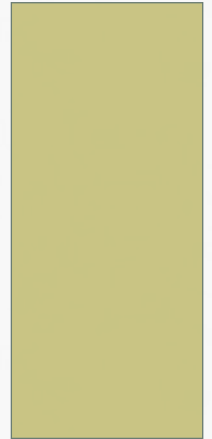


# 5C ROADS MANUAL UPDATE

2012 SALMON, WATER QUALITY, & ROADS WORKSHOP

OCTOBER 22, 2012 – TRINITY COUNTY, CA



# PURPOSE OF MANUAL

A WATER QUALITY AND  
STREAM HABITAT PROTECTION  
MANUAL  
for  
COUNTY ROAD MAINTENANCE  
IN NORTHWESTERN  
CALIFORNIA WATERSHEDS



Prepared for the  
Five Counties Salmon Conservation Program

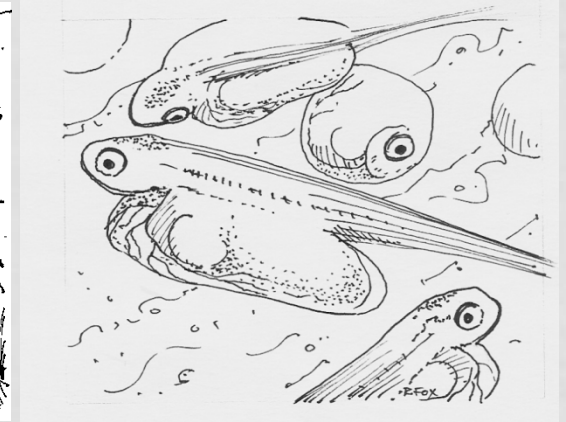
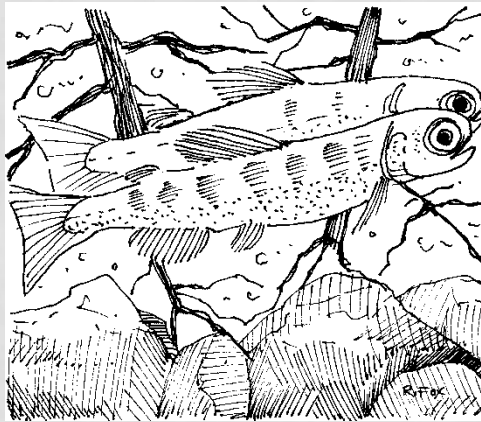
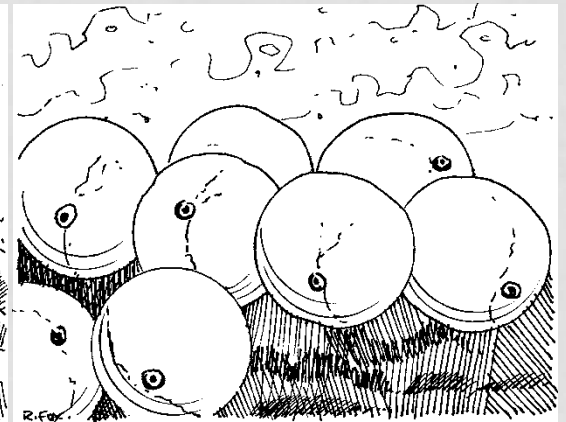
ADMINISTRATIVE DRAFT

September 2002

- One of the UCCE recommendations made for the five counties
- Purpose: To provide a user-friendly, fish-friendly guide for County road maintenance staff as part of each county's primary mission to provide a safe and open road system for the traveling public.

# COHO NEEDS

- COLD – water (>73-79 F)
- CLEAN – water, pools, and gravels without excess sediment
- COMPLEX – structure instream for hiding, rearing, flow patterns, riparian
- CONNECTED – no barriers between ocean and spawning & rearing areas



# SCOPE OF MANUAL



- Practices related to routine and emergency repair and maintenance of county roads, bridges, and maintenance yards.
- NOT included are construction, or major expansion or change in use, of roads and facilities.

# MAIN TOPICS

- Watershed, Wildlife, Habitat, and Sediment Basics
- Regulatory & Permitting Considerations
- Best Management Practices (BMPs)
- Training
- Monitoring & Reporting

# CURRENT TABLE OF CONTENTS

1. Working in the Watershed (background)
2. Following the Rules (background)
3. Maintaining the Roads
4. Maintaining the Culverts
5. Disposing the Spoil
6. Managing the Maintenance Yard
7. Maintaining the Bridges
8. Performing Emergency Work
9. Dealing with Snow & Ice
10. Monitoring the Practices
11. Training the Staff
12. Information Sources

## Appendices:

- A. Getting the Permits
- B. BMP Standard Designs
- C. Culvert Criteria for Fish Passage
- D. Water Drafting Guidelines

# REVISIONS

- New Content:
  - Low Impact to Hydrology Road Standards (LITH)
  - Vegetation Management
- Edits:
  - Clarifications of current content
  - Updated resources, weblinks, information (species listing, permitting, etc.)
  - Typo corrections

# LITH DESIGN STANDARDS

- Outsloping
- Rolling & Critical Dips

**TABLE 1**  
TYPICAL DIP DESIGNS FOR VARIOUS PROFILE GRADES – K=1 to 3\*

K<sub>min</sub> = 1 to 3 for roll crest curve & dip sag curve  
 K<sub>min</sub> = 20 for climb out crest curve  
 Climb out grade shall not exceed 16%  
 All distances in Feet except for distances in (), which are in meters

## Rolling Dip

Original Grade	Roll		Dip		Climb out Length	Climb out Grade	Total length Critical Dip
	Length	Vertical Curve	Length	Vertical Curve			
< 4%	15.00	(4.57)	15.00	(4.57)	73.00	(22.25) 6.2 %	103.00 (31.39)
. 5%	15.00	(4.57)	15.00	(4.57)	73.00	(22.25) 7.3 %	103.00 (31.39)
. 6%	15.00	(4.57)	15.00	(4.57)	76.00	(23.16) 9.5 %	106.00 (32.31)
. 7%	15.00	(4.57)	15.00	(4.57)	78.00	(23.77) 10 %	108.00 (32.92)
. 8%	15.00	(4.57)	15.00	(4.57)	83.00	(25.30) 11.3 %	113.00 (34.44)
. 9%	15.00	(4.57)	15.00	(4.57)	88.00	(26.82) 11.9 %	118.00 (35.97)
. 10%	20.00	(6.10)	20.00	(6.10)	100.00	(30.48) 14 %	140.00 (42.67)
. 11%	20.00	(6.10)	30.00	(9.14)	110.00	(33.53) 16 %	160.00 (48.77)
. 12%	20.00	(6.10)	30.00	(9.14)	130.00	(39.62) 16 %	180.00 (54.86)
. 13%	20.00	(6.10)	30.00	(9.14)	170.00	(51.82) 16 %	220.00 (67.06)
. 14%	30.00	(9.14)	30.00	(9.14)	295.00	(89.92) 16 %	355.00 (108.20)
. 15%	Not calculated – Designer's Discretion						

## Critical Dip

Original Grade	Roll		Dip		Climb out Length	Climb out Grade	Total length Critical Dip
	Length	Vertical Curve	Length	Vertical Curve			
< 4%	30.00	(9.14)	30.00	(9.14)	90.00	(27.43) 7.3 %	150.00 (45.72)
. 5%	30.00	(9.14)	30.00	(9.14)	95.00	(28.96) 8.9 %	155.00 (47.24)
. 6%	30.00	(9.14)	30.00	(9.14)	110.00	(33.53) 9.6 %	170.00 (51.82)
. 7%	40.00	(12.19)	40.00	(12.19)	145.00	(44.20) 10.4 %	225.00 (68.58)
. 8%	40.00	(12.19)	40.00	(12.19)	160.00	(48.77) 12 %	240.00 (73.15)
. 9%	40.00	(12.19)	40.00	(12.19)	200.00	(60.96) 14.7 %	280.00 (85.34)
. 10%	40.00	(12.19)	50.00	(15.24)	220.00	(67.06) 16 %	310.00 (94.49)
. 11%	40.00	(12.19)	50.00	(15.24)	230.00	(70.10) 16 %	320.00 (97.54)
. 12%	40.00	(12.19)	50.00	(15.24)	290.00	(88.39) 16 %	380.00 (115.82)
. 13%	40.00	(12.19)	50.00	(15.24)	330.00	(100.58) 16 %	420.00 (128.02)
. 14%	50.00	(15.24)	60.00	(18.29)	475.00	(144.78) 16 %	585.00 (178.31)
. 15%	Not calculated – Designer's Discretion						

\*Designing rolling dips and critical dips is an exercise in vertical profile calculations. Table 1 was developed using the smallest K values allowed and modeled after designs in AutoCAD Land Development Desktop (LDD)® at various profile slopes. Table 1 shows the typical design of both a rolling dip and critical dip at various road profile grades. Designers are required to prepare actual designs in accordance with AASHTO.



## Five Counties Salmonid Conservation Program

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## Road Design Guidelines for Low Impact to Hydrology\*

### I. General

**Purpose and Intent.** Provide Low Impact to Hydrology (LITH) Design Guidelines that can be considered for adoption as County Road Design Standards where appropriate. In addition, LITH design guidelines can be cited for private roads that are not required to meet county road standards for year round access or subdivisions, but which must meet individual county grading permits, use permits, or other standards.

The 1998 University of California Cooperative Extension's "Effects of County Land Use Regulations and Management on Anadromous Salmonids and Their Habitats: Humboldt, Del Norte, Mendocino, Siskiyou and Trinity Counties," included the following in Recommendation #9a to the counties:

"... Fish-friendly alternatives to generic CalTrans and ASHTO road standards should be developed."

During the UCCE assessment process, it was determined that the road design standards for the counties were based on crowned, or in-slope drainage into ditches. Inboard ditches, in some instances on long or steep gradient and/or in erodible soils can result in downcutting and enlargement of ditches, acceleration of cutbank erosion and/or plugging, and diversion across a road. An additional road design to accommodate outlope road segments, was recognized as desirable. The design, however, would have to meet safety, speed and topographic design considerations.

The U.S. Forest Service, the National Park Service, the USDA Natural Resources Conservation Service, California Department of Forestry and Fire Protection, and many forest and ranch landowners have all endorsed some form of the road design approach commonly referred to as "Low Impact to Hydrology" (LITH). The goal of the LITH design approach is to make roads less disruptive to natural watershed runoff processes. This is generally accomplished by "outsloping roads" in lieu of maintaining inboard ditches and installing "rolling dips" in lieu of

\* Howard Dashiell, CA Registered Civil Engineer (principal author) and Mark Lancaster, CA Registered Professional Forester



# VEGETATION MANAGEMENT

- Goal: plan and perform roadside maintenance activities to discourage or eliminate unwanted vegetation and promote desirable vegetation



Armenian Blackberry



Tree of Heaven

# VEGETATION MANAGEMENT

- Primary objectives:
  - Treating and reducing the spread of existing non-native species and noxious weeds
  - Preventing the introduction of new non-native species and noxious weeds
  - Reducing runoff and herbicide use (where used)
  - Reducing erosion and sediment discharge to rivers, streams, wetlands and other water sources, as well as roadside ditches
  - Reducing the risk of fire starts and improving fire suppression effectiveness along roadsides

# GENERAL APPROACH

- Overview of applicable local, state and federal regulations, laws and policies and permit requirements including:
  - County Tree ordinances
  - County and/or local watershed area pesticide/herbicide ordinances
  - State/federal requirements for working within streams (CDFG 1600s) and wetlands (applicable Corps permits)
  - Project specific best management practices and/or mitigation measures that are required to ensure that the projects do not have adverse environmental impacts
- Coho Recovery Plan recommendations on vegetation management are also included

# GENERAL APPROACH

- Detailed information on:
  - Routine maintenance practices & ecological effects of roads
  - Different plant communities (e.g., upland, riparian, wetlands)
  - High profile weed species and treatment methods
  - Ecologically sensitive areas and other areas with special management considerations
  - Revegetation techniques (plant selection, seed sources, spacing, irrigation, soils, other factors in establishment)
  - General cost information & estimates
- Regular monitoring techniques and follow-up on vegetation management practices
- References



# NOTES

- Not Included:
  - County specific vegetation management plans (may be pursued later if resources permit)
- Training on new content will be incorporated into:
  - Roads Workshops (central, like this one)
  - Roads Manual Best Management Practices (in each county or central)

# FEEDBACK OR QUESTIONS?

- Any information or topic that you would like to see covered in the Manual that is not part of the planned update?
- Questions on any part of the updated areas?