Aquatic Biology Report

2010

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INTRODUCTION

This report summarizes the majority of the work the Fisheries Department has conducted in 2010. In some cases, data from previous years is also presented.

Our major projects included out-migrant trapping and spawning surveys in the Little North Fork Navarro, amphibian distribution surveys, red-legged frog breeding site monitoring and egg mass abundance estimates, stream temperature monitoring, precipitation monitoring, long term channel monitoring, salmonid presence 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 2012. 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 including: pool spacing, pool frequencies, pool depths, large woody debris volume and distribution, spawning gravel quality, riparian canopy, and measuring the volume of pools which may be filled with fine sediment.

OUT-MIGRATION OF JUVENILE SALMONIDS: LITTLE NORTH FORK NAVARRO RIVER 2007 - 2010

METHODS

The recent methods for out-migrant trapping of juvenile coho salmon and steelhead trout in Little North Fork Navarro River utilized both a rotary screw trap and a pipe trap based on flow conditions. 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. The rotary screw trap allows for unimpeded upstream and downstream movements for salmonids, however the pipe trap design creates a partial barrier to upstream movements. Installation of a pipe trap required the construction of a weir that diverts a majority of the downstream flow into a 6 inch diameter pipe (Figure 1) with only small overflow built into the weir for fish passage. At the terminal end of the pipe there is a live box which captures the out-migrating salmonids.

In 2010, MRC Aquatic Biologists installed a battery powered 12 volt DC motor which turns the rotary screw trap through a chain driven system (Figure 2). This method allows the rotary screw trap to fish during the lower flow conditions while eliminating the fish passage issue created by the pipe trap weir.

Figure 1. A pipe trap weir located in the Little North Fork Navarro River 2009.

Figure 2. A motorized rotary screw trap in the Little North Fork Navarro River 2011.

RESULTS

The number of coho salmon (Table 1 & Fig.2) and steelhead (Table 2 & Fig 3) are shown to compare the estimated populations during each trapping period.

Table 1. Number of estimated coho salmon smolts for each trapping year 2007-2010.

Year	Species	Estimated Population
2007	Coho Salmon *O. kisutch*	827 +/- 92
2008	Coho Salmon *O. kisutch*	1258 +/- 25
2009	Coho Salmon *O. kisutch*	1278 +/- 33
2010	Coho Salmon *O. kisutch*	374 +/- 171

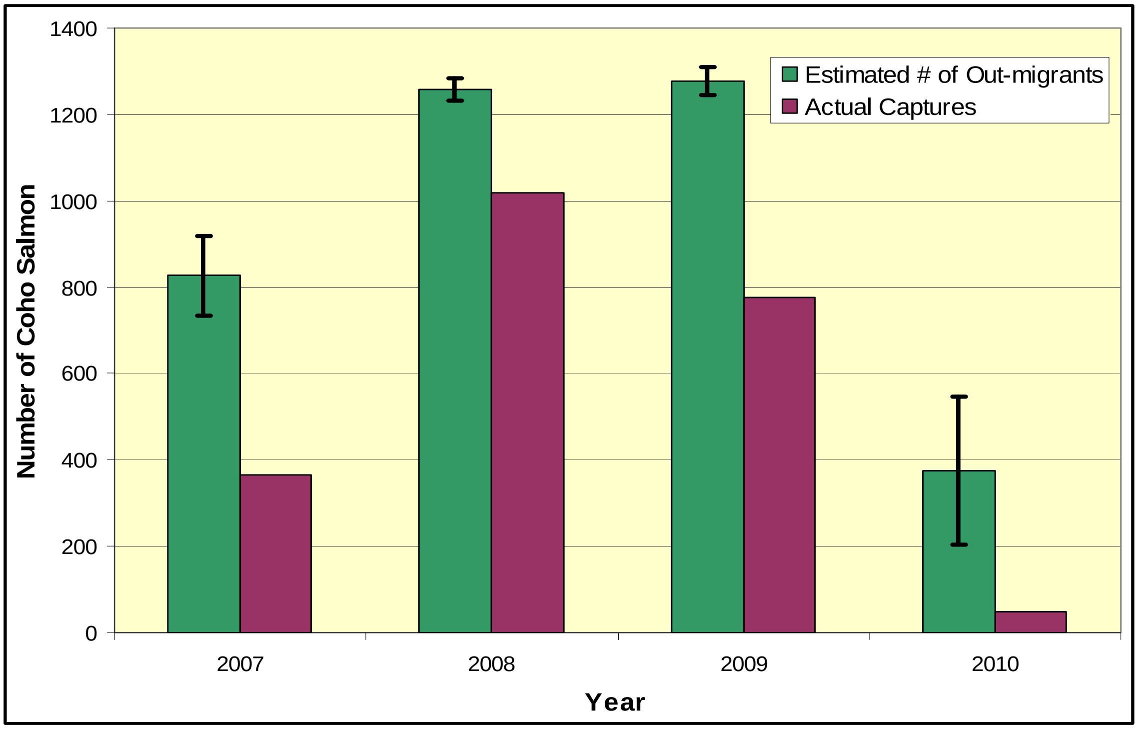

Figure 3. Number of coho salmon smolts for each trapping year 2007-2010.

Table 2. Number of estimated age 1+ steelhead for each trapping year 2007-2010.

Year	Species	Estimated Population
2007	Steelhead *O. mykiss*	2462 +/- 177
2008	Steelhead *O. mykiss*	768 +/- 85
2009	Steelhead *O. mykiss*	641 +/- 105
2010	Steelhead *O. mykiss*	653 +/- 159

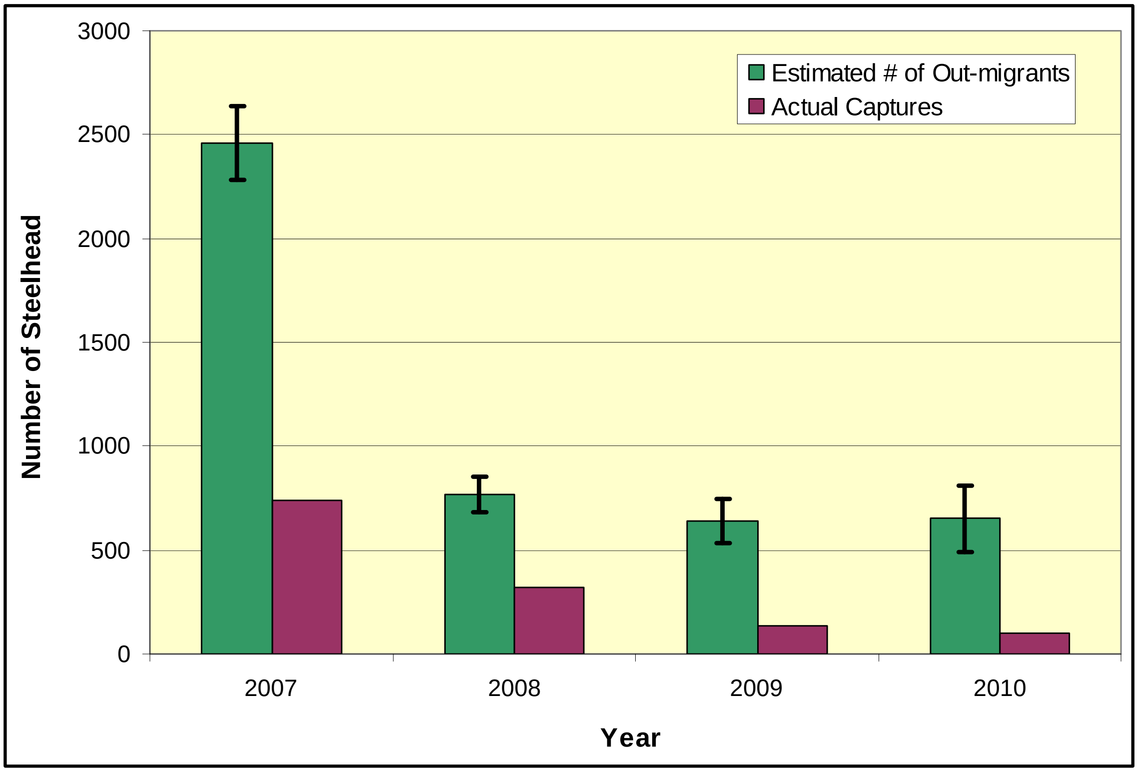

Figure 4. Number of age 1+ steelhead for each trapping year 2007-2010.

SPAWNING SURVEYS IN LITTLE NORTH FORK NAVARRO RIVER

Spawning surveys were conducted bi-weekly in six segments within the Little North Fork Navarro River from October 27, 2010 through April 22, 2011. MRC Aquatic Biologists hiked stream segments searching for redds, live adult fish, and carcasses. The measurements taken from an encountered redd included pot and tail-spill size, depth, and redd substrate size. The data collected from encountered fish included species, sex, length, fish condition, and live fish or carcass.

This year's survey effort yielded a total of 13 coho salmon redds, 3 live coho adults, 2 coho carcasses, 9 steelhead redds, 3 live adult steelhead, and 6 lamprey pits in Little North Fork Navarro River. The observed number of coho redds this year are encouraging compared to that of only a single coho redd observed during the 2009-2010 spawning survey season.

FISH PRESENCE IN MAJOR DRAINAGE BASINS

During the years 1994-1996 and 2000-2002 MRC (and the former property owner L-P) conducted intensive 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 reduced 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 (Table 3). 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 3. 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	2009	2010
Hollow Tree	Coho	Coho	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	Coho	Coho
Big River (above SF)					Coho	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	*	Coho
SF Albion	Coho	Coho	Coho	Coho	Coho	Coho	Coho	Coho	Coho	Coho	Coho	Coho
NBNF Navarro	Coho	Coho	Coho	Coho	Coho	Coho	Coho	Coho	Coho	Coho	Coho	Coho
SBNF Navarro	Coho		Coho			Coho	Coho		Coho	Coho	*	Coho
Greenwood											*	
Elk		Coho				Coho					*	
Mallo Pass											*	
Alder											*	
SF Garcia	Coho		Coho			Coho	Coho	Coho	Coho	Coho	Coho	
Wheatfield Fork											*	
Ackerman											*	

***Surveys were not conducted**
****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 more than half of the stream temperature sites. 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, 1-hour interval used from 2005-2008, and 30 minute interval used from 2009-2010) 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.
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 (Figure 5) and 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.

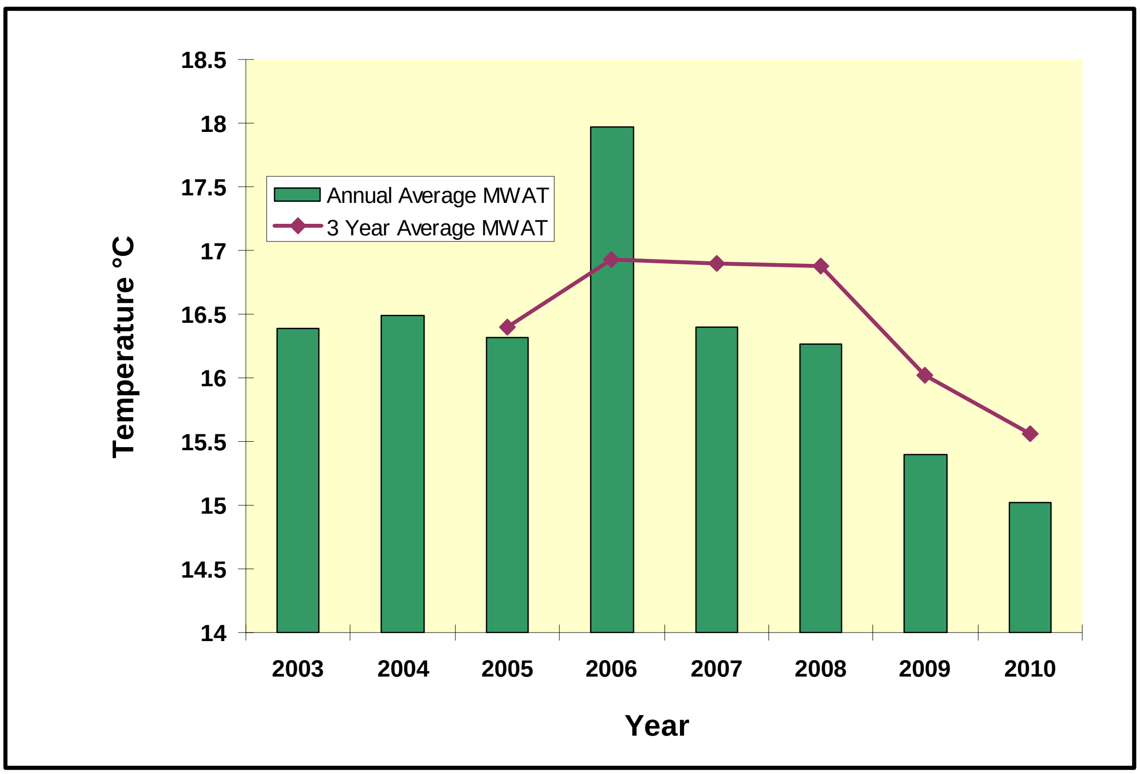

Figure 5. Annual Average and 3 Year Moving Average of MWAT for Stream Temperature Sites Monitored Yearly on Mendocino Redwood Company Timberlands.

PRECIPITATION MONITORING

Rainfall and air temperature data was collected at ten locations throughout Mendocino Redwood Company forestlands. Rainfall was collected using an Onset® RG1 and RG3 tipping-bucket collectors. 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 4. Precipitation monitoring totals (in inches) are summarized for MRC forestlands through the 2010 water year.

Gauging Station	2003	2004	2005	2006	2007	2008	2009	2010
Rockport	76.85*	50.91	56.57	79.94	42.17*	**26.30***	**41.12**	**59.45**
Hollow Tree	92.19*	58.64	56.34	92.36	43.65*	**44.38**	**33.40***	**14.69***
Noyo	42.61*	50.27	58.77	79.5	36.26	**41.86**	**8.44***	**51.42**
Big River	22.62*	38.19	22.28*	47.25*	31.99	**36.86**	**30.20**	**46.92**
Albion	53.85*	38.64	49.68	65.8	32.83	**27.52**	**29.60**	**44.61**
SBNF Navarro	51.99*	33.41	43.63	58.05	28.29*	**30.45***	**22.93**	**39.07***
Fashaurer	51.19*	39.66*	20.75*	45.15*	35.27	**41.92**	**32.77**	**51.59**
Elk	47.73*	38.45	31.84*	59.88	29.11	**34.98**	**29.76**	**36.24***
Garcia	65.35*	30.82*	70.12	78.39*	46.58	**50.74**	**46.12**	**64.41***
Gualala	54.29*	50.08	57.18	75.94	37.19	**41.55***	**36.92**	**54.25***

LONG TERM CHANNEL MONITORING

As part of MRC's watershed analysis protocol, long-term channel monitoring (LTCM) reaches have been established throughout the property. Thalweg profiles and cross sections are surveyed from established benchmarks so that future surveys can be conducted in the exact location of stream. This method allows physical changes in stream morphology to be recognized over periods of time.

In 2010, two LTCM segments were surveyed in the Little North Fork Navarro River watershed. A comparison of the 2010 data to the previous year's results has not been thoroughly completed.

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 5.

Table 5. 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	2010
Lower Albion (AL)	135	113	132	273	188	85	41*
Russian Gulch (AG)	2	3	19	23	5	23	34*
Ray Gulch (WR)	Present	Present	Present	Present	Present	Present	Present
Lower Greenwood (CG)	25	18	16	18	20	25	30*
Mallo Pass (CM)	5	0**	3	0**	2	0**	2*

* Surveys began late in the breeding season
** 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 137 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 137 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 389 sites, of which 80 sites yielded detections (21% 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%).