Developing a Framework for Improving Biological Conditions In Modified Streams (Project 5.3)

Problem Statement

Data from the SMC regional stream monitoring program suggests that fully and partially engineered channels can have significantly lower bioassessment index scores as compared to natural streams. At the same time, the SMC data and other studies have observed high index scores in certain partially engineered channels, but it is unclear what sets the biological condition in some engineered channels apart from other engineered channels, and what attributes can contribute to this biological potential.

There are a number of ways in which a natural stream channel can be physically modified including, but not limited to, channel straightening, channel-hardening, drop structures, flow dissipators, impoundments, and flow modification. Watershed based activities can also modify channel behavior such as increased imperviousness that alters runoff flow and volume, and contributions of pollutants that alters water quality. Finally, stream channel maintenance activities to manage streamflow volumes during storm events can modify streams including sediment removal, plant management, or vector control.

The challenges associated with managing biological potential in streams with modifications is reaching a turning point, as bioassessment tools are increasingly incorporated in statewide and regional regulations and programs. With biointegrity policies in place or in development, all of the SMC members – including both regulated and regulatory members – are going to be faced with decisions about protecting biological conditions in streams while also maintaining stream channels for flood protection and other uses. These will not be easy decisions for anyone, especially in the absence of information about the factors that affect the biological conditions of modified streams.

Desired Outcomes

The aim of this project is to inform decision-making that maintains healthy biological conditions as well as flood control goals in modified streams. An interpretation framework for modified streams that also considers other anthropogenic impacts, such as from pollutants and altered hydrology, is necessary for productive communication between regulators and the regulated community regarding appropriate management decisions and priorities for these systems. Ultimately, the hope is that this project will provide SMC managers with the tools they need to identify sites with the greatest potential for biological restoration, and what modification restoration efforts – physical habitat, flow, or water quality either alone or in combination - will be most successful. This outcome should provide SMC members the tools they need to support healthy streams (as required by biointegrity policies), and to target their restoration, water quality improvement, and flow management activities in locations with the greatest likelihood of success.

This study will address key questions around biological conditions in modified streams:

- What are the ranges of biological conditions in different types of modified streams?

- How do conditions in modified streams respond to changes in water quality and flows? That is, what can be done to improve conditions within existing channel forms?
- How do conditions in modified streams respond to restoration of channel form or removal of bank armoring? That is, what can be done to improve conditions by restoring natural forms/features?

The first of these questions will confirm and update previous studies by the SMC, while setting the stage to answer the other two.

Tasks

1 Create a Technical Working Group

1.1 Establish a Technical Working Group (TWG) of SMC member agency representatives and external technical experts to guide analyses, review interim products, and facilitate data requests from each agency. The TWG may also include representatives from non-SMC agencies that are involved in the regulation or management of modified channels. The TWG will report to the SMC Steering Committee.

2 Identify Classes of Modified Streams

2.1 Gather data required for analyses (bioassessment index scores and information about stream modification)

2.2 Use information on flood control infrastructure, habitat, and/or land use to identify potential classes of modified streams.

2.3 Identify classes of modified streams associated with low (e.g., non-reference condition) and high (e.g., reference condition) index scores.

2.4 Summarize results with the TWG, and refine classes (if necessary)

3 Evaluate Management Options to Improve Biological Conditions in Different Classes of Modified Streams

3.1 Evaluate likelihood of improving biological condition based on existing data

3.1.1 Develop statistical models to evaluate the relationship between biological conditions and water quality or flow conditions.

3.1.1.1 With guidance from the TWG, identify a list of priority stressors related to water quality and flow conditions to evaluate.

3.1.1.2 Create statistical models to evaluate the responsiveness of bioassessment index scores to management actions within each class of modified stream.

3.1.1.3 Create a list of management actions to improve water quality and/or flow conditions that will likely affect biological conditions within each class of modified stream.

3.1.2 Evaluate relationships between biological conditions and restoration.

3.1.2.1 Identify locations of in-stream channel restorations where modifications were removed or reduced and where bioassessment has occurred.

3.1.2.2 Compare bioassessment scores at restored sites with those at comparable unrestored sites (i.e., similarly modified streams draining comparably developed watersheds).

3.1.2.3 Identify unmonitored restored reaches where future bioassessment should occur.

3.2 Evaluate likelihood of improving biological condition based on new data.

3.2.1 For management actions where biological potential is not well-known, identify sites where the modification management action (i.e., restoration, BMP installation, etc.) has been implemented, but biological data are lacking. This task can include reaches identified in task 3.1.2.3, as well as sites identified by the TWG consulting with experts within their agencies.

3.2.2 Collect biological data (and any other needed data recommended by the TWG) at these new sites

3.2.3 Plug the new data into the biological response models developed in Task 3.1.

3.2.4 Convene a TWG workshop to present and discuss the results, summarizing potential to improve conditions in modified channels.

Assumptions

A. SMC Member agencies will provide a completed historical data set of CSCI scores collected from engineered channels (SMC program and MS4 compliance programs). SMC Members will help gather relevant data collected by non-SMC member agencies (such as the US Forest Service).
B. Member agencies will identify sites/reaches with critical flood control function, as part of flood control infrastructure (the TWG, and specifically lead flood control agencies, will help to define the criteria of the sites in this category). This includes engaging with flood control engineers from their respective agencies, as well as staff at non-SMC agencies that manage modified channels.
C. SMC member agencies will provide locations of BMPs and restoration projects

Schedule

This project will require 36 months to complete depending upon data availability and level of effort to test and refine the tool development for decision making. Allocating sufficient time for engaging regulatory and regulated agencies is essential. Tasks can overlap within the project timeline.

Budget

This project is estimated to cost $445,000. Fundamentally, this will require SMC member participation, particularly the flood control staff who build and maintain the flood control infrastructure. Fortunately, there are two leveraging projects the SMC can utilize for reducing project expenditures. The first project is the SMC Regional Monitoring Program, particularly the new monitoring initiative to assess streams with unique characteristics. This targeted

monitoring effort can be allocated to data collection supporting (Tasks 3.2). Current estimates are that $100,000 of in-kind services can be used to leverage the current project. The second project that can be used for leveraging is a SWRCB-funded project being conducted by SCCWRP. This project has very similar goals and objectives, including describing categories of modified streams and their biological potential (Task 2). This concurrent effort amounts to $75,000. The remaining balance for the SMC after these two leveraged projects is $270,000 over three years, or approximately $90,000/year. If 10 agencies participate, the annual cost is $9,000 per agency per year.

Schedule for Project Improving Biological Condition In Modified Streams (Project 5.3)

TASK	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
1. Create a Technical Working Group	■			■				■			■	■
2. Identify Classes of Modified Streams	■	■	■	■	■	■						
3.1. Evaluate likelihood of improving biological condition based on existing data				■	■	■	■	■	■			
3.2. Evaluate likelihood of improving biological condition based on new data				■	■	■	■	■	■	■	■	■

Cost Estimates for Project Improving Biological Condition In Modified Streams (Project 5.3)

TASK	Regional Monitoring Leveraging	SWRCB Leveraging	Necessary SMC Funding	Total
1. Create a Technical Working Group			$25,000	$25,000
2. Identify Classes of Modified Streams	$25,000	$65,000		$90,000
3.1. Evaluate likelihood of improving biological condition based on existing data		$10,000	$70,000	$80,000
3.2. Evaluate likelihood of improving biological condition based on new data	$75,000		$175,000	$250,000
Total	$100,000	$75,000	$270,000	$445,000