SR 202 Stream and Wetland Mitigation:

Achieving a Fine Balance

by Jon Gage, RLA, David Evans and Associates, Inc.

Introduction

WETLAND mitigation for the State Route 202 highway widening project by the Washington State Department of Transportation (WSDOT) began in November 2005. A three-mile stretch of SR 202 from State Route 520 to Sahalee Way NE in rural King County, Washington, was expanded from a two-lane highway to accommodate four and five lanes.

The widening encroached on Evans Creek, a salmon bearing stream, and its associated wetlands which provide regionally significant habitat for fish and wildlife. To comply with compensatory mitigation required by federal, state, and local environmental regulations, WSDOT hired David Evans and Associates, Inc. (DEA) to provide design and construction assistance services for wetland and stream mitigation.

The design team used innovative approaches to meet a number of significant challenges through the course of the project while addressing multiple objectives:

- creation and enhancement of wetlands for compensatory mitigation,
- compensation for lost flood storage volume from floodplain fill,
- providing off-channel wetland salmon habitat associated with Evans Creek that didn't strand fish as flood waters recede.

Project site

The 13-acre Happy Valley wetland mitigation area was the first of a two-phase plan. It cost approximately $3 million

A tributary to Evans Creek, which was confined in a narrow roadside ditch, was relocated and now meanders through the wetland, functioning as a "backwater" to Evans Creek.

to construct, spanning a two-year period due to the extent of earthwork involved. The site was a former dairy farm that was planned for commercial development before being acquired by WSDOT for the wetland mitigation area. Located on a lowland moraine, the site presented significant challenges for the design team because of its landscape setting, hydrology, and geology. The rolling hillside was riddled with seeps and artesian springs. The team's challenge was to achieve the project's multiple objectives within a complex site with both surface and groundwater hydrology.

An aerial view of the mitigation site taken after construction in June 2007.

Over 110,000 cubic yards of dirt was excavated to create riverine wetlands and provide the needed volume for flood storage. In some areas, as much as 12 feet of excavation occurred, which intercepted groundwater and opened up the wetland mitigation area to overbank flood flows from Evans Creek. These combined surface water and groundwater sources provide the hydrology essential for the success of the wetland creation.

A tributary to Evans Creek that was confined in a narrow roadside ditch presented the opportunity to significantly boost the site's habitat function. The tributary was relocated into the wetland mitigation area and hydrologically reconnected with the Evans Creek floodplain. This significantly increased the length of the channel and provided a natural channel morphology to meander through the wetland mitigation area. Twelve inches of streambed gravel and more than 50 pieces of large woody debris were placed in the channel for salmon habitat. The mouth of the tributary channel was designed to function as a "backwater" to Evans Creek. The backwater channel provides critical salmon habitat as a rest-stop for migrating adult salmon and a home for juvenile salmon to live and seek refuge from predators and flood flows in

Log jams were constructed at key locations to protect the banks of Evans Creek from increased flood flows.

the creek.

A large stand of mature conifer trees removed during the extensive excavation were salvaged to provide materials for construction of the backwater, log jams and other habitat features.

Several log jams were placed at key locations to provide bank protection where increased flood flows threatened existing banks of Evans Creek. These multi-tier log jams were designed to redirect flows to the center of the channel and away from toe of the stream bank, protect the mouth of the tributary channel, and provide instream habitat.

Innovative solutions

Given the abundance of hydrology, the challenge became how best to manage the site's water. Almost every tool in the box was used by the team to better understand the interaction of surface flows and groundwater and how they would affect the design. The team performed detailed hydrologic and hydraulic analyses of future flood flows affected by new highway bridges and roadway widening in an attempt to predict the creek's interaction with its new floodplain and wetland mitigation areas. This analysis included surface water and groundwater modeling, and collection of groundwater well data which enabled the design team to estimate how high and how long flood waters and groundwater would affect the created habitat. This understanding was crucial

for designing wetland elevations, log jams and habitat features, locating plant communities, and demonstrating that the project wouldn't strand fish when the flood waters receded. During construction, minor tweaks to the planting plan were required in response to areas where permanent ponding wasn't anticipated.

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Due to the degree of earthwork, in-water work, and permit conditions, the temporary erosion and sediment control measures and construction sequencing were a top priority to prevent sediment-laden construction runoff from polluting Evans Creek. Permit conditions required all construction below the ordinary high-water mark of Evans Creek to occur during the specified 2005 "fish window". This is the period the Washington Department of Fish and Wildlife allows

Temporary wetland sod mat paddies were constructed to stockpile the sod prior to use and during winter.

work in or near fish habitat areas for minimal impacts to fish migration and spawning cycles. Construction sequencing and timing were critical in order to comply with permit conditions and the short duration of the fish window. The contractor used water-inflated cofferdams to temporarily divert and de-water Evans Creek in the area where the mouth of tributary channel and inlet log jam were constructed. A temporary earthen berm was left in place to separate the work done during the fish window from the remaining unfinished work in the mitigation site. The remainder of the tributary and site excavation was completed the following year and the berm was removed to connect the tributary to Evans Creek. The berm and construction sequencing in conjunction with other BMPs significantly minimized water pollution to the creek during construction.

WSDOT wanted permanent erosion control and bank stabilization where channel construction occurred at the new backwater channel and along Evans Creek. The design team recommended an innovative technology that incorporates wetland vegetation into sod mats to provide erosion control, long term bank stabilization, and wetland functions. They are made of biodegradable coir mats pre-planted with native emergent wetland plants that can be rolled out like grass sod. At about $4.50 a square foot installed, it was comparable in price to typical bank stabilization measures employed by WSDOT but with a far greater upside for mitigation projects. Approximately 24,000 square feet of wetland sod matting was grown by a supplier using emergent plant species native to the Pacific Northwest. The sod was transported to the site by truck and arrived on palettes. Temporary wetland sod mat paddies were constructed to stockpile the sod prior to use and during winter.

The Evans Creek wetland mitigation project was the first WSDOT project in the state to use this technology.

Mitigation Project features

- Over 8 acres of wetland creation, almost 3 acres of wetland enhancement, and over 8 acres of buffer enhancement
- A 900-foot relocated tributary and backwater for salmon, other fish, and wildlife
- Installation of 24,000 square feet of wetland sod matting
- Numerous habitat features including log jams, raptor perches, habitat logs, and bank protection logs

Construction of the mitigation site was completed in the summer of 2007 and early indications show that the site is functioning as designed. WSDOT is monitoring the site for next 10 years to ensure the success of the project and gather valuable lessons for future wetland mitigation projects. **L&W**

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For more information, contact Jon Gage, Senior Landscape Architect, David Evans and Associates, Inc. (425) 519-6500 or email: jcga@deainc.com.