Making Room for Nature in Flood Management

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September 2018
Giving rivers more room is the best way to . . . but . . .
2017 Central Valley Flood Protection Plan Update

Making Room for Multi-Benefit Flood Management
A Tale of two multi-benefit flood projects

- Three Creeks Parkway
- Paradise Cut Bypass
Three Creeks Parkway

The project will integrate an existing, 1-acre detention at Sun Gold park into the restored channel. The basin is currently separated from the creek by a gravel road and vegetated with non-native weeds.
The challenge:
Expand the channel enough to create room for both flood conveyance and dense woody riparian vegetation.
The Three Creeks Parkway will restore native vegetation and functional floodplains along 4,000 linear feet of Marsh Creek. American Rivers and the Friends of Marsh Creek Watershed are working with the Contra Costa Flood Control District to integrate the project into adjacent city parks and the future subdivisions at Palmilla and potentially DLT Ventures.
Paradise Cut Bypass Expansion
Increased urbanization leads to increased risk.

Map by UC Berkeley Delta Initiative. 2006.

Project Description

Existing Paradise Cut

Existing Weir

Add new weir

Add flood easement to agricultural fields

Create setback levees

DWR 2016 Conceptual Model Option M-ag

Less than 10% chance of flooding in any given year.
Looking South up the San Joaquin River. Photo by Daniel Nylen, American Rivers.
Flood Risk Reduction Benefits:
Hydraulic Model of San Joaquin River (MBK, 2016)
200 year event (0.5% chance of water level in any given year)

~2.5’ reduction
~1’ reduction
~1’ reduction
Continued Agriculture in the Expansion Area: Fields will be inundated infrequently

<table>
<thead>
<tr>
<th>Flow (cfs)</th>
<th>Inundated Areages</th>
<th>Return Interval in Years (Spring-run)</th>
</tr>
</thead>
<tbody>
<tr>
<td>31,913</td>
<td>2</td>
<td>9.7 10.6 12.4</td>
</tr>
<tr>
<td>35,991</td>
<td>109</td>
<td>11.9 13.1 14.9</td>
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<tr>
<td>40,912</td>
<td>990</td>
<td>14.9 16.1 18.0</td>
</tr>
<tr>
<td>43,170</td>
<td>1,499</td>
<td>16.2 17.4 19.4</td>
</tr>
<tr>
<td>47,994</td>
<td>1,582</td>
<td>19.1 20.4 22.4</td>
</tr>
</tbody>
</table>

Flow vs. Inundated Area
(1986 Event to Approximate 25-Year Event at Vernalis)
Common Challenges

- Persuade adjacent landowners to make “room for the river”
- Multiple stakeholders each with different interests
  - The more room you make, the more people and agencies you touch.
- Initially reluctant or non-existent local champion
- Long planning horizons
- Public agency land acquisition challenges
- Funding (obtain and coordinate funds from multiple sources each with different conditions)
Important Differences

• Permitting challenge relatively easy on Marsh Creek (no 408 process)
• Environmental compliance much easier on Marsh Creek
• Marsh Creek not critical habitat for salmonids
• T&E species covered by HCP at Marsh Creek
• Flood control channel vs. regulatory floodway and levees
New or Needed Innovations

• Programmatic environmental compliance or exemptions
• Programmatic permits and biological opinions
• Advanced mitigation credits (AB2087)
• New funding specifically for multi-benefit projects and with more flexible accounting
• Tools to Guide Design and Facilitate Project Accounting
  – Habitat quantification tools
  – Other tools to measure other benefits
• Plans and policies that emphasize multiple benefit approaches
• More people willing to think and work outside the box
Nature’s Place In Engineering: Ecosystem Restoration for Floodplain Resilience

Dr. Chris Bowles, P.E.
Restoration vs Rehabilitation

The differences between restoration, rehabilitation, and remediation (adopted from Breen at al. 1999 and Bradshaw 1987).
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Importance of Multi-Objective Reconciliation
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Anthropogenic Impacts

Present Conditions

- Additional sediment eliminated by upstream dams.
- Flows concentrated by levees, resulting in the removal soil from the channel bed (incision).
- Combination of floodplain height and management of flows has resulted in decreased habitat values and disconnected floodplains.
Designing Floodplain Rehabilitation

1. Target species - aquatic or terrestrial?
2. Establish ecological habitat evaluation criteria.
3. Establish existing inundation regime.
   - Timing, duration, area, depth, frequency, etc.
   - Hydrodynamic modeling – preferably 2D.
4. Assess existing efficacy (habitat quantity/quality).
5. Design project to meet, or approach habitat evaluation criteria.
   - Floodplain grading, or river raising.
Project Examples – Southport Levee Setback
Project Examples – Southport Levee Setback
Project Examples – Southport Levee Setback
North Offset Area – In Construction
North Offset Area - Potential
Project Examples – Cordova Creek Naturalization
Project Goals

Convert a concrete-lined ditch into a naturalized channel

- Restore ecological function
- Create valuable habitat
- Provide sustainable flood conveyance
- Create a place for people to gather, learn and enjoy nature
2 Phases of construction – 2015 & 2016

Phase 1
Constructed in 2015

Limit of Phase 1

Phase 2
Constructed in 2016
Lessons Learned

1. Levels of intervention – restore, reclaim, rehabilitate, reconcile.
2. Define habitat criteria and existing/desired conditions.
5. Manage non-native plants – planting plants, sequencing, maintenance.
7. Expect the unexpected.
Thank You For Listening!

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Degraded Condition and Restoration Approach

Incised Channel with Lowered Groundwater & Loss of Riparian Vegetation

- Scoured channel leads to incised channel.
- Scouring causes river bed and water table to drop.
- Incised channel provides poor aquatic habitat.
- Native plant roots can't reach water.
- Invasive weeds take over.

Healthy Channel with High Groundwater Table

- River is connected to its floodplain.
- Restored channel provides excel lent habitat.
- Native plant roots promote soil stability.
- Native plants and healthy habitat returns.
- Water table rises.
- Rock structures called riffles are added.
Benefits of Restoration

- **Wildlife Habitat** – enhance riparian, wetland, and instream habitats for species that depend on them
- **Flood Attenuation** – restore channel sinuosity and reconnect to floodplain
- **Water Quality** – nutrient uptake, channel shading, oxygenation
- **Drought Resilience** – increase system ability to withstand extended baseflow, flash flooding
- **Recreation** – access to the river for boating, fishing, trail uses
Success Through Partnerships

City of Reno
City of Sparks
Storey County
Washoe County
Truckee River Flood Management Authority
Nevada Department of Wildlife
Nevada Division of Environmental Protection
Nevada Division of State Lands
Nevada Division of Water Resources
Pyramid Lake Paiute Tribe
U.S. Bureau of Reclamation
U.S. Bureau of Land Management
U.S. Fish & Wildlife Service
U.S. Army Corps of Engineers
National Fish and Wildlife Foundation

The Nature Conservancy
Project Timeline

• 2003 – Pilot project at TNC’s McCarran Ranch
• 2006/2007 – Large-scale McCarran Ranch project
• 2008/2009 – Projects at 102 Ranch (BLM) and Lockwood (Washoe County) properties
• 2009/2010 – Mustang Ranch project (BLM)
• 2013/2014 – Tracy Phase I project (NV Energy)
• 2014/2015 – West McCarran project (TNC, BLM)
• 2016/2017 – Tracy Phase II project (TNC, NV Energy, BLM)

To Date: ~11 miles of river restored and over 800 acres revegetated
Overview of Truckee River Protection and Restoration Projects
<table>
<thead>
<tr>
<th>Permit</th>
<th>Issued By</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nationwide 27 Permit</td>
<td>Corps of Engineers in consultation w/FWS</td>
</tr>
<tr>
<td>Temporary Working in Waterways Permit</td>
<td>NV Division of Environmental Protection</td>
</tr>
<tr>
<td>401 Water Quality Certification</td>
<td>NV Division of Environmental Protection</td>
</tr>
<tr>
<td>Stormwater General Permit</td>
<td>NV Division of Environmental Protection</td>
</tr>
<tr>
<td>Temporary Access Easement</td>
<td>Division of State Lands</td>
</tr>
<tr>
<td>Letters of Authorization from State of Nevada</td>
<td>State Engineer (Division of Water Resources), Department of Wildlife</td>
</tr>
<tr>
<td>Special Use Permits</td>
<td>Storey and Washoe Counties</td>
</tr>
<tr>
<td>Grading Permits</td>
<td>Storey and Washoe Counties</td>
</tr>
<tr>
<td>Dust Control and Vector Control Permits</td>
<td>Washoe County District Health Department</td>
</tr>
</tbody>
</table>
Measures of Success

• Great Basin Bird Observatory annual survey results demonstrate both the overall number of birds and species diversity have increased on the restoration sites.

• Vegetation monitoring results (via remote sensing) demonstrate dramatic increases in desirable native species and dramatic decreases in invasive species.

• Nevada Department of Wildlife survey results demonstrate:
  • Fish numbers are concentrated in restored reaches.
  • Healthy fish were found in restored reaches even during the worst of the drought.

• Response to recent flooding.
Thank You

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The Nature Conservancy
nature.org/nevada
Sacramento River: 30 Years of Floodplain Restoration

Ryan Luster
Hamilton City Ecosystem Restoration and Flood Damage Reduction Project
A PROCUREMENT GUIDE TO NATURE-BASED SOLUTIONS

vanjie a. leung, nathan wheeler, and mark p. smith

January 2018

Beyond Mandates: An Argument for Multi-Benefit Projects

Kristopher Tjernell, Deputy Director

FMA 2018
THANK YOU

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