Little Kern River watershed 2012 summary report

August 2-6 and October 23-25, 2012

State of California

Department of Fish and Wildlife

Heritage and Wild Trout Program

Prepared by Stephanie Hogan and Cameron Zuber

Introduction

Little Kern golden trout (*Oncorhynchus mykiss whitei*) are endemic to the Little Kern River watershed and are listed as threatened under the Federal Endangered Species Act. The Little Kern River is tributary to the Kern River, approximately 65 miles to the northeast of Bakersfield, CA (Figure 1). The Little Kern River watershed encompasses 137 miles of perennial stream habitat, the majority of which is located on public land administered by the US Forest Service (USFS) Sequoia National Forest. In 2011, the Lion Fire burned over 20,000 acres of the Little Kern River watershed, with an area of high fire intensity occurring in the vicinity of Lion Meadows on the eastern side of the drainage. This area encompasses key restoration and recovery populations of Little Kern golden trout which, according to recent genetic analyses, possess a high degree of genetic integrity relative to the populations inhabiting other portions of the watershed.

Concerns about short-term direct mortality from high stream temperatures and longer-term indirect mortality from increased sediment loads, reduction of suitable instream habitat and loss of canopy shading prompted the California Department of Fish and Wildlife (CDFW) Heritage and Wild Trout Program (HWTP) to perform habitat and population in the tributaries inhabited by these key populations. These included Lion, No Name, Sheep, Willow and Tamarack creeks. Surveys were to be performed in cooperation with the Sequoia and Inyo National Forests. Survey objectives were to gather baseline fisheries data including fish distribution, size-class composition, estimates of abundance and to document various habitat parameters and fire intensity. In addition, the HWTP conducted fisheries and habitat assessments in Clicks Creek (outside of the Lion Fire footprint) in October, 2012 with the following objectives:

- Gather baseline data including fish distribution, size-class composition and estimates of abundance
- Determine the presence or absence of hatchery trout
- Collect Little Kern golden trout tissue samples to determine the genetic relationships of fish throughout the watershed, to inform and contribute to Little Kern golden trout recovery efforts and to aid in the development of a basin-wide genetics management plan

Methods

Visual observation

A reconnaissance was conducted from August 3rd-4th, 2012 in No Name, Sheep, Willow and Tamarack creeks to document fire intensity, changes to habitat post-fire (including sedimentation, canopy cover, riparian vegetation, stream temperatures, and other attributes), potential barriers to upstream fish migration

and to identify the upstream extent of fish distribution (Figure 2). For the latter, surveyors utilized a combination of survey methods including hook and line angling, direct observation snorkel surveys and visual surveys. All observations were recorded in field notebooks and locations of key habitat or fish information (fish barriers, upstream-most observed trout, and changes in habitat or fire intensity) were photographed and geo-referenced using hand-held Global Positioning System (GPS) units (North American Datum 1983).

Direct observation

Direct observation surveys were conducted from August 2nd-6th, 2012 using snorkeling methods, an effective survey technique in many small streams and creeks in northern California and the Pacific Northwest (Hankin and Reeves 1988). Surveys were conducted in the Little Kern River from approximately 0.5 miles downstream from the confluence with Table Meadow Creek upstream approximately six miles (14 sections; Figure 2); sections were spaced between one-quarter and one-half mile apart and the start of each section was selected at random. Surveys were conducted in No Name, Sheep, Willow and Tamarack creeks from their terminus upstream to the observed extent of fish distribution (based on the results from the visual observation surveys). Lion Creek was surveyed from the Little Kern River confluence upstream to the private property boundary at Lion Meadow.

Specific section boundaries were located at distinct breaks in habitat type and/or stream gradient. Surveys were conducted in an upstream direction with one to three divers depending on wetted width, water visibility, and habitat complexity. Divers maintained an evenly-spaced line perpendicular to the current and counted fish by species. All observed trout were further separated and counted by size class. Size classes were divided into the following categories: young of year (YOY); small (< 6 inches); medium (6-11.9 inches); large (12-17.9 inches) and extra-large (≥ 18 inches). YOY are defined by the HWTP as age 0+ fish, emerged from the gravel in the same year as the survey effort. Depending on species, date of emergence, relative growth rates, and habitat conditions, the size of YOY varies greatly, but is generally between zero and three inches in total length. If a trout was observed to be less than six inches in total length but it was difficult to determine whether it was an age 0+ or 1+ fish, by default it was classified in the small (< 6 inches) size class.

Divers were instructed in both visual size class estimation and proper snorkel survey techniques (establishing a dominant side, determining the extent of their visual survey area, how and when to count (or not count) fish observed, safety considerations, etc.) prior to starting the survey. For each section, surveyors measured section length along the thalweg (ft), average wetted width, water depth and water visibility (ft). Water and air temperature (ºC) was measured and habitat type (flatwater, riffle, or pool) was identified for the Little Kern River survey sections following Level 2 protocol as defined in the California Salmonid Stream Habitat Restoration Manual (CSSHRM; Flosi et al. 1988). Habitat type

was not recorded for direct observation surveys conducted in Lion, No Name, Sheep, Willow or Tamarack creeks. Representative photographs were taken and coordinates were recorded for the section boundaries using hand-held GPS units (North American Datum 1983). Fish abundance (fish/mile) was calculated by species for each section and water (for the latter, all observed fish in all sections were summed by species and divided by the total survey length).

Single-pass electrofish

On October 23rd, 2012, a single-pass electrofish survey was conducted in the upper portion of Clicks Creek to capture Little Kern golden trout and examine fin condition (Figure 3). Anglers had recently submitted photographs of trout captured in Clicks Creek that appeared to have fin erosion, in particular, on the dorsal fin. The goal of this effort was to document and delineate potential fin erosion and identify possible causes.

Physical measurements of the stream and environmental conditions were taken, including air and water temperature (ºC) and conductivity (specific and ambient; microsiemens). These factors were used to determine appropriate shocker settings (Smith Root backpack electrofishers). Coordinates were recorded for both the upstream and downstream survey boundaries using a GPS hand-held unit (North American Datum 1983). The area was scouted for any species of concern prior to commencing the electrofish effort. Surveys proceeded in an upstream direction, with netters capturing fish and placing them in a five-gallon bucket to be held until processed. Fish were captured opportunistically at accessible locations and in deeper pool habitats. Over the course of the survey, fish were handled carefully to minimize injury and stress. All captured fish were counted and then allowed to recover before being released back into the section. Each fish was examined carefully to evaluate signs of wear and/or fin ray abnormalities (Figures 4-5).

Depletion electrofish

Three depletion electrofish surveys were conducted in Clicks Creek (Sections 2-4; Figures 2-3) on October 23rd-25th, 2012 to generate population-level data including species composition, size and age class structure and estimates of abundance. These data can be compared over time to study trends in the population. Personnel included HWTP staff (Headquarters), CDFW Central Region staff and volunteers. All multiple-pass electrofish sections were newly established in 2012 and were randomly selected. Clicks Creek, from the confluence with the Little Kern River upstream to the headwaters, was delineated into points spaced at 100-meter intervals using Geographic Information System software and each point was sequentially numbered. Using a random numbers table, three points were selected.

Using GPS units, HWTP staff navigated to each randomly-selected point and determined survey feasibility. Where feasible, the downstream mesh block net

was installed at the randomly selected point. If a mesh block net could not be installed at the randomly selected location and/or flows and water depth were not conducive to backpack electroshocking, HWTP staff moved upstream and located the nearest suitable site. Section length was approximately 40 times the average wetted width, determined by averaging five wetted width measurements taken at 50-foot intervals downstream of the random point. When feasible, width measurements were taken a day prior to the survey effort to minimize impacts on fish distribution in the survey area. If the upstream block net could not be effectively installed and maintained at the measured location, surveyors moved upstream to the first available site where a block net could be installed.

At each section boundary, nylon mesh block nets were installed across the wetted width, effectively closing the population within the section. Both sides of the nets were secured above bankful width, heavy rocks were placed side by side along the bottom of the nets, and the nets were secured in such a way as to hold the top of the net out of the water. These nets were routinely monitored and inspected throughout the survey to ensure their integrity and to prevent fish from moving into or out of the section during the course of the survey.

Prior to electrofishing, physical measurements of the stream and environmental conditions were taken, including air and water temperature (in the shade; °C) and conductivity (specific and ambient; microsiemens). These factors were used to determine appropriate electrofisher settings. Coordinates were recorded for both the upstream and downstream boundaries of the survey (North American Datum 1983). Current weather conditions were noted and the area was scouted for any species of concern prior to commencing the surveys.

Personnel needs were determined based on stream width, habitat complexity, and water visibility. For each of the surveys, individuals were assigned to shock, net, and tend live cars for the duration of the effort. Surveys were initiated at the lower block net and proceeded in an upstream direction, with netters capturing fish and placing them in live cars to be held until processed. Live cars were 32-gallon plastic trash bins perforated with holes to allow water circulation. Three to four passes were conducted in each section, with fish from each pass stored separately. Over the course of the survey, fish were handled carefully to minimize injury and stress. Fish were processed separately by pass number. Each fish was identified to species and total length (mm) and weight (g) were measured. Fish were then allowed to recover in live cars secured in the stream (with fresh flowing water) and released back into the section.

A habitat assessment was conducted in each section to document resource condition by collecting base-line data on habitat types and quality, water conditions, substrate, discharge, bank condition and other attributes. The HWTP habitat assessment is a pared-down synthesis of Rosgen (1994) and the CSSHRM (Flosi et al. 1988). Section length was measured along the thalweg. The length of the section was then divided into five cells of equal length. Wetted widths were measured at the center of each of the five cells. Across each width

transect, five depths were taken (also at the center of five evenly divided cells), and both widths and depths were averaged for each section.

Stream characteristics, including active erosion (erosion occurring in the present), percent erosion at bankful and percent canopy closure over stream area) were recorded. Section percentages were defined for each habitat type (riffle, flatwater, and pool) following Level 2 protocols as defined by the CSSHRM (Flosi et al. 1988). Using visual observation, percent substrate size classes within the wetted width were estimated. A rating (between poor and excellent) was given to the instream cover available to fish. Cover types were identified and defined as percentages of total instream cover. The change in water surface elevation (section gradient; %) and streamflow (cfs) were measured. Representative photographs of the section were taken.

Fish measurements were entered into the CDFW Fisheries Information Sharing Host database and were extracted into MicroFish (MicroFish Software). Based on the capture rate (number of fish captured per pass) and probability of capture, a population estimate was determined for each species. MicroFish also calculated the average weight of each species by section. These data were used to determine biomass (lbs/acre) and density (fish/mi) for each species.

Tissue acquisition

Tissue samples were collected from Clicks Creek Sections 3 and 4 (30 samples total). All fish were captured during the electrofish surveys and individual fish were selected for sample collection based on size and location in order to limit sampling of cohorts. Tissue samples were collected by removing a portion of the caudal fin with a clean pair of scissors, per University of California at Davis (UCD) Genomic Variation Laboratory (GVL) tissue collection protocols (Stephens pers. comm. 2011). Each tissue sample was placed in a labeled envelope with a unique identification number. Representative photographs of each trout were taken and the samples were sent to the UCD GVL in Davis, CA for processing, analysis and summarization.

Results

Visual observation

The upper portion of Sheep, Willow, and No Name creeks were assessed for fire intensity and instream habitat quality, from the trail crossing to the headwaters. In general, fire intensity was lowest near the trail crossing and the surrounding forest was relatively intact with mostly live trees. Moving upstream, fire intensity increased; in areas near the headwaters of these creeks, there was evidence of a full crown fire with no standing live trees. No Name Creek had the lowest flow (<1 cfs) and poorest habitat compared to other tributaries surveyed (Figure 4). Habitat was fair, with some areas showing evidence of scour, a few pools with holding habitat were present, and limited riparian vegetation and grasses existed.

Flatwater was the dominant habitat type with some pools; Little Kern golden trout were observed in nearly all areas associated with deeper water and/or cover in the lower portions of the creek. Working upstream, fish densities and habitat quality appeared to decrease as fire intensity increased. Three surveyors walked along both banks for the majority of No Name Creek and water depths and visibility were such that fish were readily observed. A total of 99 Little Kern golden trout were counted in approximately 0.9 miles of habitat. The upstream-most fish (approximately three inches in total length) was observed in a three-foot long pool with a water depth of six inches. Directly upstream of this pool, habitat became highly degraded and included areas of heavy sedimentation, lack of pool depth, loss of channel stability (numerous braided channels and shallow water habitat), and abundant silt and woody debris. The majority of trees surrounding the creek in this area appeared dead and little to no riparian vegetation was present. Instream fish cover was poor and zero fish were observed.

Habitat in the lower 0.8 miles of Sheep Creek was relatively good and the Lion Fire appeared to burn only understory vegetation; streamflow was estimated at 2 cfs (Figure 5). Some sediment was trapped in pool tail-outs, mostly associated with woody debris; however, it was difficult to assess whether this was a natural occurrence due to the abundance of decomposed granite in the system or whether it was due to impacts from fire. Faster water areas existed with clean gravels and good spawning habitat. Young of year were observed. In the middle portion of Sheep Creek, fire intensity appeared to increase, although some live trees were present. An increase in sediment was observed and ridges and side-slopes had an excess of exposed fines. Some canopy cover was present. Fish were visually observed in this area, although they appeared to be lower in abundance. Higher gradient areas of the stream included plunge pools and increased flows with resulting scour and exposed gravel. A potential barrier to upstream fish migration (four-foot cascade with turbulent water and densely covered by willows) was observed approximately 0.6 miles upstream of the trail crossing (Figure 6); however, one-eight inch Little Kern golden trout was visually observed upstream of this location. Fire intensity was high adjacent to this reach. Surveyors conducted a snorkel survey in five consecutive habitat units upstream of this location and observed zero fish. A second potential barrier to upstream fish migration was observed (approximately one mile upstream of the trail crossing) and consisted of a bedrock slide approximately four feet in length at a 30º angle; zero fish were observed upstream of this location and fire intensity was high, with little to no live trees. In the lower gradient reaches, high sedimentation was observed with a loss of water depth and channel stability. In higher-gradient reaches, there were numerous four-foot cascades with interspersed flatwater and pool habitat.

Habitat appeared relatively good in Willow Creek with good instream fish cover and available spawning habitat (Figure 7); YOY were observed throughout the majority of the creek. Fire intensity in the vicinity of the trail crossing appeared relatively low with a 15-foot buffer of riparian vegetation (willows, grasses, and

other herbaceous plants). Habitat was mostly flatwater interspersed with pools containing water depths up to three feet and areas of faster water (flooded riffles) with good scour and exposed gravels were present. Instream fish cover included water depth, large woody debris, water turbulence and overhanging vegetation. Approximately 0.8 miles upstream of the trail crossing, fire intensity increased with nearly 99% of the trees dead and riparian vegetation was limited to small patches of grass. However, little to no silt/sedimentation was present, fish cover was rated as good and Little Kern golden trout were observed throughout. Substrate in this portion was dominated by sand, gravel and cobble, with some boulder. A nearly vertical bedrock sheet 20 feet in length was documented approximately 1.2 miles upstream of the trail crossing (Figure 8); zero fish were observed upstream of this location and it is likely a barrier to upstream fish movement. Pool depth at the base of the feature was one foot and fish were observed directly downstream. Farther upstream, stream gradient increased and two additional fish barriers were observed (a 15-foot bedrock sheet with a gradient of 20% and no base pool and a 15-foot waterfall with a pool depth of two feet). Ridgelines and side-slopes had an excess of exposed fines.

The Lion Fire did not appear to burn the riparian corridor of Tamarack Creek, although evidence of previous fire existed (Figure 9). Instream fish habitat was good with abundant riparian/overhanging vegetation (willows and other herbaceous plants) and fish were observed and/or captured throughout the second-order reach (from the confluence with the Little Kern River upstream to the confluence of two first-order stream segments). Numerous barriers to fish migration were identified (Figure 10). Habitat type was varied and included both flatwater and pools. Tamarack Creek had the largest volume of flow of the four creeks surveyed for fire intensity.

Direct observation

Lion Creek was surveyed at five locations (Sections 112-512) from the confluence with the Little Kern River upstream approximately 1.1 miles (Figure 11 and Table 1). A total of 465.9 feet were surveyed among the five sections. Lion Creek was primarily in low-gradient forested habitat with substrate dominated by sand and gravel with some cobble and bedrock. Water and air temperature were measured at 20 and 29 ºC, respectively. Mean wetted width was 4.2 feet and mean water depth was 0.3 feet. A total of 31 Little Kern golden trout were observed with a size class distribution of 52% YOY, 42% small- and 6% medium-sized fish (Figure 12). Little Kern golden trout abundance was estimated at 351 fish/mile.

No Name Creek was surveyed at three locations (Sections 112-312) from the confluence with Willow Creek upstream approximately one-half mile. A total of 248.7 ft were surveyed. The majority of No Name Creek was low-gradient forested habitat with substrate dominated by sand and gravel. Water temperature was measured at 12 ºC and air temperature was 20 ºC. Mean wetted width was 4.1 feet and mean water depth was 0.2 feet. A total of two small-sized Little Kern

golden trout were observed. While zero YOY were observed in the No Name Creek direct observation sections, they were observed in other areas of the creek. Little Kern golden trout abundance was estimated at 42 fish/mile.

Sheep Creep was surveyed at six locations (Sections 112-612) from the confluence with the Little Kern River upstream approximately 1.3 miles. A total of 911.3 feet were surveyed. Sheep Creek was comprised primarily of low-gradient forested habitat with substrate dominated by sand and gravel with some cobble and silt. Water temperature was measured at 14 ºC and air temperature was 24 ºC. Mean wetted width was 3.9 feet and mean water depth was 0.5 feet. A total of 37 Little Kern golden trout were observed. Size class distribution of Little Kern golden trout was 16% YOY, 68% small- and 16% medium-sized fish. Little Kern golden trout abundance was estimated at 214 fish/mile.

Willow Creek was surveyed at 11 locations (Sections 112-1112) from the confluence with the Little Kern River upstream approximately 2.5 miles. Among the 11 sections, a total of 1746.1 feet were surveyed, the majority of which was low-gradient forested habitat with substrate dominated by sand and gravel with some cobble. Water temperature was measured between 12 and 14 ºC and air temperature ranged from 19 to 31 ºC. Mean wetted width was 6.3 feet and mean water depth was 0.4 feet. A total of 66 Little Kern golden trout were observed with a size class distribution of 9% YOY, 70% small- and 21% medium-sized fish. Little Kern golden trout abundance was estimated at 200 fish/mile. Numerous barriers to upstream fish migration were observed on Willow Creek near the Little Kern River confluence. The largest consisted of two cascades each approximately six to seven feet in height with a maximum pool depth of 1.5 feet.

Tamarack Creek was surveyed at ten locations (Sections 112-1012) from the confluence with the Little Kern River upstream approximately 2.1 miles. A total of 1518.6 feet were surveyed. Tamarack Creek ranged from low- to medium-gradient forested habitat with substrate dominated by sand and gravel with some bedrock, boulder, cobble and silt. Numerous barriers to upstream fish migration were documented in Tamarack Creek, predominantly in the upper portion of the drainage. Fish were observed above all barriers. Water temperature was measured between 11 and 16 ºC and air temperature ranged from 19 to 30 ºC. Mean wetted width was 6.4 feet and mean water depth was 0.5 feet. A total of 151 Little Kern golden trout were observed with abundance estimated at 525 fish/mile. Size class distribution of Little Kern golden trout was 17% YOY, 67% small- and 16% medium-sized fish.

The Little Kern River was surveyed at 14 locations (Sections 112-1412) from its confluence with Table Meadow Creek upstream 5.3 miles. The Little Kern River survey sections consisted of 11% riffle, 64% flatwater and 25% pool habitat with substrate dominated by boulder, cobble, gravel and sand with some bedrock (Figure 13). Water temperature was between 13 and 21 ºC and air temperature ranged from 17 to 29 ºC. Mean wetted width was 21.2 feet and mean water depth was 0.8 feet. A total of 140 Little Kern golden trout (724 fish/mile), 169

Sacramento suckers (*Catostomus occidentalis*; 884 fish/mile) and one unknown fish (small-sized; 5 fish/mile) were observed in the Little Kern River (Figure 14). Size class distribution of Little Kern golden trout was 18% YOY, 35% small-, 44% medium- and 4% large-sized fish.

Single-pass electrofish

One section was surveyed using single-pass electrofish methods in Clicks Creek (Section 112). A total of 32 trout were captured. Approximately six captured trout exhibited frayed and split fins, primarily on the dorsal fin; however, fin rays were parallel and symmetrical and all captured fish appeared to be of wild origin (Figure 15).

Multiple-pass electrofish

Clicks Creek flows through both low-gradient meadow habitat and medium-gradient forested reaches (Figure 16). In October, 2012 three sections were surveyed via multiple-pass electrofishing with a total survey length of 1075.0 feet (Sections 2-4). Among the three sections, the average wetted width was 10.9 feet, average water depth was 0.8 feet, and average streamflow was 0.5 cfs. Habitat was dominated by flatwater (60%), with some pools (35%) and few riffles (5%). Bankful erosion ranged from 20 to 25%, active erosion ranged from 5 to 10% and canopy closure was between 12 and 30%. Mean water temperature was 3 ºC and air temperature ranged from -2 to 4 °C, depending on the time of day. Overall instream fish cover was mostly fair with water depth, boulders, and overhanging vegetation forming the dominant cover types (Figure 17). Substrate was dominated by silts/fines (Figure 18). In total, the HWTP captured 226 Little Kern golden trout with an estimated abundance of 1268 fish/mile and 61.52 lbs/acre (Table 2). Captured Little Kern golden trout ranged in total length from 29 to 273 mm with a mean length of 125 mm; weight ranged from 0.2 to 202.0 g with a mean of 28.8 g (Table 3). A total of four captured Little Kern golden trout had frayed fins; cause is unknown at this time but based on fin ray symmetry, all captured trout appeared of wild origin.

Discussion

During the visual observation surveys (reconnaissance and snorkel surveys), recent burn damage and sediment loading was observed in the Little Kern River watershed. Damage was more severe higher upstream in each of the tributaries surveyed. With the exception of No Name Creek, short-term burn effect on Little Kern golden trout populations appeared minimal; surveyors observed various size classes including YOY, water temperatures were within normal tolerance limits, new riparian growth provided overhead cover and instream habitat appeared relatively intact. To evaluate potential long-term fire effects on Little Kern golden trout, further assessments should be conducted. Barriers corresponding to the upstream distribution of fish were identified on Sheep, Willow, and No Name creeks. Numerous barriers were also documented in

Tamarack Creek; however fish were observed from the confluence with the Little Kern River upstream to the headwaters. This is likely due to historic stocking of Little Kern golden trout into Tamarack Creek from nearby streams in the basin to create a refuge population.

Although outside of the footprint of the Lion Fire, surveys in Clicks Creek were conducted to collect resource assessment on additional putative populations of Little Kern golden trout. Previous electrofishing surveys were conducted in Clicks Creek by the HWTP in 2011 (Weaver and Mehalick 2011). For both years, estimated abundance and size class distribution of Little Kern golden trout were similar (Tables 2-3). All captured trout appeared to be of wild origin.

Fin erosion and/or deformities are common in fish raised in hatcheries and studies have shown the dorsal fins of rainbow trout are the first to erode (Arndt et al. 2001). This area was last stocked in 1997 with Little Kern golden trout from the Kernville Hatchery and it was presumed that no hatchery fish were present in the system. All trout captured during the single-pass electrofish effort were believed to be of wild origin and the cause of the fin erosion is currently unknown.

Conclusion

Little Kern golden trout are native only to the Little Kern River watershed and are a federally Threatened species. Critical habitat as determined by the US Fish and Wildlife Service (USFWS) includes the main-stem Little Kern River and all tributaries above the barrier falls located on the Little Kern River approximately one mile below the mouth of Trout Meadows Creek (Federal Register 1978). Habitat modifications and the introduction of non-native trout threaten this species. Based on the results of the 2011 assessment in watershed, the HWTP recommended a comprehensive basin-wide assessment be conducted to gather base-line fisheries and habitat data to better understand current status, abundance, and species distribution (Weaver and Mehalick 2011). Further evaluation of fin erosion throughout the watershed is recommended.

The HWTP is committed to the conservation and recovery of Little Kern golden trout and recommends future sample design should include randomization of survey site selection and consideration should be given to multiple-pass electrofish methodology. These assessments will likely occur over a multi-year period. Throughout this process, an assessment should be conducted to measure, document and geo-reference potential barriers to upstream fish migration, both natural and man-made, to aid in future restoration activities, identify isolated populations and ensure that putative populations remain isolated from introgressed fish. Collaboration among stakeholders including the USFWS, USFS, and private landowners should occur simultaneous to the basin-wide comprehensive assessment.

These data will provide up to date information to aid in the development of recovery plans with the goal of restoring Little Kern golden trout to a level at

which the subspecies can be de-listed from threatened status. Throughout this process, the HWTP recommends evaluating the Little Kern River and tributaries for designation as a Heritage and Wild Trout Water. Wild Trout Waters are those that support self-sustaining (wild) trout populations, are aesthetically pleasing and environmentally productive, provide adequate catch rates in terms of numbers or size of trout, and are open to public angling (Bloom and Weaver 2008). Wild Trout Waters may not be stocked with catchable-sized hatchery trout. Heritage Trout Waters are a sub-set of Wild Trout Waters and highlight populations of California's native trout that are found within their historic drainages. The Little Kern River and tributaries are located within the Golden Trout Wilderness Area and are open to sport fishing from the last Saturday in April through November 15th with a daily bag and possession limit of five fish and gear restricted to artificial lures with barbless hooks.

References

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Figure 1. Vicinity map of 2012 Little Kern River watershed survey locations

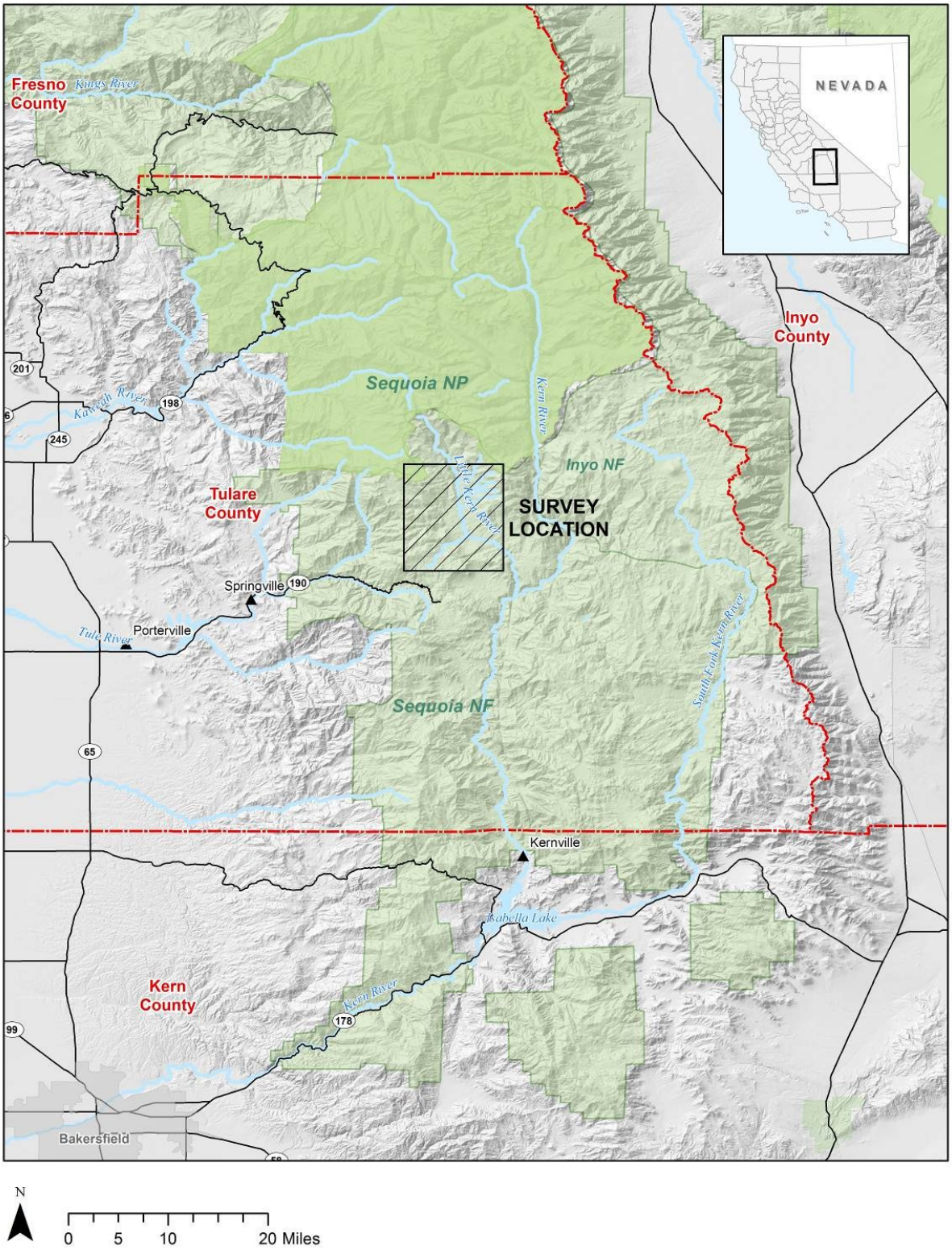

Figure 2. Detail map of 2012 Little Kern River watershed direct observation section locations and visual observations

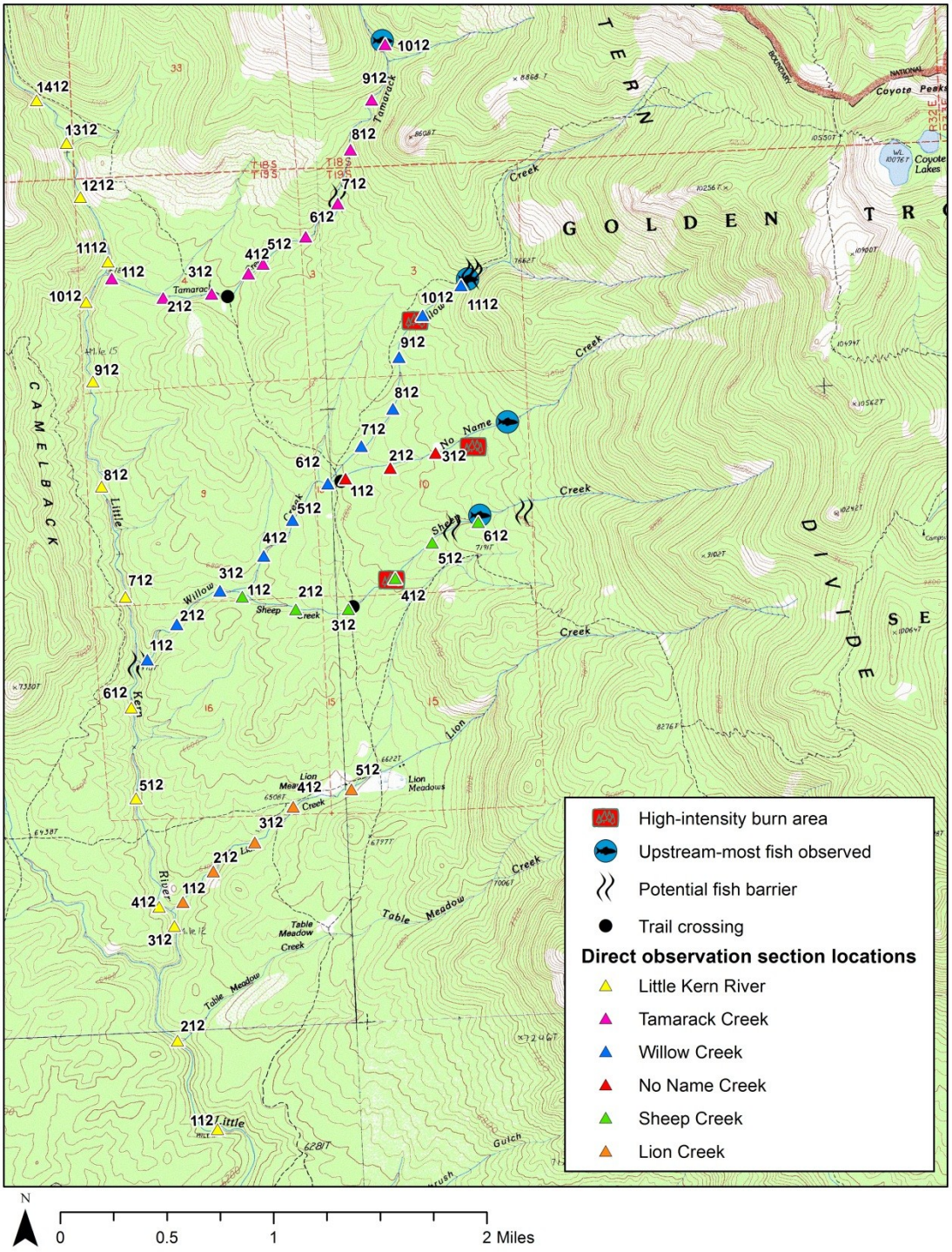

Figure 3. Detail map of 2012 Clicks Creek section locations

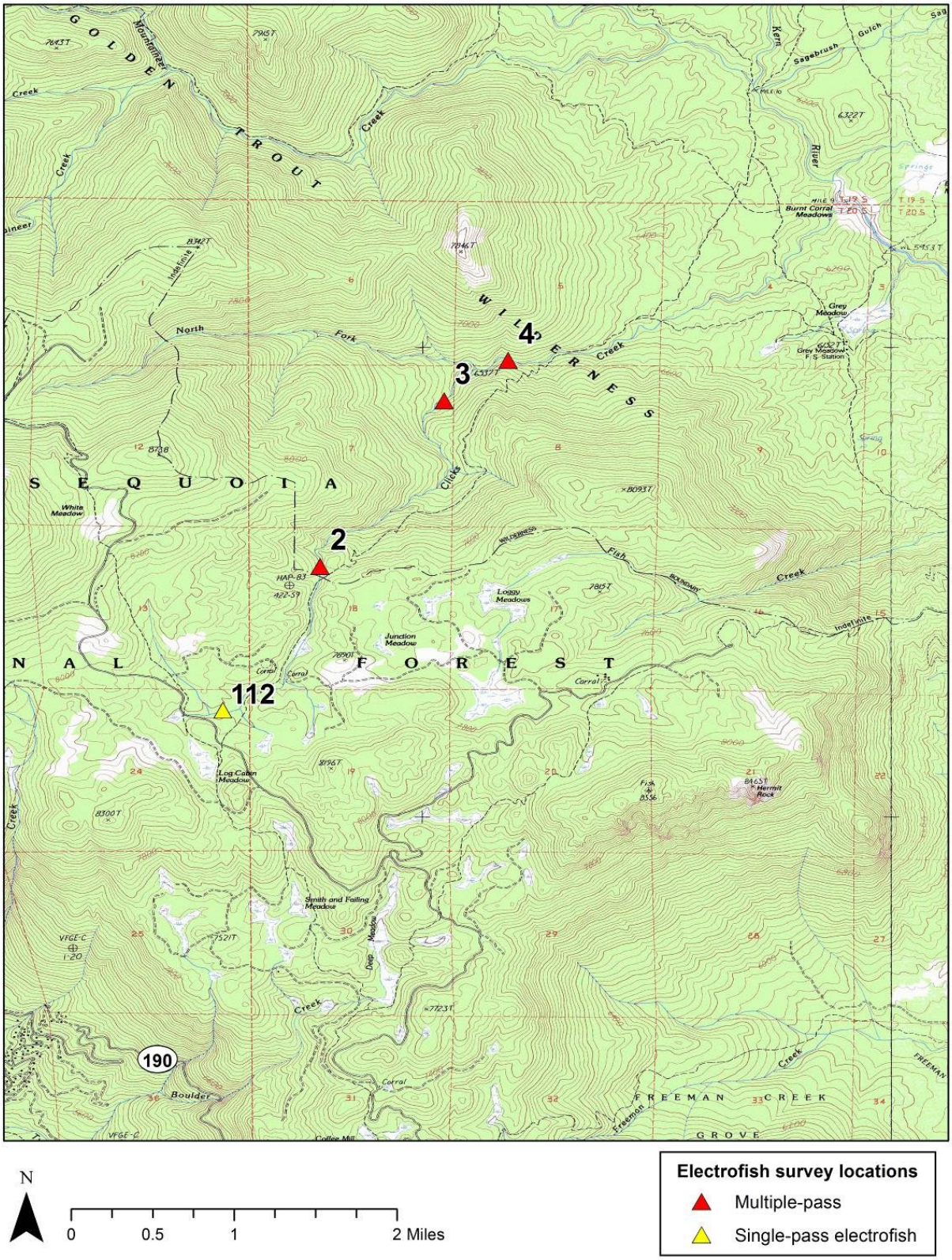

Figure 4. Representative photographs of No Name Creek in 2012 showing changes in habitat condition and fire intensity from trail crossing (top left) upstream to headwaters (clockwise)

Figure 5. Representative photographs of Sheep Creek in 2012 showing changes in habitat condition and fire intensity from trail crossing (top left) upstream to headwaters (clockwise)

Figure 6. Photographs of potential barriers to upstream fish migration in Sheep Creek in 2012

Figure 7. Representative photographs of Willow Creek in 2012 showing changes in habitat condition and fire intensity from trail crossing (top left) upstream to headwaters (clockwise)

Figure 8. Photographs of potential barriers to upstream fish migration identified in Willow Creek in 2012: barriers in upper portion of Willow Creek (top and middle rows) and barrier located near confluence with the Little Kern River (bottom row)

Figure 9. Representative photographs of Tamarack Creek in 2012






Figure 10. Photographs of potential barriers to upstream fish migration in Tamarack Creek in 2012

Figure 11. Representative photographs of 2012 Lion Creek direct observation survey sections

Figure 12. Graph of Little Kern golden trout size class distribution observed during the 2012 direct observation surveys in the Little Kern River watershed

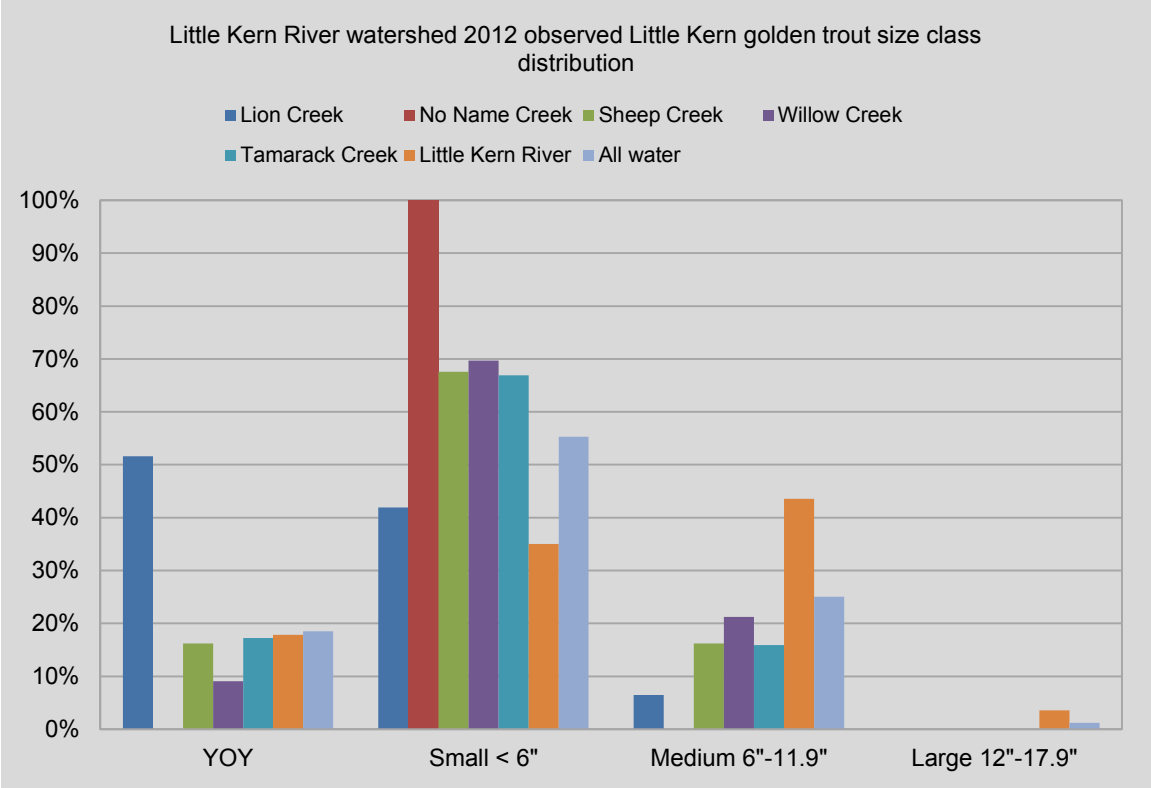

Figure 13. Representative photographs of 2012 Little Kern River direct observation survey sections

Figure 14. Photographs of Little Kern golden trout (top) and Sacramento suckers (bottom) observed in 2012 in the Little Kern River watershed

Figure 15. Photographs of Little Kern golden trout with frayed fins captured in Clicks Creek in 2012

Figure 16. Representative photographs of Clicks Creek in 2012

Figure 17. Instream fish cover observed in the Clicks Creek 2012 multiple-pass electrofishing sections

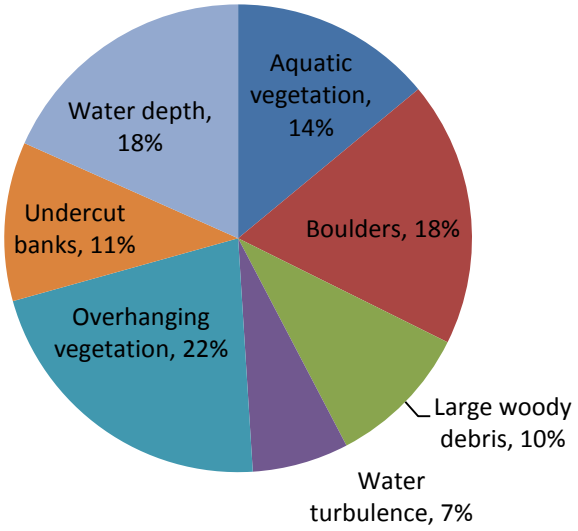

Figure 18. Substrate types observed in the Clicks Creek 2012 multiple-pass electrofishing sections

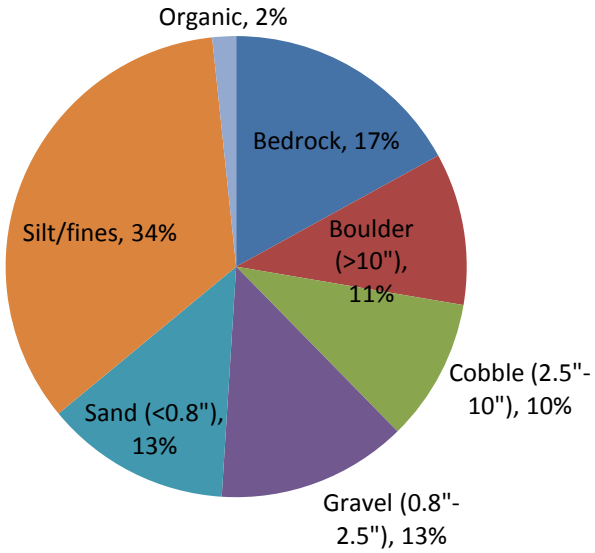

Table 1. Little Kern River watershed 2012 direct observation data

Water	Section	Section length (ft)	Species	Number of fish observed					Estimated density (fish/mi)
				YOY	Small < 6"	Medium 6"-11.9"	Large 12"-17.9"	Total	
Lion Creek	112	93.5	Little Kern golden trout	0	2	0	0	2	113
	212	102.0	Little Kern golden trout	11	5	0	0	16	828
	312	111.6	Little Kern golden trout	1	5	2	0	8	378
	412	106.4	Little Kern golden trout	4	1	0	0	5	248
	512	52.4	Little Kern golden trout	0	0	0	0	0	0
No Name Creek	112	70.0	Little Kern golden trout	0	1	0	0	1	75
	212	76.2	Little Kern golden trout	0	1	0	0	1	69
	312	102.5	Little Kern golden trout	0	0	0	0	0	0
Sheep Creek	112	147.0	Little Kern golden trout	0	7	0	0	7	251
	212	295.2	Little Kern golden trout	6	9	5	0	20	358
	312	135.8	Little Kern golden trout	0	3	1	0	4	156
	412	83.0	Little Kern golden trout	0	1	0	0	1	64
	512	111.8	Little Kern golden trout	0	5	0	0	5	236
	612	138.5	Little Kern golden trout	0	0	0	0	0	0
Willow Creek	112	152.0	Little Kern golden trout	0	1	0	0	1	35
	212	131.3	Little Kern golden trout	0	4	1	0	5	201
	312	208.0	Little Kern golden trout	0	5	0	0	5	127
	412	102.0	Little Kern golden trout	0	8	0	0	8	414
	512	180.0	Little Kern golden trout	3	11	0	0	14	411
	612	158.8	Little Kern golden trout	0	5	8	0	13	432
	712	134.5	Little Kern golden trout	2	7	2	0	11	432
	812	175.5	Little Kern golden trout	0	3	1	0	4	120
	912	151.0	Little Kern golden trout	0	1	1	0	2	70
	1012	188.0	Little Kern golden trout	0	1	0	0	1	28
	1112	165.0	Little Kern golden trout	1	0	1	0	2	64
Tamarack Creek	112	100.6	Little Kern golden trout	0	6	0	0	6	315
	212	149.3	Little Kern golden trout	4	19	0	0	23	813
	312	188.0	Little Kern golden trout	13	7	12	0	32	899
	412	194.7	Little Kern golden trout	6	22	3	0	31	841
	512	164.5	Little Kern golden trout	1	11	2	0	14	449
	612	160.0	Little Kern golden trout	1	3	0	0	4	132
	712	131.0	Little Kern golden trout	1	13	4	0	18	725
	812	125.5	Little Kern golden trout	0	12	0	0	12	505
	912	181.0	Little Kern golden trout	0	8	3	0	11	321
	1012	124.0	Little Kern golden trout	0	0	0	0	0	0

Table 1 continued

Water	Section	Section length (ft)	Species	Number of fish observed					Estimated density (fish/mi)
				YOY	Small < 6"	Medium 6"-11.9"	Large 12"-17.9"	Total	
Little Kern River	112	196.0	Little Kern golden trout	4	1	1	0	6	162
			Sacramento sucker	-	-	-	-	8	216
	212	169.8	Little Kern golden trout	0	4	2	1	7	218
			Sacramento sucker	-	-	-	-	158	4913
	312	36.0	Little Kern golden trout	0	1	2	0	3	440
	412	85.3	Little Kern golden trout	0	2	0	0	2	124
	512	35.5	Little Kern golden trout	2	1	0	0	3	446
	612	49.0	Little Kern golden trout	1	3	4	0	8	862
			Sacramento sucker	-	-	-	-	1	108
	712	44.0	Little Kern golden trout	6	0	0	0	6	720
	812	73.8	Little Kern golden trout	1	7	3	0	11	787
	912	80.5	Little Kern golden trout	3	2	5	0	10	656
	1012	35.5	Little Kern golden trout	0	1	7	1	9	1339
	1112	83.9	Little Kern golden trout	0	8	8	0	16	1007
	1212	37.2	Little Kern golden trout	2	7	13	0	22	3123
	1312	49.3	Little Kern golden trout	3	5	11	0	19	2035
			Sacramento sucker	-	-	-	-	1	107
	1412	45.7	Little Kern golden trout	3	7	5	3	18	2080
			Sacramento sucker	-	-	-	-	1	116
			unknown fish	1	0	0	0	1	116

Table 2. Clicks Creek 2011 and 2012 multiple-pass electrofishing data

Year	Section	Little Kern golden trout							
		Section length (ft)	Total number captured	Estimated population	Estimated density (fish/mi)	Estimated biomass (lbs/acre)	Capture probability	Confidence range (+/-)	95% Confidence interval
2011	1	324.5	56	64	1041	69.45	49.1%	12	52-76
2012	2	227.0	66	71	1651	65.88	47.1%	8	63-79
	3	396.0	49	59	787	27.00	35.2%	16	43-75
	4	452.0	111	117	1367	91.67	62.0%	8	109-125

Table 3. Clicks Creek 2011 and 2012 multiple-pass electrofishing data

Year	Section	Little Kern golden trout						
		Total number captured	Total length min (mm)	Total length max (mm)	Total length mean (mm)	Weight min (g)	Weight max (g)	Weight mean (g)
2011	1	56	26	200	114	0.1	89.7	22.0
2012	2	66	37	179	113	0.6	67.5	19.3
	3	49	29	235	119	0.2	134.0	26.8
	4	111	52	273	135	1.4	202.0	35.4