

River restoration planning using ecological reference conditions: Concept

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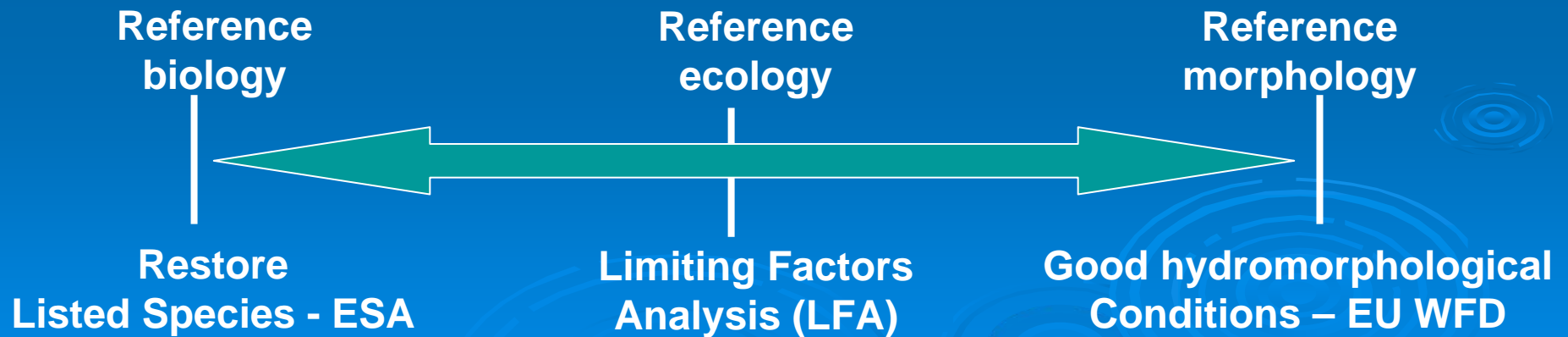
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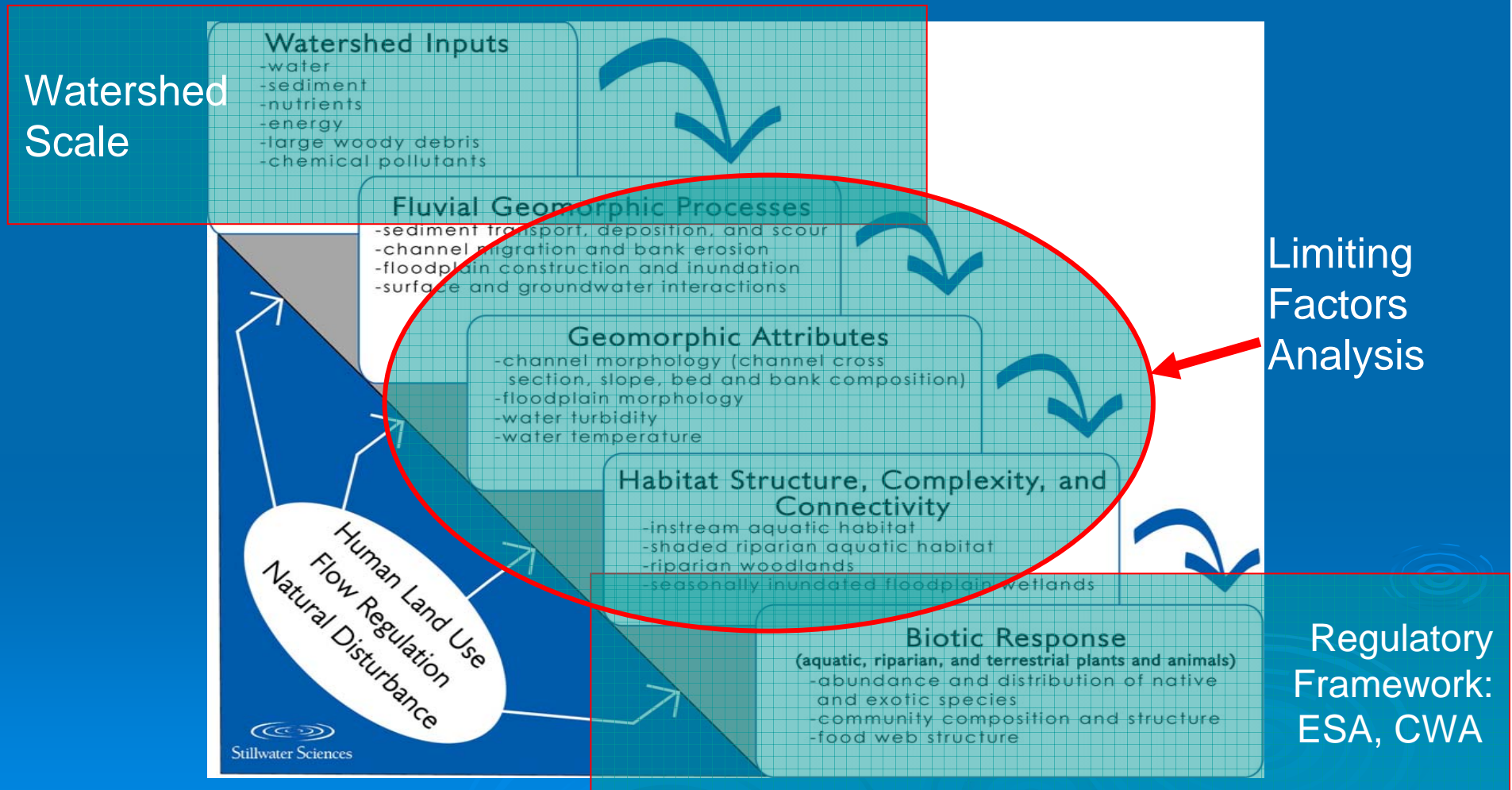
“Reference Ecology” for different watershed contexts:

- 1 – Watershed approaches in concept
Colin Thorne
- 2 – Sub-watershed approaches in practice
Peter Downs


Positioning Reference conditions conceptually



The Cascade of Issues



Outline

- Controls, Processes, Forms and Habitat
 - The West Coast Problem
 - Examples
 - The West Coast Project
- 

Controls, processes, forms and habitat

- River ecology results from:-
 - catchment inputs of water, sediment and organic material to the fluvial system and
 - Interaction of hydraulic, geomorphic and biotic processes with local boundary conditions, which result in habitat and, ultimately, biota.
- Ecological reference conditions for river restoration stem from a cascade of inputs, processes, materials, morphologies, habitats and biotic responses.

Climate and Geology

Watershed Controls

Flow and sediment
Regimes

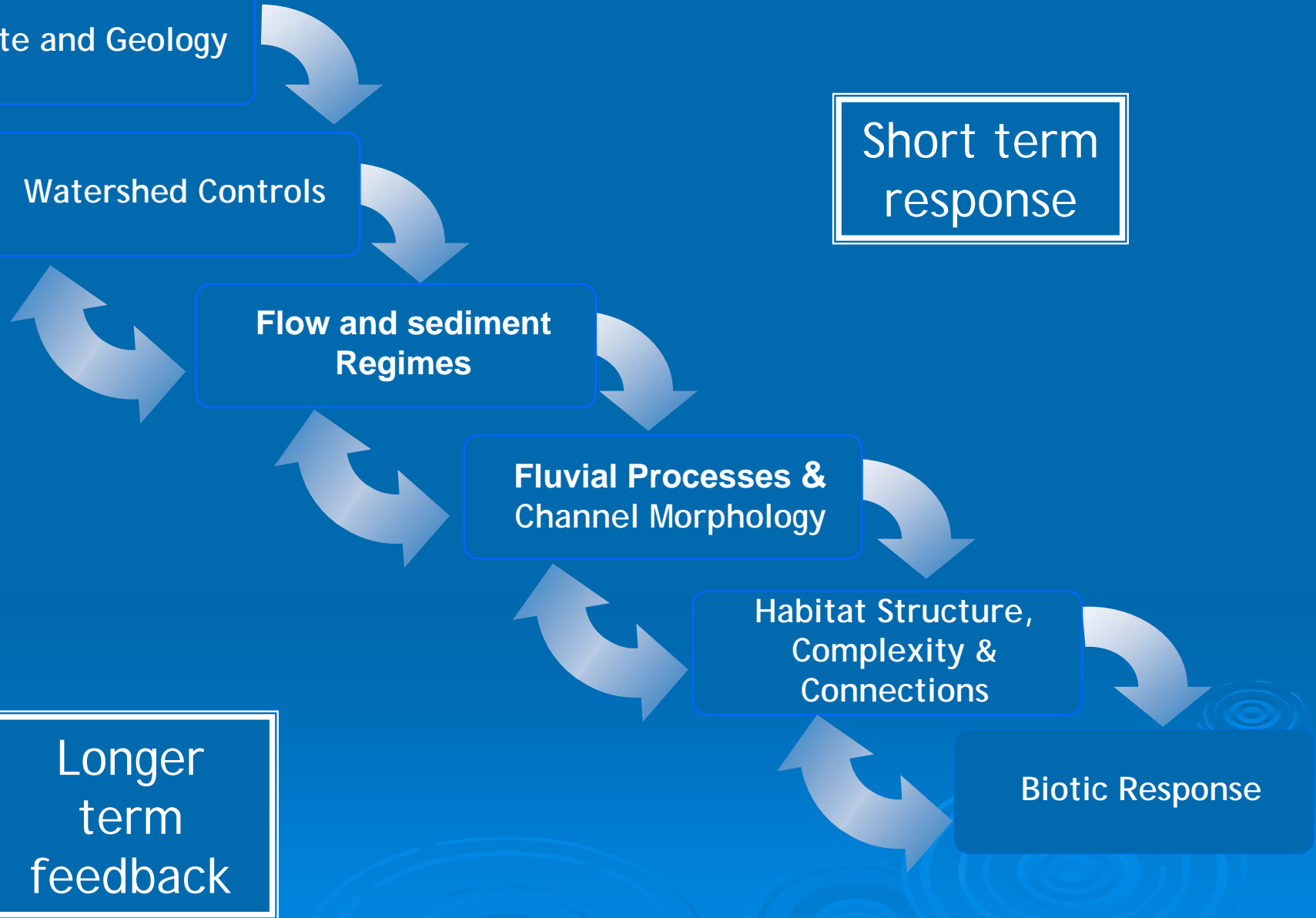
Fluvial Processes &
Channel Morphology

Habitat Structure,
Complexity &
Connections

Biotic Response

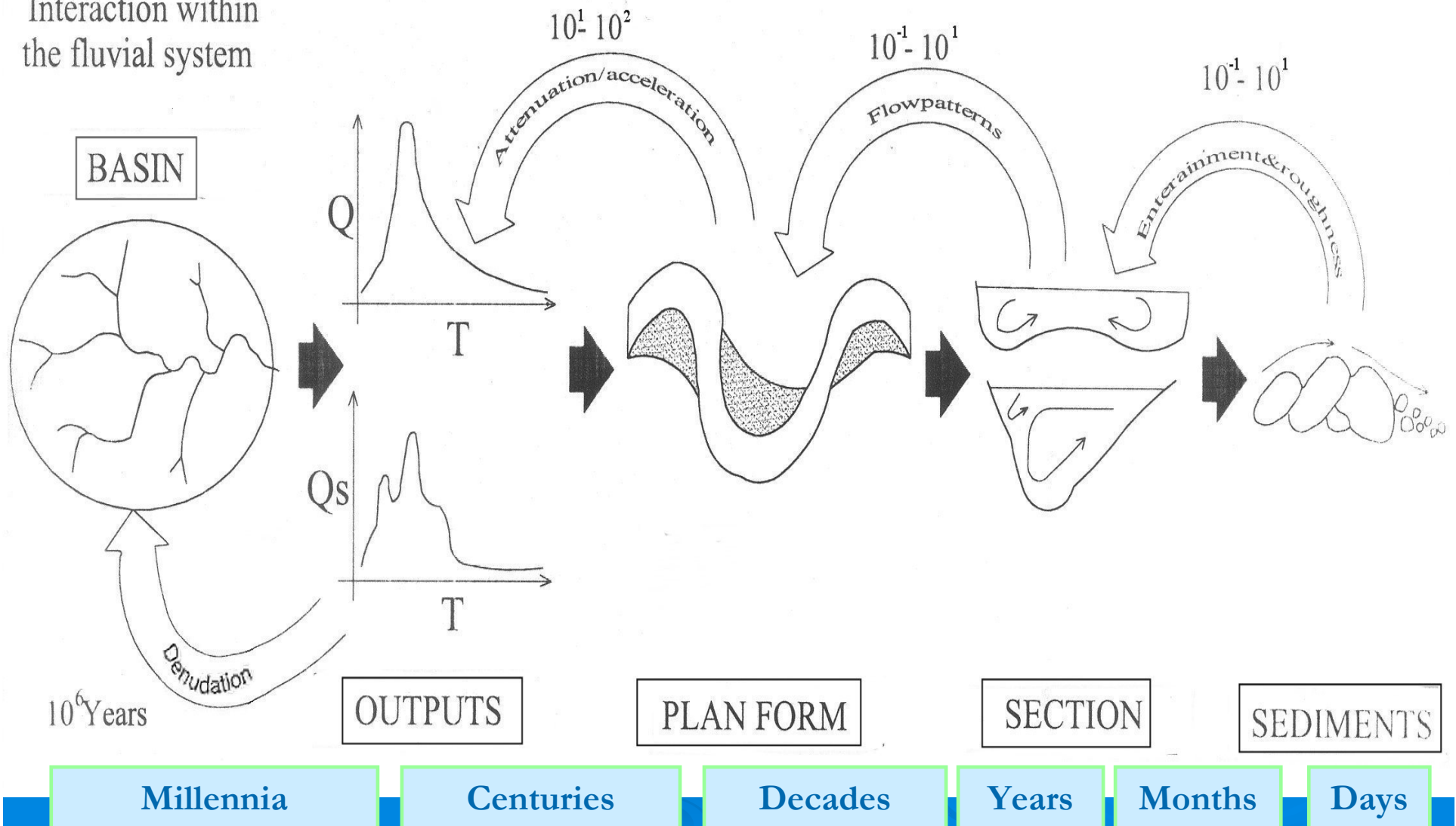
Short term
response

Longer
term
feedback



Nested Scales of Time & Space in the Channel Sediment System (Sear 1992)

Interaction within the fluvial system



Legislative Backdrop

- Ecologically-led management and restoration projects are governed by laws and statutory authorities that are to a degree habitat/species specific.
- In the USA the primary instruments responsible for restoration are the Endangered Species Act and the Clean Water Act.
- Both spring from and incorporate ecology, but their implementation focuses on protecting and reducing risks to habitat and listed species.
- Both are open to challenge due to the risk of leading to 'take' by the government.

The West Coast Problem - 1

- Ecologically-led restoration efforts focus on constructing habitat features suitable for listed species by recreating complex 'natural' morphologies.
- They do not readily promote restoring:
 - impaired catchment inputs of water, sediment and organic matter,
 - Interactions between fluvial processes & boundary materials,
- Simply implementing regulations at the species scale tends to create impediments to improving ecology sustainably and at the catchment scale.

The West Coast Problem - 2

Biological references in ESA and CWA, are poor weapons with which to drive ecologically-based restoration.

- They are good for slowing the decline of species and habitat, but not restoring rivers,
- If these laws could be changed they should promote conservation of ecosystems still functioning, direct restoration efforts towards the watershed scale, and identify watersheds too far gone to restore.
- Hence, regulators must finesse restoration based on ecological reference conditions rather than require it.

The West Coast Context

- Ecological function is impairment is widespread in California streams. Stressors include:
 - Dams;
 - Channelization and flood control schemes that disconnect channels from floodplains,
 - agricultural and urban land encroachment on riparian corridors,
 - surface and ground water abstractions.
- California streams are set in highly erosive soils with a Mediterranean-type climate and have undergone stunning losses of stream corridor habitat over the past 50 years.
- Existing problems will be eclipsed by new problems due to projected climate change coupled with population growth and increased water demand during the next 50 years.

Current restoration approaches

- \$2 billion spent in California on 'restoration' projects to date.
- Projects enhance habitat locally without accounting for fluvial and ecological processes or watershed conditions.
- They have not produced resilient morphologies or ecologies.
- Projects have been beneficial, but small scale efforts cannot achieve species recovery at watershed or regional scales.
- Larger-scale projects with wider goals and actions are needed to:
 - restore ecosystem function from headwaters to estuaries,
 - recover the full range of fluvial and biotic processes, and
 - achieve sustainable species recovery.
- Restoration of ecosystem functions requires that we 'raise the bar' in terms of setting restoration goals, objectives, designs and post project monitoring and adaptive management.

Restoration expenditures in CA.

Category	Type of Project	Number	% Total
Institutional	Habitat Acquisition and Cons Easement	9	0.1%
	Public Involvement	82	1.2%
	Public School Education	356	5.4%
	Private Sector Education	115	1.7%
	Watershed Assessment and Planning	975	14.8%
	Watershed Organization and Assistance	232	3.5%
	Water Conservation	12	0.2%
Fish Passage	Ladder	29	0.4%
	Fish Screens on Diversions	69	1.0%
	Passage	118	1.8%
	Barrier Modification	475	7.2%
Stabilization	Bank Stabilization	618	9.4%
	Riparian Replanting	551	8.4%
	Instream Habitat Enhancement	860	13.1%
	Watershed Improvements, Roads	1378	21.0%
	Maintenance and Repair of Projects	59	0.9%
Monitoring	Fish Monitoring	520	7.9%
	Post Project Monitoring	118	1.8%
TOTAL		6991	6576

> 50%

\$ >2B in past 25 years

From RRNW 2008

Examples

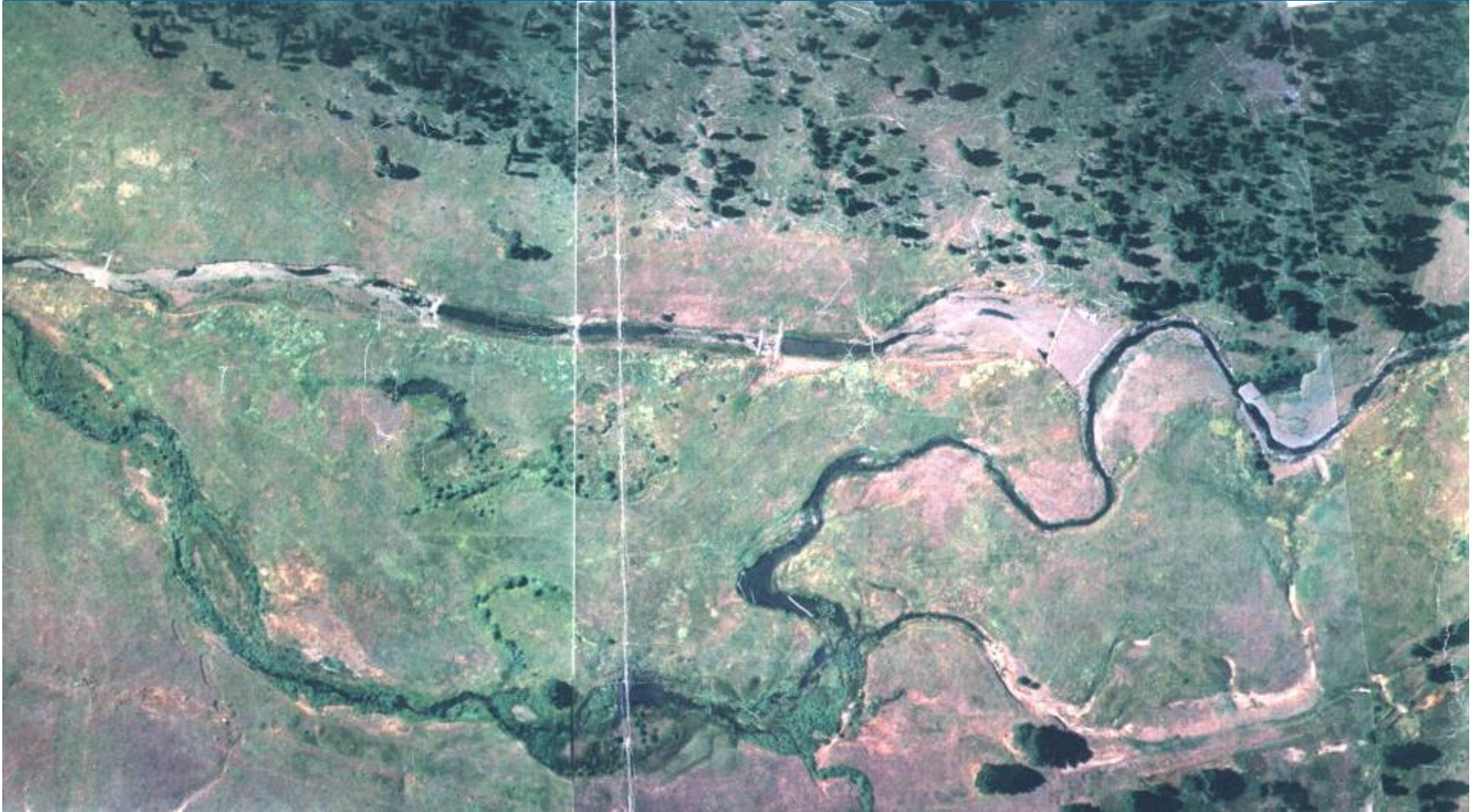
- We can restore morphology if the watershed inputs are unchanged (example: re-meandering stream in an alluvial valley), but
- Where the flow, sediment and wood regimes are heavily impaired we need to tackle these issues to make morphological restoration based on ecological reference conditions sustainable (example: dam removal in an otherwise intact watersheds)



McCoy Creek in the 1980s



Large wood structure to shunt water into historic channel.
Built in late-1990s



Post-project condition showing reconnected channel.

Restoration Planning

- Using an adaptable and accessible model (DREAM), over 70 alternative restoration scenarios were investigated to evaluate:
 - Risks to people and property (aggradation, flooding).
 - TSS releases for entire range of past hydrologic scenarios.
 - Risks to species.
 - Engineering planning and design for timing/sequence/methods of dam removal.

The West Coast Project

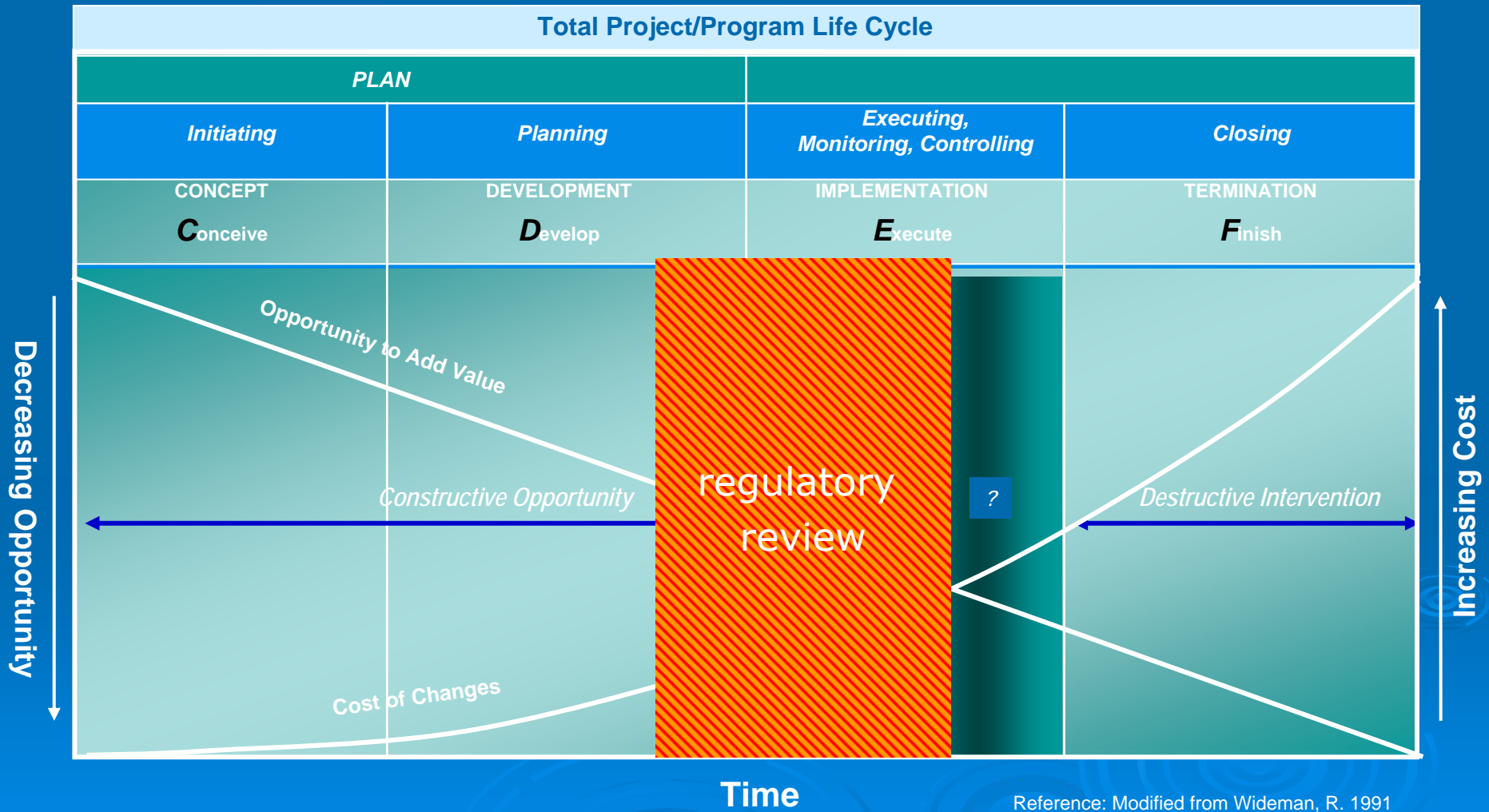
- Our approach to current regulatory impediments is to make better river science available to services staff responsible for reviewing proposals and granting permits.
- The aim is to encourage them to require more of projects than that they minimize adverse effects (risk to resource).
- The outcome should be projects that provide sustainable solutions to problems rather than addressing their local symptoms.

Project Genesis and Team

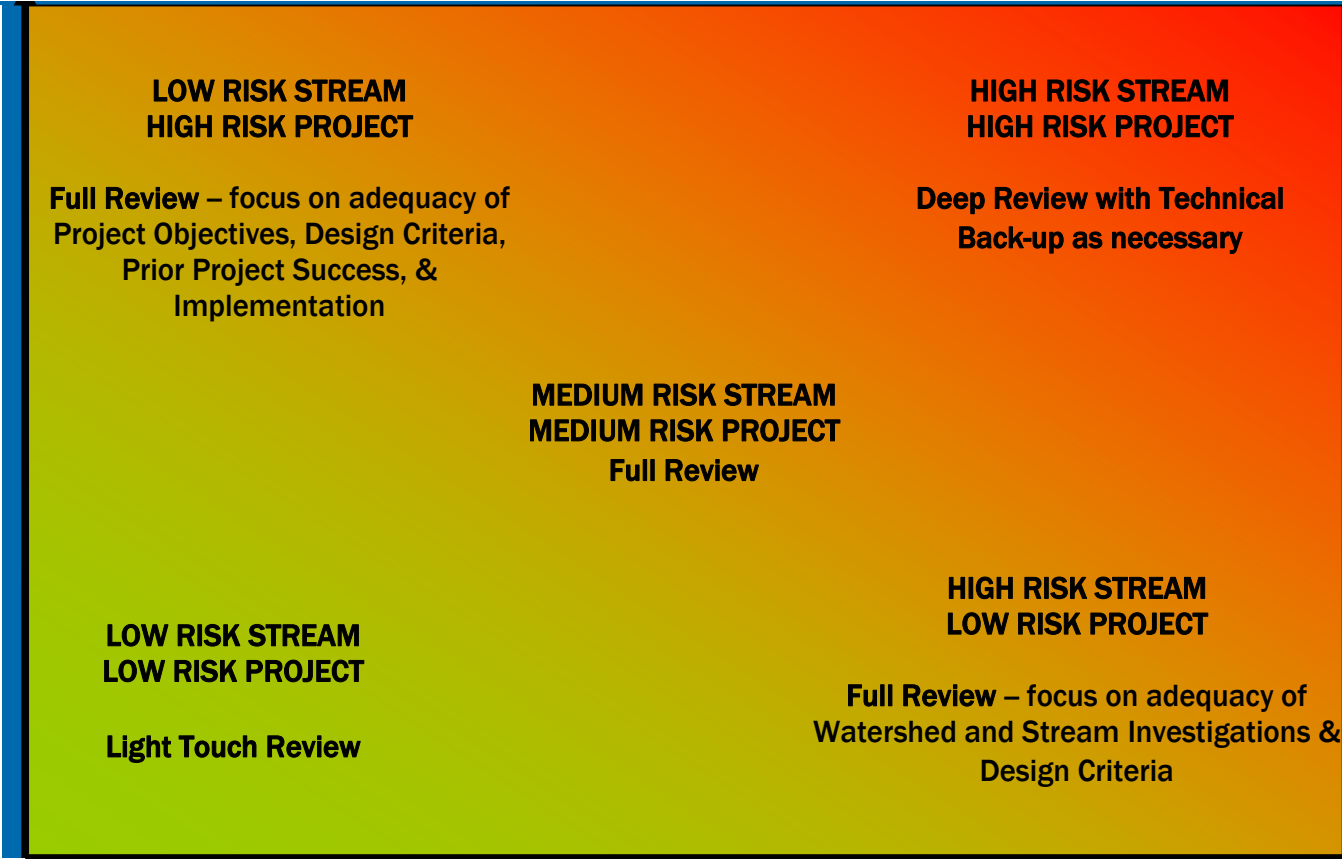
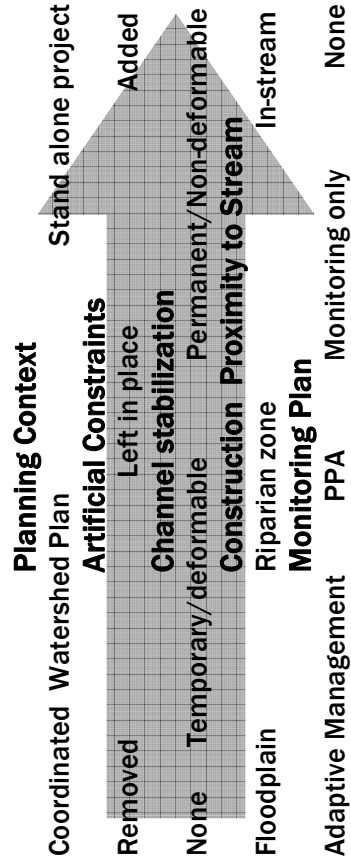
- Northwest Region HCD meeting 2006
 - Need for assistance on “large-scale” restoration projects
- Southwest region PRD request for stream corridor management guidelines that cover
 - riparian zones
 - bank stabilization
 - habitat enhancement
- Funding
 - BIOP
 - Southwest Region
- Cooperative effort
 - NWFSC
 - Northwest Region
 - Southwest Region
 - US FWS
 - Academics
 - Consultants
 - USCOE



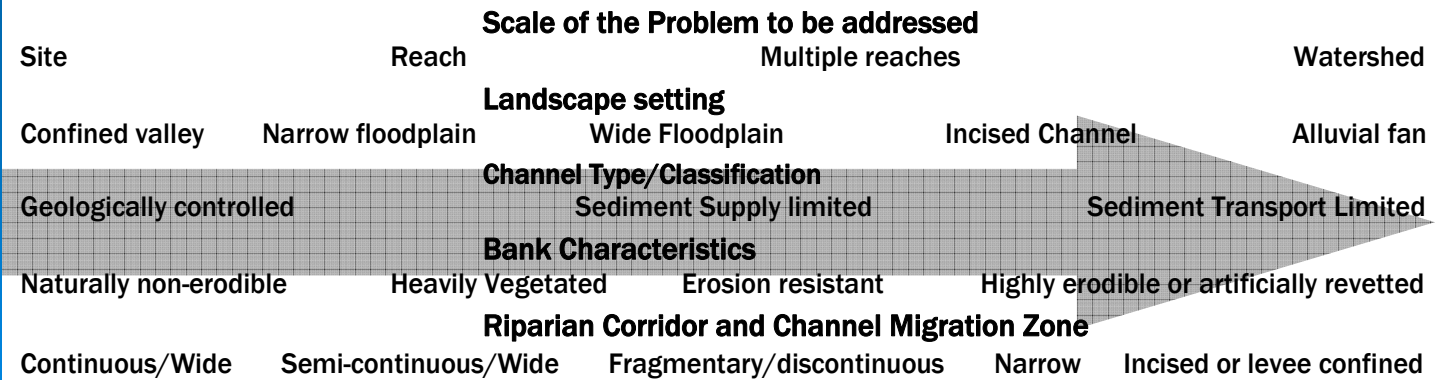
From Regulation to Consultation..



Increasing Project Impact Potential



Increasing Stream and Site Response Potential



Screening Tool

The Science Base document:

- Synthesizes the large body of watershed and fluvial geomorphic science
- Thoroughly vetted and peer reviewed
- Fosters critical thinking
- Not a *'how to manual'*, but a guide to thinking about *'why'* or *'what are the alternatives'*,
- Makes the science available *and* accessible to Services staff
- Glossary of terms
- Hyperlinked references
- Hyperlinked with the “checklist” and the “evaluation tool”



Project evaluation checklist:



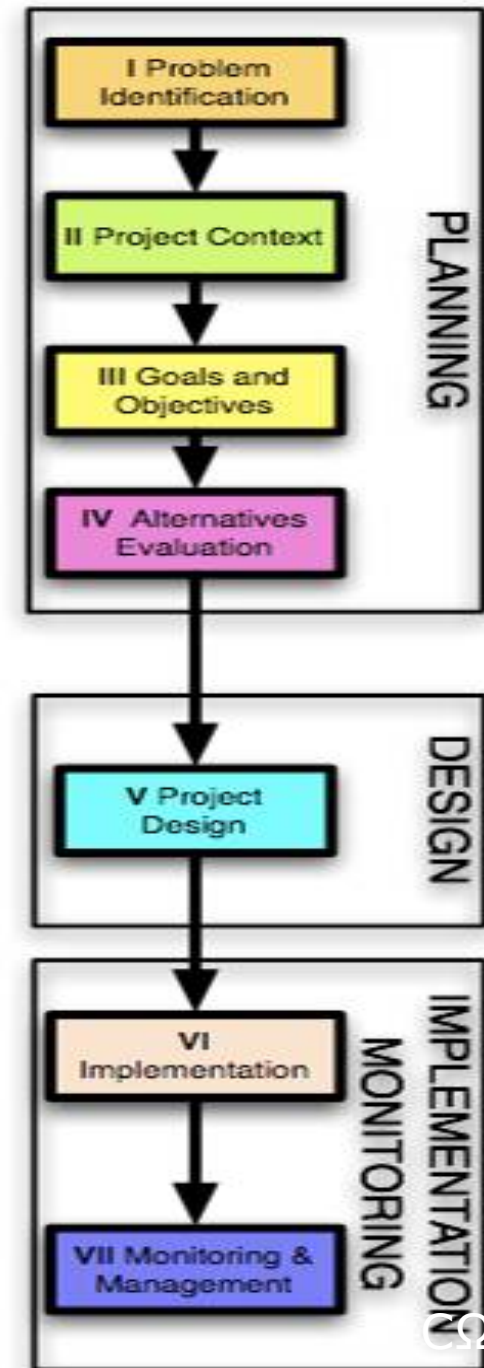
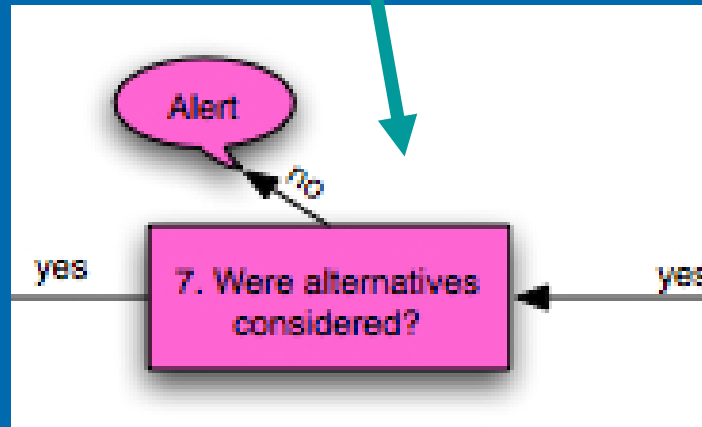
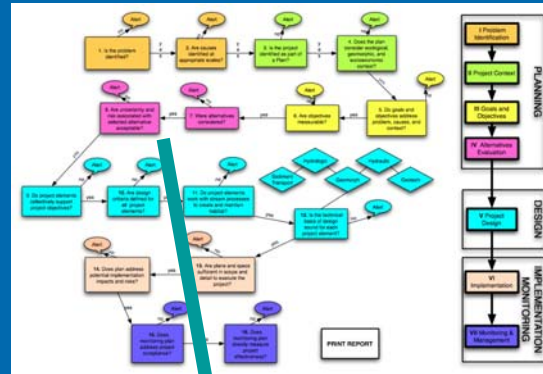
➤ Features:

- Thorough listing of information needed to accommodate simple to complex projects
- Customizable – to project scope and scale
- Reporting function to record and print results

➤ Purpose:

- Ensure that proposal is complete
- Facilitate timely review process
- Identify what is needed to applicants clearly
- Support deeper reviews

Evaluation Tool



- Questions - yes ~ proceed, no ~ dig deeper
- Second tier – explanations
- Third tier – links to science base
- Alerts – need for caution or more info, and link to science base
- Comments, notes and ‘print report’

River Restoration Assessment Tool: Web-based graphic interface to the science base

River RAT RESTORATION ASSESSMENT TOOL

The Project

River RAT Development Information

Welcome to River Restoration Analysis Tool, or River RAT. River RAT provides a tool for evaluating river restoration and stabilization projects, a synthesis of the science behind river processes and restoration design, a project information checklist.

The tool will walk you through a series of 16 questions that parallel the phases of restoration project development. Each question is designed to help you evaluate whether a project has addressed fundamental considerations at each step of the project development process. You will be able to record your responses and thoughts for each question, and print a final report or your review.

If you would like to explore River RAT [click here](#).




If the tool suites your needs, feel free to get your own username and password by contacting us [here](#).

Log In

Username

Password

Log me in! 

[Need Help With Your Password?](#)

Evaluation Tool:

The screenshot shows a web browser window titled "Restoration Review - Your Projects" with the URL "http://www.restorationreview.com/account/projects". The browser's address bar and search bar are visible. The page content includes the "River RAT RESTORATION ANALYSIS TOOL" logo, a "My Projects" section with a "Logged in as: restoringrivers@yahoo.com" status and a "Sign Out" link. Below this, there is a "Current Projects" section with a "+ Add A Project" button. Two project entries are listed: "tool review test - FEB 01, 2009" and "Peter test - JAN 22, 2009". The "Peter test" entry includes a progress bar and the text "PROGRESSION: NOT COMPLETED - QUESTION 9 - LAST EDITED: 01/22/2009" and a "VIEW AND PRINT NOTES" link. A horizontal bar below the projects is labeled "IV ALTERNATIVES EVALUATION" and contains 16 colored squares numbered 1 to 16. The "Instructions" section contains two paragraphs of placeholder text.

George Pess, Ph.C. is a stream ecologist at NOAA Fisheries Northwest Fisheries Science Center where he conducts research on ecosystem and salmonid response to restoration actions

← Back to My Projects

PROBLEM IDENTIFICATION

- 1
- 2
- 3

More Info About Question 9

More info on Question #9

[View PDF Reference](#)

[CLOSE THIS WINDOW](#)

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Project Title

#1: Is the problem

Your Notes: Question

My Projects

Current Projects

Resume Details

Resume Details

1 2 3

1 2 3

Instructions

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About

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RESTORATION ANALYSIS TOOL

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Progression: Step 1 of 16
I Problem Identification

I PROBLEM IDENTIFICATION



Project Title: tool review test

#1: Is the problem identified?

You've answered **Yes** to this question.

Your Notes: Question 1

Click here to add a new note

Save

On 02/01/2009 @ 12:49pm: You wrote:

On 02/01/2009 @ 12:49pm: You wrote:

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CLICK HERE TO HIDE LEGEND

I Project Identification

- Is the problem identified?
- Are causes identified at appropriate scales?

II Project Context

- Is the project identified as part of a Plan?
- Does the plan consider ecological, geomorphic, and socioeconomic context?

III Goals & Objectives

- Do goals and objectives address problem, causes, and context?
- Are objectives measurable?

IV Alternatives Evaluation

- Were alternatives considered?
- Are uncertainty and risk associated with selected alternative acceptable?
- Do project elements collectively support project objectives?
- Are design criteria defined for all project elements?

V Project Design

- Do project elements work with stream processes to create and maintain habitat?
- Is the technical basis of design sound for each project element?

VI Implementation

- Are plans and specs sufficient in scope and detail to execute the project?
- Does plan address potential implementation impacts and risks?

VII Monitoring & Management

- Does monitoring plan address project compliance?
- Does monitoring plan directly measure project effectiveness?

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Ambitions

- Educate:
 - Services Staff
 - Project Proponents and Sponsors
- Improve the review process:
 - Time efficiency
 - Appropriateness
 - Consistency and Objectivity (within and between regions and agencies)
 - Transparency
- Provide a template for
 - *biological assessments*
 - *programmatic agreements*
- Establish restoration priorities
- Promote better restoration outcomes



Project Timeline:

- Finalize products – February 2009
- External peer review – March-April 2009
 - Academic scientists
 - Agency scientists
- Post on Regional websites – April 2009
 - Make available for use
 - Get feedback, and improve tools
- Prep for publication ~ NOAA tech memo - May 2009
- Give training workshops – June 2009
 - With partner agencies ~ State and Federal
 - With broader audiences ~ restoration industry