FLOODPLAIN OPPORTUNITIES

flood-plain | the strip of land that borders a stream channel, and that is normally inundated during seasonal floods (Bridge 2003)

Benefits of Hydrologically Connected, Geomorphically Active, and Biologically Diverse Floodplains:

- Flood Attenuation
- Groundwater Recharge
- Water Quality Improvement
- Cultural and Recreational Importance
- Fish and Wildlife Habitat
- Ecological Resiliency to Future Changes
MULTI-BENEFIT CONCEPT

“A multi-benefit project is planned, designed, implemented, and maintained with the intended purpose of providing two or more benefits; they can also effectively minimize the potential impacts from other project elements” (CA Soc. for Eco. Rest., 2014)

• Challenges:
  • Understanding of fluvial processes and biological resources
  • Avoiding conflicts between intended benefits
  • Satisfying social and political doubt

See Booth et al. 2016 (Water) for discussion on process-based restoration
GILA RIVER FLOOD-RISK REDUCTION AND VEGETATION MANAGEMENT

PROBLEM
Flood risks increased from colonization of dense stands of non-native saltcedar (Tamarix spp.)

GOALS
Reduce flood risk and minimize need for levees while conserving biological resources and prepare for future conditions (e.g., climate change, tamarisk beetle arrival)

CHALLENGES TO OVERCOME
• Understanding of bio-physical processes
• Balance flood-risk and ecological needs
• Earning public support

APPROACH
Manage vegetation following a community supported, science-based plan
ECOHYDROLOGICAL ASSESSMENT

Vegetation Composition

Geomorphologic Assets and Hazards

Soil Texture and Chemistry

Groundwater Availability

Floodway Boundary

Vegetation Management Units

Wildlife Habitat Suitability
Management Units

- 8 Unit Types
- Remove saltcedar and replant with natives ~5000 ac of 8800 ac reach
- Reduced hydraulic roughness
- Implement over 5 years in phases
- Cost-savings:
  ~$110M for veg plan
  ~$160M for levees
Benefits of ecologically thoughtful floodplain management on the Gila River

- Understanding of bio-physical processes
- Balance flood-risk and ecological needs
- Earning public support

- Restore Native Vegetation
- Conserve Wildlife Habitat
- Reduce Flood Risks
- Avoid (Minimize) Levee Construction
- Earn Public Trust

Ecological  Societal
SALMON RIVER FLOODPLAIN HABITAT ENHANCEMENT AND MINE-TAILING REMEDIATION

PROBLEMS
Poor salmonid habitat from lack of floodplain structure/connectivity, degraded riparian, and coarsened bed substrate

GOAL
Increase long-term salmonid productivity and resiliency

CHALLENGES TO OVERCOME
• Develop meaningful restoration strategy for multiple salmonid life-stages in a large system with limited resources
• Align with temperature-TMDL plan

APPROACH
Implement community-supported approach to strategically restore stream temps, geomorphic function, and aquatic habitat
Approach

• Collaboration of tribal, federal, state, and non-profit groups

• Process-based Assessment and Design:

  1. System-wide assessment of opportunities and constraints
  2. Identification and prioritization of suitable enhancement sites
  3. Conceptual design approaches within priority sites

Alluvial Reach

Bedrock Reach

Enhancement Segment
Treatment Actions

- Identified 36 sites (23% of total length) having best combination of enhancing multi-habitat functions

- Grade and revegetate targeted floodplains and add structural complexity to:
  - Increase inundation
  - Enhance shading
  - Promote sediment sorting
  - Enhance rearing, overwintering, and spawning habitat
Benefits of fisheries-driven floodplain restoration on the Salmon River

- Develop meaningful (feasible) restoration strategy for multiple salmonid life-stages in a large system
- Align with temperature-TMDL plan

Enhance River-Floodplain Functions

Enhance Salmonid Spawning and Rearing Habitats

Improve Stream Temperatures

Improve Tribal Fisheries

Ecological

Societal
GALES-CLEAR CREEK CONFLUENCE
COLD WATER REFUGE ENHANCEMENT

PROBLEMS
High water temperatures and too few cold water refugia for salmonids in summer

GOAL
Improve access to cold water refugia

CHALLENGES
• Understanding of floodplain functions
• Avoid unintended impacts
• Landowner support

TO OVERCOME

APPROACH
Evaluate feasibility of modifying floodplain functions to cold water refugia while building trust with landowners
Revised Approach

1. Conceptual Design
2. Validate Assumptions
3. Revise Designs
4. Implement
5. Monitor Responses

CWR = \( f \) (geologic, hydrologic, geomorphic, & vegetative features, and land-uses)

EPA Region 10 (2012)
Benefits of small-scale habitat enhancement at the Gales-Clear Creek confluence

- Understanding of floodplain functions
- Avoiding unintended impacts
- Gaining landowner support

Enhance Creek-Floodplain Functions
Enhance Salmonid Cold Water Refugia
Improve Stream Temperatures
Engage Private Landowners and Build Community Support

Ecological ← Societal
• Intrinsic properties of hydrologically connected, geomorphically active, and biologically diverse floodplains can offer multiple benefits to ecological and societal needs
• Challenges must be identified and overcome
• Successful planning and implementation requires:
  • Robust understanding of bio-physical processes
  • Reconciling conflicts between intended benefits
  • Collaborations between public and private groups
  • Science-based, publicly supported approaches
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