Little Truckee River 2011 Summary Report

August 30-31, 2011

October 31-November 03, 2011

State of California

Natural Resources Agency

Department of Fish and Game

Heritage and Wild Trout Program

Prepared by Stephanie Hogan and Jeff Weaver

Introduction

The Little Truckee River is an east-slope Sierra Nevada stream originating from Weber Lake approximately 22 miles to the northwest of Truckee, CA and is tributary to the Truckee River (Sierra and Nevada counties; Figure 1). In 2009, the California Department of Fish and Game (CDFG) Heritage and Wild Trout Program (HWTP) conducted a Phase 1 initial resource assessment to evaluate its potential for designation as a Wild Trout Water. Wild Trout Waters are those that support self-sustaining 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. The HWTP utilizes a phased approach when evaluating waters for designation; Phase 1 assessments are designed to gather baseline information on fish species composition, relative abundance and size of fishes (specifically trout), public access, aesthetics of the fishery, basic habitat attributes, and whether the trout present are of wild or hatchery origin.

The 2009 HWTP Phase 1 initial resource assessment was conducted utilizing single-pass electrofishing and, based on the survey results, the HWTP recommended the following:

- Evaluate the distribution and influence of hatchery-stocked trout in the system.
- Assess the Little Truckee River at different times of the year to better understand trout utilization for residency, spawning, and rearing habitat and to better understand whether trout utilize Boca Reservoir for portions of their life history (specifically brown trout).
- Evaluate the influence of adfluvial versus resident life history patterns.
- Develop population estimates and continue evaluation of size class distribution and habitat conditions.
- Evaluate injury rates and missing maxillae in association with angling pressure.
- Complete creel census summary report.
- Assist Trout Unlimited and the U.S. Forest Service (USFS) on proposed habitat enhancement projects.

Based on these recommendations, the HWTP initiated a Phase 2 candidate water assessment in the Little Truckee River in 2011. Phase 2 assessments generally occur over a multi-year period and provide a more comprehensive evaluation of the fishery, habitat, and angler use, including estimates of trout abundance and delineation of species distribution. In addition, the 2011 surveys

were designed to assess angling regulation changes that occurred in 2007 and to evaluate and assist with proposed habitat restoration coordinated by Trout Unlimited and the USFS. Prior to 2007, sport fish regulations in the Little Truckee River specified an open season from the last Saturday in April through November 15 with a maximum size limit of 14 inches, gear restricted to artificial lures with barbless hooks, and a daily bag and possession limit of two fish. In 2007, following the recommendation of the HWTP, the California Fish and Game Commission extended the open season from November 16 through the Friday preceding the last Saturday in April. For this portion of the year, gear is restricted to artificial lures with barbless hooks and there is a zero bag limit. No changes were made to the maximum size limit, gear restrictions, and bag/possession limit from the last Saturday in April through November 15; these regulations remain in place.

Methods

Direct observation

Direct observation methodology was used to assess species distribution, trout size class structure, and estimates of fish abundance. Surveys were conducted in the Little Truckee River between Stampede and Boca reservoirs by HWTP personnel (from Headquarters and North Central Region) from August 30 to 31, 2011 using snorkeling methods, an effective survey technique in many small streams and creeks in California and the Pacific Northwest (Hankin and Reeves 1988). This reach is approximately four miles in length and was delineated into discrete habitat types following Level II protocol as defined in the California Salmonid Stream Habitat Restoration Manual (CSSHRM; Flosi et al. 1988). The entire reach was surveyed systematically in a downstream direction with section boundaries corresponding to distinct breaks in habitat types (Figure 2). The number of divers per survey section ranged from three to four and was determined based 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 categorized and counted by size class. Size classes were divided into the following categories: small (< 6 inches); medium (6-11.9 inches); large (12-17.9 inches); and extra-large (≥ 18 inches).

Divers were instructed in both visual size class estimation and proper snorkel survey techniques prior to starting the survey (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.). For each section, surveyors measured section length along the thalweg (ft) and average wetted width, water depth, and water visibility (ft). Air and water temperatures (ºC) were measured at various locations and times throughout the survey effort. In each section, representative photographs were taken and coordinates were recorded for the section boundaries using a hand-held Global Positioning System (GPS) unit (North American Datum 1983). A site sketch of each section was drawn that included features affecting water velocities, depth and/or provided fish cover

opportunities (boulders, large woody debris, instream vegetation, back-water areas, etc.) and the juxtaposition of observed trout in relation to these features. Trout abundance (fish/mi) was estimated for each section and for the entire survey area (total number of trout by species observed in all sections divided by the total length of stream habitat surveyed).

Multiple-pass electrofishing

Multiple-pass electrofishing was used to generate population-level data, including species composition, size class structure, and estimates of abundance. These data, if collected in the same location and in the same manner, can be compared over time to study trends in the population. Surveys were conducted between October 31 and November 3, 2011 at four locations (Figures 4-5) by HWTP staff (from Headquarters and North Central Region) and numerous volunteers (including assistance from the USFS, Trout Unlimited, Balance Hydraulics, local fishing guides, and anglers). All electrofishing sections were newly established in 2011 and were selected randomly. The Little Truckee River between Stampede and Boca reservoirs was delineated into 100-meter intervals using Geographic Information System (GIS) software and each interval was sequentially numbered. The Little Truckee River was further stratified into two reaches (approximately in half) and, using a random numbers table, two points were randomly selected from each reach. Using GPS equipment, HWTP staff navigated to each selected point and determined survey feasibility. Specific section boundaries were chosen at areas where mesh block nets could be effectively installed and maintained throughout the survey effort. 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 electrofishing, HWTP staff randomly selected a new point and conducted a reconnaissance for survey feasibility. The upstream boundary of each section was selected at a location conducive to net placement.

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, heavy rocks were placed side by side along the bottom of the nets, and the nets were secured 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 (ºC) and conductivity (both 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, tend live cars, and remove debris and vegetation from the downstream block net 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; fish were stored separately by pass number. For multiple-pass depletion, the HWTP conducts a minimum of three passes within each section. Due to dense aquatic vegetation, downstream block net failure occurred in two sections during the first pass; surveyors completed pass one but did not continue with subsequent passes.

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. In Section 41, a large number of sculpin (*Cottus* sp.) were captured (800+) and, due to time constraints, 200 were measured and weighed individually. The remainder were counted and weighed collectively (lengths not measured). All captured trout were examined for signs of injury (including torn maxillaries and electrofishing-related bruising) and to determine origin, whether hatchery or wild. Fin erosion and/or deformities are common in hatchery-raised fish and studies have shown that the dorsal fins of rainbow trout are the first to erode (Arndt et al. 2001). Hatchery fish were identified primarily by closely examining the fin rays on the dorsal fin; fish with irregularities in the dorsal fin rays were presumed to be of hatchery origin. Other fins were also evaluated for signs of wear and/or fin ray abnormalities. If all fin rays were symmetrical and parallel, with no abnormalities, the fish was identified as wild in origin. Fish were then recovered in live cars secured in the stream (with fresh flowing water) and released back into the section. All larger-sized fish were processed first, stored in separate live cars to reduce overcrowding and potential stress, and were released back into the section immediately following the electrofishing effort. If a larger-sized fish appeared to have slow respiration and was negatively affected by the electrofishing process, it was immediately processed, recovered, and released downstream of the section.

A habitat assessment was conducted in each section to document resource condition and collect 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. Section length, wetted width, and water depth were measured in the same manner as described for the direct observation survey.

Stream characteristics, including active erosion (erosion occurring in the present), erosion at bankful, and canopy closure were measured as percentages of either the total stream area (canopy cover) or bank area (erosion). Section percentages were defined for each habitat type (riffle, flatwater, and pool) following Level II protocols as defined by the CSSHRM. Using visual observation,

substrate size classes and the percentage of each class relative to the total bottom material within the wetted width were quantified. A rating (between poor and excellent) was given to the instream cover available to fish and cover types were identified and defined as percentages of total instream cover. The change in water surface elevation (section gradient; %) and streamflow (cubic feet per second; cfs) were measured. Representative photographs of the section were taken.

Fish measurements were entered into the DFG Fisheries Information Sharing Host (FISH) database and were extracted into MicroFish (MicroFish Software). For each section in which multiple passes were conducted, MicroFish was used to estimate the average weight (g) and section population (based on the capture rate and probability of capture) of each species. These data were used to determine biomass (pounds per acre; lb/ac) and density (fish/mi) of each species.

Angler survey box census

Two angler survey boxes (ASB) are installed on the Little Truckee River (Figure 2) and data from these ASB were examined to better understand angler use, catch rates and catch sizes for the years 2003 through 2011. Forms missing pertinent information (date, number of hours fished, and/or fish size classes) were not included in the analysis; all complete forms were examined. Catch per unit effort (CPUE; fish/hr) was calculated for each form and was averaged across all forms in a given year.

Angling

An angling effort was conducted by HWTP staff (Headquarters) in the Little Truckee River on August 31, 2011. Surveyors used fly fishing gear and recorded total effort (hours fished) and total number of fish caught by species and size class, following the size classes defined in the direct observation methods.

Results

Direct observation

The Little Truckee River between Stampede and Boca reservoirs is a tailwater fishery; the flow regime is controlled by the Federal Watermaster Office (Reno, NV) and releases are adjusted throughout the year to provide municipal and agricultural water to the greater Reno area. Streamflow during the August survey effort was approximately 103 cfs (United States Geologic Survey (USGS), provisional data, 2012). A total of 66 sections were surveyed via direct observation, with a combined survey length of 22026.0 feet (4.2 miles). Habitat was 0.6% riffle, 98.9% flatwater, and 0.5% pool (Figure 6). Flooded riffle comprised a large portion of the flatwater habitat. The Little Truckee River averaged 61.0 ft in wetted width and 1.3 ft in water depth during the direct observation survey effort. Water temperature ranged from 9 ºC to 14 ºC and air

temperature was measured between 9 ºC and 26 ºC. Divers observed 687 brown trout (*Salmo trutta*), 1927 rainbow trout (*Oncorhynchus mykiss*), 192 unknown trout, and ten sculpin (Table 1). The majority of unknown trout observed were young of year (YOY). Sculpin were not identified to species but were likely Paiute sculpin (*C. beldingi*), based on the species' distributional range within this watershed. The majority of observed trout were located in shallow edge-water or side-channel habitat and were YOY (Figure 7). Larger-sized trout were observed predominantly in areas associated with cover, including deeper water, large-woody debris, or downstream of boulders. Estimated fish abundance (density) based on the direct observation surveys show the Little Truckee River to be dominated by rainbow trout (Table 2). Water visibility ranged from two feet (from Stampede Reservoir downstream approximately two miles) to seven feet (from Boca Reservoir upstream approximately one mile). Poor visibility was due to suspended fines and aquatic vegetation including algae; divers further decreased visibility by disturbing the substrate in shallow water habitat, particularly in the upper portion of the river. Numerous anglers were observed during the survey effort.

Multiple-pass electrofishing

Four sections were selected for multiple-pass electrofish methodology; however, downstream block net failure occurred in two of these sections and only one pass was conducted (Figure 8). A habitat analysis was performed in all four of the sections but fish abundance estimates were limited to those sections where multiple passes occurred. For feasibility of backpack electrofishing, water released out of Stampede Reservoir was reduced for the survey effort. According to the USGS stream gage (provisional data), flows were reduced from approximately 151 cfs in October to approximately 34 cfs for the duration of the survey effort. Streamflow was measured at two locations (Sections 2 and 50) and averaged 28.5 cfs. Immediately following the completion of the surveys, the HWTP notified the water master and flows were increased back to the normal schedule.

The electrofish depletion effort yielded a total capture of 293 brown trout, 170 rainbow trout, 1426 sculpin, three speckled dace (*Rhinichthys osculus*) and four cyprinids (not identified to species) in 729.0 feet of habitat (Figure 9; Table 2). Nine of the captured rainbow trout (Sections 11 and 50) appeared to be of hatchery origin based on fin condition (Wagner 1986). Two crayfish (unknown species) were observed. The single-pass electrofish effort captured an additional 470 brown trout, 115 rainbow trout, and 241 sculpin in 718.0 feet of habitat. Torn maxillaries were observed on four larger-sized rainbow trout (≥ 335 mm) captured in Section 11. The majority of captured brown and rainbow trouts were in the small size class (Figure 10). Habitat surveyed was 100% flatwater, with a mean wetted width of 44.1 feet and mean water depth of 0.9 feet. Water temperature ranged from 7.5º C to 10.1º C and air temperature was measured between 0º C and 12º C, depending on the time of day. Due to low streamflow during the survey effort, active erosion was low (< 5%); however evidence of

bankful erosion ranged from 8% (Section 50) to 45% (Section 41). The Little Truckee River is a low-gradient system (<1%) with relatively little canopy cover (< 2%). Fish cover was fair in all sections and the dominant instream cover types were water turbulence, water depth, and boulders. Substrate was dominated by cobble with some gravel and organic material, the latter occurring predominantly in edge-water or back-channel habitats. The majority of trophy-sized trout (≥18") were captured in Section 11, whereas no trout greater than nine inches was captured in either Section 25 or 41 (Table 4). During the survey effort, numerous larger-sized brown trout were visually observed in the upper portion of the river directly downstream of Stampede Reservoir, presumably in preparation to spawn. Numerous anglers were observed during the survey effort.

Angler survey box census

A total of 650 voluntary ASB forms were analyzed for the years 2003 through 2011 (Table 5). The total effort reported was 2430 angling hours with an annual mean of 270 hours. Anglers reported catching 1229 trout (annual mean of 137 trout). Individual CPUE ranged from zero to 5.5 fish/hr. Annual mean CPUE was similar for all years and ranged from 0.4 to 0.7 fish/hr. Rainbow trout were the dominant species reported caught. The dominant size class of trout reported caught, for both rainbow and brown trouts, was greater than 16 inches in length (Figures 11-12). Following the change in the open season that occurred in 2007, the HTWP compared the number of forms submitted during the regular angling season (from the last Saturday in April through November 15) to that of the winter fishing opportunity to evaluate angler use. The percentage of forms submitted during the regular trout season ranged from 82% (2009) to 97% (2007) with a mean of 92% (Table 6).

Angling

Four staff participated in the angling effort and captured ten rainbow trout and three brown trout in 20 hours of effort (Table 7). CPUE ranged from zero to 2.2 fish/hr with an average of 0.7 fish/hr. The majority of captured rainbow trout were in the large size class and all of the captured brown trout were medium-sized (Figure 13).

Discussion

Species composition, size class structure, and abundance were compared between the direct observation and electrofish survey methods. Species composition differed among the two survey techniques. Direct observation results showed a 3:1 ratio of rainbow trout to brown trout, whereas electrofishing resulted in a capture of three brown trout to every rainbow trout. It is likely that brown trout detectability may be poor during direct observation (and, conversely, rainbow trout detectability may be high) due to differential habitat preferences, species-specific flight response, misidentification, and/or other factors. Estimated abundance also differed among the two methods. Electrofish depletion generated

higher estimated fish densities for all species (Figure 14). Although the surveys were conducted at different times of the year in different flow conditions and the direct observation surveys were more comprehensive in nature (22430 feet were surveyed via direct observation versus 729.0 feet via multiple-pass electrofishing), it is likely that the differences in estimated fish densities were the result of survey bias. Poor water visibility, diver inexperience, and/or habitat preferences of fishes may have resulted in poor detection during direct observation. Specifically, sculpin were estimated at 2.4 fish/mi from direct observation while the electrofish effort yielded an estimate of 17603 sculpin/mi. In addition, direct observation did not detect speckled dace. Presumably, habitat preferences, size, and cryptic coloration lead to poor sculpin and speckled dace detection via direct observation. Trout size class distribution among the two survey methodologies was similar (Figures 15 and 16).

A comparison of multiple-pass electrofish data from 2011 to previous surveys conducted by the HWTP in 1999 and 2002 show moderate fluxes in estimated abundance of all fishes among survey years as well as differences in species composition (Table 8). Lahontan redside (*Richardsonius egreguis*), Tahoe sucker (*Catostomus tahoensis*), kokanee salmon (*Oncorhynchus nerka*), and Tui chub (*Siphateles bicolor*) were captured in previous efforts but were neither observed nor captured in 2011. These species were captured predominantly downstream of the USGS gaging station within one-half mile of Boca Reservoir; neither direct observation nor electrofish surveys conducted in 2011 were located in this portion of the river.

An analysis of ASB data indicates the majority of fishing occurs between April and November during the traditional trout season. Public concern was raised that additional angling pressure during the winter months may lead to increased mortality. ASB data and a creel census conducted by the HWTP North Central Region (Hanson 2013) shows the majority of captured trout are released. It is likely that winter weather conditions limit access to this fishery. It is also worth noting that, while the Little Truckee River is well known for its potential as a trophy trout fishery, likely supported by spawning runs of large rainbow (spring months) and brown (fall months) trouts, angling during winter months misses the majority of both spawning events. Estimated trout abundance in 2011 was within the range previously documented from historic electrofish surveys. It does not appear that winter fishing limits the trout population; however, angling regulations should continue to be monitored over time.

Conclusion

The Little Truckee River is a popular fishery in close proximity to both Lake Tahoe and Reno, Nevada and is open to year-round angling (only artificial lures with barbless hooks may be used). During the course of the HWTP Phase 2 candidate water assessment, multiple size classes of both coastal rainbow and brown trout were captured, including young of year and extra-large size fish. ASB data show average catch rates in 2011 were low to moderate (0.7 fish/hr) and the

majority of fish captured were greater than or equal to 16 inches in total length. The Little Truckee River is not a fast-action fishery; however, trophy-sized trout (greater than 18 inches) are present in the system. Currently, Boca, Stampede, and Prosser reservoirs are stocked by the DFG with catchable-sized hatchery trout (among other species). Wild Trout Waters may not be stocked with catchable-sized hatchery trout and, although the Little Truckee River is not stocked directly, it is possible that hatchery-reared fish can move into the Little Truckee River (especially during spawning migrations of fish from Boca Reservoir moving upstream into the Little Truckee River). This may eliminate the Little Truckee River from consideration as a candidate Wild Trout Water. If DFG North Central Regional support exists to pursue the Little Truckee River for Wild Trout-designation, the HWTP recommends the following:

1. Evaluate the distribution and influence of hatchery-stocked trout in the system.

2. Assess the Little Truckee River at different times of the year to better understand trout utilization for residency, spawning, and rearing habitat and to better understand whether trout utilize Boca Reservoir for portions of their life history.

3. Evaluate the influence of adfluvial versus resident life history patterns.

4. Develop population estimates and continue evaluation of size class distribution and habitat conditions. Consideration should be given to utilizing mark-recapture techniques.

5. Evaluate injury rate and missing maxillae in association with angling pressure.

6. Complete creel census summary report.

7. Continue evaluation of sport fishing regulations.

8. Collaborate with local shareholders, including Trout Unlimited and the USFS on habitat modification projects.

Sample design should include randomization of survey site selection and broader geographic distribution of sampling locations. Direct observation techniques are not recommended for future assessments in the Little Truckee River.

References

Arndt, R. et al. 2001. Influence of raceway substrate and design on fin erosion and hatchery performance of rainbow trout. North American Journal of Aquaculture. 63:312-320.

Bloom, R. and J. Weaver. 2008. The California Heritage and Wild Trout Program Handbook (Draft). State of California. Resources Agency. Department of Fish and Game. Heritage and Wild Trout Program. Gold River, CA.

Flosi, G., S. Downie, J. Hopelain, M. Bird, R. Coey and B. Collins. 1998. California Salmonid Stream Habitat Restoration Manual. 3rd Edition. Vol. 1. State of California Resources Agency. Department of Fish and Game. Inland Fisheries Division.

Hankin D.G., and G.H. Reeves. 1988. Estimating total fish abundance and total habitat area in small streams based on visual estimation methods. Canadian Journal of Fisheries and Aquatic Sciences. 45:834-844.

Hanson, J. and M. Meinz. 2013. Little Truckee River angler survey 2009. State of California. Natural Resources Agency. Department of Fish and Game. Rancho Cordova, CA.

Rosgen, D.L. 1994. A Classification of Natural Rivers. Catena Vol. 22 169-199.

Wagner, E. et al. 1996. The effects of fry rearing density on hatchery performance, fin condition, and agnostic behavior of rainbow trout *Oncorhynchus mykiss* fry. Journal of the World Aquaculture Society. Vol. 27, No. 3.

USGS Current Water Data for the Nation. “USGS 10344400 Little Truckee R AB Boca Res NR Truckee CA.” Web. 19 Mar. 2012. <http://waterdata.usgs.gov/nwis/rt>.

Figure 1. Vicinity map of the Little Truckee River

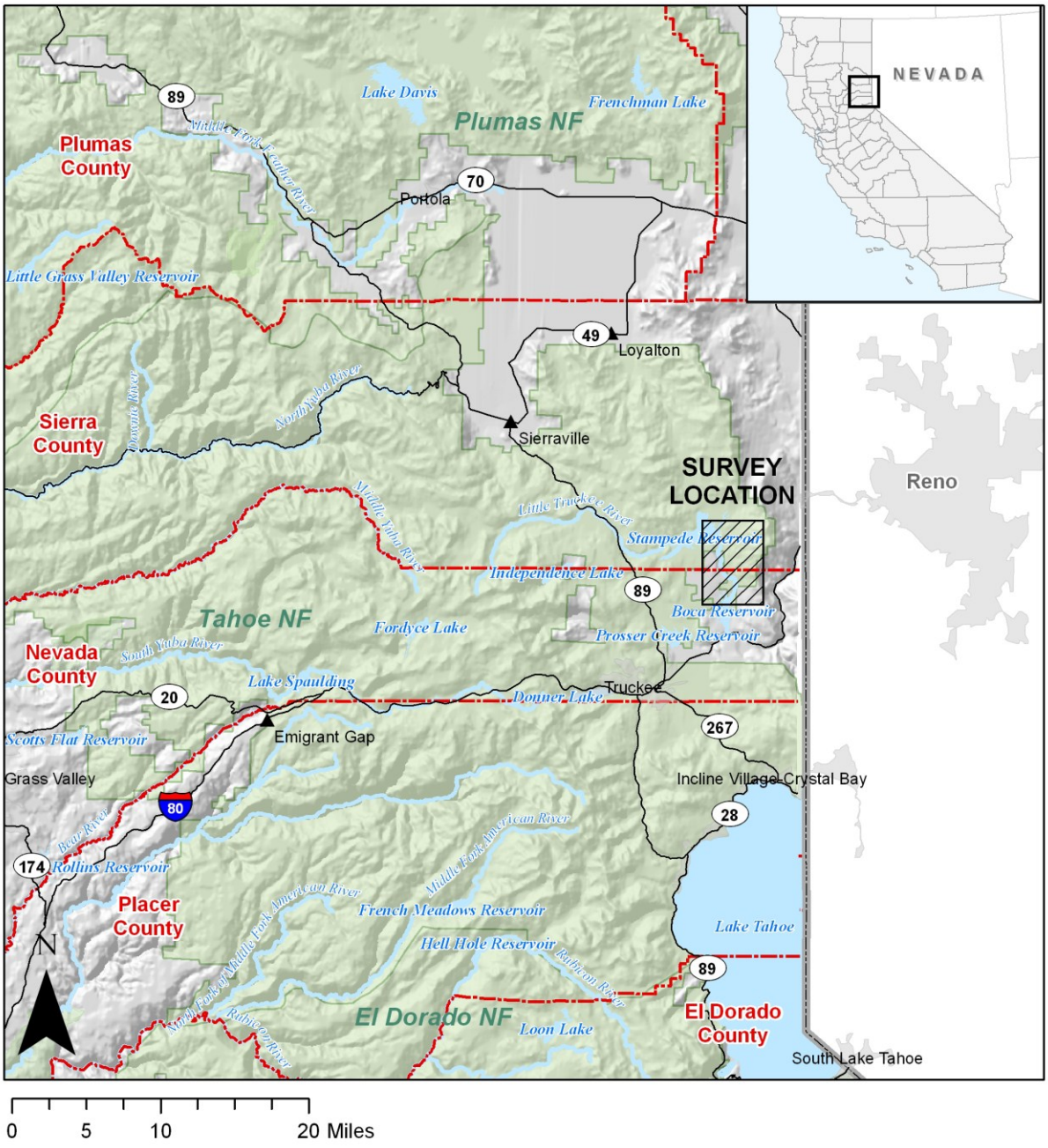

Figure 2. Detail map of Little Truckee River 2011 direct observation section locations and ASB locations

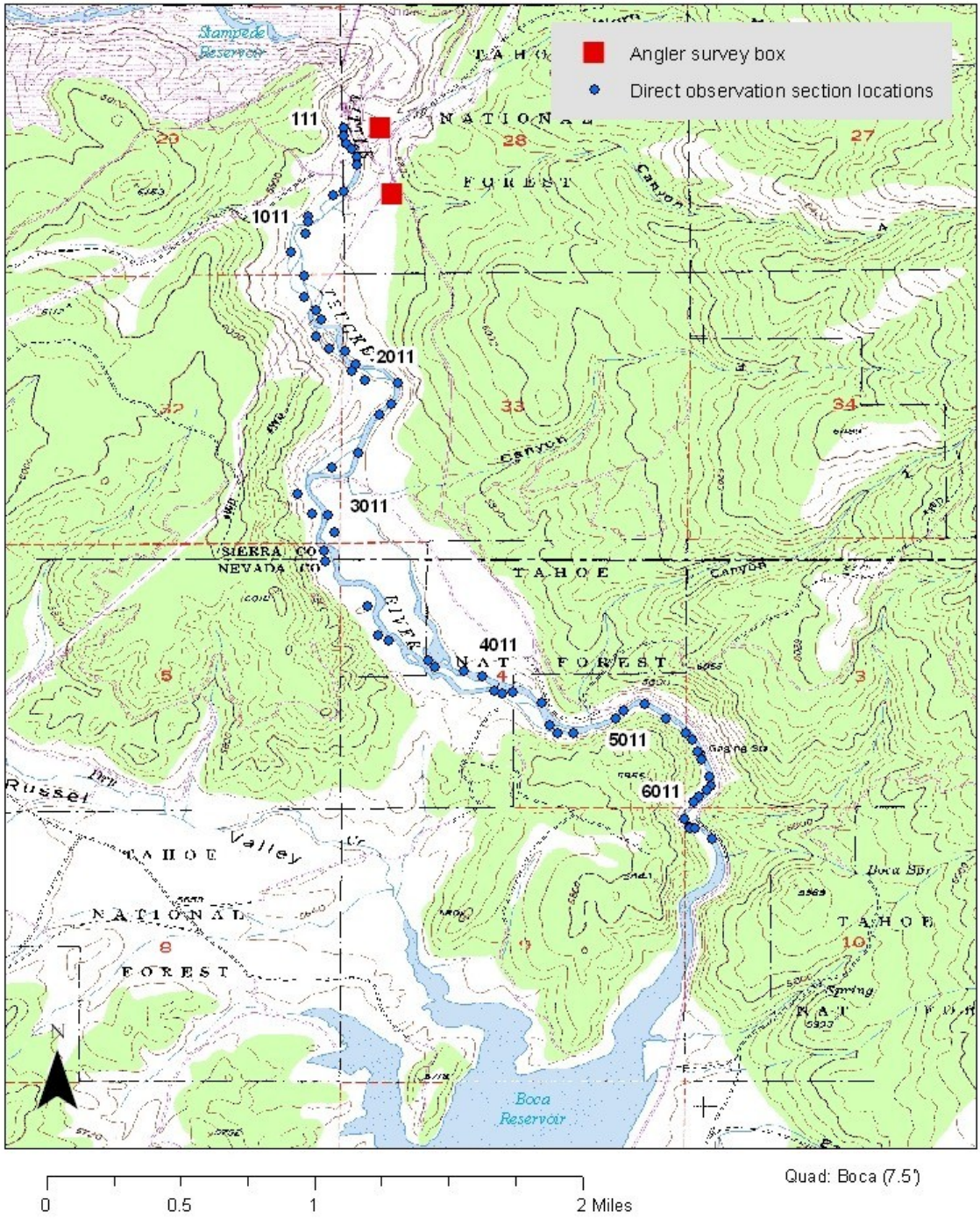

Figure 3. Aerial map of Little Truckee River 2011 direct observation section locations and ASB locations

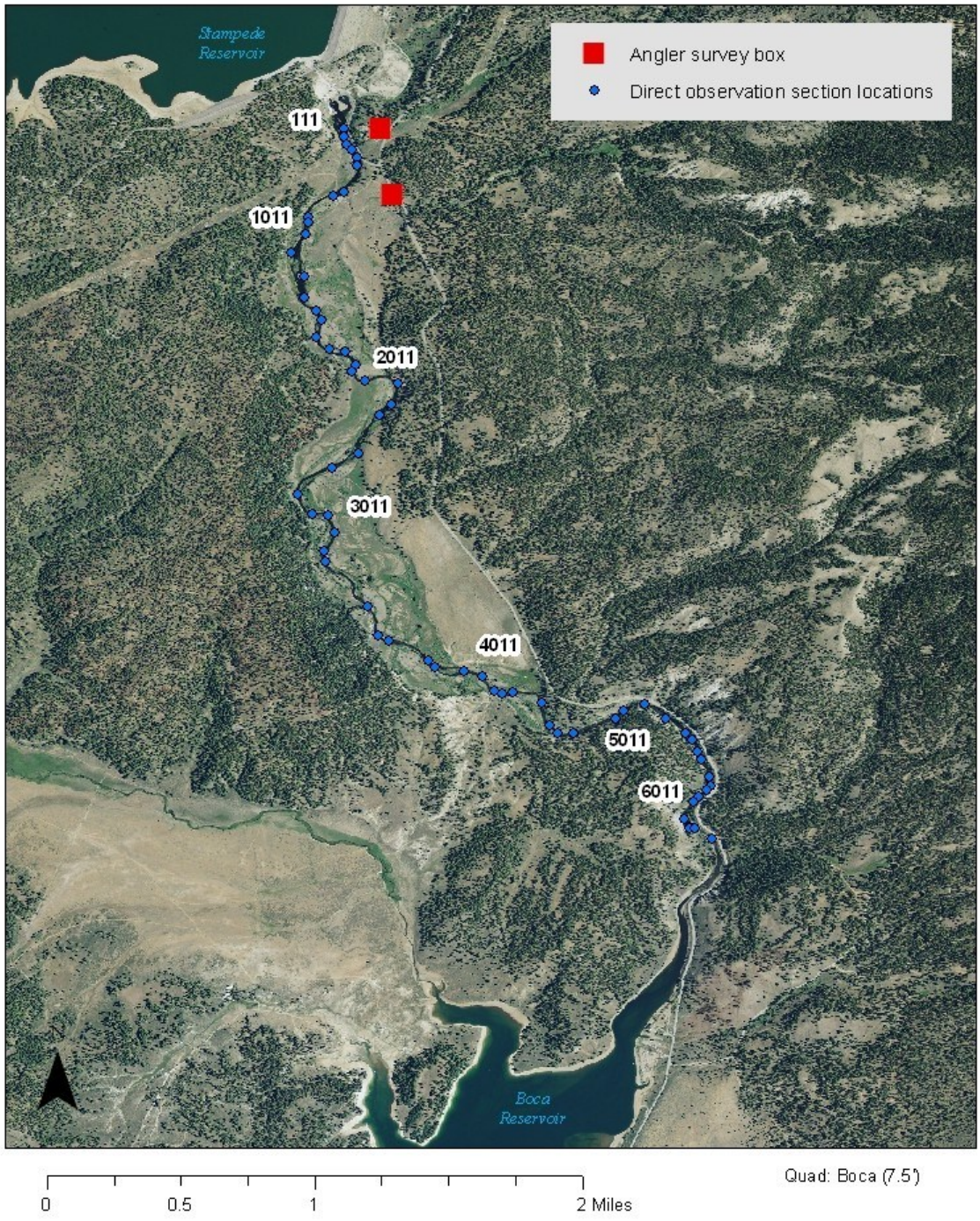

Figure 4. Map of Little Truckee River 2011 electrofish section locations and ASB locations

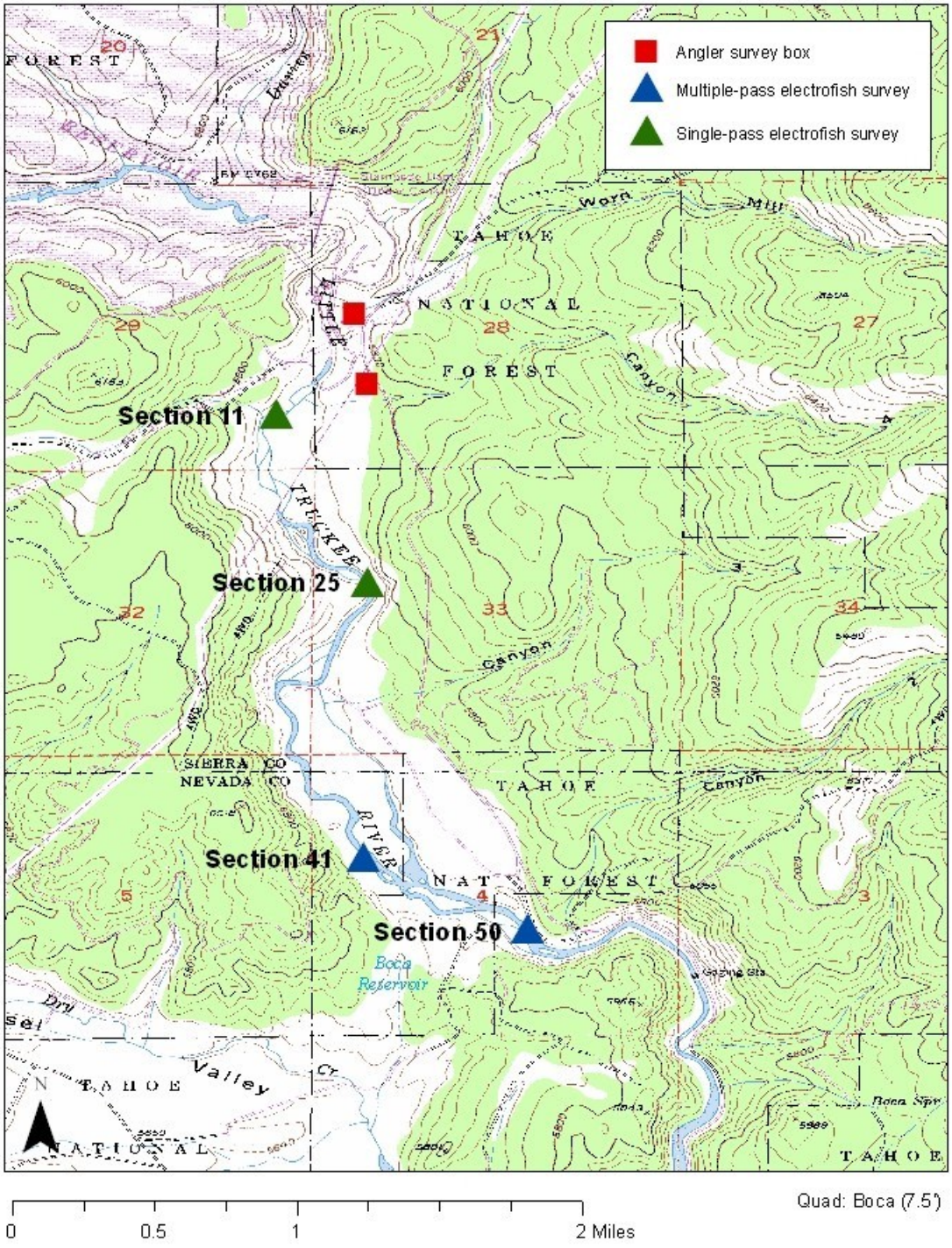

Figure 5. Aerial map of Little Truckee River 2011 electrofish section locations and ASB locations

Figure 6. Representative photographs of the Little Truckee River direct observation sections in 2011






Figure 7. Graph of Little Truckee River 2011 direct observation data: number of trout observed by species and size class (YOY and small-sized fish combined)

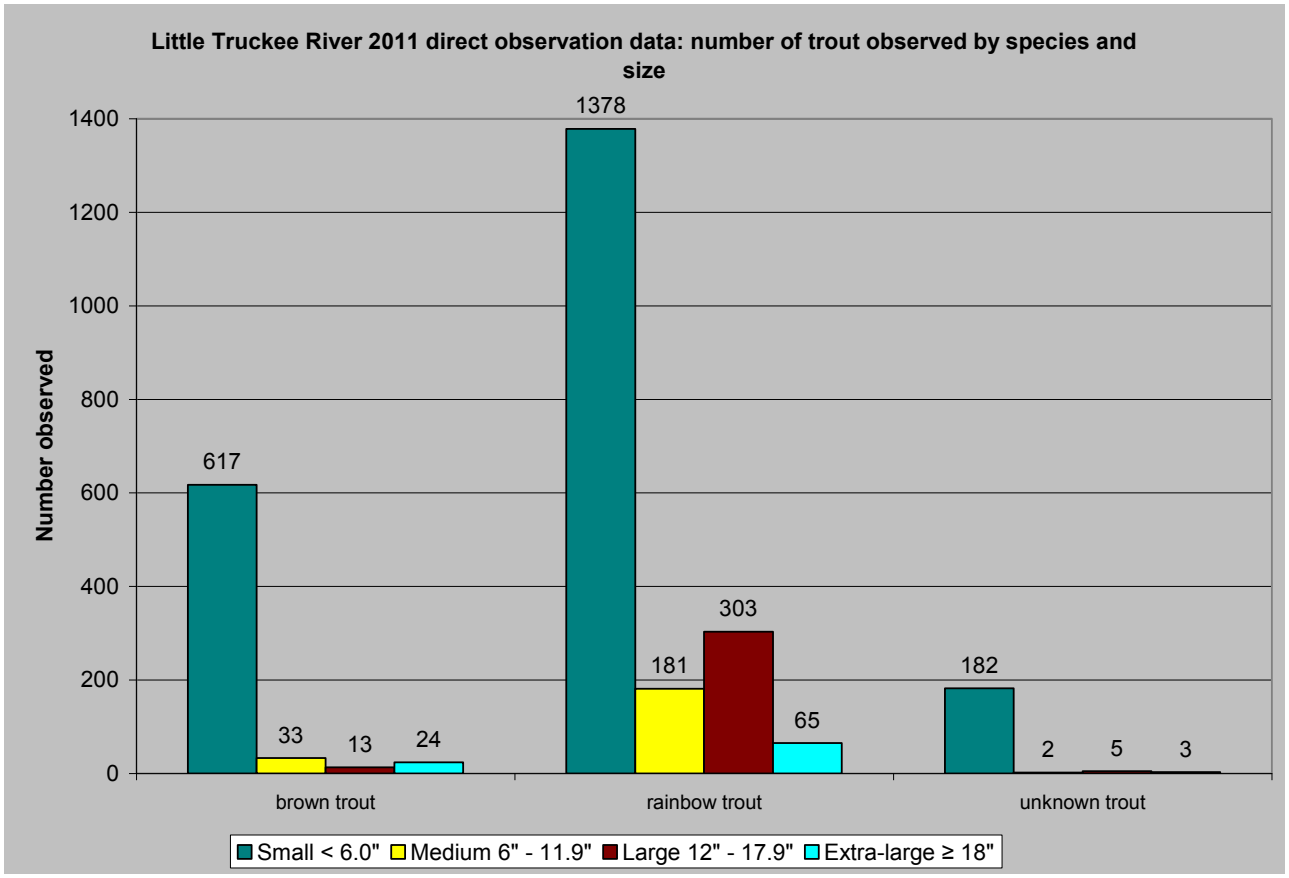

Figure 8. Representative photographs of the Little Truckee River electrofish sections in 2011

Figure 8 continued

Figure 9. Little Truckee River 2011 electrofish survey photographs of captured fish

Figure 10. Graph of Little Truckee River 2011 electrofish data: number of trout captured by species and size class (YOY and small-sized fish combined)

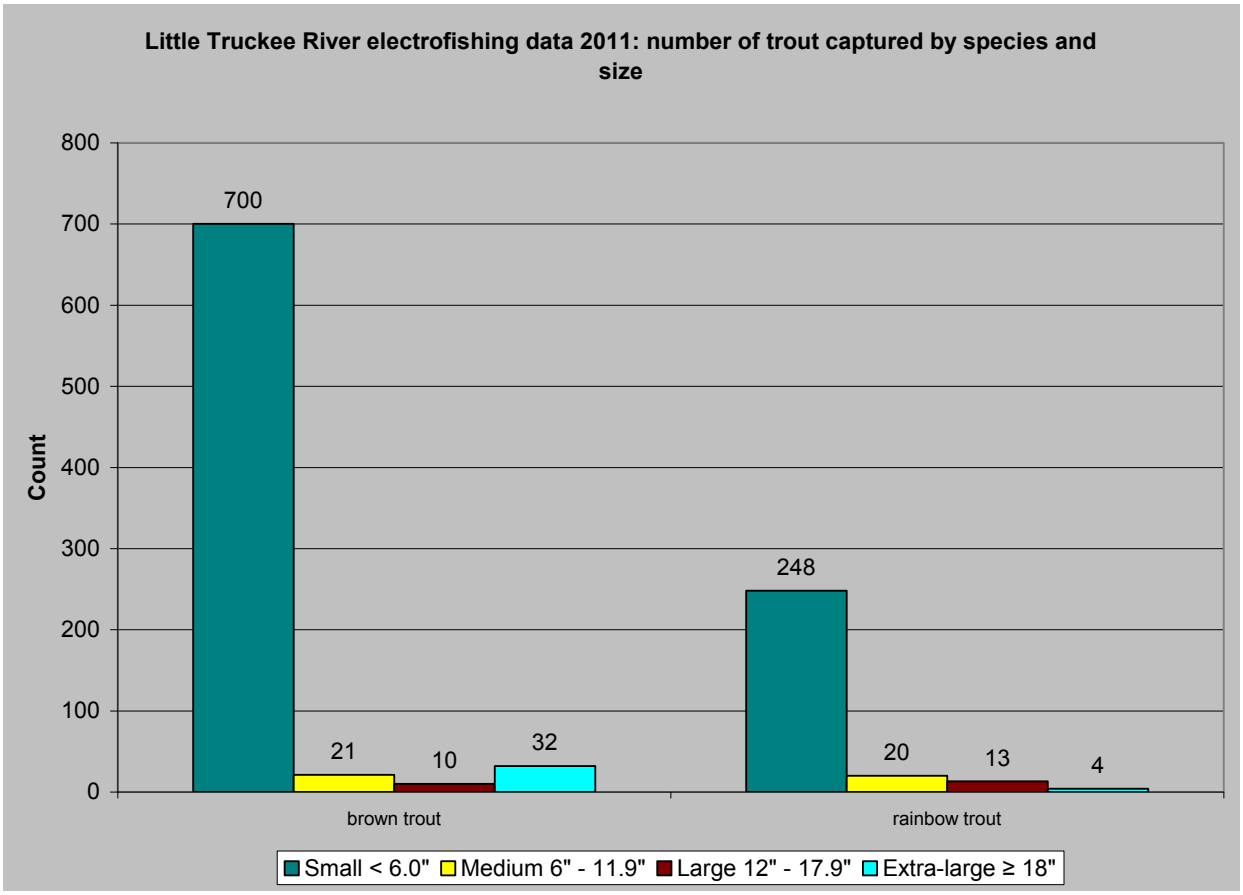

Figure 11. Graph of Little Truckee River 2002-2011 ASB data: number of brown trout reported caught by length and the number of forms analyzed per year

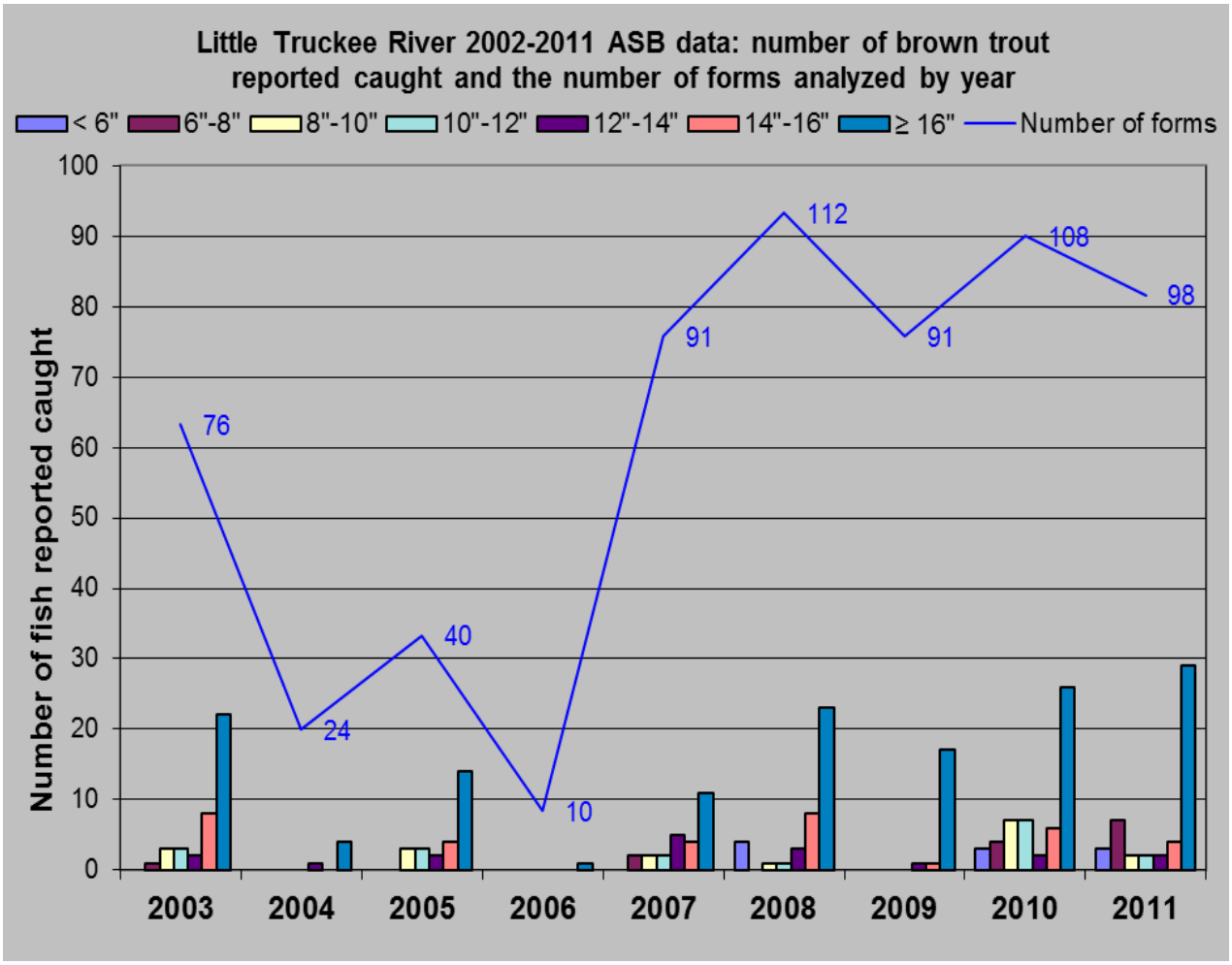

Figure 12. Graph of Little Truckee River 2002-2011 ASB data: number of rainbow trout reported caught by length and the number of forms analyzed per year

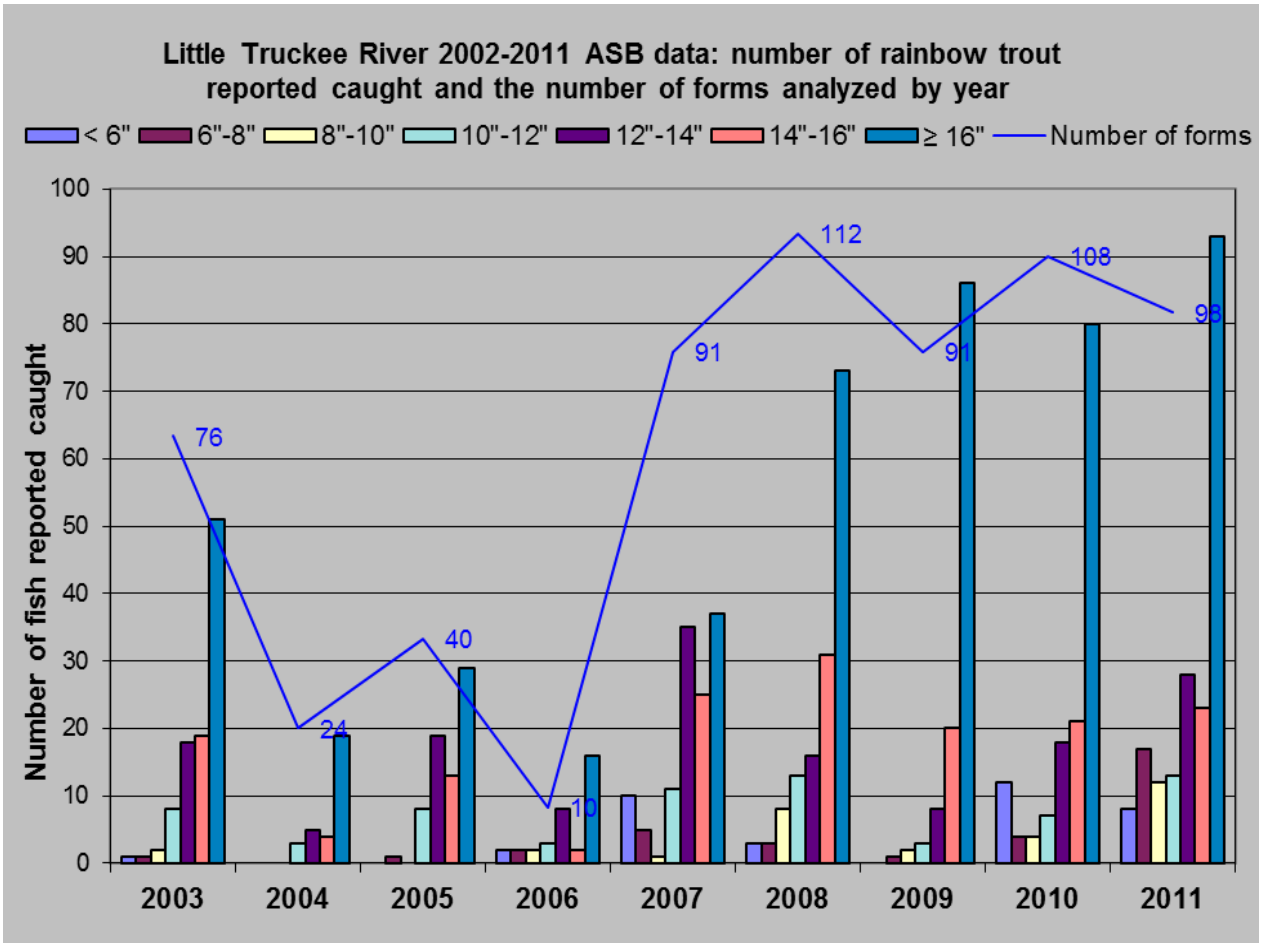

Figure 13. Little Truckee River 2011 angling data: number of trout captured by species and size class

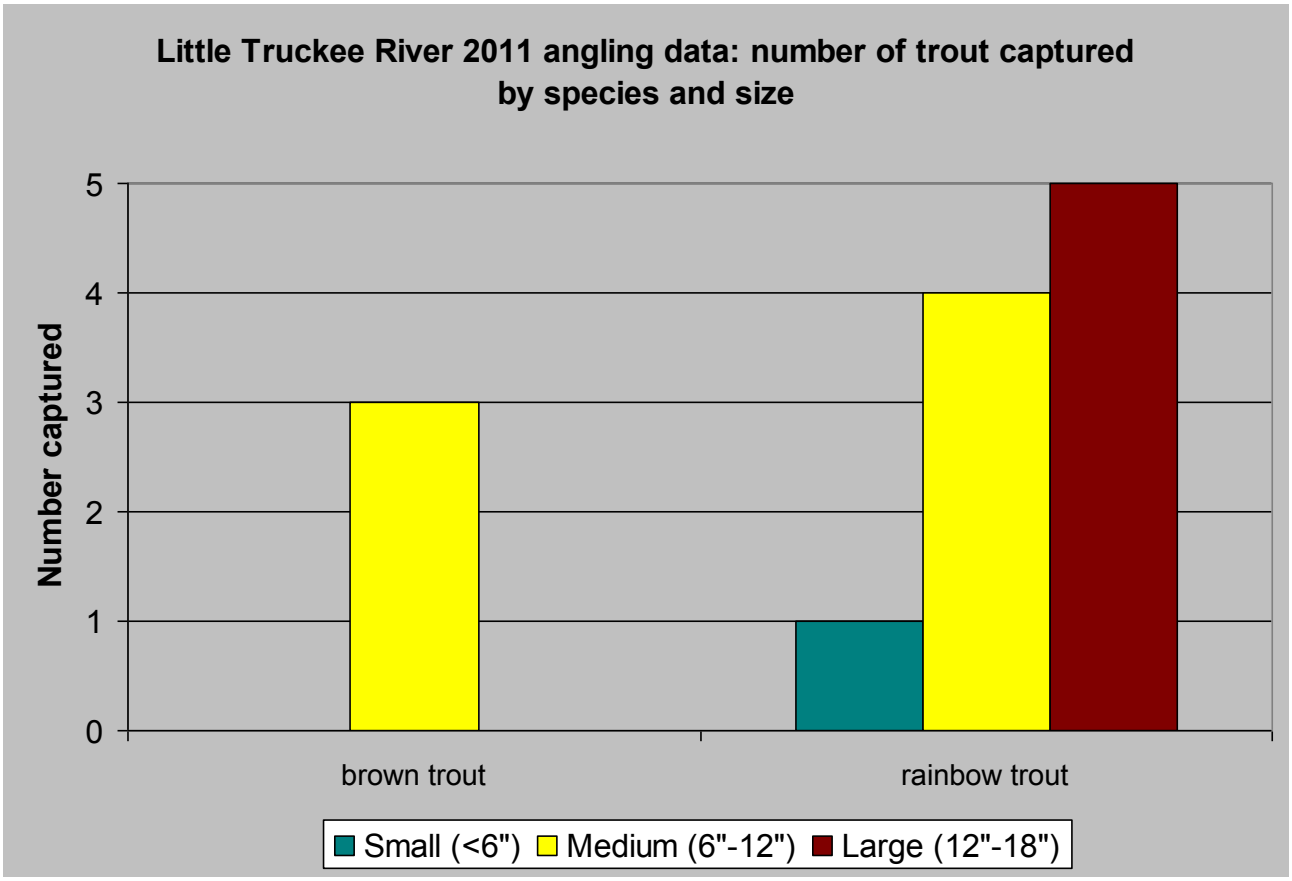

Figure 14. Little Truckee River 2011 estimated trout density by survey type

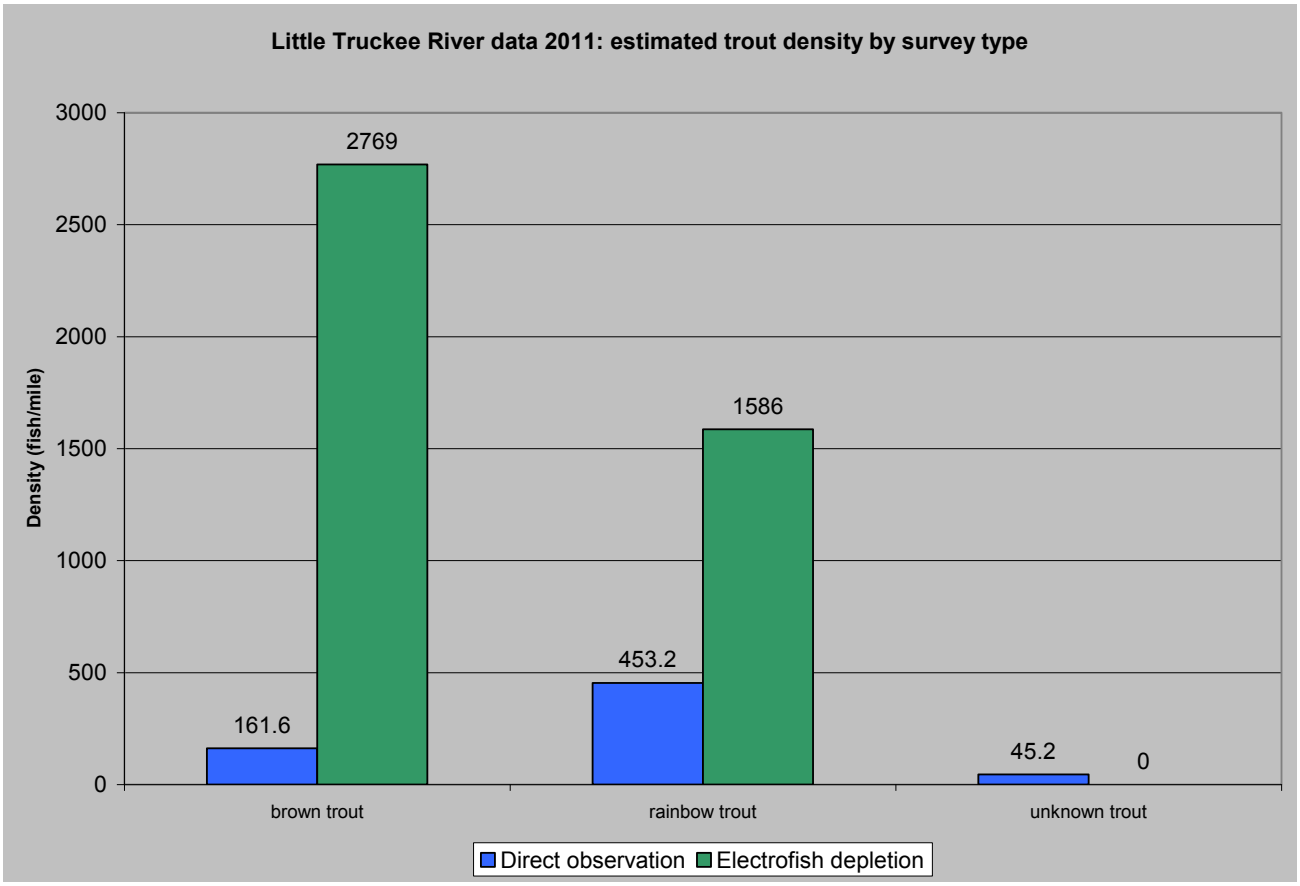

Figure 15. Little Truckee River 2011 brown trout size class distribution by survey type

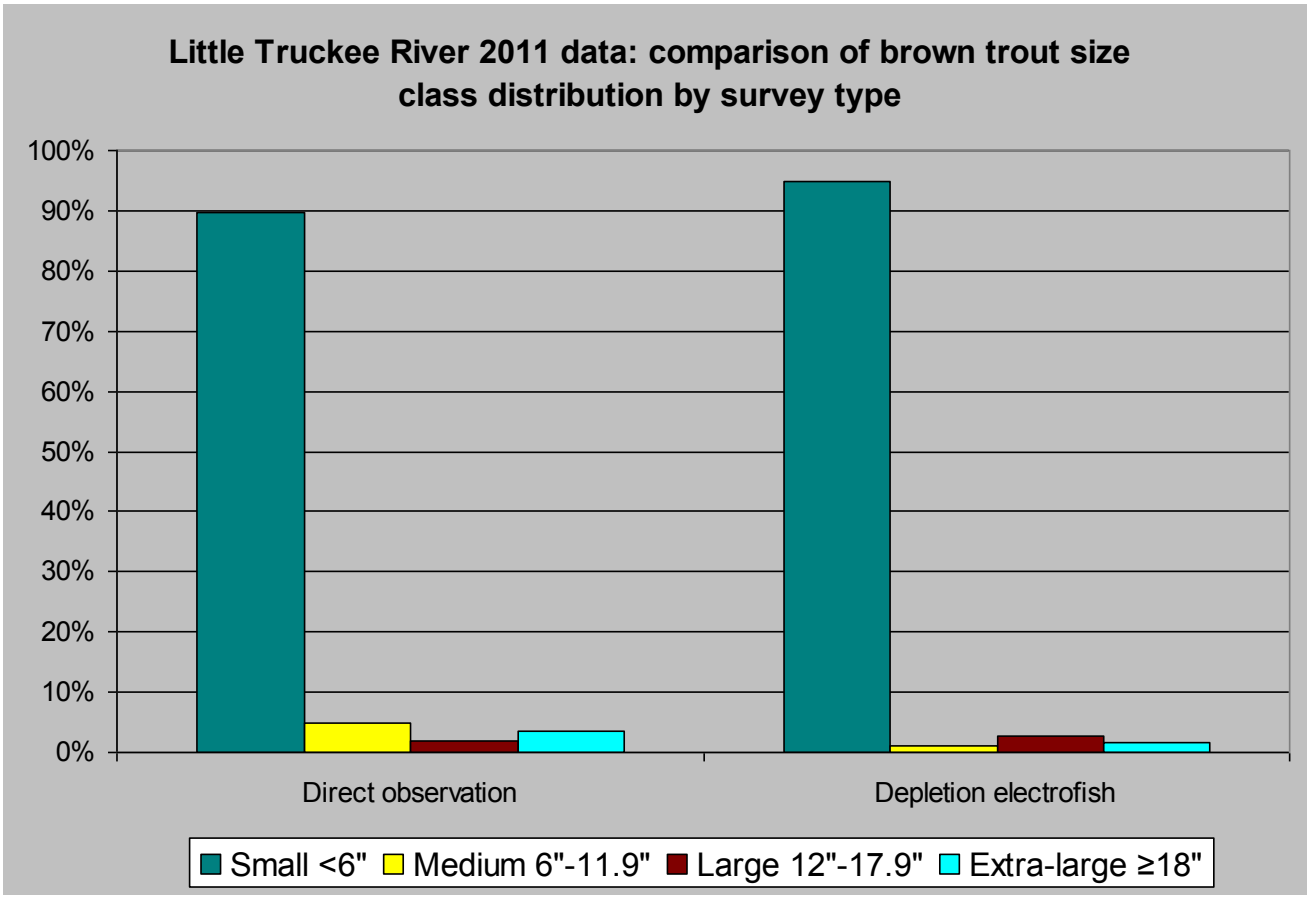

Figure 16. Little Truckee River 2011 rainbow trout size class distribution by survey type

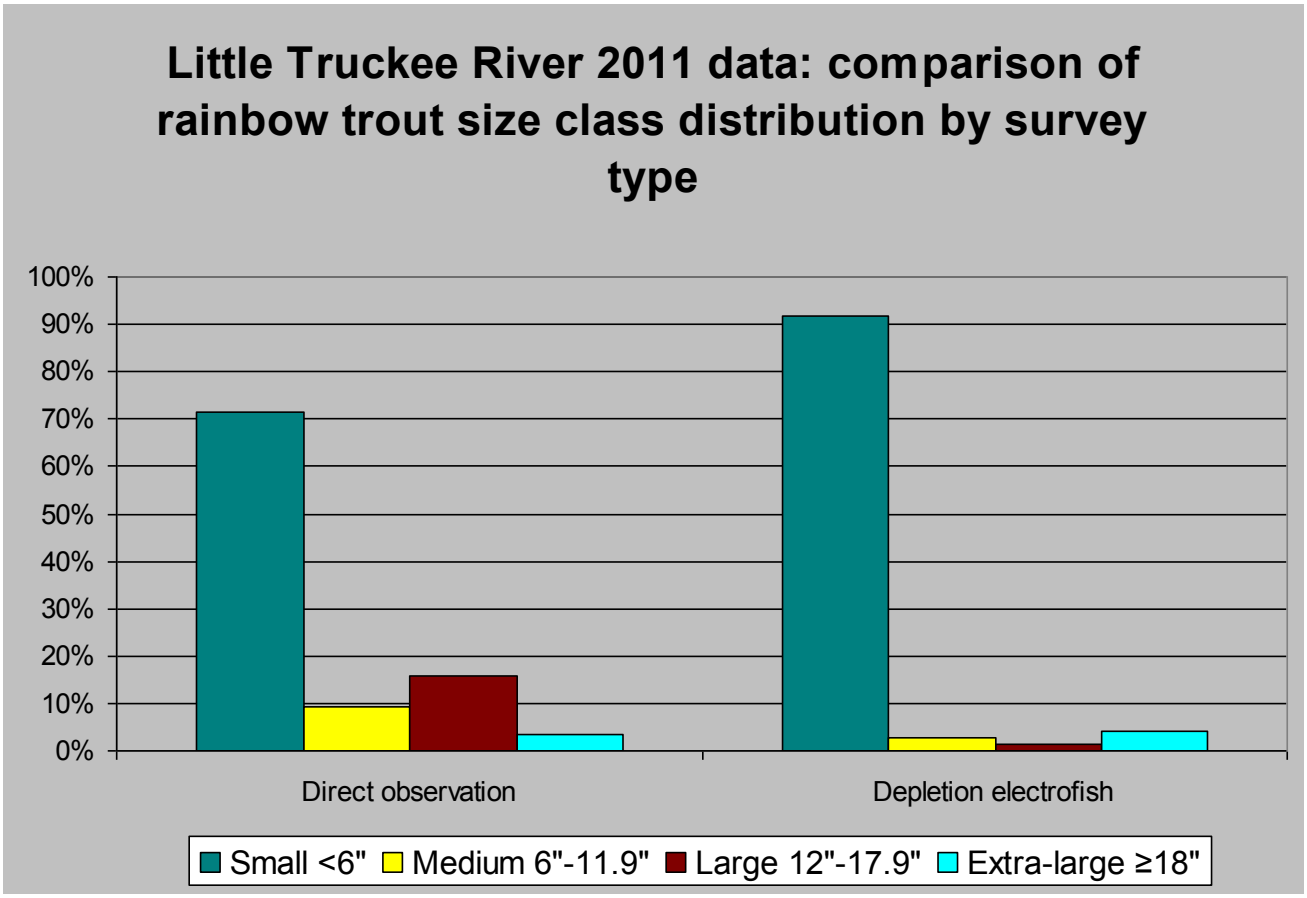

Figure 17. Estimated trout abundance in the Little Truckee River from 1999-2011

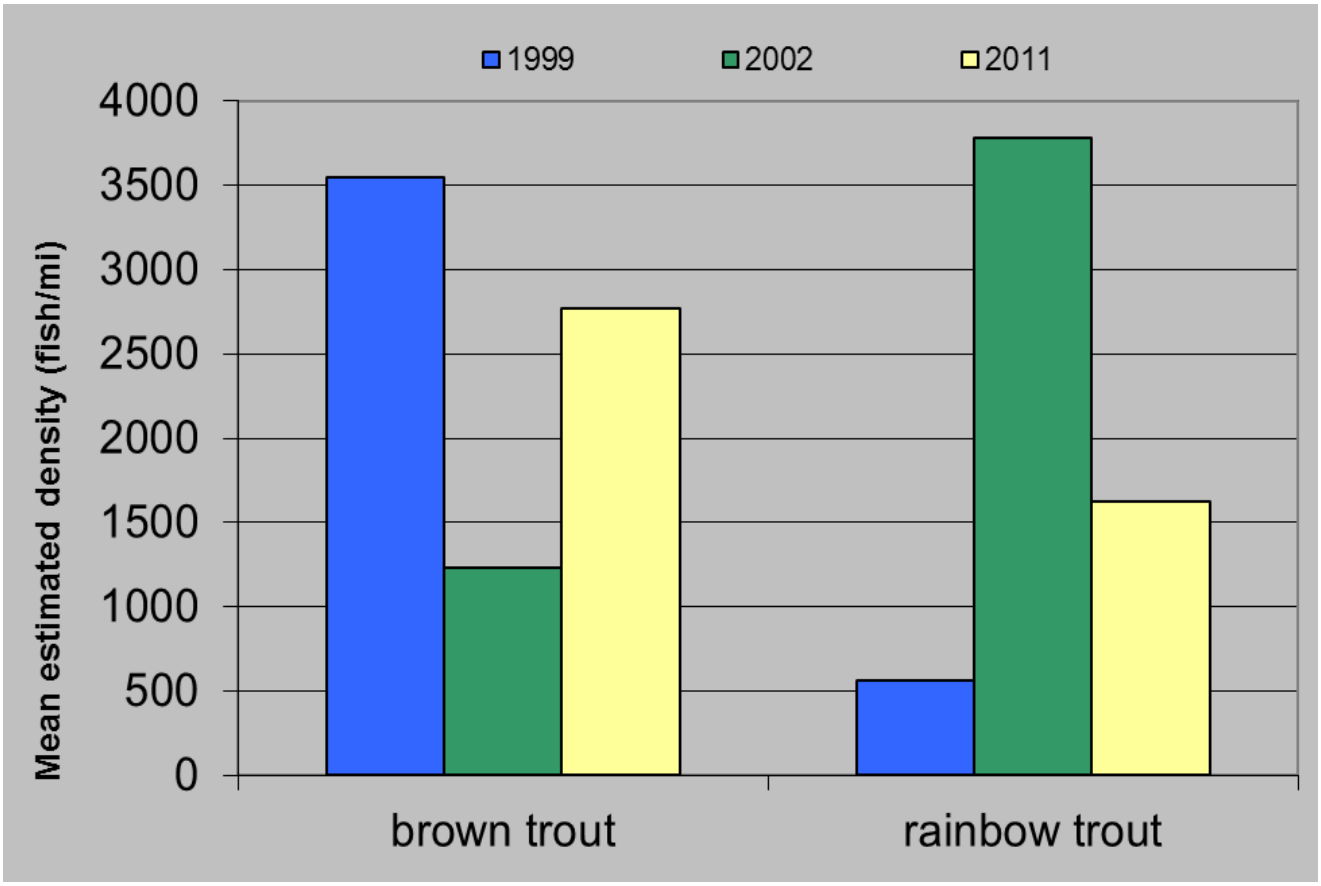

Table 1. Little Truckee River 2011 direct observation survey data

Section number	Section length (ft)	Habitat type	Species	YOY	Small (<6")	Medium (6"-11.9")	Large (12"-17.9")	Extra-large (≥18")	Total	Estimated density (fish/mi)
111	162.0	Flatwater	-	0	0	0	0	0	0	0
211	117.0	Flatwater	rainbow trout	0	1	1	2	0	4	181
			unknown trout	0	0	0	0	1	1	45
311	132.0	Flatwater	unknown trout	0	0	0	0	1	1	40
411	174.0	Flatwater	rainbow trout	0	0	0	1	2	3	91
			brown trout	0	0	0	1	2	3	91
			unknown trout	0	0	0	2	0	2	61
511	150.0	Flatwater	-	-	-	-	-	-	0	0
611	480.0	Flatwater	rainbow trout	0	0	7	7	2	16	176
			brown trout	0	0	0	0	1	1	11
			unknown trout	20	0	0	0	0	20	220
711	141.0	Riffle	unknown trout	5	0	0	0	0	5	187
811	600.0	Flatwater	rainbow trout	0	1	2	1	3	7	62
			brown trout	0	0	1	0	0	1	9
			unknown trout	3	0	0	1	0	4	35
911	93.0	Flatwater	rainbow trout	0	0	0	4	1	5	284
			unknown trout	4	1	1	0	0	6	341
1011	279.0	Flatwater	unknown trout	11	1	0	0	0	12	227
1111	450.0	Flatwater	rainbow trout	0	0	10	4	5	19	223
			brown trout	10	0	1	0	0	11	129
1211	450.0	Flatwater	rainbow trout	70	6	0	4	1	81	950
			brown trout	47	0	0	0	0	47	551
			unknown trout	25	0	0	0	0	25	293
1311	417.0	Flatwater	rainbow trout	70	6	0	3	2	81	1026
			brown trout	47	0	0	0	0	47	595
			unknown trout	25	0	0	0	0	25	317
1411	404.0	Flatwater	rainbow trout	0	3	2	1	0	6	-
			brown trout	0	0	0	0	1	1	-
			unknown trout	5	0	1	0	0	6	-
1511	234.0	Flatwater	rainbow trout	0	3	4	4	2	13	293
1611	150.0	Flatwater	rainbow trout	0	0	1	0	0	1	35
			brown trout	0	1	3	2	1	7	246
1711	306.0	Flatwater	rainbow trout	1	0	2	7	4	14	242
1811	216.0	Flatwater	rainbow trout	20	3	2	0	1	26	636
			brown trout	21	0	0	0	0	21	513
1911	429.0	Flatwater	rainbow trout	0	1	0	5	2	8	98
			unknown trout	70	0	0	0	0	70	862
2011	183.0	Flatwater	rainbow trout	0	1	0	0	0	1	29

Table 1 continued

Section number	Section length (ft)	Habitat type	Species	YOY	Small (<6")	Medium (6"-11.9")	Large (12"-17.9")	Extra-large (≥18")	Total	Estimated density (fish/mi)
2111	252.0	Flatwater	rainbow trout	0	0	0	5	2	7	147
			brown trout	10	1	0	0	0	11	230
			unknown trout	9	0	0	0	0	9	189
			sculpin	-	-	-	-	-	1	21
2211	462.0	Flatwater	rainbow trout	40	7	0	1	1	49	560
			brown trout	20	1	0	0	0	21	240
2311	339.0	Flatwater	rainbow trout	0	19	7	3	0	29	452
			brown trout	0	0	1	1	0	2	31
			unknown trout	0	1	0	0	0	1	16
			sculpin	-	-	-	-	-	1	16
2411	420.0	Flatwater	rainbow trout	20	5	0	0	0	25	314
			brown trout	10	1	0	0	0	11	138
			unknown trout	0	0	0	2	0	2	25
2511	1050.0	Flatwater	rainbow trout	170	18	2	2	0	192	965
			brown trout	15	1	0	0	0	16	80
2611	504.0	Flatwater	rainbow trout	35	12	1	2	3	53	555
			brown trout	40	0	0	0	0	40	419
2711	780.0	Flatwater	rainbow trout	250	102	3	2	2	359	2430
			brown trout	54	0	0	0	0	54	366
2811	780.0	Flatwater	rainbow trout	7	3	2	1	1	14	95
2911	258.0	Flatwater	rainbow trout	15	4	0	0	2	21	430
			brown trout	10	1	1	1	2	15	307
3011	339.0	Flatwater	rainbow trout	2	0	1	1	0	4	62
			brown trout	9	0	2	1	0	12	187
			sculpin	-	-	-	-	-	2	31
3111	471.0	Flatwater	rainbow trout	6	1	4	0	1	12	135
			brown trout	5	2	1	0	1	9	101
3211	177.0	Flatwater	rainbow trout	10	0	0	1	3	14	418
			brown trout	1	0	0	0	0	1	30
3311	1071.0	Flatwater	rainbow trout	100	5	4	8	2	119	587
			brown trout	70	1	0	0	0	71	350
3411	621.0	Flatwater	rainbow trout	0	15	9	4	0	28	238
			brown trout	70	7	6	0	0	83	706
			unknown trout	0	0	0	0	1	1	9
			sculpin	-	-	-	-	-	1	9
3511	189.0	Flatwater	rainbow trout	0	0	2	5	2	9	251
			brown trout	0	0	1	0	2	3	84
3611	759.0	Flatwater	rainbow trout	45	1	1	2	3	52	362
			brown trout	25	1	3	0	0	29	202
3711	192.0	Flatwater	rainbow trout	0	3	4	2	0	9	248
			brown trout	3	0	0	0	0	3	83
			sculpin	-	-	-	-	-	1	28

Table 1 continued

Section number	Section length (ft)	Habitat type	Species	YOY	Small (<6")	Medium (6"-11.9")	Large (12"-17.9")	Extra-large (≥18")	Total	Estimated density (fish/mi)
3811	450.0	Flatwater	rainbow trout	0	6	2	2	1	11	129
3911	450.0	Flatwater	rainbow trout	0	10	8	3	1	22	258
			brown trout	4	0	0	0	0	4	47
			sculpin	-	-	-	-	-	1	12
4011	180.0	Flatwater	rainbow trout	0	0	0	0	2	2	59
4111	315.0	Flatwater	rainbow trout	0	4	4	1	0	9	151
			brown trout	0	0	0	0	1	1	17
4211	153.0	Flatwater	rainbow trout	6	0	0	2	1	9	311
			brown trout	24	7	1	0	2	34	1173
4311	153.0	Flatwater	rainbow trout	0	3	1	1	0	5	173
			brown trout	0	1	0	0	0	1	35
4411	549.0	Flatwater	rainbow trout	0	8	8	4	0	20	192
			brown trout	1	1	0	0	0	2	19
4511	360.0	Flatwater	rainbow trout	0	2	0	1	2	5	73
			brown trout	0	0	1	1	1	3	44
			unknown trout	1	1	0	0	0	2	29
4611	228.0	Flatwater	rainbow trout	55	4	1	0	0	60	1389
			brown trout	60	0	0	0	0	60	1389
4711	267.0	Flatwater	rainbow trout	0	0	1	5	1	7	138
			brown trout	0	1	0	0	1	2	40
4811	693.0	Flatwater	rainbow trout	7	14	24	8	1	54	411
			brown trout	0	1	2	1	0	4	30
			sculpin	-	-	-	-	-	1	8
4911	174.0	Flatwater	rainbow trout	3	1	9	2	2	17	516
			brown trout	1	0	0	2	3	6	182
5011	423.0	Flatwater	rainbow trout	10	16	35	2	0	63	786
			brown trout	0	1	4	1	0	6	75
5111	429.0	Flatwater	rainbow trout	0	4	6	5	0	15	185
			brown trout	0	0	2	0	0	2	25
5211	435.0	Flatwater	rainbow trout	14	3	0	1	0	18	218
			brown trout	5	0	0	1	1	7	85
5311	180.0	Flatwater	rainbow trout	25	0	0	1	0	26	763
5411	267.0	Flatwater	rainbow trout	15	2	2	1	0	20	396
			brown trout	25	0	1	0	0	26	514
5511	216.0	Flatwater	rainbow trout	0	1	0	0	1	2	49
			sculpin	-	-	-	-	-	1	24
5611	381.0	Flatwater	rainbow trout	0	0	0	2	0	2	28
5711	195.0	Flatwater	rainbow trout	23	1	0	4	0	28	758
			brown trout	0	0	0	0	2	2	54
5811	78.0	Flatwater	rainbow trout	0	2	3	4	0	9	609
			brown trout	0	0	1	0	0	1	68

Table 1 continued

Section number	Section length (ft)	Habitat type	Species	YOY	Small (<6")	Medium (6"-11.9")	Large (12"-17.9")	Extra-large (≥18")	Total	Estimated density (fish/mi)
5911	186.0	Flatwater	rainbow trout	0	2	0	2	0	4	114
			brown trout	1	0	0	0	0	1	28
6011	102.0	Flatwater	rainbow trout	1	1	0	0	0	2	104
			brown trout	0	0	0	0	1	1	52
			sculpin	-	-	-	-	-	1	52
6111	288.0	Flatwater	rainbow trout	1	2	1	1	0	5	92
			brown trout	0	0	1	0	0	1	18
6211	180.0	Flatwater	rainbow trout	0	0	1	23	2	26	763
			brown trout	0	0	0	1	1	2	59
6311	72.0	Flatwater	-	-	-	-	-	-	0	0
6411	99.0	Pool	rainbow trout	0	0	0	41	2	43	2293
			brown trout	0	0	0	0	1	1	53
6511	354.0	Flatwater	rainbow trout	8	3	3	5	0	19	283
6611	342.0	Flatwater	rainbow trout	40	0	1	100	2	143	2208

Table 2. Little Truckee River 2011 direct observation data: summary of estimated fish abundance by species

Species	Total length surveyed (ft)	Total number observed	Estimated density (fish/mi)
brown trout	22430	687	161.7
rainbow trout		1927	453.6
unknown trout		192	45.2
sculpin		10	2.4

Table 3. Little Truckee River 2011 electrofish data: number of fish captured by species and section and estimated abundance

Section number	Survey type	Section length (ft)	Species	Total number captured	Estimated section population	95% confidence interval	Capture probability	Estimated density (fish/mi)	Estimated biomass (lbs/acre)
11	Single-pass	355.0	brown trout	250	-	-	-	-	-
			rainbow trout	56	-	-	-	-	-
			hatchery rainbow trout	4					
			sculpin	66	-	-	-	-	-
25	Single-pass	363.0	brown trout	220	-	-	-	-	-
			rainbow trout	55	-	-	-	-	-
			sculpin	175	-	-	-	-	-
41	Multiple-pass	369.5	brown trout	133	184	134-234	34.6%	2629	9.03
			rainbow trout	85	112	79-145	37.4%	1600	2.95
			sculpin	815	1438	1148-1728	24.3%	20548	47.38
			speckled dace	3	5	-22-32	23.1%	71	0.11
50	Multiple-pass	359.5	brown trout	160	198	166-230	42.1%	2908	84.81
			rainbow trout	80	107	73-141	36.5%	1572	24.18
			hatchery rainbow trout	5	5	3-7	62.5%	73	10.85
			sculpin	611	998	802-1194	27.1%	14658	29.62
			minnow	1	1	-	100.0%	15	0.01

Table 4. Little Truckee River 2011 electrofish data: total length and weight of fish captured by species and section (hatchery and wild trout combined)

Section number	Survey type	Section length (ft)	Species	Total number captured	Total length min (mm)	Total length max (mm)	Total length mean (mm)	Weight min (g)	Weight max (g)	Weight mean (g)
11	Single-pass	355.0	brown trout	250	60	732	147	2.1	4649.0	247.6
			rainbow trout	60	44	575	139	0.4	1361.0	145.5
			sculpin	66	40	113	84	0.5	24.9	8.0
25	Single-pass	363.0	brown trout	220	65	215	86	2.7	96.8	7.6
			rainbow trout	55	42	180	82	0.4	58.6	9.5
			sculpin	175	22	104	75	0.2	17.6	6.4
41	Multiple-pass	369.5	brown trout	133	62	188	88	1.9	15.4	6.7
			rainbow trout	85	50	137	69	0.8	25.9	3.6
			sculpin	815	24	99	64	0.1	16.3	4.5
			speckled dace	3	56	78	68	2.0	3.8	3.1
50	Multiple-pass	359.5	brown trout	160	66	614	114	1.8	3100.0	63.5
			rainbow trout	85	53	480	116	1.0	907.0	51.1
			sculpin	611	23	110	66	0.0	20.1	4.4
			minnow	1	39	39	39	1.3	1.3	1.3
Total	-----	1447.0	brown trout	763	60	732	112	1.8	4649.0	97.8
			rainbow trout	285	42	575	100	0.4	1361.0	48.8
			sculpin	1667	22	113	68	0.0	24.9	4.8
			speckled dace	3	56	78	68	2.0	3.8	3.1
			minnow	1	39	39	39	1.3	1.3	1.3

Table 5. Little Truckee River 2003-2011 ASB data: number of forms analyzed, total effort, number of fish captured, and CPUE

Year	Number of forms analyzed	Total effort reported (hrs)	Total trout reported caught	Minimum CPUE (fish/hr)	Maximum CPUE (fish/hr)	Mean CPUE (fish/hr)
2003	76	299.25	137	0.0	2.0	0.5
2004	24	90	36	0.0	1.7	0.4
2005	40	159.5	93	0.0	2.3	0.5
2006	10	60.5	36	0.0	2.1	0.6
2007	91	292	151	0.0	2.5	0.5
2008	112	397.5	190	0.0	2.3	0.5
2009	91	383	139	0.0	4.0	0.4
2010	108	397	204	0.0	5.0	0.5
2011	98	351	243	0.0	5.5	0.7

Table 6. Little Truckee River 2003-2011 ASB data: number of forms analyzed in traditional trout season versus winter season

Year	Number of forms			Percent of forms	
	Last Saturday in April through November 15th	Winter season	Total	Last Saturday in April through November 15th	Winter season
2007	88	3	91	97%	3%
2008	93	19	112	83%	17%
2009	75	16	91	82%	18%
2010	95	13	108	88%	12%
2011	89	9	98	91%	9%

Table 7. Little Truckee River 2011 angling data: total effort, number of fish captured, and CPUE

Angler	Date	Total effort (hrs)	Species	Number of fish captured	CPUE (fish/hr)
Drummond	8/31/2011	6.00	rainbow trout	2	0.3
Rizza	8/31/2011	5.50	rainbow trout	1	0.2
Wassmund	8/31/2011	4.00	-	0	0.0
Silva	8/31/2011	4.50	rainbow trout	7	2.2
			brown trout	3	

Table 8. Little Truckee River 1999-2002 historic depletion electrofish data: number of fish captured by species and section and estimated abundance

Section number	Survey date	Section length (ft)	Species	Total number captured	Estimated section population	95% confidence interval	Capture probability	Estimated density (fish/mi)	Estimated biomass (lbs/acre)
6	10/19/1999	414.0	brown trout	410	464	435-493	41%	5918	22.45
			rainbow trout	45	57	45-77	32%	727	6.99
			Paiute sculpin	271	373	306-440	28%	4757	4.81
			Lahontan redside	4	4	4-4	80%	51	0.03
6	10/16/2002	425.0	brown trout	134	147	134-160	55%	1820	8.09
			rainbow trout	423	531	475-587	41%	6574	12.79
			Paiute sculpin	1441	2117	1912-2322	32%	26208	36.43
7	10/21/1999	438.0	brown trout	126	143	126-160	50%	1724	18.95
			rainbow trout	56	61	56-69	55%	735	12.13
			Paiute sculpin	1022	3069	1668-4470	13%	36997	73.96
			Lahontan redside	14	25	14-70	23%	301	0.9
			kokanee	1	1	1-1	100%	12	0.96
			Tahoe sucker	258	1126	258-2834	8%	13574	81.40
			dace	1	1	1-10	50%	12	0.01
7	10/17/2002	440.0	brown trout	36	38	36-43	59%	456	10.85
			rainbow trout	82	127	82-188	29%	1525	7.89
			Paiute sculpin	742	1978	1094-2862	15%	23756	61.41
			Tahoe sucker	357	5192	357-32055	2%	32356	193.44
			tui chub	5	13	5-110	14%	156	0.24
8	10/22/1999	348	brown trout	135	198	135-261	32%	3004	48.13
			rainbow trout	15	15	15-16	83%	228	5.68
			Paiute sculpin	483	1894	483-3719	9%	28737	54.17
			speckled dace	32	48	32-83	30%	728	0.34
8	10/18/2002	350	brown trout	79	95	79-115	44%	1429	114.51
			rainbow trout	96	215	96-418	18%	3234	71.89
			Paiute sculpin	133	2426	133-28581	2%	36488	18.87
			speckled dace	3	5	3-36	23%	75	0.12