UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE

MEMORANDUM FOR:	Board of Forestry Forest Practice Committee
FROM	National Marine Fisheries Service, Southwest Region Protected Resources Division
DATE:	April 3, 2006
LOCATION:	Resources Auditorium 1416 Ninth Street Sacramento, California
SUBJECT:	Regulatory Review and Rule Amendment Consideration by the California Board of Forestry for Threatened and Impaired Rules

The California Board of Forestry (BOF) will consider amendments of existing Forest Practice Rules for threatened or impaired watersheds by December 31, 2006. The BOF review of Threatened and Impaired Watershed Rules (T&I Rules) is outlined in a BOF March 6, 2006, staff draft status report. The BOF goals are to "...review relevant literature on topics related to the T&I Rules; compile summary of literature review findings; review field implementation of the T&I Rules and evaluate effectiveness of implementation towards meeting T&I goals; and evaluate the need for, and consider regulatory amendments or other actions for, T&I Rules based on literature review and other information."

The attached matrix is a preliminary deliberative draft provided by the National Marine Fisheries Service (NMFS) to assist with the first of the described goals, "...review relevant literature on topics related to T&I Rules...". The list of references is not exhaustive and does not represent all pertinent resources available. The draft matrix is a first attempt to begin summarizing references provided by Mr. Pete Cafferata (California Department of Forestry) and other state agencies. References in the matrix, not included in Mr. Cafferata's list, were found in the Jackson State Demonstration State Forest draft EIR, other literature reviews and the NMFS Santa Rosa/Arcata office libraries.

NMFS hopes the BOF Forest Practice Committee finds this draft matrix useful and we look forward to a productive dialog to improve on the matrix in both content and format.

National Marine Fisheries Service
Summary of Buffer Widths
Sediment-Streambank Stability

Author	Buffer Studied	Buffer Function	Reference Type	Location	Notes	Source
ManTech 1996	Gentle slopes 30 meters; Steep slopes 90 meters				Sediment	
FEMAT 1993	0.5 SPTH	Probably provides stabilizing influence of riparian root strength			Root Strength	JDSF EIR
Ziemer and Lewis 1984		Root biomass dropped 42% in 11 years; began to increase again	Unpublished retrospective study root dieback		Root Strength	JDSF EIR
Johnson and Ryba 1992	100 feet	Sediment control			Sediment	JDSF EIR
Spence et al. 1996	1 SPTH	Traps most fine sediment provided that slopes are not too steep			Sediment	JDSF EIR
	<1 SPTH	Gentle slopes probably sufficient			Sediment	CA; JDSF EIR
NMFS and USFWS 1997		Stream bank stability	Industry report		study did not provide distance for buffer zone however did suggest, root systems of large trees supplemented by large wood and shrub layer	DH reviewed - Cafferata
Kondolf et al. 1996	variable - width buffer system	Better protection of riparian-dependent organisms and of energy linkages between the land-water systems	report	Sierra Nevada	system based on community and energy area in combination with slope and other measurable risk factors	DH reviewed
Broderson 1973	60-80 meters or one site potential tree height	Maintain integrity of stream riparian ecosystem with processes such as sediment flow	report			DH, in Ledwith 1996
Beschta et al. 1993	60-80 meters or one site potential tree height	Processes such as sediment flow	report			DH, in Ledwith 1996
Thomas et al. 1993	60-80 meters or one site potential tree height	processes such as sediment flow	report			DH, in Ledwith 1996
Belt et al. 1992	60m-91m	50% sediment removal	Literature review			DH, in Christensen 2000
Cederholm 1974	38m	minimum to protect streambanks from erosion	Literature review			DH, in Christensen 2000
Dillaha et al. 1988	5m-9m	53-98% sediment removal	Literature review			DH, in Christensen 2000
Erman et al. 1977	30m	80% sediment removal	Literature review			DH, in Christensen 2000
Davies and Nelson 1994	30m		Literature review			DH, in Christensen 2000
Gilliam and Skaggs 1988	88m	50% sediment removal	Literature review			DH, in Christensen 2000
Karr and Schlosser 1977	30-38m	75% sediment removal	Literature review			DH, in Christensen 2000
Lowrance et al. 1986	39m-80m		Literature review			DH, in Christensen 2000
Lynch et al. 1985	30m	75-80% sediment removal in managed forests	Literature review			DH, in Christensen 2000
Magette et al. 1989	5m-9m	66-82% sediment removal	Literature review			DH, in Christensen 2000
Moring 1982	30m	90% sediment removal in logging areas	Literature review			DH, in Christensen 2000
Peterjohn and Correll 1984	19m-40m	90-94% sediment removal	Literature review			DH, in Christensen 2000
Raleigh et al. 1986	30m		Literature review			DH, in Christensen 2000
Terrell and Perfetti 1989	61m		Literature review			DH, in Christensen 2000
Vanderholm and Dickey 1978	91m - 262m	80% sediment removal depending on slope	Literature review			DH, in Christensen 2000
Wong and McCuen 1982	30m - 61m	90-95% sediment removal	Literature review			DH, in Christensen 2000
Young et al. 1980	21m - 27m	66 - 93% sediment removal	Literature review			DH, in Christensen 2000
Clinnick 1985	30m	effective width for intercepting sediment inputs			DH, in Kreutzweiser and Capell 2001	DH, in Kreutzweiser and Capell 2001

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National Marine Fisheries Service
Summary of Buffer Widths
Sediment-Streambank Stability

Author	Buffer Studied	Buffer Function	Reference Type	Location	Notes	Source
Kreutzweiser and Capell 2001	no buffers necessary	reducing sediment inputs	peer	Ontario, Canada	study suggested buffer zones not necessary for selective harvesting in hardwood forests	DH reviewed- Cafferata

National Marine Fisheries Service
Summary of Buffer Widths
Nutrients-Macroinvertebrates

Author	Buffer Studied	Buffer Function	Reference Type	Location	Notes	Source
Erman et al. 1977	> 30 meters	Little to no effect on stream macroinvertebrates	Report from Dept. of Forestry, UC Berkeley	Northern California		DH reviewed - Cafferata
Newbold et al. 1980	> 30 meters	Little to no effect on stream macroinvertebrates	Peer	Northern California		DH reviewed - Cafferata
Hairston and Adams 1998	50-100 feet	16 conifers per 100 m or 48/1000ft, on average 51% of trees retained in RMA's could contribute LWD	Peer	Oregon		DH reviewed - Cafferata
FEMAT 1993	98.4 feet (0.5 SPTH)	Distance most organic litter originates				CA; JDSF EIR
Spence et al. 1996	LWD Buffer	Likely provides 199% of detrital input				
	0.75 SPTH	Full protection for litter inputs				
Straughan Environmental Services, Inc. 2003	75 feet wide on each side of the stream	Remove nitrogen from ground and surface water	Literature review			DH reviewed - Cafferata
Alliance for the Chesapeake Bay	75-100 feet on each side of the stream	Remove nitrogen from ground and surface water	Literature review			DH, in Straughan Environmental Services, Inc. 2003
Peterjohn and Correll 1984	50m	73-84% phosphorus reduction	Peer			DH, in Christensen 2000
Erman and Mahoney 1983	>30 meters	Width needed to adequately protect stream	Report from Dept. of Forestry, UC Berkeley	Northern California	Study sites occurred in selectively logged, clear cut and unlogged sites	DH reviewed - Cafferata
Chesapeake Bay Program, and US EPA	recommends the 3-zone buffer system: Zone 1 should be undisturbed; Zone 2 is managed; and Zone 3 is the outer edge of grasses	Provide nutrient uptake stored in woody vegetation and through denitrification	Literature review		buffers provide leaf food for fish and aquatic organisms, when falling into streams; provide fish habitat	DH, in Straughan Environmental Services, Inc. 2003
	62 feet of forest buffer	removes 74.3% of nitrogen				
	76 feet of forest and grass	removes 75.3% nitrogen				
	95 feet of forest and grass	removes 80.1% of nitrogen				
Castelle et al.						DH, in Straughan Environmental Services, Inc. 2003
	<30 foot VFS		Literature review			DH, in Straughan Environmental Services, Inc. 2003
Fennessy et al.	30 meters	removes nearly 100% of nitrate	Literature review			DH, in Straughan Environmental Services, Inc. 2003
Jacobs and Gilliam 1985	16 m	minimum for nitrogen removal	Literature review			DH, in Christensen 2000
Hubbard and Lowrance 1992	7m	nitrogen uptake	Literature review			DH, in Christensen 2000
Lowrance 1992	50m - 60m	94% nitrogen reduction	Literature review			DH, in Christensen 2000
Osborne and Kovacic 1993	16m	96% nitrogen reduction	Literature review			DH, in Christensen 2000
Xu et al. 1992	10m	95% nitrogen reduction	Literature review			DH, in Christensen 2000
Dillaha et al. 1988	5m - 9m	54-84% nitrogen and phosphorus reduction	Literature review			DH, in Christensen 2000

National Marine Fisheries Service
Summary of Buffer Widths
Nutrients-Macroinvertebrates

Author	Buffer Studied	Buffer Function	Reference Type	Location	Notes	Source
Shisler et al. 1987	19m	80-90% nitrogen and phosphorus reduction	Literature review			DH, in Christensen 2000
Magette et al. 1989	5m-9m	41-53% phosphorus reduction	Literature review			DH, in Christensen 2000
Mander et al. 1997	20m-28m	67-81% phosphorus reduction	Literature review			DH, in Christensen 2000
Petersen et al. 1992	10m	minimum for phosphorus removal	Literature review			DH, in Christensen 2000
Vought et al. 1994	8m-16 m	66-95% phosphorus reduction	Literature review			DH, in Christensen 2000
Schultz et al. 1995	20m	nutrient removal	Literature review			DH, in Christensen 2000
Young et al. 1980	36m	nutrient removal	Literature review			DH, in Christensen 2000
Terrell and Perfetti 1989	30m - 183m	range for vegetation	Literature review			DH, in Christensen 2000
	canopied vs non canopied stream sections (no widths reported)		Report	Oregon	the presence or absence of riparian canopy did not appear to be a major concern regarding the amount of fish food available	DH reviewed- Cafferata

National Marine Fisheries Service
Summary of Buffer Widths
Shade-Temperature-Microclimate

Author	Buffer Studied	Buffer Function	Reference type	Location	Notes	Source
ManTech	0.75 site potential tree height	100% of stream shading, litter inputs and nutrient regulation				
James 2001	15 meters into buffer from clearcut	Edge effect				
Brazier and Brown 1973	22-30 meters (72-100 feet EIR)	Angular canopy densities at 80-90%	Peer	Southern Cascades and Oregon Coast		CA; JDSF EIR
Steinblums et al. 1984	38 meters (125 feet EIR)	ACD of 100% shading		Western Cascades		CA: JDSF EIR
Murphy 1995	30 meters (100 Feet)	Adequate Shade	Lit Review?; Peer			CA: JDSF EIR
Johnson and Ryba 1992	30 meters	Adequate Shade	Peer, Lit Review?			CA: JDSF EIR
Beschta et al. 1987	30 meters	Shade as that of an old growth stand				CA
		Rate of recovery depends on streamside conditions, vegetation and stream size				CA; JDSF EIR
	<100 feet or Selectively Logged	Species composition, stand age, vegetation density important				CA; JDSF EIR
	100 Feet	100% ACD in Old Growth				CA; JDSF EIR
FEMAT 1993	0.75 - 1 SPTH	100% effective shade				
CH2MHill and Western Watershed Analysts 1999	0.5 SPTH (125 feet)	80% cumulative riparian shade effectiveness	Review of FEMAT			CA; JDSF EIR
Lynch et al. 1985	25-30 meters	Maintain water temperatures				
Welch et al. 1998	25-30 meters	Maintain water temperatures				
Johnson 1984	30 meters (find paper)					
Ledwith 1996	30 meters; 100 feet (find paper)	Avoid significant alterations in microclimate				
Sedell et al 1993	0.7 tree heights	achieves maximal levels of shading				
	Riparian Microclimate					
Brosofske et al. 1997	30-60 meters	Avoid effects on microclimate on streams 6-12 feet in width		western Oregon		CA; JDSF EIR
Brosofske et al. 1997	45 meters	eliminate most of the edge effects on riparian microclimate gradients		western Oregon		CA; JDSF EIR
Chen 1991	575 Feet (from Clearcut)	Achieve conditions for humidity found in interior old growth				CA; JDSF EIR
Chen et al. 1993	575 Feet (from Clearcut)	Achieve conditions for humidity found in interior old growth				CA; JDSF EIR

National Marine Fisheries Service
Summary of Buffer Widths
Shade-Temperature-Microclimate

Author	Buffer Studied	Buffer Function	Reference type	Location	Notes	Source
James 2003	40 Feet (from clearcut)	No discernible impact on microclimate		Sierra Nevada		
	40 Feet (from clearcut)	Average/Maximum daily air temperature within riparian zone increased up to 0.5C				
Spence et al. 1996	0.75 SPTH	Fully protect stream shading				
Nakamoto 1998 (NEED)				NF Caspar		
Bartholow 2000 (NEED)		Stream shade 40%; stream width also important				
Hughes et al. 2004 (NEED)		Microclimate		JDSF		
Washington Forest Practices Board	75 feet of the bankfull width or channel migration zone of the stream	provide adequate shade for streams	board manual	Eastern Washington Bull Trout Overlay		DH reviewed- Cafferata
NMFS and USFWS 1997	Average of at least 85 percent overstory tree canopy closure	maintain targeted temperature regimes	industry report	Northern California	recommend increasing to greater than 90 percent where temperature regimes do not meet the criteria for "properly functioning."	DH reviewed- Cafferata
Osborne and Kovacic 1993	10-30 meters	maintain effectively stream temperatures	peer	North America		DH reviewed- Cafferata
Brazier and Brown 1973	80 feet	provide maximum shade to stream	peer	Oregon mountain stream	buffers next to clear cuts, authors suggest using canopy densities as a factor in considering buffer widths	DH reviewed- Cafferata
	100-200 feet	provide maximum shade to stream	peer	Oregon mountain stream	buffers next to clear cuts	DH reviewed- Cafferata
Ledwith 1996	>30 meters	avoid significantly altering the microclimate of a riparian zone	report from hydrologist	Six Rivers National Forest, CA	study sites next to recent clear-cut slopes	DH reviewed- Cafferata
Geldert 2005	100 - 125 feet	effective shading of channel	report from Ca Dept of Forestry			DH reviewed- Cafferata
Chan et al. 2004	25 meters	relative humidity begins to stabilize at this distance from stream		Western Oregon	douglas fir and western hemlock forests 40-70 years old	DH reviewed
Belt and O'Laughlin 1994	variable by slope and stream class (50 to 200 ft)	moderating stream temperature	peer	California	Buffer strip requirements in forest practices act in Class 1 and 2 streams	DH reviewed- Cafferata

National Marine Fisheries Service
Summary of Buffer Widths
LWD

Author	Buffer Studied	Buffer Function	Reference Type	Location	Notes	Source
Bilby and Bisson 1998	20-50 meters	70% - 90% of LWD recruitment				
Cederholm 1994	30-60 meters; 100-200 feet	Maintain natural levels of recruitment	Peer, Literature Review			
Hedrick et al. 1998	remove sections of deciduous riparian vegetation	increase periphyton biomass production, which increases number of aquatic invertebrates	Peer	Alaska	potential to increase number of fish	DH reviewed- Cafferata
ManTech 1996	One-site potential tree height	100% of LWD recruitment				
McDade et al. 1990	55 meters (one site-potential tree height)			Oregon and Washington		CA
	33 feet	50% LWD recruitment		Oregon and Washington		CA;JDSF EIR
	75 feet	85% LWD recruitment		Oregon and Washington		CA;JDSF EIR
	154 feet	100% LWD recruitment		Oregon and Washington		CA;JDSF EIR
	89 feet	90% LWD recruitment		Oregon and Washington		CA;JDSF EIR
Murphy and Koski 1989	30 meters	99% of LWD recruitment	Peer	Southeastern Alaska	Study sites were located in old-growth forests of Western hemlock and Sitka spruce	DH reviewed-Cafferata
O'Connor and Ziemer	> 30 meters	90% of LWD recruitment				
Reid and Hilton 1998	One-tree-height width	96% of LWD recruitment		NF Caspar, Mendocino Co	Blowdown/MassFailures	CA;JDSF EIR
	4-5 tree heights' width	Input zones for rates similar to undisturbed forests				
	35 meters	90% LWD recruitment (where forests have not been re-entered for logging)				
	50 meters	90% LWD recruitment (where forests have been clear-cut and forest buffers left)				
	20-50 meters	70% - 90% of LWD recruitment				
	20-50 meters	70% - 90% of LWD recruitment				
	20-50 meters	70% - 90% of LWD recruitment				
Van Sickle and Gregory 1990	1 SPTH	LWD beyond seldom reaches channel			Model	CA;JDSF EIR
Robison and Beschta 1990	1 SPTH	LWD beyond seldom reaches channel			Model	CA;JDSF EIR
Spence et al. 1996	1 SPTH	100% natural levels of recruitment of LWD	Literature Review			CA; JDSF EIR
Bisson et al. 1987	>12" DBH/39Ft Length Streams >66Ft Wide	Size of key piece				CA;JDSF EIR
Benda et al. 2002	20-40 meters	Wood recruitment		Humboldt County	Absence of landsliding; Old growth	CA;JDSF EIR
		18% Bank Erosion		Van Duzen River	Second growth	CA;JDSF EIR
		21% Mortality		Van Duzen River	Second growth	CA;JDSF EIR
		13% Landsliding		Van Duzen River	Second growth	CA;JDSF EIR
		50% Anthropogenic		Van Duzen River	Second growth	CA;JDSF EIR
	10 meters	90% wood recruitment			Second growth	CA;JDSF EIR
	15 meters (50 Feet)	90% prediction of wood recruitment	Theoretical Prediction Curve		Absent Landsliding	CA;JDSF EIR
	60 meters (200 Feet)		Theoretical Prediction Curve		Landsliding	CA;JDSF EIR
Benda 2004	14 meters (46 Feet)	90% wood recruitment		Ten Mile	Bank erosion; Streamside Landsliding	CA;JDSF EIR
	8 meters (26 Feet)	90% wood recruitment		Noyo River	Bank erosion; Streamside Landsliding	CA;JDSF EIR
Lienkaemper and Swanson 1987	20-30 meters	Zone of large wood input to ensure future supplies of large wood	Literature review			DH, in Lassettre and Harris 2001

National Marine Fisheries Service
Summary of Buffer Widths
LWD

Author	Buffer Studied	Buffer Function	Reference Type	Location	Notes	Source
Lassettre and Harris 2001	20-30 meters	Zone of large wood input to ensure future supplies of large wood	peer			DH reviewed
Geldert 2005	20-40 meters	where most large wood recruitment to stream occurs	report from Ca Dept of Forestry		from laterally stable channel banks	DH reviewed- Cafferata
Benda 2003	within 45 feet	recruitment of 90% of wood			in second growth forests and non-landslide areas	DH, in Geldert 2005, Cafferata
	within 200 feet	recruitment of 90% of wood			in second growth forests and landslide areas	DH, in Geldert 2005, Cafferata
Erman et al. 1977	<30 meters	avoid significantly impacting riparian environments	report			DH, in Ledwith 1996
Steinblums 1977	<30 meters	avoid significantly impacting riparian environments				DH, in Ledwith 1996
Rudolph and Dickson 1990	<30 meters	avoid significantly impacting riparian environments				DH, in Ledwith 1996
Chen 1991	<30 meters	avoid significantly impacting riparian environments				DH, in Ledwith 1996
Spackman and Hughes 1994	<30 meters	avoid significantly impacting riparian environments				DH, in Ledwith 1996
Broderson 1973	60-80 meters or one site potential tree height	delivery of LWD	report			DH, in Ledwith 1996
Beschta et al 1993	60-80 meters or one site potential tree height	delivery of LWD	report			DH, in Ledwith 1996
Thomas et al. 1993	60-80 meters or one site potential tree height	delivery of LWD	report			DH, in Ledwith 1996
O'Laughlin and Belt 1994	one site-potential tree height	provide maximum amounts of LWD	peer	Western U.S.		DH reviewed, Cafferata
						DH reviewed-Cafferata

National Marine Fisheries Service
Summary of Buffer Widths
General Environmental Variables

Author	Buffer Studied	Buffer Function	Reference Type	Location	Notes	Source
Budd et al. 1987	15 m	protection of anadromous fish in King County, temperature, habitat, erosion control and food supply	peer	Washington		DH-Cafferata
Ligon et al. 1999	75 feet	Protection of riparian habitat	Report	California	slope class<30% for Class 1 streams	DH reviewed- Cafferata
	100 feet				slope class 30-50% for Class 1 streams	
	150 feet				slope class >50% for Class 1 streams	

Source of flooding and location	# Depth in feet above ground. *Elevation in feet (NGVD).
Maps are available for inspection at the Mineral County Courthouse, Clerk and Treasurer's Office, Corner of 1st and A Street, Hawthorne, Nevada.	
OKLAHOMA	
Roger Mills County and Incorporated Areas (FEMA Docket No. 7306)	
White Shield Creek Tributary "B":	
At its confluence with White Shield Creek	*1,737
Approximately 150 feet upstream of Steele Street	*1,778
White Shield Creek:	
At State Route 34	*1,702
Approximately 50 feet upstream from Steele Street	*1,754
Memorial Park Tributary:	
At its confluence with Sergeant Major Creek	*1,938
Approximately 884 feet upstream from U.S. Highway 283 (Main Street)	*1,977
Dry Creek:	
At its confluence with Sergeant Major Creek	*1,941
Approximately 8,400 feet upstream of confluence with Sergeant Major Creek	*1,985
Sergeant Major Creek:	
At its confluence with Washita River	*1,923
Approximately 8,600 feet upstream from confluence with Dry Creek	*1,974
Washita River:	
At State Route 34	*1,703
Approximately 16,800 feet upstream from its confluence with Sergeant Major Creek	*1,949
Maps are available for inspection at the County Courthouse, Llmales and Broadway Avenue, Cheyenne, Oklahoma.	
Maps are available for inspection at City Hall, 714 Main Street, Hammon, Oklahoma.	
Maps are available for inspection at City Hall, 317 N. Broadway, Cheyenne, Oklahoma.	
OREGON	
Clackamas County (Unincorporated Areas) (FEMA Docket No. 7302)	
Tickle Creek:	
Approximately 2,600 feet downstream of Southeast 362nd Avenue	*672
Approximately 2,350 feet upstream of Southeast 395th Avenue	*1,011
Maps are available for inspection at the Clackamas County Department of Transportation and Development, 902 Abernathy Road, Oregon City, Oregon.	
Sandy (City), Clackamas County (FEMA Docket No. 7302)	
Tickle Creek:	
Approximately 1,980 feet downstream of 362nd Avenue	*684
Approximately 1,620 feet upstream of Highway 211	*946
Maps are available for inspection at the Planning and Development Department, 39250 Pioneer Boulevard, Sandy, Oregon.	
TEXAS	
Kerr County and Incorporated Areas (FEMA Docket No. 7278)	
Stream TC–1:	
Approximately 2,300 feet downstream of Interstate Highway 10	*1,662
Just upstream of Interstate Highway 10	*1,718
Stream QC–2:	
Just downstream of State Highway 16	*1,706
Just upstream of Interstate Highway 10	*1,761
Stream QC–1:	
Just upstream of Leslie Road	*1,688
Approximately 200 feet upstream of Interstate Highway 10	*1,801
Quinlan Creek:	
Just upstream of State Highway 27	*1,606
Approximately 900 feet upstream of Interstate Highway 10	*1,719
Town Creek:	
Just upstream of State Highway 27	*1,624
Approximately 200 feet downstream of Schreiner Road	*1,630
Approximately 900 feet upstream of Interstate Highway 10	*1,689
Elm Creek:	
Approximately 600 feet upstream of Goat Creek Road	*1,649
Approximately 800 feet upstream of Laurel Wood Drive	*1,764
Camp Meeting Creek:	
Approximately 500 feet downstream of Preston Trail	*1,592
Approximately 2,100 feet upstream of Southway Drive	*1,699
Maps are available for inspection at the Upper Guadalupe River Authority, 125 Lehmann Drive, Kerrville, Texas.	
Maps are available for inspection at the City of Kerrville, 800 Junction Highway, Kerrville, Texas.	
WASHINGTON	
Clark County (Unincorporated Areas) (FEMA Docket No. 7250)	
East Fork Lewis River:	
Approximately 17,000 feet downstream of Daybreak Road	*32
Approximately 400 feet downstream of Daybreak Road	*75
Maps are available for inspection at the Clark County Department of Community Development, Development Services Division, Office of Engineering Review, 1408 Franklin Street, Vancouver, Washington.	

(Catalog of Federal Domestic Assistance No. 83.100, "Flood Insurance.")

Dated: May 17, 2000.

Michael J. Armstrong,

Associate Director for Mitigation.

[FR Doc. 00 14293 Filed 6 6 00; 8:45 am]

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DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

50 CFR Part 223

[Docket No. 000202022–0156–02; I.D. 012100F]

RIN 0648–AN58

Endangered and Threatened Species: Threatened Status for One Steelhead Evolutionarily Significant Unit (ESU) in California

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Final rule.

SUMMARY: Following completion of a comprehensive status review of west coast steelhead (*Oncorhynchus mykiss*, or *O. mykiss*) populations throughout Washington, Oregon, Idaho, and California, NMFS published a proposed rule to list 10 ESUs as threatened or endangered under the Endangered Species Act (ESA) on August 9, 1996. One of these steelhead ESUs, the Northern California ESU, was proposed for listing as a threatened species. Because of scientific disagreements, NMFS deferred its final listing

determination for five of these steelhead ESUs, including the Northern California ESU, on August 18, 1997. After soliciting and reviewing additional information to resolve these disagreements, NMFS published a final determination in March 1998 that the Northern California ESU did not warrant listing under the ESA because available scientific information and conservation measures indicated the ESU was at a lower risk of extinction than at the time of the proposed rule. Because the State of California did not implement conservation measures that NMFS considered critically important in its decision to not list the Northern California steelhead ESU, NMFS completed an updated status review for the ESU and reassessed the State and Federal conservation measures that were in place to protect the ESU. Based on this reconsideration, NMFS proposed to list the Northern California steelhead ESU as a threatened species under the ESA on February 11, 2000.

After considering public comments on the proposed determination, NMFS now issues a final rule to list the Northern California ESU of steelhead as a threatened species. Within the Northern California ESU, only naturally spawned populations of steelhead (and their progeny) residing below naturally occurring and man-made impassable barriers (e.g., impassable waterfalls and dams) are listed. NMFS has examined the relationship between hatchery and natural populations of steelhead in this ESU and concludes hatchery populations are not essential for recovery; therefore, no hatchery populations are listed. At this time, NMFS is listing only the anadromous life forms of *O. mykiss* in this ESU. NMFS intends to designate critical habitat and promulgate protective regulations under section 4(d) of the ESA for this ESU in separate rulemakings.

DATES: Effective August 7, 2000.

ADDRESSES: Assistant Regional Administrator, Protected Resources Division, NMFS, Southwest Region, 401 West Ocean Blvd., Suite 4200, Long Beach, CA 90802 4213.

FOR FURTHER INFORMATION CONTACT: Craig Wingert, 562 980-4021, or Chris Mobley, 301 713 1401.

SUPPLEMENTARY INFORMATION:

Previous Federal ESA Actions Related to West Coast Steelhead

The history of petitions NMFS has received regarding west coast steelhead is summarized in a final rule and notice of determination for five steelhead ESUs (Lower Columbia River; Central Valley, California; Oregon Coast; Klamath Mountains Province; and northern California ESUs) that was published on March 19, 1998 (63 FR 13347). The most comprehensive petition was submitted by Oregon Natural Resources Council and 15 co-petitioners on February 16, 1994. In response to this petition, NMFS assessed the best available scientific and commercial data, including technical information from Pacific Salmon Biological Technical Committees (PSBTCs) and interested parties in Washington, Oregon, Idaho, and California, and convened a Biological Review Team (BRT), composed of staff from NMFS' Northwest and Southwest Fisheries Science Centers and Southwest Regional Office, as well as a representative of the U.S. Geological Survey Biological Resources Division (formerly the National Biological Service) to conduct a coast-wide status review for west coast steelhead (Busby *et al.*, 1996).

Based on the results of the BRT's status review, an analysis of Federal, State and local conservation measures, and other information which NMFS determined constituted the best scientific and commercial data available, NMFS published a proposed listing determination (61 FR 41541, August 9, 1996) that identified 15 ESUs of steelhead in the states of Washington, Oregon, Idaho, and California. Ten of these ESUs, including the northern California ESU, were proposed for listing as threatened or endangered species, four were found not warranted for listing, and one was identified as a candidate for listing.

On August 18, 1997, NMFS published a final rule listing five ESUs as threatened and endangered under the ESA (62 FR 43937). In a separate notice published on the same day, NMFS determined substantial scientific disagreement remained for five proposed ESUs, including the northern California steelhead ESU (62 FR 43974, August 18, 1997). In accordance with section 4(b)(6)(B)(i) of the ESA, NMFS deferred its decision on these five steelhead ESUs for 6 months for the purpose of soliciting additional data. During this 6-month period of deferral, NMFS received new scientific information regarding the status of these proposed steelhead ESUs. This new information was evaluated by NMFS' BRT which prepared both an updated status review for these five ESUs (Memorandum to William Stelle and William Hogarth from M. Schiewe, December 18, 1997, Status of Deferred and Candidate ESUs of West Coast Steelhead (NMFS, 1997a)), and a review of the associated hatchery populations (Memorandum to William Stelle and William Hogarth from Michael Schiewe, January 13, 1998, Status Review Update for Deferred ESUs of West Coast Steelhead: Hatchery Populations (NMFS, 1998a)).

Based on a review of the updated scientific information for these ESUs, as well as a review and evaluation of Federal, state, and local conservation measures reducing the threats to these ESUs, NMFS issued a final rule (63 FR 13347, March 19, 1998) listing two ESUs as threatened (Lower Columbia River and Central Valley California), and a notice of determination that three ESUs (Oregon Coast, Klamath Mountains Province, and Northern California) did not warrant listing. NMFS' determination that these three ESUs did not warrant listing was based on the best available scientific and commercial data which indicated these ESUs were at a lower risk of extinction than at the time of the proposed listing determination. Even though the risks confronting these ESUs had been reduced to a point at which listing was not warranted, NMFS still expressed concerns about the status of these three ESUs in the notice of determination, and, therefore, identified them as candidate species which the agency would continue to monitor.

NMFS's March 19, 1998 (63 FR 13347), decision not to list the Northern California steelhead ESU was based largely on a determination that sufficient Federal and state conservation measures were in place to reduce threats to the ESU such that the proposed threatened listing was unnecessary. The Federal and state conservation measures upon which NMFS based this determination included: (1) implementation of a March 11, 1998, Memorandum of Agreement (MOA) between NMFS and the State of California (NMFS/California MOA, 1998), with particular importance given to implementation of those provisions in the MOA which were intended to improve non-Federal forest land protections in the ESU (81 percent of land ownership is non-Federal land); (2) implementation of more restrictive in-river harvest regulations by California which were intended to reduce mortality and increase the viability of naturally reproducing steelhead populations; and (3) improved protections to habitat and naturally reproducing steelhead from expanded habitat protection and restoration efforts, improvements in the management of hatchery steelhead stocks, and expanded population monitoring.

At the time of its decision not to list the Northern California ESU, NMFS considered the protection and restoration of freshwater spawning, rearing, and migratory habitat on non-Federal lands to be essential for the long-term survival and recovery of this ESU because non-Federal lands represented such a large portion of the available habitat (63 FR 13347, March 19, 1998). Because of NMFS' concerns regarding the preponderance of private timber lands and timber harvest in the northern California ESU, the NMFS/California MOA contained several provisions calling for the review and revision of California's forest practice rules (FPRs), and a review of their implementation and enforcement by January 1, 2000. NMFS considered full implementation of these critical provisions within the specified time frame to be essential for achieving properly functioning habitat conditions for steelhead in this ESU.

In accordance with the NMFS/California MOA, a scientific review panel was established by the State to review the California FPRs, including their implementation and enforcement. The scientific review panel completed its review and provided the State's Board of Forestry (BOF) with its findings and recommendations in June 1999. In its findings, the review panel concluded that California's FPRs, including their implementation through the existing timber harvest plan process, do not ensure protection of anadromous salmonid habitat and populations. To address these shortcomings, and as specified in the NMFS/California MOA, the California Resources Agency and CalEPA jointly presented the BOF with a proposed rule change package in July 1999. Following several months of public review, the Board of Forestry took no action on the package in October 1999, thereby precluding any possibility of implementing improvements in California's FPRs by January 1, 2000, as the State committed to do in the NMFS/California MOA.

Although NMFS' March 19, 1998, decision not to list the northern California ESU concluded that improvements in steelhead harvest and hatchery management would provide immediate conservation benefits to this ESU, an essential component of the decision was based on NMFS' expectation that changes in the State's FPRs would be implemented by January 1, 2000. Because these critical conservation measures were not being implemented by the State of California, and therefore, were not reducing threats to this ESU that were anticipated at the time of its March 19, 1998, decision not to list the ESU, NMFS determined that a formal reconsideration of the status of this ESU was warranted (December 3, 1999, Memorandum from Rodney R. McInnis and William Stelle, Jr. to Penelope D. Dalton (NMFS, 1999)).

As part of this reconsideration, the Southwest Fisheries Science Center (SWFSC) completed an updated status review for the Northern California steelhead ESU in January, 2000 which concluded that its biological status had changed little since NMFS' steelhead BRT determined in December 1997 that the ESU was likely to become endangered in the foreseeable future. NMFS also conducted a re-evaluation of Federal and state conservation measures that were in place to protect this ESU, including the implementation and success of measures such as the NMFS/California MOA that were considered important factors in the original decision not to list the ESU. Based on the updated status review and re-assessment of conservation measures, NMFS concluded that the Northern California steelhead ESU was likely to become endangered in the foreseeable future, and therefore, proposed to list the ESU as a threatened species under the ESA on February 11, 2000 (65 FR 6960).

Steelhead Life History and Background

Biological information for west coast steelhead (*Oncorhynchus mykiss*) and the northern California ESU in particular can be found in steelhead status assessments conducted by NMFS (Busby *et al.*, 1996; NMFS, 1997a; NMFS, 2000) and in previous **Federal Register** documents (61 FR 41541, August 9, 1996; 63 FR 13347, March 19, 1998; 65 FR 6960, February 11, 2000). A summary of steelhead life history follows.

O. mykiss exhibits one of the most complex suites of life history traits of any salmonid species. Individuals may exhibit anadromy (meaning they migrate as juveniles from fresh water to the ocean, and then return to spawn in fresh water) or freshwater residency (meaning they reside their entire life in fresh water). Resident forms are usually referred to as "rainbow" or "redband" trout, while anadromous life forms are termed "steelhead." Few detailed studies have been conducted regarding the relationship between resident and anadromous *O. mykiss* and as a result, the relationship between these two life forms is poorly understood. The scientific name for the biological species that includes both steelhead and rainbow trout has been changed from *Salmo gairdneri* to *O. mykiss*. This change reflects the premise that all trouts from western North America share a common lineage with Pacific salmon.

Steelhead typically migrate to marine waters after spending 2 years in fresh water. They then reside in marine waters for typically 2 or 3 years prior to returning to their natal stream to spawn as 4- or 5-year-olds. Unlike other Pacific salmon, steelhead are iteroparous, meaning they are capable of spawning more than once before they die. However, it is rare for steelhead to spawn more than twice before dying; most that do so are females. Steelhead adults typically spawn between December and June (Bell, 1990; Busby *et al.*, 1996). Depending on water temperature, steelhead eggs may incubate in "redds" (nesting gravels) for 1.5 to 4 months before hatching as "alevins" (a larval life stage dependent on food stored in a yolk sac). Following yolk sac absorption, young juveniles or "fry" emerge from the gravel and begin actively feeding. Juveniles rear in fresh water from 1 to 4 years, then migrate to the ocean as "smolts."

Biologically, steelhead can be divided into two reproductive ecotypes, based on their state of sexual maturity at the time of river entry and the duration of their spawning migration. These two ecotypes are termed "stream maturing" and "ocean maturing." Stream maturing steelhead enter fresh water in a sexually immature condition and require several months to mature and spawn. Ocean maturing steelhead enter fresh water with well developed gonads and spawn shortly after river entry. These two reproductive ecotypes are more commonly referred to by their season of freshwater entry (i.e., summer [stream maturing] and winter steelhead [ocean maturing]). The Northern California ESU contains populations of both winter and summer steelhead.

Two major genetic groups or "subspecies" of steelhead occur on the west coast of the United States: a coastal group and an inland group, separated in the Fraser and Columbia River Basins approximately by the Cascade crest (Huzyk & Tsuyuki, 1974; Allendorf, 1975; Utter & Allendorf, 1977; Okazaki, 1984; Parkinson, 1984; Schreck *et al.*, 1986; Reisenbichler *et al.*, 1992). Behnke (1992) proposed classifying the coastal subspecies as *O. m. irideus* and the inland subspecies as *O. m. gairdneri*. These genetic groupings apply to both anadromous and nonanadromous forms of *O. mykiss*. Both coastal and inland steelhead occur in Washington and Oregon. California is thought to have only coastal steelhead while Idaho has only inland steelhead. The northern

California steelhead ESU is part of the coastal grouping.

Historically, steelhead were distributed throughout the North Pacific Ocean from the Kamchatka Peninsula in Asia to the northern Baja Peninsula. Presently, the species distribution extends from the Kamchatka Peninsula, east and south along the Pacific coast of North America, to at least Malibu Creek in southern California. There are infrequent anecdotal reports of steelhead occurring as far south as the Santa Margarita River in San Diego County (McEwan & Jackson, 1996). In 1999, juvenile *O. mykiss* suspected of being the progeny of steelhead were reported from San Mateo Creek which is in northernmost San Diego County, just north of the Santa Margarita River. Historically, steelhead likely inhabited most coastal streams in Washington, Oregon, and California as well as many inland streams in these states and Idaho. However, during this century, over 23 indigenous, naturally reproducing stocks of steelhead are believed to have been extirpated, and many more are thought to be in decline in numerous coastal and inland streams in Washington, Oregon, Idaho, and California. Forty-three stocks have been identified by Nehlsen *et al.* (1991) as being at moderate or high risk of extinction.

Summary of Comments Received in Response to the Proposed Rule

Following NMFS proposal to list 10 steelhead ESUs in 1996, including the Northern California ESU (61 FR 41541), a total of 16 public hearings were held in California, Oregon, Idaho, and Washington to solicit comments on the proposed rule. During the 90-day public comment period, NMFS received nearly 1,000 written comments on the proposed rule from Federal, state, and local government agencies, Indian tribes, non-governmental organizations, the scientific community, and other individuals. A number of comments addressed specific technical issues pertaining to a particular geographic region or *O. mykiss* population. These technical comments were considered by NMFS' steelhead BRT in its re-evaluation of ESU definitions and status, including the Northern California steelhead ESU, and were discussed in the updated status review report (NMFS, 1997a).

During the 60-day public comment period that followed publication of the proposal to list this ESU (65 FR 6960), NMFS received numerous written comments and also held one public hearing in Eureka, California to solicit comments on the proposal. A total of 20 individuals presented testimony at this public hearing, with the majority expressing their opposition to the proposed listing. During the 60-day public comment period that followed publication of the proposed rule, NMFS received 44 written comments from Federal, state, and local government agencies, Indian tribes, non-governmental organizations, and other individuals. In contrast to the public hearing, the majority of written comments were supportive of the proposal. A number of comments addressed issues pertaining to the designation of critical habitat which was not proposed at the time of the listing proposal. Several commenters requested NMFS promulgate an ESA 4(d) rule that would allow continued catch and release angling opportunities in coastal streams occurring within the Northern California steelhead ESU. At least one commenter resubmitted comments that had originally been submitted to NMFS when this ESU was first proposed for listing in 1996.

A summary of comments received in response to the proposed rule follows.

Issue 1: Sufficiency and Accuracy of Scientific Information and Analysis

Comment 1: Some commenters questioned the sufficiency and accuracy of data NMFS employed in the listing proposal.

Response: Section 4(b)(1)(A) of the ESA requires that NMFS make its listing determinations solely on the basis of the best available scientific and commercial data, after reviewing the status of the species and taking into account any efforts being made to protect such species. NMFS believes that information contained in the agency's original status review (Busby *et al.*, 1996), together with more recent information (NMFS, 1997a; NMFS, 1998a; NMFS, 2000), represents the best scientific and commercial information presently available for the Northern California steelhead ESU addressed in this final rule. NMFS has made every effort to conduct an exhaustive review of all available information and has solicited information and opinion from all interested parties.

Comment 2: Some comments suggested that the ESA does not provide for the creation of ESUs and that ESUs do not correspond to species, subspecies, or distinct population segments (DPSs) that are specifically identified in the ESA. Further, NMFS' use of genetic information (allozyme- or DNA-derived information) to determine ESU boundaries was criticized. It was argued that allozyme-based electrophoretic data cannot be used to imply either evolutionary significance or local adaptation. Some commenters felt that information was lacking concerning a number of "key" criteria for defining the Northern California steelhead ESU, such as phenotypic differences, evolutionary significance, or ecological significance of various summer and winter steelhead populations. Commenters contended that NMFS did not find any life history, habitat, or phenotypic characteristics that were unique to any of the steelhead populations discussed.

Response: General issues relating to ESUs, Distinct Population Segments (DPSs), and the ESA have been discussed extensively in past **Federal Register** documents. Regarding application of its ESU policy, NMFS relies on its policy describing how it will apply the ESA definition of "species" to anadromous salmonid species published in 1991 (56 FR 58612, November 20, 1991). More recently, NMFS and the U.S. Fish and Wildlife Service published a joint policy, that is consistent with NMFS' policy, regarding the definition of "distinct population segments" (61 FR 4722, February 7, 1996). The earlier policy is more detailed and applies specifically to Pacific salmonids, and therefore, was used for this determination. This policy indicates that one or more naturally reproducing salmonid populations will be considered to be distinct and, hence, a species under the ESA, if they represent an ESU of the biological species. To be considered an ESU, a population must satisfy two criteria: (1) It must be reproductively isolated from other population units of the same species; and (2) it must represent an important component in the evolutionary legacy of the biological species. The first criterion, reproductive isolation, does not have to be absolute but must have been strong enough to permit evolutionarily important differences to occur in different population units. The second criterion is met if the population contributes substantially to the ecological or genetic diversity of the species as a whole. Guidance on applying this policy is contained in a NOAA Technical Memorandum entitled "Definition of 'Species' Under the Endangered Species Act: Application to Pacific Salmon" (Waples, 1991) and in a more recent scientific paper by Waples (1995).

NMFS identified all west coast steelhead ESUs including the Northern California ESU in the original steelhead status review, using the best available scientific and commercial information. As discussed in the original status review, genetic data were used primarily to evaluate the criterion

regarding reproductive isolation, not evolutionary significance. In some cases, there was a considerable degree of confidence in the ESU determinations. The west coast steelhead status review describes a variety of characteristics that support the ESU delineations for this species, including ecological and life history parameters.

Comment 3: Some commenters suggested that listing of the Klamath Mountains Province (KMP) steelhead ESU was also warranted based on the rationale NMFS provided for its decision to propose listing the Northern California steelhead ESU.

Response: NMFS' decision not to reconsider the KMP steelhead ESU for listing is based on the determination that there are sufficient Federal and state conservation measures in place to reduce the threats to the ESU such that listing is not warranted. The Federal and state conservation measures which NMFS bases this determination on include: (1) the large portion of Federal land ownership in the ESU (64 percent for the entire ESU and 80 percent in the California portion of the ESU) coupled with successful implementation of the Northwest Forest Plan on Federal lands which reduced habitat risks; (2) substantial changes to the management of recreational fisheries and artificial propagation programs by the states of Oregon and California which are reducing impacts to steelhead; and (3) general improvements to habitat conditions throughout the ESU resulting from state-wide conservation strategies and monitoring efforts in both Oregon and California. In California, these efforts include implementation of the California Department of Fish and Game's (DFG) strategic management plan for KMP steelhead ESU, the State's Watershed Protection Program which includes an ongoing habitat restoration program, and the NMFS/California MOA which assures implementation of steelhead angling regulation changes, changes in the management of hatchery steelhead programs, habitat protections on non-Federal land, and expanded steelhead monitoring. In Oregon, these efforts include the implementation of conservation measures contained in the Oregon Plan for Salmon and Watersheds.

Issue 2: Status Assessment for the Northern California Steelhead ESU

Comment 4: Some commenters suggested that risk assessments were made in an arbitrary manner and that NMFS did not rely on the best available science. Several commenters questioned NMFS' methodology for determining whether the Northern California steelhead ESU warranted listing. In some cases, such commenters also expressed opinions regarding whether listing was warranted.

Response: Throughout the status review for west coast steelhead and all subsequent updates, NMFS has solicited and evaluated the best available scientific and commercial data for the species. NMFS believes that these reviews, coupled with considerable input from the public, co-managers, peer reviewers, and other species experts, clearly demonstrate that its listing determinations are not arbitrary, but instead are based on an open and rigorous scientific assessment.

NMFS has identified a number of factors that should be considered in evaluating the level of risk faced by an ESU, including: (1) absolute numbers of fish and their spatial and temporal distribution; (2) current abundance in relation to historical abundance and current carrying capacity of the habitat; (3) trends in abundance; (4) natural and human-influenced factors that cause variability in survival and abundance; (5) possible threats to genetic integrity (e.g., from strays or outplants from hatchery programs); and (6) recent events (e.g., a drought or changes in harvest management) that have predictable short-term consequences for abundance of the ESU. These factors were considered by NMFS in the original 1996 status review and all subsequent updated reviews (NMFS, 1997a; NMFS, 2000) and served as the basis for agency determinations regarding the biological status of the Northern California steelhead ESU.

Issue 3: Factors Contributing to the Decline of Northern California Steelhead ESU

Comment 5: Some commenters identified factors for decline that were either not identified in the original or updated status reviews or which they believed were not given sufficient weight in the risk analysis. Other commenters contended that recent declines in Northern California steelhead abundance were related to natural factors such as predation and changes in ocean productivity. Furthermore, these commenters contend that NMFS did not show how the present declines were significantly different from natural variability in abundance, nor that abundances were below the current carrying capacity of the marine environment and freshwater habitat.

Response: The status review did not attempt to exhaustively identify factors for decline, except insofar as they contributed directly to the risk analysis. Nevertheless, NMFS agrees that a multitude of factors, past and present, have contributed to the decline of west coast steelhead. Many of the identified risk factors were specifically cited in NMFS' original west coast steelhead status review (Busby *et al.*, 1996) and subsequent listing notices (61 FR 41541; 63 FR 13347; 65 FR 6960). In addition, NMFS has prepared a report that summarizes the factors leading to the decline of steelhead on the west coast entitled: "Factors for Decline: A supplement to the notice of determination for west coast steelhead" (NMFS, 1996). This report concludes that all of the factors identified in section 4(a)(1) of the ESA have played a role in the decline of the species. The report identifies destruction and modification of habitat, overutilization for recreational purposes, and natural and human-made factors as being the primary causes for the decline of steelhead on the west coast. NMFS recognizes that natural environmental fluctuations have likely played a role in the species' recent declines as well. However, NMFS believes other human-induced impacts (e.g., harvest in certain fisheries, artificial propagation, and widespread habitat modification) have played an equally significant role in the decline of steelhead.

NMFS' 1996 status review briefly addressed the impact of adverse marine conditions and climate change, but concluded that there is considerable uncertainty regarding the role of these factors in steelhead abundance. At this time, we do not know whether these climate conditions represent a long-term shift in conditions that will continue into the future or short-term environmental fluctuations that can be expected to reverse soon (NMFS, 1996). A recent review by Hare *et al.* (1999) suggests that these conditions could be part of an alternating 20- to 30-year regime pattern. These authors concluded that although at-risk salmon stocks may benefit from a reversal in the current climate/ocean regime, fisheries management should continue to focus on reducing impacts from harvest and artificial propagation and improving freshwater and estuarine habitats.

NMFS believes there is ample evidence to suggest that the elimination and degradation of freshwater habitats have contributed to the decline of this steelhead ESU (NMFS, 1996). Many of the identified risks and conclusions apply specifically to Northern California steelhead populations. Examples of habitat alterations affecting steelhead include: water withdrawal, conveyance, storage, and flood control (resulting in insufficient flows, stranding, juvenile entrainment, and increased stream temperatures); and logging and

agriculture (resulting in loss of large woody debris, sedimentation, loss of riparian vegetation, and habitat simplification) (NMFS, 1996; Spence *et al.*, 1996; Busby *et al.*, 1996). These human-induced impacts in freshwater ecosystems have likely reduced the species' resiliency to natural factors for decline such as drought and poor ocean conditions. A critical next step in restoring listed steelhead will be identifying and ameliorating specific factors for decline at both the ESU and population level.

With respect to predation impacts on steelhead, NMFS has recently published reports describing the impacts of California sea lions and Pacific harbor seals upon salmonids and on the coastal ecosystems of Washington, Oregon, and California (NMFS, 1997 and 1999b). These reports conclude that in certain cases where pinniped populations co-occur with depressed salmonid populations, salmonid populations may experience severe impacts due to predation. An example of such a situation is at the Ballard Locks, Washington, where sea lions are known to consume significant numbers of adult winter steelhead. These reports further conclude that data regarding pinniped predation are quite limited and that substantial additional research is needed to fully address this issue. Existing information on the seriously depressed status of many salmonid stocks may be sufficient to warrant actions to remove pinnipeds in areas of co-occurrence where pinnipeds prey on depressed salmonid populations (NMFS, 1997 and 1999b).

Issue 4: Consideration of Existing Conservation Measures

Comment 6: Some commenters expressed concerns about NMFS' reliance and characterization of the efficacy of the Northwest Forest Plan (NFP), citing significant differences in management practices between various Federal land management agencies. Numerous commenters noted that an array of state and Federal conservation measures were underway for this and other species (particularly in northern California) and asked that NMFS give them more consideration in its listing determination.

Response: In the listing proposal, NMFS noted that the NFP requires specific management actions on Federal lands, including actions in key watersheds in southern Oregon and northern California that comply with special standards and guidelines designed to preserve their refugia functions for at-risk salmonids (i.e., watershed analysis must be completed prior to timber harvests and other management actions, road miles should be reduced, no new roads can be built in roadless areas, and restoration activities are prioritized). In addition, the most significant element of the NFP for anadromous fish is its Aquatic Conservation Strategy (ACS), a regional-scale aquatic ecosystem conservation strategy that includes: (1) special land allocations (such as key watersheds, riparian reserves, and late-successional reserves) to provide aquatic habitat refugia; (2) special requirements for project planning and design in the form of standards and guidelines; and (3) new watershed analysis, watershed restoration, and monitoring processes. These ACS components collectively ensure that Federal land management actions achieve a set of nine ACS objectives that strive to maintain and restore ecosystem health at watershed and landscape scales, to protect habitat for fish and other riparian-dependent species and to restore currently degraded habitats. NMFS will continue to support the NFP strategy and address Federal land management issues via ESA section 7 consultations.

Additional consideration was given to various conservation efforts in California that have been implemented or are expected to be initiated. See "Efforts Being Made to Protect West Coast steelhead" later in this document.

Comment 7: Several commenters expressed their belief that current California Forest Practice Rules (FPR's) were adequate to protect the Northern California steelhead ESU. Several comments expressed concern that NMFS did not adequately review and consider the interim FPR changes adopted by the California Board of Forestry (BOF) for anadromous salmonids in March 2000.

Response: NMFS disagrees with the assertion that the state's FPRs as currently implemented are adequate to protect anadromous salmonids in California. NMFS has reviewed the State FPRs, including those interim changes recently adopted by the Board of Foresty and concludes that they do not adequately protect anadromous salmonids, including steelhead, or provide for properly functioning habitat conditions. In fact, the deleterious impacts of timber harvest and other activities have resulted in recent listings by the Environmental Protection Agency of many north coast California streams as sediment and/or temperature impaired under Section 303(d) of the Clean Water Act.

NMFS' March 19, 1998 (63 FR 13347), decision not to list the Northern California steelhead ESU was based largely on a determination that sufficient Federal and state conservation measures were in place to reduce threats to the ESU such that the proposed threatened listing was unnecessary. The Federal and state conservation measures upon which NMFS based this determination included the implementation of a March 11, 1998, Memorandum of Agreement (MOA) between NMFS and the State of California (NMFS/California MOA, 1998), with particular importance given to implementation of those provisions in the MOA which were intended to improve non-Federal forest land protections in the ESU. At the time of NMFS' decision not to list the Northern California ESU in 1998, NMFS considered the protection and restoration of freshwater spawning, rearing, and migratory habitat on non-Federal lands to be essential for the long-term survival and recovery of this ESU because non-Federal lands represented such a large portion (81 percent) of the available habitat (63 FR 13347, March 19, 1998; 65 FR 6960, February 11, 2000). Because of NMFS' concerns regarding the preponderance of private timber lands and timber harvest in the northern California ESU, the NMFS/California MOA contained several provisions calling for the review and revision of California's FPRs, and a review of their implementation and enforcement by January 1, 2000. NMFS considered full implementation of these critical provisions within the specified time frame to be essential for achieving properly functioning habitat conditions for steelhead in this ESU. In accordance with the NMFS/California MOA, a scientific review panel was established by the state to review the California FPRs, including their implementation and enforcement. The scientific review panel completed its review and provided the state's Board of Forestry with its findings and recommendations in June 1999. In its findings, the review panel concluded that California's FPRs, including their implementation through the existing timber harvest plan process, do not ensure protection of anadromous salmonid habitat and populations. To address these shortcomings, and as specified in the NMFS/California MOA, the California Resources Agency and CalEPA jointly presented the Board of Forestry with a proposed rule change package in July 1999. Following several months of public review, the Board of Forestry took no action on the package in October 1999, thereby precluding any possibility of implementing improvements in California's FPRs by January 1, 2000, as the State committed to do in the NMFS/California MOA.

The California State Legislature, purusant to Senate Bill 621, gave special authority to BOF to adopt new rules twice during the year 2000 for the specific purpose of revising the State's FPRs to meet ESA requirements for salmonids. Following its decision to take no action in October 1999, BOF continued working on revisions to the state's FPRs through March 2000. During this period, NMFS and other groups strongly urged BOF to adopt the entire FPR package as a necessary first step for protecting anadromous salmonid habitat. On March 14, 2000, (the deadline for the Board of Forestry to exercise its authority under SB 621), the Board only adopted a subset of rule changes from the package. These rule changes only apply to those harvest plans approved between July 1, 2000, and December 31, 2000. NMFS has reviewed these recently adopted rule changes and has determined that they are inadequate to protect anadromous salmonids or provide for properly functioning habitat conditions. This position is supported by the scientific review panel report of June 1999. For a more detailed discussion on the adequacy of California's FPRs, including the recently proposed interim FPRs changes, see "Inadequacy of Existing Regulatory Mechanisms, Land Management" later in this document.

Comment 8: Several commenters argued that NMFS had not considered existing conservation programs designed to enhance steelhead stocks within the northern California ESU.

Response: NMFS has reviewed existing conservation efforts relevant to the Northern California steelhead ESU and concludes that existing conservation efforts in these areas are not sufficient to preclude listing of the ESU at this time. Several of the plans addressed in comments show promise for ameliorating the risks facing steelhead. However, in most cases, measures described in comments have not been implemented or are in their early stages of implementation and have not yet demonstrated success. Some of these measures are also geographically limited to individual river basins or political subdivisions, thereby improving conditions for only a small portion of the entire ESU.

While existing conservation plans are unable to preclude the need for listing at this time, they are nevertheless valuable for improving watershed health and restoring fishery resources. In those cases where well-developed, reliable conservation plans exist, NMFS may choose to incorporate them into the recovery planning process. In the case of threatened species, NMFS also has flexibility under ESA section 4(d) to tailor section 9 take regulations based on the contents of available conservation measures. NMFS fully intends to recognize local conservation efforts to the fullest extent possible.

Issue 5: Steelhead Biology and Ecology

Comment 9: Some commenters believe that resident rainbow trout should be included in the Northern California steelhead ESU if it is listed. Several commenters also stated that NMFS should address how the presence of rainbow trout populations may ameliorate risks facing anadromous populations within listed ESUs.

Response: In its August 9, 1996, listing proposal, NMFS stated that based on available genetic information, it was the consensus of NMFS scientists, as well as regional fishery biologists, that resident fish should generally be considered part of the steelhead ESUs, but also concluded that available data were inconclusive regarding the relationship of resident rainbow trout and steelhead. NMFS requested additional data in the proposed rule to clarify this relationship and determine if resident rainbow trout should be included in listed steelhead ESUs.

In response to this request for additional information, many groups and individuals expressed opinions regarding this issue. In most cases these opinions were not supported by new information that resolves existing uncertainty. Two state fishery management agencies (CDFG and WDFW) and one peer reviewer provided comments and information supporting the inclusion of resident rainbow trout in listed steelhead ESUs. In general, these parties also felt that rainbow trout may serve as an important reservoir of genetic material for at-risk steelhead stocks.

While conclusive evidence does not yet exist regarding the relationship of resident and anadromous *O. mykiss*, NMFS believes available evidence suggests that resident rainbow trout should be included in listed steelhead ESUs in certain cases. Such cases include: (1) where resident *O. mykiss* have the opportunity to interbreed with anadromous fish below natural or man-made barriers; or (2) where resident fish of native lineage once had the ability to interbreed with anadromous fish but no longer do because they are currently above human-made barriers, and they are considered essential for recovery of the ESU. Resident fish above long-standing natural barriers, and those that are derived from the introduction of non-native rainbow trout, would not be considered part of any ESU.

NMFS believes resident fish can help buffer extinction risks to an anadromous population by mitigating depensatory effects in spawning populations, by providing offspring that migrate to the ocean and enter the breeding population of steelhead, and by providing a "reserve" gene pool in freshwater that may persist through times of unfavorable conditions for anadromous fish. In spite of these potential benefits, presence of resident populations is not a substitute for conservation of anadromous populations. A particular concern is isolation of resident populations by human-caused barriers to migration. This interrupts normal population dynamics and population genetic processes and can lead to loss of a genetically based trait (anadromy). As discussed in NMFS' "species identification" paper (Waples, 1991), the potential loss of anadromy in distinct population segments may in and of itself warrant listing the species as a whole.

FWS and NMFS adopted a joint policy to clarify their interpretation of the phrase "distinct population segment (DPS) of any species of vertebrate fish or wildlife" for the purposes of listing, delisting, and reclassifying species under the ESA (61 FR 4722). DPSs are "species" pursuant to section 3(15) of the ESA. Previously, NMFS had developed a policy for stocks of Pacific salmon where an ESU of a biological species is considered "distinct" (and hence a species) if (1) it is substantially reproductively isolated from other conspecific population units, and (2) it represents an important component in the evolutionary legacy of the species (November 20, 1991, 56 FR 58612). NMFS believes available data suggest that resident rainbow trout are in many cases part of steelhead ESUs. However, the FWS, which has ESA authority for resident fish, maintains that behavioral forms can be regarded as separate DPSs and that absent evidence suggesting resident rainbow trout need ESA protection, the FWS concludes that only the anadromous forms of each ESU should be listed under the ESA (DOI, 1997; FWS, 1997).

Comment 10: Commenters and some peer reviewers questioned NMFS' inclusion of both summer- and winter-run steelhead in the same ESU. These commenters suggested that summer- and winter-run steelhead be segregated into individual ESUs based on life history differences.

Response: While NMFS considers both life history forms (summer- and winter-run steelhead) to be important components of diversity within the species, new genetic data reinforce

previous conclusions that, within a geographic area, summer- and winter-run steelhead typically are more genetically similar to one another than either is to populations with similar run timing in different geographic areas. This indicates that an ESU that included summer-run populations from different geographic areas but excluded winter-run populations (or vice-versa) would be an inappropriate unit. The only biologically meaningful way to have summer- and winter-run steelhead populations in separate ESUs would be to have a very large number of ESUs, most consisting of just one or a very few populations. This would be inconsistent with the approach NMFS has taken in defining ESUs in other anadromous Pacific salmonids. Taking these factors into consideration, NMFS concludes that summer- and winter-run steelhead should be considered part of the same ESU in geographic areas where they co-occur.

Issue 6: Consideration of ESA Section 4(d) Regulation for Recreational Angling

Comment 11: Numerous commenters requested that if NMFS lists the Northern California steelhead ESU as a threatened species the agency promulgate an ESA 4(d) rule that provides for recreational angling opportunities similar to what is contained in the ESA 4(d) rule NMFS recently proposed for other threatened steelhead ESUs in California (64 FR 73479; December 30, 1999).

Response: The steelhead ESA 4(d) rule that NMFS proposed on December 30, 1999, contains a limitation on the application of the section 9 take prohibitions that would allow recreational angling for steelhead listed as threatened to continue under certain conditions, provided that the State of California prepares a Fishery Management and Evaluation Plan (FMEP) meeting certain criteria and that NMFS approves it. Because the pending steelhead 4(d) rule will be finalized by June 19, 2000, NMFS expects to begin working soon with the State of California and DFG in preparing one or more FMEPs so that recreational angling can continue where it is consistent with the conservation of steelhead listed as threatened. It is NMFS' intent to promulgate an ESA 4(d) rule for the Northern California steelhead ESU which is consistent with the 4(d) rule that will be published on June 19, 2000 so that recreational angling which meets appropriate conservation criteria can continue.

Northern California Steelhead ESU Determination

The Northern California steelhead ESU has been described in previous **Federal Register** documents (61 FR 41541, August 9, 1996; 62 FR 43937, August 18, 1997; 63 FR 13347, March 19, 1998; 65 FR 6960, February 11, 2000) based on analyses conducted by NMFS and summarized in the following documents: "Status Review for West Coast Steelhead from Washington, Idaho, Oregon, and California" (Busby *et al.*, 1996); and "Status Review Update for West Coast Steelhead from Washington, Idaho, Oregon, and California" (NMFS, 1997a). The relationship between hatchery steelhead populations and naturally spawned steelhead within this ESU was also assessed in: "Status Review Update for Deferred ESUs of West Coast Steelhead: Hatchery Populations" (NMFS, 1998a). Copies of these NMFS documents are available upon request (see **ADDRESSES**). NMFS received no new scientific or commercial information as a result of the February 11, 2000, proposal to list this ESU, which indicates that a change in the Northern California ESU is warranted.

The ESU occupies river basins from Redwood Creek in Humboldt County, CA, to the Gualala River, inclusive, in Mendocino County, CA. Dominant vegetation along the coast is the redwood forest, whereas some interior basins, much drier than surrounding areas, are characterized by many endemic species. This area includes the extreme southern end of the contiguous portion of the Coast Range Ecoregion (Omernick, 1987). Elevated stream temperatures are a factor in some of the larger river basins (greater than 20°C), but not to the extent that they are in river basins further south. Precipitation is generally higher in this geographic area than in regions to the south, averaging 100 200 cm of rainfall annually (Donley *et al.*, 1979). With the exception of such major river basins as the Eel, most rivers in this region have peak flows of short duration. Strong and consistent coastal upwelling begins at about Cape Blanco and continues south into central California, resulting in a relatively productive nearshore marine environment.

The northern California ESU includes both winter and summer steelhead, including what is presently considered to be the southernmost population of summer steelhead, in the Middle Fork Eel River. Half-pounder juveniles also occur in this geographic area, specifically in the Mad and Eel Rivers. Snyder (1925) first described the half-pounder from the Eel River; however, Cramer *et al.* (1995) suggested that adults with the half-pounder juvenile life history may not spawn south of the Klamath River Basin. As with the Rogue and Klamath Rivers which are located in the Klamath Mountains Province ESU, some of the larger rivers in this ESU have migrating steelhead year-round, and seasonal runs have been named. River entry ranges from August through June and spawning from December through April, with peak spawning in January in the larger basins and late February and March in the smaller coastal basins.

Based on the review of steelhead hatchery programs in this ESU (NMFS, 1998a), NMFS' steelhead BRT concluded that the following steelhead hatchery stocks are part of this ESU because they were established from indigenous natural populations and there is limited impact from the inclusion of out-of-basin fish in the broodstock: Van Arsdale Fisheries Station stock (Eel River), the Yager Creek stock (Eel River tributary), Ten Mile River stock, and North Fork Gualala River stock. The BRT concluded that the Mad River hatchery summer steelhead stock is not part of the ESU based on its origin from out-of-basin steelhead populations combined with the mixing of Eel River summer steelhead in the broodstock. Rearing of this stock was terminated at the Mad River hatchery in 1996. The majority of the BRT concluded that the Mad River hatchery winter steelhead stock is not part of this ESU although a minority of the BRT was uncertain regarding its relationship to the naturally spawning population. This stock was founded from South Fork Eel River steelhead (within the ESU, but out of the Mad River basin) and some local Mad River steelhead.

Status of Northern California Steelhead ESU

Section 3 of the ESA defines the term "endangered species" as "any species which is in danger of extinction throughout all or a significant portion of its range." The term "threatened species" is defined as "any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. In its previous status reviews for west coast salmon and steelhead, NMFS has identified a number of factors that should be considered in evaluating the level of risk faced by an ESU, including: (1) absolute numbers of fish and their spatial and temporal distribution; (2) current abundance in relation to

historical abundance and current carrying capacity of the habitat; (3) trends in abundance; (4) natural and human-influenced factors that cause variability in survival and abundance; (5) possible threats to genetic integrity (e.g., from strays or outplants from hatchery programs); and (6) recent events (e.g., a drought or changes in harvest management) that have predictable short-term consequences for abundance of the ESU.

Based on these factors and the best available scientific information, NMFS' BRT first reviewed the status of the northern California ESU in its original coast-wide status review for steelhead (Busby *et al.*, 1996). The BRT concluded that the northern California steelhead ESU was likely to become endangered in the foreseeable future. Population abundance was determined to be very low relative to historical estimates (1930's dam counts), and recent trends were downward in most stocks for which data were. The BRT expressed particular concern regarding sedimentation resulting in part from poor land management practices and channel restructuring due to floods. The abundance of the pikeminnow as a predator in the Eel River was also identified as a significant concern. For the Mad River, in particular, the BRT was concerned about the influence of hatchery stocks both in terms of genetic introgression and the potential for ecological interactions between introduced stocks and native stocks.

The status of the northern California ESU was reassessed by NMFS' BRT in an updated status review following the 6-month period of deferral because of scientific disagreements (NMFS, 1997a). Based on this updated status review, NMFS' BRT once again concluded that northern California steelhead ESU was likely to become endangered in the foreseeable future. The BRT reported that there *was very limited abundance data available for this ESU, particularly for winter-run steelhead.* The most complete data set available in this ESU is a time series of winter steelhead dam counts on the Eel River at Cape Horn Dam. The updated abundance data (through 1997) showed moderately declining long-term and short-term trends in abundance, and the vast majority of these fish were believed to be of hatchery origin. These data show a strong decline in abundance prior to 1970, but no significant trend thereafter. Additional winter steelhead data are available for Sweasy Dam on the Mad River which show a significant decline, but that data set ends in 1963. For the seven populations where recent trend data were available, the only runs showing recent increases in abundance in the ESU were the relatively small populations of summer steelhead in the Mad River which has had high hatchery production, and winter steelhead in Prairie Creek where the increase may be due to increased monitoring or mitigation efforts.

As in its original assessment, the BRT continued to be concerned about the risks associated with interactions between naturally spawning populations and hatchery steelhead in this ESU. Of particular concern to the BRT was the potentially deleterious impact to wild steelhead from past hatchery practices at the Mad River hatchery, primarily from transfers of non-indigenous Mad River hatchery fish to other streams in the ESU and the production of non-indigenous summer steelhead. These potentially deleterious hatchery practices for summer steelhead ended in 1996.

Habitat degradation and other factors were also of concern to the BRT in its reassessment of the long-term risks to this ESU. Specific factors which the BRT identified included dams on the upper Eel and Mad Rivers, the likely existence of minor blockages throughout the ESU, continuing impacts of catastrophic flooding on the 1960s, and reductions in riparian and instream habitat and increased sedimentation from timber harvest activities. The BRT also cited poaching of summer steelhead and predation by pikeminnow in the Eel River as factors for concern. NMFS' supplemental review of factors affecting west coast steelhead also identified water diversion and extraction, agriculture, and mining as factors affecting habitat conditions for steelhead in this ESU (NMFS, 1996).

In conjunction with NMFS' reconsideration of the Northern California steelhead ESU, the BRT provided a status review update for this ESU [January 2000 Memorandum from Pete Adams, Southwest Fisheries Science Center [SWFSC] to Rodney R. McInnis, Regional Administrator, SWR (NMFS, 2000)]. Based on a review of updated abundance and trend information that was available for this ESU, the SWFSC concluded that the current status of the ESU has not changed significantly since it was last evaluated by NMFS' BRT in December 1997 (NMFS, 1997a). The Eel River winter and summer steelhead populations, which represent the best available data set for this ESU, are still severely reduced from pre 1960's levels. Updated abundance and trend data show small increases for winter and summer steelhead in the Eel River, but current abundance is still well below estimates in the 1980s, and even further reduced from levels in the 1960s. Redwood Creek summer steelhead abundance remains very low. There are no new data suggesting substantial increases or decreases in populations since the last updated status review was completed. NMFS received no new scientific or commercial data or information as a result of the February 11, 2000, listing proposal which changes the conclusions reached by the SWFSC.

Summary of Factors Affecting the Species

Section 4(a)(1) of the ESA and NMFS' implementing regulations (50 CFR part 424) set forth procedures for listing species. The Secretary of Commerce (Secretary) must determine, through the regulatory process, if a species is endangered or threatened based upon any one or a combination of the following factors: (1) The present or threatened destruction, modification, or curtailment of its habitat or range; (2) overutilization for commercial, recreational, scientific, or education purposes; (3) disease or predation; (4) inadequacy of existing regulatory mechanisms; or (5) other natural or human-made factors affecting its continued existence.

NMFS has prepared a report that summarizes the factors leading to the decline of steelhead on the west coast entitled: "Factors for Decline: A supplement to the notice of determination for west coast steelhead" (NMFS, 1996). This report, available upon request (see **ADDRESSES**), concludes that all of the factors identified in section 4(a)(1) of the ESA have played a role in the decline of the species. The report identifies destruction and modification of habitat, overutilization for recreational purposes, and natural and human-made factors as being the primary causes for the decline of steelhead on the west coast. NMFS (1996) identified several factors that were considered to have contributed to its decline of the northern California steelhead ESU including: impacts from historic flooding (principally in 1955 and 1964), predation, water diversions and extraction, minor habitat blockages, poaching, timber harvest, agriculture, and mining. NMFS' steelhead BRT also identified the potentially adverse impacts of the release of non-indigenous, hatchery-produced steelhead in this ESU as an important factor, and expressed concerns regarding the lack of reliable abundance and trend data for assessing the status of steelhead in this ESU (NMFS, 1997a).

Finally, NMFS was also concerned about the impacts of recreational angling because of the depressed status of steelhead populations and the uncertainty regarding the status of this ESU (March 11, 1998, Memorandum from William Hogarth to Rolland Schmitten (NMFS, 1998e)). The following discussion briefly summarizes findings regarding factors for decline across the range of west coast steelhead, including the northern California ESU.

The Present or Threatened Destruction, Modification, or Curtailment of Steelhead Habitat or Range

Steelhead on the west coast of the United States have experienced declines in abundance in the past several decades as a result of natural and human factors. Forestry, agriculture, mining, and urbanization have degraded, simplified, and fragmented habitat. Water diversions for agriculture, flood control, domestic, and hydropower purposes have greatly reduced or eliminated historically accessible habitat. Among other factors, NMFS (1996) specifically identified timber harvest, agriculture, mining, habitat blockages, and water diversions as important factors for the decline of steelhead in the northern California ESU. NMFS (1998a) discussed these factors in more detail. Studies estimate that during the last 200 years, the lower 48 states have lost approximately 53 percent of all wetlands and the majority of the rest are severely degraded (Dahl, 1990; Tiner, 1991). Washington and Oregon's wetlands are estimated to have diminished by one-third, while California has experienced a 91 percent loss of its wetland habitat (Dahl, 1990; Jensen *et al.*, 1990; Barbour *et al.*, 1991; Reynolds *et al.*, 1993). Loss of habitat complexity has also contributed to the decline of steelhead. For example, in national forests in Washington, there has been a 58 percent reduction in large, deep pools due to sedimentation and loss of pool-forming structures such as boulders and large woody debris (FEMAT, 1993). Similarly, in Oregon, the abundance of large, deep pools on private coastal lands has decreased by as much as 80 percent (FEMAT, 1993). Sedimentation from land use activities is recognized as a primary cause of habitat degradation in the range of west coast steelhead.

Overutilization for Commercial, Recreational, Scientific, or Education Purposes

Steelhead are not generally targeted in commercial fisheries. High seas driftnet fisheries in the past may have contributed slightly to a decline of this species in local areas, but could not be solely responsible for the large declines in abundance observed along most of the Pacific coast over the past several decades (NMFS, 1996).

Steelhead support an important recreational fishery throughout most of their range. During periods of decreased habitat availability (e.g., drought conditions or summer low flows when fish are concentrated), the impacts of recreational fishing on native anadromous stocks may be heightened.

Although harvest of steelhead in the Northern California ESU was not originally identified as a major factor for decline (NMFS, 1996), NMFS is concerned about the impacts of recreational angling given currently depressed steelhead population levels and the lack of reliable abundance and trend data for accurately assessing the status of individual populations and the ESU as a whole. Because of NMFS' concerns about recreational angling impacts to naturally reproduced steelhead populations in coastal watersheds in California north of the Russian River, the California Department of Fish and Game (DFG) proposed and the California Fish and Game Commission adopted new steelhead angling regulations in 1998 for all watersheds in the northern California ESU. These new regulations prohibit retention of naturally spawned adult steelhead; eliminate fishing for juvenile steelhead in tributary streams; minimize impacts on juvenile steelhead in mainstem rearing and migratory areas through a combination of gear restrictions and delayed seasonal openings; prohibit retention of summer steelhead during their upstream migration and prohibit fishing in their summer holding areas; and provide for directed harvest and retention of hatchery-produced steelhead which are fully marked state-wide. NMFS (1998b,c,d) analyzed these new regulations and concluded that they would substantially reduce fishing effort and reduce mortality to that associated with catch-and-release of naturally produced steelhead in the northern California ESU. These regulations remain in effect and are enforced by DFG.

Disease or Predation

Infectious disease is one of many factors that can influence adult and juvenile steelhead survival. Steelhead are exposed to numerous bacterial, protozoan, viral, and parasitic organisms in spawning and rearing areas, hatcheries, migratory routes, and the marine environment (NMFS, 1996). Specific diseases such as bacterial kidney disease (BKD), ceratomyxosis, columnaris, furunculosis, infectious hematopoietic necrosis virus, redmouth and black spot disease, erythrocytic inclusion body syndrome, and whirling disease, among others, are present and are known to affect steelhead and salmon (Rucker *et al.*, 1953; Wood, 1979; Leek, 1987; Foott *et al.*, 1994; Gould and Wedemeyer, undated). Very little current or historical information exists to quantify changes in infection levels and mortality rates attributable to these diseases for steelhead (NMFS, 1996). However, studies have shown that naturally spawned fish tend to be less susceptible to pathogens than hatchery-reared fish (Buchanon *et al.*, 1983; Sanders *et al.*, 1992).

Introductions of non-native species and habitat modifications have resulted in increased predator populations in numerous river systems, thereby increasing the level of predation experienced by salmonids. In the Northern California steelhead ESU, predation from Sacramento pikeminnow that were released into the Eel River is a major problem. Predation from pikeminnow is discussed in more detail in NMFS (1996). The DFG is currently engaged in a program to control pikeminnow predation in the Eel River.

Predation by marine mammals is also of concern in some areas experiencing dwindling steelhead run sizes. NMFS (1997b) reviewed the available literature concerning the impacts of California sea lion and Pacific harbor seal predation on west coast anadromous salmonids, and concluded that there was insufficient data in all but one instance (i.e., Ballard Locks in Puget Sound) to conclude that pinnipeds were having a significant impact on wild salmon or steelhead populations. For this reason, and because of the high likelihood that impacts might be occurring, the study concluded that substantial additional research was needed to address this issue further. Based on this research recommendation, NMFS has initiated several field studies in coastal watersheds on the west coast designed to assess the magnitude of pinniped predation on individual salmon or steelhead populations. In California, these studies are being conducted in the lower Klamath River, Scott Creek, and the San Lorenzo River.

Inadequacy of Existing Regulatory Mechanisms

1. Federal Land and Water Management

The Northwest Forest Plan (NFP) is a Federal land management policy with important benefits for west coast steelhead. While the NFP covers a very

large area, the overall effectiveness of the NFP in conserving steelhead is limited by the extent of Federal lands and the fact that Federal land ownership is not uniformly distributed in watersheds that comprise individual ESUs. The extent and distribution of Federal lands limits the ability of the NFP to achieve its aquatic habitat restoration objectives at watershed and river basin scales, and highlights the importance of complementary salmon habitat conservation measures on non-federal lands within the subject ESUs.

Federal land ownership and management in the Northern California steelhead ESU is very limited; representing only about 19 percent of the total land area. Federal lands (i.e., Redwood National Park, portions of the Six Rivers and Mendocino National Forests, and the Kings Range National Conservation Area) that do occur in this ESU are also highly fragmented, unlike some other steelhead ESUs (e.g., Klamath Mountains Province and Snake River Basin). Although Federal lands are limited in extent and fragmented in this ESU, NMFS believes that implementation of the NFP on the Six Rivers and Mendocino National Forests lands (upper reaches of Eel and Mad Rivers) and implementation of other habitat protections in Redwood National Park (lower reach of Redwood Creek) will provide some limited benefits to steelhead. Nevertheless, long-term habitat protection and the key to achieving properly functioning habitat conditions in this ESU continues to be improvement in non-Federal land management, particularly those lands used for timber harvest.

Because threatened coho salmon populations occur on Federal lands located within the Northern California steelhead ESU, NMFS routinely engages the U.S. Forest Service (USFS), Bureau of Land Management (BLM), and Redwood Creek National Park in section 7 consultations to ensure that ongoing or proposed activities do not jeopardize coho salmon or adversely modify its critical habitat. Through this section 7 consultation process, NMFS ensures that the NFP and other protective measures are fully implemented on Federal lands that occur in this ESU. The NFP and measures implemented as a result of the section 7 consultations for coho salmon also benefit steelhead.

The Pacific Gas and Electric Company's (PG&E) Potter Valley hydroelectric project is a major diverter of water from the mainstem Eel River, which is located in the northern California ESU. This water is diverted into the Russian River basin to generate hydroelectric power and provide water for agriculture and urban uses. Pursuant to a Federal Energy Regulatory Commission (FERC) licensing requirement, PG&E implemented a 10-year monitoring program in the Eel River for the purpose of developing recommendations for a flow release schedule and other project facilities and/or operations necessary to protect and maintain fishery resources, including steelhead. This study was completed in 1996, as was construction of a $14 million dollar fish screen facility at the Van Arsdale Dam diversion on the Eel River. Based on the results of the monitoring study, PG&E has developed a preferred alternative for project operations that, along with several other alternatives, are the subject of National Environmental Policy Act (NEPA) review for ongoing FERC license amendment proceedings. NMFS is currently consulting with FERC pursuant to section 7 of the ESA on PG&E's proposed license amendment.

On March 1, 1999, the Pacific Lumber Company (PALCO), the State of California, the Department of the Interior, and the Department of Commerce entered into a complex land purchase, land exchange and Habitat Conservation Plan (HCP) transaction covering the Headwaters Forest, Elk Head Springs Forest and the remainder of Pacific Lumber Company's land holdings in Humboldt County California. The Federal and State governments acquired approximately 10,000 acres of conifer and hardwood forest, over 3,000 acres of which is ancient redwoods, with some trees over 1,000 years old. This land is now subject to Federal and state control under conservation easements. The PALCO HCP addresses non-Federal timber lands in several drainages that occur in the northern portion of Northern California steelhead ESU. These include portions of several tributaries to Humboldt Bay (Elk River, Jacoby Creek, Freshwater Creek, and Salmon Creek), and portions of the Van Duzen River (including Yager Creek), Eel River, Bear River, Salt River, and Mattole River watersheds. The HCP covers 211,000 acres, has a term of 50 years and covers the following federally listed and candidate anadromous salmonid ESUs: (1) Southern Oregon/ Northern California coho salmon (threatened), (2) Northern California steelhead (candidate), and (3) California Coastal Chinook salmon (threatened). The HCP also covers numerous terrestrial species listed under the ESA and California Endangered Species Act.

The HCP's Operating Conservation Program (Program) contains the conservation and management measures and prescriptions necessary to minimize, mitigate and monitor the impacts of take of the covered species resulting from timber operations. The Program incorporates specific conservation plans for all terrestrial and aquatic species covered under the HCP along with measures to conserve habitat diversity and structural components. Monitoring for implementation, effectiveness and trends is a critical component of the Program. The monitoring component includes an independent third party HCP monitor to determine if the provisions of the aquatics plan are effective and whether the aquatic habitat is responding as expected. There is also a provision for adaptive management if the results are not as predicted. An Aquatics Conservation Plan (ACP) is an integral part of the overall Program. The goal of the ACP is to maintain or achieve over time properly functioning aquatic habitat conditions, which are essential to the long-term survival of salmonids. The reduction in land management impacts and habitat improvement that will be realized through implementation of the ACP will also benefit other species.

NMFS believes that the conservation measures contained in the HCP will protect and provide for long-term conservation of steelhead populations occurring on PALCO lands in the northern California ESU.

2. State Land Management

Timber Harvest. The California Department of Forestry and Fire Protection (CDF) enforces California's FPRs on non-Federal (private and State managed forests) lands. These rules are promulgated through the State Board of Forestry (BOF). Timber harvest activities have been documented to result in adverse effects on streams and stream side zones including the loss of large woody debris, increased sedimentation, loss of riparian vegetation, and the loss of habitat complexity and connectivity (NMFS, 1996).

The vast majority of freshwater habitat in the northern California steelhead ESU (approximately 81 percent of total land) is on non-Federal lands, with the majority being privately owned. For the major river basins in this ESU (i.e., Redwood Creek, Mad River, Eel River, Mattole River, Ten Mile River, Noyo River, Big River, Albion River, Navarro River, Garcia River, and Gualala River), private forest lands average about 75 percent of the total acreage, with a range of 42 percent (Eel River) to 94 (Gualala River) percent.

NMFS reviewed the California FPRs in conjunction with its determination to

not list the Northern California steelhead ESU in 1998 (63 FR 13347). That review concluded that although the FPRs mandate protection of sensitive resources such as anadromous salmonids, the FPRs and their implementation and enforcement do not accomplish this objective. Specific problems with the FPRs include: (1) protective provisions that are not supported by scientific literature; (2) provisions that are scientifically inadequate to protect salmonids including steelhead; (3) inadequate and ineffective cumulative effects analyses; (4) dependence upon registered professional foresters (RPFs) that may not possess the necessary level of multi-disciplinary technical expertise to develop THPs protective of salmonids; (5) dependence by CDF on other State agencies to review and comment on THPs; (6) failure of CDF to incorporate recommendations from other agencies; and (7) inadequate enforcement due to staffing limitations. NMFS further concluded that until a comprehensive scientific peer review process was implemented and appropriate changes to the FPRs and the THP approval process were made, properly functioning habitat conditions would not exist on non-Federal lands in the northern California steelhead ESU.

The NMFS/California MOA which was entered into in March 1998 to ensure the conservation of steelhead populations in northern California (i.e., Northern California and KMP steelhead ESUs) contained specific provisions to address NMFS' concerns over the California FPRs. In the NMFS/California MOA, the State committed to: (1) conduct a scientific review of the State's FPRs, including their implementation and enforcement; (2) make appropriate changes in implementation and enforcement of the FPRs based on this review; and (3) make recommendations to the BOF for changes in the FPRs if they were found to be necessary for the conservation of northern California coastal anadromous salmonids. Full implementation of these provisions in the NMFS/California MOA, including implementation of changes in the FPRs by January 1, 2000, was a critical factor in NMFS's decision previously to not list this ESU.

In accordance with these provisions, a subcommittee of the State's scientific review panel for its Watershed Protection Program was appointed to undertake an independent review of the FPRs. The subcommittee's review and recommendations were completed and presented to the BOF in June 1999. The scientific review panel concluded that California's FPRs, including their implementation through the timber harvest plan process, do not ensure protection of anadromous salmonid populations. Based in part on the scientific review panel report and findings in July 1999, the California Resources Agency and CalEPA jointly presented the BOF with a proposed rule change package designed to address shortcomings in the State's existing FPRs. The BOF circulated the proposed rule package for public review, held several meetings and two public hearings on the proposals from July until October 1999, but failed to take action to adopt any of the proposed FPR changes, thereby precluding any possibility of implementing improvements in California's FPRs by January 1, 2000, as the State committed to do in the NMFS/California MOA.

The California State Legislature, under Senate Bill 621, gave special authority to the BOF to adopt new rules twice during the year 2000 for the specific purpose of revising the State's FPRs to meet ESA requirements for salmon. Public review and revisions of the BOF's FPR package continued from January 2000 to March 2000, during which time NMFS, California Legislature, the California Department of Forestry, the California Department of Fish and Game, the North Coast Water Quality Control Board, environmental groups and others strongly urged the Board to adopt the package in its' entirety as a necessary first step in protecting anadromous salmonid habitat. On March 14, 2000, the deadline for the BOF to exercise its authority under SB 621, the BOF adopted a subset of rule changes from the package which will only apply for those timber harvest plans approved between July 1 and December 31, 2000. During this period, the BOF has committed to work with interested parties in the development of a watershed analysis approach to timber harvest planning.

The interim FPRs changes adopted by the BOF, which sunset December 31, 2000: (1) define watersheds with threatened and impaired values, acknowledging they exist and need special prescriptions; (2) direct analysis on cumulative watershed effects to ensure beneficial uses of water are maintained if in good condition, protected where threatened, and restored where impaired, and that riparian zones be fully protected from site specific and cumulative impacts; (3) require protection and maintenance of stream flow during low water periods, large woody debris recruitment and shade canopy for temperature control; (4) require no measurable increase in sediment load, no decrease in channel or bank stability and no measurable blockage of aquatic migratory route; (5) define the watercourse transition line as 2 times the bankfull depth for confined channels and the outer edge of the active channel boundary for unconfined channels; (6) identify a 150 foot minimum water and lake protection zone for all fish-bearing streams, with 85 percent overstory shade canopy retained post-harvest for the first 75 feet (22.9 meters (m)), and 65 percent shade retained for the outer 75 feet (22.9 m); (7) require a no-cut buffer in channel zones out to the transition line and large woody debris standards including no salvage logging within the water and lake protection zone without an approved plan; (8) request the registered professional forester identify all active erosion sites and provide remediation; (9) prohibit construction of roads, landings and skid trails during the winter months on slopes over 40 percent; (10) provide specific road construction provisions on slopes over 50 percent; and (11) require that all crossings over fish-bearing streams meet 100-year flood standard and allow for passage of all life stages of fish.

NMFS believes the interim rule changes adopted by the Board of Forestry constitute a good first step in addressing many concerns raised during the FPR review process; however, they are currently inadequate to protect anadromous salmonids, including steelhead, and their habitat. Specifically, the interim rule changes are inadequate because they to not address: (1) site-specific variation and long-term riparian functions; (2) non-fishbearing perennial streams and ephemeral streams that carry water during the winter months; (3) rate of timber harvest in a watershed; (4) all other winter operations and wet weather road and skid trail planning; (5) road planning, construction, maintenance and decommissioning; (6) loss of riparian function and chronic sediment inputs from streamside roads; (7) unstable areas except for inner gorges; (8) timber harvest plan preparation, review, implementation, enforcement and technical validity; (9) harvest plan exemptions and (10) watershed analysis, cumulative effects, adaptive management and monitoring. The adopted rules lack these, and other, critical elements recommended by the scientific review panel as necessary to avoid, minimize and/or mitigate adverse cumulative watershed impacts on salmonid populations.

Multi-County Planning Efforts. As a result of the listing of coho salmon in coastal watersheds in northern

California, the counties of Del Norte, Siskiyou, Trinity, Humboldt and Mendocino developed and have implemented a multi-county, regional approach to assessing and improving county-controlled activities in a way that would enhance the quality and increase the quantity of salmonid habitat that is potentially affected by those county activities. NMFS and the State of California have contributed funding to this multi-county planning effort.

This county-level conservation planning approach involves a thorough review of general plans, ordinances, procedures, practices and policies developed and implemented at the county level. Through the assessment and evaluation of these county-controlled mechanisms, a process is being developed that will enable the counties to exert control at the local level over human activities that can adversely affect anadromous salmonid populations and habitat. This multi-county planning effort was memorialized in a Memorandum of Agreement (Multi-County MOA) which was signed by all five counties in late 1997. Under the terms of the Multi-County MOA, the counties agreed to embark on a cooperative planning and restoration effort; assess the adequacy of existing general plans, county policies and practices, zoning and other land use ordinances; review county management procedures that affect anadromous salmonid habitat in each county; recommend changes to specific county ordinances and/or practices as necessary; develop a watershed-based education and technical assistance/training program for local agencies and decision-makers that will foster better understanding of the linkages between land use and county maintenance practices and salmonid habitat; and seek to establish some form of regulatory recognition at the state and/or federal level. As an example, within the range of the northern California steelhead ESU, the northern five counties (Del Norte, Humboldt, Trinity, Siskiyou, and Mendocino Counties) Conservation Planning Group has organized a program to survey approximately 4700 miles of county roads to identify existing and potential barriers to the passage of listed salmonids in northern California streams. These barriers, which include undersized or failed culverts and other types of road crossings over streams, presently block significant amounts of stream habitat that could otherwise support spawning, rearing and migration of listed salmon and steelhead. To date, all coastal streams in Del Norte, Humboldt and Mendocino Counties have been inventoried, and habitat assessment and treatment prioritization reports are being drafted (Pers. Comm. Mark Lancaster, Trinity County Planning Dept. with Miles Croom, NMFS, April 24, 2000). In the coastal streams within Del Norte, Humboldt and Mendocino Counties, some 81 barriers have been identified. When removed, an additional 77 miles of suitable salmonid habitat will become available to listed species. The passage barrier inventory is part of a comprehensive aquatic habitat conservation program being developed by the multi-county group to improve county-level policies and procedures in an effort to reduce sedimentation and erosion, protect water quality, establish priorities for repairing problem sites, and institutionalize the utilization of improved practices at the county level with the goal of conserving aquatic habitat for the survival and recovery of listed salmonids.

This multi-county assessment is being used to document the effectiveness of existing regulations. Where the assessment identifies areas for improvement, the planning effort will develop alternative policies, ordinances and practices that are suitable for maintaining or enhancing anadromous salmonid habitat. The assessment will address the need to focus public works projects on sites that improve fisheries habitat. A watershed-based approach will be used, even where watersheds cross county boundaries, to ensure that enhancement efforts are complementary to natural ecosystem processes.

The outcome of this county-level effort is expected to be a comprehensive and coordinated analysis of local land use regulations. Where it is found that development standards such as subdivision restrictions, zoning, and capital improvement programs may not adequately maintain or restore salmonid habitat, model ordinances will be developed for consideration by each of the participating counties. Conversely, innovative approaches for land use (such as density modifications and standards that preserve habitat functions) or other county activities that have been developed in some counties will be presented as options for the other counties. This collaborative, regionally-based planning effort is based on existing environmental, economic, social and administrative concerns and opportunities. At the same time, the planning effort is designed to be complementary with state and national salmonid recovery efforts. The planning process encourages public participation through direct contact with interested public agencies, landowners, community organizations, environmental groups, industry representatives and others. The public process is being implemented through public hearings, meetings, scoping sessions, forums and other avenues.

Agricultural Activities. Agricultural activity has had multiple and often severe impacts on salmonid habitat. These include depletion of needed flows due to irrigation withdrawals, blocking of fish passage by diversion or other structures, destruction of riparian vegetation and bank stability by grazing or cultivation practices, and channelization resulting in loss of side channel and wetland-related habitat (NMFS, 1996).

Impacts from agricultural and grazing practices have not historically been closely regulated in California. This is an important concern to NMFS because a significant portion of the acreage in the northern California ESU is comprised of farmland. For example, farmland constitutes approximately 25 30 percent of the total acreage of Humboldt and Mendocino counties which in turn constitute much of the northern California ESU. Private lands, and public lands not administered by the Federal government, are now being addressed by the California Rangeland Water Quality Management Program (CRWQMP) which was adopted by the State Water Resources Control Board and CDF in 1995. The CRWQMP is a water quality improvement program based on the voluntary participation of landowners for compliance with state and Federal non-point source pollution reduction requirements. The CRWQMP was initiated as a cooperative effort among the livestock industry, conservation organizations and state and Federal agencies to address the impacts of grazing and land use practices on water quality in streams that flow through private property. Through this Program, private landowners will be able to maintain rangeland productivity and enhance landowners' abilities to manage these lands in a manner that protects water quality standards necessary for the survival and recovery of listed salmonids.

Between 1995 1998, rangeland plans were developed under the CRWQMP for more than 250,000 acres on the north coast ranging from San Francisco to the Oregon border. The State plans to review the implementation status of these plans at intervals of 3, 5 and 10 years, provided resources are available. NMFS is encouraged by these ongoing efforts. Plans that are consistent with this guidance are likely to meet state

water quality standards, but the program is voluntary and it is uncertain to what extent their implementation will contribute to improved habitat conditions and riparian function.

The USDA Natural Resources Conservation Service (NRCS), NMFS, FWS, the U.S. Environmental Protection Agency (EPA), the California Association of Resource Conservation Districts (CARCD), and the State of California (State) have recently developed a joint approach that is expected to encourage the voluntary use of improved conservation management practices for agriculture on private land. Recognizing that recovery of listed and other at-risk salmonid populations depends on the willing participation of private landowners, these agencies have the goal of providing an incentive to landowners to enhance the quality and quantity of habitat needed by species of concern. To accomplish this goal, the agencies have agreed to support cooperative approaches and consensus-building activities, foster communication among agencies and private landowners, share resources and information, and establish strong, effective working relationships that instill trust and promote sound stewardship.

This agreement is the subject of a draft Memorandum of Understanding (MOU) among the partner agencies. Through the procedures described in the MOU, landowners will have the knowledge that practices contained in the NRCS Field Office Technical Guides (FOTG) have undergone ESA section 7 scrutiny by NMFS and FWS. For those practices that NMFS and FWS determine are not likely to adversely affect listed species or critical habitat, the landowner should have confidence that those practices, if implemented in accordance with the FOTG standards and specifications, will not result in any additional permitting requirement or penalties under the ESA. The objective of this MOU is to encourage the adoption of protective land use practices on private lands, to provide some regulatory assurance for landowners, to improve habitat conditions for sensitive species, to continue sustainable economic production on private lands, to facilitate better coordination among the partner agencies and to foster better awareness and support for conservation programs throughout the State. The draft MOU is under review by the State and upon completion is expected to be formally signed by all parties.

3. Dredge, Fill, and In-water Construction Programs

Corps of Engineers Section 404 Program. The Army Corps of Engineers (COE) regulates removal/fill activities under section 404 of the Clean Water Act (CWA), which requires that the COE not permit a discharge that would "cause or contribute to significant degradation of the waters of the United States." One of the factors that must be considered in this determination is cumulative effects. However, the COE guidelines do not specify a methodology for assessing cumulative effects or how much weight to assign them in decision-making. Furthermore, the COE does not have in place any process to address the additive effects of the continued development of waterfront, riverine, coastal, and wetland properties.

The U.S. Army Corps of Engineers, State, and local governments have developed and implemented procedures reviewing, approving and monitoring gravel mining activities in Del Norte and Humboldt counties which are authorized under a Letter of Permission (LOP) process. This process regulates gravel mining in a substantial portion of the Northern California steelhead ESU (including the Mad, Eel and Van Duzen Rivers) where listed coho salmon and chinook salmon populations also occur. These procedures are designed to provide substantially improved protection for anadromous salmonids and their habitats, including steelhead. Important elements of the process include: a prohibition on gravel mining in the active channel and on trenching except in limited instances, a restriction on gravel operations to the dry season, monitoring of channel cross sections to detect changes in channel morphology and habitat conditions, fisheries monitoring, and gravel mining on a sustained yield basis. An additional element of the process in Humboldt County, which is located in the Northern California ESU, is the participation of an independent scientific review committee which makes annual recommendations on gravel quantities and site design features in order to minimize adverse impacts. Additionally, any channel crossings must be designed to allow for fish passage. NMFS participated in the development of these procedures and has concluded, through section 7 consultation with the COE, that these procedures will not jeopardize the continued existence of coho salmon or steelhead. NMFS recently reinitiated formal consultation with the COE on the LOP process to address the final critical habitat designation for coho salmon and the recent listing of California Coastal chinook salmon as threatened.

State Streambed Alteration Agreements. Section 1603 of the Fish and Game Code in California requires that any person who proposes a project that will substantially divert or obstruct the natural flow or substantially change the bed, channel or river bank of any river, stream or lake, or use materials from a streambed, notify the DFG before beginning any work. The authorization for these activities under section 1603 is called a Lake or Streambed Alteration Agreement. Beginning May 1, 1999, the 1603 process was significantly modified to require a higher level of review by DFG that is in compliance with the California Environmental Quality Act (CEQA). Any proposed project that DFG determines may substantially adversely affect existing fish and wildlife resources will need to comply with the CEQA standard of mitigating project impacts to the level of insignificance. The new standard for project review has resulted in increasing the time needed for project approval from two weeks to 60 120 days.

Although the State has substantially improved the level of project review under the 1603 process to comply with the new CEQA standard, the State has not submitted the program to NMFS for review to determine whether it adequately protects anadromous salmonids. The State currently issues 1603 streambed alteration agreements to project applicants with the disclosure that the applicant may need to obtain incidental take authorization from NMFS. In most cases, however, where a project proposes a stream or watercourse modification and listed species are present, a Clean Water Act, section 404 permit from the Army Corps of Engineers is required. Within the geographic area encompassing the northern California steelhead ESU, the presence of listed coho and chinook salmon populations requires the Corps to consult with NMFS under section 7 of the ESA prior to the issuance of 404 permits.

4. Water Quality Programs

Under Clean Water Act section 303(d), states, territories and authorized Tribes are required to establish lists of impaired water bodies, set priorities for addressing the pollutant source, and write pollutant control plans to achieve and maintain water quality standards. These plans, Total Maximum Daily Loads (TMDLs), provide an effective mechanism for determining the causes of water body impairment, quantifying the various pollutant sources, and setting targets for reducing pollutant discharges. Generally, states are responsible for developing TMDLs and related implementation plans, which are

subject to EPA review and approval. If the EPA disapproves a TMDL or if a state fails to establish one, the EPA is required to step in and establish the TMDL. The TMDL is then implemented through existing regulatory and non-regulatory programs to control, reduce or eliminate pollution from both point and non-point sources.

The TMDL process provides a flexible assessment and planning framework for identifying load reductions or other actions needed to attain water quality standards such as protection of aquatic life, provision of safe drinking water, etc. The TMDL should address all significant stressors (*e.g.*, chemicals, temperatures, sediment loads) that cause or threaten to cause deleterious effects to water quality. The TMDL assessment is the sum of the individual waste load allocations from point sources, load allocations from non-point sources, allocation from natural sources, and an appropriate margin of safety to account for uncertainty. The TMDL may address single or multiple pollutants but must clearly identify the links between the water quality impairment (or threat) of concern, the causes of the threat or concern and the load reductions or conservation actions needed to remedy or prevent the impairment.

As TMDL assessments and implementation plans are developed and approved, the State of California, through the State Water Resources Control Board and the nine Regional Water Quality Control Boards, will adopt and implement the TMDLs. The TMDL contains a problem statement, numeric targets, source analysis, allocations of loads or controls and a monitoring plan. The implementation component includes descriptions of land management practices, remediation activities and restoration projects necessary to attain the goals established in the TMDL assessment. It is through the implementation plan that necessary controls and restoration actions are assigned to specific parties and attainment schedules are promulgated.

In coastal watersheds of northern California, 38 water body segments have been identified as impaired and have been scheduled for development of TMDLs. The schedule for development of TMDLs in northern California extends to the year 2011 (Russian River and Lake Pillsbury). However, the schedule in this area is driven in part by a consent decree (*Pacific Coast Federation of Fishermen's Associations, et al.* v. *Marcus*, No. 95 4474 MHP, March 11, 1997). Under this consent decree, EPA agreed to oversee the development of TMDLs on eighteen rivers on the north coast of California. Twelve of these river basins are located within the northern California steelhead ESU. The consent decree establishes a schedule for developing TMDL criteria for listed rivers. Under this schedule, seven river basins in the northern California ESU would have TMDLs developed within the next two years, with the remaining rivers having TMDLs developed by 2002. This legally-binding schedule is expected to result in significant progress on improving the beneficial uses of these watersheds, where the beneficial use has been identified as habitat for salmonids.

On May 28, 1998, the North Coast Regional Water Quality Control Board approved a TMDL for the Garcia River. The TMDL contains the following elements: (1) findings that the Garcia River is impaired due to sediment and temperature impacts resulting from land use practices, primarily timber operations and related activities, (2) adoption of the Water Quality Attainment Strategy as part of the Water Quality Control Plan for the North Coast Region (Basin Plan) that would eliminate 90 percent of total controllable road-related sediment sources within 20 years and 50 percent of controllable upslope sediment sources within 40 years, (3) numeric targets including specified numerical values for percent fine sediments, frequency of pools in stream habitat profiles, and improving trends in large woody debris, (4) an implementation plan which specifies that either default prescriptions be observed or a site-specific plan be implemented that provides assurances that source reduction targets will be met, (5) assurances that sediment reduction or control goals are capable of being met and that the concept of site-specific planning and implementation by landowners provides a flexible framework, (6) a monitoring plan to verify that conservation practices are implemented and to measure effectiveness.

The TMDL process provides a flexible, adaptive management approach that relies on substantial public input and participation to set targets, identify protection measures and implement and monitor corrective practices. The completion of the Garcia River TMDL, and the initiation of TMDLs for the other listed rivers, represents a significant step forward in improving watershed health for steelhead and other salmonids on the north coast of California. In the long-term, the development and implementation of these TMDLs should be beneficial for steelhead; however, their development and implementation will be difficult and it will take many years to assess their efficacy in protecting steelhead habitat. Furthermore, it is essential that the EPA consults with NMFS on the formulation of TMDLs in waters that contain listed salmonids. Such consultations will help ensure TMDLs adequately address the needs of these species.

5. State Hatchery and Harvest Management

Hatchery Management. In an attempt to mitigate the loss of habitat and enhance fishing opportunities, extensive hatchery programs have been implemented throughout the range of steelhead on the west coast. While some of these programs have succeeded in providing fishing opportunities, the impacts of these programs on native, naturally-reproducing stocks are not well understood. Competition, genetic introgression and disease transmission resulting from hatchery introductions may significantly reduce the production and survival of native, naturally-reproducing steelhead (NMFS, 1996). Collection of native steelhead for hatchery broodstock purposes often harms small or dwindling natural populations. Artificial propagation can play an important role in steelhead recovery through carefully controlled supplementation programs.

In the past, non-native steelhead stocks have been introduced as broodstock in hatcheries and widely transplanted in many coastal rivers and streams in California (Bryant, 1994; Busby *et al.*, 1996; NMFS, 1997a). Because of problems associated with this practice, DFG has developed and implemented a Salmon and Steelhead Stock Management Policy. This policy recognizes that mixing of non-native stocks with native stocks is detrimental, and seeks to maintain the genetic integrity of all identifiable stocks of salmon and steelhead in California, as well as to minimize interactions between hatchery and natural populations.

NMFS's BRT identified the potentially adverse impacts of interactions between hatchery (Mad River hatchery) and wild steelhead as an important concern with regard to the northern California ESU (NMFS, 1997a). As part of its strategic management plan for this ESU, DFG has implemented several changes in its hatchery practices. In addition, DFG has implemented several additional measures pursuant to the 1998 NMFS/California MOA. These hatchery management measures include:(1) marking of all hatchery steelhead released from the Mad River hatchery and all cooperative rearing facilities in

the Northern California ESU; (2) continuation of long-standing hatchery management practices aimed at minimizing hatchery and wild steelhead interactions including prohibitions on stocking of resident trout in anadromous waters; (3) releasing hatchery steelhead only at times, sizes and places that minimize impacts on naturally produced fish; (4) only releasing hatchery fish that are determined to be healthy; (5) initiation of monitoring efforts intended to measure hatchery fish stray rates; and (6) a joint NMFS/DFG review of the Mad River hatchery including its stocking history, analysis of current broodstock, and its consistency with the strategic management plan for the northern California ESU.

Fisheries Management. In conjunction with the improved hatchery management practices, in-river sport fisheries in the northern California ESU now focus on harvest of marked, hatchery-produced steelhead, and sport fishing regulations have been modified to protect wild adult and juvenile steelhead.

Other Natural or Human-Made Factors Affecting Continued Existence of Steelhead

Natural climatic conditions have exacerbated the problems associated with degraded and altered riverine and estuarine habitats. Persistent drought conditions have reduced already limited spawning, rearing and migration habitat. Climatic conditions appear to have resulted in decreased ocean productivity which, during more productive periods, may help offset degraded freshwater habitat conditions (NMFS, 1996).

Efforts Being Made to Protect West Coast Steelhead

Section 4(b)(1)(A) of the ESA requires the Secretary of Commerce to make listing determinations solely on the basis of the best scientific and commercial data available after conducting a review of the status of the species and after taking into account efforts being made to protect the species. Therefore, in making its listing determinations, NMFS first assesses the status of the species and identifies factors that have lead to the decline of the species. NMFS then assesses conservation measures to determine if they ameliorate risks to the species.

In judging the efficacy of existing conservation efforts, NMFS considers the following: (1) the substantive, protective, and conservation elements of such efforts; (2) the degree of certainty such efforts will be reliably implemented; and (3) the presence of monitoring provisions that determine effectiveness and that permit adaptive management. In some cases, conservation efforts may be relatively new and may not have had time to demonstrate their biological benefit. In such cases, provisions for adequate monitoring and funding of conservation efforts are essential to ensure intended conservation benefits are realized.

As part of its west coast steelhead status review, NMFS reviewed an array of protective efforts for steelhead and other salmonids, ranging in scope from regional strategies to local watershed initiatives. NMFS summarized some of the major efforts in a document entitled "Steelhead Conservation Efforts: A Supplement to the Notice of Determination for West Coast Steelhead under the Endangered Species Act" (NMFS, 1996c). NMFS also reviewed conservation measures being implemented by the State of California for steelhead at the time of its final listing determination for the northern California, Klamath Mountains Province, and Central Valley steelhead ESUs (63 FR 13347, March 19, 1998). The following sections update the current status of the State of California's conservation efforts for steelhead with particular emphasis on the northern California steelhead ESU.

The state of California's conservation efforts that address steelhead in the northern California ESU include: (1) development of the State's Watershed Protection Program, which includes funding and implementation of an expanded watershed planning and habitat restoration program; (2) implementation of the DFG's strategic management plan for the northern California ESU and (3) implementation of the 1998 NMFS/California MOA which addresses management of coastal steelhead in northern California. The status of these conservation efforts is discussed in more detail below.

California Watershed Protection Program and Implementation of SB 271

In July 1997, California's Governor created the State's Watershed Restoration and Protection Council (WPRC) for the purpose of: (1) overseeing all state activities aimed at watershed protection and enhancement, including the conservation and restoration of anadromous salmonids in California; and (2) directing the development of a California Watershed Protection Program that would provide for the conservation of anadromous salmonids in the state of California. A working group of the WPRC issued a detailed report in December, 1998 entitled "Protecting California's Anadromous Fisheries." The Executive Order that established this program expired in January, 1999; however, continued coordination of the program is occurring under the auspices of the California Biodiversity Council (CBC). NMFS is encouraged that the State initiated a comprehensive, watershed-based approach to salmon management and restoration; however, the California Watershed Protection Program is still under development and has not been implemented as originally envisioned.

To support the Governor's WPRC and its efforts to develop a Watershed Protection Program, DFG implemented a $3 million Watershed Initiative in 1997 98 for coastal watershed projects north of San Francisco, through its Fishery Restoration Grants Program. These projects focused on watershed and riparian habitat restoration, instream habitat restoration; watershed evaluation, assessment, and planning; and restoration project maintenance and monitoring. Beginning in 1998 1999, DFG funded additional staff positions to assist in watershed planning efforts and grant proposal development.

A key element of the State's Watershed Protection Program that is also specified in the 1998 NMFS/California MOA is DFG's implementation of an expanded habitat restoration program for coastal salmonids, including steelhead. In 1997, the California legislature enacted Senate Bill 271 which provided DFG with $43 million over six years for habitat restoration and watershed planning to benefit anadromous salmonids in coastal watersheds, including the geographic area which encompasses the northern California steelhead ESU. The program was initiated in 1997 98 and has expanded since that time. Based on the SB 271 legislation, funding is expected to continue through at least 2002. Substantial funding from this program has been committed to habitat restoration, enhancement, and watershed planning efforts within the northern California steelhead ESU since 1997 98. Throughout Humboldt and Mendocino counties, which constitute much of the geographic area comprising the northern California steelhead ESU, DFG has funded over 200 projects costing in excess of $7.5 million during the past three years (1997 98 through 1999 2000). NMFS participates as an ex-officio member of the Advisory Committee that reviews the distribution of SB 271 grant funding to ensure that available funds are spent on projects that will contribute to the conservation of listed salmonids as well as north coast steelhead. In addition to the

expanded habitat restoration program funded by SB 271, DFG has added additional staff positions to assist in administering the program, provide technical support in the development of watershed plans and habitat restoration projects and implement a new steelhead monitoring and adaptive management program throughout coastal northern California.

Northern California Steelhead ESU Strategic Plan

In February 1998, DFG completed its strategic management plan for steelhead stocks in the northern California ESU (DFG 1998). In March 1998, the State and DFG formally committed to implement this plan as part of the NMFS/California MOA. The plan describes existing and new management measures for recreational steelhead angling, steelhead hatchery programs, and steelhead monitoring, assessment and adaptive management efforts in this ESU. In addition, the plan describes DFG's ongoing efforts to protect and enhance steelhead habitat within this ESU. These management measures were intended to provide immediate protection for steelhead populations in this ESU, while longer-term measures were implemented to protect anadromous fish habitat on non-federal lands through the Watershed Protection Program and the SB 271 habitat restoration program. The main elements of the northern California steelhead strategic management plan are briefly discussed here.

1. Harvest Measures

The strategic management plan includes several harvest management actions which are intended to reduce impacts on adult and juvenile steelhead in the Northern California ESU. These include: (1) no retention of unmarked (i.e., naturally produced) adult and juvenile steelhead in all rivers and streams; (2) fishing closures in steelhead rearing tributaries to protect juveniles; (3) expanded closures in mainstem rivers through May to protect outmigrating juvenile steelhead; and (4) various gear and bait restrictions designed to reduce mortality associated with incidental hooking of steelhead.

In February and March 1998, the California Fish and Game Commission (Commission) adopted emergency changes to the State's inland fishing regulations which were intended to implement the harvest regulation changes contained in the northern California steelhead strategic management plan. In conjunction with the final listing determination for this ESU in March 1998 (63 FR 13347), NMFS reviewed these regulatory changes and concluded that they would substantially reduce impacts to adult and juvenile steelhead and also assist in the conservation of the ESU (NMFS, 1998). These emergency regulations were formally enacted by the Commission in June 1998 following public review and comment, and they currently remain in place. NMFS believes that these angling regulations continue to provide the reduction in impacts and conservation benefits that were expected at the time the decision was made not to list this ESU in March 1998.

2. Hatchery Measures

The strategic plan for the northern California ESU contains a wide range of existing and new hatchery management measures that are intended to reduce the impacts of hatchery steelhead programs on wild steelhead populations in this ESU. Measures incorporated into the plan include: (1) release strategies that require a minimum 6" size and release at the hatchery rather than off-site; (2) marking of all hatchery-produced fish that are released and the implementation of spawner surveys to assess the extent to which hatchery fish stray into natural spawning areas; (3) a commitment to reduce hatchery releases or implement other changes in hatchery practices if significant straying of hatchery fish is found to occur; (4) a cap on hatchery production to current levels, regular health checks during each rearing cycle and the destruction of diseased fish that cannot be effectively treated; (5) a review of the existing operating procedures for all cooperative rearing facilities permitted by the State; and (6) adoption of a requirement that all cooperative facilities develop and submit five-year management plans to the State for approval. NMFS previously reviewed these existing and new hatchery management measures and concluded that they would substantially reduce potential impacts to wild steelhead (NMFS, 1998d). Because of NMFS concerns regarding the operations of the the Mad River Hatchery which is located in this ESU, DFG also committed in the 1998 NMFS/California MOA to: (1) undertake a comprehensive review of the hatchery program, including its stocking history and genetic analysis of current broodstock; and (2) develop a plan to eliminate any adverse impacts of hatchery operations on northern California steelhead if necessary.

The DFG implemented a statewide mass-marking program for its hatchery steelhead programs beginning in 1997 which includes the hatchery steelhead programs in the northern California steelhead ESU. DFG is also requiring all cooperative rearing programs that produce steelhead in this ESU to mark all released fish. This marking program has continued since its implementation in 1997 and DFG is committed to continuing this program into the future. The DFG and the NMFS have also initiated a comprehensive review of DFG's hatchery programs in this ESU (Mad River Hatchery and cooperative rearing programs), with the objective of ensuring that these programs are compatible with the conservation of naturally produced steelhead. This review is expected to be completed in 2000. Comprehensive monitoring of stray rates for hatchery produced fish has not been implemented in this ESU, but DFG expects to begin a north coast steelhead monitoring program in 2000.

3. Steelhead Monitoring and Adaptive Management

The strategic management plan for the northern California ESU identifies ongoing and expanded monitoring programs to assess steelhead abundance. A commitment to implement these programs is contained in the 1998 NMFS/California MOA. A key element of this monitoring program was a commitment to establish a joint scientific and technical team including representatives from DFG and NMFS to design appropriate detailed monitoring programs for steelhead in this ESU. NMFS considered these monitoring efforts critically important given the uncertain status of steelhead populations in these ESUs, and indicated that adequate State funding was critical to implementing the program (63 FR 13347, March 19, 1998). As part of the NMFS/California MOA, both DFG and NMFS committed to seek adequate funding for this program. The DFG has taken significant steps to implement this expanded steelhead monitoring program in the northern California steelhead ESU, but the full program has not been yet fully developed or implemented. The DFG has committed significant fiscal resources to hire and redirect existing staff resources to create a north coast steelhead monitoring team and program that will address the northern California steelhead ESU as well as areas further north in California, and has established a scientific and technical team to guide development of this effort. A set of comprehensive monitoring proposals have been developed which are under review by the scientific and technical team. NMFS expects the finalized monitoring program for this ESU to be implemented in early 2000.

NMFS/California Memorandum of Agreement

NMFS evaluated a wide range of conservation efforts that California had adopted or was in the process of developing in conjunction with NMFS' decision not to list the northern California steelhead ESU (63 FR 13347, March 19, 1998). NMFS concluded that DFG's harvest and hatchery programs for this ESU would increase adult escapement, increase juvenile survival, and reduce adverse impacts of hatchery populations on wild fish. In the near-term, NMFS expected these measures would contribute to improved survival and population stability for steelhead. In addition, DFG's monitoring and adaptive management programs were expected to provide State and Federal managers with the ability to assess the status of steelhead populations and their response to harvest and hatchery management changes. However, NMFS was also concerned that California's habitat protection efforts, (e.g., development of a Watershed Protection Program and implementation of the expanded habitat restoration program established by SB 271), were not adequate to secure properly functioning habitat conditions for this ESU over the long-term. To address these concerns, NMFS entered into a MOA with the State (NMFS/California MOA, 1998).

Under the terms of the NMFS/California MOA, the State committed to a broad range of measures including: (1) compliance with existing State regulations, with particular emphasis on the management measures contained in the strategic management plans for north coast steelhead; (2) implementation of harvest and hatchery management measures contained in the strategic management plan for northern California steelhead; (3) implementation of a monitoring evaluation and adaptive management program for steelhead, including those elements contained in the strategic management plan for northern California steelhead; (4) continued implementation of a California Watershed Protection Program, including the SB 271 watershed planning and habitat restoration program in coastal watersheds, and the joint review and revision of the State's forest practice rules (FPRs) in conjunction with a scientific review panel to ensure that the revised FPRs were adequate to conserve anadromous salmonids, including steelhead. As previously discussed, because of the preponderance of private timber lands and timber harvest activity in the northern California ESU, NMFS considered this to be a critically important provision in the MOA.

Many of the provisions in the NMFS/California MOA relating to the northern California steelhead ESU have been or are being implemented by the State; however, critically important provisions related to revision of the FPRs have not been implemented. The current status of the State's effort to implement the MOA, with particular regard to the Northern California steelhead ESU, is discussed here.

1. Compliance with existing State regulations

In accordance with section 4 of the NMFS/California MOA, the DFG made recommendations to the Fish and Game Commission to implement detailed angling regulation changes contained in the strategic management plan for northern California steelhead. The Commission adopted these recommendations on an emergency basis in February 1998 and permanent regulations became effective in August 1998. Within this ESU, these regulations specifically prohibit retention of naturally spawned adult steelhead, prohibit fishing for naturally produced juvenile steelhead in tributary streams, minimize the angling impacts on juvenile steelhead in mainstem rearing areas through gear/bait restrictions, prohibit retention of summer steelhead and prohibit fishing in their summer holding areas and provide for the retention of marked, hatchery-produced steelhead.

2. Harvest and Hatchery Management

In accordance with section 6 of the NMFS/California MOA, two provisions have been implemented. First, the DFG recommended and the Fish and Game Commission adopted permanent regulations that provide only for the retention of non-listed, hatchery-produced steelhead. Second, the DFG has implemented a state wide mass marking program for hatchery produced steelhead. This program was initiated with brood year 1997 steelhead released in winter 1998, and the marking program has continued annually since that time. This program has resulted in complete marking of all steelhead produced at the Mad River Hatchery, which is located in this ESU. In addition, DFG is requiring that all cooperative rearing programs that produce steelhead mark them prior to release.

Three additional provisions contained in section 6 of the NMFS/California MOA have not yet been implemented, but are either in progress or will be initiated shortly. To date, DFG has not implemented a process for establishing recovery and strategic goals for north coast steelhead, including this ESU, nor has it initiated a monitoring program to measure stray rates of hatchery produced steelhead. However, the DFG has established a North Coast Steelhead Monitoring Program to develop and implement a monitoring program, which will include the northern California steelhead ESU, and a joint scientific and technical team to provide guidance to the program. DFG has developed a preliminary monitoring program and is consulting the joint scientific and technical team to refine the program and explore options for establishing recovery and strategic goals within this ESU. NMFS anticipates that this program will commence in 2000. Although the monitoring program specified in the NMFS/California MOA has not been fully implemented, DFG has continued to carry out several monitoring and research programs on the north coast, primarily in the Klamath Mountains Province ESU, which have provided data useful for the management of steelhead. Finally, NMFS and DFG have recently undertaken a state-wide review of the State's hatchery programs, including the Mad River Hatchery which is located in this ESU, as well as the State's cooperative rearing program which has a small number of projects within this ESU. This review is expected to be completed by June 2000.

3. Monitoring Evaluation and Adaptive Management

In accordance with section 7 of the NMFS/California MOA, the DFG has implemented, at least in part, two key provisions. First, the DFG has established a joint scientific and technical team to assist it with the development of a comprehensive monitoring program for steelhead on the north coast, including the northern California ESU. The NMFS/California MOA called for this program to be developed by June 1998; however, as discussed in the preceding section, DFG has not yet completed development of the study plan or initiated a comprehensive monitoring program. Second, the DFG has secured the necessary funding to establish a north coast steelhead monitoring program, including the dedication of professional staff and the acquisition of necessary equipment and facilities. A preliminary monitoring program plan has been developed by the monitoring program staff, and this plan is currently under review by the joint scientific and technical team.

4. California's Watershed Protection Program

Section 9 of the NMFS/California MOA commits the State to continue

development of its Watershed Protection Program, with a specific element addressing salmonid conservation, and to coordinate with NMFS in establishing a scientific review panel that would advise the State in its development of this program. In addition, Section 9 commits the State to direct personnel and fiscal resources to implement an expanded habitat restoration program in coastal watersheds using SB 271 funds. Details of the State's Watershed Protection Program and DFG's efforts to implement expanded watershed planning and habitat restoration in coastal watersheds were described previously (see Efforts Being Made to Protect West Coast Steelhead).

Section 9 of the NMFS/California MOA contains several measures relating to the review and revision of the State's FPRs because of NMFS's concerns regarding the effects of State-regulated timber harvest freshwater habitat conditions for anadromous salmonids, including steelhead in the Northern California ESU. Specifically, the NMFS/California MOA calls for: (1) a joint review of the FPRs by NMFS and the State, including their implementation and enforcement, (2) the State to make appropriate changes in implementation and enforcement, if necessary, (3) the State, in consultation with NMFS, to make recommendations to the BOF for changes in the FPRs necessary to conserve anadromous salmonids, and (4) the BOF to complete action on the recommended changes in the FPRs by January 2000. Full implementation of these NMFS/California MOA provisions, including implementation of changes in the FPRs by January 1, 2000, was a critical factor in NMFS's decision to not list the northern California steelhead ESU. For details of the State's current FPRs, including the recently adopted interim FPR changes, see Inadequacy of Existing Regulatory Mechanisms.

Listing Determination

Section 3 of the ESA defines an endangered species as any species in danger of extinction throughout all or a significant portion of its range, and a threatened species as any species likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. Section 4(b)(1) of the ESA requires that the listing determination be based solely on the best scientific and commercial data available, after conducting a review of the status of the species and after taking into account those efforts, if any, being made to protect such species.

In December 1997, the NMFS' steelhead BRT concluded that the Northern California steelhead ESU was likely to become endangered in the foreseeable future based on a review of the best available biological information (NMFS, 1997). Based on a review of updated abundance and trend information that was available for this ESU, NMFS's SWFSC (NMFS, 2000) concluded that the current biological status of the ESU has changed little since it was last evaluated in 1997. Updated abundance and trend data show small increases for winter and summer steelhead in the Eel River, but current abundance is well below estimates in the 1980s and even further reduced from levels in the 1960s. Redwood Creek summer steelhead abundance remains very low. There are no new data suggesting substantial increases or decreases in populations since the last updated status review was completed. The Eel River winter and summer steelhead populations, which represent the best available data set for this ESU, are still severely reduced from pre 1960s levels.

As discussed elsewhere in this final rule, California has implemented several of the conservation measures that NMFS relied upon in making its decision not to list the northern California ESU. Specifically, the State has enacted substantial changes to the State's in-river angling regulations in 1998 to protect coastal steelhead populations including steelhead in this ESU. These regulations, with slight modification, remain in effect, and NMFS believes they continue to provide the substantial protection and conservation benefits that were expected to occur at the time of the decision not to list this ESU. The State has also implemented, or begun to implement, several other conservation measures for this ESU, including extensive watershed planning and/or habitat restoration through the SB 271 program, marking of hatchery produced steelhead and other improvements in hatchery practices, and steelhead monitoring. Although implementation of some of these measures has been delayed, as is the case for the steelhead monitoring program, NMFS continues to believe that these efforts will collectively benefit steelhead in this ESU and eventually contribute to an improved understanding of its status.

Although these conservation efforts are expected to benefit steelhead in this ESU, NMFS continues to believe that improved habitat protection and restoration of properly functioning freshwater habitat conditions for spawning, rearing, and migration are essential to the long-term survival and recovery of this ESU. Because Federal land ownership is both fragmented and limited in this ESU (approximately 19 percent of ESU), the key to achieving habitat protection and properly functioning habitat conditions in this ESU is the improvement of land management activities on non-Federal lands (approximately 81 percent of ESU). To ensure improved protection of habitat on non-Federal lands in this ESU, the NMFS/California MOA contained several provisions for the review and modification of the State's FPRs. Full implementation of these provisions, including implementation of changes in the FPRs by January 1, 2000, was a critical factor in NMFS's previous decision not to list this ESU. Because the State has not implemented changes in the FPRs necessary to protect steelhead in this ESU, NMFS believes that critically important conservation measures are not being implemented to reduce the threats to this ESU from timber harvest activities on non-Federal lands. Consequently, NMFS concludes that existing State and Federal conservation measures collectively fail to provide for the attainment of properly functioning habitat conditions necessary to provide for the long-term protection and conservation of this ESU.

Based on a review of the best available information, therefore, NMFS concludes that the Northern California steelhead ESU warrants listing as a threatened species at this time. In arriving at this determination, NMFS carefully considered the December 1997 scientific conclusions of the BRT regarding this ESU, the results of an updated status review for the ESU (NMFS, 2000), the status of State and Federal conservation efforts directed at protecting steelhead in this ESU, including implementation of provisions contained in the NMFS/California MOA.

NMFS previously examined the relationship between hatchery and natural populations of steelhead in this ESU, and also assessed whether any hatchery populations are essential for their recovery. At this time, NMFS does not believe any specific hatchery populations in this ESU are essential for recovery and therefore none are listed. Accordingly, only naturally reproduced populations of steelhead and their progeny in this ESU are listed as a result of this determination.

However, the determination that a hatchery stock is not essential for recovery at this time does not preclude it from playing a role in recovery in the future if such a conservation measure is warranted. Any hatchery population that is part of the ESU is potentially

available for use in recovery if circumstances warrant it. In this context, an essential hatchery population is one that is vital to incorporate into recovery efforts. If in the future any hatchery population in this ESU is determined to be essential for recovery and is integrated into recovery efforts, NMFS will consider taking the administrative action of listing that hatchery population.

NMFS' "Interim Policy on Artificial Propagation of Pacific Salmon Under the Endangered Species Act" (58 FR 17573, April 5, 1993) provides guidance on the treatment of hatchery stocks in the event of a listing. Under this policy, "progeny of fish from the listed species that are propagated artificially are considered part of the listed species and are protected under the ESA."

For unlisted hatchery populations that are part of the Northern California ESU, NMFS believes it may be desirable to incorporate naturally spawned, listed fish into the broodstock to ensure that its genetic and life history characteristics do not diverge significantly from natural populations. Therefore, NMFS may allow the collection of broodstock for this use if it is consistent with an acceptable conservation plan (e.g., Hatchery and Genetic Management Plan) for the ESU. If listed fish are used as broodstock consistent with an acceptable conservation plan, NMFS may determine that it is not necessary to consider the progeny of intentional hatchery x listed crosses as listed fish (except in those cases where the hatchery population is listed as well). NMFS believes this is consistent with NMFS' interim policy and with the policy and purposes of the ESA.

At this time, NMFS is only listing the anadromous life forms of *O. mykiss*.

Prohibitions and Protective Measures

Section 4(d) of the ESA requires NMFS to issue protective regulations it finds necessary and advisable to provide for the conservation of threatened species. Section 9 of the ESA prohibits violations of protective regulations for threatened species promulgated under ESA section 4(d). The ESA 4(d) protective regulations may prohibit, with respect to the threatened species, some or all of the acts which section 9 of the ESA prohibits with respect to endangered species. These ESA section 9 prohibitions and 4(d) regulations apply to all individuals, organizations, and agencies subject to U.S. jurisdiction. NMFS intends to develop and promulgate an ESA 4(d) protective regulation for the northern California steelhead ESU in a separate rulemaking. The process for completing the ESA 4(d) rule will provide the opportunity for public comment on the proposed protective regulations.

In the case of threatened species, NMFS has flexibility under ESA section 4(d) to tailor the protective regulations to provide for the conservation of the species. Even though existing conservation efforts and plans are not sufficient to preclude the need for listing at this time, they are nevertheless valuable for improving watershed health and restoring fishery resources. In those cases where well-developed, reliable conservation plans exist, NMFS may choose to incorporate them into the recovery planning process, starting with the protective regulations. For example, the interim ESA 4(d) rule for the Southern Oregon/Northern California coho (62 FR 24588, May 7, 1997) does not prohibit habitat restoration activities conducted in accordance with approved plans or fisheries under an approved state management plan. NMFS recently proposed ESA 4(d) regulations for 14 ESUs of steelhead and salmon (64 FR 73479). Any future ESA 4(d) protective regulation for the Northern California steelhead ESU is likely to be comparable to the 4(d) regulations proposed for steelhead, and therefore, contain limitations on the section 9 take prohibitions for activities such as recreational angling, artificial propagation, habitat restoration, scientific research and other activities when they are conducted in accordance with approved conservation plans.

Sections 7(a)(2) and 7(a)(4) of the ESA require Federal agencies to consult with NMFS to ensure that activities they authorize, fund, or conduct are not likely to jeopardize the continued existence of a listed species or a species proposed for listing, or adversely modify critical habitat or proposed critical habitat. Examples of Federal actions likely to affect steelhead in the Northern California ESU include authorized land management activities of the USFS and BLM, operation of hydroelectric and storage projects permitted by FERC, and activities permitted by the Corps of Engineers. Such activities may include timber sales and harvest, permitting livestock grazing, hydroelectric power generation, and flood control. Other Federal actions, including the Corps section 404 permitting activities under the CWA and section 10 permitting under the Rivers and Harbors Act, and FERC licenses for non-Federal development and operation of hydropower may also require consultation.

Sections 10(a)(1)(A) and 10(a)(1)(B) of the ESA provide NMFS with authority to grant exceptions to the ESA's "take" prohibitions. Section 10(a)(1)(A) scientific research and enhancement permits may be issued to entities (Federal and non-Federal) for scientific purposes or to enhance the propagation or survival of a listed species. NMFS has issued section 10(a)(1)(A) research/enhancement permits for listed chinook salmon and steelhead for a number of activities, including trapping and tagging, electroshocking to determine population presence and abundance, removal of fish from irrigation ditches and collection of adult fish for artificial propagation programs.

Section 10(a)(1)(B) incidental take permits may be issued to non-Federal entities performing activities which may incidentally take listed species so long as the taking is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. The types of activities potentially requiring a section 10(a)(1)(B) incidental take permit include the operation and release of artificially propagated fish by state or privately operated and funded hatcheries, state or academic research not receiving Federal authorization or funding, logging, road building, grazing, and diverting water into private lands.

Take Guidance

NMFS and the FWS published in the **Federal Register** on July 1, 1994 (59 FR 34272), a policy that NMFS shall identify, to the maximum extent practicable at the time a species is listed, those activities that would or would not constitute a violation of section 9 of the ESA. The intent of this policy is to increase public awareness of the effect of this listing on proposed and ongoing activities within the species' range. NMFS believes that the following actions are not likely to be prohibited in an ESA 4(d) rule and therefore will not result in a violation of section 9:

1. Possession of steelhead from any steelhead ESU listed as threatened which are acquired lawfully by permit issued by NMFS pursuant to section 10 of the ESA, or by the terms of an incidental take statement pursuant to section 7 of the ESA.

2. Federally funded or approved projects that involve activities such as silviculture, grazing, mining, road construction, dam construction and operation, discharge of fill material, stream channelization or diversion for which section 7 consultation has been completed, and when activities are conducted in accordance with any terms and conditions provided by NMFS in an incidental take statement accompanying a biological opinion.

Activities that NMFS believes could potentially harm steelhead in the northern California ESU and, therefore, may be prohibited in a 4(d) rule applying section 9 take prohibitions, include, but are not limited to:

1. Land-use activities that adversely affect steelhead habitat in the proposed ESU (e.g., logging, grazing, farming, urban development, road construction in riparian areas and areas susceptible to mass wasting and surface erosion).
2. Destruction/alteration of the steelhead habitat in the proposed ESU, such as removal of large woody debris and "sinker logs" or riparian shade canopy, dredging, discharge of fill material, draining, ditching, diverting, blocking, or altering stream channels or surface or ground water flow.
3. Discharges or dumping of toxic chemicals or other pollutants (e.g., sewage, oil, gasoline) into waters or riparian areas supporting steelhead in the proposed ESU.
4. Violation of discharge permits.
5. Pesticide applications.
6. Interstate and foreign commerce of steelhead from the listed ESU and import/export of steelhead from any ESU without a threatened or endangered species permit.
7. Collecting or handling of steelhead from the listed ESUs. Permits to conduct these activities are available for purposes of scientific research or to enhance the propagation or survival of the species.
8. Introduction of non-native species likely to prey on steelhead in the listed ESU or displace them from their habitat.

These lists are not exhaustive. They are intended to provide some examples of the types of activities that might or might not be considered by NMFS as constituting a take of steelhead in the northern California ESU under the ESA and its regulations. Questions regarding whether specific activities will constitute a violation of the section 9 take prohibitions, and general inquiries regarding prohibitions and permits, should be directed to NMFS (see **ADDRESSES**).

Critical Habitat

Section 4(a)(3)(A) of the ESA requires that, to the maximum extent prudent and determinable, NMFS designate critical habitat concurrently with a determination that a species is endangered or threatened. Pursuant to 4(b)(6)(C)(ii), if critical habitat is not then determinable, however, NMFS may extend the designation for up to one year after the date of the final rule listing the species. While NMFS has completed its initial analysis of the biological status of steelhead in the Northern California ESU, it has not performed the full analysis necessary for designating critical habitat at this time. Since critical habitat is not now determinable for the Northern California ESU, NMFS intends to develop a critical habitat proposal for designation within the next year.

References

A complete list of all cited references is available upon request (see **ADDRESSES**).

Classification

National Environmental Policy Act

The 1982 amendments to the ESA, in section 4(b)(1)(A), restrict the information that may be considered when assessing species for listing. Based on this limitation of criteria for a listing decision and the opinion in *Pacific Legal Foundation* v. *Andrus*, 675 F. 2d 825 (6th Cir. 1981), NMFS has concluded that ESA listing actions are not subject to the environmental assessment requirements of the National Environmental Policy Act (NEPA). See NOAA Administrative Order 216 6.

Executive Order 12866 and Regulatory Flexibility Act

As noted in the Conference Report on the 1982 amendments to the ESA, economic impacts cannot be considered when assessing the status of species. Therefore, the economic analysis requirements of the Regulatory Flexibility Act (RFA) are not applicable to the listing process. In addition, this final rule is exempt from review under Executive Order 12866.

Executive Order 13132—Federalism

In keeping with the intent of the Administration and Congress to provide continuing and meaningful dialogue on issues of mutual State and Federal interest, NMFS has conferred with State and local government agencies in the course of assessing the status of the Northern California steelhead ESU, and considered, among other things, state and local conservation measures. State and local governments have expressed support both for the conservation of the Northern California steelhead ESU and for activities that affect this ESU. The history and content of this dialogue, as well as the basis for this action, is described in the proposed rule, and in other Federal Register Documents preceding this action. (See 61 FR 41541, August 9, 1996; 62 FR 43974, August 18, 1997, and 63 FR 13347, March 19, 1998). NMFS staff have had numerous discussions with various governmental agency representatives regarding the status of this ESU, and have sought working relationships with agencies and others in order to promote salmonid restoration efforts. In addition, NMFS' staff have given presentations to interagency forums and other interested groups considering conservation measures. NMFS has engaged in informal and formal contacts with affected state, local or regional entities, giving careful consideration to all written or oral comments received. As one part of that process, NMFS held public hearings on the proposed action. NMFS also consulted with appropriate elected officials in the establishment of a final rule.

At this time NMFS is not promulgating protective regulations pursuant to ESA section 4(d) or proposing to designate critical habitat. Prior to finalizing ESA 4(d) regulations for this ESU, or proposing to designate critical habitat, NMFS will comply with all relevant NEPA and RFA requirements.

List of Subjects in 50 CFR Part 223

Endangered and threatened species, Exports, Imports, Marine mammals, Transportation.

Dated: May 31, 2000.

Penelope D. Dalton,

Assistant Administrator for Fisheries, National Marine Fisheries Service.

For the reasons set forth in the preamble, 50 CFR part 223 is amended as follows:

PART 223—THREATENED MARINE AND ANADROMOUS SPECIES

1. The authority citation for part 223 continues to read as follows:

Authority: 16 U.S.C. 1531 1543; subpart B, Section 223.102 also issued under 16 U.S.C. 1361 *et seq.*

2. In § 223.102, paragraph (a)(22) is added to read as follows:

§ 223.102 Enumeration of threatened species.

* * * * *

(a) * * *

(22) *Northern California steelhead (Oncorhynchus mykiss).* Includes all naturally spawned populations of steelhead (and their progeny) in coastal river basins ranging from Redwood Creek in Humboldt County, California to the Gualala River, inclusive, in Mendocino County, California.

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