Water Bundle Workshop

Update

23RD GLOBE Annual Meeting

Detroit, USA

July 14-18, 2019

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Workshop Agenda

GLOBE Hydrology Protocols Overview (20 min)

a. Have you done some GLOBE hydrology measurements?

b. Why should we do GLOBE hydrology measurements in your area?

c. What kind of hydrology sites in your area? (e.g. lake, river, ocean)

d. Who is using the hydrology site, for what, where is the water come from, what are land cover types around the hydrology site?

e. GLOBE hydrology equipment (showing GLOBE hydrology equipment, Vernier, and Pasco probes)

f. GLOBE water bundle blogs, e.g. (lake, river, ocean, water cycle, water quality bundle blogs)

Workshop Agenda

Brain storming on what are hydrology problems that you are facing in your area? E.g. water pollution, water shortage, high nutrient influx, high sediments, decreasing in biodiversity, beach erosion, lake eutrophication and etc. (25 min)

- **Group work, select one hydrology problem per group**
- **Draw a map of your hydrology site, inlet and outlet**
- **What are the sources of problems**
- **How to fix the problems**
- **What are GLOBE hydrology, atmosphere, land cover and soil protocols that you might do in order to make you a better understanding about the site.**
- **Come up with possible solutions**
- **How to get the community to be involved fixing the hydrology problem you are facing.**

Workshop Agenda

Group presentation (30 min)

- 3 min per group
- Group presentation with flip chart
- Q & A (10 min)

Seeing hydrology as a part of Earth as a system. (15 min)

- Summarizing why we should do hydrology measurements along with atmosphere, soil and land cover protocols.
- Reflection from participants. They should share their ideas and learn from others.
- How participants would implement this in their local environment

GLOBE Hydrology Protocols

Nitrate

Alkalinity
Conduct
Salinity

Macroinv
mosquito

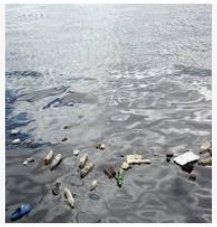
DO Temp
pH

what are hydrology problems that you are facing?

Water Pollution Facts, Types, Causes and Effects ...
nrdc.org


Water and Air Pollution - HISTORY
history.com


EWG Tap Water Database | Pollution Sources
ewg.org


Solutions to water pollution: h...
solarimpulse.com


Water Pollution Facts, Types, Causes and Effect...
nrdc.org


5 Ways You Might Be Contributing To Water Pol...
care2.com


Water Pollution Worries in Developing World | ...
ecomena.org


Solutions to water pollution: how to improve water q...
solarimpulse.com


Water Pollution Facts: What Are The Causes ...
conservationinstitute.org


Water pollution and types of water pollutants - Onli...
onlinebiologynotes.com

Water Pollution Facts to Share with Kids
filterbutler.com


The deadly effects of water pollution | South ...
southcoastherald.co.za


Water pollution is aggravating in Basra amid c...
thebaghdadpost.com

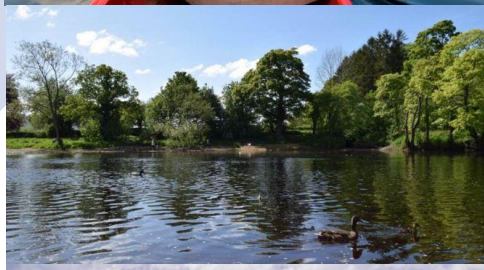

25 shocking facts about water pollution
surfertoday.com


Water Pollution - Highland Conservancy
highlandconservancy.net

SWG blogs: Protocol Bundles

Hydrology

- Ocean
- River & Lakes
- Water Quality
- Water Cycle



www.globe.gov/web/earth-systems

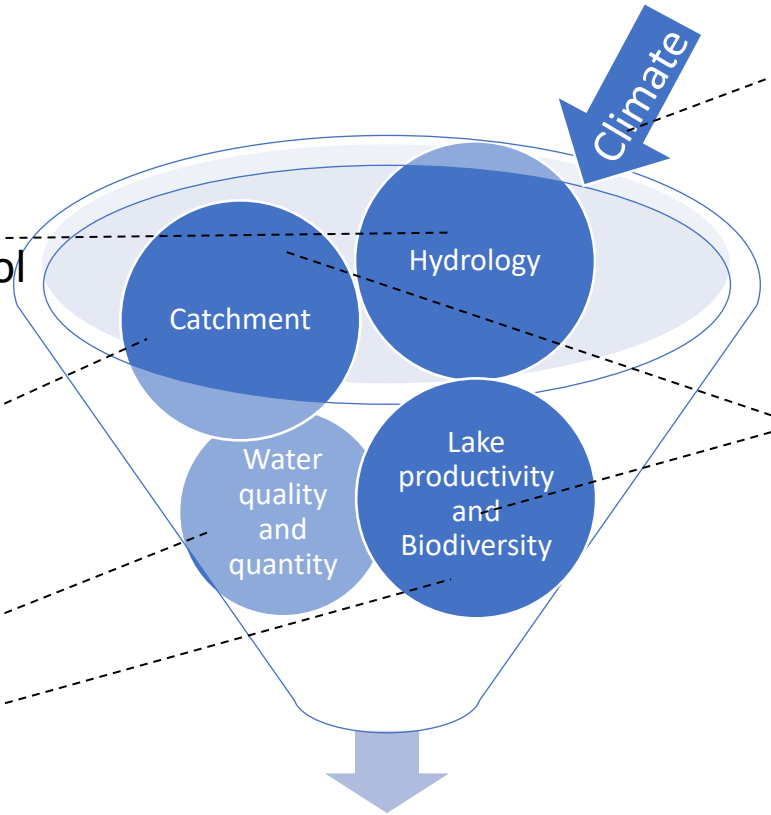
What is in the bundle blog?

- **Summary**
- **List of GLOBE Protocols**
- **Science Background**
- **Discussion of GLOBE Protocols**
- **Study Case Example, References**

Rivers and Lakes protocol bundle

Hydrology Protocol

- ✓ pH
- ✓ EC
- ✓ Transparency
- ✓ Temperature
- ✓ Salinity
- ✓ DO
- ✓ Nitrates



Atmosphere Protocol

- ✓ Air Temperature
- ✓ Relative Humidity
- ✓ Precipitation

Land cover Protocol (for River/Lake bank vegetation)

Target 6.6 of SDG 6

By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes

Ocean protocol bundle

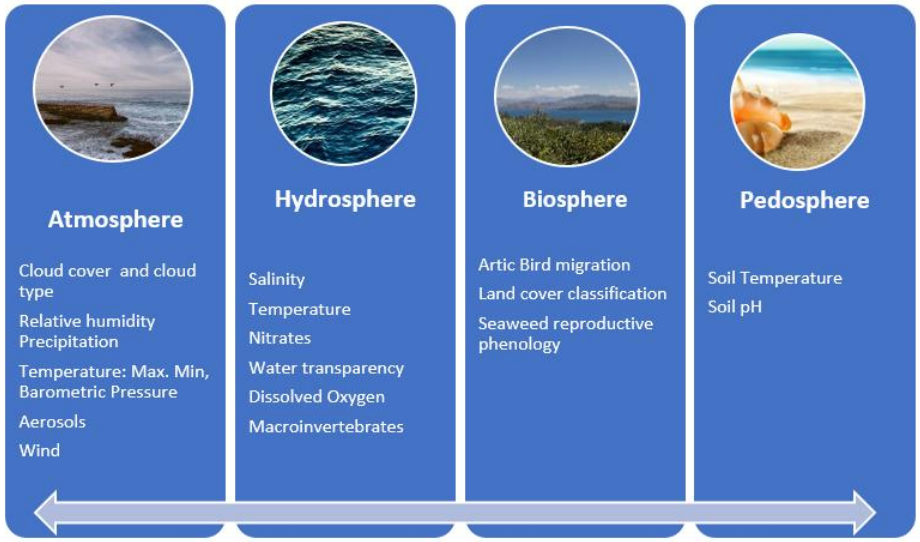


Figure 1. Protocols to be included in the Oceans Protocol Bundle.

Ocean systems are complex, interacts with other spheres

Two thirds of Earth's surface (70.9%) is covered by oceans (NOAA, 2018).

Oceans are a vast source of food and raw materials recreation, transportation, and other functions of importance for human well-being (Halpern et al. 2012).

Questions?

- How much does the surface temperature change in relation to the distance from shore?
- What are the most common cloud types close to the ocean?
- How is the land cover close to the coastline and how is it affected by the nearby ocean?
- What is the relation between turbidity and algae biomass?

Ocean bundling study case Title: Influence of environmental factors on marine benthic communities in a man-made mangrove in Pak Nakhon, Thailand

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School: Princess Chulabhorn Science High School Nakhon Si Tammarat
Teacher: Ms.Rawiwan Chinnawong and Mrs.Kanokrat Singnui

ABSTRACT

This study investigated environmental factors affecting the diversity of Marine benthic communities in man-made mangrove forest at Pak Nakhon, Thailand. The objectives were to study the species and numbers of Marine benthic animals in the study site and also to examine the relationship between environmental factors and numbers of Marine benthic animals. The samplings were collected from mangrove area that was divided into three zones according to the distance from the Pak Nakhon estuary. The parameters measured where benthos number and composition, air temperature, humidity, soil pH, moisture and temperature reflecting three GLOBE protocols namely biosphere, atmosphere and pedosphere. Results showed that among several environmental factors, soil temperature and moisture affect the number of benthos.

Keywords: Environmental factors, Relationship, Benthic community

Introduction

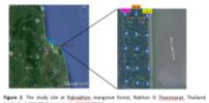
In general mangrove forest in the coastal area of Thailand has decreased since 1961. We found from the reports that due to the rehabilitation efforts, mangrove vegetation in Nakhon Si Thammarat province has improved substantially (Figure 1). The mangrove forests in Nakhon Si Tammarat are natural ones as restored by human management. Mangroves are the most important sources providing fish, shrimp, etc for human consumption. Taken that marine benthic animals are sensitive or tolerant to changing environmental conditions, they are considered biological indicators for any change in environmental condition.

Research question: What are the environmental factors that affect benthic communities in the restoration mangrove?

Hypothesis: Most environmental factors may strongly influence the benthic population and diversity

Materials and methods:

Study site: The study site was located at Paknakhon mangrove forest, Nakhon Si Thammarat, southern Thailand. Lattitude 8.482100 N, Longtitude 100.057800 E (Figure 2).



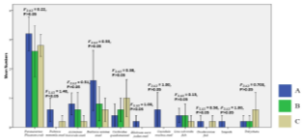
GLOBE protocols used: Biosphere, Atmosphere and Pedosphere

Parameters measured: Atmospheric temperature and humidity. Soil pH, moisture and temperature. Marine benthos (number and composition)

Data Collection: We collected sample from the study site which was divided into three zones according to the distance from the Pak Nakhon estuary. Five samples were collected in each zone

Results

The mean number of different species of Marine benthos is presented in Figure 3 for the three zones under investigation. The relationship between soil (pH, moisture, temperature), Relative humidity, and air temperature and the benthic population are presented in Table 1.



Benthos number and Temperature	Benthos number and Soil temperature	Benthos number and Soil pH
R = - 0.198	R = 0.611	R = -0.147
P = 0.478	***P* = 0.015**	*P* = 0.601
N = 15	N = 15	N = 15

Discussion:

Results on the biodiversity of benthic communities at the mangrove sites, showed that the numbers of benthos are dependent on soil temperature and soil moisture. Benthos and soil moisture are positively correlated ($P<0.05$), whereas benthos and soil temperature are negative correlated ($P<0.05$). The presence and distribution of Marine benthic species depends on the tolerance to the habitat (Suzuki et al., 2002).

Conclusion:

Among several environmental factors soil temperature and moisture affect the numbers of benthos.

References

Suzuki T., M. Nishihira and N. Paphavasit. 2002. Size structure and distribution of Ovassiminea brevicula (Gastropoda) in a Thai mangrove swamp. Wetlands Ecol. Manage. 10 (3): 265–271.

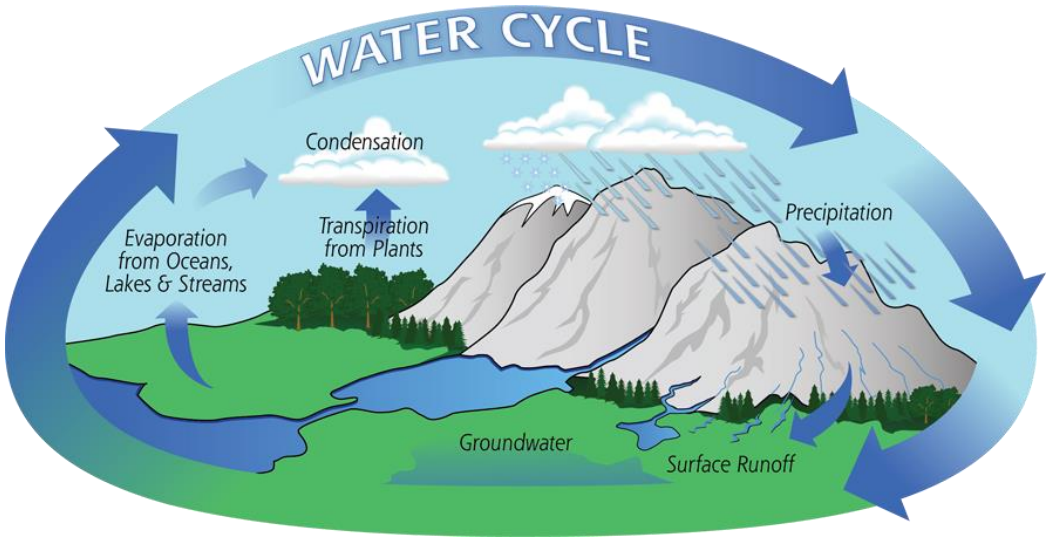
Water Cycle

Protocols

Atmosphere
- Precipitation
- Relative Humidity
- Surface Temperature

Hydrosphere
- Water Temperature

Pedosphere
- Soil Moisture
- SMAP Soil Moisture



Possible Research Questions

1. How does the water cycle change with seasons throughout the year where you live?
2. Where is there more water stored (e.g., clouds, lakes, soils) where you live? Does this change during the year?

Water Quality Bundle

Protocols

- **Precipitation and Precipitation pH**
- **Soil pH**
- **Water pH**
- **Alkalinity**
- **Salinity or Conductivity**
- **Dissolved Oxygen**
- **Nitrates**
- **Water Transparency**
- **Water Temperature**
- **Freshwater Macroinvertebrates**

Guiding Questions

- What is the quality of the water in my environment?
  - Is my water safe to drink?
  - Is my water safe to swim or bathe in?
  - Is my water safe to water crops and plants?
- What impacts does water- both above and below ground- have on our environment?
  - If we have a large rain event, will it flood?
  - Can we grow crops in our soil now?
  - Is my area prone to erosion and landslides?
- How does water quality impact living organisms?
- What types of macroinvertebrates in the water body? How has water quality been affected by human activities?

Group presentation

(30 min)

- 3 min per group
- Group presentation with flip chart
- Q & A (10 min)

Hydrology as a part of Earth as a system

(15 min)

- Summarizing why we should do hydrology measurements along with atmosphere, soil and land cover protocols.
- Reflection from participants. They should share their ideas and learn from others.
- How participants would implement this in their local environment