7.2 Best Practices for Floodplain Restoration Projects

The original expert panel recognized the potential for unintended consequences and outlined a set of general environmental qualifying conditions for all stream restoration projects (USR EPR, 2014—excerpted in Appendix A). These general recommendations were designed to promote a watershed-based approach to screen restoration projects to improve their stream function and habitat.

While Group 4 concurs and reaffirms the prior expert panel recommendations, they concluded that future projects should apply a specific list of "best practices" to reduce the potential for un-intended environmental impacts. Further, the group agreed that best practices need to be applied over the entire project life-cycle – beginning with initial site assessment, project planning and design, construction, and operation over the lifetime for which the credit is generated.

Our current understanding of best practice is always evolving as new science sheds light on how aquatic ecosystems respond to restoration interventions along the stream and its floodplain. At this time, the group strongly recommends adoption of the following best practices for stream and floodplain restoration projects:

Best Practices During Project Planning and Design

1. Planners should evaluate options for combining stream and floodplain restoration with stormwater, forestry and agricultural BMPs in the contributing watershed area. It is generally accepted that individual stream and floodplain restoration projects are more effective when pollutant loads delivered from the contributing watershed also are reduced. The CBP has developed numerous BMP options that can be applied for pollutant reduction credit within contributing watershed areas:

    - Stormwater retrofits (of ponds, ditches and new practices)
    - Impervious cover disconnection or removal
    - Landscaping practices, such as rain gardens and conservation landscapes
    - Tree planting and reforestation projects
    - Urban nutrient plans for managed turf
    - Street and storm drain cleaning
    - Investigations at stormwater outfalls to trace pollutant discharges

2. Identify and remedy site-specific source(s) of impairment in the stream and floodplain (e.g. sedimentation, flow alterations and/or habitat degradation). Use both reference form and processes to assess impairment and provide the basis for restoration designs. Individual project designs should apply the restoration principles outlined by EPA (2000).
3. Follow guidance from the appropriate federal, state or local regulatory authority regarding assessment of existing high-quality habitat and ecosystem functions. The following are considerations that may be required:

- Assess existing habitat characteristics and functions across the project during project planning and design phases and compare with predicted post-construction conditions to evaluate uplift
- Conduct intensive surveys when high quality stream or wetland resources are identified within or immediately downstream of the project reach to assess potential impacts to these resources
- Avoid restoration projects at sites where aquatic assessment metrics indicate that the stream is currently in good or excellent condition.
- Avoid restoration projects at sites where floodplain or wetland metrics indicate that the current floodplain plant community is functioning well.
- Carefully survey existing forests minimize tree clearing during construction and identify individual trees that should be saved.

4. Give special consideration to protecting freshwater mussels and their host fish if they are present within or immediately downstream of the project reach. Common, rare, threatened and endangered species all deserve conservation consideration per the findings of Kreeger et al (2018). The site should be surveyed for mussels as soon as possible. Freshwater mussels can be inconspicuous and as such a thorough survey is important. Site designs should consider the presence of live mussels and avoid disturbances. It may be helpful to view their presence similar to infrastructure or wetlands (Blevins et al. 2019). Mussels represent one of the priority species of conservation in these ecosystems, and as such stream restoration designs which leads to known disturbance of these organisms would be counterproductive and inappropriate.

5. Ensure that all aquatic life (e.g. fish, eels, etc.) can safely pass through the project reach through careful design of instream structures. Passage may be accomplished by aquatic life moving through, over, or around instream structures.

6. Avoid designs that:

    - Create stagnant pools within the stream channel and long-term inundation or ponding across the floodplain width. Creation of vernal and temporary pools within the floodplain as a habitat feature is acceptable.
    - Rely on extensive bank armoring using rock or other fixed structures and disregard the maximum armoring limits adopted by Group 3 (2020).
    - Dewater perennial stream channels. Rather, irrigation curtains and other techniques can be used to maintain consistent baseflow conditions.

7. Clearly describe how the proposed project will affect local and downstream elevations of the 100-year floodplain, and conform to federal and state floodplain management requirements through appropriate H&H modeling.

8. Assess potential for toxics contamination in floodplains located within highly urban areas or brownfields and watersheds that have a history of potential

contamination through soil investigations. Avoid disturbing acidic soils if they are present at the project site.

Best Practices During Project Construction

1. Reduce the use of "iron-stone" rock or sand and other iron-rich construction materials when raising the streambed to avoid iron flocculation during anoxia.

2. Decrease the use of labile organic matter added to the stream bed (e.g., compost) to avoid mobilization of metals or phosphorus.

3. If required by the appropriate federal, state or local regulatory authority, minimize removal of mature trees in the existing riparian zone, as specified in the project's forest conservation plan.

4. Minimize disturbance caused by construction access and use appropriate equipment to reduce compaction of the stream's bed, banks and floodplain.

5. Work "in the dry" during project construction to reduce potential for downstream bed sedimentation or turbid discharges.

6. Recycle wood from any trees cleared during construction to introduce carbon sources and restore habitat features within the restoration project site.

Best Practices for Post Construction Phase

1. Verify that stream restoration projects continue to meet their performance objectives for hyporheic exchange and floodplain reconnection functions. Individual floodplain restoration projects should be inspected every five years using the visual indicators, numeric triggers and failure thresholds outlined by Group 1 (2019). Some of the key indicators for this class of projects focus on maintaining the:

    - Pre-restoration baseflow conditions in the stream channel
    - Intended bank heights along the project reach to achieve the desired frequency of floodplain reconnection
    - Desired density and species targets in the restored floodplain plant community.

2. Implement a vegetation management plan to maintain the post-restoration vegetation target for the banks and floodplain (including invasive species management). Also consider potential mosquito management needs if the project is in close proximity to residential or public access.

3. Allow for adjustment of structures that affect water elevations if they are responsible for unacceptable inundation or pooling over the surface of the

floodplain. If this is a concern, the inspection frequency may need to be increased.