

PANGIL RIVER PROFILE

I. Description of the Area

1. Location and Site Definition

The 12.5 kilometer long Pangil River is situated in the town of Pangil, a fourth class municipality in the Province of Laguna (See Figure 1 and 2). The municipality is geographically located at 14°24'11"N and 121°27'58"E, about 121 kilometers south of Manila through Southern Luzon Express Way, and about 85 kilometers via Pililia, Rizal route (Department of Interior and Local Government [DILG], undated).



Figure 1. Pangil, Laguna location Map
(Image source: wikipedia.org)

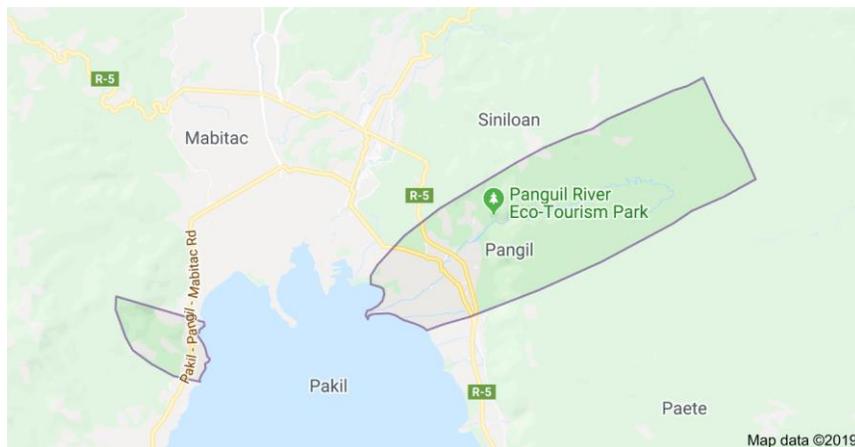


Figure 2. Pangil, Laguna area cover
(Image source: Google Maps 2019)

The river lies at the southern tip of the Sierra Madre Mountain range (DILG, undated). It used for domestic, agricultural, ecotourism in the Municipality of Pangil, and has seen potential for other economic uses such as hydropower (DILG, undated). It is also one of 22 River tributaries of Laguna de Bay (see Figure 3).

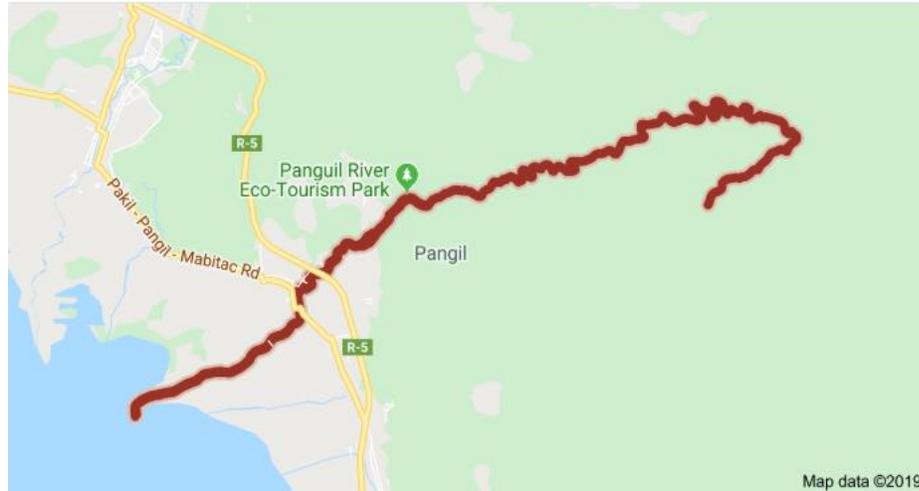


Figure 3. Pangil River Location Map
(Image source: Google Maps 2019)

2. Photos of the the river





II. Environmental Information

1. Physical Characteristics

a. Climate

The weather of Laguna, where Pangil is located, is relatively dry in November to April, and wet to the rest of the months (Department of Education – Laguna, 2018). In particular, Pangil's climate is tropical, however there is significant rainfall throughout

the year, even on the driest month (Climate-data.org, undated). The temperature in the town has an average of 27.0 °C and precipitation of 2,690 mm (Climate-data.org, undated).

b. Water quality and hydrology

The Pangil River sub-basin has a drainage area of 51.14 square kilometers (Lasco & Espaldon, 2005). According to DILG (undated), the highlands of the town *are in the convergence of some 5 important watershed divides namely: Siniloan-Romero, Panguil, Lalawinan, Salasalaban and Tatacpo Watersheds.*

Pangil River was found to be compliant with DENR Administrative Order 2016-08 Class B water quality standards for In-situ parameters such as DO, pH, and temperature except for temperature taken at midstream section of the river. Still, this is inclusive that the all the sections of the river is safe for swimming and other contact recreation.

Other equally important parameters such as BOD, fecal coliform, chloride, nitrates (asNO₃-N), phosphates, and total suspended solids (TSS), should be measured as well to completely ascertain its safety or suitability for recreational activities.

Below are the results of the Water quality assessment at Pangil River (see Tables 1 to) during the Wetlands Bioblitz field work (September 25, 2016).

Table 1. Site Characterization of upstream section of Pangil River.

Geomorphic setting/location (barangay)	Upstream/ Biak na Bato
Weather	Cloudy, with small amount of rain
Water flow/velocity	Fast-flowing
Water appearance/color	Clear
Riverbed substrate	Boulders, rocks, and cobbles
Canopy cover Stream bank stability	Semi-closed canopy The well-vegetated riverbank provides stability and protection against erosion
Land-use	Forested

Table 2. Water quality status of Pangil River upstream section based on in-situ parameters

Parameter	Unit	DENR Administrative Order 2016-08 water quality criteria for Class B & C water bodies		Result	Remarks
		B	C		
Dissolved Oxygen (DO)	mg/L	5 (min)	5 (min)	7.64	Passed

pH	Range	6.5-8.5	6.5-9.0	7.88	Passed
Temperature	C	26-30	25-31	26.0	Passed
Salinity	ppt.	No set DENR Class B & Class C Criteria		59.73	
Conductivity	Us/cm			133.2	
Total Dissolved Solids	mg/L			90.37	

Table 3. Site characterization of midstream section of Pangil River.

Geomorphic setting/location (barangay)	Midstream/Brgy.Natividad Extension
Weather	Sunny/Clear
GPS Reading	Lat: 14.41 Longitude: 121.48
Water flow	Moderately fast
Water appearance/color	Clear
Riverbed substrate	Cobble, Gravel
Canopy cover Stream bank stability	Semi-open canopy Part of the river banks are planted with trees and shrub while sloping structures were also constructed in some areas along the banks to protect the slope and defence against erosion
Land-use	Recreation

Table 4. Water quality status of Pangil River midstream section based on in-situ parameters

Parameter	Unit	DENR Administrative Order 2016-08 water quality criteria for Class B & C water bodies		Results	Remarks
		B	C		
Dissolved Oxygen (DO)	mg/L	5 (min)	5 (min)	7.46	Passed
pH	Range	6.5-8.5	6.5-9	7.42	Passed
Temperature	C	26-30	26-31	27.5	Passed
Salinity	ppt.	No set DENR Class B & Class C Criteria		64.2	
Conductivity	Us/cm			137.2	
Total Dissolved Solids	mg/L			96.13	

Table 5. Site characterization of downstream section of Pangil River.

Geomorphic setting/location (barangay)	Downstream/ Isla Bridge
Weather	Sunny/Clear
GPS Reading	Lat: 14.40 Longitude: 141.47
Water flow	Stagnant

Water appearance/color	Greenish-brown/murky or turbid/smelly
Riverbed substrate	Silt/clay/mud
Canopy cover Stream bank stability	Open-canopy Structures are constructed along the river banks
Land-use	Roads/Residential

Table 6. Water quality status of Pangil River downstream section based on in-situ parameters

Parameter	DENR Administrative Order 2016-08 water quality criteria for Class B & C water bodies		Result	Remarks
	B	C		
Dissolved Oxygen (DO)	5 mg/L	5 mg/L	5.99	Passed
pH	6.5-8.5	6.5-9.0	7.44	Passed
Temperature	26-30 C	26-31 C	30.7	Failed (B); Passed (C)
Salinity	No set DENR Class B & Class C Criteria		84.77	
Conductivity			186.17	
Total Dissolved Solids			127.73	

Figure 4 shows the plotted cross-sectional measurement of the river. The measurement came from the Hydrology assessment of the River.

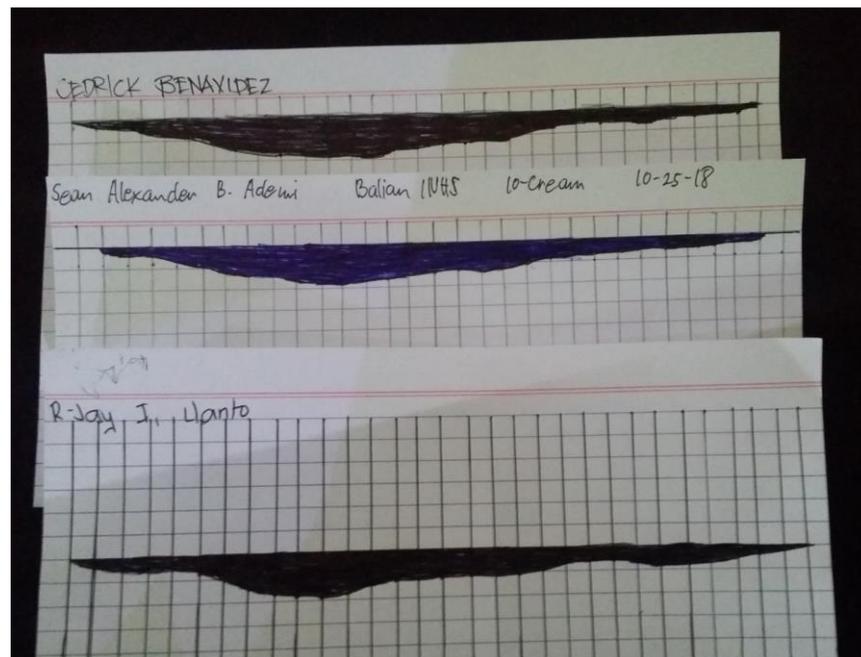


Figure 4. Sample of plotted cross-sectional measurement of the river

III. Biological Characteristics

a. Flora

The three sampling stations were chosen along the river within the Pangil River and Ecopark Area. Sampling Station 1 is located near the swimming pool and picnic area. As such, this segment of the river is the most anthropogenically disturbed among the three sites. Forest canopy above the river is open, allowing sunlight to enter. Sampling Station 2 is located about 200m from the main activity/swimming pool area. Forest canopy in this area is a bit closed, thus giving a cooler feel compared to Station 1. There are no more picnic huts in this area, but traces of picnic activities are observed in the river banks. Sampling site 3 is located within the restricted area of the Ecopark trail leading towards the waterfalls area. Forest canopy in this area is also a bit open. It can be noted that aside for the bamboo bridge constructed, there are hardly any anthropogenic disturbance observed.



Figure 5. Sampling sites for Flora Inventory at Pangil River.

Based on the data gathered, more plants were identified in Station 1 compared to the other sampling sites. The plants were composed mainly of introduced or exotic plant species that are mainly ornamental in nature and are pioneer species. Lower species richness was documented at stations 2 and 3. This can be attributed to the area being less disturbed thus allowing stabilisation of existing species. More native species and late successional species were observed in Stations 2 and 3.

Table 7. List of identified flora at Pangil River sampling stations.

Plant types	Station 1	Station 2	Station 3
Non-Vascular	mosses	mosses	mosses
	liverworts		liverworts
Vascular	<i>ferns</i>	<i>Bamboo</i>	<i>Hoya multiflora</i>

	<i>Acalypha sp</i>	<i>Hedyotis corymbosa</i>	<i>Globba leucantha</i>
	<i>Ageratum conyzoides</i>	<i>Phyllanthus sp.</i>	<i>Ficus sp.</i>
	<i>Aglaomena commutatum</i>	<i>Ground orchid</i>	<i>Aglaonema commutatum</i>
	<i>Phyllanthus sp.</i>	<i>Asplenium nidum</i>	<i>Begonia sp.</i>
	<i>Homalomena philippinensis</i>	<i>Iris pseudacorus</i>	<i>Mangifera indica</i>
	<i>Lygodium circinnatum</i>	<i>Lygodium circinnatum</i>	<i>Costus sp</i>
	<i>Cordyline fruticosa</i>	<i>Ipomoea batatas</i>	<i>Acalypha sp.</i>
	<i>Heliconia sp.</i>	<i>Colocassia esculenta</i>	<i>Phyllanthus sp.</i>
	<i>Selaginella sp.</i>	<i>Psidium guajava</i>	<i>Sphagneticola trilobata</i>
	<i>Guzmania sp.</i>	<i>Macaranga sp.</i>	<i>Arenga pinnata</i>
	<i>Spathiphyllum</i>	<i>Arenga pinnata</i>	<i>Sandoricum koetjape</i>
	<i>Chlorophytum elatum</i>	<i>Elephantopus tomentosus</i>	<i>Ficus pseudopalma</i>
	<i>Sphagneticola trilobata</i>	<i>Sphagneticola trilobata</i>	<i>Mussaenda philippica</i>
	<i>Althernanthera sp.</i>	<i>Paspalum sp.</i>	<i>Colocassia sp.</i>
	<i>Ficus sp</i>	<i>Aroid (heart-shaped, climbing)</i>	<i>Panicum sp</i>
	<i>Zebrina pendula</i>	<i>Selaginella</i>	
	<i>Epipremnum sp</i>	<i>Pachystachys spicata</i>	
	<i>Codium varigatum</i>		
	<i>Ficus septica</i>		
	<i>Musa sp.</i>		
	<i>Commelina bengalensis</i>		
	<i>Hedyotis corymbosa</i>		
	<i>Euphorbia hirta</i>		
	<i>Episcia sp.</i>		

	<i>Vernonia cinerea</i>		
	<i>Desmodium sp.</i>		
	<i>Cyperus kyllingia</i>		
	<i>Pepperomia pellucida</i>		
	<i>Axonopus compressus</i>		
	<i>Cynodon dactylon</i>		
	<i>Mangifera indica</i>		
	<i>Laportea sp.</i>		
	<i>Pyrrosia sp.</i>		
	<i>Thyphonium sp</i>		

Below are some of the actual photos during the flora survey.



Figure 6. Photos of some Flora in the Upstream Section of Pangil River.



Figure 7. Photos of some Flora in the Midstream Section of Pangil River.

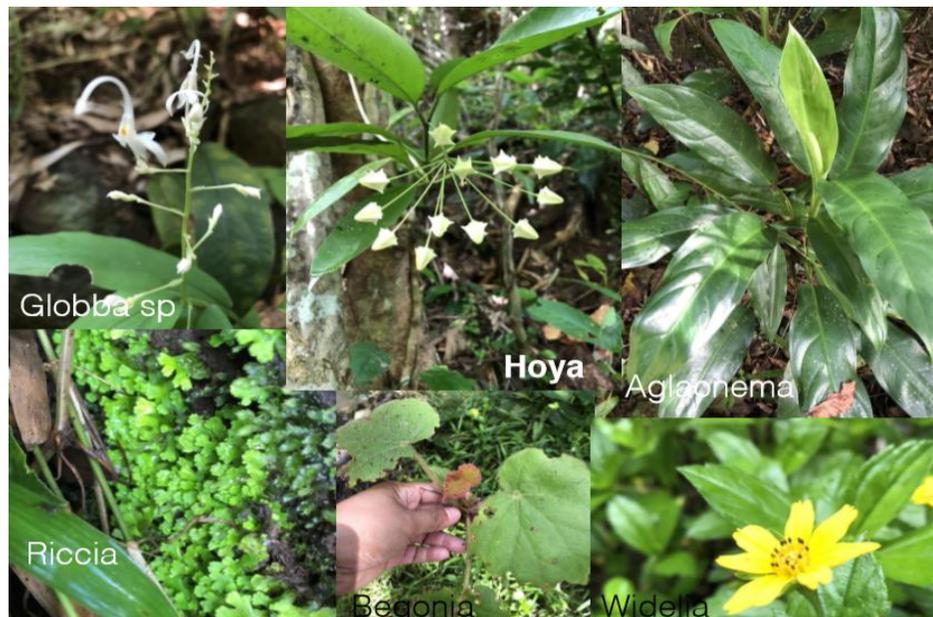


Figure 8. Photos of some Flora in the Downstream Section of Pangil River.

b. Avifauna

There are 13 different bird species identified along the Pangil River, of which nine (9) are seen and four (4) species were heard. Furthermore, eight (8) of avifauna identified are endemic, three (3) are residents, and one (1) is migrant. The most observed avifauna in the area is the Philippine Bulbul. The team conducted the avifauna assessment at Camp site (midstream), on the first day afternoon, and in the campsite up to halfway trail to

Ambon-Ambon Falls (upstream), on the morning of the second day. Below is the list of the identified avifauna spotted on September 24 and 25, 2019.

Table 8. List of identified Avifauna at Pangil River.

Day 1 (Midstream)	Day 2 (Upstream)
Scale-feathered Malkoha	Brown Shrike
Philippine Magpie Robin	White-throated Kingfisher
Swiftlet	Coppersmith Barbet
Elegant Tit	Scale-feather Malkoha
Philippine Bulbul	Common Kingfisher
White-throated Kingfisher	Collard Kingfisher
Philippine Tailorbird	Philippine Serpent Eagle
Colasisi	
Brown Shrike	





Figure 9. Pictures of some birds that can be found in Panguil River Ecotourism Park.

c. Entomofauna

The diversity of Insects in Panguil River Eco-Park are the following

- Orthoptera (crickets and grasshoppers)
- Hemiptera (bugs, hoppers, scales)
- Coleoptera (beetles)
- Diptera (flies)
- Hymenoptera (bees and ants)
- Lepidoptera (butterflies and moths)
- Odonata (Family of Epallagidae, Coenagrionidae, and Chrolocyphidas)
- Blattodea (Cockroach)





Figure 10. of the insects observed in the Panguil River Eco-Park

d. Aquatic Fauna and Flora

The biological parameters that were found in the river are the Phytoplanktons (microscopic plants) and Benthic fauna (organisms that thrive in the bottom parts of a river body like riverbed and lakebed). It was found out that the 3 stations have good diversity because the organisms that were identified are indicators of good water quality. Below are the results for aquatic flora and fauna assessments.

Table 9. Aquatic Fauna and Flora Results in Station 1.

Time of Observation: 2:05 - 2:12 pm	Station 1: After the swimming area
Organisms Found (in the water/river)	<i>Coleoptera (Beetles)</i> <i>Ephemeroptera (Mayfly)</i> <i>Amphipoda (Scad)</i> <i>Plecoptera (stone fly)</i>
Other materials: (within the area)	Rocks (S, M, L) color:reddish, gray texture: rough, smooth Water: moderately clear
Waterflow	Moderately fast
Waste materials	Leaves
Trees	Big / small / medium (all sizes)
Waterbed	rocky
Canopy	Sunny
Area covered	Front of cottage 22B

Table 10. Aquatic Fauna and Flora Results in Station 2.

Time of Observation: 2:20 - 2:30 pm	Station 2. Before the swimming area
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Organisms Found (in the water/river)	<i>Hemiptera (Water Strider)</i> <i>Ephemeroptera (Mayfly)</i> <i>Plecoptera (stone fly)</i>
Other materials: (within the area)	Rocks (S,M,L) color: black, brown, gray texture: rough, smooth Water: clear Stone looks/shape: grasshopper
Waterflow	Fast
Waste materials	Leaves, Flexible plastics
Trees / plants	Big / small / medium (all sizes), Bamboo, Ferns, Weeds (small plants)
Waterbed	rocky
Canopy	Cloudy
Area covered	Before the Barkong Bato

Table 11. Aquatic Fauna and Flora Results in Station 3.

Time of Observation: 2:38 - 2:47 pm	Station 3 Protected area
Organisms Found (in the water/river)	<i>Decapoda (Fresh water crab)</i> <i>Plecoptera (stone fly)</i> <i>Ephemeroptera (mayfly)</i>
Other materials: (within the area)	Rocks (S,M,L) color: black, gray, brown, reddish texture: rough, smooth Water: clear
Waterflow	Fast
Waste materials	Leaves, Flexible plastics
Trees / plants	Big / small / medium (all sizes), Mango tree Ferns, Weeds (small plants)
Waterbed	rocky
Canopy	Clear Sky
Area covered	Barkong Bato

e. Ecosystem Services

RAPID ASSESSMENT OF WETLAND ECOSYSTEM SERVICES FIELD ASSESSMENT SHEET						
Key ++ + 0 - -- ?	How important? Potential significant positive benefit	Wetland name: Pangil River GPS co-ordinates Pangil, Laguna 14°24'11"N and 121°27'58"E Date: September 24-26, 2019 Assessors: RAWES Group in Wetlands BioBlitz Event				
	Potential positive benefit					
	Negligible benefit					
	Potential negative benefit					
	Potential significant negative benefit					
	Gaps in evidence					
Provisioning services	Services	How important?	Describe benefit	Scale of benefit		
				Local	Regional	Global
	Fresh water	++	water is used for recreation, tourism, and livestock,	x		
	Food	++	provides fish other food products	x		
	Fuel	++	some dried branches of trees are used as firewood	x		
	Fibre	+	Presence of forest which can be source of fiber	x		
	Genetic resources	++	Variety of species can be found, including migratory birds			x
	Natural medicines or pharmaceuticals	?				

	Ornamental resources	++	some plant species may be used as ornamentals used in beautification of the ecotourism area	x		
	Clay, mineral, aggregate harvesting	?		x		
	Waste disposal	-	The downstream of the river is habituated by residents of Pangil and the domestic waste management is challenging. The Midstream of the river is the ecotourism park. Solid waste management must be strengthened.	x		
	Energy harvesting from natural air and water flows	?				
Regulatory Services	Services	How important?	Describe benefit	Scale of benefit		
				Local	Regional	Global
	Air quality regulation	++	the wetland provides cooling effect to the surrounding environment	x		
	Local climate regulation	++	the wetland provides cooling effect to the surrounding environment	x		
	Global climate regulation	++	wetlands are natural carbon sink			x
	Water regulation	+	stores and regulates water	x		
	Flood hazard regulation	+	stores and regulates water, avoiding flooding	x		

	Storm hazard regulation	+	stores and regulates water	x		
	Pest regulation	?		x		
	Disease regulation - human	?				
	Disease regulation - livestock	0				
	Erosion regulation	0				
	Water purification	++	the wetlands act as water purifier	x		
	Pollination	++	Presence of variety of pollinators	x		
	Salinity regulation	?				
	Fire regulation	?				
	Noise and visual buffering	+	The river act as buffer zone for noise			
Cultural Services	Cultural heritage	++	There are a lot of stories, including myths and legends involving the river	x		
	Recreation and tourism	++	The river is used as an ecotourism area with many activities including trail trekking, river tubing, swimming, etc	x		
	Aesthetic value	++	landscape view	x		

Cultural Services	Services	How important?	Describe benefit	Scale of benefit		
				Local	Regional	Global
	Spiritual and religious value	++	The river is part of some of the spiritual activities of the residents			
	Inspiration value	+	The river has a picturesque view	x		
	Social relations	++	The river plays an important role on facilitating social activities of the people because it is used for recreation, livestock raising	x		
	Educational and research	++	Presence of various species, forest and wetland ecosystems which could be subjected to research and educational purposes			x
Supporting Services	Soil formation	++	soils from organic materials	x		
	Primary production	++	presence of primary producers, ie algae, etc	x		
	Nutrient cycling	++	internal cycling of plant material, inputs of nutrients from floodwaters, presence of fauna to recycling nutrients, etc	x		
	Water recycling	?				
	Provision of habitat	++	presence of trees for birds and river system for fish; presence of endemic and migratory birds			x

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