

**NATURAL RESOURCES CONSERVATION SERVICE  
CONSERVATION PRACTICE STANDARD**

**AQUATIC ORGANISM PASSAGE**

(Mi.)

**CODE 396**

**DEFINITION**

Modification or removal of barriers that restrict or impede movement of 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**

Passage will be planned for all aquatic, semi-aquatic, and terrestrial species that could potentially occur on-site, and that require aquatic habitats to move. Unless, an ecological reason exists to exclude a species or it is determined not practical or feasible to address all species needs.

Utilize a quantitative method to identify and evaluate passage barriers (see 396 Specifications). Information derived from this method will assist planning and budgeting activities.

Evaluate sites for variations in stage and discharge, 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.

Mitigate undesirable 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 or anticipated swimming and leaping capabilities. Consult a biologist (or experienced technical experts) for this assessment as needed. Utilize hydraulic computations to document how designs satisfy the physiological requirements of target organisms.

- If it is determined that species needs cannot be identified then design passage structures to mimic channel geometry and morphology referenced from an adjacent reach that provides passage or from an analog (model) reach.

At a minimum, design and evaluate passage structures for hydraulic performance and structural integrity at the bankfull and 25-year peak flow events.

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 trashracks on culverts or fishways only if required or necessary. Ensure that trashracks are self-cleaning and/or easily maintained.

Select construction materials that are non-toxic and resistant to degradation.

Plan construction logistics, methods, and sequencing to minimize adverse effects to aquatic organisms, riparian areas, and instream habitat.

## CONSIDERATIONS

Consider removing a passage barrier before installing or retrofitting a new facility or structure. Complete or partial barrier removal often provides better passage conditions, and is more economical than designing, constructing, operating, and maintaining many new passage structures.

Culverts or bottomless arches designed using the 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.

Retain as much riparian and streambank vegetation as possible during project access and construction activities to maintain shade, riparian continuity, and sources of nutrient and structural inputs for aquatic ecosystems. Where appropriate, consider removing access roads or trails and restoring native vegetation representative of the site.

Replacing or removing an existing instream 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 (see conservation practice standards Channel Stabilization – Code 584 and Grade Stabilization Structure – Code 410).

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.

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 through the use of additional floodplain relief culverts.

Assess 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 may injure or kill aquatic species. Prevent fish entrainment or impingement, particularly of juveniles, into diversions, penstocks, or pumps by installing screens.

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 instream flow and/or other water quality parameters (e.g., temperature, dissolved oxygen).

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

Floodplain and water development often alter historic river channel pattern and location. Consider bypassing a barrier by restoring streamflow to former, stable natural channels.

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

In the case of low-water crossings, water quality impacts from vehicular pollutants and erosion caused by tire action can be severe. Where possible, reroute roadways or install hardened instream crossings (see Stream Crossing, Code 578).

## PLANS AND SPECIFICATIONS

Site specific planning for this practice shall follow the Standard and Specifications, and be recorded using the appropriate, approved job sheet(s). Narrative statements in the conservation plan or other documentation may provide supplemental information.

In addition to conservation plan requirements, the plan shall identify and describe the:

- aquatic species potentially present, and the passage requirements of those species.
- baseline (pre-treatment) condition, including a quantitative assessment of any passage restrictions.
- structural implementation actions necessary to achieve the goals and objectives, including identification of NRCS engineering practices needed to remedy the passage barrier. Detailed construction designs (including elevations, profiles, cross-sections, etc.) will be provided through the associated engineering practices.
- management actions necessary to achieve the goals and objectives.

## OPERATION AND MAINTENANCE

The following actions shall be carried out to ensure that this practice functions as intended throughout its expected life. These actions include normal repetitive activities in the application and use of the practice (operation), and repair and upkeep of the practice (maintenance):

- Check the site at regular intervals to ensure that aquatic passage is provided as intended. Regular checks, especially during critical passage times, will help to ensure a quicker remedy to the barrier issue.
- Take immediate actions to correct any passage deficiencies.

Guidance for structural operation and maintenance will follow the engineering design criteria.

## REFERENCES

[Aquatic Nuisance Species Information](#). 2006. (per Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 [16 U.S.C. 4701]).

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