

Aim: What are the steps involved in cultural eutrophication?

DO - the free, non-compound oxygen present in water

- an important parameter in assessing water quality (2-9 ppm for animal survival)

BOD - the amount of dissolved oxygen used by bacteria to decompose the organic matter in the water

- can be used as a measure of the degree of pollution

Steps in Cultural/Artificial Eutrophication

1. excess N and P enter waterways by runoff
2. nutrients promote plant growth, esp. algae
3. algal bloom occurs
4. algae die and are decomposed by bacteria
5. decomposition of algae increase BOD
6. there is a drop in DO (hypoxia = oxygen deficiency)
7. fish and other aquatic life forms die



Sources of Nitrogen and Phosphorus



1. runoff from chemically fertilized lawns, croplands, and golf courses
2. runoff of phosphate detergents
3. livestock manure runoff
4. urban sewage with fecal matter
5. aquaculture (fish farming) waste build up
6. burning fossil fuels → HNO_3 (nitric acid) → acid rain

Cultural/Artificial Eutrophication: Prevention and Remediation

1. land use control to reduce runoff (examples: commercial/residential zoning laws , limit land-clearing)
2. bans/limits on P in detergents
3. advanced wastewater treatment to filter sewage
4. skimming algae at formation
5. dredging (scooping up nutrient build-up)
6. aerating - to increase DO in water (expensive)

Cultural Eutrophication Review Questions

1. Which of the following would be a reactive way of dealing with cultural eutrophication?
 - (A) skimming and dredging waterways
 - (B) making stricter laws concerning land use
 - (C) making stricter regulations regarding the amount of phosphorus used in detergents
 - (D) planting vegetative barriers to reduce runoff from farmland
 - (E) improving wastewater treatment to remove more organic wastes from urban sewage

2. Which of the following are sources of nutrients that promote algal blooms?
 - I. fertilizers
 - II. detergents
 - III. animal wastes
 - (A) I, only
 - (B) I and II, only
 - (C) I and III, only
 - (D) II and III, only
 - (E) I, II, and III

3. Which of the following represents some of the steps that lead to cultural eutrophication in the order that they occur?
 - (A) runoff of fertilizer → algal bloom → increased dissolved oxygen → fish die
 - (B) decreased dissolved oxygen → algae dies → increase of bacteria → fish die
 - (C) runoff of fertilizer → algal bloom → algae die → decrease in dissolved oxygen → fish die
 - (D) increase of bacteria → decrease of dissolved oxygen → algae die → CO₂ increases → fish die
 - (E) runoff of fertilizer → algal die → bacteria die → fish die

4. Although it is not one of the major causes of eutrophication, some water environments, such as the Yellow Sea are affected by cultural eutrophication because of
 - (A) runoff of phosphate detergents
 - (B) acid rain
 - (C) oil spills
 - (D) thermal pollution from nearby factories
 - (E) agricultural runoff

5. As the number of bacteria in an aquatic system increase
 - (A) BOD and DO increase
 - (B) BOD and DO decrease
 - (C) BOD increases and DO decreases
 - (D) BOD decreases and DO increases
 - (E) BOD and DO remain unaffected

6. Chemical fertilizers affect nutrient cycles because they are rich in
 - (A) nitrogen and sulfur
 - (B) phosphorus and carbon
 - (C) sulfur and carbon
 - (D) phosphorus and nitrogen
 - (E) potassium and carbon dioxide

7. Fish farming is also known as
 - (A) aquaculture, which does not contribute to eutrophication
 - (B) aquaculture, which contributes to eutrophication
 - (C) hydroculture, which does not contribute to eutrophication
 - (D) hydroculture, which contributes to eutrophication
 - (E) none of the above

8. How is dredging organic material different from skimming?
 - (A) dredging is a proactive means of dealing with eutrophication, while skimming is reactive
 - (B) dredging is a reactive means of dealing with eutrophication, while skimming is proactive
 - (C) dredging requires the scooping of organic material from the bottom of an aquatic environment, while skimming deals with organic growth on the surface of an aquatic environment
 - (D) skimming requires the scooping of organic material from the bottom of an aquatic environment, while dredging deals with organic growth on the surface of an aquatic environment
 - (E) dredging is only performed in lakes, while skimming is only performed in bays and oceans

9. Aerating ponds and lakes is
 - (A) a proactive way of decreasing dissolved carbon dioxide in the water
 - (B) a reactive way of decreasing dissolved carbon dioxide in the water
 - (C) a proactive way of decreasing dissolved oxygen in the water
 - (D) a reactive way of increasing dissolved carbon dioxide in the water
 - (E) a proactive way of increasing dissolved oxygen in the water

10. Which of the following is not one of the steps in cultural eutrophication?
 - (A) algal blooms increase photosynthesis which depletes dissolved oxygen
 - (B) fish suffocate due to hypoxia (lack of oxygen)
 - (C) fertilizer runoff enters an aquatic ecosystem
 - (D) BOD by bacteria increases
 - (E) dissolved oxygen decreases as a result of an increased BOD by bacteria