MODULE 12 - RESERVOIR ECOSYSTEM (PART-2)

OBJECTIVES

After seeing this program students will be able to understand:

1. Productivity of Reservoir.

2. Biotic Community in Reservoir.

3. Water quality of Reservoir.

4. Precautions regarding Reservoirs.

SUMMARY

Reservoirs are useful in several ways but often pose great hazards as well. Knowing the ecological framework of a reservoir helps in judicial construction and use of the same. There are mainly 3 phases of reservoir development or fertility levels – i.e. initial fertility, trophic depression and final fertility. The physicochemical characteristics, metamorphic forms and location of reservoir have a marked impact on the ecosystem that develops their by influencing the productivity of the resource. Temperature and light penetration has their own role to play as different communities develop and start thriving in the manmade ecosystem.

TRANSCRIPTION

Reservoir Ecosystem

Reservoir Productivity Factory

In this first of program we have seen how important the reservoir are, we have also seen stages of its fertility namely

1. Initial fertility.
2. Profit and depression.
3. Final fertility.

In this part of program we shell dealt with the aspect of reservoir productivity and we shall dealt deep into ecosystem to get familiar with biotic community living down there.

The productivity of reservoir depends upon various physical and chemical and metamorphic character like the shape and size of reservoir for example deeper

reservoir are seem to develop bloom green algae as soon as they are impounded, such blooms are usually maintain round the gap. Shallow reservoirs are usually to give production of plankton.
The location of a reservoir is an important factor which contributes to the productivity for example a reservoir situated near Gravity and Gneisses rocks are found to have high phosphorus, nitrogen and organic carbon content in its sediments there by contributing to high productivity.

Water Quality Factor
Some other factors in reservoir productivity are water PH, bound carbon dioxide as carbonate, total alkalinity, calcium, free carbon dioxide.
These factors show depth wise variations.
Surface water often develop high PH value due to photosynthesis while water below the zone of the effective live penetration show low PH value. In soft water reservoir least productivity is meet with at PH value range of 3 to 6. Bound CO2 as carbonate less than9 to 10 ppm i.e. part per million, total alkalinity up to 20 ppm and calcium content of 10 ppm.
In medium water reservoir highest productivity is medium at PH 7. Bound CO2 as carbonate at 30 to 35 ppm, total alkalinity at 20 to 90 ppm and Ca content 10 to 25 ppm.
In hard water reservoir highest productivity meet with at PH 8.5 upwards, bound CO2 as carbonate at 35-40 ppm and reaching up to 200 ppm, Ca content great than 25 ppm.

Temperature Factor
Temperature is an important factor causing thermal stratification in reservoir. In temperate region reservoir often develop thermo cline with the formation of epilimnion or the upper warm circulating water. Metalimnion or the middle layer and the hypolimnion the lower colder non circulation layer of water. High penetration causes the formation of littoral, limnetic and aphotic zone in reservoir. Littoral zone is the shallow water region with light penetration to the bottom typically rooted plant.
Limnetic zone is the open water zone to the depth of effective light penetration or compensation level i.e., level at which photosynthesis just balances respiration. The community is this zone is composed of plankton, nektons and sometimes neuston, this zone is absent is small shallow reservoir. The aphotic zone is the bottom deep water area which beyond depth effective live penetration.

Biotic Community
The biotic community in the reservoir consists of the producer and consumers in the various zones. In the littoral zone producers are of two types, the rooted or bentic plants belonging to spermatophyte like typha and limphia and phytoplankton comprising mostly of algae like basilliracy and chlorophya and synophata.

The consumers in this zone are of 3 categories. The primary consumers consisting mainly of herbivorous form feeling exclusively on floating submerged or rooted vegetation like snails of the geneous limina, zooplankton species like typhnia and symocephalous and amphibian vertebrates larvae like that of frogs and toads which are exclusively primary consumers.
Secondary consumers and species like dragon fly larvae and damselfly larvae which are exclusively carnivorous. These may be found resting or mooring on the bottom. The amphibian vertebrate like turtles, frogs and water snails are exclusively carnivorous.
The tertiary consumers like certain fish specially the cap fish and Chena fish species represent the end of food chain.
In the limnetic zone the producer consisting algae of three different groups chiefly the dino flagellates, euglenidea and volvocidea and algae like green flagellates.
The primary consumers are fresh water species of fish. In the profoundal or aphotic zone the datratic consumers and secondary consumers are met with the consumers forms the major community consisting of bacteria and fungi. The secondary consumers consisting of blood worm that is hemoglobin containing organism like chironomus and chaoborus larvae.

Precautions to be taken

The gradual transformation from riverine to lacustine ecosystem give rise to intrinsic ecosystem which groups as a result of an artificial system.
Due to the reservoir are useful in several ways they may often posses' great hazards. For meeting his needs men goes to nay extent and thus he tents to often overlook the negative aspect of things whether construction of dams is concern often such steps are taken which may turn out to be great hazards for future i.e. often dams are built in earthquake zone areas while often large of fertile agriculture land are lost and large human population displaced. If we may take care that negative point are kept in mind that reservoir may remain the temple of modern India.
In this program thus we find in the reservoir a fascinating phenomenon quite like nature own healing powers that a river when suddenly stop on its way develop a completely different ecosystem effecting a gradual transformation frame lotic to lentic ecosystem.

GLOSSARY

1. Aphotic zone – Also called profundal zone of a lake lying below the light compensation depth. (where effective light penetration is nil)
2. Benthos / Benthic – Organic living on or in the bottom of a water body.
3. Biota – The flora and fauna of an area
4. Community – A naturally accusing group of organisms living in common environment.

5. Detritus – Dead organic matter, mainly of fallen leaves as leaf litter in forest / litter of dead organisms in lakes (the microbes decomposing detritus are called detrivores)
6. Ecology – The science of relationship between living organisms and their environment
7. Ecosystem – Ecological system formed by interaction of coating organisms and their environment. A group of interacting organisms along their environment
8. Hypolimnion – The zone of a lake or a reservoir etc where water does not circulate and temperature is low.
9. Intrinsic – Delicate, refined, inherent, essential.
10. Litter – Waste matter deposited on land or at the bottom of an aquatic body.
11. Lotic- Running water (river, stream)
12. Lentic water – Standing water (lake, pound, reservoir)
13. Limentic zone – Living in open water zone, a depth where effective light may penetrate
14. Lithoral zone – A shallow water region near sea-shore, lying between high and low tide levels. Also a shallow – water region in a lake or a pond
15. Metalimnion – The layer of water in a lake, pond or reservoir where temperature falls rapidly with depth.
16. Nekton – Organisms that swim in water
17. Neuston – Organisms that float or rest on the surface of water
18. Thermocline – The layer of water in a lake or reservoir (or thermal stratification zone) lying between epilimnion and hypolimnion. In this zone temperature decreases rapidly with increasing depth.
19. Tropihic level – The functional level occupied by an organism in any food chain.

FAQ'S

1. What is initial fertility?

A. It is the first stage of reservoir fertility when gradual imudation causes an initial surge of biota.

2. What is an impoundment?

A. A barrier built across a river or a stream to make reservoirs for use in various purposes like generation of hydel power, fishery, etc.

3. What is meant by biotic community?

A. It is the community of living organisms thriving in an ecosystem.

4. What is trophic depression?

A. It is a stage in reservoir fertility caused by gradual diminution of the rate of nutrient release.

5. How does trophic depression set in?
A. Trophic depression mainly sets in due to continuous sedimentation on the reservoir bed.

6. Name some agents that cause diminision of nutrients in a reservoir.
A. a) Aquatic vegetation
   b) Continuous sedimentation

7. What is final fertility?
A. A stage of fertility of a reservoir when accumulation of organic substances at the bottom of a reservoir helps in regaining fertility.

8. What is fertility of an ecosystem?
A. Presence of nutrients in an ecosystem that furnish growth of living organisms in an ecosystem.

9. What is metamorphic character of a reservoir?
A. Metamorphic character pertains to the type and composition of rock beds, shape and size of reservoirs etc.

10. What is pH?
A. Quantitative measure of the strength of the acidity or alkalinity of solution. It is defined as a negative common logarithm of the concentration of hydrogen ions (H+) in a solution.

11. What is productivity?
A. The rate of organic matter accumulation in living component of an ecosystem in unit time.

12. What is trophic level?
A. The functional level occupied by an organism in any food chain.

13. What is food chain?
A. A series of organisms arranged in a linear manner with repeated eating and being eaten.

14. List any three physiochemical characteristics of soft water reservoir.
A. a) pH value ranges between 3 to 6
   b) Bound CO_2 as carbonate in less than 9 to 10 ppm
   c) Total alkalinity in up to 20 ppm

15. What is ppm?

A. It is parts per million which is a unit of quantitative measurement of substances in a relative manner e.g. amount of salt in a solution.

16. What is the characteristic feature of a medium water reservoir?
A. The characteristic feature of a medium water reservoir is that highest productivity is met with at a neutral pH
(i.e. pH 7)

17. What is the characteristics feature of a hard water reservoir?
A. In hard water reservoir highest productivity is met with an alkaline pH of 8.5 upwards.

18. What is a thermocline?
A. A layer of water in a lake or reservoir lying between epilimnion and hypolimnion. In this layer of satisfaction temperature decrease is rapidly with increasing depth.

19. What is epilimnion?
A. Epilimnion is the warmer uppermost layer of water above the thermocline in a lake.

20. What is hypolimnion?
A. It is the layer of colder non-circulating water usually near the bottom of a lake or reservoir.

21. What is metalimnion?
A. This is a zone between epilimnion and hypolimnion where thermal satisfaction is highest developing into a thermocline or gradient of rapid decrease in temperature.

22. What are the 3 zones formed due to light penetration in a reservoir?
A. The 3 zones formed due to light penetration are –
a) Littoral
b) Limnetic
c) Aphotic

23. Which zone may also be called as the open water zone?
A. Limnetic zone.

24. Name 3 layers of thermal stratification in a reservoir.
A. Epilimnion; Metalimnion; Hypolimnion.

25. Which zone is absent in shallow reservoirs?
A. Limentic zone or the open water zone.

26. Name some nektons

A. Some nektons or organisms swimming in water are tadpoles, fisheries, etc.