

Klamath Fisheries Restoration in the Era of Climate Change, Dam Removal and Megafires













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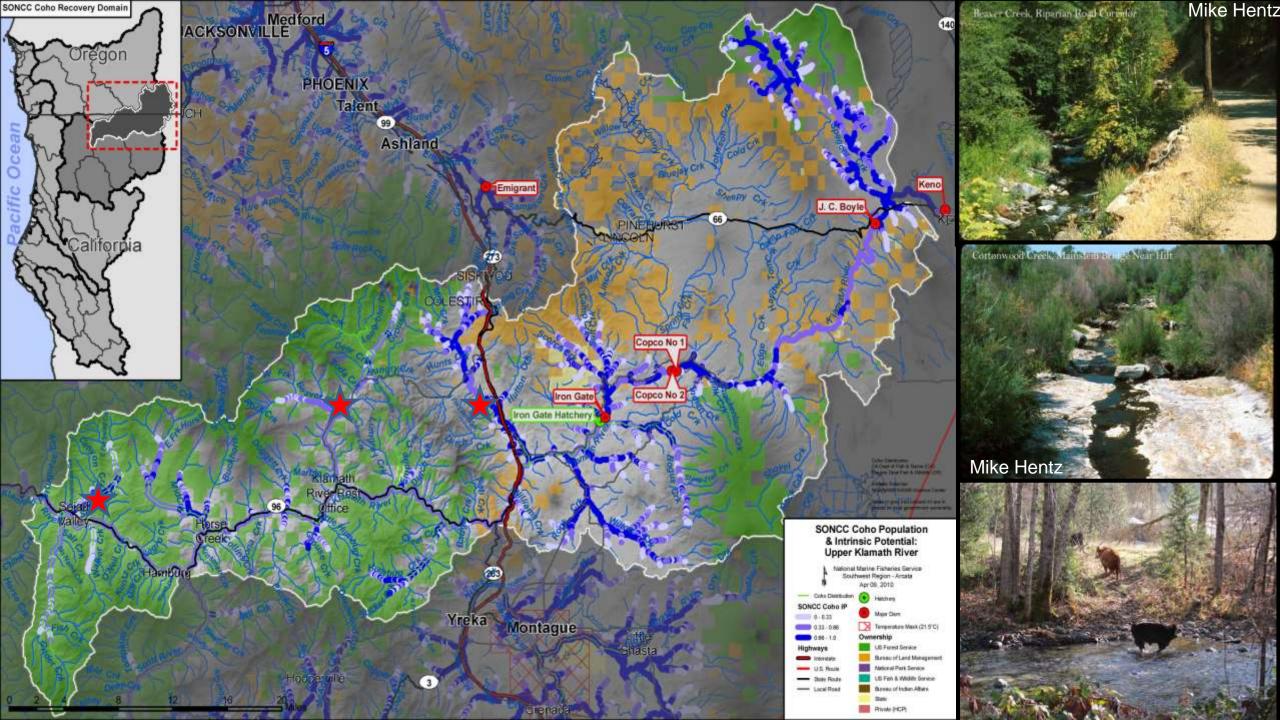
Mid Klamath Watershed Council

MKWC employed 74 people in 2018: 13 Full-time employees, 28 Part-time employees, 23 Seasonal employees, and 10 Interns. Clean audits 2014-2018.

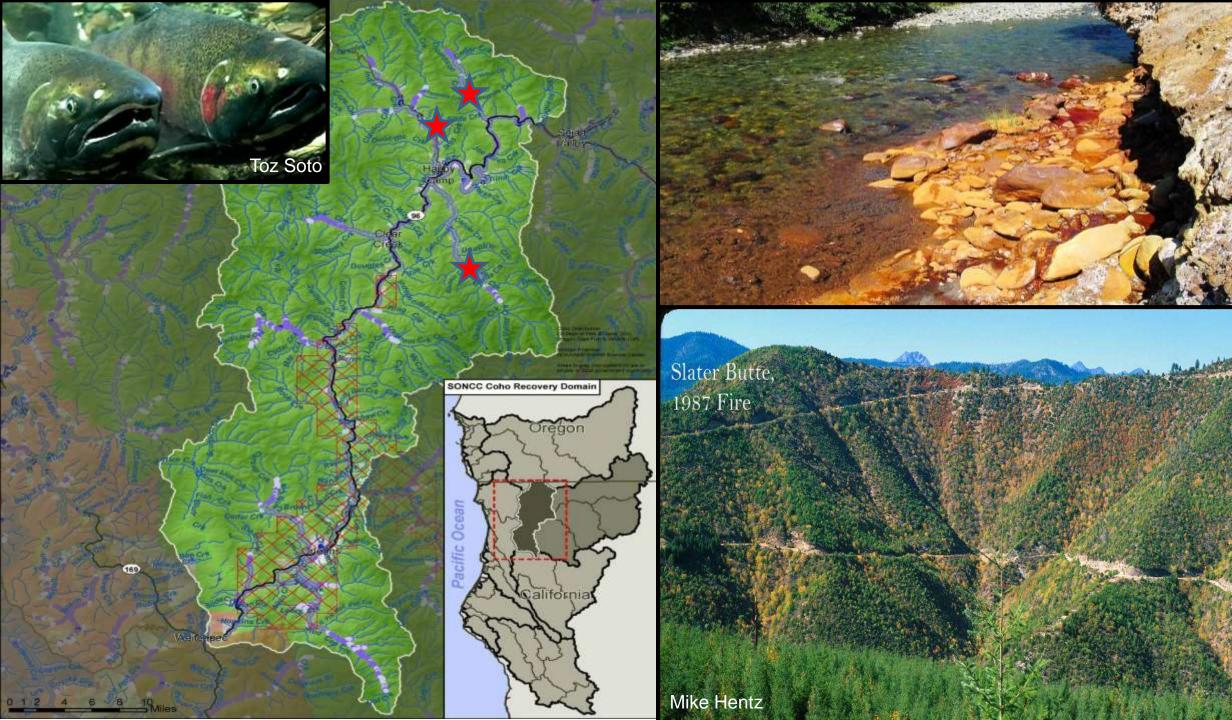
MKWC plays a major role in building a restoration-based economy in the Western Klamath Mountains. We are results oriented and work through developed partnerships to plan and implement projects based on traditional cultural knowledge and the best available western science.

Presentation Outline

- Klamath River: Press Disturbances Dying From a Thousand Cuts
 Legacy of Roads, Logging, Mining, Dams, and Fire Exclusion/Suppression
- Why Solving the Fire Crisis is Essential to Fish Restoration
 - Implications of Recent Studies, and Solutions for Restoring Fire Processes
- Coho Habitat Restoration on the Klamath River
 - Lessons Learned from a Decade of Off-channel in In-channel Habitat Restoration
- Report Out on Recent Mid Klamath Fish Habitat Restoration
 - Boise Beaver Dam Analogues
 - Six Rivers NF Aquatics Ecosystem Analysis and Aquatic Restoration Action Plan
 - Middle Klamath River Floodplain Enhancement & Mine Tailing Remediation Plan



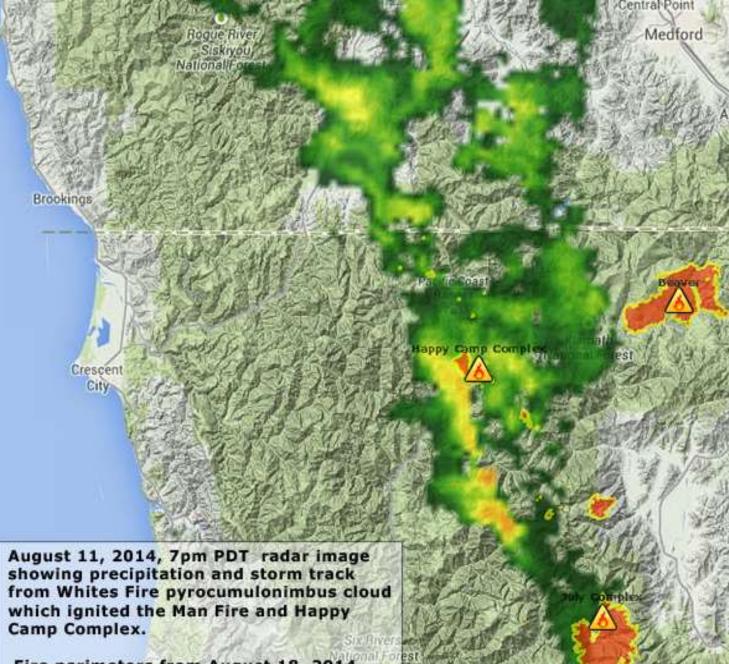




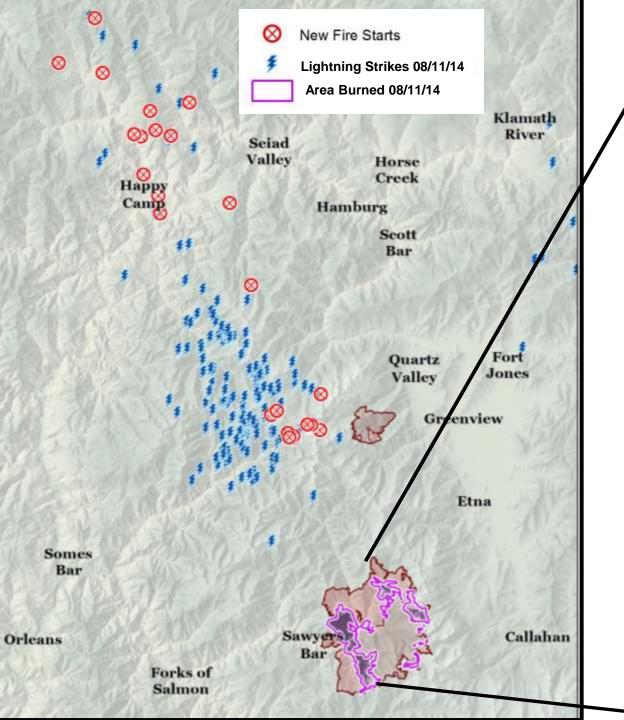


NF Salmon River After 1987 Fires

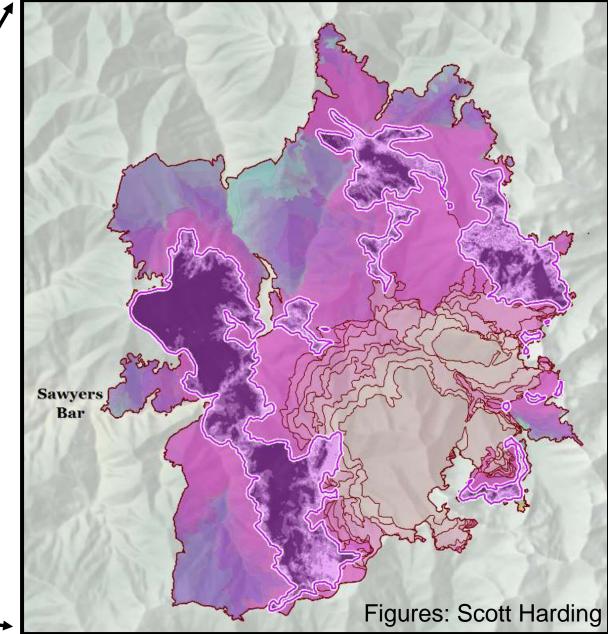
2014 Whites Fire (Re-defining Spot Fires)



Fire perimeters from August 18, 2014. and State Parks



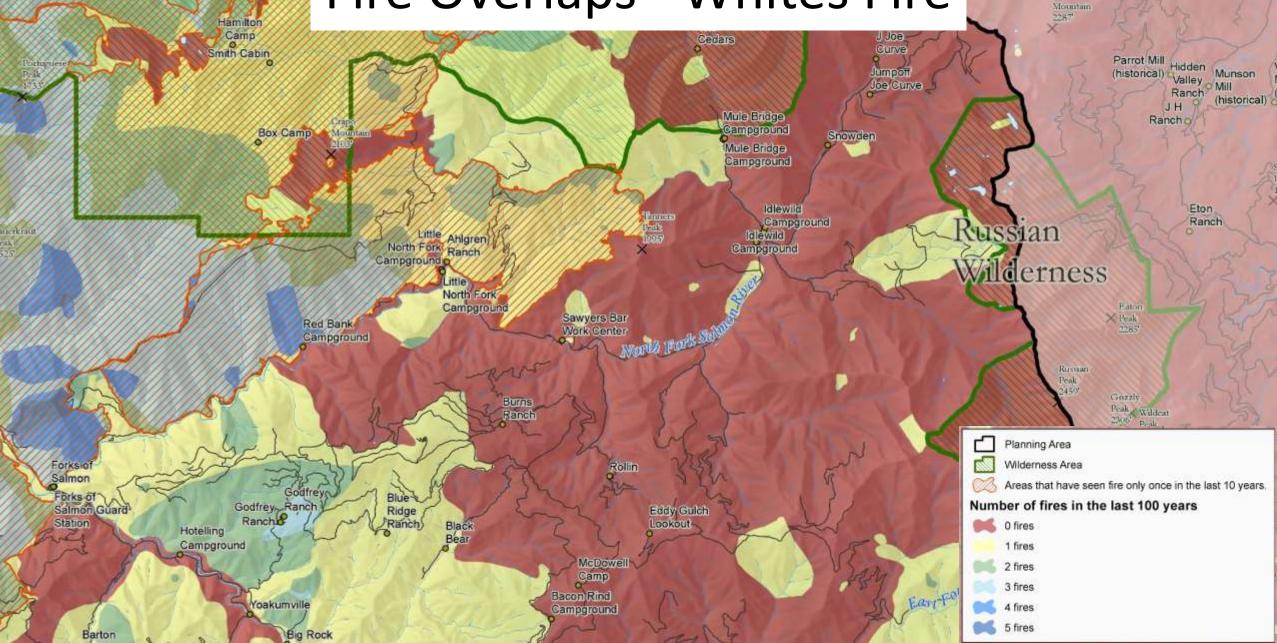
Lightning Fires from Whites Fire Pyrocumulus Started 2014 Happy Camp Complex and 2014 Man Fire



Fire Overlaps - Whites Fire

Abbott

Etrus



February 2015 High Water in Whites Fire Footprint

2014 Happy Camp Complex

Grider Creek at Pacific Crest Trailhead

Feb 2015 July 2015

Photos: Mark Motyka

Photos: Michael Hentz

Stage Zero Baby!

Grider Creek - Wilderness Bridge - 2002

Grider Creek - Wilderness Bridge - 2015

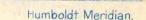


Horse Creek – Spawning Coho – Dec 2015



1944 Aerial Photo Near Happy Camp, CA

1931 Fire Perimeters – Hoopa Valley – Native Burning Patterns

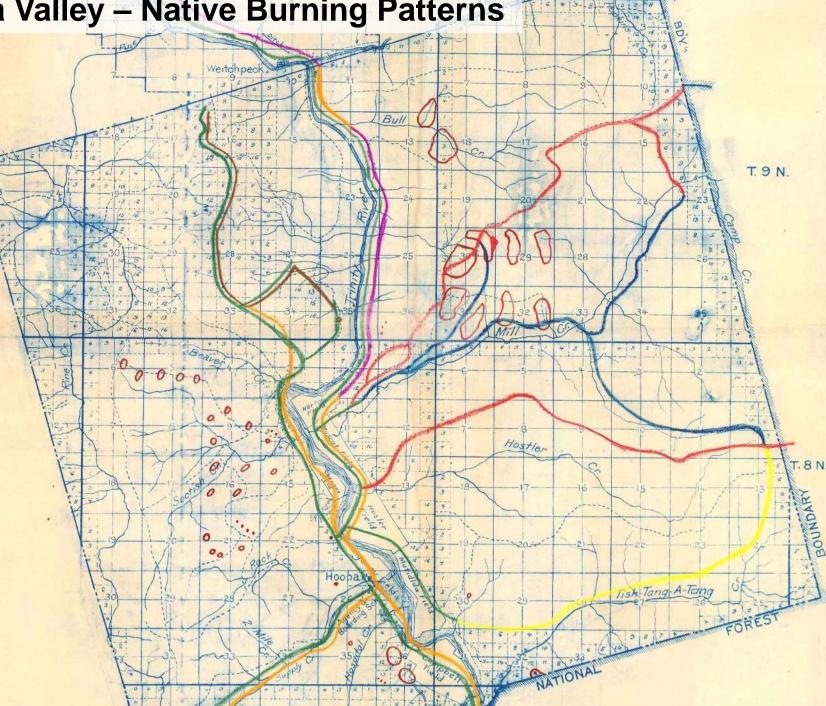


Scale of Miles

DEPARTMENT OF THE INTERIOR OFFICE OF INDIAN AFFAIRS Hon.F.H.Abbott, Acting Commissioner



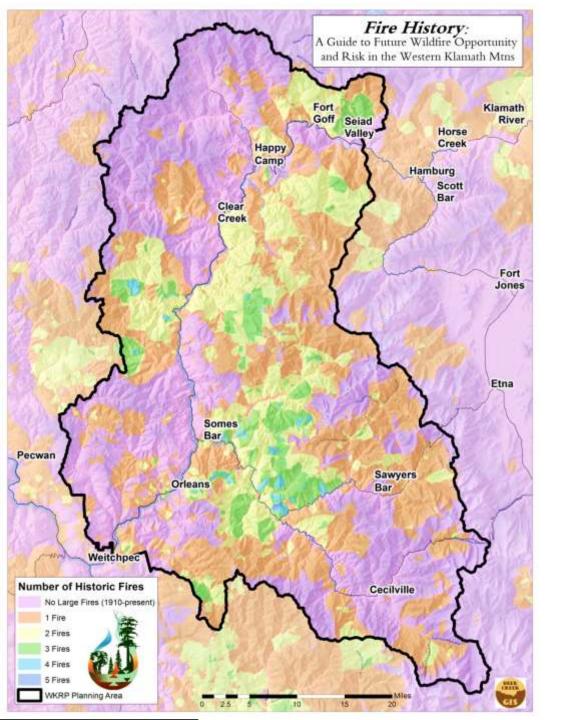
Indian Villages
Swamp Land
Roads and Trails
Agency & Boarding School
Fires 1931
Roads
Graded Trails
Good Paths
Lines-Copper
Lines to Rebuild



Red Cap Glade - 2005

Big Rock in Orleans, CA Looking up the Klamath River

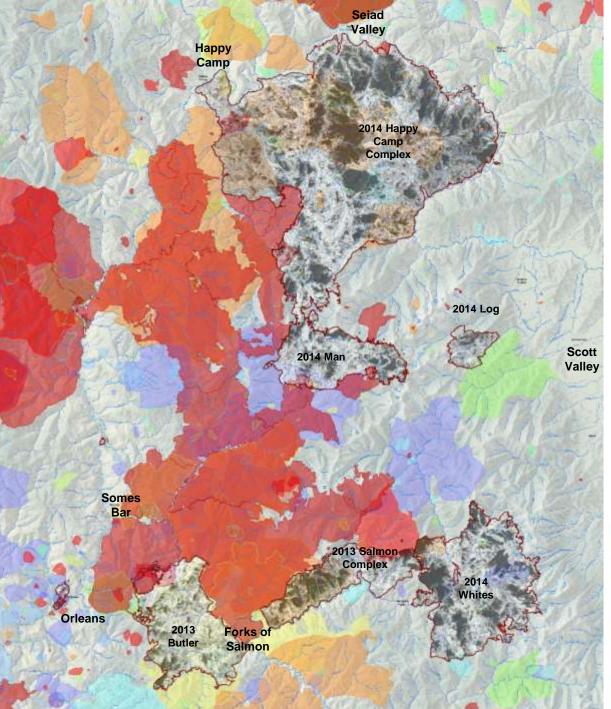
2006: Frank Lake



Grim Realities and Potential Opportunities from Fire History Analysis

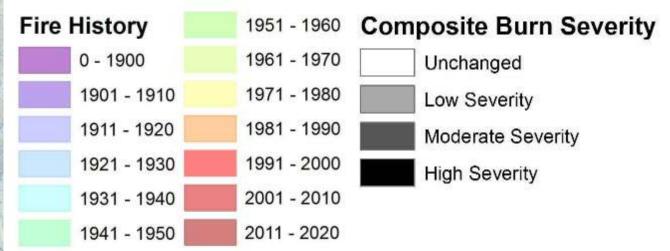
- No areas are within their historic fire return intervals, or even remotely close. Major press disturbance for salmonids.
- With no fire exclusion and continued native burning patterns, we would see smaller self-limiting fire footprints, and some places with 30-100 fire overlaps.

2017: Overlapping Fires Since 1914 in the Klamath Mountains		
Number of Fires	Sum of Acres	Percent of Planning Area
0	499,432	41.7%
1	406,735	34.0%
2	211,770	17.7%
3	71,322	6.0%
4	7,821	0.7%
5	638	0.1%
Total Acres	1, 196,750	100%



Fire Perimeters by Decade with 2013-2014 Fire Severity

- Size and severity are increasing.
- Only recent fire footprints (<10yrs) are stopping or significantly slowing new fire spread.
- 42% of the entire Salmon River watershed has burned in the last decade.



Red Cap Creek Drainage >110 years since fire

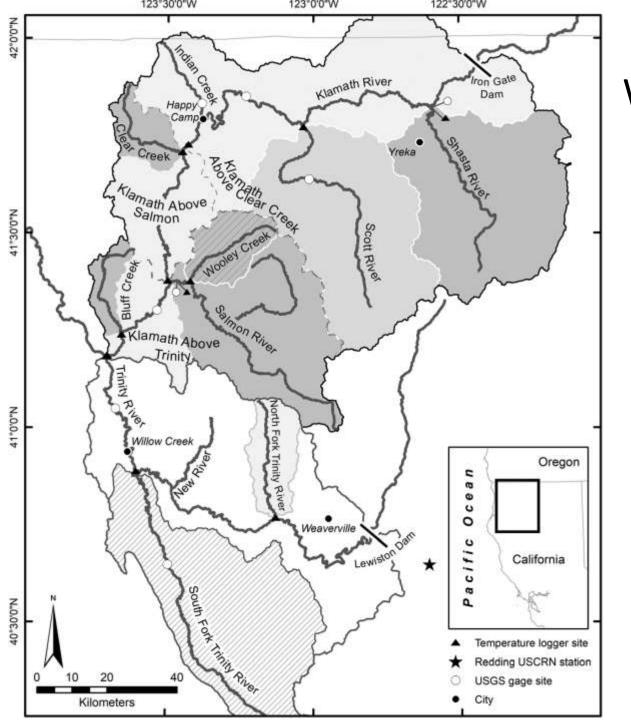
- Lack of instream wood and spawning gravel
- Lack of sunlight to drive primary productivity
- Decreased summer base flow 3-4 times historic stem density
- Entrenched degraded channel vegetation armors stream bank
- Severe risk for large scale high severity wildfire

Elk Creek During the 2014 Happy Camp Complex Fire

Current Fire Suppression Policy: Maximizing the Negative Impacts of Fire in the Klamath Mountains

- 98+ percent of all fire starts are suppressed.
- The few fires that escape suppression typically do so because they start at the hottest, driest times of year.
- > proportion of high intensity fire, > risk to firefighters and communities.
- Nearly 500,000 acres burned, \$550 million dollars spent on fire suppression in the Klamath Mtns in past decade.

2013 Salmon Complex Fire



Wildfire Smoke Cools Summer River and Stream Water Temperatures

David, A. T., Asarian, J. E., & Lake, F. K. (2018). Wildfire smoke cools summer river and stream water temperatures. Water Resources Research, 54. https:// doi.org/10.1029/2018WR022964

- All 12 streams analyzed benefitted from smoke induced cooling.
- Smoke-induced cooling has the potential to benefit cold-water adapted species.

2015 Steinacher Fire in Wooley Creek

2013 Salmon River at Mouth of Crapo Creek

2013 Salmon River Drainage Post-Wildfire

2013 Butler Fire

2013 Salmon Complex

Photo: Thomas Dunklin

Spring Chinook Salmon - Lower Clear Creek

2014: Boulder Gulch – NF Salmon River – Spring Chinook Rotting Under Ledge

2012: Spring Chinook Holding Lower SF Salmon River







ESTERN KLAMATH RESTORATION PARTNERSHIP

• Began facilitated upslope restoration workshops w US Fire Learning Network in Spring 2013.

• An open group comprised of Federal, Tribal, Nongovernmental Organization (NGO) and local participants.

•Trust originally developed thru collaborative instream restoration.

- Collaboratively identified planning area (1.2 million acres)
- Goal: Restore "historic" (natural w people) fire regimes in the Western Klamath Mtns.



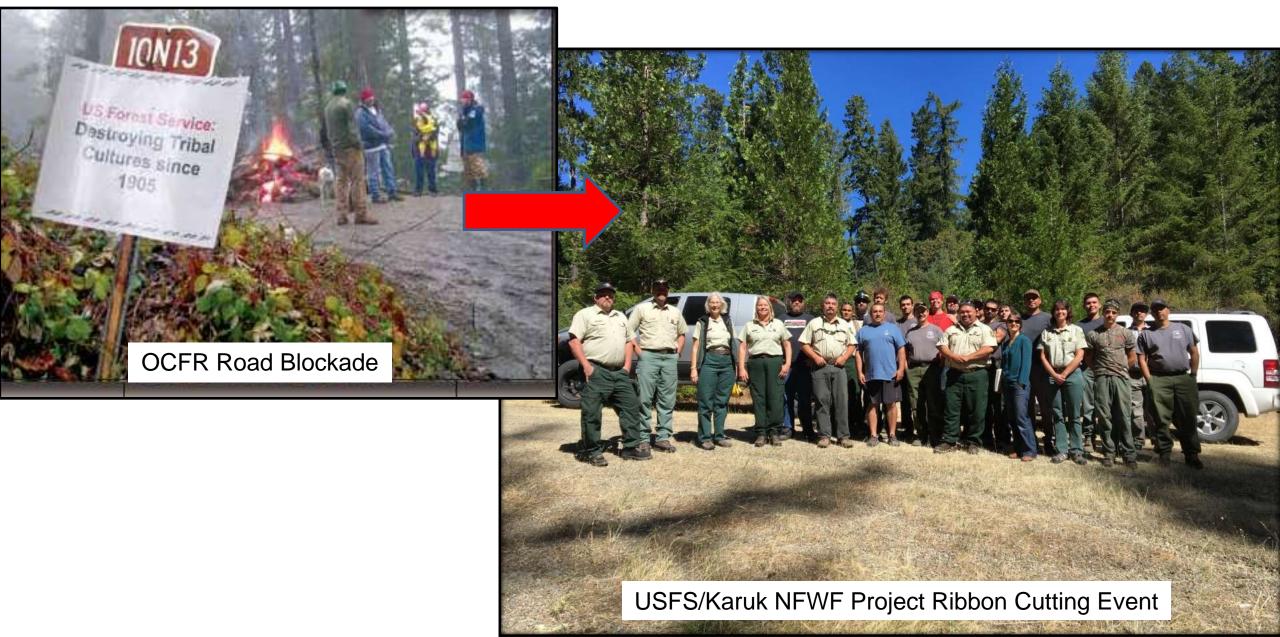
Wholistic Fire Management: Social, Cultural, Ecological, Economic Perspectives in Balance

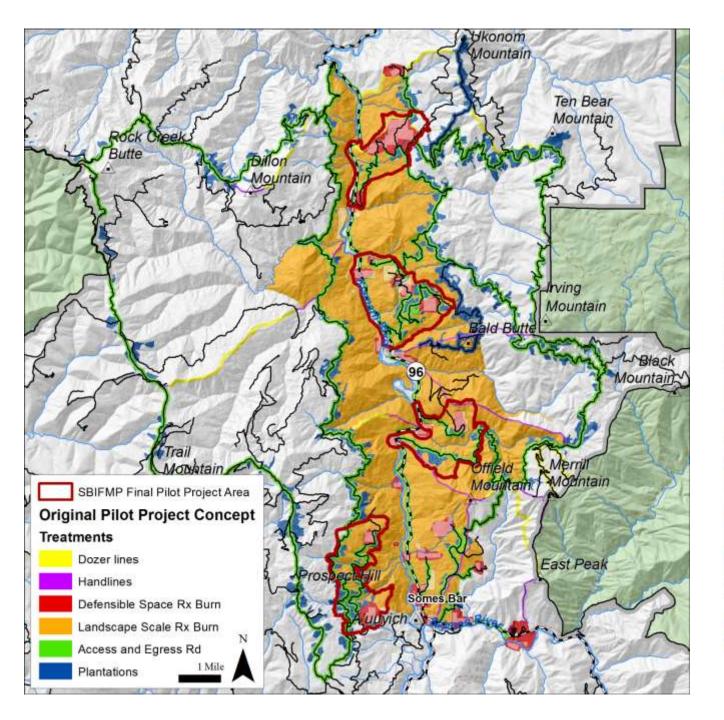
- Building support at all levels for upslope restoration actions to expedite the creation of fire resilient communities and forests.
- Initiating large scale project planning and implementation through multi-agency Inter-disciplinary Teams.
- Implementing Prescribed Fire Training Exchanges (Klamath TREX 2014-2018).
- Workforce Development
- \$5 Million CALFIRE grant 2018, submitted \$40 million CFLRP proposal Aug 2019





From Conflict to Collaboration





Somes Bar Integrated Fire Management Project Final Environmental Assessment





Pacific Southwest Region

west Six Rivers National Forest R5-MB-312 April 2018



2014-2018 Klamath TREX Accomplishments

2,000 acres burned in 100+ properties in the WUI of seven communities

- 300+ participants from local, tribal, state, national and federal organizations
- No escaped fires

Prescribed Fire

- Maximize opportunities for RX burning across ownerships.
 - Interagency mobile burn teams.
 - Collaborative rx burn database.
 - Fund training: Invest in art and science of RX fire.
- Maximize opportunities for managed wildfires.
 - Collaboratively identify where and under what conditions wildfires can be managed for resource objectives.
 - ID and create landscape scale fuelbreaks based on shared values overlay assessment.



Western Klamath Restoration Partnership Orleans - Somes Bar Prescribed Burning



Coho Off-Channel Habitat Restoration in the Middle Klamath A Half-assed History and Some Lessons Learned



Off-Channel Habitat Construction for Juvenile Coho Salmon (2010 – Present)



- 2010: Stender, Buma, Alexander Ponds All on Seiad Creek
- 2011: Lower Seiad and West Grider Ponds
- 2012: May Pond on Seiad Creek
- 2013: Ponds on Tom Martin, O'Neil, Camp, and Stanshaw Creeks
- 2014: DeCoursey Pond (Middle Creek trib to Horse Creek) and Durazo Ponds on Seiad Creek.
- 2015: Goodman Pond on Middle Creek
- 2017: Lawrence Ponds on Horse Creek
- 2018: Fish Gulch Ponds on Horse Creek
- Primary objective is to rapidly increase coho winter rearing habitat, however summer use has been documented in all ponds.
- Extensive Monitoring: water quality (DO, temp), snorkel surveys, mark/recap popn estimates, maintaining habitat connectivity.
- Shari Anderson MS thesis (2014) on coho growth, density, and abundance in constructed habitats, as well as tributary and beaver influenced habitats. HSU grad student Michelle Krall about to publish MS thesis.
- Funding: USFWS Partners Program, NFWF/PacifiCorp, FishAmerica/NMFS, Caltrans/USFS and CDFW.

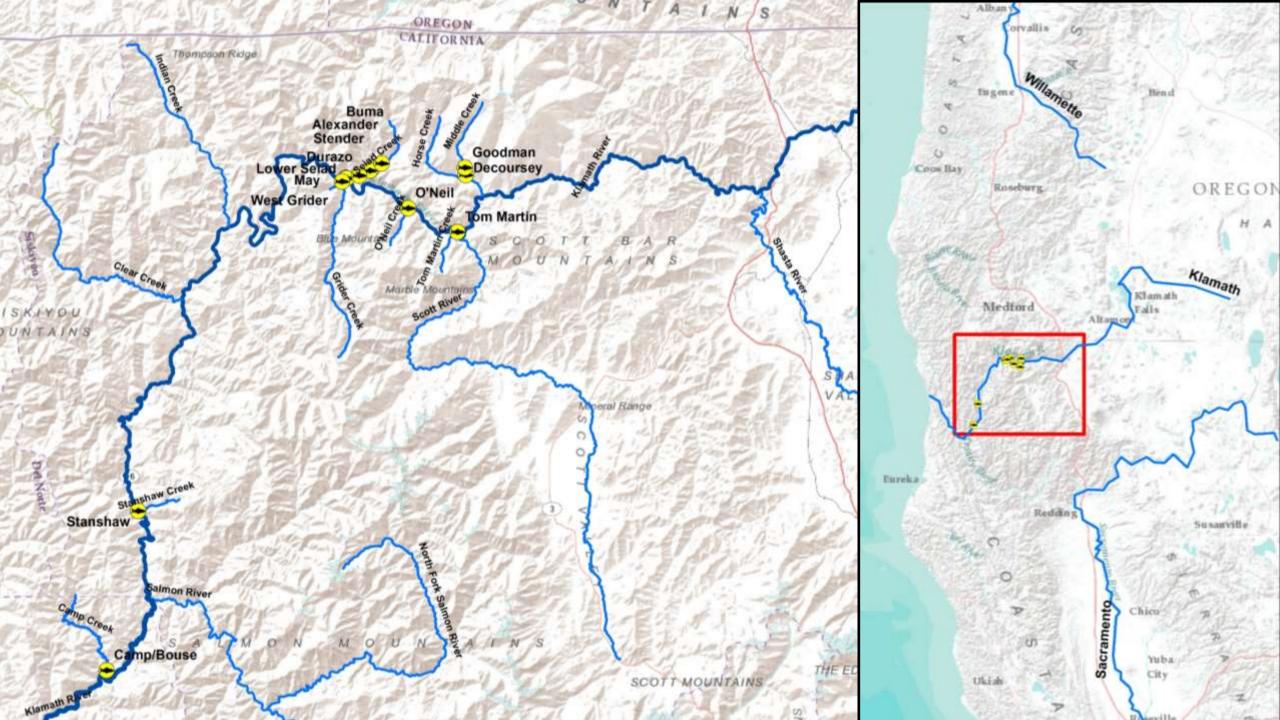






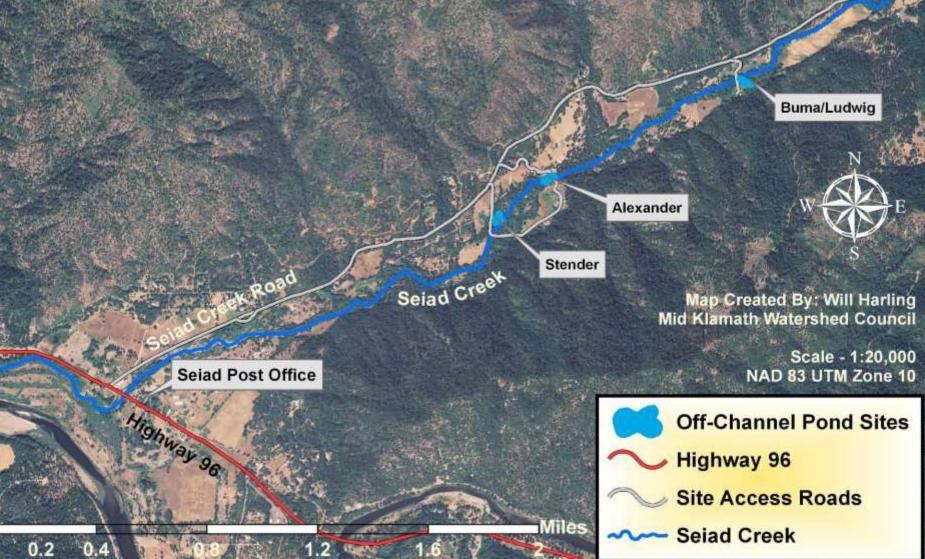






Seiad Creek Off-Channel Coho Ponds Project Location Map

Projects Implemented in 2010



- Key coho stream in Mid Klamath.
- Heavily impacted by channelization (levees) to make room for ag/domestic use, and past mining.
- Willing landowners in a hostile landscape.
- Working in an altered landscape.
- Experimenting with site longevity based on connectivity during flood events.

Buma Ludwig Off-Channel Salmonid Rearing Habitat on Seiad Cree 2009-PARTNERS-HR-14

Project Location: 2700 Seiad Creek Road, Seiad, CA 96086 TRS: T46N R11W Section 5

Seiad Creek

Map Created By: Will Harling Mid Klamath Watershed Council

Scale - 1:2,000 NAD 83 UTM Zone 10

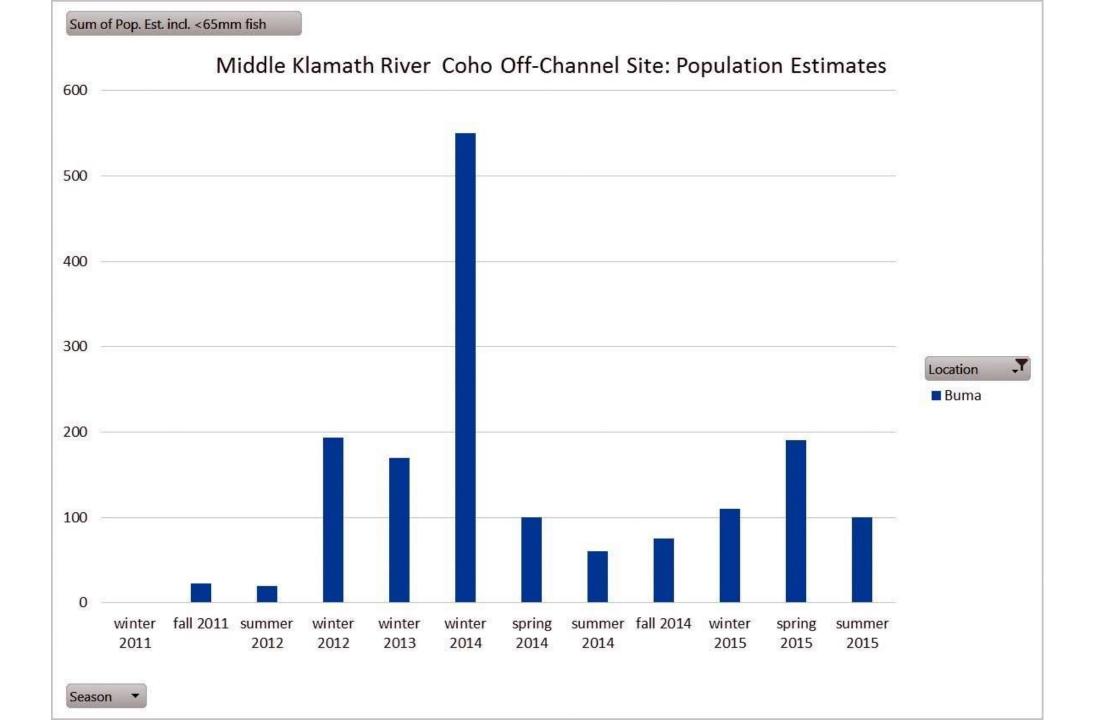
			Meters		
15	30	60	90	120	



- Dug into side channel w through flow in 5-10 year flood event.
- Very low cost of construction (~\$10,000).
- Beaded channel design.
- Early issues with connectivity. Entered Seiad Creek mid-riffle...

Buma Pond: After Construction 11-3-10



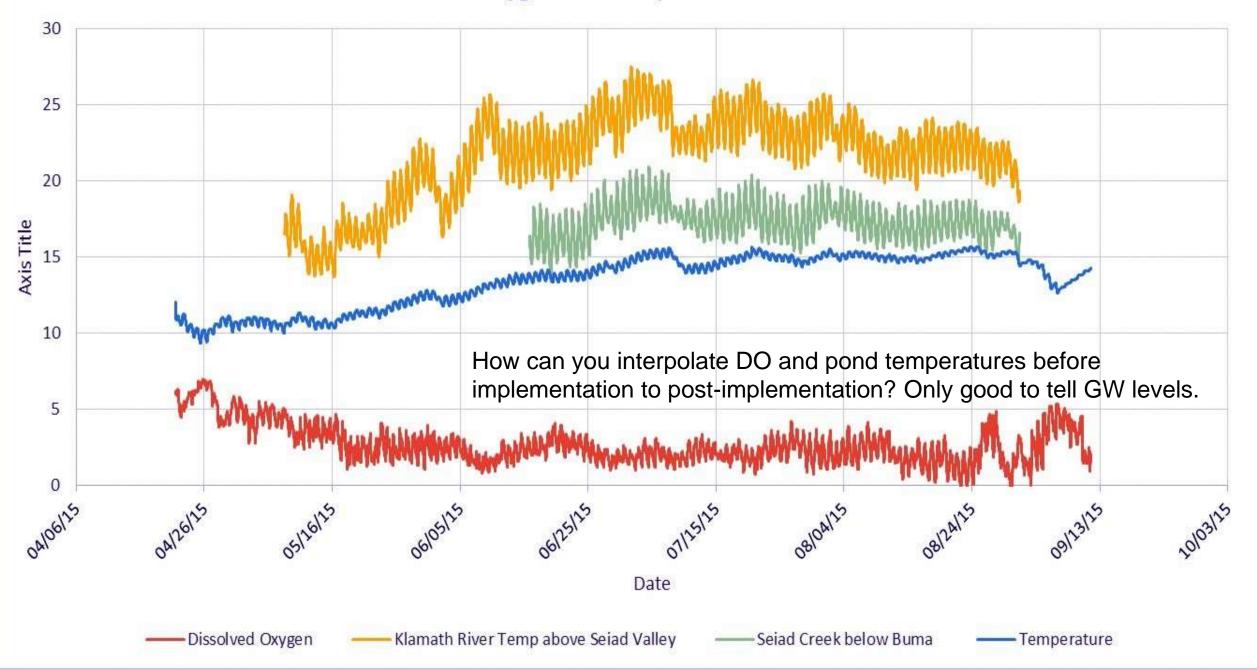


Buma Pond – High Retention - High Numbers of Large 1+ Coho

To the Ocean!!!

SIZE MATTERS!!!

2015 Dissolved Oxygen and Temperature Data: Buma Pond





Before - November 2009

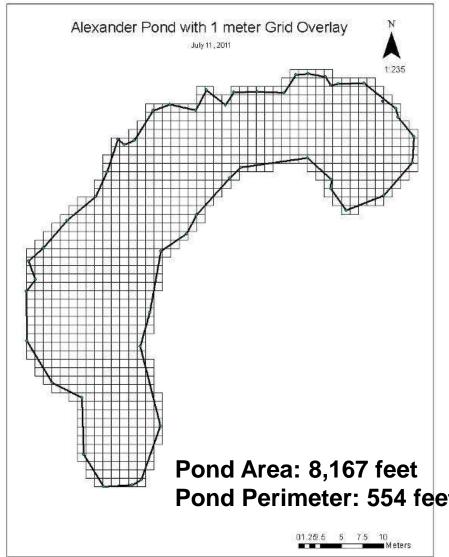


During – October 2010



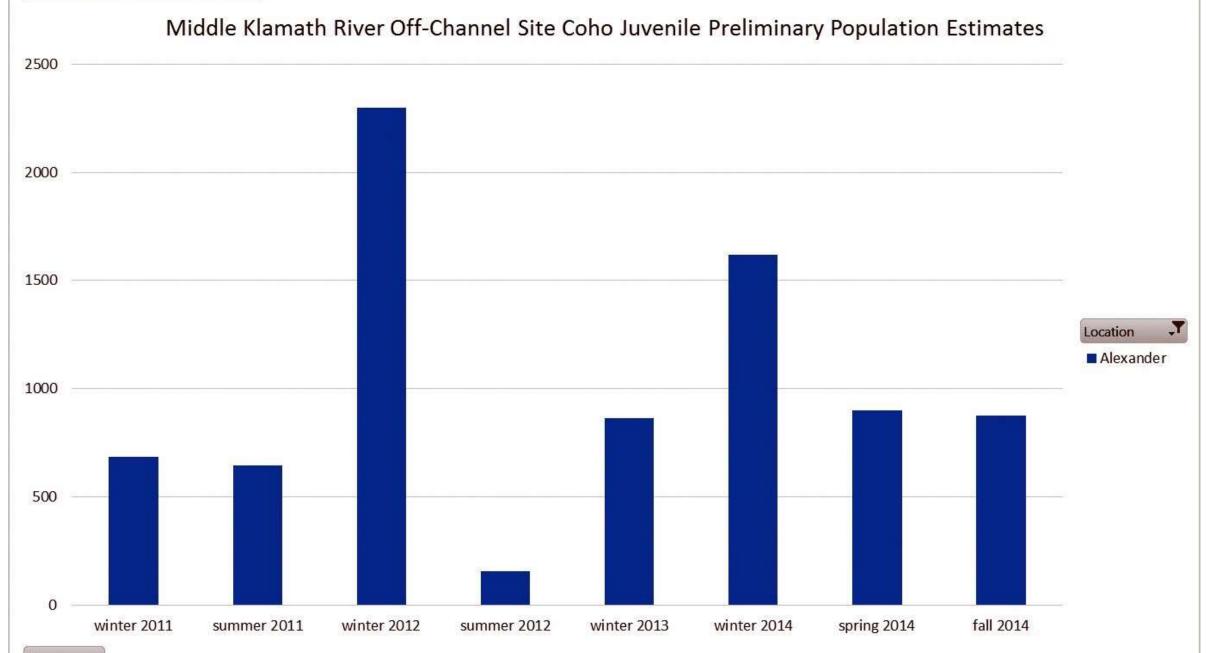
Alexander Pond

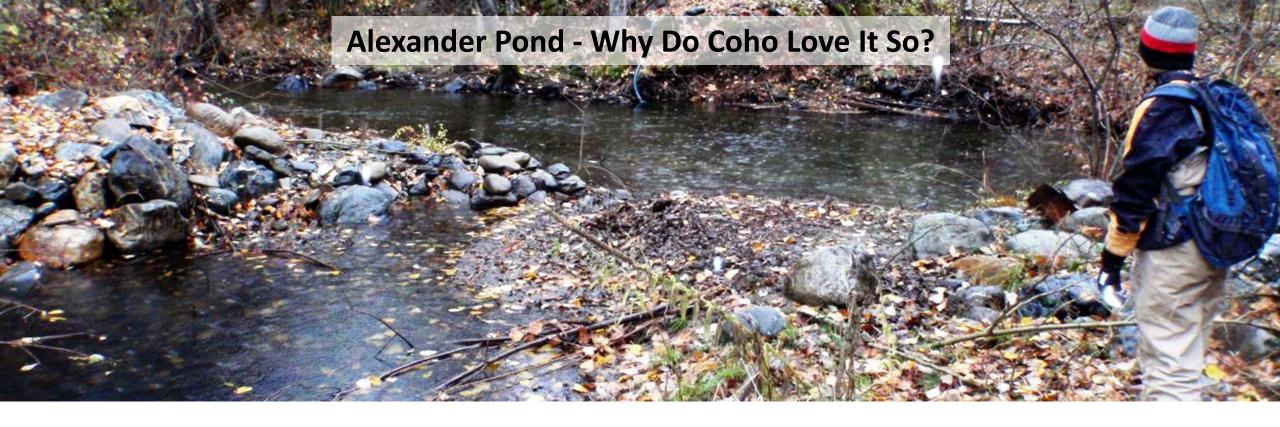
~ 2 mi. up Seiad Creek



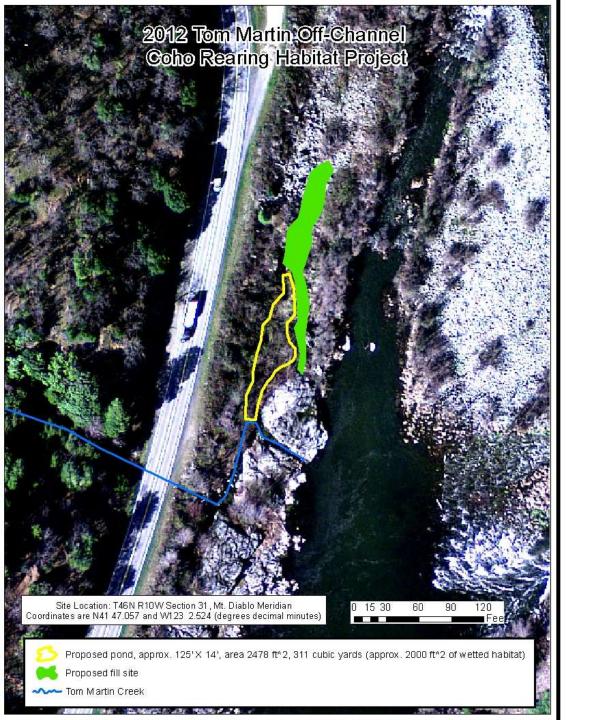
After – February 2011

Sum of Pop. Est. incl. <65mm fish





- Located just downstream of a key spawning reach on lower Canyon Creek.
- Eight feet deep at summer base flow.
- Suitable summer temperatures and dissolved oxygen levels.
- Complex wood structures
- High plankton levels may help to deter predation.
- Connection to Seiad Creek increases from two feet to nearly 20 feet during high flows. This may increase the ability for juvenile coho to find the site during high water events.



Tom Martin Creek

- First thermal refugia below Scott River
- 748 coho observed in 200' section below Hwy 96 culvert (Summer 2012).
- First project with specific focus to expand summer thermal refugia.
- Implemented November 2013



Tom Martin Pond – Before Construction

Tom Martin Pond – After Construction

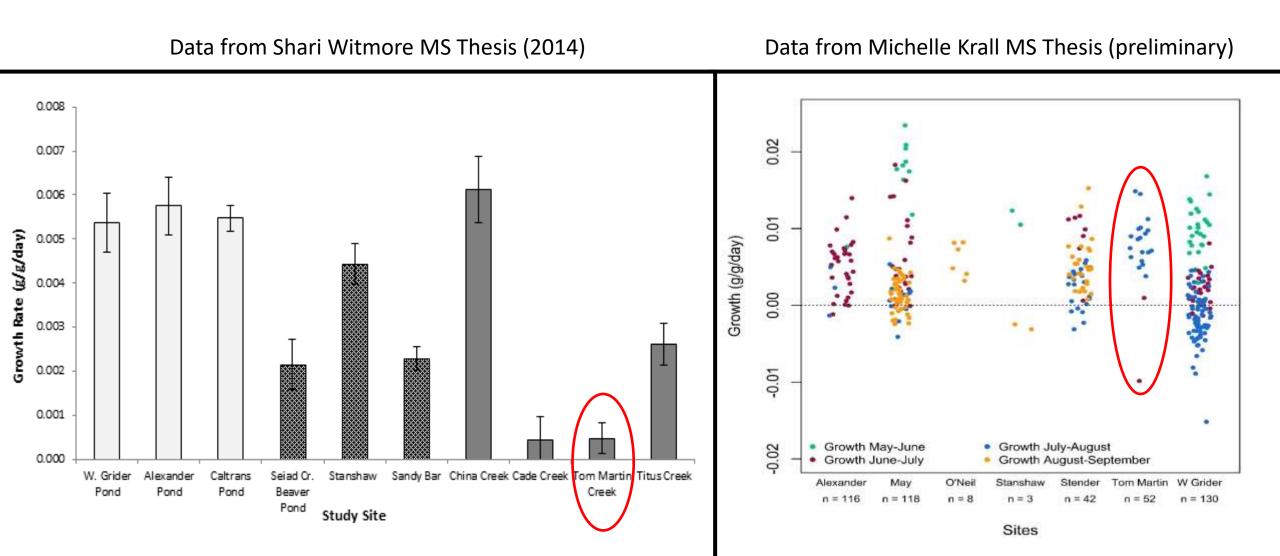
Tom Martin Pond

Tom Martin – After Brush Bundles



Tom Martin Pond After Feb 2015 High Flow Event

Summer Growth Rates in Tom Martin Creek Pre- and Post-Construction

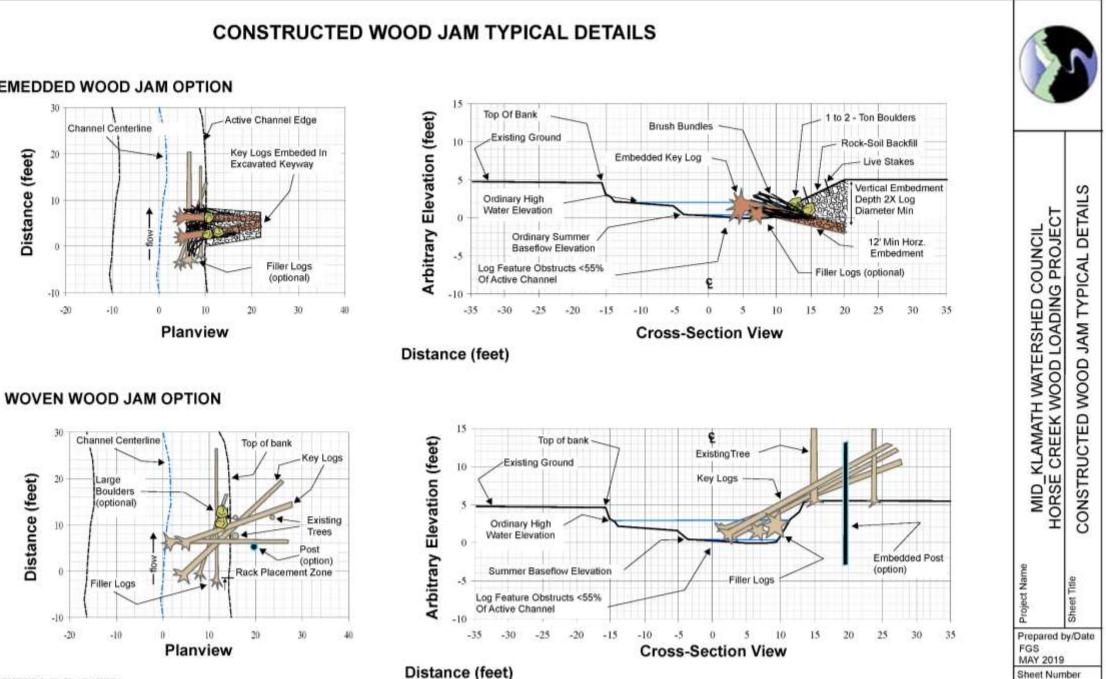


2012 Goff Fire

Stender Off-Channel Pond on Seiad Creek 2012: Post-Debris Flow

Horse Creek Drainage: Post-fire 2016

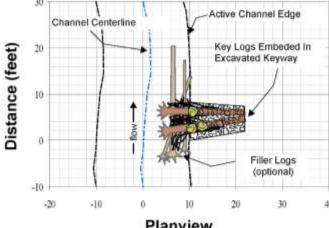
- Historical oak woodland forest converted to even-aged conifers.
- Extreme risk for stream evulsion into ag lands in lower valley.
- Potential to relax levees, increase floodplain capacity to sort sediment and wood, and provide off-channel habitat for rearing juvenile coho salmon.
- Social license lacking for restoration at the scale needed.



REVIEW DRAFT

Distance (feet)

EMEDDED WOOD JAM OPTION

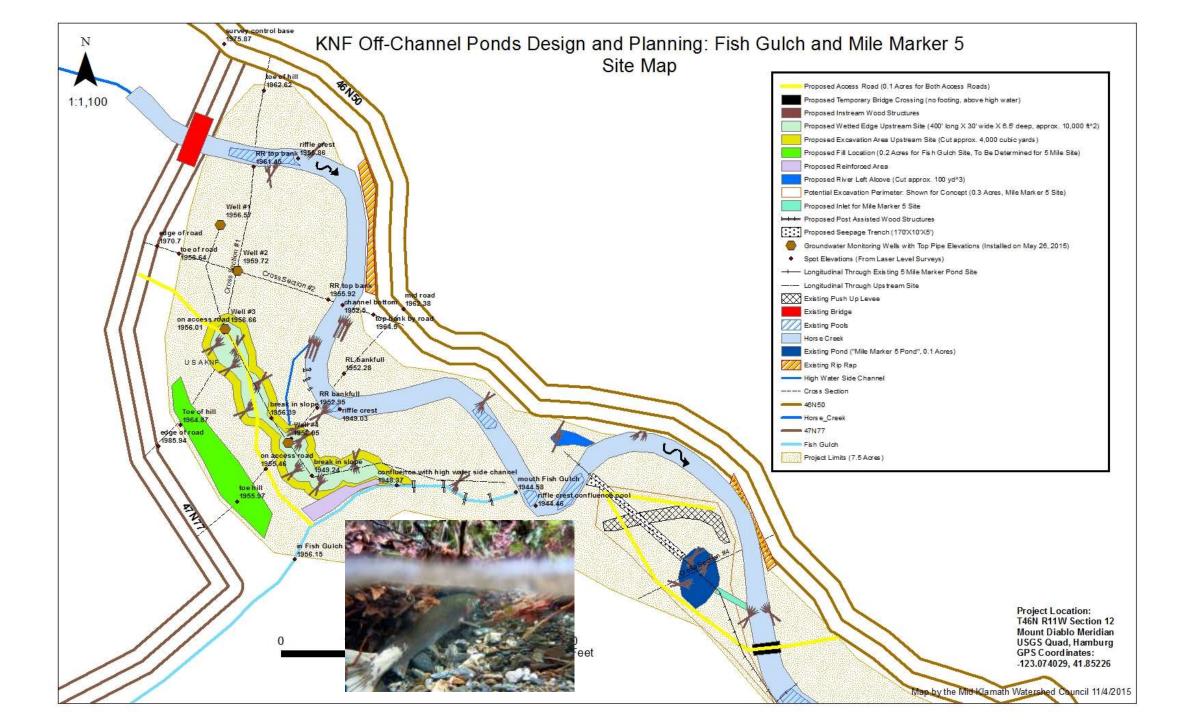




3 of 3













Lower Seiad Creek Beaver Dam...Analogue???



Six Rivers Aquatic Restoration Project Environmental Assessment



Forest Service

United States Department Net TEPA Decision

- Final Environmental Assessment completed in December 2018
- Programmatic in Scope and Scale
- Covers entire Six Rivers NF
- Coastal Conservancy funded MKWC to enter into a Collection Agreement with Six Rivers NF to complete the
- Restoration Actions can occur anywhere in fish bearing streams, lakes and ponds, as well as adjacent riparian areas, as identified on the project area maps

Six Rivers Aquatic Restoration Project Final Environmental Assessment

United States Department of Agriculture



Forest Service

USDA

acific Southwest

Six Rivers National Fores R5-MB-317 December 2018

Programmatic Level NEPA

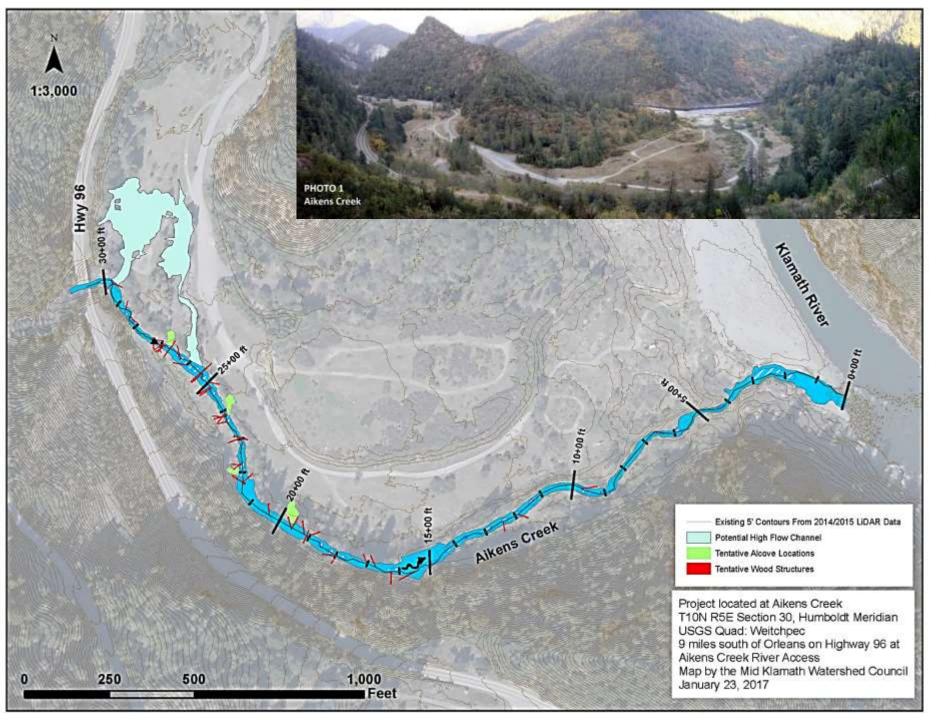
SRNF NEPA is programmatic and covers 2 kinds of project locations:

1/ Specific Project Locations or previous instream restoration locations and sites identified through collaboration. This includes locations....

- where cultural resource surveys have occurred such that site specific design features are developed.
- where projects are smaller in size where no ground disturbance would occur.

2/ New Project Locations within the analysis footprint (example: polygons found around fish bearing streams and lake/pond features)

• Sites where no on-the-ground cultural surveys have occurred, however, non-ground disturbing projects could still be implemented.



Aikens Creek Coho Habitat Restoration Project

- Post-'64 Flood Bluff Creek "Ghost Channel" converted to USFS Campground.
- Aikens Creek put into ditch on side of valley.
- USFS, Karuk and Yurok Tribes and MKWC worked for 7 years to get to implementation phase.

Restoration Toolbox

Fish Habitat Connectivity – Aquatic Species Passage Restoration

- Instream Habitat Enhancement
- 1/ Large wood and boulder placement
- 2/ Existing structure improvements/removal
- 3/ Beaver habitat restoration
- 4/ Gravel Augmentation
- 5/ Off-/Side-Channel Restoration

- Riparian and Streambank Restoration
- 6/ Streambank Restoration
- **7/Riparian Vegetation Treatments**
- 8/ Non-Native Invasive Plant Control
- 9/ Reduction/Relocation of Recreation Impacts

Restoration Toolbox

- Riparian and Streambank Restoration
- 6/ Streambank Restoration
- **7/Riparian Vegetation Treatments**
- 8/ Non-Native Invasive Plant Control
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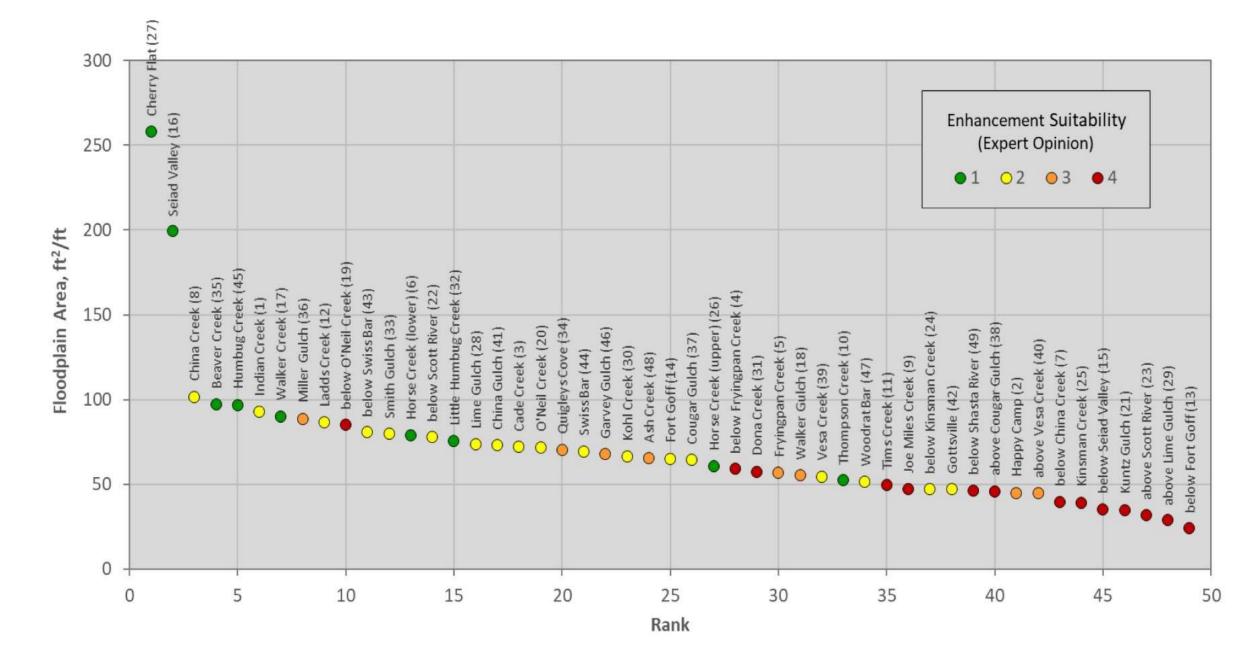
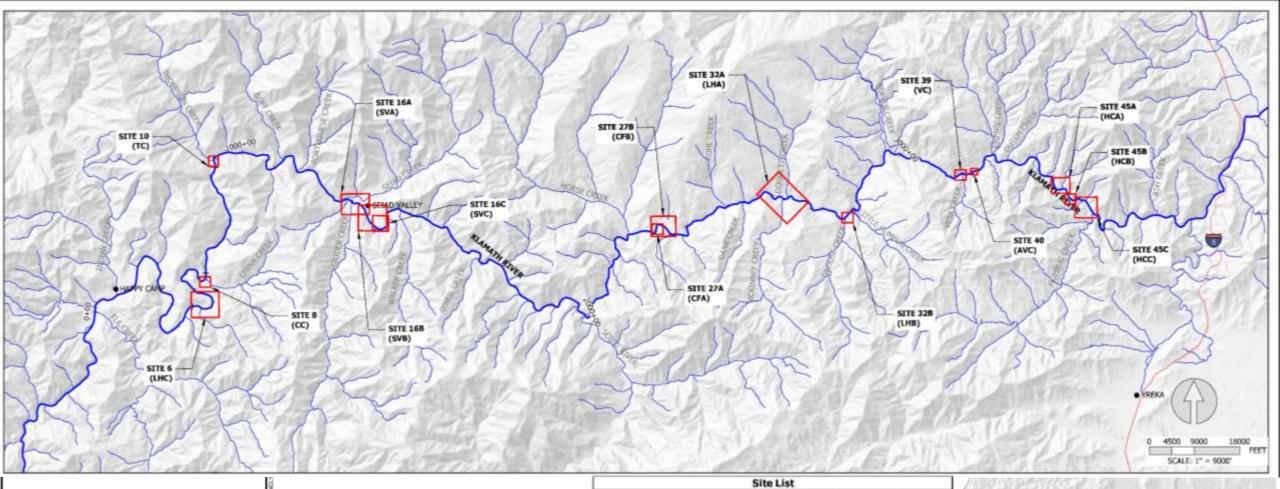


Figure 5. Reach enhancement suitability and rank relative to floodplain area $1 \ge 5$ ft above the riffle crest thalweg datum.



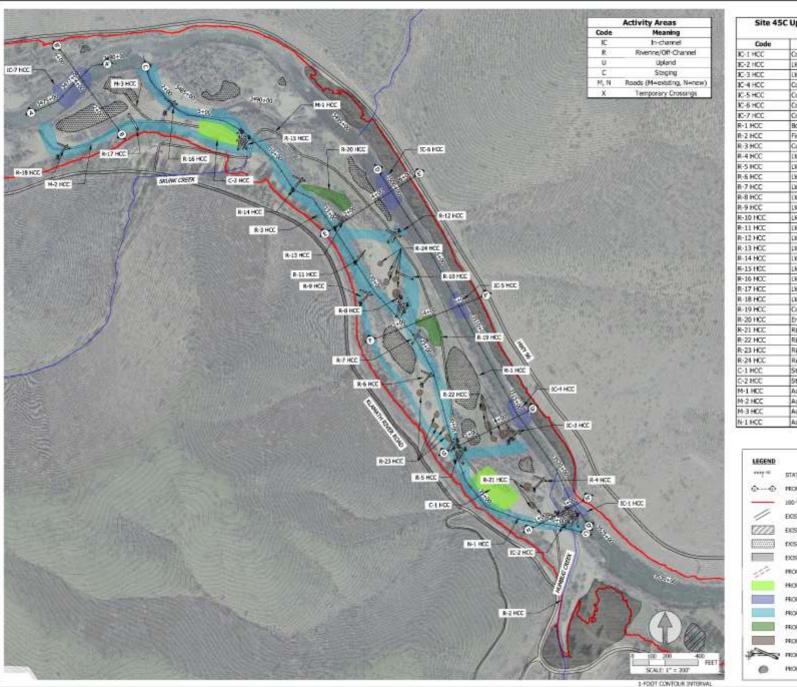
MID-KLAMATH FLOODPLAIN HABITAT	LEGEND
SISKIYOU COUNTY, CA	####+00
Stillwater Sciences	÷

Still	water	Sciences	
850 G ST, S ARCATA, CA		P: (707) 822-9607	

LEGEND	
	KLAMATH RIVER
####+00	STATIONING IN FEET
·	TRIBUTARIES
•	CITY
	SITE VIEW FRAME

Code	Design Site	Site No.	Reach No.
UHC	Little Horse Creek	6	6
CC 00	China Creek	8	8
TC	Thompson Creek	10	10
SVA	Lower Seiad Valley	16A	16
SVB	Mid-Seiad Valley	168	16
SVC	Upper Seiad Valley	16C	16
CFA	Cherry Flat A	27A	27
CFB	Cherry Flat B	278	27
LHA	Little Humbug Creek A	32A	32
LHB	Little Humbug Creek B	328	32
VC	Vesa Creek	39	39
AVC	Above Vesa Creek	40	40
HCA	Lower Humbug Creek	45A	45
HCB	Humbug Creek	458	45
HCC	Upper Humbug Creek	45C	45





Site 45C Upper Humbug Creek (HCC) Description Coarse sedment addition LWD placement LWD placement Coarse sedment addition Coarse sedment addition Coarse sedment addition Coarse sedment addition Bouider levee removal Fish passage improvement Constructed side channel LWD placement LWD/boulder placement - to split flow LWD placement LWD placement UWD/boulder placement - to split flow LWD placement LWD placement LWD placement LWD placement LWD/boulder placement - to split flow WD placement LWD/boulder placement - to split flow **LWD** placement LWD placement LWD placement Constructed off-channel pond inhance existing beaver pond. Riperian planting Riparian planting Riperian planting Repartant planting Staging area Staging area Access road - existing Access road - existing Access med - existing Access road - new



MID-KLAMATH FLOODPLAIN HABITAT ENHANCEMENT PROJECT

SISKIYOU COUNTY, CA Stillwater Sciences

854 G 17, 52172 4 MICATA, CA 85521 91 (761) 422-9607

SCALE: AS NOTED

.

200F-

DATE: 1/29/19

DESIGN: JS

DRAWN: RT

CHECKED; JM

APPROVED: ---

CREEK (HCC)

PLAN VIEW

SITE 45C - LOWER HUMBUG

SHEET 1 OF 2

Klamath River at Humbug Creek - 2014

