Title

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Authors

Jorgensen, Kelley
Sikes, Jeremy
MacDonald, Anne
et al.

Publication Date

2005-08-29

What is "Natural?" Lessons Learned in Applying Context Sensitive Design to Stream Restoration And Mitigation Project Development

Kelley Jorgensen (Phone: 503-222-7200, Email: Kelley_Jorgensen@urscorp.com) **Jeremy Sikes** (Phone: 503-222-7200, Email: Jeremy_sikes@urscorp.com), and **Anne MacDonald** (Phone: 503-222-7200, Email: anne_macdonald@urscorp.com) URS Corporation, 111 SW Columbia, Suite 1500, Portland, OR 97201

Doug Sovern (Phone: 206-438-2318, Email: doug_sovern@urscorp.com), URS Corporation, 1501 4th Avenue, Suite 1400, Seattle, WA 98101

Abstract

Instream projects—whether for habitat enhancement, culvert and bridge replacements, mitigation for fisheries or aquatic habitat impacts, or bank protection—often occur in altered streams in altered watersheds. For this paper, we will use the term "enhancement" to include all forms of "restoration" and "rehabilitation." Infrastructure typically interrupts watershed geomorphic processes and places constraints from both physical and legal liability viewpoints. Stakeholders can bring constraints in the form of biased perceptions and interests. Raw materials that may have been historically available for habitat-forming features are likely greatly reduced or even wholly unavailable to the stream, especially lower in the watershed. As a result, these natural materials can be unavailable to sustain or construct enhancement projects, or conversely, may be available to excess. While we often recognize that watersheds are altered, we frequently do not apply that information in the context of individual project development and implementation. As a result, inappropriate project design results from a lack of consideration of the entire project context (both project and watershed scale) and from circumventing a detailed constraints analysis early in the process.

Practitioners often try to improve instream and riparian habitats with the goal of restoring "natural" functions without recognizing the larger context of the existing altered conditions in the watershed. This nearly ubiquitous state of alteration requires us to recognize that the altered state of urban, and even many wildland streams, is unlikely to support historic habitat functions without structural intervention. Elements that formed instream habitat in the undisturbed stream may not work or may require adaptation in the new urban or disturbed environment. If "natural" defines the undisturbed stream, the obvious question is how "non-natural" do our design options need to be in the new urban or disturbed environment?

Our interdisciplinary design team and project management approach mirrors most of what defines the Context Sensitive Design (CSD) approach. We find that CSD applies a balanced approach in order to maximize natural, self-sustaining, low-maintenance elements that provide more long-term habitat functions, while still realizing the immediate creation or enhancement of missing habitats to provide needed functions to keep imperiled species viable. We share a common goal to create successful, natural, and self-sustaining stream-enhancement project designs that contribute to species and ecosystem recovery. This approach is usually more acceptable to the regulatory and environmental community. We are able to apply the reliability and stability of engineered features that may best provide short-term habitat functions, while larger-scale natural processes are allowed to re-establish.

We have identified a list of project and watershed elements that define project context as it relates to CSD and stream enhancement projects. Project context goes beyond site-specific or watershed condition assessment to include:

- Regulatory drivers, expectations and requirements
- Temporal constraints and goals, (short-term and long-term functions and processes)
- Physical/spatial constraints and goals, including landowners and infrastructure
- Liability considerations
- Cost
- The scope and scale of multi-level planning processes and stakeholder involvement.

We will compare the risks and benefits of different project approaches (CSD versus traditional) relative to ecological processes and professional liability. We will discuss natural vs. engineered/non-natural adaptations and new components in terms of:

- Long-term vs. short-term habitat functions and processes
- Symptoms vs. root problems
- Techniques/methods/materials
- Perceptions of stakeholders applied to all of the above

We will present project case studies in the Lower Columbia and Willamette River basins in Washington State and Oregon. Some interesting differences will be noted that resulted from both applying CSD early on, versus applying CSD late in the design process. These projects will illustrate ways to identify and define the watershed and project

context, prioritize structural and non-structural project elements, and develop and choose from a toolbox that includes the maximum range of methods, techniques, materials, and approaches. We will address pre- and post-project monitoring as a critical (but often overlooked and underfunded) element in the successful adaptive management of dynamic resources. Finally, we will reaffirm the message that CSD has great applicability in the future development and prioritization of stream- and river-enhancement projects to improve the success of species and ecosystem recovery on a large scale.