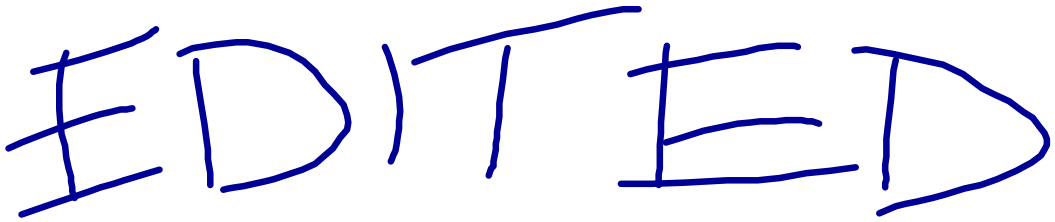
Passage 1 is adapted from Theodore S. Melis, Ed., "Effects of Three High-Flow Experiments on the Colorado River Ecosystem Downstream from Glen Canyon Dam, Arizona," published in 2011 by the U.S. Geological Survey. Passage 2 is adapted from Paul E. Grams, "A Sand Budget for Marble Canyon, Arizona—Implications for Long-Term Monitoring of Sand Storage**Passage 1**



At the time Glen Canyon Dam was constructed (1956–63), little consideration was given to how dam operations might affect downstream resources in Grand Canyon National Park. In fact, the dam was completed before enactment of the National Environmental Policy Act of 1969 and the Endangered Species Act of 1973. By the late 1950s, public values began to shift, and throughout the 1960s and 1970s recognition of the environmental consequences of Glen Canyon Dam and its operation grew. National Park Service and U.S. Geological Survey scientists and river recreationists observed the physical transformation of the river in Grand Canyon, including the loss of large beaches used for camping, narrowing of rapids so as to reduce navigability, and changes in the distribution and composition of riparian vegetation. The humpback chub and Colorado pikeminnow, species found only in the Colorado River Basin, were listed as endangered in 1967 by the U.S. Fish and Wildlife Service, which concluded in 1978 that the dam and its operation jeopardized the continued existence of humpback chub in Grand Canyon.

Annual spring snowmelt floods were the defining attribute of the pre-dam flow regime. Before the Colorado River was regulated by dams, streamflow gradually increased from mid-December to March, precipitously increased in April and May, and reached its peak in early June.

Pre-dam floods disturbed the aquatic ecosystem, and native fish species developed strategies to survive periods when the velocity in the main part of the channel was high and large amounts of suspended sediment were being transported. For example, several of the native fish species share unusual body shapes, including a large adult body size, small depressed skulls, large humps on their backs, and small eyes, which presumably developed as adaptations to life in a turbid and seasonably variable riverine environment. Sandbars, riverbanks, and their accompanying aquatic habitats were reshaped during floods. Additionally, the increased elevation of the river surface during floods provided water to native riparian vegetation otherwise principally dependent on precipitation.

Passage 2

Decline in the size and abundance of sandbars since the pre-Glen Canyon Dam era has been documented by analysis of old aerial and ground-level photographs and by topographic surveys that began in the mid-1970s. Scientists have estimated that sandbar area in the upstream 100 miles of Glen, Marble, and Grand Canyons was 25 percent less in 2000 than in average pre-dam years. This decline occurred because releases of water from Lake Powell are virtually free of sediment. The tributaries that enter the Colorado River downstream from the dam supply only a fraction of the pre-dam sand supply, and the capacity of the post-dam river to transport that sand greatly exceeds this limited supply. Normal dam operations, therefore, tend to erode, rather than build, sandbars.

By experimentation, scientists have learned that controlled floods, if released from the reservoir immediately following large inputs of sand from tributaries, can build sandbars. These sandbars are built during controlled floods when sand is carried from the riverbed and temporarily suspended at high concentration in the flow. The suspended sand is transported into eddies where it is then deposited in areas of low stream-flow velocity. Sandbars enlarged by this process provide larger camping beaches for river-rafting trips and create backwater habitats used by native fish. Newly deposited sandbars also provide areas for riparian vegetation to grow and are a source of windblown sand. Windblown sand carried upslope from sandbars helps to cover and potentially preserve some of the culturally significant archeological sites in Grand Canyon.

Scientists have also learned that controlled floods may erode sandbars if the concentration of suspended sand during a controlled flood is too low. The concentration of sand during a flood is directly proportional to the amount of the riverbed covered by sand and the size of that sand. Higher concentrations of suspended sand occur when the sand is relatively fine and large amounts of the riverbed are covered by sand. These findings are incorporated in the current

reservoir-release management strategy for Glen Canyon Dam, which involves releasing controlled floods— administratively referred to as High Flow Experiments (HFEs)—whenever the Paria River
90 has recently delivered large amounts of sand to the Colorado River. The magnitude and duration of the controlled floods is adjusted to transport just the amount of sand that has recently been delivered from the Paria River.

1. The author of Passage 1 most likely believes that the Glen Canyon Dam

- A. is a useful tool for managing scarce water resources.
- B. was built with a lack of foresight.
- C. has decimated native fish populations.
- D. has had a calming effect on the aquatic ecosystem.

2. Which choice provides the best evidence for the answer to the previous question?

- A. Lines 1-4 ("At the time…Park")
- B. Lines 17-23 ("The humpback…Canyon")
- C. Lines 24-25 ("Annual…regime")
- D. Lines 30-34 ("Pre-dam floods…transported")

3. The author of Passage 1 mentions scientists and river recreationists primarily to

- A. provide support for the idea that post-dam river looks drastically different.
- B. draw a contrast between scientific observations and casual observations of river conditions.
- C. emphasize the spirit of collaboration between the science community and the public in conservation efforts.
- D. prove that the Glen Canyon Dam has had a ruinous effect on the river.

4. Passage 1 suggests that the humpback chub

- A. is now extinct in the Grand Canyon.
- B. has a small, depressed skull.
- C. can survive in changing environments.
- D. thrives in high velocity river channels.

5. As used in line 25, "regime" most nearly means

- A. government.
- B. tenure.

- C. system.
- D. management.

6. As used in line 65, "suspended" most nearly means

- A. stopped.
- B. mixed.
- C. withheld.
- D. hanging.

7. It is reasonable to conclude that controlled floods

- A. successfully simulate pre-dam snowmelt floods.
- B. contain large amounts of suspended sediment.
- C. may be detrimental to the health of the Colorado River.
- D. should be done during the months that snowmelt floods typically occur.

8. Which choice provides the best evidence for the answer to the previous question?

- A. Lines 58-59 ("Normal…sandbars")
- B. Lines 66-68 ("The suspended…velocity")
- C. Lines 71-73 ("Newly…sand")
- D. Lines 77-79 ("Scientists…low")

9. The author of Passage 1 would most likely respond to the High Flow Experiments described in Passage 2 by

- A. appreciating the efforts of scientists to maintain the sand supply below the dam.
- B. warning of the calamity of interfering with the river ecosystem.
- C. questioning the ability of controlled floods to build up sandbars.
- D. worrying that reshaped habitats will harm native fish.

10. Which of the following best describes the structure of the two passages?

- A. Passage 1 introduces a problem, and Passage 2 proposes a solution to the problem.
- B. Passage 1 offers a historical discussion, and Passage 2 describes the implications of a scientific practice.
- C. Passage 1 gives background information, and Passage 2 details recent changes.
- D. Passage 1 describes an experiment, and Passage 2 offers suggestions for future action.

11. Which of the following statements is true of Passage 1, but not of Passage 2?

- A. The passage gives details of scientific studies conducted on the river.
- B. The passage offers documented evidence of topographic change in the river.
- C. The passage indicates the importance of floods to the river ecosystem.
- D. The passage gives specific examples of species affected by the dam.

Change," published in 2013 by the U.S. Geological Survey.

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