Ohio Environmental Protection Agency

Guidance on Mitigation Options for Ephemeral Stream Impacts in ORC 6111.311 through 6111.316

Background

On April 6, 2022, the Ohio General Assembly passed House Bill 175 which changed several sections of Ohio Revised Code (ORC). The legislation changed the definition of" Waters of the State" in ORC 6111.01(H) to exclude ephemeral features that are not federally jurisdictional as determined by the US Army Corps of Engineers. For those ephemeral features that are federally jurisdictional, ORC 6111.311 through 6111.316 establishes the best management practices (BMPs), mitigation and restoration requirements, performance standards, and monitoring and reporting requirements that can be included in the issuance of Section 401 Water Quality Certifications. The legislation takes effect on July 21, 2022.

This guidance details the mitigation procedure and how certain stormwater practices can be used to mitigate impacted ephemeral streams.

Ephemeral Stream Impacts Requiring Mitigation

The mitigation options provided below only apply to a certain subset of ephemeral stream impacts. First, only streams that are classified as jurisdictional by the US Army Corp of Engineers are eligible. Second, only impacts above 3/100 acres (1,306 square feet) are required to provide mitigation, impacts below that threshold do not require mitigation. If the stream meets the above criteria, then mitigation may be required.

Calculating Required Mitigation

The required mitigation for impacts to ephemeral streams is based upon the width of the streamway and slope of the stream, where the streamway is the flood-prone area associated with a stream and is necessary to maintain geomorphically stable stream processes that support ecological functions. Therefore, the first step in calculating the area of mitigation required (A_{mit}) is by finding the area of the streamway as shown below:

1. Calculate the Area of the Streamway, $\mathbf{A_{SW} = 147 \times DA^{0.38} \times L_v}$ **(feet²)**

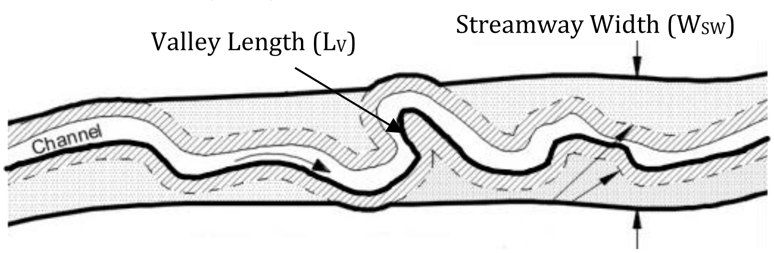
   Where:

   $A_{SW} = W_{SW} \times L_v$ (feet²)

   $W_{SW} = 147 \times (DA)^{0.38}$ (feet)

   L_V = valley length of stream (feet)

   DA = drainage area in square miles (determined via GIS or other acceptable method)



2. Calculate the area of mitigation required (A_{MIT}) using the appropriate formula below given the stream's average gradient or slope:

Stream slope	A_{MIT}
< 2percent	$A_{SW} \div 2$
>2 percent and < 4 percent	$A_{SW} \div 5$
>4 percent	$A_{SW} \div 8$

   Slope is determined by finding the rise over the run for the entire stream length on the development parcel.

3. Calculate the volume of mitigation required (V_{MIT}) using the following formula:

   $V_{MIT} = A_{MIT} \times 1$

The frequently flooded area adjacent to the stream of interest for the analysis of mitigation requirements is based upon the concept of the streamway *(Ward and Trimble, 2004; ODNR, 2006; Ward, et. al, 2008).* The bankfull width equation is derived from relationships for eastern U.S. streams (Dunne and Leopold, 1978) and data from Ohio streams (Sherwood and Huitger, 2005) as modified by the Ohio DNR Division of Soil and Water Conservation. Calculated bankfull widths are used in place of site-specific bankfull width measurements to standardize and simplify the calculation.[1]

[1] Site-specific measurements may be substituted for calculated measurements in instances where site geology or geomorphic conditions (i.e., entrenchment ratio and flood-prone area (Rosgen, 1996)) are different than the calculated value.

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Example Mitigation Calculation

A 20-acre site with streams within the area has 300 feet of federally jurisdictional ephemeral stream that is being planned to be permanently impacted or filled. This channel has a bankfull width of 6 feet, thus, 1,800 square feet of stream will be impacted (or 0.04 acres, which is over the 0.03-acre threshold). This ephemeral stream has a slope of 1 percent and a drainage area of 64 acres, or 0.1 square miles:

L_V = 300 feet
DA = 0.1 square miles
$W_{SW} = 147 \times (0.1)^{0.38} = 61.3$ feet
$A_{SW} = W_{SW} \times L_V = 61.3 \times 300 = 18{,}390$ square feet
$A_{MIT} = A_{SW} \div 2 = 18{,}390 \div 2 = 9{,}195$ square feet

Thus, the area of mitigation for filling impacts to this 300-foot section of federally jurisdictional, ephemeral stream with a 64-acre drainage area and a 1 percent slope is 9,195 square feet (0.21 acres).

Mitigation Options for Permanent Impacts to Ephemeral Streams

Once the area of mitigation is successfully calculated using the formulas above, one may select from the five following mitigation options provided in ORC 6111.313(B):

1. Provide an equivalent area of channel using a 1:1 ratio using the required A_{MIT} for the stream(s) being impacted. This new channel must be geomorphically stable and must be within the impacted 8-digit hydrologic unit code (HUC) watershed.
   - Using the above example of a low gradient stream, to mitigate for this impact, a new channel with a stable bed, bank, and plan form must be designed that has an area of at least 9,195 square feet. There are numerous designs that might be appropriate for this purpose such as those from the Natural Resource Conservation Service (National Engineering Handbook 654) or Ohio's Rainwater and Land Development (RLD) manual Appendix 7 (Planning for Streams) and Chapter 2.3 Grass Swale. In this case, a 1,150-foot long, low-gradient, shallow swale that is 8 feet wide and conveys flow at a non-erosive velocity by following the design standards provided in the RLD manual Chapter 2.3 would sufficiently mitigate for the impacted stream, as the channel area provided would be 9,200 square feet.
2. Provide bioretention that has a filter bed area at least as large as the A_{MIT} required. The bioretention must be designed as per the standards provided in the RLD manual.
   - As an example, if the 20-acre site in the previous example is to be developed into a medium-density, conservation development, residential subdivision with a total impervious area of 5 acres, bioretention could be utilized to manage the WQv and mitigate for the ephemeral stream impacts. To meet the design criteria in the RLD manual for post-construction WQv treatment and design standards in Chapter 2.9 Bioretention, three (3) separate bioretention cells with filter bed areas of approximately 3,500 square feet each will be necessary. The total area of bioretention provided (10,500 square feet) exceeds the required A_{MIT} of 9,125 square feet.
3. Provide an increased volume and surface area to a wet extended detention basin equal to the V_{MIT} required. The WQv shall be increased by the required V_{MIT} without increasing the maximum WQv discharge, but drawdown times may be increased proportionally. The additional required surface area may be in the form of a wetland shelf consistent with the design guidance from the RLD manual. Where no onsite post-construction stormwater detention is planned, surface water storage volume with slow discharge may be provided using the required V_{MIT} as the temporary storage volume.
   - As an example, if the post-construction WQv for the planned development of the 20-acre site in the previous example will be addressed with a wet extended detention basin having an 800-foot perimeter and 30,000 square feet of surface area, adding an aquatic bench along its perimeter that meets the criteria in RLD manual Chapter 2.6 could mitigate for the ephemeral stream impacts. Extending a 12-foot wide bench along the perimeter would add 9,600 square feet (800 ft × 12 ft) of wetland, thus exceeding the required A_{MIT} of 9,125 square feet. At a WQv detention depth of one foot, the bench would also provide an additional 9,600 cubic feet of detention volume exceeding the required V_{MIT} of 9,125 cubic feet. Note that the WQv outlet orifice remains at the original elevation and diameter, without adjustment for the added aquatic bench.
4. Provide an equivalent area of channel (1:1) using the A_{MIT} required by purchasing stream credits from an established mitigation bank or in-lieu fee (ILF) program for the stream(s) being impacted within the impacted 8-digit HUC watershed. Many mitigation banks and ILF programs offer stream credits using a linear accounting system instead of area, in which case the valley length of impacted stream should be used for determining 1:1

mitigation needs. If there are no mitigation bank or ILF credits with a service area that includes the impacted watershed, credits may be purchased from another provider.

5. Provide an equivalent area of channel (1:1) using the required A_{MIT} by contributing funds to the Ohio Department of Natural Resources for stream improvement activities to address acid mine drainage or other water quality impacts. This mitigation may occur outside of the 8-digit HUC watershed where the impacts will occur.

Restoration Requirements for Temporary Impacts to Ephemeral Streams

ORC 6111.311(G) defines "temporary impact" as an impact to an ephemeral stream where:

- it facilitates a proposed activity or aids in the access, staging, or development of any construction,
- it will not last more than two years, and
- upon termination of the impact, the conditions of the ephemeral stream are expected to return to pre-impact function or better within twelve months of such termination.

If the project involves temporary impacts to ephemeral streams, ORC 6111.313(B)(2) requires the following.

- Restoration of the ephemeral stream upon the completion of the temporary impact.
- Restore the flow regime to that of the pre-impact ephemeral flow regime or better.
- Restore the physical integrity of the ephemeral stream to pre-impact or better condition.
- Provide at least three high resolution color photographs taken of the restored stream. This should include one upstream, one downstream, and one closeup that clearly depicts the substrate composition for each restored ephemeral stream.
- Monitor the restored stream for two years following completion of restoration activities to ensure the stream is meeting the performance standards.

References

Ward, A.D., and S.W. Trimble (2004). Environmental Hydrology, Second Edition, Lewis Publishers, Boca Raton, FL, 462 pp.

ODNR, 2018 Rainwater and Land Development. https://epa.ohio.gov/divisions-and-offices/surface-water/guides-manuals/rainwater-and-land-development

Ward, A.D., J.L. D'Ambrosio, J.D. Witter, A.D. Jayakaran, and D. Mecklenburg (2008). Floodplains and setbacks. Agriculture and Natural Resources Fact Sheet AEX-455-02. The Ohio State University Extension, Columbus, OH. 7 pp.

Dunne, Thomas and Luna Leopold (1978). Water and Environmental Planning, W.H. Freeman and Company, 818 pp.

Sherwood, J.M., and Huitger, C.A., 2005, Bankfull Characteristics of Ohio Streams and Their Relation to Peak Stream-flows: U.S. Geological survey Scientific Investigation Report 2005-5153, 38 pp.

Rosgen, David, Applied River Morphology, 1996, Wildland Hydrology, Pagosa Springs, CO.

Contact

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