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**Mattole River Watershed  
Analysis  
Amphibian and Reptile  
Assessment  
Appendix F**

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Public Review Draft

September 2011

Prepared by  
Humboldt Redwood Company, LLC Sciences



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## ACRONYMS

ARA	Amphibian and reptile assessment
ASTR	Tailed frog ( <i>Ascaphus truei</i> )
ATM	Aquatic Trend Monitoring Station
BR	Bear River
CDF	California Department of Forestry and Fire Protection
CDFG	California Department of Fish & Game
CG	Consolidated geologic (unit)
CGU	Channel gradient unit
CROR	Northern Pacific Rattlesnake ( <i>Crotalus oreganus</i> )
DBH	Diameter at breast height
DITE	Pacific giant salamander ( <i>Diacamptodon tenebrosus</i> )
EMMA	Northwestern pond turtle ( <i>Emys marmorata marmorata</i> )
ERSC	Elk River / Salmon Creek
Fm	Franciscan melange
FWC	Freshwater Creek
GIS	Geographic information system
GPS	Global positioning system
HCP	Habitat Conservation Plan
HRC	Humboldt Redwood Company, LLC
LEED	Lower Eel / Eel Delta
LIDAR	Light detection and ranging
LWD	large woody debris
MWAT	Maximum weekly average temperature
<i>n</i>	Number of samples
NMFS	National Marine Fisheries Service (now NOAA Fisheries)
PALCO	Pacific Lumber Company
PFC	Properly functioning condition
Q	Undivided Quaternary sediment rocks
Qrt	River terrace deposit

RAAU	Northern red-legged frog ( <i>Rana aurora aurora</i> )
RABO	Foothill yellow-legged frog ( <i>Rana boylei</i> )
RHVA	Southern torrent salamander ( <i>Rhyacotriton variegatus</i> )
RMZ	Riparian management zone
SE	One standard error of the mean
SRT	HCP Signatory Review Team
THAT	Oregon Garter Snake ( <i>Thamnophis atratus hydrophilus</i> )
THP	Timber harvesting plan
TKfs	Coastal Belt Franciscan Complex
TSS	Total suspended solid
UG	Unconsolidated geologic unit
USFWS	United States Fish & Wildlife Service
WAU	Watershed Analysis Unit
WDNR	Washington Department of Natural Resources

## 1.0 ABSTRACT

Using the Watershed Analysis Methods guidelines developed cooperatively between the Wildlife Agencies and PALCO, for lands formerly owned by PALCO and now owned and managed by Humboldt Redwood Company, LLC (HRC), we used existing data and new data collected during the watershed analysis period to conduct an assessment of the occurrence and habitat of four amphibians and one reptile species of concern on HRC lands within the Mattole River Watershed Analysis Unit (WAU). The goal of this assessment is to answer the list of critical questions concerning distribution, habitat, and possible impacts of land management on the species, by using known location data, identifying locations of potential habitat for the species, and utilizing available habitat information.

Habitat occurs for all five of the species of concern in the Mattole River WAU. There is habitat and potential habitat for the headwater species (southern torrent salamander and tailed frog), and a limited amount of existing and potential habitat for the lowland species (red-legged frog, yellow-legged frog, and northwestern pond turtle). There are no records on HRC lands in the Mattole WAU for the pond turtle and tailed frog. In addition, the reported sighting of a red-legged frog may have been a misidentification.

Streams and riparian zones have had varying amounts of recovery time since initial harvest impacted watersheds adversely, but conditions in all appear to be improving. Factors contributing to the generally good habitat conditions include: primarily consolidated geologic types, high gradient transport reach streams with gravel and cobble substrates and cool water, relatively high canopy closure in upland areas, instream pool habitat in lowland areas, and pond habitat. For the amphibian and reptile species of concern, management practices should be designed to allow for continued recovery, including maintenance of riparian canopy cover, prevention of large sediment influx, and retention or improvement of instream pools and pond habitats.

## 2.0 INTRODUCTION

The Amphibian and Reptile Assessment (ARA) of the Mattole River WAU is designed to characterize habitat conditions and define the potential distribution limits for the following four amphibians and one reptile species of concern: southern torrent salamander (*Rhyacotriton variegatus*), tailed frog (*Ascaphus truei*), northern red-legged frog (*Rana aurora aurora*), foothill yellow-legged frog (*Rana boylei*), and northwestern pond turtle (*Emys marmorata marmorata*).

This appendix summarizes the results of the ARA conducted for the Mattole River WAU in accordance with the Watershed Analysis Methods as revised cooperatively between the Wildlife Agencies and PALCO, for lands now owned and managed by HRC, in March 2005.

The primary goal of the ARA is to identify the locations where each species has high and low occurrence potential in the watershed by evaluating each species' known and potential distribution within the stream network. The assessment was not intended to evaluate terrestrial habitat conditions or terrestrial habitat use for these species. Although the ARA was designed to answer as many of the questions listed in Table F-1 as possible, it does not identify the actual distribution limits of each species within the watershed or test hypotheses regarding species' habitat requirements in the field.

To accomplish the module goals as stated above, the ARA consisted of the following components:

- A review of existing data and field investigations to collect data on habitat condition and species occurrence;
- An assessment of each species' potential distribution based on habitat needs as published by the U.S. Fish and Wildlife Service (USFWS 1997*a-d*), characteristics of stream channels by CGU (see Appendix D), and locations of species occurrence;

- A discussion of the potential influence of current riparian conditions and microclimate on target species;
- A discussion of the effects of current water quality conditions reported in Appendix D on target amphibians and reptiles; and
- An assessment of confidence in the module analysis.

**Table F-1: Critical questions for completing the amphibian and reptile assessment**

	<b>Question or Need</b>	<b>Where addressed</b>
<b>Amphibian and Reptile Habitat</b>		
<b>Critical Questions</b>	1. Based on existing data, and data collected incidental to stream surveys, what is the distribution of the covered amphibian and reptile species in the watershed?	F 4.1 Tables F-8 to F-11 Maps F-1 to F-5
	2. What are the extent, distribution, and condition of occupied and unoccupied habitats in the watershed including those upslope of the RMZs?	F 3, F 4 Tables F-8 to F-11 Maps F-1 to F-5
	3. What are the characteristics of degraded habitats in the watershed by species, life history, and habitat attributes?	F 3 & F 4 Maps F-1 to F-5
	4. Where are areas of existing or potential habitat use in the watershed by species and life history?	F 3, F 4 Tables F-8 to F-11 Maps F-1 to F-5
	5. Where are areas of limited habitat availability and areas of poor habitat suitability?	F 3, F 4 Maps F-1 to F-5
	6. Where are headwater streams in the watershed that have, or are likely to have, suitable (southern torrent salamander and tailed frog) habitat conditions?	F 3.1.1, F 4.1 Maps F-1 & F-2
	7. Is there evidence of increased fine sediment levels in headwater streams?	See Stream Channel Report; also F 3, F 4
	8. Is there evidence of loss of small ponds in flood plains (northern red-legged frog)?	F 3.1.2, F 4 Map F-3
	9. Is there evidence of (northern red-legged frog) habitat being created by land management practices?	F 3, F 4 Map F-3
	10. Is there evidence of increased fine sediment levels or loss of (foothill yellow-legged frog) breeding sites (e.g., gravel and cobble bars) in the fish-bearing watercourses?	F 3, F 4 Stream Channel and Fisheries Reports Map F-4
	11. Are (northwestern pond turtle) basking sites (e.g., sunny areas with large woody debris [LWD] or other materials) or breeding sites (e.g., sandy, non-vegetated areas near streams) available? Are sites being impacted by management activities?	F 3.1.3, F 4 Stream Channel and Fisheries Reports Map F-5
	12. Is there evidence of diminished pool area, depth, or distribution including off-channel (northwestern pond turtle) habitat?	F 3.1.3, F 4 Stream Channel and Fisheries Reports
	13. Do recorded water temperatures approach or exceed stressful levels for covered species? Are there reaches where distribution may be limited by water temperatures?	F 4.3 Figure F-3 Maps F-1 to F-5
<b>Information Needs</b>	Use existing information to identify local temperature regimes and general microclimate and water temperature conditions.	F 3.1, F 3.2, F 3.3, F 4.3, F 5 Figure F-3 Tables F-10 & F-11
	Review the microclimate information from riparian module and assess its relevance to amphibian species needs.	F 5
	Describe habitat and life history requirements of all life stages of covered herptile species including areas upslope from RMZs based on the most current existing information. Upslope habitat uses include pond turtle egg-laying and over-wintering habitat and red-legged frog foraging and over-wintering habitat.	F 2, F 3
	Describe any existing information on species or habitat distribution and habitat quality. Additional field verification of habitat conditions should be conducted as part of the channel, fisheries, or amphibian module fieldwork.	F 3
	Make monitoring recommendations based on uncertainty in results of watershed analysis.	F 7

## 2.1 SPECIES LIFE HISTORY REQUIREMENTS

The Mattole River ARA does not provide a comprehensive description of each species' life history requirements; however, this information is presented in the ERSC Watershed Analysis ARA (PALCO 2004), Van Duzen River Watershed Analysis ARA (PALCO 2001), Freshwater Creek Watershed Analysis ARA (PALCO 2000*b*), and the LEED Watershed Analysis ARA (PALCO 2002). Tables F-2 through F-6 in this report include summaries of the life history requirements of each target species from draft Habitat Needs matrices developed from the literature by the USFWS, CDFG, and other resource agencies (USFWS 1997*a-d*). The draft Habitat Needs matrices have not been revised since their development. However, recent scientific literature on these species was reviewed for this assessment and was cited where relevant.

**Table F-2: Habitat requirements of the southern torrent salamander**

Parameter	Target	Source	References
Stream Class	Class II	PALCO (2000 <i>a</i> )	Diller and Wallace (1996), Welsh and Lind (1996)
Substrate Composition	≥ 68% of substrate surface area gravel, boulder, or bedrock, but <50% Cobble/Gravel <sup>a</sup>	USFWS (1997 <i>a</i> )	Diller and Wallace (1996), Welsh and Lind (1996)
% Embeddedness	<18 to 33	USFWS (1997 <i>a</i> )	Diller and Wallace (1996), Welsh and Lind (1996)
% Canopy Cover	>80	USFWS (1997 <i>a</i> )	Chen <i>et al.</i> (1993), Bury and Corn (1989), Welsh and Lind (1996)
LWD (% Downed Wood/Stream Length) <sup>b</sup>	-	USFWS (1997 <i>a</i> )	-
Water Temperature (°C)	6.5 to 15.0	USFWS (1997 <i>a</i> )	Diller and Wallace (1996), Welsh and Lind (1996)
<sup>a</sup> Gravel was 2-16 mm.			
<sup>b</sup> Target values were not available.			

**Table F-3: Habitat requirements of the tailed frog**

Parameter	Target	References <sup>a</sup>
Substrate Composition (Dominant/Subdominant Substrates)	%Boulders + %Cobbles>50% (Boulders or cobbles dominant, Cobbles>10cm diameter)	Hawkins <i>et al.</i> (1988), Altig and Brodie (1972)
% Embeddedness	<18 to 33	Hawkins <i>et al.</i> (1988), Altig and Brodie (1972)
% Canopy Cover	>85	Bury and Corn (1989), Chen <i>et al.</i> (1993), Welsh <i>et al.</i> (1993)
LWD (% Downed Wood/Stream Length)	>7	Bury and Corn (1989), Welsh <i>et al.</i> (1993)
Water Temperature (°C)	5 to 18.5	Brown (1975), Claussen (1973), Diller and Wallace (1996)
<sup>a</sup> All references were cited within USFWS (1997b).		

**Table F-4: Habitat requirements of the northern red-legged frog**

Parameter	Target	Source
Water Depth (ft)	>0.5	Storm (1960)
Water Temperature (°C)	8 to 18	Dumas (1966)

**Table F-5: Habitat requirements of the foothill yellow-legged frog**

Parameter	Target	References <sup>a</sup>
Water Depth (ft)	-	-
Water Temperature (°C)	<24 to 27	Kupferberg (1996)
<sup>a</sup> All references were cited within USFWS (1997c).		

**Table F-6: Habitat requirements of the northwestern pond turtle**

Parameter	Target	References <sup>a</sup>
Water Depth (ft)	>0.5	Bury (1972), Reese (1996)
% Canopy Closure	>50	Reese (1996)
LWD (% Downed Wood/Stream Length) <sup>b</sup>	-	-
Water Temperature (°C)	<32	Bury (1972)
<sup>a</sup> All references were cited within USFWS (1997d).		
<sup>b</sup> Target values were not available.		

## **3.0 METHODS OF DATA COLLECTION AND ANALYSIS**

### ***3.1 SPECIES DISTRIBUTION***

Surveys and habitat assessments for the species of concern have been ongoing through implementation of HCP monitoring strategies. Sections of the HCP addressing amphibians and reptiles include: 6.3.2.1, 6.3.5.2.4, and 6.10. These HCP sections discuss the process by which both watershed analysis and effectiveness monitoring address the species' habitat needs.

Records of species occurrence came from incidental observations recorded during Timber Harvesting Plan Surveys, from historical records, wildlife and monitoring surveys including protocol surveys of Class I and low gradient Class II stream reaches, and field experiments. The methods and protocols used to survey for five species were developed cooperatively between the Wildlife Agencies and PALCO, for lands now owned and managed by HRC, and are described in more detail in the following sections.

For this report, we mapped all locations of the species occurrences from the above sources and then integrated each species' life history requirements (Tables F-2 through F-6) with GIS layers to predict the habitat quality (Maps F-1 – F-5). Species occurrence survey sample size was not uniformly distributed among all CGU and geologic unit strata due to the time limitations of this assessment.

For the Mattole River WAU, we only report where species were present (not sites that were surveyed and none were found). Species observations were coded by survey method. Patterns in species presence were explored visually and graphically with respect to the watercourse, geologic unit, and geographic distribution.

Species-specific survey protocols are described below.

### 3.1.1 TAILED FROG AND SOUTHERN TORRENT SALAMANDER

The tailed frog and southern torrent salamander protocols suggest an area-constrained search method of Class II waters (including watercourses, seeps and springs) to delineate the distribution of the two species. The suggested sampling period for torrent salamanders is after the first winter rains (e.g., November) through May, depending on weather and watercourse conditions; however, surveys have shown that specific stream conditions are more important than time of year for locating salamanders. For tailed frogs, the suggested sampling period is March through June, again depending on weather and watercourse conditions. Based on results of surveys to date in the Mattole River and other watersheds, the survey season for both species may be extended when favorable water conditions exist (i.e., when streams are not unavailable for survey due to either extreme low or high flow conditions).

Samples consisted of 150-300 meter (m) stream reaches. The sample site was the randomly selected 150-300 m transect along a watercourse. The field technician laid out a series of stream reaches and sample belts. Reaches were 10-m stream segments laid out by gradient class at the sample site. Belts were 1.5-m stream segments selected from within the stream reaches for animal searches. Habitat information collected during these surveys included: habitat type, flow regime, channel type and width, gradient, water depth, substrate type and competence, embeddedness (%), canopy closure (%), woody debris (number of pieces per size category), and water temperature (°C). These data were used to describe habitat condition and refine potential distribution maps.

The survey protocol for these species refers to surveys of Class II watercourses. Watercourses with potential habitat for torrent salamanders and tailed frogs were, by definition, classified as Class II watercourses, seeps, or springs per the PALCO HCP. However, in many situations some waters may not have been classified as Class II *a priori*, but first underwent field review to determine if potential amphibian habitat exists. Thus, some of the Class II waters that were eventually surveyed according to the protocol may initially have consisted of unknown, unclassified, or Class III waters.

### **3.1.2 NORTHERN RED-LEGGED FROG**

Adult red-legged frogs are terrestrial, and live both near breeding sites where females deposit their eggs in ponded waters, and in nearby upland areas. The egg masses are large (grapefruit size) and usually near the water surface, and thus easy to find. Our surveys on HCP covered lands show that this species has been found breeding in ponds (natural and man-made) including drainage ditches and settling basins.

The best time to survey for red-legged frog egg masses is after the first winter rains, which occur in November. Egg masses can take 4 to 6 weeks to hatching so surveys can continue through February. At least 2 visits per site are conducted, one early in the season, and the other later in the breeding period to check for presence and survival of tadpoles (when eggs are found on the first visit). At each site, technicians record a series of habitat parameters including canopy closure (%), water source, site dimensions, and emergent and riparian vegetation types. At a potential breeding site, surveyors also describe how the pond was formed (roadside ditches, man-made ponds, natural ponds, settling basins, result of heavy equipment use, etc.).

### **3.1.3 NORTHWESTERN POND TURTLE**

The goal of the northwestern pond turtle protocol surveys was to determine the distribution of this species within the HRC ownership, using techniques of observing potential habitat (e.g., Holland 1994). The best time to sample for pond turtles is during the summer months, June through September. Sampling methods for pond turtles primarily employ visual searches (i.e., walking surveys), but also may include snorkel-surveys, and floating surveys where surveyors look for basking turtles while in a boat, kayak, or canoe. In the Mattole River watershed, surveyors in 2005/2006 walked along Class 1 watercourses searching for basking turtles on the rocks and logs.

### **3.1.4 FOOTHILL YELLOW-LEGGED FROG**

Foothill yellow-legged frog distributional information was derived from historical data, incidental observations, and the protocol (21 April 2005) yellow-legged frog surveys.

Survey and monitoring techniques for this species were also area-constrained searches on linear stream segments, concentrating on surveying river and stream reaches for tadpoles and adults. Survey sites were visually searched for the presence or absence of foothill yellow-legged frogs, using a 400-meter reach as the survey site.

Surveys were concentrated during a period when the larger tadpoles, recent metamorphs, and adults were relatively easy to locate by searching the slow water edges of the wetted channel (annually dependent, but approximately June through September). Presence was established when  $\geq 10$  individuals were found at the survey site. Habitat characteristics were recorded for the 100-meter segments of the reach that were surveyed for yellow-legged frog, including: primary habitat type, canopy cover, bankfull width, primary substrate type, and gradient.

## **3.2 POTENTIAL HABITAT DELINEATION**

We mapped the potential amphibian and reptile habitat (Maps F-1 – F-5) using the known habitat needs of each species, the channel type, species occurrence data in these watersheds, and information reported in previous watershed analyses (ERSC, FWC, VDR, LEED, and BR). An important factor throughout the previous watershed analyses has been to consider the association between consolidated and unconsolidated geologic units and the species of concern. With respect to and stream channels in general, consolidated geologic (CG) units produce (relatively) robust stream substrates that form and move as gravel, cobble, and boulder-sized sediment. Because the majority of this watershed is CG, stream characteristics are similar throughout. Therefore, gradient and channel type were given equal or greater consideration when making potential habitat calls. Table F-7 lists the criteria used to determine potential habitat limits of the species of concern. The higher gradient streams can provide suitable habitat for tailed frog and

torrent salamander while habitat for yellow-legged frog and pond turtle can be found in the lower gradient streams.

**Table F-7: Criteria used to determine potential habitat limits of the species of concern**

Species	High Habitat Potential		Low Habitat Potential	
	Characteristics	GIS Criteria	Characteristics	GIS Criteria
Northern red-legged frog	Class I & II watercourses with ≤ 4% gradient	Class I & II watercourses with ≤ 4% gradient	Class I & II watercourses with >4% gradient	Class I & II watercourses with >4% gradient
Foothill yellow-legged frog	Class I & II watercourses with <8% gradient containing gravel and cobble substrates	Class I & II watercourses with <8% gradient	Class I & II watercourses with 8-16% gradient	Class I & II watercourses with 8-16% gradient
Northwestern pond turtle	Class I watercourses with ≤ 3% gradient	Class I watercourses with ≤ 3% gradient	Class I watercourses with 3-8% gradient	Class I watercourses with 3-8% gradient
Southern torrent salamander	Class II watercourses; >8% gradient or likely to have embedded steep sections, in consolidated geologies	Class II watercourses with >8% gradient and not in Q and fm geology types.	Class II watercourses with 4-8% gradient that may have embedded steep sections	Class II watercourses with 4-8% gradient within Q and fm geology types.
Tailed frog	Class I & II watercourses with 8-16% gradient and consolidated geologies	Class I & II watercourses with 8-16% gradient and not in Q and fm geology types.	Class II watercourses 4-8% gradient in consolidated geologies	Class II watercourses 4-8% gradient and not in Q and fm geology types.

Northern red-legged frogs are highly mobile and have been found up to several hundred feet from a water source (PALCO 2002). However, their breeding habitat is restricted to slow-moving or standing water with vegetation growing in the water or at its edge and with overhanging cover (PALCO 2002). Habitat surveys, conducted by PALCO staff on

lands now owned and managed by HRC, within the Mattole River watershed have covered all known ponds and ditches that demonstrated potential as habitat for this frog, especially those associated with roads, as well as stream channels. Picture F-1 illustrates typical habitat for red-legged frog. Based on information from other known breeding sites, we assume that low-gradient channel types ( $\leq 4\%$  gradient) have potential to provide the habitat characteristics red-legged frogs may prefer: slow-moving water, fine sediment substrates that are conducive to growing aquatic vegetation, and pools and glides (see also Table F-7).

**Picture F-1: Example of potential red-legged frog breeding habitat: a side channel in Upper North Fork Mattole**



Rearing habitat for yellow-legged frog tadpoles consists of sunny low-gradient gravel and small cobble bars that are along vegetated banks (Welsh *et al.* 2005). Yellow-legged frogs occur in fish-bearing channels where the lower gradient channels are used for egg deposition and larval development. As adults, yellow-legged frogs will move higher up in watercourse channels to forage and find shelter. Within the Mattole River WAU, the average channel gradient of sites with yellow-legged frogs was 11.49% (SE = 1.7%,  $n = 32$ , see section 4.1 Figure F-2). All low gradient Class I and II channel types were

therefore assigned high potential yellow-legged frog habitat and steep Class I and II channels were assigned low potential habitat for yellow-legged frogs. Picture F-2 shows an example of yellow-legged frog habitat.

**Picture F-2: Example of yellow-legged frog breeding habitat: a Class I reach in Oil Creek**



Northwestern pond turtles breed in open, sunny, grass- and brush-land that may be close to or quite distant from the stream channels. Females scratch nests into dry soil with high clay and sand contents. Northwestern pond turtle observations are much more likely to be linked to the mainstem channel type than to the underlying geologic unit. Channel types that have large, deep pools, side channel pools, and open, grassy stream banks are preferred by this species, so low gradient Class I watercourses were assigned high potential habitat. Picture F-3 shows marginal habitat for pond turtle.

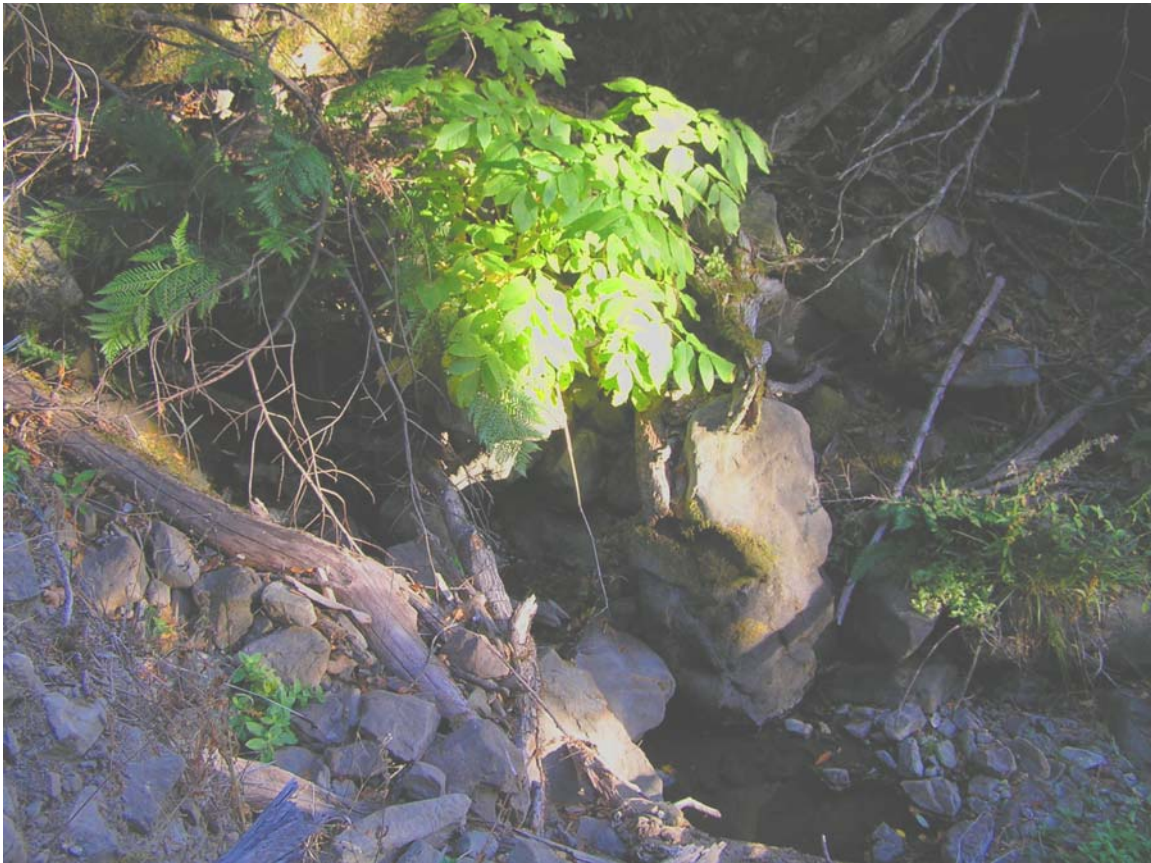
**Picture F-3: Example of potential pond turtle habitat: a pool on Upper North Fork  
Mattole**



Tailed frogs and torrent salamanders rely on cold water temperatures and consolidated substrate for juvenile rearing and adult refuge, and there are strong correlations between tailed frog and southern torrent salamander occurrence and geologic unit type in north coastal California (Diller and Wallace 1996, 1999). Although there is overlap in distribution of these species, tailed frogs may be found in fish bearing streams while torrent salamanders are typically not found in fish bearing streams. In the Mattole River WAU, torrent salamanders were found in waters ranging from 12 to 18°C (Table F-10). Among sites with torrent salamanders on the HRC ownership within the Mattole River WAU, the average channel gradient was 21.5% (SE = 5.9%,  $n = 5$ , see section 4.1 Figure F-2). High gradient non-fish bearing watercourses were assigned as high potential habitat for torrent salamanders (Table F-7). Although there were no records of tailed frogs on the HRC ownership within the Mattole River WAU, medium to high gradient

watercourses (including Class 1 fish bearing watercourses) were assigned as high potential habitat for tailed frogs. Picture F-4 shows examples of tailed frog habitat and Picture F-5 shows southern torrent salamander habitat. These photos were taken by Michael Dunkelberger in late October after a prolonged dry period.

**Picture F-4: Example of potential tailed frog habitat: Class II stream in the Oil Creek sub-basin**



**Picture F-5: Example of southern torrent salamander habitat: high gradient Class II stream in the Oil Creek sub-basin**



### ***3.3 WATER TEMPERATURE***

Refer to PALCO (2003) Temperature Instrumentation and Deployment-WOP 09 for methods. Measurements of water temperature were taken using continuous recording data logger devices (Hobos or Optic Stowaways). Temperature data loggers were placed into the stream at locations with thermal mixing, cover and the ability to maintain sufficient flow during summer months. Loggers were retrieved and data downloaded onto a computer. Data was used to develop Maximum Weekly Average Temperature (MWAT). MWAT is defined as the average daily mean temperature for the warmest consecutive 7 days during the monitoring period. MWAT calculations are described further in PALCO (2003) Stream Temperature Monitoring-WOP 07. Water temperatures

were measured during spring-summer 1999-2004, and 2006-2010 at ATM stations within Sulphur Creek and Rattlesnake Creek/Upper North Fork Mattole, and at the new ATM station within McGinnis Creek. Data loggers were removed by the end of July or the first week of August each year with the exception of 1999, when monitoring continued through to the end of August.

Temperature data thus obtained were evaluated in the context of amphibian habitat requirements as presented in Tables F-2 through F-6 (section 2.1), to identify extent, if any, to which temperature might adversely affect species-specific habitat. While this data is most directly relevant to evaluating water quality conditions for the foothill yellow-legged frog, northern red-legged frog, and northwestern pond turtle since temperature data was collected primarily from low gradient (<3%), fish-bearing (Class I) reaches; general information regarding headwater stream temperatures relative to the southern torrent salamander and tailed frog can also be inferred.

## 4.0 RESULTS AND DISCUSSION

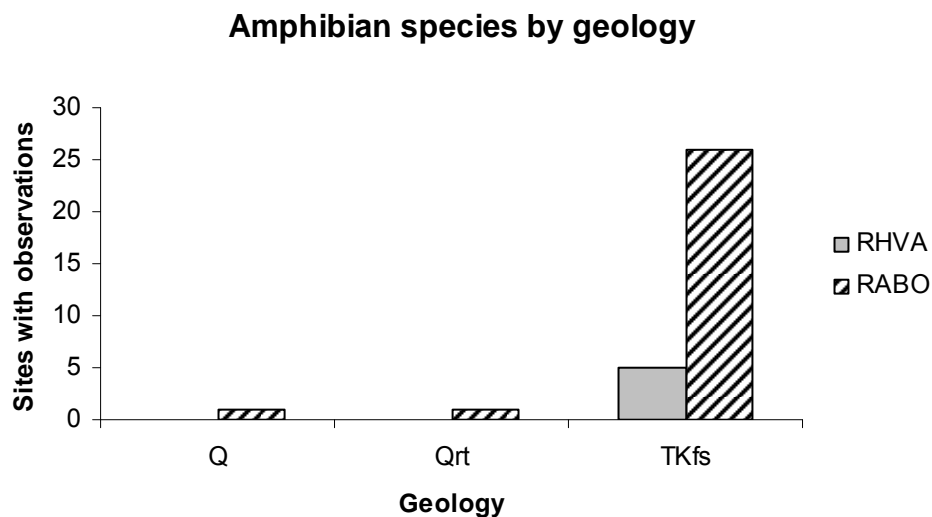
### 4.1 SPECIES DISTRIBUTION

The Mattole River WAU contains habitat for all five of the species of concern. There is habitat and potential habitat for the headwater species (southern torrent salamander and tailed frog), as well as existing and potential habitat for the lowland species (red-legged frog, yellow-legged frog, and northwestern pond turtle). There are no records of pond turtles or tailed frogs on HRC lands in the Mattole, and the sighting of a red-legged frog may have been a misidentification.

Tables F-9, F-10 and F-11 (in Appendix F-1 at the end of this report) list details of amphibian and reptile records from the Mattole River WAU.

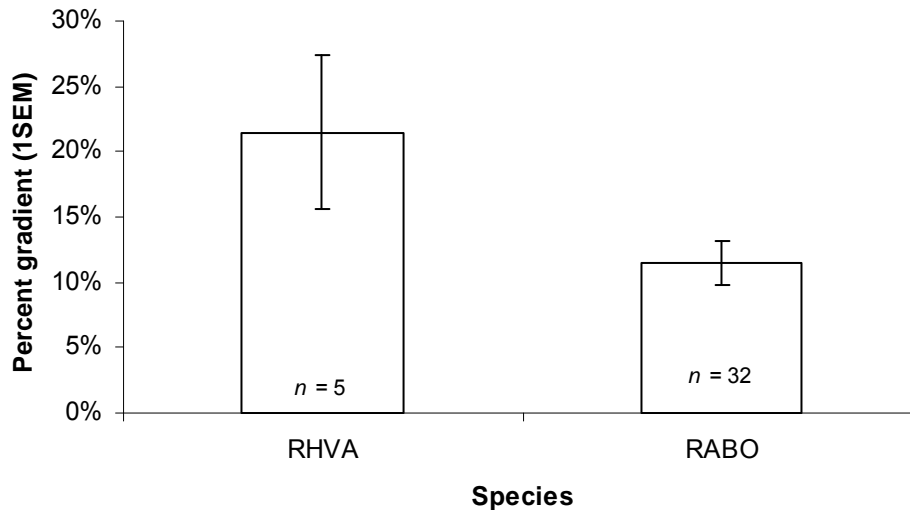
In general, the headwater species (southern torrent salamander) occurs in the consolidated geologic formations and in the higher gradient reaches (Figure F-1, and Tables F-10 and F-11 [in Appendix F-1 at the end of this report]) while the lowland species, yellow-legged frog, typically occurs in low gradient reaches regardless of geology.

**Figure F-1: Number of sites with amphibian species observations by geology**



Most observations of southern torrent salamander and yellow-legged frogs were at sites in the Coastal Belt Franciscan Complex (TKfs) (Figure F-1). Only two sites with yellow-legged frog were classified as undivided Quaternary sediment rocks (Q) and River terrace deposit (Qrt). Most observations of southern torrent salamander were at high gradient sites (~20%) while all observations of yellow-legged frog were in low gradient sites (~10%) (Figure F-2). Yellow-legged frog is considered common to the Mattole WAU.

**Figure F-2: Average gradient (% slope) at sites with amphibian species observations**



In other watersheds, the goal of the red-legged frog protocol surveys was to determine the approximate distribution of breeding sites. However, in the Mattole River WAU, appropriate habitats that are suitable for red-legged frog breeding, such as ponds and puddles, have not been located. Although suitable breeding sites may exist within the mainstem channels, red-legged frogs were not observed during pond turtle surveys. Periodic surveys for habitats, and monitoring of old stock pond locations will occur to see if suitable habitat might develop in HRC Mattole lands. Determining the method of pond formation is useful as it relates to red-legged frog breeding habitat selection, because some ponds that frogs select for egg laying (e.g., roadside ditches) may dry up before tadpoles complete their metamorphosis into frogs. There is concern that these ephemeral sites could be demographic traps. The distribution of feral pigs in areas of the Mattole is

also of concern, as they can cause significant disturbance of vegetation and soils in streams, springs, and meadows – areas important for habitat. Also, these feral pigs could be a serious limiting factor in the abundance and distribution in red-legged frogs by their predation on the species as adults and larva.

Species distribution also potentially impacted by cattle grazing and congregating in areas near streams. Over-use of these areas can result in degradation of vegetation and soils, and streamside erosion. These impacts would occur more readily when cattle are forced to access Class II and III streams to meet their water needs.

Proper classification and subsequent on-the-ground application of appropriate RMZs for amphibian habitat during THP layout is important. Since the torrent salamander was considered for listing (1995-1996), local company staff have had a considerable amount of training in the identification of torrent salamander habitat. In addition, Class II designation has broadened significantly, and Class II waters now often extend essentially to the ridgeline and to places that have previously been designated as Class III waters, or were unclassified.

## **4.2 SUB-BASIN EVALUATION**

The sub-basin evaluations in this section are restricted to those sub-basins where HRC has ownership. Table F-8 shows species observations by sub-basin in the Mattole WAU. All or nearly all of each sub-basin in the Mattole WAU is composed of Franciscan geology.

### **North Fork**

The over-stream canopy is sparse (<19%) along the North Fork Mattole itself and appears ideal for yellow-legged frogs. Potentially, pond turtles could also exist in this sub basin in some of the deeper pools. The canopy increases to over 85% for the tributaries on HRC's lands, which are primarily on the south bank of the North Fork and have gradients mostly exceeding 20%. Considering the geology, steep gradients, and the canopy closure, this is ideal habitat for the headwaters species (southern torrent salamander and

tailed frog). HRC has no records of red-legged frogs in this sub-basin, and it appears that the absence of natural and artificial ponds (e.g., stock ponds) is a limiting factor.

**Table F-8: Number of sites with amphibian and reptile observations by sub-basin in Mattole River watershed**

Sub-basin	Yellow-Legged Frog	Tailed Frog	Southern Torrent Salamander	Red-Legged Frog	Pond Turtle
North Fork Mattole	-	-	-	-	-
Alwardt Creek	-	-	1	-	-
Lower east branch	-	-	-	-	-
East Branch North Fork Mattole River (EBNF)	2	-	-	-	-
Sulphur Creek	3	-	-	-	-
Conklin Creek	1	-	-	-	-
McGinnis Creek	1	-	-	-	-
Oil Creek	15	-	3	1 <sup>b</sup>	-
Rattlesnake Creek	6	-	1	-	-
Camp Mattole Complex	-	-	-	-	-
Pritchard Creek	-	-	-	-	-
Dry Creek Complex	-	-	-	-	-

“-“ = No records (Off-property, not on HCP lands, or not detected during survey).

<sup>a</sup> Historical sites.

<sup>b</sup> Unconfirmed.

### Alwardt Creek

This sub-basin includes the majority of Alwardt and Rodgers Creeks. The over-stream canopy closure is >85%, except for one open stretch of Alwardt Creek that runs under 19% canopy closure. The mainstem of both Alwardt and Rodgers Creeks are low gradient, below 12% for most of the channel; however, the upper reaches and tributaries run up to and over 30%. There is suitable habitat for southern torrent salamander in the higher gradient reaches and there is also an incidental observation in this location. To

date, there are no records of yellow-legged frog, red-legged frog, tailed frog, or pond turtle in this drainage. However, habitat does exist for some of these species. For example, the upper reaches of the headwater streams are >12% with >85% over-stream canopy closure, thus providing the necessary habitat elements for the tailed frog. There is also potential habitat for the yellow-legged frog on short (< 1 km) reaches of the mainstem Alwardt Creek where the gradient is <12% and with <19% over-stream canopy closure. The absence of natural and artificial ponds and deep instream pools is a limiting factor for both red-legged frog and pond turtle.

### **Lower East Branch**

Very little of this sub-basin is in HRC ownership and, due to its remote location, surveys have yet to be conducted for the covered species in this area. The slopes are north-facing with an over-stream canopy closure that is >70% and gradients mostly exceeding 30%. These features satisfy the habitat needs for both amphibian headwaters species and would allow them to persist in this sub-basin. Additionally, it is possible that potential habitat for the yellow-legged frog exists along the mainstem of the Lower East Branch where canopy closure opens up and the stream gradient remains below 12% (off HRC lands). There are no records of red-legged frog or pond turtle, perhaps due to the absence of natural and artificial ponds and deep instream pools.

### **East Branch of the North Fork**

Very little of this sub-basin is in HRC ownership and due to its remote location very few surveys have been conducted for the covered species in this area. The slopes support an over-stream canopy closure that is >85%, except for the mainstem portion of the East Branch of the North Fork of the Mattole (EBNF) on the very western portion of the sub-basin, where the canopy closure dips down to <19%. The habitat features found in the headwaters of the EBNF and its tributaries where gradients increase to over 20% satisfy the habitat needs for both amphibian headwaters species and would allow them to persist at some locations in this sub basin. Additionally, it is possible that potential habitat for the yellow-legged frog exists along the mainstem of the western portion of the EBNF

where canopy closure opens up and the stream gradient remains below 12%. Yellow-legged frogs have been observed both at the mouth of Sulphur Creek and just downstream along the EBNF where canopy closure is >85%. There are no records of red-legged frog or pond turtle, perhaps due to the absence of natural and artificial ponds and deep instream pools which are habitat requirements for both species.

### **Sulphur Creek**

Sulphur Creek runs approximately south and is typically of a moderate to low gradient (<12%) stream, except for the extreme upper reaches of the headwalls and tributaries which quickly ramp up over 20% gradient. Over-stream canopy closure runs high (>85%) throughout the drainage, except for a few remote areas above tributary #2 due to un-vegetated inner gorge areas. The high canopy closure can be expected to maintain a microclimate suitable for headwater species in the higher gradient reaches. Although there are no records of tailed frogs, there are records of torrent salamanders in a few dispersed locations within the sub basin. There is habitat for yellow-legged frogs and they have been found along Sulphur Creek during surveys; there are also passive observations recorded from this drainage. However, the high (>85%) canopy closure may limit the distribution and abundance of yellow-legged frogs in these places. As with the other sub basins in the Mattole River where HRC has ownership, there are no records of red-legged frogs or pond turtles, and there is little if any habitat for either species. The absence of natural and artificial ponds and deep instream pools may be a limiting factor for both species.

### **Conklin Creek**

The drainage runs towards the southwest with a moderate to low (<12%) gradient. HRC ownership is limited to slopes on the south banks. The low canopy closure (<19%) along the mainstem of Conklin Creek is correlated with the wide channel and lack of contiguous stands of conifer, possibly due to the fire history in this area. In the small seeps and springs where canopy closure is denser, there is potential habitat for torrent salamanders. Along the mainstem Conklin Creek and some of the lower tributaries,

yellow-legged frogs were detected during surveys, and pond turtle habitat may exist in some locations along mainstem Conklin Creek where low gradient pools have formed and cobble sizes are smaller than boulders to allow passage by the turtles. Although there are no records of red-legged frogs or pond turtles, potential red-legged frog habitat may exist in this sub-basin.

### **McGinnis Creek**

McGinnis Creek is very similar to Conklin Creek; however, it has higher overall canopy closures in the lower portions of the drainage where HRC has ownership. The drainage runs towards the west with a moderate to low (<4%) gradient. The canopy closure along the mainstem of McGinnis Creeks runs above 85% due to contiguous stands of conifer and hardwood that exist there. In the small seeps and springs there is potential for southern torrent salamanders and one record from 2006 exists. Along the mainstem McGinnis Creek and some of the lower tributaries, yellow-legged frogs were detected during surveys. Although there are no records of red-legged frog, there is potential red-legged frog habitat in this sub-basin. Pond turtle habitat may exist in some locations along mainstem McGinnis Creek where low gradient pools have formed and cobble sizes are smaller than boulders to allow passage by the turtles.

### **Oil Creek**

The drainage runs towards the southeast with a low (<4%) gradient along the mainstem channel, some steep gradient tributaries (>20% with many reaches above 30%) feeding in from the west, and moderate gradient tributaries feeding from the east. The low canopy closure (<19%) along the mainstem of Oil Creek is correlated with the wide channel and lack of contiguous or advanced stands of conifer and hardwood. In the small seeps and springs and upper stream reaches where canopy closure is denser, habitat for the headwaters species exists; however, they have not yet been detected there. Along the mainstem Oil Creek and some of the lower tributaries, yellow-legged frogs were detected during surveys. There is one incidental observation of a red-legged frog, but repeated entries into the area where the observation was made failed to confirm the presence of

this species. Since the individual was not captured, there is a possibility that a misidentification was made and the individual sighted was actually a yellow-legged frog that is known to exist in this watercourse. However, the sub-basin does appear to have red-legged frog habitat. While surveys conducted in Oil Creek in 2005 failed to detect pond turtles, suitable habitat may exist in some locations along mainstem Oil Creek where low gradient pools have formed and cobble sizes are smaller than boulders to allow passage by the turtles.

### **Rattlesnake Creek**

This sub-basin, including Fox Camp Creek, runs towards the south with a low (<4%) gradient along the mainstem channel. The mainstem is feed by steep gradient tributaries (>20% with many above 30%) from both the east and the west. The low canopy closure (<19%) along the mainstem of Rattlesnake Creek and Fox Camp is correlated with the wide channel and lack of contiguous or advanced stands of conifer and hardwood.

In the small seeps and springs and tributaries where canopy closure is denser, habitat for the headwaters species exists, and a southern torrent salamander was detected during the 2006 field season.

Along the mainstem Rattlesnake Creek and some of its lower tributaries, yellow-legged frogs were detected during surveys. However, this species has not been detected as high up in the drainage as Fox Camp Creek.

There are no records of red-legged frogs, but there does appear to be red-legged frog habitat in this sub-basin, possibly in side channel pools.

Pond turtle habitat may exist in some locations along lower mainstem Rattlesnake Creek where low gradient pools have formed and cobble sizes are smaller than boulders to allow passage by the turtles. However, surveys conducted in Rattlesnake Creek and Fox Camp Creek in 2005 failed to detect any pond turtles.

**Camp Mattole Complex**

Little of this sub-basin is owned by HRC. The portions that are within the ownership are comprised of younger timber stands and prairies, and mostly are steep slopes. There are some stream segments above 20% gradient, but canopy closure is low and generally less than 40%. Although the portion of this sub-basin in HRC ownership may possess habitat for yellow-legged frogs and other species, it is likely that more habitats exist in the greater portion of the sub-basin outside of HRC ownership.

**Pritchard Creek**

The drainage runs towards the south with moderate to low gradient (<12%) watercourses. Except for a stretch on upper Pritchard Creek, the canopy closure along the mainstem runs greater than 85%, due to the contiguous stands of conifer and hardwood that exist. In the small seeps, springs, and upper tributaries where canopy closure is dense, there is suitable habitat for the headwaters species. Along the mainstem Pritchard Creek and some of the lower tributaries, yellow-legged frogs were detected during incidental observations made by biological staff members, but were not mapped. There are no records of red-legged frogs even though there appears to be potential red-legged frog habitat in this sub-basin. Pond turtle is questionable along the HRC portion of the mainstem Pritchard Creek even where low gradient pools have formed due to the large cobble and boulder sizes that will restrict passage by the turtles. The absence of natural and artificial ponds and deep instream pools may also be a limiting factor for both species.

**Dry Creek Complex**

The drainage runs towards the south and only a portion of the ridge top is in HRC ownership. It is unlikely that this area would serve as habitat for any of the covered species due to the lack of watercourses and the presence of the Honeydew County Road that bisects the area.

### **4.3 WATER TEMPERATURE**

PALCO and HRC staff collected stream temperature data using continuous data loggers during the summer months from 1999-2010 at ATM station 133, Sulphur Creek (Figure F-3). ATM station 133 is located on a lower, fish-bearing reach of Sulphur Creek which has a stream gradient of <3% and provides potential suitable habitat for the foothill yellow-legged frog, northern red-legged frog, and northwestern pond turtle. Recorded MWAT values for lower Sulphur Creek ranged from 15.4°C to 19.55°C over this period with a trend towards decreased stream temperature in recent years (2007-2010). These temperatures are well within the habitat requirements of the foothill yellow-legged frog (<24-27°C) and northwestern pond turtle (<32°C) but at the upper range of temperature preferred by the northern red-legged frog (8-18°C).

Historical temperature data are available for two fish-bearing tributaries to the Sulphur Creek mainstem as a result of a June 1999 CDFG habitat survey (see Fish Habitat Assessment Report for more information). Sulphur Creek Tributary #1 provides 0.9 mile of perennial stream habitat in its lower reaches, is gravel dominated, meandering, and deeply incised in gentle terrain with a moderate to high sediment supply. Water temperatures ranged from 14.5-16.0 °C (air 21-24.5°C) and canopy was 87%. Sulphur Creek Tributary #2 provides approximately 1.2 miles of perennial stream habitat in its lower reaches, and is moderately entrenched with gravel substrate. Channel morphology is riffle dominated with infrequently spaced scour pools. Stream temperatures were 17°C (air 13.9-18.3°C) and canopy density was 64%. Thus, side channel pools and low flow instream pools along with relatively cool stream temperatures in Tributaries #1 and #2 may provide critical thermal refugia for both frog species and, less likely due to a smaller drainage area (i.e. less flow), the pond turtle.

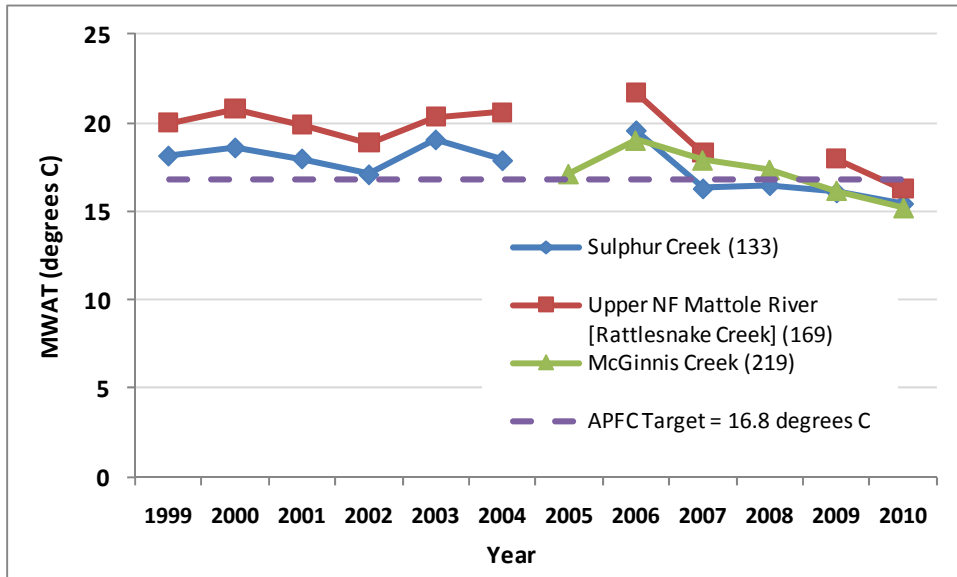
PALCO and HRC staff measured the MWAT values at ATM station 169 in Rattlesnake Creek/Upper North Fork Mattole from 1999-2010 (Figure F-3). ATM station 169 is located on a lower, fish-bearing reach which has a stream gradient of <3% and provides potential suitable habitat for the foothill yellow-legged frog, northern red-legged frog,

and northwestern pond turtle. Recorded MWAT values for this stream reach ranged from 16.3°C to 21.67°C over this period, also with a trend towards decreased stream temperature in recent years (2007-2010). As with Sulphur Creek, these temperatures are well within the habitat requirements of the foothill yellow-legged frog and northwestern pond turtle but at the upper range of temperature preferred by the northern red-legged frog. Steep canyon walls provide some shade to the stream during part of the day, however, the channel is open and exposed for a majority of its length. Canopy density has increased over time due to hardwood growth near the channel, but over-all shade canopy is low, and sunning potential exists for the yellow-legged frog and the pond turtle.

PALCO and HRC staff measured the MWAT values at a newer ATM station (219) in McGinnis Creek from 2005-2010 (Figure F-3). Steep canyon walls provide topographic shade to some reaches throughout the day, however, much of the channel relies upon riparian canopy for shade value. Riparian canopy density has increased over time due to growth of young hardwoods in floodplains and on banks. Stream temperatures were similar to those found in Sulphur Creek and suitable for inhabitation by the foothill yellow-legged frog, northern red-legged frog, and northwestern pond turtle.

Limited headwater Class I and II temperature data exist; therefore, temperature conditions relative to the habitat requirements of the tailed frog and the southern torrent salamander must be inferred from these downstream Class I temperatures and headwater overstream canopy cover conditions (see Appendix C). Overstream canopy conditions in excess of 85% cover combined with micro-climate shade provided by overhanging banks, boulders, LWD, and inherently near-source, cool emergent groundwater suggest forested headwater stream temperatures throughout most of HRC's Mattole ownership likely fall within target conditions; however, data collection would be necessary to confirm this.

Figure F-3: 1999-2010 MWAT for Class I streams in the Mattole River WAU



## 5.0 DISCUSSION OF RIPARIAN MICROCLIMATE IN THE MATTOLE

Most amphibians require moist conditions to survive, because their very thin, vascularized skin is an ineffective water barrier (Zug 1993 in Johnston and Frid 2002). Thus, when amphibians are not actually in the water, they require high humidity and high soil moisture conditions. For example, tailed frogs and southern torrent salamanders require relatively low temperatures (Tables F-2 and F-3), but they may be able to survive warmer conditions if humidity is very high (Metter 1966, Metter and Pauken 1969).

Generally, amphibians do not tolerate large fluctuations in temperature and moisture over short time periods (Hutchison 1961; Spotila 1972; Maiorana 1978; Jaeger 1980; Welsh 1990; all in Johnston and Frid 2002), and temperature and moisture in timber harvest areas, especially clearcuts, are more extreme and variable than in mature forests (See Appendix C; Chen *et al.* 1993 and 1995; Brososke *et al.* 1997; Black 2001; Johnston and Frid 2002).

Unlike the cool and foggy Freshwater and Elk River/Salmon Creek watersheds, the climatic conditions in Mattole River are rarely influenced by the fog in the summer months, and temperatures can climb to over 37 °C. Thus, waters outside of coastal influence depend more on ground water sources, canopy, and position of slope to provide lower water temperatures. As a result, amphibians in the Mattole River WA are more likely to rely on the riparian forests for terrestrial activities (Johnston and Frid 2002; Jackson *et al.* 2001) during the summer months than amphibians in the Freshwater and Elk River/Salmon Creek watersheds. This would especially be the case for small amphibians with low vagility, such as torrent salamanders, where micro-habitat characteristics such as water and air temperature can be strongly influenced by local conditions.

Riparian buffer forests that are assumed to provide suitable habitat conditions include redwood, Douglas-fir, mixed conifer and hardwood types with large and moderate DBH,

and with dense and moderate canopy closure. Other riparian buffers can provide suitable habitat conditions when other conditions are met, for example rocky substrates around groundwater springs can provide suitable habitat for torrent salamanders when riparian canopy is less than optimal. Riparian buffers that currently may not provide cool, moist habitat for headwater species include redwood, Douglas-fir, mixed conifer and hardwood types with small DBH and open or sparse canopies.

Riparian buffers that currently do not provide cool moist microclimates tend to occur in the floodplains, but are not a major concern for the species inhabiting these areas. For instance, northwestern pond turtles, red-legged frogs, and yellow-legged frogs—all of which prefer sunny open riparian areas with grasses and low vegetation—are the most likely amphibian and reptile inhabitants along Mattole River where open and sparse riparian stands can dominate. The torrent salamanders and tailed frogs, which are more heat and humidity sensitive, are unlikely to find suitable habitat in these reaches, but have plentiful habitat upslope in tributary streams.

## **6.0 CONFIDENCE IN THE ANALYSIS**

### **6.1 *HABITAT REQUIREMENTS***

#### **Accuracy of Habitat Requirements**

The critical habitat needs for the species of concern are only generally known. Future surveys will be conducted to develop a better understanding of species distribution in the watershed as budgets and staffing allow. In-depth habitat investigations have not been completed. Therefore, the habitat characteristics we used to assign habitat potential only provide a broad network-scale assessment of habitat. As the amphibian and reptile monitoring program progresses and the associated database for each of the species of concern is expanded, species-specific habitat diagnostics will be developed that will facilitate a better assessment of habitat conditions and improve our ability to better identify potential hazards to habitat conditions in future watershed analyses.

### **6.2 *SPECIES DISTRIBUTIONS***

#### **Accuracy and Completeness of Species Distributions**

The field surveys on HRC lands in the Mattole River WAU covered a small number of sites across a broad area. At this point, only a subset of the surveys has been conducted using protocols developed in cooperation with the Wildlife Agencies. Other species location information was derived from incidental observations. Thus, confidence in the species distribution is moderate. More consistent information from present/absence protocol surveys could improve the confidence and utility of the database.

## **6.3 POTENTIAL HABITAT DELINEATION**

### **Accuracy of Class II/III Channel Assignations**

Class II/III channel breaks have only been verified using current methods for timber harvest plans since 1997 (PALCO 2000a). Since then, Class II channels have been extended further up the drainages than they were mapped prior to 1997, and a significant portion of Mattole River WAU has been entered, so confidence in the accuracy of the Class II/III channel break locations is relatively high. In addition, each Class II/III channel break is verified in the field during the Timber Harvesting Plan (THP) planning process and then reviewed by a multi-disciplinary team. Finally, changes in the Class II/III channel breaks are then incorporated into GIS watercourse maps. As Class II/III channel breaks continue to be extended and as new Class II watercourses are found using LIDAR and THP planning, the amount of potential amphibian habitat should increase over time.

### **Accuracy of Channel Substrate Composition Assumptions**

We have high confidence that channel substrates for channel types are generally as described, though conditions at some locations may differ. This assessment is backed by the survey information gathered during the various species investigations and information from other module assessments for the Mattole River WAU.

### **Accuracy of Mapped Geologic Contacts**

The geologic units were mapped at a scale of 1:24000 by the California Department of Conservation Division of Mines and Geology in the early 1980's, in cooperation with the CDF, the Environmental Protection Agency, the California Department of Water Resources, the California Department of Parks and Recreation, the California Department of Water Resources, and the State Water Resources Control Board and can therefore be considered as reasonably precise, and the best information available. Stream gradients were calculated at 200-foot intervals from drainages modeled from 10-foot grids produced from LIDAR digital elevation data which is much more reliable than

information provided on USGS topographic maps. Although geology types are well described on the broad scale, uncertainty exists in the mapping of consolidated/unconsolidated geologic contacts at the micro-site scale. We attempted to compensate for this uncertainty by erring on the conservative side and mapping all tributaries with appropriate gradients as having either High or Low habitat potential for headwater species. Thus, overall we have relatively high confidence in the mapping of the geologic units and the outcome in terms of potential habitat calls.

## ***6.4 WATER TEMPERATURE***

We are confident that the water temperature monitoring results accurately reflect conditions in the stream reaches monitored (see Fish Habitat Assessment on water temperature). We are confident that our assumptions about general water temperatures in the unmonitored tributary reaches also are reasonably accurate.

## ***6.5 MICROCLIMATE***

Microclimate information is highly variable, and no microclimatic data have been collected on HRC lands in the Mattole River WAU, so our descriptions were extrapolated from other sources. The Mattole River watershed differs from some other WAUs that have been analyzed in that there is less coastal influence (e.g. fog) on air and water temperatures. Summer conditions can be more like areas further inland with relatively high daytime temperatures. Thus, aspect, canopy, and other conditions that can influence microclimate were assessed. As a result, we have moderate confidence in the accuracy of characterizations of the riparian microclimatic conditions, and high confidence that the consequences of erring in our assessments are low in these watersheds.

## 7.0 RESPONSES TO CRITICAL QUESTIONS

1. *Based on existing data, and data collected incidental to stream surveys, what is the distribution of the covered amphibian and reptile species in the watershed?*

See Section F 4.1, Tables F-8 through F-11, and Maps F-1 – F-5.

There were no sightings of pond turtles in the Mattole River WAU. There was an unconfirmed sighting of red-legged frogs at one site in Oil Creek. There were three historical sightings of tailed frogs in Sulphur Creek (not on map) but no tailed frogs were detected in more recent surveys. There were confirmed reports of the remaining two amphibian species (yellow-legged frogs and torrent salamanders) of concern in the WAU. In general, the headwater species occurred in the consolidated geologic formations and in the higher gradient reaches while the lowland species (yellow-legged frog) typically occurred in low gradient reaches regardless of geology.

2. *What are the extent, distribution, and condition of occupied and unoccupied habitats in the watershed including those upslope of the RMZs?*

See Sections F 3 and F 4, Tables F-8 through F-11 and Maps F-1 through F-5.

In general, the headwater species require watercourses, seeps and springs in consolidated geologies. Thus, the extent, distribution and condition of occupied and unoccupied habitat mimic the presence or absence of these animals across the WAU. In upslope habitats, the torrent salamander and tailed frog are seldom found far from watercourses, seeps or springs. The yellow-legged frog is also found primarily within riparian zones of perennial watercourses.

Potential aquatic habitat for red-legged frogs and pond turtles does exist in the Mattole River WAU (Maps F-3 and F-5, respectively). Pond turtles also use terrestrial habitat for nesting, and potential nesting habitat is typically not considered for forest management (i.e. sandy floodplains or prairies near riparian zones). Given the lack of confirmed sightings of these species in the Mattole River WAU, it is reasonable to assume that if these species are present in the WAU that they are in very low numbers and very restricted in distribution.

3. *What are the characteristics of degraded habitats in the watershed by species, life history, and habitat attributes?*

See Sections F 3 and F 4; and Maps F-1 – F-5.

Degraded habitats for the species of concern have resulted from historic logging

practices that directly impacted riparian habitat through various means, including vegetation removal, heavy equipment use or yarding through stream corridors, and poor crossing and road construction that resulted in direct sediment inputs. In historically suitable habitat (i.e. consolidated substrate, perennial waters, etc.) current use may simply be a matter of the type of disturbance, and recovery time since the disturbance (e.g. Ashton 2002).

Characteristics of degraded habitats for the headwater species include those that have received excess sediment, or may lack adequate canopy to maintain cool water temperatures, particularly on south-facing slopes. For the lowland species, sediment that clogs interstitial spaces and fills in pools is a characteristic of degraded habitat. Removal of LWD from streams may have reduced the amount of basking habitat for pond turtles. There is no information indicating that red-legged frog breeding habitat has been reduced.

4. *Where are areas of existing or potential habitat use in the watershed by species and life history?*

See Sections F 3 and F 4; Tables F-8 through F-11 and Maps F-1 – F-5.

5. *Where are areas of limited habitat availability and areas of poor habitat suitability?*

See Sections F 3 and F 4; and Maps F-1 – F-5.

6. *Where are headwater streams in the watershed that have, or are likely to have, suitable (southern torrent salamander and tailed frog) habitat conditions?*

See Sections F 3.1.1 and F 4.1; and Maps F-1 and F-2.

7. *Is there evidence of increased fine sediment levels in headwater stream CGUs?*

See Riparian Function Assessment (Appendix C); also, Sections F 3 and F 4.

8. *Is there evidence of loss of small ponds in flood plains? (northern red-legged frogs).*

See Sections F 3.1.2 and F 4; and Map F-3.

Historically, there were probably more ponds in the Bear River WAU. Cattle ranchers created stock ponds for their herd. Unfortunately, this tended to

concentrate the herd into a relatively small area. To reduce the impacts of over-grazing, ranchers expanded the distribution of the herd by draining the stock ponds and by scattering tubs of water throughout the landscape at prairie spring locations. We do not know if red-legged frogs used these stock ponds or if there were any frogs to use these ponds in the Mattole WAU.

9. *Is there evidence of (northern red-legged frog) habitat being created by land management practices?*

See Sections F 3 and F 4; and Map F-3.

Yes, see above discussion. In addition, road building and associated drainage structure installation (e.g. undersized culverts that can get blocked, settling pond construction) has created some red-legged frog and pond turtle habitat in the WAU. Future road construction and/or improvements should consider the potential loss of these habitats (e.g. previous adaptive management changes to PALCO's HCP have included consideration for breeding sites such as delaying road improvements until metamorphosis is complete, or moving animals to other locations).

10. *Is there evidence of increased fine sediment levels or loss of breeding sites (e.g. gravel and cobble bars) in the fish-bearing channels? (foothill yellow-legged frogs).*

See Sections F 3 and F 4; Map F-4; the Fish Habitat Assessment.

There does not appear to be a loss of yellow-legged frog breeding sites. The Mattole River Stream Channel Assessment (Appendix D) indicates stream channels on HCP covered lands are actively incising through alluvial material and that the system is in an advanced state of recovery subsequent to the excessive sedimentation that occurred during the 1950s and 1960s, suggesting the upper watershed at least is trending back towards historical conditions. However, where there is evidence of sediment having led to high embeddedness, the ability of yellow-legged frogs to deposit their eggs under cobbles is diminished (i.e. USFWS 1997).

11. *Are northwestern pond turtle basking sites (e.g. sunny areas with LWD or other materials) or breeding sites (e.g. sandy, unvegetated areas near streams) available? Are sites being impacted by management activities?*

See Sections F 3.1.3, F 4; Map F-5, and the Fish Habitat Assessment.

Basking sites and breeding sites are available within the Mattole River WAU.

However, the amount of LWD available in channels for use as basking sites is low due to high levels of disturbance associated with winter flows. Only extremely large, well-keyed LWD are likely retained during high flow events - smaller LWD are likely to be transported out of the system. Some breeding sites may be impacted by agricultural activities and ranching, however impacts from timber harvest are unlikely.

*12. Is there evidence of diminished pool area, depth, or distribution including off-channel northwestern pond turtle habitat?*

See Section F 3.1.3 and F 4; the Stream Channel Assessment and Fish Habitat Assessment.

The Fish Habitat Assessment (Appendix E) indicates that there is no documentation of historic habitat conditions that existed prior to logging, road building and large flood events, and CDFG surveys conducted in 1966 on select tributaries in the WAU represent the only available “historic” information and are qualitative in nature. The Mattole River Stream Channel Assessment (Appendix D) indicates stream channels on HCP covered lands are actively incising through alluvial material and that the system is in an advanced state of recovery subsequent to the excessive sedimentation that occurred during the 1950s and 1960s, suggesting the upper watershed at least is trending back towards historical conditions. There appears to be an increase of wood formed pools from approximately 20% to 60% at both ATM sites (133 and 169) in the northern Mattole sub-basins in 2000 to 2004 (see Stream Channel Assessment, Figure 41). However, there are no data available that allows a comparison of pool areas and depth over the same time period.

*13. Do recorded water temperatures approach or exceed stressful levels for covered species? Are there reaches where distribution may be limited by water temperatures?*

F 4.3, Figure F-3, and Maps F-1 – F-5.

The MWATs available for this analysis never exceeded the target ranges for yellow-legged frogs or northwestern pond turtles. The MWATs exceeded the upper temperature criterion for red-legged frogs (i.e., 18°C), tailed frogs and torrent salamanders. There were no instances of recorded temperatures below the lower ranges for any of the amphibian and reptile species of concern.

Water temperatures in the monitored stream reaches do not appear to present a problem to amphibians using those reaches. Species that are typically found in the main channels at low elevations are adapted to the warm temperature regimes in these areas. For the headwater species, streams with a northerly aspect and/or

with groundwater input tend to be cool regardless of shading. Areas of concern are south- or southwest-facing drainages with low shade in channels with high torrent salamander habitat potential (Map F-1).

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## 9.0 APPENDIX F-1: RECORDS OF AMPHIBIAN AND REPTILE OBSERVATIONS

**Table F-9: Records of incidental amphibian and reptile observations in the Mattole River WAU**

<b>Sub-basin</b>	<b>SiteID</b>	<b>Geology</b>	<b>Gradient</b>	<b>Date</b>	<b>Species</b>
Sulphur Creek	956WO	TKfs	1.8%	7/1/2002	RABO
Sulphur Creek	953WO	TKfs	16.7%	7/17/2002	RABO
Oil Creek	602WO	TKfs	16.2%	8/24/1995	RABO
Rattlesnake	76WO	Q	0.7%	10/4/2001	RABO
Alwardt Creek	12WO	TKfs	4.4%	5/9/1999	RHVA

**Table F-10: Records of amphibians and reptiles observed during tailed frog/torrent salamander surveys in the Mattole River WAU<sup>a</sup>**

Sub-basin	SiteID	Reach	Geology	Gradient	Embed	Temp	Date	Species	Age <sup>b</sup>	Count
Devil's Cr.	43800	14	TKfs	25%	1	12	8/29/2006	RHVA	A	1
Devil's Cr.	43800	3	TKfs	17%	2	12	8/29/2006	DITE	L	1
Devil's Cr.	43800	3	TKfs	17%	2	12	8/29/2006	DITE	A	1
Devil's Cr.	43800	3	TKfs	17%	2	12	8/29/2006	RABO	A	1
Devil's Cr.	43800	1	TKfs	26%	1	12	8/29/2006	DITE	L	4
Devil's Cr.	43800	4	TKfs	29%	3	12	8/29/2006	DITE	A	1
Devil's Cr.	44410	2	TKfs	30%	1	16	8/28/2006	DITE	L	1
Devil's Cr.	44410	7	TKfs	21%	3	15	8/28/2006	DITE	L	2
Devil's Cr.	44410	9	TKfs	45%	1	15	8/28/2006	RABO	A	1
Devil's Cr.	44410	11	TKfs	33%	2	15	8/28/2006	RABO	A	1
Devil's Cr.	44410	12	TKfs	29%	1	15	8/28/2006	RABO	A	1
Devil's Cr.	44410	13	TKfs	40%	1	15	8/28/2006	RABO	A	1
Devil's Cr.	44410	13	TKfs	40%	1	15	8/28/2006	DITE	L	1
Devil's Cr.	43800	1	TKfs	26%	1	12	8/29/2006	DITE	A	3
Devil's Cr.	44410	9	TKfs	45%	1	15	8/28/2006	DITE	L	2
Devil's Cr.	44410	11	TKfs	33 %	2	15	8/28/2006	DITE	L	3

Sub-basin	SiteID	Reach	Geology	Gradient	Embed	Temp	Date	Species	Age <sup>b</sup>	Count
Oil Cr.	2619	7	TKfs	22%	2	15	8/22/2006	DITE	L	1
Oil Cr.	2619	11	TKfs	33%	2	15	8/22/2006	RABO	A	1
Oil Cr.	2619	1	TKfs	17%	2	15	8/22/2006	RABO	A	1
Oil Cr.	2619	15	TKfs	24%	3	15	8/22/2006	RABO	A	1
Oil Cr.	2619	14	TKfs	25%	2	15	8/22/2006	RABO	A	1
Rattlesnake	2972	7	TKfs	30%	2	18	8/21/2006	RHVA	A	1
Rattlesnake	2972	12	TKfs	20%	3	18	8/21/2006	DITE	L	1
Rattlesnake	2972	3	TKfs	37%	2	18	8/21/2006	DITE	L	2
Rattlesnake	2972	9 <sup>c</sup>	TKfs	39%	3	18	8/21/2006	DITE	L	2
Rattlesnake	2972	11	TKfs	28%	2	18	8/21/2006	DITE	L	4
Rattlesnake	2972	12	TKfs	20%	3	18	8/21/2006	DITE	A	1
Rattlesnake	2972	13	TKfs	28%	3	18	8/21/2006	DITE	L	1

<sup>a</sup> At all sites, the reach and belt flows were continuous surface and competent substrates, except where noted.

<sup>b</sup> T = tadpole, L = larval, J = juvenile, A = adult.

<sup>c</sup> Intermittent surface flow

**Table F-11: Records of amphibians and reptiles observed during yellow-legged frog surveys in the Mattole River WAU**

Sub-basin	SiteID	Segment	Geology	Gradient	Date	Species	Count
Devil's Cr.	227	1	TKfs	27.7%	9/8/2005	RABO	7
Devil's Cr.	227	2	TKfs	27.7%	9/8/2005	RABO	2
Devil's Cr.	227	3	TKfs	27.7%	9/8/2005	RABO	2
Devil's Cr.	235	1	TKfs	27.7%	9/8/2005	RAAU	1
Devil's Cr.	235	1	TKfs	27.7%	9/8/2005	CROR	2
Devil's Cr.	235	1	TKfs	27.7%	9/8/2005	RABO	1
Devil's Cr.	235	4	TKfs	27.7%	9/8/2005	RAAU	1
Devil's Cr.	235	4	TKfs	27.7%	9/8/2005	RABO	1
Fox Camp Cr.	326	1	TKfs	8.4%	9/22/2004	RABO	8
Fox Camp Cr.	326	2	TKfs	8.4%	9/22/2004	RABO	4
North Fork Mattole	323	1	Q	1.5%	9/30/2004	RABO	1
North Fork Mattole	323	1	Q	1.5%	9/30/2004	RABO	1
North Fork Mattole	323	2	Q	1.5%	9/30/2004	RABO	1
North Fork Mattole	323	3	Q	1.5%	9/30/2004	RABO	1
North Fork Mattole	323	3	Q	1.5%	9/30/2004	CROR	1
North Fork Mattole	323	4	Q	1.5%	9/20/2004	RABO	1

Sub-basin	SiteID	Segment	Geology	Gradient	Date	Species	Count
North Fork Mattole	353	1	TKfs	6.6%	10/1/2004	RABO	11
McGinnis Cr.	355	1	Q	0.3%	10/1/2004	RABO	4
McGinnis Cr.	355	2	Q	0.3%	10/1/2004	RABO	2
McGinnis Cr.	355	3	Q	0.3%	10/1/2004	RABO	1
McGinnis Cr.	355	4	Q	0.3%	9/20/2005	RABO	3
Oil Cr.	236	1	TKfs	17.7%	9/20/2005	RABO	1
Oil Cr.	236	2	TKfs	17.7%	9/20/2005	RABO	2
Oil Cr.	236	3	TKfs	17.7%	9/20/2005	RABO	1
Oil Cr.	236	4	TKfs	17.7%	9/7/2005	RABO	1
Oil Cr.	268	1	Qrt	14.7%	9/7/2005	RABO	2
Oil Cr.	268	2	Qrt	14.7%	9/7/2005	RABO	3
Oil Cr.	268	3	Qrt	14.7%	9/7/2005	RABO	2
Oil Cr.	268	4	Qrt	14.7%	9/7/2005	RABO	4
Oil Cr.	269	1	TKfs	10.8%	10/6/2004	RABO	10
Oil Cr.	282	1	TKfs	8.3%	10/5/2004	RABO	4
Oil Cr.	282	3	TKfs	8.3%	10/5/2004	RABO	2
Oil Cr.	282	4	TKfs	8.3%	10/5/2004	RABO	4
Oil Cr.	296	1	TKfs	28.9%	9/6/2005	RABO	1

Sub-basin	SiteID	Segment	Geology	Gradient	Date	Species	Count
Oil Cr.	296	1	TKfs	28.9%	9/6/2005	RABO	3
Oil Cr.	296	3	TKfs	28.9%	9/6/2005	DITE	1
Oil Cr.	296	4	TKfs	28.9%	9/6/2005	DITE	1
Oil Cr.	296	4	TKfs	28.9%	9/6/2005	RABO	1
Oil Cr.	296	4	TKfs	28.9%	9/6/2005	THAT	1
Oil Cr.	304	1	TKfs	21.2%	9/6/2005	RABO	2
Oil Cr.	304	1	TKfs	21.2%	9/6/2005	DITE	1
Oil Cr.	304	1	TKfs	21.2%	9/6/2005	THAT	1
Oil Cr.	304	2	TKfs	21.2%	9/6/2005	RABO	1
Oil Cr.	304	4	TKfs	21.2%	9/6/2005	DITE	1
Oil Cr.	304	4	TKfs	21.2%	9/6/2005	RABO	1
Oil Cr.	321	1	TKfs	3.6%	10/7/2004	RABO	8
Oil Cr.	321	2	TKfs	3.6%	10/7/2004	RABO	2
Oil Cr.	333	1	TKfs	8.7%	10/14/2004	RABO	2
Oil Cr.	333	3	TKfs	8.7%	10/14/2004	RABO	3
Oil Cr.	333	3	TKfs	8.7%	10/14/2004	toad	1
Oil Cr.	340	1	TKfs	4.2%	10/11/2004	RABO	1
Oil Cr.	347	1	TKfs	6.0%	10/13/2004	RABO	3

Sub-basin	SiteID	Segment	Geology	Gradient	Date	Species	Count
Oil Cr.	347	2	TKfs	6.0%	10/13/2004	RABO	1
Oil Cr.	347	3	TKfs	6.0%	10/13/2004	RABO	1
Oil Cr.	347	4	TKfs	6.0%	10/13/2004	RABO	1
Rattlesnake	316	1	Q	2.6%	9/16/2004	RABO	11
Rattlesnake	316	1	Q	2.6%	9/16/2004	RABO	2
Rattlesnake	325	1	TKfs	11.7%	9/21/2004	RABO	6
Rattlesnake	325	2	TKfs	11.7%	9/21/2004	RABO	4
Rattlesnake	334	1	TKfs	6.6%	9/17/2004	RABO	12
Rattlesnake	345	1	TKfs	6.6%	9/29/2004	RABO	2
Rattlesnake	345	4	TKfs	6.6%	9/29/2004	RABO	2
Sulphur Cr.	339	1	TKfs	2.0%	9/24/2004	RABO	4
Sulphur Cr.	339	2	TKfs	2.0%	9/24/2004	RABO	3
Sulphur Cr.	339	3	TKfs	2.0%	9/24/2004	RABO	1
Sulphur Cr.	339	4	TKfs	2.0%	9/24/2004	RABO	3
Sulphur Cr.	342	1	TKfs	2.0%	9/27/2004	RABO	6
Sulphur Cr.	342	2	TKfs	2.0%	9/27/2004	RABO	4
Sulphur Cr.	350	1	TKfs	2.0%	9/28/2004	RABO	3
Sulphur Cr.	350	2	TKfs	2.0%	9/28/2004	RABO	1

<b>Sub-basin</b>	<b>SiteID</b>	<b>Segment</b>	<b>Geology</b>	<b>Gradient</b>	<b>Date</b>	<b>Species</b>	<b>Count</b>
Sulphur Cr.	350	3	TKfs	2.0%	9/28/2004	RABO	3
Sulphur Cr.	350	4	TKfs	2.0%	9/28/2004	RABO	3
Upper North Fork Mattole	257	1	TKfs	22.3%	9/13/2005	DITE	1
Upper North Fork Mattole	257	1	TKfs	22.3%	9/13/2005	RABO	1

## **10.0 11" X 17" MAPS**

Map F-1 Tailed frog distribution and potential habitat

Map F-2 Southern torrent salamander distribution and potential habitat

Map F-3 Red-legged frog distribution and potential habitat

Map F-4 Yellow-legged frog distribution and potential habitat

Map F-5 Northwestern pond turtle distribution and potential habitat