izabal.

Camera: Nikon D5. Lens: Nikon AF-S VR Micro-NIKKOR 105mm IF-ED. Settings: 1/320 sec; f/13; ISO 2,500.

**PHOTO CREDITS FROM PAGE 29**

***Pontederia cordata***

Photo by: Nicholas Hellmuth, FLAAR Mesoamerica, Jan. 26, 2021, 11:09 am. marsh swamp water plant parallel to Río Calix, Livingston, Izabal.

Camera: Nikon D5. Lens: Nikon AF-S VR Micro-NIKKOR 105mm IF-ED. Settings: 1/400 sec; f/14; ISO 1,250.

**PHOTO CREDITS FROM PAGE 34**

***Pontederia cordata***

Photo by: Nicholas Hellmuth, FLAAR Mesoamerica, Feb. 4, 2021, 10:40 am. Río Calix, Livingston, Izabal, Guatemala.

Camera: Nikon D5. Lens: Nikon AF-S VR Micro-NIKKOR 105mm IF-ED. Settings: 1/500 sec; f/11; ISO 1,000.

## 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. So 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](http://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](http://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.

## WEBPAGES THAT WE HAVE CONSULTED FOR THE PRESENT REPORT ON *PONTEDERIA* PLANTS

<http://www.theplantlist.org>

Shows which are Accepted and which are Synonyms.

<https://aihd.ku.edu/foods/pickerelweed.html>

Description and uses

<http://web.fscj.edu/David.Byres/flora/pick.htm>

Focus on USA; no mention of Mesoamerica or even Caribbean.

[www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?kempercode=a428](http://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?kempercode=a428)

Basic introduction to this plant in North America. Mentions native range "to Caribbean" but clearly focuses on USA, specifically Missouri. I will ask my siblings if we have this plant in marshes on our family farm in the Missouri Ozarks.

[www.plantsoftheworldonline.org/taxon/urn:lsid:ipni.org:names:283610-2](http://www.plantsoftheworldonline.org/taxon/urn:lsid:ipni.org:names:283610-2)

Lists the total native range of *Pontederia cordata* L. "This species is accepted, and its native range is E. Canada to N. Venezuela, Cuba, Brazil to N. Argentina."

<http://tropical.theferns.info/viewtropical.php?id=Pontederia+cordata>

This website is one source for the material on pfa.org

<http://tropical.theferns.info/image.php?id=Pontederia+cordata#plantimages/a/f/af940c3624e06016a68092ff-13b5e88660ebe273.jpg>

These photographs show that the ecosystems of Morales and Izabal are comparable to the ecosystems for this plant in the rest of the Americas.



## APENDIX A

A few examples of where samples have been noted for Guatemala

To find any and every plant, simply go to:

And put in the scientific name, click, and you get all the results. We don't waste time filling in any of the other things such as Locality Criteria (since we wish to see Mexico, Belize, Guatemala and nearby countries all at once).

- **Catalog #:** ASU0014845
- **Occurrence ID (GUID):** 56c7ad99-596a-4191-bff9-52fc7fa774fb
- **Secondary Catalog #:** 53866
- **Taxon:** *Pontederia sagittata* Roxb.
- **Family:** Pontederiaceae
- **Determiner:** R. M. Lowden
- **Collector:** R. M. Lowden 10-F
- **Date:** 1970-07-31
- **Verbatim Date:** 1970-7-31
- **Locality:** Guatemala, Izabal, Quiriqua, by railroad in swampy area in front of abandoned hospital.  
15.269444 -89.040278 +-20000m.
- **Catalog #:** 1671775
- **Taxon:** *Pontederia sagittata* C. Presl
- **Family:** Pontederiaceae
- **Collector:** B. LeDoux, D.B. Dunn & Torke 2106
- **Date:** 1975-08-08
- **Locality:** Guatemala, Izabal, At Shell Oil Station and vicinity just south of Río Dulce. In rain forest that has been cut and regrown; Thalia and grass both 12 ft. high or more; very wet area  
15.65 -88.99
- **Elevation:** 22 meters (72ft)

- **Catalog #:** 1671871
  - **Taxon:** *Pontederia sagittata* C. Presl
  - **Family:** Pontederiaceae
  - **Determiner:** Novelo, August
  - **Collector:** W.E. Harmon & J.A. Fuentes 1873
  - **Date:** 1970-02-10
  - **Locality:** Guatemala, Izabal, 1 km east of Santo Tomás de Castilla. Collection from along a small creek at margin of sugarcane field in dense thickets. Yellow-red clay soil  
15.69 -88.6
  - **Elevation:** 5 meters (16ft)
- 
- **Catalog #:** 2005277
  - **Taxon:** *Pontederia sagittata* C. Presl
  - **Family:** Pontederiaceae
  - **Determiner:** A. Novelo R.,
  - **Collector:** Rolando Tún Ortíz 512
  - **Date:** 1970-01-03
  - **Locality:** Guatemala, Petén, En la orilla de Laguna Petén Itzá, frente Playa Blanca, Santa Elena.
- 
- 16.92 -89.89
  - **Catalog #:** 3143443
  - **Taxon:** *Pontederia sagittata* C. Presl
  - **Family:** Pontederiaceae
  - **Determiner:** E. Poll,
  - **Collector:** Estudiantes Taxonomía de 7400
  - **Date:** 1996-07-20
  - **Locality:** Guatemala, Izabal, Laguna El Salvador, Chocón Machacas, acuática  
15.78 -88.87
  - **Elevation:** 50 meters (164ft)
- 
- **Catalog #:** 3461241
  - **Taxon:** *Pontederia sagittata* C. Presl
  - **Family:** Pontederiaceae
  - **Determiner:** E. de Pöll,
  - **Collector:** Elfriede de Pöll 388
  - **Date:** 1979-03-17
  - **Locality:** Guatemala, Izabal, El Estor, Desembocadura Río Zarco  
15.33 -89.54

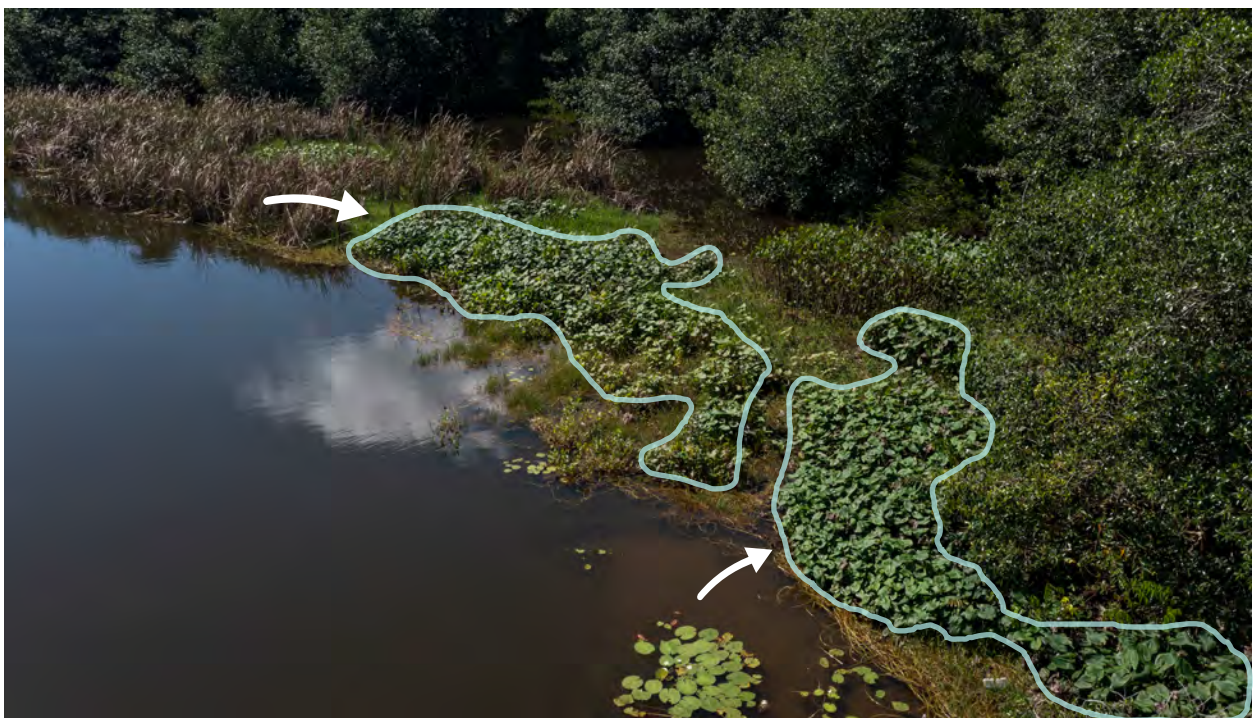
Does not have one single solitary specimen from Guatemala.

## APENDIX B

Drone Photos of Wetlands where you can find *Pontederia cordata*

Drone pilot: Haniel López; drone: DJI Mavic Pro 2. Model: L1D-20c; Jan 26, 2021; location: Río Cáliz, south side of El Golfete, Livingston, Izabal, Guatemala.

Follow the white shapes on the duplicated photo to spot the *Pontederia* plant masses.

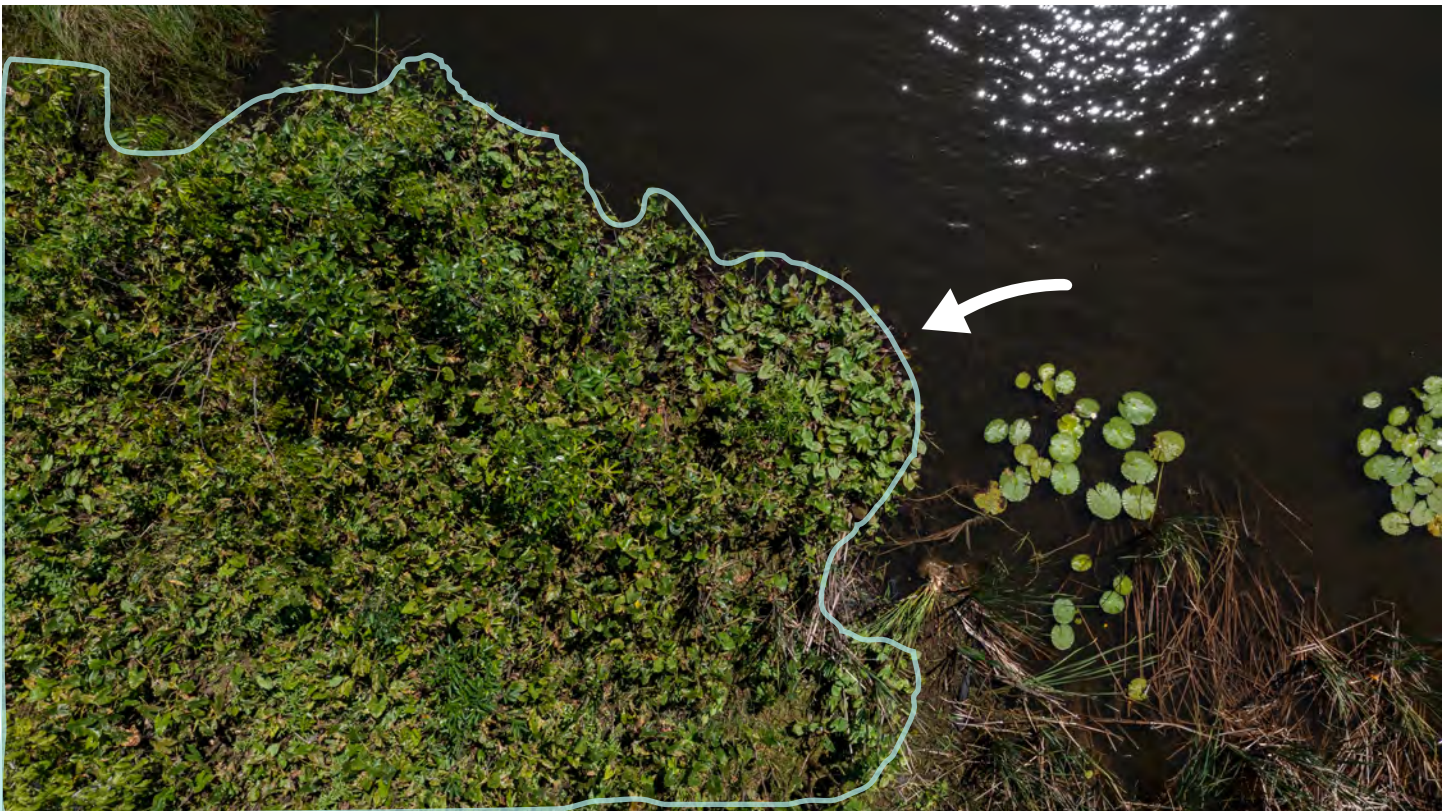












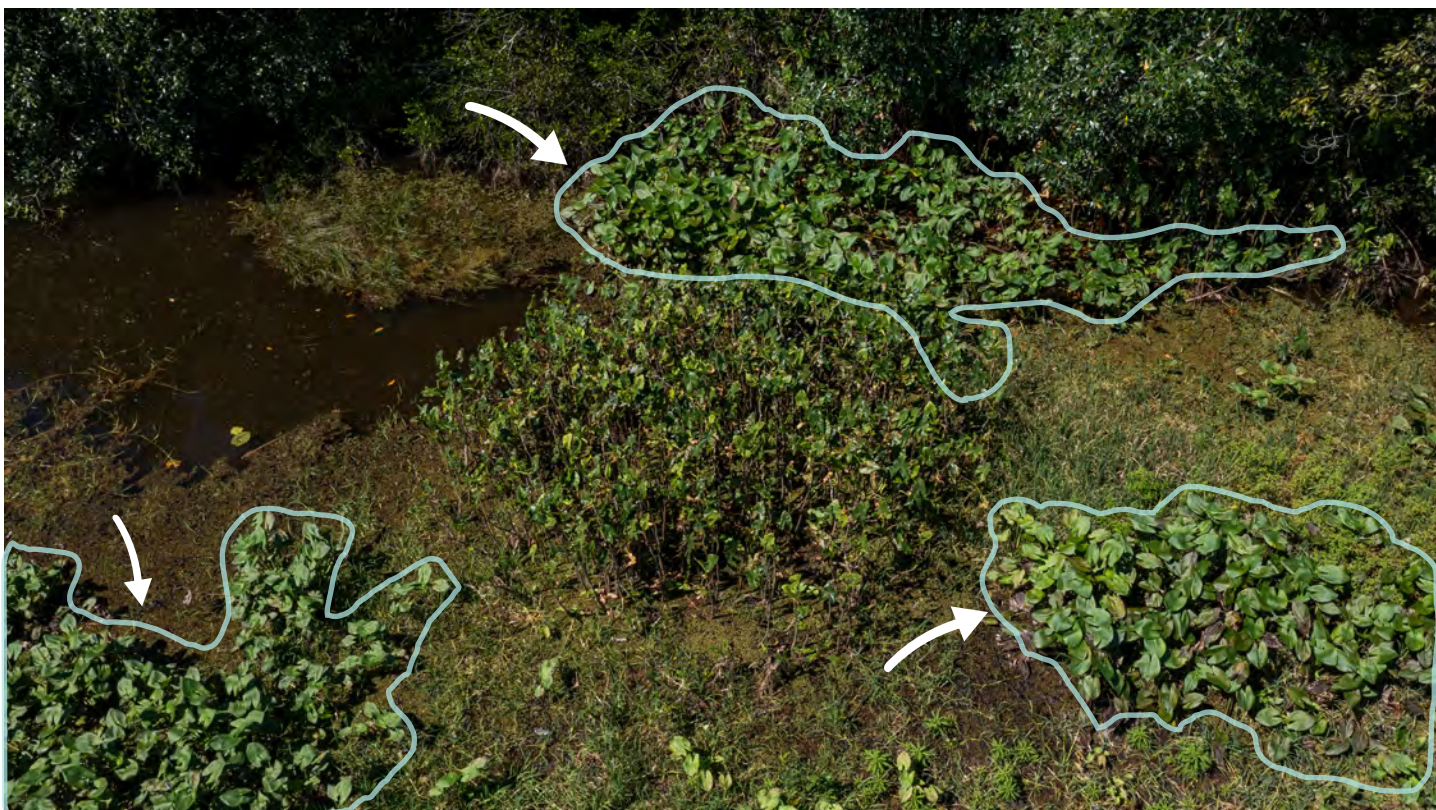
















## LIVINGSTON: THE CARIBBEAN BIODIVERSITY WONDERLAND OF GUATEMALA

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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, and 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 it 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 working in Río Sarstun, CONAP covering Río Dulce, CECON-USAC in Chocón-Machacas, and ARNPG with more than ten private reserves, among many others) are records of species of flora, fauna and ecosystems of this municipality of 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 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.



MUNICIPALIDAD DE  
**Livingston**



**FLAAR**  
MESOAMÉRICA



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## ACKNOWLEDGEMENTS TO FLAAR MESOAMÉRICA

The reports are a joint production between the field trip team and the in-house office team.

So here we wish to cite the full team:

**Flor de María Setina** is the office manager, overseeing all the diverse projects around the world (including FLAAR-REPORTS research on advanced wide-format digital inkjet printers, a worldwide project for over 20 years). We also utilize the inkjet prints to produce educational banners to donate to schools.

**Vivian Díaz** environmental engineer, is project manager for flora, fauna projects (field work and resulting reports at a level helpful for botanists, zoologists and ecologists, and for university students). Also coordinates activities at MayanToons, division where educational material for kids is prepared.

**Victor Mendoza** identifies plants, mushrooms, lichen, insects, and arachnids. When his university schedule allows, he also likes to participate in field trips on flora and fauna research.

**Vivian Hurtado** is part of our bibliography team. In addition, she also prepares blogs and articles for our websites with helpful information about the flora and fauna we document in our field trips and other topics we interested in.

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

**Senaida Ba** is photography assistant for many years. She knows the Canon, Nikon and is learning the new Canon mirrorless R5 and our four new Sony mirrorless cameras. She prepares, packs, sets-up, and helps the photographers before, during, and after each day's field trip.

**Jaqueline González** is a designer who puts together the text and photographs to create the actual report (we have several designers at work since we have multiple reports to produce).

**Roxana Leal** is Social Media Manager for flora and fauna research and publications, and MayanToons educational book projects

**María Alejandra Gutiérrez** is an experienced photographer, especially with the Canon EOS 1D X Mark II camera and 5x macro lens for photographing tiny insects, tiny flowers, and tiny mushrooms. Work during and after a field trip also includes sorting, naming, and processing. And then preparing reports in PDF format.

**David Arrivillaga** is an experienced photographer and is able to handle both Nikon and the newest Sony digital cameras. Work during and after a field trip also includes sorting, naming, and processing.

**Juan Carlos Hernández** takes the material that we write and places it into the pertinent modern Internet software to produce our web pages (total network is read by over half a million people around the world).

**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.

**Valeria Avilés** is an illustrator for MayanToons, the division in charge of educational materials for schools, especially the Q'eqchi' Mayan schools in Alta Verapaz, Q'eqchi' and Petén Itzá Maya in Petén, and the Q'eqchi' Mayan and Garifuna schools in the municipality of Livingston, Izabal.

**Josefina Sequen** is illustrator for MayanToons and also helps prepare illustrations for Social Media posts and for animated videos.

**Rosa Sequen** is also an illustrator for MayanToons and also helps prepare illustrations for Social Media posts and for animated videos.

**Laura Morales** is preparing animated videos in MayanToons style since animated videos are the best way to help school children how to protect the fragile ecosystems and endangered species

**Heidy Alejandra Galindo Setina** joined our design team in August 2020. She likes photography, drawing, painting, and design.

**María José Rabanales** she is part of the team for editing photographic reports and educational material of Flora and Fauna since September 2020. She works together with others of the team to prepare the finished pdf editions of the material of the Yaxha, Nakum and Naranjo Project.

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

**Alexander Gudiel** designer who join the editorial design team on December 2020. He will combine the text, pictures and maps into the FLAAR Mesoamerica editorial criteria.

**Cristina Ríos** designer student who join the editorial design team on December 2020. She will combine the text, pictures and maps into the FLAAR Mesoamerica editorial criteria.

**Carlos Marroquín** is a USAC graphic design student who volunteered to do his professional practice with the Editorial Design Team. We are very grateful with people like him who join our team and bring his knowledge and work.

**Sergio Jerez** prepares the bibliography for each subject and downloads pertinent research material for our e-library on flora and fauna. All of us use both these downloads plus our in-house library on flora and fauna of Mesoamerica (Mexico through Guatemala into Costa Rica).

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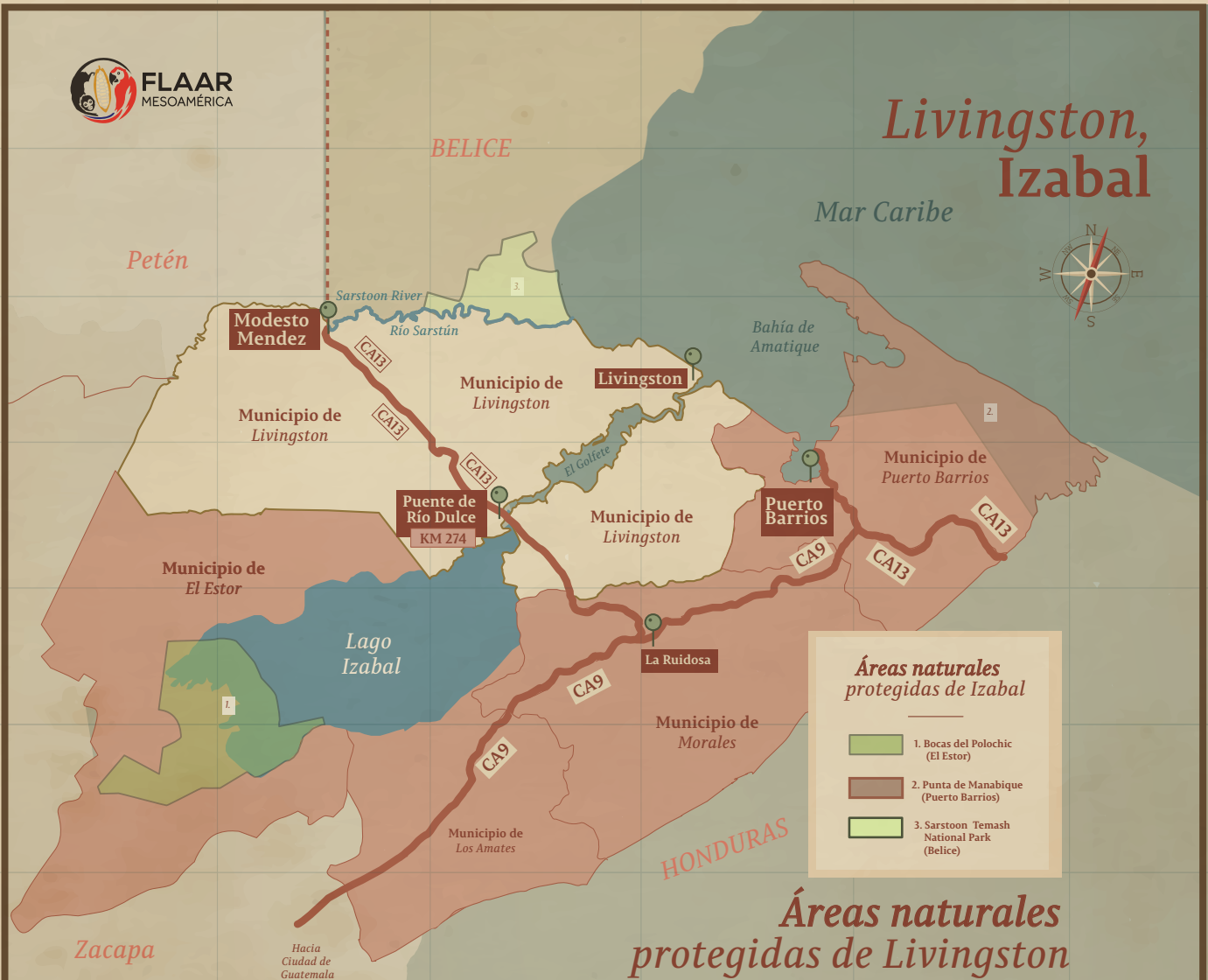
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# Reserva Natural Tapón Creek, Livingston

## Bahía de Amatique

Área de Usos Múltiples  
Río Sarstún

Punta  
Cocolí

Aldea Buena  
Vista Tapon Creek

San Juan

Reserva Natural Tapón Creek  
Municipio de Livingston

Siete  
Altares

Finca  
Gangadiwali

Sarstún Creek

Taponcito  
Creek

El Rosario

San  
Martin

La Desmembración

Plan Grande  
Tatín

Área de Usos Múltiples  
Río Sarstún

Biotopo  
Chocón Machacas

El Golfete

Parque Nacional  
Río Dulce

Izabal



### Información de referencia:

- Límites 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



# Edible Wetlands Plants of Municipio de Livingston, Izabal

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

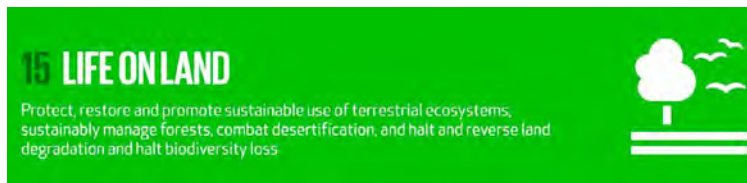
<p><b>Cyperus esculentus</b></p> <p>Chufa, Yellow Nutsedge, Earth Almond</p> <p>MLW#1</p>	<p><b>Eleocharis geniculata</b> <b>Eleocharis caribaea</b></p> <p>Caribbean Spike-Rush</p> <p>MLW#2</p>	<p><b>Montrichardia arborescens</b></p> <p>Camotillo Water Chestnut</p> <p>MLW#3</p>	<p><b>Nymphoides indica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

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

<p><b>Amphitecna latifolia</b></p> <p>Black calabash</p> <p>MLW#9</p>	<p><b>Coccoloba uvifera</b></p> <p>Uva del mar</p> <p>MLW#10</p>	<p><b>Manicaria saccifera</b></p> <p>Confra, Manaca</p> <p>MLW#11</p>	<p><b>Chrysobalanus icaco</b></p> <p>Coco Plum</p> <p>MLW#12</p>	<p><b>Avicennia germinans</b></p> <p>Black Mangrove</p> <p>MLW#13</p>	<p><b>Rhizophora mangle</b></p> <p>Red Mangrove</p> <p>MLW#14</p>
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Wetland Series 3: plants that grow alongside water: rivers, lagoons, swamps, or ocean

<p><b>Glossary</b> of Wetland Terms</p> <p>Bibliography of Wetlands Habitat Names</p> <p>MLW#15</p>	<p><b>Acoelorrhaphe wrightii</b></p> <p>Pimientillo, Tasiste, Palmetto Palm</p> <p>MLW#16</p>	<p><b>Acrostichum aureum</b></p> <p>Mangrove Fern</p> <p>MLW#17</p>	<p><b>Annona glabra</b></p> <p>Alligator Apple</p> <p>MLW#18</p>	<p><b>Bactris major</b></p> <p>Huiscoyol Palm</p> <p>MLW#19</p>	<p><b>Diospyros nigra</b></p> <p>Zapote negro</p> <p>MLW#20</p>
<p><b>Grias cauliflora</b></p> <p>Palo de Jawuilla</p> <p>MLW#21</p>	<p><b>Inga vera</b> <b>Inga multijuga</b> <b>Inga thibaudiana</b></p> <p>River Koko</p> <p>MLW#22</p>	<p><b>Pithecellobium lanceolatum</b></p> <p>Bastard Bully Tree Chucum Red Fowl</p> <p>MLW#23</p>	<p><b>Coccoloba belizensis</b></p> <p>Papaturro</p> <p>MLW#24</p>	<p><b>Symphonia globulifera</b></p> <p>Barillo</p> <p>MLW#25</p>	<p><b>Crataeva tapia</b></p> <p>Matasanillo, Granadillo, Tortugo</p> <p>MLW#26</p>



The current Alcalde of Livingston, Mr. Daniel Pinto, together with his team of International Cooperation division, have 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. From this agenda, FLAAR (USA) and FLAAR Mesoamerica (Guatemala) will collaborate to achieve Sustainable Development Goal (SDG) number 15 "Life on Land".

Throughout this cooperation project, different materials have been prepared, like this Photo Essay, that helps to collect information on species, different ecosystems: terrestrial, wetlands and fresh water biodiversity. This information would also be useful as part of a strategy to protect threatened species and prevent their extinction. The municipality's goals include to promote the sustainable use, conservation and research of the species of flora and fauna of the terrestrial, wetlands and aquatic shore and coastal ecosystems of the Guatemalan Caribbean. Learn more about this project and the SDG indicators at:

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

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This report may be cited with this information:

HELLMUTH, N. (2021). Wetland Series MLW6: Edible Plants of Municipio de Livingston from Swamps, Marshes and Seasonally Inundated Flatlands of Izabal. Plants that Provided Food for the Classic Maya, *Pontederia cordata*. Wetlands report #6, MLW6 Number 6. FLAAR (USA), FLAAR Mesoamerica (Guatemala).

#### PHOTO FROM BACK COVER

##### *Pontederia cordata*

Photo by: David Arrivillaga, FLAAR Mesoamerica, Jun. 26, 2021, 11:15 am. El Golfete Rio Calix, Livingston.

Camera: Sony Alpha A7R IV. Settings: 1/2,000 sec; f/13; ISO 1,250.

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All national parks, nature reserves, and comparable are welcome to have and use our reports at no cost. USAC, UVG, URL, Universidad Rural, INTECAP and other Guatemalan universities, and high schools, and schools, are welcome to post our reports, at no cost.

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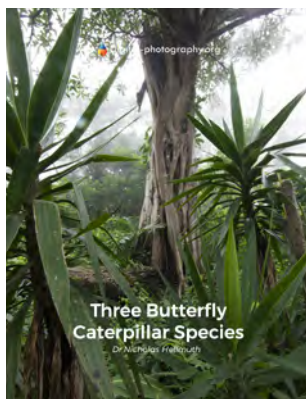
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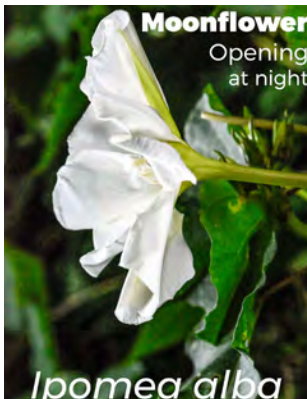
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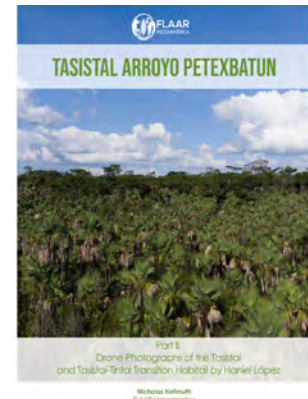
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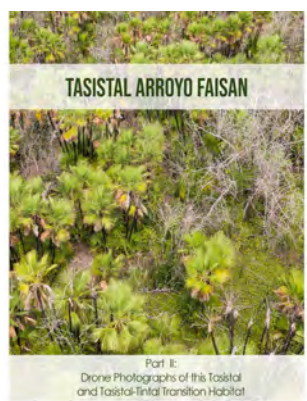
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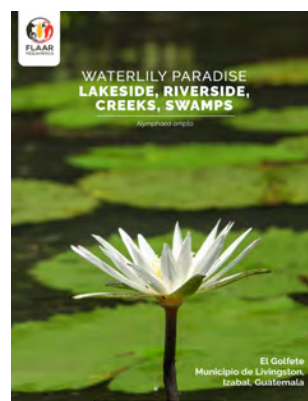
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