

Discovering Panigan-Tamugan Watershed

Our Future Source of Drinking Water



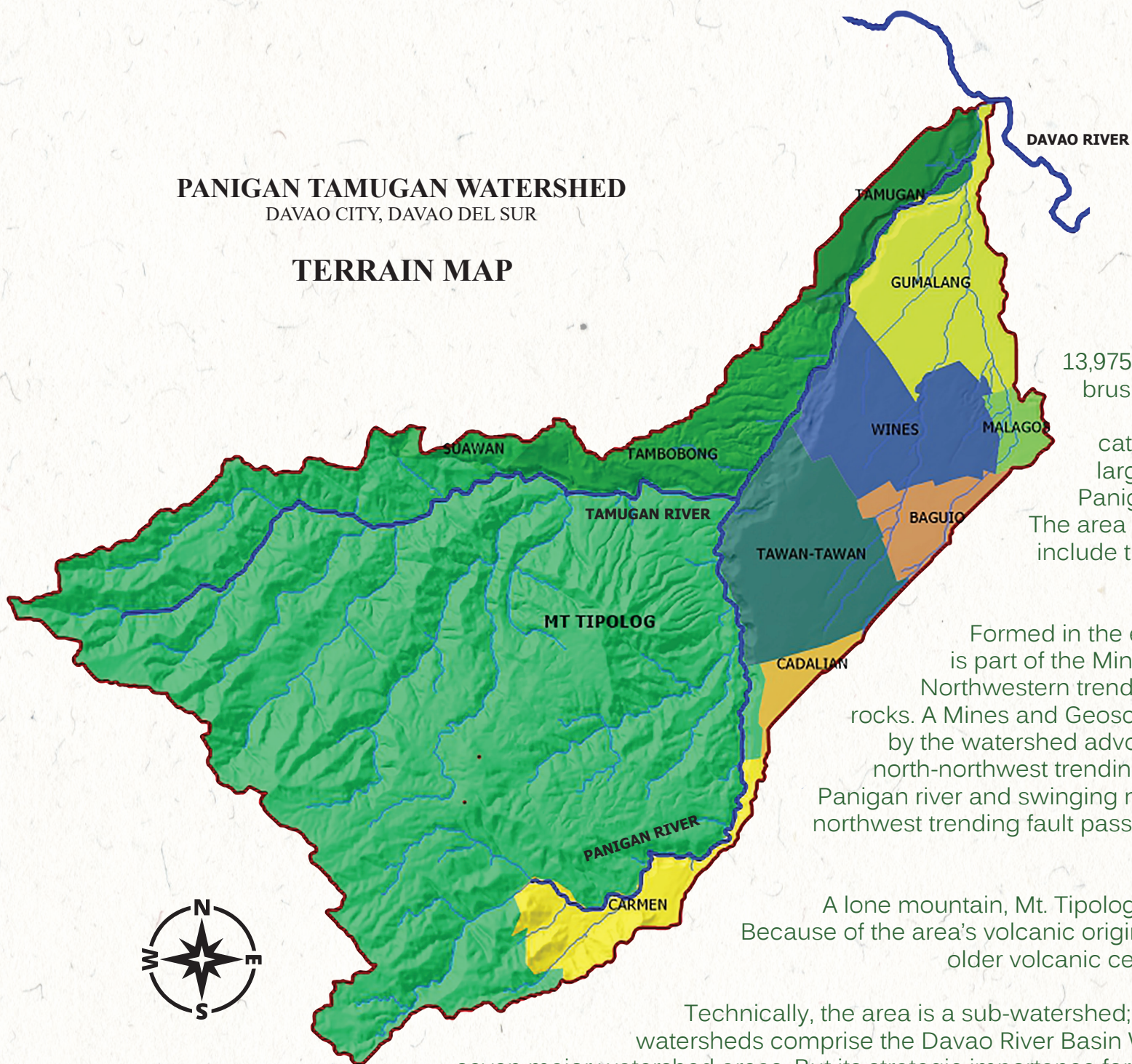
Surrounded by watersheds, Davao City's drinking water is among the best in the world. The potable water supplied by the local water utility provider is obtained from groundwater sources. Ninety-eight percent of the water is tapped from the aquifers of the Talomo-Lipadas watershed. But with the city's increasing population, there is now a gap between the supply and demand. Data from the Davao City Water District showed that while the current supply is at 112 cu.m/year, the consumer demand is projected to increase from 108 cu.m/year to 154 cu.m. in the coming years. In order to allow the aquifers to replenish its groundwater for future generations, surface water must be utilized to meet the consumer demand for more drinking water.

Among Davao's watersheds, only the rivers of the Panigan-Tamugan watershed have the sufficient quantity and quality to meet the city's future need for drinking water. In this year's edition of the IDIS advocacy calendar, we take a closer look at this critically important area, which has been, until lately, below the radar of public perception.

While the relative anonymity has afforded it some protection against widespread development, it still continues to face threats. With the increasing public pressure on finding new water sources, it becomes more imperative to protect the watershed so that it will continue to provide the key ecosystem services that the city needs in order to survive.

PANIGAN TAMUGAN WATERSHED
 DAVAO CITY, DAVAO DEL SUR

TERRAIN MAP



The Lay of the Land

The Panigan-Tamugan Watershed

The Panigan-Tamugan watershed covers 13,975.47 hectares of mainly agricultural, swamp, brush and forest lands and is located in Baguio District, Davao City. It consists of the upper catchment basin of the Panigan River and the larger Tamugan River downstream into which Panigan, and another river named Kidale, drain. The area is home to indigenous communities which include the Obu Manuvu, the Bagobo Klata and the Bagobo Tagabawa.

Formed in the early Pleistocene period (Ice Age), the area is part of the Mindanao Central Cordillera, which is a North-Northwestern trending mountain range comprised of volcanic rocks. A Mines and Geoscience Bureau (MGB) study, commissioned by the watershed advocacy group IDIS, revealed the existence of north-northwest trending faults: the north fault lies parallel to lower Panigan river and swinging northwest towards Sitio Tuburan, while the northwest trending fault passes along Mt. Tipolog area and along upper Panigan River at Carmen area.

A lone mountain, Mt. Tipolog, stands over the Panigan-Tamugan rivers. Because of the area's volcanic origins, geologists believe that Mt. Tipolog is an older volcanic center than Mt. Apo. It is, fortunately, inactive.

Technically, the area is a sub-watershed; the Panigan-Tamugan and two more sub-watersheds comprise the Davao River Basin Watershed, which is the largest of the city's seven major watershed areas. But its strategic importance for the future of Davao's potable water supply cannot be understated. Out of all the rivers in Davao City, only the Panigan-Tamugan has the sufficient volume and the necessary quality to become the city's future source of drinking water.

And yet, it continues to face several threats. Pesticide-intensive plantations continue to encroach into the watershed threatening to contaminate the river waters with toxic pesticides. Illegal quarrying of river stones are still present in the area, resulting to the erosion of riverbanks and the turbidity of the river water. The increasing population in the area and their improper disposal of wastes has also resulted to the trash finding its way downstream to the gulf, where it threatens the marine ecosystem.

1 January 2017

Sun	Mon	Tue	Wed	Thu	Fri	Sat
1 6:22 AM - 5:37 PM	2 6:22 AM - 5:37 PM	3 6:22 AM - 5:38 PM	4 6:23 AM - 5:38 PM	5 6:23 AM - 5:39 PM	6 6:23 AM - 5:40 PM	7 6:24 AM - 5:40 PM
8 6:24 AM - 5:41 PM	9 6:24 AM - 5:41 PM	10 6:24 AM - 5:42 PM	11 6:25 AM - 5:42 PM	12 6:25 AM - 5:43 PM	13 6:25 AM - 5:44 PM	14 6:25 AM - 5:44 PM
15 6:25 AM - 5:45 PM	16 6:25 AM - 5:45 PM	17 6:25 AM - 5:46 PM	18 6:26 AM - 5:46 PM	19 6:26 AM - 5:47 PM	20 6:26 AM - 5:48 PM	21 6:26 AM - 5:48 PM
22 6:26 AM - 5:49 PM	23 6:26 AM - 5:49 PM	24 6:26 AM - 5:50 PM	25 6:26 AM - 5:50 PM	26 6:26 AM - 5:51 PM	27 6:26 AM - 5:51 PM	28 6:25 AM - 5:52 PM
29 6:25 AM - 5:52 PM	30 6:25 AM - 5:53 PM	31 6:25 AM - 5:53 PM				



2 February 2017

Sun	Mon	Tue	Wed	Thu	Fri	Sat
				1 6:25 AM - 5:54 PM	2 6:25 AM - 5:54 PM	3 6:24 AM - 5:54 PM
				4 6:24 AM - 5:55 PM	5 6:24 AM - 5:56 PM	6 6:23 AM - 5:56 PM
				7 6:23 AM - 5:56 PM	8 6:23 AM - 5:56 PM	9 6:23 AM - 5:57 PM
				10 6:22 AM - 5:57 PM	11 6:22 AM - 5:57 PM	12 6:22 AM - 5:58 PM
				13 6:21 AM - 5:58 PM	14 6:21 AM - 5:59 PM	15 6:21 AM - 5:59 PM
				16 6:20 AM - 5:59 PM	17 6:20 AM - 5:59 PM	18 6:20 AM - 6:00 PM
				19 6:19 AM - 6:00 PM	20 6:18 AM - 6:00 PM	21 6:18 AM - 6:01 PM
				22 6:17 AM - 6:01 PM	23 6:17 AM - 6:01 PM	24 6:16 AM - 6:01 PM
				25 6:15 AM - 6:02 PM	26 6:15 AM - 6:02 PM	27 6:14 AM - 6:02 PM
				28 6:14 AM - 6:02 PM		



View of Mt. Tipolog from nearby pineapple plantations in Panigan-Tamugan Watershed.

Environmental Days



January National Zero Waste Month

Feb 25 People Power Anniversary

Funded by



National Holidays

Jan 1 Jan 28 New Year's Day Chinese Lunar New Year's Day



A Joining of Two Rivers

Panigan and Tamugan

The watershed is traversed by the Panigan and Tamugan rivers, the second largest rivers after the Talomo-Lipadas. Tamugan River is the foremost of the rivers found in the sub-watershed. Originating from the Mt. Apo range in North Cotabato, it flows down the area's slopes where it is joined by the Panigan and, further downstream, the Kidale. At different points in the watershed, the creeks Gumalang and Wines join the flowing Tamugan on its journey towards the sea.

The DENR-EMB XI has designated Tamugan River as a Water Quality Management Area. The quality of Tamugan's surface waters has been categorized as Class A, which means that it is fit for drinking after undergoing treatment according to national standards.

But the encroachment of plantations and livestock farms in the watershed threaten to contaminate the rivers with toxic pesticides and solid waste. At present, there are three large-scale plantations operating in the area which use pesticide-intensive methods to produce bananas and pineapples.

Community efforts by the Bantayo Aweg and the Bantay Bukid volunteers are undertaken to protect the rivers from contamination. The Davao City Water District has also been implementing their Adopt-A-Site Reforestation Program in this area. At the city level, the Watershed Management Council takes the lead in ensuring the sustainable management of the watersheds.

3 March 2017



4 April 2017



Environmental Days

Mar 14
International Day of Action for Rivers

- March 3 World Wildlife Day
- Mar 21 International Day of Forests
- Mar 22 World Water Day
- April 22 Earth Day

National Holidays

Apr 9 Araw ng Kagitingan
Apr 13 Maundy Thursday

Apr 14 Good Friday
Apr 16 Easter Sunday

Funded by



A Watershed of Endemism & Biodiversity

The Local Flora and Fauna

The Panigan-Tamugan watershed is home to many species of endemic wildlife. In a resource assessment study commissioned by the watershed advocacy group IDIS, researchers from the Philippine Eagle Foundation were able to document 171 vertebrate species, most of which are endemic, living in the remaining dipterocarp forests in the area. Twenty-eight of these species are categorized as threatened or near threatened by the International Union for the Conservation of Nature (IUCN).

Along with the Philippine Eagle, the list also includes the Tarictic Hornbill, the rare Mindanao montane racquet tail, the Mindanao Scops Forest Owl, the Mindanao Fruit Bat, the Philippine Flying lemur and the Philippine Pygmy Squirrel.

The wildlife researchers attribute the high level of endemism in the watershed due to its prehistoric geographical link with the Greater Mindanao Region –the biogeographic region formed by Leyte, Samar, Bohol, Mindanao and nearby islands during the Ice Age (Pleistocene). This allowed massive animal and plant exchanges followed by multiple species colonizations from Borneo, Sulawesi and other Pleistocene islands. When rising sea levels resulted to Mindanao's separation from the larger geographic group, the island's species evolved resulting to the rich biodiversity it has today.

At top, Alwaan (*Medinilla pendula*), an IUCN endangered species and one of the 80 species of *Medinilla* endemic in the country. At bottom, an IUCN endangered Philippine Bubble-nest frog (*Philautus acutirostris*) in Mt. Tipolog (c) RSEA/PEF



5 May 2017

Sun	Mon	Tue	Wed	Thu	Fri	Sat
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			



6 June 2017

Sun	Mon	Tue	Wed	Thu	Fri	Sat
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	



TARICTIC HORNBILL *Penelopides Panini*

An IUCN endangered species endemic to the Philippines, it inhabits primary dipterocarp forests but can live in fragmented secondary growth or tall, isolated fruiting trees. It nests on treetops and in clusters of nest-holes around remaining habitat patches. Fruit makes up for the bulk of its diet but prey items brought to its nests are comprised of small animal specimens. (c) Leif Gabrielsen 2007

Environmental Days

May 22
International Day for Biodiversity

- June** Philippine Environment Month
- June 4-10** Philippine Eagle Week
- June 5** World Environment Day
- June 8** World Ocean Day
- June 25** National Arbor Day

Funded by



National Holidays

May 1 Labor Day



Protecting the Lost Volcano

The Bantay Bukid Volunteers

In the old days, Mt Tipolog was once called “ t’pog”, a Bagobo word which means lush and green. Today, as the lone mountain in the Panigan-Tamugan watershed, it is protected and revered by the indigenous communities living on its slopes and nearby areas.

With an elevation of 1,340 meters above sea level, the mountain enjoys the reputation of being a “lost volcano”. Because of its volcanic origin and non-active status, its slopes are fertile for agro-forestry production. It is also the habitat of various endemic wildlife. According to the Mines and Geosciences Bureau (MGB), Tipolog’s volcanic slopes are also major recharge areas for groundwater that should be protected.

The mountain’s wild beauty and relative anonymity have lured mountaineers who are on the look-out for unexplored places. Unfortunately, recent trekking activities have left piles of trash on the summit, threatening to spoil the mountain ecosystem.

In 2013, the Watershed Management Council (WMC) deputized a pioneer batch of 42 Bantay Bukid volunteers to respond to the cases of environmental violation in the area. Since then, the Bantay Bukid have made regular foot patrols on the mountain, reporting violations to the barangay and the WMC. The Bantay Bukid has also ensured the return of native trees to the ecosystem by propagating wildlings in community nurseries and replanting them along the slopes. They also help protect the Philippine Eagle by regularly monitoring its activity in the watershed.



Bantay Bukid forest rangers patrolling at Mt. Tipolog

7 July 2017

Sun	Mon	Tue	Wed	Thu	Fri	Sat
						1 5:31 AM - 6:28 PM
2 5:31 AM - 6:28 PM	3 5:32 AM - 6:28 PM	4 5:32 AM - 6:28 PM	5 5:32 AM - 6:28 PM	6 5:33 AM - 6:28 PM	7 5:33 AM - 6:28 PM	8 5:33 AM - 6:28 PM
9 5:33 AM - 6:28 PM	10 5:34 AM - 6:28 PM	11 5:34 AM - 6:28 PM	12 5:34 AM - 6:28 PM	13 5:35 AM - 6:28 PM	14 5:35 AM - 6:28 PM	15 5:35 AM - 6:28 PM
16 5:35 AM - 6:28 PM	17 5:35 AM - 6:28 PM	18 5:36 AM - 6:27 PM	19 5:36 AM - 6:27 PM	20 5:37 AM - 6:27 PM	21 5:37 AM - 6:27 PM	22 5:37 AM - 6:27 PM
23 5:38 AM - 6:26 PM	24 5:38 AM - 6:26 PM	25 5:38 AM - 6:26 PM	26 5:38 AM - 6:26 PM	27 5:39 AM - 6:25 PM	28 5:39 AM - 6:25 PM	29 5:39 AM - 6:25 PM
30 5:39 AM - 6:25 PM	31 5:40 AM - 6:24 PM	1ST QTR, JULY 1	NEW MOON, JULY 9	3RD QTR, JULY 17	FULL MOON, JULY 23	

8 August 2017

Sun	Mon	Tue	Wed	Thu	Fri	Sat
		1 5:40 AM - 6:24 PM	2 5:40 AM - 6:23 PM	3 5:40 AM - 6:23 PM	4 5:41 AM - 6:23 PM	5 5:41 AM - 6:22 PM
6 5:41 AM - 6:22 PM	7 5:41 AM - 6:21 PM	8 5:41 AM - 6:21 PM	9 5:42 AM - 6:20 PM	10 5:42 AM - 6:20 PM	11 5:42 AM - 6:19 PM	12 5:42 AM - 6:19 PM
13 5:42 AM - 6:18 PM	14 5:42 AM - 6:18 PM	15 5:43 AM - 6:17 PM	16 5:43 AM - 6:17 PM	17 5:43 AM - 6:16 PM	18 5:43 AM - 6:16 PM	19 5:43 AM - 6:15 PM
20 5:43 AM - 6:14 PM	21 5:43 AM - 6:14 PM	22 5:44 AM - 6:13 PM	23 5:44 AM - 6:13 PM	24 5:44 AM - 6:12 PM	25 5:44 AM - 6:11 PM	26 5:44 AM - 6:11 PM
27 5:44 AM - 6:10 PM	28 5:44 AM - 6:09 PM	29 5:44 AM - 6:09 PM	30 5:44 AM - 6:08 PM	31 5:44 AM - 6:07 PM		
1ST QTR, JULY 30	NEW MOON, AUG 8	1ST QTR, AUG 15	FULL MOON, AUG 22	3RD QTR, AUG 29		



TANGLE *Shorea polysperma*

One of the rare and endangered species endemic to the Philippines which is found in Mt. Tipolog. Tangle occurs in mixed dipterocarp forests. Classified as hardwood, it is heavily exploited as a timber resource for the export market. (c) RSEA/PEF

Environmental Days

July
National Disaster
Consciousness Month

July 11 World Population Day

National Holidays

Aug 21 Ninoy Aquino Day
Aug 28 National Heroes Day

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Watching the Waters

The Bantayo Aweg Volunteers

Today's generation of water watchers continue the work begun in 2005 by their community elders. Borne out of the need to monitor the water quality of the Panigan-Tamugan river, the Bagobo youth volunteers conduct monthly physico-chemical monitoring of the river water to ensure that the Class A quality of the river is maintained. They compile their monthly readings and submit it to the local barangay environment committee which uses the data as part of their local monitoring of the rivers.

In the Bagobo language, Bantayo Aweg means water guardians. The initiative begun as a result of a series of environment literacy trainings conducted by the watershed advocacy group IDIS for the upland communities in the Panigan-Tamugan watershed. Today, it is an established community volunteer initiative, with past members moving on to larger leadership roles in the community while younger members continue with the task.

The Bantayo Aweg monitors the following water quality parameters:

- River water Temperature
- Dissolved Oxygen Levels
- Nitrates
- Phosphates
- pH level
- Stream flow discharge rate
- Turbidity
- Macro-Invertebrate Sampling

At top, volunteers collecting macro-invertebrate samples. At bottom, volunteers measuring the dissolved oxygen content through a colorimetric wheel.



9 September 2017

Sun	Mon	Tue	Wed	Thu	Fri	Sat
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30



10 October 2017

Sun	Mon	Tue	Wed	Thu	Fri	Sat
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				



Portable Water Monitoring Equipment
 Since 2014, Bantayo Aweg has been using the Hach DR900 Multiparameter Handheld Colorimeter, a portable instrument which can detect up to 90 most common parameters, among others, DO, nitrates, phosphates, pH, color, turbidity and temperature automatically.

Environmental Days

Sept 18
 World Water Monitoring Day

- Sept 16** International Day of Preservation of Ozone Layer
- Oct 16** World Food Day
- Oct 24** International Day of Climate Action
- Oct 20-26** International Lead Poisoning Prevention Week

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National Holidays

Sept 2-3 Eid al-Adha



Rainforesting our Riverbanks

The U-CARE for the Watersheds Approach

Reforestation of riverbanks is an important step towards maintaining the viability of any river as healthy and clean source of drinking water. In the Panigan-Tamugan watershed, community reforestation efforts go one step higher by using native species of trees and shrubs to restore forest cover along the riverbanks. This method, called rainforestation, approximates the development of a tropical rainforest ecosystem using trees native to the watershed.

Restoring riverbank trees and shrubs, which were cut and removed over the years, is an important task to ensure improved water cleanliness, more stable riverbanks and better fish and wildlife habitat for the Panigan-Tamugan River. Community volunteers were trained to established community nurseries using native wildling stock sourced out from the watershed. The saplings were then planted along the riverbank areas and regularly monitored and nurtured by the community volunteers and the Bantay Bukid.

To date, the initiative was able to restore the native tree population in the watershed area. Indigenous forest species like the apitong, patikan (palm species), almon, almaciga, anitap, malibago, barubo, tiger and vetiver grass, and ulingon (Hypercacea) are now flourishing along the riverbank areas. Additionally, fruit bearing trees like cacao, durian, lanzones, marang, guyabano, mangosteen, santol and avocado have been also planted to create a viable agro-forestry livelihood for project beneficiaries from 2013-2016, a total of 75,349 seedlings have been planted in approximately 83.5 hectares in the watershed.

11 November 2017

Sun	Mon	Tue	Wed	Thu	Fri	Sat
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

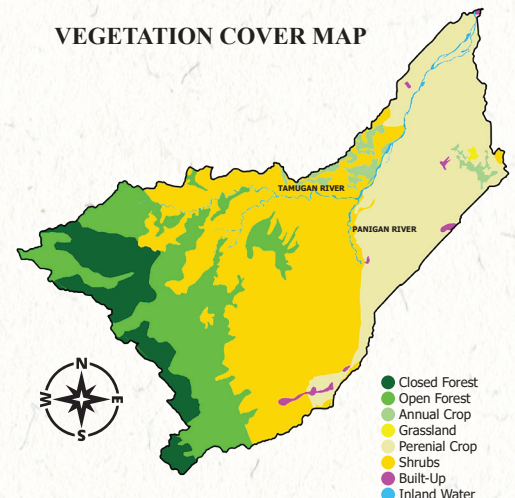
NEW MOON, NOV 4 1ST QTR, NOV 11 FULL MOON, NOV 18 3RD QTR, NOV 27

12 December 2017

Sun	Mon	Tue	Wed	Thu	Fri	Sat
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

NEW MOON, DEC 3 1ST QTR, DEC 10 FULL MOON, DEC 18 3RD QTR, DEC 26

VEGETATION COVER MAP



Environmental Days

Dec 3
Davao City Organic Agriculture Day

- November** Philippine Clean Air Month
- Dec 3** International Day of No Pesticides Use
- Dec 10** International Mountain Day

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National Holidays

Nov 1 All Saints' Day
Nov 2 All Souls' Day
Nov 30 Bonifacio Day

Dec 25 Christmas Day
Dec 30 Rizal Day