Ecosystems Services Approach Toward Assessing Benefits of Flood Planning

The Central Valley Flood Protection Project

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Overview

- CVFPP context
- Basin-Wide Feasibility Studies
  - Assessment Methods
  - Recommendations
CVFPP Context: A Stressed System, the Need for Action

- Central Valley people, property and assets at risk
- Current flood risk management path unsustainable
- Lack of funding for capital works and for ongoing operations and maintenance of existing infrastructure
- In 2008, the Legislature enacted the Central Valley Flood Protection Act, which authorized and required development of the Central Valley Flood Protection Plan (CVFPP) to address these issues
Benefitting Floodplain and Riverine Ecosystems is a CVFPP Goal

CVFPP Primary Goal
*Improve Flood Risk Management*

CVFPP Supporting Goals

- **Improve Operations & Maintenance**
  - Improve dynamic hydrologic flow & geomorphic processes

- **Promote Ecosystem Functions**
  - Increase & improve habitat quantity, diversity, quality, and connectivity

- **Improve Institutional Support**
  - Contribute to the recovery & sustainability of native species

- **Promote Multi-Benefit Projects**
  - Reduce stressors that negatively affect at-risk species
CVFPP Seeks to Provide a Range of Benefits

Flood risk management

Ecosystem Restoration

Water supply and water quality

Recreation and open space

Hydropower

Navigation

Commercial fisheries

Social and regional economic effects
Ecosystem Restoration Concepts Consistent with Flood management

- Bypass improvements
- Levee setbacks
- Transitory storage areas
Ecosystem Restoration Benefit Assessment Methods - Key influences

- Conservation Strategy
  - Defines the objectives for managing the ecosystem in the public interest

- Habitat Equivalency Analysis (HEA)
  - Provides the framework and guidance for quantifying gains and losses in ecosystem services

- California Rapid Assessment Method (CRAM)
  - Basis for the ecological metrics for quantifying the gains and losses in ecosystem services
Methods

Conservation Strategy Goals and Metrics

Ecosystem Processes

- Natural Streambank (miles)
- Inundated floodplain (acres)
- River meander (acres)

Target Species

- Marsh/other wetland habitat (acres)
- Riparian habitat (acres)
- Riparian-lined banks (miles)

Stressors

- Invasive plant infestations (acres removed)
- Fish barriers (# removed)

Habitats
Methods - Key concepts

- Functions vary with hydrologic process: floodplain inundation

*Riparian plantation*

Lower Colorado River, Cibola Valley Conservation Area

*Riparian inundation*

Sacramento River, Fremont Weir
Methods - Key concepts

- Functions vary with geomorphic process: river meander
Ecosystem (Habitat) Models

- Riparian
- Marsh & other wetland
- Channel bank
Methods

Structure for all models

\[ \text{Functional Acres} = f [ \text{Acreage} \times (\text{Process} + \text{Structure} + \text{Landscape} + R) ] \]
Methods

Variables

1. Ecosystem Process Variables
   • Floodplain inundation (Expected Annual Habitat)
   • Meander potential, presence vs. absence
   • Tidal range

2. Structure Variables
   • Width
   • Vegetation structure development
   • Invasive plant dominance
   • Crop type
   • Shading vegetation type

3. Landscape Variable - buffer condition

4. Remainder Variable - residual value
Results

Raw Acres vs. Fully Functional Acres

Net increase in Riparian Scrub/Woodland Acreage

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<tr>
<td>6</td>
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</table>

Acres

Site
Results

Raw Acres vs. Fully Functional Acres

- Ecological processes (inundation, meander potential) contribute to functionality
Recommended Applications

• Assess cost/benefit of restoration
• Refine or optimize the restoration concepts
• Potential yardstick for compliance or effectiveness monitoring
• Assess the potential for a Conservation Strategy target species to use a location
• Identify target species with unmet conservation needs
The Path Forward

- Need to change how we think about flood risk management
- 2017 Update will refine the 2012 CVFPP and provides a holistic path forward to a different approach
- The refined approach enables the State to integrate and prioritize investments in multi-benefit flood risk reduction projects
- CVFPP will take 30 years to implement at a cost of approximately $20 Billion
References and Resources

Primary References
• Central Valley Flood System Conservation Strategy (DWR, 2015)
• Handbook for Assessing Value of State Flood Management Investments (DWR, 2014)
• California Rapid Assessment Method (California Wetland Monitoring Workgroup, 2013)

Other Resources
• Habitat Equivalency Analysis: An Overview (NOAA, 2006)
• Application of Habitat Equivalency Analysis to USACE Projects (Ray, 2009)