SALMON RIVER FLOODPLAIN & MINE TAILING HABITAT RESTORATION AND ENHANCEMENT

Spring-run Chinook Symposium
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Jay Stallman
jay@stillwatersci.com
SALMON RIVER

Resiliency
- High elevation sub-basin within Klamath River
- Federal ownership and protections
- Little diversion for consumptive water use
- Removed from Klamath Basin hatcheries
- Community support for restoration

Vulnerability
- Poor off-channel rearing and over-wintering habitat
- Poor summer rearing habitat
- Depressed over-summering carrying capacity
- Poor spawning habitat
• Denudation = degraded riparian conditions, reduced shade cover & increased exposure to solar radiation
• Aggradation = wider & shallower channels, reduced pool depth, reduced complexity, disconnected floodplain and off-channel habitats.
• Coarse sediment inputs = Coarsened bed with reduced mobility, less and lower quality spawning habitat
• Elevated summer water temperatures = limited thermal refugia
• SRRC initiated collaborative, science-based planning process in 2014

• System-wide approach to strategically restore and enhance stream temperatures, geomorphic functions, and fish habitat.

• Overarching goal: Increase long-term salmonid productivity.

• Objectives:
  - Improve riparian functions (e.g., shading, hyporheic exchange)
  - Protect and enhance thermal refugia within summer low flow channel
  - Improve limiting habitat conditions for salmonids
  - Increase resiliency against global warming impacts
Project area includes 55 mi from Nordheimer Creek on Mainstem to wilderness boundaries on North Fork and South Fork.

- 14 alluvial channel reaches totaling 37 river miles.
- 36 potential enhancement segments totaling 13 miles

Three phases:

1. Develop plan that includes system-wide assessment of opportunities and constraints, identifies and prioritizes suitable sites, and provides conceptual designs for priority sites.

2. Environmental review and permitting.

3. Phased implementation.
WORK TO DATE

- Technical Advisory Committee formed
- In-Stream Restoration Candidate Action Table
- Riparian vegetation assessment
- LiDAR and TIR data acquisition
- Delineation of alluvial reaches and segments
- Delineation of mine-tailings and related disturbances
- Hydraulic modeling of floodplain inundation
- Analysis of thermal refugia using TIR data
- Off-channel and riparian habitat enhancement design projects
FLOODPLAIN HABITAT RESTORATION AND ENHANCEMENT POTENTIAL

- Life Histories and Limiting Factors
- Disturbance history
- Reach morphology
- Thermal Landscape
- Flow Inundation
- Site-scale geomorphology
REACH-SCALE MORPHOLOGY

- Valley width/confinement
- Bedrock vs alluvial boundaries
- Extent of mining disturbance and infrastructure
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SEGMENT-SCALE FLOODPLAIN ENHANCEMENT POTENTIAL

- Channel gradient and confinement
- Alluvial channel features
- Floodplain inundation
- Summer thermal conditions
- Riparian vegetation
- Spawning and rearing habitat
- In-stream restoration priorities identified by Technical Advisory Committee
THERMAL LANDSCAPE

Approach:

- Airborne thermal infrared (TIR) imagery acquired for 85 mi in July, 2009
- 25°C defines wetted channel
- 100 meter sampling zones
- Moving median temperatures over 500 meter channel length
- Temperature departure calculated by subtracting median zone temperature from observed TIR temperature
- Temperatures within thermal refugia identified based on 22°C threshold.
THERMAL LANDSCAPE

Thermal Refugia Temperatures (≤ 22°C)
- < 17
- 17 - 19
- 19 - 20
- 20 - 21
- 21 - 22
Thermal Refugia Temperatures (≤ 22°C)

- < 17
- 17 - 19
- 19 - 20
- 20 - 21
- 21 - 22
Thermal Refugia Temperatures (≤ 22°C)

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- 17 - 19
- 19 - 20
- 20 - 21
- 21 - 22
FLOW INUNDATION

Approach:

- Hydrologic Engineering Center's River Analysis System 5.0 (2D)
- 35 mi of river channel
- Topographic source: 2014 LiDAR DEM
- Grid Resolution:
  - Center spacing 10 ft X 10 ft
  - Refined by adding resolution and strategic cell center orientation
- Simulated Flows:
  - 20% exceedance to 100-year peak flow
  - Daily flow duration and peak flow magnitudes (LPIII) scaled by drainage area using Salmon River at Somes Bar gage (USGS Station No. 11522500; 751 mi²)
SF9 sta 52,800 (1)
Velocities – 1.5 year Peak Flow
SF9 sta 52,800 (1) Geomorphic Mapping
SF16 sta 137,100 (1)
Inundation
SF16 sta 137,100 (1)
Velocities – 20% Exceedance Flow
PROJECT TREATMENTS TO IMPROVE THERMAL, HYDROLOGIC, AND GEOMORPHIC FUNCTIONS

1. Enhance and expand cold water refugia and increase riparian shading to improve summer rearing conditions

2. Grade and revegetate floodplains and mine tailings to reduce heating, increase inundation frequency, and improve connectivity

3. Add structural complexity to side-channels and main channel margins to improve rearing habitat

4. Create in-channel structures that promote sorting to improve spawning habitat and summer rearing habitat

5. Create, enhance, and connect off-channel ponds and wetlands to improve winter habitat
ENHANCE AND EXPAND COLD WATER REFUGE HABITAT
GRADE AND REVEGETATE FLOODPLAINS AND MINE TAILINGS
ADD STRUCTURAL COMPLEXITY TO SIDE-CHANNELS AND MAIN CHANNEL MARGINS
CREATE IN-CHANNEL STRUCTURES
CREATE, ENHANCE, AND CONNECT OFF-CHANNEL PONDS AND WETLANDS
NEXT STEPS

- Spawning gravel mapping and spawner capacity estimate
- Site-specific field mapping and verification of opportunities and constraints
- Conceptual site designs at priority sites
- System-wide cultural resource assessment
- Programmatic NEPA

For more information:

Karuna Greenberg, Lyra Cressey, Melissa Van Scoyoc
Salmon River Restoration Council
PO BOX 1089
25631 Sawyers Bar Road
Sawyers Bar, CA 96027
530.462.4665
srrc.org