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Continuing Education Course #455
Culvert Design for Fish Passage

1. What are some of the adverse effects of culverts that act as barriers to fish passage?
- a. They can isolate sub-populations of fish.
- b. They can cause local extinction of some fish species.
- c. They can cause the loss of prey species for other wildlife.
- d. All of the above.

2. What are some of the ways that culverts can become obstacles to fish passage?
- a. Causing excessive water velocities.
- b. Providing adequate flow for a 100 year storm.
- c. Removing streamside vegetation.

3. When determining the effect of water velocity on fish passage, the engineer simply needs to calculate the average velocity within the culvert barrel.
- a. True.
- b. False.

4. Physical barriers, including weirs, baffles, and debris within the culvert barrel can be an obstacle to fish passage.
- a. True.
- b. False.

5. What is turbidity?
- a. A measure of the change in stream temperature.
- b. A measure of the degree to which water loses its transparency due to the presence of suspended solids.
- c. A measure of the water depth vs. the stream velocity.

6. Fish ladders can include which of the following features:
- a. Weirs.
- b. Gates.
- c. Orifices.
- d. All of the above.

7. What is the velocity over a 3 foot wide weir, with a flow of 6 CFS and a head of 9”?
- a. 3.98 FPS.
- b. 39.8 FPS.
- c. 2.45 FPS.
- d. There is not enough information given.

8. Fish ladders are considered to be able to allow for passage of all fish species and for all ages of fish.
- a. True.
- b. False.

9. What is one factor that can cause excessive turbulence in a culvert?
- a. Inlet contraction.
- b. Open-bottomed culverts.
- c. Fords.
- d. Box culverts.

10. Which methodology involves absolutely no impediment to fish passage?
- a. No impedance approach.
- b. Geomorphic simulation approach.
- c. Hydraulic simulation approach.
- d. Hydraulic design approach.

11. Using the geomorphic simulation approach will cause in increase in downstream channel velocities for all design storms.
- a. True.
- b. False.

12. Using the hydraulic design approach will only allow for passage of certain target species of fish during specific times in their life cycles.
- a. True.
- b. False.

13. What does active width of a channel refer to?
- a. The area in the channel where the fish are most active.
- b. The area of the channel where the velocities are highest.
- c. The area in the channel where the velocities are lowest.
- d. The width of the channel at its current or recent discharges.

14. Using the stream classification system developed by Montgomery & Buffington, what is the stream type that has a gradient of 1% with a gravel channel?
- a. Cascades.
- b. Step-pool.
- c. Pool-riffle.
- d. Dune-riffle.

15. What is the roughness value (n) of a concrete channel?
- a. Between 0.015 and 0.020.
- b. Between 0.15 and 0.20.
- c. 0.040.
- d. 0.075.

16. What is meant by particle entrainment?
- a. It means that particles are lifted into the streamflow.
- b. It means the particles are not lifted into the streamflow.

17. If possible, it is preferable for a roadway to intersect a stream at a right angle and to avoid skewed crossings.
- a. True.
- b. False.

18. Which of the following can be used to minimize the length of a stream crossing?
- a. Adding retaining walls or wingwalls at the upstream and downstream faces.
- b. Making the road embankment steeper.

○ c. Lowering the road elevation relative to the streambed.
○ d. All of the above.
○ e. None of the above.

19. The Oregon Department of Fish & Wildlife (ODFW) categorizes cobbles as particles of what size?
○ a. >13 feet.
○ b. Between 10 inches and 13 feet.
○ c. Between 0.1 and 2.5 inches.
○ d. Below 0.1 inches.
○ e. None of the above.

20. Which of the following is not one of the ODFW design strategies for providing for fish passage?
○ a. Remove or abandon the crossing.
○ b. Extend the length of the crossing.
○ c. Provide a ford instead of a culvert or a bridge.
○ d. Provide a culvert placed a t zero grade.

21. When are fords advisable to culverts or bridges?
○ a. On interstate highways.
○ b. When the traffic on the roadway is infrequent.
○ c. On roadways that are not subject to flooding.
○ d. Only in the southern states.

22. Countersinking a culvert means which of the following?
○ a. The inlet and outlet ends of the culvert are sunk into the streambed the same amount.
○ b. The inlet is sunk into the streambed to a greater degree than the outlet.
○ c. The outlet is sunk into the streambed to a greater degree than the inlet.

23. Culverts placed at zero grade are only applicable in what circumstances.
○ a. Steep, rocky streams.
○ b. Streams with a gradient of less than 2.5%.
○ c. Streams with a gradient between 5% and 10%.

24. The Hydraulic Design Approach is suitable for virtually all situations and is generally recommended as the first choice in designing a culvert for fish passage.
○ a. True.
○ b. False.

25. When designing a culvert for fish passage, it is always necessary to determine the applicable local, state, and federal regulations that pertain to the particular project.
○ a. True.
○ b. False.