

Implementing AOP Enhancement Projects in Vermont

With the recent focus and funding availability for aquatic organism passage (AOP), a growing number of watershed and conservation organizations have expressed interest in identifying potential projects for AOP enhancement. This is not a simple task and will require a project manager who is able to effectively plan, communicate and coordinate various aspects of a project's development while addressing variety of municipal, state and local interests. The following is a brief overview of steps likely to be encountered in the identification and development of AOP enhancement projects based upon experience from past projects. Project funding is not included in this summary.

I. Watershed-Level Assessment – In some cases, a specific stream crossing may be identified based upon knowledge of local resource managers or others. In many cases, a target watershed is identified and a watershed-level assessment is used to narrow down the number of potential projects to those with the greatest potential ecological benefits:

1. Identify target watershed.
2. Identify target species (may be driven by potential funding) – *confer with regional VDFW Fisheries Biologist for information on species distributions within the watershed of interest.*
3. Conduct or utilize existing ANR culvert assessments within the target watershed . This information can be found:
 - On the ANR Natural Resource Atlas (<http://anrmaps.vermont.gov/websites/anra/>) a GIS mapping tool. Stream crossing assessments can be found by expanding the Fish and Wildlife layer and selecting “Stream Crossings”.
 - On the VDEC Stream Geomorphic Assessment website (<https://anrweb.vt.gov/DEC/SGA/Default.aspx>). Stream crossing assessment data can be exported into an excel or dBase format by selecting datasets...structures...export tables.
4. Use ANR culvert assessment data to identify projects with the greatest **potential** benefits using culvert inventory metrics:
 - a. If culvert replacement is an option – focus on AOP rank and habitat gain measures
 - b. If retrofit is only option – focus on AOP rank, retrofit potential and habitat gain measures.
 - c. Consider geomorphic compatibility rank when identifying potential projects.

II. Site Specific Assessment

Stream Crossing Structure Conditions – prior to moving ahead with a project design it will be important to have preliminary approval for the project in concept from the structure owner and have an understanding of the feasibility of the project.

1. Who is the structure owner? Town, state, private? Is the structure in good condition or is it likely to be repaired or replaced in the near future? Are there chronic maintenance problems that would make the structure a poor candidate for retrofit? Are there specific treatment options that would not be permitted by the structure owner? *Contact structure owner for information on culvert status, maintenance problems, etc, and to determine if a potential project would be considered. If it is a state structure, use the protocol developed by VTrans and VDFW to proceed with a potential AOP project (attached).*

2. Are there site specific constraints that would preclude construction of AOP enhancements (e.g. utility crossings, machinery access, etc.)?
3. Who are the adjacent, downstream or upstream landowners that will be affected by the project? Will they support the project in concept? Will you need their permission to access the structure for project implementation?

Aquatic Resource and Habitat Conditions – prior to moving ahead with a project design it will be necessary to know if the project will provide significant ecological benefits.

1. Will the project enhance populations of target species? *Contact VDFW Fisheries Biologist.*
 - a. Are target species present above or below the structure? Will the project benefit these populations? Do biological assessments indicate that the structure currently passes the target species?
 - b. Is the habitat quality (physical habitat, temperature and flow regime, water chemistry, etc.) above and below the structure adequate to support target species?
 - c. Are there undesirable aquatic species that would gain access to upstream reaches as a result of the project?
2. Are there undocumented barriers (e.g. natural falls, private dams or culverts) above or below the project that would compromise the benefits of the project?

III. Project Coordination – Once a specific project is selected it will be necessary to keep all parties informed of project plans and progress throughout the planning and design process. These parties include, but may not be limited to:

- Town officials (selectboard, road commissioner, transportation planner, conservation commission)
- Adjacent landowners
- Regional fisheries biologists
- State transportation officials and district managers (for state projects).
- Regulators (VDEC River Management Program Stream Alteration Engineers, Corps of Engineers)
- Funding organization

It is very important to keep concerned parties informed of project progress to avoid unnecessary delay or project failure.

IV. AOP Project Design – With the exception of very simple projects, engineering/environmental consultants with experience in fluvial geomorphology, hydrology and hydraulic engineering should be used to design AOP enhancement proposals. Without a proper analysis and design, projects may not meet AOP objectives and could compromise flood capacity of the structure and put public and private infrastructure at risk. A list of consulting contractors who attended the VDFW AOP Design Workshop is available on request.

Retrofit Project Design – a proper project design will provide an analysis of the existing and proposed conditions on:

- target species passage ability at a range of predetermined flows
- flood capacity of the structure at a range of desired flows

- flow elevations above and below the structure relative to private and public infrastructure

A retrofit design process will require a survey of the stream profile and cross section, geomorphic measures and structure profiles as described in Fish Xing software and other appropriate hydraulic models. The project engineer should use the survey data to complete analysis of the structure to evaluate fish passage potential (FishXing) and flood capacity. This process should include the use of design data forms from the Vermont AOP Design Guidelines (Vermont Fish Passage Design Data Checklist – Hydraulic and Low-Slope Designs) for the existing structure, and a description target species. This document should also be used to identify biological criteria and the range of passage flows for target species. All references used should be listed in the engineering report.

Based on the above analysis the project engineer should provide a brief written description of the recommended retrofit design(s). The design options descriptions should include supporting data from the physical, hydraulic and biological analysis and a summary of why the option is or is not recommended.

Culvert Replacement Project Design – The first step in this process should be to contact the regional River Management Program Stream Alteration Engineer for information on proper sizing, project design requirements, required permits and potential conditions for the project design.

Examples of completed project designs are available upon request.

V. Permits

Below are the more common permits that may be required for an AOP enhancement project at a stream crossing. Local permits may be required in certain towns. In addition, archeological assessments may be required by certain permits or funding sources. In some cases, no permits may be required. It is best to find out if your project will be subject to one or more of these permits as early as possible and to make contact with appropriate agency. As a first step, the regional Stream Alteration Engineer should be contacted for information on required permits and potential conditions or adjustments to the project design (http://dec.vermont.gov/sites/dec/files/wsm/rivers/docs/RME_districts_12.14.pdf).

U.S. Army Corps of Engineers, Vermont General Permit. www.nae.usace.army.mil/

10 V.S.A. Chapter 41. Stream Alteration Permit.

http://dec.vermont.gov/sites/dec/files/wsm/rivers/docs/2014_04_10_Stream_Alteration_GP.pdf

10 V.S.A. Chapter 151. State and Land Use Development Plans (for projects under Act 250 jurisdiction). www.nrb.state.vt.us/lup/index.htm

VI. Project Implementation – It is desirable to hire a contractor who has experience working in streams. VDEC Stream Alteration Engineers and River Scientists, VDFW Fisheries Biologists or the project design consultant may have experience with contractors in your specific area and should be contacted for suggestions. The project design contractor (or equivalent) should be retained to oversee project construction, including:

- pre-construction assessment of access, material storage
- construction sequencing
- project schedule
- project design
- technical specifications of materials
- erosion and sediment control
- streambank restoration and revegetation
- permit compliance
- project evaluation and repair

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Aquatic Organism Passage Project Contacts:

VDEC River Management Program Stream Alteration Engineers:

http://dec.vermont.gov/sites/dec/files/wsm/rivers/docs/RME_districts_12.14.pdf

VDEC River Management Program River Scientists:

http://dec.vermont.gov/sites/dec/files/wsm/rivers/docs/rv_River_Scientist_Regions_Jan2016.pdf

VDFW Fisheries Biologists:

<http://www.vtfishandwildlife.com/common/pages/DisplayFile.aspx?itemId=247326>

For general information on AOP, AOP Design Guidelines, AOP Assessments, etc.:
Rich Kirn, VDFW Fisheries Biologist (rich.kirn@vermont.gov); 802-485-7566

Aquatic Organism Passage Project Resources:

Vermont Fish & Wildlife AOP Webpage – provides many of the links listed below.

http://www.vtfishandwildlife.com/about_us/fish_division/aquatic_organism_passage_at_road-stream_crossings/

The Vermont Stream Crossing Handbook - is a user friendly overview of stream/road crossing issues with links to additional technical assistance.

<http://www.vtfishandwildlife.com/common/pages/DisplayFile.aspx?itemId=111508>

Guidelines for the Design of Stream/Road Crossings for Passage of Aquatic Organisms in Vermont – is a technical document providing biological and engineering design guidance for new, replacement stream/road crossings and repairs.

<http://www.vtfishandwildlife.com/common/pages/DisplayFile.aspx?itemId=111510>

Aquatic Organism Passage Treatment Sketches – is a compilation of diagrams for common AOP design approaches which may be useful for developing project plans.

<http://www.vtfishandwildlife.com/common/pages/DisplayFile.aspx?itemId=111514>

The Vermont Culvert Aquatic Organism Screening Tool – describes the ANR culvert inventory measures and metrics used to identify potential AOP enhancement projects.

http://dec.vermont.gov/sites/dec/files/wsm/rivers/docs/rv_VTAOPScreeningTool.pdf

The Vermont Culvert Geomorphic Compatibility Screening Tool – describes the ANR culvert inventory measures and metrics used to identify stream crossing structures at risk for failure due to incompatibility with natural stream processes.

http://dec.vermont.gov/sites/dec/files/wsm/rivers/docs/rv_VTCulvertGCScreenTool.pdf

The Vermont Bridge and Culvert Assessment – describes the protocol for assessing stream crossing structures for AOP and geomorphic compatibility.

<http://dec.vermont.gov/sites/dec/files/wsm/rivers/docs/assessment-protocol-appendices/G-Appendix-G-09-Bridge-and-Culvert-Protocols.pdf>

Vermont Stream Geomorphic Assessment Protocols. Vermont Agency of Natural Resources. Provides protocols for stream measures required for AOP analysis and design.

<http://dec.vermont.gov/watershed/rivers/river-corridor-and-floodplain-protection/geomorphic-assessment>

FishXing. Software and Learning Systems for Fish Passage Through Culverts.

This comprehensive website provides technical presentations, case studies, software, reference library and links on fish passage and stream assessment.

www.stream.fs.fed.us/fishxing/

Stream Simulation: An Ecological Approach to Providing Passage for Aquatic Organisms at Road-Stream Crossings. U.S. Forest Service. 2009. A comprehensive design manual for AOP stream crossings.

www.stream.fs.fed.us/fishxing/aop_pdfs.html

Aquatic Organism Passage (AOP) Enhancement of State Structures and Culverts by Non-state Partners

VTrans is committed to working with non-government organizations, watershed groups, municipal officials and others interested in improving aquatic habitats. In some instances these groups are engaged in habitat restoration projects that affect state-owned bridges, culverts, and other infra-structure and property. The following information will assist these groups in achieving agency approval of these projects via the issuance of a VTrans 19 V.S.A. Section 1111 permit needed to gain access and work in VTrans-owned rights-of-way.

These projects do not involve agency funds and are not being conducted by or on behalf of VTrans to meet any project permitting requirements.

Applicants must address the following in order to receive final VTrans approval of their project:

- VTrans must not be restricted in future use of VTrans' infrastructure and property. The applicant must demonstrate, for example, that federal funding sources will not invoke future federal requirements of section 6(f) of the Land and Water Conservation Fund Act (16 U.S.C. §460/-4 et. seq.)
- The project will not have an adverse effect on the structural integrity of VTrans' infrastructure or compromise the structure's hydraulic adequacy
- The project will not require future maintenance and inspection commitments on the part of VTrans
- Any project right of way issues and/or environmental permitting are the responsibility of the applicant
- The project must not impede future VTrans' infrastructure inspection and maintenance activities
- Quality Assurance requirements must be followed when applicable

Project Review Process Steps:

1. Initial Contact and Project Facilitator: The applicant contacts the Planning Outreach and Community Affairs Division Environmental Policy Manager (802-828-5756) or the Program Development Division Environmental Director (802) 828-5265 to be assigned a project facilitator. The facilitator will assist the applicant in navigating the process outlined below. ***Applicants must have made initial contact and gained support for the project from the VT Department of Fish and Wildlife before contacting VTrans***
2. Preliminary Information Sharing: The applicant provides basic location information for the project including the route number, mile markers, structure type, location map and property boundaries to the following VTrans entities:
 - The appropriate Operations District Project Manager or District Tech (visit: http://vtransoperations.vermont.gov/maintenance_districts to determine the right VTrans regional district office) who will provide any known information on the condition, replacement plans, and or assessment reports for the bridge or culvert
 - The VTrans Structures Engineer (802) 828-2621 (for culverts greater than 6' diameter) who will provide any known information on the condition, replacement plans, and/or assessment reports
 - The Chief Roadway Engineer (802) 828-2664 (for culverts less than 6' diameter) who will provide any known information on the condition, replacement plans, and/or assessment reports

- The VTrans Hydraulics Engineer (802) 828-3987 to obtain a hydraulics assessment of the site including preliminary design flows and hydraulic adequacy
3. Section 1111 Pre-application Review: The applicant assembles the information obtained in the step above, refines the project concept and contacts the Chief of Utilities and Permits (802)828-5742. A permit application manager will be assigned to the project and an initial *project review meeting* will be scheduled. VTrans may recommend not proceeding with the project or may provide conditions to be addressed during the design process. Approval to move forward to develop a project design does not indicate final project approval.
 4. After the results of the initial project review meeting and any follow-up reports are provided to the applicant, *preliminary engineering plans and a summary of a pre and post construction hydraulic model (HEC-RAS, HY8 or similar model)* are prepared by the applicant and reviewed by VTrans through the internal procedures established by the Utilities and Permits Unit. An alternatives review may be required by VTrans for complex projects.
 5. Section 1111 Permit Review: Permit for the project issued or denied with conditions or justification as appropriate
 6. Construction Oversight: District personnel will inspect the project during construction and will be responsible for closing out the work authorized under the Section 1111 Permit.