NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

AQUATIC ORGANISM PASSAGE

(Mile)

CODE 396

DEFINITION

Modification or removal of barriers that restrict or impede movement aquatic organisms.

PURPOSE

Improve or provide passage for aquatic organisms.

CONDITIONS WHERE PRACTICE APPLIES

All aquatic habitats where barriers impede passage of aquatic organisms.

CRITERIA

Planning and Evaluation

Evaluate sites for variations in stage and discharge, tidal influence, hydraulics, geomorphic impacts, sediment transport and continuity, and organic debris movement. Design passage features to account for the known range of variation resulting from this evaluation.

Minimize any foreseeable channel plan or profile shifts resulting from the modification or removal of a passage barrier.

Plan and locate passage for compatibility with local site conditions and stream geomorphology to the extent possible.

Avoid locating fishway entrances and exits in areas that will obstruct function, increase harassment or predation, or result in excessive operation and maintenance requirements.

Design Requirements

Design passage to accommodate present and reasonably anticipated changes in watershed conditions.

Design passage structures according to known swimming and leaping capabilities of target species or a similar species with comparable swimming abilities. Utilize hydraulic computations to document how designs satisfy the physiological requirements of target organisms.

Design passage structures for hydraulic performance and structural integrity at the bankfull and 25-year peak flow events (at a minimum).

Design passage features to minimize or avoid energy deficits, physical stress, and harm to migratory organisms.

Design passage features to minimize or avoid excessive delays during migration periods.

Provide adequate attraction flow into a passage facility across the full range of discharge during which target species will move.

Use trash racks on culverts only if required or necessary. Ensure that trash racks are self-cleaning and/or easily maintained.

Select construction materials and methods that are non-toxic, minimize adverse consequences to aquatic organisms, and are resistant to degradation.

CONSIDERATIONS

Develop a quantitative method to identify and evaluate passage barriers (see References). Information derived from this method can assist planning and budgeting activities.

Consider removing a passage barrier before installing or retrofitting

a new facility or structure. Complete or partial barrier removal usually provides better passage conditions, and is more economical than designing, constructing, operating, and maintaining many passage structures.

Culverts or bottomless arches designed using stream simulation approach (USFS 2008) that incorporate natural streambed substrates throughout their length are preferred over other culvert configurations for passage purposes. Natural streambeds provide numerous passage and habitat benefits to many life stage requirements for fish and other aquatic organisms compared to man-made surfaces.

Design and locate features to improve or provide passage for as many different aquatic species and age classes as possible.

Retain as much riparian and streambank vegetation as possible during access and construction activities.

Where appropriate, consider removing access roads or trails and restoring native vegetation to the site.

Replacing or removing an existing in-stream structure may trigger channel adjustments (e.g., aggradation and/or degradation) upstream and/or downstream of the work site. Install grade controls or other slope modifications to mitigate adverse physical or ecological consequences using Oklahoma NRCS Channel Stabilization (584) or Grade Stabilization Structure (410) as appropriate.

Analyze any potentially negative interactions, including hybridization, disease, competition, or predation, between target and aquatic nuisance species when passage is provided above a barrier. If serious consequences are likely, take steps to minimize adverse effects.

Where possible, consider the habitat requirements of other aquatic or terrestrial species that may be affected by a passage project. Some passage facilities may improve survival for terrestrial vertebrates by providing safe migration routes under roadways.

Consider the amount of habitat upstream and downstream of a barrier to evaluate into project feasibility, cost effectiveness, and/or potential for connecting fragmented habitats. Using a watershed approach whenever possible provides a framework for project planning.

Fish passage facilities are often associated with water diversions or intakes that injure or kill aquatic species. Prevent entrapment of fish, particularly juveniles, in diversions, penstocks, or pumps by installing screens.

Fish passage projects can affect water management practices such as diversion, power generation, or storage. Strive to balance aquatic organism passage with other water management objectives.

Consider upstream and larger watershed issues that may affect passage. Common solutions may include maintaining or restoring adequate in-stream flow and/or other water quality parameters (e.g., temperature and dissolved oxygen).

Barrier removal, especially dams and road crossings, can significantly affect wetlands, flooding potential, existing infrastructure, and social and cultural practices. Evaluate and address the full range of impacts when planning or designing barrier removal projects.

Floodplain and water development often alter historic river channel patterns and locations. Consider by-passing a barrier by restoring streamflow to former, stable natural channels.

Passage facilities can assist population recovery and management. Where applicable, consider local, state, or federal brood stock collection and species management initiatives when planning passage features.

Consider using self-regulating tidegates in marine environments. These structures can be adjusted to automatically regulate saltwater intrusion into estuaries, and often improve estuarine functions and passage conditions.

In the case of low-water crossings, water quality impacts from vehicular pollutants and erosion caused by tire action can be severe. Where possible, re-route roadways or install hardened in-stream crossings.

PLANS AND SPECIFICATIONS

Provide site-specific plans for this practice. Plans will specify passage structure design, layout, and overall objectives, and include at a minimum:

- Location map and plan view of site.
- Detailed construction drawings showing site elevations (including headwater and tailwater fluctuations), description and analyses of design flows, and structural operating criteria.
- Construction specifications describing materials, logistics (including erosion control), and timing.
- Guidance for post-construction evaluation and monitoring to assess structural integrity and compliance with design criteria.

OPERATION AND MAINTENANCE

Develop an operation and maintenance plan for all applications of this standard. Within the plan, provide for periodic inspection and corrective action should passage conditions become impaired because a structure is damaged or inoperable. Typical operation and maintenance items include:

- Specify what entity is responsible for the daily operation and maintenance of a passage structure.
- Check a passage structure at regular intervals to ensure it is operating within design criteria.
- Clean trash racks and debris collectors or remove debris accumulations regularly.
- Adjust gates, orifices, valves, or other control devices as needed to regulate flow and maintain a passage structure within operating criteria.
- Periodically check staff gages or other flow metering devices for accuracy.
- Annually inspect passage structures for structural integrity and disrepair.
- Inspect gate and valve seals for damage.
- Replace worn or broken stop logs, baffles, fins, or other structural components.
- Remove sediment accumulations from within passage structure where applicable.

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