



ESTUARY SUBJECT REVIEW

Fill-in-the-Blank

1. An _____ is a partially enclosed body of water and its adjacent habitats where saltwater from the ocean mixes with freshwater from rivers or streams.
2. Waters whose salt content is between that of freshwater and that of seawater are called _____.
3. Of the 32 largest cities in the world, 22 are located on _____.

WORD BANK

stenohaline

euryhaline

energy

pneumatophores

propagules

anaerobic

zoa

megalope

anthropogenic

storms

winter ice

anoxic

glaciers

high tides

bar built

barrier

delta

tectonic

smaller

unique

geology

estuary

brackish

estuaries

salinity

variable

tides

two

freshwater

nurseries

pollutants

habitat

fish

ecosystem services

ice age

decreases

lagoons

sediment

earthquakes

fjords

tidal creeks

pannes

mudflats

nutrients

watershed

SWMP

polluted

buffers

coastal elevation

coastal plain

halophytes

smooth cordgrass

mangrove

prop roots

salinity

dense

tidal range

isohalines

highest

mixing

salt wedge

slightly stratified

vertically-mixed

storms

peat

red mangrove

flooded

salinity

wrack

conversion

pollution

biomagnification

sediments

eutrophication

nutrient

pathogens

combined sewage

overflows

invasives

NERRS

increases

dissolved oxygen

photosynthesis

organic matter

turbidity

pH

chlorophyll

4. In the ocean the concentration of salts, or _____, averages about 35 parts per thousand.
5. The salinity of estuarine water is _____ from one day to the next.
6. _____ are a major influence on many estuaries.
7. Most areas of the earth experience _____ high and low tides each day.
8. Tides at broad mudflats might appear to be _____ than tides at the end of a long, narrow inlet.
9. Every estuary is _____.
10. Estuaries are typically classified based on how saltwater and freshwater mix in the estuary and on their _____.
11. Estuaries formed by rivers or streams entering massive lakes are called _____ estuaries.
12. Estuaries are often called _____ of the sea.
13. Estuaries filter out _____ from rivers and streams before they flow into the oceans.
14. Estuaries provide critical _____ for many birds, fish, amphibians, insects, and other wildlife.
15. Estuaries provide habitat for more than 75 percent of the _____ harvested in the United States.
16. _____ are fundamental life support processes upon which all organisms depend. [two words]
17. _____ is a spongy matrix of live roots, decomposing organic material, and soil that helps filter pollutants out of the water.

18. One reason that estuaries are so productive is that the water filtering through them brings in _____ from the surrounding watershed.
19. The entire land area that drains into a particular body of water, like a lake, river or estuary is called a drainage basin or _____.
20. Estuaries are some of the most fertile ecosystems on earth, yet they may also be one of the most _____.
21. Estuaries and their surrounding wetlands act as _____ that stabilize shorelines and protect coastal areas from floods, storm surges, and excessive erosion.
22. The _____ determines the rate of freshwater that flows into an estuary from rivers and streams. [two words]
23. _____ estuaries are formed when rising sea levels flood existing river valleys. [two words]
24. _____ estuaries are characterized by barrier beaches or islands that form parallel to the coastline and separate the estuary from the ocean. [two words]
25. _____ beaches and islands are formed by the accumulation of sand or sediments deposited by ocean waves.
26. A _____ is characterized by large flat fan-shaped deposits of sediment at the mouth of a river.
27. _____ estuaries are formed when the earth's tectonic plates run into or fold-up underneath each other.
28. _____ are steep-walled river valleys created by advancing glaciers that later became flooded with seawater as the glaciers retreated.
29. Most coastal plain estuaries in North America were formed at the end of the last _____. [two words]

30. A protected area of calm water between the coast and a barrier island is called a _____.
31. Bar-built estuaries and deltas both have large deposits of _____.
32. The first stage in the formation of a tectonic estuary typically occurs during _____.
33. _____ tend to have a moderately high input of freshwater, but very little inflow of seawater.
34. When a sill prevents deep waters in an estuary from mixing with deep waters of the sea, poor water exchange causes _____ (low oxygen) water to build up on the bottom of the estuary.
35. Estuaries with a sill are found in areas that were once covered with _____.
36. _____ create saltwater currents that move seawater into estuaries. [two words]
37. The daily mixing of freshwater and saltwater in estuaries leads to variable and dynamic chemical conditions, especially _____.
38. Because freshwater flowing into the estuary is less _____ than water from the ocean, it often floats on top of the heavier seawater.
39. The difference between the average low tide and the average high tide is the _____. [two words]
40. _____ are areas in water that have equal salt concentrations.
41. The shape of the isohalines indicates the amount of _____ that is occurring, and may provide clues about the estuary's geology.

42. _____ estuaries occur when a rapidly-flowing river discharges into the ocean where tidal currents are weak. [two words]
43. In _____ estuaries, saltwater and freshwater mix at all depths. [two words]
44. A _____ estuary occurs when river flow is low and tidally generated currents are moderate to strong. [two words]
45. Freshwater estuaries are driven by _____.
46. Salt marshes are a mosaic of snaking channels called _____.
47. Salt _____ are shallow depressions that contain very high concentrations of salt.
48. Burrowing organisms such as clams, mussels, oysters, fiddler crabs, sand shrimp, and blood worms are typical of _____.
49. Salt marshes are covered with salt-tolerant plants called _____.
50. _____ is one of the main components of peat and dominates the low marsh all the way up to the estuary's edge. [two words]
51. _____ trees grow at tropical and subtropical latitudes, and can grow in anoxic soils where slow moving waters allow fine sediments to accumulate.
52. Many mangals can be recognized by their dense tangle of _____ that make the trees appear to be standing on stilts above the water. [two words]
53. The _____ colonizes the seaward side of mangals. [two words]
54. The zones where white mangrove and buttonwood trees grow are almost never _____.

55. Plants and animals living in estuaries must be able to respond quickly to drastic changes in _____.
56. Plants and animals that can tolerate only slight changes in salinity are called _____.
57. Plants and animals that can tolerate a wide range of salinities are called _____.
58. It requires a lot of _____ to adapt to constantly changing salinities.
59. Many species of mangrove trees have aerial roots called _____ that take up oxygen from the air for the roots.
60. Mangrove seeds that begin growing while still attached to the parent plant are called _____.
61. During low tides, oysters close up their shells, stop feeding, and switch to _____ respiration.
62. Blue crab larvae called _____ require water with a salinity over 30 ppt for optimal development.
63. As they develop, blue crabs eventually return to the estuary as young crabs called _____.
64. _____ disturbances are caused by humans.
65. Large _____ are especially destructive to estuaries.
66. A common natural disturbance to estuaries in non-tropical regions is _____. [two words]
67. A natural disturbance in salt marshes caused by the burial of vegetation by rafts of dead floating plant material, is called _____.
68. The greatest human-caused threat to estuaries is their large-scale _____.

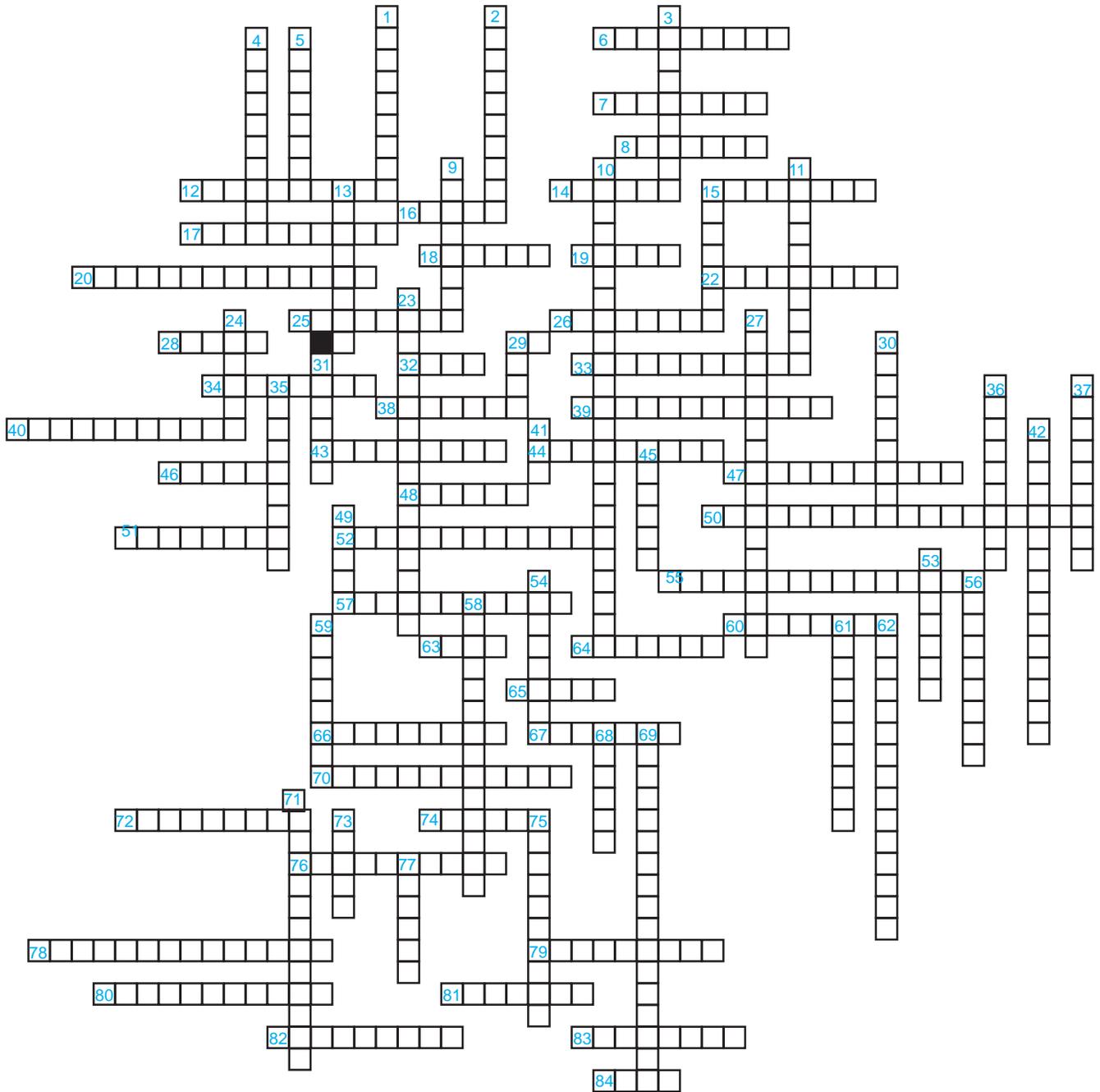
69. _____ is probably the most important threat to water quality in estuaries.
70. _____ is a process through which toxic substances can accumulate in the tissues of organisms that consume these substances.
71. Some toxic substances become attached to _____ that flow down rivers and get deposited in estuaries.
72. _____ is a type of pollution in which excess nutrients stimulate an explosive growth of algae which depletes the water of oxygen when the algae die and are eaten by bacteria.
73. _____ pollution is the single largest pollution problem affecting coastal waters of the United States.
74. _____ are disease-causing organisms.
75. In most estuaries, the largest contributor of bacteria and viruses is probably _____. [three words]
76. _____ are plants and animals that have found their way into areas outside their normal range.
77. Non-native species are often introduced to estuaries in the _____ water of ships.
78. _____ is a partnership program between NOAA and U.S. coastal states that protects more than one million acres of estuarine land and water.
79. The health of every National Estuary Reserve is continuously monitored by the _____.
80. As water temperature increases, the amount of oxygen that can dissolve in the water _____.
81. In estuaries, salinity levels are generally _____ near

- the mouth of a river where the ocean water enters.
82. The amount of oxygen that can dissolve in water _____ as salinity decreases.
83. The amount of _____ in an estuary's waters is the major factor that determines the type and abundance of organisms that can live there. [two words]
84. Oxygen enters the water through two natural processes: diffusion from the atmosphere, and _____.
85. Bacteria, fungi, and other decomposer organisms reduce DO levels in estuaries because they consume oxygen while breaking down _____. [two words]
86. _____ is related to the amount of sediment and other solids suspended in water.
87. The chemical components in seawater resist large changes to _____.
88. Scientists can determine the density of phytoplankton and the amount of primary productivity by measuring _____.



ESTUARY REVIEW

Crossword Puzzle



Across

6. As water temperature increases, the amount of oxygen that can dissolve in the water _____.
7. During low tides, oysters close up their shells, stop feeding, and switch to _____ respiration.
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Down

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49. _____ substances are chemicals and metals that can causing serious illness or death. They may be poisonous, carcinogenic (cancer-causing) or harmful in other ways to living things. Pesticides, automobile fluids like antifreeze, oil or grease, and metals such as mercury or lead have all been found to pollute estuaries. These substances can enter an estuary through industrial discharges, yard runoff, streets, agricultural lands, and storm drains.
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