Did this Thing Come with Instructions? Exploring Design in Restoration

A Concurrent Session at the 41st Annual Salmonid Restoration Conference
Santa Rosa, California, March 26-29, 2024

Session Coordinator: Eric Ginney, ESA, and Brian Cluer Ph.D., *NMFS*

In recent years a paradigm shift in restoration has occurred where embracing natural processes to create and sustain habitat over time has started to replace the immediacy of habitat construction, and for good reason. There is a need to increase the pace and scale of restoration to recover salmonoids. Process based restoration and the need to increase the pace and scale is now well-established in the theoretical and applied sciences underpinning habitat restoration. Society is demanding a faster pace to salmonid habitat restoration to support recovery, as evidenced by the 100-year flood of restoration funding that is upon us. Additionally, with several decades of habitat restoration in the rearview mirror, the inventory of “low-hanging-fruit” projects (small, straight-forward, low-cost projects that deliver large benefits) is declining. Some projects are getting bigger, more expensive, and taking longer. As practitioners, we find ourselves seeking to do more, do it faster, and because we want to improve, we want to become even more effective. How will we efficiently design and deliver these projects faster, and how will a relatively finite number of regulators (reviewers) efficiently and effectively review even more projects?

As the habitat restoration industry matures, and considering the question above, there are characteristics and tendencies of the restoration design process that can be observed and further explored. One such characteristic is that of balancing competing interests and the tensions inside the design process that stem from efforts to strike that balance. Oftentimes (but not always) this is a healthy tension in the design process that receives attention, curiosity, and careful consideration: one example is dynamism versus predictability and certainty in outcomes; another is the long-term ecosystem uplift balanced against short-term impacts. But these tensions don’t just play out in the abstract mind of a fisheries biologist, engineer, or geomorphologist—they play out within design teams and with downstream landowners, public works officials, agency regulators, and citizen advocates—to name but a few. The fear of lawsuits, of doing harm, and failing (even the perception of failure!), is very real and as the most powerful human emotion, fear can drive us toward increased design efforts to increase certainty and immediacy through reducing risks of all sorts (from ecological to reputational). The tendency to increase control and certainty in a design can yield beneficial outcomes; however, some observations suggest that risk aversion can drive up costs, reduce progress, limit positive outcomes and sustainability, and even reduce collaboration.

Session Coordinator: Eric Ginney, ESA, and Brian Cluer Ph.D., *NMFS*

Application of engineering principles to the restoration design process, while bringing benefits in terms of professional accountability and rigorous analysis, has often increased the degree of risk aversion associated with stream restoration projects. The risks being averted include things such as the risk of a contractor leveraging less-developed drawings to force contract change orders or the risk that a regulator will not have certainty of the habitat outcome (or impact avoidance) without greater detail, more effort in a design, or even an additional design phase. Enter, fear of the unknown or fear of failure.

The problem with risk aversion is that it can lead to emphasizing stability over dynamic processes, “more effort” over good enough, even when the true risks (consequences of something bad happening) are low or tolerable. To constrain risk, we tend to overdesign and increase the engineering factor of safety. Risk reduction can compound as project development proceeds from concept to design, review, and approval. At each step, fear of the unknown or fear of failure may push the process and/or the design out of balance, further from collaboration and a shared sense of success or failure. Is all of that just inherent? Can we discuss this, consider everyone’s perspectives, and find better ways to strike the balance?

This session will examine these factors, and others, and consider approaches to address these challenges including examples of ways to design and construct projects not commonly undertaken today. Session attendees will be better-informed across a wide variety of perspectives and, optimally, will support them in making the call for a broader dialogue in the restoration engineering practitioner community on this subject.

Realizing that the subject of engineering in the design process is complex, sensitive, holds many questions, and can go in many directions in any one conversation amongst practitioners, the coordinators organized this session to examine two basic questions:

- How will we efficiently design and deliver larger and less certain projects faster, and how will a relatively finite number of regulators (reviewers) efficiently and effectively review even more projects?
- How much design detail is necessary?

Session Coordinator: Eric Ginney, ESA, and Brian Cluer Ph.D., *NMFS*

This is a sensitive topic, and the coordinators realized that. They also realized this is a broad topic, that context (such as risk) matters, and that one conference session is not adequate to discuss the breadth and nuance. However, they aimed to get the conversation started and hope to create a thoughtful and reflective dialog that may, over time, result in some guidance on these basic questions. Their goal was a safe venue for everyone who participated. Therefore, they requested that all participants be courteous, thoughtful, and professional. This session was a starting point for work-in-progress—intellectual work that we all need to engage in.

Presentations

Did this Thing Come with Instructions? Exploring Design in Restoration

41st Annual Salmonid Restoration Conference

March 28-29, 2024
Santa Rosa, California

Session Coordinators: Eric Ginney, ESA, and Brian Cluer Ph.D., NMFS

Reflections of A Grumpy Old Engineer on the Design Process
Rachel Shea, PE, Michael Love & Associates, Inc

Pragmatic Aspects of Engineering and Geologic Involvement in Restoration
Jon Mann, PE, California Department of Fish and Wildlife; and Colin Hughes, PG, CEG, and Jon Mann, P.E., California Department of Fish and Wildlife

It's All Relative - Why Context is Important in Ecosystem Restoration
Jeff Sanchez, PG, PH, and Kristine Pepper, PE, California Department of Fish and Wildlife

Toward a Next Generation of Project Planning, Design, and Implementation
Darren Mierau, California Trout

Considering Construction at the Inception of Your Restoration Project
Mark Cederborg, Outset Advisors

Employing Non-Engineered Techniques to Allow Fish Passage in Heavily Disturbed, Industrially Logged Landscapes
Thomas Leroy, Pacific Watershed Associates

Our Speakers & Your Questions

Panel Questions submitted no later than end of Tom’s talk

Salmonid Restoration Federation 2024
Exploring Design in Restoration Session

Reflections of a Grumpy Old Engineer on the Design Process

Rachel Shea M.S., P.E.

Engineering Geomorphologist

Michael Love & Associates
Hydrologic Solutions
PO Box 4477 • Arcata, CA 95518 • (707) 822-2411

Albion River, Comptche California

Our Goal

A rapidly declining species needs habitat, STAT!

Focus on Process-Based Restoration

Talk Outline

1. How to Select an Appropriate Level of
   - Design
   - Review
2. Unsolicited Thoughts on:
   - Minimum Design Levels
   - Construction
3. Moving Forward

How to Select an Appropriate Level of Design?

- Engineer's concerns regarding
  - liability
  - doing harm
  - project failure
  - implementing new ideas
- Too many engineers and too much overdesign! ($$$$)

RISK!!

Increases the level of design costs and generally slows implementation down

How to Select an Appropriate Level of Design?

What is Risk?

-Risk is a function of the probability of something bad happening and the severity of the impact

Mother Nature will Always Kick Your Ass

Design Level ≈ Level of Risk

RiverRat

Skidmore, et al., 2012

Thorne et al., 2014

NOAA Technical Memorandum NMFS-NWFSC-112

Science Base and Tools for Evaluating Stream Engineering, Management, and Restoration Proposals

Peter B. Skidmore,[1] Colin R. Thorne,[2] Brian L. Cluer,[3] George R. Pess, Janine M. Castro,[4] Timothy J. Beechie, and Conor C. Shea[5]

Pacific Northwest Region
Resource & Technical Services
Large Woody Material -
Risk Based Design Guidelines

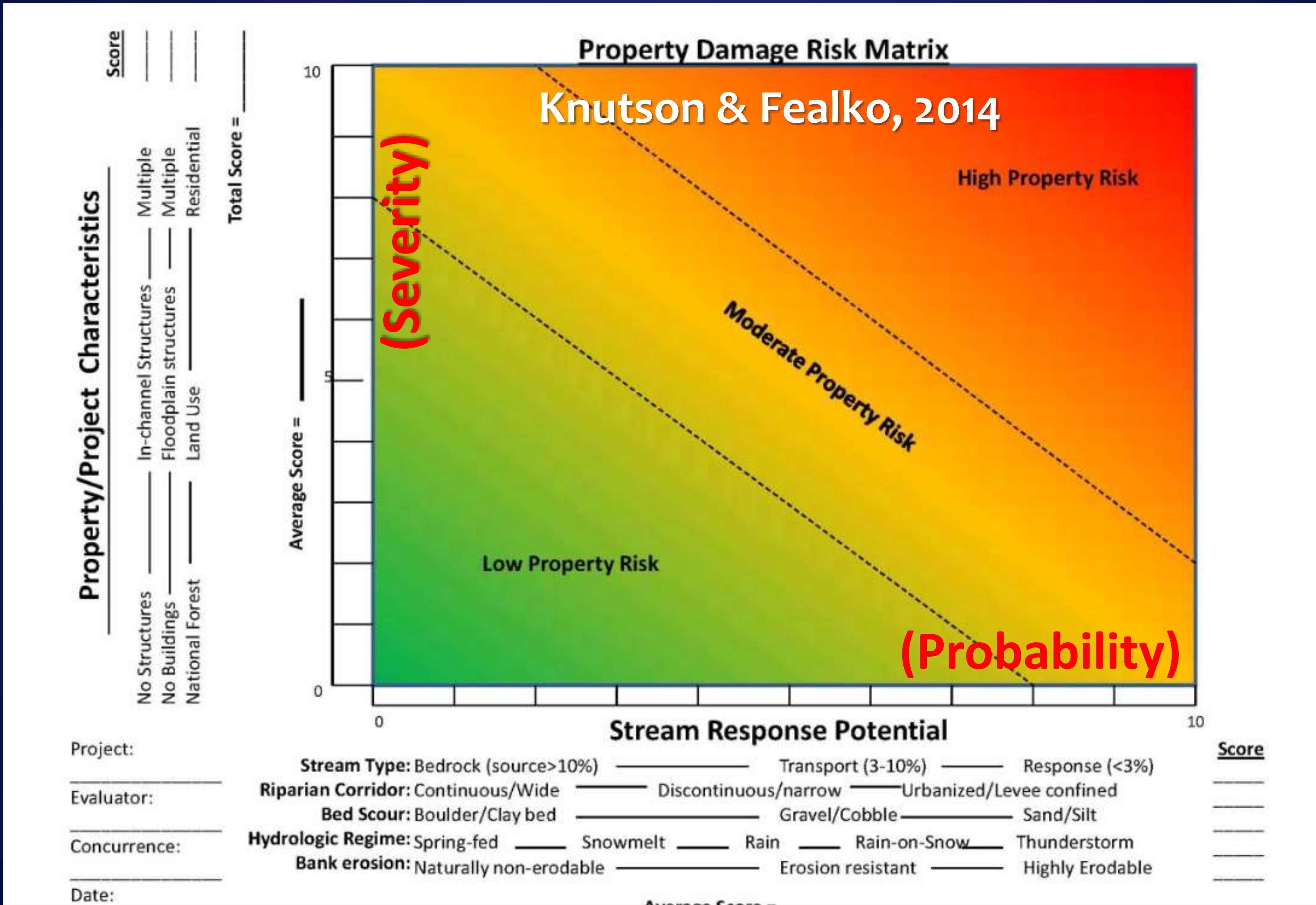
Authors:

M. Knutson, P.E., Bureau of Reclamation, Pacific Northwest Region, Resource and Technical Services, River Systems Analysis Group, Hydraulic Engineer
mknutson@usbr.gov, 208-378-5031

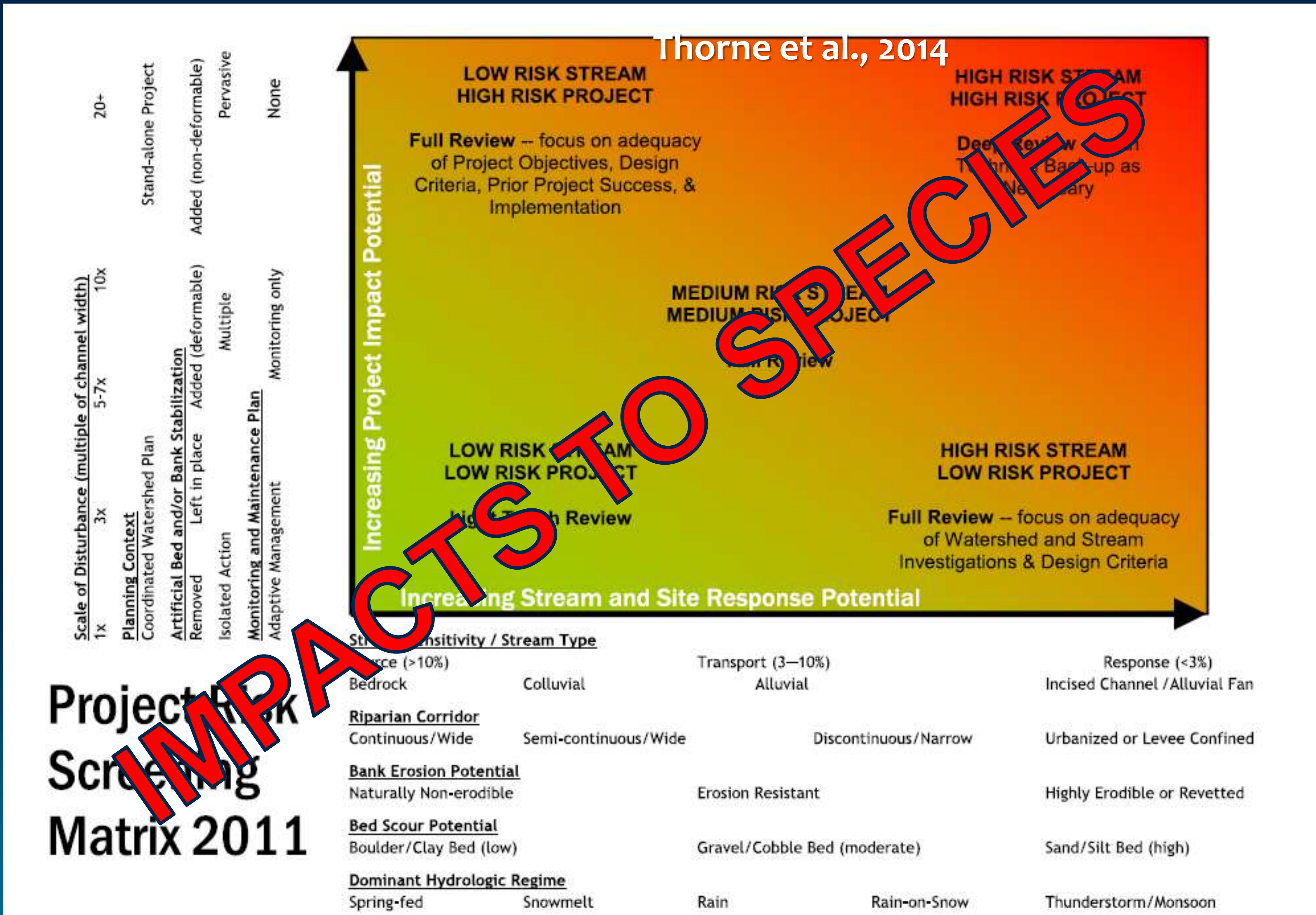
J. Fealko, P.E., Bureau of Reclamation, Pacific Northwest Region, Resource and Technical Services, River Systems Analysis Group, Hydraulic Engineer
jfealko@usbr.gov, 208-378-6540

Knutson & Fealko, 2014

Risk = f(Probability Bad x Severity Impact)

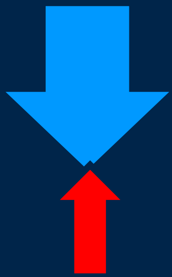


Design/Review Commensurate with Risk Level



Design Standards: Factor of Safety
Not Just for "Safety"

$$\mathbf{FS} = \frac{\text{Resisting Forces}}{\text{Driving Forces}}$$



- Stable when FS > 1
- Protection against unknowns/uncertainties

"….There are unknown unknowns"
(Rumsfeld, 2002)

Mother Nature will Always Kick Your Ass!

Minimum Desing Requirements

REPORT

- Definition of Project Goals/Objectives
- Constraints
- Risk Assessment
- Geomorphic Assessment
- Expectations/Outcomes
- Maintenance Needed/Duration
- Adaptive Management

Consequences of Failure

- Impact to Species
- Loss of geomorphic work
- Perception of Ineffectiveness
- OPM

Over-Engineering

1. Lack Inter-disciplinary team
2. Fuzzy Objectives
3. Risks Not identifi
4. Engineer
   some
5. not “The

Risk Assessment

Under-Engineering

Under-Geomorphing

1. **Identify dominant processes**
2. **Understand upstream and downstream conditions**
3. **CEM Stage**
4. **Select appropriate restoration methods**
5. **Make things look more natural**

"You Need To have the Process for PBR to be Successful…"

Damion Ciotti, USFWS

Design Considerations for Construction

1. Contractor is Overbooked
2. Unforeseen situations
3. Good plans make good relations/ product
4. Designer should be onsite

Construction
Low Bid is BAD

1. You Get What You Pay For (Generally)

2. Consider, Pre-qualification, Double Envelope, Quals-based

3. Time and Materials is Very Risky, Stressful

4. Design/Build OK

5. Small Companies Do a Great Job with Less Overhead

The Future

1. Agencies adopt RiverRat
2. Agree on Level of Design/Review EARLY
3. Streamline Permitting/ Environmental Documenting, WQ/SWPPP
4. Monitoring (FUNDING!)/Adaptive Management $
5. Share Successes and Failures
6. Eliminate Low Bid

Monitoring and Sharing

Summary

1. You Need To Do A Risk Assessment, They Are Easy
2. Sometimes You Need an Engineer, Sometimes You Don't
3. If You Bring Your Engineer In Early, They Won't Get Grumpy
4. You Need an Interdisciplinary Team
5. Listen To Your Geomorphologist
6. Get Rid Of Low Bid
7. Monitor and Share Results

Monitoring!

Determining Design Standards Based on Risk

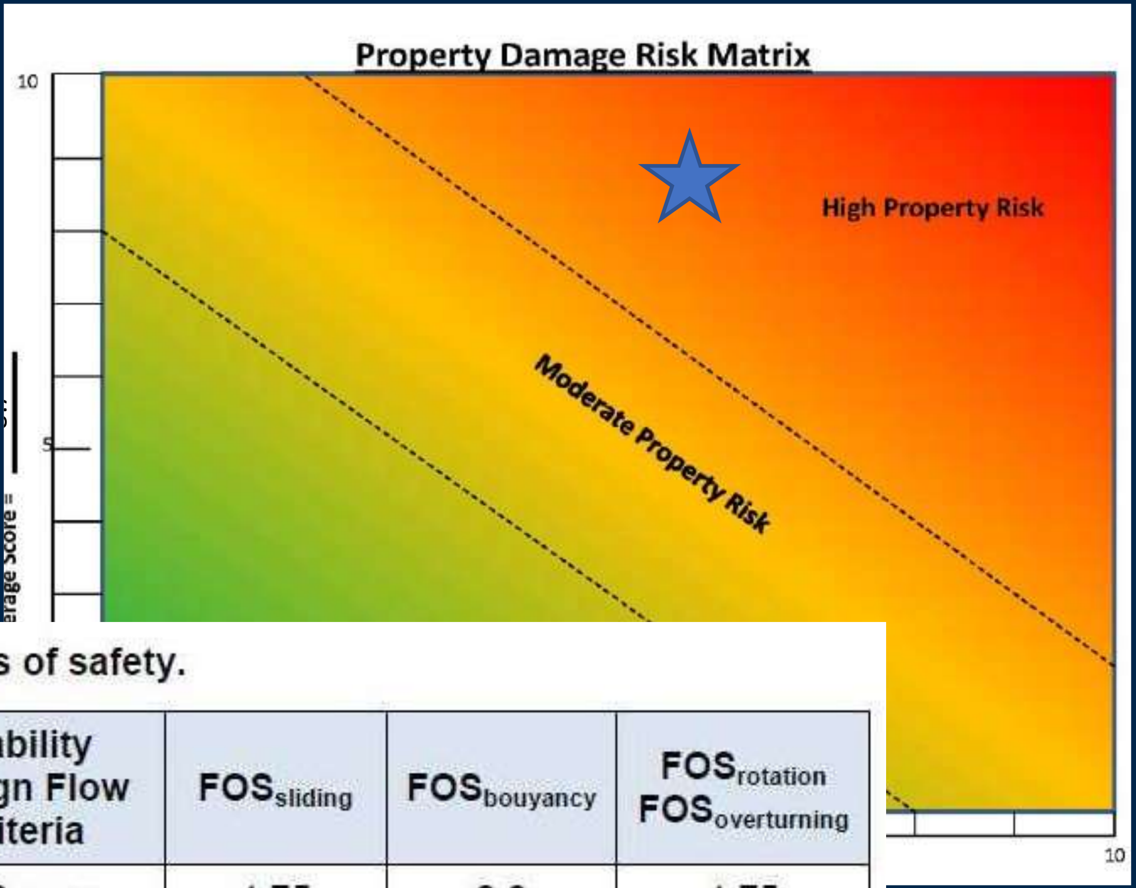


Table 4. Minimum recommended factors of safety.

Public Safety Risk	Property Damage Risk	Stability Design Flow Criteria	$FOS_{sliding}$	$FOS_{bouyancy}$	$FOS_{rotation}$ $FOS_{overturning}$
High	High	100-year	1.75	2.0	1.75
High	Moderate	50-year	1.5	1.75	1.5
High	Low	25-year	1.5	1.75	1.5
Low	High	100-year	1.75	2.0	1.75
Low	Moderate	25-year	1.5	1.75	1.5
Low	Low	10-year	1.25	1.5	1.25

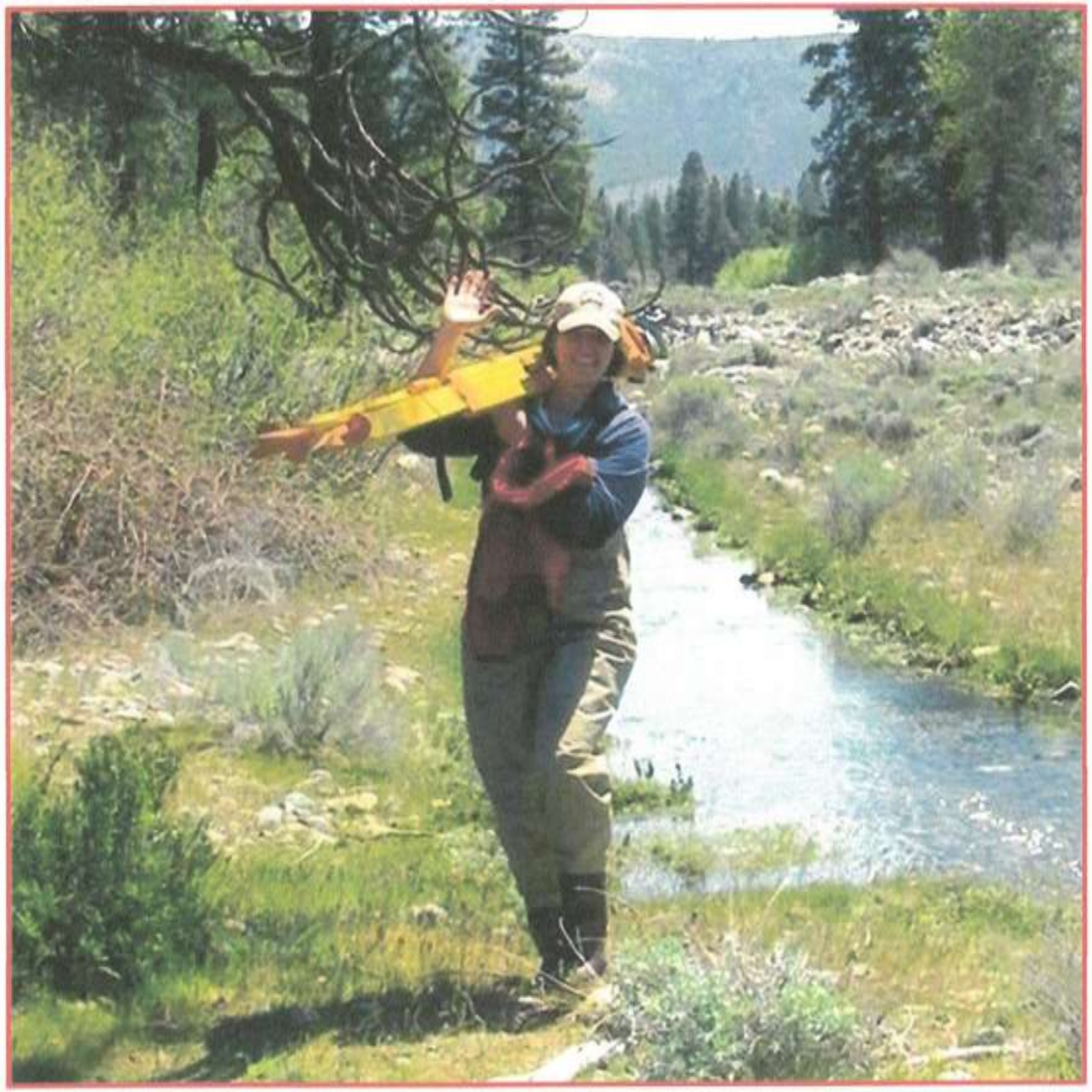
(from Knudsen and Fealko, 2014)

Pragmatic aspects of engineering and geological involvement in restoration

Jon Mann, PE, California Department of Fish and Wildlife

Colin Hughes, PG, CEG, California Department of Fish and Wildlife

Margie =
pragmatic engineer



This is the fundamental paradox of loss: it never disappears.

Marjorie Elizabeth Caisley

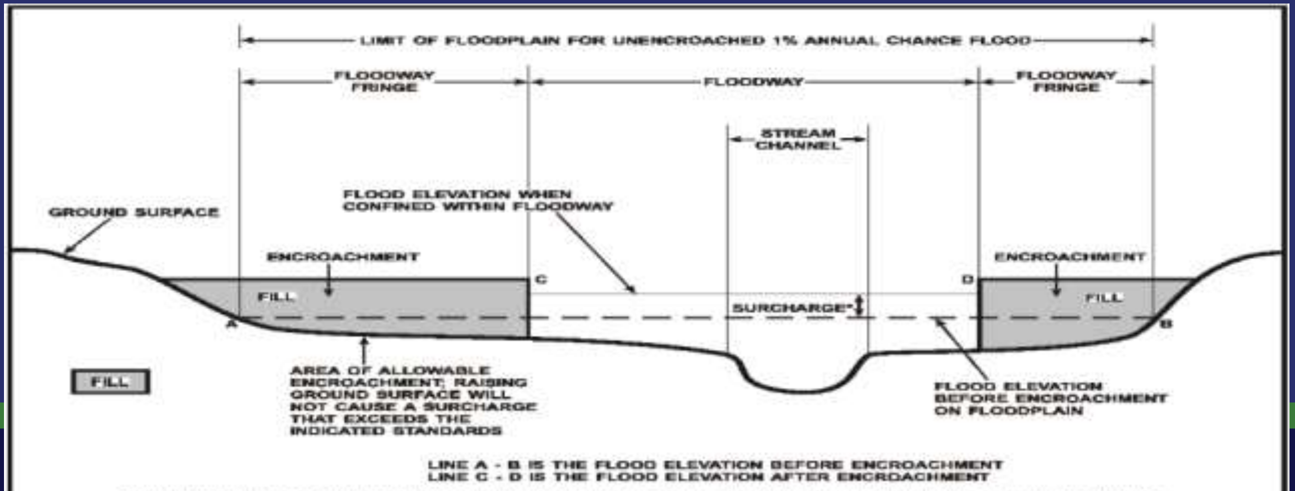
8 July 1976 ~ 4 July 2022

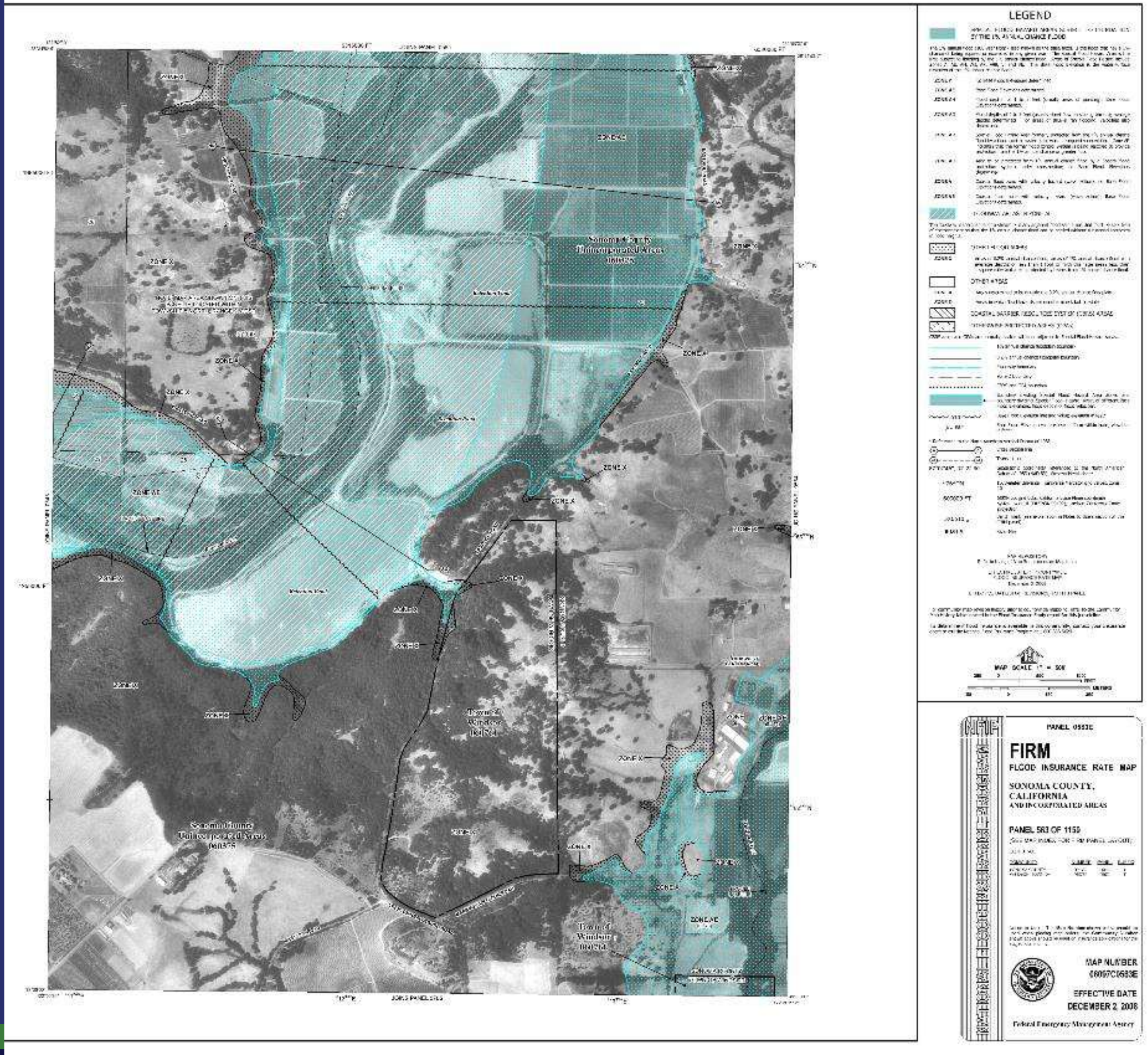
Outline

1. Brief history
2. Professional Engineers Act - Business and Professions Code 6700-6799
3. Current roles and responsibilities
4. Geologist and Geophysicist Act – Business and Professions Code 7800-7887
5. Current roles and responsibilities – engineering geology focus
6. Further evolution of roles and responsibilities – Example
7. Pragmatic opportunities for increasing the **SPACE** and therefore the pace, scale, and potential effectiveness of restoration
8. Conclusions

Brief History

- Engineering = human nature
- Regulation and systematic coding/zoning typically follows disasters, or lawsuits
- Public health and safety
- For riverscapes = Flood control/floodplain management (NFIP)
- Engineer roles/responsibilities = Hydraulic analysis and engineering
- Evolving roles/responsibilities, present times -> environmental protection = public health and safety





Brief History - Professional Engineers Act
CA Business and Professions Code §§6700-6799

- Licensing for land surveyors (first in nation) was enacted on March 31, 1891 by the Legislature, which also established the State Surveyor General.
- Following St. Francis Dam failure in 1928 – inception of the California Civil Engineers Act
- 1929 - The Board (now the Board for Professional Engineers, Land Surveyors, and Geologists) was created by the Legislature. Registration was for civil engineers only. Restrictions on use of other engineering titles (this began the creation of the “title acts”) for the branches of professional engineering in other fields followed over time.
- 2000s - Laws requiring licensees to execute written contracts for professional services were enacted.

Professional Engineers Act
CA Business and Professions Code §§6700-6799

- 6700 This chapter constitutes the chapter on professional engineers. It may be cited as the Professional Engineers Act.
- 6701 "Professional engineer," within the meaning and intent of this act, refers to a person engaged in the professional practice of rendering service or creative work requiring education, training and experience in engineering sciences and the application of special knowledge of the mathematical, physical and engineering sciences in such professional or creative work as consultation, investigation, evaluation, planning or design of public or private utilities, structures, machines, processes, circuits, buildings, equipment or projects, and supervision of construction for the purpose of securing compliance with specifications and design for any such work.
- 6730 In order to safeguard life, health, property and public welfare, any person, either in a public or private capacity, except as in this chapter specifically excepted, who practices, or offers to practice, civil engineering, electrical engineering or mechanical engineering, in any of its branches in this state, including any person employed by the State of California, or any city, county, or city and county, who practices engineering, shall submit evidence that he or she is qualified to practice, and shall be licensed accordingly as a civil engineer, electrical engineer or mechanical engineer by the board.

Current roles and responsibilities

Last 3+ decades of evolution - CDFG/W focus

- Fish passage design and implementation - hydraulic engineers
- Support FRGP – channel restoration – hydraulic engineers and engineering geologists with fluvial geomorphology expertise
- Permitting – Lake and Streambed Alteration – ditto for expertise
- Special projects with engineering and geologic aspects – ditto for expertise plus other specialties

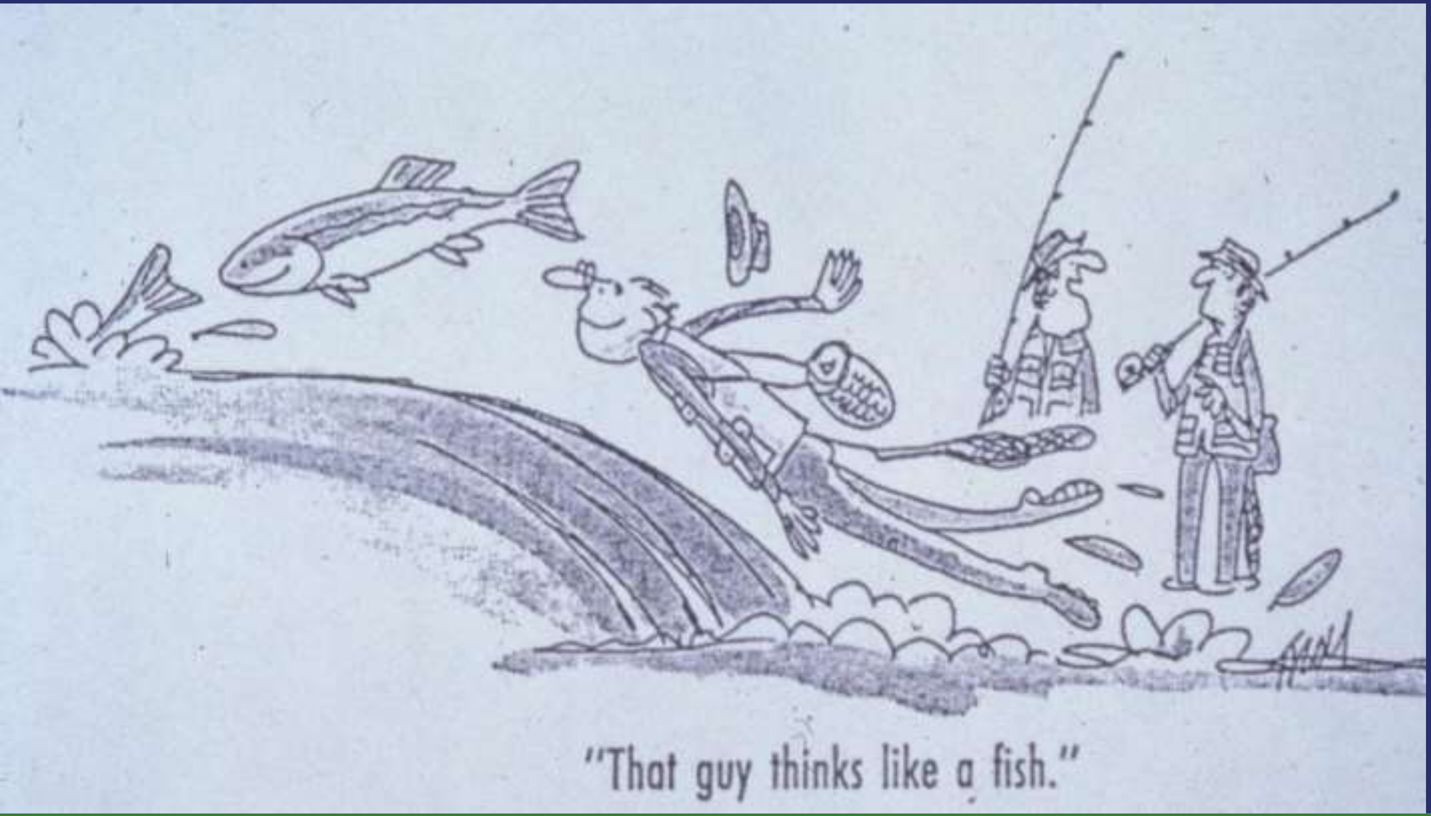
Roles in restoration projects

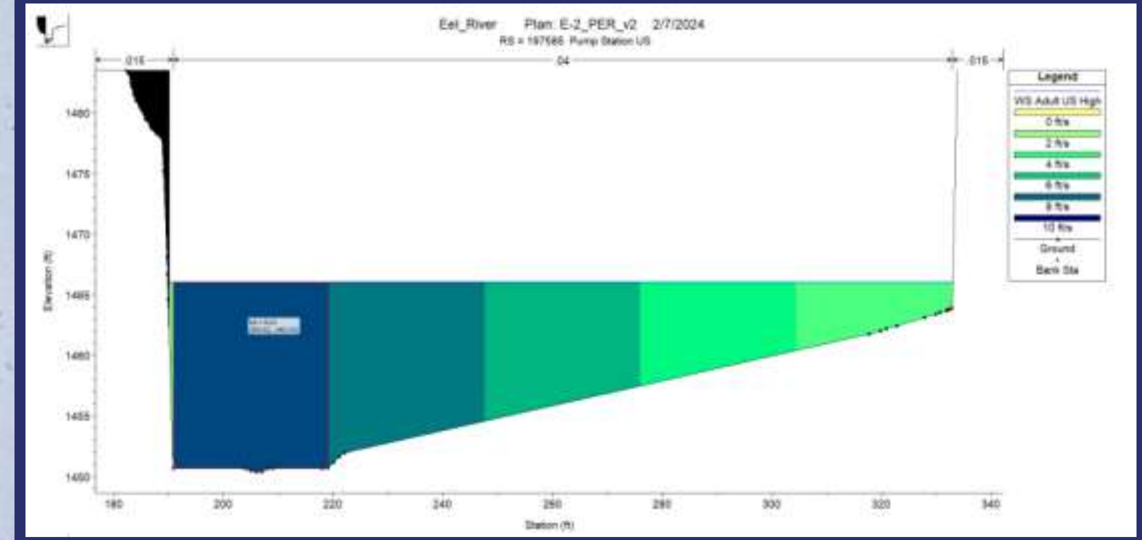
- Review proposals and designs for application of criteria and guidelines
- Participate in technical advisory groups for larger projects - multi-disciplinary
- Intent is not just compliance but also to help advance the state of art/science/technology while ensuring consistencies across programs and regions

Figure XII-34. Goldsborough Dam Removal Project. An example of V-shaped rigid weirs.

Current roles and responsibilities

- Protect nature for the future
- Translate engineering for biologists
- Translate biology for engineers





What projects require a CA Licensed Professional?

- ✓ Stream crossings (culverts, bridges, armored fills, vented fords)
- ✓ Energy dissipation/erosion prevention solutions (rock aprons)
- ✓ Instream bank/slope stabilization, or grade control (weirs)
- ✓ Water retaining embankments (ponds) and appurtenant structures (outlets, emergency spillways)
- ✓ Upslope (roads remediation/decom, landslide ID/stabilization)
- ✓ Hydrogeologic evaluations (surface/groundwater interaction)
- ✓ Geotechnical evaluation (earthquakes) and structural analysis (loads)
- ✓ Land surveying as defined by Business and Professions Code Section 8700 et. seq.

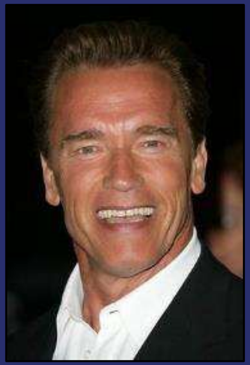
What projects may not require a CA Licensed Professional?

- ✓ Geomorphic assessment (stream type)
- ✓ Instream or riparian habitat restoration (non-fixed structures)
- ✓ Erosion control BMPs (straw wattles, silt fences)
- ✓ Watershed Evaluation, Assessment, Planning
- ✓ Water conservation techniques
- ✓ Water measuring devices
- ✓ Groundwater wells (installation, pump testing)*

Brief History - Geologist and Geophysicist Act CA Business and Professions Code §§7800-7887

Borne from consumer demand

- 1952 - Following flooding and landslides in the City of Los Angeles, LA city ordinance was developed requiring geologic opinion for grading.
- 1957 - LA establishes an Engineering Geologist qualifications board.
- 1959 – LA County grading ordinance and qualifications requirements established.
- 1969 – Board for Geologists and Geophysicists (BGG). California becomes one of the first U.S. states to license geologists, passing the Geologists Act and forming a licensing board afforded the authority to regulate practice of geology and geophysics (1973).
- 2009 - ABx4 20 Legislation terminated the BGG and transferred duties to the Board for Professional Engineers and Land Surveyors, creating the Board for Professional Engineers, Land Surveyors, and Geologists (BPELSG)



Geologist and Geophysicist Act
CA Business and Professions Code §§7800-7887

7802. Defines "Geology" relevant to the GGA as, "…*that science which treats of the earth in general; investigation of The earth's crust and the rocks and other materials which compose it; and the applied science of utilizing knowledge of the earth and its constituent rocks, minerals, liquids, gasses and other materials for the benefit of mankind."*

7810.1 Protection of the public shall be the highest priority for the board in exercising its licensing, regulatory, and disciplinary functions pursuant to this chapter. Whenever the protection of the public is inconsistent with other interests sought to be promoted, the protection of the public shall be paramount.

BPELSG Mission Statement:

"We protect the public's safety and property by promoting standards for competency through licensing and regulating the Board's professions."

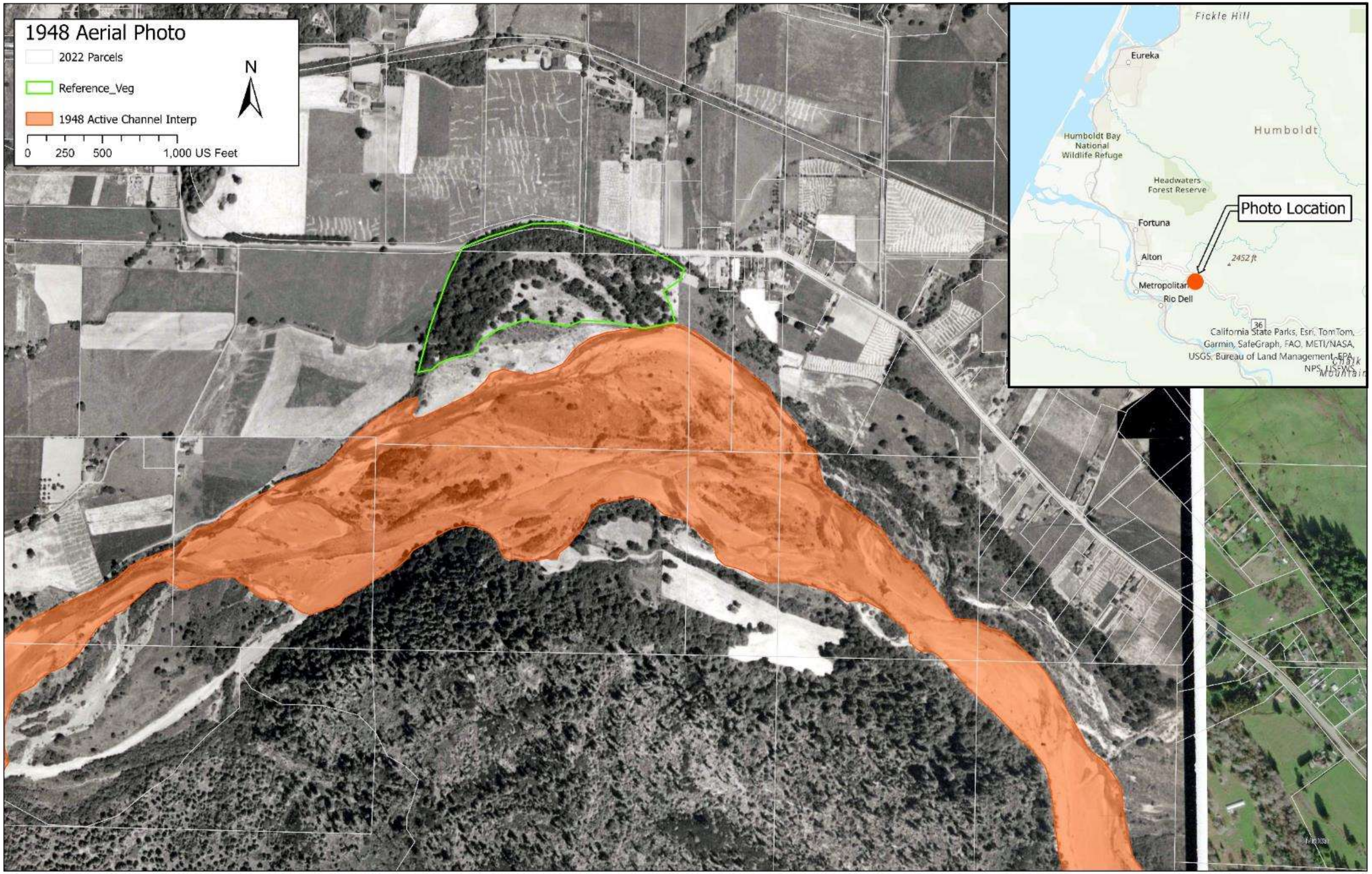
Current roles and responsibilities in restoration and conservation

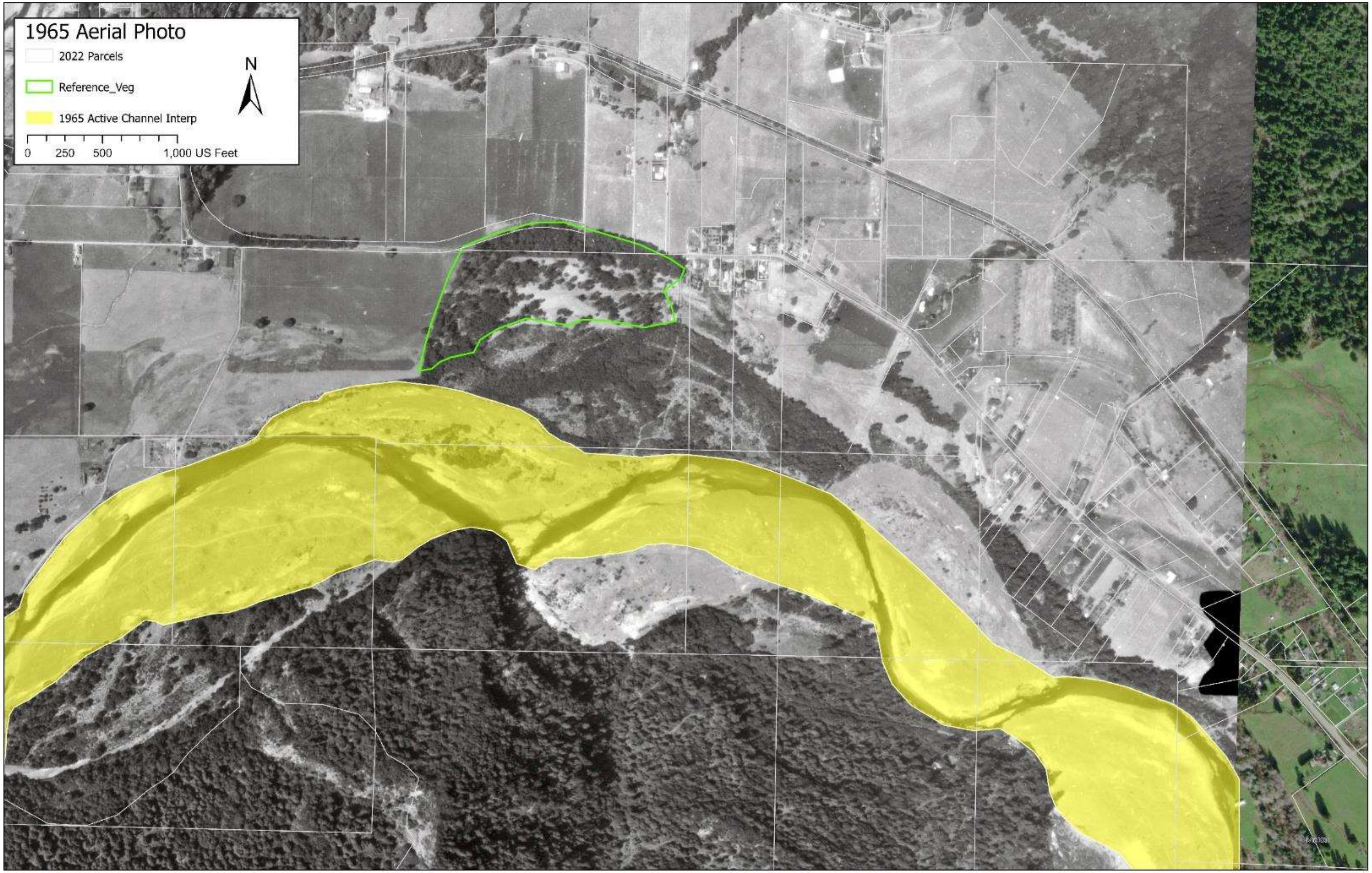
CDFW Engineering Geologists provide technical support to Department conservation and restoration programs

LSA review
CEQA document review
Grant proposal review
Timber program support
CDFW lands/facilities consultation
CDFW special projects
Regulatory programs support
..and more

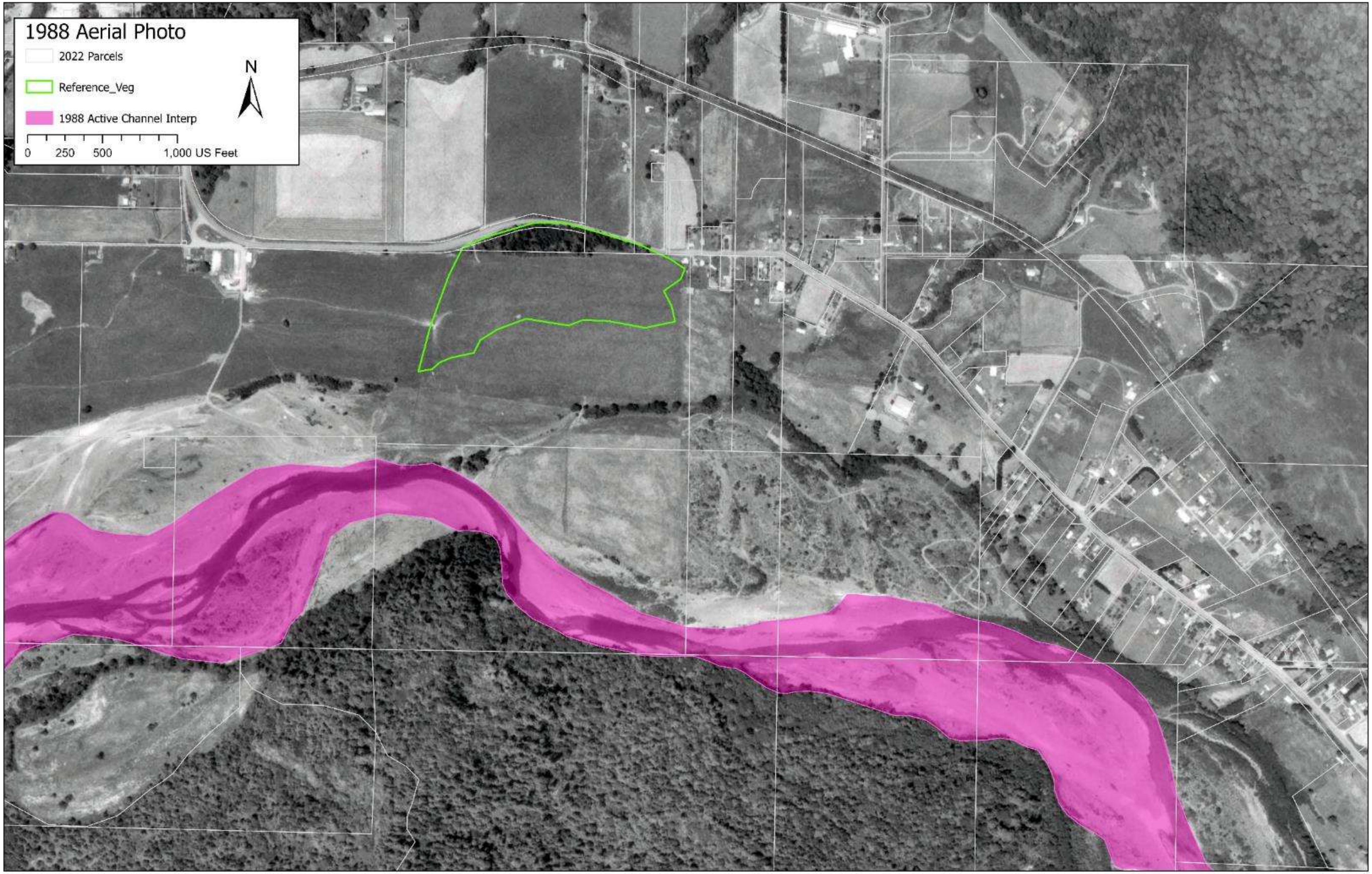
Common technical work of professional engineering geologists in restoration:

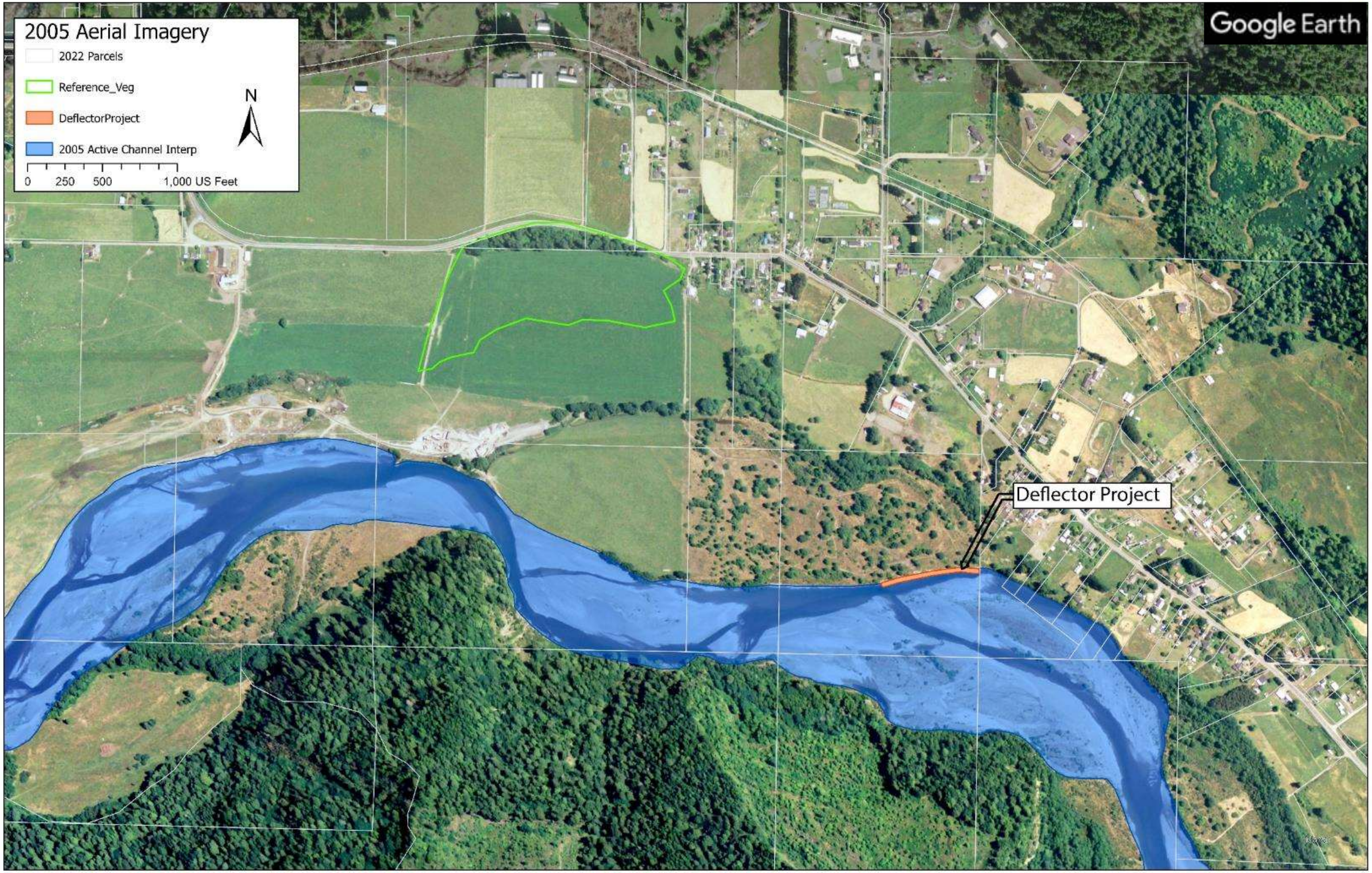
Subsurface investigations and materials properties characterization
Grading and earth materials construction
Road storm-proofing (upgrading and decommissioning) planning
Landslide hazard assessment (including post-wildfire)
Slope stability assessments and mitigation design
Erosion risk assessment, quantification, mitigation
Sediment supply and transport analyses
Geomorphic characterization
Hydrogeologic evaluations/groundwater surface water interaction
Soils contaminant remediation
Seismic hazard identification and design criteria specification

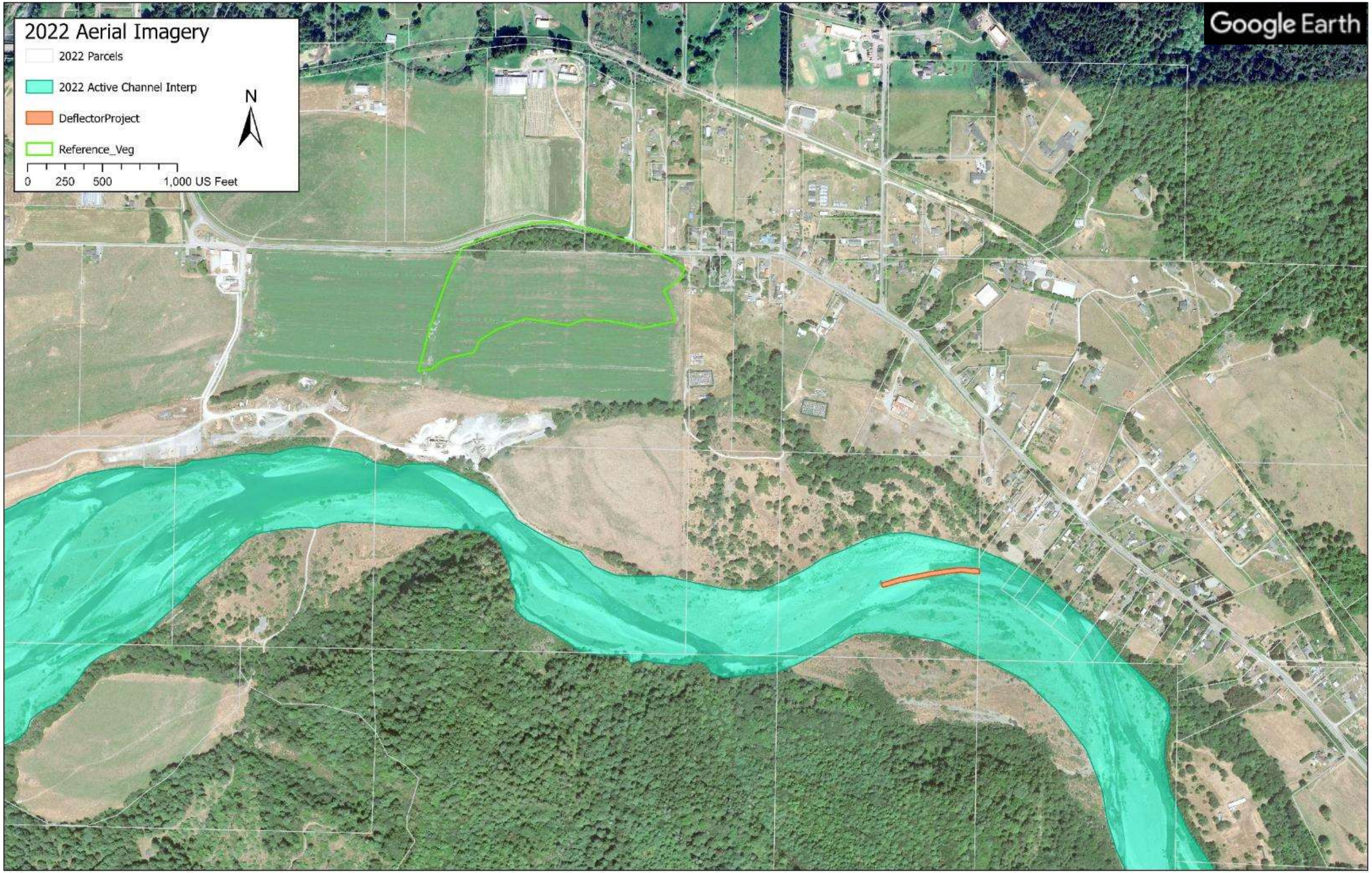

1948 Aerial Photo
2022 Parcels
Reference_Veg
1948 Active Channel Interp
N
0
250
500
1,000 US Feet
Fickle Hill
Eureka
Humboldt
Humboldt Bay National Wildlife Refuge
Headwaters Forest Reserve
Photo Location
Fortuna
Alton
2452 ft
Metropolitan
Rio Dell
36
California State Parks, Esri, TomTom, Garmin, SafeGraph, FAO, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, USFWS



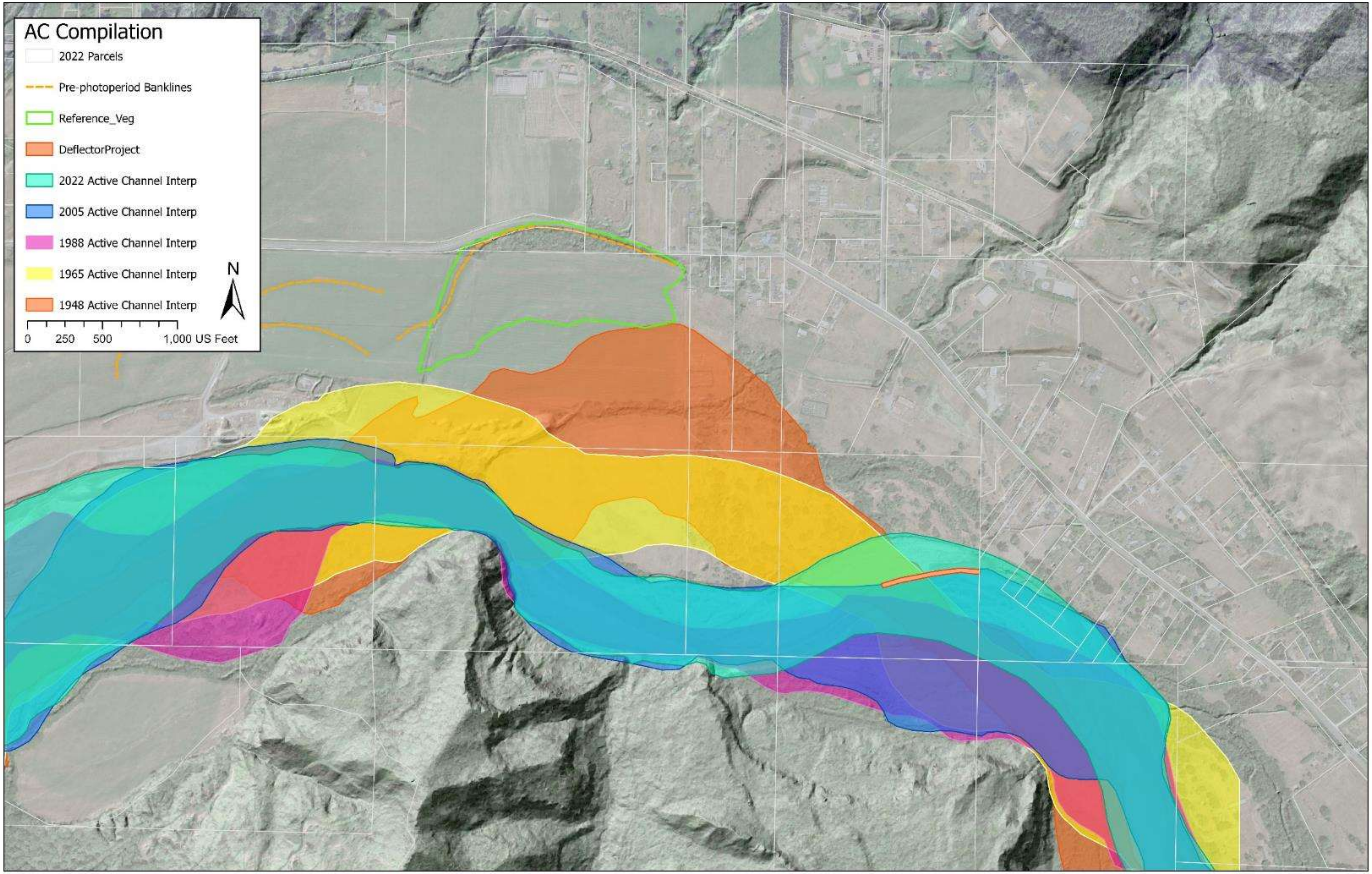
1965 Aerial Photo
2022 Parcels
Reference_Veg
1965 Active Channel Interp
0
250
500
1,000 US Feet
N

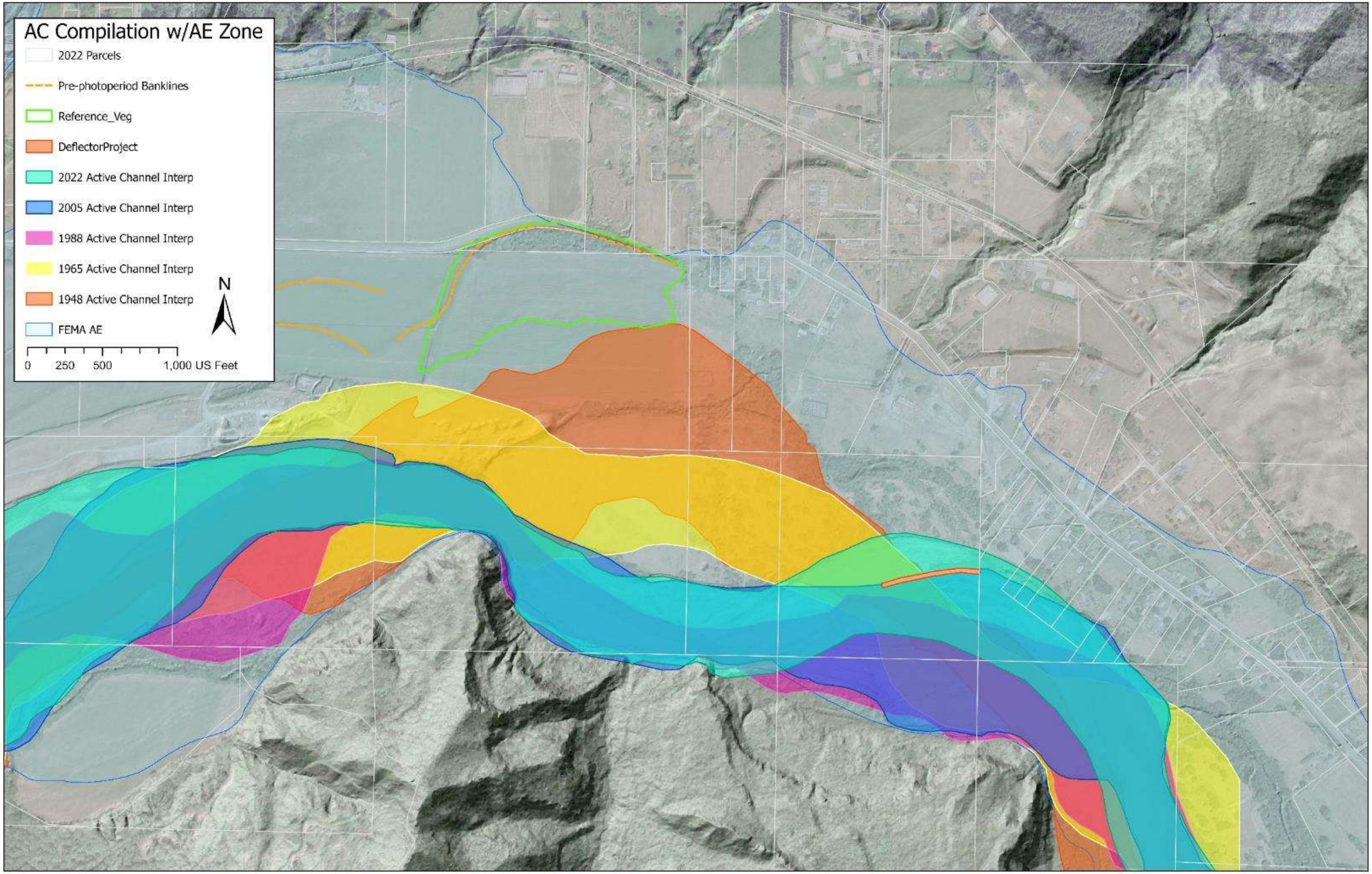

1988 Aerial Photo
2022 Parcels
Reference_Veg
1988 Active Channel Interp
N
0 250 500 1,000 US Feet


2005 Aerial Imagery
2022 Parcels
Reference_Veg
DeflectorProject
2005 Active Channel Interp
N
0 250 500 1,000 US Feet
Google Earth
Deflector Project



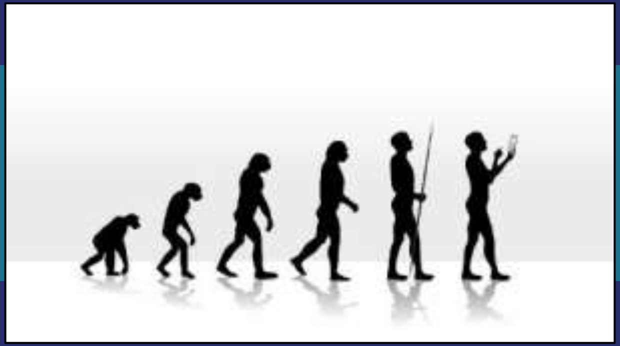
2022 Aerial Imagery
2022 Parcels
2022 Active Channel Interp
DeflectorProject
Reference_Veg
N
0 250 500 1,000 US Feet
Google Earth


AC Compilation
2022 Parcels
Pre-photoperiod Banklines
Reference_Veg
DeflectorProject
2022 Active Channel Interp
2005 Active Channel Interp
1988 Active Channel Interp
1965 Active Channel Interp
1948 Active Channel Interp
N
0
250
500
1,000 US Feet


AC Compilation w/AE Zone
2022 Parcels
Pre-photoperiod Banklines
Reference_Veg
DeflectorProject
2022 Active Channel Interp
2005 Active Channel Interp
1988 Active Channel Interp
1965 Active Channel Interp
1948 Active Channel Interp
FEMA AE
N
0 250 500 1,000 US Feet

Evolution of geologist roles and responsibilities

- Geologists/geomorphologists should play a key role in defining CMZs, Stream Conservation Areas (SCA), and process space designation in coordination with county and state planning processes.
- Roles in multi- and inter-disciplinary teams for agency review, restoration project advisory committees, design teams, construction oversight, and adaptive management to increase informed decision-making related to geological processes and earth materials.
- Geologists/earth scientists can play a key role in identifying the *causes, nature,* and *extent* of anthropogenic impacts to salmonid habitats. This recognition is critical to restoration effectiveness in ensuring restoration actions are commensurate with the scale and nature of existing habitat degradation.



Pragmatic opportunities for increasing the SPACE and therefore the pace, scale, and potential effectiveness of restoration

Pragmatic opportunities for increasing the SPACE and therefore the pace, scale, and potential effectiveness of restoration

Regulation (includes engineering and liability)

- Land use and zoning changes (stream conservation areas or zones)
- Update business and contracting codes/rules
- State-level Regional Floodplain Boards regulating SCAs that are enabled for restoration

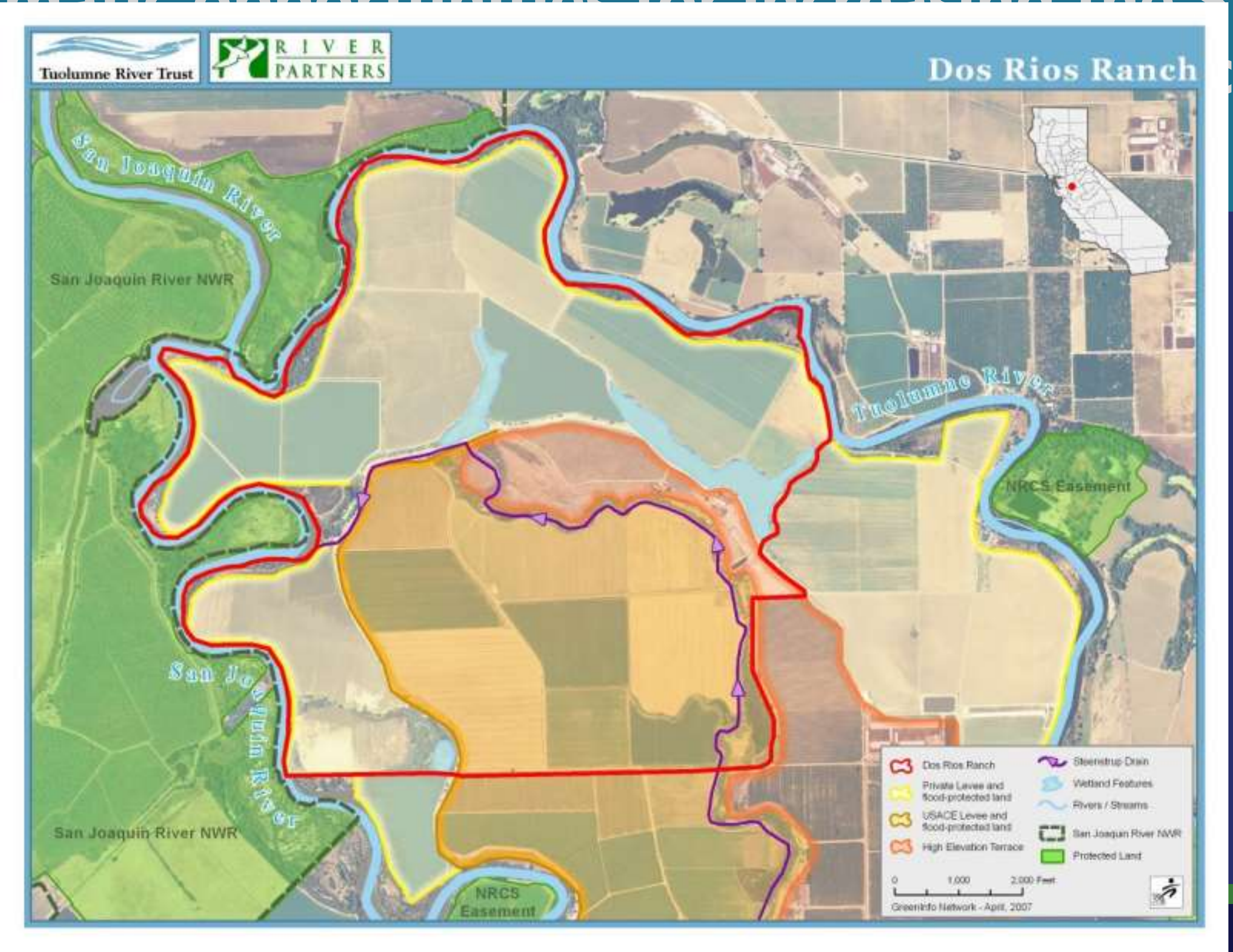
Capacity building

- Multi-disciplinary involvement (some experts are inter-disciplinary)
- Structured inter-agency collaboration – include NGOs (temporary duty, job trading/shadowing, externships)
- State-led prioritization and implementation with common goals

Pragmatic opportunities for increasing the SPACE and there... ...ctiveness of resto...

Dos...
Par...

- 2...
- $...
  F...
  a...



Conclusions – Can we be pragmatic?

Measured and systematic policy changes to enable more effective restoration

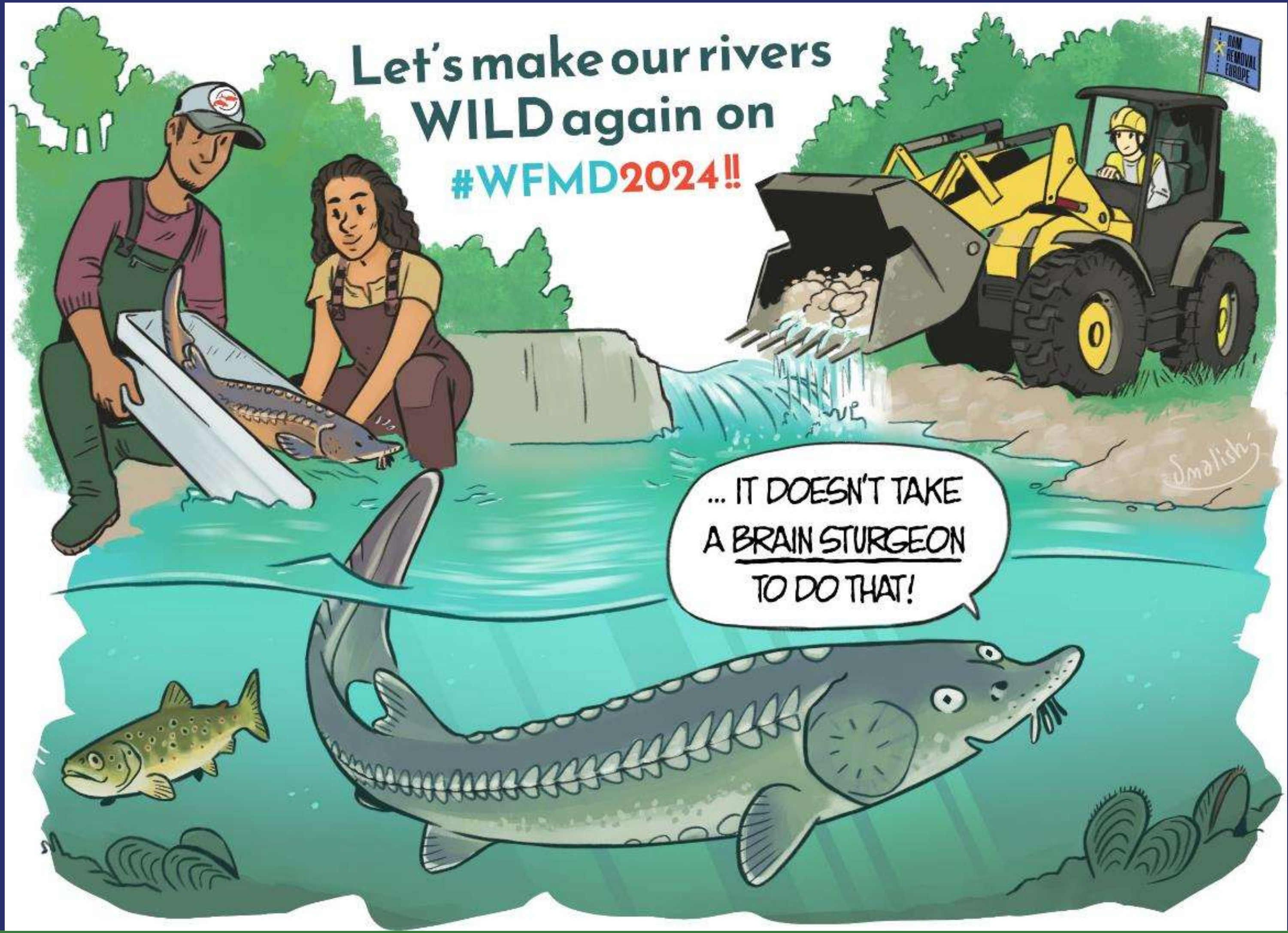
- Reform flood control – riverscape resiliency
- Identify key flood hazard areas that need PBR and/or would greatly benefit salmon recovery
- Societal/cultural education and gradual change back to a salmon nation

Use disasters but don't be disastrous

- Be ready for the next flood – $$ for conservation easements, SCA/CMZ acquisitions
- FEMA and CalOES – integrate planners with riverscape restoration skills and include other river experts, not just the hydraulic engineers
- Absolutely don't make it worse (perspective based)

Other ideas?

Conclusions



Sam Duncan for:
World Fish Migration Day

Promo

International Fish Passage Conference

UC Davis

03 – 07 May 2026

https://units.fisheries.org/fishpassagejointcommittee/activities/fishpassageconference/

It's All Relative

Why Context and Communication is Important in Ecosystem Restoration

Kristine Pepper, P.E. and Jeffrey Sanchez, P.G., P.H.
California Department of Fish and Wildlife
Conservation Engineering Branch

Context

We Have a Common Goal -- Ecological Restoration

"intentional activity that initiates or accelerates the recovery of an ecosystem with respect to its health, integrity and sustainability."

- Geomorphic Context
- Risk related to legal –Property, life, and safety
- Risk related ecological benefit – meeting project goals
- Scale
  - Sized to address decades/centuries of human affects
- Every location is unique – be careful of trends
- Multi-disciplinary – Technical Advisory Committee (TAC)
- Stakeholders and the greater community
- Engineered is not the opposite of natural

Con · text noun
[ˈkäntekst]

1: the parts of a discourse that surround a word or passage and can throw light on its meaning

2: the interrelated conditions in which something exists or occurs : ENVIRONMENT, SETTING

Oxford Languages, 2024

Communication

- Collaboration is Key – Common Goal
  - Project Management - facilitation
  - Multi-disciplinary – Technical Advisory Committee (TAC)
  - Develop Clear Goals and Objectives - based on the Context
  - Provide a Record of Decisions – just trust me is not enough
  - Transparency – engage the community and stakeholders
  - Without Bias and Unfounded Assumptions - about others is damaging – be open
  - Evaluation of Risk - discuss both legal and ecological risk openly as a team
    - Optimize the trade-off between potential benefits and potential risks

Geomorphic Context to Inform Restoration Goals

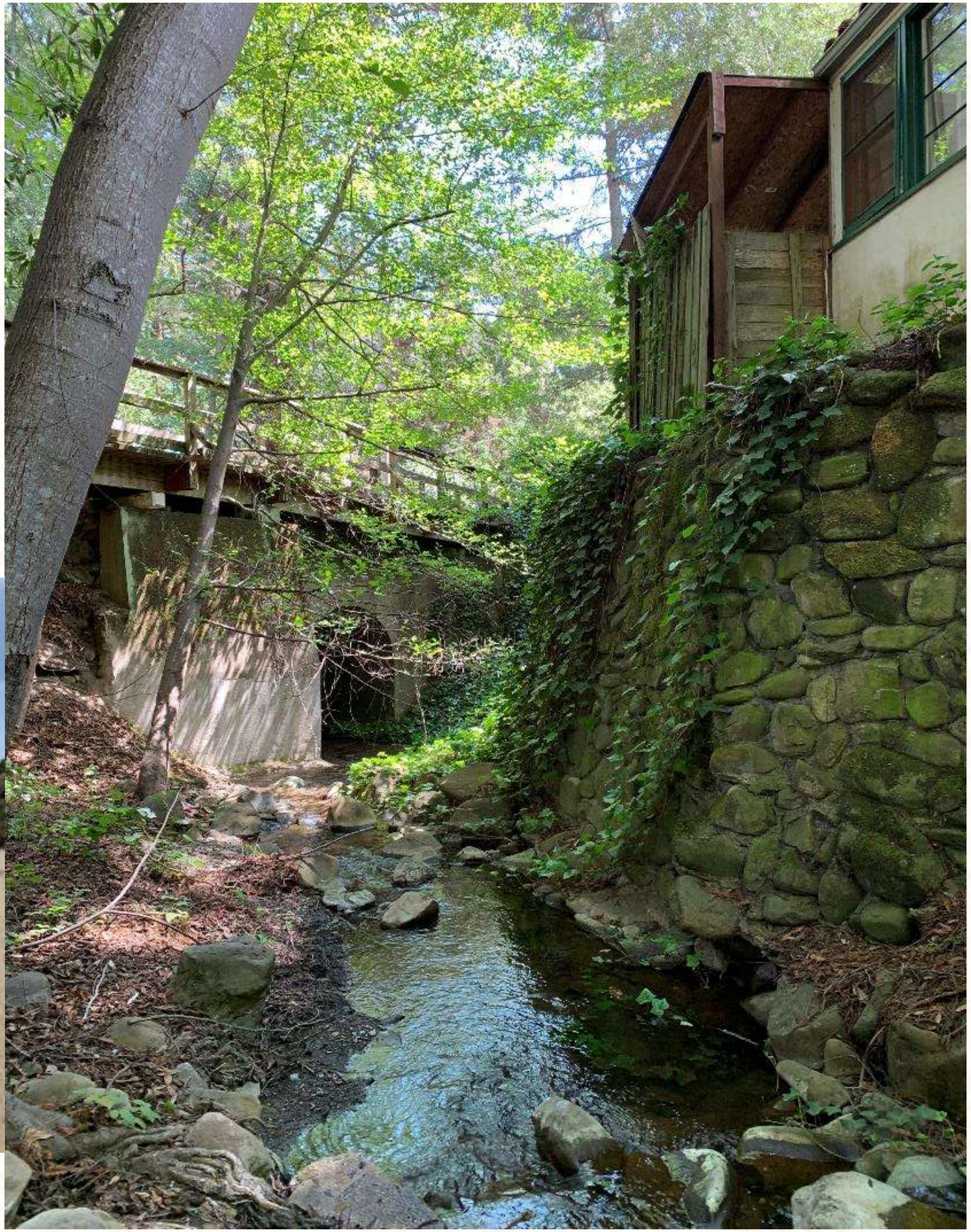
- Controls on contemporary river form and process
  - Geologic history
  - Biophysical characteristics
  - Legacies of past human alterations
  - Positions within the river network
  - River corridor geometry
  - Base level stability
  - Disturbance regime
  - Contemporary human alterations
- Assessment Results in
  - **Context** fosters awareness of a **broader** range of potential restoration targets

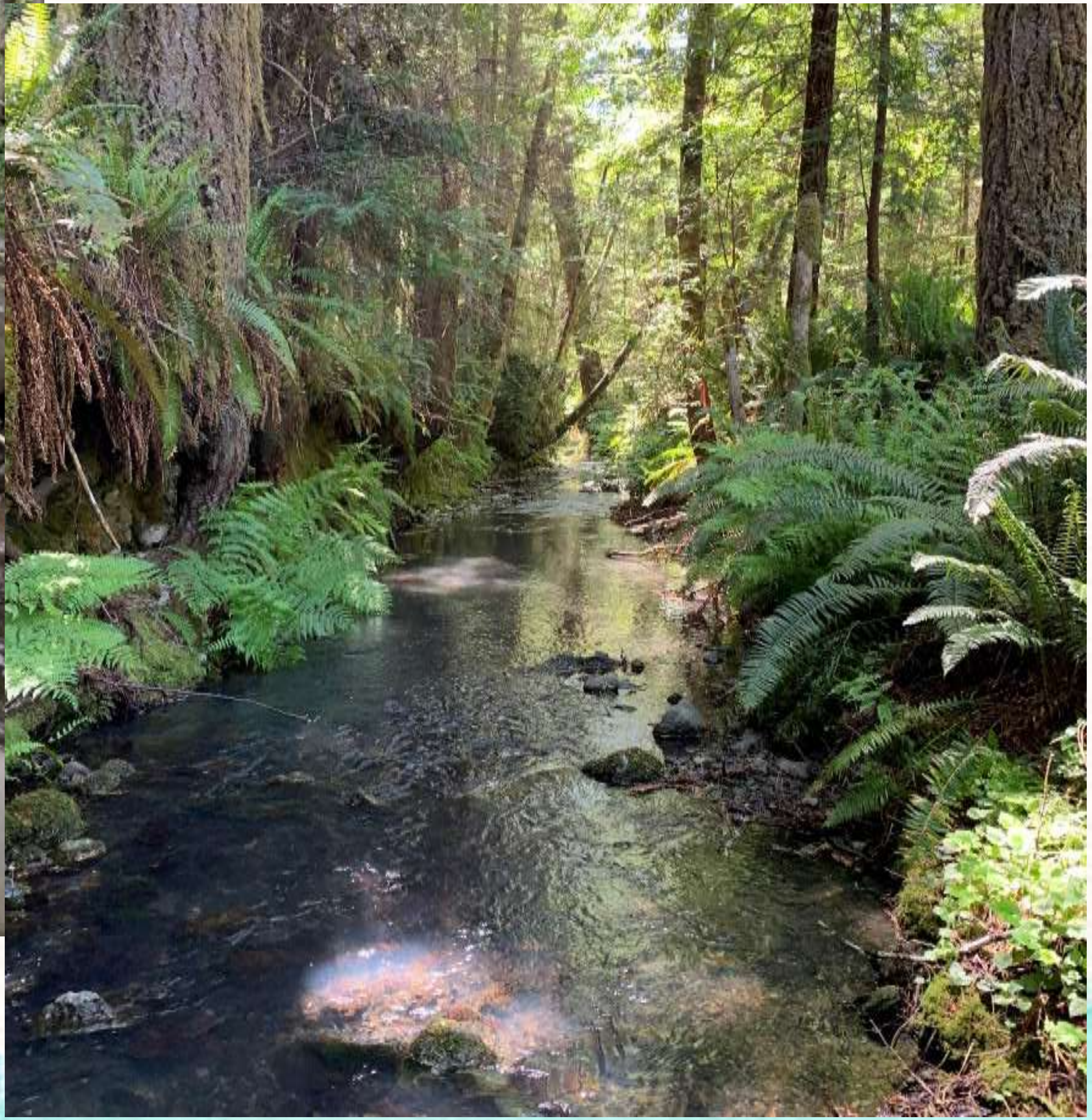
Wohl et al., 2024

Context of Risk - Engineering and Project Goals

- Who's Adverse to Risk
  - Engineer, Public, Environmental Resources, Property Owner, Mitigation Threshold, and Stakeholders
- Unintended Consequences/Project performs as expected - Failing elegantly
- Just Trust Me - it will be fine
- Every project and location is unique
  - One size doesn't fit all – beware of the latest trend
- Not all risk is bad – there is always risk
  - To err is human – it is what you do with these mistakes that matters
- May or may not need licensed professional involved
  - check early - planning development
  - And check in again if project approach changes

Context



Context and Communication–Why does it matter?

Example Moving Slowly- meadow/stream restoration on Department Land

Dept is landowner and permitting agency; funding not requested from Dept, labor match;

Activities include: **channel fill, grade control/fill retention**, conifer removal, PALS, BDAs; severe wildfire 2021

Project team included experienced practitioners but no licensed professionals; 'typicals' only, no detailed design

(2021) Disagreements over level of design detail and need for licensed professional involvement;

Multiple agencies raised similar concerns related to channel fill, grade control/fill retention; and indicated these activities did not fit expedited permitting pathways

(2023) 3rd party Engineer **review** memo also indicates need for design details, rock sizing/gradation, shear stress calculations

NEXT TIME: engage engineer before 30% design;

engage permitting agencies (~30-60%) to align project to streamlined permits;

Example Moving Fast- Road Decommissioning/ Stream Restoration, Dept Grant funding

Activity	Licensed Professional Involvement	Detailed Design
Culvert Removal	Yes	provided
Bank Armoring Removal	Yes	provided
Site Access	Yes	*contingency TBD
Road Decommissioning	Yes	provided

Project team consists of experienced practitioners and licensed professionals (bio, hydro, geo, engr)

Process-based restoration approach- remove anthropogenic elements, add wood, get out of way

Site is highly unstable post-fire and will evolve after each high flow event; site characterized as best as possible, but revisions to the plan details may be needed

Easy access already lost, if not implemented in 2024, secondary access may become infeasible

CEB (2023& 2024) recommendations to Project Team: "Proceed with haste" and Grants Branch: "Fund the design **AND** implementation ASAP"

Example Design Detail- Large Wood, LSAA's

Unanchored Wood	Anchored/Ballasted Wood
Large wood structures to increase complexity and restore natural processes; 150 trees, ~30 structures	Log and boulder deflectors to reduce erosion and protect road; 15 trees, 4 structures
Small stream, very large trees (~3x bankfull width)	Large stream, large trees (<1/3 bankfull width)
FB 184: Low Risk (Key pieces wedged in live trees)	FB 184: High Risk (rock/soil ballast, pins)
Structures may adjust or re-distribute	Structures intended to be stable, minimal shifting
Experienced Practitioners	Licensed Professional
Plan A, Typicals, intent, bookends (Map & Table)	Stamped design, details and stability calcs, BOD

- Key Differences: relation of log size to bankfull dimensions; how logs are secured
- Projects entered LSA process generally as described above, moved quickly

Example Design Detail- Meadow and tributary restoration, Dept Grant and LSAA

Activity	Licensed Professional- Design Level
Grade Control/Fill Retention, channel fill	Yes- site specific design, details
Bridge, abutments, scour countermeasures	Yes- site specific design, details
Armored low water crossing	Yes- site specific design, details
Bank armoring (rock)	Yes- site specific design, details
Culverts and scour countermeasures	Yes- site specific design, details
Hydraulic Modeling, Basis of Design	Yes- site specific (justify stability for hardened elements)
Invasive species treatment	No- "Plan A", intent, bookends
Conifer removal	No- "Plan A", intent, bookends
BDA's/PALS (isolated from hardened project elements)	No- "Plan A", Typicals, intent, bookends (field fit)
Surface Roughness (e.g. vegetation, logs, rock)	No- "Plan A", Typicals, intent, bookends

- Grant process led to streamlined LSAA; LSAA amended when plans changed/ bookends exceeded

Thoughts from reviewing perspective on moving faster- efficiently

DO:

- Recognize we ALL have the same general goal of ecosystem improvement, 'trustee agency'
- Interact with the DFW early and often; grants administered by WRGB should set stage for efficient DFW permitting;
- Be open to modifying project to meet program criteria (e.g. CGT/streamlined vs LSAA)
- Start the planning process with an interdisciplinary team
- Plan and budget for inclusion of licensed professionals in early development stages (not review final design)
- Use outlines/templates/boilerplates for submittals (but…)

DON'T:

- Forget to update boilerplates to reflect the specific proposed project/site
- Assume all funding sources directly align with DFW permitting needs
- Approach DFW and other agencies at 'permitting phase' and '100% design'

Characteristics of Efficient Projects

Project Context ➪ Clear Goals and Objectives

Context

- Fosters awareness of broader range of potential restoration targets
- Provides the foundation for the development of project specific goals and objectives
- Scale restoration in relation the scale anthropogenic damage

Good Communication

- Clearly defined project goals
- Well organized progress meetings – Project Management
- TAC - Multi-disciplinary, public, and stakeholders
- Encourage full engagement from all stakeholders in meetings (in person if possible)
- Engage TAC early and at each decision point with all stakeholders
- Full transparency of planning and project development process

Early and regular communication results in clear expectations;

knowing what to expect reduces guessing and need for "rework".

Resources

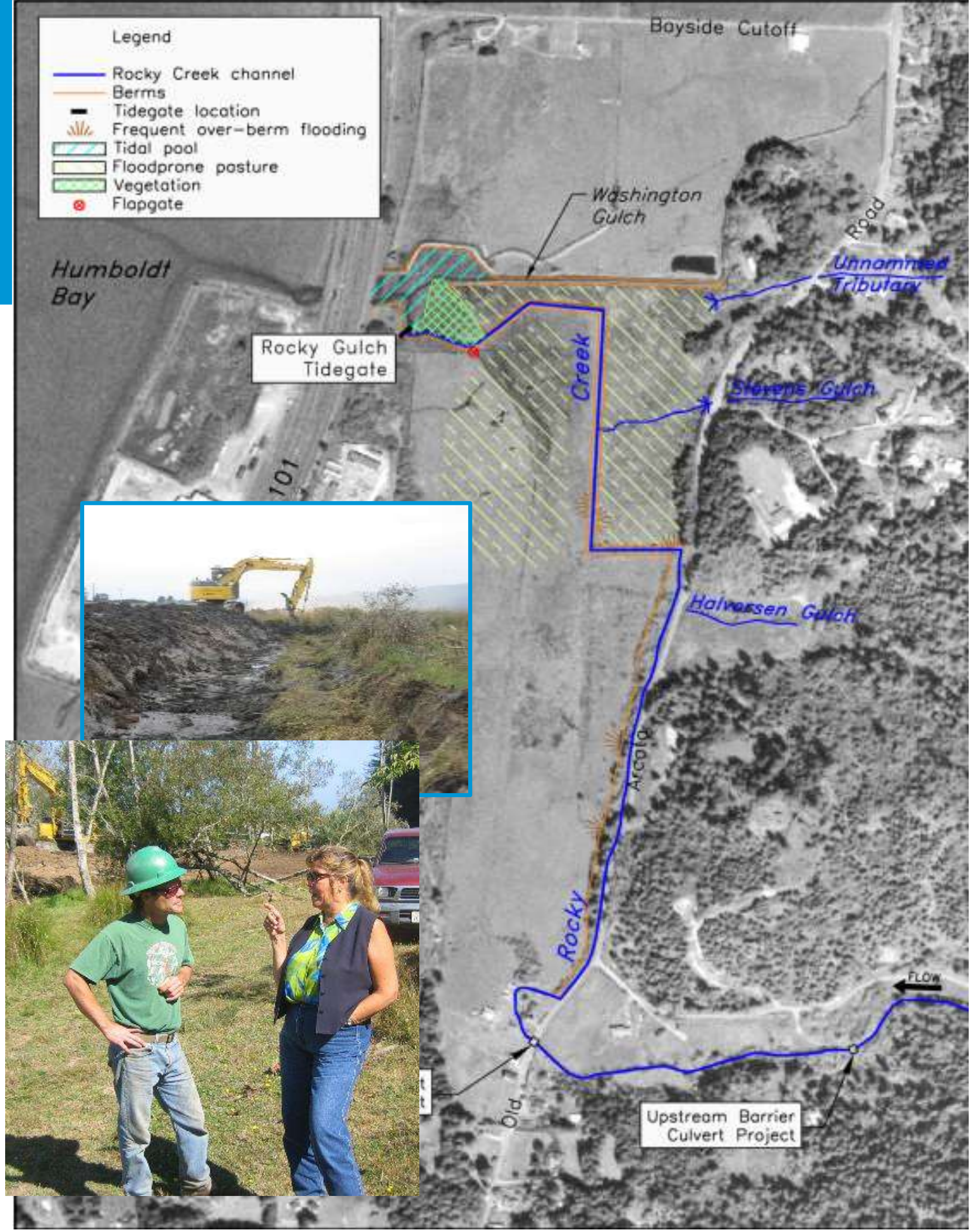
- Geomorphic context in process-based river restoration (Wohl et al., 2024)
- National Large Wood Manual: Assessment, Planning, Design, and Maintenance of Large Wood in Fluvial Ecosystems: Restoring Process, Function, and Structure.(USBR and ERDC). 2016.
- Low Tech Process Based Restoration of Riverscapes (Wheaton et al, 2019)
- A Stream Evolution Model Integrating Habitat and Ecosystem Benefits (Cluer and Thorne, 2014)
- www.wildlife.ca.gov/Grants
- jeffrey.sanchez@wildlife.ca.gov
- kristine.pepper@wildlife.ca.gov

CALIFORNIA TROUT

FISH · WATER · PEOPLE

Toward a Next Generation of Project Planning, Design, and Implementation

Building a Resilient Future

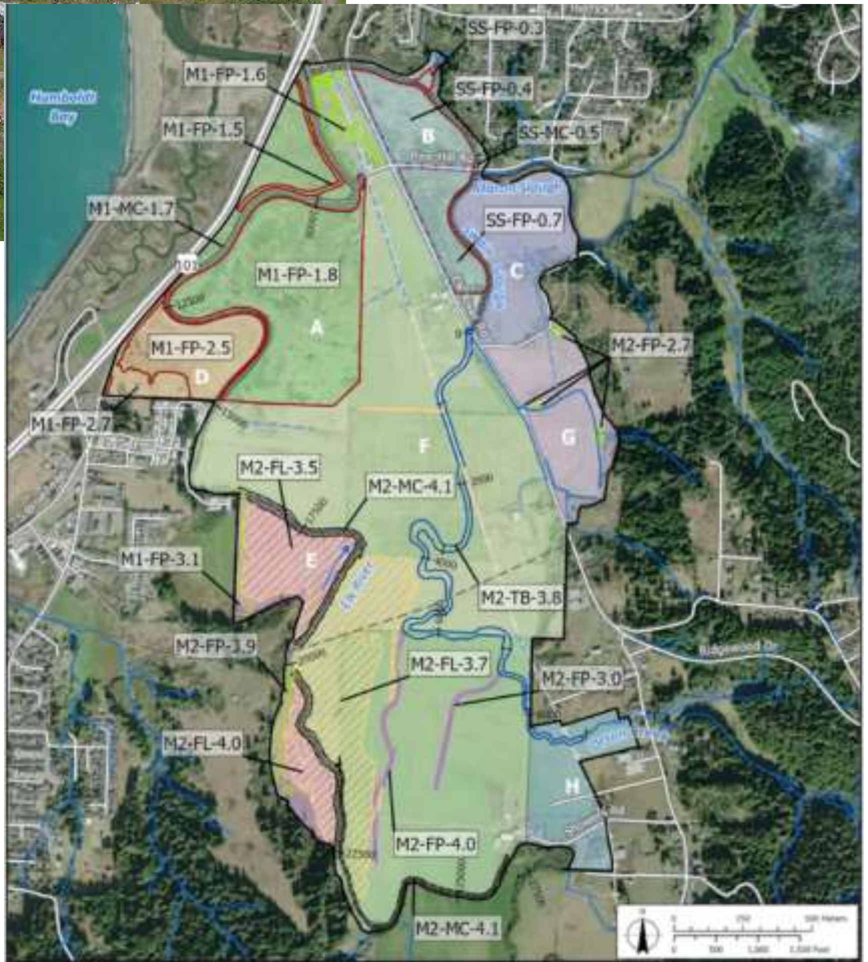


Rocky Creek Restoration 2002-07

Project Activities

- Installed new tidegate
- Restored 1,100 ft of tidal slough and 2,800 ft stream channel
- Revegetated 10 acres riparian habitat
- Replaced culvert with bridge
- ~9,000 cu yds cut/fill volume

Total Construction Cost: ~$340k



Orton Creek (Elk River) NOAA Proposal = $14.6M (2027)

- 9,000 ft stream channel
- 50 ft riparian buffer
- Reconnection to tidal slough channel

$/yd3 (2027 $$) = **$165/yd3**

Rocky Creek Total Project Cost = $340,000 (2005)

Inflated to 2027 = $1.05M

$/yd3 (2027 $$) = **$117/yd3**

Construction costs have escalated in 20 years.
WHY ?

- Competitive bids
- Prevailing wage requirements
- Fish removal and dewatering
- Water quality monitoring
- Construction management
- Erosion control
- Revegetation standards

We were subsidizing the projects.




What inspires me is that we built a local restoration industry, and now we're being called upon for a higher purpose ....climate adaptation.

Restoration Industry Capacity
Funding Availability
Proposal Simplification
Grant Program Oversight
Grant Management and Administration
Indirect Cost Recovery
Permitting Simplification
Engineering Design and Review
Monitoring (mainly CMP)

Eel River Forum
Restoration Practitioner Workshop
December 13, 2017

Priority Issues

1. Balance of Risk and Responsibilities
2. Solicitation and Proposal Review
3. Grant Management
4. Priorities and Protocols
5. Engineering Design Review
6. Funding Structure and Availability
7. CEQA (the elusive ”Programmatic”) and Permitting
8. Project Monitoring
9. Population Monitoring

Program Name	Funding Source	Agency	Annual $ Available	Concept or Full Proposal	Application Date	Months to Award
FRGP (Fisheries Restoration Grants Program)	PCSRF/State Match	CDFW	$12-16M	FP	March	16
RGP (Watershed Restoration Grants Program)	Prop-1	CDFW	$24M	FP	July	7
WCB Streamflow Enhancement	Prop-1	WCB	$24-36M	FP	August	10
SCC (Water, Wetlands, Fish, and Urban Greening)	Prop-1	SCC	$30M	FP	3 Times/Yr	3
NPS Clean Water Act 319h Grant Program	Federal CWA	SWRCB	$10M	CP	February	14
NOAA Community-Based; Coastal Resilience	Federal	NOAA	~$15M	FP	March	6-8
			$115-130M PER ANNUM!!			

Recent PSN Funds

Program Name	Funding Source	Agency	Annual $ Available	Concept or Full Proposal
FRGP (PCSRF)	PCSRF	CDFW	$17M	CP/FP
WRGP *	Various	CDFW	$177M	CP Rolling
WCB **	Various	WCB	$100-200M	CP/FP Rolling
SCC ***	Various	SCC	$150M	CP/FP Rolling
USEPA - NPS 319h	Federal CWA	SWRCB	$4.5M	CP/FP
NOAA Transformational	BIL	NOAA	$240M (Nationwide	FP
NOAA Coastal Zone	BIL	NOAA	$60M (Nationwide)	LOI/FP
NFWF - Coastal Resilience	Misc	NFWF	$140M (Nationwide	CP/FP
			$1.04 BILLION	
* Prop 1, 68, Drought, Climate, NBS, as of Feb 2023				
** Prop 1, 68, GGRF, as of 2023				
*** Average of Past 3 FYs				

***Generational Funding**

"Restoration Leaders Ad Hoc Committee" Recommendations for Improving Grant Programs January 3, 2019

Four Categories of Recommendations
18 Recommendations

- General
- Grant Program Priority Setting
- Grant Administration, Process, and Policy
- Permitting, CEQA Compliance, and Engineering Review

Report to the Director of the California Department of Fish and Wildlife
Final Recommendations for Improving the CDFW's Granting Programs
January 3, 2019

Background

In January of 2018, the Director of the Department of Fish and Wildlife (CDFW) convened a group of CDFW staff and habitat restoration leaders to solicit input on CDFW's grant program. Director Bonham requested that the restoration leaders work with CDFW Grant Program staff to develop recommendations for improving the efficiency and effectiveness of CDFW's granting program. During the spring of 2018, CDFW conducted a survey of the restoration leaders to obtain input on the types of issues that should be addressed to improve CDFW's grant program.

Director Bonham reconvened the group on May 31, 2018, and the group agreed to organize an ad hoc committee to respond to the Director's request. To efficiently respond to Director Bonham's request and address the issues identified in the survey referenced above, the restoration leaders divided into three subcommittees: 1) Grant program priority setting; 2) Grant administration, process, and policy; and 3) Permitting, CEQA compliance, and engineering review.

The subcommittees met throughout the summer of 2018 to draft recommendations, and the leaders of the various subcommittees worked together to integrate these recommendations into eighteen recommendations described on the following pages. The first recommendation is to continue the ad hoc Committee during 2019 to refine and build upon these recommendations and provide guidance for implementing any grant improvement program decisions made by the Director.

The habitat restoration leaders that participated in the Ad Hoc Committee and its three subcommittees included.

John Cain, American Rivers
Matt Clifford, Trout Unlimited
John Carlon, River Partners
Julie Fair, American Rivers
Darren Mierau, California Trout
Jayme Ohlhaver, California Trout
Freddy Otte, City of San Luis Obispo
Julie Rentner, River Partners
Monty Schmitt, The Nature Conservancy
Steph Wald, CreekLands formerly Central Coast Salmon Enhancement

Grant Program Priority Setting Recommendations

- ✓ 4. Continue to fund regional planning and restoration planning.

Grant Administration, Process, and Policy Recommendations

- ✓ 5. Delegate authority to grant management to approve amendments.
- ✓ 7. Utilize federal accounting rules and NICRA to determine indirect cost recovery.
- ✓ 8. Accept and review concept proposals (pre-proposals), on a rolling, open-cycle basis.
- ✓ 9. Simplify full proposals.

Permitting, CEQA Compliance, and Engineering Review Recommendations

- ✓ **12. Facilitate CEQA compliance for CDFW-funded projects.**

- ❖ Cutting the Green Tape Program
- ❖ Statutory Exemption for Restoration Projects (SERP)
- ❖ Restoration Management Permits
- ❖ Restoration Consistency Determination

[CDFW is working with the NOAA and USFWS to develop a new process for issuing CDs for restoration projects that have received approvals for programmatic biological opinion (PBO) for restoration.]

- ❖ Supported the Statewide Restoration General Order

- ✓ **15. Determine how CDFW engineers direct project design relative to grantee-hired engineers.**
- ✓ **16. Develop guidelines defining review processes for design phase review.**
- ✓ **17. Explicitly define when a project design is required.**
- ✓ **18. Recognize the benefits of the design-build approach.**

The CDFW Conservation Engineering Branch
… reviewed and made extensive comments and specific recommendations for a path forward [Memo; July 2021]

Next steps include:
- ❖ Convey direction and potential ideas for implementation with stakeholders
- ❖ Vet feasibility of options within Department (what is our latitude within the realm of funding source requirements, liability assessment, and identification of resources?)
- ❖ Finalize specific recommendations to address each of the below RLC recommendations.

Darren's Engineering Questionnaire
Invited 8 local engineers. Got 4 responses.

1. .
2. .
3. .
4. Do you agree that the State of California needs to accept more responsibility and liability for the engineering design of projects intended to protect public resources?
5. Do you think the status quo for engineering design is causing you to be overly cautious in your designs
6. .
7. .
8. .

Not likely practical or appropriate to transfer project liability from the engineer to the State

Dividing up the risk amongst the designer and funding agencies would be helpful

Enable more rigorous studies and analysis in the design process to

… improve engineering designs

…determine appropriate level of risk mitigation at a site

Some standardization of Basis of Design Reports and the risk assessment portion of those reports

Identify "appropriate standard of care" (*)

Identify where engineering designs have flexibility for field adjustments (design build)

Final Thoughts…

Consider ourselves a professional industry with an essential mission.

Slow down to go faster. Build our process infrastructure for the long-haul.

Continue to fund watershed-scale planning and prioritization for restoration and conservation (build grant funding around science-based priorities).

Advertise bids and secure contractors at 65% Design (experimental).

Value Engineering and Climate Engineering (*).

NGO Landowner Agreements for duration of Grant Agreement

Fund the CA Monitoring Program

FUND MONITORING PROGRAMS

WHY MONITOR ?

Allows us to practice better science.

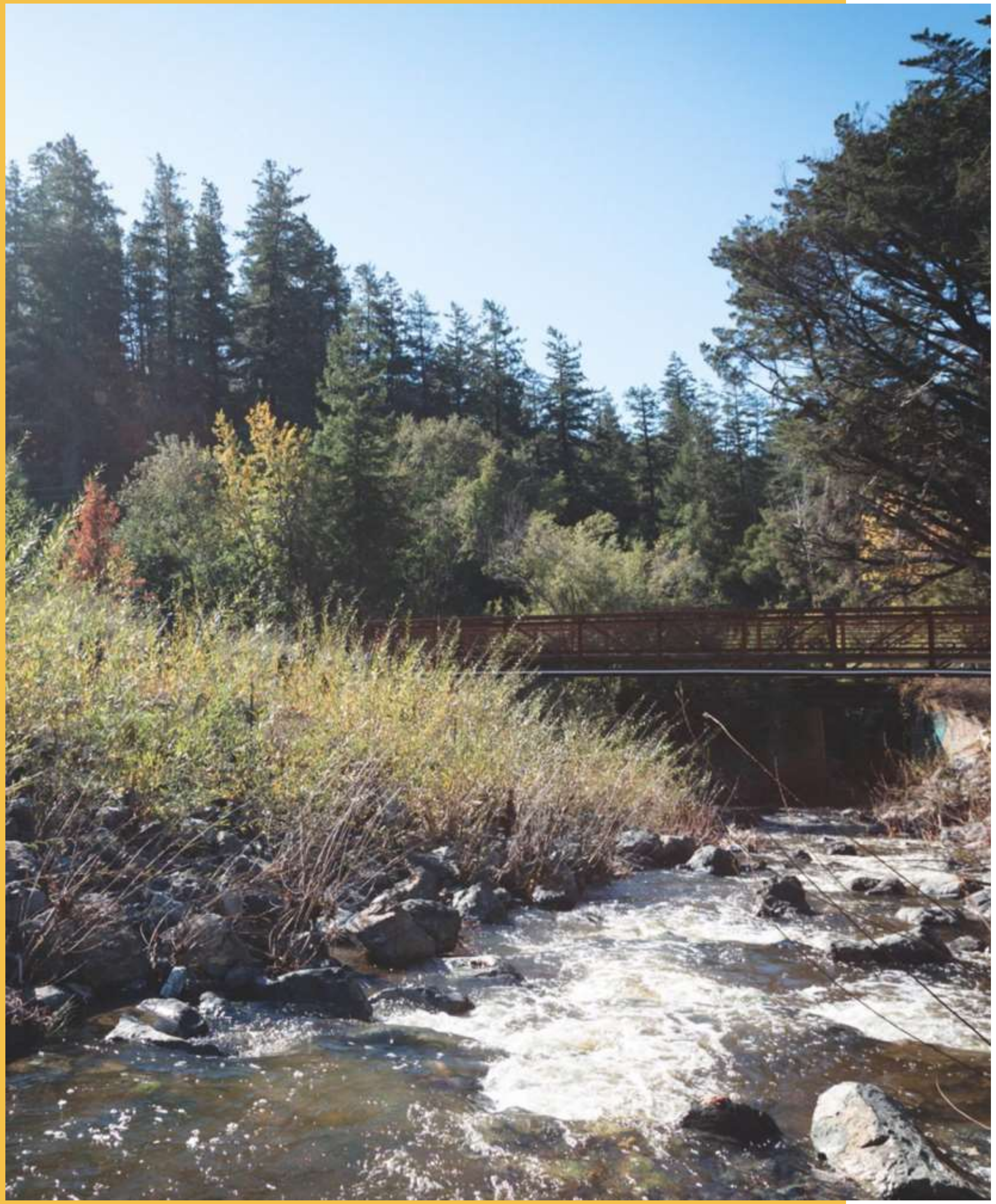
Informs population status and trends.

Informs success of restoration investment.

Trains next generation of scientists.

Brings public interaction, engagement, and interest.

THANK YOU !



Considering construction at the inception of your restoration project

MARK CEDERBORG / SRF / 3.29.24

Outset Advisors
ECOLOGICAL + CONSTRUCTION

Thank you to SRF

Just a quick shout out and thanks to the SRF for creating and facilitating yet another compelling and informative conference.

I’m honored to be here again — albeit in a different capacity than in previous years.

A bit about me

Recently I have new endeavor called Outset Advisors focusing on Ecological + Construction and planning for project success.

You might know me from my 24 years at Hanford. It is through prior experience in the construction industry, and working my way through the ranks at Hanford, specializing in construction of restoration projects, that brings me here today.

Traditional Civil Construction Process

Concept

Design

Permitting

Construction

Concept → Design → Permitting → Construction

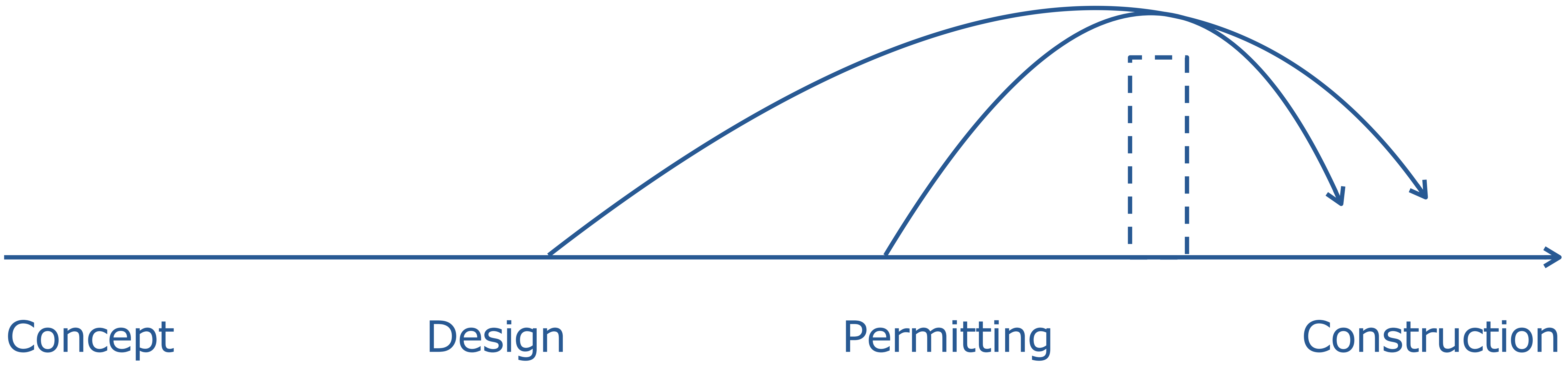
Traditional Civil

EXAMPLE

Bridge

- Linear process
- End product is static
- Engineer out all the uncertainty
- Predictable quantifiable immediate results
- Fixed and depreciating

Traditional Civil Construction Process



$$$$ / 🙁

Restoration Process

FOLLOWING CIVIL MODEL

Concept → Design → Permitting → Construction

Restoration

EXAMPLE

Stream

- Non-linear process
- End product is dynamic
- Cannot engineer out all the uncertainty
- Results are not immediate and not always predictable
- Dynamic and appreciating

$$$$ / 😐

Restoration Process

PROGRESSIVE CHANGE

Construction Concept Design Permitting Contracting

$$$$ / 🙂

Restoration Process

PROGRESSIVE CHANGE

Contractor

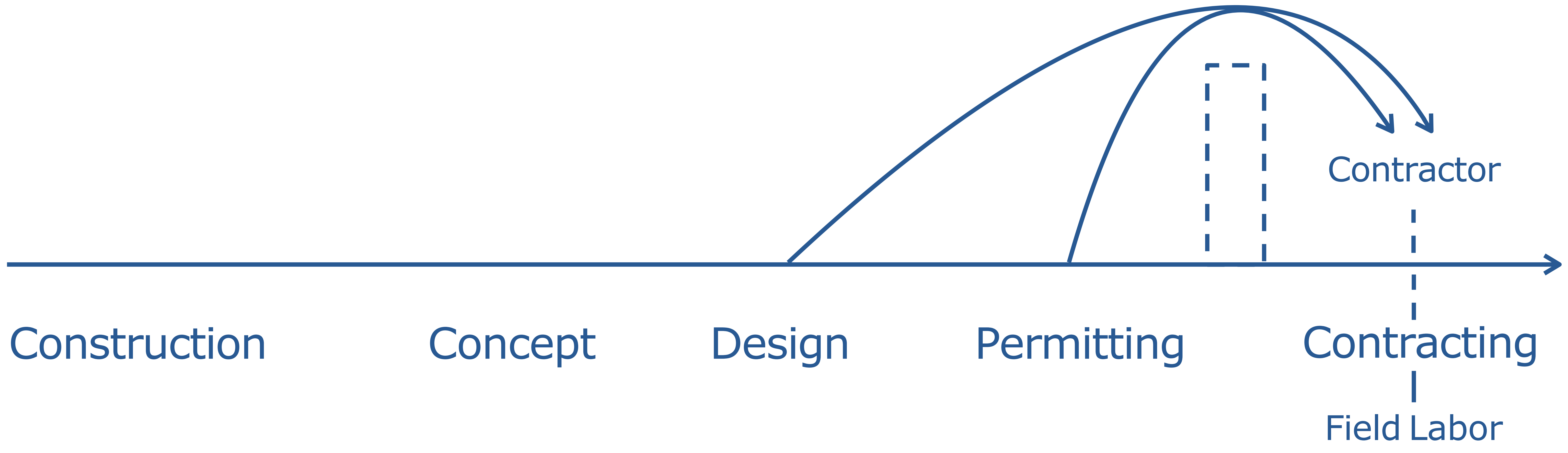
Construction — Concept — Design — Permitting — Contracting

Field Labor

$$$$ / 🙂

Restoration Process

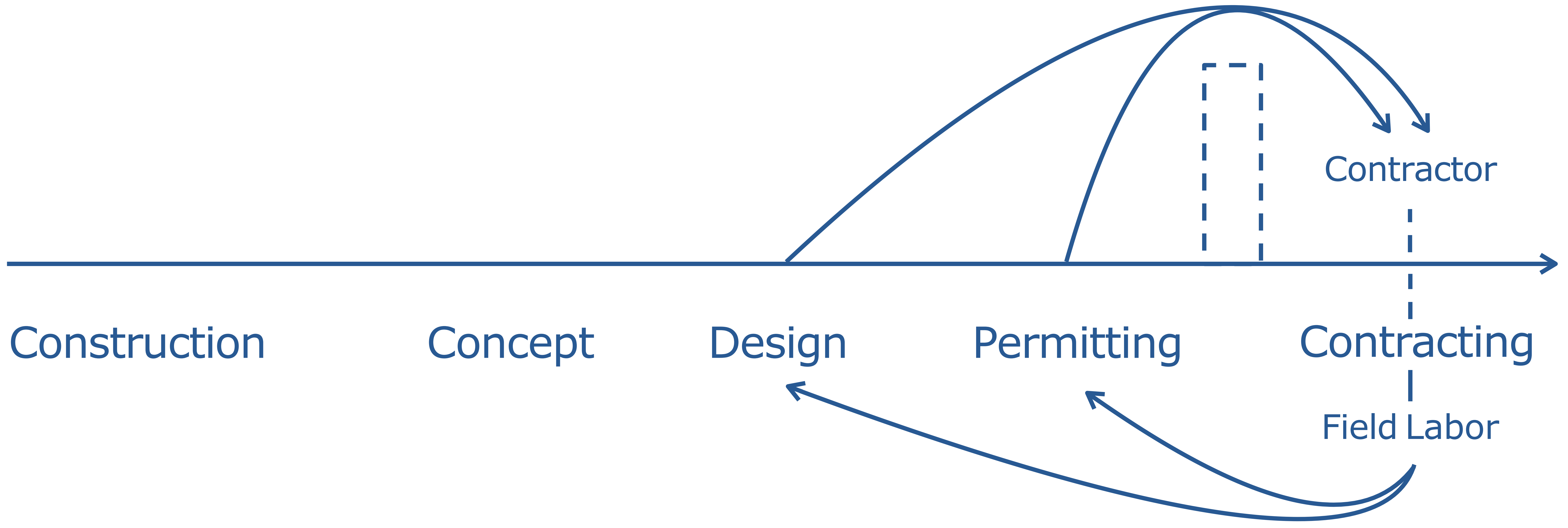
PROGRESSIVE CHANGE



$$$$ / 😀

Restoration Process

PROGRESSIVE CHANGE



Traditional Civil

EXAMPLE

Bridge

- Linear process
- End product is static
- Can engineer out all the uncertainty
- Predictable quantifiable immediate results
- Fixed and depreciating

Restoration

EXAMPLE

Stream

- Non-linear process
- End product is dynamic
- Cannot engineer out all the uncertainty
- Results are not immediate and not always predictable
- Dynamic and appreciating

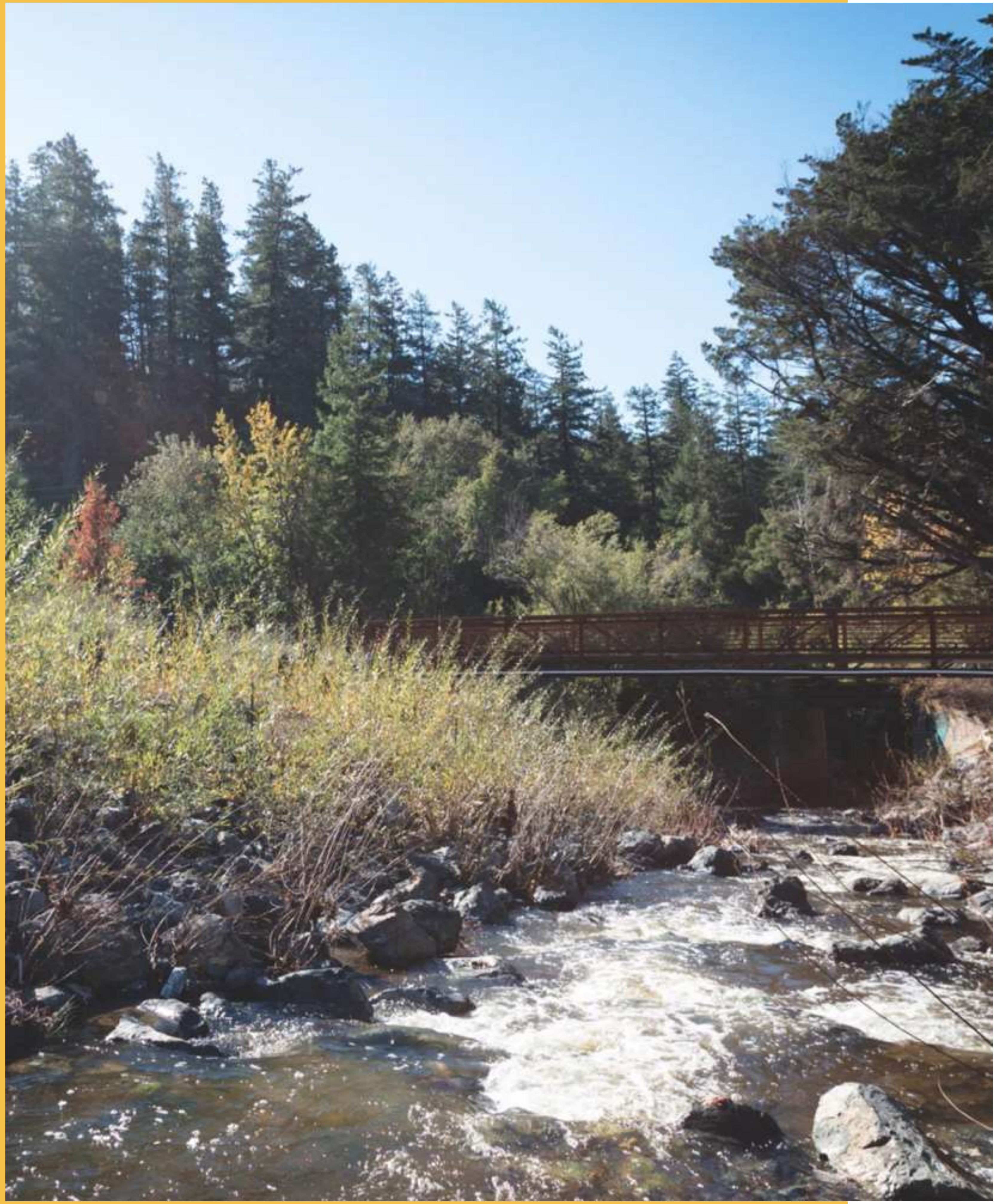
Positivity and human interaction from inception to post-construction

Each person who participates in the process of restoration provides a critical role that is both interdependent and interactive with every other participant. Consider the restoration community is an ecosystem in itself...

The process is so important because although there are always goals, there is no true 'end product', like a bridge, with our work.

Positivity and human interaction from inception to post-construction
Human interaction, even when the human is behind the wheel of a huge piece of equipment, is key to making the process as enjoyable as reaching the goal.

And, if the process is considered successful and rewarding, everyone involved *(including funders)* will want to do it again!



Thank you.

THIS PRESENTATION WAS DESIGNED BY CATCH CREATIVE.

Employing Non-Engineered Techniques to Allow Fish Passage in Heavily Disturbed, Industrially Logged Landscapes

Thomas H. Leroy — Pacific Watershed Associates
Dan Resnik — California Department of Fish and Wildlife
Anna Halligan — Trout Unlimited

If you know who this is,
you have been blessed!

If you don't, that's ok,
but you missed out!

Special Thanks to Marjorie Caisley (CDFW)

- At the time of this project, what we did was considered an experiment, the term "Processed Based Restoration" hadn't even gained traction at that point in time.

- If not for Margie giving us her blessing to try something out, that at the time was considered somewhat experimental, this project would not have happened.

- Thanks Margie, for all your support, guidance, and providing us an opportunity to work *with* mother nature to heal our rivers and streams!

Historic Watershed Scale Disturbances in Industrially Logged Timberlands (The Great Disturbance 1950 to 1980)

- Road and skid trail construction
- Conversion of Upland and Riparian Forests
- Bull Dozing in Stream channels
- Stream Clearing of Large Wood

The Aftermath of the Great Disturbance

- Lets look at impacts to watershed processes and not focus too hard on direct impacts to species
- Lets agree, none of these disturbances by themselves resulted in the dysfunctional aquatic habitat currently observed within our watersheds. Rather, its the complex interactions of these disrupted processes that have resulted in the significant loss of high value aquatic habitat

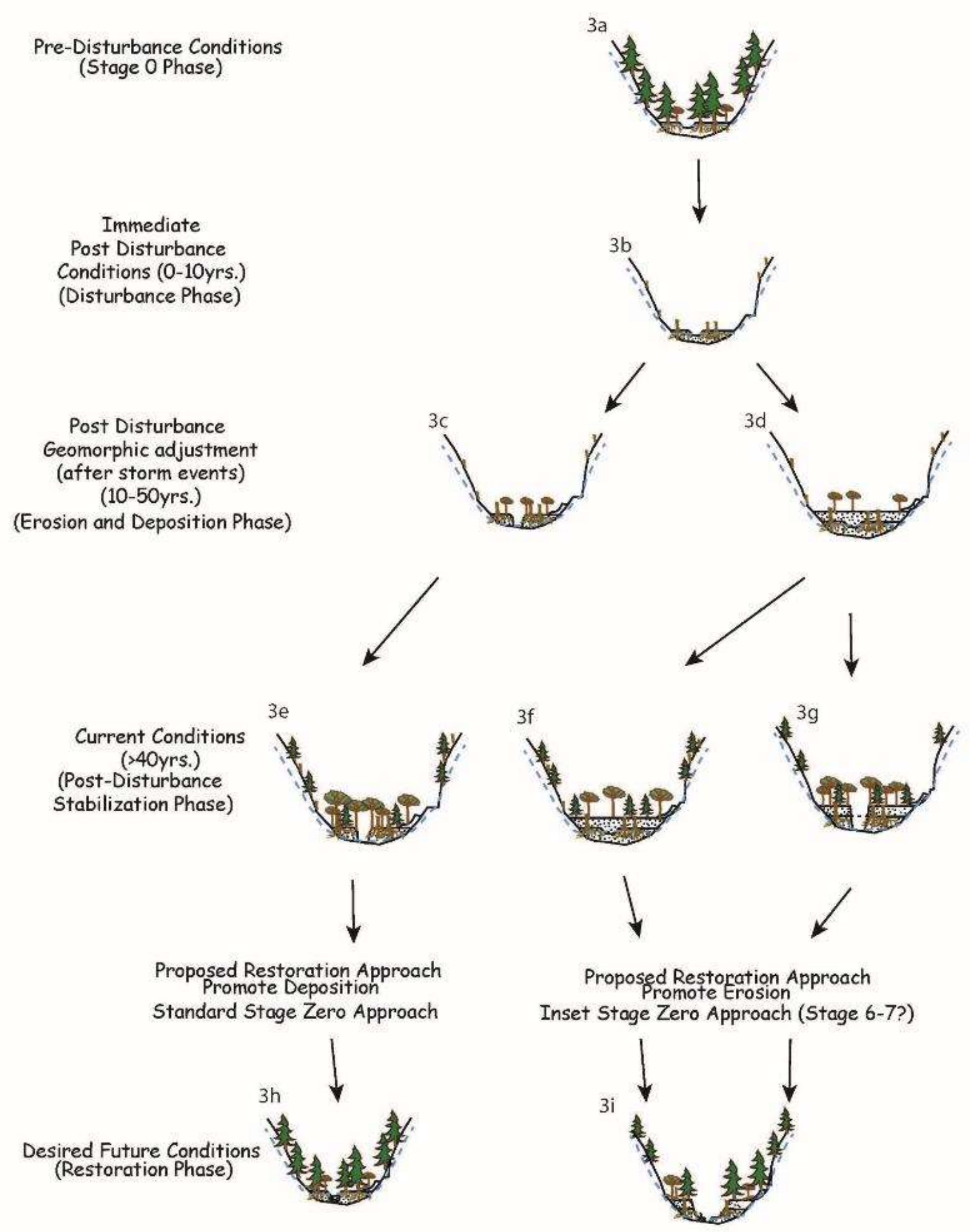
Impacts to watershed processes

- Surface and groundwater hydrologic processes
  - Impacts include accelerated delivery of surface flow from roads to stream channels, puts peaks in stormwater runoff hydrographs
- Sediment accumulation, transport, and depositional processes
  - Impacts include routing channel substrates out of low order channels and into higher order channels
  - Accelerates erosion and sediment delivery at the time of disturbance at the cost of long-term stochastic sediment delivery to the watershed
- Natural recruitment of riparian wood to the stream channel
  - Impacts include reducing roughness elements within the stream channel that otherwise would govern the flux of water and sediment through any given channel reach.

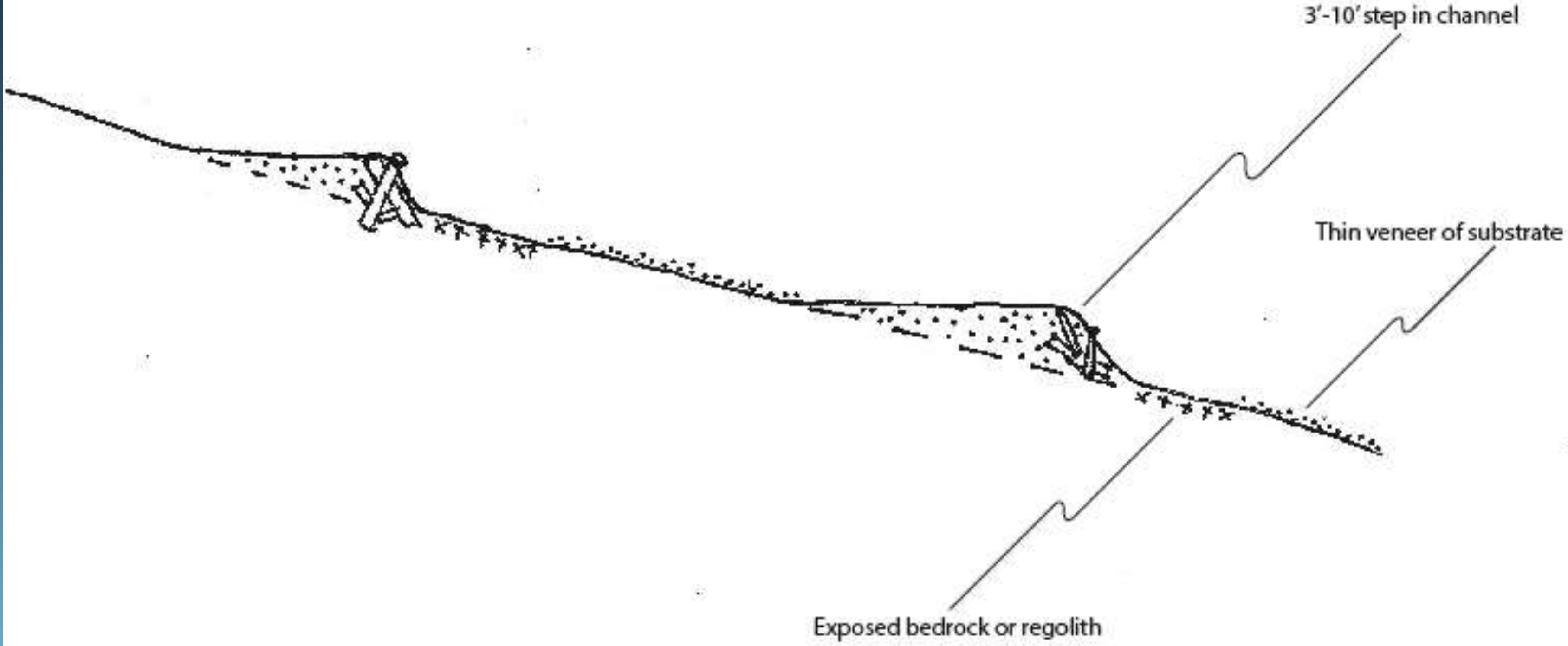
Roads accelerate surface water delivery to streams and drain shallow groundwater

Watershed scale disturbances change reach scale bio-fluvial-geomorphic conditions

- Altered channel forming processes result in changes in the distribution of channel stored wood and sediment
- A channel evolution model that includes both aggradation and erosion as a starting point



Cartoon depicting an uneven distribution of wood and sediment within a channel reach



Note: uneven distribution of wood and sediment

less obvious impacts from road systems

Channel incised down to regolith

Large wood and sediment accumulation

Large wood jam creating step (temporal, flow dependent fish barrier) in a stream channel

Blown out wood jam

Strong indicators of pre disturbance conditions

Older tree that has been subjected to burial and subsequent channel incision

Evidence of burial and subsequent incision

Older tree that has been subjected to burial in a stream channel corridor

Evidence of reach scale channel incision

Note the roots protruding from both sides of the channel….This is a strong indicator of channel incision

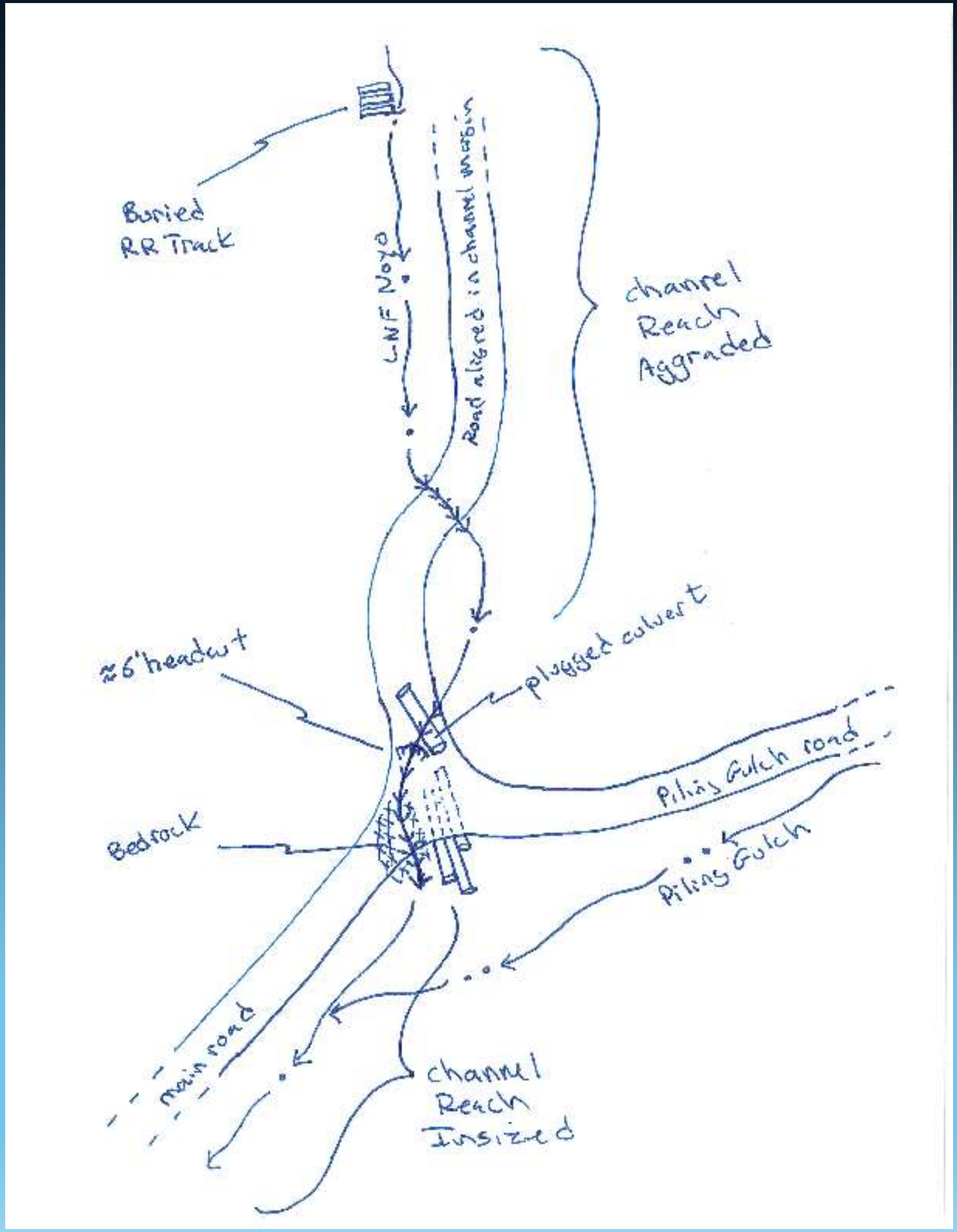
If the roots only protruded from one side, it could indicate lateral migration of the channel..

Little North Fork Noyo

- An example of a non-engineered, process-based, fish passage project

LNF Noyo existing conditions sketch

All evidence points to significant accelerated sediment delivery to the channel corridor



Conditions upstream of the barrier

Channel wide and shallow,
representative of
significant channel aggradation…

No Fish Presence for over 20 years

Conditions at the barrier

Conditions downstream of the barrier

Channel appears incised with regolith exposed on bed of channel

Amazingly, Steelhead are present below the barrier

The Plan to facilitate fish passage……

We were only funded to decommission the road and load wood into the channel, not develop an engineered fish passage project…..

Our conceptual idea of how, or if, we were going to address this fish barrier was making Dan (our CDFW Project grant manager) a little nervous as we were starting to tap dance outside of our original scope of work………

- Our conceptual plan was to:

(1) create a series of wood features downstream of the headcut barrier that were intended to trap channel bed material and lift the channel bed up to 18"-24"…..

(2) Pull the Humboldt logs and plugged culvert to allow a headcut to migrate upstream….

(3) Add large wood features above the headcut with the intent of forcing lateral migration of the channel as the headcut migrates upstream…..

- The idea was to allow the headcut to erode its way upstream to provide the channel with a little more depth. The dislodged substrate would mobilize downstream and get trapped by the structures below the barrier. Overall, the channel bed would raise downstream and lower upstream to significantly reduce the magnitude of the barrier and allow fish passage…

Wait!.....This is Dan Speaking.....

"You are proposing to create a series of 18" to 24" steps in the channel!!!
This significantly exceeds our maximum 6" step requirement"...

We needed to bring in the big guns!

Margie "Go big or go home" Caisley

To make a long story short…..

- We showed Margie three observations to convince her our plan was appropriate……

(1) Our proposed steps were only 50'-75' downstream of a 6' vertical step in the channel, so we weren't going to really limit fish access upstream

(2) There were 5-10 existing 18" steps in the channel downstream of our proposed steps that fish were not having trouble getting by.

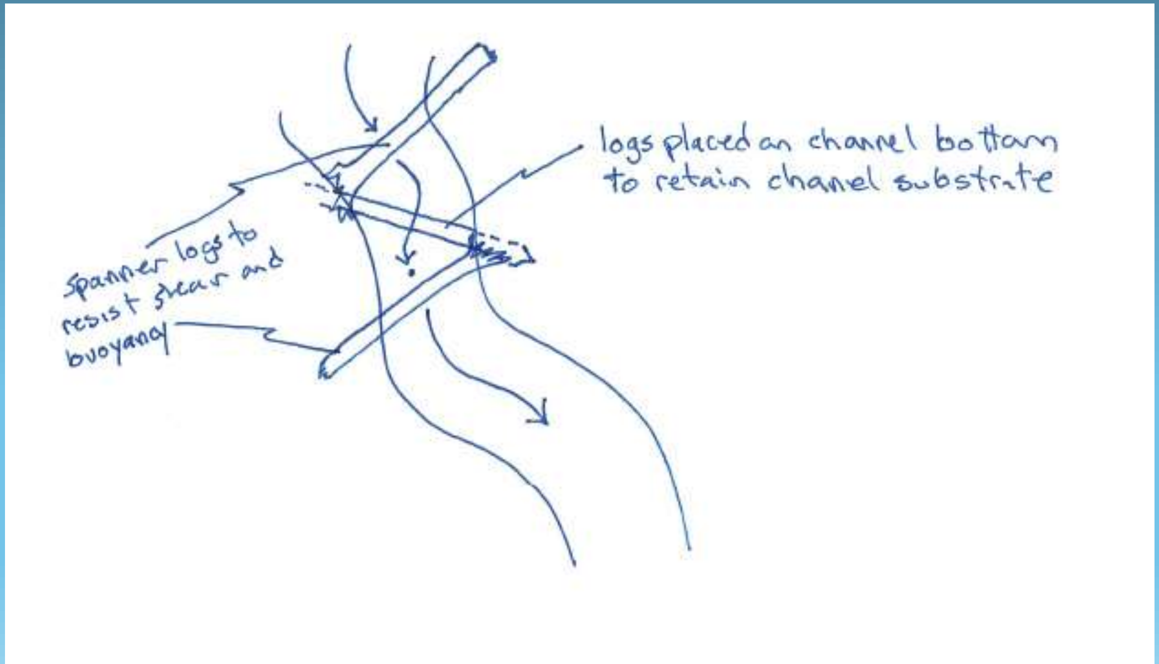
(3) There were historic RR tracks buried up to 3'-4' deep above the barrier indicating significant post anthropogenic disturbance channel aggradation above the large step in the channel

How are we going to construct non-engineered grade control structures?....

- We still need to consider how to counteract anticipated structure failure mechanisms....
- Buoyancy
- Shear
- Flanking

Sounds like engineering, huh?

The "LeJuan" Structure



Before and after construction of a "LeJuan" Structure

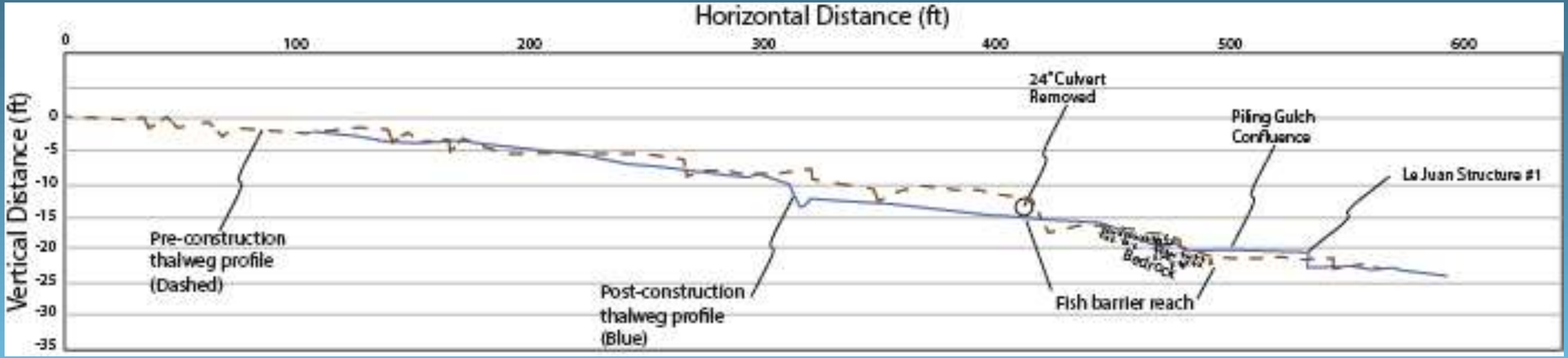
More LeJuan structures

Note there are 3 LeJuan structures in this photo

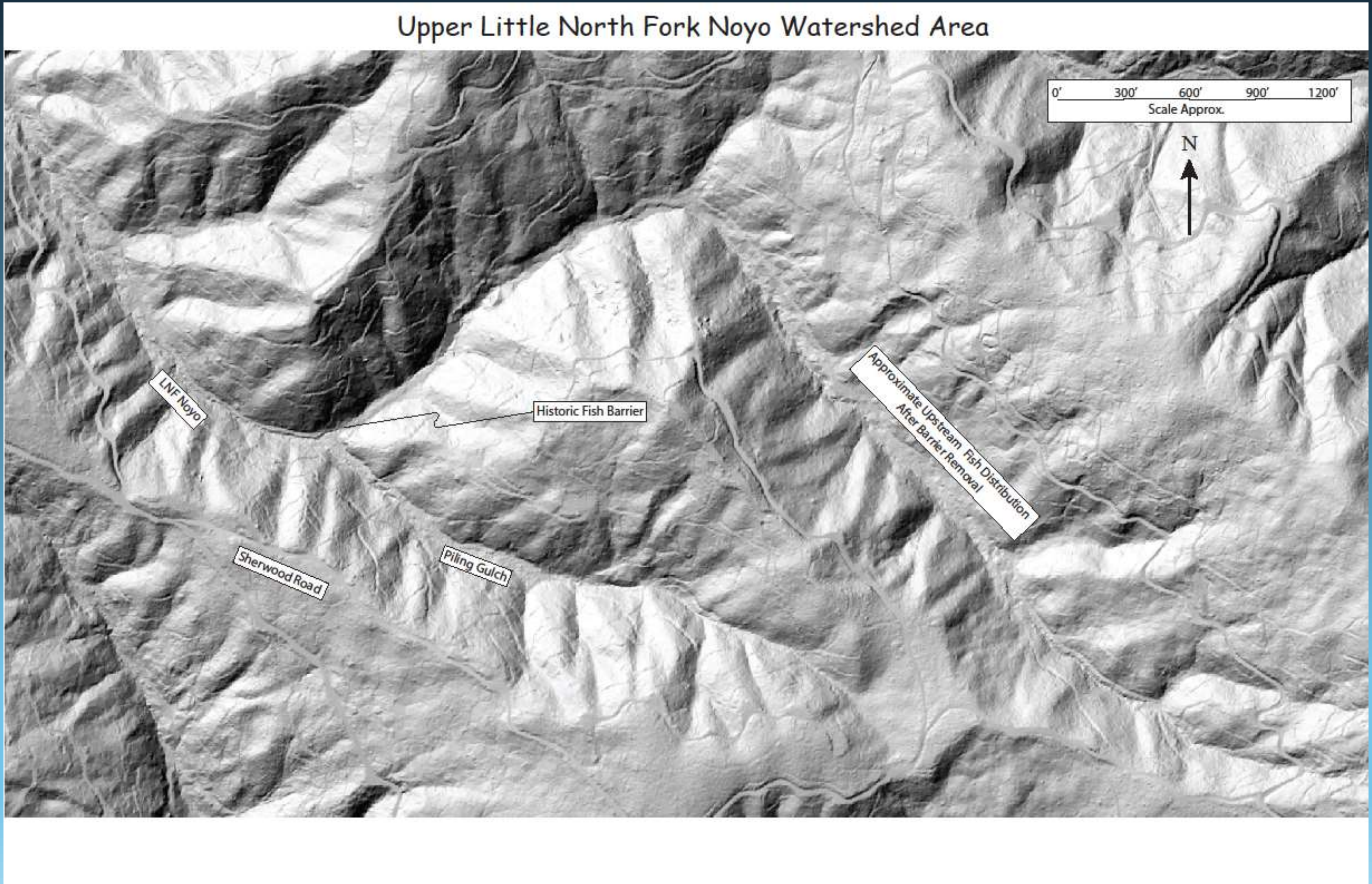
More LeJuan Structures

And more……

Channel profiles before and after execution of "The Plan"



Holy $#!t !....It worked!



Overall Results

- The headcut disintegrated and migrated upstream as planned
- The channel below the headcut trapped dislodged substrate and was raised up to 24" in some areas
- The channel above the headcut incised for about 100', then the headcut got hung up on a section of channel filled in with angular rock with cohesive matrix and abundant woody debris
- We turned one 6'-8' step in the channel into 3-5 smaller steps while improving channel substrate conditions and allowing fish passage.

Lessons learned

- You can achieve fish passage in low-risk environments with low tech, process-based techniques, without expensive engineering
- You still need to consider general engineering concepts when developing your designs, local conditions are important to evaluate and consider
- Characterize and factor in reach scale sediment dynamics and attributes
- Instream structures that are designed to trap and retain channel substrate work best if a deluge of sediment overruns them rather than allowing substrate to trickle over them
- Closely examine the geologic substrate that you want mother nature to incise into, some substrates lend themselves to erosion more than others
- Plan on longer channel adjustment time frames and adaptive management when relying on mother nature as a partner