

## Chapter 8

### **CONSTRUCTION CONSIDERATIONS**

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***To ensure an effective project, the project designer should be on-site during construction!***

The Keystone Stream Team strongly recommends that a project designer or a person knowledgeable and accountable for the project be on-site during key construction periods. Experience in natural stream channel design is limited among construction contractors, so it's critical to provide direct oversight by someone who understands the project and has knowledge of the structures being installed. The key is to work with contractors so that experience and competency will grow in this evolving field. Where possible, encourage peer learning opportunities.

Communication between the designer, contractor, and landowners is critical to the success of the construction phase. Walk the site together and discuss access, local availability of rock materials, and use of fill. Ensure landowners that site will be adequately cleaned up after construction is completed. Satisfied landowners upstream may mean a greater acceptance by landowners downstream for future construction work.

#### **Pre-construction conferences**

A pre-construction meeting should be held on site to ensure that all aspects of the plan are understood by the contractor and construction crew. Include the designer, contractor, construction crew, construction inspector (if have one), landowner, conservation district, and agency representatives. Send notification of the pre-construction meeting to the Corps of Engineers.

Points to consider at the pre-construction meeting:

- recognize most sensitive areas of the site
- review sequence and schedule of implementing control measures
- review mechanisms for emergency response
- note any changes to the erosion & sediment control plan
- review any changes made to final copies of plans and permits
- reviewing right of entry agreements on private properties
- review any public utility locations and related concerns
- review the staging and transportation plan (consider access to project site in terms of landowner concerns and how to transport materials and equipment)
- review records and reports that will be needed to provide necessary documentation for progress on site

#### **Erosion and Sediment Control**

With any project, the goal is to minimize secondary erosion impacts associated with construction. Therefore, be sure to limit the time of disturbance to the stream and corridor.

The Erosion & Sediment Pollution Control Plan should include a written analysis of various alternatives explaining why work will be done in the stream or from its banks. *This narrative should be part of a permit application.* Reference the cost/benefit ratio to help justify approach if necessary. Analyses will vary across different physiographic regions of the state. Be sure to consider and include a “NO ACTION” alternative as part of your analysis.

If concerns exist with regard to sediment and turbidity during construction, use sediment and bedload sampling prior to construction and throughout the construction period. A study underway on Big Bear Creek by Dr. Mel Zimmerman of the Lycoming College Clean Water Institute is showing that benthic macroinvertebrates are returning four to eight-times their original numbers after the implementation of a natural stream channel design. The current phase is documenting turbidity and bedload data, and fish populations will be measured.

The Keystone Stream Team offers the following tips on controlling erosion and sedimentation during and after construction, selecting the best construction periods and locations, and choosing the right equipment:

**E&S Stabilization Tips:**

- All work should be done from the bank where possible. Minimize the amount of time and extent of disturbance in the channel as much as possible.
- Oftentimes, working from within the stream with excavating equipment is the most effective way to install structures such as rock vanes or cross rock vanes. Working from within a stream will also protect any riparian vegetation. Depending on stream size, it is more effective to allow equipment in the stream as needed and then retreat up the bank slope to properly key structures into the stream bank. Equipment should work from the side of the stream where in-stream structures are being installed. Avoid the installation of in-stream structures from opposing stream banks as soil may be pulled toward the channel.
- Stabilize all disturbed areas concurrently with restoration activities. Seed, mulch or geo-mulch with jute mat, and then add live stakes, plants, or seed. Seed and mulch/mat areas from bankfull to the water’s edge (active stream channel). The design will stabilize an active stream channel.
- Point bars should be stabilized by seeding rye grass (if fairly flat stream). If there’s a medium for growth, take the effort to re-seed area for added measure of stabilization.
- Depending on soil types, consider using erosion blankets especially on non-cohesive soils that are more prone to erosion. This practice is particularly useful along meanders.
- Avoid the use of silt fence along the immediate stream bank area during construction (it will be in the way and is not practical). The installation of

silt fence may also disturb the bank area during installation. In most situations where limited disturbance occurs, silt fence is not needed.

- Everything over design bankfull should be permanently stabilized.
- Consider the environment. Limitations will be different for Spring Creek and Letort Run compared to Codorus or Bentley creeks due to differences in geology.
- Consider requirements imposed by Special Protection status of some streams. Situations may require pumping or costly E&S controls in order to get projects permitted -- this may cause a project to never be completed.
- Collect pre/post construction information on turbidity and bank erosion.

### **When and where to construct?**

- Identify specific windows for construction.
  - In-channel construction activities should take place during low-flow periods.
  - Sometimes frozen ground is an asset for access to a stream.
  - With regard to fish spawning and stocked trout constraints, no work should be done in wild trout streams between 10/1 and 12/31; stocked trout streams between 3/1 and 6/15; Lake Erie tributaries between 9/1 and 4/30; and warm water streams between 4/15 and 6/15.
- It may be necessary to move equipment or work within the stream with minimal movement to avoid destroying sensitive riparian areas or mature forests. Streams can rejuvenate themselves faster than a riparian forest.
- Begin stream restoration work upstream and proceed downstream. The installation of in-stream structures will change flow patterns within the channel and, therefore, any required adjustments to restoration activities can be made downstream as needed.
- Using natural stream channel design and fluvial geomorphic principles, it is advantageous to construct in-stream structures with normal to low flow in the channel to observe the reaction of channel flow to the installed structure. Therefore, consider avoiding the use of coffer dams or the diversion of flow around the work area. Doing so will add to construction delays and increase project costs.
- For newly constructed channels or stream channel relocations, consideration should be given to constructing the new channel in dry conditions. The new channel can then be seeded and planted and allowed to become stabilized before water is diverted into the new channel. Construction of a new stream channel in dry conditions can be completed in a shorter time frame, and it's easier to navigate installation. The one disadvantage to this option is that flow conditions and the reaction of flow vectors to in-stream structures cannot be observed. This option may require adjustments to the channel and structures after water is diverted

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into the new channel. Soil removed from the newly excavated stream channel will need to be stockpiled and stabilized until the old channel is ready for backfilling. Upon completing channel construction, the abandoned channel may need to be at least partially backfilled (if it's hydraulically critical), vegetated, and stabilized.

- Abandoned mine reclamation projects: Impervious liner must be placed to prevent stream flow loss to abandoned underground mines or fill areas. It is essential to place the liner and construct the natural stream channel in the dry.
- Bankfull rain events truly test the design. Such storms can be beneficial from a design standpoint during construction. You can observe how the new stream channel functions during high flow events and modify construction techniques to improve the overall design.
- Wetlands within the limits of disturbance must be clearly identified on the drawings and flagged at the project site prior to start up. Disturbance of wetlands or other soft wet riparian area should be avoided.
- Avoid impacts to existing woody vegetation and their root masses along stream banks.
- Carefully select staging areas for equipment and materials. Stockpile an adequate amount of materials on site prior to construction to avoid project delays and additional hauling while under construction.
- Identify any soil disposal areas which may be required as a result of regrading steep bank slopes. Soil requiring disposal should be "feathered out" in thin layers (less than 3 inches) across the floodplain in the work area especially in pasture areas. This will not apply to wetland areas which should be avoided. This soil should be seeded concurrently with grading activities.
- When fording a stream, select areas with a stable bottom and where channel is not entrenched to minimize the amount of disturbance.

### **Choice of equipment**

- Match the size of construction equipment to the size of project and materials. Undersized equipment can mean staying in the stream longer and creating more of a disturbance, which can ultimately mean more time and money. Larger excavators can handle working from bank if mandated to do so. However, where useable, smaller equipment may disturb less area.
- Excavators with thumb attachment can greatly improve the handling of large material such as root wads and vane rocks. For wheel loaders, a four-yard bucket is best for moving large rocks.
- Ensure that the contractor has liability insurance.
- Encourage the use of biodegradable fluids in construction equipment.
- Prepare for and use the right equipment for wet conditions.
- Have a spill kit on site to handle accidental spills of hazardous materials.