Inexpensive restoration techniques for rapidly increasing wood cover for salmonids

Jennifer Carah, Ecologist, The Nature Conservancy, jcarah@tnc.org
Dave Wright, Campbell Timberland Management
Christopher Blencowe, Blencowe Watershed Management
Lisa Bolton, Trout Unlimited

Wood for Salmon

- Why wood?
- What approach are we using?
- What have we done so far?
- What do you need for a successful project?
- Design criteria
- Funding, permitting considerations
- What are the limitations of our method?
- What are others ways to add wood?

What do salmon need?

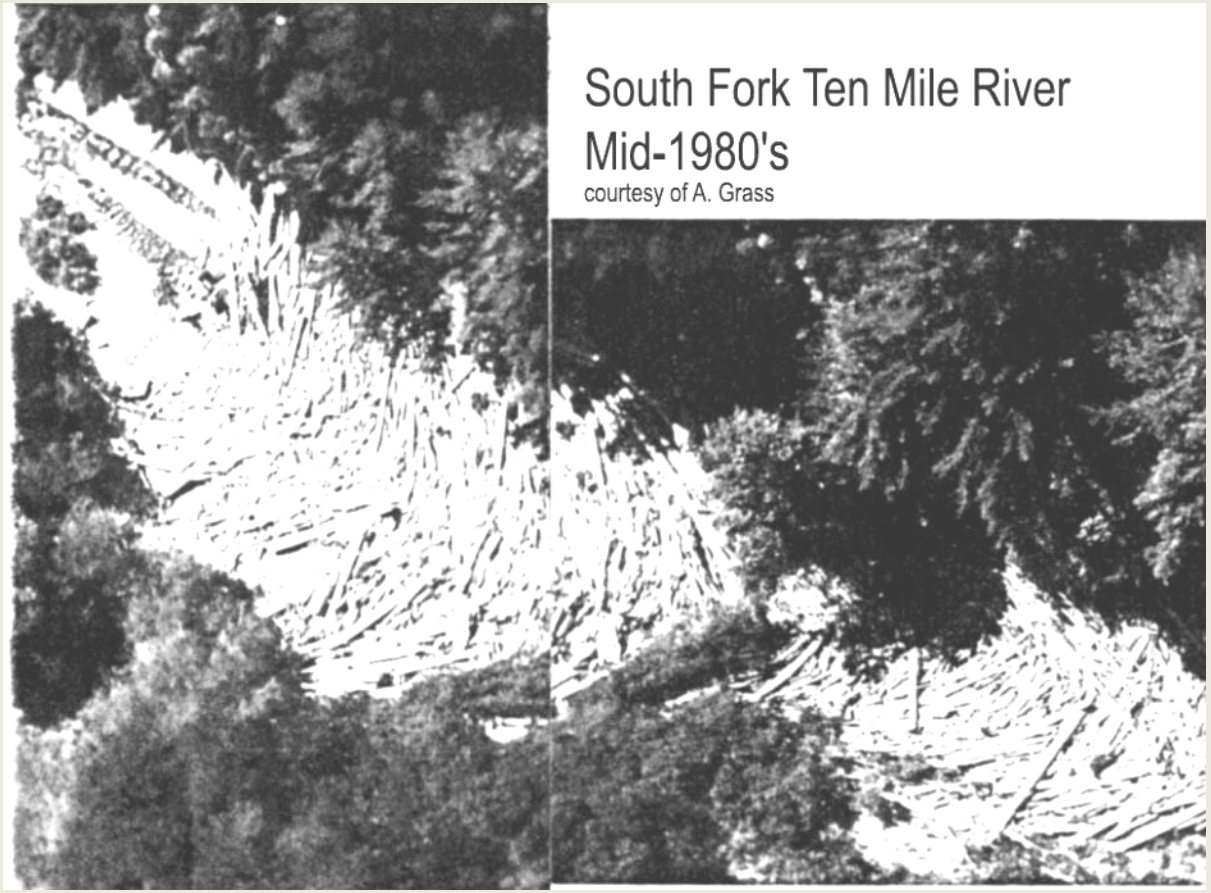
- Cold, clean water (quality & quantity)*
- Connectivity
- Spawning gravels*
- Deep pools*
- Cover from predators at all life stages*
- Healthy riparian forests/shade
- Refuge from high winter flows*
- Healthy estuaries*
- Food*
- Healthy oceans

Phase 1: 1,000,000+ years of wood loading

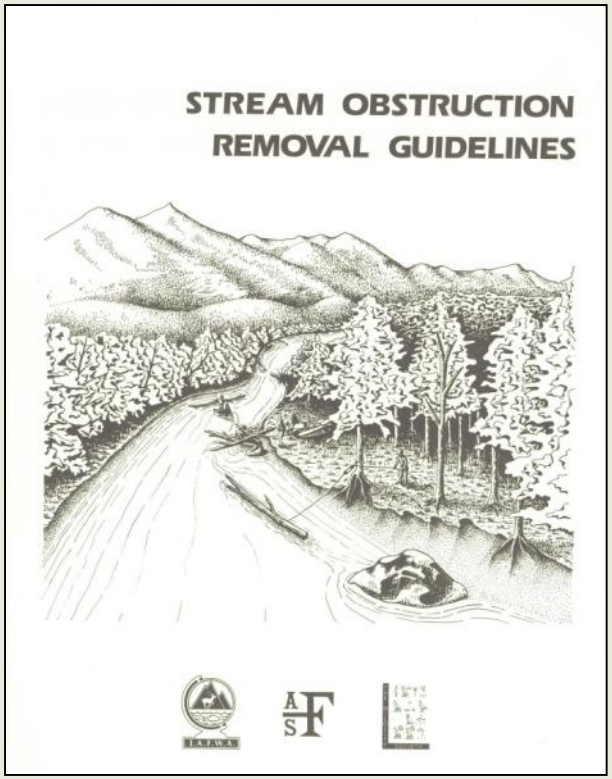
Phase 2: Early Logging (1860s – 1920s): Instream and streamside tree and wood clearing

Phase 3: Post WW-II Logging (1940s – 1970s)
Excessive wood loading

Phase 4: Stream Clearing (1970-80s)



South Fork Ten Mile River
Mid-1980's
courtesy of A. Grass

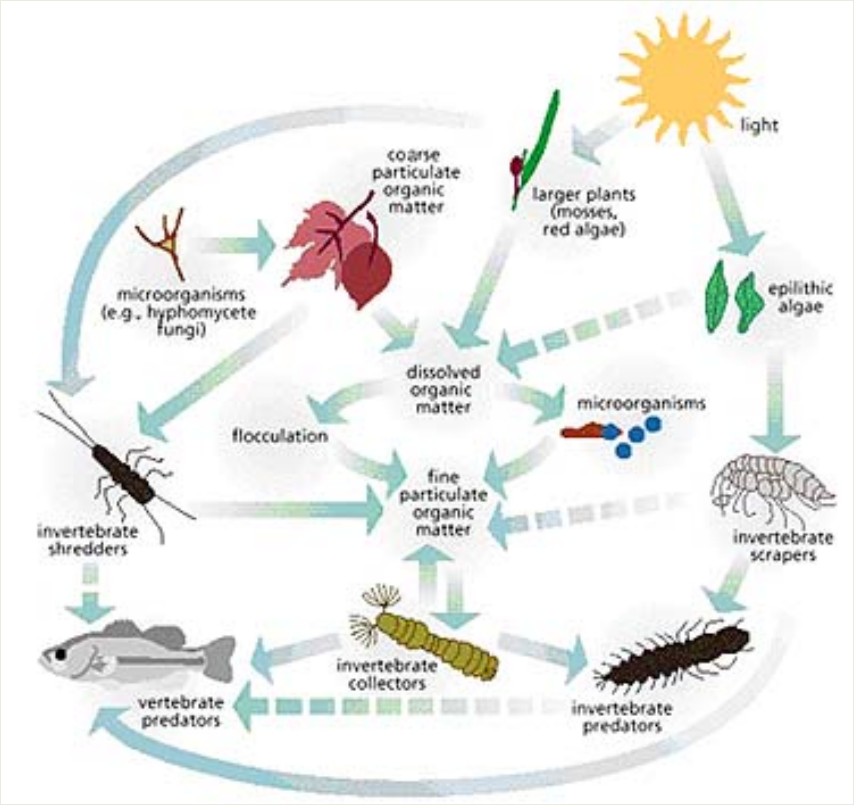


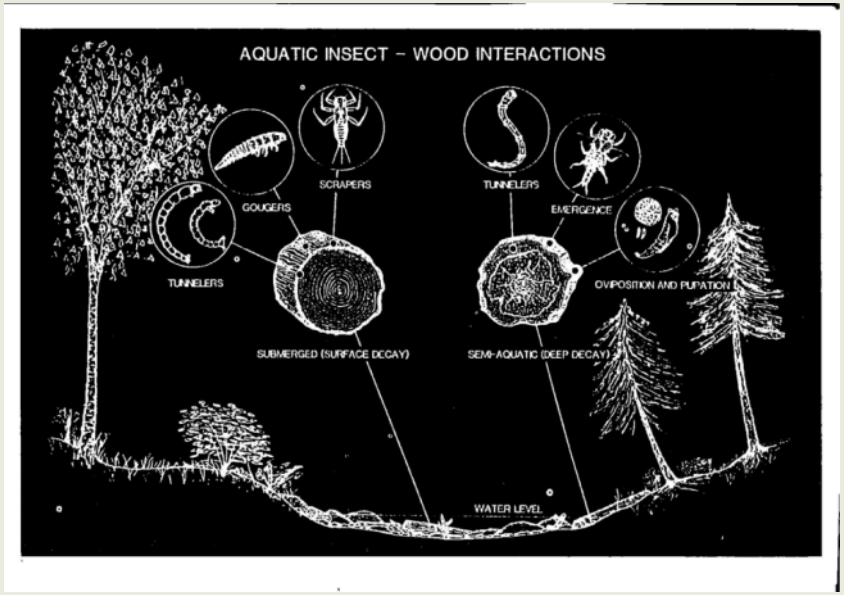
Phase 5: Waiting for riparian corridors to mature (Present)

Hydraulics/Habitat Formation

Cover

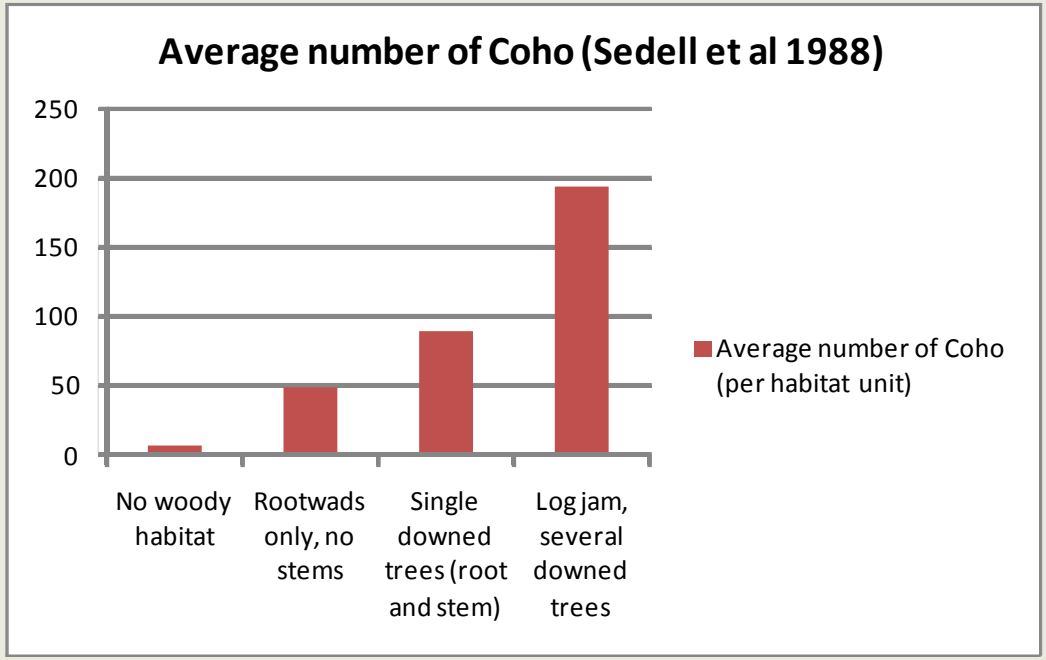
Food


light
coarse particulate organic matter
larger plants (mosses, red algae)
microorganisms (e.g., hyphomycete fungi)
epilithic algae
dissolved organic matter
microorganisms
flocculation
fine particulate organic matter
invertebrate shredders
invertebrate scrapers
invertebrate collectors
vertebrate predators
invertebrate predators


AQUATIC INSECT – WOOD INTERACTIONS
GOUGERS
SCRAPERS
TUNNELERS
TUNNELERS
EMERGENCE
OVIPOSITION AND PUPATION
SUBMERGED (SURFACE DECAY)
SEMI-AQUATIC (DEEP DECAY)
WATER LEVEL

Wood and Salmon

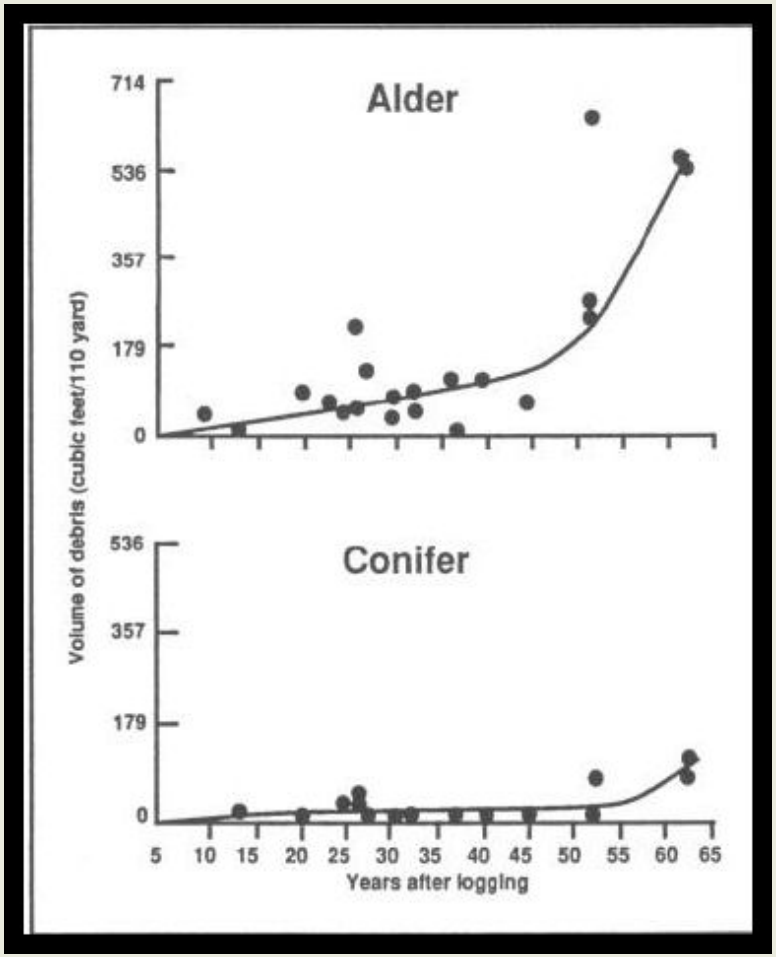
- ↑ wood – high priority coho recovery action
- 80% of NMFS CCC ESU Coho Core Areas have poor wood stocking



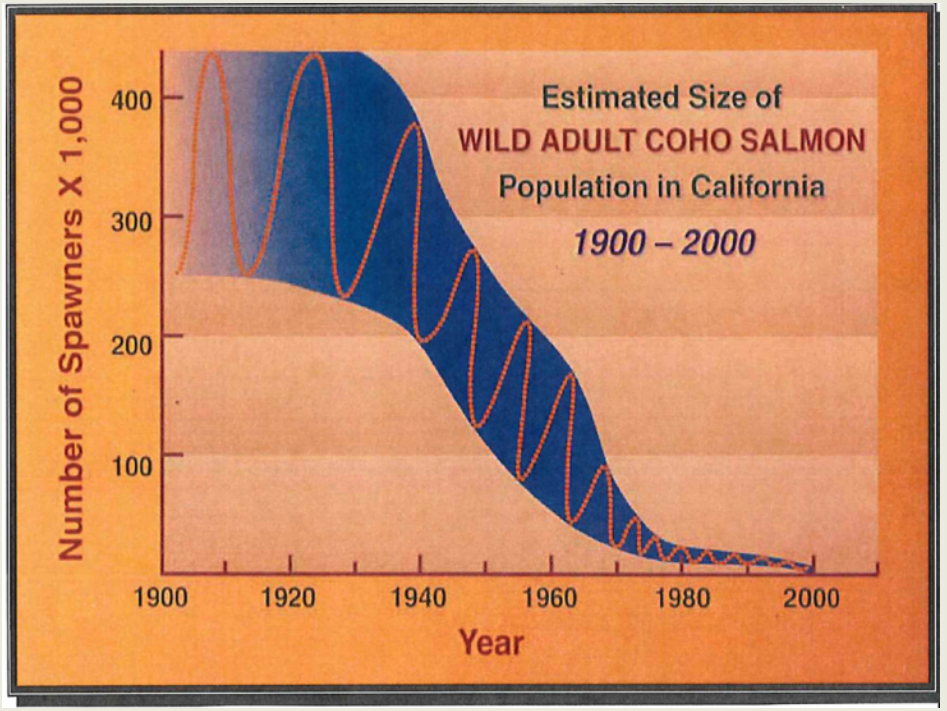
Restoration Strategies

1. Protect and restore riparian forests and processes
   - Riparian buffers
   - Selective management

Problem?



Sedell et al. 1988



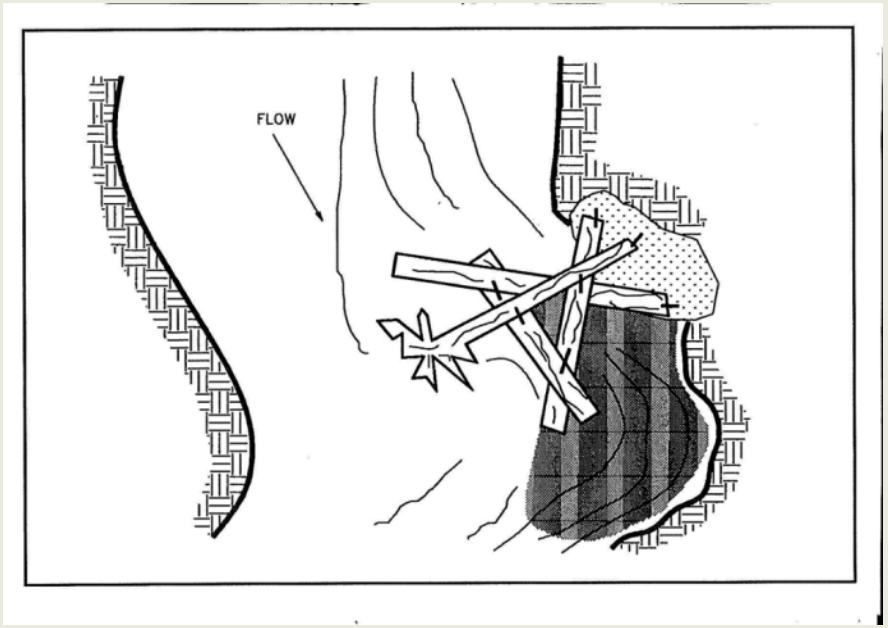
Public Draft Recovery Plan for the ESU of CCC Coho Salmon (NMFS 2010)

Restoration Strategies

2. Accelerated recruitment of wood as a stop-gap measure

Accelerated Recruitment

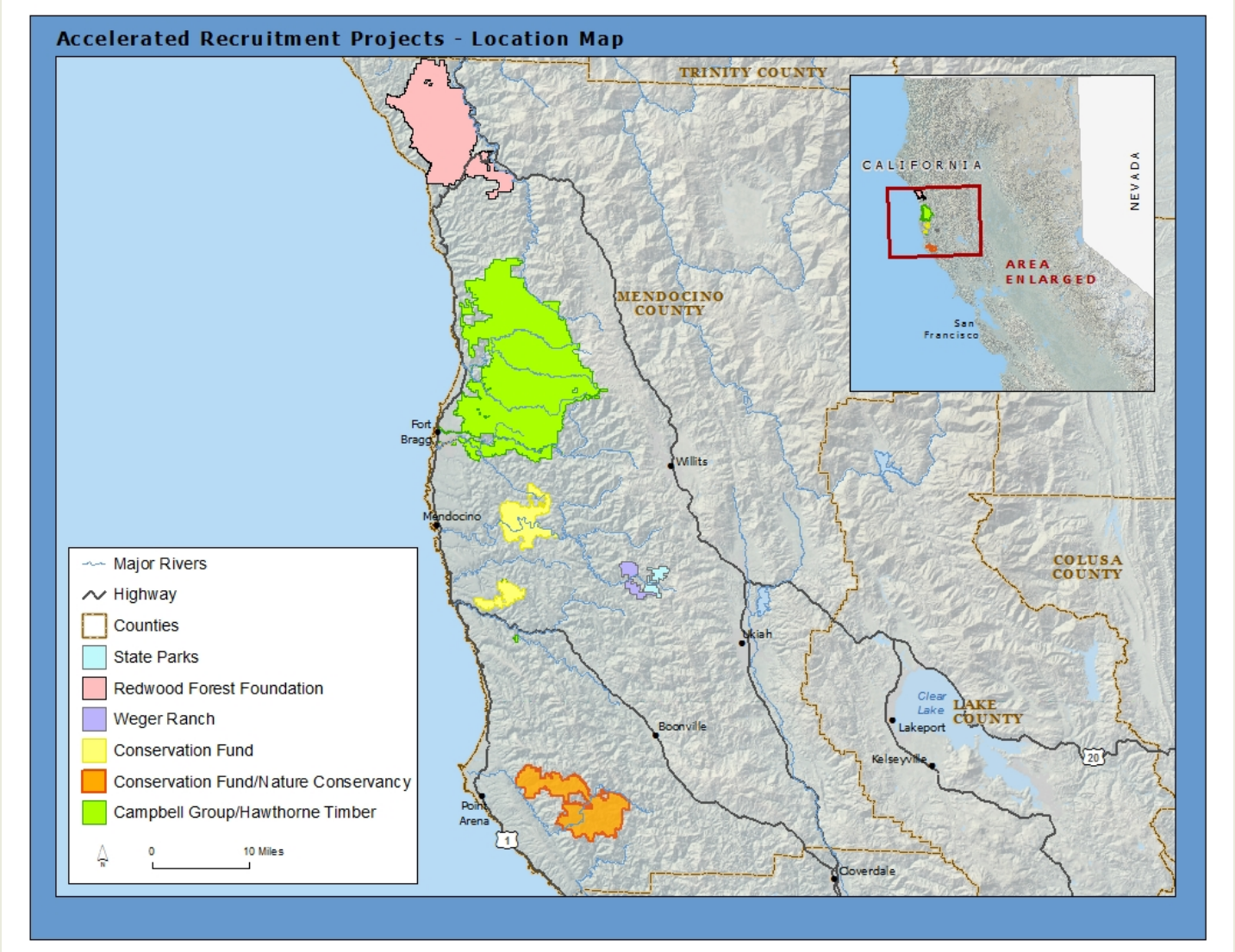
- Wood augmentation is not a new idea
- Our strategy:
  - ↑ pace and scale
  - rapid, efficient accelerated recruitment of wood as a stop-gap measure
  - natural wood recruitment is the goal



Accelerated Recruitment

- Gualala Redwoods, Inc./ Gualala River Watershed Council
  - treated 14 streams
  - 781 individual wood pieces
  - total volume 93,359 ft^3

Where we are working



What have we done?

Project	Project Partners	Watershed size (square miles)	Av. bankfull width (ft)	Miles treated	Pieces placed
Clark Fork Ten Mile	Campbell/Hawthorne	34	70	1	31
Kass Creek (Noyo)	Campbell/Hawthorne/ Trout Unlimited	2.5	13	2.6	140
North Fork Ten Mile	Campbell/Hawthorne/ Trout Unlimited	39	53	10	392
South Fork Ten Mile	Campbell/Hawthorne/ Trout Unlimited	39	49	9.4	309
Inman Creek (Garcia)	Nature Conservancy/ Conservation Fund	9	42 (lower), 38 (upper)	4	188
Signal (Garcia)	Nature Conservancy/ Conservation Fund	6	31	3	122
North Fork Garcia	Nature Conservancy/ Conservation Fund	16	52 (upper), 50 (lower)	1.5	117
Little North Fork Big River	Conservation Fund	13	32	1.7	81
NF Usal	Redwood Forest Foundation/ Campbell/Trout Unlimited	16	25	2	94
South Fork Big River	Weger Ranch/State Parks/ Trout Unlimited	38	41 (upper), 30 (lower)	2.1	160
Big Salmon Creek	Conservation Fund	13	25 (upper), 16 (lower)	6.4	323
Totals				**43.7**	**1957**

Methods

- Dynamic, process-based approach
  - unanchored
  - engineered by nature

Inman Creek/TNC-TCF - October 2009

Methods

1. Use rubber tired skidder and/or backhoe to place nearby salvaged material or cut trees

Inman Creek/TNC-TCF - October 2009

South Fork Ten Mile//CTM - July 2008

Methods

2. Use rubber tired skidder to wedge cut trees

Inman Creek/TNC-TCF - October 2009

South Fork Ten Mile/CTM - July 2008

Methods

3. Opportunistically free falling near-stream trees

South Fork Ten Mile/CTM - July 2008

NF Ten Mile, CTM 2011

Methods

Monitoring

- Pre- and post-treatment surveys
  - habitat typing
  - wood density and distribution
  - photopoints
- Tagging/mapping placed wood

August 2009 – before treatment

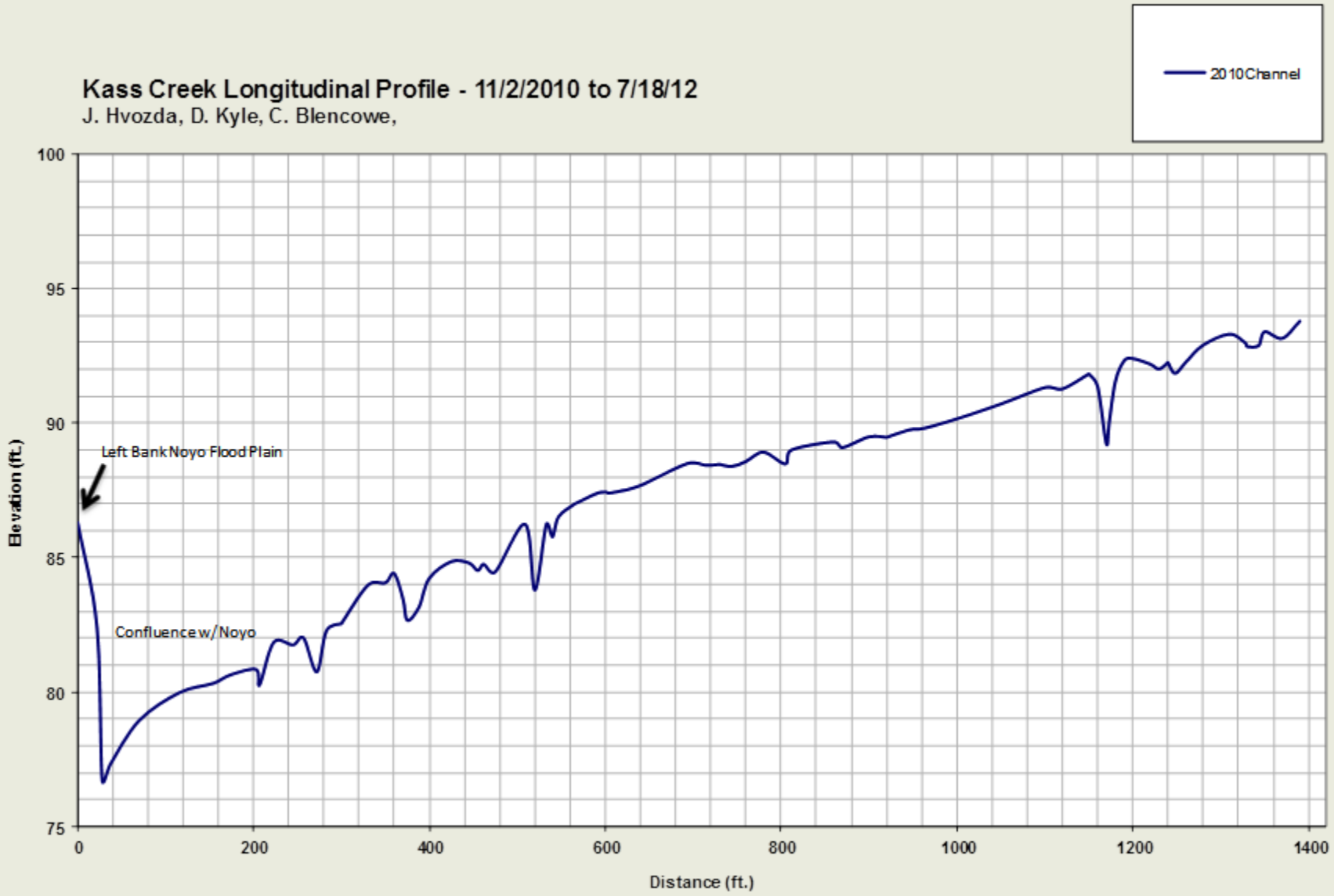
October 2009 – after treatment

June 2010 – after first winter

August 2011 - after second winter

Inman Creek, Garcia River Forest, Mendocino County, CA

Longitudinal Profile of Lower 1400’ Project Reach in Kass Creek (Noyo River) (2010-2012)



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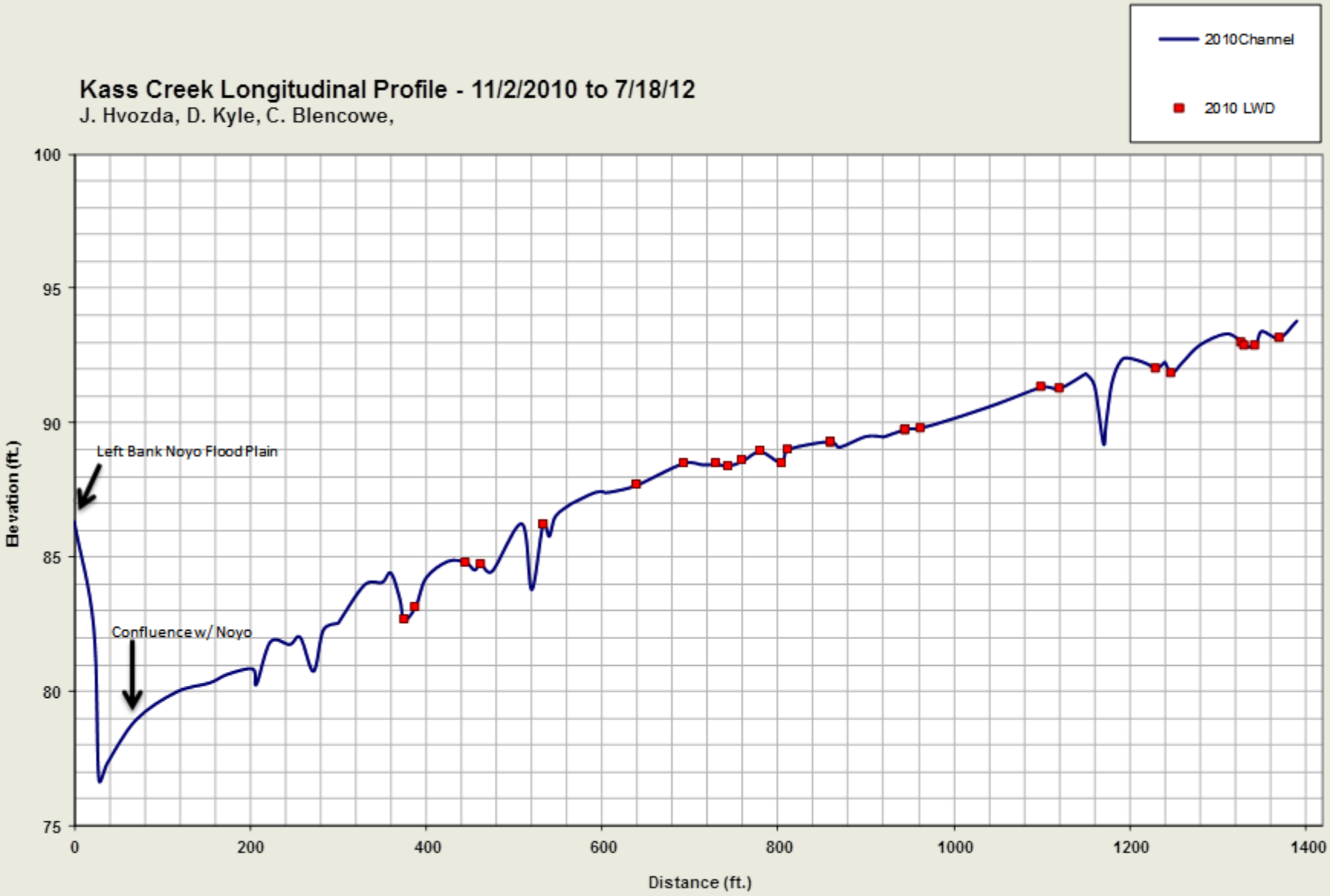

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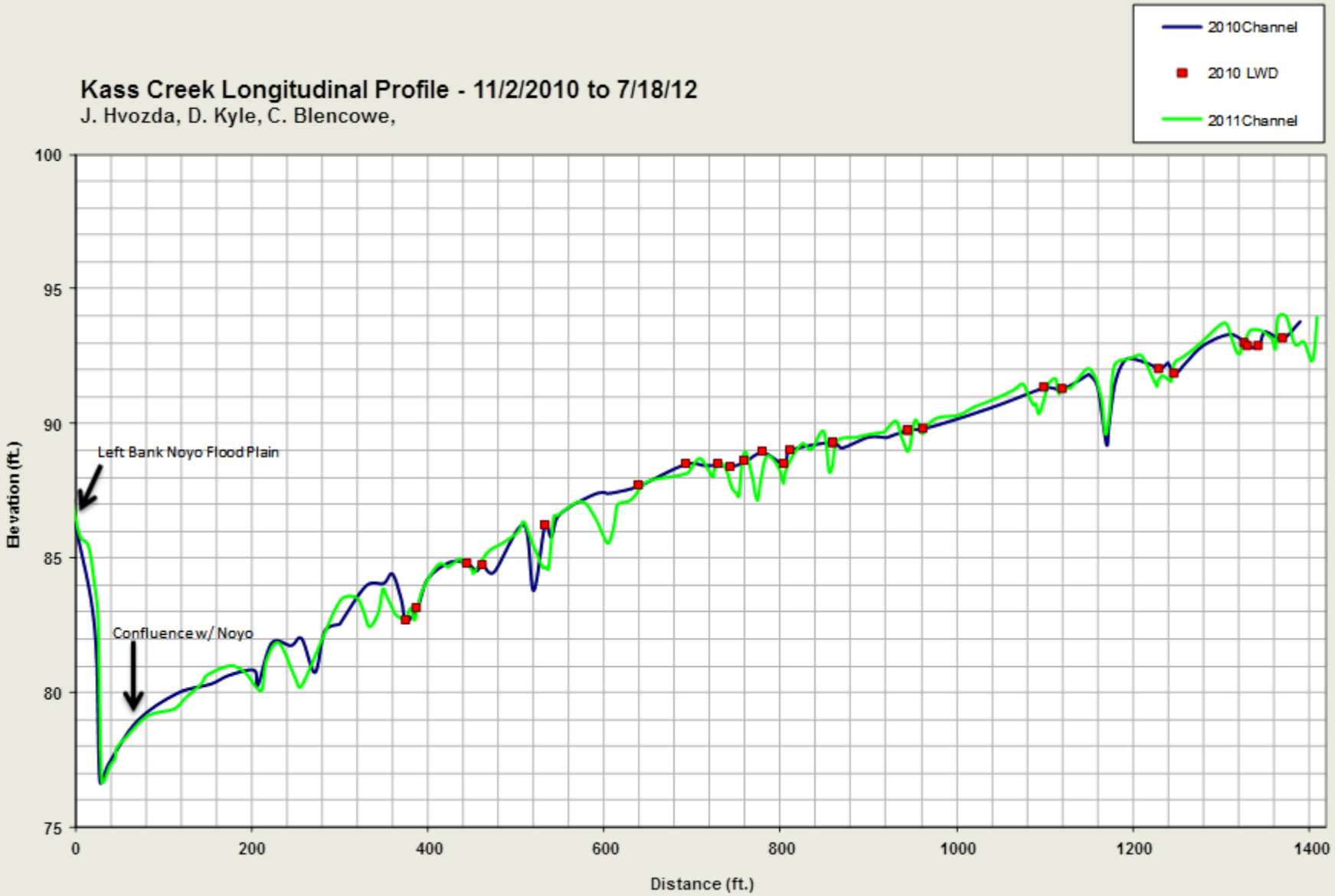


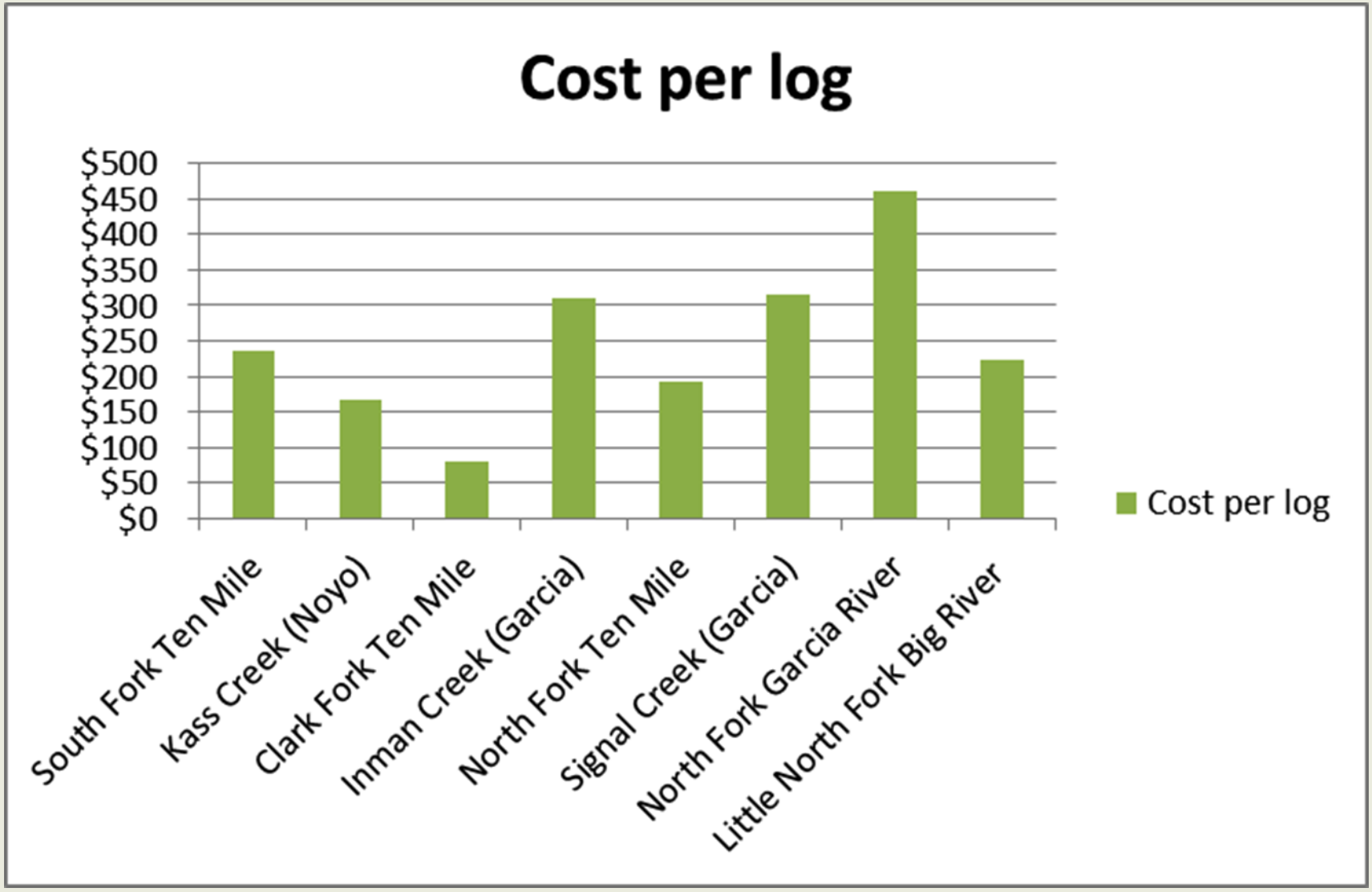
Summary of Percent Change in Key Habitat Variables in Six Mendocino County Streams

Percent Change in Several Key Variables in Six Mendocino County Streams After Project Implementation

	% Pools by Total Length	Total LWD (6'-19')	Total LWD (≥20')	Residual Pool Depths	# of Pools 3.0' - 3.9'	# of Pools ≥ 4.0'	Pool Shelter Rating	% shelter is LW	% shelter is SW
Signal Creek	38.0%	46.0%	113.0%	-4.0%	11.0%	33.0%	5.0%	81.0%	47.0%
SF Big River (Wegner Reach)	25.0%	22.0%	9800.0%	-11.0%	-30.0%	-33.0%	60.0%	1300.0%	2100.0%
LNF Big River	6.0%	10.0%	97.0%	4.0%	14.0%	50.0%	37.0%	12.0%	18.0%
Kass Creek (lower 1400 ft)	24.0%	13.0%	62.0%	0.0%	-100.0%	0.0%	24.0%	49.0%	24.0%
Lower Inman Creek	24.0%	123.0%	327.0%	3.0%	0.0%	100.0%	86.0%	277.0%	587.0%
NF Garcia	10.0%	-7.0%	152.0%	-9.0%	233.0%	0.0%	36.0%	78.0%	76.0%
Mean	21.2%	34.5%	1758.5%	-2.8%	21.3%	25.0%	41.3%	299.5%	475.3%
SD	11.6%	46.7%	3940.6%	6.2%	112.0%	46.8%	28.3%	498.7%	825.6%

Retention rates

Project	Project Age	Retention Rate
SF Ten Mile	6	82%
Inman Creek	4	73%
Signal Creek	2	97%
North Fork Garcia	2	100%


Cost per log
$500
$450
$400
$350
$300
$250
$200
$150
$100
$50
$0
South Fork Ten Mile
Kass Creek (Noyo)
Clark Fork Ten Mile
Inman Creek (Garcia)
North Fork Ten Mile
Signal Creek (Garcia)
North Fork Garcia River
Little North Fork Big River
Cost per log

What do you need for a successful project?

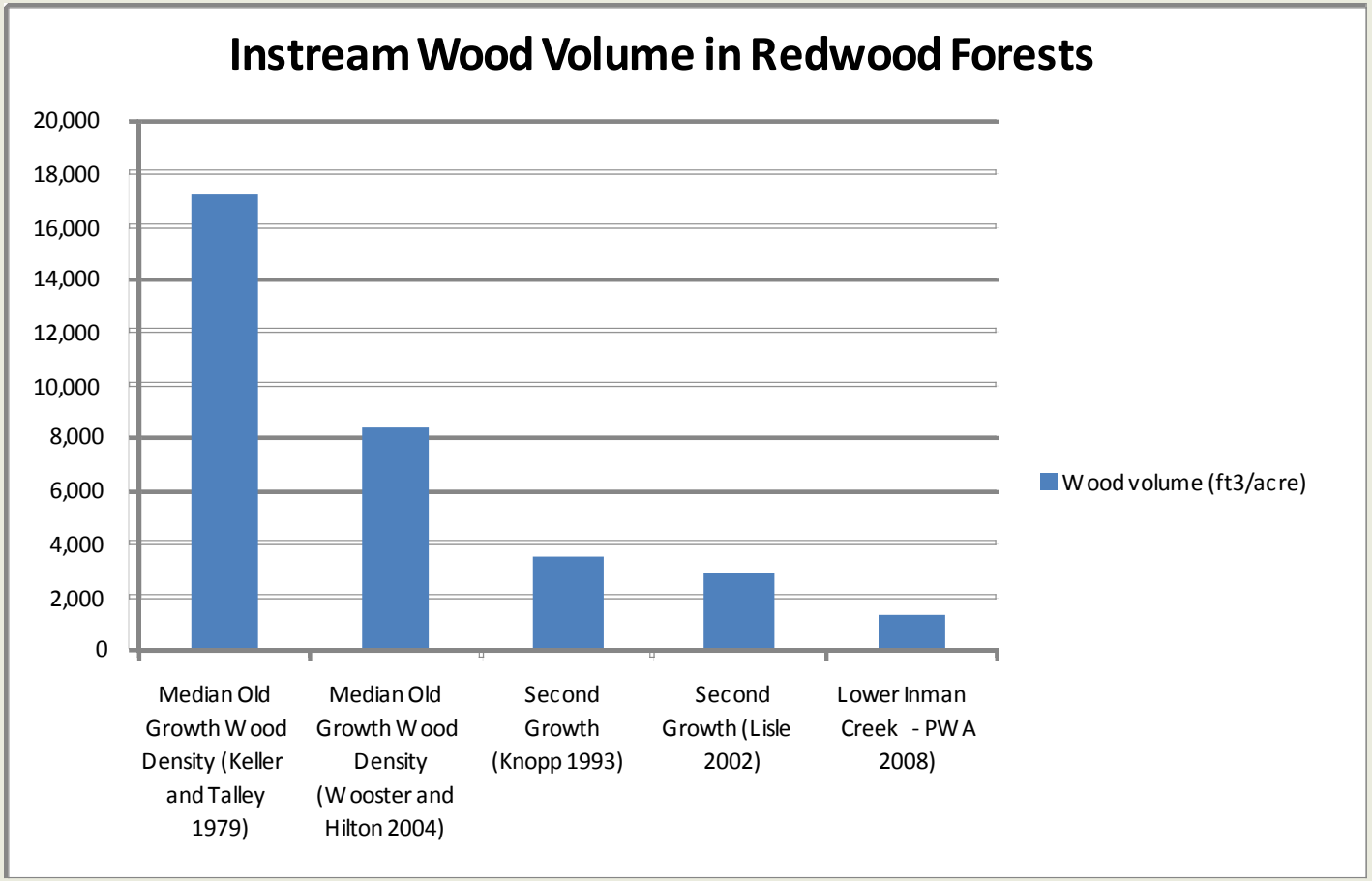
- A skilled team
  - hydrology/geomorphology
  - fisheries
  - skilled heavy equipment operators/fallers
- Good understanding of your stream
  - limiting factors
  - existing conditions
- $, wood, permits
- Monitoring

Design criteria

Which location to target? Which trees to use?

- canopy cover
- wood availability
- wood size (DBH and length)
- layout
- equipment access
- channel morphology/local conditions
- safety

How much wood to add?



Permitting Options

- 'Choose your own adventure'
- Fisheries Restoration Grant Program
- Timber Harvesting Plan (under ASP rules, maybe)

Funding Options

- DFW Fisheries Restoration Grant Program
- DFW Steelhead Fishing Report and Restoration Card
- NOAA Community Restoration Programs
- Resource Conservation Districts/NRCS
- Prop 84 Integrated Regional Water Management (IRWM) funds
- Water Board 319h
- DWR Urban Streams Restoration Program
- Fish America Foundation
- NGO partnerships
- THPs??

Findings

- Pool habitat increases
- Shelter and structure values increase
- Wood volume increases
- Large wood is retained in the channel
- Residual Pool Depths appear to decrease, which may elevate streambeds over time
- Accelerated recruitment is more economical than traditional anchoring (~$1000 vs ~$250 log)
- However, it is only one tool in the restorationist's tool box

Should everyone do this?

Who should consider doing this?

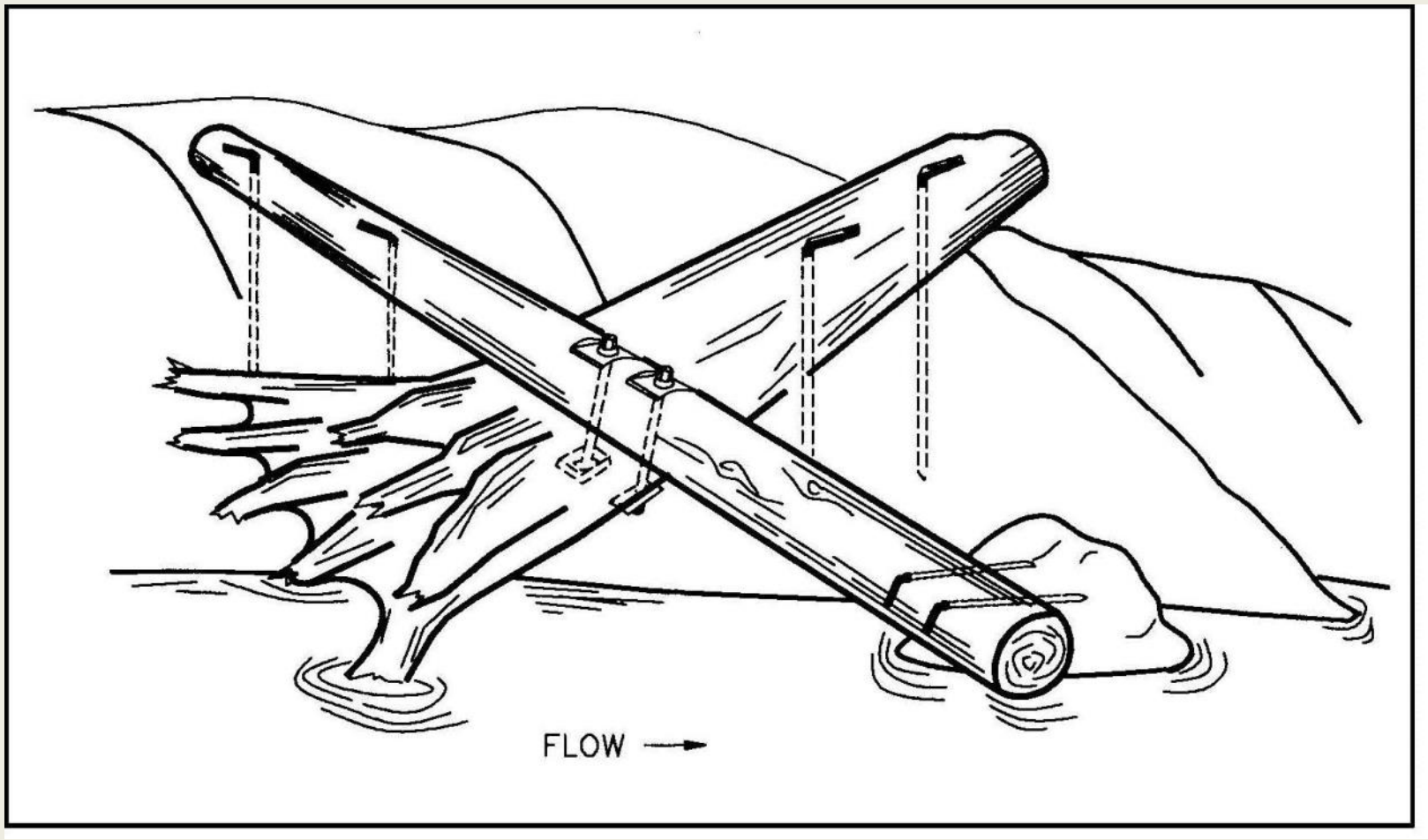
- Landowners with large holdings, lots of trees and little risk to infrastructure

- These ownerships are key to recovering coho

- The 7 largest landowners own 73% of the properties in Mendocino County's CCC ESU Coho Core Areas

Engineered Log Jams (ELJs)

Traditional anchored structure



Acknowledgments

- The Nature Conservancy, The Conservation Fund, Campbell Timberland Management, Hawthorne Timber Company, Trout Unlimited, Weger Associates, California State Parks
- TNC/NOAA Community Restoration Grants Program, DFW Fisheries Restoration Grant Program, Fish America Foundation, Felton Family Foundation
- Ken Smith, Allison Chambers

Permitting Resources

- Wood for Salmon Working Group Permitting Guidance Document*: http://conserveonline.org/workspaces/woodforsalmon
- Fisheries Restoration Grant Program: http://www.dfg.ca.gov/fish/Administration/Grants/FRGP/
- Coho HELP Act link: http://www.dfg.ca.gov/fish/Resources/Coho/HELP/

*link will no longer be live after 6/30/2013. Email me after that at jcarah@tnc.org for documents and new web address.