



Angler Demographics and Fishing Catch and Effort in Olympic National Park Rivers and Lake Crescent from 2009 to 2012

Natural Resource Technical Report NPS/OLYM/NRTR—2013/830



ON THE COVER

Angler Fishing the Queets River, April 2012

Photograph by: Jim Kerr

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Abstract

This report summarizes angler interviews across key Olympic National Park (OLYM) watersheds from 2009 to 2012. The objectives were to: characterize angler demographics, quantify the extent and seasonality of sport fishing effort, report catch by fish species, and determine incidental catch of federally threatened bull trout. We completed angler interviews in the Queets, Hoh, and Elwha Rivers and Lake Crescent. A total of 3,433 anglers were interviewed, fishing 20,184 hours and catching 11 fish species. Anglers were from 33 states, two Canadian provinces, and seven countries. Ninety percent of all anglers were from Washington representing 29 counties. A total of 61% of anglers were from Puget Sound and 30% were from counties immediately surrounding OLYM. Ninety-six percent of anglers were male, 44% were older than 50 years of age, and 77 % were satisfied with fishing regulations. Anglers generally preferred catch-and-release regulations (62%). Ninety-three percent of anglers were aware the lake or river was managed by OLYM, 75% had seen a copy of the fishing regulations, and 908 anglers were members of organized fishing groups. In the Queets and Salmon rivers, 2,993 anglers fished 18,981 hours, 53% were boat anglers and 9% were reported as guided fishing trips. Steelhead trout were the most common fish targeted and anglers caught 1,998 steelhead (1,292 hatchery; 659 wild; 47 unknown), retained 944 fish, and averaged one steelhead per 8.6 hours of fishing. A total of 178 federally threatened bull trout were encountered. Incidental catch of bull trout comprised 5% of the total catch across all rivers.

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Introduction

The objective of this report is to characterize angler demographics, quantify the extent and seasonality of sport fishing effort, report catch by fish species, and determine incidental catch of federally threatened bull trout. In order to accomplish this, angler interviews were conducted in the Queets River, the Hoh River, the Elwha River and Lake Crescent. The first report covering these topics from Olympic National Park (OLYM) was published in 2012 by Brenkman et al. and presented survey results from 2009-2011; this report contains additional data from 2012, the final year of the study.

Background

Encompassing nearly one million acres of designated wilderness on the Olympic Peninsula of northwestern Washington, Olympic National Park consists of 12 major watersheds, 646 high lakes, two large lakes and 4,000 miles of rivers and streams. The Park is a designated World Heritage Site and Biosphere Reserve that contains one of the largest contiguous areas of relatively pristine habitat throughout the range of several west coast fish species. On the west side of the Park are major coastal rivers that include the Hoh, South Fork Hoh, Queets, and Quinault (Figure 1). To the north are the Elwha and Sol Duc rivers and to the east is the North Fork Skokomish River. These rivers drain directly into the marine waters of the Pacific Ocean, Strait of Juan de Fuca, or Hood Canal/Puget Sound. In the Park's rugged terrain that ranges in elevation from 2,438 mfeet to sea level are two large lakes – Lake Crescent, a nearly pristine ultra-oligotrophic lake, and Lake Ozette, the third largest lake in Washington State.

The diverse aquatic habitats of OLYM harbor 31 species of freshwater and anadromous fish and at least 70 unique populations of sockeye salmon (*Oncorhynchus nerka*), Chinook salmon (*O. tshawytscha*), coho salmon (*O. kisutch*), chum salmon (*O. keta*), pink salmon (*O. gorbuscha*), steelhead (*O. mykiss*), rainbow trout, cutthroat trout (*O. clarkii*), bull trout (*Salvelinus confluentus*) and Dolly Varden (*S. malma*). There are a total of six species in the Park that are recognized as federally threatened under the Endangered Species Act including Puget Sound Chinook salmon, Puget Sound steelhead, Puget Sound/Coastal bull trout, Hood Canal summer chum salmon, Lake Ozette sockeye salmon and Eulachon.

Steelhead trout are a sea-run (anadromous) form of the rainbow trout and are among the most highly prized and most popular sport fish in Washington State. The Olympic Peninsula contains most of the last remaining rivers that support steelhead fishing most months of the year. There are two runs of steelhead that are distinguished by the time of year when they return to freshwater as adults. Winter-run steelhead return to freshwater from November to April, and summer-run steelhead typically return to freshwater from May to July.

Salmonid populations that inhabit rivers in the Park are of high ecological importance. Pacific salmonids are known to provide food for over 130 species of aquatic and terrestrial wildlife species (Cederholm et al. 2001), and studies have shown that 20 to 40% of the phosphorus, nitrogen, and carbon in freshwater systems may be marine-derived through carcasses of spawned salmon (Kline et al. 1990, 1994; Bilby et al. 1996).

In addition to their ecological importance, these salmonid populations have a significant role in the cultures of eight Treaty tribes that surround the Park including the Elwha S'Klallam, Hoh, Jamestown S'Klallam, Makah, Queets, Quileute, Quinault, and Skokomish tribes. Salmon that return to rivers that drain from OLYM are economically important, and are annually harvested in commercial and subsistence fisheries that are operated by the tribes. Commercial gill-net fisheries operate during most weeks of the year in coastal rivers. These in-river commercial fisheries intercept Pacific salmonids originating in OLYM in addition to ocean fisheries.

Commercial and recreational fisheries influence the number of adult salmonids that return to National Park waters, yet, despite the high ecological, recreational, and cultural value of salmonids and known threats to their persistence, Park managers historically have had insufficient information to understand the extent of sport fishing pressure and its impact on OLYM's fishery resources. Because salmonids are migratory, leaving OLYM for most of their life cycle, they are especially vulnerable to recreational and commercial fisheries as they return to watersheds that drain from the Park.

Many of the rivers that drain from the Park support important fish populations that are targeted in recreational fisheries. Virtually all of the waters in OLYM support highly popular sport fisheries that include guided and non-guided fishing parties. The popularity of fishing in OLYM is fostered by the proximity of Seattle/Tacoma metropolitan area (100 miles away), within which many of the rivers in the Seattle area that still harbor salmonids are closed to fishing. The Seattle/Tacoma area has seen its human population grow significantly over recent decades – growth was about 20% from 1990 to 2000 – a trend that is projected to continue.

Sportfishing in OLYM rivers and lakes is promoted by a consistently high level of media interest. National and regional publications such as Salmon Trout Steelheader, ESPN Outdoor, Northwest Flyfishing, fishing websites, and several guide books regularly promote fishing in OLYM rivers and lakes. An internet search for “Olympic Peninsula Fishing” or “Olympic Peninsula Fishing Guide” provides ready perspective on the popularity of these fisheries.

Road access for bank fishing and boating in OLYM tends to be excellent, and anglers come from around the world to fish for the diverse array of salmonids during most months of the year. Recreational fishing has long been a popular activity on the Olympic Peninsula, and now is a multimillion-dollar industry. Olympic National Park requires fishing guides to register with the Park. There were nine to ten guides registered with OLYM each year from 2009 to 2012.

On the western Olympic Peninsula, State and Tribal hatcheries produce and release millions of hatchery steelhead, coho salmon, sockeye salmon, chum salmon, and Chinook salmon in portions of rivers located outside park boundaries (on file at OLYM). These hatchery fish are used to supplement recreational and commercial fisheries and contribute to recreational fishing catch.

Fishery Management Fabric at OLYM

The goal of fisheries management at OLYM is to provide recreational opportunities for quality fishing while preventing unacceptable impacts to Park fishery resources. Established in 1938 and

having exclusive jurisdiction over recreational fisheries within its boundaries, OLYM hired its first fisheries biologist in the late 1980s, primarily to establish annual harvest and gear regulations in cooperation with the State of Washington and Treaty tribes.

To meet National Park Service (NPS) management objectives of protecting and perpetuating native aquatic species and preserving the diversity and ecological integrity of native fish populations, the Park generally promotes catch-and-release of wild fish and harvest of non-native and hatchery origin fish.

Prior to this study, programs to monitor in-river catch and effort were primarily administered by the State and tribes and were limited to the lower portions of the rivers outside park boundaries. However it was evident that significant recreational fisheries were occurring within the Park that needed to be documented in order to make informed management decision about the resource.

The goal of this study was to provide information on fishing effort and catch and angler demographics from park waters. The specific objectives were as follows: 1) quantify the extent, seasonality, and magnitude of recreational fishing effort in selected OLYM rivers and one lake; 2) estimate fishing effort, catch, and success by fish species based on angler interviews with an emphasis on Queets River; 3) assess angler demographics throughout OLYM; and 4) determine incidental catch of federally threatened bull trout. We targeted high priority watersheds in need of regular and future monitoring by OLYM's Fisheries Management Program.

In this study, we addressed the following questions that are of importance to park resource managers:

- What is the extent and magnitude of recreational fishing pressure in selected park watersheds?
- What are the targeted fish species?
- What is the composition of catch by fish species?
- What percent of the catch in a given river is comprised of wild versus hatchery raised fish?
- Which months receive the most intensive recreational fishing pressure?
- How many boats typically fish the Queets River during fall and winter?
- What is the relative catch between permitted guides versus non-guides?
- What is the extent of incidental catch of federally listed and threatened fish species in OLYM's recreational fisheries?

Study Area

This study occurred in portions of the Queets, Salmon, Hoh, Elwha, and North Fork Skokomish rivers and Lake Crescent (Figure 1).

Queets/Salmon Rivers

The Queets River is a glacial river that is one of the most pristine rivers in the western United States and is the largest watershed (1,157 km²) on the Olympic Peninsula (Figure 1). The upper 86% of the Queets main stem drains from OLYM and the lower portions of river flow through tribal lands. The Salmon River is a major tributary to the Queets that travels through tribal, state and OLYM land.

The most intensive survey efforts occurred during the winter steelhead and salmon fisheries in the Queets and Salmon rivers from October 27, 2009 to April 15, 2010, October 1, 2010 to April 15, 2011 and from October 1, 2011 to April 15, 2012. Surveys in the Queets River occurred from the Matheny Creek confluence downstream to the Clearwater River confluence at the Park boundary (from approximately river kilometer (rkm) 27 to 11; Figure 1). Surveys in the Salmon River were limited to the lowermost portion of the river in OLYM and occurred from rkm 0 to rkm 1.8 (Figure 1).

The Queets River provides a popular sport fishery for Pacific salmonids and supports self-sustaining populations of coho salmon, spring–summer and fall Chinook salmon, chum salmon, bull trout, summer and winter steelhead, cutthroat trout, and mountain whitefish. The Queets River offers diverse fishing opportunities that include: bait fishing (downstream of the mouth of the Salmon River) and single barbless hooks and artificial lure restrictions (Appendix A). Anglers commonly fish from drift boats and pontoon boats throughout the winter. Tribal gill-net fisheries exist for several species in the lower Queets River during most weeks of the year (Appendix B).

Hoh River

The Hoh River is a glacial river that flows in a westerly direction from its headwaters on the western slopes of the Olympic Mountains to its confluence with the Pacific Ocean (Figure 1). Sixty-five percent of the Hoh River watershed (a 45-river-kilometer [rkm] reach) occurs in OLYM. The lower portion of the river flows through State, tribal, and private lands. The river drains 644 km² and descends in elevation from 1,216 m in the headwaters to its confluence with the ocean. River discharge in the Hoh River basin is strongly influenced by rainfall in autumn and winter and glacial runoff in spring and summer. The South Fork Hoh River is the major tributary to the Hoh River. The South Fork Hoh River drains 130 km² and descends in elevation from 1,475 to 128 m.

Surveys occurred in the upper Hoh River during the winter steelhead fishery from January 4 to April 15, 2010 and from February 1 to April 15, 2011. The study area for the Hoh River included a short section of river from rkm 50 to 57 where fishing regulations require fly-fishing only. The Hoh River provides a popular sport fishery for Pacific salmonids and supports self-sustaining populations of coho salmon, spring–summer and fall Chinook salmon, chum salmon, bull trout, summer and winter steelhead, cutthroat trout, and mountain whitefish. Tribal gill-net fisheries exist for steelhead and Chinook and coho salmon in the lower Hoh River outside OLYM during most weeks of the year (Appendix B).

Lake Crescent

Lake Crescent is a pristine deep-water lake of glacial origin located in the northwest corner of the Park (Figure 1). The lake is situated between the Strait of Juan de Fuca and Olympic Mountains, and

is one of the most popular visitor attractions in OLYM. The ultra-oligotrophic lake is 18 km in length, drains 12,127 ha, has a surface area of 1,880 ha, has a maximum depth of 191 m, and occurs at 176 m in elevation. Lake Crescent is located within OLYM (91% of watershed) and is managed as a natural area by the NPS. Private landowners, including those who own summer homes or permanent residences, hold approximately 47 ha in 106 tracts.

Angler surveys occurred in Lake Crescent during the summers of 2010 and 2011. Lake Crescent is ecologically and recreationally significant because of its unique co-occurring populations of rainbow trout and cutthroat trout. These fish are unique based on their large size and life history patterns, and also given their geographic isolation within Lake Crescent due to a prehistoric landslide several thousand years ago. The trouts of Lake Crescent were first described in the late 1800's as "blueblack trout" *Salmo gairdneri beardsleei*, "long-headed trout" (*Salmo bathoecetor*), and "speckled trout" *Salmo gairdneri crecentis* of Lake Crescent (Jordan 1896, Meek and Elliott 1899, and Jordan and Evermann 1905), and were later recognized as unique and endemic to the lake (Madsen 1939; Pierce 1984). Lake Crescent cutthroat trout (locally termed Crescenti) are among the largest documented for coastal cutthroat at 5.4 kg (Behnke 2002), and lake dwelling rainbow trout (locally termed Beardslee) reach up to 10.4 kg.

Elwha River

The Elwha River flows 72 km from glaciers and ice fields, and descends from 1,372 m at the headwaters to its confluence (at sea level) with the Strait of Juan de Fuca in the Pacific Ocean. The uppermost portions of the Elwha River are remote and only a foot trail parallels the upper 45 km. Eighty-two percent of the watershed occurs in OLYM and is managed by the National Park Service as a wilderness area. The mean daily discharge of the Elwha River is 42 m³/s and annual minimum flows range from 8.5 to 14 m³/s during summer (Curran et al. 2009). Average annual rainfall ranges from 100 cm/year to over 550 cm/year in the headwaters (Duda et al. 2008). The Elwha River originates in OLYM on Washington's Olympic Peninsula (Figure 1). The 6th order (Strahler 1957) river drains 833 km² and constitutes 19% of OLYM.

Limited angler surveys occurred in the Elwha River from June thru September, 2010 in OLYM from Glines Canyon Dam downstream to the Park boundary (rkm 21.7 to 15.6; Figure 1). Bull trout, rainbow trout, and non-native brook trout inhabit the river in OLYM.

North Fork Skokomish River

The study area, the North Fork Skokomish River included the portion of river from the confluence of Four Stream (rkm 50.4) to the Park boundary (rkm 45.1) near the inlet to Lake Cushman. The river basin upstream from Lake Cushman drains 126 km².

Limited angler surveys occurred in the North Fork Skokomish River from June 14 to September 9, 2010 where anglers may catch bull trout, mountain whitefish, rainbow trout, and cutthroat trout.

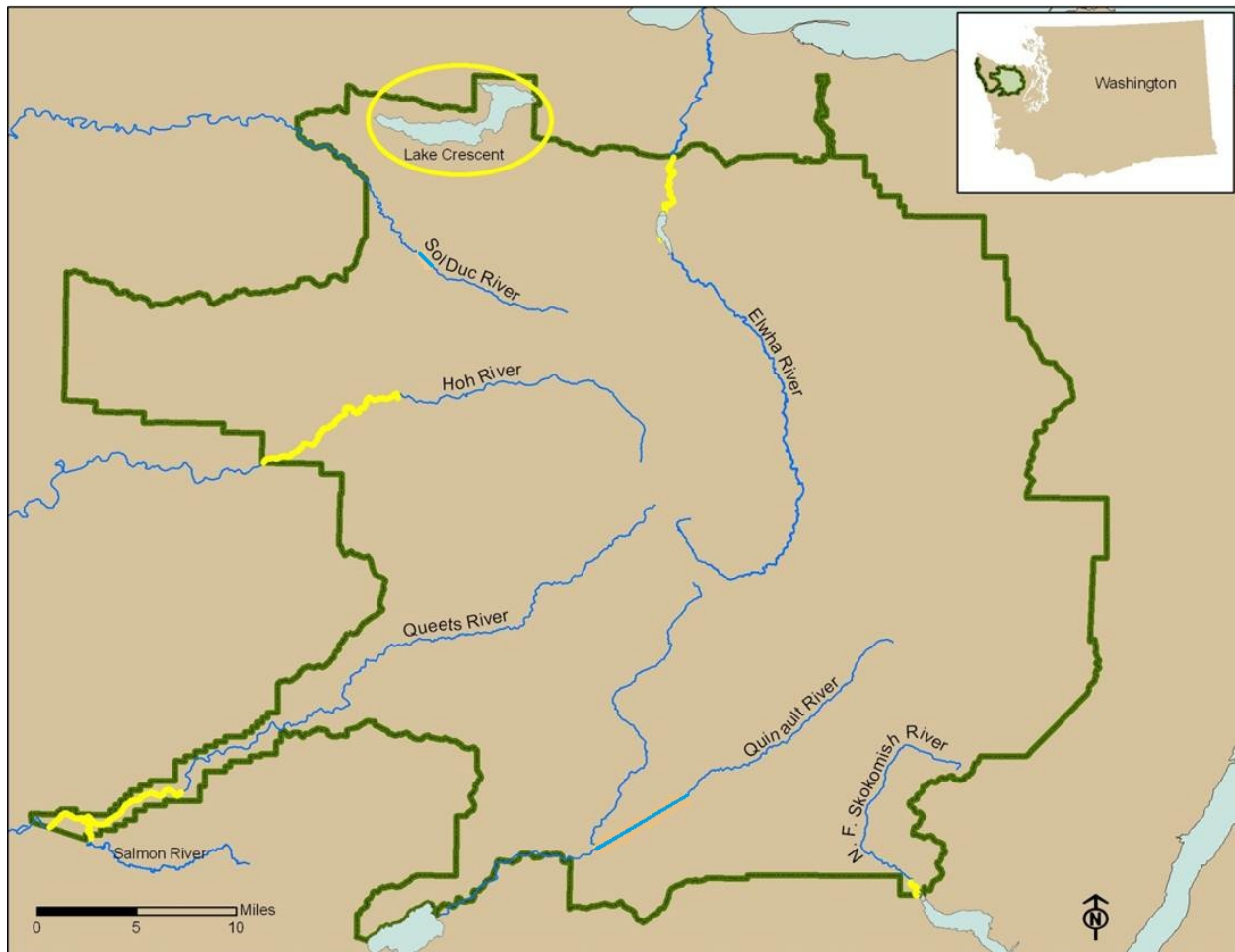


Figure 1. Map of Olympic National Park with survey areas highlighted in yellow including Lake Crescent, Hoh River, Queets River, North Fork Skokomish River, and Elwha River.

Methods

We used established techniques in conducting angler interviews to quantify fishing effort, catch, and angler demographics in portions of the Queets and Salmon rivers from 2009 to 2012, the Hoh River from 2009 to 2010 and Lake Crescent from 2010 to 2011. Additionally, we conducted cursory creel surveys in 2010 in the North Fork Skokomish River and Elwha River.

Survey Design

Creel surveys, or angler interviews, were used to assess the temporal distribution of fishing effort and catch. Sites, dates, and sampling times were selected based on methods described in *Sampling the Recreational Fishery* by Malvestuto (1983) and Pollock et al. (1997) and methods outlined in Hahn et al. (2000). We also consulted with other agency biologists experienced in the design of creel surveys.

Intensive “roving” interviews were conducted during winter months in the Queets, Salmon, and Hoh rivers when fishing pressure was highest due to returning runs of Pacific salmon and steelhead. In a roving survey, the surveyor interviewed anglers during or after their fishing trips along a predetermined route. The prescribed route was such that all anglers fishing the same length of time have an equal probability of being contacted within an allotted timeframe (Hahn et al. 2000).

For the Queets and Salmon Rivers, we relied on sampling all of the weekdays and weekend days that were deemed fishable based on river flow conditions. In the Hoh River, the primary focus was on weekdays due to limited personnel. The goal was to conduct as many angler interviews within a day as possible. Surveyors interviewed anglers to determine: State of permanent residence; length of time fished (defined as time between initiation of fishing and either current time or the time at which angler quit fishing); targeted species, the number and species of fish caught; kept, or released, whether fish were hatchery, wild; or non-native, type of gear; use of guide or no guide, fishing from bank or by boat; and location of fishing (river, river mile) (see Appendix C).

We obtained approval from Office of Management and Budget Social Survey Board to conduct NPS sponsored public surveys. We hired and trained seasonal technicians who performed angler interviews across park watersheds throughout the year. We met with Washington Department of Fish and Wildlife for review of the study design and to discuss types of information being collected. Care was taken when interviewing each angler. Training and instructions were provided to all participating surveyors to ensure standardized contacts among anglers. The training emphasized courteous and professional appearances and contacts with all anglers. Interviews were brief (<5 minutes) and questions were carefully screened, rehearsed, and presented. Short questions were presented first, and more open-ended questions were asked at the end of the interview. Additionally, surveyors recorded gender and approximated the age of anglers by placing anglers into appropriate age categories (<18 years old, 18-30 years old, 31-50 years old and >50 years old). Surveyors conducted interviews only with willing participants. For a given fishing party, each angler was interviewed. Some interviewed anglers chose not to answer certain questions, or questions were unable to be answered due to angler time constraints. This resulted in some variability in sample sizes among survey questions.

The time required to complete a tour of the angler survey area under expected angler densities was as follows: Queets River (40 min), Hoh River (25 min), Lake Crescent (60 min), North Fork Skokomish (20 min), and Elwha (25 min).

Estimation of Sport Catch

Catch-per-effort was estimated based on interviews of fishing parties that completed their fishing trip. Instantaneous effort is defined as the number of anglers multiplied by the number of hours in the sampling period. Catch-per-unit-effort estimates were obtained by dividing measured catch or harvest by measured effort in angler hours.

Results

During the study period (October 27, 2009 to April 15, 2012), 3,351 anglers were interviewed on five different rivers and Lake Crescent. Surveys conducted on the Skokomish and Elwha Rivers made up a small portion of the anglers interviewed (19 and 54 anglers respectively) due to low numbers anglers fishing and limited survey effort at these locations. Parkwide, anglers in the survey fished a total of 20,084 hours and landed 3,579 fish retaining 1,365 fish. The sample size, or numbers of anglers interviewed, varies for each question as some anglers did not respond to particular questions.

Interviewed anglers came from six countries outside the United States (U.S.); in the U.S. they came from 33 different states. Washington residents were the most frequently interviewed comprising 90% of all anglers interviewed; Oregon (2%), California (2%) and Idaho (1%) were the next most common places of origin (Figure 2). Of the Washington anglers interviewed, King (21%), Pierce (18%), and Grays Harbor (17%) were the most common counties (Figure 3).

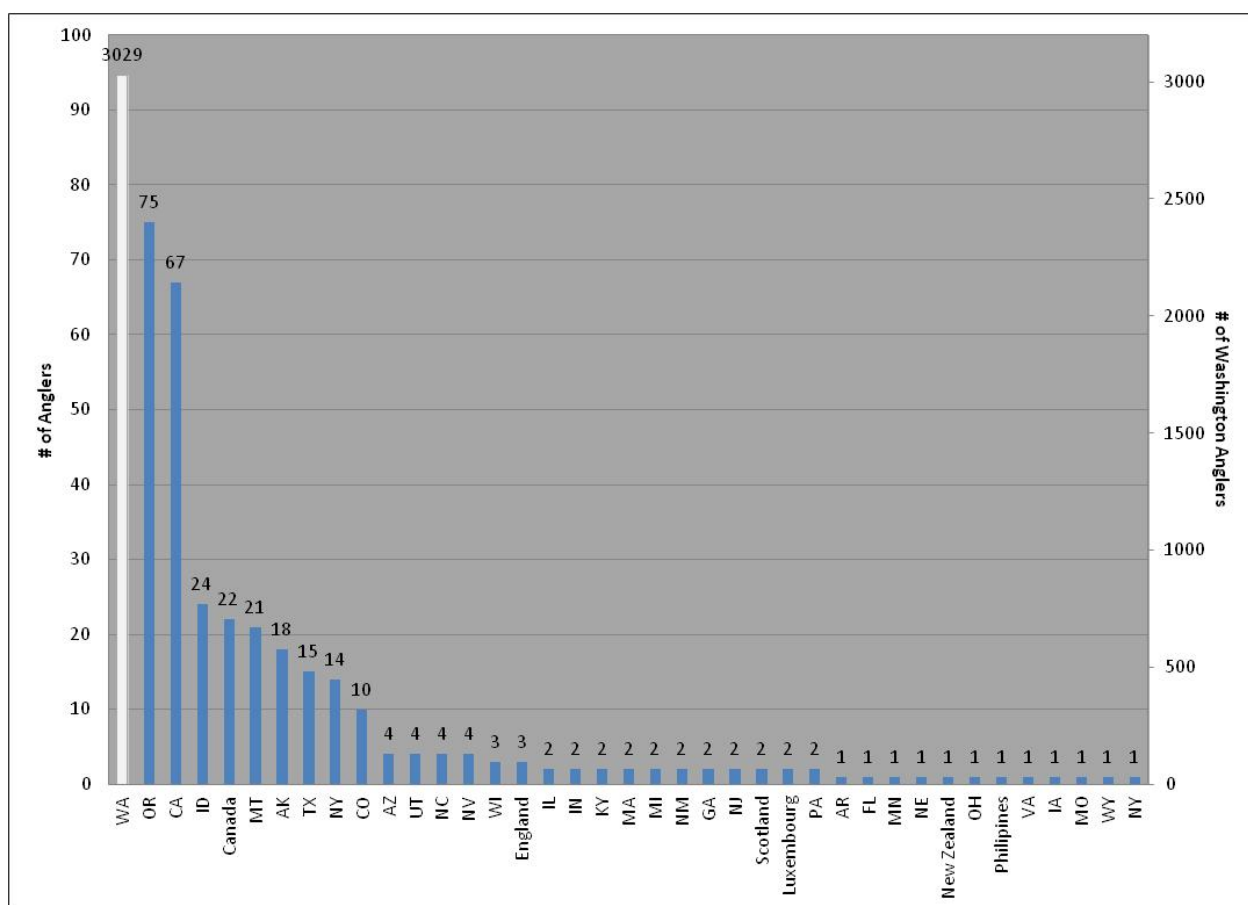


Figure 2. State in United States and country of residence of all anglers (n=3,351) interviewed at all survey sites from October, 2009 to April, 2012.

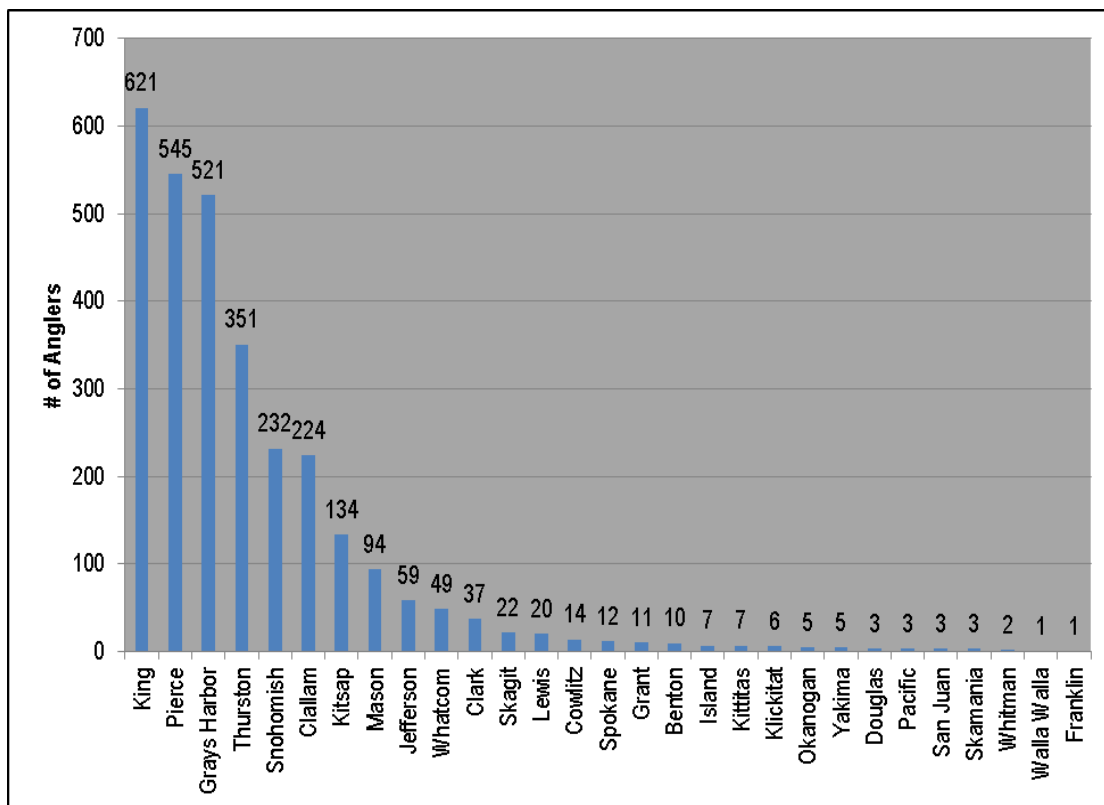


Figure 3. County of residence for Washington State anglers (n=3,002) interviewed at all survey sites from October, 2009 to April, 2012.

The vast majority of anglers interviewed throughout the surveyed watersheds were male (96%) with 15% of anglers 18-30 years old, 39% were 31-50 years old, and 44% were over 50 years of age (Figure 4).

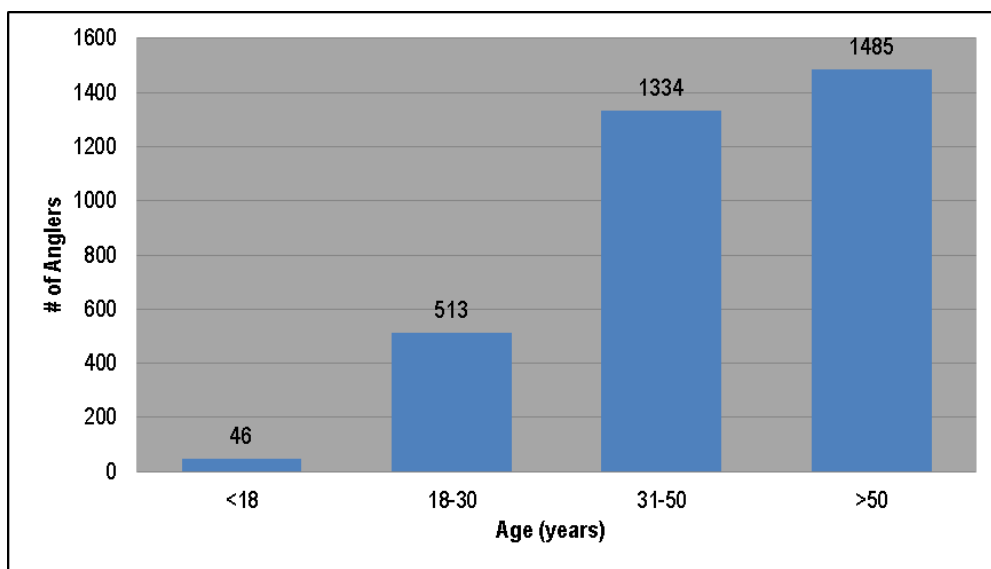


Figure 4. Age distribution of anglers interviewed at all survey sites (n=3,378) from October, 2009 to April, 2012.

The majority of anglers made less than five fishing trips to the Park each year (58%), compared to 18% who took six to 10 trips and 13% that made 11-20 trips. More frequent users took 21-90 trips per year (9%), with 1% of anglers taking more than 90 trips to the Park each year (Figure 5). Of all anglers interviewed, 27% belonged to fishing organizations (Figure 6). The most common fishing organizations were Coastal Conservation Association and Trout Unlimited (Figure 7).

When asked how crowded the river/lake was compared to what they were expecting, 37% said it was less crowded, 35% said it was similar to their expectations and 22% thought it was more crowded than expected. The remaining 6% of anglers did not have expectations regarding the amount of fishing pressure (Figure 8).

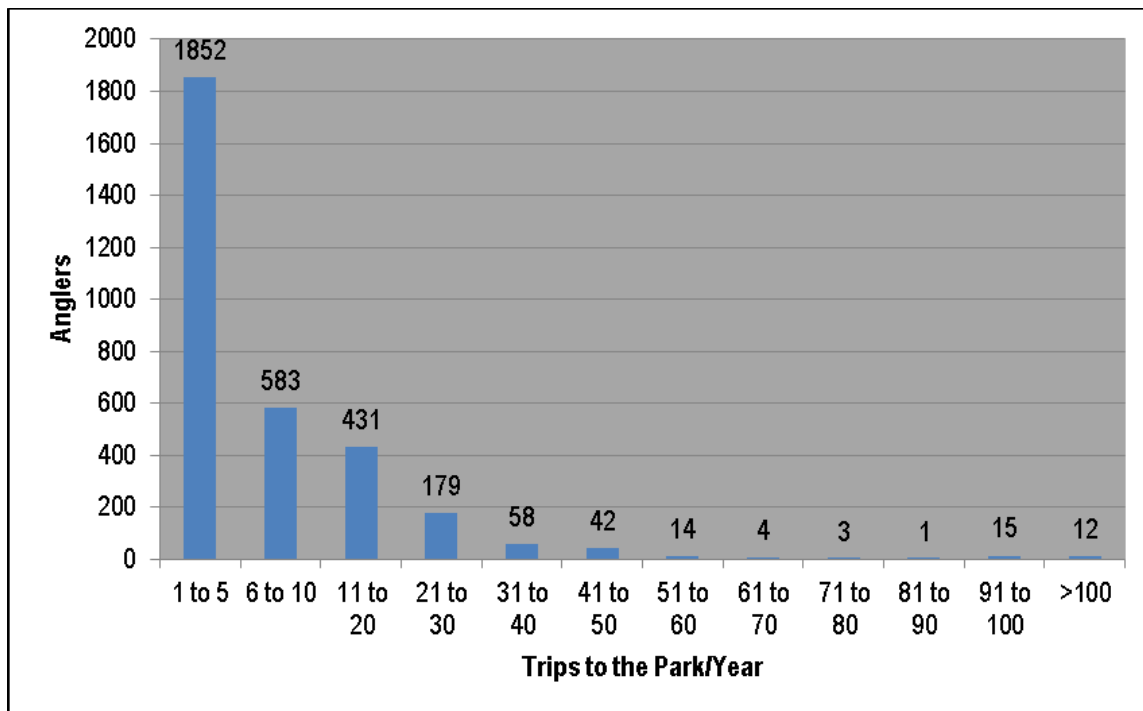


Figure 5. Distribution of average number of annual trips each angler takes to Olympic National Park based on interviews (n=3,194 anglers) conducted at all survey sites from October, 2009 to April, 2012.

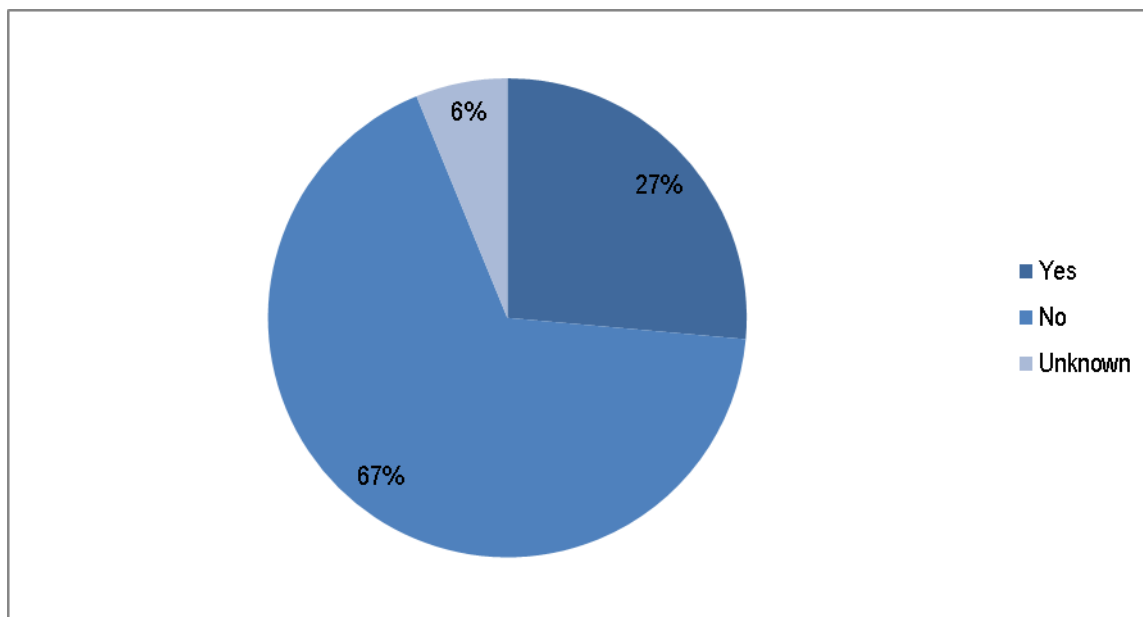


Figure 6. Proportion of anglers that belong to a fishing organization based on interviews (n=3,436 anglers) conducted at all survey sites from October, 2009 to April, 2012.

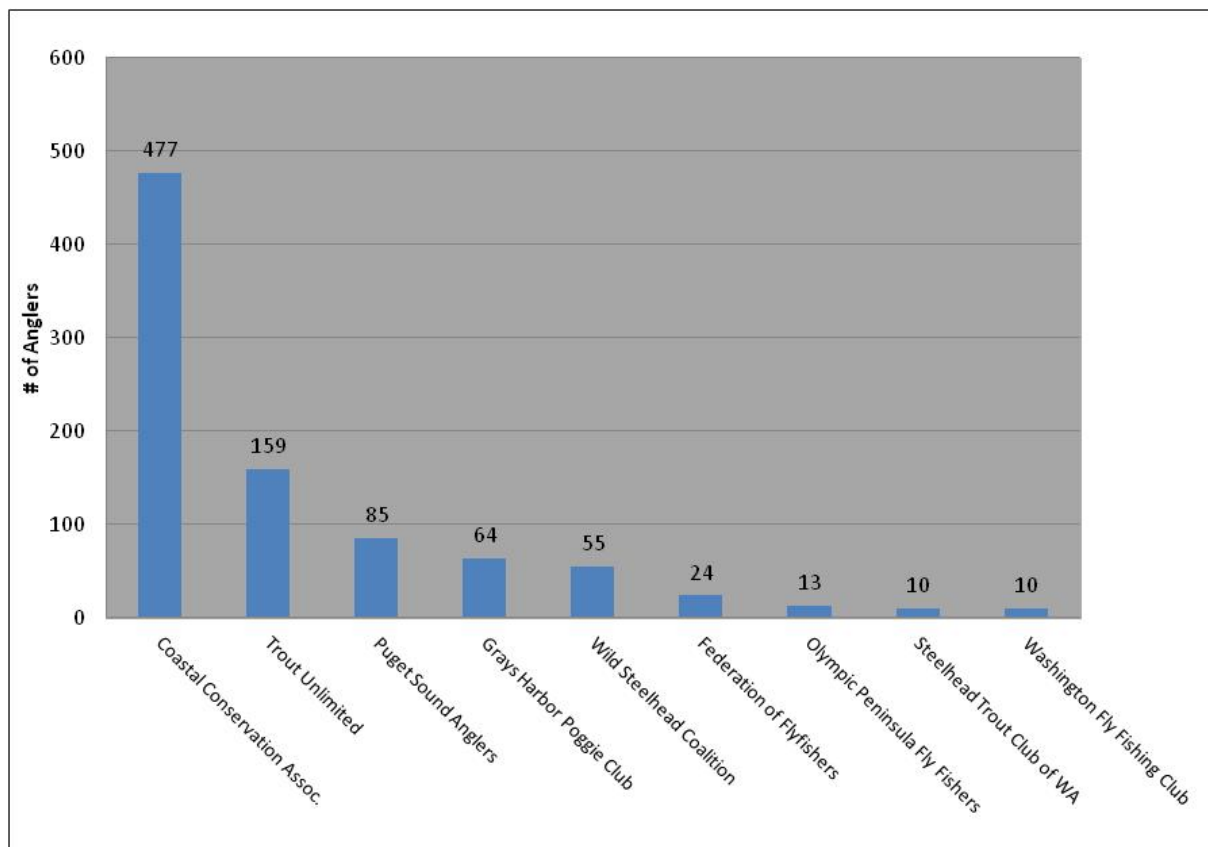


Figure 7. Number of anglers in most popular fishing organizations (n=897 anglers) based on interviews conducted at all survey sites from October, 2009 to April, 2012.

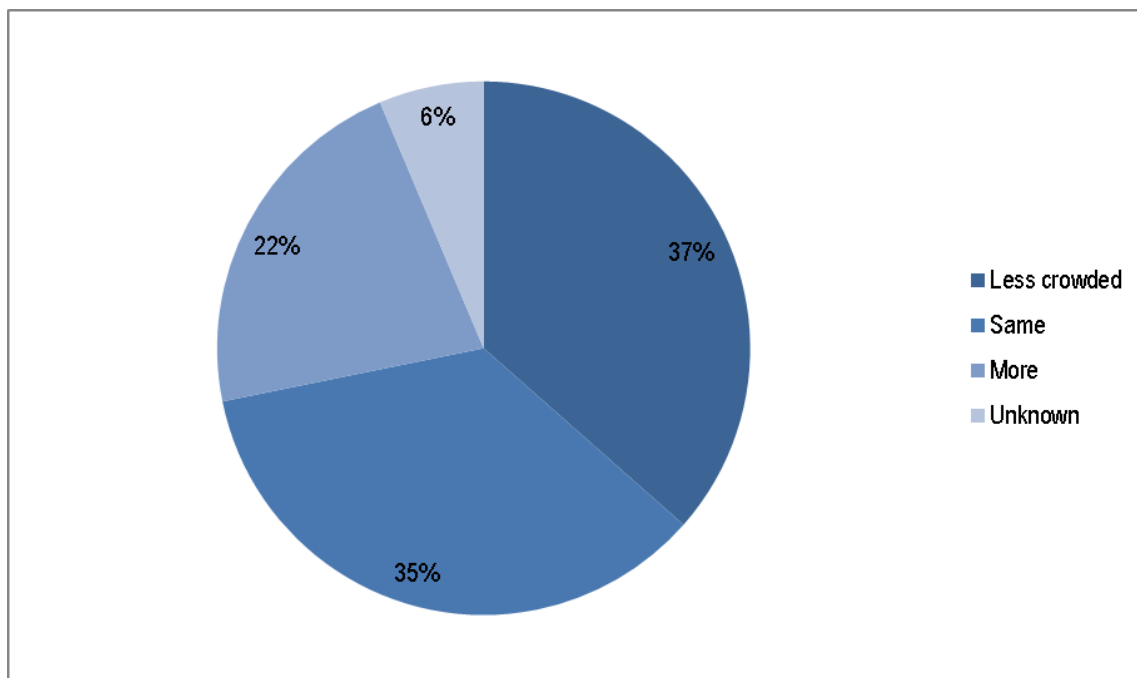


Figure 8. Angler expectations regarding crowding on the river/lake fished based on interviews (n=2,674 anglers) conducted at all survey sites from October, 2009 to April, 2012.

Of all the anglers interviewed throughout the Park, 93% were aware the river/lake was managed by the NPS (Figure 9), 75% had seen a copy of OLYM fishing regulations (Figure 10), and 77% of those that had seen the regulations were satisfied with them (Figure 11). OLYM fishing regulations can be found online, as well as at fee entrance booths, ranger stations and local fishing related businesses. These regulations are specific to individual lakes and rivers, time of year and target fish species (Appendix A). Sixty-two percent of anglers stated that they preferred to catch-and-release wild fish, compared to 18% who preferred to retain wild fish; for 14% of anglers, their preference was dependent upon the fishing season, river, or fish species (Figure 12). OLYM anglers reported catching 11 different species of fish during the study period. Steelhead was the most frequently caught fish (57%); coho (13%) and Chinook (11%) were the next most commonly caught (Figure 13).

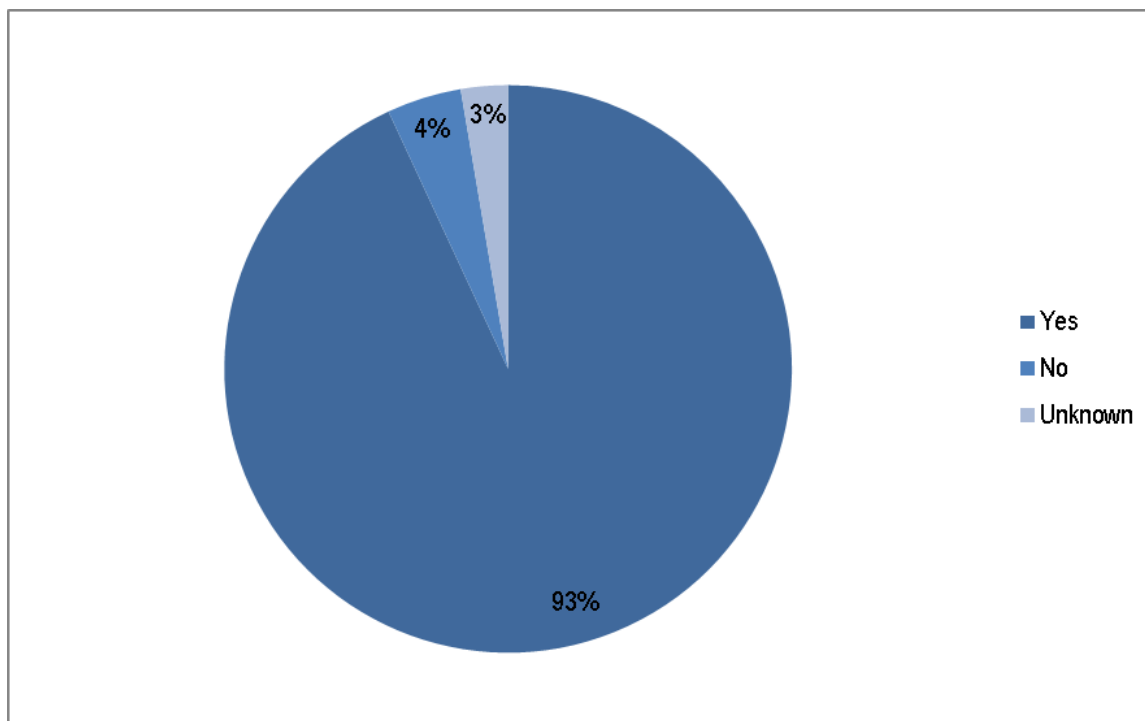


Figure 9. Proportion of anglers (n=3,436 anglers) that were aware of National Park Service management of river based on interviews conducted at all survey sites from October, 2009 to April, 2012.

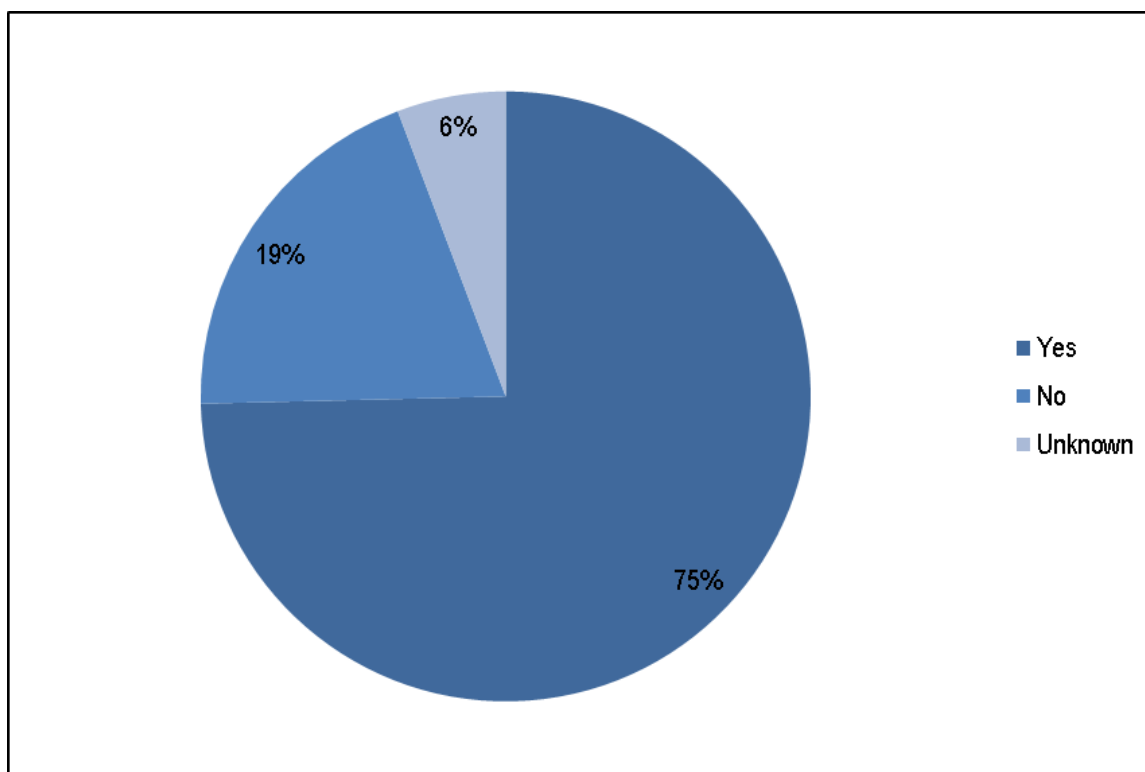


Figure 10. Proportion of anglers (n=3,436 anglers) that had seen a copy of Olympic National Park fishing regulations based on interviews conducted at all survey sites from October, 2009 to April, 2012.

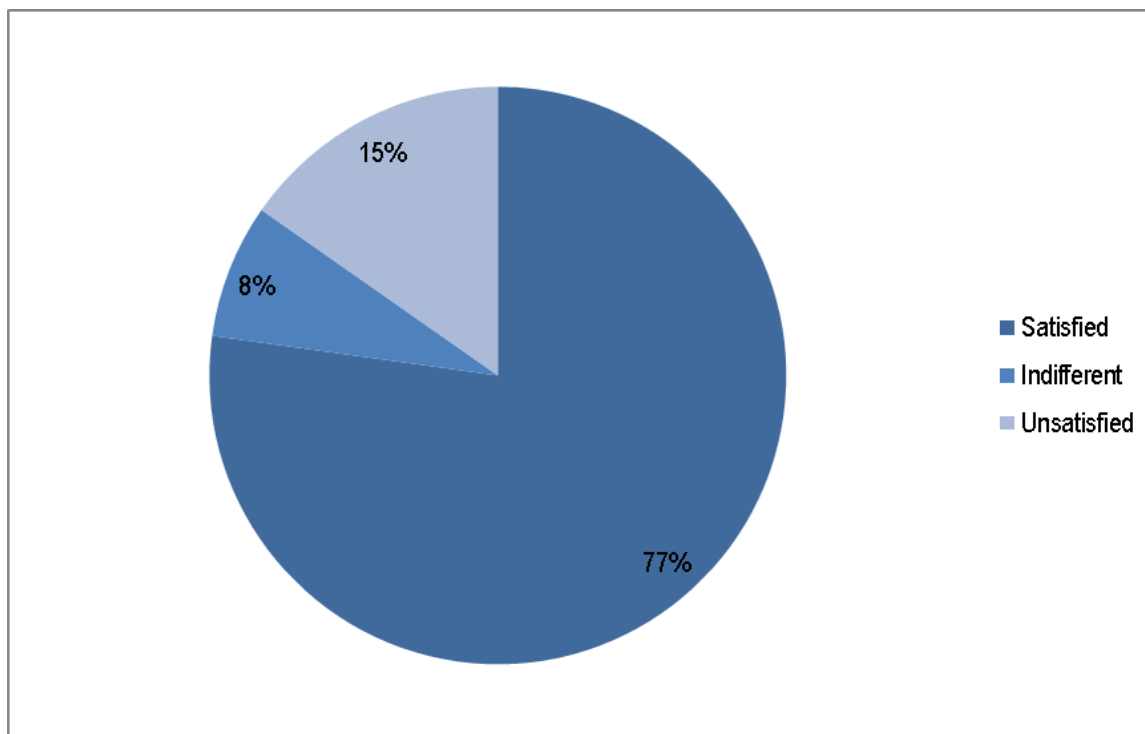


Figure 11. Percent of anglers (n=2,035 anglers) that were satisfied with Olympic National Park fishing regulations based on interviews conducted from October, 2009 to April, 2012.

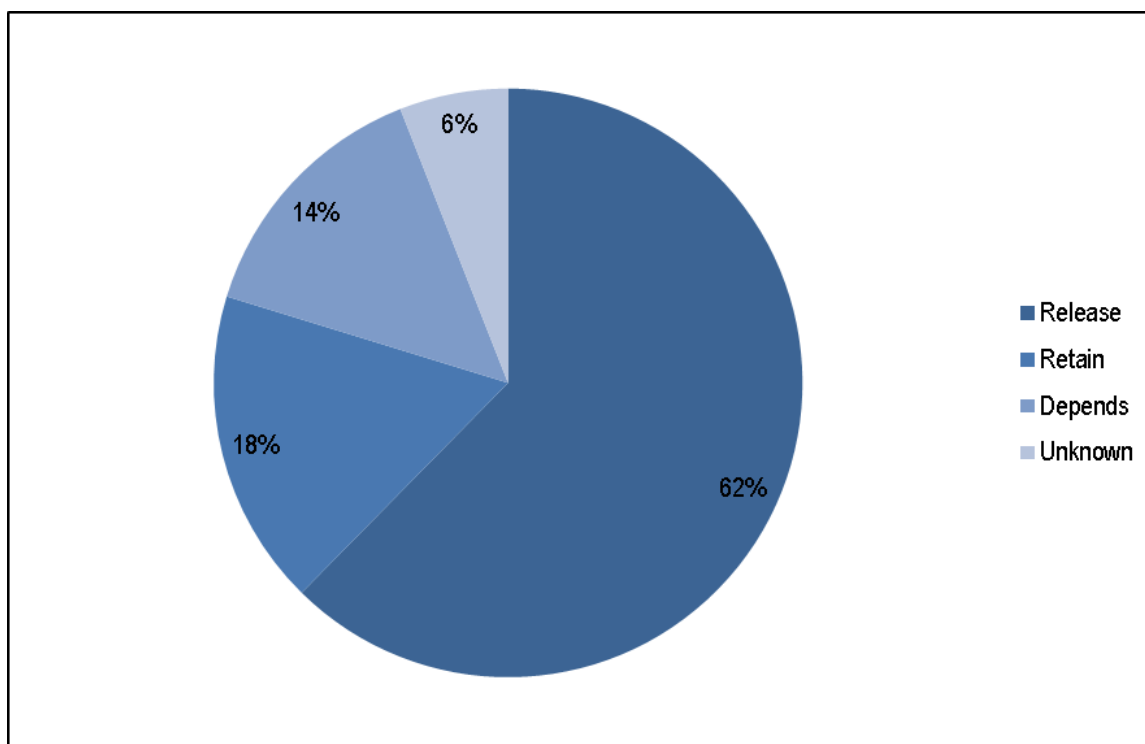


Figure 12. Angler preferences regarding releasing or retaining wild fish based on interviews (n=3,436 anglers) conducted at all survey sites from October, 2009 to April, 2012.

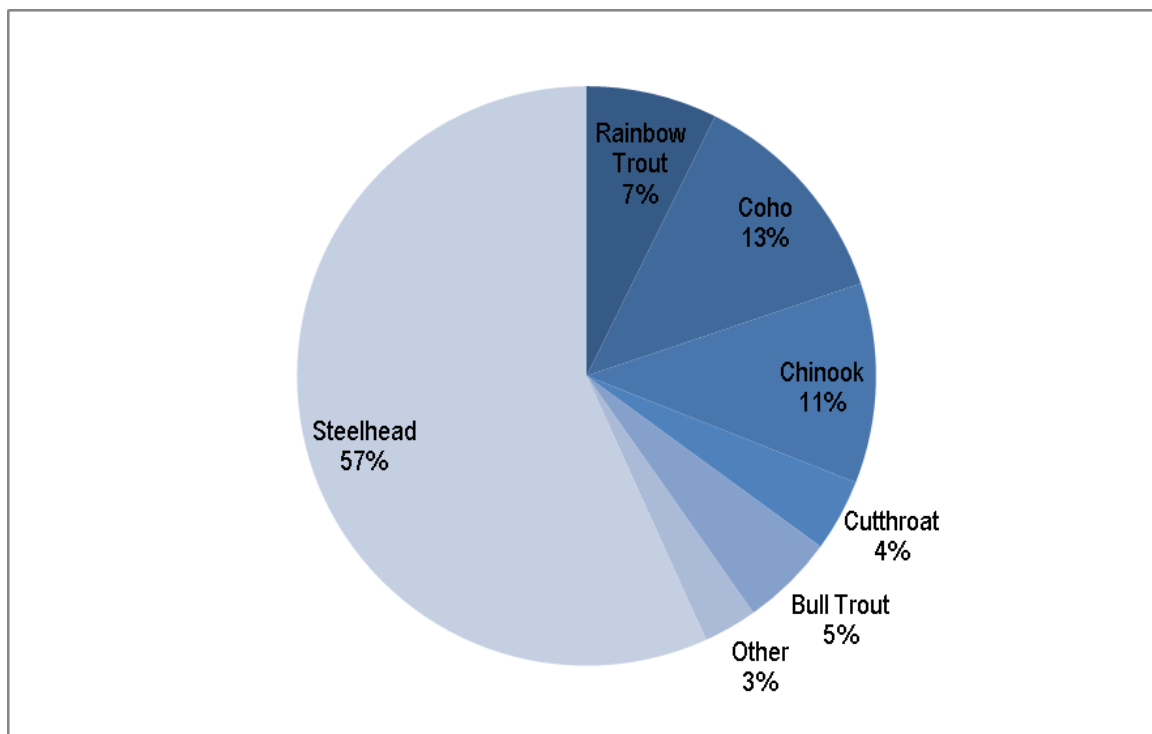


Figure 13. Percent of each fish species (n=3,579 fish) caught in all designated survey areas from October, 2009 to April, 2012.

Queets and Salmon Rivers

From October 2009 to April 2012, 2,993 anglers were interviewed fishing the Queets and Salmon Rivers. Total angler hours (unexpanded) in the Queets and Salmon Rivers were 4894, 4455, 9632 in 2009-2010, 2010-2011 and 2011-12, respectively. Distribution of angler hours was more concentrated around the hatchery steelhead run in late-November through early-January. The wild steelhead run in mid-February through mid-April brought an increase in angler hours although not as marked as the hatchery season (Figure 14). There were variable river flows during the winter fishing season (October-mid-April). The maximum and minimum flows recorded in 2009-10, 2010-11, and 2011-12, respectively, were 45,800 and 1,780 cfs; 66,500 and 1,280 cfs; and 47,900 and 1,080 cfs (Figures 15a, 15b, 15c).

We surveyed 69% of the fishable days excluding October, 2009 which was the onset of the project. We conducted surveys on 182 weekdays and 93 weekend days from November, 2009 to April, 2012. Survey effort was concentrated on the days that were deemed fishable based on the Queets River gage and river flows that were less than 5,000 cfs for the Queets and 8,000 cfs for the Salmon. During the 2009-2010 season (Nov-April 15), 74% of the days during the fishing season were deemed fishable and 68% of those days were surveyed. In the 2010-2011 season, 70% of the days of the fishing season were determined fishable and 76% of those days were surveyed. In the 2011-2012 season, 69% of the days of the fishing season were determined to be fishable and 64% of those days were surveyed (Table 1).

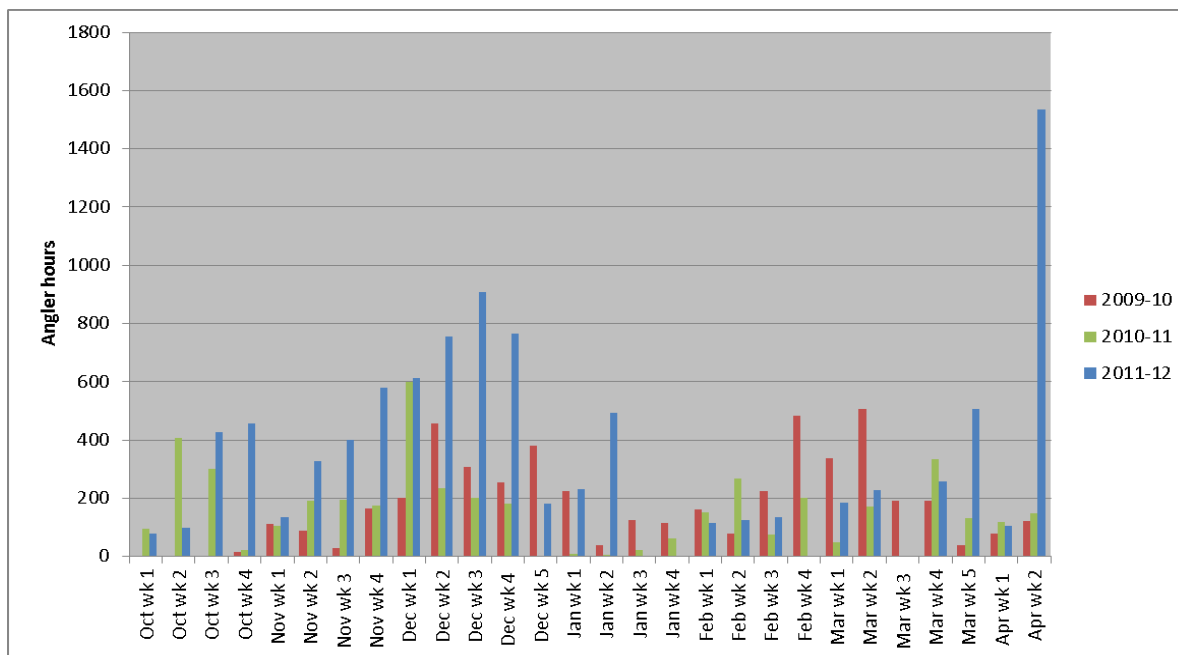


Figure 14. Total weekly angler hours for the Queets and Salmon Rivers, 2009 to 2012 (n=2993 anglers fishing 18,981 hours).

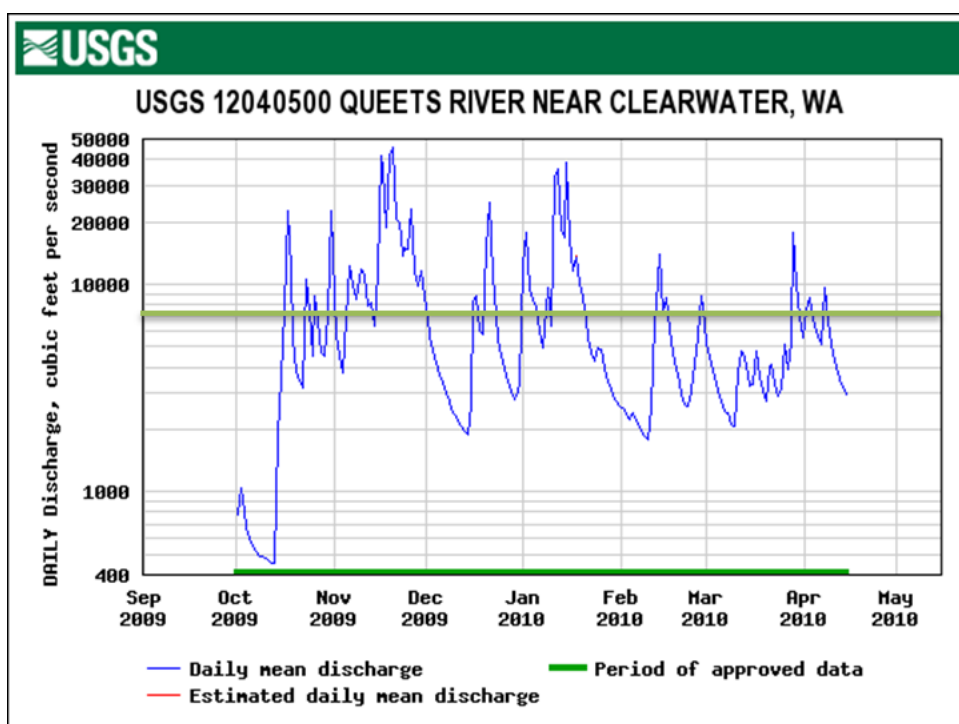


Figure 15a. River flows (cfs) for the Queets River during the 2009-10 fishing season.
http://waterdata.usgs.gov/wa/nwis/uv/?site_no=12040500&PARAMeter_cd=00060,00065. No surveys were conducted on dates when riverflows were above 8,000 cfs as illustrated by the green line.

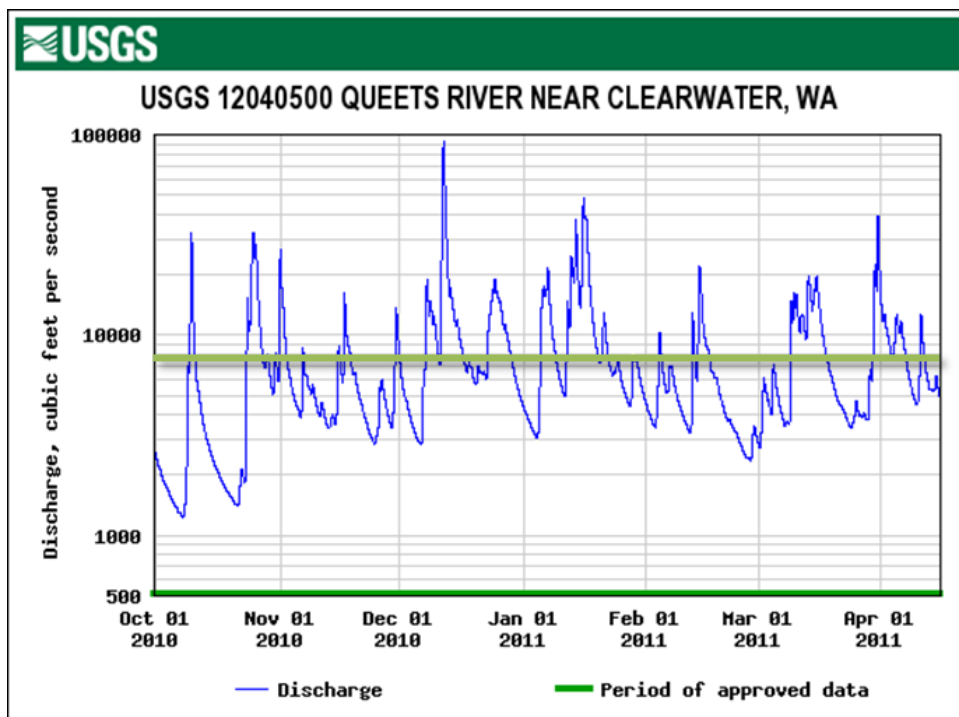


Figure 15b. River flows (cfs) for the Queets River during the 2010-11 fishing season. http://waterdata.usgs.gov/wa/nwis/uv/?site_no=12040500&PARAMeter_cd=00060,00065. No surveys were conducted on dates when riverflows were above 8,000 cfs as illustrated by the green line.

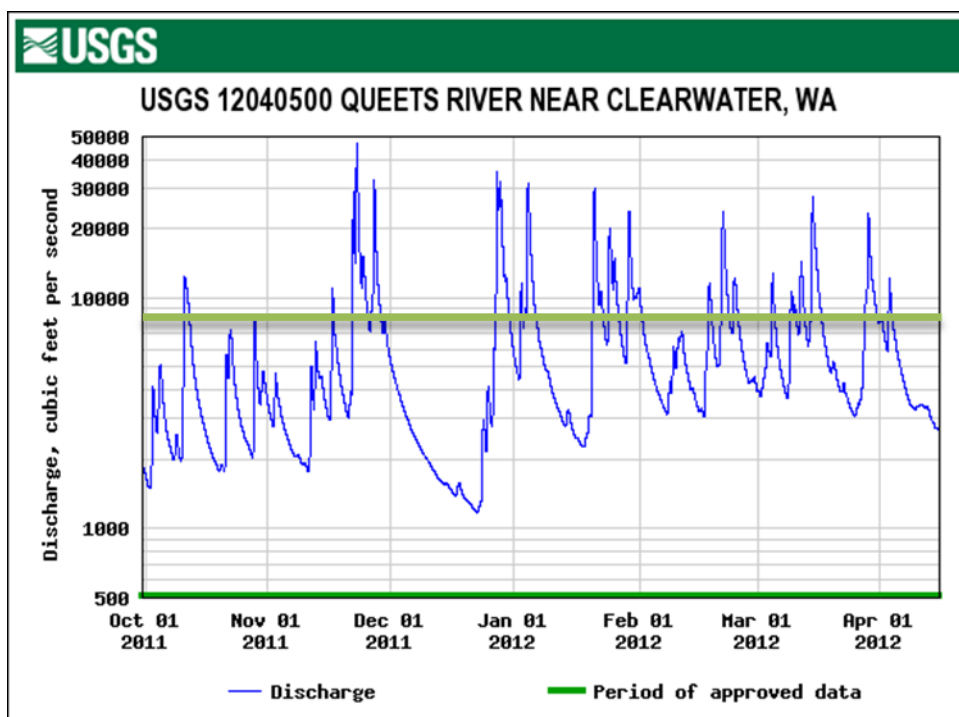


Figure 15c. River flows (cfs) for the Queets River during the 2011-12 fishing season. (http://waterdata.usgs.gov/wa/nwis/uv/?site_no=12040500&PARAMeter_cd=00060,00065). No surveys were conducted on dates when riverflows were above 8,000 cfs as illustrated by the green line.

Table 1. Percent of weekdays and weekend days surveyed in Queets River from 2009 to 2012. Survey effort was concentrated on the days that were deemed fishable based on the Queets River gage when flows were less than 5,000 cfs for the Queets and 8,000 cfs for the Salmon.

		Total # Weekdays	Total # Weekend Days	# Weekdays Fishable	# of Fishable Weekdays Surveyed	# Weekend Days Fishable	# Fishable Weekends Days Surveyed	%Fishable Weekdays Surveyed	%Fishable Weekend Days Surveyed
Queets/Salmon 2009-10	November	21	9	7	5	5	4	71%	80%
	December	23	8	21	12	8	8	57%	100%
	January	21	10	11	7	7	7	64%	100%
	February	20	8	18	10	8	8	56%	100%
	March	23	8	20	10	8	6	50%	75%
	April	11	4	8	4	2	2	50%	100%
Queets/Salmon 2010-11	October	21	10	15	6	10	8	40%	80%
	November	22	8	16	10	8	8	63%	100%
	December	23	8	14	8	5	5	57%	100%
	January	22	10	15	13	7	4	87%	57%
	February	20	8	19	16	8	7	84%	88%
	March	23	8	12	10	4	4	83%	100%
	April	11	4	4	4	2	2	100%	100%
Queets/Salmon 2011-12	October	21	10	18	12	8	0	67%	0%
	November	22	8	16	8	6	3	50%	50%
	December	22	9	19	14	9	6	74%	67%
	January	22	9	13	6	4	2	46%	50%
	February	21	8	15	12	4	3	80%	75%
	March	22	9	11	9	4	3	82%	75%
	April	10	5	6	6	4	3	100%	75%

Demographic Information

Anglers that fished the Queets and Salmon Rivers were from a variety of different locations. Anglers were interviewed from a total of seven countries and 22 different states within the U.S. Of those anglers who lived in the U.S., most were from Washington State (89%) followed by Oregon (2%), California (2%) and Idaho (1%) anglers (Figure 16). Washington anglers came from 26 different counties, with King (21%), Grays Harbor (20%), Pierce (20%) and Thurston (12%) being the most represented counties (Figure 17). Ninety-seven percent of anglers interviewed in the Queets and Salmon Rivers were male with 15% of all anglers 18-30 years old, 40% 31-50 years old, and 43% over 50 years of age (Figure 18).

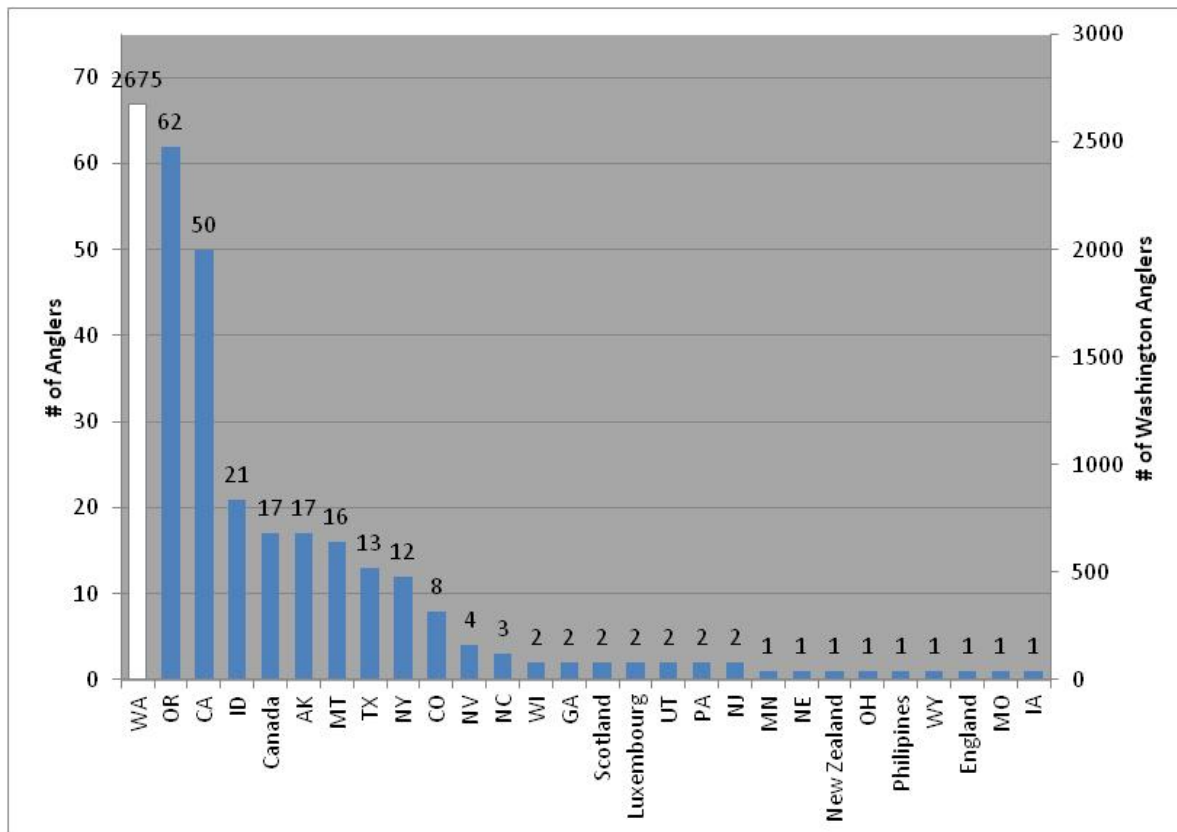


Figure 16. Angler state in the United States and country of residence on Queets River based on interviews conducted from October, 2009 to April, 2012 (n=2,921 anglers).

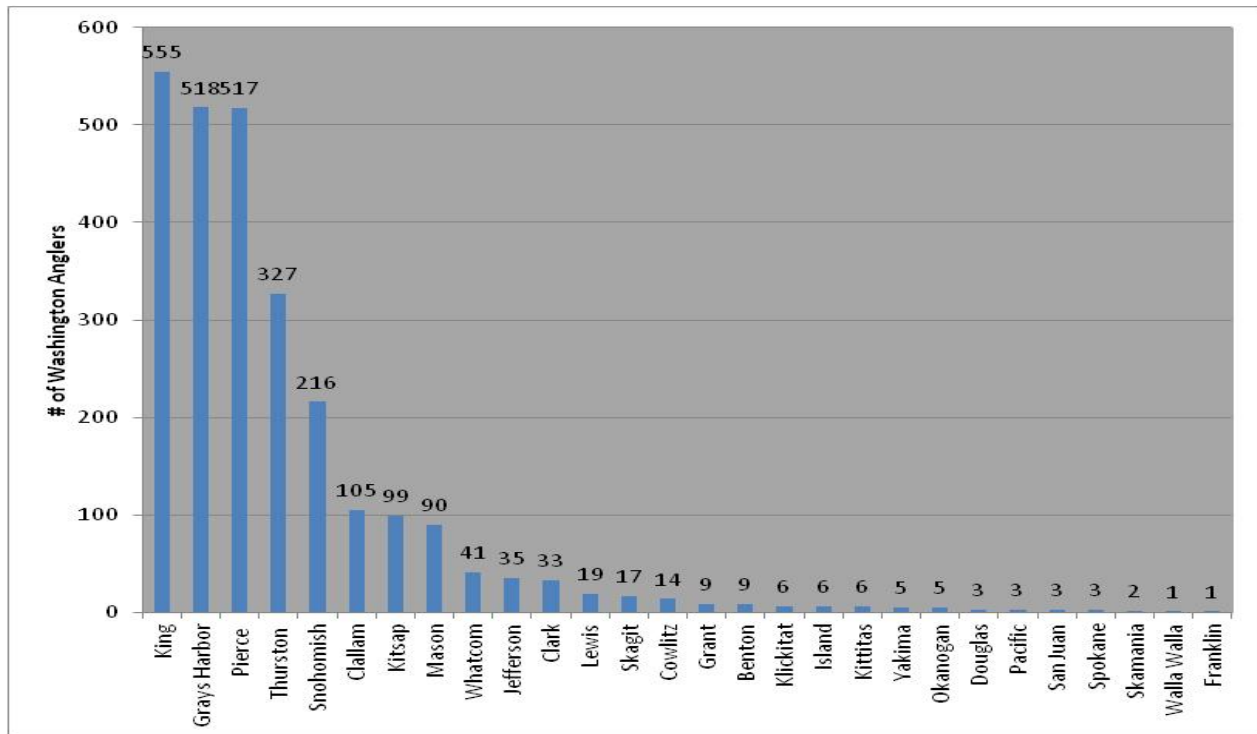


Figure 17. County of residence for Washington State anglers in the Queets River based on interviews conducted from October, 2009 to April, 2012 (n=2,648 anglers).

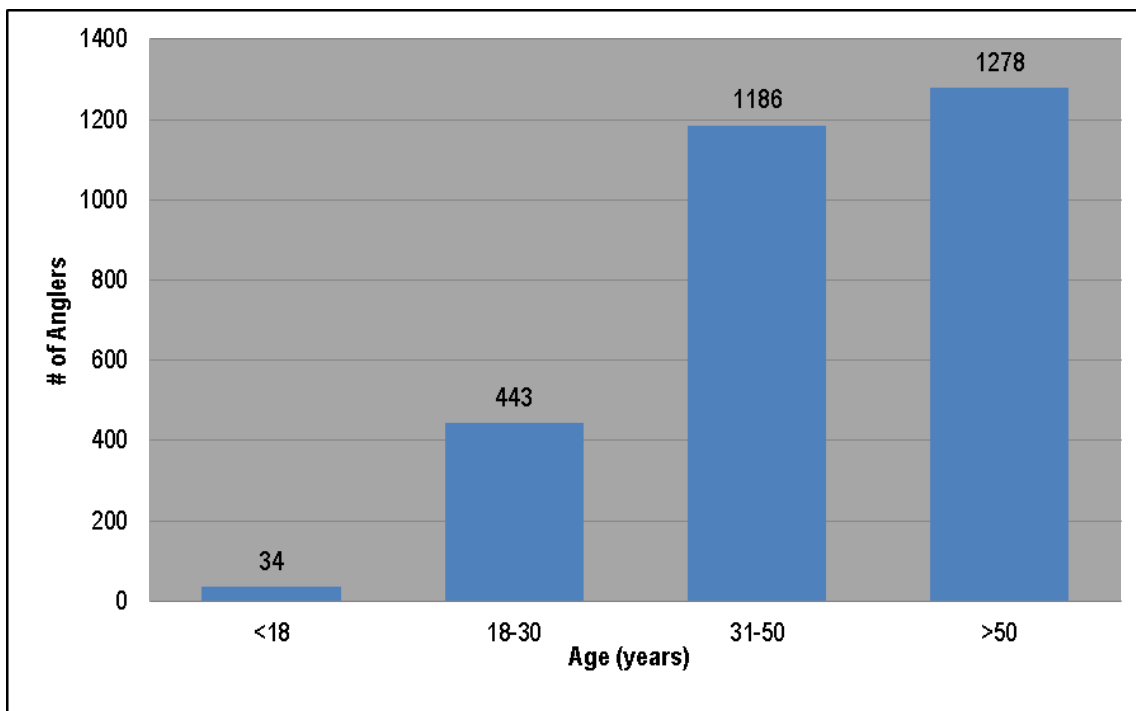


Figure 18. Age distribution of anglers fishing the Queets River based on interviews conducted from October, 2009 to April, 2012 (n=2,941 anglers).

Fifty-nine percent of all the anglers interviewed on the Queets and Salmon Rivers preferred catch-and-release fishing, compared to 19% that preferred to retain wild fish. Sixteen percent of anglers interviewed indicated that their preference was dependent upon the fishing season, river, or fish species and 6% did not answer the question (Figure 19). The preference for catch-and-release fishing varied throughout the winter months and was lowest (29%) when hatchery steelhead were targeted (Nov to Dec). A significantly higher percentage (92%) of anglers favored catch-and-release fishing when wild steelhead were the primary population in the river and regulations required their release (Figure 20). Of all anglers interviewed on the Queets and Salmon rivers, 27% belonged to at least one fishing organization. The most popular fishing organizations were the Coastal Conservation Association (CCA) and Trout Unlimited (TU).

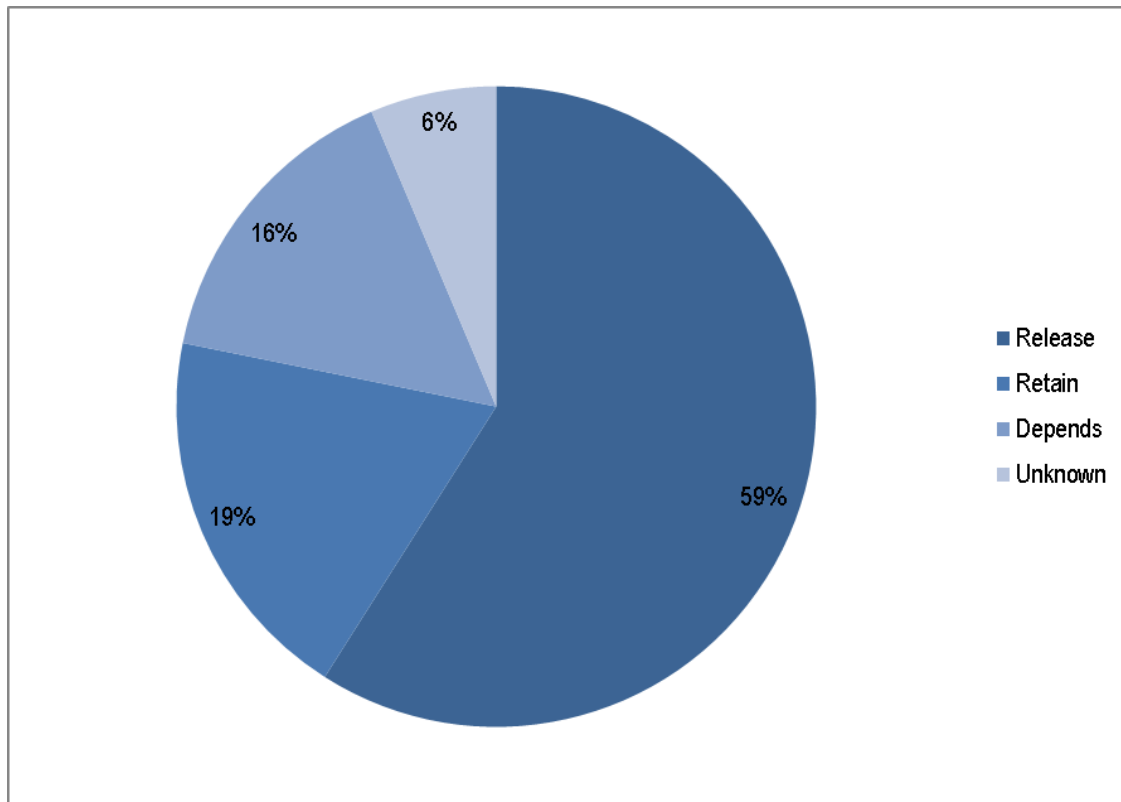


Figure 19. Angler preference for releasing or retaining wild fish on the Queets and Salmon Rivers based on interviews conducted from October, 2009 to April, 2012 (n=2,993 anglers).

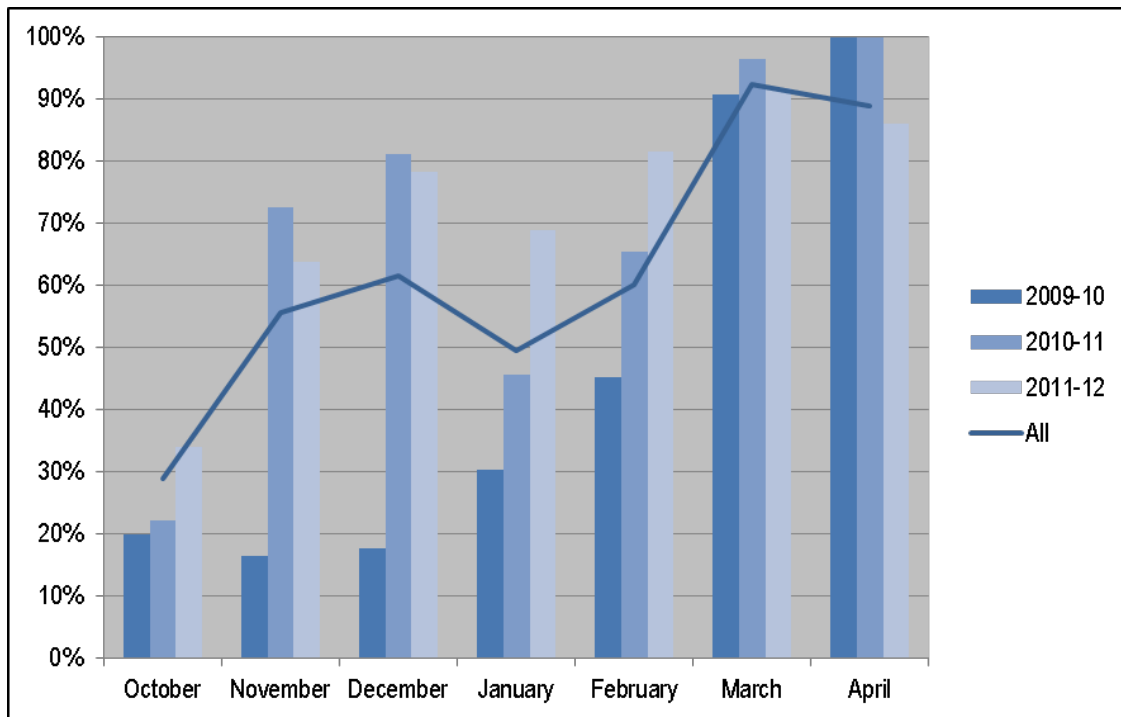


Figure 20. Percent of anglers that preferred to catch-and-release wild fish by month on the Queets and Salmon Rivers, 2009 to 2012 (n=2993 anglers).

Catch and Effort Information

Interviewers asked anglers about their choices on the day of the interview to get an understanding of common angler choices. A variety of different choices are available to anglers fishing the Queets and Salmon Rivers, in regard to fishing locations, gear types, bank or boat angling, employing a fishing guide, and whether to retain or release fish .

During the study period, 47% of anglers fished from the bank and 53% fished from a boat (Figure 22), although this percentage varied throughout the season (Figure 23). The total number of boat trailers observed during roving surveys each year was 397, 335 and 754 in 2009-10, 2010-11 and 2011-12, respectively. The maximum number of boats recorded by surveyors during the study period was 19 boats floating ~8 km of river (Figure 21).

Anglers used a variety of different gear types throughout the seasons. Using a combination of gear types (e.g. lures, plugs, flies, or bait) was the most popular choice (35%) closely followed by using lures (33%). Fly-fishing (15%), bait fishing (12%) and plug fishing (6%) were also represented, although not as popular (Figure 24). Of a total of 1,450 fishing trips (2,993 anglers) on the Queets and Salmon Rivers, 9% were reported as guided trips (Figure 25). The majority of the guided fishing trips were fly fishing trips (49%), followed by lure fishing (23%), those fishing with a combination of gear types (19%), plug fishing (6%), and bait fishing (2%).

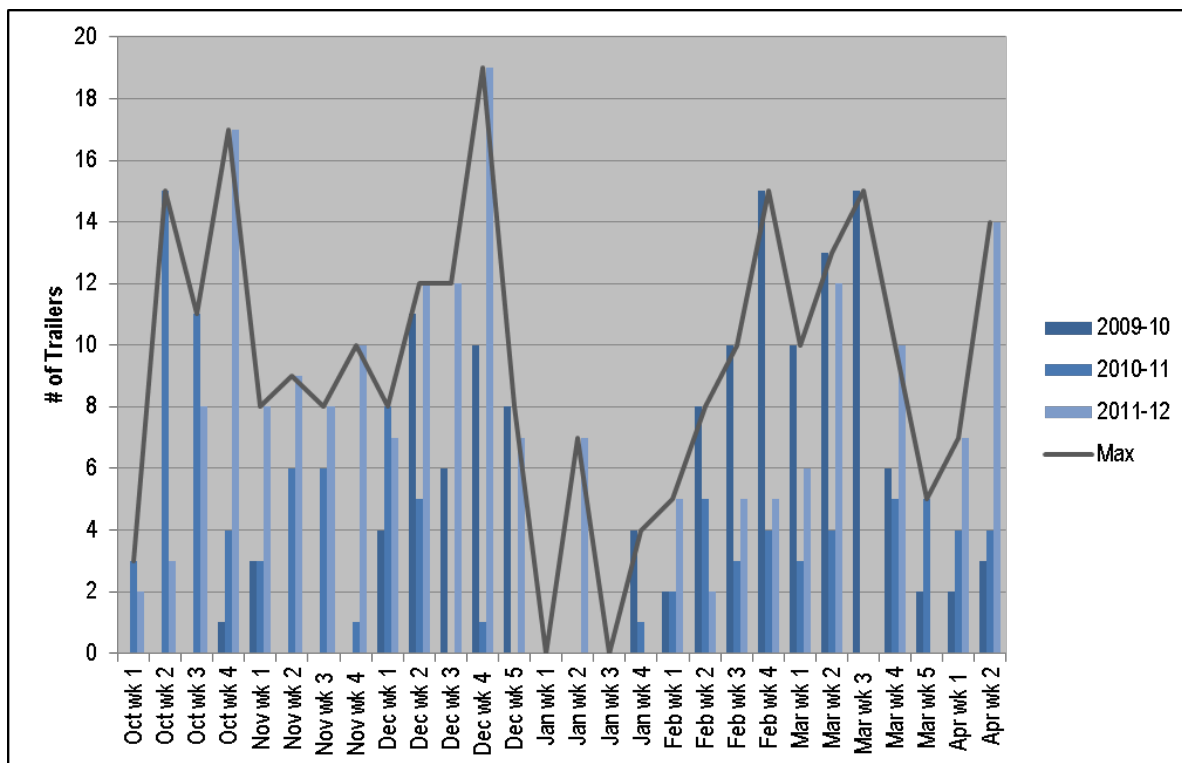


Figure 21. Maximum number of trailers counted each week based on roving surveys on the Queets River, 2009 to 2012 (n= 562 surveys).

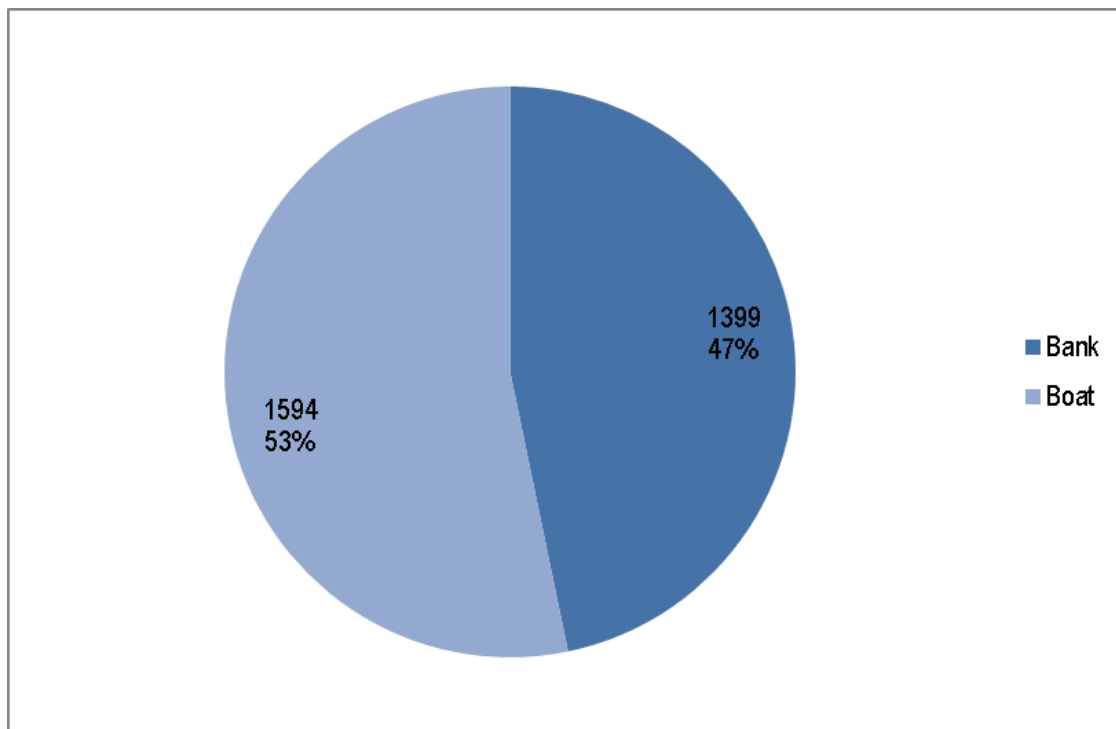


Figure 22. Proportion of boat versus bank anglers on the Queets River based on interviews conducted from October, 2009 to April, 2012 (n=2,993 anglers).

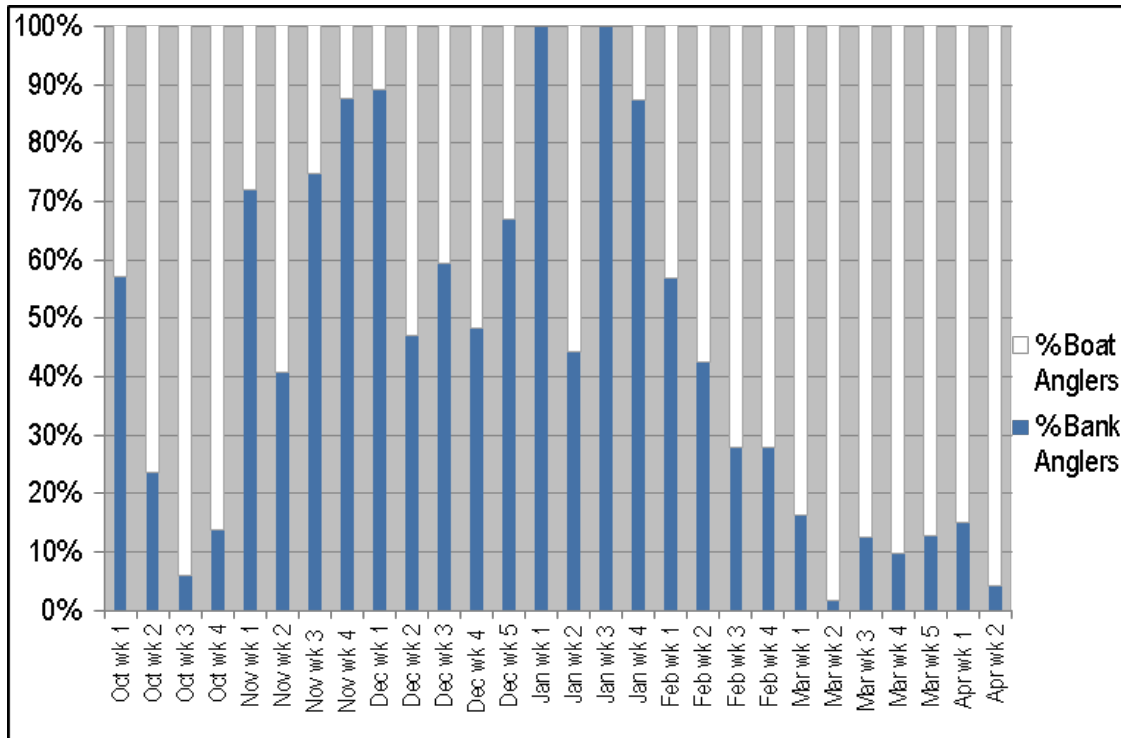


Figure 23. Percent of boat versus bank anglers by week on the Queets and Salmon Rivers based on interviews conducted from October, 2009 to April, 2012 (n=2993 anglers).

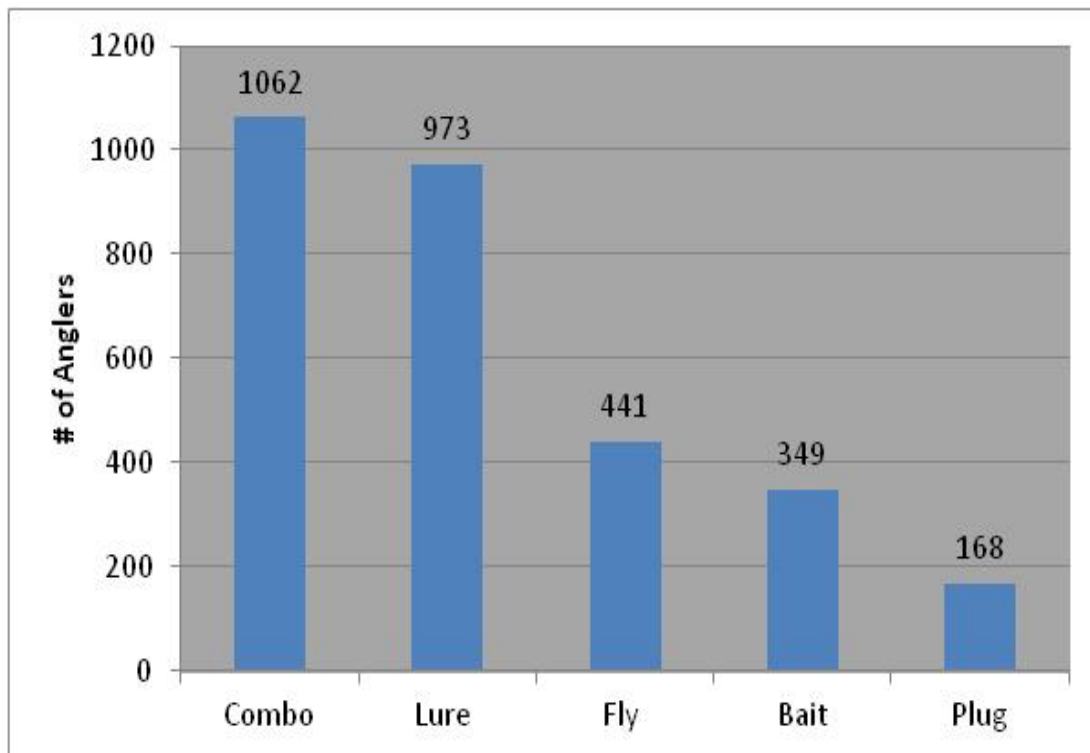


Figure 24. Gear types used on the Queets River based on interviews conducted from October, 2009 to April, 2012 (n=2,993 anglers).

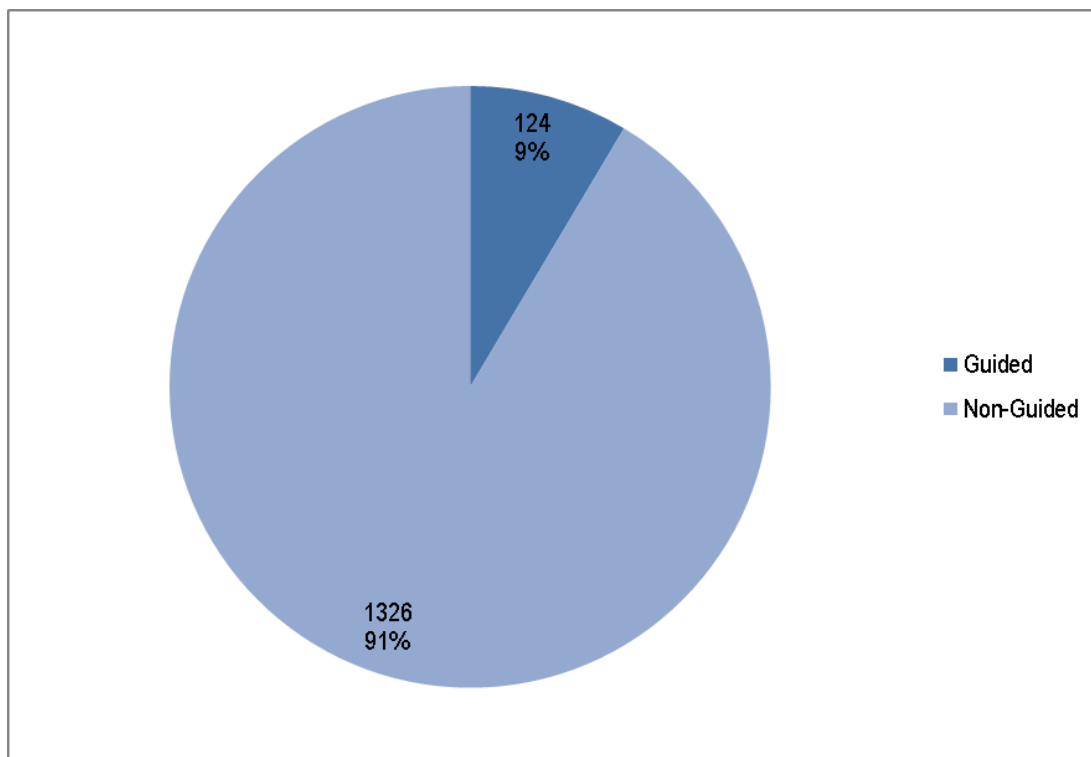


Figure 25. Percent of guided and non-guided fishing trips on Queets River based on interviews conducted from October, 2009 to April, 2012 (n=1,450 trips).

During interviews anglers were asked about both target and non-target fish species. A total of 11 different fish species were caught during the study period, four of which were non-target species. Steelhead was the most common fish targeted, with 85% of anglers fishing specifically for steelhead. The next common target species was coho with 9% of anglers targeting coho. Steelhead comprised 63% of the catch during the study period, with coho (14%) and Chinook (13%) the next most commonly caught species (Figure 26).

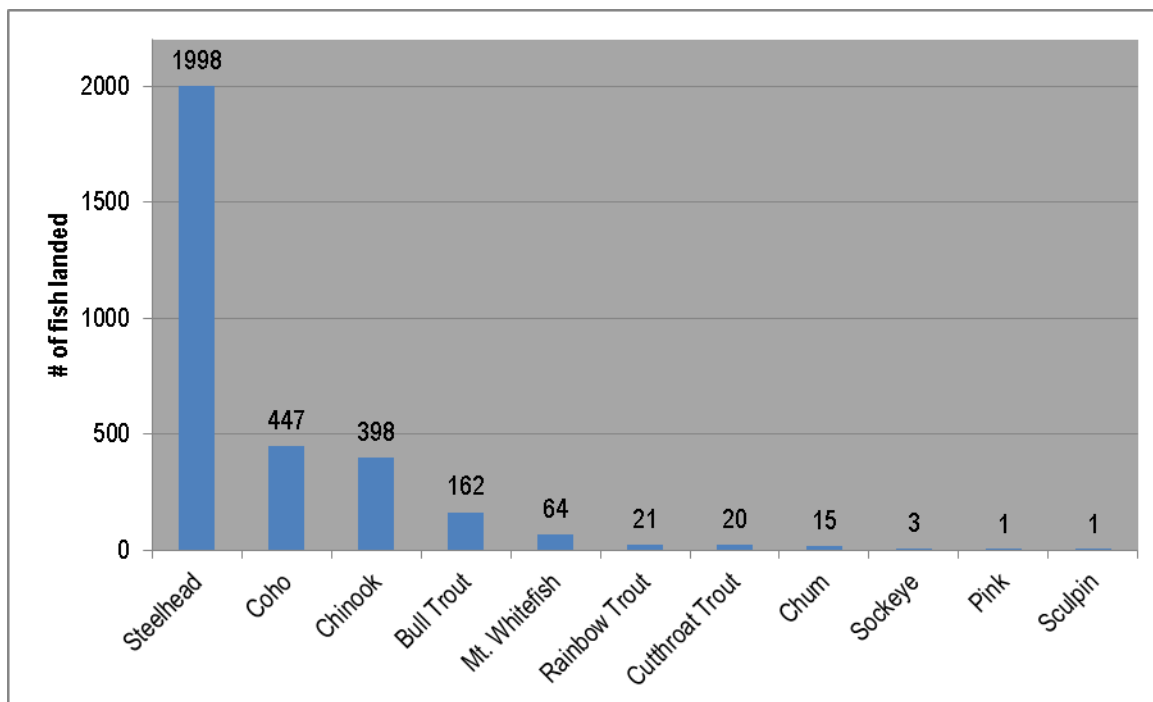


Figure 26. Numbers of each fish species captured in the Queets River sport fishery from 2009 to 2012 (n=3,130 fish).

During the study period a total of 1,998 steelhead were caught on the Queets and Salmon Rivers, 65% of which were of hatchery origin and 33% were wild steelhead; the remaining were of unknown origin (Figure 27). Anglers released 53% of steelhead caught and retained 47%. Although the retention of wild or unmarked steelhead is prohibited in OLYM, two of the steelhead harvested were unmarked fish. Of the fish that were released, 351 were hatchery fish, 657 unmarked and 46 of unknown origin (Table 2). Female steelhead dominated (59%) the wild steelhead catch every year during the study (Figure 28). The male to female ratio was relatively equal as for both coho and Chinook salmon on the Queets River during the study period.

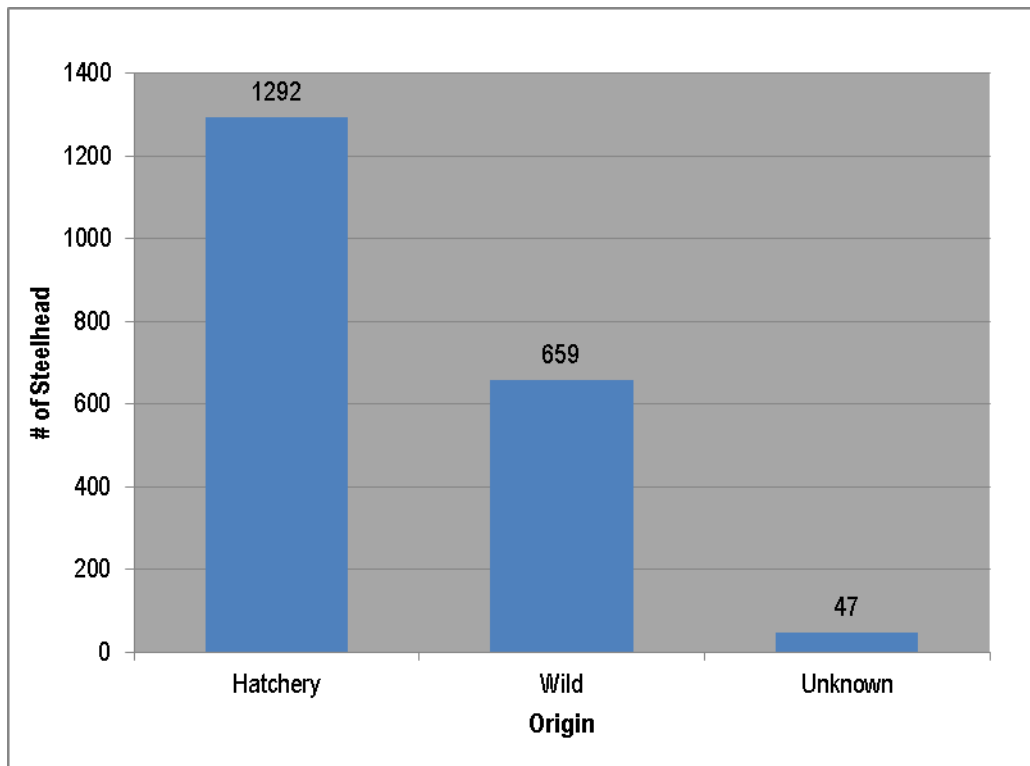


Figure 27. Numbers of wild and hatchery winter steelhead trout captured in the Queets and Salmon rivers from 2009 to 2012 (n=1,998 winter steelhead).

Table 2. Monthly catch and reported fishing effort for steelhead in the Queets and Salmon Rivers.

Month		Estimated Hours of Effort	Marked Steelhead Released	Unmarked Steelhead Released	Unknown Steelhead Released	Total Steelhead Released	Marked Steelhead Harvested	Unmarked Steelhead Harvested	Unknown Steelhead Harvested	Total Steelhead Harvested
2009-2010	October	14.72	0	0	0	0	0	0	0	0
	November	433.92	1	0	0	1	2	1	0	3
	December	1557.67	9	11	3	23	83	0	0	83
	January	514.33	14	5	5	24	3	0	0	3
	February	955.28	17	34	3	54	6	1	0	7
	March	1214.93	6	79	2	87	0	0	0	0
	April	203.13	0	25	0	25	0	0	0	0
2010-2011	October	840.46	0	3	0	3	0	0	0	0
	November	852.19	18	13	3	34	89	0	0	89
	December	999.3	8	7	1	16	101	0	0	101
	January	125.96	5	1	2	8	1	0	0	1
	February	665.95	21	29	0	50	7	0	0	7
	March	717.38	3	39	0	42	0	0	0	0
	April	266.65	0	24	0	24	0	0	0	0
2011-2012	October	1075.2	0	1	0	1	0	0	0	0
	November	1551.5	56	9	19	84	144	0	0	144
	December	3078.0	170	82	5	257	457	0	0	457
	January	725.1	15	9	3	27	44	0	0	44
	February	442.5	5	34	0	39	3	0	0	3
	March	1114.4	3	89	0	92	2	0	0	2
	April	1645.1	0	163	0	163	0	0	0	0
Total		18993.67	351	657	46	1054	942	2	0	944

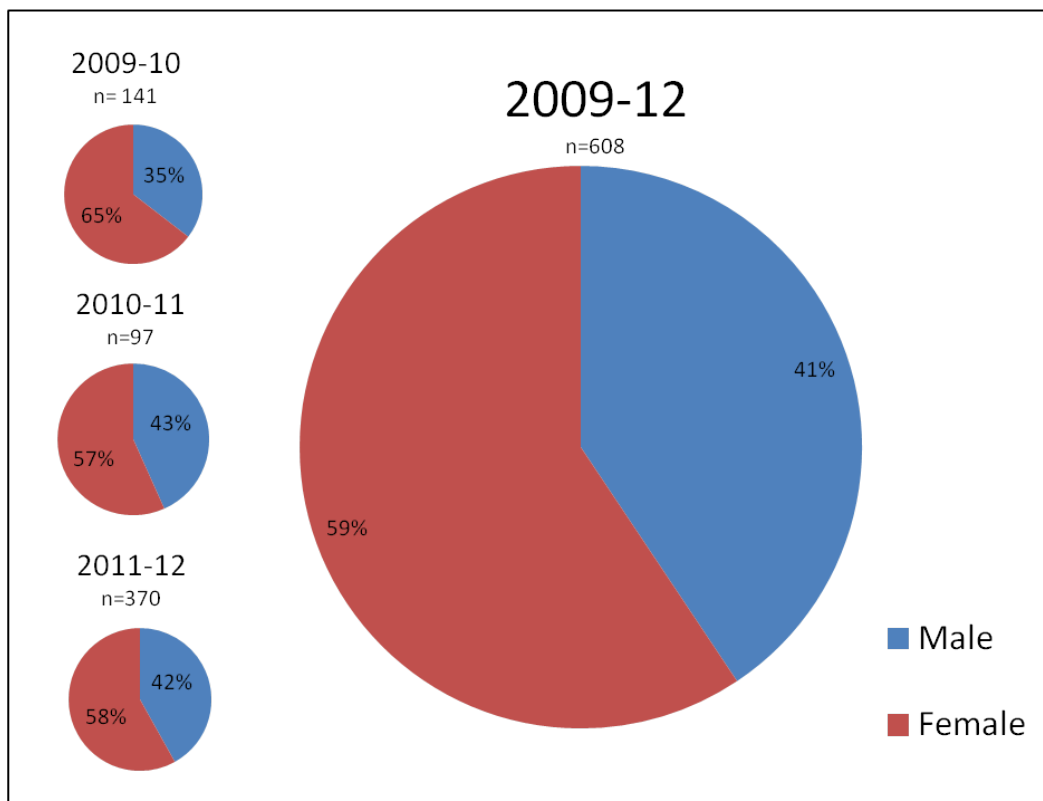


Figure 28. Proportion of male and female wild steelhead captured in the Queets and Salmon Rivers each year and in all years combined (n=608 steelhead).

Angler success was measured in the number of hours it took to catch each fish or catch per unit effort (CPUE), by this measurement the lower the CPUE the higher the success of the angler. In 2009 to 2012, anglers that were targeting steelhead from November through April fished for an average of 8.6 hours per steelhead landed (Figure 29). Anglers who fished with a guide spent less time (7.8 hours) per steelhead when compared to anglers who did not fish with a guide (9.2 hours per steelhead (Figure 30).

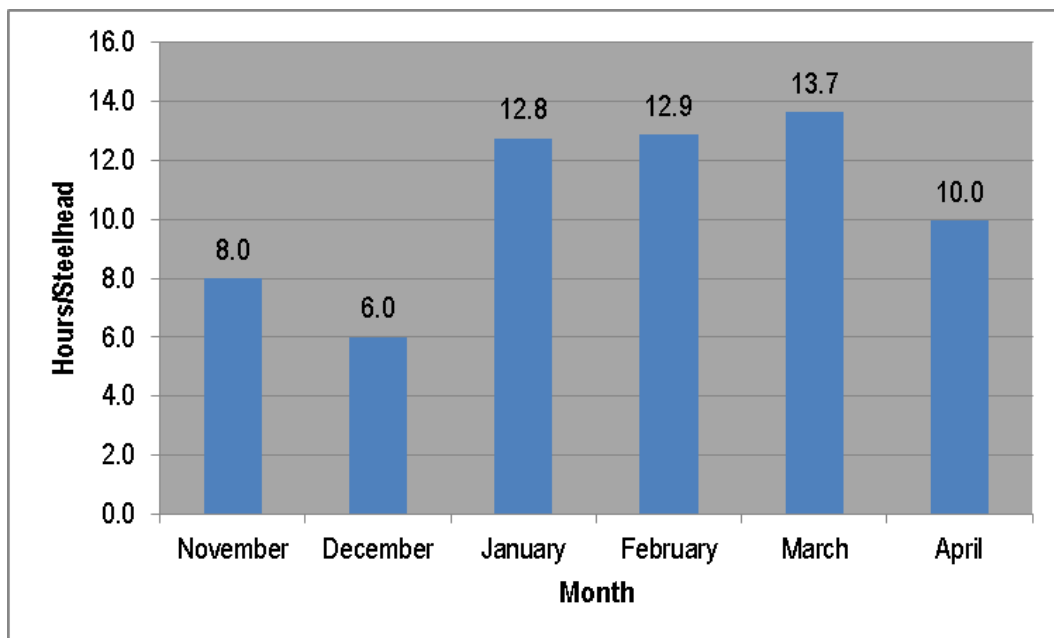


Figure 29. Steelhead catch per unit effort in hours per fish caught by month based on angler interviews conducted on the Queets and Salmon Rivers from 2009 to 2012 (n=18,982 hours of effort).

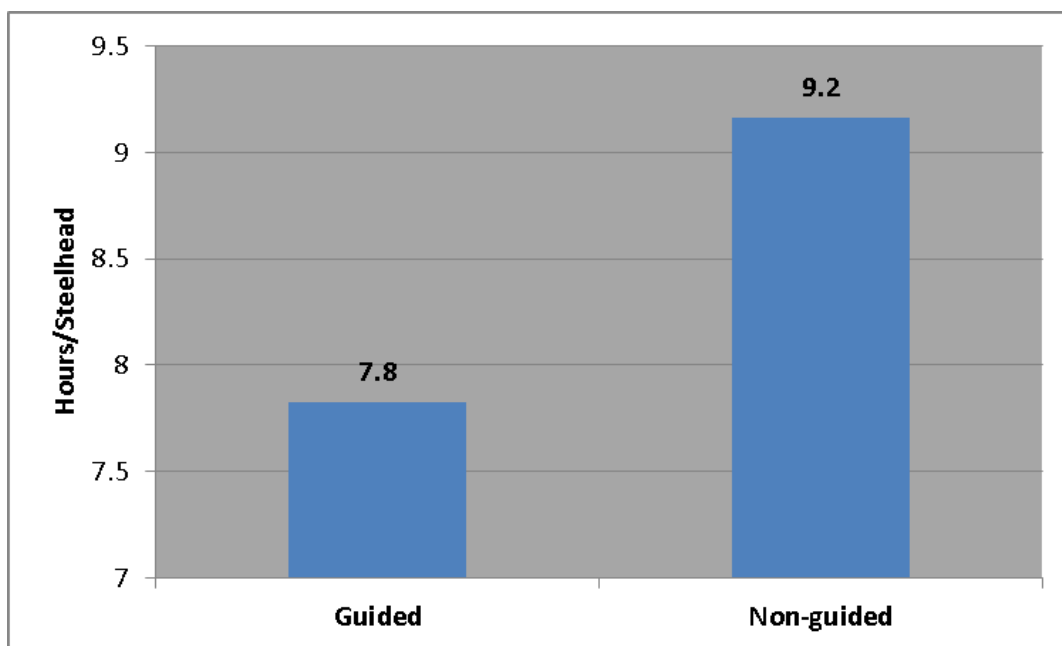


Figure 30. Steelhead catch per unit of effort in hours per fish caught on guided and non-guided trips based on angler interviews conducted on the Queets and Salmon Rivers from 2009 to 2012 (n=18,982 hours of effort)

Incidental Catch of Federally Threatened Bull Trout

The most common non-target species caught were federally threatened bull trout. Incidental catch of bull trout made up 5% of the total catch. During the study period 42, 34 and 86 bull trout were caught on the Queets and Salmon Rivers in 2009-10, 2010-11 and 2011-12, respectively (Table 3). Other

non-target catch included rainbow trout (7%), cutthroat trout (4%) and mountain whitefish (2%) (Figure 26).

Table 3. Comparisons of bull trout catch and fishing effort on the Queets/Salmon and Hoh Rivers, 2009 to 2012.

	Month	Estimated Hours of Effort	Bull Trout Caught and Released		Total Bull Trout Caught and Released
			Queets	Hoh	
2009-2010	October	14.72	0	n/a	0
	November	433.92	9	n/a	9
	December	1557.67	7	n/a	7
	January	556.75	9	3	12
	February	1079.51	8	9	17
	March	1366.21	9	0	9
	April	240.96	0	0	0
2010-2011	October	840.47	1	n/a	1
	November	852.2	8	n/a	8
	December	1016.05	4	n/a	4
	January	125.97	5	n/a	5
	February	789	10	4	14
	March	798.35	6	0	6
	April	287.4	0	0	0
2011-2012	October	1075.2	5	n/a	5
	November	1551.5	19	n/a	19
	December	3078	27	n/a	27
	January	725.1	10	n/a	10
	February	442.5	6	n/a	6
	March	1114.4	16	n/a	16
	April	1645.1	3	n/a	3
Total		19590.98	162	16	178

Hoh River

During the study period (January 2010 – April 2011), 205 anglers were interviewed while fishing in the Hoh River. Documented fishing hours on the Hoh River was 356 and 217 angler hours in 2010 and 2011, respectively. The Hoh River had variable conditions during the winter season, January to mid-April (Figure 31a, 31b). The maximum flows recorded during those months were 18,400 cfs and 9,350 cfs in 2010 and 2011 respectively, while the minimum flows were 1,130 cfs and 1,320 cfs. Our survey effort was concentrated on the days where river flows were less than 4,000 cfs, which we determined to be the fishable flows on this stretch of the Hoh River. In 2010, 77% of the days during the fishing season were determined to be fishable, 63% of those days were surveyed. In 2011, 65% of the days of the fishing season were determined to be fishable, 56% of those days were surveyed (Table 4).

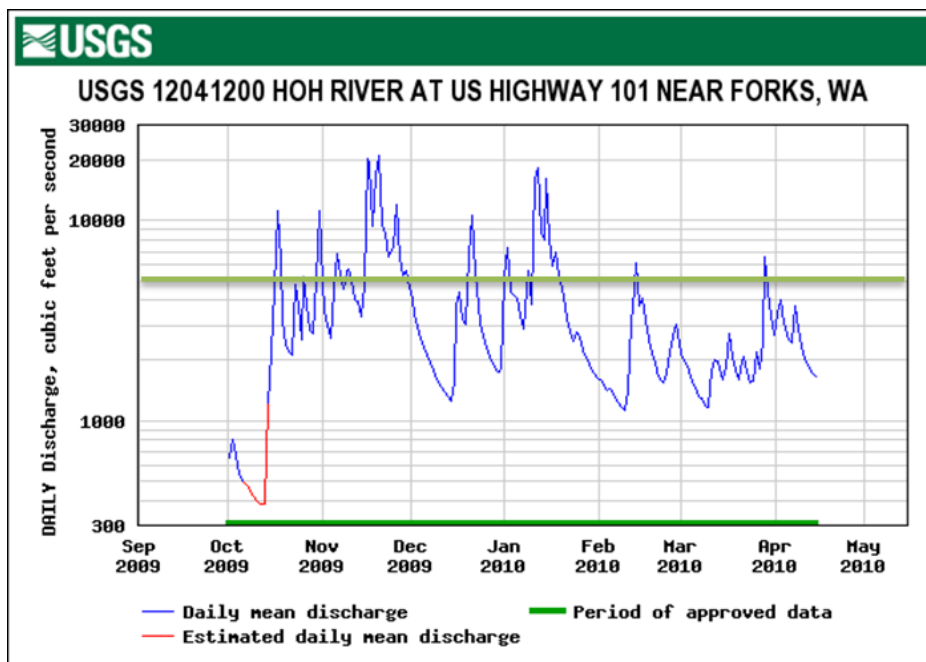


Figure 31a. River flows (cfs) for the Hoh River in 2010.
http://waterdata.usgs.gov/wa/nwis/uv/?site_no=12041200&PARAMeter_cd=00060,00065. No surveys were conducted on dates when river flows were above 4,000 cfs as indicated by the green line.

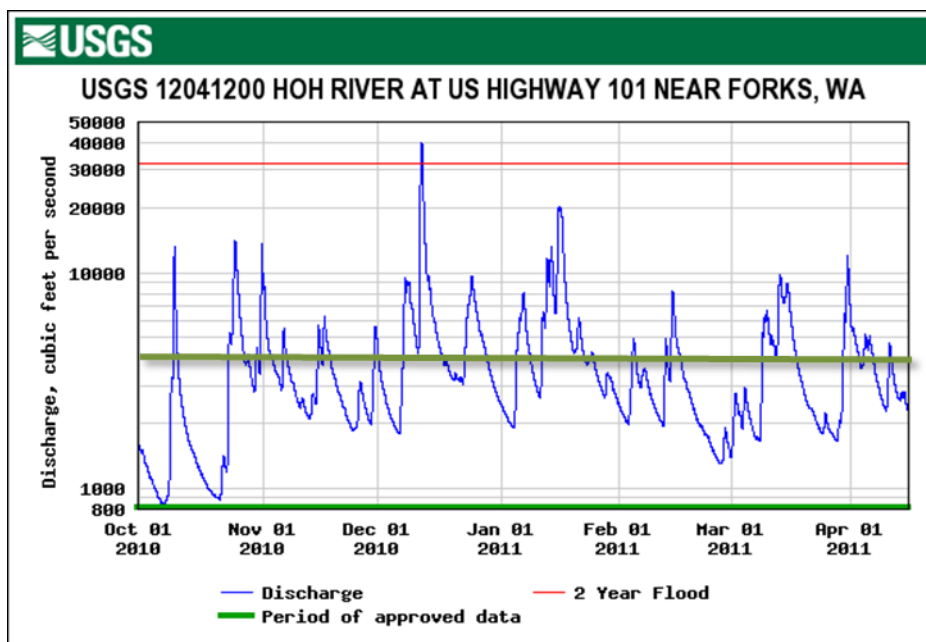


Figure 31b. River flows (cfs) for the Hoh River in 2011.
http://waterdata.usgs.gov/wa/nwis/uv/?site_no=12041200&PARAMeter_cd=00060,00065. No surveys were conducted on dates when river flows were above 4,000 cfs as indicated by the green line.

Table 4. Numbers of fishable and surveyed days on the Hoh River in Olympic National Park in 2010 and 2011.

	Month	Total # Weekdays	Total # Weekend Days	# of Weekdays Fishable	# of Fishable Weekdays Surveyed	# Weekend Days Fishable	# Fishable Weekends Days Surveyed	%Fishable Weekdays Surveyed	%Fishable Weekend Days Surveyed
Hoh 2010	January	21	10	10	6	5	4	60%	80%
	February	20	8	19	10	6	6	53%	100%
	March	23	8	20	10	8	8	50%	100%
	April	11	4	10	4	3	3	40%	100%
Hoh 2011	February	20	8	12	11	5	1	92%	20%
	March	23	8	13	9	6	0	69%	0%
	April	11	4	8	6	4	0	75%	0%

Demographic Information

Hoh River anglers came from a variety of different locations. We interviewed anglers from three different countries and 11 different states within the U.S. Of those anglers who lived in the U.S., the majority were from Washington State (86%). The next most represented states were California (3%), Montana (3%) and Idaho (2%) (Figure 32). Washington anglers came from 13 different counties, with King (28%), Clallam (19%) and Pierce (11%) being the most represented counties (Figure 33). The vast majority of anglers interviewed were male (91.2%) with 18% of all anglers 18-30 years old, 38% 31-50 years old, and 44% over 50 years of age (Figure 34).

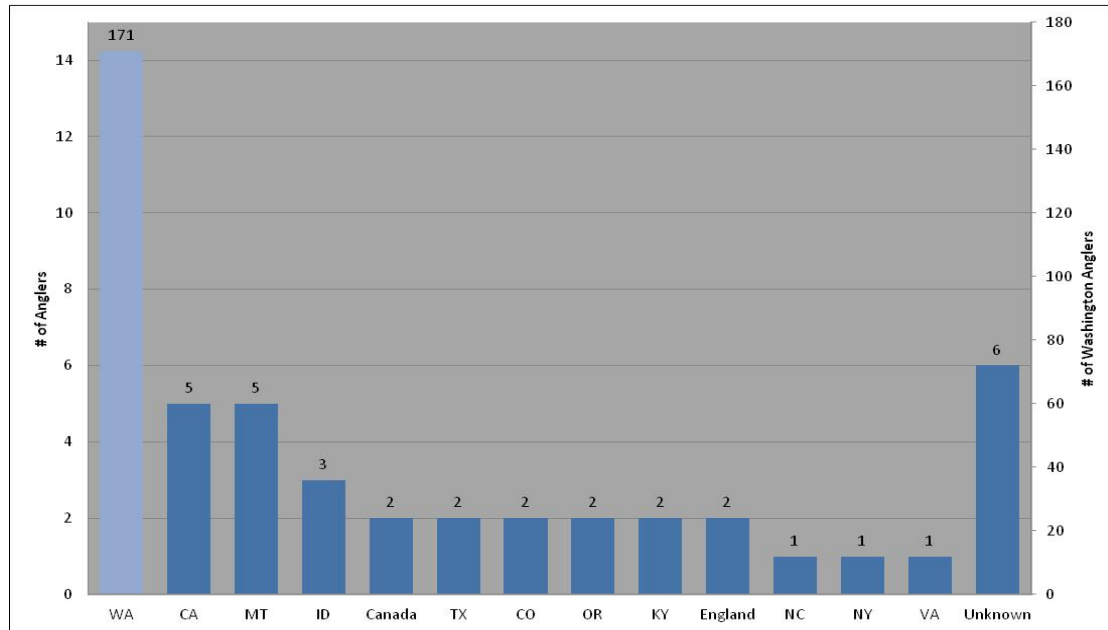


Figure 32. Angler state in the United States and country of residence on the Hoh River based on interviews conducted from January, 2010 to April 2011 (n=199 anglers).

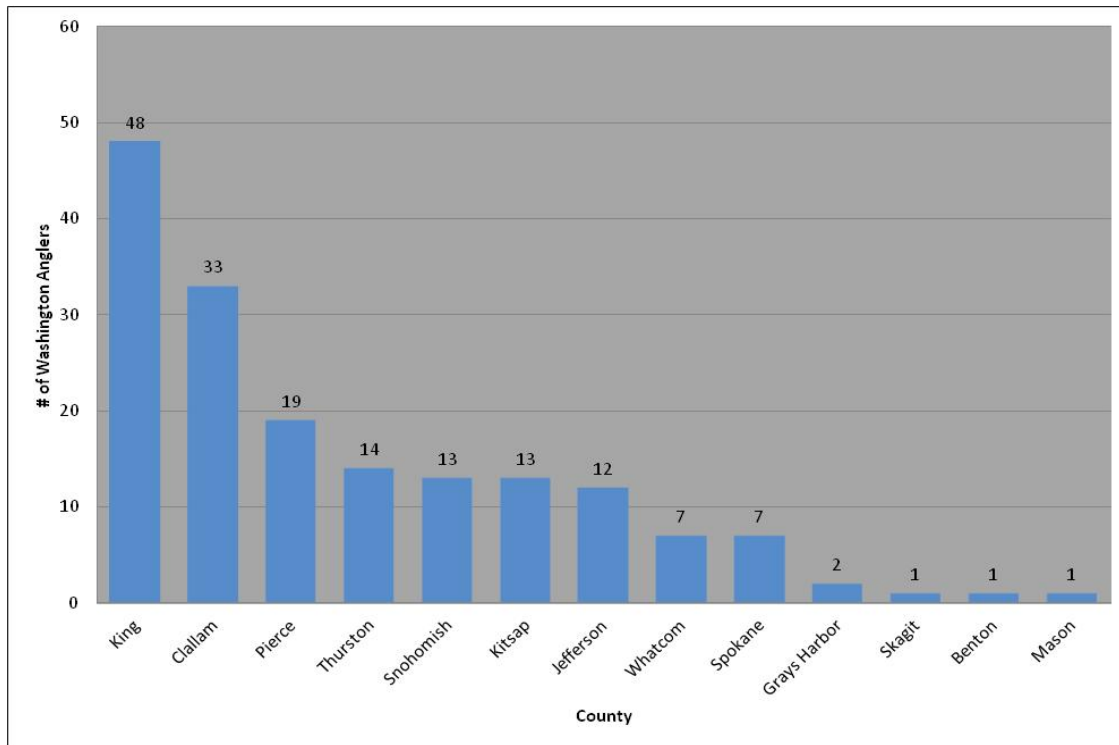


Figure 33. County of residence for Washington anglers on the Hoh River based on interviews conducted from January, 2010 to April 2011 (n=171 anglers).

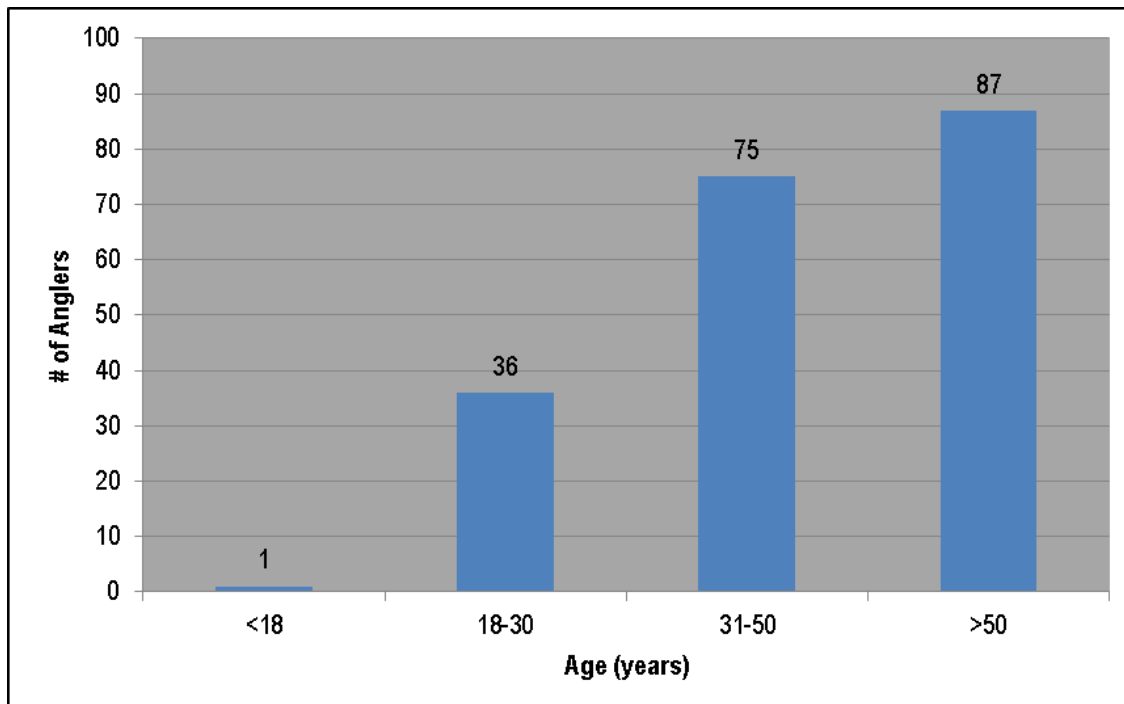


Figure 34. Age distribution of anglers fishing the Hoh River based on interviews conducted from January, 2010 to April 2011 (n=199 anglers).

Ninety percent of the anglers interviewed on the Hoh River preferred catch-and-release fishing; only 4% preferred to retain wild fish. Some angler (3%) preferences on release or retention were dependent upon the fishing season, river, or fish species (Figure 35). Of all anglers interviewed on the Hoh River, 28% belonged to fishing organizations. The most popular fishing organizations were Trout Unlimited (TU) and the Wild Steelhead Coalition (WSC).

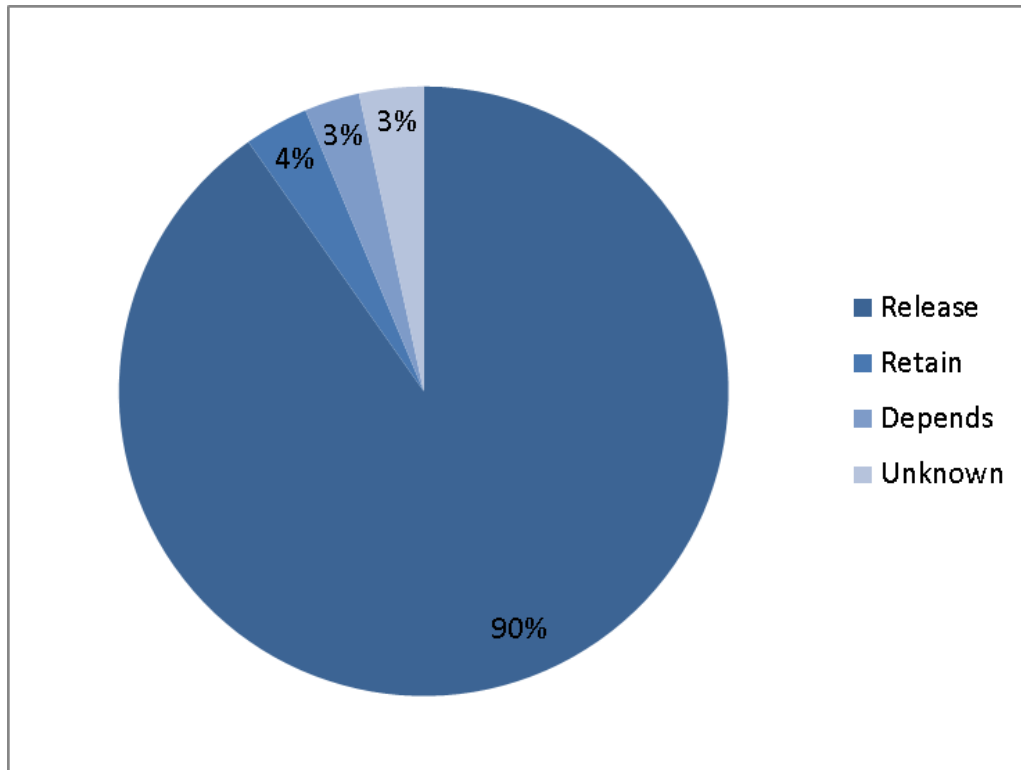


Figure 35. Angler preference for releasing or retaining wild fish on the Hoh River based on interviews conducted from January, 2010 to April, 2011 (n=205 anglers).

Catch and Effort Information

Hoh anglers used a variety of different fishing gear types. Even though sections of the Hoh River were restricted fly-fishing only the survey area also contained areas open to multiple gear types (Appendix A). Fly-fishing was the most popular gear choice (77% of anglers) followed by lures (22%), a combination of gear types (1%) and plugs (0.5%) (Figure 36). Of the total of 205 anglers interviewed on the Hoh River, only one angler was employing a fishing guide.

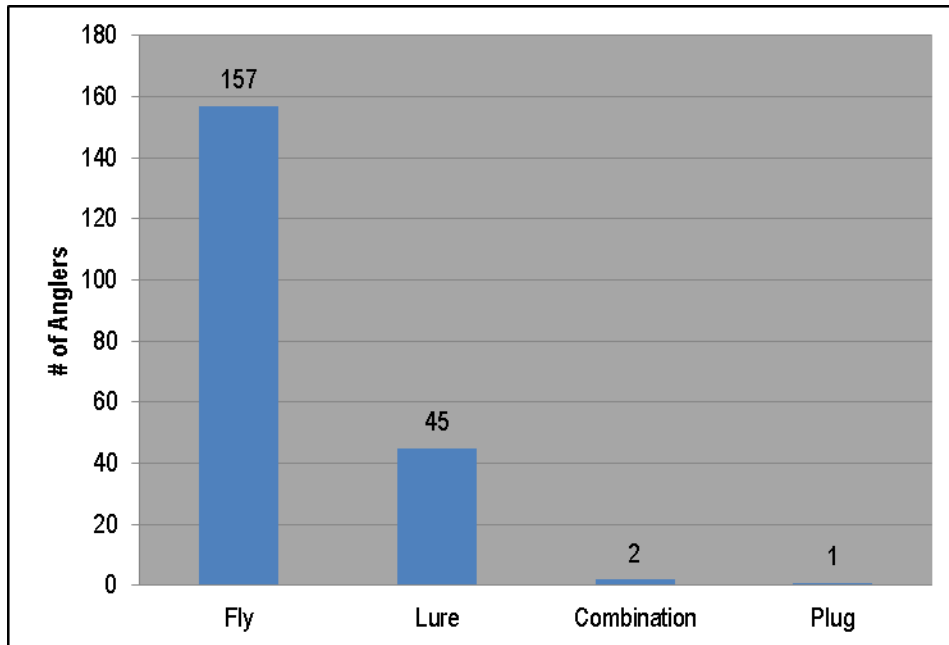


Figure 36. Gear types used on the Hoh River based on interviews conducted from January, 2010 to April, 2011 (n=205 anglers).

During interviews anglers were asked about both target and non-target fish species. A total of seven different fish species were caught during the study period, two of which were non-target species (Figure 37). Steelhead was the most common fish targeted with 94% of anglers fishing specifically for steelhead. Steelhead made up 54% of the total catch on the Hoh River during our study period (Table 5). The most common non-target species caught was bull trout. Incidental bull trout catch made up 29% of the total catch and mountain whitefish comprised 3%.

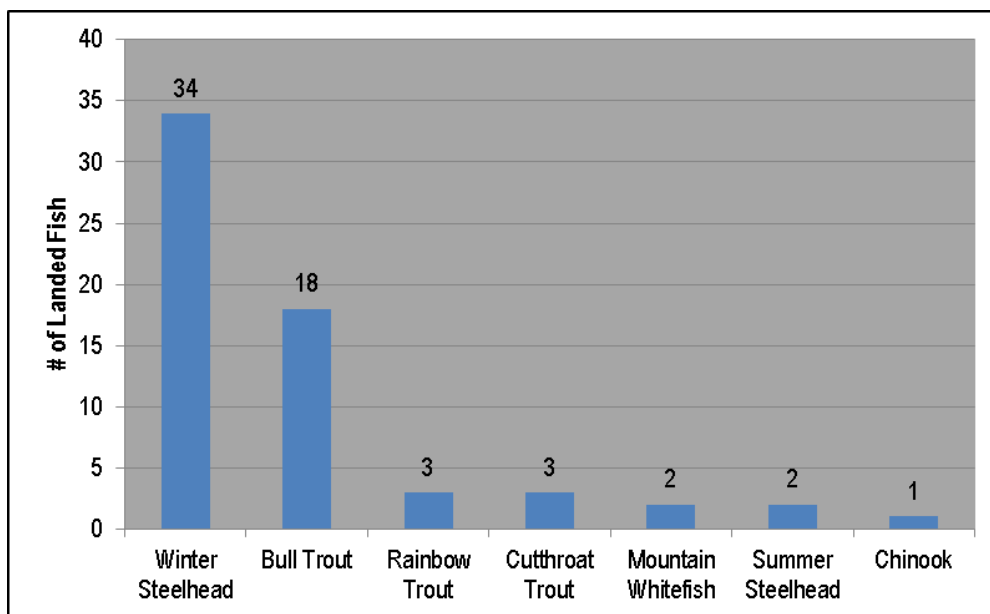


Figure 37. Numbers of each fish species captured in the upper Hoh River sport fishery from 2010 to 2011 (n=63 fish).

Table 5. Numbers of marked and unmarked winter steelhead released and harvested by month in the upper Hoh River in Olympic National Park, 2010 to 2011.

	Month	Estimated Hours of Effort	Marked Steelhead Released	Unmarked Steelhead Released	Total Steelhead Released	Marked Steelhead Harvested	Unmarked Steelhead Harvested	Total Steelhead Harvested
2010	January	42.4	0	1	1	0	0	0
	February	124.2	1	6	7	0	0	0
	March	151.3	0	5	5	0	0	0
	April	37.8	0	4	4	0	0	0
2011	February	123.1	0	10	10	1	0	1
	March	73.4	0	4	4	0	0	0
	April	20.8	0	3	3	0	0	0

Lake Crescent

During the summer of 2010 and 2011, 162 fishermen were interviewed on Lake Crescent based on opportunistic roving creel surveys during limited days. Those anglers spent a total of 358 hours fishing the lake.

Demographic Information

We interviewed anglers from the U.S. and Canada. Of those anglers who lived in the U.S., 83% were from Washington State. Anglers from Oregon (5%) and California (4%) were the next most frequently interviewed (Figure 38). Washington anglers came from 16 different counties, with the highest percentages in Clallam (49%), Kitsap (14%) and King (11%) counties (Figure 39). Eighty seven percent of anglers were male and 14% of all anglers were 18-30 years old, 31% were 31-49 years old, and 50% were over 50 years of age (Figure 40).

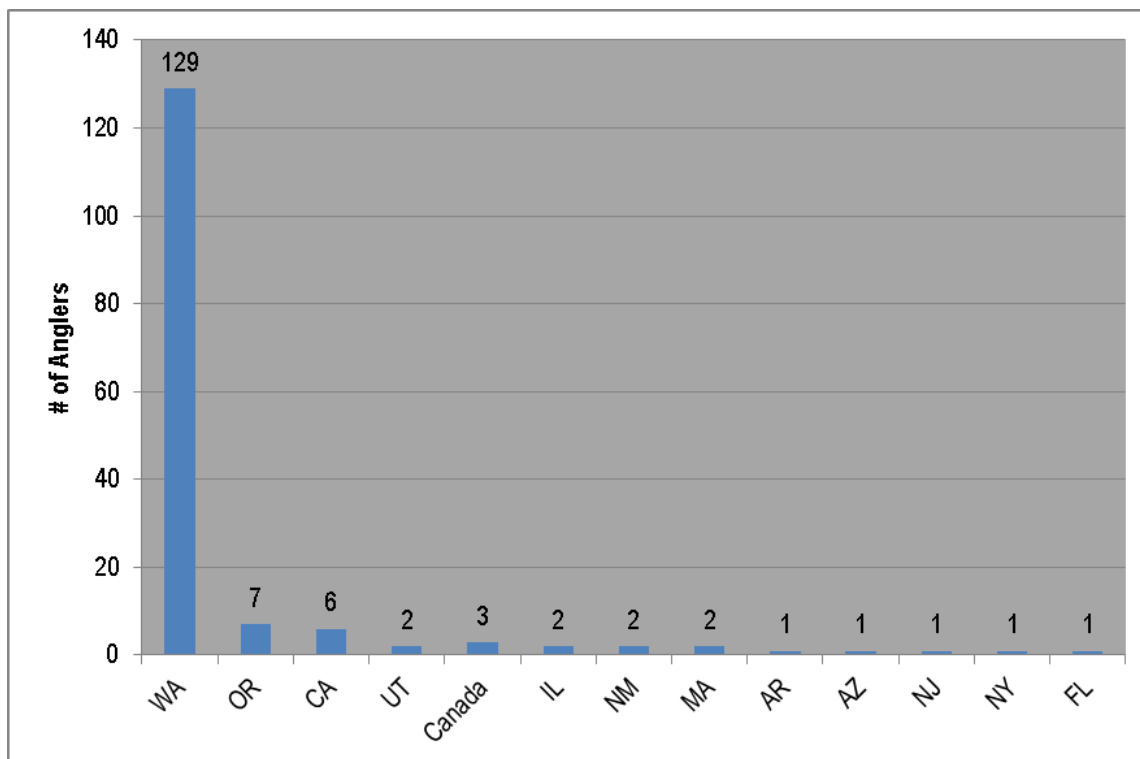


Figure 38. Angler state in the United States or country of residence on Lake Crescent based on interviews conducted in summers of 2010 and 2011 (n=158 anglers).

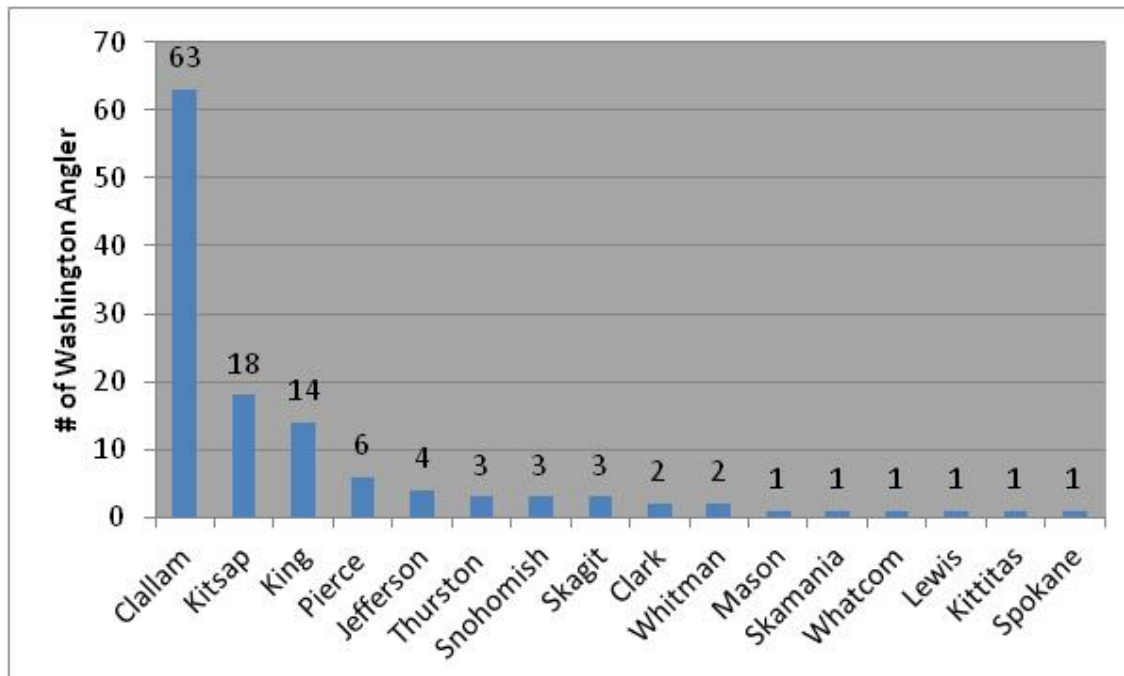


Figure 39. County of residence for Washington anglers on Lake Crescent based on interviews conducted in the summers of 2010 and 2011 (n=124 anglers).

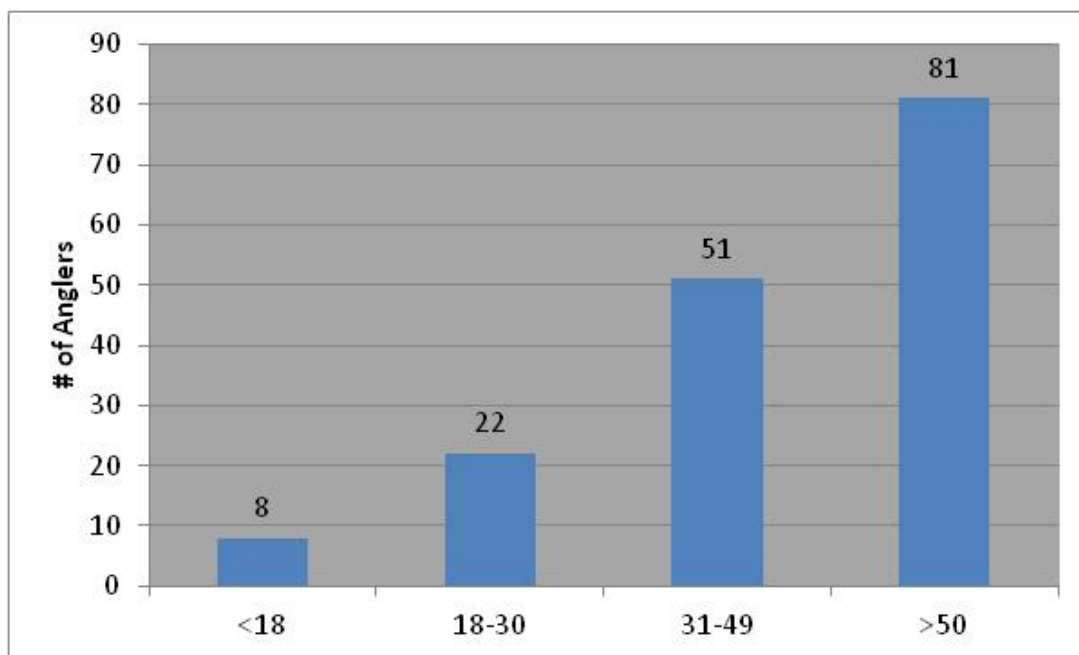


Figure 40. Age distribution of anglers fishing Lake Crescent based on interviews conducted in the summers of 2010 and 2011 (n=162 anglers).

The majority of anglers interviewed on Lake Crescent preferred catch-and-release fishing (80%), compared with 8% that preferred to retain caught fish. Some anglers (12%) release or retention preference was dependent on the situation (Figure 41). Of all anglers interviewed on Lake Crescent, 13% belonged to fishing organizations. The most popular fishing organizations were Olympic Peninsula Fly Fishers, Trout Unlimited (TU), and Graywolf Flyfishing Club.

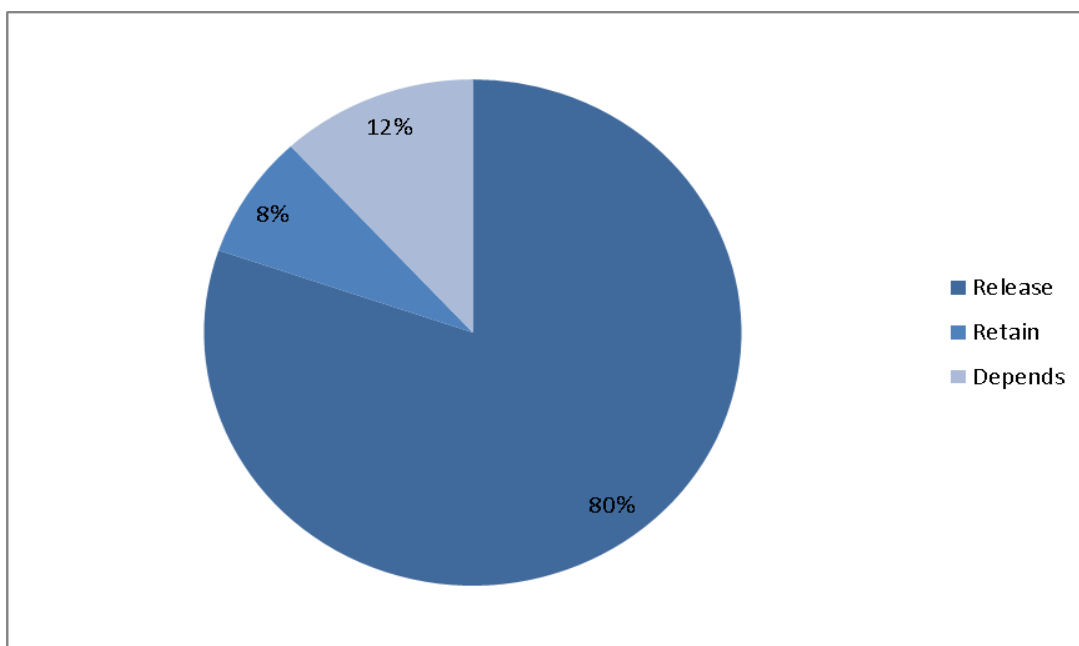


Figure 41. Angler preference for releasing or retaining wild fish on Lake Crescent based on interviews conducted during the summers of 2010 and 2011 (n=152 anglers).

Catch and Effort Information

Anglers may access Lake Crescent either by bank fishing or fishing from a boat. In the summer of 2010, 51% of anglers fished from a boat, 46% were bank fisherman and 3% used both bank and boat access (Figure 42). The majority (67%) of the anglers interviewed was fishing with lures, 24% were fly fishing and 11% were using a combination of gear types. One angler was observed using fishing illegally with bait (Figure 43).

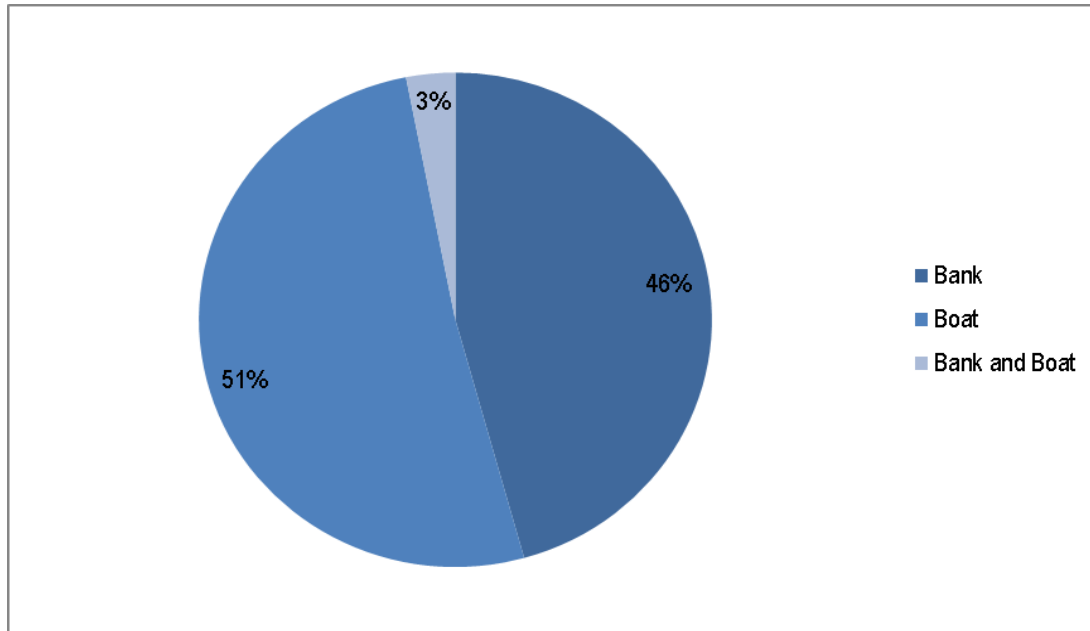


Figure 42. Proportion of boat versus bank anglers on Lake Crescent based on interviews conducted in the summers of 2010 and 2011 (n=162 anglers).

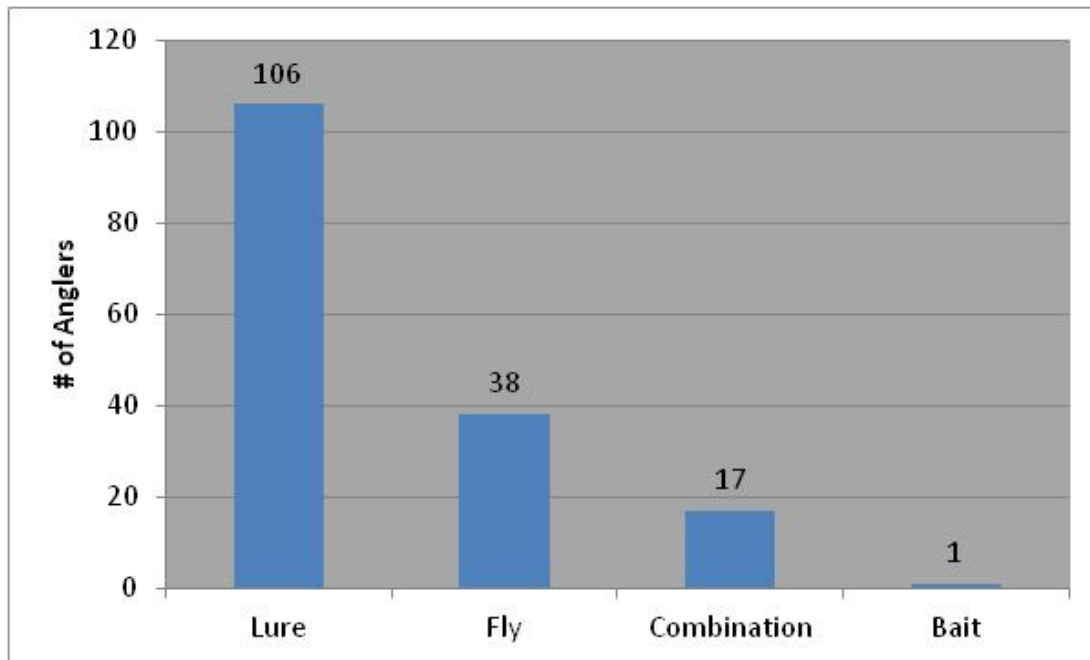


Figure 43. Gear types used on Lake Crescent based on interviews during the summers of 2010 and 2011 (n=162 anglers).

Based on the 162 anglers interviewed on Lake Crescent during the summer seasons of 2010 and 2011, 275 fish were caught. Beardslee and cutthroat trout accounted for 93% of the catch (estimated at 50% and 43%, respectively); other species included kokanee at 4% and sculpin at 0.4% (Figure 44).

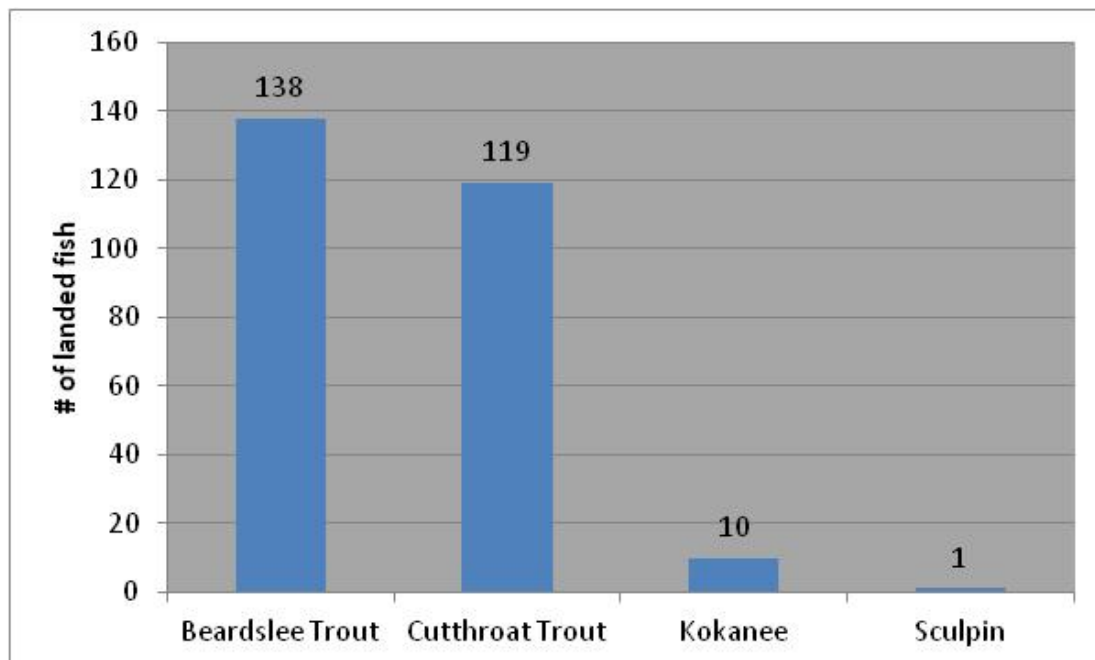


Figure 44. Numbers of each fish species captured in the Lake Crescent sport fishery based on interviews in summers of 2010 and 2011 (n=268 fish).

Discussion

All Rivers

The objectives of this project were to assess angler demographics, quantify fishing pressure, estimate fishing effort and catch, and understand the incidental catch of federally threatened bull trout in high priority watersheds in Olympic National Park (OLYM).

Demographic

Even though we expected that most OLYM anglers in the area surveyed would be from Washington, our results revealed that anglers came from seven different countries and 33 U.S. states.

Understanding the client base within the Park is important to Park biologists on how best to disseminate fishing regulations to Park visitors and is important to Park interpreters for interacting with specific user groups.

Although the intent of this report was to highlight catch and demographic information within each watershed, there were a few differences among watersheds worth noting. Washington residents were the most commonly interviewed anglers on all three rivers. Of those anglers, 55% of Lake Crescent anglers were from nearby Olympic Peninsula counties. The Hoh and Queets River each had only 28% of Washington anglers from Olympic Peninsula counties. The Queets River anglers were from mostly from Puget Sound counties (63%) as were those on the Hoh River (56%), followed by Lake Crescent (24%) This suggests that the Hoh and Queets Rivers draw anglers from farther distances than Lake Crescent which tends to be utilized by a more localized group. Increased local angler numbers at Lake Crescent may also be explained by its proximity to Port Angeles and fishing by lakeside residents.

Hoh River anglers showed a marked preference for fly fishing (77% anglers) compared to those on Lake Crescent (24%) and the Queets (15%) (Figures 24, 34, and 41). On the Hoh River, 90% of anglers interviewed also expressed a preference for releasing rather than retaining wild fish compared to 80% on Lake Crescent and 59% on the Queets River. However, the survey results on a catch-and-release fishery and interest in fly fishing by Hoh River anglers may have been influenced by the survey location, much of which was designated as a fly-fishing-only area.

Fisheries managers and staff are often confronted with negative feedback on fishing regulations, so the high “approval” rating (77% satisfaction) of the fishing regulations and awareness of the NPS jurisdiction was unexpected. As managers continue to design regulations based on best available science, the survey results give managers reassurance that the public supports management decisions.

Effort

Survey effort was most concentrated on the Queets, which was found to be more heavily utilized for fishing than other Park rivers. As a result of increased survey efforts in the Queets, park wide results are heavily weighted by the results from interviews in that river. In addition to differing fish species among watersheds, sport fishing use also differs between locations. This knowledge can help managers craft regulations specific to individual locations that balance conservation with recreational fishing activities.

Catch

Bull trout made up 5% of the total catch with a total of 162 individual bull trout caught and released by interviewed anglers. As bull trout are listed as threatened under the Endangered Species Act, all incidental catch is relevant information for fisheries managers.

Due to the difficulty of differentiating between Beardslee and Crescenti trout from Lake Crescent, identification of these species by anglers may be inaccurate. We presented data from identifications made by individual anglers and thus acknowledge that the species results presented from Lake Crescent may be off.

Queets River

Demographic

Although 59% of all the Queets/Salmon river anglers preferred catch-and-release of wild fish, angler retention preferences varied throughout the season and were more prevalent during harvest oriented seasons (Figure 20). The preference for catch-and-release fishing was lowest during the winter months (29%) when hatchery steelhead were targeted (Nov to Dec) and higher (92%) when wild steelhead were the primary population in the river (January-April). This preference for catch-and-release during the non-harvest season is most likely attributed to sport anglers who prefer to release wild fish choosing to fish within the Park where retention is prohibited. During this same time anglers that prefer to retain wild fish species can choose to fish outside of the Park where limited retention is permitted.

Effort

The Queets River received intensive fishing pressure with 2,993 anglers fishing for a total of 18,981 hours. The peak in angler hours occurred in December in all three years. We were surprised to see that there was a notable consistency of days deemed “fishable” among the three years with 133, 139, and 137 fishable days in the 2009-10, 2010-11 and 2011-12 seasons respectively. River conditions are frequently variable and it was initially expected that each year would have notably different number of days that would allow anglers to fish.

During the 2011-12 fishing season, although survey effort by interviewers remained similar to that of previous years and fishing conditions were consistent, more anglers were interviewed and anglers reported fishing more hours than in the previous two fishing seasons combined. This is most likely explained by anglers catching a greater abundance of fish and passing this information on to other anglers thereby increasing the crowds and fishing effort.

Anglers had opportunities to fish from both the bank and boat on the Queets River. The percentage of bank and boat anglers varied throughout the study period as the fishing seasons changed. In November and December during the hatchery steelhead season, anglers spent more time fishing from the bank. During this time fish pass through the Queets River and enter the Salmon River which is only accessibly by bank. Later in the spring when the wild steelhead fishery is occurring and the Salmon River is closed to salmon and steelhead fishing, angler preference switches to boat based fishing (Figure 23). This is likely due to many areas of the Queets River being inaccessible to bank

fisherman. Only 9% of anglers reported being on a guided fishing trip during interviews, this number is most likely higher than reported as it is believed that illegal guiding is common on the Queets River.

Catch

Despite high ecological, recreational, and cultural values, managers have little information to evaluate catch levels of sport fishing in OLYM. Fishing pressure poses threats to the persistence of wild and federally threatened fish in OLYM, quantifying the extent of this pressure and certain runs of fish is imperative to the management of these species. Those species with the greatest fishing popularity are thereby those with the greatest management concerns. Steelhead was the most targeted and most caught fish species in the Queets River with 85% of anglers targeting these fish. This was expected based on: 1) their popularity as a sport fish and the well-known winter steelhead fishing opportunities that OLYM rivers provide; and 2) the timing and frequency of surveys that overlapped directly with steelhead fishing season. Chinook and coho salmon were the next most frequently targeted and caught fish species in the Queets River. Understanding the extent of catch by sport anglers allows for comparisons with catches in commercial fisheries in the Queets River.

The steelhead catch on the Queets River was dominated by hatchery fish (65%) over the three years. These hatchery fish are mostly from the Quinault Indian Nation fish hatchery at river mile four on the Salmon River. Over the last decades, extensive tribal hatchery operations have released millions of salmonids into the Queets River to enhance recreational and commercial fisheries. Each year, Quinault Indian Nation releases ~1,000,000 hatchery salmonids from the Salmon River Hatchery into the Queets River including 650,000 coho, 200,000 fall Chinook, and 150,000 winter steelhead.

Hatchery fish, through inevitable straying and interbreeding with wild fish, reduce fitness, spread infectious diseases, and reduce genetic differentiation among wild populations (Chilcote 1986, Reisenbichler 1977). These hatchery fish are also harvested at higher rates than can be sustained by wild stocks. One unfortunate consequence of continued hatchery releases is that over time it can be seen as acceptable to sacrifice productivity and integrity of wild populations so long as hatcheries compensate for the loss.

On the Queets River, winter steelhead catch favoring female over male fish is especially interesting. In Olympic Peninsula fisheries management, run calculations are based on the assumption that each run of fish is comprised of equal parts male and female fish. These data may suggest that female fish are more prevalent than male fish. However, it is possible that behavioral differences between males and females cause female steelhead to be more likely to be caught by sport fisherman. This could be due to the timing of fishing pressure intersection with a time when more females are moving through the river or that different gear types may be more appealing to female steelhead than to males. These data highlight a need for future analysis of sex ratios on a river by river basis to improve methods of estimating numbers of fish returning to spawn.

Management Implications

The information obtained in this study will allow OLYM biologists the opportunity for increased communication with cooperative State and tribal managers. In particular, the information will allow

for the comparison of OLYM fishing pressure with similar information collected by the state via angler interviews and punch cards, thus providing the State with more comprehensive baseline information to manage fishery resources. In addition, this study allows managers to better understand and predict pressures on fishery resources (timing, which drainages, which species, etc.) by using the demographics and angler catch and effort results from key park watersheds, including specific information on spatial and temporal fishing pressures.

Data Limitations

As the results in this study are used in management decisions, we think that it is important to consider the inherent biases that routinely occur during creel (catch) interviews. These biases have been identified in different studies of the same nature (Pollock 1997, Mallison 2004), and although effort was made to reduce bias in this study the presence of said bias is still recognized. These interviews are based upon the assumption that anglers are accurately and honestly reporting the catch and other events of day. Misinformation whether intentional or not is likely to be present in these types of data sets. Some anglers may not remember non-target catch at time of interview; some anglers may choose to be dishonest because of illegal fishing activities (i.e. gear choice) or others may inflate/deflate the number of fish landed, etc. Analysis of information collected in angler interviews relies upon the assumption of honest reporting.

Recommendations for Future Work

We recommend future creel studies define questions carefully, being sure to ask very specific questions regarding catch. Anglers were not specifically asked about bull trout or other non-target catch; rather, they were asked what they caught. The high importance of salmon and steelhead catch to anglers' personal experience may have led them to view these fish as the only fish being asked about. We suggest listing all probably non-target species to the anglers to remind them that surveyors are interested in all fish caught during fishing hours.

At Olympic National Park this project served to highlight the Queets River as a river in need of regular and future monitoring based on levels of fishing pressure witnessed during surveys. The widespread interest and notable amount of fishing pressure has the potential to impact important runs of wild fish that the Park is mandated to protect under the Organic Act. It is important that managers use current data to inform fishing regulations so that they may properly and effectively protect native fish.

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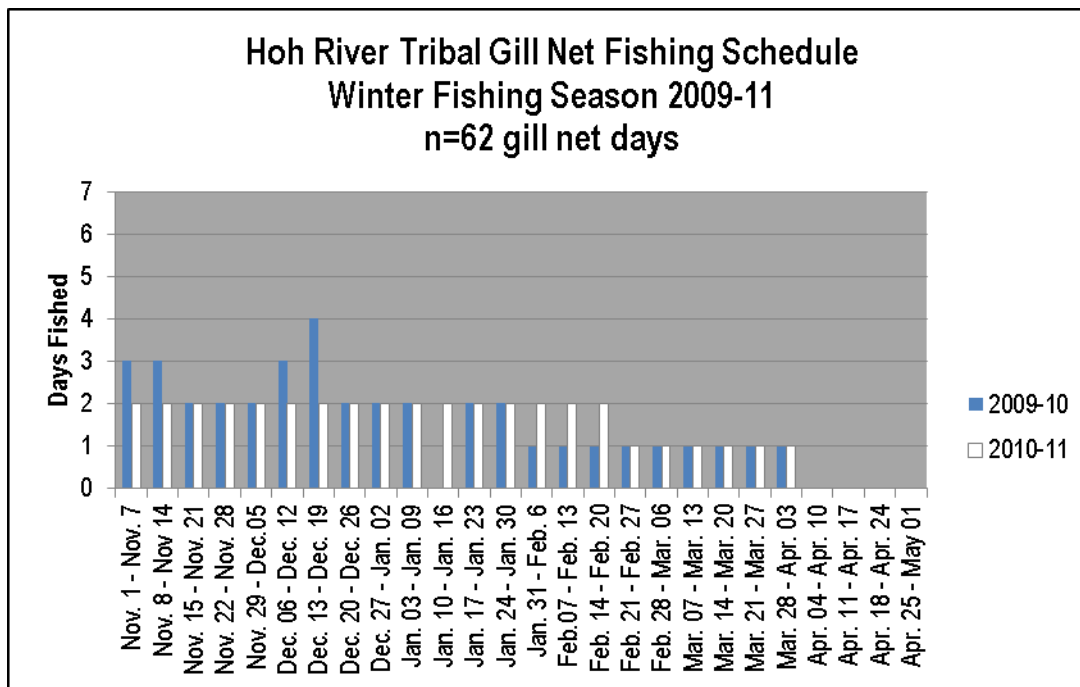
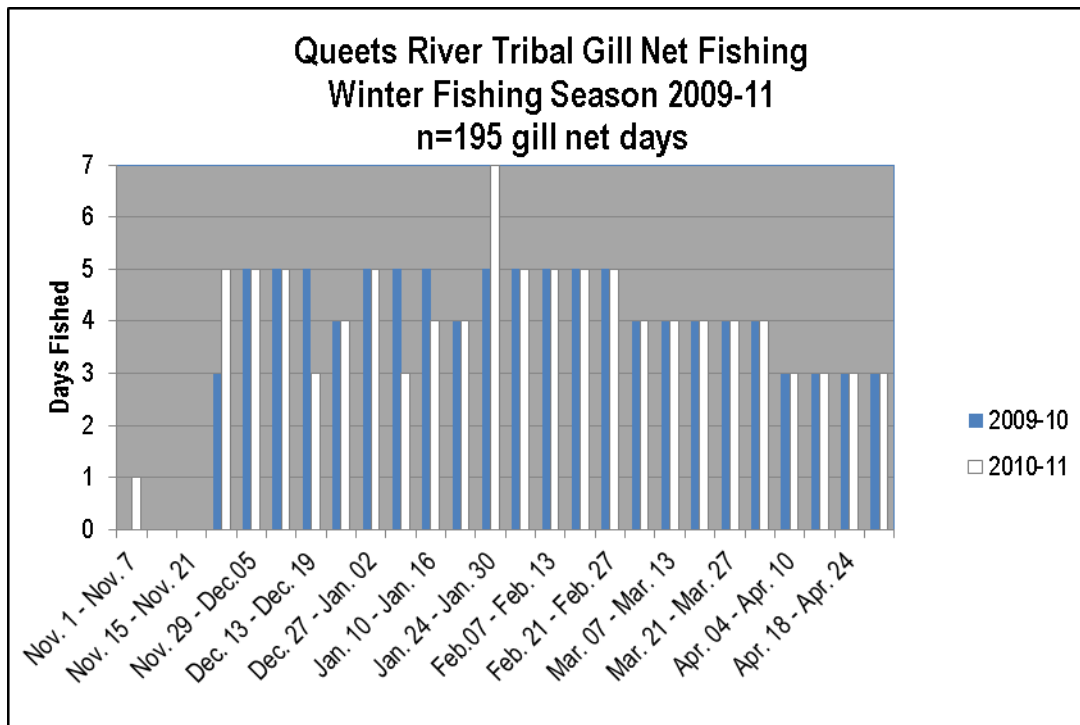
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Appendix A. Olympic National Park Fishing Regulations.

Drainage		Species	Season	Gear	Daily Limit
Skokomish, North Fork		All Species	June 1 - Sept. 15	Artificial Lure with barbless single point hook	Catch & release
Queets River	Mainstem, Below Harzel Boat Launch	Salmon	Sept. 1 -Nov. 30	Bait, treble and barbed hooks allowed	Can retain 2 hatchery or wild coho. Release ALL wild Chinook
		Steelhead	June 1 - Aug 31	Artificial Lure with barbless single point hook	Catch & release. Can retain 2 adipose clipped hatchery steelhead
			Sept. 1 - Nov 14	Bait, treble and barbed hooks allowed	Can retain 2 adipose clipped hatchery steelhead
			Nov. 15 - Feb. 28	Bait, treble and barbed hooks allowed	Can retain 2 total hatchery steelhead (adipose clipped, ventral clipped, or with dorsal fin height less than 2 1/8 inches)
			Mar. 1 - Apr. 15	Artificial Lure with barbless single point hook	Can retain 2 adipose clipped hatchery steelhead
		All other Species	June 1 - Apr. 15	All season: Artificial Lure with barbless single point hook Sept. 1 - Feb 28: Bait, treble and barbed hooks allowed	Catch & release
	Mainstem, Above Hartzel Boat Launch	All Species	June 1 - Apr. 15	Artificial Lure with barbless single point hook	Catch and release. Can retain 2 adipose clipped hatchery steelhead. From Nov. 15- Feb 28, can retain 2 hatchery steelhad (adipose clipped, ventral clipped, or with dorsal fin height less than 2 1/8 inches
	Salmon River	Salmon	Sept. 1 - Nov 30	Bait, treble and barbed hooks allowed	Can retain up to 3 coho. Release wild Chinook
		Steelhead	June 1 - Aug. 31	Artificial Lure with barbless single point hook	Catch & release. Can retain 2 adipose clipped hatchery Steelhead
			Sept. 1 - Nov. 14	Bait, treble and barbed hooks allowed	Can retain 2 adipose clipped hatchery steelhead
			Nov. 15 - Feb. 28	Bait, treble and barbed hooks allowed	Can retain 2 total hatchery steelhead (adipose clipped, ventral clipped, or with dorsal fin height less than 2 1/8 inches)
		All other Species		All season: Artificial Lure with barbless single point hook Sept. 1 - Feb 28: Bait, treble and barbed hooks allowed	Catch & release
Hoh River (and South Fork Hoh River)		All Species	June 1 - April 15	Artificial Lure with barbless single point hook Fly fishing ONLY 1/4 mile below Hoh campground to boat launch above South Fork Hoh confluence	Catch & release Except can retain 2 hatchery steelhead
Lake Crescent		All Species	June 1 - Oct. 31	Artificial lures with barbless single point hook; 2 ounce weight restriction	Catch & release
Elwha River		All Species	Last Saturday in April to Oct 31	Artificial lure with barbless single point hook	Catch & release

*Elwha River closed to fishing in March, 2012.

Appendix B. Tribal Gill Net Fishing Days.



Appendix C. Angler Survey Form.

River Angler Survey Form – Olympic National Park

Interviewer:_____

Weather:_____

Page __ of __

Date (mm/dd/yy):_____

Riverflow:_____ cfs Visibility(ft): <1 1-2 2-3 3-4 4-5 >5

I-C-1

I. Angler Information-One Line/Angler or Fish Leave a Blank Line Between Parties										II. Catch Details									
Angler Number (Sequential by date)	River Section	(A)dult or (J)uvenile	Boat (BT) or Bank (BK) Angler	# Vehicles (no bikes or motorcycles)	Time Started Fishing	Time of Interview	Completed Trip (Y/N)	Gear Type: (B)ait, (F)ly, (L)ure, (P)lug, (C)ombination	Guided Trip (Y/N)	Species Caught	Marks: (N)one, (A)d, (D)orsal, (V)entral	# Kept	# Released	Total Length (in)	Sex (M/F)	(H)atchery, (W)ild, or (U)ncnown	Genetic Sample no.	Comments	

Boat anglers = **BT**, Bank anglers = **BK**; **Gear Codes**: (B)ait; (L)ure (spinners, spoons, corkies, jigs); (F)lyfishing; (P)lugs (trolled or cast); (C)ombination.
Species Codes: **WSH**=winter steelhead; **COHO**=coho/silver; **CHIN**=Chinook/king; **SSH**=summer steelhead; **DV/BT**=Dolly Varden/Bull trout; **RBT**=rainbow trout; **CTT**=cutthroat trout; **WHF**=mountain whitefish.

River Angler Survey Form – Olympic National Park

Interviewer: _____

Weather: _____

Date (mm/dd/yy): _____

Riverflow: _____ cfs Visibility(ft): <1 1-2 2-3 3-4 4-5 >5

C-2

I. Angler Information-One Line/Angler Leave a Blank Line Between Parties									II. Demographic Information								
Angler Number (Sequential by date)	River Section	Previously interviewed by NPS this season on this river (Y/N)?	Target Fish Species	(M)ale / (F)emale	Aware river managed by NPS	*Estimate Age	State of Residence or Canadian Province	County of Residence	# of fishing trips to OLYM each year?	# years fishing?	# years fishing in OLYM?	Do you prefer catch- and-release or to keep wild fish?	Have you seen a copy of the park fishing regulations?	**If yes, how satisfied are you	Do you belong to a fishing	***Were you expecting to see more people fishing	Comments:

*Age Estimate (A=18-29) (B=30-49) (C= >50)
 ** (S)atisfied, (I)ndifferent, (U)nsatisfied
 *** (L)ess crowded/**Yes**, (S)ame, (M)ore/**No**, (U)nknown

Appendix D. Photographs.



Multiple bank anglers fishing in the Queets River, Olympic National Park.



Angler interview being conducted at the Lake Crescent boat ramp Olympic National Park.



Photo of a guided fishing trip in the Hoh River.



Hatchery winter steelhead caught in the upper Hoh River, Olympic National Park.



Female winter steelhead caught in the Hoh River (Photo credit: John McMillan).



Parking area during periods of high sport fishing pressure in Salmon River, December 2011.



Wild winter steelhead captured in the Hoh River.

The Department of the Interior protects and manages the nation's natural resources and cultural heritage; provides scientific and other information about those resources; and honors its special responsibilities to American Indians, Alaska Natives, and affiliated Island Communities.

NPS 149/123109, December 2013

National Park Service
U.S. Department of the Interior



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