



Fisheries Annual Report

2008

Prepared By:
Fisheries Department
Mendocino Redwood Company, LLC
PO Box 489
Fort Bragg, CA 95437

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INTRODUCTION

This report summarizes the majority of the work the Fisheries Department has conducted in 2008. In some cases, data from previous years is also presented.

Our major projects included out-migrant trapping in the Little North Fork Navarro, amphibian distribution surveys, red-legged frog breeding site monitoring and egg mass abundance estimates, red-legged frog breeding phenology studies, stream temperature monitoring, precipitation monitoring, long term channel monitoring, fish presence or absence in MRC's major drainage basins, drafting and editing the sections pertinent to aquatic biology in MRC's Habitat Conservation Plan (HCP), and providing assistance to forestry staff regarding stream classification and compliance with state 1600 permits.

Since 2003, the Fisheries Department has focused upon determining the spatial distribution of three key amphibian species (red-legged frogs, coastal tailed frogs, and southern torrent salamanders). We expect to have the distribution of these species identified throughout the majority of MRC's ownership by 2011. Upon completion of the amphibian distribution studies, we will focus our efforts on population estimates of out-migrating juvenile coho salmon, monitoring amphibian distribution and beginning to collect abundance estimates of larval tailed frogs.

The Fisheries Department has completed all field work and fish habitat analyses pertinent to MRC's Watershed Analysis throughout the entire ownership. Now that we have completed all of the Watershed Analysis work, we are now focusing on measurements within our long term channel monitoring segments. These measurements assess the quality of fish habitat by measuring pool spacing, pool frequencies, pool depths, spawning gravel quality and permeability, measuring the volume of pools which may be filled with fine sediment and the complexity of the habitat.

In 2008, our long term channel monitoring was focused in 5 watersheds which were impacted by the 2008 Mendocino Lightning Complex fires. Over the next several years we will continue to monitor the effects of these fires upon aquatic habitats through monitoring potential changes in our long term channel monitoring segments.

OUT-MIGRATION OF JUVENILE SALMONIDS: LITTLE NORTH FORK NAVARRO 2007 and 2008

METHODS

Both a rotary screw trap and a pipe trap were fished in Little North Fork Navarro in the spring of 2007 and 2008. During higher flows (>5.5 CFS) the rotary screw trap was used and during lower flow levels (< 5.5 CFS) a pipe trap was used at the same trapping location.

COHO SALMON

The number of coho salmon smolts migrating during the 2007 trapping period was 822 +/- 92 fish. In 2008, the coho salmon smolt population was estimated to be 1258 +/- 25 fish. The 2008 coho salmon smolt population was quite larger than that of 2007. The 2008 trap operated very efficiently hence the rather tight margin of error (+/- 25 fish). Based upon empirical evidence collected during spawning survey efforts, more adult coho salmon spawned upstream of our trapping location in 2007 than in 2006. This assumption is further supported by the increase in coho salmon smolt numbers. MRC is conducting more rigorous spawning surveys in 2009 and will be able to make more statistically valid statements regarding the number of adults spawning.

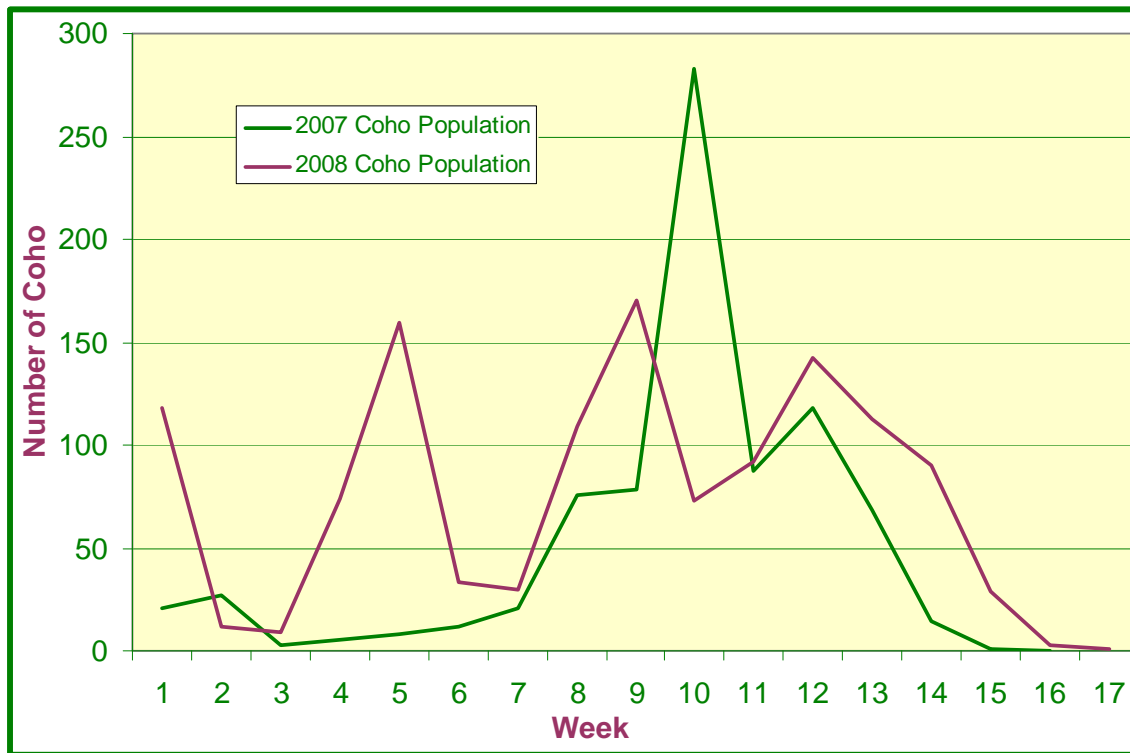


Figure 1: Number of coho salmon smolts estimated for years 2007 and 2008.

STEELHEAD

The total estimated migration for all age 1+ steelhead was 2459.6 ± 177.5 fish in 2007. In 2008, the age 1+ steelhead smolt population was estimated to be 768 +/- 84 fish. The population was much smaller in 2008 than in 2007. Although the abundance of steelhead out-migrants appears to have declined, it is within the range of variation commonly observed elsewhere.

It is important to note that the statistical assumptions required to generate these estimates are generally not met by steelhead. Towards the end of the season the steelhead captured in our traps were likely not en route to the ocean and thus not actually migrating. Most likely, these were resident trout or steelhead which will spend another season in the freshwater environment before migrating to the ocean.

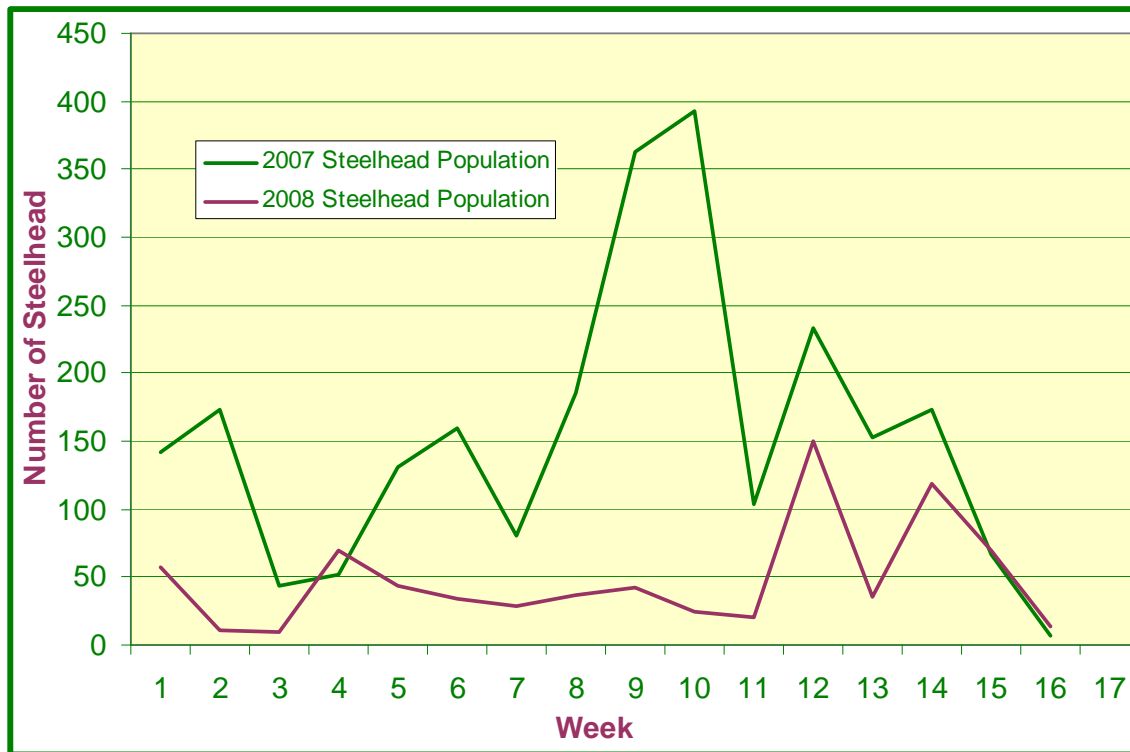


Figure 2: Number of all age 1+ steelhead estimated during 2007 and 2008.

FISH PRESENCE IN MAJOR DRAINAGE BASINS

During the years 1994-1996 and 2000-2002 MRC (and the former property owner L-P) conducted very robust sampling for fish distribution (450 sites sampled throughout the property for 3 consecutive years). MRC intends on repeating another round of this 3-year effort in the future. To monitor the distribution of fish more frequently, but on a less intensive scale, MRC conducts surveys in each of all of the major drainage basins owned. Basins were selected for annual monitoring if MRC owned a majority of the land to ensure the results reflect MRC’s management as opposed to factors outside of MRC’s control.

The major drainage basins identified for annual monitoring are listed below. Steelhead trout were detected every year within all major drainage basins sampled. If coho salmon were detected during a particular sampling year it is denoted with the word ‘Coho’ in the pertinent table cell.

Table 1: Results of fish distribution surveys combined from the 1994-1996; 2000-2002; and current annual studies within each major drainage basin identified for annual monitoring.

Basin	1994	1995	1996	2000	2001	2002	2005	2006	2007	2008
Hollow Tree	Coho	Coho	Coho	Coho	Coho	Coho	Coho	Coho	Coho	Coho
Cottaneva	Coho	Coho	Coho	Coho	Coho	Coho	Coho	Coho	Coho	Coho
Hardy							Coho*	Coho		
Juan										
Howard										
NF Noyo	Coho		Coho	Coho	Coho	Coho	Coho	Coho	Coho	Coho
Big River (above SF)					Coho	Coho	Coho	Coho	Coho	Coho
SF Big River		Coho	Coho			Coho	Coho	Coho	Coho	Coho
Albion (above SF)	Coho	Coho	Coho	Coho	Coho	Coho	Coho	Coho	Coho	Coho
SF Albion	Coho	Coho	Coho	Coho	Coho	Coho	Coho	Coho	Coho	Coho
NBNF Navarro	Coho	Coho	Coho	Coho	Coho	Coho	Coho	Coho	Coho	Coho
SBNF Navarro	Coho		Coho			Coho	Coho		Coho	Coho
Greenwood										
Elk		Coho				Coho				
Mallo Pass										
Alder										
SF Garcia	Coho		Coho			Coho	Coho	Coho	Coho	Coho
Wheatfield Fork										
Ackerman										

*Coho salmon detected immediately downstream of MRC property.

STREAM TEMPERATURE

INTRODUCTION

Stream temperature is a key water quality parameter that can be altered as a result of streamside forest management practices. Concern over abnormal warming of stream temperatures as a result of streamside vegetation removal has generally focused on the impacts to coldwater inland fisheries. The California Forest Practice Rules addresses the effects of streamside timber harvesting activities on water temperatures and dictates the implementation of Best Management Practices to minimize impacts on water quality within forested watersheds. With recent attention to coho salmon and pressure to develop Total Maximum Daily Loads (TMDLs) for coastal watersheds, monitoring stream temperatures is becoming increasingly important. Tailoring land management to meet water quality requirements has come to the forefront.

METHODS

Louisiana-Pacific initiated stream temperature monitoring within forestlands now owned by MRC in the summer of 1989. Stream temperatures were not monitored in 1998 as MRC was in the process of purchasing this timberland. Monitoring continued in 1999 and was expanded to include Class II streams in 2001. Additional monitoring began in 2002 on all major streams on the property where coho salmon were detected during aquatic species distribution studies. Air temperatures were also monitored at all of the sites throughout the ownership. Air temperature data loggers were placed within 50 feet of the water temperature data loggers out of direct sunlight along the stream bank.

Stream water temperatures were monitored continuously (2-hour interval used from 1989-2004 and a 1-hour interval from 2005 to present) during summer and early fall (May-October) each year using remote electronic temperature recorders. The stream temperature recorders were placed in shallow pools (< 1 m in depth) directly downstream of riffles and out of direct sunlight. Placement of temperature recorders in these areas ensured monitoring water that was adequately mixed and prevented de-watering of the monitoring devices. Each data recorder was held in place with a piece of rebar that was driven into the streambed substrate with a sledge hammer and a post driver. Wire was used to attach the data recorders to the rebar stakes.

Data Analysis

Three different indices were used to characterize the water temperature regime in streams. We averaged daily maximum temperatures and daily mean temperatures for 7-day periods and then reported the highest average for the entire summer. These metrics are commonly called Maximum Weekly Maximum Temperature (MWMT) and Maximum Weekly Average Temperature (MWAT) and reflect 7-day moving averages. These weekly average temperatures are widely used as indicators of long-term exposure. We also reported the absolute

maximum value for the entire summer. The absolute maximum temperatures are useful however, these values may only occur briefly. Long-term exposure to sub-lethal temperatures may do more physiological damage than short-term exposure to higher temperatures.

RESULTS

Stream temperature was monitored in 108 streams at 145 sites in 2008. Climatic variability causes stream temperatures to fluctuate; this fluctuation requires many years of data in order to determine trends. Property-wide averages of MWAT can be useful to reveal trends (see Figure 3). The monitoring program currently in place has a site variation of less than 3%, thus allowing for property-wide comparisons. At this point no trends are evident. Responsible land management is necessary to maintain or decrease stream temperatures. Because of recent emphasis on land management and increasing scrutiny by regulatory agencies, stream temperature monitoring should continue and this data should be used to tailor management needs to specific water quality issues.

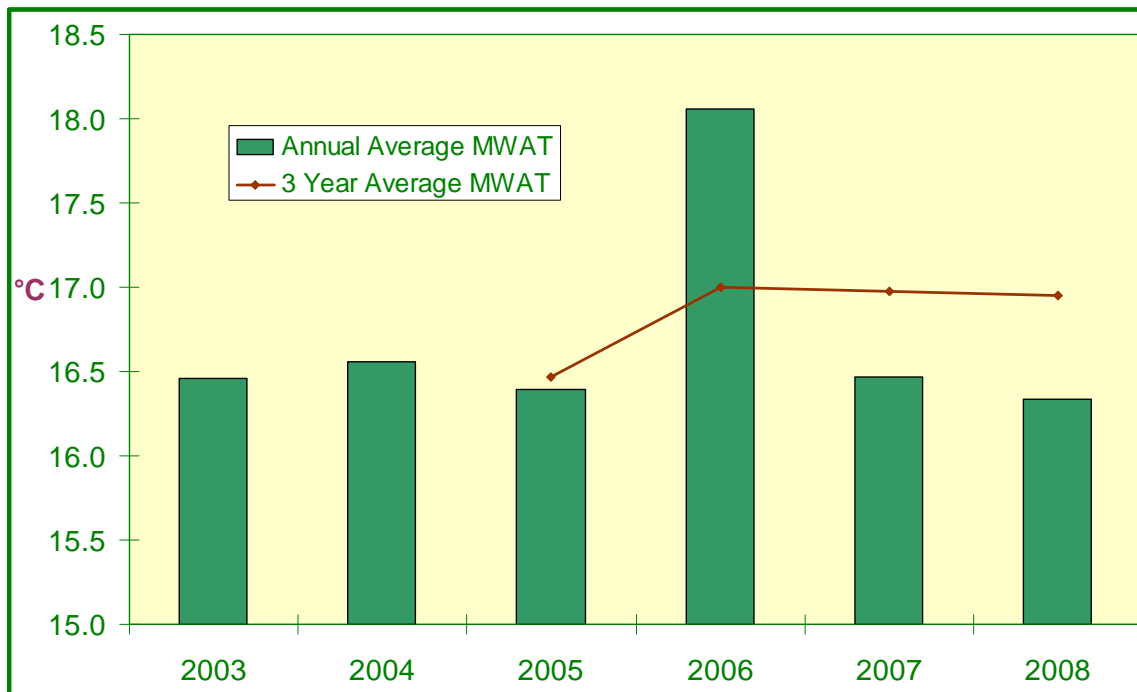


Figure 3. Annual average and 3 year moving average of MWAT for stream temperature sites consistently monitored on Mendocino Redwood Company timberlands in Mendocino and Sonoma Counties, California.

PRECIPITATION MONITORING

Rainfall and air temperature data was collected at ten locations throughout Mendocino Redwood Company forestlands. Rainfall was collected using an Onset® RG1 tipping-bucket collector. Rainfall and air temperature data was recorded using a HOBO® Event data logger. Each tipping bucket collection gauge was attached to a metal stake secured with guy wires. Rainfall collection stations were installed in existing forest openings (typically landings) having minimal obstruction to rainfall. Rainfall was measured in hundredths of an inch.

Table 2: Precipitation monitoring totals (in inches) are summarized for MRC forestlands through the 2008 water year.

Gauging Station	2003	2004	2005	2006	2007	2008
Rockport	76.85*	50.91	56.57	79.94	42.17*	44.38
Hollow Tree	92.19*	58.64	56.34	92.36	43.65*	26.30*
Noyo	42.61*	50.27	58.77	79.5	36.26	41.86
Big River	22.62*	38.19	22.28*	47.25*	31.99	36.86
Albion	53.85*	38.64	49.68	65.8	32.83	27.52
SBNF Navarro	51.99*	33.41	43.63	58.05	28.29*	30.45
Fashauer	51.19*	39.66*	20.75*	45.15*	35.27	41.92
Elk	47.73*	38.45	31.84*	59.88	29.11	34.98
Garcia	65.35*	30.82*	70.12	78.39*	46.58	50.74
Gualala	54.29*	50.08	57.18	75.94	37.19	41.55

*Indicates missing data.

RED-LEGGED FROG MONITORING AND EGG MASS PRODUCTION

INTRODUCTION

It is generally agreed upon by most herpetologists that the number of egg masses deposited each season is indicative of the number of mature females in the red-legged frog meta-population. Monitoring estimates of the total number of egg masses deposited is useful in determining the status of the species as well as assessing the impacts of land management activities upon the frogs.

METHODS

Red-legged frog egg masses are rather conspicuous and can usually be observed quite easily. Upon arrival to the site- a starting point is selected and marked to determine the ending point of the survey. Multiple (2 or 3) independent surveys are conducted by walking the entire perimeter of the site. Egg masses are tallied as the observer walks the perimeter of the site. Upon reaching the marked ending point, the survey is considered complete.

Some sites are very complex (due to floating debris, etc) or are difficult to access. In these cases efforts to count egg masses were not undertaken and efforts were focused on detecting presence of the species. Most often the presence of egg masses in these sites is confirmed using binoculars and float tubes. Complex sites which were difficult to survey were removed from Table 3.

Minimal rainfall during the egg deposition season in 2008/2009 complicated egg mass counts. Most sites were nearly dry during our survey efforts. This report is being written on February 3, 2009. It is likely that additional egg masses may be deposited if we happen to get more rainfall after this report is completed. The low egg mass counts reflect the poor water year (to date). The egg deposition season started in November 2008 and has continued until February 1, 2009 (to date).

Table 3: Egg mass production estimates for planning watersheds known to support red-legged frog reproduction. Estimates were combined from all sites within the planning watershed to yield an overall egg mass production for each planning watershed.

Planning Watershed	2004	2005	2006	2007	2008	2009
Lower Albion (AL)	135	113	132	273	188	85
Russian Gulch (AG)	2	3	19	23	5	23
Ray Gulch (WR)	Present	Present	Present	Present	Present	Present
Lower Greenwood (CG)	25	18	16	18	20	25
Mallo Pass (CM)	5	0**	3	0**	2	0**

** Indicates site remained dry all season

AMPHIBIAN DISTRIBUTION

INTRODUCTION

In 2003, MRC began efforts to identify the distribution of three amphibian species (red-legged frogs, coastal tailed frogs, and southern torrent salamanders). Prior to efforts by MRC the distribution of these species was largely unknown.

RED-LEGGED FROG DISTRIBUTION SUMMARY

A total of 127 potential breeding sites were identified during this study. Approximately 15% of the potential breeding sites identified during this study were found to support red-legged frog reproduction (20 of 127 sites). All of the documented breeding sites identified had minimal canopy cover. Canopy cover over documented red-legged frog breeding sites ranged from 0-60% with a median value of 10% (\bar{x} = 13%). The majority of documented breeding sites identified were natural or manmade ponds within wet meadows or wetlands. All of the documented breeding sites identified were over 2-feet in depth at high water. Forty percent of the documented breeding sites identified were manmade (8 of 20 sites).

COASTAL TAILED FROG DISTRIBUTION SUMMARY

Coastal tailed frog surveys were conducted at 388 sites, of which 79 sites yielded detections (20% of sites). The majority of coastal tailed frogs (87%) were detected in watercourses with gradients ranging from 0-10%. These findings are consistent with studies conducted by Diller and Wallace (1999), who found the median stream gradient where larvae were found to be present was 7.1%. It appeared that watercourses with gradients which exceeded 10% were often dominated by step-pools or cascades, and contained minimal amounts of riffle habitat (the preferred coastal tailed frog habitat).

SOUTHERN TORRENT SALAMANDER DISTRIBUTION SUMMARY

Surveys were conducted at 189 sites throughout the MRC ownership, and 35 sites yielded detections of southern torrent salamanders (~18% of sites). The distribution of southern torrent salamanders appears to be much less widespread than in Humboldt County. Diller and Wallace (1996) found southern torrent salamanders present in 80.3% of sites sampled in Humboldt County. Perhaps the ameliorating affects of coastal fog is more significant in Humboldt County, than in the southernmost portion of the species range (Mendocino County).

Southern torrent salamanders were found in only one site with a southerly aspect, and were only detected at sites within 5 miles of the Pacific Ocean. The canopy closure over sites with southern torrent salamanders present ranged from 30-100% with a median value of 85% (\bar{x} = 80%). Southern torrent salamanders were found in small watercourses (49%) and seeps, springs, and soil pipes (51%).

ADAPTIVE MANAGEMENT

INTRODUCTION

Ecosystems are inherently complex, which makes predicting species and habitat responses to management actions difficult. Changes in land use outside the MRC ownership may also introduce uncertainty. To address such uncertainties, MRC enlists principles of adaptive management, which allow us to adjust conservation measures based on results of monitoring. This approach provides greater assurance that we will achieve our biological goals and objectives.

Monitoring the outcomes of management is the foundation of an adaptive approach and thoughtful monitoring can both advance scientific understanding and modify management actions iteratively (Williams et al. 2007). Adaptive management is necessary because of the degree of uncertainty and natural variability associated with ecosystems and their management. Based on the best scientific information currently available, MRC expects our conservation measures to achieve our biological objectives.

However, there is uncertainty about management techniques, changing conditions within the area, regional habitat conditions, and the status of species and natural communities. Any of these may change in unexpected ways. Perhaps conservation measures other than those currently provided will prove more effective in achieving our biological objectives. Results of monitoring may indicate that some of our conservation measures are less effective than anticipated. To address these uncertainties, MRC will use an adaptive management approach, based on monitoring efforts, to inform our decisions.

AQUATIC BIOLOGY RELATED ADAPTIVE MANAGEMENT IN 2008

For the second consecutive season, we observed a lack of red-legged frog reproduction in one particular breeding site (pond habitat). We reviewed our data and noted that this pond had experienced a significant reduction in depth. We theorized that the reduction in depth may be the culprit behind the lack of egg masses or tadpoles in recent years. In 2008, our Aquatic Biology Staff used shovels to restore the former depth of the pond. We also planted native plants around the perimeter of the pond to restore oviposition media for the frogs.

In early 2009, red-legged frogs were detected once again using this pond as breeding habitat (one egg mass deposited). We are proud that this process has worked to the benefit of the red-legged frog. Employing a low level of disturbance to restore the habitat quality at this site appears to be successful at this time. Future monitoring efforts will help provide these answers and allow us to make better decisions moving forward.