

Lower Elk River Restoration Summit

February 8-9, 2012

Agricultural Center

Eureka, CA



State of California
Department of Conservation

Restoration Summit Agenda – Day 1

Morning Theme: Education / Information

Welcome & Introductions

Presentations

Overview RWQCB Programs in the Elk River Watershed

Overview of RCAA Grant

Restoring Lower Elk River: A Proposal

Nuisance Reach Pilot Sediment Study

Restoration Summit Agenda – Day 1

Afternoon Theme: Consensus Approach

Discussions

Initial Reactions and Restoration Needs

Consensus-approach

Participation & Leadership

Action Planning



Summit Goal

Work together to define a process and technical approach that is science-based and stakeholder-driven to improve physical and biological (ecosystem) functions in the Lower Elk River

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State of California
Department of Conservation

RCAA/NRS Mission: Healthy Communities and Healthy Watersheds

Linking Land & Sea



Linking Land and Sea: A Northern California Coastal Conservation Needs Assessment

Prepared by:
Natural Resources Services
A Division of Redwood Community Action Agency
and
Pacific Marine Conservation Council



Funded by:
NOAA Coastal Services Center
and
California State Coastal Conservancy

Contact Information:
Molra McEnery,
California State Coastal Conservancy
1330 Broadway, 11th Floor
Oakland, CA 94612
(510) 286-1015

Humboldt Bay Watershed Salmon and Steelhead Conservation Plan



Prepared for:
California Department of Fish & Game and the
California Coastal Conservancy



Prepared by:
The Humboldt Bay Watershed Advisory Committee and
The Natural Resources Services Division of
Redwood Community Action Agency

RCAA/NRS Mission: Healthy Communities and Healthy Watersheds

Humboldt Bay Watershed Priority Riparian
Restoration Projects
DFG Grant Agreement Number P0210447



Prepared for:

California Department of Fish and Game
619 Second Street
Eureka, California 95501

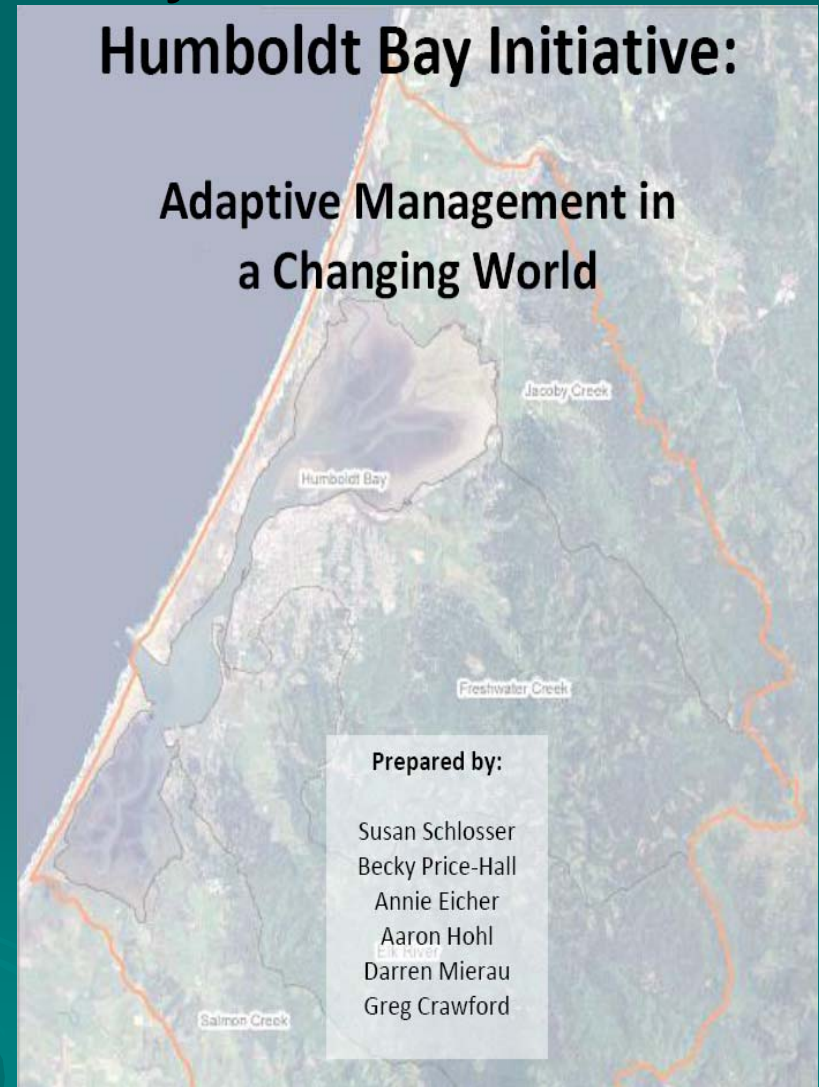
Prepared by:

Ruth Blyther
Natural Resources Services Division - Redwood Community Action Agency
904 G Street
Eureka, CA 95501

*Final Project Report – Task 2 Riparian Strategy
Humboldt Bay Watershed Advisory Committee
March 2005*

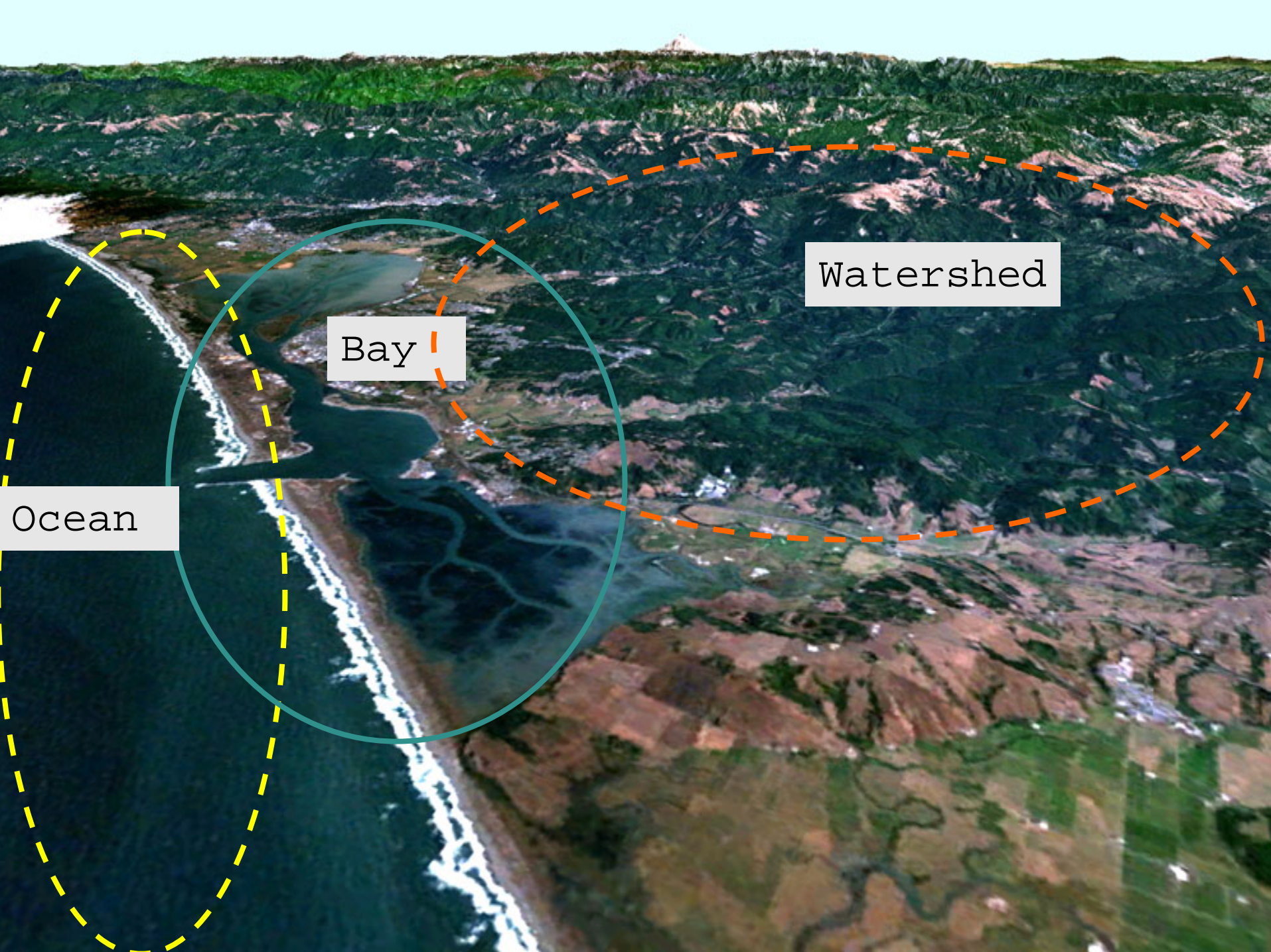
Humboldt Bay Initiative:

Adaptive Management in a Changing World



Prepared by:

Susan Schlosser
Becky Price-Hall
Annie Eicher
Aaron Hohl
Darren Mierau
Greg Crawford



Ocean

Bay

Watershed

RCAA/NRS

- Roads Assessment
- Erosion & Sediment Control & Stormwater Compliance
- Active Living Projects (Trails, Safe Routes to School, etc.)
- Community Gardens
- Secure funding to address unmet community needs... predict, anticipate, and be proactive rather than ignore and become reactive

RCAA/NRS

➤ NRS exists for...

- Immediate -landowners/land managers
- Intermediate - agencies/municipalities/other organizations
- Ultimate - public and resources

Genesis of RWQCB Grant to RCAA

- Building on previous efforts funded by RWQCB and work done by HBWAC
- In Anticipation of TMDL for Elk River, wanted to provide assistance to landowners to comply with TMDL's, continued support for sediment monitoring, and an implementation component
- Worked with Regional Board staff to develop strategy for grant proposal

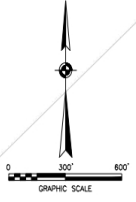
Three Components of the Sedship Water Board Grant

- Martin Slough Enhancement Project Design & Implementation
- Sediment Monitoring – support 2 Turbidity Threshold Sampling(TTS) monitoring stations, Channel X-secs, Data analysis, QA/QC Salmon Forever
- Landowner Outreach –NPS Mgmt, TMDL Compliance, and/or Restoration Plans

Martin Slough Enhancement

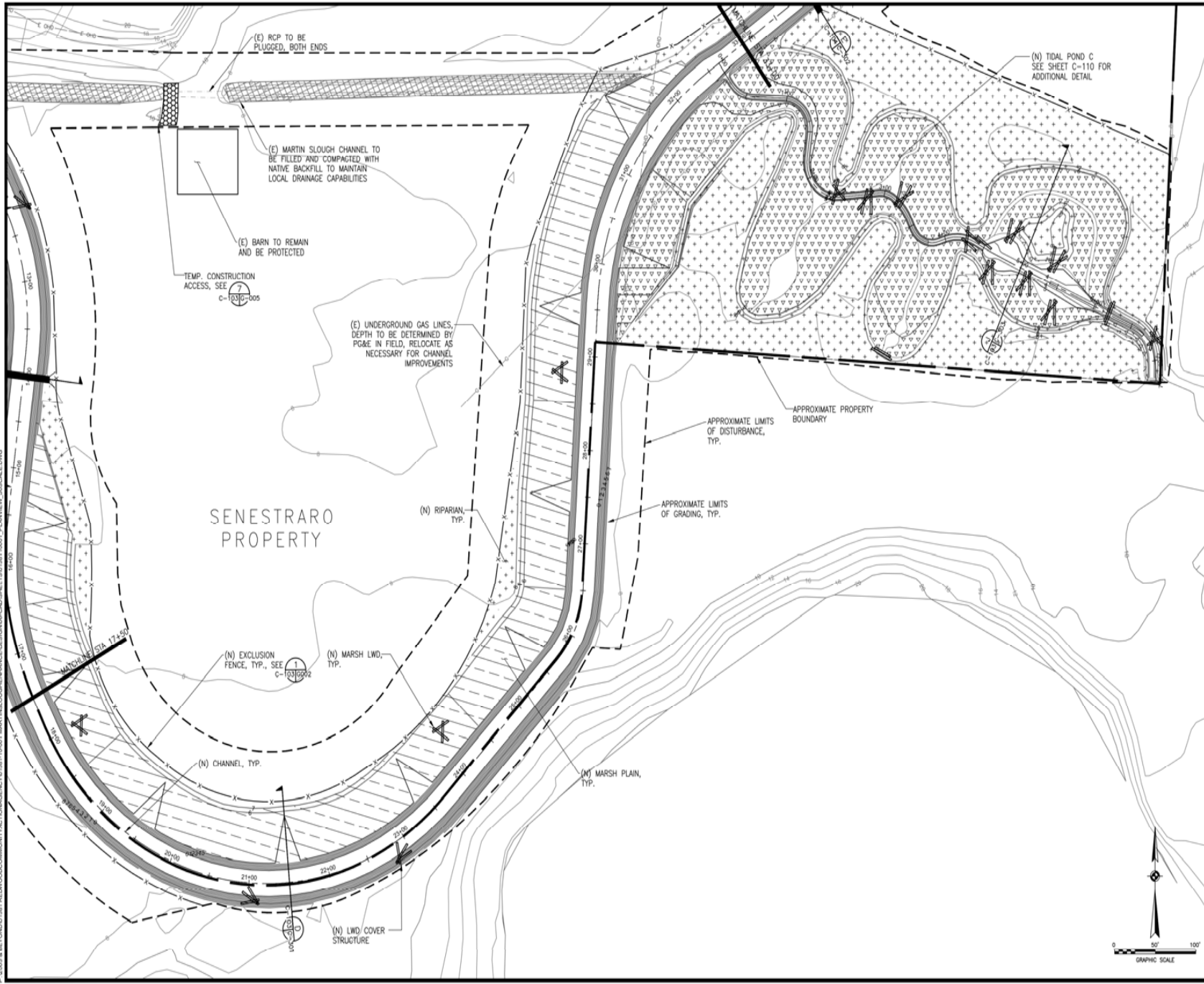
- Feasibility Study – develop preferred alt
- Form TAC
- Conceptual Plan + easements
- 30% Design for entire project
 - Drainage improvements, levees, culverts, bridges
 - Habitat improvements, O-C ponds, rip. reveg plan
- 90% Design for tide gate
- Public meetings/CEQA/Permits
- Phase I - partial implementation

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RCA/CITY OF EUREKA MARTIN SLOUGH ENHANCEMENT PROJECT	PROJ NO: 01581-10-001	C-100
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SITE PLAN SHEET INDEX	SHEET 6 OF 24	
	30% SUBMITTAL NOT FOR CONSTRUCTION SEPTEMBER, 2011	
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C-103 SHEET 9 OF 24	



Three Components of the Sedship Water Board Grant

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- Landowner Outreach –NPS Mgmt, TMDL Compliance, and/or Restoration Plans

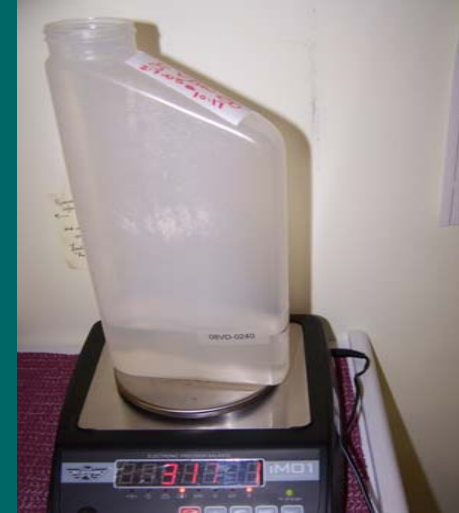
Sediment Summit – July 2010

- Formed TAC – Lisle, Eads, Lewis, Klein, Madej, Trush, Cui, and others
- RWQCB
- Convened PALCO/SCOPAC, GDR, Salmon Forever and others performing monitoring in Elk R. & Freshwater Ck
 - Presentations on activities
 - Evaluate compatibility of methodologies
 - Consider combining data sets
 - Discussed fisheries uses

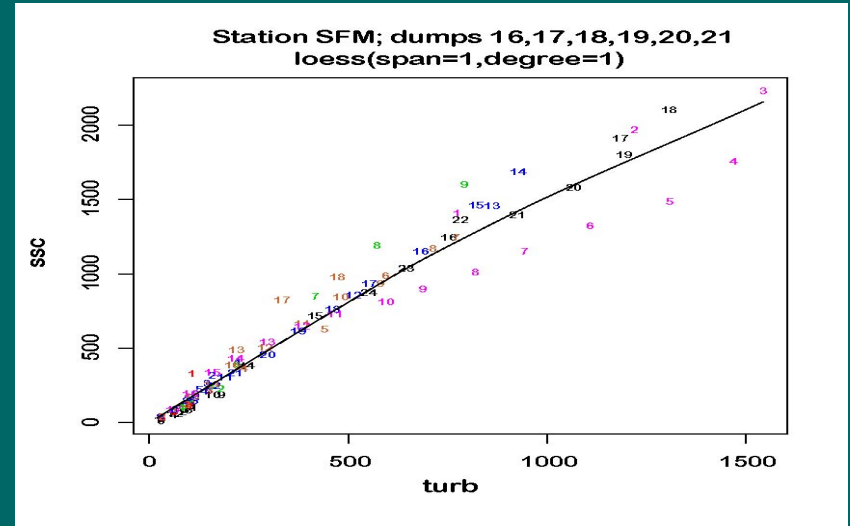
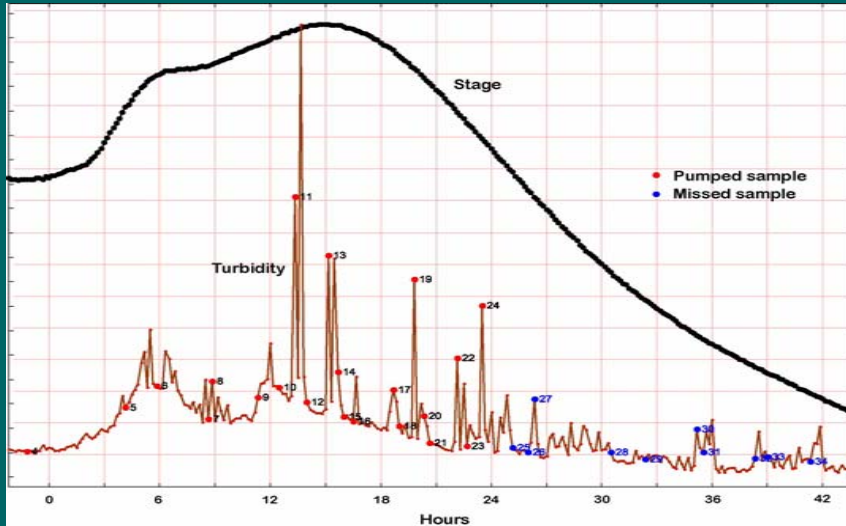
Sediment Summit



Sediment Summit



Sediment Summit



Three Components of the Sedship Water Board Grant

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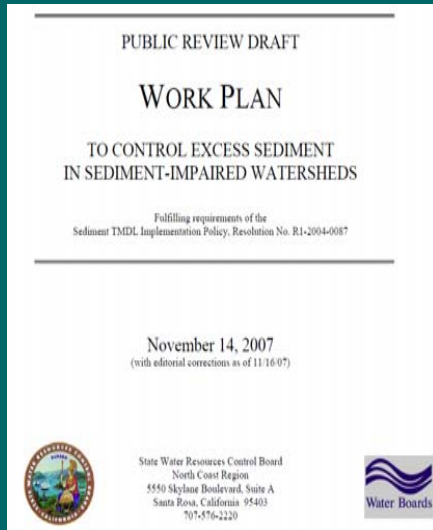
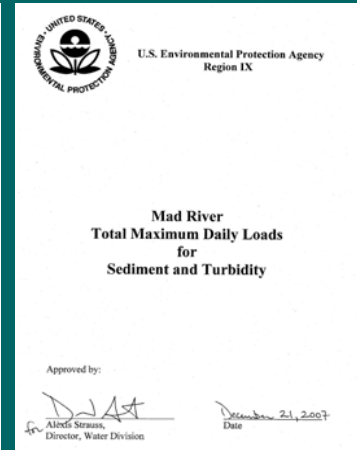
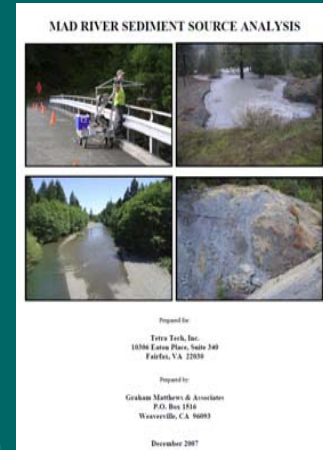
Landowner Outreach: Assistance with TMDL Compliance

- Prop 40 Mad River (2011)
 - Watershed-wide, multi-stakeholder approach
 - Watershed Assessment
 - TMDL Compliance Plan
 - TMDL Compliance Monitoring Plan

- Prop 50 Elk River/Freshwater Creek (2012)
 - Lower watershed, parcel by parcel approach
 - Pollution prevention BMPs, sediment-related restoration opportunity sites

TMDL Compliance Plan

EPA TMDL



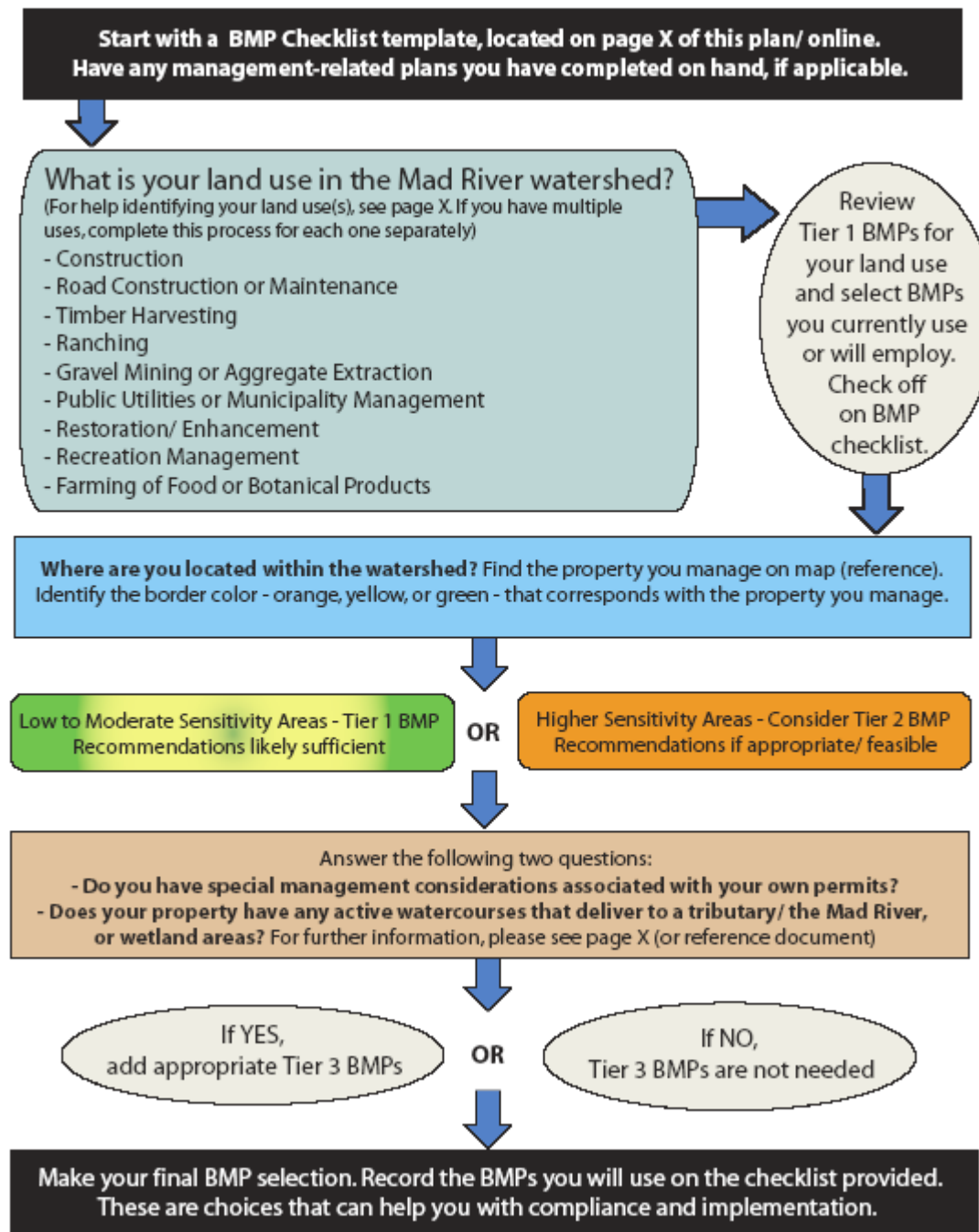
Compliance Plan & Monitoring Plan

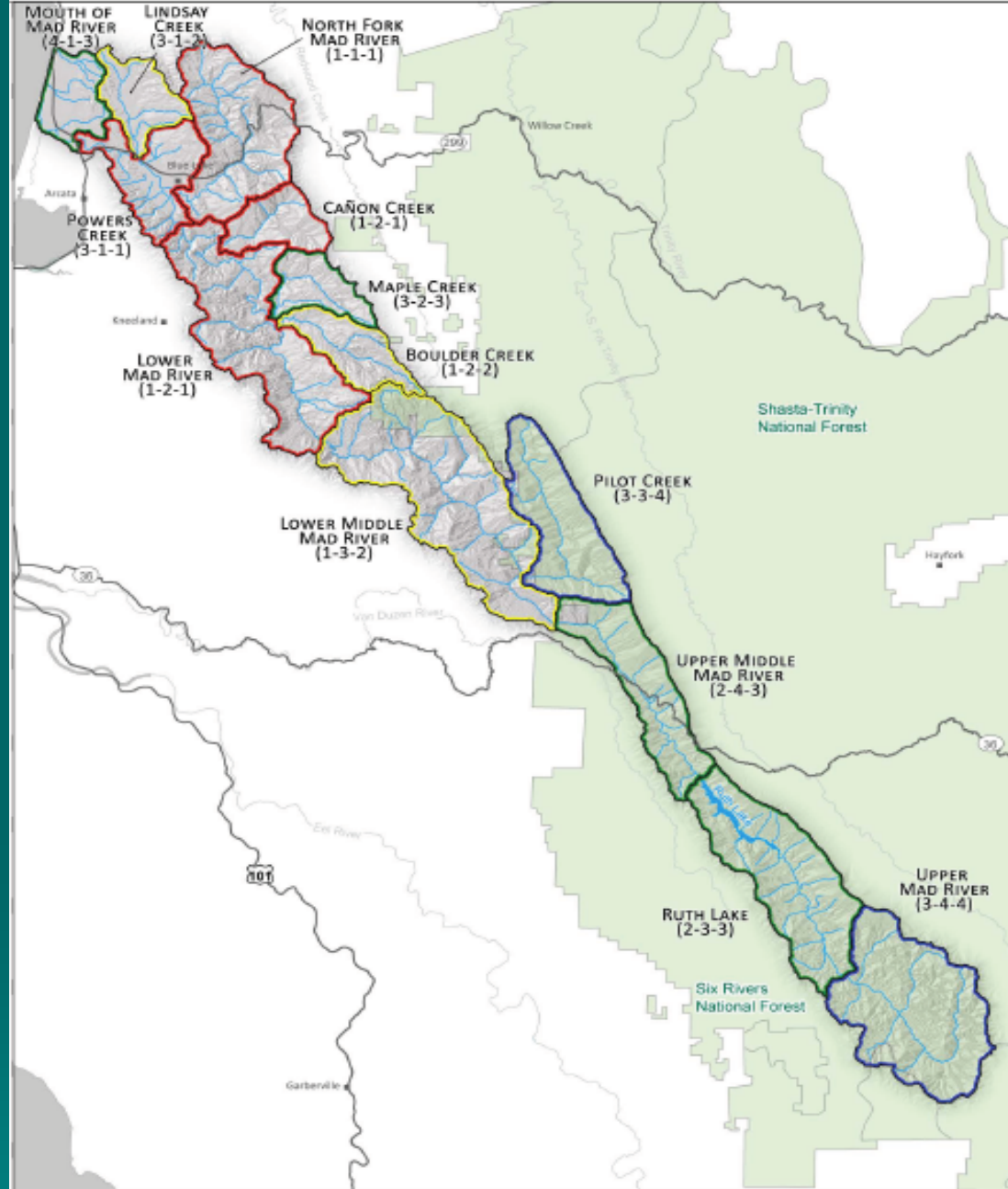
Watershed Assessment

State TMDL Implementation Plan

Waiver for those not already in compliance through 401 Cert, WDRs, prohibitions

Figure X. 'How to Identify Best Management Practices for your Land Use' Flowchart





Risk Levels - (#1 - #2 - #3)
 #1 - Sediment Delivery Hazard
 #2 - Aquatic Habitat Sensitivity
 #3 - Risk of Sediment Impairment



Mad River TMDL Compliance BMP Checklist – LAND USE

Name of Individual or Organization:

TIER 1 – BASIC RECOMMENDATIONS

BMP No.	Check if using	BMP Name	Purpose	Source of BMP Information	BMP Monitoring Notes

TIER 2 – RECOMMENDATIONS FOR SENSITIVE WATERSHED AREAS OR USES

BMP No.	Check if using	BMP Name	Purpose	Source of BMP Information	BMP Monitoring Notes

TIER 3 – AS NEEDED, SELF-IDENTIFIED USERS ONLY

BMP No.	Check if using	BMP Name	Purpose	Source of BMP Information	BMP Monitoring Notes
			<i>Add to this list or make copies if needed.</i>		

Construction BMPs

- Craig Benson (RCAA)
- Superordinate BMP list to be referred to by other landuse BMP lists

Mad River TMDL Compliance BMP Checklist – Construction

Name of Individual or Organization:

TIER 1 – BASIC RECOMMENDATIONS

BMP No.	Check if using	BMP Name	Purpose	Source of BMP Information	BMP Monitoring Notes
SS-1		Scheduling	Erosion Source Control- Non Structural	Caltrans Storm Water Quality Handbook	
SS-2		Preservation of Existing Vegetation	Erosion Source Control- Non Structural	Caltrans Storm Water Quality Handbook	
SS-3		Hydraulic Mulch	Erosion Source Control - Structural	Caltrans Storm Water Quality Handbook	
SS-4		Hydroseeding	Erosion Source Control - Structural	Caltrans Storm Water Quality Handbook	
SS-5		Soil Binders	Erosion Source Control - Structural	Caltrans Storm Water Quality Handbook	
SS-6		Straw Mulch	Erosion Source Control - Structural	Caltrans Storm Water Quality Handbook	
SS-7		Geotextiles, Plastic Covers & Erosion Control Blankets/Mats	Erosion Source Control - Structural	Caltrans Storm Water Quality Handbook	
SS-8		Wood Mulching	Erosion Source Control - Structural	Caltrans Storm Water Quality Handbook	
SC-1		Silt Fence	Sediment Treatment Control - Structural	Caltrans Storm Water Quality Handbook	
SC-2		Sediment/Desilting Basin	Sediment Treatment Control - Structural	Caltrans Storm Water Quality Handbook	
SC-3		Sediment Trap	Sediment Treatment Control - Structural	Caltrans Storm Water Quality Handbook	
SC-4		Check Dam	Sediment Treatment Control - Structural	Caltrans Storm Water Quality Handbook	
SC-5		Fiber Rolls	Sediment Treatment Control - Structural	Caltrans Storm Water Quality Handbook	

Name of Individual or Organization:

SC-6		Gravel Bag Berm	Sediment Treatment Control - Structural	Caltrans Storm Water Quality Handbook	
SC-7		Street Sweeping and Vacuuming	Sediment Treatment Control – Non-Structural	Caltrans Storm Water Quality Handbook	
SC-8		Sand Bag Barrier	Sediment Treatment Control - Structural	Caltrans Storm Water Quality Handbook	
SC-9		Straw Bale Barrier	Sediment Treatment Control - Structural	Caltrans Storm Water Quality Handbook	
SC-10		Storm Drain Inlet Protection	Sediment Treatment Control - Structural	Caltrans Storm Water Quality Handbook	
WE-1		Wind Erosion Control	Sediment Treatment Control – Non-Structural	Caltrans Storm Water Quality Handbook	
TC-1		Stabilized Construction Entrance/Exit	Sediment Source Control - Structural	Caltrans Storm Water Quality Handbook	
TC-2		Stabilized Construction Roadway	Sediment Source Control - Structural	Caltrans Storm Water Quality Handbook	
TC-3		Entrance/Outlet Tire Wash	Sediment Treatment Control - Structural	Caltrans Storm Water Quality Handbook	
NS-1		Water Conservation Practices	Non-Stormwater – Non-Structural	Caltrans Storm Water Quality Handbook	
NS-3		Paving and Grinding Operations	Non-Stormwater – Non-Structural	Caltrans Storm Water Quality Handbook	
NS-6		Illicit Connection/Illegal Discharge Detection and Reporting	Non-Stormwater - Non-Structural	Caltrans Storm Water Quality Handbook	
NS-7		Potable Water/Irrigation	Non-Stormwater - Non-Structural	Caltrans Storm Water Quality Handbook	
NS-8		Vehicle and Equipment Cleaning	Non-Stormwater - Non-Structural	Caltrans Storm Water Quality Handbook	
NS-9		Vehicle and Equipment Fueling	Non-Stormwater - Non-Structural	Caltrans Storm Water Quality Handbook	
NS-10		Vehicle and Equipment Maintenance	Non-Stormwater - Non-Structural	Caltrans Storm Water Quality Handbook	

Name of Individual or Organization:

NS-11		Pile Driving Operations	Non-Stormwater - Non-Structural	Caltrans Storm Water Quality Handbook	
NS-12		Concrete Curing	Non-Stormwater - Non-Structural	Caltrans Storm Water Quality Handbook	
WM-1		Material Delivery and Storage	Waste Management - Structural	Caltrans Storm Water Quality Handbook	
WM-2		Material Use	Waste Management – Source Control Non-Structural	Caltrans Storm Water Quality Handbook	
WM-3		Stockpile Management	Waste Management - Source Control Structural	Caltrans Storm Water Quality Handbook	
WM-4		Spill Prevention and Control	Waste Management – Source and Treatment Control – Structural and Non-Structural	Caltrans Storm Water Quality Handbook	
WM-5		Solid Waste Management	Waste Management – Source and Treatment Control – Structural and Non-Structural	Caltrans Storm Water Quality Handbook	
WM-6		Hazardous Waste Management	Waste Management – Source and Treatment Control – Structural and Non-Structural	Caltrans Storm Water Quality Handbook	
WM-7		Contaminated Soil Management	Waste Management – Source and Treatment Control – Structural and Non-Structural	Caltrans Storm Water Quality Handbook	
WM-8		Concrete Waste Management	Waste Management – Source Control – Structural	Caltrans Storm Water Quality Handbook	
WM-9		Sanitary/Septic Waste Management	Waste Management – Source and Treatment Control – Structural and Non-Structural	Caltrans Storm Water Quality Handbook	
WM-10		Liquid Waste Management	Waste Management – Source and Treatment Control – Structural and Non-Structural	Caltrans Storm Water Quality Handbook	

Name of Individual or Organization:

TIER 2 – RECOMMENDATIONS FOR SENSITIVE WATERSHED AREAS OR USES

BMP No.	Check if using	BMP Name	Purpose	Source of BMP Information	BMP Monitoring Notes
EC-12		Preservation of Riparian Vegetation/Buffers	Erosion Source Control- Non Structural	EPA Storm Water BMP Manual	
EC-16		In-Stream Structures	Erosion Source Control - Structural	DFG Salmonid Restoration Manual	
EC-19		Geotechnical Slope Stabilization	Erosion Source Control - Structural	DFG Salmonid Restoration Manual and Fishnet 4C County Road Manual	
SS-9		Earth Dikes and Levees & Drainage Channels	Erosion Source Control - Structural	Caltrans Storm Water Quality Handbook	
SS-10		Culvert Outlet Velocity Dissipation Devices	Erosion Source Control - Structural	Caltrans Storm Water Quality Handbook	
SS-11		Slope Drains	Erosion Source Control - Structural	Caltrans Storm Water Quality Handbook	
SS-12		Streambank Stabilization	Erosion Source Control - Structural	Caltrans Storm Water Quality Handbook	
NS-2		Dewatering Operations	Non-Stormwater - Non-Structural	Caltrans Storm Water Quality Handbook	
NS-4		Temporary Stream Crossing	Non-Stormwater - Structural	Caltrans Storm Water Quality Handbook	
NS-5		Clear Water Diversion	Non-Stormwater - Structural	Caltrans Storm Water Quality Handbook	
NS-13		Material and Equipment Use Over Water	Non-Stormwater - Structural	Caltrans Storm Water Quality Handbook	
NS-15		Structure Demolition/Removal Over or Adjacent to Water	Non-Stormwater - Structural and Non-Structural	Caltrans Storm Water Quality Handbook	
AE-1		Aggregate Extraction	Source and Treatment Control - Structural and Non-Structural	See Aggregate Extraction BMP Section of this Document	
RC-1		Road Construction	Source and Treatment Control - Structural and Non-Structural	See Road BMP Section of this Document	

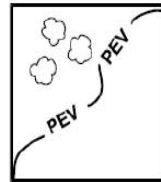
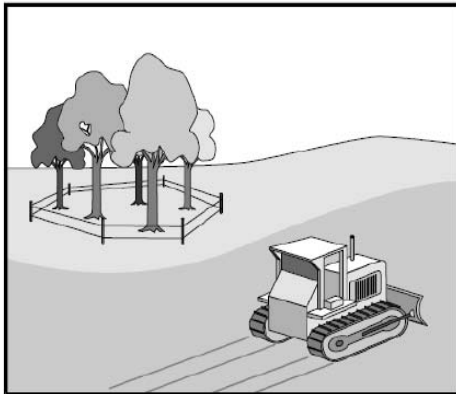
Name of Individual or Organization:

RA-1		Restoration Activities	Source and Treatment Control - Structural and Non-Structural	See Restoraton BMP Section of this Document	
FR-1		Forestry Activities	Source and Treatment Control - Structural and Non-Structural	See Forestry BMP Section of this Document	
GR-1		Grazing and Ranching	Source and Treatment Control - Structural and Non-Structural	See Grazing BMP Section of this Document	
RC-1		Recreation	Source and Treatment Control - Structural and Non-Structural	See Recreation BMP Section of this Document	

TIER 3 – AS NEEDED, SELF-IDENTIFIED USERS ONLY

BMP No.	Check if using	BMP Name	Purpose	Source of BMP Information	BMP Monitoring Notes

Preservation of Existing Vegetation

SS-2


Standard Symbol

BMP Objectives

- Soil Stabilization
 - Sediment Control
 - Tracking Control
 - Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

Definition and Purpose Preservation of existing vegetation is the identification and protection of desirable vegetation that provides erosion and sediment control benefits.

Appropriate Applications

- Preserve existing vegetation at areas on a site where no construction activity is planned or will occur at a later date. Specifications for preservation of existing vegetation can be found in Standard Specifications, Section 7-1.11.

- On a year-round basis, temporary fencing shall be provided prior to the commencement of clearing and grubbing operations or other soil-disturbing activities in areas.
- Clearing and grubbing operations should be staged to preserve existing vegetation.

Limitations Protection of existing vegetation requires planning, and may limit the area available for construction activities.

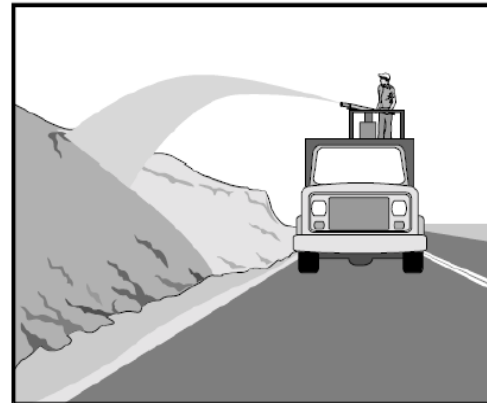
Standards and Specifications

- Preservation of existing vegetation shall be provided prior to the commencement of clearing and grubbing operations or other soil-disturbing activities in areas identified on the plans to be preserved, especially on areas designated as Environmentally Sensitive Areas (ESAs).
- Preservation of existing vegetation shall conform to scheduling requirements set forth in the special provisions.

Design and Layout

- Mark areas to be preserved with temporary fencing made of orange polypropylene that is stabilized against ultraviolet light. The temporary fencing shall be at least 1 meter (3.2 ft) tall and shall have openings not larger than 50 mm by 50 mm (2 in by 2 in).

Hydraulic Mulch

SS-3


Standard Symbol

BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

Definition and Purpose Hydraulic mulch consists of applying a mixture of shredded wood fiber or a hydraulic matrix and a stabilizing emulsion or tackifier with hydroseeding equipment, which temporarily protects exposed soil from erosion by raindrop impact or wind. This is one of five temporary soil stabilization alternatives to consider.

Appropriate Applications

- Hydraulic mulch is applied to disturbed areas requiring temporary protection until permanent vegetation is established or disturbed areas that must be re-disturbed following an extended period of inactivity.

Limitations

- Wood fiber hydraulic mulches are generally short-lived (only last a part of a growing season) and need 24 hours to dry before rainfall occurs to be effective.

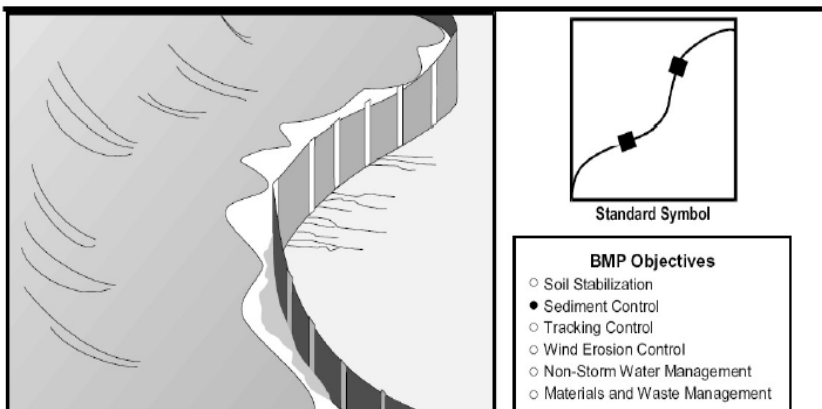
- Paper mulches are not permitted.

- Avoid use in areas where the mulch would be incompatible with immediate future earthwork activities and would have to be removed.

Standards and Specifications

- Prior to application, roughen embankment and fill areas by rolling with a crimping or punching type roller or by track walking. Track walking shall only be used where other methods are impractical.
- Hydraulic matrices require 24 hours to dry before rainfall occurs to be effective unless approved by the Resident Engineer.
- Avoid mulch over-spray onto the traveled way, sidewalks, lined drainage channels, and existing vegetation.
- Selection of hydraulic mulches by the Contractor must be approved by the Resident Engineer (RE) or Construction Storm Water Coordinator.

Silt Fence

SC-1


Definition and Purpose A silt fence is a temporary linear sediment barrier of permeable fabric designed to intercept and slow the flow of sediment-laden sheet flow runoff. Silt fences allow sediment to settle from runoff before water leaves the construction site.

Appropriate Applications Silt fences are placed:

- Below the toe of exposed and erodible slopes.
- Down-slope of exposed soil areas.
- Around temporary stockpiles.
- Along streams and channels.
- Along the perimeter of a project.

Limitations

- Not effective unless trenched and keyed in.
- Not intended for use as mid-slope protection on slopes greater than 1:4 (V:H).
- Must be maintained.
- Must be removed and disposed of.
- Don't use below slopes subject to creep, slumping, or landslides.
- Don't use in streams, channels, drain inlets, or anywhere flow is concentrated.
- Don't use silt fences to divert flow.

Silt Fence

SC-1

- Maintenance and Inspection**
- Repair undercut silt fences.
 - Repair or replace split, torn, slumping, or weathered fabric.
 - Inspect silt fence when rain is forecast. Perform necessary maintenance, or maintenance required by the Resident Engineer (RE).
 - Inspect silt fence following rainfall events. Perform maintenance as necessary, or as required by the RE.
 - Maintain silt fences to provide an adequate sediment holding capacity. Sediment shall be removed when the sediment accumulation reaches one-third (1/3) of the barrier height. Removed sediment shall be incorporated in the project at locations designated by the RE or disposed of outside the right-of-way in conformance with the Standard Specifications.
 - Silt fences that are damaged and become unsuitable for the intended purpose, as determined by the RE, shall be removed from the site of work, disposed of outside the highway right-of-way in conformance with the Standard Specifications, and replaced with new silt fence barriers.
 - Holes, depressions or other ground disturbance caused by the removal of the temporary silt fences shall be backfilled and repaired in conformance with the Standard Specifications.
 - Remove silt fence when no longer needed or as required by the RE. Fill and compact post holes and anchorage trench, remove sediment accumulation, and grade fence alignment to blend with adjacent ground.

Source Material for Construction BMP SC-1 Silt Fence

2003. State of California Department of Transportation. Caltrans Storm Water Quality Handbook Construction Site BMP Manual.

Roads

- Tyler Ledwith (RCAA), Craig Benson (RCAA), Matt House (GDR), Ruthanne Schulte (Buckeye Conservancy), Walt Dragolowski (Caltrans), Andrew Bundschuh (Hum Co PW) with input from Carolyn Cooke & Adam Dresser (USFS), Rick Tippet (Trinity Co DOT), Sandra Perez (5 Counties Salmonid Conservation Program), and others.
- To be referred to by other landuse categories to cover road-related sediment pollution

Mad River TMDL Compliance BMP Checklist – Road BMPs

Name of Individual or Organization:

TIER 1 – BASIC RECOMMENDATIONS

BMP No.	Check if using	BMP Name	Purpose	Source of BMP Information	BMP Monitoring Notes
RD-1: Road Design					
RD-1.1		Planning and Coordination	Source Control, Non-structural	Handbook for Forest and Ranch Roads (Weaver and Hagans)	
RD-1.2		Routing and Location	Source Control, Non-structural	Handbook for Forest and Ranch Roads (Weaver and Hagans)	
RD-1.3		Road Drainage	Source and Treatment Control, Structural	Handbook for Forest and Ranch Roads (Weaver and Hagans) CA Salmonid Habitat Restoration Manual (CDFG)	
RD-1.4		Road Surfacing	Source Control, Structural	Road Maintenance Manual (Five Counties) County Road Maintenance Guidelines (FishNet 4C)	
RD-2: Road Construction					
RD-2.1		Employ Tier 1 Construction BMPs	Source and Treatment Control/ Structural and Non-structural	See Construction BMP list	
RD-2.2		Outslope Road	Source Control, Structural	CA Salmonid Habitat Restoration Manual (CDFG) County Road Maintenance Guidelines (FishNet 4C)	
RD-2.3		Rolling Dips	Source Control, Structural	CA Salmonid Habitat Restoration Manual (CDFG) County Road Maintenance Guidelines (FishNet 4C)	

Name of Individual or Organization:

RD-2.4		Ditches Maintenance	Source Control, Structural	County Road Maintenance Guidelines (FishNet 4C) Road Maintenance Manual (Five Counties)	
RD-2.5		Ditches – Check Dams	Treatment Control, Structural	County Road Maintenance Guidelines (FishNet 4C) Road Maintenance Manual (Five Counties)	
RD-2.6		Short Span Bridges	Source Control, Structural	Handbook for Forest and Ranch Roads (Weaver and Hagans)	
RD-2.7		Fords	Source Control, Structural	CA Salmonid Habitat Restoration Manual (CDFG) Handbook for Forest and Ranch Roads (Weaver and Hagans)	
RD-2.8		Stream Crossing Installation	Source Control, Structural	CA Salmonid Habitat Restoration Manual (CDFG) Handbook for Forest and Ranch Roads (Weaver and Hagans)	
RD-2.9		Critical Dips	Source Control, Structural	CA Salmonid Habitat Restoration Manual (CDFG) County Road Maintenance Guidelines (FishNet 4C)	
RD-2.10		Ditch Relief Culvert Installation	Source Control, Structural	CA Salmonid Habitat Restoration Manual (CDFG) County Road Maintenance Guidelines (FishNet 4C) Handbook for Forest and Ranch Roads (Weaver and Hagans)	
RD-2.11		Outlet Protection	Source Control, Structural	Storm Water Quality Handbooks (CALTRANS) County Road Maintenance Guidelines (FishNet 4C)	
RD-2.12		Energy Dissipater	Source Control, Structural	County Road Maintenance Guidelines (FishNet 4C) Weber County, Engineering Department. Ogden, Utah	
RD-2.13		Trash Rack	Source Control, Structural	County Road Maintenance Guidelines (FishNet 4C) Road Maintenance Manual (Five Counties)	

Name of Individual or Organization:

RD-2.14		Inlet Protection	Treatment Control, Structural	County Road Maintenance Guidelines (FishNet 4C)	
RD-2.15		Water Drafting	Source Control, Structural	Road Maintenance Manual (Five Counties)	
RD-2.16		Stockpile Management	Source Control, Structural	Storm Water Quality Handbooks (CALTRANS) County Road Maintenance Guidelines (FishNet 4C)	

RD-3: Road Maintenance

RD-3.1		Road & Culvert Inspections	Source Control, Non-Structural	CA Salmonid Habitat Restoration Manual (CDFG) Handbook for Forest and Ranch Roads (Weaver and Hagans)	
RD-3.2		Grading	Source Control, Structural	County Road Maintenance Guidelines (FishNet 4C) Road Maintenance Manual (Five Counties)	
RD-3.3		Resurfacing and Repair	Source Control, Structural	Road Maintenance Manual (Five Counties) County Road Maintenance Guidelines (FishNet 4C)	
RD-3.4		Bridge Cleaning	Treatment Control, Structural	Road Maintenance Manual (Five Counties)	
RD-3.5		Drainage System Upgrades	Source Control, Non-structural	County Road Maintenance Guidelines (FishNet 4C) Road Maintenance Manual (Five Counties)	
RD-3.6		Culvert Replacement	Source Control, Structural	CA Salmonid Habitat Restoration Manual (CDFG) County Road Maintenance Guidelines (FishNet 4C) Road Maintenance Manual (Five Counties)	
RD-3.7		Armor Shotgun Culvert	Source Control, Structural	Storm Water Quality Handbooks (CALTRANS) County Road Maintenance Guidelines (FishNet 4C)	

Name of Individual or Organization:

RD-3.8		Stream Crossing and Ditch Relief Culvert Cleaning	Treatment Control, Structural	CA Salmonid Habitat Restoration Manual (CDFG) County Road Maintenance Guidelines (FishNet 4C)	
RD-3.9		Wind Erosion Control	Source Control, Structural	Stormwater Quality Handbook (CALTRANS)	
RD-3.10		Vegetation Management	Source Control, Structural	County Road Maintenance Guidelines (FishNet 4C)	

RD-4: Emergency Repair

RD-4.1		Emergency Response	Source Control, Non-Structural	County Road Maintenance Guidelines (FishNet 4C)	
RD-4.2		Emergency Culvert Repair	Source Control, Structural	Road Maintenance Manual (Five Counties)	
RD-4.3		Emergency Landslide and Washout Repair	Source Control, Structural	County Road Maintenance Guidelines (FishNet 4C)	
RD-4.4		Emergency Stockpile Management	Source Control, Structural	Storm Water Quality Handbook (CALTRANS) County Road Maintenance Guidelines (FishNet 4C)	

RD-5: Utilize Training Resources

RD-5.1		Road BMP Resources	Non-Structural	Choose from Road BMP Road Sources	
RD-5.2		Road Management and BMP Training	Non-Structural	Road Maintenance Manual (Five Counties)	
RD-5.3		Regulatory Consultation	Non-Structural	County Road Maintenance Guidelines (FishNet 4C) Road Maintenance Manual (Five Counties)	

RD-6: Road Upgrades

Name of Individual or Organization:

RD-6.1		Road Assessment	Source Control, Non-Structural	CA Salmonid Habitat Restoration Manual (CDFG)	
RD-6.2		Road Surface Upgrade	Source Control, Structural	Handbook for Forest and Ranch Roads (Hagans & Weaver)	
RD-6.3		Re-route Road	Source Control, Structural	Handbook for Forest and Ranch Roads (Weaver and Hagans)	
RD-6.4		Stabilize Road Prism	Source Control, Structural	Handbook for Forest and Ranch Roads (Weaver and Hagans)	
RD-6.5		Culvert Upgrade - Sizing	Source Control, Structural	Designing Watercourse Crossings for Passage of 100-year Flood Flows, Wood, and Sediment (CDF)	

RD-7: Road Decommissioning

RD-7.1		Assess & Prioritize	Source Control, Non-Structural	CA Salmonid Habitat Restoration Manual (CDFG)	
RD-7.2		Understanding Road Removal	Non-Structural	Handbook for Forest and Ranch Roads (Weaver and Hagans) Road-Ripper Guide to Wildland Removal (Bagley)	
RD-7.3		Road Closure	Source Control, Structural	A Guide for Road Closure and Obliteration in the Forest Service (USFS)	
RD-7.4		Full Recontouring	Source Control, Structural	Road-Ripper Guide to Wildland Removal. (Bagley) BMP for Road Rehabilitation (CA Parks)	
RD-7.5		Partial Recontouring	Source Control, Structural	BMP for Road Rehabilitation (CA Parks)	
RD-7.6		Pull Stream Crossing	Source Control, Structural	CA Salmonid Habitat Restoration Manual (CDFG) Handbook for Forest and Ranch Roads (Weaver and Hagans)	

RD-1.3 DRAINAGE FOR UNPAVED ROAD SURFACES

DESCRIPTION

Roads should be designed and constructed to cause minimal disruption of natural drainage patterns. Provisions for two components of road drainage should be included in every road project: 1) road surface drainage (including drainage which *originates* from the cutbank, road surface, and fillslope); and 2) hillslope drainage (including drainage from large springs, gullies, and streams which *cross* the road alignment).

BEST MANAGEMENT PRACTICES

- Maintain natural drainage patterns in watershed through installing drainage features to keep water within sub-basins.
- Crown or slope the road to avoid ponding or concentration of runoff. Outslope all roads where possible and safe (see Road BMP RD-2.2 Outslope).
- Use rolling dips instead of ditch relief culverts (DRCs) when possible (Table 1) (Figure 1). Rolling dips require less maintenance and are less prone to failure than culverts (see Road BMP RD-2.3 Rolling Dips).
- Disconnect road drainage features from watershed hydrology. Shorten ditch lengths to stream crossings by installing a ditch relief culvert or rolling dip before the watercourse (see Road BMP RD-2.10 Ditch Relief Culvert Installation).
- In addition to installing DRCs on either approach to the stream crossings, it is also advisable to consider installing ditch drains before curves, above and below through-cut road sections, and before and after steep sections of the road.
- Ditches should neither be discharged directly into the inlet of a stream crossing culvert, nor should DRCs discharge into a watercourse without first directing flow through an adequate filter strip.
- Culverts should be designed and installed at intervals along the road that are close enough to prevent erosion of the ditch and at the culvert outfall. They should be installed at locations where collected water and sediment is not discharged directly into watercourses (Table 2).
- DRCs should not be used on erosive slopes without a downspout (see Construction BMP SS-11 Slope Drains).
- In areas of high erosion and/or storm runoff, *minimum* ditch relief culvert sizes should be 18 inches in diameter, and never less than 12 inches in other areas.
- A 10% grade to the culvert will usually be self cleaning. The culvert grade should also be at least 2% greater than the ditch which feeds it. The culvert should be placed at a 30 degree skew to the ditch to improve inlet efficiency and prevent plugging and erosion at the inlet.

- Stream crossings culverts and DRCs should be installed at the gradient of the original ground slope, so it will emerge on the ground surface beyond the base of the fill. If not, either the fill below the culvert outlet should be armored with rock, or the culvert should be fitted with an anchored downspout to carry erosive flow past the base of the fill (Figure 2) (see Road BMP RD-2.8 Stream Crossing Installation).
- Culverts should be covered by a minimum of 1 foot of compacted soil, or a depth of 30% of its diameter, whichever is greater.
- Inlet protection, such as rock armoring or drop structures, can be used to help minimize erosion.
- DRCs must be spaced frequently enough to carry ditch and road surface waters without creating erosive concentrated flows. See attached table for spacing guidelines.

Road grade %	Upslope approach (distance from up-road start of rolling dip to trough) (ft)	Reverse grade (distance from trough to crest) (ft)	Depth below average road grade at discharge end of trough (ft)	Depth below average road grade at upslope end of trough (ft)
<6	55	15-20	0.9	0.3
8	65	15-20	1.0	0.2
10	75	15-20	1.1	.01
12	85	20-25	1.2	.01
>12	100	20-25	1.3	.01

Table 1. Table of rolling dips dimensions. From CDFG (2006).

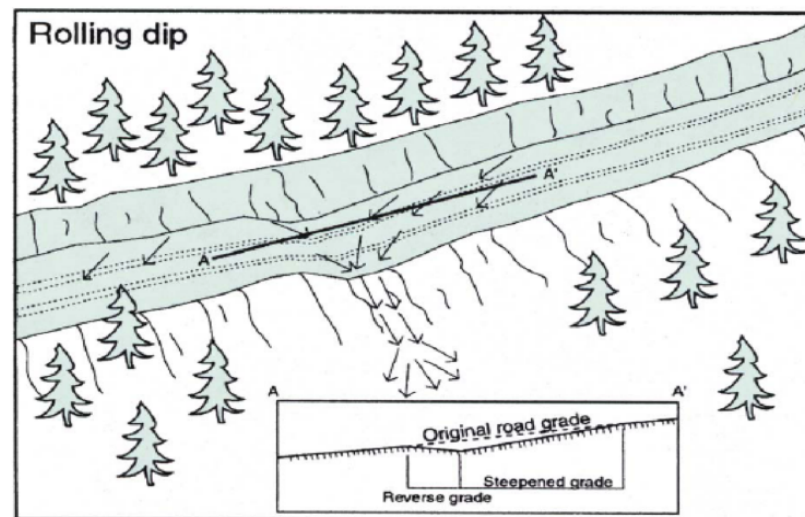
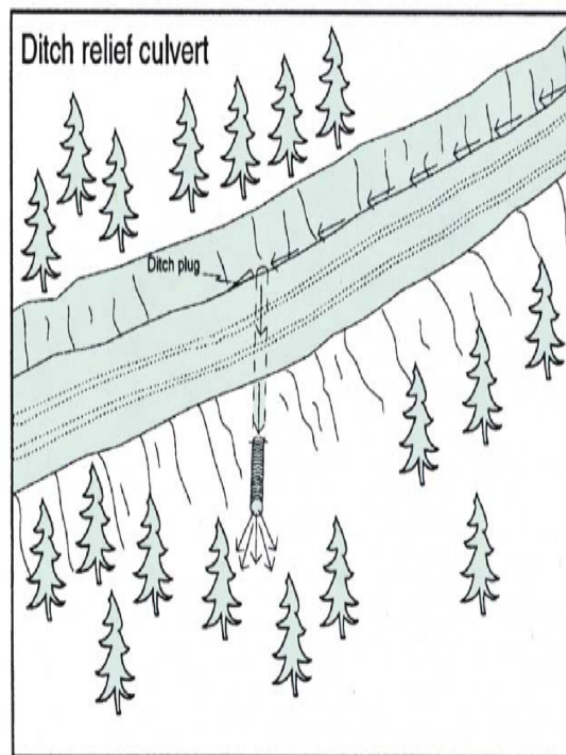
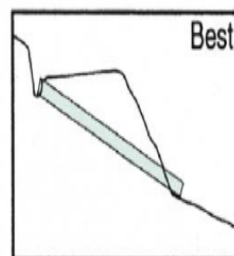
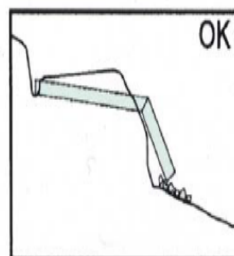
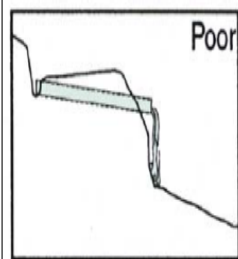


Figure 1. Use of rolling dips to reduce ditch erosion and surface runoff. Rolling dips must drain the road surface and be driveable for the expected traffic. From CDFG (2006).



Cross sections of typical installations

Table 2. Maximum suggested spacing for ditch relief culverts¹ (ft)

Road grade (%)	Soil credibility				
	very high	high	moderate	slight	very low
2	600-800 ²				
4	530	600-800 ²			
6	355	585	600-800 ²		
8	265	425	525	600-800 ²	
10	160	340	420	555	
12	180	285	350	460	600-800 ²
14	155	245	300	365	560
16	135	215	270	345	490
18	118	190	240	310	435

¹Adapted from *Transportation Handbook* USDA Forest Service, R-6, 1966. Culvert spacing may be too great in locations where ditch runoff is accumulated and discharged onto steep hillslopes that are prone to gullying. Spacing is designed to control ditch erosion, not culvert outfall erosion, and are based on 25-year storm and precipitation rate of 1-2 in/hr for 15 minutes. If less, multiply by the intensity 0.50, 0.30, etc. If 2-3 in/hr, divide distance in table by 1.50; if 3-4 in/hr, divide by 1.75; and if 4-5 in/hr, divide by 2.00. The U.S. Forest Service also publishes abundant information on preventing and controlling gully erosion below culvert outfalls. From Hagans and Weaver (1994).

²Even with stable ditches, ditch relief culvert spacing greater than about 600 to 800 feet is generally not recommended due to the large volume of road surface and cutslope runoff that would be discharged through the culvert and onto lower slopes during peak runoff periods. Culvert outlet erosion may occur with less than 800 feet of contributing ditch line, so observe local conditions to determine the upper limit of acceptable spacing in your area.

Source Material for Road BMP RD-1.3 Road Drainage for Unpaved Road Surface

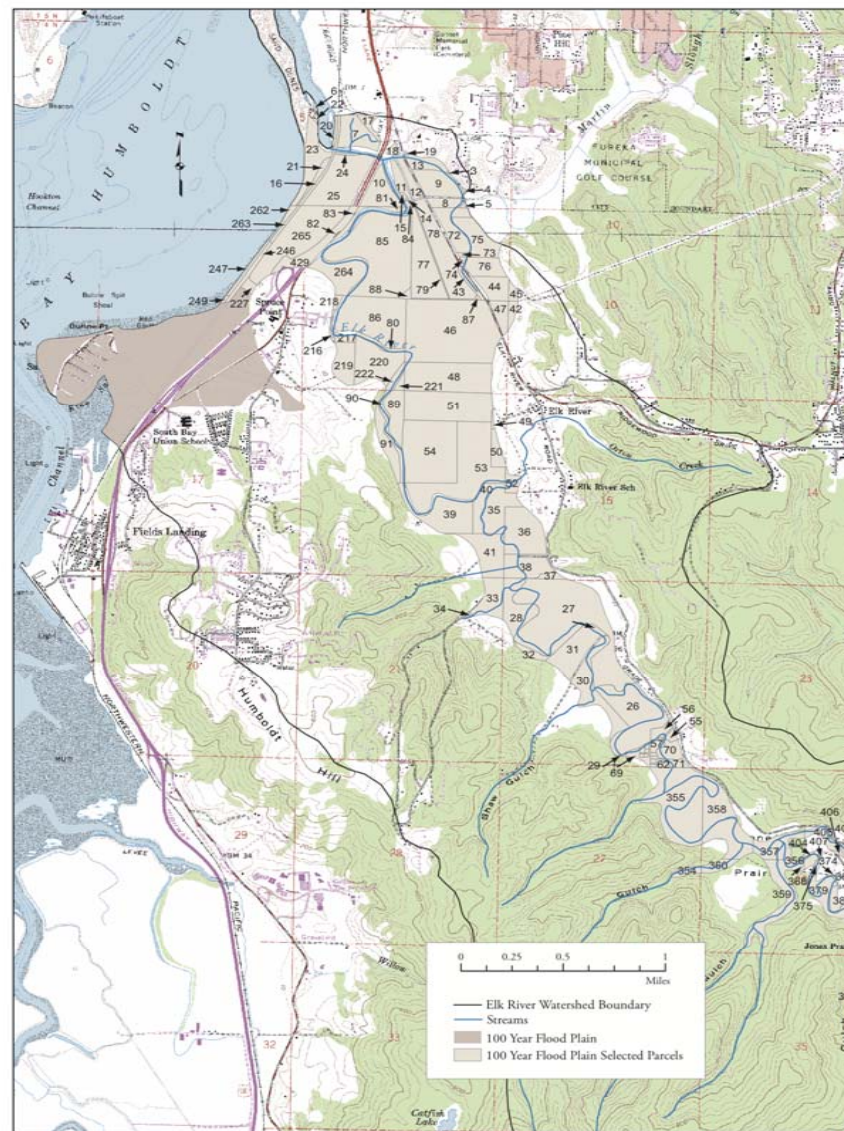
2006. California Department of Fish and Game. Part X - Upslope Erosion Inventory and Sediment Control Guidance, California Salmonid Stream Habitat Restoration Manual.

1994. Weaver W.E. and D.K. Hagans. Handbook for Forest and Ranch Roads. Mendocino County Resource Conservation District

Elk River Outreach

- Initiate outreach to landowners, elevation 60' and below and in FEMA Floodplain
- Letters sent out in April 2008, follow up letters in June 2008.
- Began meeting with respondent landowners in summer 2008
- State stop-work order, re-initiate work in October 2009
- Presented and/or attended TMDL, grazing waiver, dairy waiver mtgs

Selected Parcels of the Elk River 100 Year Flood Plain



Landowner Outreach: Projects

- Developed Flood Preparedness Plan
- Developed conceptual sediment mgmt. and riverine restoration projects with landowners
- Pilot Sediment Study

Flood Preparedness Plan



Lower Elk River Community Flood Response Plan



Produced by:
Natural Resources Services
A division of Redwood Community Action Agency
904 G Street
Eureka, CA 95501

Personal/ Individual	Family/ Household	Neighborhood/ Community
If not preparing a family emergency kit, prepare an individual kit (see right).	Prepare an emergency kit that includes: a 3 day supply of water (1 gallon per person per day) and food that will not spoil, changes of clothing and footwear, blankets/ sleeping bags, emergency tools, extra sets of keys and credit cards, sanitation supplies, any special items for infants, elderly or disabled, extra eyeglasses.	Take first aid, CPR and/or emergency preparedness training courses. Notify your neighbors about your training.
Move vehicle(s) to high ground.	Prepare a family disaster plan and evacuation routes.	Create a neighborhood phone tree and check-in schedule, particularly for elderly, infirm or single individuals.
Avoid situating buildings or valuable infrastructure in the flood plain where possible.	Have a generator and extra fuel available.	Identify special medical, technical or other skills your neighbors may have.
Fill containers, bathtubs, sinks with clean water. Sanitize and rinse sinks and tubs prior to using.	Elevate/ move valuable supplies and belongings – including firewood necessary for heating.	Purchase a NOAA weather radio.
Move or secure animals, including livestock/ poultry and pets.	Turn off utilities at the main power switch or valve.	Construct temporary or permanent barriers at strategic locations to minimize or stop flood waters if possible.
Seal walls, particularly in below-ground rooms, to avoid seepage	Keep important family documents in a waterproof storage container.	Assist critically affected operations by arranging for auxiliary power supplies.

Flooding Hazards in the Lower Elk River

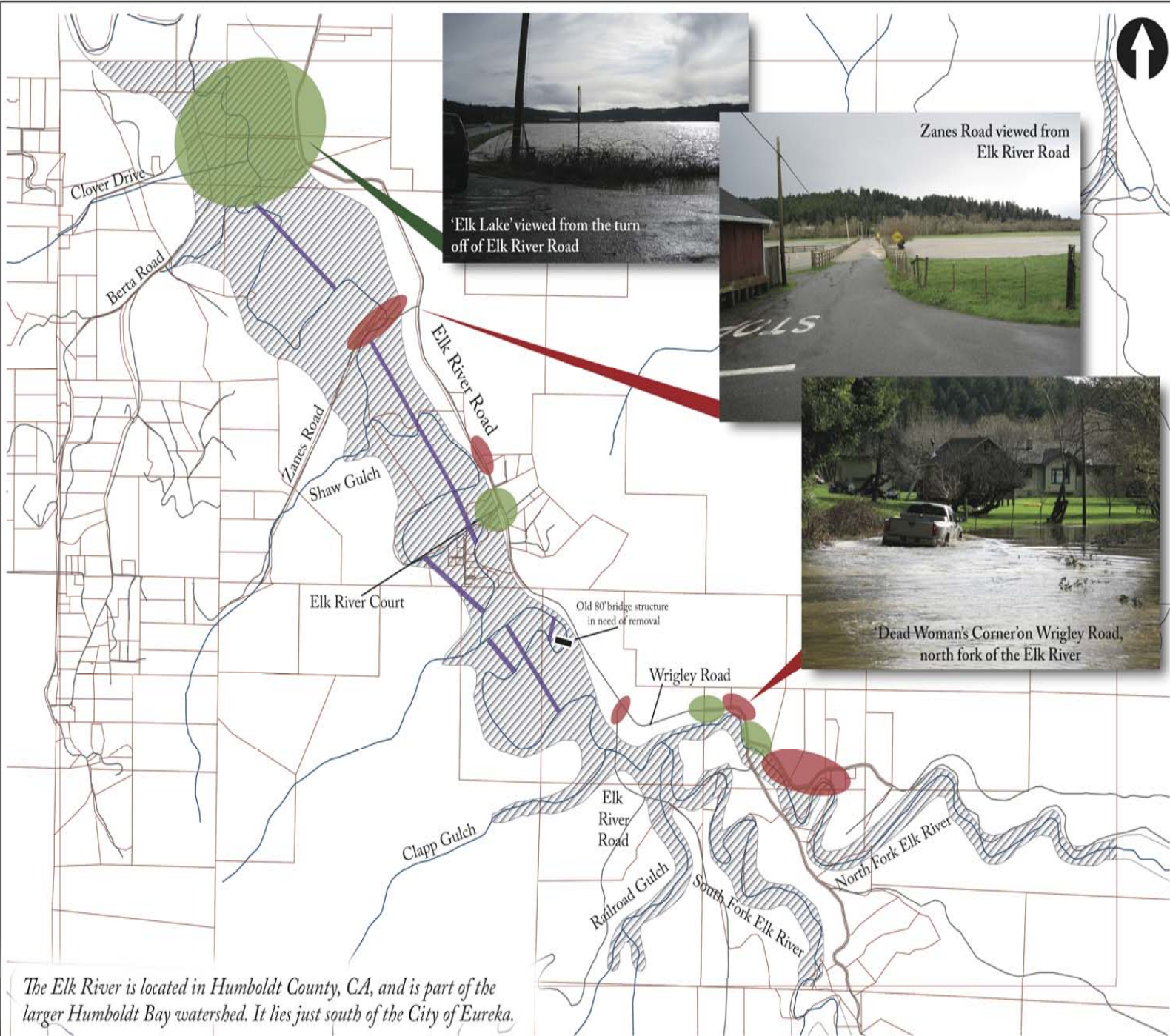
Selected parcels and features based on residents' experiential knowledge of impacts

Data gathered by RCAA in 2011 directly from affected landowners, photographs taken by RCAA

- Areas frequently flooded (multiple times per year)
- Areas where flooding hazards are very severe, and completely block access
- Places where the river tends to cut through
- Watercourses
- Parcel lines
- FEMA 100 year flood plain, as of 2011

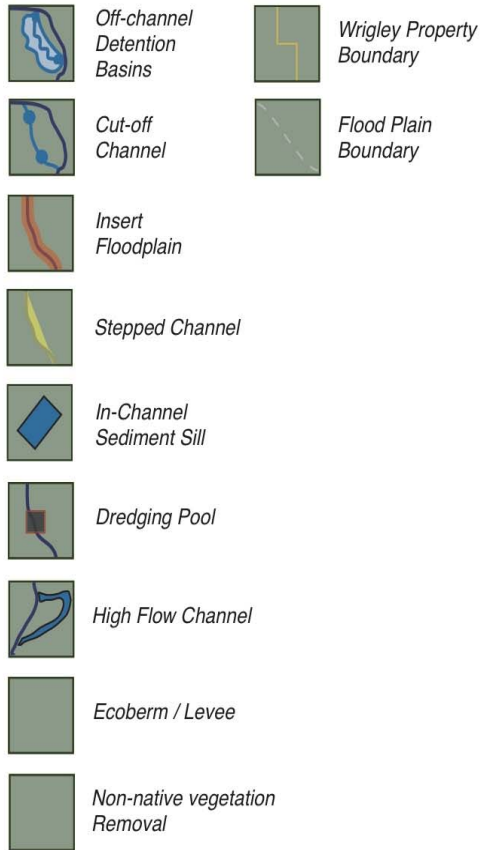


0 500 1,000 2,000 Feet



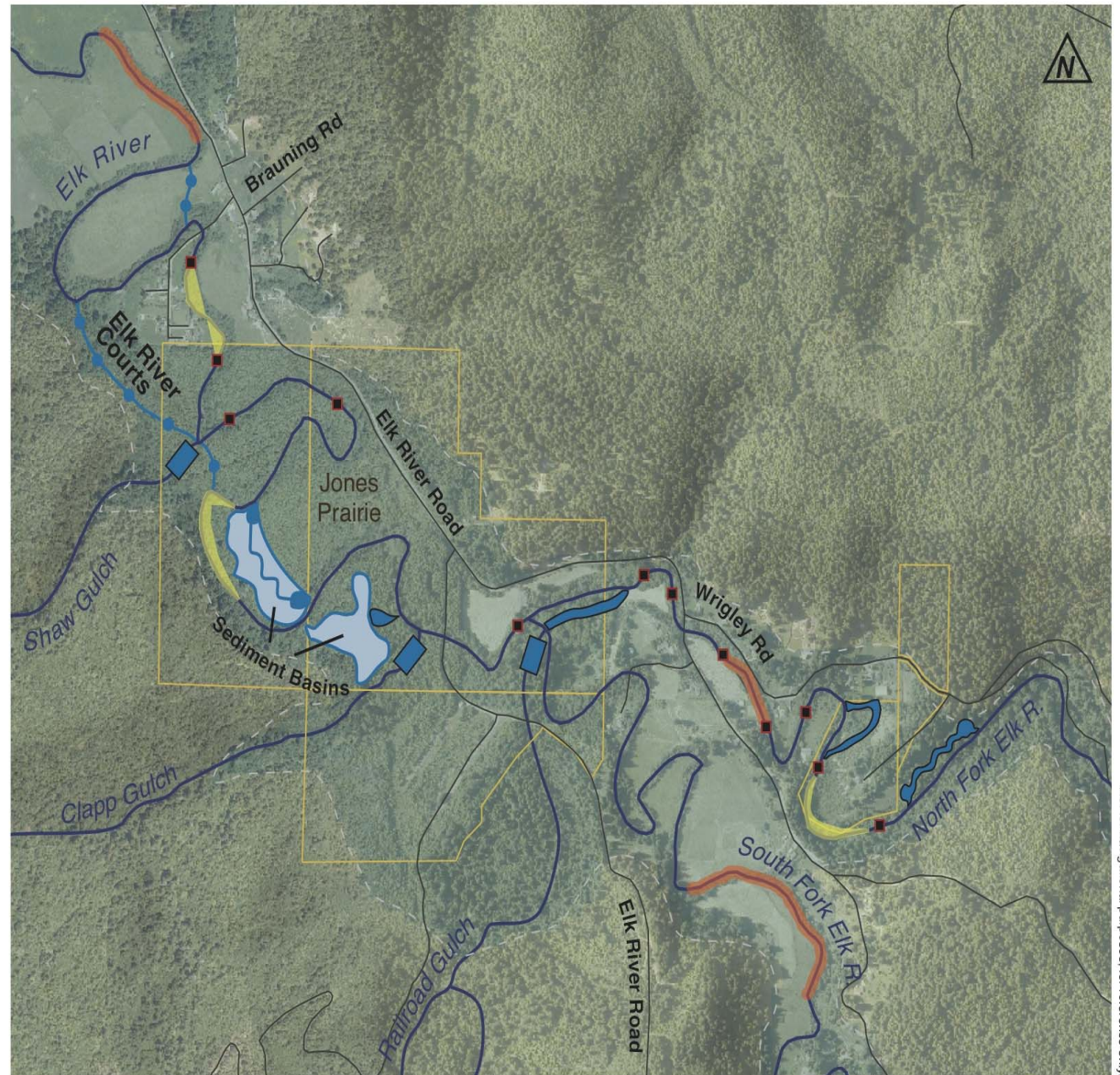
The Elk River is located in Humboldt County, CA, and is part of the larger Humboldt Bay watershed. It lies just south of the City of Eureka.

Lower Elk River (Nuisance Reach): Potential Restoration Actions



Data Sources:
Aerial Imagery (USDA NAIP 2010),
30m DEM (USGS),
Assessor Parcels (County of
Humboldt 2009), All other data
produced by RCAA.

0 625 1,250 2,500 Feet



Cartography: C. Escarcega, 2011-12. Redwood Community Action Agency.

Not for navigational purposes; for reference only.

Summit Goal

Work together to define a process and technical approach that is science-based and stakeholder-driven to improve physical and biological (ecosystem) functions in the Lower Elk River