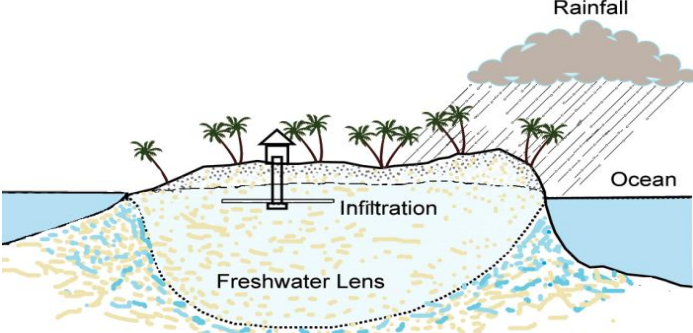
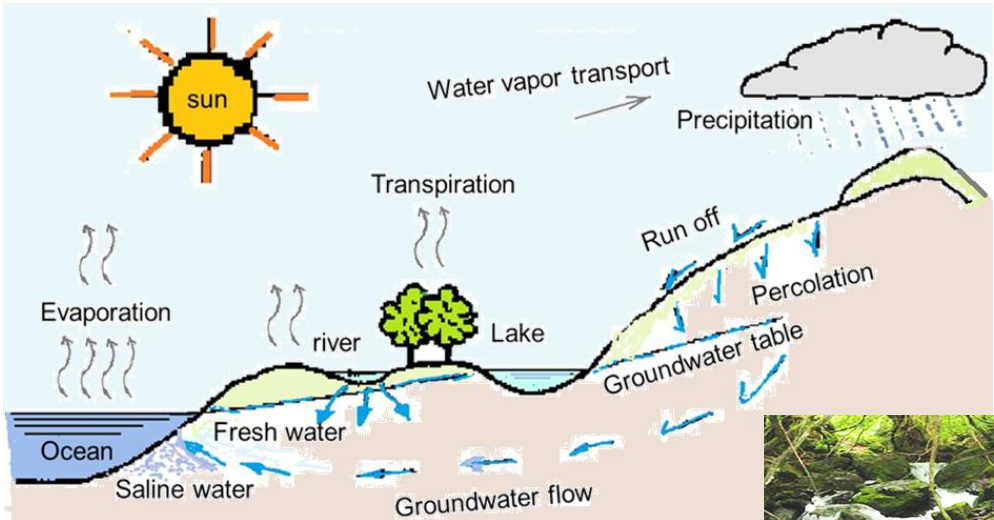


# JICA EPS Training started from Miyako-Jima, Okinawa.

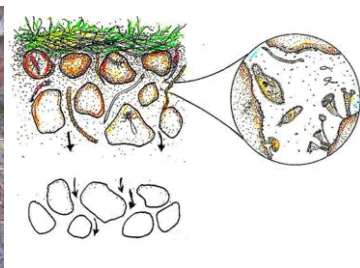
## EPS is Wise Use of Natural Purification System.

### Part 13.

EPS 2025-OBW  
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Miyako-Jima island is an **uplifted coral reef island** where is quit different environment compared with main part of Japan.  
Area of islands of Miyako-Jima is 204 km2, population is 55,000 persons.



We use natural purified water.



Filipe



JICA EPS training started in 2006 in Miyako-Jima.



Sodeyam WTP was build in 1953 using hard ground water.

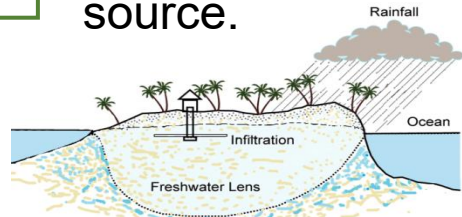
Before 1997, **pre-chlorination** as **algicide** to receiving well was a popular to **kill the algae** and to **stop** the algal growth in **all over Japan**. This is popular for Rapid Sand Filter.

Mr. Mitsutoshi Tomari, managing director of Sodeyama WTP, Miyako-Jima, visited to Nakamoto, Shinshu Univ. in July 8, **1997**. Nakamoto explained about the ecological purification system of slow sand filter.

He **stopped to injection** of **algicide** into receiving well. As soon as the **injection stop**, the taste of tap water became **delicious**.



① They pumped up the underground water as water source.



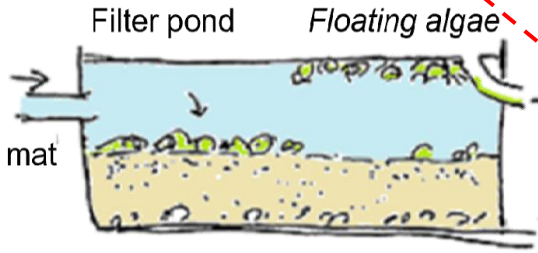
② In the filter pond, algal bloom was so severe. They could not flow out from the scum out.



③ The **pre-chlorination** was a popular treatment to **stop the algal growth** for WTP in **all over Japan**. The **close the scum out** was also popular.



④ After the injection stopped in 1997, the algae grew well in filter ponds.



⑥ New hard work raised to remove floating algae.



⑤ Biological processing has begun to work.

⑦ **EPS functioned.** The tap water became **delicious**.



⑧ Hardness reducing plant was completed in 1998.

⑨ The recovery of the taste was **one year before** the run of the hardness reducing plant.

Sodeyama Purification plant

Miyako-Jima, Okinawa



Receiving well

Designed capacity  
(7 filters, 1 filter is spare  
: 8 (new)+1 (old)=9 filters)

17.25m x 27.6m(x2.6m) x7 filter ponds  
(17.25m x 27.6m=476.1m<sup>2</sup>)  
23.7m x 20.0m(x2.6m) x 1 filter pond  
(23.7m x 20.0m=474m<sup>2</sup>)

475m<sup>2</sup> x 7m/d = 3,325 m<sup>3</sup>/d  
x 7 filters= 23,275 m<sup>3</sup>/d  
Water demand 400 liter/day/person  
= 58,000 persons

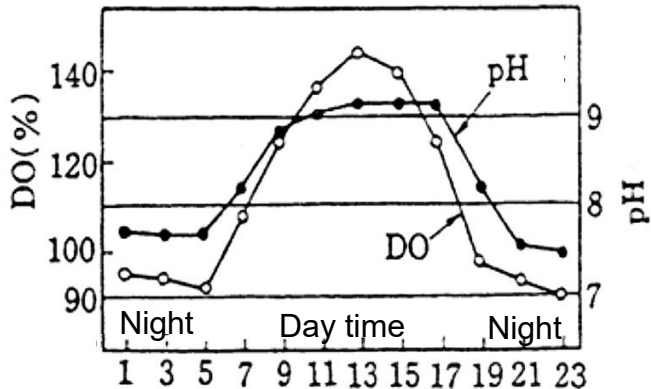
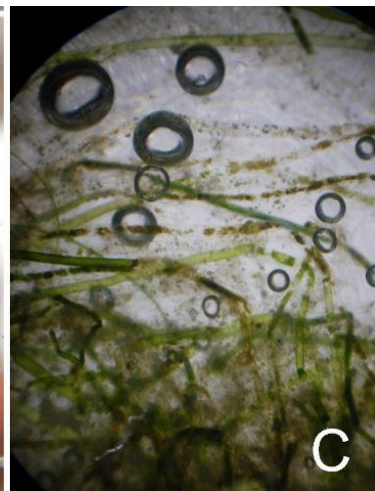
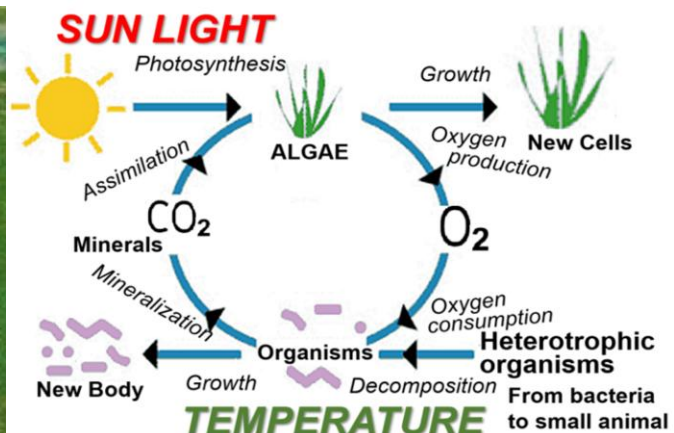


2021-2025 (4 yrs)  
Refresh plant

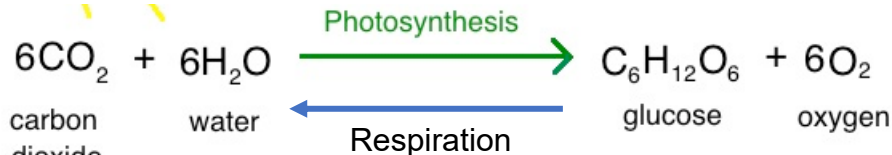
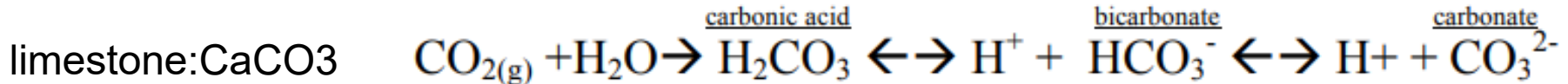
Hardness reducing plant



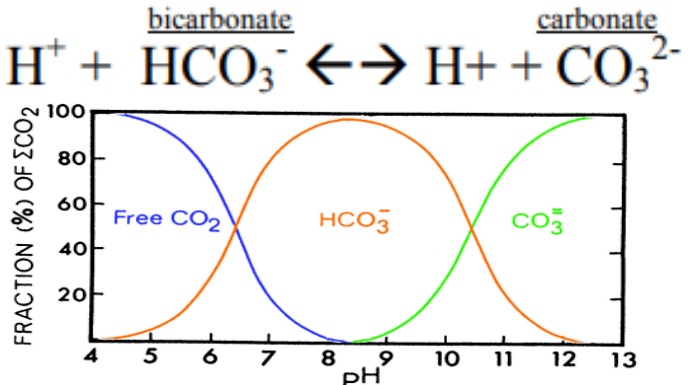
Due to active photosynthesis, water pH shifted to high.



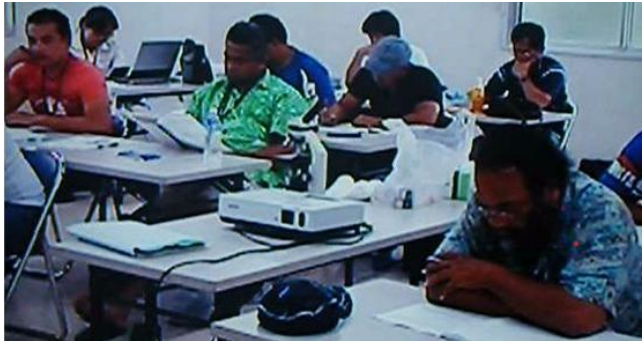
合山幹二、水環境指標(1979)



Biological softening happened by active photosynthesis process.



Lecture on EPS in a room.



using bucket model.



Sand surface was taken.



Sand is clear.  
Algal mat is  
just laid on  
the sand  
surface.

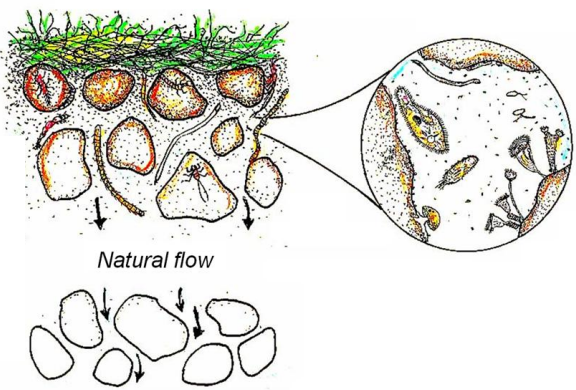
***Aerobic condition for small animals is the key.***



***Scratch the  
bottom by stick.***

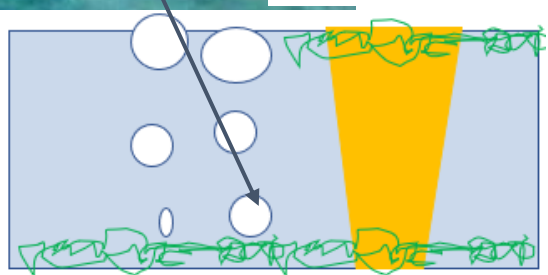
**Sand is just habitat.**

**Small sand and  
uniformity of  
sand size is not  
important.**

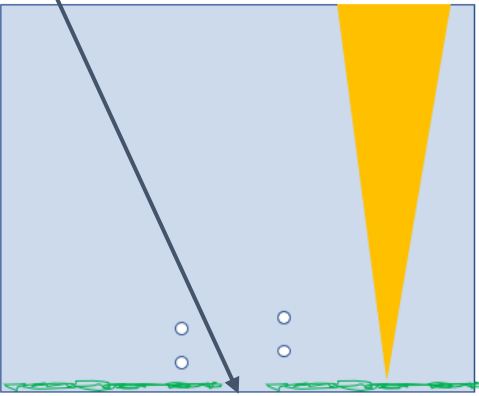


Large size of sand and  
higher flow rate are better  
for organisms.

***Scratch the bottom by stick.***

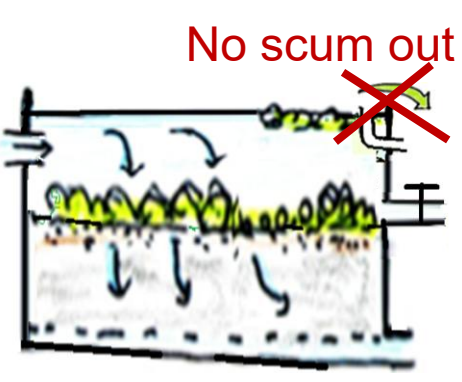
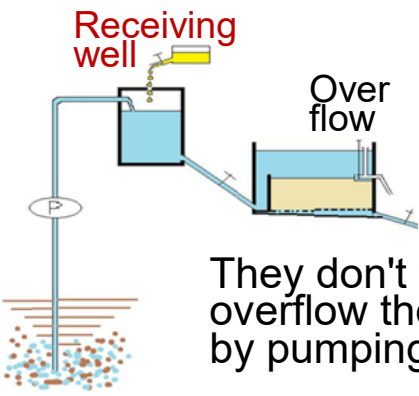


***Super saturated dissolved  
oxygen at the bottom.***

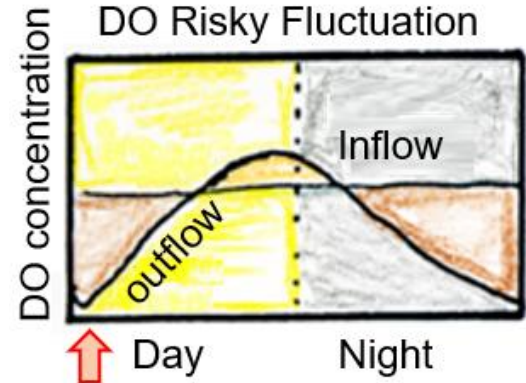


***Shallow depth is better.***  
***Active photosynthesis by algae and  
aerobic condition for small animals are  
the key for biological purification.***

Aerobic condition is essential for biological activity to make delicious filtrate.



Soon heavy algal growth under strong sun shin.



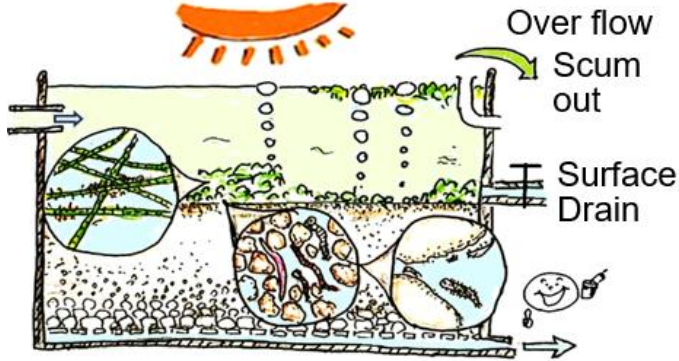
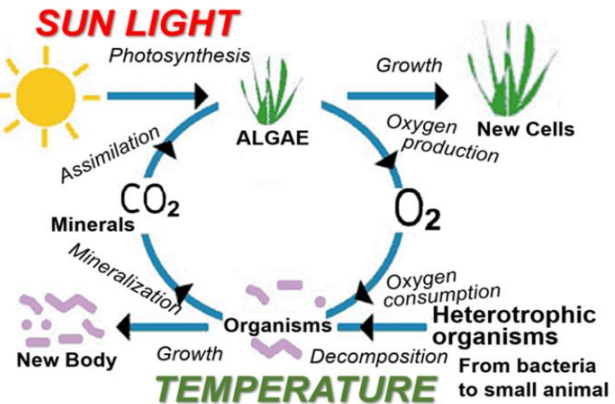
Slow flow rate  
↓  
Consume up DO  
↓  
Anaerobic condition

Early days after scraping. Biomass of algal mat is small. Sand is clear.

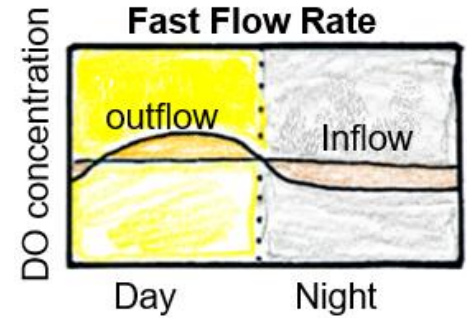
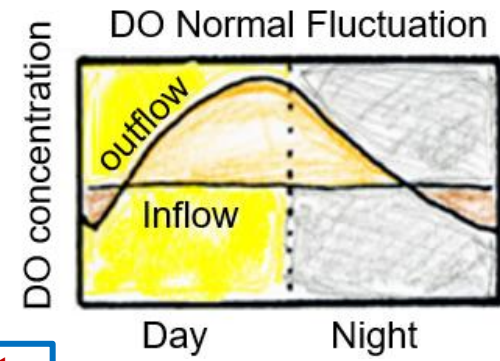
Aerobic condition in the sand layer



Bad smell



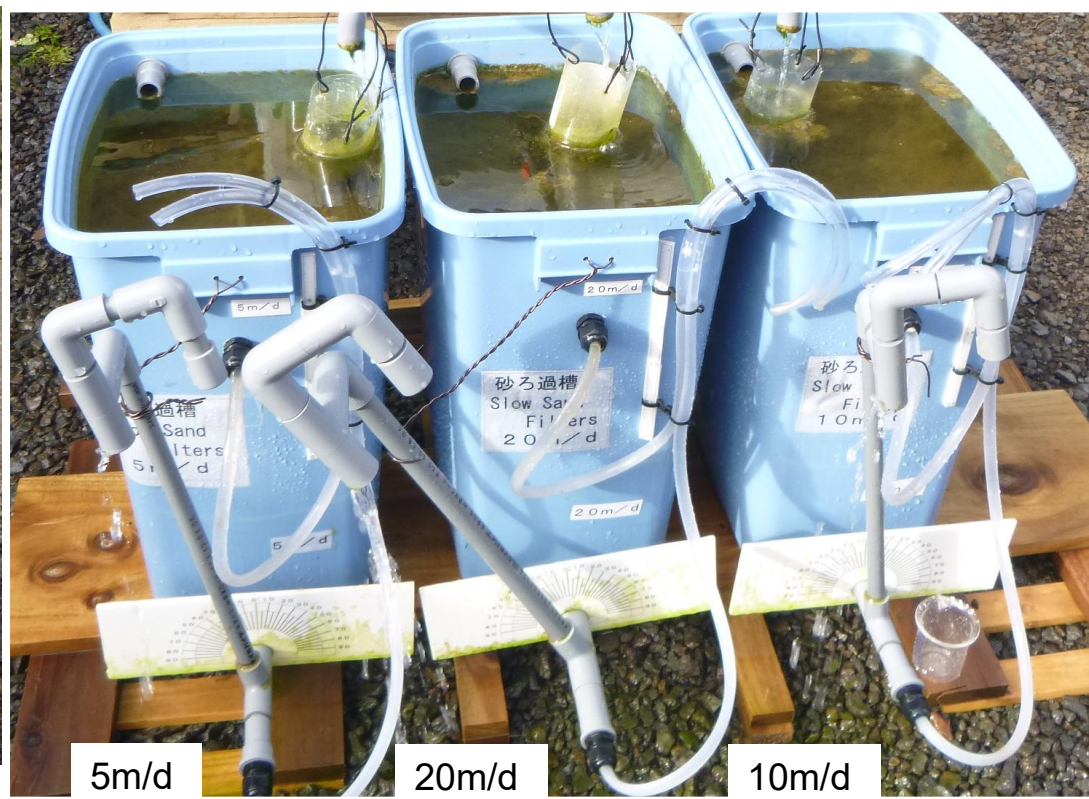
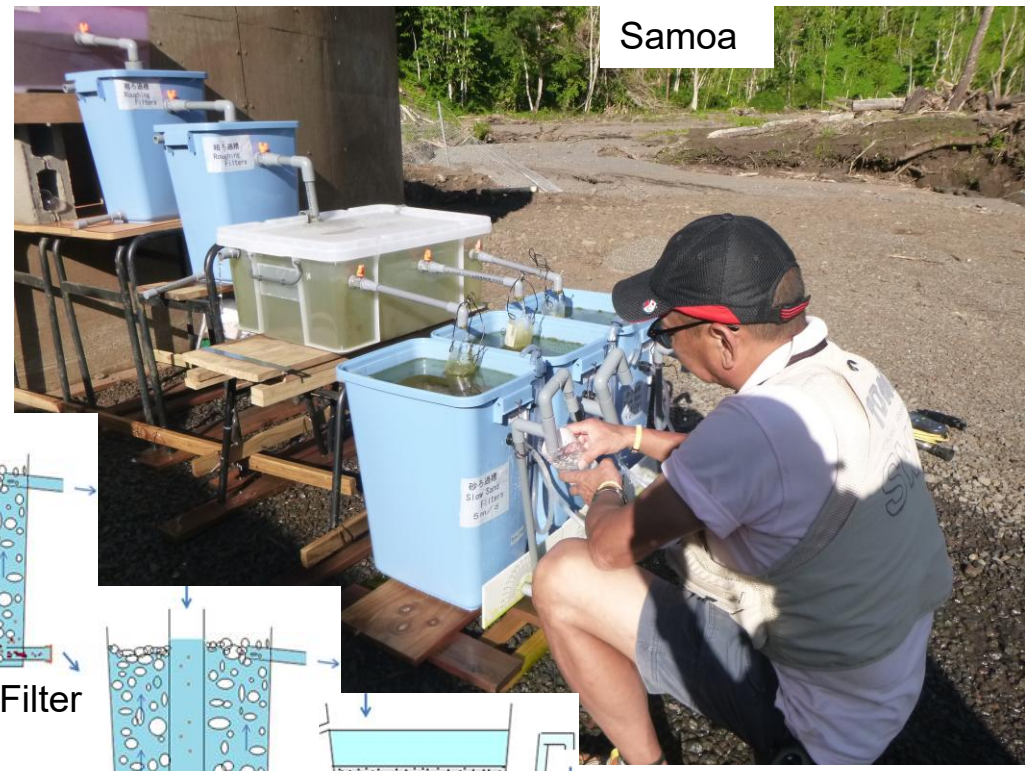
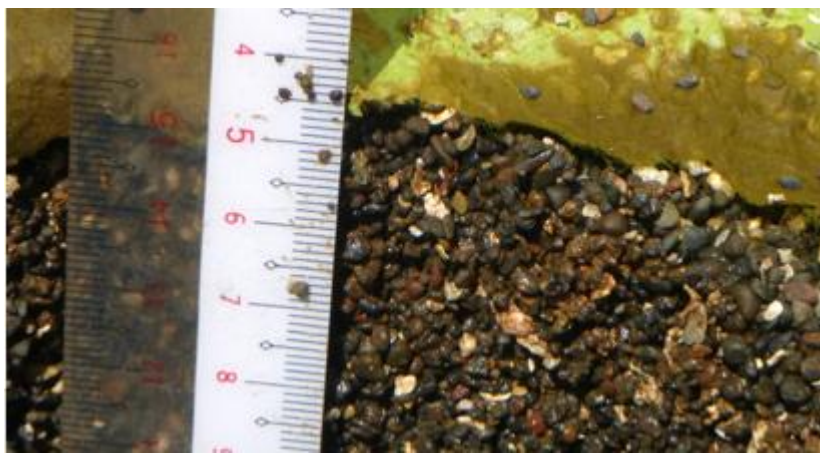
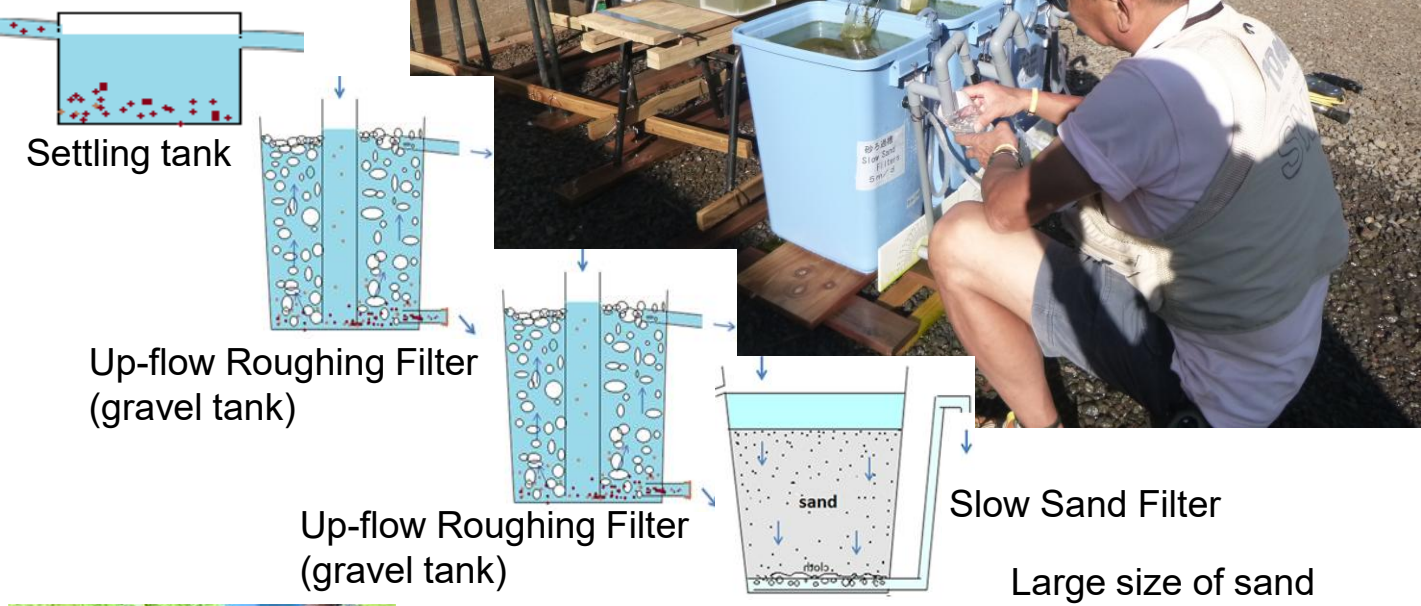
Over flow: scum out and Fast flow



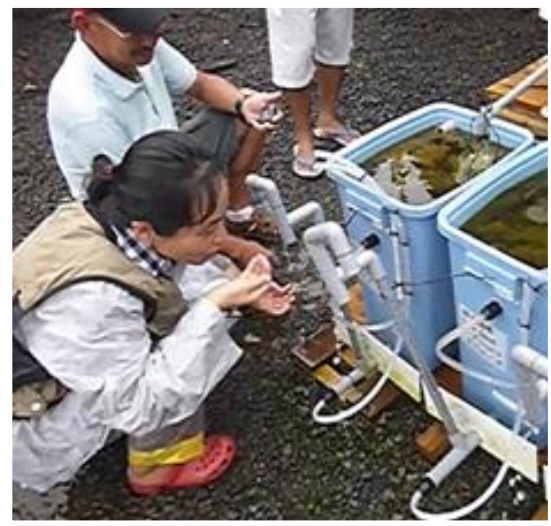
Anaerobic condition

Delicious filtrate

We confirmed the performance of the higher flow rate using bucket model in Samoa.



Even the high flow rate, the filtrate is good.



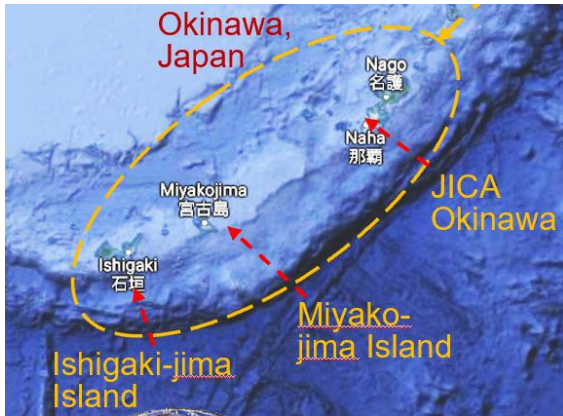
Every filtrate is delicious and safe water of germ bacteria free water.

# EPS training in Ishigaki-Jima, Okinawa.

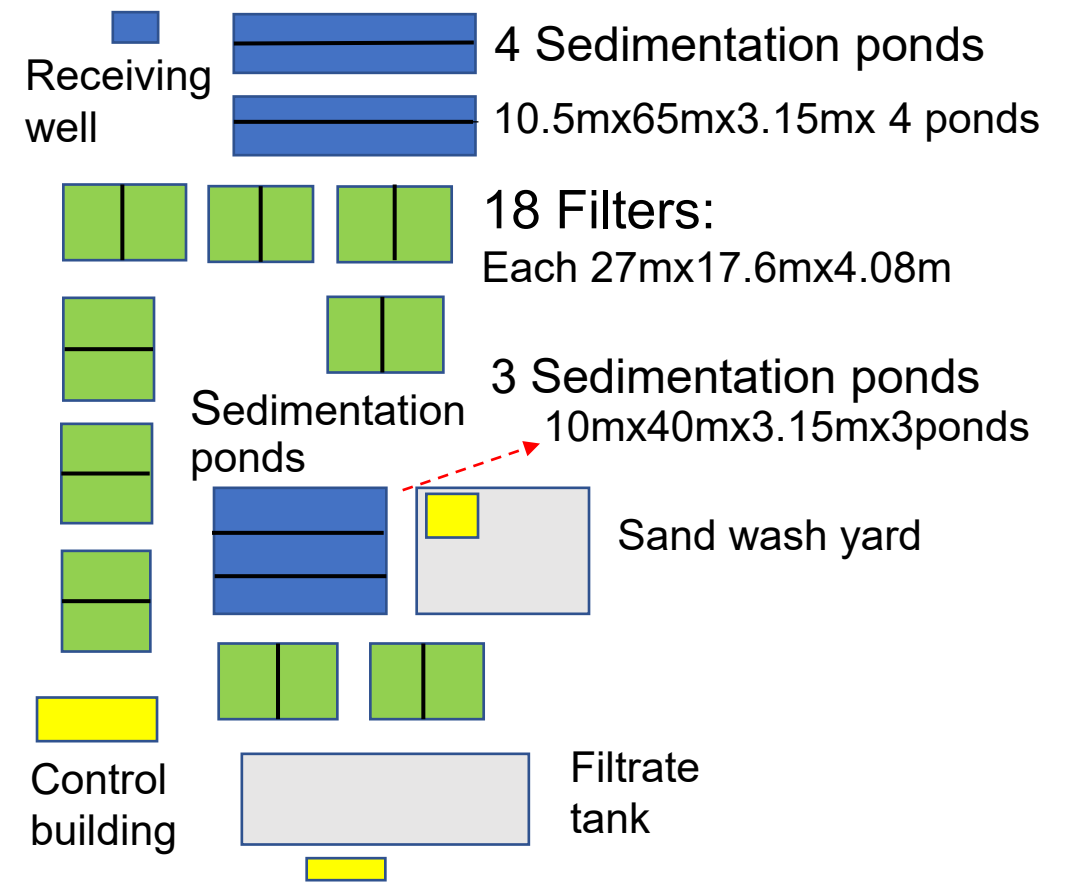
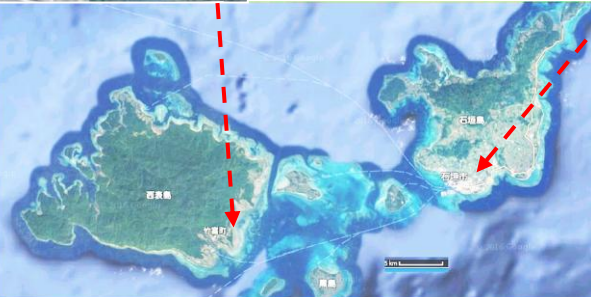
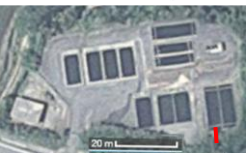
## Part 14.

EPS 2025-OBW  
Nov. Part 14:127-130  
4 slides

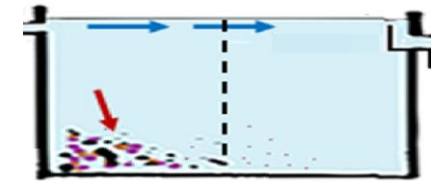
Ishigaki WTP



JICA EPS training in Okinawa expanded to Ishigaki-Jima Island from 2009.



Residence time of sedimentation ponds: 0.4 day = 10 hrs. in manual.



Heavy suspended matters sink down to the bottom. But fine particles do not sink. And surface water drifts near the surface and passes the sediment pond. This means residence time of near surface water is shorter time than the manual.



*I explain  
always the  
importance  
of depth  
and flow.*

# Ishigaki plant

Design capacity: 30,160m<sup>3</sup>/d  
in manual.

Slow sand filter:

**4m/d** : Design filter rate in manual.

Each filter: 27m x 17.6m = 475.2m<sup>2</sup>

475.2m<sup>2</sup> x **4m/d** = 1,901m<sup>3</sup>/d

1,901m<sup>3</sup>/d x 16filters = 30,413m<sup>3</sup>/d

2 filters are spare use.



Water supply per person

0.3m<sup>3</sup>/person/d ⇒ 100,000persons.

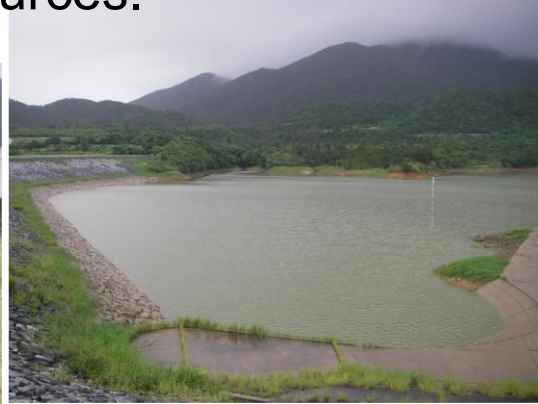
0.5m<sup>3</sup>/person/d ⇒ 60,000persons.

Big capacity



Ishigaki WTP is a large plant in Ishigaki island.  
There are several water sources.

Mountain stream.  
Shiramizu intake



Ma'e sato reservoir



Omoto intake



Pump station for  
underground water

There are two small plants.

## Yoshihara plant

Designed capacity 1,040m<sup>3</sup>/d  
(2 filters and 1 spare)

Sedimentation pond:  
3.2m x 18.2m x 3.0m x 2 ponds

Slow sand filter  
9.4m x 14.1m (x 4.0m) x 3 filter (2+1)  
 $9.4 \times 14.1 = 132.54 \text{ m}^2$  (1 filter)  
 $132.54 \text{ m}^2 \times 4 \text{ m/d} = 530.2 \text{ m}^3/\text{d}$

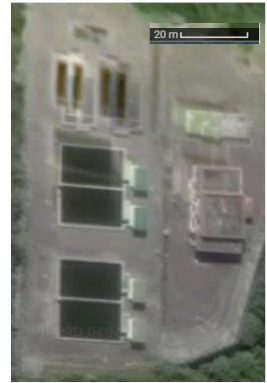


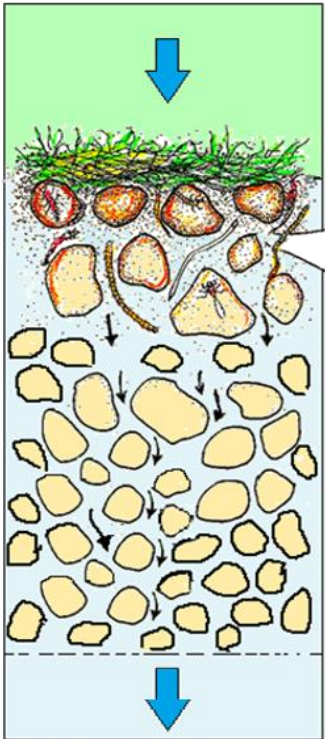
## Nosoko plant

Designed capacity  
1,066m<sup>3</sup>/d  
(3 filters and 1 spare)

Sedimentation pond:  
3.0m x 11.2m x 3.0m x 4 ponds

Slow sand filter  
11.0m x 13.5m (x 2.4m) x 4 filter (3+1)  
 $11.0 \times 13.5 = 148.5 \text{ m}^2$  (1 filter)  
 $148.5 \text{ m}^2 \times 4 \text{ m/d} = 594 \text{ m}^3/\text{d}$





**Biological activity is high in warm region.**

Muddy materials are trapped at the surface.  
**Sand is always clear.**  
 Biological community works near the surface.  
 There is food for them near the surface.



**Grazer Activity is high in warm region.**

Scraping the surface at Ishigaki plant.



In case of surface water intake, muddy materials are easily accumulated at the surface of sand filter.  
*Sand is clear. We need not remove all of the biological active layer.*

# EPS is Wise Application of Natural Ecosystem.

## Key are Dissolved Oxygen and Gentle Flow.

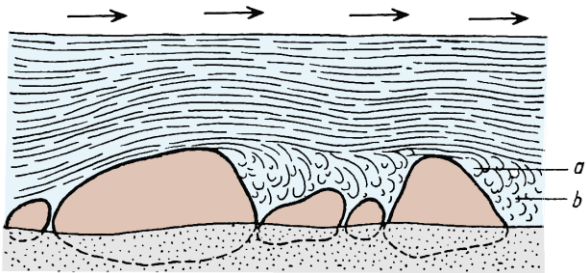
Part 15.

EPS 2025-OBW  
Nov. Part 15:131-139  
9 slides



Running water, but unexpected flush out by storm event

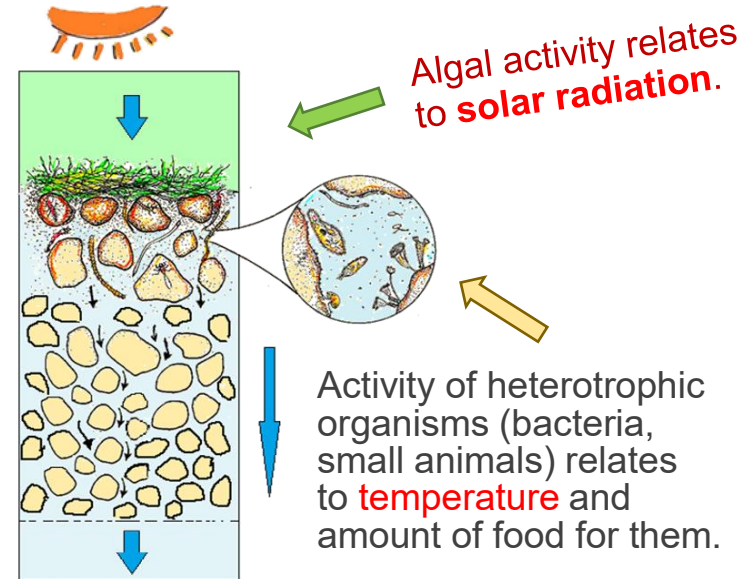
When plants and animals do not flush out, water is always clear.



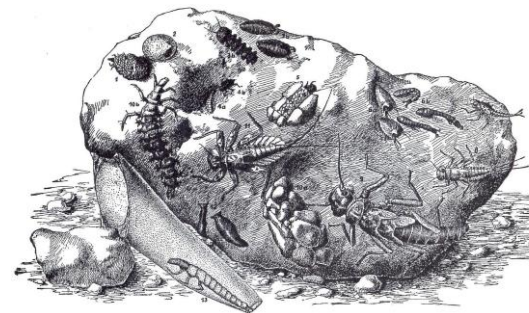
Vertical current is gentle for small animals on the surface of sand and soil particle.

Small animals on the surface of rocks collect turbid matters.

“slow” means “gentle for organisms”



Sand, stone and rocks **don't role and move** in a small creak among dense forest.





It is better to scrape during wet condition and short time.

Clean sand means that dirty matter does not enter in deep.



Mollusk is grazing animal of green algae. Long filter run.

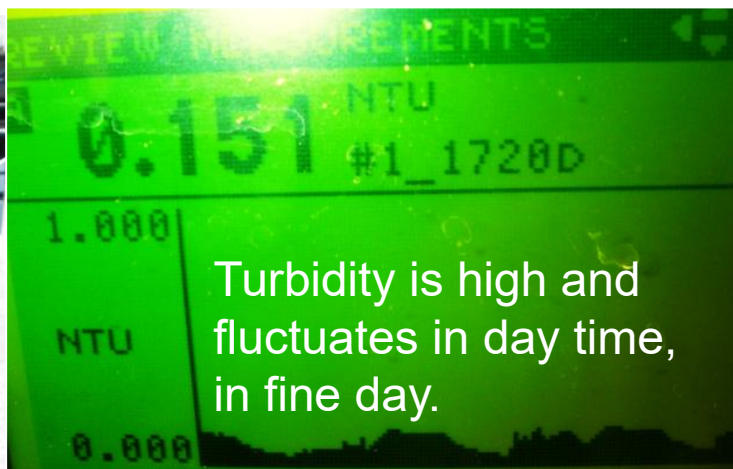


***Oligochaeta in top of sand layer.***

***If filter surface is dried up, these animals escape into deep sand layer where is wet enough.***



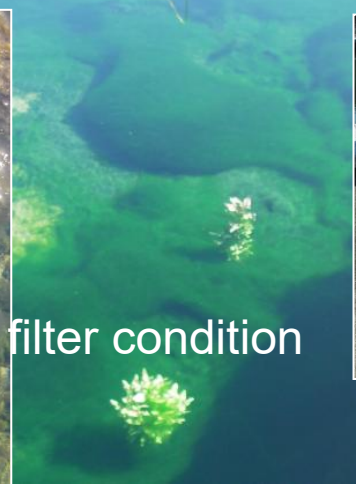
SS free sub-surface water is taken.



Turbidity is high and fluctuates in day time, in fine day.



Long filter run



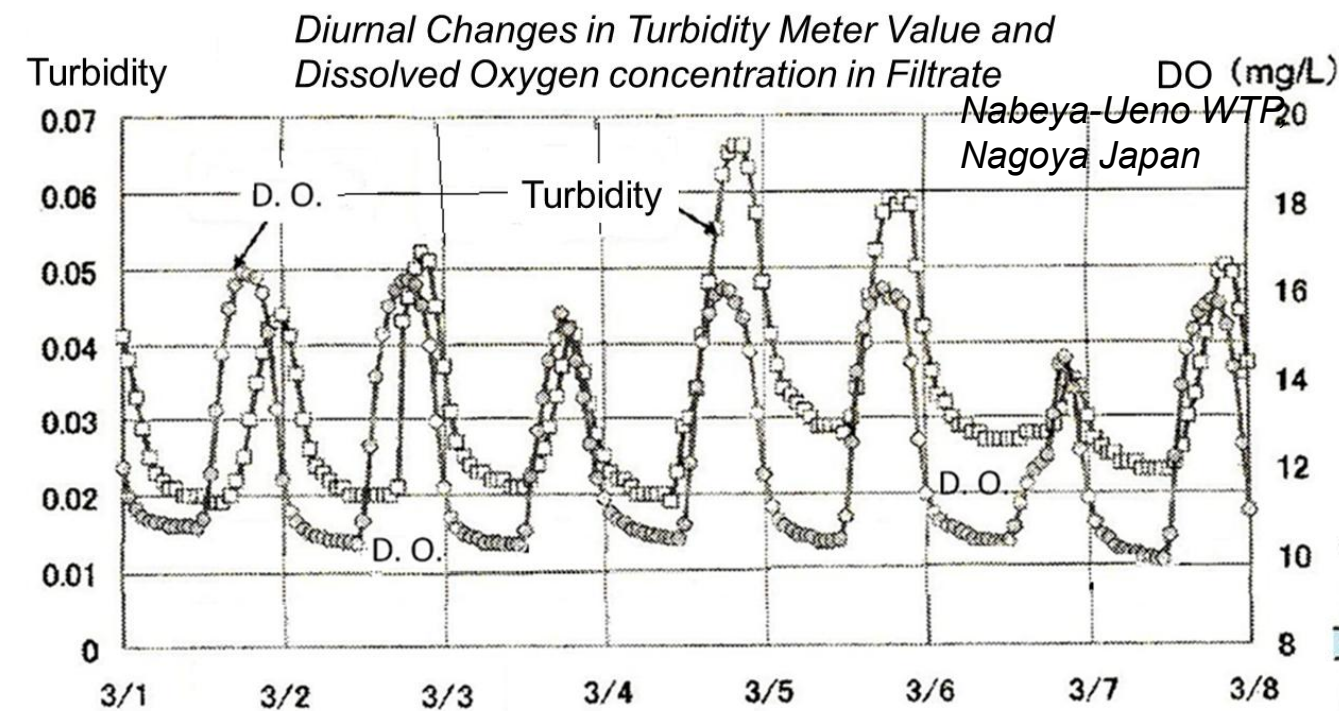
Good filter condition



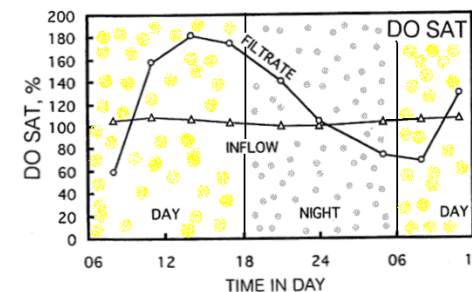
Sampling pump



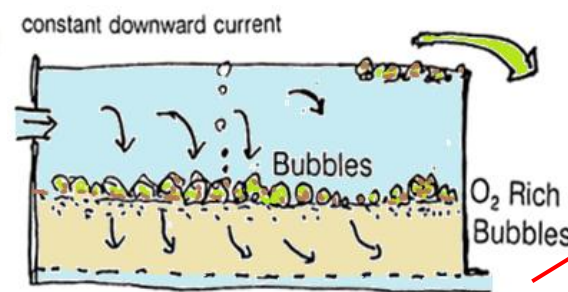
Micro bubbles are observed.



Photosynthetic activity is high in day time. DO concentration becomes super-saturation. After the sampling pump, oxygen bubbles form in water. Turbidity is due to bubbles.



Bubbles are easily formed under super-saturate condition with any small hit.



Meter

Pump

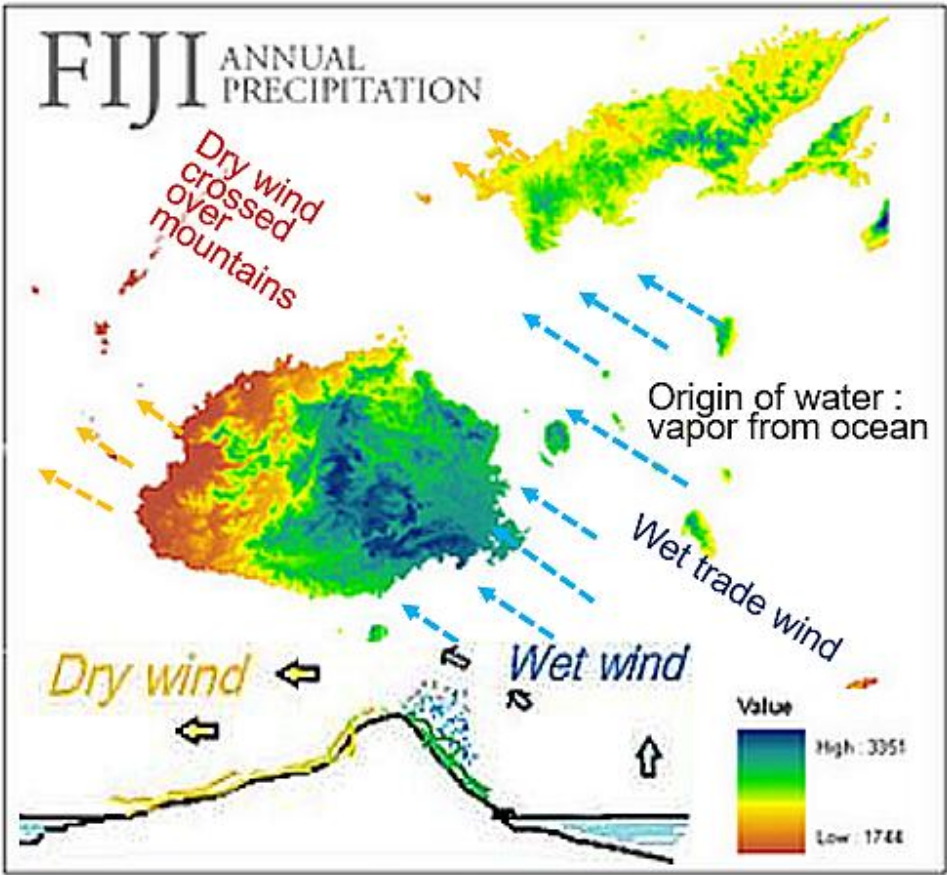
Turbidity meter value is not equal to real suspended matter. This particulate by the meter is micro-bubble.

Bubbles are not formed in filtrate under the high pressure and gentle condition.

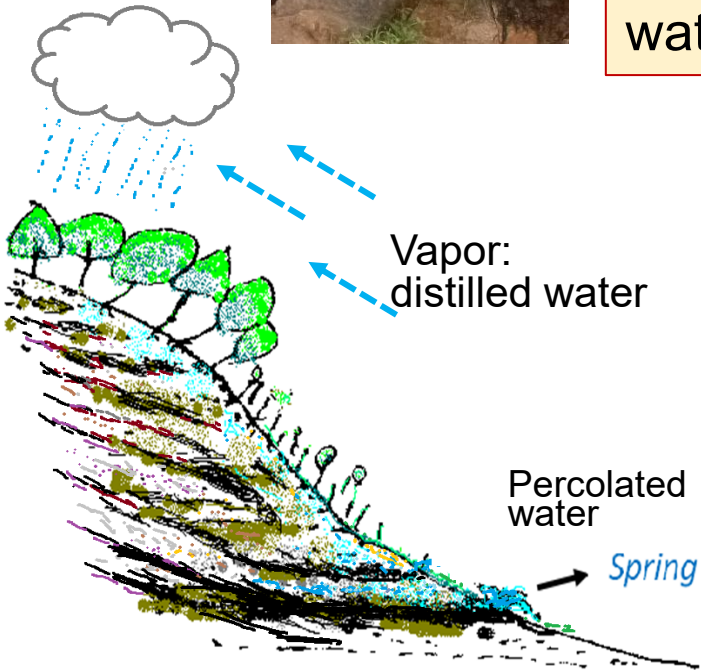
# Where can we find safe water in nature?



People prefer to drink natural spring water.



This water is not guaranteed by the authority. However, people trusts this water.



In mountainous country, many houses are scattered on the slope. They use natural spring on the slope.



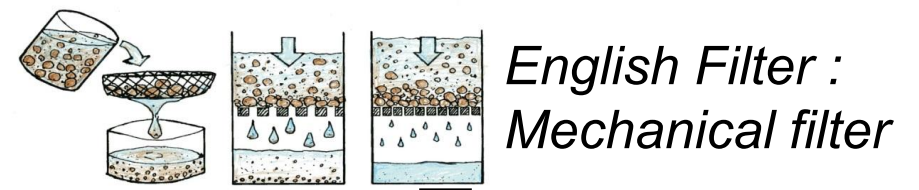
*These waters by natural purified process are always clear and safe to use.*



Porous pipes were placed under the gravel bed in a river. Almost suspended free water is taken for a slow sand filter plant. This is an intake of an artificial subsurface water.

# THIS is FOOD CHAIN

- ① The present **vertical type of slow sand filter** was devised by James Simpson in **1829** after his 2,000 miles inspection trip all over the Britain.
- ② This filter provided safe drinking water, **free of pathogens to residents** in London. This vertical type of filter spread round the world and was known as the “English Filter”.
- ③ Slow sand filter has been believed that it was a **mechanical filter** with **fine sand** under **slow** current.
- ④ However, the **major contribution** of the purification of the impurities is the **food chain** in this system.
- ⑤ The word of “**slow**” was “**gentle for organisms**”.
- ⑥ Recently, the English filter of “**Slow Sand Filter**” has been recognized as “**Ecological Purification System**” in Japan.

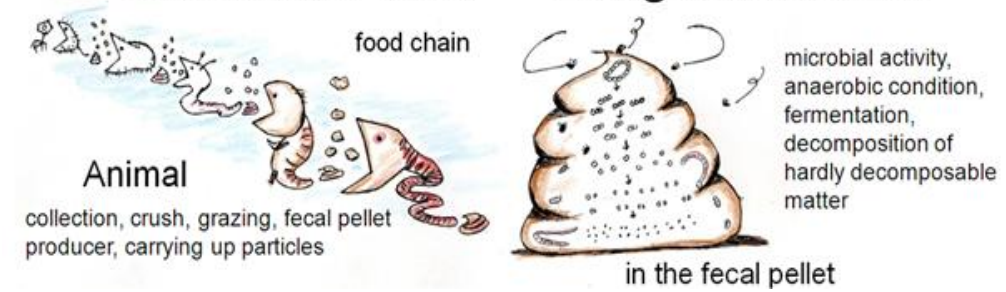


English Filter :  
Mechanical filter

## Biological Filter

### Short time work

### Long term action



## Ecological Purification System New Concept and New Name



Biological activity depend  
on Temp & Radiation.



Sand is habitat.

# EPS-Use of Natural Process-**Chemical Free** : **Gentle for small organisms**



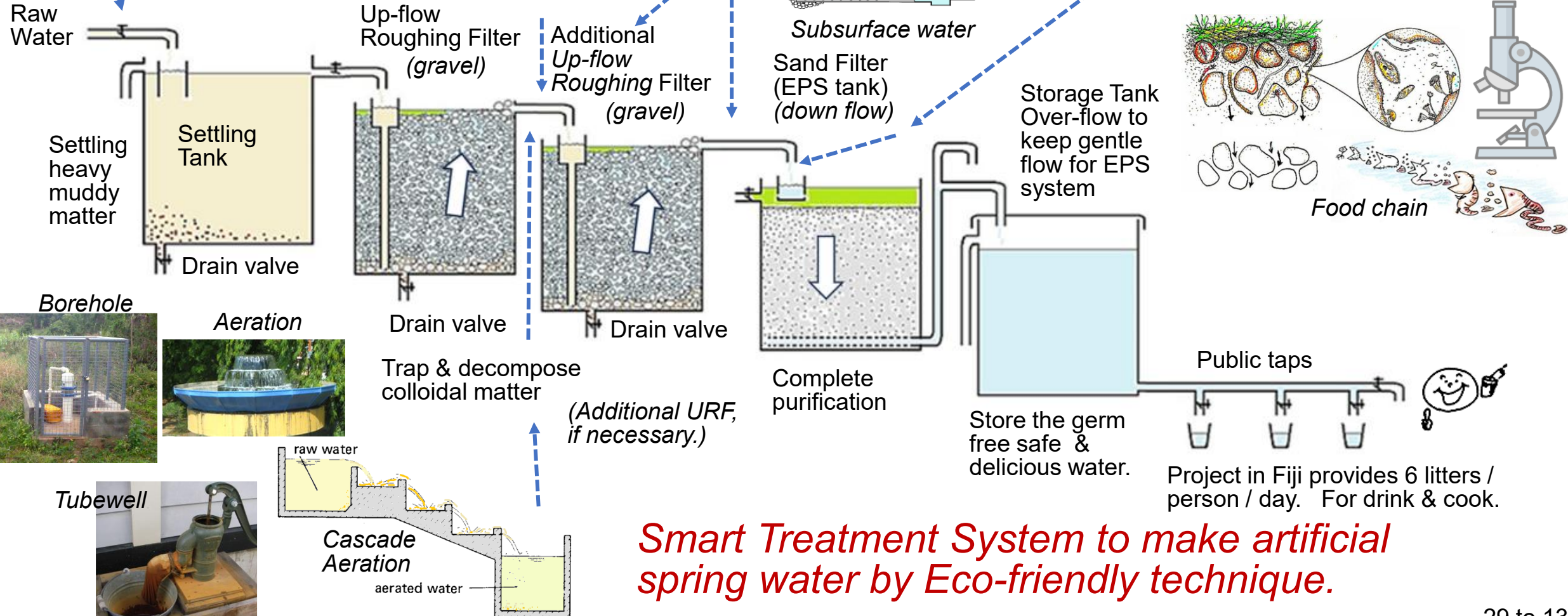
Surface stream



Reservoir

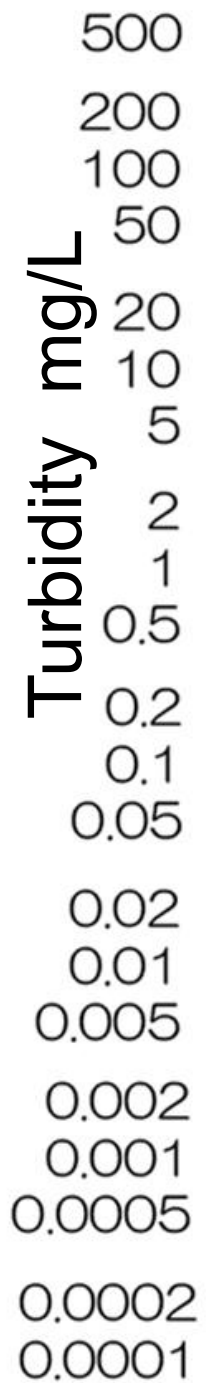


Clean spring water



**Smart Treatment System to make artificial spring water by Eco-friendly technique.**

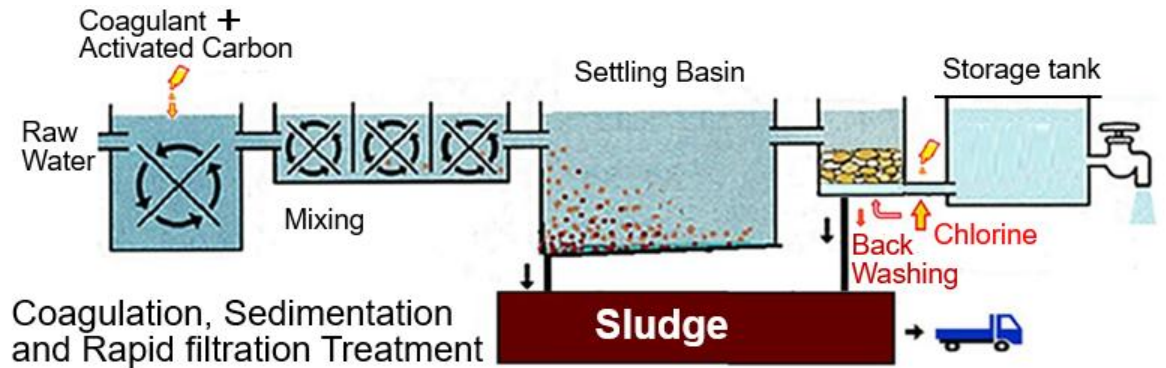
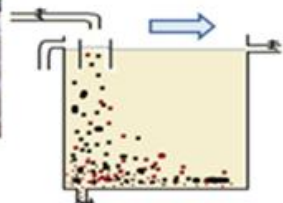
Turbidity mg/L



Storm event



Major turbid matter in mountain stream is easily set within several hours.



Coagulant + Chlorine  
Rapid Sand Filter

SS passes by  
backwash.

2 degrees  
Jap. standard

After Crypto  
outbreak.

Recommended  
to 0.1 degrees



Chlorination  
is essential.



This is a  
commercial  
filter.



Purified  
by small  
organisms

Natural  
spring



Super clean  
and delicious.



Artificial Natural spring water



EPS from Japan to the World

Wise Use of Natural Phenomena for Human Life. Safe and Delicious Water by EPS. Our Smart Technology.

This is Smart Applied Ecology for Human Life.



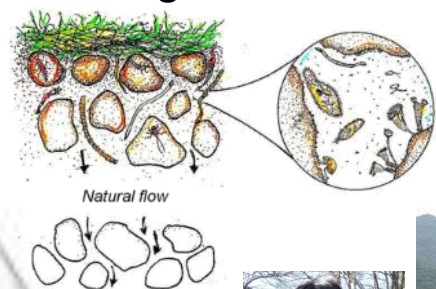
Nigeria



Super clean delicious water



Ecological Purification System



Gentle for small organisms

Food chain



Trust Our Sense !



Mechanism of EPS  
7 minutes

<https://www.youtube.com/watch?v=ArWM3PVY3GM>

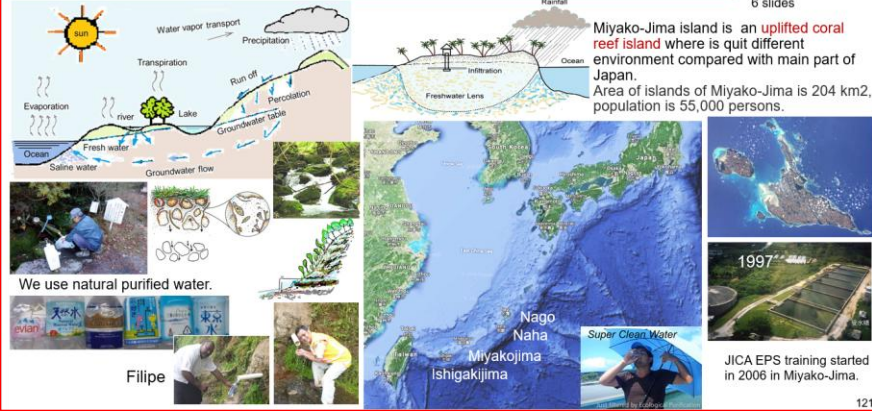
Remember Three Steps

1. Knowing is NOT enough. We must APPLY it to something useful.
2. Willingness is NOT enough. We must PUT it into the PLAN and ACTION.
3. Putting the PLAN into action is NOT enough. We must ACCOMPLISH the goals.

## JICA EPS Training started from Miyako-Jima, Okinawa. EPS is Wise Use of Natural Purification System.

**Part 13.**  
EPS 2025-OBW  
Nov. Part 13:121-126  
6 slides

Miyako-Jima island is an **uplifted coral reef island** where is quite different environment compared with main part of Japan.  
Area of islands of Miyako-Jima is 204 km<sup>2</sup>, population is 55,000 persons.



We use natural purified water.

Filipe

1997

JICA EPS training started in 2006 in Miyako-Jima.

121

[https://youtu.be/1mKg\\_P7DFIs](https://youtu.be/1mKg_P7DFIs)

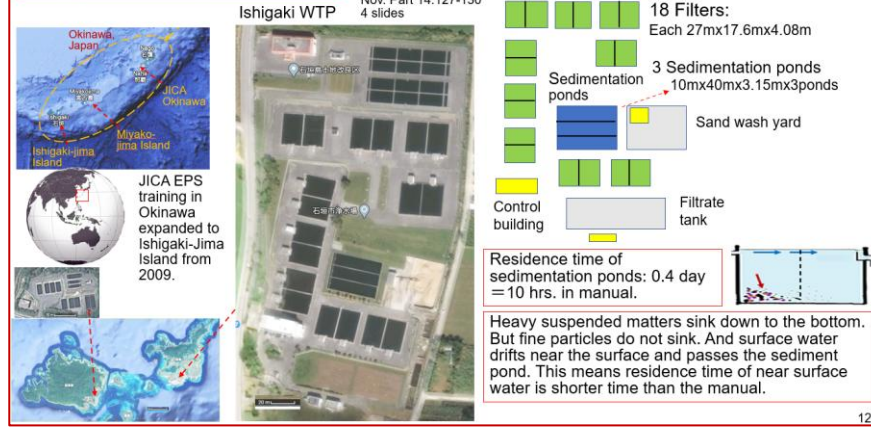


## EPS training in Ishigaki-Jima, Okinawa.

**Part 14.**  
EPS 2025-OBW  
Nov. Part 14:127-130  
4 slides

Ishigaki WTP

JICA EPS training in Okinawa expanded to Ishigaki-Jima Island from 2009.



4 Sedimentation ponds  
10.5mx65mx3.15mx4 ponds

18 Filters:  
Each 27mx17.6mx4.08m

3 Sedimentation ponds  
10mx40mx3.15mx3 ponds

Sand wash yard

Control building

Filtrate tank

Residence time of sedimentation ponds: 0.4 day  
= 10 hrs. in manual.

Heavy suspended matters sink down to the bottom. But fine particles do not sink. And surface water drifts near the surface and passes the sediment pond. This means residence time of near surface water is shorter time than the manual.

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<https://youtu.be/mph2NIHyswo>



## EPS is Wise Application of Natural Ecosystem. Key are Dissolved Oxygen and Gentle Flow.

**Part 15.**  
EPS 2025-OBW  
Nov. Part 15:131-139  
9 slides

Running water, but unexpected flush out by storm event  
When plants and animals do not flush out, water is always clear.

Vertical current is gentle for small animals on the surface of sand and soil particle.

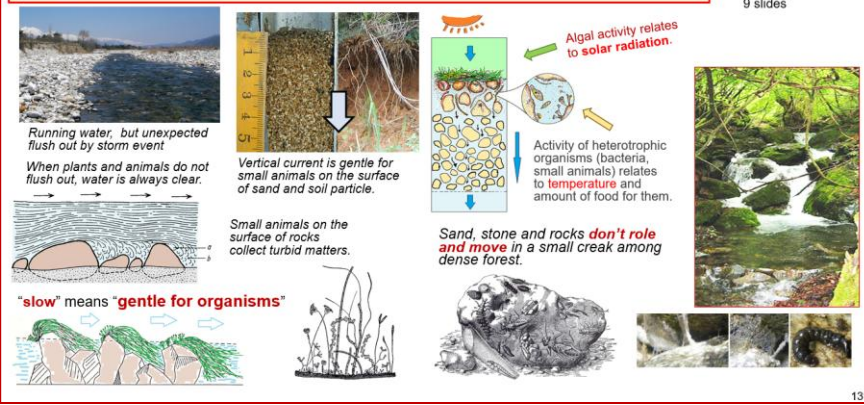
Small animals on the surface of rocks collect turbid matters.

"slow" means "gentle for organisms"

Algal activity relates to solar radiation.

Activity of heterotrophic organisms (bacteria, small animals) relates to temperature and amount of food for them.

Sand, stone and rocks **don't** role and move in a small creek among dense forest.



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<https://youtu.be/eORovvI89sk>