Puyallup Tribal Fisheries

2014-2015

Annual Salmon, Steelhead, and Bull Trout Report:

Puyallup/White River Watershed
Water Resource Inventory Area 10

September 2015

The following annual report is the culmination of nearly a year of extensive field work and research. Project funding was provided though the Pacific Coast Salmon Recover Fund (PCSRF), B.I.A 638, Pacific Salmon Treaty, Forest and Fish, TFW, Puyallup Tribal Funding, and the Puget Sound Energy Electron settlement fund.

The updated written material and data contained in this report supersedes and replaces all previous annual reports. While the authors believe everything in this report is accurate, the reader should not presume and should confirm the information in this report from other sources.

This report is available for download at http://nwifc.org/publications/tribal-technical-reports/.

Suggested citation format:

Marks, E. L., R.C. Ladley, B.E. Smith, A.G. Berger, J.A. Paul, T.G. Sebastian and K. Williamson. 2015. 2014-2015 Annual Salmon, Steelhead, and Bull Trout Report: Puyallup/White River Watershed--Water Resource Inventory Area 10. Puyallup Tribal Fisheries, Puyallup, WA.

2014-2015

Annual Salmon, Steelhead, and Bull Trout Report:

Puyallup/White River Watershed
Water Resource Inventory Area 10

Eric L. Marks
Russell C. Ladley
Blake E. Smith
Andrew G. Berger
Justin A. Paul
Terry G. Sebastian
Puyallup Tribe Fisheries Division

Kristin Williamson
South Puget Sound Salmon Enhancement Group

Puyallup Tribe of Indians
6824 Pioneer Way E.
Puyallup, Washington 98371

If we do not own the freshness of the air and the sparkle of the water, how can you buy them?

~ Chief Seattle ~

TABLE OF CONTENTS

Introduction

Watershed Rivers, Streams and Projects

TABLE OF CONTENTS

Watershed Rivers, Streams and Projects *(Continued)*

TABLE OF CONTENTS

Appendices

INTRODUCTION

Puyallup/White River Watershed

The Puyallup/White River Watershed is identified as Watershed Resource Inventory Area 10 (WRIA 10) by the Washington State Department of Ecology. Hylebos and Wapato creeks are part of WRIA 10, yet are independent drainages that flow directly into Commencement Bay. The Puyallup/White River Watershed provides over 1,300 linear river miles (RM) of drainage over an area greater than 1,000 square miles. The three major river drainages are the Puyallup, White, and Carbon rivers which flow almost entirely within Pierce County; as well as part of South King County. All three river systems originate from north and west slope glaciers located on Mt. Rainier. The Carbon and White rivers converge with the Puyallup River at RM 17.8 and RM 10.4 respectively.

The White River is a significant tributary to the Puyallup River, with a drainage area nearly twice that of the Puyallup. However, the White and Puyallup drainages are often viewed and managed as two distinct and separate entities. This management approach is due in part because prior to 1906, the White River did not flow into the Puyallup. Salo and Jagielo (1983) described that prior to 1906; the majority of the White River flowed north towards Elliot Bay. Despite this northern course, some of the water from the White often flowed south into the Puyallup through the Stuck River channel. In November of 1906, a flood event mobilized a tremendous amount of wood debris that blocked the north flowing channel in what is now downtown Auburn. The blockage forced the river to avulse and find a new channel. This newly created diversion sent nearly the entire White River flow down through the Stuck River channel into the Puyallup; more than doubling the size of the Puyallup River drainage. In 1915, a concrete structure was constructed; thereby, permanently diverting the White River into the Puyallup.

The Puyallup River continues flowing west from its confluence with the White River until it reaches Commencement Bay in the city of Tacoma. An extensive system of levees, approximately 90 miles, was constructed along the Puyallup, White, and Carbon rivers from the early through mid 20th century. Several significant fish bearing tributaries feed these mainstem rivers, including the Clearwater River, Greenwater River, Mowich River; as well as Huckleberry, Boise, and South Prairie creeks.

The mean annual flow of the Puyallup River over the first 86 year gauged history was 2,922 cfs. The largest flood on record was 57,000 cfs and occurred in December 1933. Most of the large flood events have occurred in the months of November and December in response to heavy rains on a substantial snow pack. The minimum low flow defined as the 90%-exceedance level for the Puyallup was 1,156 cfs. Over the past couple of decades there has been a trend of decreasing low flows (Sumioka 2004). The Puyallup River at Puyallup flow gage *(#12101500)* was activated in 1915 and is located at RM 6.6.

The Puyallup, White, Carbon, and Mowich rivers originate from glaciers located on Mt. Rainier; all conveying a tremendous volume of fluvial materials which contributes to the dynamic nature of the system. The high sediment loads are responsible for the braided channel morphology characteristic of broad unconfined valley segments which are quite prevalent throughout the upper reaches. Channel gradients in the upper basins are typically moderate, with a high riffle-low pool character. River and stream bedding consists mainly of Tertiary sedimentary rock and other products created by ancient volcanic activity. Substrate size within active river channels is typically large; consisting primarily of large gravels, cobble and boulders. Significant quantities of LWD are present within channel migration zones; however, a considerable amount of the larger wood which is deposited during high flow events and settles on the higher bars is detached from, or perched well above active channels during average flow regimes, thereby reducing any habitat creating interactions. Headwater tributaries are typically non-glacial and are characterized by confined steep valley channels with comparatively short, low-to-moderate gradient anadromous reaches.

The Puyallup River has been severely impacted by over a century of land and water resource exploitation, including damming and substantial water diversions; considerable riparian alterations; dewatering and low instream flow regimes; as well as, significant channel manipulation. These impacts have lead to a discernible deterioration in the land and hydrological behavior of this river system by causing water flow of poorer quality, quantity and timing. Several limiting factors have been recognized and accepted with regards to the healthy function of stream habitat and salmonid populations in the watershed. Limiting factors include lost or diminished habitat connectivity and migration corridors; fragmentation and reduction of habitat quality; diminished water quality; fish entrainment; entrapment; unknown species interactions and potential climate change impacts.

Downstream *(outside)* of the National Park boundaries, the Puyallup River courses through industrial forestlands, as well as National Forest land; but primarily through private timber company ownership's. As a result, a prolific transportation network of roads extends throughout the basin. The transportation network within the Upper Puyallup Basin consists almost entirely of unimproved roads developed and utilized primarily for timber harvesting; as well as, hunting, recreational activities, hydroelectric operations, and wildlife/fisheries applications. Road density in timber production areas may approach as much as six lineal miles per square mile. Current road networks and bridge emplacements along the Puyallup and Mowich rivers directly interact or alter the hydrology within the upper basin. Roads have contributed many of their trademark problems such as landslides, slope failures, altered hydrology; as well as, culvert and bridge projects which can effect upstream migration and increased levels of sedimentation within effected drainages.

Electron Hydro LLC's Electron diversion dam and headworks *(constructed in 1904*) is the only human-made obstruction preventing or disrupting migration of salmonids. The Electron project was sold by Puget Sound Energy *(PSE)*, and ownership transferred to Electron Hydro LLC in the fall of 2014. The project can divert up to 400 cfs. of water *(currently unscreened)* from the Puyallup River at river mile 41.7. This structure/operation contributes, in whole or in part, toward many of the impact issues previously stated. In the fall of 2000, Puget Sound Energy and the Puyallup Tribe completed construction of a 1.1 million dollar fish ladder circumventing the diversion; thereby restoring anadromous fish passage for the first time since 1904. There are no known barriers above the diversion preventing fish from migrating throughout the upper basin. To insure habitat connectivity and migratory accessibility for bull trout and other salmonids, minimum in-stream flows below the Electron diversion were established in 1997 through a Resource Enhancement Agreement (REA) with Puget Sound Energy (Puyallup Tribe of Indians and Puget Sound Energy 1997). The project continues to operate under the REA agreement and Puget Sound Energy since no sale or transfer agreement with Electron Hydro LLC was made with the Puyallup Tribe.

The long-standing presence of private industry, primarily hydroelectric and commercial timber harvesting; in addition to, the repercussions of recreational usage and negative air and water quality, have all created lasting impacts on the upper watershed. These impacts include; loss of in-stream large woody debris and LWD recruitment; stream bank modifications; increased sedimentation issues and slope failures due to deforestation; unsatisfactory RMZ management; new road construction; road failures, and road decommissioning or abandonment. A great deal of the forestland throughout the Upper Puyallup Basin has been harvested at least once, and in many instances twice; leading to many of the wide-ranging issues common with deforestation. Air and water quality issues vary from measurable levels of airborne contaminants which have been detected in Mt. Rainier National Park; including heavy metals and pesticides discovered in samples of snow, soil and fish (Landers et al. 2008).

Watershed Salmonids

The Puyallup/White River Watershed supports several species of native salmonids, including Chinook *(Oncorhychus tshawytscha)*, coho *(O. kisutch)*, chum *(O. keta)*, pink *(O. gorbuscha)*, sockeye *(O. nerka)*, steelhead/rainbow trout *(O. mykiss)*, cutthroat trout *(O. clarki)*, bull trout *(Salvelinus confluentus)*, mountain whitefish (*Prosopium williamsoni*); as well as non-native brook trout *(S. fontinalis)* and brown trout (*Salmo trutta).* Puget Sound Chinook and coastal-Puget Sound bull trout are currently listed as "threatened" under the U.S. Federal Endangered Species Act (ESA). In May of 2007, after a year of investigation, the National Marine Fisheries Service (NMFS) announced the listing of Puget Sound steelhead as "threatened" under ESA. The ESA listing of steelhead offers protection for naturally spawned steelhead; however, it does not offer protection for rainbow trout, the fresh water resident form of the species.

Each of the eight Pacific salmonid species present in the Puyallup/White River system exhibits unique life-history strategies. However, the five major Pacific salmon species *(Chinook, coho, chum, pink, and sockeye)* all share some common life-history characteristics. Pacific salmon are all anadromous; meaning, fish spawn and reside in fresh water; however, the instream residence time varies considerably by and within species. Salmon will eventually emigrate *(smoltification)* to marine waters where they will continue to forage and grow until they return to fresh water as sexually mature adults to reproduce. Furthermore, these species will only reproduce once *(semelparous)* during their life cycle. This single reproductive event requires tremendous amounts of energy and effort, as well as proper spawning site selection to be successful. Therefore, the end result of this reproductive strategy is that all five major species of Pacific salmon will die as a result of this reproductive process. Nevertheless, this sole reproductive strategy is very successful due to the considerable degree of energy put into producing vast amounts of gametes *(eggs and sperm)*, thus ensuring the survival of at least some offspring. Other salmonid species; such as steelhead, cutthroat, and bull trout, may reproduce more than once *(iteroparous)* during their life cycle.

All female salmonids are oviparous *(producing eggs that hatch outside the body)*, and during the act of spawning the male and female will release gametes in a simultaneous effort. Eggs released by the female drift to the bottom and are actively buried in the substrate creating an egg pocket. A redd is the excavated site formed in the substrate from multiple spawning events and typically contains several egg pockets. The rate of development and growth varies between species and is greatly influenced by water temperature (Piper et al. 1986; Groot and Margolis 1991). As fish age, they lay down annual growth rings on their scales; these scales are often collected to determine age, as well as important growth, environmental and life history factors.

Early Salmonid Development

During the act of spawning, males and females release gametes *(eggs and sperm)* in a synchronized effort. The fertilization of eggs occurs rather quickly. The membrane surrounding each egg is gas permeable and is initially quite malleable. Penetration of a single spermatozoon into the egg *(through the micropyle)* will create a reactionary process preventing the infiltration of additional spermatozoa. However, once eggs exit the female and are exposed to water, each egg will begin to take up water causing the internal pressure of the egg to increase and swell (Alderdice et al. 1984). This process causes the outer membrane of the egg to firm up or "water harden"; whereby, closing the micropyle and preventing fertilization in as little as 30 seconds (Groot and Margolis 1991). Once an egg is fertilized it goes through three phases of development prior to hatching *(cleavage, epiboly, and organogenesis)*. Some of the water properties influencing salmonid egg survival and development are temperature, dissolved oxygen, and velocity (McNeil 1966; Leman 1993; Peterson and Quinn 1996). The rate of development and growth varies between species, and is significantly influenced by water temperature (Piper et al. 1986; Beacham and Murray 1990; Groot and Margolis 1991). For example, coho salmon take 50 days to hatch in water that is 10°C *(50°F)*; other Pacific salmon species take between 47-65 days to hatch at the same temperature. Stream bed characteristics and water properties are additional factors that are imperative to the survival and development of salmonid eggs and larvae.

Upon hatching, young salmonid larvae *(alevins)* are not fully developed and are unable to feed; therefore, they remain within the interstitial spaces of the gravel substrate while continuing to grow and further develop. Young alevins do, however, posses a considerable yolk sack necessary to fuel their prolonged growth and developmental needs. Alevins are also relatively tolerant of dewatering and low dissolved oxygen levels for several hours after hatching. Although buried, developing alevins have a sense of up and down *(geotaxis)*, and if the substrate size allows, they will often migrate vertically and horizontally throughout the substrate depending on light stimulus *(Phototaxis)* and the level of dissolved oxygen available in the water (Heard 1964; Carey and Noakes 1981; Groot and Margolis 1991; Quinn 2005). Alevins will migrate toward the surface of the substrate when their yolk sacks are absorbed *(buttoned-up)*. Emergence of the newly *(or nearly)* buttoned-up fry occurs during the late winter and early spring; however, this emergence point is dependent on the species; as well as the spawn timing of the parents.

The duration of time newly emerged fry spend instream varies by species and within species *(see species descriptions for more information)*. Depending on the species, salmon fry will emigrate to marine waters within days or weeks upon emergence, or may remain in fresh water for an extensive period of time to rear *(several months or years)*. Both adaptive strategies have advantages and disadvantages in regards to growth and survival. Fish that emigrate early to more productive, and possibly warmer marine waters, will grow faster; yet, they face a higher rate of mortality due to their smaller size, as well as the substantial increase in predation. Fish that rear in fresh water will grow slower *(less available food, colder water)*, but face a lower predation risk, and will be larger *(lower mortality risk)* when they emigrate to the marine environment.

Anadromous salmon and steelhead will inevitably emigrate to marine waters *(smolts)*. For young migrating salmon and steelhead this process of "smoltification" is complex. Smolts will undergo behavioral; as well as, tremendous internal and/or external physiological changes including body metamorphosis, coloration and metabolic transformations. In addition, smolts must undergo the osmoregulation adaptations necessary to make the transition from a fresh water environment to a marine environment. The physiological process of osmoregulation involves the forceful governing of the osmotic pressure of bodily fluids in order to maintain internal stability, or homeostasis, of the body's water content. In the case of fish, it essentially prevents a fish's bodily fluid from becoming too dilute or too concentrated with salt. Fish in freshwater actively expel excess water to conserve salt; whereas fish in marine waters actively excrete salt to maintain homeostasis. This process of osmoregulation is critical when making the transition from fresh water to salt water, or when undertaking the reverse procedure. Fish, such as salmonids, with this ability to tolerate and adapt to such a wide range of salinity are known as euryhaline species. Fish that make the transition to the marine environment successfully may spend several months, or years, foraging and growing in the more productive marine waters before returning to freshwater to spawn.

Spawning Site Selection

Spawning site selection for salmonids is critical to insure offspring survival. Stream bed characteristics and water properties are important factors in the survival and development of salmonids eggs and larvae. Some of the water properties influencing salmonid egg survival and development are temperature, dissolved oxygen, and velocity (McNeil 1966; Leman 1993; Peterson and Quinn 1996). Substrate size and density are primary factors involved in the permeability of bottom materials (Wicket 1958; McNeil and Ahnell 1964; McNeil 1966). Temperature dictates the rate of development and metabolic level of salmonids from earliest development through adulthood. Adequate levels of dissolved oxygen must be present in the water to support energetic demands of growing embryos and fry. Dissolved oxygen levels vary with stream topography (Peterson and Quinn 1996), as well as temperature and depth (Leman 1993). Survival depends on oxygenated water reaching the buried eggs and larvae within a redd site. Sources of intergravel water include ground water and surface water (McNeil 1966).

Having established the fact that oxygenated water is important for survival and development; velocity of delivery is also important (Leman 1993). Salmon may be able to detect variation in water velocity more readily than substrate quality (Witzel and MacCrimmon 1983). The variations in velocity are often influenced by different substrate types; salmonids may choose, indirectly, suitable substrate size for redd sites based on water velocity (Shirvell and Dungey 1983).

The rate of oxygen utilization varies with development (McNril 1966; Peterson and Quinn 1996). As metabolic demands of developing salmon utilize the available oxygen; more must be supplied. The velocity *(rate)* at which oxygenated water can be delivered is largely governed by the general size and density of substrate materials. McNeil (1966) states: “The permeability of bottom materials is a function of particle compaction, arrangement, and size.” According to McNeil and Ahnell (1964) the velocity of intergravel water is related to the size of the bottom materials. Smaller materials (fines) decrease the velocity of water through redds. Wicket (1958) showed that the survival of pink and chum salmon eggs and larvae increased with the increased permeability of the stream bed. All of the previously discussed issues are important factors to consider when addressing glacially driven river systems like the Puyallup, White, and Carbon rivers.

Spawning Behavior

Aggression is an integral aspect of spawning behavior in Pacific salmon *(Oncorhychus)* species (Chebanov et al. 1983; Keenley and Dupuis 1988; Quinn et al. 1996). Several factors influence the frequency and focus of male aggression, including the operational sex ratio *(OSR)* (Quinn et al. 1996), size of the male (Chebanov et al. 1983; Foote 1989; Keenleyside and Dupuis 1991), density of spawners (Chebanov 1991, 1994) and an individual’s status (Schroder 1973; Chebanov et al. 1983). The OSR represents the number of ripe *(ready to reproduce)* male to the number of ripe females. Variations in the OSR affect the frequency of aggression in males; changes lead to an increase *(low OSR)* or decrease *(high OSR)* in aggressive behavior (Quinn et al. 1996). Aggression can be displayed in several forms (Mork 1995); including charging, chasing, biting, fighting, as well as, lateral and frontal displays. Mork (1995) reported that lateral movements, charging, chasing, and biting were often the preferred methods of aggression displayed by salmon under study. Aggression is not only focused towards the same species, but other species as well.

The size of the male affects his position in the hierarchal structure and his success in spawning (Chebanov 1983; Foote 1989). Larger males are more successful at securing females and are therefore more often in the position of dominance. Females prefer to mate with larger males (Foote 1989) and may delay spawning if courted by small males. Holding a dominate position leads to increased encounters with other males who are trying to displace him, or attempting to mate with the female (Chebanov et al. 1983; Chebanov 1994). A change in the density of spawners leads to changes in the frequency of aggression. As the densities of spawning fish increases, so will the number of aggressive actions (Schroder 1973; Parenskiy 1990); this holds true for both males and females. Furthermore, at lower densities, aggressive actions decrease. An individual's status may also determine the frequency and focus of aggressive actions. Schroder (1973) describes how dominate or "Alpha" males take up positions just behind the females and shift from side to side defending their territory and females. Satellite males line up behind the dominate male. These sub-dominate males defend their positions in the chain. The natural drive to mate with females often leads to aggressive interactions between males. The success of males also depends on the level of aggression directed toward other males (Chebanov et al. 1983). Females compete with other females for nesting sites (Schroder 1973, 1981; Keenleyside and Dupuis 1988). Female's attempt to defend their nests *(redds)* against other female's attempts to overtake them, and guard sites to prevent superimposition *(displacing or covering over)* of their eggs (Schroder 1981; Keenleyside and Dupuis 1988). Females dig their nests and guard them until they die, or are displaced by another female (Schroder 1973).

Chinook Salmon *(O. tshawytscha)*

Puget Sound Chinook stocks were listed on the federal register of endangered species in 1999, and are currently designated as "threatened." Two distinct stocks of Chinook are present in the Puyallup/White River system. They include the White River Spring Chinook *(springer or spring-run)* and Puyallup River Fall Chinook *(fall or fall-run)*. White River Spring Chinook are the only Spring Chinook stock existing in the Puget Sound region and are unique due to their genetic and life-history traits (WDFW et al. 1996). This unique stock of Chinook was classified as distinct in the 1992 Washington State Salmon and Steelhead Inventory (WDFW et al. 1993). Microsatellite DNA analysis of Chinook from the White River shows a distinct mixture of spring and fall-run Chinook stocks (Spidle 2010; Shaklee and Young 2003; Ford et al. 2004). Spidle (2010), analyzed 913 tissue samples collected by PTF from NOR Chinook captured in the USACE trap on the White River from 2004-2007. Genetic samples were evaluated to calculate the proportion of Spring and Fall Chinook returning to the upper White River. Results from the multilocus microsatellite genotypes analysis showed a range of 84.6% (2004) to 93.1% (2005) Spring Chinook *(95% confidence interval*). Spidle also stated in the report that, "In addition to mixture modeling, Bayesian lineage clustering was conducted to determine if there was evidence for multiple populations of Spring or Fall Chinook salmon, and also to look more closely at the separation of the spring and fall populations. There was no evidence of multiple populations within either run-time." Ford et al. (2004), reported that approximately 60% of Chinook smolts genetically sampled above the Buckley diversion were spring-run, and 40% were fall-run; whereas, smolts sampled below the dam were approximately 42% springers and 58% fall.

Spring Chinook enter the freshwater river system as early as May, and hold in the river until spawning commences as early as mid August. Adults generally return as three-to-four-year-olds; however, the age of adult Chinook returning to spawn can range between two-to-five years. Although the majority of documented spawning occurs in the larger tributaries, such as the Greenwater and Clearwater rivers; mainstem spawning by Spring Chinook in the upper White River has been documented by PTF biologists via radio telemetry studies (Ladley et al. 1996). Spring Chinook spawning also occurs throughout the lower *(below RM 24.3)* White River. Egg to fry emergence of young Chinook takes approximately 90-110 days depending on water temperature. The majority of juvenile Spring Chinook (80%) migrate to salt water as sub-yearlings *(0 age- less than one year old)* (Dunston 1955). DNA and aging analysis of adult (NOR) Chinook collected from the USACE trap in Buckley and integrated into the Muckleshoot's White River Spring Chinook program, showed that 77% of the springers sampled migrated to salt water as sub-yearlings (Johnson unpublished work). Aging data from 2,879 readable scale samples taken by PTF biologists from Chinook captured in the USACE Fish trap *(1994-2008)*; revealed 91.73% of Chinook sampled *(springers & falls)* migrated as sub-yearlings.

Escapement data for White River Spring Chinook has been collected from fish captured in the U.S. Army Corps of Engineers' (USACE) fish trap on the White River near the city of Buckley since 1941. After 1950, there was a steep decline in the number of Spring Chinook captured in trap. Spring Chinook escapements dropped under 1,000 fish annually after 1955; continued to drop to as few as 66 fish in 1977, and dipped down to only 6 fish in 1986. This precipitous decline prompted the State of Washington and South Puget Sound tribes to implement a recovery plan in the mid 70s (WDFW et al. 1996). The recovery plan involved starting a program involving the artificial propagation of wild and captive brood stocks. Currently, there are two Spring Chinook programs in operation; the Muckleshoot Indian Tribe's hatchery on the White River and WDFW's Minter Creek program. Fish from Minter Creek are available only if a surplus exists, and if the tribes *(Puyallup/Muckleshoot)* are willing to pay for marking and rearing. These artificial propagation programs in conjunction with the use of acclimation ponds, continues to be an integral part of restoring the run to near historic levels.

Puyallup River Fall Chinook are endemic throughout the Puyallup River, Carbon River, Lower White River, plus many of the tributaries associated with these mainstem river systems. A large component of the adult fall spawners are hatchery origin from the WDFW Fall Chinook program operated on Voights Creek. In 2004, the Puyallup Tribe began operation of its own Fall Chinook hatchery *(@RM 1)* on Clarks Creek, a tributary to the lower Puyallup River *(RM 5.8)*. The Puyallup River Fall Chinook Baseline Report (WDFW 2000) states that genetic testing has shown similarities in both hatchery and wild Puyallup River Fall Chinook, with those of Chinook stocks found in several other watersheds within the Puget Sound region. The similarities are likely due to significant numbers of Fall Chinook imported to these watersheds from the Green River hatchery. Although Spring Chinook are known to spawn in the Puyallup River system, the straying rate is significantly less than that of Puyallup River origin Fall Chinook. Additional evidence shows a significant number of Puyallup River Fall Chinook stray into the White River system to spawn. There is no Fall Chinook supplementation program on the a White River; however, carcass sampling from 2003 to 2011 on Boise Creek, a significant Chinook spawning tributary to the White *(RM 23.5)*, showed 47-80% of Chinook sampled to be of hatchery origin *(fall-run)* due to the presence of a coded-wire-tag and/or adipose fin clip.

Puyallup River Fall Chinook enter the Lower Puyallup River in June, and continue to move through the system as late as November. The majority of tributary spawning activity occurs from September through late October, with the exception of some lower tributaries which often have fish present through early November. Initial spawning generally commences in the upper watershed; while the lower river and tributaries commonly experience active spawning beyond the time that live fish are even observed in the upper watershed. The age of adult Fall Chinook returning to spawn can range between two-to-five years of age. However, the largest components of adult returns are made up of four-year-olds; with a smaller proportion returning as three-year-olds.

The majority of post emergent fry spend a moderate period of time residing instream before migrating to marine waters. Trapping data from a rotary screw trap in the lower Puyallup River showed that 99.7% *(n=911)* of wild out-migrant Chinook caught were sub-yearlings (Berger and Williamson 2005). Chinook downstream migration in the Puyallup begins as early as February and runs well into the last week of August, with the peak of the exodus taking place the end of May. Berger and Williamson (2005), reported that sub-yearling Chinook sampled varied in length from 40-100mm during the trapping season *(February 26-August 16)*, with significant size increases occurring throughout the season. The average fork length of Chinook measured from February through mid June was 65.18mm *(range 42-83)*. Yet, the minimum size range did not exceed 60mm until after June 5th. Data results from 2007 showed the average fork length of sub-yearling Chinook captured from mid February to August was 67.36mm *(range 39-95)* (Berger et al. 2007).

Coho Salmon *(O. kisutch)*

Coho are prevalent throughout the Puyallup/White River Watershed, with several of the lower and mid range drainages experiencing some escapement. Coho are frequently observed spawning as high as Silver Springs on the White River (RM 60.5), and a limited number make their way into the habitat available above Electron Hydro LLC's Electron Diversion Dam on the Puyallup River (RM 41.7). Although the majority of coho in the system are primarily tributary spawners, some mainstem spawning occurs along the peripheries of the main river channels and in the lower velocity side channels. Key spawning areas for coho include South Prairie Creek, Boise Creek, Clearwater River, Greenwater River, Huckleberry Creek; as well as Fox and Kapowsin creeks on the Puyallup.

The WDFW hatchery on Voights Creek has artificially propagated coho since 1917, having in the past incorporated fry and smolts from other drainages, including Big Soos Creek, Minter Creek, Garrison Springs, George Adams Creek; as well as the Skagit and Washougal rivers. Voights Creek currently produces approximately 800,000; 100% mass marked *(adipose clip)* pre-smolts annually, of which 100,000 to 200,000 are transferred to acclimation ponds in the upper Puyallup Watershed when available *(see Salmon and Steelhead Hatchery Production; as well as Fish Enhancement and Restoration sections in this report)*. Hatchery fish from Voights Creek are released in April and generally move rapidly downstream. The majority of wild coho juveniles rear in freshwater for over a year *(18 months)* before migrating to marine waters. Wild smolt out-migration runs from March through the first part of July, with peak migration occurring near mid May. Smolt trapping data in 2005 on the Puyallup River indicated that approximately 91% of wild coho smolts migrated to marine waters as yearlings (Berger and Williamson 2005). However, there is a small class of sub-yearlings and two year old smolts.

The vast majority of coho spend over a year in saltwater before returning to freshwater to spawn as three-year-olds. A small component of coho return to spawn as two-year-olds; yet, the age of fish returning to spawn can range between two-to-four years. The Puyallup Tribe's test fisheries data consistently shows adult coho entering the lower Puyallup River system in early August. Spawning surveys and USACE Buckley trap data show coho continue to move through the watershed as late as February/early March. The majority of spawning occurs from mid September through late December, with peak spawning occurring around the end of October through the first part of November. The South Prairie Creek drainage has a unique late run of coho that spawn well into February and early March. Hundreds of adult coho are often observed holding in South Prairie Creek in December prior to moving into upper tributaries, such as Coal Mine and Spiketon creeks to spawn.

Chum Salmon *(O. keta)*

Chum salmon are numerous and widespread throughout the lower and mid-river system. Chum have been observed spawning as high as Boise Creek on the White River (RM 23.5), Fox Creek on the Puyallup (RM 29.5), and as high as river mile 8.5 on the Carbon and river mile 12 on South Prairie Creek. Chum are mass spawners, frequently utilizing the habitat found in the placid flows of primary side channels and secondary ephemeral side channels established along the major mainstem rivers. Also commonly utilized are the shallower outer margins of the mainstem rivers; nevertheless, most of the spawning efforts are focused in the numerous smaller tributaries located off the lower Puyallup and White rivers, as well as South Prairie Creek. A split stock of wild and hatchery origin chum are present in the Puyallup/White system. Genetic testing of 900 chum tissue samples collected throughout the watershed by Puyallup Tribal Fisheries biologists, implied a difference between lower Puyallup River chum *(Clarks, Diru, Swan and Clear creeks*) and upper river chum *(Carbon River, White River, Salmon Tributary, South Prairie Creek, Fennel and Canyonfalls creeks)* (Ford and Schwenke 2004).

The Puyallup Tribe began rearing and releasing chum from its Diru Creek Hatchery facility, a small tributary to Clarks Creek on the lower Puyallup River, in 1979. The Puyallup Tribe currently raises 1.5 to 2.7 million-chum smolts annually for release into the lower Puyallup River. This program significantly augments a tribal river fishery and All Citizen purse seine fishery in East and West Pass in Puget Sound. This stock originated initially from Chambers Creek. Eliminating the need to import chum from outside the Puyallup/White River Watershed, the Puyallup Tribe began propagating chum for its own program at Diru Creek in 1993. The Puyallup Tribe's chum program releases 1,000 to 3,000 pounds annually based on available brood stock returns to Diru Creek Hatchery. Currently, this is the only chum supplementation program operating in the Puyallup/White River Watershed.

Adult chum salmon enter the Puyallup River as early as October. An early run of chum in Fennel Creek and the Carbon River can be observed spawning in late October. In most of the rivers and tributaries, active spawning occurs from the middle of November through the end of January, with peak spawning occurring in mid December. Scale data collected by Puyallup Tribal Fisheries (PTF) from commercial gill-net fisheries in the lower Puyallup and Diru Creek Hatchery returns, show most adult spawners returning as three-to-four-year-olds. During most years, adult spawners are predominately four-year-olds (>50%) with a small contingency of two and five-year-olds (< 4%). Instream residence time for newly emerged chum is short, emerging from the gravel in late winter to early spring, juveniles move quickly downstream to the marine waters of Commencement Bay. Since 2001, the Puyallup Tribal Fisheries Department has operated a rotary screw fish trap on the lower Puyallup (RM 10.6). Trapping data reports downstream migrating chum are captured in the trap as early as the first week of March, with peak out-migration occurring during the first quarter of May (Berger and Williamson 2005).

Pink Salmon *(O. gorbuscha)*

Pink salmon in the Puyallup/White River system return on odd years to spawn. The range and habitat utilized by pink salmon throughout the watershed has changed considerably over the past several spawning seasons. Washington Department of Fisheries biologists, in a 1975 publication, describe pink salmon utilization to be almost exclusively limited to the mainstem Puyallup River; the lower Carbon and White rivers; South Prairie Creek and Fennel Creek (Williams et al. 1975). This description of pink salmon utilization was generally accurate until 2003, when an unprecedented number of adult pink salmon returned to the Puyallup/White River Watershed. Washington Department of Fish and Wildlife escapement data from 1959 to 2001 shows the number of adult pinks returning to the Puyallup system ranged from 2,700 to

49,000, with an average seasonal return of 19,400. Pink escapement estimates obtained from WDFW reported an estimated pink return of 185,000 during the 2003 run; and in 2005 the escapement was estimated at over 466,000 (Scharpf 2006). The adult pink escapement for 2007 is estimated at well over 600,000, and just over 1.2 million in 2009. Pink escapement has fallen moderately since its peak in 2009.

Beginning in 2003, significant numbers of pink salmon have been transported above Mud Mountain Dam to spawn in the Upper White River, and the West Fork of the White. Substantial numbers of pinks were observed in several key tributaries, including Huckleberry Creek, as well as the Greenwater *(past George Creek at RM 12)* and Clearwater rivers. In addition, several pink spawners have been documented in Cripple; Pinochle and Wrong creeks; in 2007, pinks were observed as high as Sunrise Creek at river mile 63. The Puyallup and Carbon River drainages have not experienced the same significant expansion of pink salmon as the White River. Even so, pink escapements have been exceedingly elevated throughout the mainstem Puyallup River below river mile 27.5; as well as the lower Carbon River, South Prairie, Wilkeson and Fennel creeks.

All pink salmon in the Puyallup/White system are wild. Adult pink migration and spawning coincides closely with Chinook, with pinks entering the river as early as mid-July, and spawning from late August through mid-November. Like chum, pinks are mass spawners; frequently utilizing the habitat found in the placid flows of primary side channels and secondary ephemeral side channels established along the major mainstem rivers. Also commonly utilized are the shallower outer margins of the mainstem rivers, although, much of the spawning efforts are centered on the numerous main river tributaries. Peak spawning occurs from late September to early October, with fry emerging from late fall through winter. Residence time instream is limited, with smolt out migration running from February to June, with the peak out migration occurring at the end of March. The production estimate for the 2003 pink brood year, calculated 1,988,441 out-migrants (Berger and Williamson 2004); estimates for the 2005 brood year was 7,095,017 pink smolts (Berger et al. 2006); estimates for 2007 and 2009 pink smolt escapement is 14,936,007 and 11,148,303 (Berger et al. 2008; Berger et al. 2010). After two years in the marine environment, adults return to spawn as two-year-olds, hence the odd year only spawning. The unique life history of pink salmon does make the species more susceptible to stochastic events, which can have an immeasurable impact on an entire year class.

Sockeye Salmon *(O. nerka)*

Due to their diminutive numbers, sockeye are seldom seen or documented throughout most of the Puyallup/White River basin. Thus, sockeye are generally considered insignificant and are treated with little regard. The exception to this generalization is the USACE trap on the White River in Buckley, which provides a rare opportunity to collect data on adult sockeye. Each year from 1983 to 2008, between 5 and 378 *(annual average of 42)* adult upstream migrants were captured and transported above Mud Mountain Dam. It is currently undetermined how many, if any, of the adult sockeye are native to the system or are strays from other watersheds. Migrating adults are caught in the trap from mid July through early September. Sockeye transported to the upper White are often observed in several of the major tributaries, including the Greenwater River, Clearwater River, Huckleberry Creek and Silver Springs Creek. Spawn timing runs from mid September through October, coinciding with Chinook, pink, and coho spawners. Sockeye often utilize similar spawning habitat as Chinook and coho, which is evident by the fact that sockeye are regularly seen spawning side-by-side with these other species. Spawning sockeye are easily distinguished from other salmon species by their distinctive bright red bodies and green heads. Post emergence, juvenile sockeye spend one-to-two years *(typically two years)* rearing in freshwater before migrating to marine waters. After two-to-three years in saltwater, the majority of adults return to spawn as four-year-olds.

Steelhead/Rainbow Trout *(O. mykiss)*

Both steelhead and rainbow trout are present throughout the Puyallup/White River Watershed. The steelhead is simply an anadromous form of rainbow trout; offspring from either steelhead or rainbow trout can become anadromous, or remain in freshwater *(resident form)* their entire lives. In May of 2007, NOAA's National Marine Fisheries Service released a statement regarding the listing of Puget Sound steelhead as "threatened" under ESA. The ESA protection covers naturally spawned steelhead, in addition to a couple of hatchery stocks. However, the ESA protection does not pertain to rainbow trout.

Steelhead are generally categorized as *winter-run* or *summer-run*, depending on the time of the year they return to freshwater river systems to reproduce. Unlike other pacific salmonid species, steelhead can spawn more than once *(iteroparous)* during their life-cycle. Scales collected from 1984 to 2005 by Puyallup Tribal Fisheries biologists at the USACE trap on the White River, and analyzed by WDFW, show an average of 5% *(range 0-26.4%)* repeat spawners returning annually *(frequently females)*. Puyallup and White river winter-run steelhead generally enter the river system beginning in winter *(January)*, and continue through spring *(June)*, whereas summers migrate during late spring and summer seasons. Summer and winter-run steelhead enter freshwater systems in various degrees of reproductive maturation (Pauley et al. 1986). Summer steelhead enter river systems immature, and will not be ready to spawn until the following spring; whereas, winter steelhead will be ripe *(mature)* enough to spawn within a few months or less after entering freshwater (Pauley et al. 1986). The major distribution of winter-run steelhead includes many of the coastal and Puget Sound river systems such as the Humptulips, Quinalt, Chehalis, Hoh, Bogachiel, Soleduc, Skagit, Skykomish, Snoqualmie, Green, Puyallup and Nisqually rivers. Winter-run steelhead are also present in several river systems along the lower Columbia River. Summer-run steelhead distribution in the Puget Sound includes the Skagit, Stilliguamish, Skykomish and Green rivers.

The majority of steelhead returning to the Puyallup and White river system are winter-run. However, a few summer-run strays, likely from the Green or Skykomish rivers, are caught annually during August and September in the lower Puyallup; as well as the USACE trap on the White River. Therefore, steelhead are often present in the watershed throughout the year. The main run of hatchery origin winter steelhead *(Voights Creek production ceased in 2009)* enters the Puyallup River in November, with the peak of the run occurring in mid December. On the White River, steelhead are occasionally caught in the USACE trap as early as late December. Although, most fish don't start migrating towards the upper reaches until March. The winter run continues through June, with peak migration occurring in mid-to-late April, through early May. Puyallup Tribal Fisheries spawning ground data shows peak spawning takes place in the upper Puyallup and White River basins in late April to early May; and in the lower White River, peak spawning occurs typically in mid-late May.

Steelhead spawners frequently utilize the mainstem Puyallup, White, and Carbon rivers; although, the majority of spawning takes place in many of the associated tributaries. Some of the major tributaries on the White River supporting winter steelhead include Boise Creek, in addition to the Clearwater and Greenwater rivers. Along the Puyallup River, the upper reach tributaries of Kellog, Niesson and LeDout creeks, support the majority of spawners. In addition, the roughly five miles of mainstem river channel below the Electron diversion dam (RM 41.7) consistently experiences a small number of spawners as well. The habitat above Electron has been accessible since the completion of a 215 foot fish ladder in the fall of

2000. Steelhead are known to be accessing the reach above the Electron Dam, yet little is known about spawning or rearing utilization and distribution. Currently, the only information available is from aerial surveys conducted on the upper Puyallup and Mowich rivers in the spring of 2005 and 2006. Surveys conducted in 2006, reveal limited steelhead spawning activity in the mainstem Puyallup River, and no spawning activity in the Mowich.

The Carbon River mainstem, below river mile 11, has consistently supported steelhead spawners. Spawning ground survey data from 1995 to 2006, shows an average of 15.8 redds annually *(range 0-54)* in the mainstem Carbon; however, escapement has dropped significantly over the last few years. South Prairie Creek, a substantial tributary to the Carbon River, has long been the one of the most significant salmon and steelhead drainage in the Puyallup basin. Survey data obtained from WDFW shows the average number of steelhead redds observed in South Prairie from 1999 to 2005, was 133 *(range 32-196).* Voights Creek, on the lower Carbon, also experiences a small steelhead escapement.

After fertilized eggs are deposited in the gravel substrate, the embryonic development and emergence of fry takes between 4-8 weeks depending on water temperature. Juvenile steelhead will rear in freshwater for 1-4 years before migrating to marine waters in the spring. Scale data from 792 adult winter steelhead captured in the USACE trap from 1985 to 2004 shows the majority of young wild winter steelhead migrate to saltwater after 2 years in freshwater (81.6%). Approximately 2.5% of the steelhead sampled spent 1 year in freshwater, 15.6% three-years, and less than 0.25% four-years before out-migrating. None of the steelhead sampled spent more than 4 years residing in freshwater. Nearly all hatchery reared steelhead, if grown to a large enough size *(five fish-to-the-pound, or 90 grams each)*; will migrate to saltwater shortly upon release as yearlings *(one-year-old plus fish).* After spending between 1-4 years in saltwater; adult winter steelhead will return to the Puyallup/White system at 3-7 years of age. Typically, most fish return after 2-3 years in saltwater as 4-year-olds (56%) and 5-year-olds (34%).

Prior to January, 2009, WDFW conducted the only long-term winter steelhead supplementation program in the basin. Each spring, the Washington Department of Fish and Wildlife's hatchery on Voights Creek released yearling fish into the system. In 2005, the Voights Creek facility released over 207,000 adipose clipped steelhead, and over 231,000 in 2004 (Berger and Williamson 2005). Brood-stock for this program have originated from several different drainages, including the Humptulips, Bogachiel, and Skagit rivers; as well as Chambers and Tokul creeks. From 1980 to 2000, the Puyallup Tribe operated a winter steelhead program at the Diru Creek facility *(located in the city of Puyallup).* The brood-stock for this supplementation program came from the coastal Quinalt River system. During the 20 year span of the program, the tribe released between 8,237 and 116,957 yearling smolts annually into the Puyallup system. The Diru Creek program was successful, with an average of 915 (*range 364-1,144*) adults returning annually from 1993 to 1999. Unfortunately, this earlier program was discontinued due the lack of water necessary to rear steelhead year round.

During the spring of 2006, in response to the declining number of winter steelhead, the Puyallup and Muckleshoot Tribes; as well as the Washington Department of Fish and Wildlife, began a steelhead supplementation pilot project developed for the White River. The primary goal of this project is to restore the run to a strong self-sustaining population. The pilot project utilizes captured wild brood stock from the USACE trap in Buckley to generate approximately 25K-35K+ yearling smolts. The 2010 season demonstrated the beginning of some measurable success from the program; out of 521 total steelhead captured, 298 *(57% of the run)* were program fish retuning to Buckley and 223 were unmarked/wild *(43% of run).*

The 2010 return to Buckley was also the second largest since 1992. The 2011 return saw 353 program fish return *(65%)* and 186 unmarked/wild steelhead *(35%)*. 2012 and 2013 experienced the best return since 1992 with over 561 and 574 steelhead captured. Of the steelhead captured in 2012, 202 were program fish *(36%)* and 359 were unmarked/wild *(64 %)*. 574 steelhead were captured in 2013, of which 36.2% *(208)* were program fish, and 63.8% *(366)* were unmarked/wild steelhead *(see appendix G for additional data)*. Beginning in January of 2009, the Puyallup Tribe assumed the majority of responsibility for continuing this important restoration effort. Steelhead brood-stock collected from the White River USACE fish trap in Buckley are currently held, spawned, incubated, and reared at the Puyallup Tribe's Diru Creek hatchery for a year. After rearing for a year, and when the fish are of size *(approximately 17 fish per pound)*, the pre-smolts are transported to the Muckleshoot hatchery on the White River to acclimate before being re-leased. With the completion *(fall 2012)* of the Jensen Creek acclimation pond on the Clearwater River; the expectation is to utilize the pond to acclimate the winter steelhead prior to release. The success or failure of this project will likely determine if an additional supplementation program will be implemented on the Puyallup River *(Wilkeson Creek Hatchery currently in development)*.

The winter steelhead stocks in the Puyallup basin have been declining since 1990. The precipitous decline within just the past several years has created serious concern among fisheries managers. Factor(s) responsible for the decline in steelhead escapement are unknown, especially when other salmon species are experiencing relatively good success. Escapement numbers for the USACE trap in Buckley during 2005 *(152 adults)* was the lowest ever recorded since 1941. South Prairie Creek averaged 129 steelhead redds annually from 1999 to 2011 (*range 32-196*). Decreased numbers of redds have been observed in several other drainages as well; yet a few, such as Boise Creek on the White River, have experienced comparatively stronger returns in spite of the basin wide declines. The smolt trapping program operated by the Puyallup Tribe's Fisheries department on the Puyallup River observed a substantial decrease in the number of steelhead smolts captured from 2003 to 2005 (*average 62.6 [range 39-77] from 2003-2005 vs. average of 315 [range 156-539] from 2000-2002)* (Berger and Williamson 2005). However, significant increases in escapement were observed from 2008-2011 *(average 362 [range 189-579])* (Berger et al. 2011). The previous numbers don't include the steelhead escapement for the White River due to the traps location approximately 0.2 miles above the White/Puyallup confluence.

Bull Trout *(Salvelinus confluentus)*

Bull trout have existed historically throughout many Pacific Northwest coastal and inland rivers, streams, lakes, reservoirs and marine waters; from southern Alaska to northern California, and inland to Idaho, western Montana and northern Nevada (Fraley and Shepard 1989, Buchanan et al. 1997, Rieman et al. 1997, High et al. 2008). On November 1, 1999, all bull trout in the coterminous United States were listed as "threatened" on the federal register of endangered species by the U.S. Fish and Wildlife Service (USFWS 1999). Bull trout are a cold water species sensitive to deleterious changes in water quality (Selong et al. 2001, Dunham et al. 2003); as well as the fragmentation and loss of habitat (Rieman and McIntyre 1995). Bull trout require unobstructed migration corridors and connectivity of rivers, streams, and other water bodies (Rieman and McIntyre 1993) in order to provide access to spawning, rearing, foraging, and overwintering habitats.

Bull trout belong to a group of fishes called char *(genus Salvelinus)*, a subgroup of the family Salmonidae. Char include dolly varden *(S. malma)*; white spotted char *(S. leucomaenis)*; Arctic char *(S. alpinus)*; brook trout (*S. fontinalis)*, and lake trout *(S. namaycush)*. Morphologically, bull trout and dolly vardon are nearly indistinguishable; however, genetic and morphometric analysis in the late 1970s distinguished that bull trout and dolly vardon are in fact different species (Cavender 1978). The bull trout is actually more closely related to the Asiatic white-spotted char (Cannings and Ptolemy 1998). In addition, regional research has established that both bull trout and dolly vardon reside sympatrically in several Western Washington rivers and streams (Leary and Allendorf 1997).

To determine the specie(s) of char present in the Puyallup/White River system, tissue samples from over 110 char were collected by Puyallup Tribal Fisheries *(PTF)* biologists for genetic analysis. Most of the samples collected were from char captured in the US Army Corps of Engineers *(USACE)* fish trap on the White River, as well as a limited number collected from Electron Hydro LLC's *(Formally Puget Sound Energy)* Electron forebay on the Puyallup River, and one sample came from the Lower Puyallup River near Commencement Bay. Results from the genetic analysis disclosed that all samples collected were bull trout, with no indication of hybridization (Baker et al. 2003). To date, there has been no affirmation of dolly vardon in the Puyallup River Watershed. Bull trout are endemic to the Puyallup, Carbon, and White River drainages in which they exhibit primarily residential and fluvial life history traits. Although diminished, the Puyallup Watershed also supports the anadromous life history form of bull trout. Resident bull trout reside in smaller headwater tributaries, while fluvial bull trout frequently utilize mainstem rivers and tributaries to forage and overwinter.

During the fall, migratory bull trout journey from spawning and rearing habitats in the upper watershed to foraging and overwintering habitats located lower in the river system. From spring through early summer, migrant bull trout commence their upstream journey to cooler spawning, rearing, and foraging refugium high in the watershed where spawning will occur primarily during the month of September (Ladley et al. 2008, Marks et al. 2009). In response to changing habitat and reproductive needs, migratory bull trout in the White River travel up to 75 miles or more between the lower river, and headwaters located in or near Mt. Rainier N.P. To accomplish this, bull trout require unobstructed migration corridors and connectivity of streams and rivers in order to provide them with access to spawning, rearing, foraging, and overwintering habitats. Currently, the genetic relationships and population(s) size of bull trout within the Puyallup core area is undetermined. The National Park Service has ongoing bull trout surveys, distribution, and genetic (DeHaan et al. 2008) efforts being conducted within the park.

Bull trout are primarily piscivorous *(fish eaters)*. However, they are opportunistic feeders, feeding on a variety of prey items depending on their particular life history strategy and stage of development. Adults feed almost exclusively on other fish, including a range of salmon and trout species; as well as other resident fish species. Juveniles feed on aquatic invertebrates, including stoneflies *(Plecoptera)*, caddisflies *(Trichoptera)*, and mayflies *(Ephemeroptera)*. Bull trout require a healthy aquatic environment in order to survive and prosper. They need an environment that provides the prey base; in addition to the rearing and reproductive habitat necessary to ensure their continued survival and reproductive success. Bull trout are endemic to the Puyallup, Carbon, and White River drainages. Currently the population dynamics of bull trout within the watershed is unknown. However, since the Coastal Puget Sound listing in 1999, the Puyallup Tribal Fisheries department has made a focused effort on collecting biological data; as well as spacial information on bull trout distribution and utilization. Documented areas of utilization include the lower and upper mainstem of the Puyallup, White, Carbon and Mowich rivers. Currently, the best documentation of bull trout utilization exists on the White River. The Upper White River provides some of the preeminent critical habitat for bull trout spawning and rearing. Surveys of numerous headwater tributaries along the White River and the West Fork White within Mt. Rainier National Park during the summer of 2000, revealed the presence of adult and juvenile bull trout in several of the drainages (Marks unpublished work).

Each year, since 1999, adult upstream migrants were captured and sampled in the USACE trap on the White River and transported above Mud Mountain Dam. This trap and haul operation conducted by the U.S. Army Corps of Engineers has been functioning since 1941. The abundance of upstream migrants captured in the USACE trap has increased precipitously since 2009. From 1999-2008, an average of 36 *(range 14-49)* bull trout were captured and sampled annually. From 2009-2015, an average of 200 *(range 68-401)* bull trout were captured and sampled. Data gathered by PTF on these captured fish strongly indicates both *fluvial* and *anadromous* life history traits. Fluvial bull trout utilize the main river system and tributaries to forage as adults; yet, migrate to their natal streams or other spawning tributaries to reproduce. Anadromous fish migrate downstream to forage in more productive marine waters.

Spawning ground surveys conducted by Puyallup Tribe Fisheries biologists on Klickitat Creek during the 2002 through 2006 seasons, observed floy tagged adult fish previously captured in the USACE trap, spawning with non-tagged fish. In view of the fact that adults are rarely observed in the smaller spawning tributaries pre-or-post spawning, it is surmised that most of the unmarked fish observed were fluvial bull trout entering from the mainstem river. However, it is undetermined what component of adults spawners, if any, are residents. Further research is needed to understand and identify the life history patters and population dynamics of bull trout in the White River. Addressing this issue, in 2006 and 2007, Puyallup Tribe Fisheries biologists conducted extensive bull trout migration telemetry studies and redd surveys along the upper White River and West Fork White River, focusing heavily on the headwaters located within Mt. Rainier National Park. The study results showed that the cold high elevation mountain streams located within the National Park provide the majority of the critical bull trout spawning habitat in the basin. The study involved surgically implanting bull trout captured in the USACE trap with LOTEC radio transmitters *(10 fish in 2006, 19 in 2007)*. The radio tagged bull trout were then tracked for 6 months as they made their upstream migrations to spawning sites in the upper White River; as well as their post-spawning migrations downstream. During the 2006 study, seven of the ten bull trout spawned in tributaries located on the mainstem of the White River within Mt. Rainier National Park; one spawned in Lodi Creek on the West Fork within the park, and another in Silver Creek *(lowest observed spawning elevation @2600')*just a half mile outside of the National Park. In 2007, 8 radio tagged bull trout were observed spawning in tributaries located on the White River inside the National Park. Two other bull trout were tracked up the West Fork White near Lodi Creek. Far less is known about bull trout utilization in the Puyallup, Carbon and Mowich rivers.

The Upper Puyallup Basin encompasses the Mowich River; North and South Forks of the Puyallup; as well as the mainstem Puyallup River. The upper basin supports several species of salmonids including bull trout, Chinook *(Oncorhychus tshawytscha)*, coho *(O. kitsutch)*, pink *(O. gorbuscha)*, sockeye *(O. nerka)*, steelhead/rainbow trout *(O. mykiss)*, and cutthroat trout *(O. clarki)*. Bull trout have been observed in all three river systems, yet spawning has only been documented in the upper Carbon River within Mt. Rainier National Park. Bull trout spawning throughout the watershed occurs primarily during the first three weeks in September, however, spawning has been observed taking place from the last week of August through the first week of October. Bull trout are iteroparous *(have the ability to spawn more than once)*; therefore, recovering pre-or-post spawn mortalities for examination is extremely rare. Spawners in the upper White River tributaries are observed utilizing various sized substrate from small gravels to small cobble. Redds are often constructed in the tail-out of pools and along the channel margins. Embryonic development is slow *(depending on water temperatures)*; it may take between 165-235 days for eggs to hatch and for alevin to absorb their yolk (Pratt 1992). Bull trout fry emerge in late winter and early spring. Young fry can often be seen by mid March foraging in the lateral habitat along the upper mainstem White River and associate tributaries.

Several tributaries within the Upper Puyallup River Basin have been identified as potential or know bull trout occupied habitats (USFWS 2004a, Marks et al. 2010). However, several seasons of bull trout spawning surveys and telemetry studies conducted on the White River have shown that in addition to well established occupied habitats; bull trout frequently exploit small, often unknown or unidentified tributaries of ephemeral or intermittent flow (Marks et al. 2010). Unlike the Upper White River, much of the headwater habitat located within the Upper Puyallup Basin falls outside of the National Park border; where land use is extensive and resource protections are diminished. Bull trout habitat throughout the Puyallup and White rivers has been severely impacted by over a century of land and water resource exploitation; including, damming and substantial water diversions, considerable riparian alterations *(deforestation)*, dewatering and low instream flow regimes, as well as significant channel manipulation. These impacts have lead to a marked deterioration in land and hydrological behavior within these river systems by causing water flow of poorer quality, quantity and timing. Several limiting factors are involved with regards to the healthy function of stream habitat and bull trout populations in the watershed; including lost or diminished habitat connectivity and migration corridors *(human-made fish passage barriers)*, fragmentation and reduction of habitat quality *(entrainment, transportation networks, forest management practices and operations, direct water withdrawal)*; in addition to, water quality, fish entrainment and entrapment, unknown species interactions, and potential climate change impacts *(changes in flow regimes, scour effects, thermal variations, changes in water chemistry)*.

Point specific areas of human-made fish migration barriers or obstacles include Electron Hydro LLC's *(formally Puget Sound Energy)* Electron hydroelectric facility *(Puyallup River)*; the operation diverts up to 400 cfs. from the Puyallup River at RM 41.7. For 96 years *(1904-2000)* the diversion dam completely isolated the population(s) of bull trout established throughout the 26+ miles of habitat upstream of the structure; thereby, stemming the genetic flow from bull trout *(populations)* located elsewhere in the basin, or watershed, for several generations. A similar diversion dam and flume intake is located on the White River near the city of Buckley. In addition, Mud Mountain Dam, an impassable man-made earthen dam designed for flood control, is located on the White River just over 5 miles upstream of the diversion dam. These three structures/operations contribute, in whole or in part, to many of the impact issues stated above. A prolific transportation network of paved and unimproved roads extends throughout both watersheds. Additionally, the upper White River Watershed has a network of trails utilized by hikers, horseback riders and mountain bikers. The transportation network within the Upper Puyallup Basin consists almost entirely of unimproved roads developed and utilized primarily for timber harvesting; as well as, hunting, recreational activities, hydroelectric operations, and wildlife and fisheries applications. The transportation networks within the Upper White River basin consist of both paved and unimproved roadways. Lands in timber production areas are densely roaded with some sections approaching six lineal miles per square mile. Roads have contributed many of their trademark problems such as landslides, slope failures, altered hydrology, as well as culvert and bridge projects which can effect upstream migration, and increased levels of sedimentation within effected drainages. Current, as well as former major transportation lines such as highway 410, Sunrise Park Road and the USFS access road #74, in addition to several other road networks and bridge emplacements along the Puyallup and White rivers, all directly interact or alter the hydrology within both upper watersheds. Like the Puyallup, The Upper White River Basin has a vast network of unpaved roads developed and utilized primarily for timber harvesting; as well as, recreational, wildlife, and fisheries applications. There is no direct fishery on bull trout in the Puyallup/White drainage; however, they are legal to catch, but must be released.

The long-standing presence of private industry, primarily hydroelectric and commercial timber harvesting; in addition to recreational uses and the repercussions of negative air and water quality issues, have all produced lasting impacts on the upper watersheds. These impacts include; loss of in-stream large woody debris and LWD recruitment, stream bank modifications, increased sedimentation issues and slope failures due to deforestation, unsatisfactory RMZ management; in addition to, new road construction, road failures, and road decommissioning. A great deal of the aforementioned forestland has been harvested at least once, and in many cases twice; leading to many of the wide-ranging issues common with deforestation. Air and water quality issues vary from measurable levels of airborne contaminants which have been detected in Mt. Rainier National Park; including heavy metals and pesticides discovered in samples of snow, soil and fish. Additional private industrial impacts include the substantial 2006 diesel fuel spill *(estimated @18,000 gal.)* into Silver Creek, a documented bull trout spawning stream. The spill emanated from Puget Sound Energy's back-up electrical generation station on Crystal Mountain.

Harvest

For thousands of years the native populations looked to the Puyallup River as a critical resource. In December of 1854, the Puyallup Tribe along with several other Western Washington tribes, signed the Treaty of Medicine Creek with territorial governor Isaac Stevens *(1818-1862)*. In accordance with the treaty of Medicine Creek, the tribes agreed to reside on appointed reservations, which further required them *(the treaty tribes)* to relinquish much of their historic fishing and hunting lands. However, fishing and hunting rights were addressed in article 3 of the treaty which states in part:

"The right of taking fish, at all usual and accustomed grounds and stations, is further secured to said Indians in common with all citizens of the territory"

The rights of natives to fish would be protested and challenged many times, yet the tribe's treaty right to fish their usual and accustomed areas *(U&A)* was reaffirmed in February 1974, by Judge George Boldt *(Case number C70-9213; U.S. vs. Washington, also known as "The Boldt Decision")*. This historic decision allowed treaty member tribes a right to take 50% of the annual harvestable returns. As a result of the Boldt decision, treaty tribes also became responsible for managing their own fisheries. Today, the Puyallup Tribe continues to view the Puyallup and White rivers as a valuable cultural and economical resource to be protected. In a cooperative effort with state and federal regulatory agencies, the Puyallup Tribe has become an integral link in "Co-Managing" the fisheries and water resources of the Puyallup/White River Watershed.

The Puyallup tribe currently targets Fall Chinook, coho and chum in its net fishery on the Lower Puyallup River. As a protection and enhancement measure, the Puyallup Tribe has not targeted Spring Chinook in its commercial fishery for over 30 years. In addition, the Puyallup Tribe releases all wild steelhead caught incidentally in its fisheries. The goal for all target species is to maintain a harvestable stock by ensuring that a sizable escapement component successfully makes it to the spawning grounds to reproduce. Timing and fishing efforts are focused on harvesting the stronger hatchery stocks of Fall Chinook, coho and chum, while protecting the smaller stocks of wild fish. A harvest biologist with the Puyallup Tribe manages the fishery to prevent overharvest and to protect species of concern. The Puyallup Tribal Fisheries Department works closely with biologists from other state, federal, and tribal agencies to determine the tribal fishing regulations for each season. The Puyallup Tribe employs a rigorous monitoring and evaluation program to monitor and assess effects of in-river harvest management actions. Monitoring and evaluation efforts include extensive spawning ground escapement surveys for Chinook, coho, pink, chum and steelhead; as well as, sampling adult anadromous salmonid returns at the USACE fish trap on the White River.

In conjunction with tribal fishing, the Puyallup River system has long supported a significant sport fishery. Sport fishing regulations and laws are managed and enforced by the Washington Department of Fish and Wildlife. The sport anglers in the Puyallup basin target several species, including Chinook, coho, pink, chum, and steelhead. In the Washington State Sport Catch Report for the 2001-2002 season, (Manning and Smith 2005) reported, based on catch data received from anglers, that 14,292 salmon were harvested in the Puyallup system. Harvest summary results reported by WDFW shows 359 *(marked)* steelhead were caught *(284-winter/75-summer)* during the 2001-2002 season (WDFW 2004). In the State Sport Catch Report for the 2007 season, (Kraig 2011) reported, based on catch data received from anglers, that 27,150 salmon were harvested in the Puyallup system. Harvest summary results reported by WDFW shows 112 *(marked)* steelhead were caught *(109-winter/3-summer)* during the 2007 season (WDFW 2011). Seasons and limits *(quantity, size, origin: wild or hatchery, type of gear used, fishing areas)* are specifically set for each target species to prevent overharvesting and to protect threatened or depressed stocks such as bull trout, Spring Chinook, and wild winter steelhead.

In addition to in-river sport fishing and local tribal harvests, salmon produced in the Puyallup/White River system are harvested outside of the watershed by commercial, sport, and other tribal fisheries. Significant numbers of Puyallup/White River produced salmon are caught annually in the Puget Sound, and fisheries ranging from Oregon to Alaska. Coded wire tag recovery data shows that out of 448 tags recovered from Voights and Diru Creek Fall Chinook releases *(1997 brood-year)*, approximately 36% were harvested in the tribal net fishery in the Puyallup, 17.4% were recovered from hatchery returns, 20% were caught in Puget Sound and Washington ocean fisheries, 0.4% in Oregon marine waters, 25% in Canadian fisheries, and 0.4% in Alaskan fisheries.

Tags recovered from 1,063 White River Spring Chinook *(1993-1994, zero age brood-years)*, which generally reside in Puget Sound waters as adults, shows 78% of tags recovered were from hatchery returns, 16% were from the Puget Sound sport fishery, and 4% from Canadian sport and commercial fisheries. Tag recovery data for 1994 through 1996 coho brood-years show out of 450 tags recovered, 23% were from coho caught in the Puget Sound sport fishery, 3% in Washington ocean sport fishing, 3% in the Canadian ocean sport fishery, 15% were caught in the tribal net fishery in the Puyallup, and 55% were recovered from hatchery returns.

Limiting Factors Affecting Fish Populations

The following pages addressing limiting factors (through flood control history) was written by Russ Ladley and originally printed in the 2000 Puyallup River Fall Chinook Baseline Report. The following version has been edited since originally drafted in 1999.

Over 45 miles of levee exists along the Puyallup and Carbon rivers. As a result, habitat restoration and enhancement actions must emphasize the need to promote freedom for stream channel movement and natural floodplain processes. Within the Salmon Recovery Planning Act, limiting factors are defined as "conditions that limit the ability of habitat to fully sustain populations of salmon." Clearly, levees which block access to peripheral habitat and reduce the available area of active channel have had a limiting affect on the fish production. Channel confinement by levees has dramatically reduced availability of suitable spawning habitat. Setback levees are the solutions to this problem but unfortunately, are years away. The first setback levee project on the Puyallup River (RM 24-26) is an outstanding example of what can be accomplished and the many benefits that are possible. In the short period since completion the river has braided and migrated forming a natural meander pattern that has reduced gradient. The lower average velocity has permitted retention of gravel material that was previously scoured away under high velocity flows. Channel braiding and large woody debris recruitment has added channel complexity and established productive spawning and rearing habitat where it did not previously exist.

Development is the greatest threat to habitat restoration and enhancement. Communities such as Orting are experiencing rapid growth but unfortunately have not provided sufficient setback from floodways and critical areas. Development within both Sumner and Puyallup has, in many cases, encroached so close to the levee that any setback opportunity has either been lost or is so costly to be prohibitive. Further "infilling" will diminish restoration opportunities and at the same time increase dependency upon structural flood management alternatives.

Commencement Bay/Puyallup River Estuary

The Port of Tacoma is today the third largest commercial shipping terminus in the western U.S. Since 1880, a wide variety of activities associated with industrialization and commerce have affected the physical, chemical and biological functions of the Puyallup River estuary. The physical change involves the transformation of 5,700 acres of intertidal wetlands and mudflats into uplands suitable for commercial and industrial development. In 1982, the federal government ranked Commencement Bay amongst the most hazardous waste sites in the U. S. and portions of the area were officially designated as Superfund sites under CERCLA. The Commencement Bay/Nearshore Tideflats (CB/NT) was later added to the National Priorities List (NPL) after fish, shellfish and sediments were found to contain elevated levels of harmful substances.

Commencement Bay is surrounded by industrial, commercial and residential development and is one of the most highly modified and stressed estuaries in Puget Sound (Shreffler et al. 1992). The Tacoma Pierce County Health Department has identified approximately 480 point and non-point sources that discharge into Commencement Bay (Rogers et al. 1983). The first step in cleanup actions involves source control. The industries that have contributed to this dubious distinction include, shipbuilding, coal gasification, petroleum storage and refining, ore handling and smelting, wood products storage, burning, and manufacturing, including Kraft pulp bleaching, chemical storage and manufacturing, solvent processing and many others.

The chemical and biological impacts associated with industrial process contamination have proven the most difficult and costly to assess. After nearly 15 years of study, we are just beginning to understand the full extent of contamination. Although some sites have been remediated, cleanup in many areas is still years away. Research related to fish health and/or injury resulting from contamination is far from conclusive. However, work by Varanasi et al. (1993) indicates juvenile Chinook are susceptible to PCB uptake in polluted estuaries. Furthermore, this contamination has been linked to suppression of the immuno-response system in these fish.

Restoration planning of the CB/NT area is the responsibility of the Natural Resource Damage Trustees. This group includes the NOAA, USFWS, DOE, DNR, WDFW, and the Puyallup and Muckleshoot tribes. The Trustees are charged with restoring injured natural resources. The approach they will use is outlined in the Commencement Bay Restoration Plan and Final Programmatic Environmental Impact Statement (1997). Because of the dramatic loss of intertidal wetland and salt marsh habitat during the last 120+ years, restoration planning and CB/NT mitigation projects will require the conversion of subtidal or upland habitat into intertidal habitat.

Sewage Treatment Facilities

At the present time there are six wastewater treatment plants (WWTP) which discharge directly to the Puyallup and Carbon rivers. These are Carbonado, Wilkeson, South Prairie, Orting, Sumner, and Puyallup. The outfall from the City of Tacoma's WWTP was moved from the Puyallup River to Commencement Bay in 1990. That outfall extends 1200-feet offshore and discharges 38 MGD at a depth of 150-feet. The Puyallup plant is now the largest facility discharging directly to the river with a volume of 3.765-MGD dry weather *(10.72 MGD wet weather and 9.46-MGD annual average)*. Most of the existing WWTP's provide secondary treatment. Both Puyallup and Orting plants were recently expanded to provide both increased capacity as well as advanced treatment. The Wilkeson plant and South Prairie plant are undersized for current capacity. The City of Sumner WWTP has a permitted capacity of 2.62 MGD. Sumner employs chlorine disinfection and sulfur dioxide dechlorination. The actual outfall diffuser is located on the White River 0.4 mile upstream of the confluence with the Puyallup River.

Pierce County is presently evaluating its sewer system within the context of a programmatic EIS. This is being done as part of Comprehensive Plan requirements to prepare and update a long-range service plan. The concepts under review include centralized treatment where all potential sewer service areas will route to the Chambers Creek Regional WWTP. This concept differs from the current decentralized treatment that utilizes facilities based on watershed or sub-watershed proximity and maximizes gravity flow. One of the major concerns with this alternative relates to instream flow loss resulting from the transfer of water out of basin. All of the alternatives under consideration have controversial impacts as does the no-action alternative. Defining the impacts of increased wastewater discharge on fisheries, fish habitat, and the state's antidegradation policy for groundwater are significant and complex matters. Although these issues apply to both centralized and decentralized systems, fisheries impacts are probably greater with a decentralized system because of required plant capacity increases necessary to accommodate future growth.

Upper Puyallup River

The Upper Puyallup Basin had been void of anadromous fish between the construction of the Electron Dam in 1904 and the completion of the 215 foot fish ladder in 2000. The Electron Hydro-project *(formally Puget Sound Energy)* involves a water diversion dam located at RM 41.7, 10.5 miles of flume, a forebay for sediment removal, power generation station and transmission equipment. The project operates under a 400-cfs water right but seldom if ever operates under that volume. Typical operating flows utilize about 350-cfs withdrawal. In 1997 the Puyallup Tribe entered into a Resource Enhancement Agreement (REA) with Puget Sound Energy, the project owner/operator, to begin fisheries restoration efforts within the project affected area. The REA includes provisions for the maintenance of minimum instream flows within the project bypass *(a 10.1-mile reach of the Puyallup River formerly subject to withdrawal of all water save for tributary inflow)*. The Electron project was sold and ownership transferred to Electron Hydro LLC in the fall of 2014; however, the project continues to operate under the REA agreement and Puget Sound Energy since no sale or transfer agreement was made with the Puyallup Tribe.

Excellent spawning habitat exists throughout the Upper Puyallup Watershed, including upstream of the Electron Hydro's diversion dam. Adult Chinook were reintroduced to the Upper Puyallup River in 1999. Surplus Chinook from the WDFW Voights Creek Hatchery were trucked and released at three different locations to maximize disbursement. Subsequent surveys revealed excellent results. Additional adult Chinook plants have been made annually when surplus fish were available. The REA also provided for construction and operation of rearing ponds for coho and Chinook supplementation. The fish production potential of the upper Puyallup is unknown. However, over 26 miles of stream habitat exists above the dam which becomes accessible following completion of the Electron Dam fish ladder in the fall of 2000. The ladder is designed to operate with at least 40-cfs and incorporates a modified weir and rock design. The REA also provides for minimum instream flows which were not previously required despite established state law. Under the REA, Electron Hydro will provide 60-cfs year- round in the bypass reach. This will increases to 80-cfs during the four-month period from July 15 and November 15 to facilitate adult salmon migrating upstream. Water spilled at the dam in conjunction with tributary and spring flow accretion will provide sufficient flow for upstream passage.

Completion of the fish ladder was the centerpiece of the REA. Viable fish habitat must be accessible to realize full production potential. The absence of anadromous fish above Electron Dam prior to 2000 has in all likelihood biased the scrutiny and regulatory oversight of past land use, forest practice and road construction/maintenance actions. Hancock Forest Resource Group *(formally Camble Group L.L.C.)* is the primary private landowner in this WAU but the federal government has considerable holdings as well. The bulk of the Forest Service ownership is contiguous with the Mount Rainier National Park and located on the east headwaters. Primary tributaries to the upper Puyallup include: Neisson Creek, Kellogg Creek, LeDout Creek, Swift Creek, Deer Creek, Mowich River and the North Fork Puyallup River. In addition, numerous small-unnamed wall base channels parallel the Puyallup River and provide prime rearing habitat. Because of the large basin size (110,080 acres) and the quality of habitat available, recovery efforts are a high priority for the Tribe.

Carbon River

The Carbon River flows 33 miles before reaching the Puyallup River near the City of Orting and has a mean annual flow of 664-cfs. The Carbon supports all five species of salmon as well as steelhead, cutthroat and bull trout. Hancock Forest Resource Group and the US Forest Service have roughly equal land ownership in this 92,000-acre WAU. Approximately 66,000-acres are in federal ownership, including National Park designation. The upper 12 miles of the Carbon River in the vicinity of Carbonado and Fairfax are deeply incised in a bedrock gorge which restricts human access. A number of small tributaries enter in this reach but plunge vertically into the river and hence, are not fish bearing. The lower 8.5 miles of the river are artificially confined with a network of levees built and maintained by Pierce County for flood control purposes. This reach of the Carbon also supports a number of naturally spawning Chinook, chum, and steelhead. Productive habitat is severely limited due to confinement between levees and levee/culvert blockages of wall base channels.

South Prairie Creek

South Prairie Creek has long been considered the heart of the Puyallup River fisheries resource. Although returns have declined over the past twenty years, it remains one of the top producers in the Puyallup River system. No other stream in the Puyallup/White basin, except for Boise Creek on the White River, is as productive in terms of both spawning density *(number of spawners per mile)* and total escapement size. The 15.4-miles of anadromous habitat in South Prairie Creek support more Chinook, pink, chum and steelhead than the entire 68 miles of the mainstem Puyallup River. Resource protection within this drainage is therefore paramount. Land use policy and water allocation are two issues that will play a critical role in the long-term viability of this unique drainage.

South Prairie Creek was placed on the state 303-(d) list in 1997 for water temperature excursions. This is alarming particularly because the causal mechanism is not evident. South Prairie Creek flows westward within a steep valley and is bordered by a relatively healthy RMZ throughout much of its course. The fact that the excursion was measured on private timberlands is all the more mysterious. Perhaps ambient water temperatures are naturally warm in this system. Further monitoring will hopefully help edify this enigma.

Hancock is the largest landowner (31%) in the basin followed by the USFS (17%) and Plum Creek (10%). Additionally, 30% of the basin area is mixed residential and agricultural lands. There are approximately 52 miles of stream in the watershed, including tributaries.

Lower Puyallup River

Two primary landform processes are responsible for the current configuration of the Puyallup River valley; glaciation and deposition of alluvial materials. The valley is bordered by uplands made up of unstratified till deposits that were carried by moving ice. They consist of clay, sand and gravel and boulders. Tills are generally stable and well compacted from the weight of glacial ice they once supported.

The valley walls often lack the same compaction and consist primarily of sand and gravel. This material is open and loose. This geological makeup makes them prime candidates for aggregate materials commonly used for Portland cement and structural fill. This high demand resource explains the proliferation of gravel mines in such areas. The primary component of the floodplain is alluvial deposits from streams and rivers. This material is made up of fine sand, silt and clay. These are the nutrient rich soils that brought agricultural fame to the Puyallup valley. Prior to flood control projects, alluvial materials were deposited on the valley floor during seasonal flood events.

The "Limiting Factors Analysis" for the Puyallup River Basin completed by the Washington State Conservation Commission (WCC 1999) found the lower section of the Puyallup River to function primarily as a transportation corridor having lost most of its riparian habitat, spawning habitat, and rearing habitat. Tidal influence can extend upstream to approximately RM 6.0. The salinity halocline has been observed as far upstream as Interstate 5 (WDOT).

Solutions to today's absence of estuarine habitat focus on introducing historical processes, functions and conditions where possible. Although the Commencement Bay tide-flats area may never again resemble pre-European settlement conditions, many opportunities remain to improve upon current conditions. In the fall of 2008, the Puyallup Tribe completed construction of one of its most prevalent watershed restoration projects to date. The Sha Dadx *(Frank Albert Road)* wetland restoration project, located on the lower Puyallup River, created a 12-acre off-channel wetland habitat for salmonids and other freshwater resident fish. The project was instrumental in reestablishing an old disconnected oxbow and low lying wetland to the mainstem river. The reclaimed habitat was lost during the construction of the lower river levee system in the early 1900's. In response to the loss of nearly an entire estuarine ecosystem that once existed, the creation of this critical and necessary lower river environment will provide overwintering, as well as foraging opportunities for young juvenile salmon. In addition, this habitat will offer the benefits that the estuaries once provided to out migrating *(smolting)* salmon during the transition from fresh water to salt water.

Flood Control History

The flood control history described in the White River Spring Chinook Recovery Plan also applies to much of the Puyallup and Carbon rivers. Essentially, flood control was achieved through a combination of practices such as dredging, straightening, revetment and levee construction. The most intensive application of these methods was directed toward the lower Puyallup River from the confluence of the White River to Commencement Bay. In this 10.4-mile stretch, the river is channeled and constrained within a concrete trapezoidal revetment. This effort was initiated by a legislative Act in 1913 which created the Inter-County River Improvement District. This entity was a joint King and Pierce County entity was established to address flooding problems that primarily originated on the White River but which have the greatest impact on the lower Puyallup River.

The bulk of the gravel mining has traditionally taken place in the vicinity of Orting both on the Carbon and Puyallup rivers. Both rivers are tightly confined by levees, which further fuels the perceived need for gravel removal. When a gravel bar is deposited after high flow events, the obvious perception is that it is blocking the channel and must be removed. Many local residents believe gravel mining is an essential component of flood prevention. Public visibility has been an important factor in siting gravel removal operations. The problem with this is that we are recruiting and familiarizing more and more people to the practice who will likely acquire the sentiment that gravel extraction is necessary for flood safety. Gravel removal operations have ceased since the ESA listing of Chinook. Surprisingly, there is little if any scientific data that supports gravel removal as a viable means of flood protection. On the other hand, if residents understood the fact that the flood carrying capacity of the Carbon and Puyallup rivers is less than the 100-year flood at numerous locations (Prych 1988) then they might acknowledge the need for additional land acquisitions and/or setback levee construction. They might also be less willing to purchase homes located in close proximity to the floodway.

The annual volume of gravel material removed from the Puyallup and Carbon rivers has not been well documented. However, most recently, HPA data reveal a trend toward diminishing volumes. Part of this relates to increased concerns about impacts to fish habitat and related difficulties in permitting. Pierce County Water Programs *(formerly River Improvement)* targets gravel removal sites in proximity to public facilities. Bridges and levees that are prone to material buildup *(aggradation)* are typically at the top of the list for gravel removal.

The Department of Natural Resources had the option of charging royalties on aggregate materials mined from waters of the state. The term waters of the state apply to navigable waters which have been determined to be the Puyallup River downstream of the confluence with the Carbon River (RM 17.3). Ideally, mining royalties could be collected and applied to WRIA based mitigation, enhancement and/or land acquisition programs.

On the Puyallup River upstream of Orting, RM 21-25, Pierce County has emphasized property acquisition in lieu of costly maintenance repairs and reconstruction. In fact, since the inception of the property acquisition program in 1991, Pierce County has acquired 21 homes and over 500 acres of floodplain area. This approach was taken to reduce maintenance expenditures associated with repetitive losses of high-risk levee facilities.

In 1997 a 2-mile long setback levee was constructed on the right-bank of the Puyallup between RM 23 and 25. Over 123 acres of public land was added to the floodplain as part of the levee setback. The expanded floodplain will allow flood flow energy to dissipate over a greater area thereby reducing scour depth and providing greater channel stability. In late 2006, a 6000 foot levee set-back was completed upstream of the Calistoga Bridge near the Old Soldiers Home in the town of Orting. This new set-back added over 55 acres to the floodplain within this reach. Freedom from levee confines has permitted natural fluvial processes to reengage the surrounding landscape. Already significant and beneficial changes are apparent. The wooded bottom lands are being flooded, scoured and are forming a diverse floodplain providing characteristic physical and biological features and functions that have been absent since the levees were constructed over 50 years ago.

Property buyout and setback programs must be encouraged. Although expensive, this approach represents the best opportunity for reestablishing natural production. The levee setbacks should be considered only the first in a long list of habitat recovery projects. Additional restoration opportunities offering flood protection benefits are discussed in the Puyallup Tribes, Restoration Site Catalog (Ladley and Smith, 1999). However, there are many more sites that can be added to this list to provide significant habitat additions. Recently released rule language governing take propose significant restrictions to current land use policies. For example, the recognition of channel migration zone (CMZ) will be a key element within the evolving ESA § 4(d) rule now being packaged by the Tri-County governments. It is possible that levee repairs in repetitive loss locations may conflict with CMZ management principles currently under development. This issue is also pertinent to the NMFS concept of properly functioning conditions (PFC). Rule language in the Federal Register reads: properly functioning conditions is the sustained presence of natural habitat forming processes in a watershed (*e.g. riparian community succession, bedload transport, precipitation runoff pattern, channel migration*) that are necessary for the long term survival of the species through the full range of environmental variation. Gravel mining operations clearly affect three of the four italicized elements.

In 1997, at the request of the Puyallup Tribe, Pierce County formed an ad hoc committee on gravel mining. After the February 8, 1996 flood event, a renewed interest in flood protection and gravel removal arose. Pierce County went as far as to prepare a public bid package for the removal of 1-million cubic yards of gravel from the Puyallup River system. Fortunately, no action was taken. The committee addressed local demand for riverine aggregate materials while at the same time recognized the need to protect fish and their habitat. The group was instrumental in approving gravel removal proposals and for the first time used current spawning survey data to minimize adverse impacts to significant spawning habitat.

Vegetation management is another important component of flood management in the Puyallup River, particularly on levees and/ or revetment. For over 65 years vegetation was actively managed to limit size and distribution. The general theory follows that any vegetation that covers revetments may hide obvious signs of structural weakness or potential problems. Root structures from trees were also perceived as a threat to levee integrity. Root balls torn out by flooding or high wind may expose the underlying levee fill material. Without the armor layer to provide protection a levee can rapidly unravel and is susceptible to catastrophic failure.

The Puyallup Tribe has entered in to a levee vegetation management agreement with both Pierce County and the Corps of Engineers. The Corps has flood facility jurisdiction on the lower Puyallup River from RM 3.0 to the mouth. Pierce County has jurisdiction upstream of RM 3.0 to RM 8.26 on the Carbon and to RM 27 on the Puyallup. These agreements were designed to reform levee management practices and reduce habitat injury associated with levee maintenance. The agreements specify where and what vegetation is permissible both on and/or near revetment structures. The arrangement provides for both structural inspection needs and a modicum of fisheries habitat requirements. Since the agreements were adopted, levee vegetation has flourished. Although riparian conditions are still far from ideal, the existing vegetation does provide an important shading function.

Salmonid Escapement Monitoring and Evaluation Program

Project Description: Rigorous monitoring and evaluation to determine the status, trends, responses and use by various life history stages of ESA listed Spring/Fall Chinook, bull trout and winter steelhead; as well as non-listed coho, pink, chum and sockeye salmon within the Puyallup/White River Watershed *(Puget Sound ESU).*

Goals, Purpose and Expected Benefits: In addition to the recovery and sustainability of ESA listed Spring/Fall Chinook, winter steelhead, and non-listed coho, pink, chum and sockeye stocks, the RM&E project is vital for constructing informative and adaptive management decisions leading to effective actions in support of maintaining and improving fisheries stocks for implementation of tribal treaty and subsistence fishing rights. The monitoring and evaluation project is a high priority for the Puyallup Tribe and is vital towards assessing the status and trends of Natural Origin Recruits (NORs) and hatchery salmonids and their environments; as well as, investigating factors affecting salmonid population viability and providing information essential for resolving existing and potential habitat, water quality and hydraulic violation issues through corrective and/or mitigatory actions.

Purpose:

- Provide extensive and statistically rigorous data and information on the status and trends of ESA listed and non-listed salmonids within the Puyallup/White River Watershed.
- Provide comprehensive data and information necessary to ascertain and regulate tribal and non-tribal harvest management actions affecting ESA listed and non-listed salmonids.
- Provide data addressing factors significant to natural events or human activities that impact the viability and ecology of anadromous salmonids.
- Disseminate monitoring and evaluation program discoveries to resource managers.

Benefits:

- Develop adaptive management plans resulting in effective enhancement and protection of ESA listed *(Chinook & steelhead)* and non-listed salmonids present in the Puyallup/White River Watershed.
- Provide future tribal harvest opportunities.
- Provide account of genetic makeup of Chinook and steelhead present in the Puyallup/White River basin to distinguish and preserve genetic diversity and gene flow among local populations.
- Protection and maintenance of pacific salmon and steelhead habitat may benefit other ESA listed salmonid species including bull trout.
- Recommendation of potential restoration or recovery projects, including additional research, assessment or monitoring needs.
- Protection and maintenance of existing salmonid occupied habitats.
- Monitoring of additional salmonid local populations.
- Comprehensive index of spawning reaches necessary for monitoring reproductive salmonid abundance and productivity trends.
- Formulate and institute plans to insure that operations can be adaptively managed to optimize hatchery and natural production, sustain harvest, and minimize ecological impacts.

- Provide statistically analyzable data to establish relationship between adult and juvenile escapements and subsequent smolt production.
- Resolve existing or potential habitat, water quality and hydraulic violation issues through corrective and/or mitigatory actions.

The Washington Department of Fish and Wildlife regularly conducts surveys on several key drainages, including the Clearwater River and Wilkeson Creek for steelhead; as well as South Prairie Creek for Chinook and steelhead. Precise escapement for the upper White River drainage is known, given that all adult salmon and steelhead that spawn in the upper White are first captured in the USACE fish trap, then transported and released above Mud Mountain Dam *(MMD @ RM 29.6)*. Therefore, surveys conducted on the upper White River are done primarily to determine fish distribution and spawning success. Adult spawning data is especially important regarding Spring Chinook, since adult production monitoring is an integral part of the White River Spring Chinook Recovery Plan.

Fall and early winter survey conditions are often marked by extremely low, turbid flows. Early in the Chinook run, flows in the main stem river side channels and tributaries are often too low to allow fish access to these key spawning habitat areas. The resulting focus by Chinook on mainstem spawning is therefore extremely difficult to document due to highly turbid conditions in the Puyallup, White, and Carbon rivers. Low water visibility during the spring often affects the late steelhead surveys in the mainstem rivers as well. Most of this report summarizes spawning ground data gathered from August through June of each spawning season. Chinook *(pink in odd years)* surveys commence in mid August and continue through the first week of November, with peak spawning occurring around the later part of September into early October. The window for bull trout reproduction is quit brief; with the majority of spawning taking place during the first three weeks of September. Coho are observed on the spawning grounds the mid-part of September through late December, peaking around the end of October through the first part of November *(upper South Prairie creeks experiences a late run into February/March)*. Chum spawn as early as the end of October *(Fennel Creek)*, continuing through the first half of February, hitting their spawning peak in mid to late December. Steelhead *(winter run)* surveys begin in mid-March and conclude in mid-June. However, do to the occurrence of both summer and winter steelhead, adult steelhead are often present in the Puyallup/White River Watershed year round. Most streams are surveyed by foot, with the exception of the Puyallup, White and Carbon rivers, as well as South Prairie Creek, which are floated by raft. Peak spawning in the upper watershed occurs in late April to early May; while peak spawning in the lower river system occurs mid-to-late May.

Data collected for all species during spawning surveys include the number of live and dead fish observed throughout the survey reach. With respect to Chinook, steelhead, and bull trout; the number and locations of redds are also documented. Redds are marked with flagging, and the redd locations are collected using a hand held GPS unit. Maps are generated from the GPS data collected, showing the redd locations for Chinook, bull trout, and steelhead *(Appendix B)*. Significant carcass sampling is conducted for adult Chinook and coho throughout the watershed. Carcasses are examined for fin clips *("marked fish" removal of adipose or ventral fin)* and checked for coded wire tags *(CWT's)* with a metal detecting wand. Chinook carcasses with a left or right ventral clip are White River Spring Chinook from acclimation ponds located above Mud Mountain Dam. Carcasses with an adipose clip or a combination adipose clip and CWT, are hatchery origin Fall Chinook. Adult coho carcasses are examined for adipose clips and CWT's. Coho carcasses with no marks or CWT's are considered wild, whereas coho with a missing adipose, and / or CWT's, are considered hatchery origin fish. The snouts are removed from carcasses with detectable CWT's, labeled, and then forwarded to the Washington Department of Fish and Wildlife for identification and entry into the RMIS database.

A tremendous void exists pertaining to knowledge or facts regarding bull trout and other salmonid species distribution and utilization within the Upper Puyallup *(above Electron Diversion @RM 41.7)*. Identifying and assessing the tributary and mainstem habitat available along more than 26 miles of the Upper Puyallup River Basin supporting bull trout, Chinook, coho, and steelhead will provide an invaluable foundation for future conservation, restoration, and recovery actions. Evaluating physical and biological data collected on salmonids in the Upper Puyallup will assist in differentiating genetic diversity among basin populations and aid in recovery planning and implementation. However, such extensive undertakings require additional funding to accomplish. Yet, continuing efforts are being made by the Puyallup Tribe to increase and expand the survey coverage area in order to improve escapement estimates. Improved effort is especially needed in expanding bull trout and steelhead survey areas.

To date, only modest effort has been applied toward surveying the habitat above the Electron diversion dam on the Puyallup River, as well as the mainstem White above Mud Mountain Dam, or the habitat above the upper Carbon River Gorge. Through limited survey observations, along with data collected from adult and juvenile fish caught in the Electron forebay, it is know that Chinook, coho, and steelhead are accessing and spawning in the upper reach of the Puyallup, as well as the Mowich River. Unfortunately, a very limited amount of data has been collected on escapement and spawning distribution of fish in the upper Puyallup River basin.

Adult Salmon and Steelhead Escapement Estimates

It is important to note that the numbers of live fish observed and represented in the graphs are an accumulation of all fish seen throughout the survey season. The total number of live fish observed does not depict the actual estimated escapement which is derived through statistical analysis (AUC method). The area-under-the-curve method used for most of the salmon escapement estimates is the trapezoidal approximation (English et al. 1992; Bue et al. 1998).

Adult Chinook escapement is determined by expanding the number of redds observed by 2.5 fish per redd (Smith and Castle, 1994). Due to the tremendous volume of pink salmon on odd years, the success of determining Chinook redds from pinks is vastly reduced. Therefore, The AUC method is used to determine escapement during pink runs. Currently, instead of using the AUC method to determine steelhead escapement, the Puyallup Tribal Fisheries Department and WDFW determine steelhead escapement based on redd counts. Since the mid 1980's, state biologists have derived steelhead escapement from data obtained through WDFW's *(formally Washington Department of Game)* Snow Creek Research Project (Freymond and Foley 1985). Researchers placed a weir on Snow Creek, and over several years were able to count the number of steelhead passed above, as well as the number of redds produced by spawners. A final factor of 0.81 females per redd was calculated. Furthermore, a ratio of 1 male to 1 female is used when no sex ratio is known; which is the case throughout the Puyallup/White River system. Therefore, to determine the total escapement for steelhead, each redd is multiplied by a factor of 1.62 *(i.e. 42 redds x 1.62 steelhead per redd = total escapement of 68 steelhead)*. This system is not applied to steelhead redds observed in the upper White River drainage. As stated earlier, precise escapement numbers for the upper White River drainage are known. Adult salmon and steelhead that spawn in the upper White are first captured in the U.S. Army Corps of Engineers' fish trap, then transported and released above Mud Mountain Dam. Therefore, surveys conducted on the upper White River are done primarily to determine fish distribution and spawning success.

Juvenile Salmon and Steelhead Production Estimation

The Puyallup Tribe began monitoring marine-migrating salmonids *(smolts)* on the lower Puyallup River *(RM 10.6)* in 2000. The principal objectives of the Puyallup River Juvenile Salmonid Production Assessment Project are to obtain juvenile production estimates, run-timing, survival; as well as growth and species composition indices on Chinook, coho, chum, pink, and steelhead out-migrants *(wild and hatchery for Chinook, coho, and steelhead)*. Fisheries managers can correlate these indices with the estimated adult escapements obtained through spawning surveys to produce juvenile survival rates, along with forecasting future adult returns. The “smolt trapping” mechanism utilized is an E.G. Solutions’ 8-foot diameter rotary screw mounted on two 40-foot pontoon floats *(see Puyallup River Juvenile Salmonid Production Assessment Project section in this report)*. Depending on river conditions, the trap is generally operated on a continuous basis from February/March, through August/September. The traps location upstream of the confluence with the White River excludes making production estimates for the White. However; fisheries managers agree there is a significant need for assessing juvenile salmon and steelhead production in the White River. Although the Puyallup Tribe has possessed a rotary screw trap to employ on the White River since 2002; the lack of adequate site locations, theft, and extreme vandalism have prevented trapping operations from being conducted on a continuous long term basis.

Salmon and Steelhead Hatchery Production

There are currently four hatcheries located within the Puyallup/White River Watershed producing Spring Chinook, Fall Chinook, coho, chum, and steelhead. In addition to the terminal hatchery production, supplementary Spring Chinook are transferred from the WDFW Minter Creek hatchery facility to acclimation ponds located in the upper White River ***(WDFW terminated fish contribution to the Spring Chinook restoration project in 2012, unless surplus fish are available and the tribes (Puyallup/Muckleshoot) pay for marking and rearing)***. The Puyallup Tribe operates two hatcheries on the Puyallup; in addition, the Muckleshoot tribe operates a facility on the White River, and WDFW operates a facility on Voights Creek, a tributary to the Carbon River. The Puyallup Tribe’s salmon hatcheries on the lower Puyallup are located on Clarks Creek and Diru Creek. Clarks Creek Salmon Hatchery is located at RM 1 on Clarks Creek *(10.0027)*. The Clarks Creek facility was constructed in order to address several fish management, and water supply issues; including minimizing the straying of adult Fall Chinook reared by the tribe; providing space for rearing and acclimating White River Spring Chinook, chum and winter steelhead if necessary; creating an independent and self sustaining Fall and Spring Chinook program for the tribe; as well as providing a reliable water supply to rear and expand fish production.

In 2004, the Puyallup Tribal Fisheries Department began acclimating and releasing Fall Chinook from the Clarks Creek facility, thereby discontinuing all Chinook releases from the Diru Creek Hatchery. In early 2005, construction of a new incubation building was completed at Clarks Creek. The incubation building houses 32 incubator stack; each stack is capable of holding up to 77,000 Chinook eggs. This provides for a total capacity of approximately 2.5 million eggs. Once fish are ready to be moved from the incubators, they can be place in one of the 16 aluminum raceway-troughs and hand feeding can begin. The troughs are 16 feet in length with a flow rate of up to 25 gpm. When the fish are approximately 500 to the pound, they are transferred to one of the cement lined ponds. Holding the Chinook in the cement pond is only temporary until they are large enough in size, usually in March/April, to be massed marked via an automated tagger.

Once tagged, the fish are planted in one of the two natural in situ acclimation ponds until they are released in late May or early June.

Diru Creek Hatchery is primarily a chum facility *(Diru Creek is a tributary to Clarks Creek)*; however, the Puyallup Tribe is currently rearing around 25,000+ winter steelhead pre-smolts as well. The Puyallup Tribe currently raises 1.5 to 2.3 million chum smolts for release into the lower Puyallup River. This program significantly augments a tribal river fishery and All Citizen purse seine fishery in East and West Pass in Puget Sound. This stock originated initially from Chambers Creek. Puyallup Tribal Fisheries releases 1,000 to 3,000 pounds annually based on available brood stock returns to Diru Creek Hatchery. The program was started in 1991 and has become self-sustaining.

In 2006, the Puyallup Tribe, in partnership with WDFW and the Muckleshoot Tribe, began artificially propagating White River winter steelhead. Rearing young steelhead is an integral part of the White River winter steelhead pilot project, a program designed to increase winter steelhead escapement in the White River. With the temporary closure of WDFW's Voights Creek hatchery in January of 2009, the Puyallup Tribe has since assumed the majority of responsibility for continuing this important enhancement effort. Steelhead brood-stock collected from the White River USACE fish trap in Buckley are currently held, spawned, incubated, and reared at the Puyallup Tribe's Diru Creek hatchery for a year. After rearing for a year and fish are of size *(approximately 17 fish per pound)*, the pre-smolts are transported to the Muckleshoot hatchery on the White River to acclimate before being released *(data available under the Buckley and Diru Cr. sections in this report).*

The Muckleshoot Tribe operates a Spring Chinook hatchery on the White River near the City of Buckley. Since 1994, the Puyallup tribe has operated ponds used for acclimating Spring Chinook, which are planted in March, and released in May or early June. The Spring Chinook plants are an integral part of the White River Spring Chinook Recovery Plan. The juvenile Spring Chinook originated from the Muckleshoot White River Hatchery and WDFW's hatchery on Minter Creek. Unfortunately, WDFW terminated fish contribution to the Spring Chinook restoration project in 2012; unless, surplus fish are available and the tribes pay for marking and rearing. Depending on availability, between 100,000 to 900,000+ Spring Chinook program fish are transported to the acclimation ponds in early spring, and released in late spring. Spring Chinook are mass marked with left or right ventral fin clips before being planted in acclimation ponds. Odd brood years *(year the fish were spawned)* are marked with left ventral fin clips, and even brood years with right ventral clips. These fish can later be immediately identified and aged when caught at the USACE fish trap in Buckley, and then transported above Mud Mountain dam to spawn naturally. The three operational acclimation ponds the Puyallup Tribe currently operates are satellite facilities to the White River and Minter Creek *(if fish and tribal funding is available)* Spring Chinook hatcheries. The acclimation ponds are located in the upper White River Watershed on the Clearwater River *(Jensen Creek)*; Cripple Creek *(currently non- operational)*; Huckleberry Creek and the Greenwater River pond *(George Creek).* The newest pond located on Jensen Creek in the Clearwater River drainage was completed in the fall of 2012, and will be utilized for enhancing White River Spring Chinook and White River winter steelhead stocks. Chinook production levels vary, but average around 400,000+ smolts; however, numbers of available smolts fluctuates based on available brood stock.

Fish Enhancement and Restoration

Project Description: Currently, the Puyallup Tribe operates up to five acclimation ponds in the Puyallup/White River Watershed designed to reestablish and enhance Spring/Fall Chinook, winter steelhead and coho stocks. Each of two acclimation ponds *(Cowskull & Rushingwater)* on the Puyallup River receive as many as 100K+ hatchery origin Spring/Fall Chinook and/or coho. Three additional acclimation ponds located in the Upper White River drainage *(George Creek (Greenwater River), Huckleberry & Jensen creeks)* can be planted collectively with up to 900K+ White River Spring Chinook and 25K+ White River winter steelhead pre-smolts. The newest pond located on 28 Mile Creek *(Greenwater River)* is slated for completion in the fall of 2015. Jensen Creek in the Clearwater River drainage was completed in the fall of 2012. When obtainable, the Puyallup Tribe will collect, haul and plant surplus adult hatchery fall Chinook and coho from WDFW's Voights Creek hatchery to spawn naturally in minor spawning or underutilized areas in the upper Puyallup River basin. When available, the Puyallup Tribe will in-stream plant juvenile hatchery fall Chinook and chum from the Tribe's Clarks and Diru Creek hatchery facilities to underutilized habitat areas. Steelhead pre-smolts would come from the White River steelhead pilot project the Puyallup Tribe has conducted since 2006.

Goal: One of the Puyallup Tribe's most significant restoration goals is to rebuild depressed Chinook and steelhead stocks and remove them from ESA listing. Acclimation ponds, juvenile in-stream plants and adult surplus fish plants are a proven method for increasing fish stocks, and are key component to restoration goals. Using acclimation ponds, limiting harvest and creating substantial gains in habitat restoration, the tribe will be able to accomplish restoration goals. Levee setbacks, oxbow reconnections both inter tidal and upland, Commencement Bay cleanup, and harvest cutbacks have already been initiated.

Purpose:

- Produce Spring/Fall Chinook, winter steelhead and coho for the Puyallup/White River salmon conservation and harvest programs.
- Establish a total annual return of Spring Chinook Natural Origin Recruits (NORs) that meets the escapement goals for White River Spring Chinook recovery.
- Provide sustainable harvest for tribal and non-tribal fisheries on Fall Chinook and non ESA listed coho.
- Optimize hatchery and natural production consistent with the conservation of naturally produced native fish.
- Maintain genetic makeup of Chinook and steelhead populations spawned or reared in captivity.

Benefits:

- ➢ Reestablish and enhance ESA listed Spring/Fall Chinook and steelhead; as well as non-listed coho into their endemic range.
- ➢ Increased total abundance of the composite natural/hatchery populations.
- ➢ Increased spawning ground escapement and trend of Natural Origin Recruits (NORs).
- ➢ Improve distribution of salmon to minor spawning and underutilized rearing habitat areas *(out planting of live fish)*.
- ➢ Provide future tribal and sport harvest opportunities.
- ➢ Nutrient enhancement in oligotrophic *(nutrient-poor)* streams.

In 2006, the Puyallup Tribe, in partnership with WDFW and the Muckleshoot Tribe, began artificially propagating White River winter steelhead. Rearing young steelhead is an integral part of the White River winter steelhead pilot project; a program designed to increase winter steelhead escapement in the White River. Beginning in 2009, the Puyallup Tribe assumed the majority of responsibility for the continuance of this vital fish enhancement project. Steelhead brood stock collected from the White River are currently held, live spawned, incubated, and reared at the Puyallup Tribe's Diru Creek hatchery for a nearly a year before being transported to the Muckleshoot's hatchery on the White River to acclimate *(imprinting)*. Steelhead are acclimated and released in late May *(3 months)*; at which time they have reached approximately 6-8 fish per pound.

Habitat Restoration and Effectiveness Monitoring

In the fall of 2008, the Puyallup Tribe completed construction of one of its most prevalent watershed restoration projects to date. The Sha Dadx *(Frank Albert Road)* wetland restoration project, located on the lower Puyallup River, created a 17-acre off-channel wetland habitat for salmonids and other freshwater resident fish. The project was instrumental in reestablishing an old disconnected oxbow; in addition to a low lying wetland back into the mainstem river. The reclaimed habitat was originally lost during the construction of the lower river levee system in the early 1900s. In response to the loss of nearly an entire estuarine ecosystem that once existed, the creation of this critical and necessary lower river environment will provide overwintering; as well as foraging opportunities for young juvenile salmon. In addition, this habitat will offer some of the benefits that the estuary once provided to out migrating *(smolting)* salmon during the transition from fresh water to salt water.

A fyke net was put into the Sha Dadx wetland on June 24th, and fished through July 13 , 2010, to monitor residance timing of salmonid smolts in the lower Puyallup River. The only salmonids sobserved were Coho because fyke net construction and installation was delayed. It is expected that most salmonid species would utilize the wetland throught the migration season. During the testing period of the fyke net a total of 570 wild Coho smolts were caught. The majority of this catch, 530, were coho outmigrants from the wetland back into the river. A peak catch of 366 wild coho smolts accured on July 7th 2010, following increased water temperatures and low tides. This data suggests that salmonid smolts do utilize the Sha Dadx wetland as a residance opportunity. Additional effectiveness monitoring to determine salmonid utilization is planed using both the fyke net and/or siene net.

About This Annual Report

The information and spawning data contained within this report is not all inclusive of the entire watershed, but rather focuses on those stream and river segments known to support the majority of spawners. This report is organized alphabetically by stream name, project or facility. If applicable, each includes river miles surveyed, the WRIA designation, as well as a description of the drainage, project or facility. Most of the data is graphically represented by species, showing the total number of live fish, dead fish, and redds counted throughout the spawning season. In addition, yearly species comparisons are presented when three or more years of survey data is available. If less than three years of data is available, or if a particular drainage was not surveyed with any regularity, or if few fish were observed, no graphs are presented. However, raw survey data for each stream and river surveyed can be found in Appendix C. Some graphs in this report were generated using data collected by WDFW. Also included in this report is information and data collected from several other Puyallup Tribal Fisheries projects, including the U.S. Army Corps of Engineers (USACE) fish trap on the White River; Electron Hydro LLC's Electron forebay fish collection facility; The Puyallup Tribal Fisheries Puyallup River juvenile salmonid production assessment project (*smolt trap*); as well as the Puyallup Tribe of Indians salmon hatcheries on Clarks and Diru creeks.

REFERENCES

Alderdice, D.F., J.O.T. Jensen, and F.P.J. Velsen. 1984. Measurement of hydrostatic pressure in salmonid eggs. Can. J. Zool. 62:1977-1987

Beacham, T.D., and C.L. Murray. 1990. Temperature, Egg Size, and Development of Embryos and Alevins if Five Species of Pacific Salmon: A Comparative Analysis. Trans. Amer. Fish. Soc. 119:927-945

Baker, J.D., P. Moran, and R.C. Ladley. 2002. Nuclear DNA identification of migrating bull trout captured at the Puget Sound Energy diversion dam on the White River, Washington State. Molecular Ecology (2003) 12, 557-561

Berger, A., and K. Williamson. 2004. Puyallup River Juvenile Salmonid Production Assessment Project 2004. Puyallup Tribal Fisheries Division, Puyallup, WA.

Berger, A., and K. Williamson. 2005. Puyallup River Juvenile Salmonid Production Assessment Project 2005. Puyallup Tribal Fisheries Division, Puyallup, WA.

Berger, A., R. Conrad, and M. Parnel. 2006. Puyallup River Juvenile Salmonid Production Assessment Project 2006. Puyallup Tribal Fisheries Division, Puyallup, WA.

Berger, A., R. Conrad, and J. Paul. 2007. Puyallup River Juvenile Salmonid Production Assessment Project 2007. Puyallup Tribal Fisheries Division, Puyallup, WA.

Berger, A., R. Conrad, and J. Paul. 2008. Puyallup River Juvenile Salmonid Production Assessment Project 2008. Puyallup Tribal Fisheries Division, Puyallup, WA.

Berger, A., R. Conrad, and J. Paul. 2011. Puyallup River Juvenile Salmonid Production Assessment Project 2011. Puyallup Tribal Fisheries Division, Puyallup, WA.

Bue, B.G., S.M. Fried, S. Sharr, D.G. Sharp, J.A. Wilcock, and H.J. Geiger. 1998. Estimating salmon escapement using area-under-the-curve, aerial observer efficiency, and stream-life estimates: The Prince William Sound pink salmon example. North Pac. Anadr. Fish. Comm. Bull. 1: 240-250

Cannings, S. G., and J. Ptolemy. 1998. Rare freshwater fish of British Columbia. BC Ministry of Environment, Lands and Parks, Victoria, BC.

Carbon River Watershed Analysis. May 1998, Mount Baker Snoqualmie National Forest

Carey, W. E., and D. L. G. Noakes. 1981. Development of photo behavioral responses in young rainbow trout, *Salmo gairdneri* Richardson. Journal of Fish Biology Volume 19, Issue 3, Pages285 – 296. 1981 The Fisheries Society of the British Isles

Cavender, T.M. 1978. Taxonomy and distribution of bull trout *(Salvelinus confluentus)* from the American Northwest. California Fish and Game.64 (3): 139-174.

Chebanov, N.A. et al. 1983. Effectiveness of spawning of male sockeye salmon, *Oncorhynchus nerka* (Salmonidae), of differing hierarchical rank by means of genetic-biochemical markers. Ichthyolo., 23: 51-55.

Chebanov, N.A. 1991. The effects of spawner density on spawning success, egg survival, and size structure of the progeny of sockeye salmon, *Oncorhynchus nerka.* Ichthyolo., 31: 103-109.

Chebanov, N.A. 1994. Behavioral mechanisms of density regulation in Pacific salmon genus *Oncorhynchus* during spawning. 1. An analysis of the results of field experiments with sockeye salmon *O. nerka*. Ichthyolo., 34: 51-61. Commencement Bay Nearshore /Tideflats Record of Decision. 1989. EPA Region 10. Seattle, WA.

Dunston, W. 1955. White River downstream migration. Puget Sound Stream Studies (1953-1956). Washington Department of Fisheries, Olympia, WA.

English, K.K., R.C. Bocking, and J.R Irvine. 1992. A robust procedure for estimating salmon escapement based on the area-under-the-curve method. Can. J. Fish. Aquat. Sci. 49: 1982.

Foote, C.J. 1989. Female mate preferences in Pacific salmon. Animal Behavior, 38: 721-723

Ford, M.J., and P. Schwenke. 2004. Report to the Puyallup Tribe Fisheries Division regarding genetic variation among samples of chum salmon collected in the Puyallup River. Watershed Northwest Fisheries Science Center, Conservation Biology Division, Seattle, WA.

Ford, M.J., T. Lundrigan, and M. Baird. 2004. Population Structure of White River Chinook Salmon Draft Report. Watershed Northwest Fisheries Science Center, Conservation Biology Division, Seattle, WA.

Governor's Salmon Recovery Office. 1999. Statewide strategy to recover salmon – extinction is not an option. State of Washington. 325 pages with appendices.

Groot, C., and L. Margolis. 1991. Pacific Salmon Life Histories. University of British Columbia Press, Vancuver, B.C., Canada. 564pp.

Johnson, B.A., and B.M. Barrett. 1988. Estimation of salmon escapement based on stream survey data. Regional Inf. Rep. 4K88-35, Alaska Department of Fish and Game, Division of Commercial Fisheries, Kodiak, Alaska.

Johnson, R. (2006) Information presented to the White River Spring Chinook Technical Committee regarding DNA and age results for unmarked (NOR) Chinook at the USACE Buckley trap that were subsequently incorporation into the White River hatchery program. Unpublished document.

Heard, W. R. 1964. Phototactic behavior of emerging sockeye salmon fry. Animal Behavior 12(2—3):382—388. Heiser, D. W. 1969.

Keenleyside, M.H.A., and H.M.C Dupuis. 1988. Courtship and spawning competition in pink salmon *(Oncohynchus gorbuscha)*. Can. J. Zool. 66: 262-265.

Kraig, E. 2011. Washington State Sport Catch Report 2007. Washington Department of Fish and Wild life, Fish Program Science Division. Olympia, Wa.

Ladley, R.C., and B. E. Smith. 1999. Restoration Opportunities on the Puyallup River, Restoration Site Catalog. Puyallup Tribal Fisheries, Puyallup, WA. 66pp.

Ladley, R.C., B. E. Smith, and M.K. MacDonald. 1996. White River Spring Chinook Migration Behavior Investigation. Puyallup Tribe Fisheries Division, Puyallup, WA.

Leary, R.F., and F.W. Allendorf. 1997. Genetic Confirmation of Sympatric Bull Trout and Dolly Vardon in Western Washington. Trans. Amer. Fish. Soc. 126:715-720.

Leman, V.N. 1993. Spawning sites of chum salmon, *Oncorhynchus keta*: Microhydrological regime and varibility of progeny in redds (Kamachatka River basin). Journal of Ichthyology, 33 (2): 104-143

Manning, T., and S. Smith. 2005. Washington State Sport Catch Report 2001. Washington Department of Fish and Wildlife, Fish Program Science Division. Olympia, Wa.

Marks, E.L. (2000). Surveys to determine the presence or absence of bull trout in river and stream dranages within Mount Rainier National Park during the summer of 2000. Unpublished work. National Park Service, Division of Natural Resources, Longmire, WA.

McNeil, W.J., and W.H. Ahnell. 1964. Success of pink salmon spawning relative to size of spawning bed matrials. U.S. Fish and Wildl. Serv., Special Scientific Report – Fisheries No. 407: 20pp.

McNeil, W.J. 1966. Effects of the spawning bed environment on the reproduction of pink and chum salmon. U.S. Fish and Wildl. Serv. Fish. Bull. 65: 495-523.

Mork, O.I. 1995. Aggressive behavior of two size classes of four salmonid species. Fisken Og Havet. NR. 19pp. Pauley, G.B., Bortz, B.M., and Shepard, M.F. 1986. Species profiles: life histories and environmental requirements of coastal fishes and invertebrates (Pacific Northwest) -- steelhead trout. U.S. Fish and Wildl. Serv. Biol. Rep. 82(11.62). U.S. Army Corps of Engineers, TREL-82-4. 24pp.

Peterson, N.P., and T.P. Quinn. 1996. Spacial and temporal variation in dissolved oxygen in natural egg pockets of chum salmon, in Kennedy Creek, Washington. Fish Biol. 48: 131-143

Piper, R.G. et al. 1982. Fish Hatchery Management. United States Department of the Interior, Fish and Wildlife Service, Washington D.C. 517pp.

Pratt, K.L. 1992. A review of bull trout life history. Pages 5-9 *in* P.J. Howell and D.V. Buchanan, editors. Proceedings of the Gearhart Mountain Bull trout workshop. Oregon Chapter of the American Fisheries Society, Corvallis.

Prych, E.A. 1987. Flood –carrying capacities and changes in channels of the lower Puyallup, White and Carbon Rivers in Western Washington: U. S. Geological Survey Water-Resources Investigation Report 87-4129, 71pp.

Quinn, T.P. et al. 1996. Behavioral tactics of male sockeye *(Onchorynchus nerka)* under varying operational sex ratios. Ethology 102, 304-322.

Quinn, T.P. 2005. The behavior and ecology of Pacific salmon and trout. American Fisheries Society, Bethesda, MD, and Univ. of Washington Press, Seattle, WA. 378pp.

Salo, E.O., and T.H. Jagielo. 1983. The Status of the anadromous fishes of the White-Puyallup River system. Report submitted to the Seattle District United States Army Corps of Engenieers, Seatle, Wa. 200pp.

Shaklee, J.B., and S.F. Young. 2003. Microsatellite DNA Analysis and Run Timing of Chinook Salmon in the White River (Puyallup River Basin). Genetics Laboratory, Conservation Biology Unit, Science Division, Fish Program. Washington Department of Fish and Wildlife, Olympia, WA.

Sheridan, W.L. 1962. Water flow through a salmon spawning riffle in Southeastern Alaska. U.S. Fish and Wildl. Serv., Special Scientific Report Fisheries No. 407: 20pp.

Shirvell, C.S., and R.G. Dungey. 1983. Micro-habitats chosen by brown trout for feeding and spawning in rivers. Trans. Amer. Fish. Soc. 102: 312-316

Shreffler, D.K., C.A. Simenstad, and R.M. Thom. 1992. Juvenile salmon foraging in a restored estuarine wetland. Can. J. Fish. Aquat. Sci. 47: 2079-2084.

Simenstad, C.A. 1999. Commencement Bay aquatic ecosystem assessment – ecosystem scale restoration for juvenile salmon recovery. Prepared for City of Tacoma, Washington Department of Natural Resources, U.S. Environmental Protection Agency. 51 pp.

Smith, Carol J. and Pete Castle. 1994 Puget Sound Chinook Salmon *(Oncorhynchus tshawytscha)* Escapement Estimates and methods – 1991. Northwest Fishery Resource Bulletin, Project Report NO. 1. Northwest Indian Fisheries Commission, Olympia, WA.

Spidle, A. 2010. Population structure of Natural Origin Recruits Passed Upstream of the White River's Buckley Trap. Hatchery Reform Project Completion Report. Unpublished work. NWIFC Olympia, WA.

Sumioka, S.S. 2004. Trends in streamflow and comparisons with instream flows in the lower Puyallup River Basin, Washington: U.S. Geological Survey Scientific Investigations Report 2004-5016, 46 p.

Varanasi, U. et al. 1993. Contaminant exposure and associated biological effects in juvenile Chinook salmon *(Onchorynchus tshawytscha)* from urban and non-urban estuaries of Puget Sound. NOAA Technical Memorandum NMFS-NWFSC-8 76 pp and appendices.

Washington Conservation Commission. 1999. Salmon habitat limiting factors report for the Puyallup River basin. (Water Resource Inventory Area 10) 126 pp.

Washington Department of Fish and Wildlife. 2004. 2001-2002 Steelhead Harvest Summary (run corrected). Washington Department of Fisheries, Olympia, WA.

Washington Department of Fisheries, Washington Department of Wildlife and Western Washington Treaty Indian Tribes. 1993. 1992 Washington state salmon and steelhead stock inventory. Washington Department of Fisheries, Olympia, WA.

Washington Department of Fish and Wildlife, Puyallup Indian Tribe and Muckleshoot Indian Tribe. 1996. Recovery Plan for White River Spring Chinook Salmon. WDFW, Olympia WA.

Washington Department of Fish and Wildlife and Puyallup Indian Tribe. 2000. Puyallup River Fall Chinook Baseline Report. Washington Department of Fisheries, Olympia, WA.

Wicket, W.P. 1958. Review of certain environmental factors affecting the production of pink and chum salmon. Journal of Fisheries Research Board of Canada. 15: 1103-1126

Williams, R.W., R.M. Laramie, and J.J Ames. 1975. A catalog of Washington streams and salmon utilizetion, volume 1-Puget Sound Region. Washington Department of Fisheries, Olympia, WA.

Witzel, L.D., and H.R. MacCrimmon. 1983. Redd-site selection by brook trout and brown trout in Southwestern Ontario streams. Trans. Amer. Fish. Soc. 112: 760-771

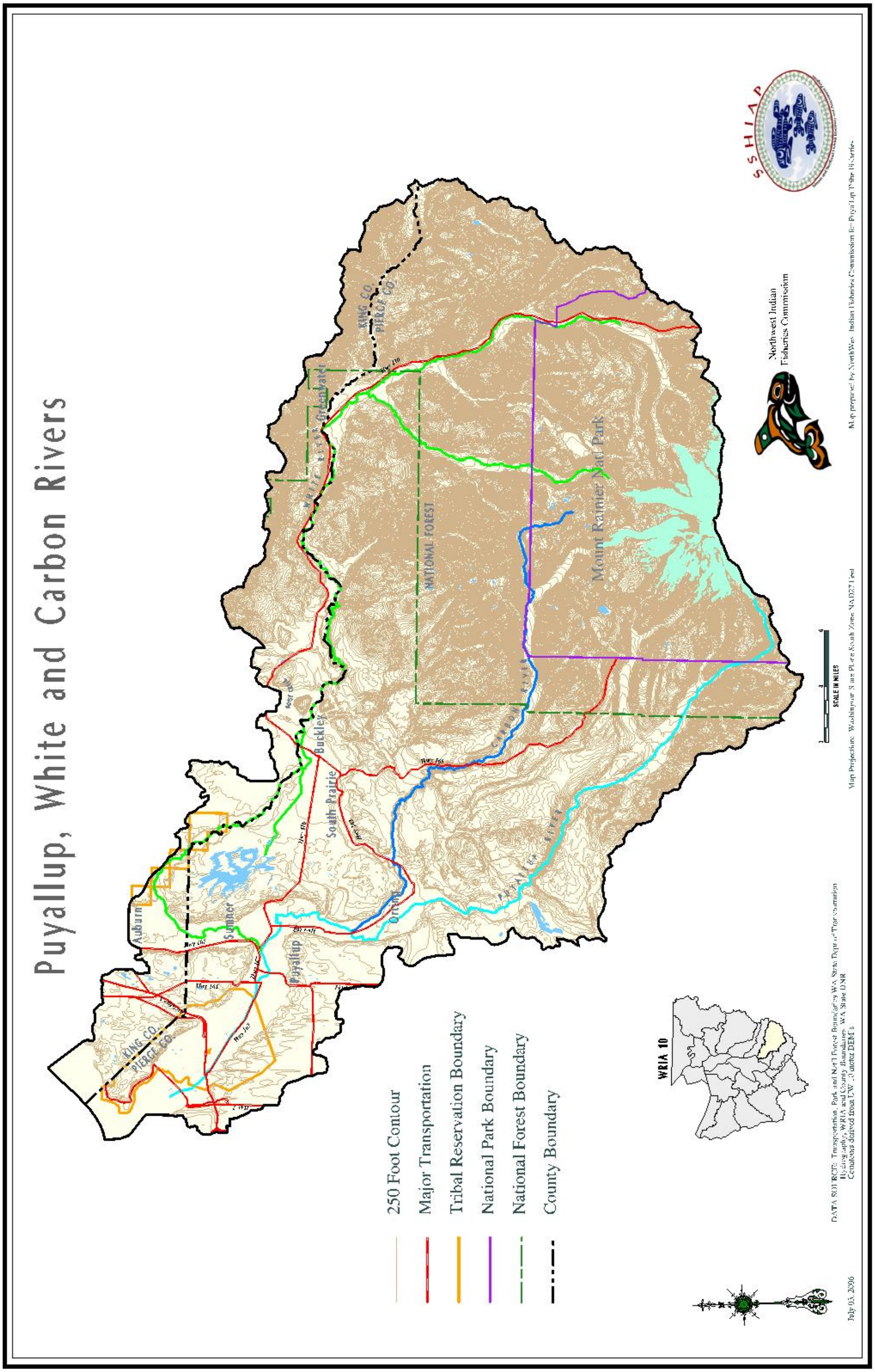
SUMMARY OF 2014/2015 ACCOMPLISHMENTS

Several fisheries escapement and enhancement projects were continued or completed during the 2014-2015 season. Most of the following projects or studies are covered in more detail in this report. Other Puyallup tribal fisheries projects involving harvest, TFW, environmental, management, and habitat are covered in separate reports.

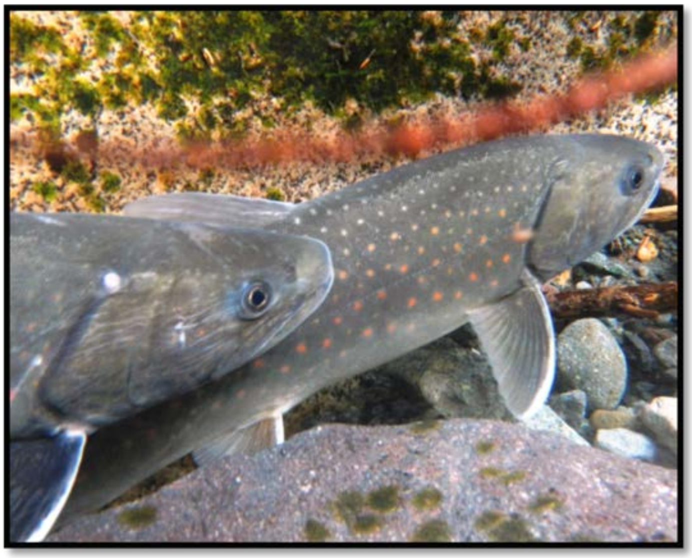
- Spring Chinook spawning surveys in the upper White River above Mud Mountain Dam.
- Spring/Fall Chinook spawning surveys in the Puyallup/lower White River Watershed.
- Upper White River bull trout spawning surveys.
- Coho spawning surveys in the Puyallup/White River Watershed.
- Chum spawning surveys in the Puyallup/lower White River Watershed.
- Winter steelhead spawning surveys in the Puyallup/White River Watershed.
- Juvenile salmonid production assessment project on the lower Puyallup River.
- Sampled and monitored adult salmonids at the USACE trapping facility on the White River.
- Monitored, sampled and evaluated the migration and survival of salmonids at Electron Hydro's *(formally owned/operated by PSE)* Electron fish collection facility *(Puyallup River)*.
- Spring Chinook acclimation project on upper White River tributaries: Huckleberry Creek and the Greenwater River.
- Fall Chinook acclimation project on the Puyallup River and Hylebos.
- Fall Chinook hatchery production at Puyallup Tribe's hatchery facility on Clarks Creek.
- Chum hatchery production at Puyallup Tribe's hatchery facility on Diru Creek.
- Collected wild brood-stock for the White River winter steelhead supplementation project *(project initiated in 2006)*.

ABBREVIATIONS, ACRONYMS AND INITIALISMS

AUC: Area under the curve
CB/NT: Commencement Bay/ Nearshore Tideflat
CERCLA: Comprehensive Environmental Response, Compensation, and Liability Act
CFS: Cubic Feet per Second
CWT: Coded Wire Tag
DIDSON: Dual Frequency Identification Sonar
DNA: Deoxyribonucleic acid (genetic sample)
DNR: Department of Natural Resources
EIS: Environmental Impact Statement
ELJ: Engineered Log Jam
ESA: Endangered Species Act
GIS: Geographic Information Systems
GPM: Gallons per Minute
GPS: Global Positioning System
LP: Lower Pond
LWD: Large Woody Debris
M: Marked fish (internal/external tags or fin clipped), Hatchery origin
MMD: Mud Mountain Dam (USACE Facility)
MGD: Million Gallons per Day
MS-222: Tricaine methanesulfonate (anesthetic)
N/O: None Observed
NOAA: National Oceanic & Atmospheric Administration
NOR: Natural Origin Recruit (Wild)
NPS: National Park Service
NTU: Nephelometric Turbidity Units
NWIFC: Northwest Indian Fisheries Commission
RM: River Mile
RMIS: Regional Mark Information System
RMZ: Riparian Management Zone
PIT: Passive Integrated Transponder (internal tag)
PSE: Puget Sound Energy
PTF: Puyallup Tribal Fisheries
TFW: Timber, Fish and Wildlife
U: Unmarked fish (no internal/external tags or fin clips), Wild
UP: Upper Pond
USACE: United States Army Corps of Engineers
USFS: United States Forest Service
WDFW: Washington Department of Fish and Wildlife
WRIA: Water Resource Inventory Area
0 (age): Sub-yearling, zero aged fish (less than one year old), young of the year
1+: Yearling (1 year + age fish)


Puyallup, White and Carbon Rivers
250 Foot Contour
Major Transportation
Tribal Reservation Boundary
National Park Boundary
National Forest Boundary
County Boundary
WRIA 10
NATIONAL FOREST
Mount Rainier Nat'l Park
Auburn
Sumner
Puyallup
Orting
South Prairie
Buckley
Greenwater
KING CO.
PIERCE CO.
SCALE IN MILES
Northwest Indian Fisheries Commission
SSHIAP
July 03, 2006

ANTLER CREEK 10.0352

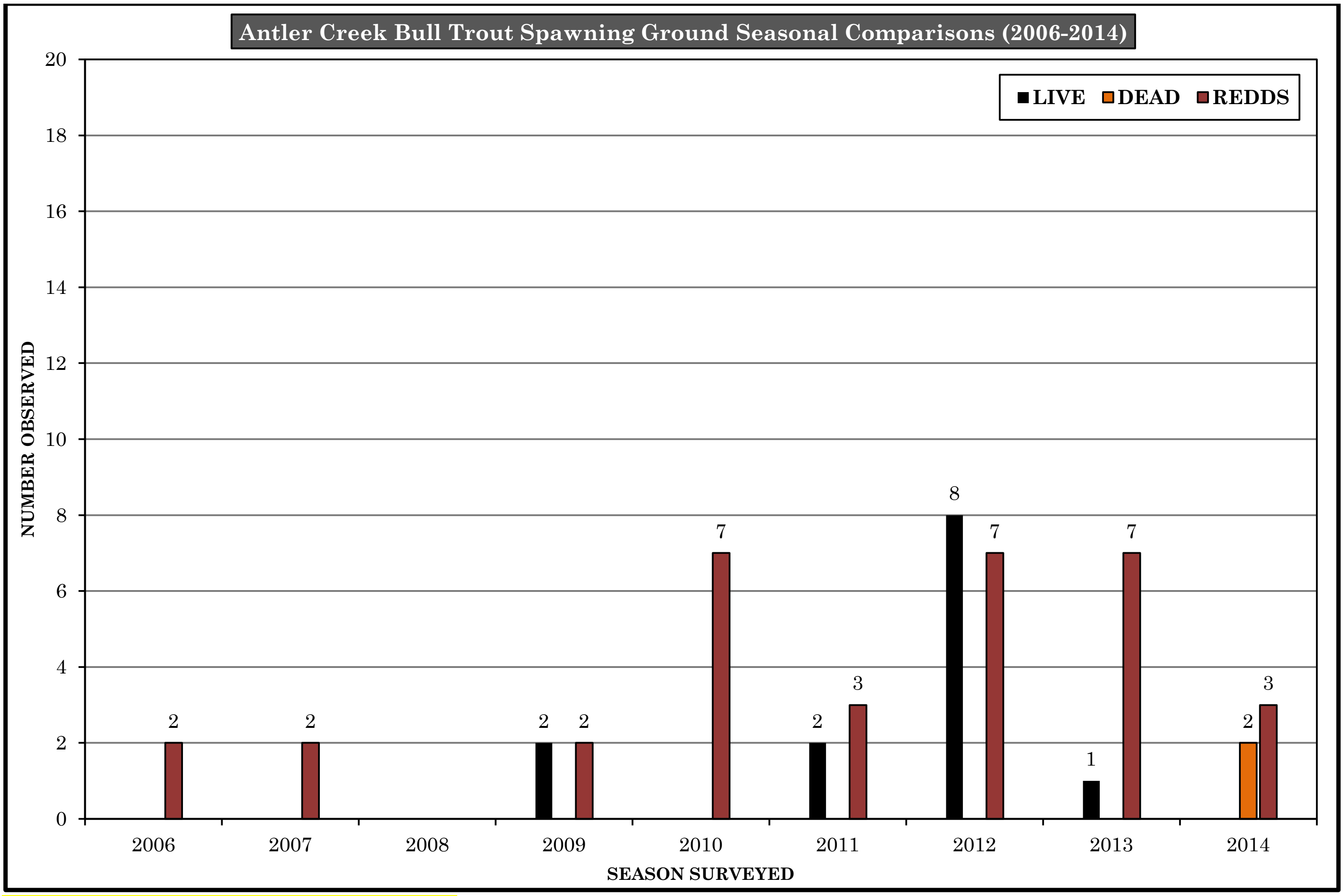


Antler Creek is not officially named by the Washington State Board on Geographic Names; however, for easy identification the creek is referred to as "Antler" by PTF staff. Antler is a small, short run *(1.2+ miles total length)*, west facing right bank headwater tributary to the White River. Primarily supporting bull trout, Antler Creek is a small stream located entirely within Mt. Rainier National Park. Despite its lack of habitat accessible by salmonids, the lower reach of Antler does provide suitable habitat conditions for bull trout rearing and spawning. Since 2006, the Puyallup Tribe has surveyed the creek for bull trout spawning activity from late

August through early October, with peak spawning occurring around the third week in September *(see Appendix C for survey data)*. Unfortunately, Antler Creek's elevation *(mouth @ 2950')* is likely too high for other salmon species. Originating along the slopes of Crystal Mountain Ridge, the creek flows entirely within Mt. Rainier National Park *(NPS stream designation w09-00a),* entering the White River at approximately RM 65.9; which is 0.4 miles downstream of Crystal Creek.

Characteristic of many headwater tributaries, the mouth of the creek frequently drifts due to its position within the open channel migration zone of the White River. As a result of mainstem river incursions, the creeks lower channel *(100'+)* and riparian habitat are frequently altered. The habitat within this section is the least conducive to spawning due to a primarily sandy substrate. In addition, this reach of the creek is highly subjected to the possibility of redd scouring or heavy silt deposition due to the influences of the mainstem White River.

Nearly the entire accessible reach of the creek *(approximately 400')* is low gradient. Although spawning does occur within this small stretch *(depending on mainstem influence),* it is often limited due the lack of quality spawning substrate created by the fine alluvial deposits *(sand & silt)* from the White River. In addition, bull trout spawning has been less consistent and frequent in this tributary compared to that observed in more significant headwater tributaries located along the White River, such as Klickitat Creek *(elev. 3300')* located 2 miles upstream. There are small quantities of instream LWD present, as well as a beneficial riparian buffer zone of primarily conifers along the majority of the creek. Upstream of the accessible reach, the creek enters the heavily forested lower slope of the valley floor as it begins to climbs up the valley wall. From this point, the creek assumes a pool-riffle-cascade configuration up the steep valley wall. At approximately RM 0.2, the creek passes under Hwy 410, near mile marker 61. For more information on bull trout, refer to the Klickitat Creek section in this report.



See Appendix B for bull trout redd locations.

BOISE CREEK 10.0057

Boise Creek is a significant tributary to the White River, converging with the White River at RM 23.5, just upstream of where highway 410 crosses the river north of the city of Buckley. In contrast to most of the Puyallup/White River Watershed which falls within Pierce County, Boise Creek lies within South King County, with much of the lower creek flowing just south of the city of Enumclaw. With its headwaters located in a well forested area of the Grass Mountain Range; Boise creek drains an area of approximately 15.4 mi^2.

Despite its numerous impairments, Boise Creek has often proven to be highly productive tributary over the past decade. A majority of the lower 4.5 miles of the creek provides suitable habitat for several salmonid species including spring and fall Chinook *(center)*, coho, pink, chum, sockeye, steelhead, bull trout and cutthroat trout. In August of 2003, the city of Tacoma *(TPU)* removed its 99 year old concrete pipeline crossing located at RM 23 on the White River. The concrete and rebar structure had long been suspected of injuring salmon and limiting upstream migration of weaker swimmers like chum salmon. The removal of the old concrete structure has resulted in increased number of chum salmon being able to access Boise Creek. Chum were observed in the lower 2.5 miles of the creek during the 2008 through 2010 seasons.

A 12-ft bedrock falls at RM 4.5 marks the upper extent of adult salmon and steelhead migration. Cutthroat and rainbow trout have been observed above the falls; although, no data is available on the size or range of the population(s). Above the falls, the gradient increases, becoming a small cascade/step-pool configuration. The channel upstream of the falls, to where Boise crosses under highway 410, was altered back in the mid 1930's to accommodate for the construction of the highway. Upstream of 410, the creek passes through the old Weyerhaeuser mill site, which continues to be a source of sedimentary input.

For approximately 0.2 miles below the falls, Boise flows through a lower gradient riffle-pool channel bordered by a dense second growth forest; there are several spawning opportunities throughout this forested stretch. Continuing downstream of the forested area is a low gradient reach flowing for approximately 0.5 miles within the golf course in the city of Enumclaw. The riparian zone alongside this section is exceptionally sparse; the banks are merely ripraped and bordered by maintained turf grass, blackberry, and small deciduous trees. There is, however, a short section located within the golf course below RM 4.0 with an intact hardwood riparian zone. Spawning is noticeably reduced throughout the entire reach of the creek flowing within the open range of the golf course. Downstream from the golf course, Boise Creek begins to flow through residential and agricultural lands. This more developed reach extends from approximately RM 3.7 down to RM 0.3; much of the stream along this stretch is incised to depths of 20 feet or more. Extensive tracts of land bordering Boise Creek below RM 3.5 are primarily used for maintaining cattle and other livestock *(below)*.

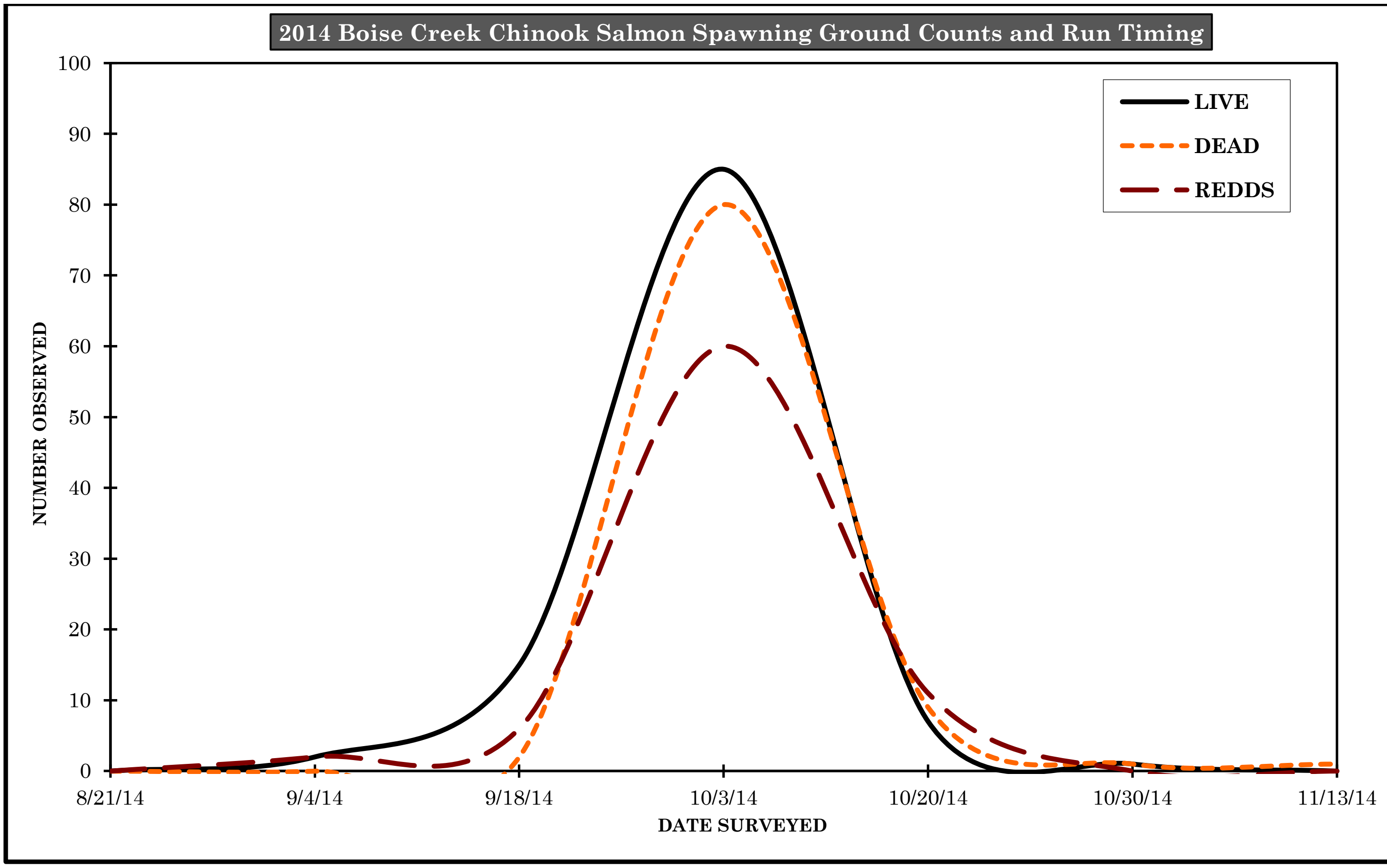
Although spawning activity for nearly all species occurs throughout the entire 4.5 miles, as much as 65-70% of Chinook, coho, and pink spawning frequently occur above RM 2.2. From 1999 to 2007, an average of 63.8% *(range 53.5%-83.3%)* of steelhead spawned above RM 2.2. During the 2005 season, the first significant numbers of chum salmon were observed as high as RM 1.5. Boise has continued to support a significant number of Chinook spawners *(previous page, center)* over the past several seasons, as well as pinks on odd years. Carcass sampling data shows that a significant number of Chinook, as high as 80% *(in 2011)*, that spawn in Boise Creek are hatchery origin Fall Chinook. DNA sampling studies of Chinook in the White River, Ford et al. (2004), showed an approximately 60% fall and 40% Spring Chinook component in the lower river *(below RM 24.3)*. The pink salmon returns to Boise in 2005, 2007, and 2009 were unprecedented. Estimate calculations put

the escapement at nearly 16,000 fish in 2005, nearly 28,000 in 2007, and over 100,000 in 2009. Further pink returns have been significantly less than the 2009 escapement.

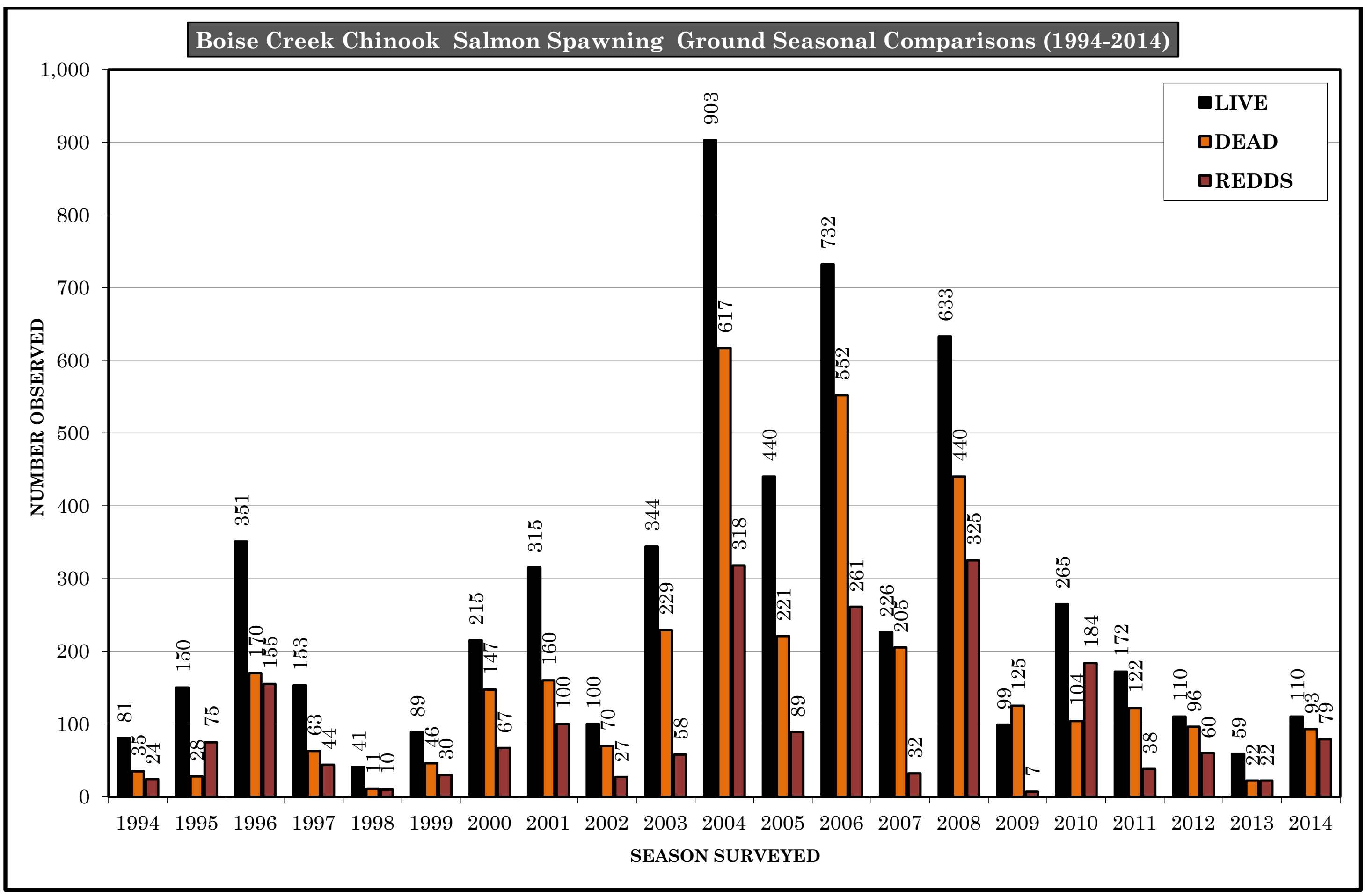
Spawning opportunities for all species is considerably reduced in the lower 0.1- 0.3 miles of the creek *(upstream of Mud Mountain Dam Road)*. The gradient throughout this short stretch is steeper, the banks are confined by high sheer walls, and the substrate consists of mostly boulders and large

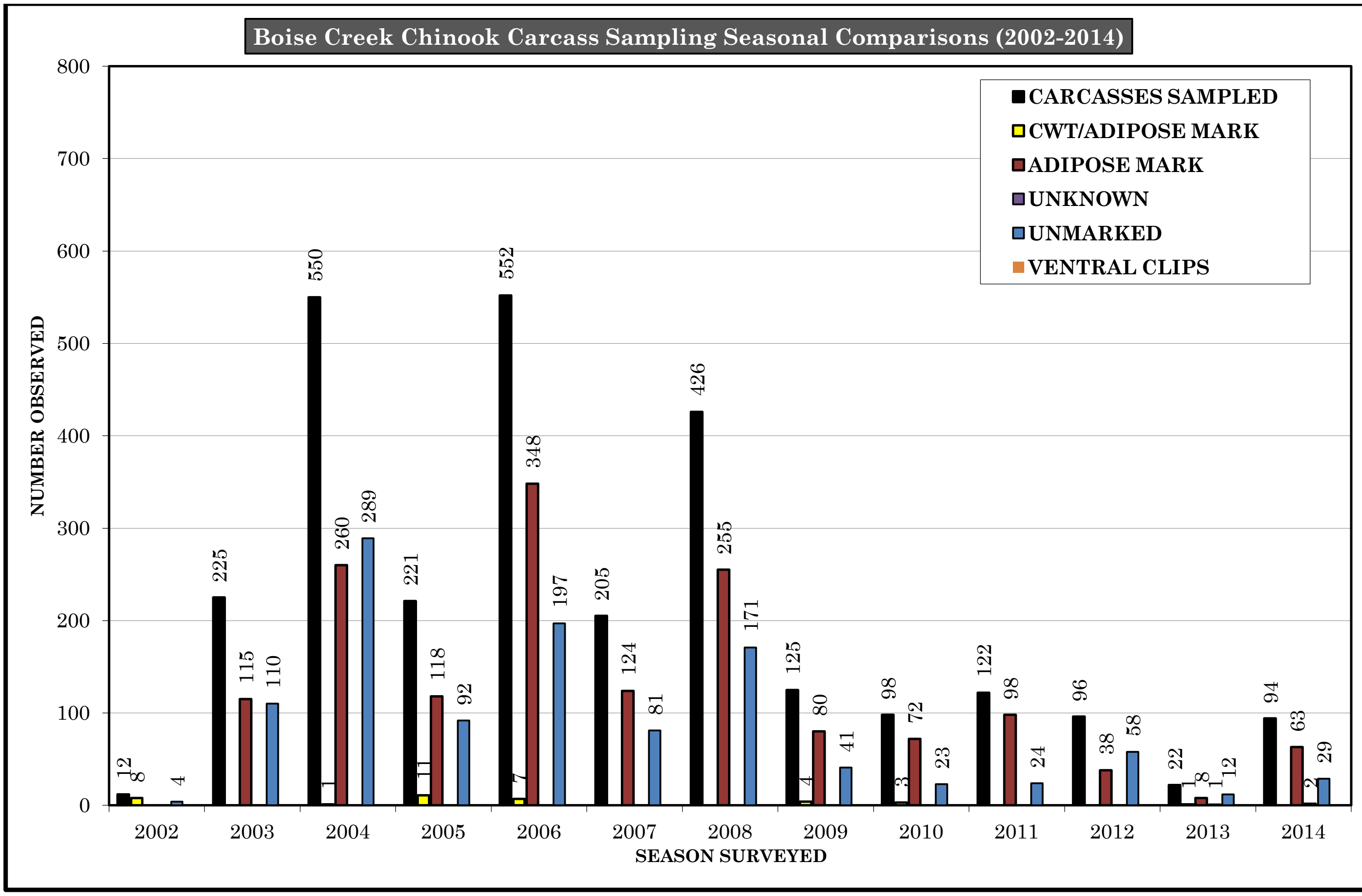
cobble. Chinook, coho, and steelhead are especially vulnerable to poaching and harassment in this urban stream. In addition, surrounding agricultural land use continues to impact channel and water quality conditions. Other limiting factors affecting Boise include the loss of historic flood plain and streamside riparian, channel confinement and realignment, temperature and other water quality issues *(surface water discharge)*; as well as, reduced LWD inputs and the removal of instream LWD and substrate material *(dredging)* by land owners.

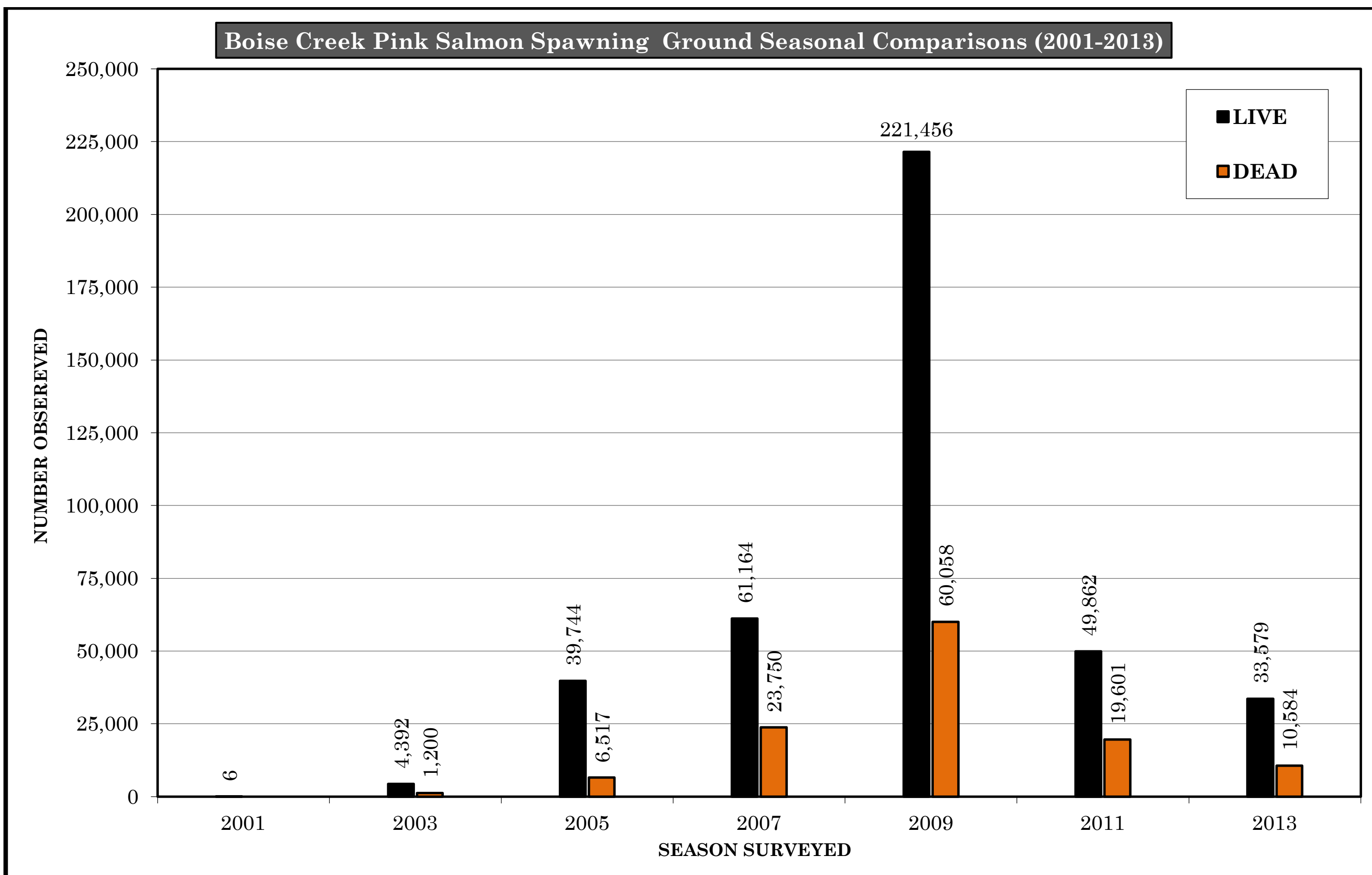
Tremendous improvements to riparian and stream channel conditions are possible but require willing land owners, technical expertise and funding. Despite its many habitat related shortcomings, Boise Creek continues to support returns of wild steelhead, a remarkable fact in light of the basin-wide decline over the past decade. In fact, Boise exhibits the highest steelhead redd density found anywhere in the watershed, including South Prairie creek. In 2010, the establishment of a new lower channel was completed; starting from Mud Mountain Dam Road, downstream to the White River. The new channel offers improved rearing and spawning habitat. Steelhead redds have been observed in the new channel each season since its completion. In the spring of 2013, the King County Water and Land Resources Division initiated a channel enhancement project along the mid Boise creek channel above 268th St. *(top right)*. The project is designed to improve instream and surrounding wetland complexity, as well as utilization.

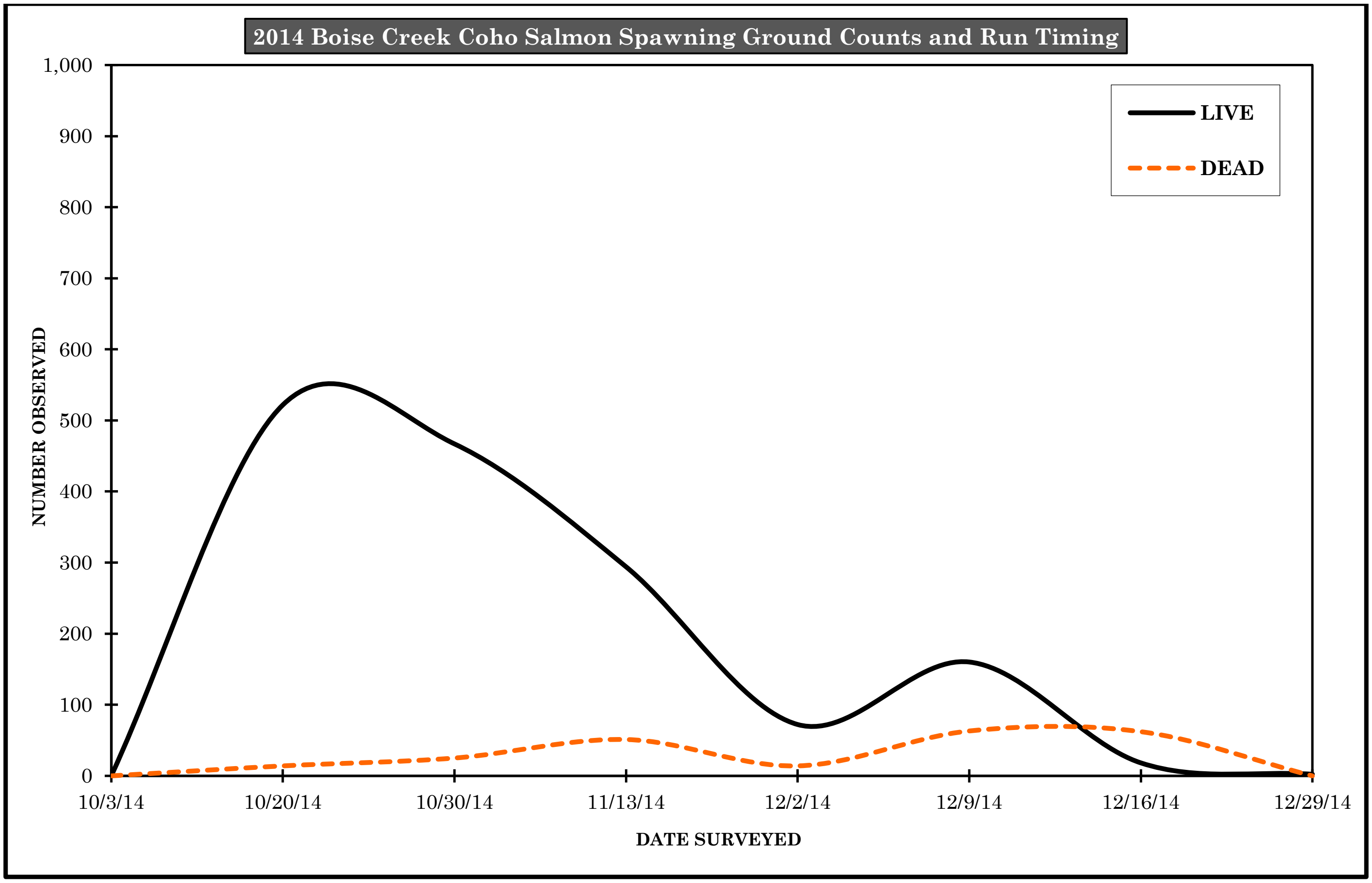


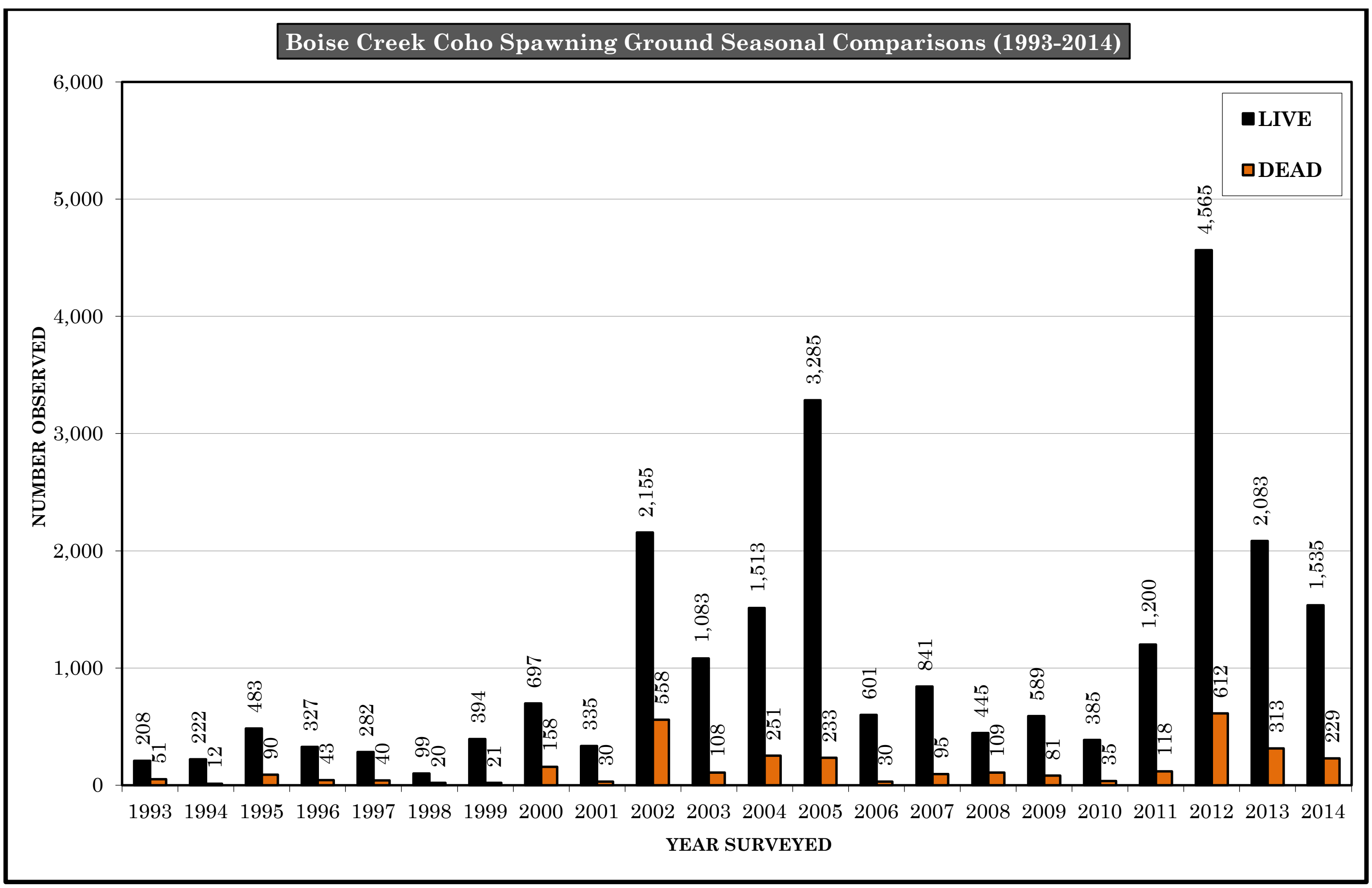
See Appendix B for Chinook redd locations.

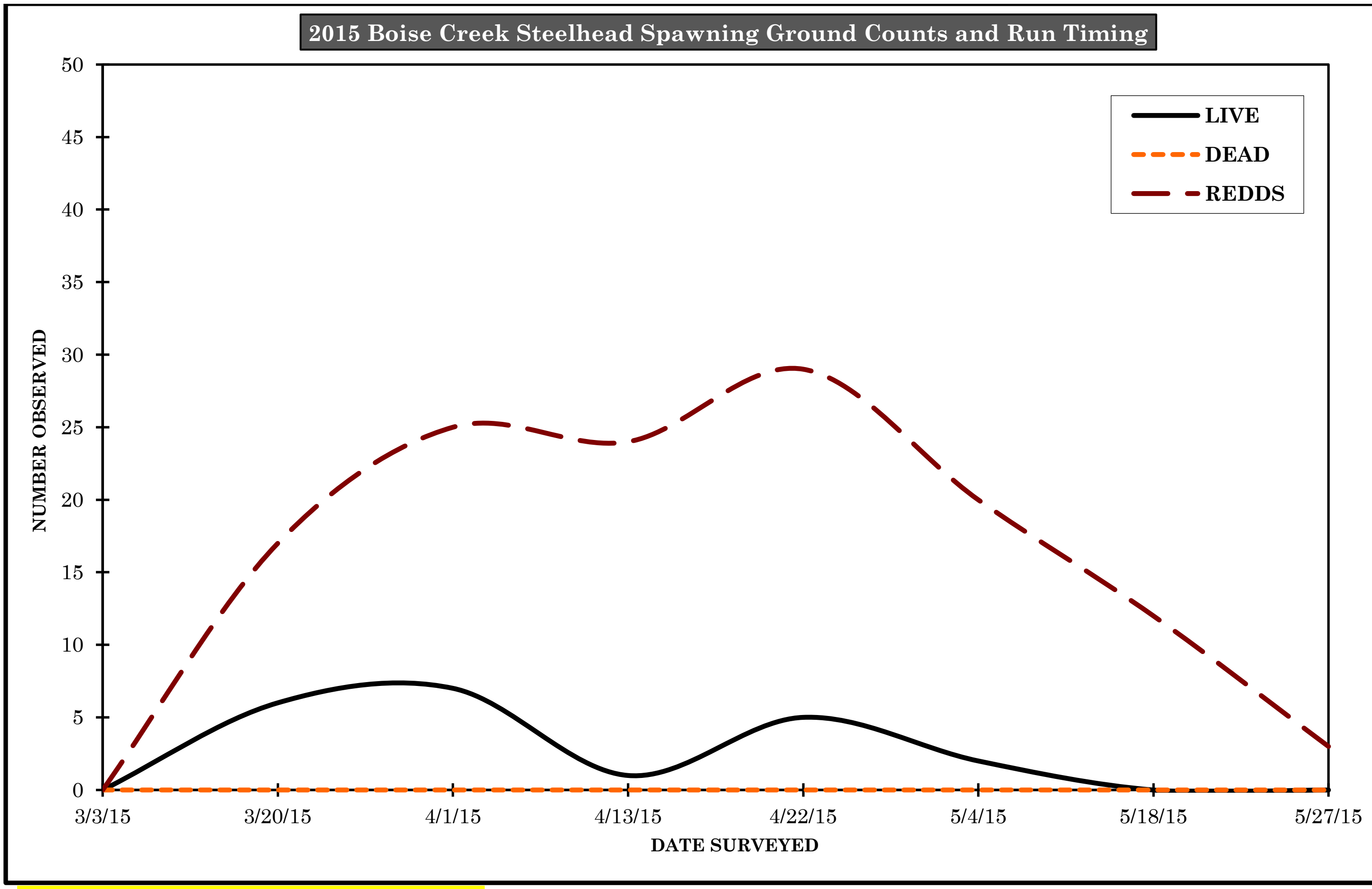



Boise Creek Chinook Carcass Sampling Seasonal Comparisons (2002-2014)
CARCASSES SAMPLED
CWT/ADIPOSE MARK
ADIPOSE MARK
UNKNOWN
UNMARKED
VENTRAL CLIPS
NUMBER OBSERVED
SEASON SURVEYED
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014

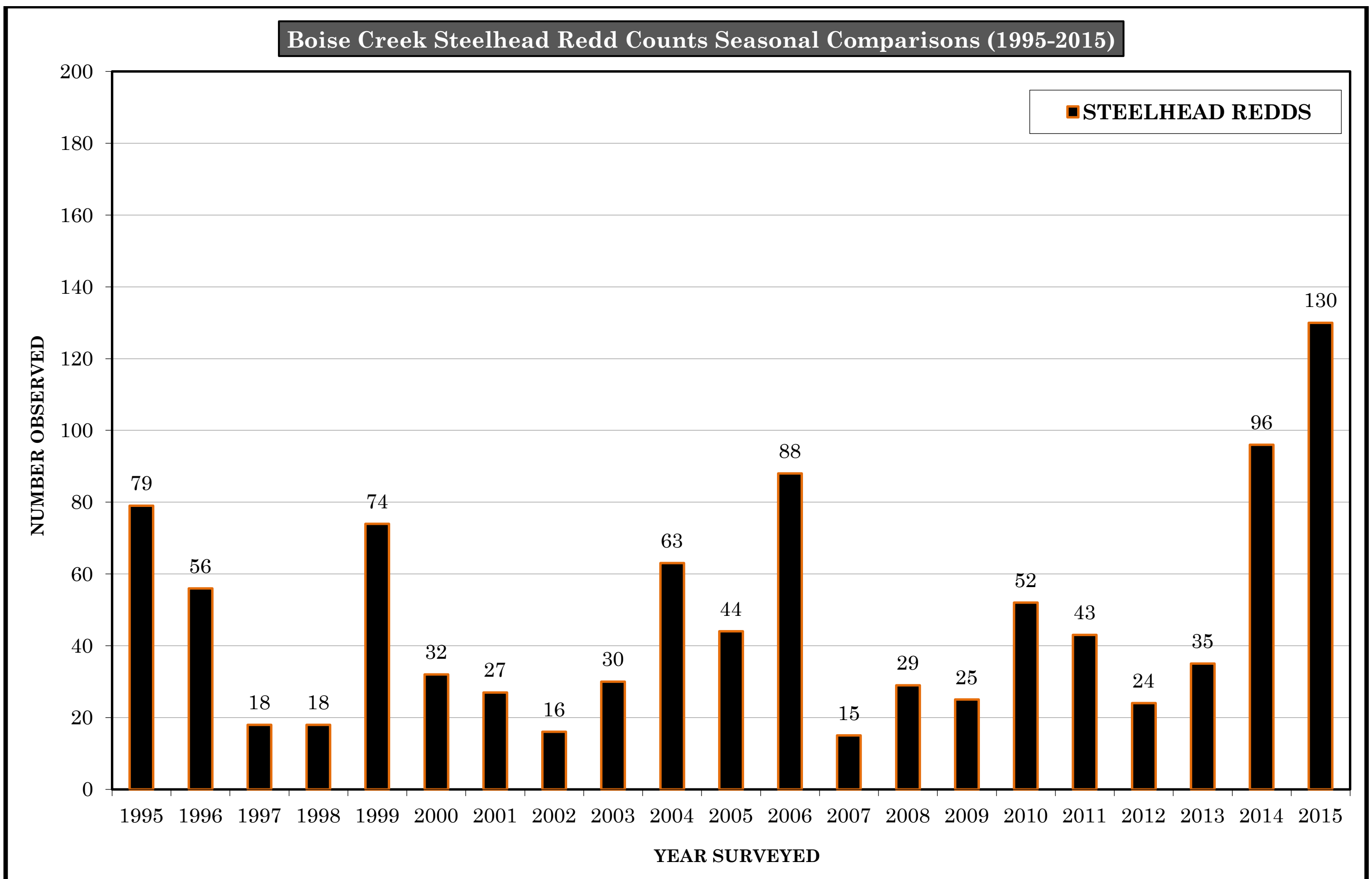

Boise Creek Pink Salmon Spawning Ground Seasonal Comparisons (2001-2013)
LIVE
DEAD
NUMBER OBSEREVED
SEASON SURVEYED
2001
2003
2005
2007
2009
2011
2013
6
4,392
1,200
39,744
6,517
61,164
23,750
221,456
60,058
49,862
19,601
33,579
10,584


2014 Boise Creek Coho Salmon Spawning Ground Counts and Run Timing
LIVE
DEAD
NUMBER OBSERVED
0
100
200
300
400
500
600
700
800
900
1,000
10/3/14
10/20/14
10/30/14
11/13/14
12/2/14
12/9/14
12/16/14
12/29/14
DATE SURVEYED


Boise Creek Coho Spawning Ground Seasonal Comparisons (1993-2014)
LIVE
DEAD
NUMBER OBSERVED
0
1,000
2,000
3,000
4,000
5,000
6,000
1993 208 51
1994 222 12
1995 483 90
1996 327 43
1997 282 40
1998 99 20
1999 394 21
2000 697 158
2001 335 30
2002 2,155 558
2003 1,083 108
2004 1,513 251
2005 3,285 233
2006 601 30
2007 841 95
2008 445 109
2009 589 81
2010 385 35
2011 1,200 118
2012 4,565 612
2013 2,083 313
2014 1,535 229
YEAR SURVEYED



See appendix B for steelhead redd locations.



BUCKLEY:
USACE FISH TRAP WHITE RIVER

The U.S. Army Corps of Engineers' *(USACE)* fish trapping facility is located at RM 24.3 near Buckley *(top left photo)*. Salmon, steelhead, bull trout, and other native fishes *(mountain whitefish, rainbow trout, cutthroat)* migrating to the upper White River enter this trap and are transported above Mud Mountain Dam. Fish not allowed upstream include marked hatchery released Fall Chinook and steelhead; the exception being, White River steelhead acclimated and released from the Muckleshoot hatchery *(see following page)*. The Corps' trapping facility is uniquely integrated into a diversion dam and flume intake that was, up until January 2004, used to divert water from the White River to generate power. Since PSE ceased power production, some measure of water has continued to be diverted from the White River to maintain the water levels and water quality in Lake Tapps. Engineering and development is currently underway way to replace the existing structure with a new diversion dam and fish trapping facility. The USACE facility offers unparalleled access to significant numbers of salmonids, which has been invaluable tool for research, salmon recovery and escapement estimates. During the months that salmon, steelhead and bull trout return to the upper White River, the USACE empties the trap daily, the trap is hoisted to a tanker truck, and fish are released from the trap into the truck. Fish are then transported above Mud Mountain Dam and released back into the White River at RM 33.6; four miles above the dam and approximately one mile below the confluence with the Clearwater River.

Species of salmonids captured in the trap include spring and Fall Chinook, coho, pink, sockeye, chum, steelhead and bull trout. Puyallup Tribe Fisheries staff samples the contents of the trap once a week throughout the entire year. Species sampled regularly include Chinook, steelhead, sockeye, and bull trout. During the Spring Chinook/sockeye/bull trout run *(late May- early October)* PTF staff sample the trap 1 to 5 days per week; the frequency is dependent on the number of fish captured throughout the entire run. Steelhead are sampled regularly by PTF staff from late January through June. All fish sampled are dip-netted from the trap and placed into a 30 gallon water filled stainless steel bin and anesthetized with MS-222. All fish are examined for fin–clips; in addition, Chinook and steelhead are sampled for coded-wire tags with a metal detector *(center)*, and bull trout are scanned for PIT tags. Additional sampling includes measuring each of the previous species for fork length; collecting a tissue sample for DNA analysis; as well as scale samples. DNA sampling involves removing a small amount of the anal fin and preserving it in 95% ethanol *(C_2H_5OH)* for later analysis. In addition to DNA and scale samples, bull trout are PIT tagged *(left)* and transported above Mud Mountain Dam. Wild and White River program steelhead *(see following page)* are transported and release approximately 2

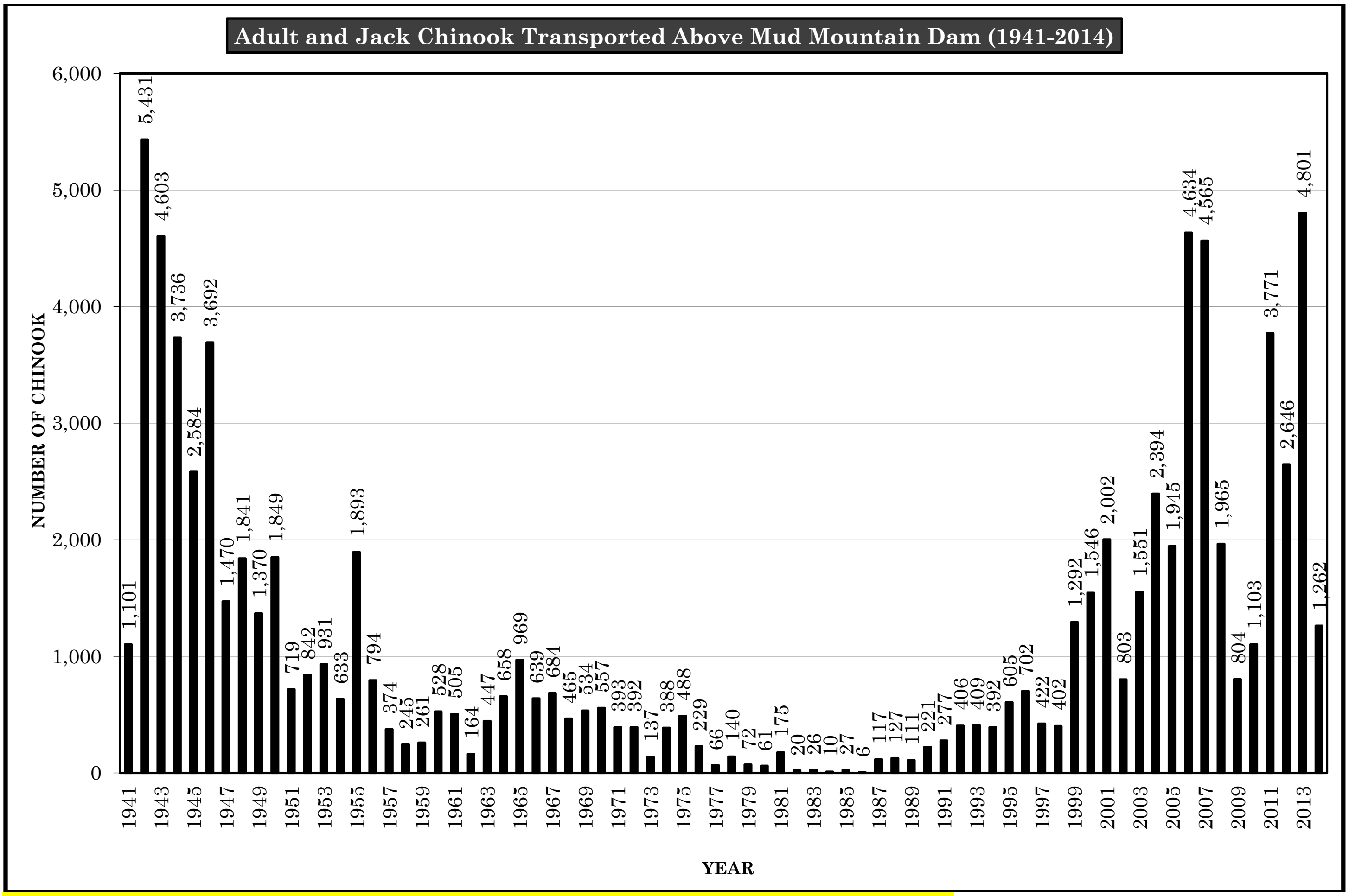
Steelhead sampling

Bull trout

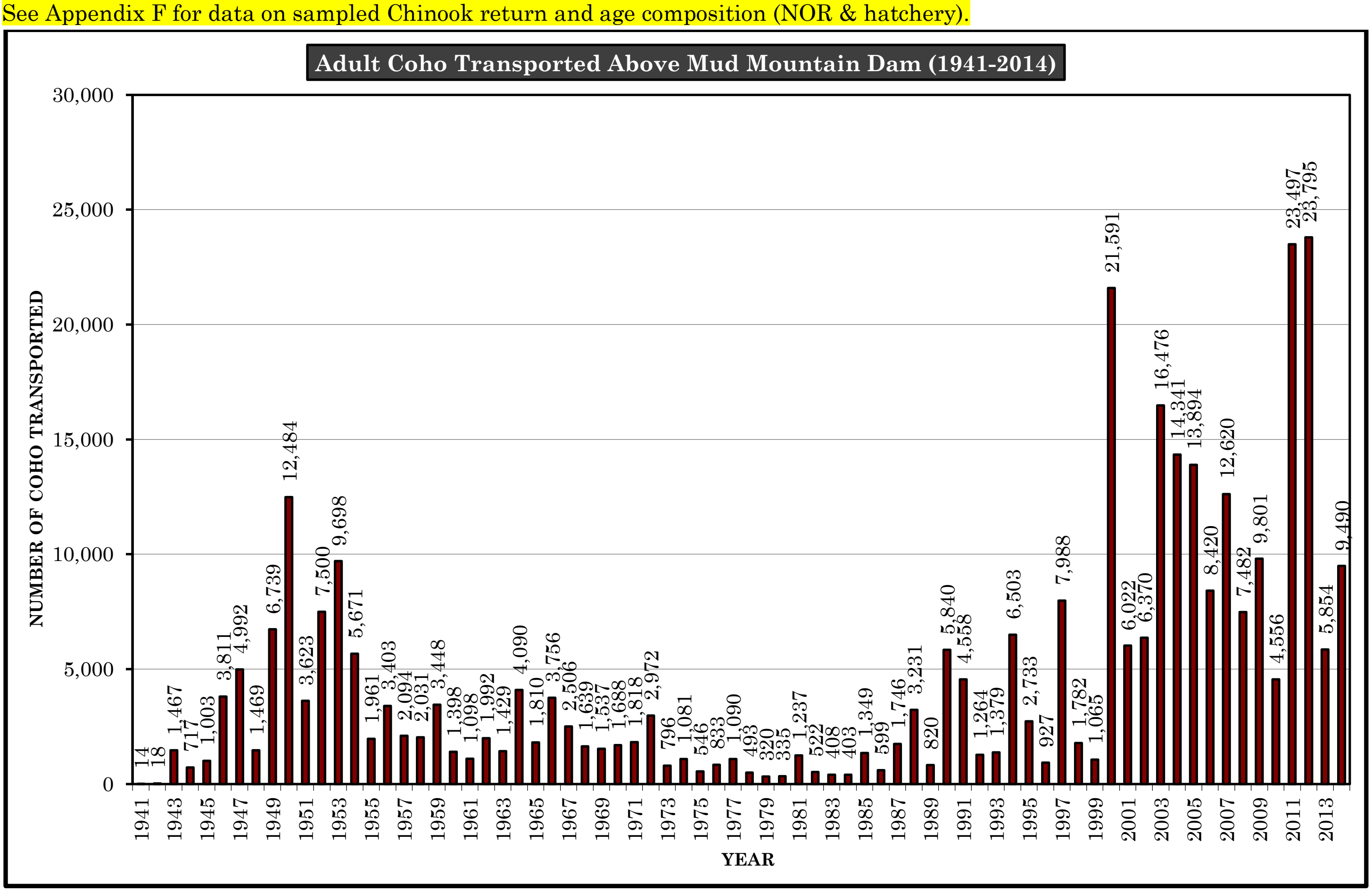
miles above Mud Mountain dam, while non White River *(adipose clipped)* steelhead are returned back to the White River below the USACE trap as per agreement with the Muckleshoot Indian Tribe and the State of Washington.

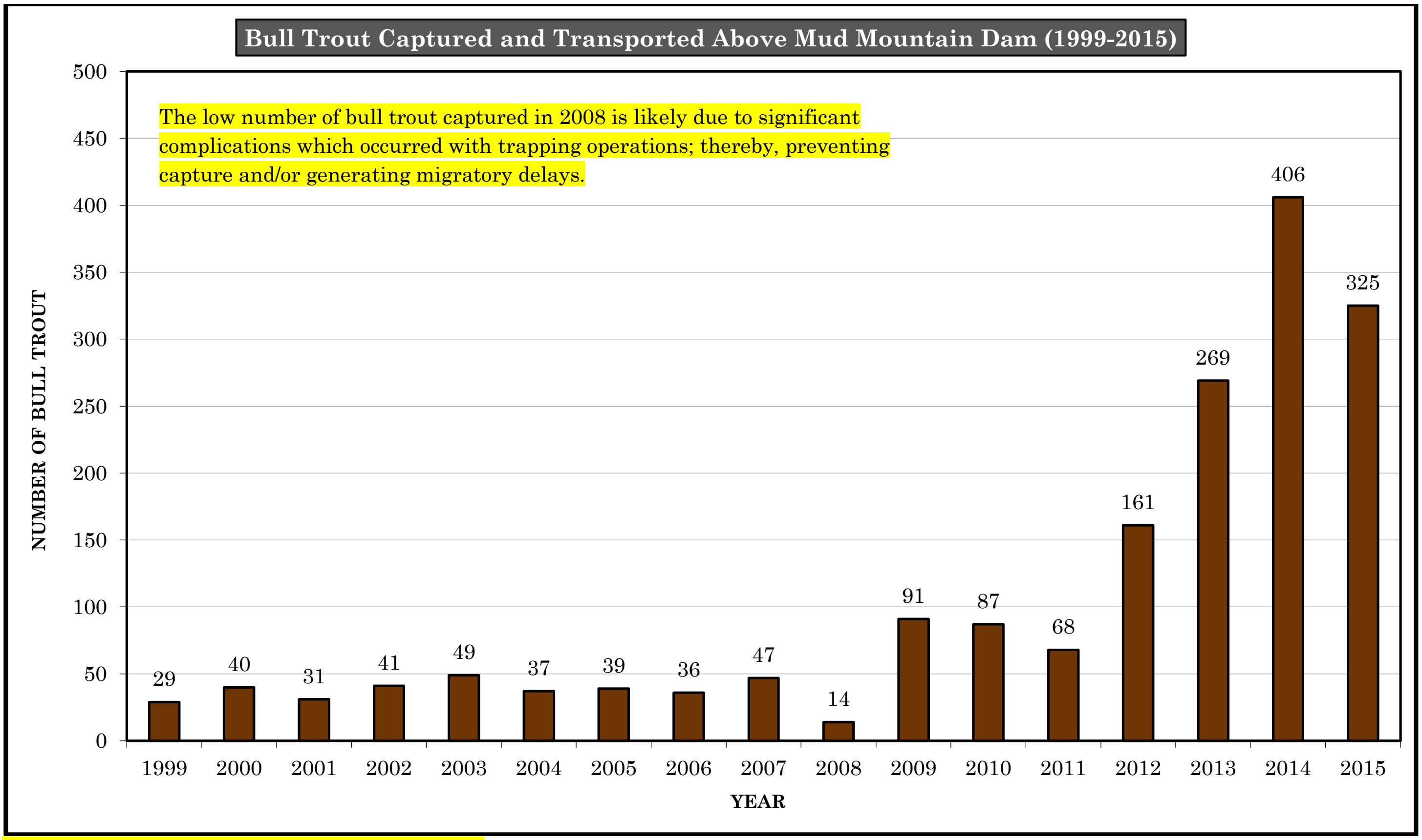
In 2006, the Puyallup Tribe, in partnership with WDFW and the Muckleshoot Tribe, began artificially propagating White River winter steelhead. Rearing young steelhead is an integral part of the White River winter steelhead pilot project, a program designed to increase winter steelhead escapement in the White River. With the temporary closure of WDFW's Voights Creek hatchery in January of 2009, the Puyallup Tribe assumed the majority of responsibility for continuing this important restoration effort. Steelhead brood-stock *(approximately 10 males and 10 females)* are collected from the White River USACE fish trap in Buckley and are currently held, spawned, incubated, and reared at the Puyallup Tribe's Diru Creek hatchery for a year. Each fish is implanted with a blank wire tag *(same as a CWT- minus the binary code)* for later identification. After rearing for a year and fish are of size *(approximately 17 fish per pound)*; the pre-smolts are transported to the Muckleshoot hatchery on the White River to acclimate before being released into the White River *(fish were acclimated and released from the Huckleberry Cr. pond in 2013)*. The project goal is to release up to 40,000+ steelhead pre-smolts annually. Currently, the project releases approximately 25K+ pre-smolts. This project has already seen some success; several marked *(blank wire tag)* steelhead have been captured and passed above Mud Mountain dam since 2009. However, damage to the diversion dam structure in 2015, allowed an undetermined number of steelhead to migrate upstream of the fish trap *(between the two dams)*. Dozens of steelhead were observed milling around at the base of Mud Mountain Dam. In cooperation with the USACE, Puyallup Tribal biologist recovered 14 steelhead and released them upstream near the community of Greenwater.

Beginning in 2003, substantial numbers of pink salmon have been transported above Mud Mountain Dam to spawn in the Upper White River, and the West Fork of the White. Washington Department of Fisheries biologists, in a 1975 publication, describe pink salmon utilization to be almost exclusively limited to the mainstem Puyallup River; the lower Carbon and White rivers; South Prairie Creek and Fennel Creek (Williams et al. 1975). This description of pink salmon utilization was generally accurate until 2003, when an unprecedented number of adult pink salmon returned to the Puyallup/White River Watershed. Washington Department of Fish and Wildlife escapement data from 1959 to 2001 shows the number of adult pinks returning to the Puyallup/White River system ranged from 2,700 to 49,000. In 2009, over 540,000 were fish transported above MMD by the USACE. Unfortunately, the sheer number of pink salmon attempting to reach the upper White River has overtaxed the Corps' resources and capabilities. The current fish trapping and hauling operation is incapable of managing the magnitude of pinks returning to the White River. The current design is also responsible for causing numerous injuries to fish *(center)*. The 70+ year old configuration is antiquated and needs to be replaced with modern trap and haul capabilities on both sides of the river.

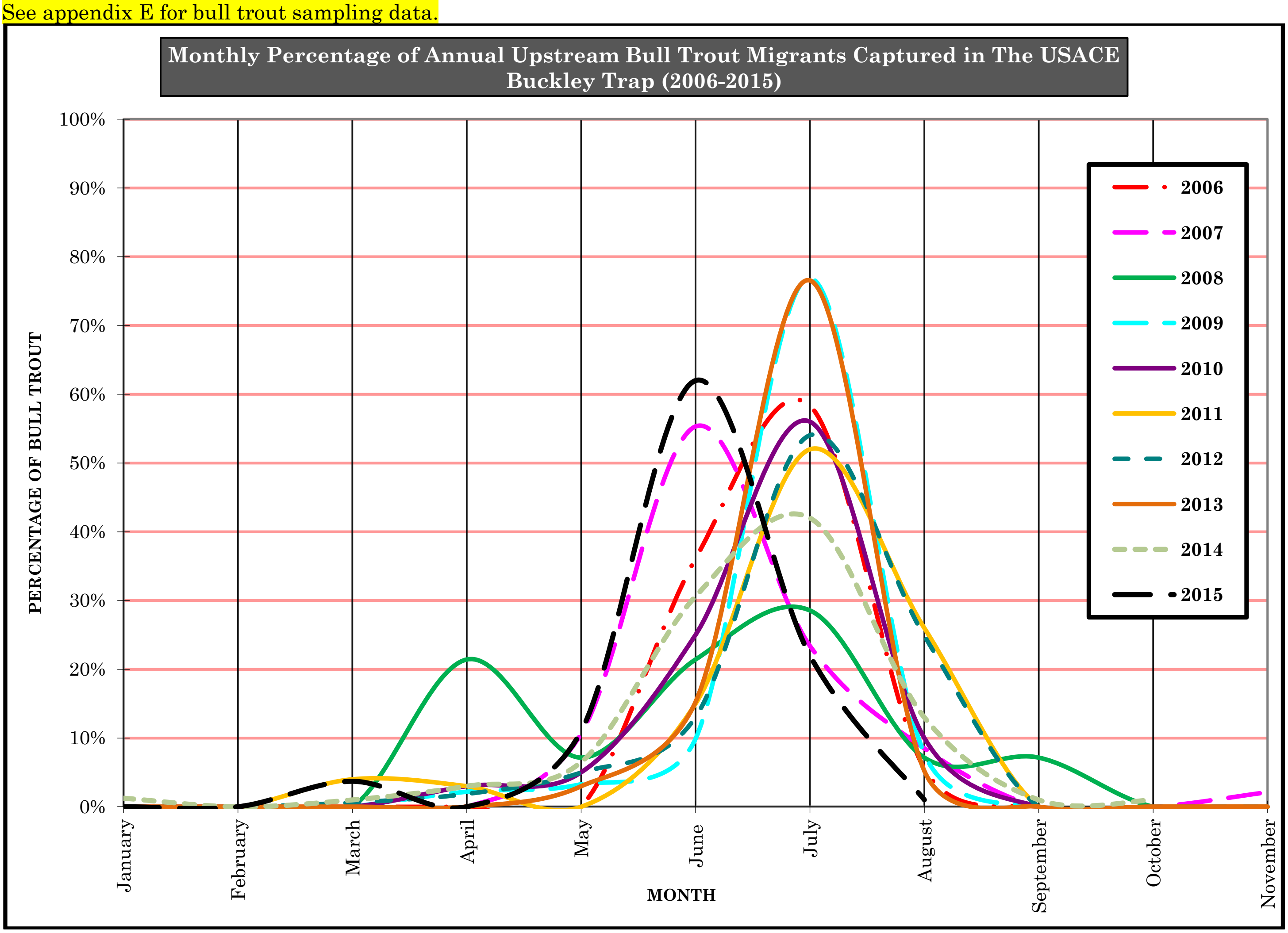


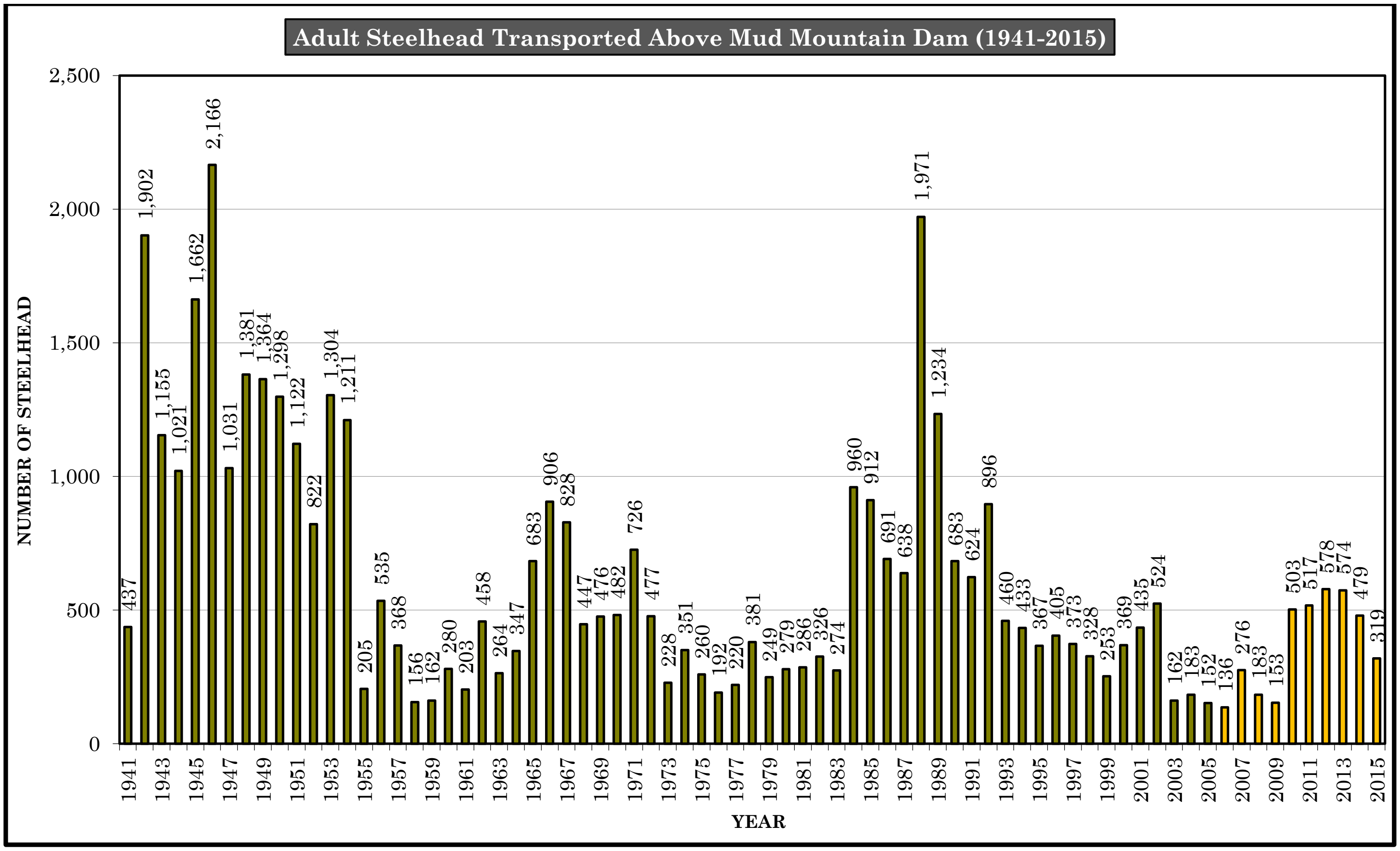
See Appendix F for data on sampled Chinook return and age composition (NOR & hatchery).



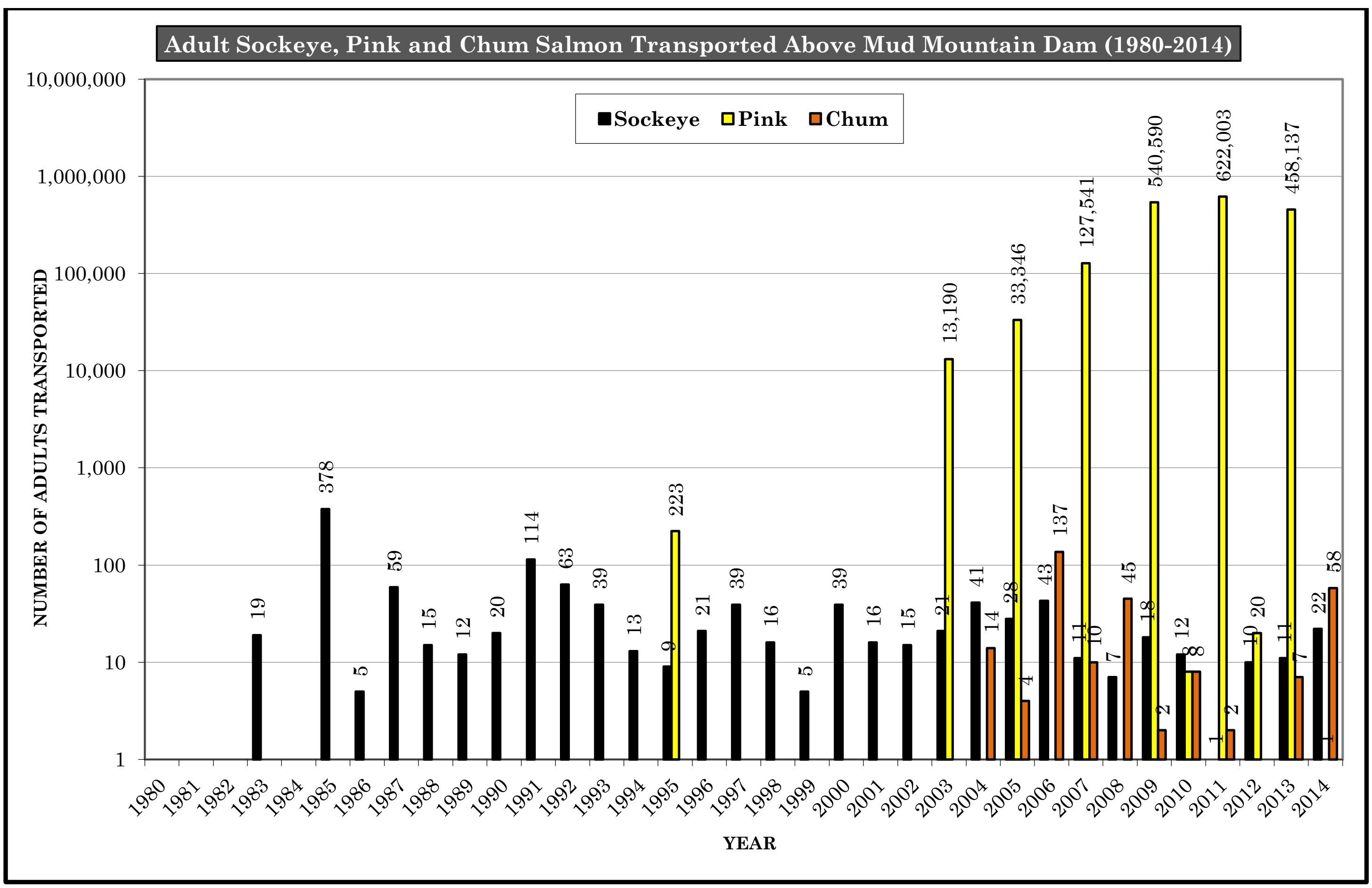


See appendix E for bull trout sampling data.





The graph above details the number of steelhead transported above Mud Mountain Dam. Additional steelhead captured in the trap since 2006 have been utilized as brood-stock for the White River steelhead supplementation pilot project. See Appendix G for the breakdown of steelhead returns.



CANYON CREEK

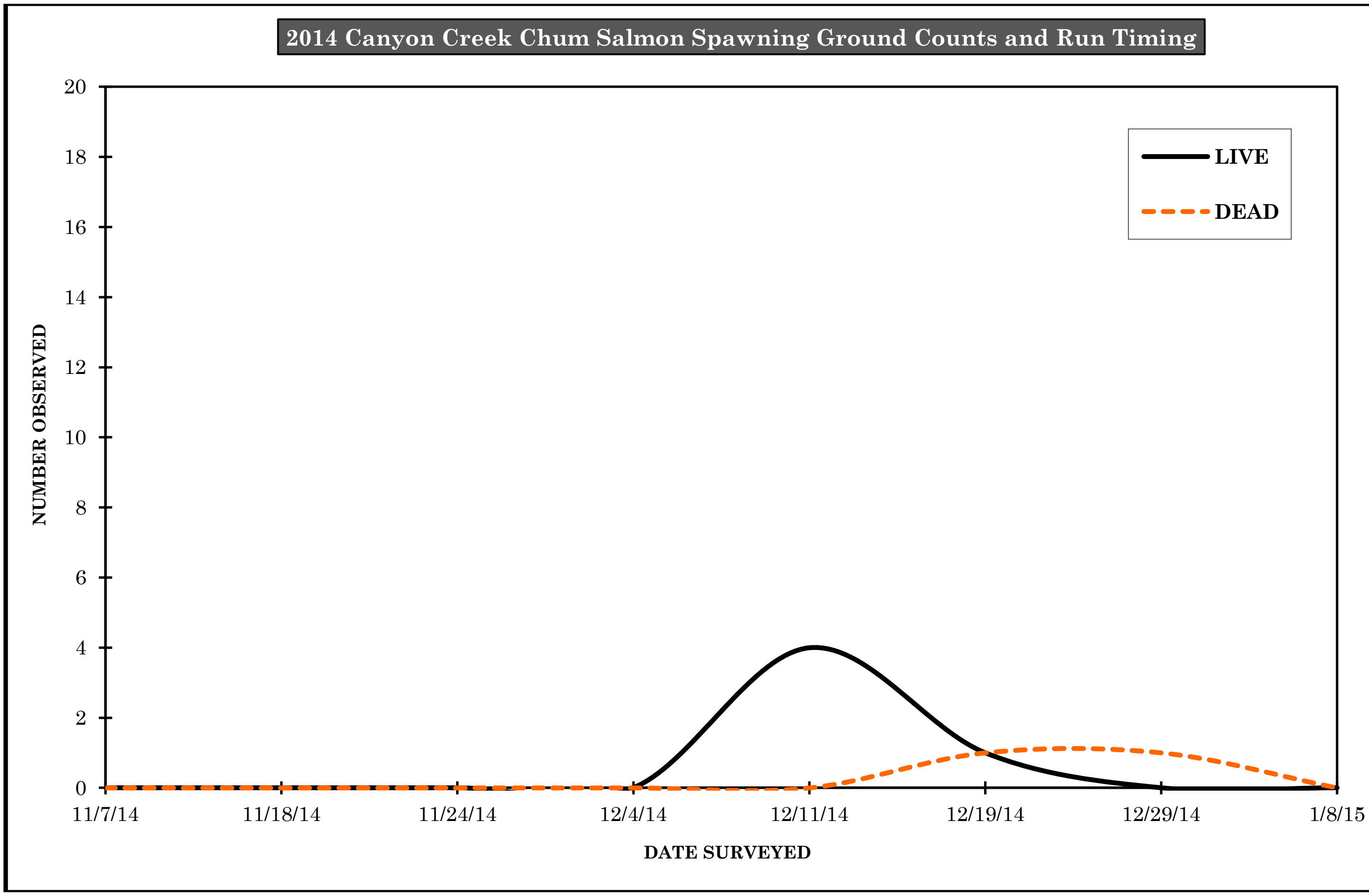
Canyon Creek is a small tributary within the larger 12.1 mi^2 Clear Creek Basin *(10.0022)*. The Clear Creek Basin drains the plateaus and flatlands running along the southern valley of the lower Puyallup River, just west of the city of Puyallup. Canyon Creek doesn't appear on the hydrology of most common mapping systems. Furthermore, this stream is not listed in the WRIA catalog of streams for area 10, and has not been assigned a designated WRIA number. Canyon supports several species, including Chinook, coho, pink, chum, steelhead/rainbow and bull trout.

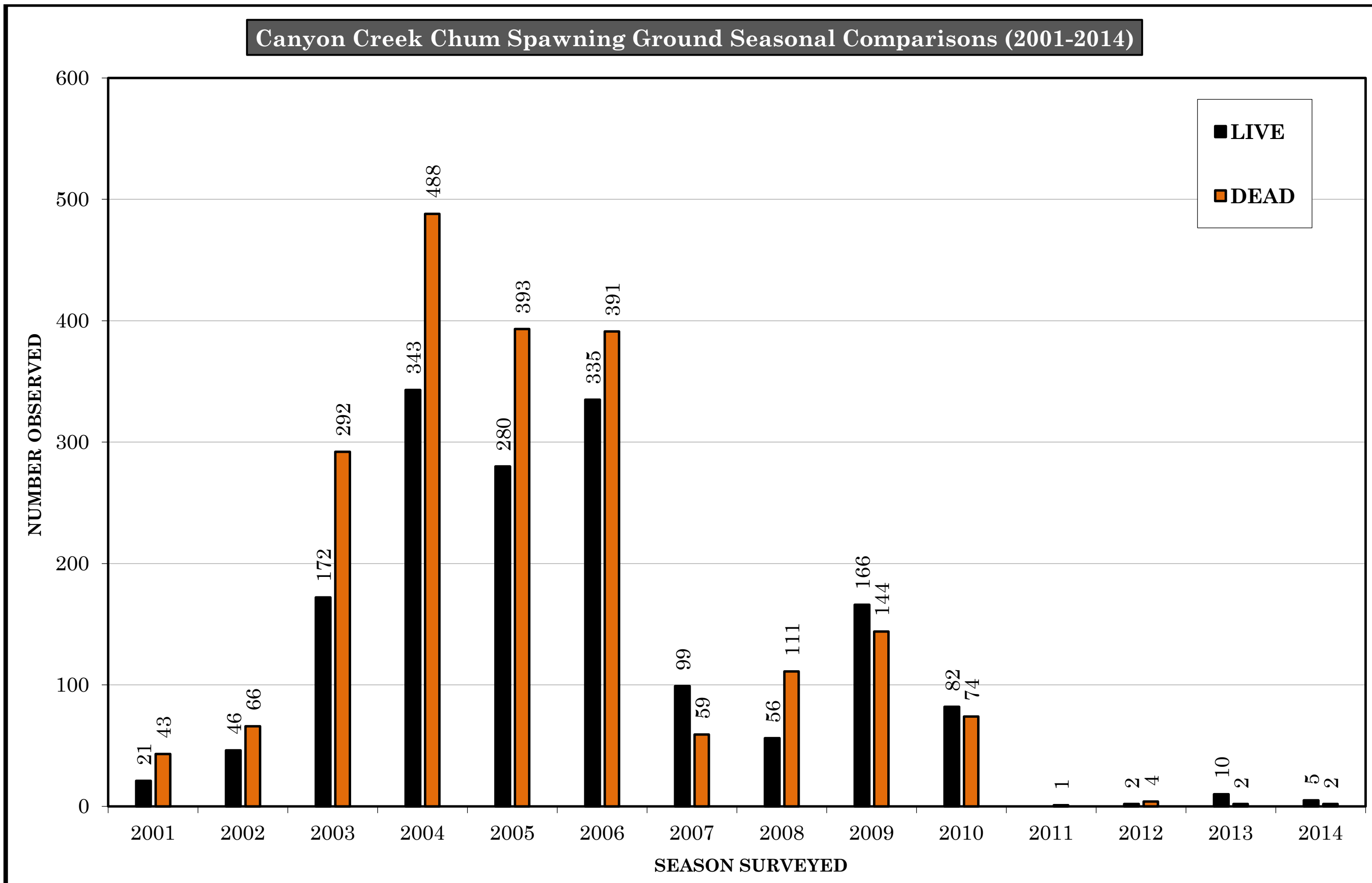
Little stream complexity exists within Canyon Creek, and seasonal flows are rarely adequate to allow access for adult Chinook or steelhead to spawn. However, adult Chinook have been observed in the creek *(2 adults were observed in 2009)* and it's highly likely juveniles from adult spawners *(Chinook and/or coho)* in Clear and Swan creeks utilize Canyon Creek, especially for foraging and overwintering. There is often an abundance of chum fry during the spring, as well as coho fry throughout spring and summer for juvenile Chinook, steelhead, and cutthroat to forage on. Adult fluvial bull trout are also known to forage in the smaller tributaries of the lower Puyallup, including Canyon Creek.

Chum salmon are the only species observed spawning in significant numbers; from late November through January. Adult coho are periodically seen in the same reach as chum, but no surveys are conducted for coho by the Puyallup Tribe given their escapement numbers are extremely low. Canyon lacks any real habitat complexity such as LWD, off channel habitat, or variation in stream channel type. The greater part of the lower reach of the creek consists of a flat low gradient channel with few hydraulic breaks. However, there are approximately 450 feet of suitable spawning habitat in Canyon Creek, this spawning section flows along Canyon road upstream of Pioneer Way *(bottom).* Nonetheless, this exceptionally small stretch has proven to be productive for several seasons.

The channel gradient increases substantially above the culvert crossing under Canyon Road. In the past, the culvert itself did not appear to be an encumbrance to chum, since they were often observed spawning on the fine gravel within the culvert. However, the majority of the culvert *(scheduled for replacement in 2017)* has become filled with stream bedload.

The main channel above the culvert has been engineered with the placement of log weirs to retain gravel. They appear to be only moderately effective because the amount of fines in the entire reach is excessive. Downstream of Pioneer, the substrate consists of fine sand and extremely compacted small gravel. Storm and ground water runoff along the east side of Canyon Road flows into Canyon Creek next to the downstream end of the culvert.


2014 Canyon Creek Chum Salmon Spawning Ground Counts and Run Timing
NUMBER OBSERVED
0
2
4
6
8
10
12
14
16
18
20
LIVE
DEAD
11/7/14
11/18/14
11/24/14
12/4/14
12/11/14
12/19/14
12/29/14
1/8/15
DATE SURVEYED

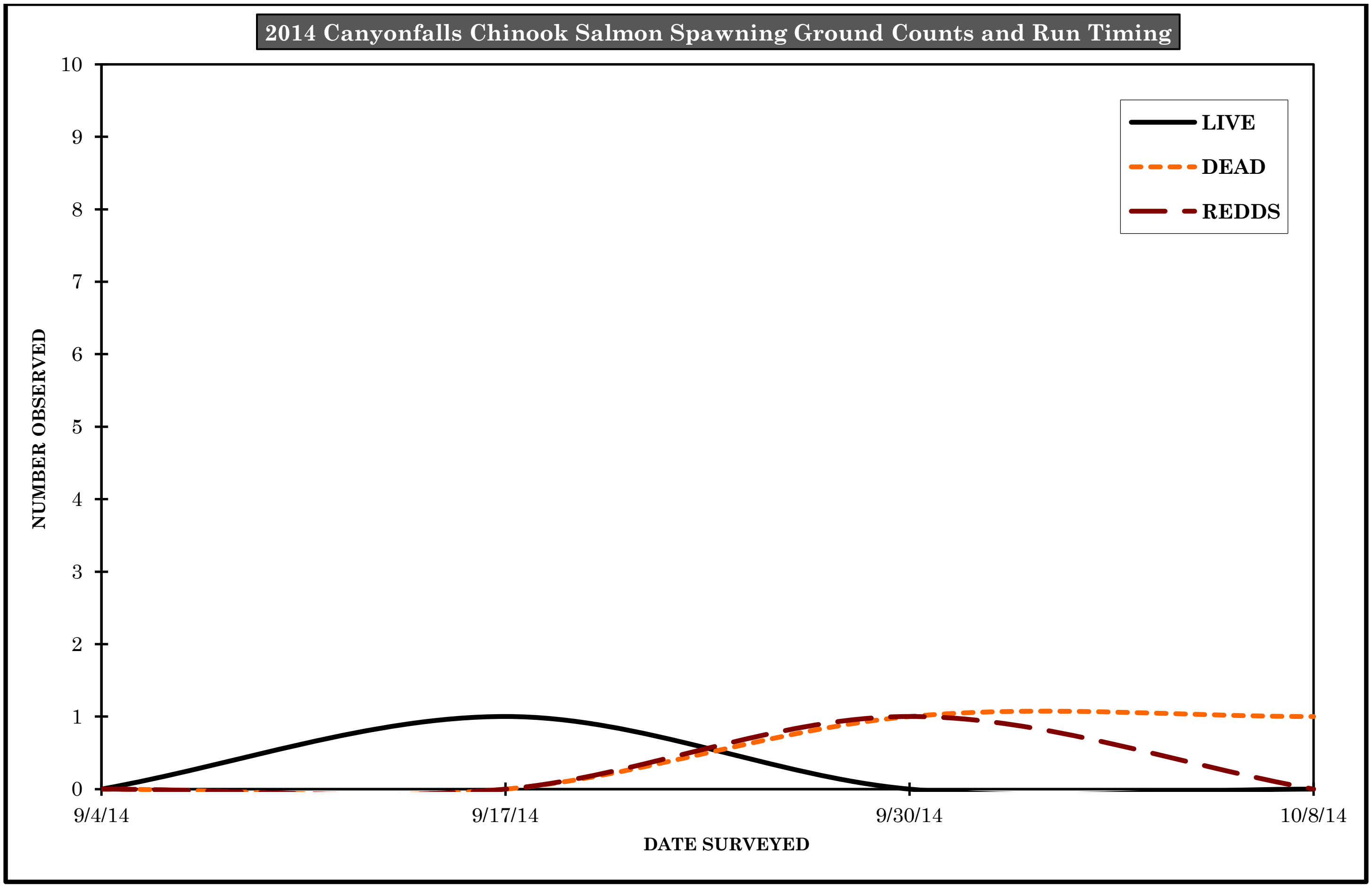

Canyon Creek Chum Spawning Ground Seasonal Comparisons (2001-2014)
NUMBER OBSERVED
0
100
200
300
400
500
600
LIVE
DEAD
21
43
46
66
172
292
343
488
280
393
335
391
99
59
56
111
166
144
82
74
1
2
4
10
2
5
2
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
SEASON SURVEYED

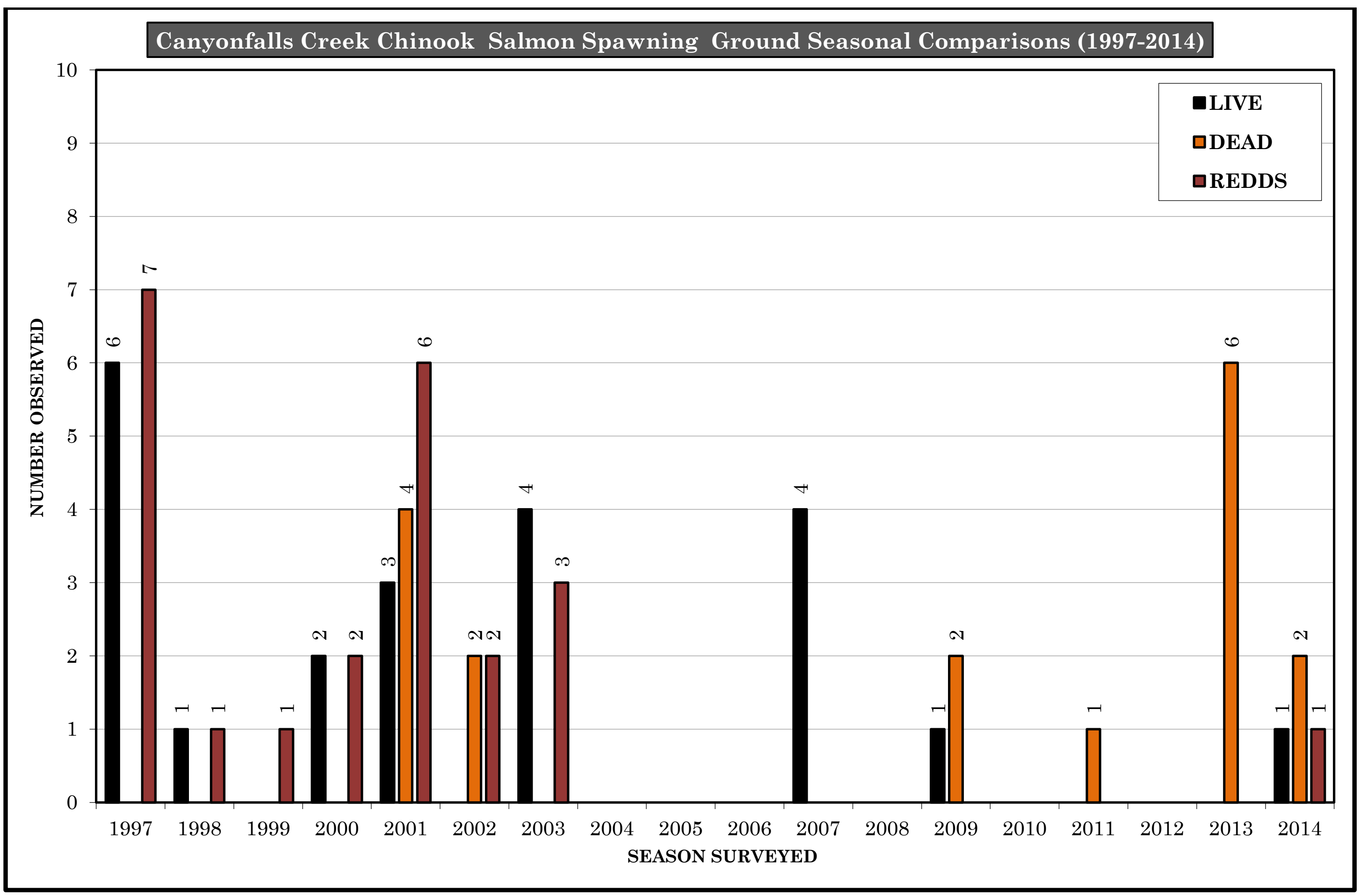
CANYONFALLS CREEK 10.0410

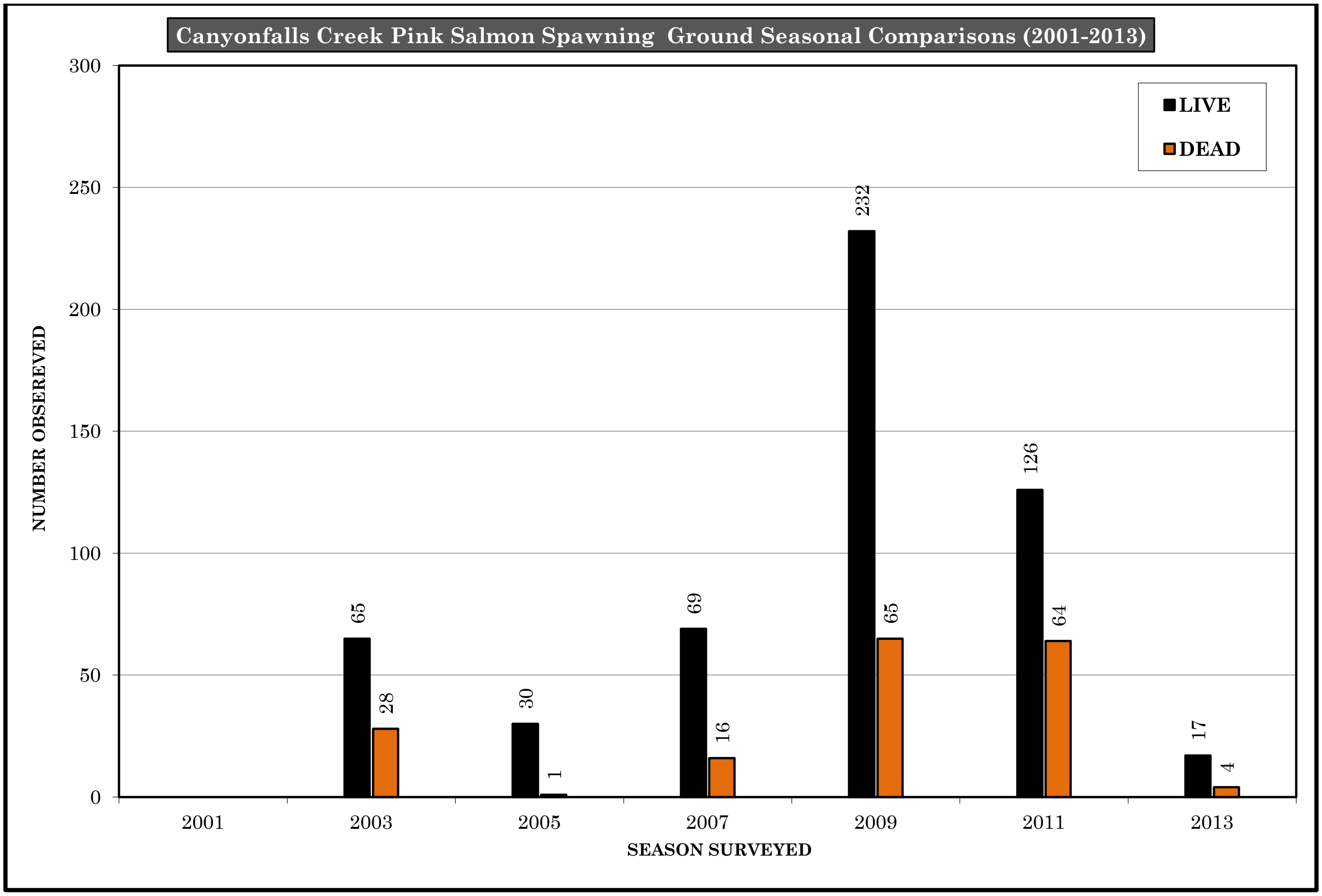
Canyonfalls Creek is a small tributary entering the Puyallup River at approximately RM 16.2, near the town of McMillin *(north of Orting)*. Canyonfalls is primarily a spring fed stream that has relatively consistent instream flows, even in late summer. Although the stream length is three mile, nearly all spawning activity for species common to the creek takes place below the culvert under McCutcheon Rd. at RM 0.5. The gradient quickly increases above the culvert, but there are several pockets of usable spawning gravel just upstream of the culvert. In 2003, a large cement box culvert replaced the old culvert under McCutcheon Road. However, accumulating bedload above and within the culvert has created potential road flooding and spawning access issues. This culvert is once again under consideration for replacement as a result of Pierce County requesting a Army Corps' permit to dredge the reach immediately above and below the culvert. A new box culver must be a minimum of 16 feet wide.

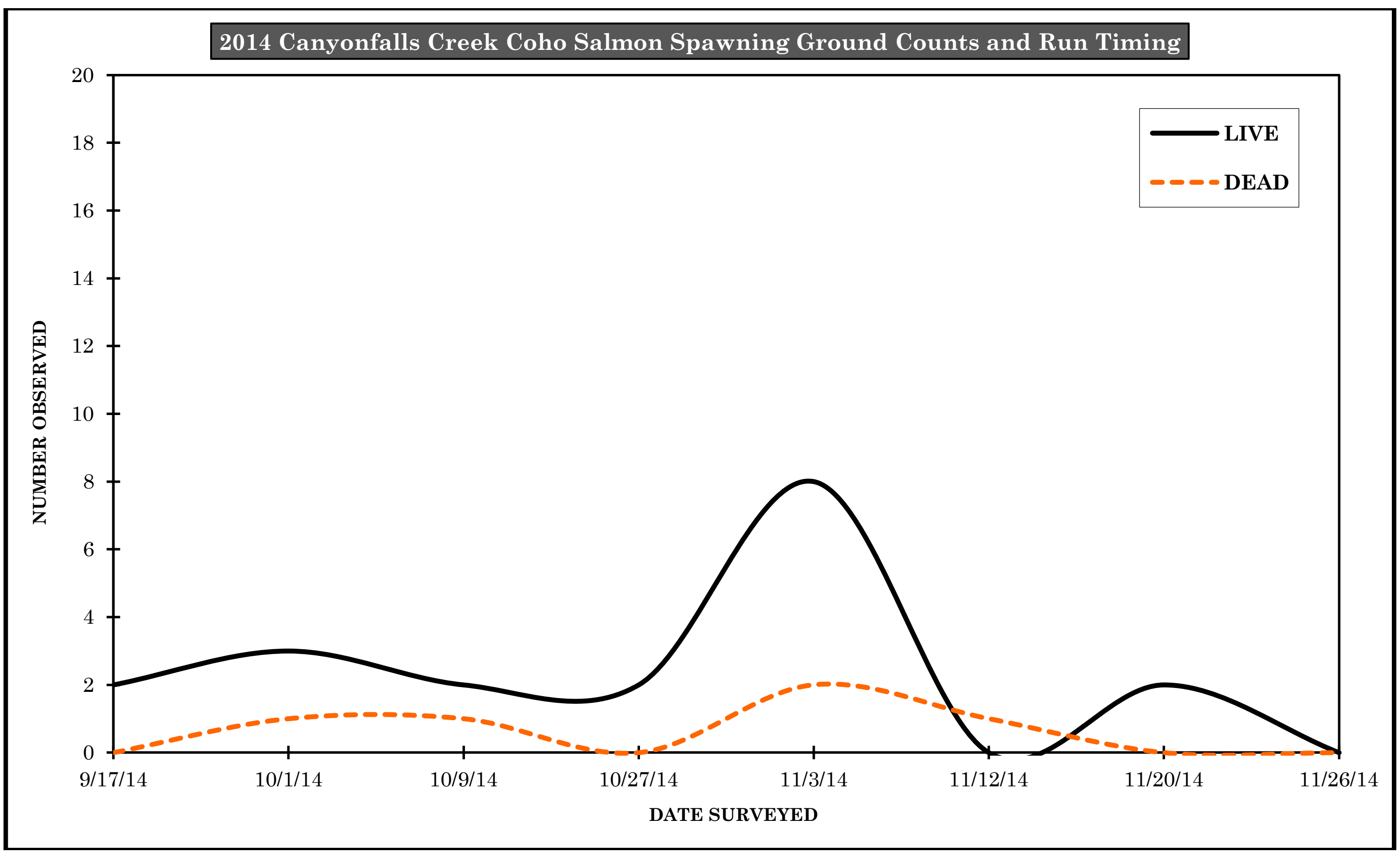
Approximately 400 feet upstream of the culvert, the creek rapidly climbs nearly 300 feet in elevation to where it's discharged from a privately owned hatchery *(Trout Lodge)*. The creek is diverted to meet the needs of raising trout for planting in regional lakes. Above the hatchery the creek continues to climb through a forested area. As mentioned, the lower anadromous reach of the creek extends downstream of McCutcheon road; the substrate is a combination of sand and gravel within a low gradient pool-rifle channel. In the summer of 2002, 220 cubic yards of 1-to-3 inch spawning quality drain rock was deposited directly downstream of the McCutcheon road culvert and distributed along an approximately 0.2 mile stretch of the creek. The rock was deposited as a result of a settlement agreement between the Puyallup Tribe, and Fennel Resources; which has a gravel mining operation located on Fennel Creek. Nearly all spawning activity observed occurs within this short 0.2 mile stretch of the creek. Below this point the substrate consists primarily of fines, which is more typical for this stream type, but unfortunately is rarely suitable for spawning. The riparian is primarily alder and salmonberry. The width of the riparian zone along the right bank is limited due to the extremely close proximity of McCutcheon Rd. Canyonfalls creek also benefits from small amounts of woody debris inputs; as well as excellent coho habitat created by frequent beaver (*Castor canadensis*) activity. Although in 2004, a beaver dam below the survey reach prevented Chinook from accessing the spawning habitat farther upstream.

Chinook, coho and chum are the most prevalent species observed spawning in the creek. Coho juveniles and fry are present in the creek year round, and are often observed during adult spawning surveys. In addition to these key species, pink salmon have been observed consistently during odd years since 2003. Prior to 1998, steelhead were documented spawning in the creek on a consistent annual basis. Unfortunately, similar to many streams within the Puyallup and White River Watershed, few live steelhead or signs of spawning activity have been observed over the past decade. Bull trout utilization within this spring fed drainage is unknown; however, adult bull trout have been caught by sport anglers in the Puyallup River near the mouth of Canyonfalls. Spawning activity by bull trout has not been documented, yet Canyonfalls does offer excellent foraging and overwintering opportunities for all species, including bull trout.


2014 Canyonfalls Chinook Salmon Spawning Ground Counts and Run Timing
NUMBER OBSERVED
DATE SURVEYED
9/4/14
9/17/14
9/30/14
10/8/14
LIVE
DEAD
REDDS

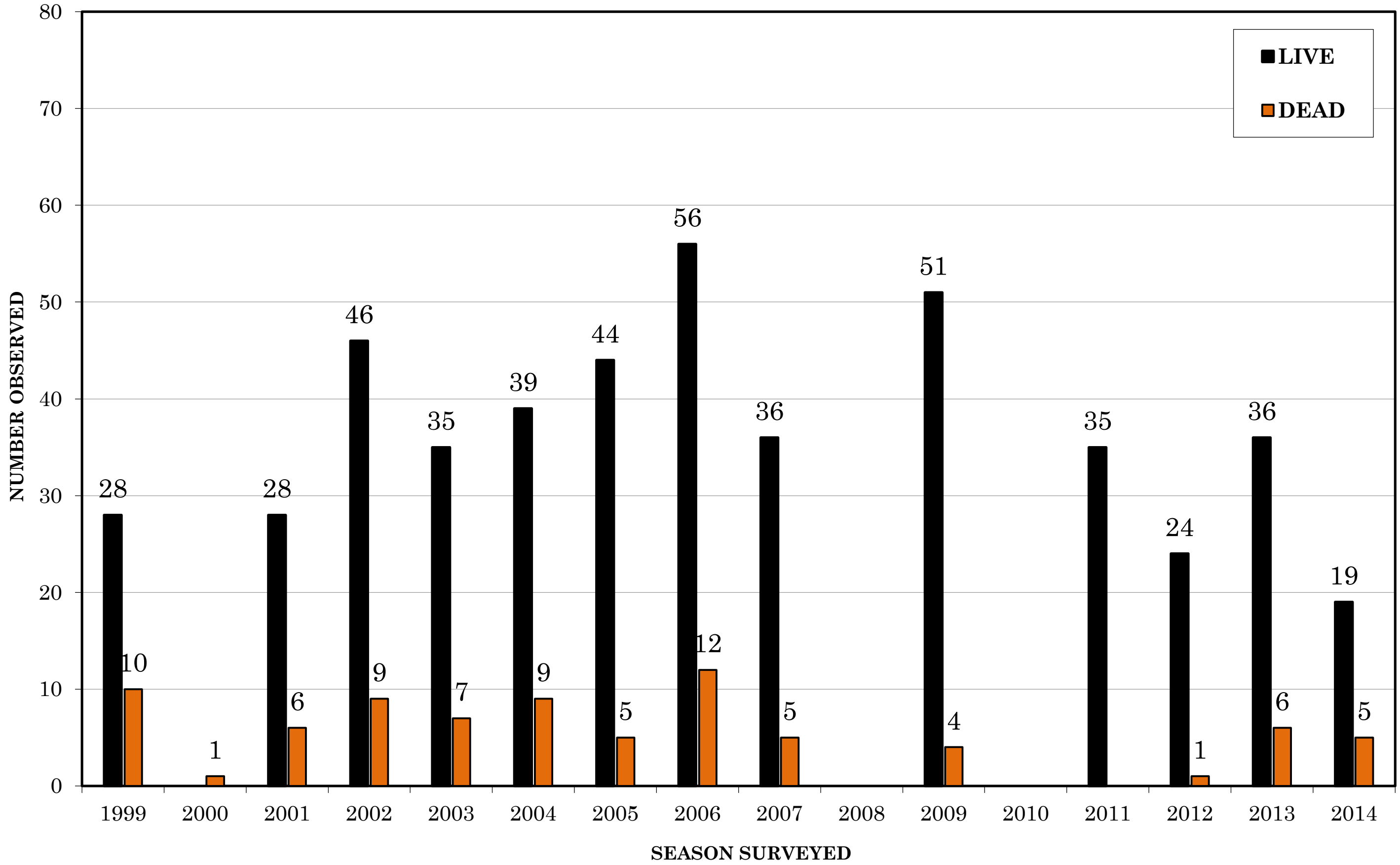

Canyonfalls Creek Chinook Salmon Spawning Ground Seasonal Comparisons (1997-2014)
NUMBER OBSERVED
SEASON SURVEYED
LIVE
DEAD
REDDS
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014



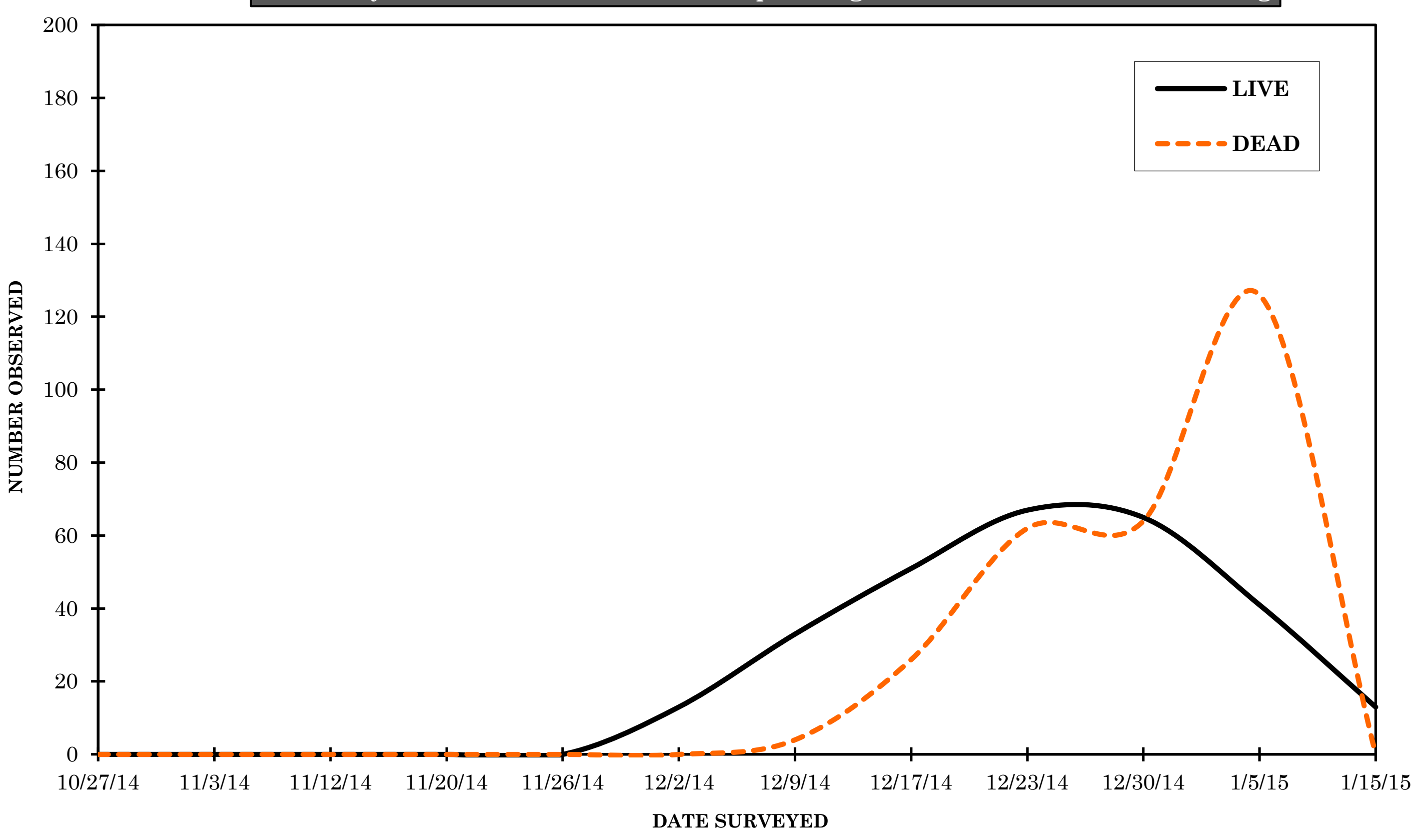


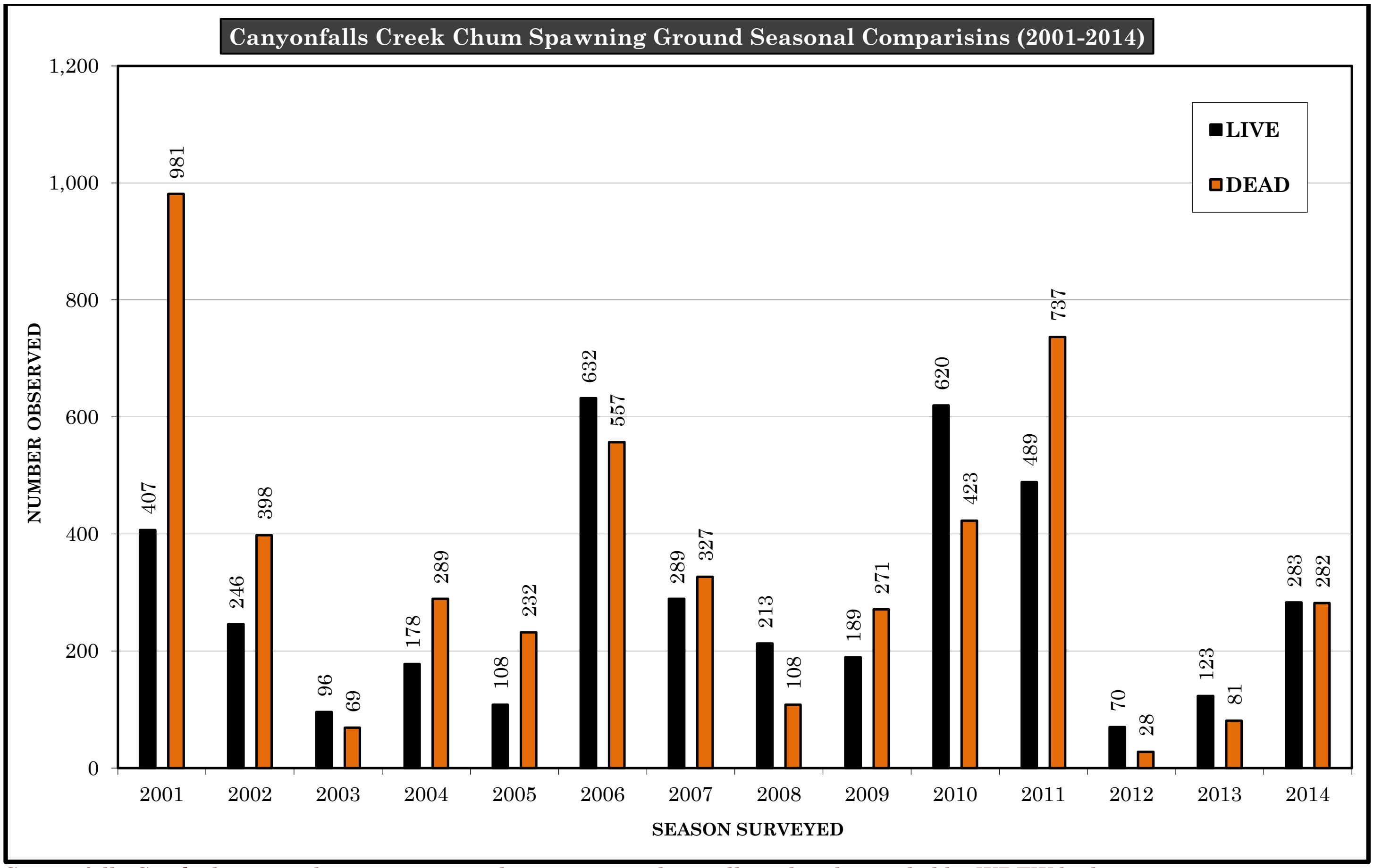
Canyonfalls Creek coho graphs were generated using survey data collected and provided by WDFW biologists.

Canyonfalls Creek Coho Spawning Ground Seasonal Comparisons (1999-2014)

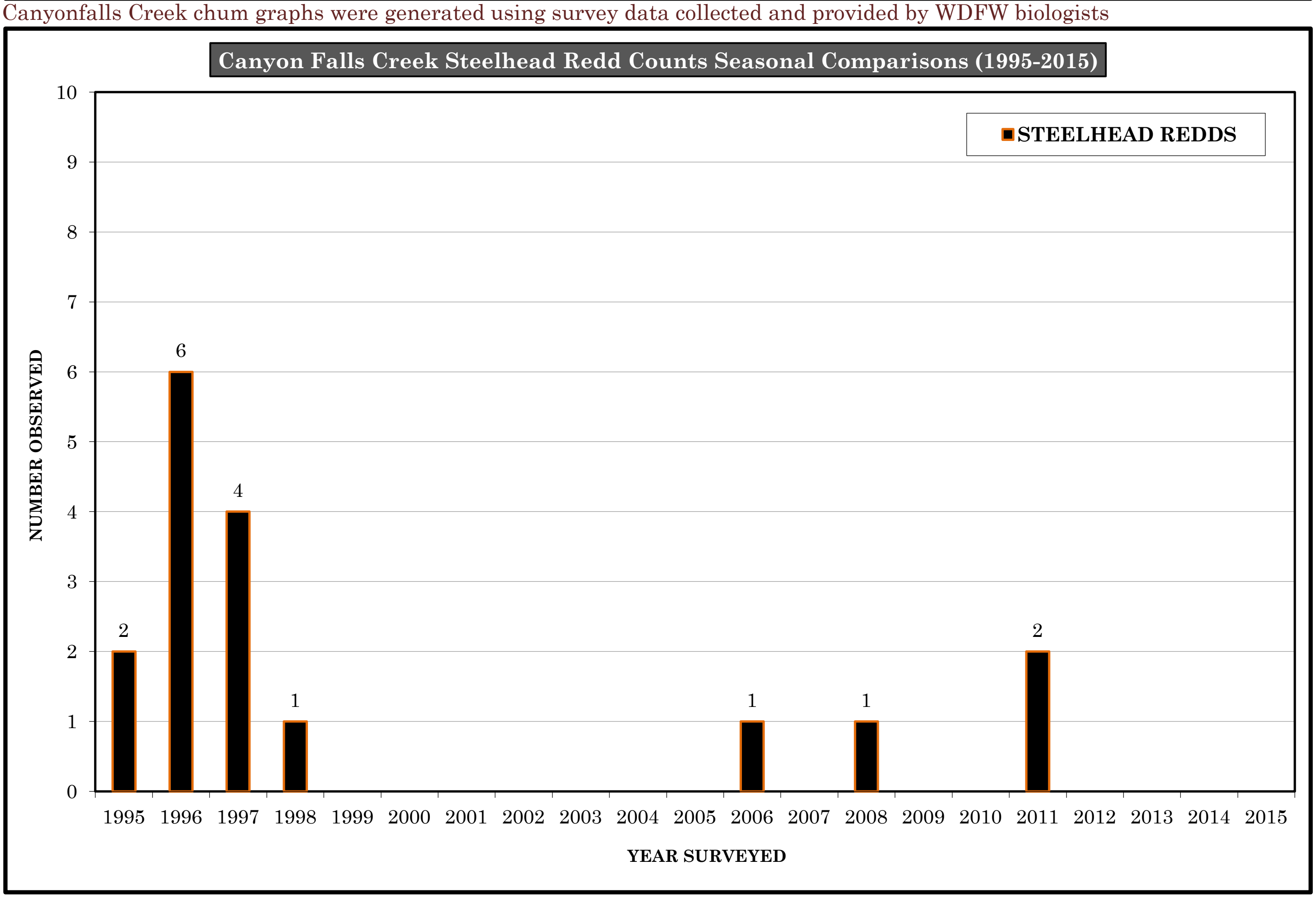


2014 Canyonfalls Creek Chum Salmon Spawning Ground Counts and Run Timing





Canyonfalls Creek chum graphs were generated using survey data collected and provided by WDFW biologists



CARBON RIVER 10.0413

Carbon River @ RM 8.5

The Carbon River is a major tributary of the Puyallup River, entering the Puyallup at RM 17.9; just north of the city of Orting. The Carbon River and its associated tributaries provide excellent spawning and rearing opportunities for salmon, steelhead, and bull trout. In the past, steelhead have been documented as high as the Mt. Rainier National Park boundary. However, the majority of spawning for all species within this drainage, with the exception of bull trout, occurs in South Prairie Creek and the lower 11 miles of the mainstem Carbon. The lower 3 miles of the Carbon River are constrained by earthen levees. Failures along this levee system during the November 2006 flood event reinforces the need for levee set-backs, which would help address the need for improved fish habitat and increase flood capacity within this drainage. Currently, the lower river channel varies considerably in width *(up to 1000')*. The resulting channel is only moderately diverse with a pool riffle character. Spawning gravel exists in limited quantities and is utilized by all species of salmonids present, although not in the numbers observed in the upper reaches. From RM 3.0 to the mouth of South Prairie Creek at RM 6.0, the river is constrained by a levee along the south bank3. Large natural bluffs hold the Carbon along its northern bank allowing the river to migrate over a channel of up to 0.5 miles wide. This reach contains multiple channels and many woody debris jams throughout its length. The spawning and rearing habitat is more improved throughout this reach and the highest spawning densities of all species are observed along this stretch of the river.

The reach above South Prairie Creek, from RM 6.0 to 8.5, is again constrained by both levees and natural bluffs along the north bank *(left)*. This reach has a slightly higher gradient than the lower river and as a result contains less spawning habitat. There are portions that are utilized by Chinook and steelhead, but not in the densities observed in the reach above Voights Creek *(RM 4.0)*. Above RM 8.5, the Carbon River flows through a narrow canyon for several miles before becoming unconstrained below the Mt. Rainier National Park boundary. This canyon reach supports Chinook and steelhead spawning, however, chum and pink salmon have not been observed above RM 8.

The Mt. Rainier National Park boundary is located at RM 23. From the park boundary, up to approximately RM 26, the gradient remains low enough to provide some spawning opportunities along channel margins and pool tail-outs. Several small and moderate debris jams occur throughout this reach. Above this, the gradient gradually increases to the terminus of the Carbon glacier.

There is less channel braiding in this section and the substrate is considerably larger providing far fewer spawning opportunities.

Several tributaries of the Carbon River providing critical habitat for fish include South Prairie Creek, Voights Creek, Ranger and Ipsut creeks.

South Prairie Creek is a major tributary of the Carbon River, entering the Carbon near RM 6, just downstream of the Highway 162 and the Foothills

Trail bridge crossings. With a drainage area over 90 mi², South Prairie Creek is considered one of the most productive drainages in the Puyallup/White River Watershed. The headwaters originate along the northwest foothills of Mt. Rainier within the Mt. Baker-Snoqualmie National Forest. The mainstem creek flows for over 21.5 miles; coursing its way through or near the communities of Wilkeson, Burnett, and South Prairie. The creek offers critical spawning and rearing habitat for adult and juvenile salmonids including; Chinook, pink, coho, chum and steelhead. Bull trout have been documented in the creek, but distribution and utilization is unknown. Limiting factors associated with South Prairie include; low summer flows, channel confinement and narrowing, bank erosion, disconnected floodplain, water quality *(303 (d) listed for temperature)*, areas of deficient riparian cover, and invasive non-native plant species.

The Upper Carbon River Channel.

The anadromous range extends roughly the first 15 miles of the mainstem; a series of impassable falls near RM 15.4 prevents any further upstream migration. Tributaries including Wilkeson, Spiketon, Beaver, plus several unnamed tributaries, add miles of additional spawning and rearing habitat, as well as flow contributions.

From the mouth, upstream to RM 12.6, the stream is typically a low to moderate gradient pool-riffle channel with many deep pools and a few short low gradient cascades. The lower 8 miles flows within a broad valley floor and spawning opportunities for all species is abundant throughout. Land use along this section is mainly agricultural and recreational. Chinook spawning occurs primarily within the lower 8 miles, while coho show increased usage throughout the middle and upper reaches of the 15 mile anadromous section of the creek. South Prairie experiences a unique late-run of coho, which often spawn into late February and early March. Chum regularly utilize the lower 3 miles heavily but are frequently observed well above RM 10. Steelhead utilize areas along the entire stream below the barrier falls; however, usage is reduced in the canyon reach below the falls. The valley walls narrow significantly above RM 8; at this point the creek channel becomes more confined and the gradient increases. Spawning and rearing opportunities are still prevalent here, as is the increase in LWD and LWD inputs from the surrounding forest.

From RM 12.6 to the falls at RM 15.4, the channel gradient increases substantially and the creek channel becomes moderately to extremely confined within a steep canyon. Spawning and rearing opportunities are severely reduced or non-existent. Spawning gravel is scarce in this upper reach and many heavily scoured bedrock sections exist.

The riparian zone changes dramatically over the 15.4 miles of anadromous stream. The upper canyon reach flows through a commercial forest and streamside vegetation consists of second growth fir and alder. Buffer widths along recent harvest areas are generally wider than the state regulated minimum due to steep, potentially unstable slopes along the canyon. From RM 12.6 to RM 6.0 the riparian zone is relatively intact, consisting of mature hardwoods with some fir. Below this point, to the confluence, significant portions of the banks are armored and streamside residential development is common. Much of the lower 6 miles flows through active agricultural land where alder and cottonwood are the most common streamside tree species.

Voights Creek is a tributary to the lower Carbon River, entering the Carbon at RM 4.0. Voights is currently only surveyed for steelhead due to the presence of a state salmon hatchery at RM 0.5. There are just less than 4 miles of anadromous habitat available in Voights Creek, an impassable falls at RM 3.9 blocks any further upstream migration. Steelhead are often observed spawning throughout the entire creek, right up to the falls. Unfortunately, steelhead escapement in Voights Creek has fallen dramatically over the past few years. During higher autumn flows, coho, and occasionally Chinook, easily bypass the hatchery and spawn throughout the entire creek up to the falls. The stream channel varies in complexity from wide, braided channels, to confined narrow gorges. Nearly the entire 3.9 miles below the falls contains excellent, although somewhat sporadic patches of gravel within a moderate gradient stream channel. However, below the water intake for the state hatchery at RM 1.0 the gradient decreases, the substrate size is more consistent although smaller and somewhat compacted. The riparian zone is a mix of 2nd growth conifer and deciduous trees. There is a moderate amount of small and medium woody debris recruited, and minute amounts of LWD present, what little is present is generally quite old.

Ranger Creek is a left bank tributary to the upper Carbon River; entering at RM 28.3. Typical of many headwater tributaries, Ipsut Creek is non-glacial and is characterized by confined steep valley channels with a comparatively short, low-to-moderate gradient anadromous reach. This mountain stream flows for just over 2.8 miles through a steep glacial valley originating near Castle Peak along the Alki Crest. Ipsut flows entirely within Mt. Rainier National Park. Headwater sources are derived from snowpack accumulations; as well as other surrounding surface and groundwater sources including Doe Creek *(right bank- RM 1.2)* and an unnamed tributary *(right bank- RM 0.8)*. Neither tributary is accessible by fish. The creek continues to drop precipitously from through much of its length until it reaches the lower channel migration zone of the Carbon River, at which point the creek channel is reduced to a low-moderate gradient pool-riffle channel capable of supporting salmonids.

Past surveys have verified bull trout utilization within Ipsut; furthermore, the creeks 2300' elevation makes it one of the lowest elevation streams known to support bull trout spawning and is quite capable of supporting Chinook, coho, pink and steelhead as well. Other species including cutthroat, non-native brook trout and sculpins are known to inhabit the creek. However, salmonid migration upstream to reach headwater tributaries in the upper Carbon Basin, including Ipsut, is assumed to be extremely limited due to substantial cascades present throughout the roughly 5 mile long Carbon River Gorge. The Puyallup Tribe conducted salmon, steelhead and bull trout spawning surveys during 2000 and 2001; yet, no salmon or steelhead were observed. However, surveyors did observe several redds early in the spawning season *(September)*, but their timing matched the bull trout spawning documented in other headwater tributaries in the watershed including Ranger Creek and several Upper White River tributaries.

The riparian zone along Ipsut consists primarily of old growth cedar, fir and hemlock which contributes greatly to the large woody debris in the stream; as well as diversity to the channel habitat. Unfortunately, spawning opportunities are limited due to the size and makeup of the substrate material; much of which consists of flat and angular stones not conducive to movement, especially by smaller fish such as bull trout. However, small patches of suitable gravel do exist. The lower anadromous reach of the creek is also subject to, and has frequently experienced disturbances caused by Carbon River flood events. These intrusions often deposit significant amounts of fine material and woody debris. An impassable falls at approximately RM 0.7 prevents any further upstream migration.

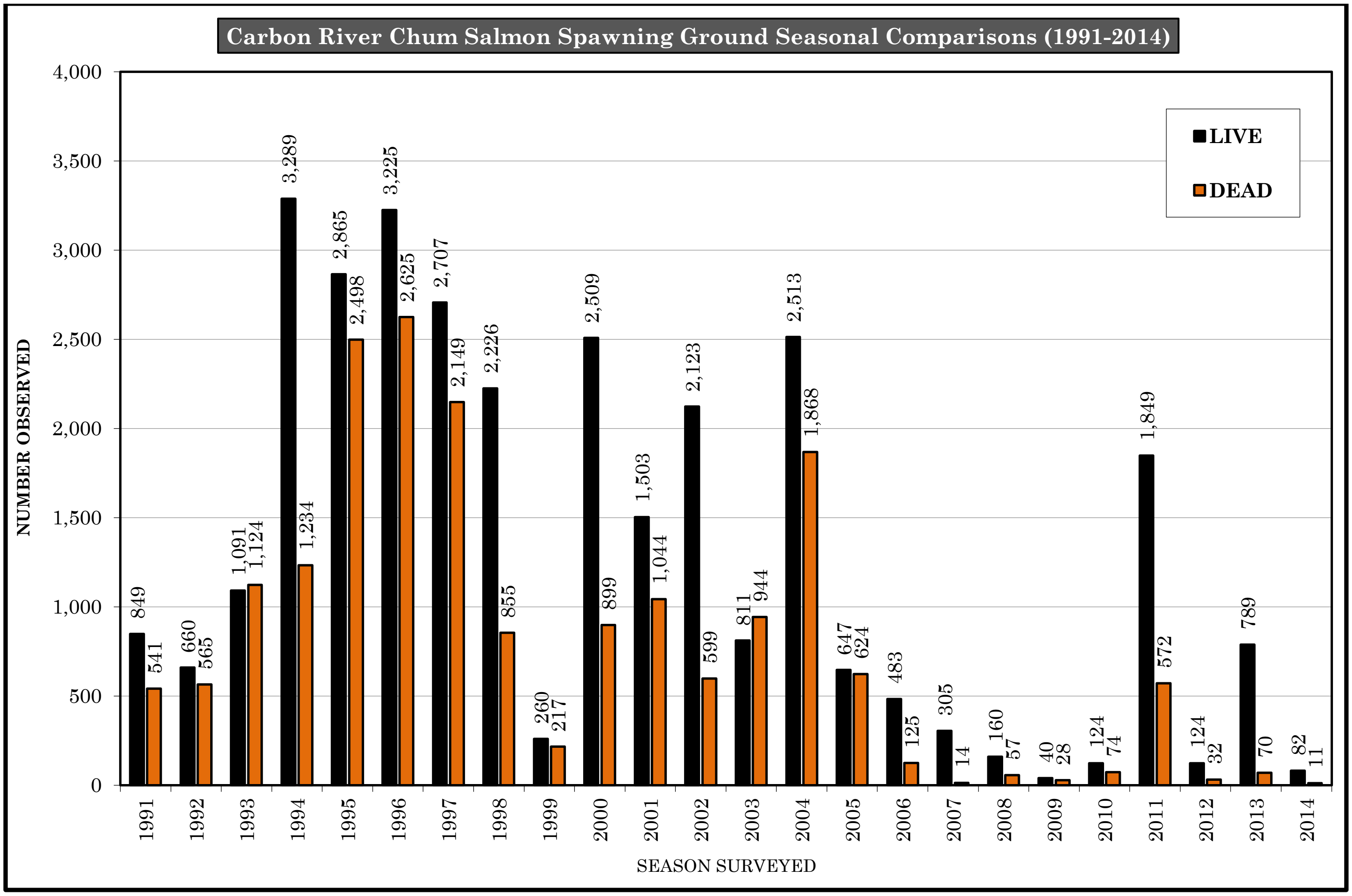
Unfortunately, no substantial data is available on bull trout spawning escapement or population size within the upper Carbon River. Currently, the Carbon River bull trout population is considered one-of-five local populations identified and managed within the Puyallup River Watershed Core Area.

Ipsut Creek is a left bank tributary to the upper Carbon River; entering at RM 28.3. Typical of many headwater tributaries, Ipsut Creek is non-glacial and is characterized by confined steep valley channels with a comparatively short, low-to-moderate gradient anadromous reach. This mountain stream flows for just over 2.8 miles through a steep glacial valley originating near Castle Peak along the Alki Crest. Ipsut flows entirely within Mt. Rainier National Park. Headwater sources are derived from snowpack accumulations; as well as other surrounding surface and groundwater sources including Doe Creek *(right bank- RM 1.2)* and an unnamed tributary *(right bank- RM 0.8)*. Neither tributary is accessible by fish. The creek continues to drop precipitously from through much of its length until it reaches the lower channel migration zone of the Carbon River, at which point the creek channel is reduced to a low-moderate gradient pool-riffle channel capable of supporting salmonids.

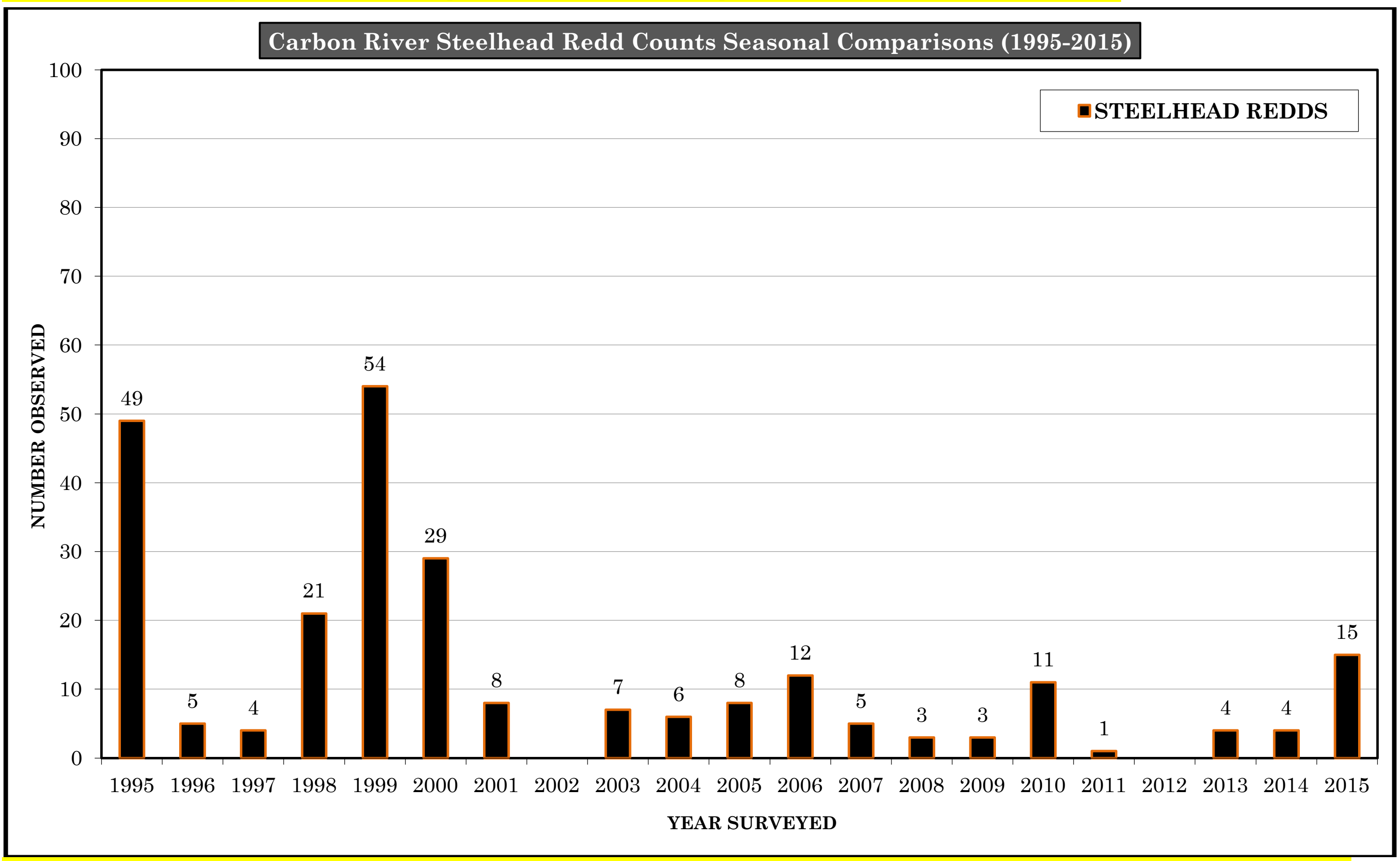
Past surveys have verified bull trout utilization within Ipsut; furthermore, the creeks 2300' elevation makes it one of the lowest elevation streams known to support bull trout spawning and is quite capable of supporting Chinook, coho, pink and steelhead as well. Other species including cutthroat, non-native brook trout and sculpins are known to inhabit the creek. However, salmonid migration upstream to reach headwater tributaries in the upper Carbon Basin, including Ipsut, is assumed to be extremely limited due to substantial cascades present throughout the roughly 5 mile long Carbon River Gorge. The Puyallup Tribe conducted salmon, steelhead and bull trout spawning surveys during 2000 and 2001; yet, no salmon or steelhead were observed. However, surveyors did observe several redds early in the spawning season *(September)*, but their timing matched the bull trout spawning documented in other headwater tributaries in the watershed including Ranger Creek and several Upper White River tributaries.

The riparian zone along Ipsut consists primarily of old growth cedar, fir and hemlock which contributes greatly to the large woody debris in the stream; as well as diversity to the channel habitat. Unfortunately, spawning opportunities are limited due to the size and makeup of the substrate material; much of which consists of flat and angular stones not conducive to movement, especially by smaller fish such as bull trout. However, small patches of suitable gravel do exist. The lower anadromous reach of the creek is also subject to, and has frequently experienced disturbances caused by Carbon River flood events. These intrusions often deposit significant amounts of fine material and woody debris. An impassable falls at approximately RM 0.7 prevents any further upstream migration.

Winter steelhead stocks have been in serious decline for the past several years. Tribal and state fisheries managers are currently working on a recovery plan to improve future steelhead returns and hope to implement this plan within the next few years. Continuing efforts are being made by the tribe and WDFW to increase and expand the survey coverage area in order to improve escapement estimates. During the 2005, 2006, 2008 and 2010 steelhead survey season, WDFW biologists and Puyallup Tribe fisheries staff increased the survey coverage along the Carbon by making regular helicopter surveys of the river from the NPS boundary at RM 23, to its confluence with the Puyallup River.



The 2014 data is incomplete due to extremely poor survey condition which prevented a regular full season of surveys.



The 2008, 2009, 2013 & 2014 redd data is incomplete due to extremely poor survey condition which prevented a regular full season of surveys.

CLARKS CREEK 10.0027

Clarks Creek is an urban tributary flowing into the lower Puyallup River, entering the Puyallup at RM 5.8. The Clarks Creek Basin drains the plateaus and flatlands running along the southern valley of the lower Puyallup River, just west of the city of Puyallup. The basin drains a 13 mi^2 area, with an average flow of nearly 60 cfs *(Basin Gauge #12102075)*. Clarks has several smaller tributaries, including Diru and Rody creeks; both of which are salmon bearing streams supporting Chinook *(above)*, coho, chum, pink, steelhead, and bull trout. Woodland Creek and Meeker Ditch contribute additional flow. Several salmonid species are known to utilize Clarks Creek for spawning, rearing and foraging. These include ESA threatened Chinook, steelhead and bull trout; as well as non-listed species such as coho, pink, chum and cutthroat trout. Brown trout, a non-native species is also present in the basin.

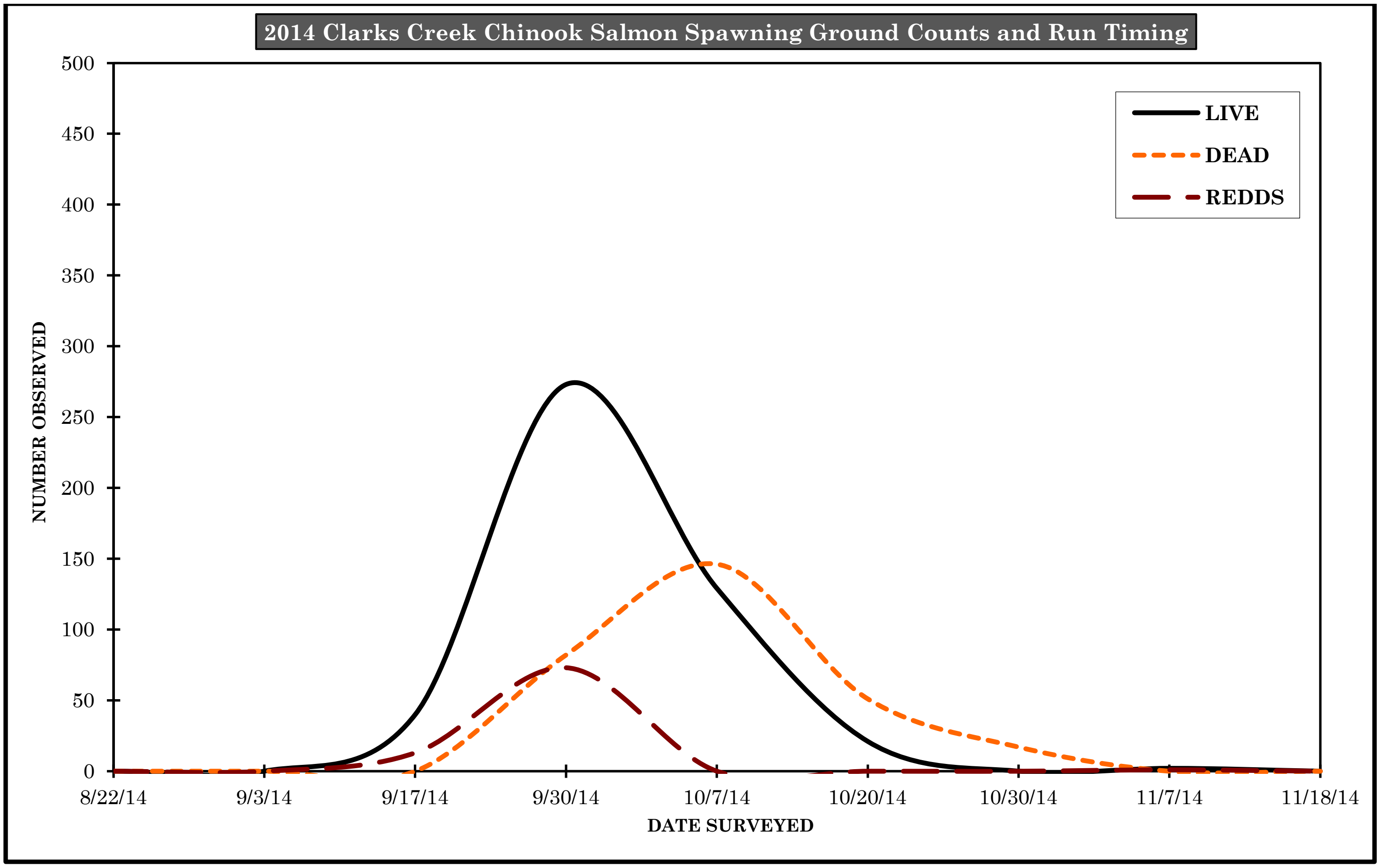
Several fish and habitat limiting factors associated with Clarks include; channel confinement, complete fish barriers, no off-channel habitat, flooding and channel erosion, absent or deficient riparian cover, water quality *(Iron, pH & bacteria)*, conveyance of storm water run-off, and the significant growth of elodea (*Elodea canadensis*). In addition, there is considerable development along the creek, primarily rural residential.

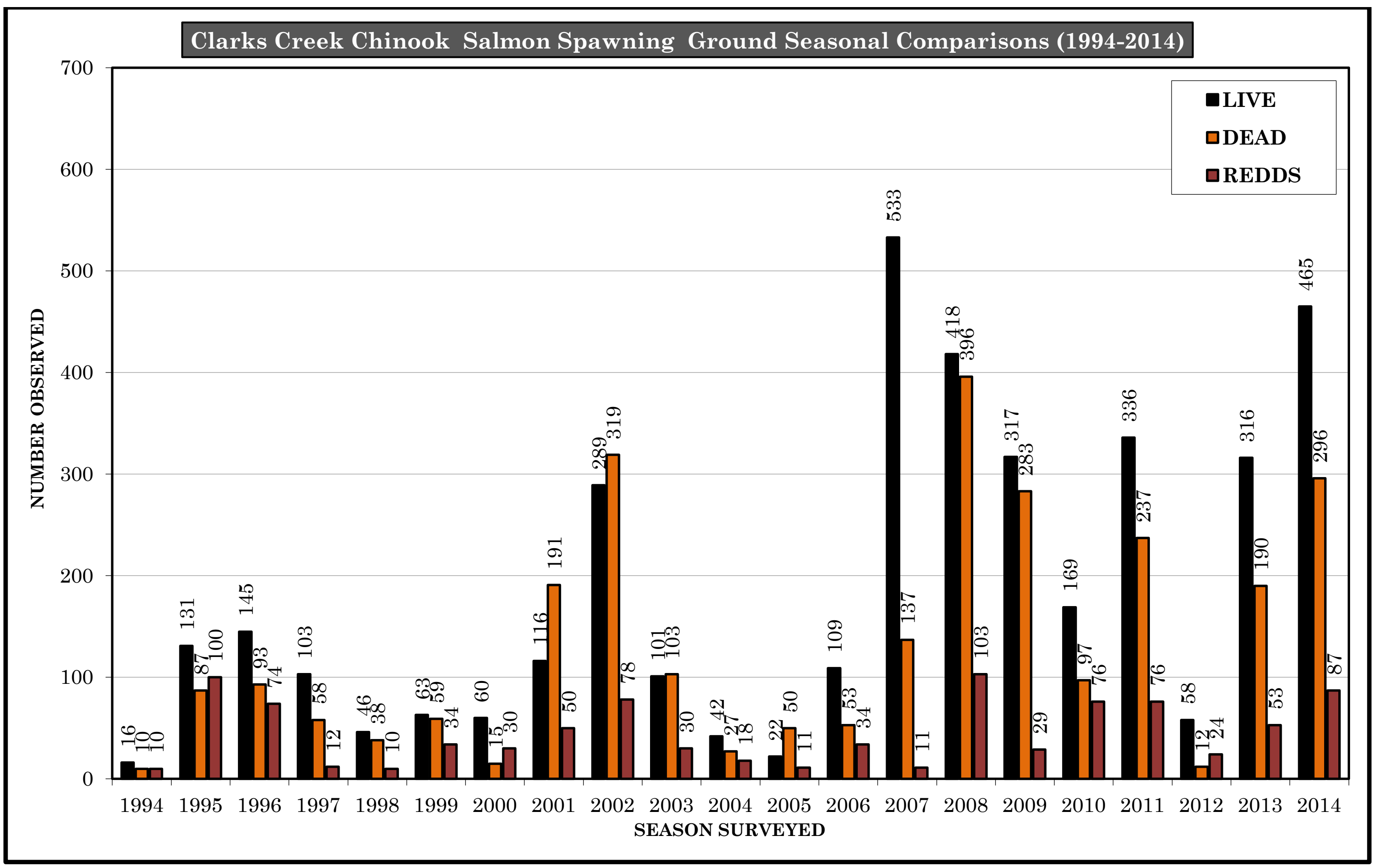
The anadromous reach of Clarks is a low gradient spring-fed stream *(Maplewood Springs)* with a pool-riffle character. The surveyed reach of the Clarks Creek *(RM 3.4 to 3.7)* provides abundant spawning opportunities for all species; however, upstream migration is blocked by a dam at RM 3.7. Consequently, the dam also prevents the fluvial movement of gravel downstream to critical spawning areas.

Salmonberry, maple, and alder dominate the overstory riparian zone along much of the upper surveyed reach. The remaining stream channel below the surveyed reach *(RM 3.4)* contains little gravel and the substrate consists of fine sand and mud; subsequently, little or no spawning has been observed downstream of this point. WDFW operates a fish hatchery near the barrier dam on Clarks. The state operated hatchery raises trout for stocking local lakes. Spawning size gravel was introduced into the channel from RM 3.5 to 3.7 in the fall of 1997, and the summer of 1999. In addition to gravel inputs, several log weirs have been placed above the interpretive bridge to aid in gravel retention. This has greatly enhanced the spawning opportunities for Chinook, pink, coho and chum salmon. Unfortunately, adult steelhead spawning activity has rarely been observed in Clarks Creek since 1997. However, steelhead are occasionally captured or observed in tributaries of Clarks Creek.

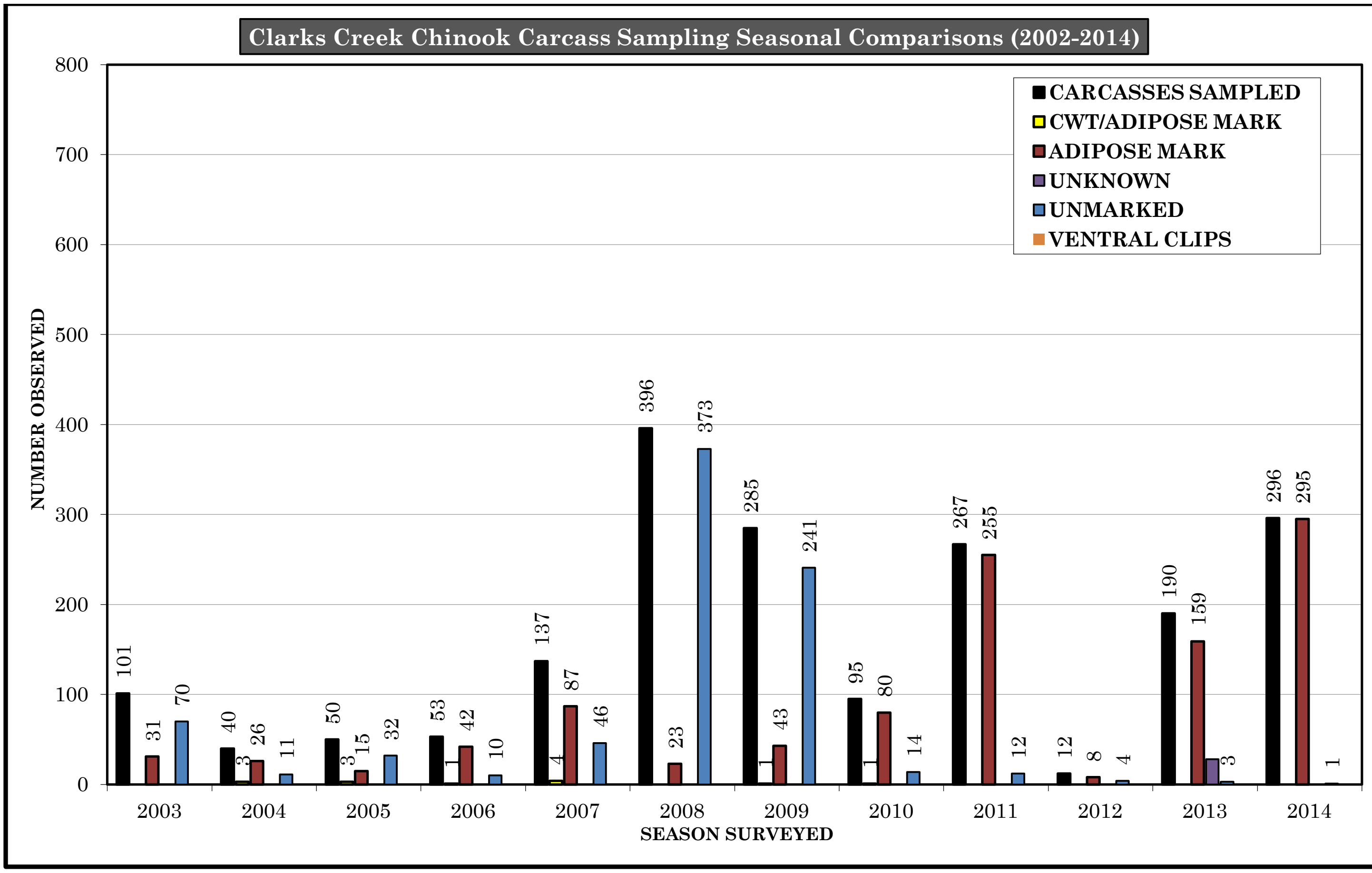
Due to limited availability of spawning habitat, high densities of Chinook and chum often results in considerable redd superimposition throughout this short reach. There is often an abundance of coho and chum fry during the spring *(pink fry/odd years)* for cutthroat and juvenile Chinook to feed on. Adult and juvenile bull trout are also known to forage in the smaller tributaries of the lower Puyallup, including Clarks Creek.

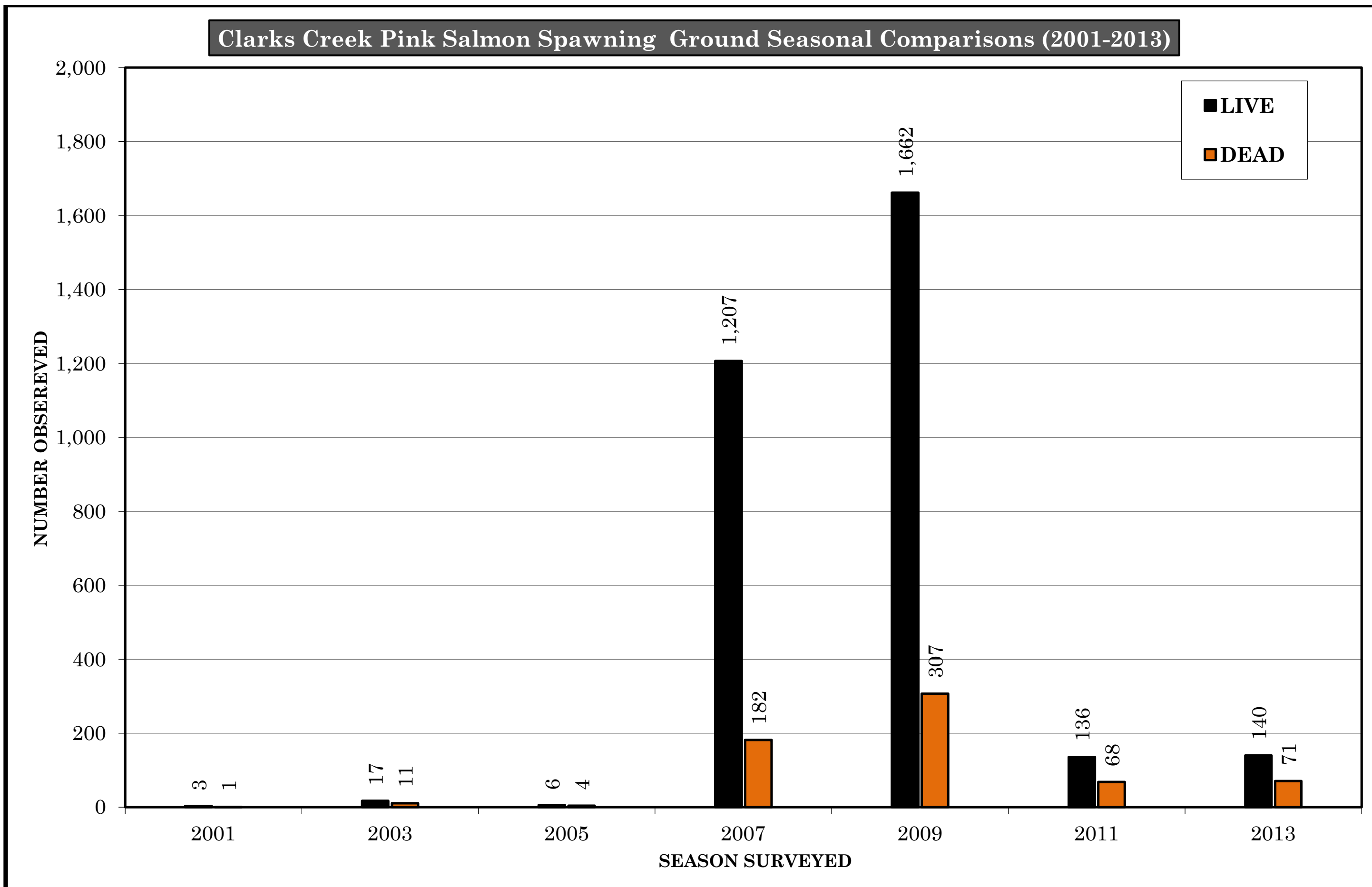
In 2004, the Puyallup Tribe completed construction of a Fall Chinook salmon hatchery on Clarks Creek *(RM 1.0)*. The hatchery was constructed in order to address several fish management issues, one of which includes minimizing the straying of adult Fall Chinook reared by the Puyallup Tribe.

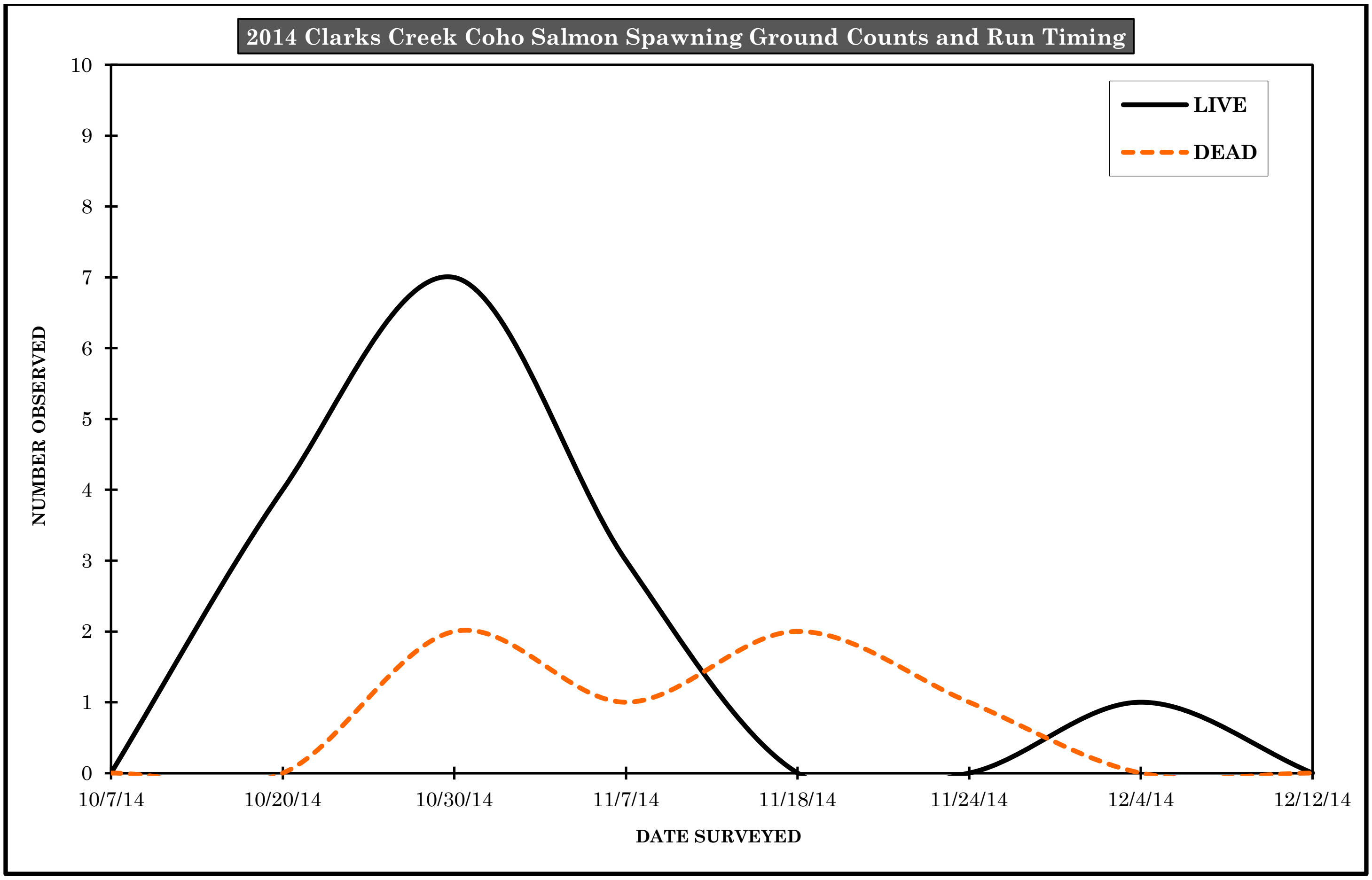


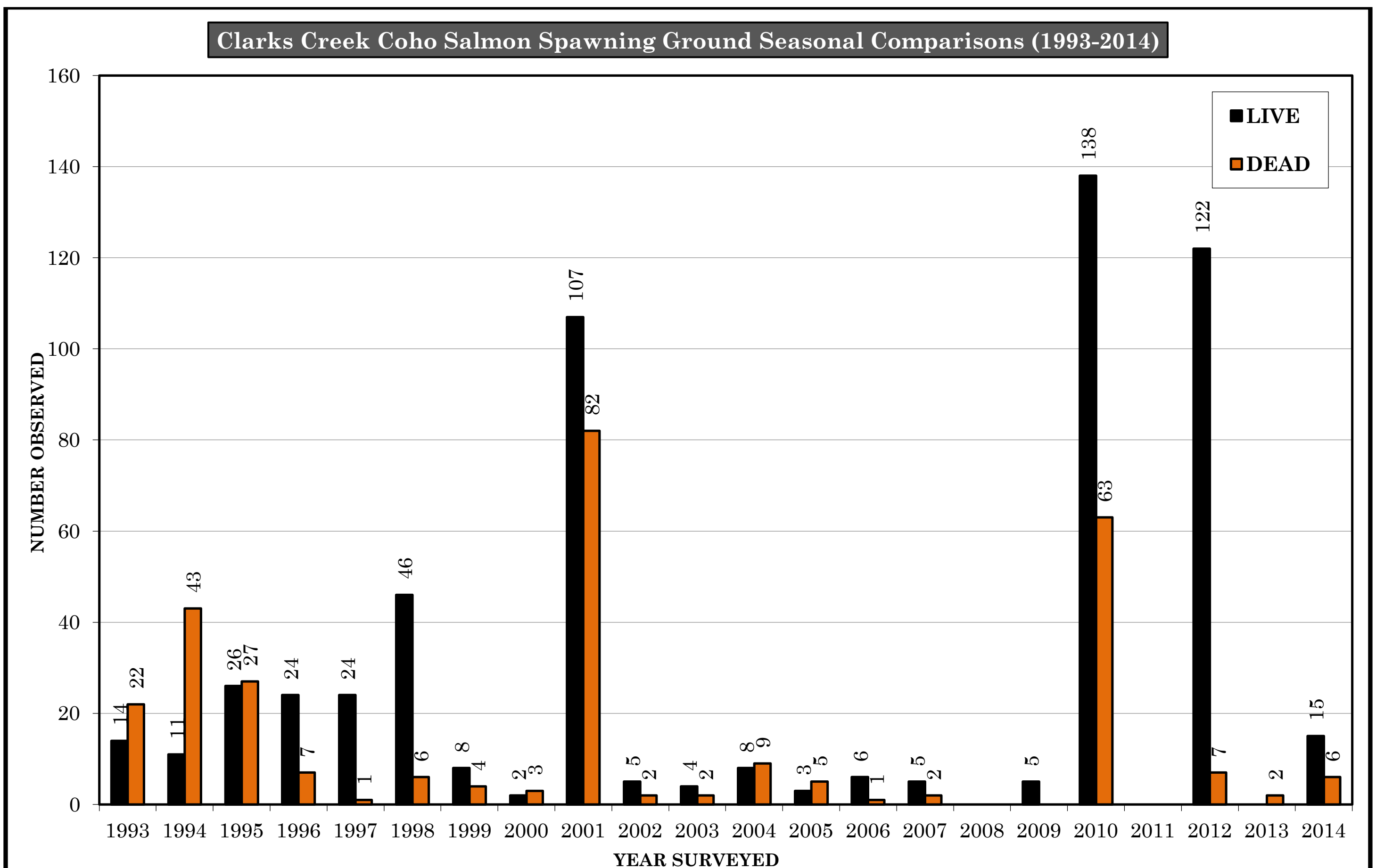


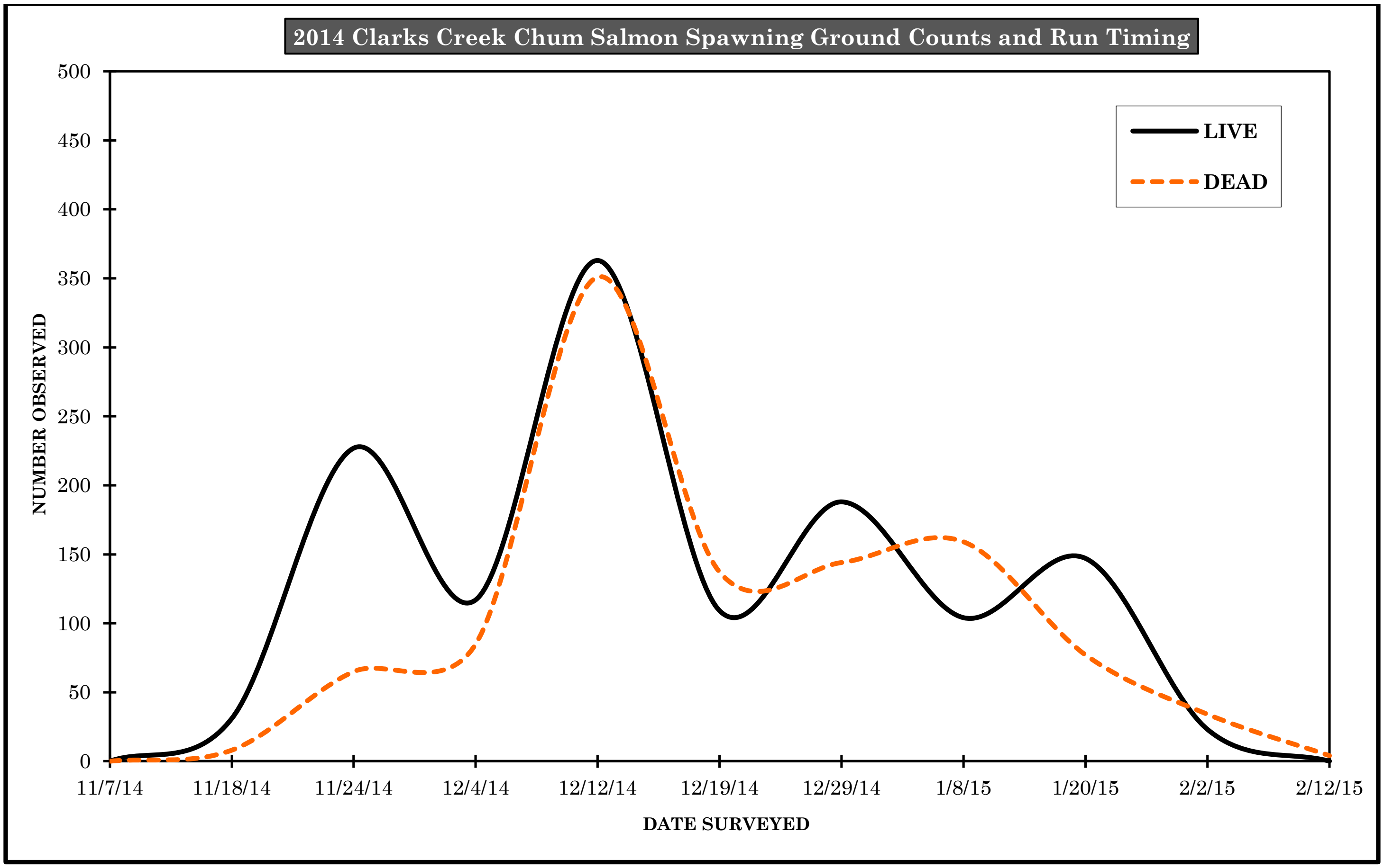
Note: A high proportion of the Chinook observed in 2007, were jacks *(2 year olds)*.

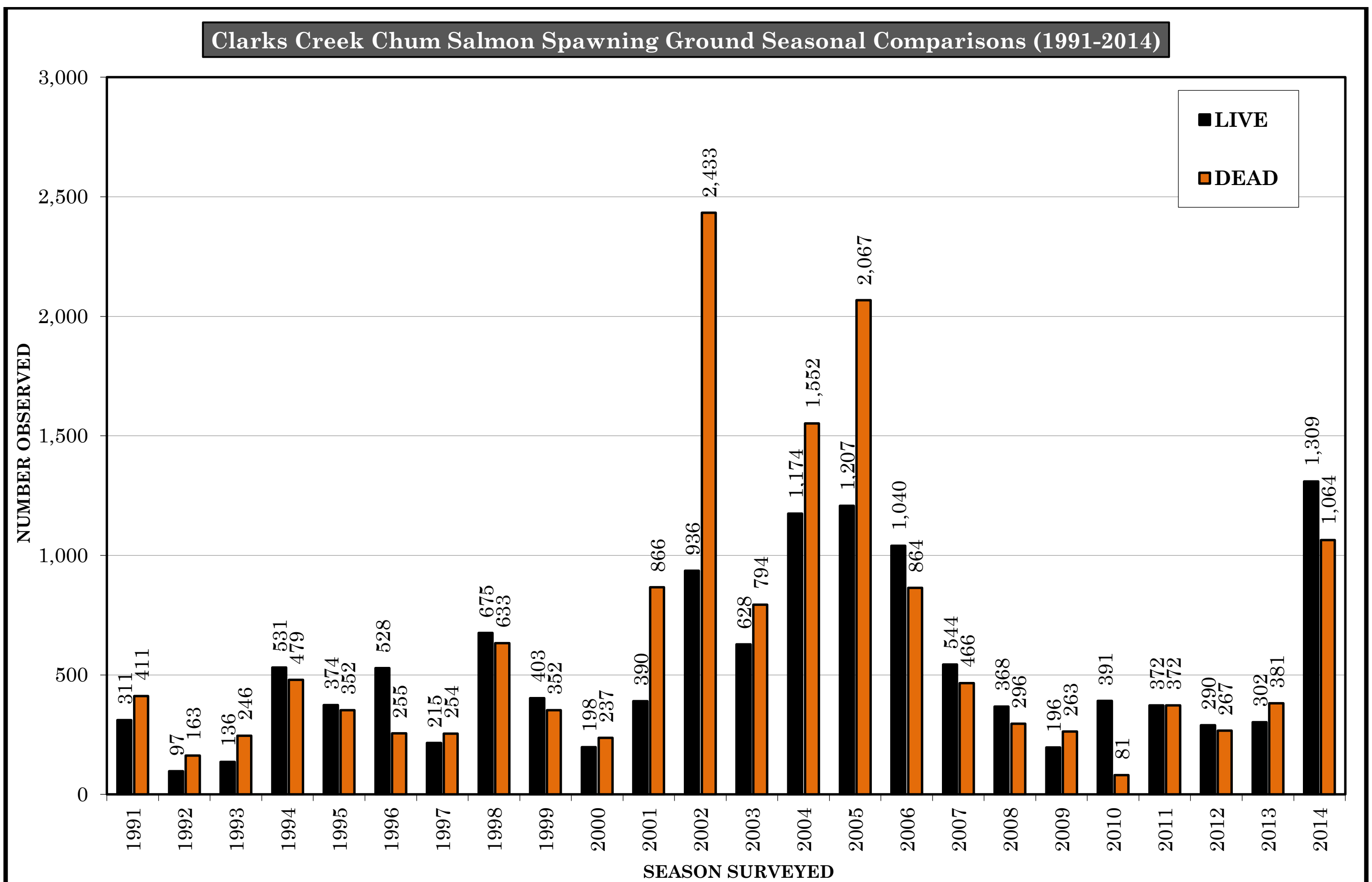

Clarks Creek Chinook Carcass Sampling Seasonal Comparisons (2002-2014)
NUMBER OBSERVED
SEASON SURVEYED
CARCASSES SAMPLED
CWT/ADIPOSE MARK
ADIPOSE MARK
UNKNOWN
UNMARKED
VENTRAL CLIPS
0
100
200
300
400
500
600
700
800
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
101
31
70
40
3
26
11
50
3
15
32
53
1
42
10
137
4
87
46
396
23
373
285
1
43
241
95
1
80
14
267
255
12
12
8
4
190
159
3
296
295
1

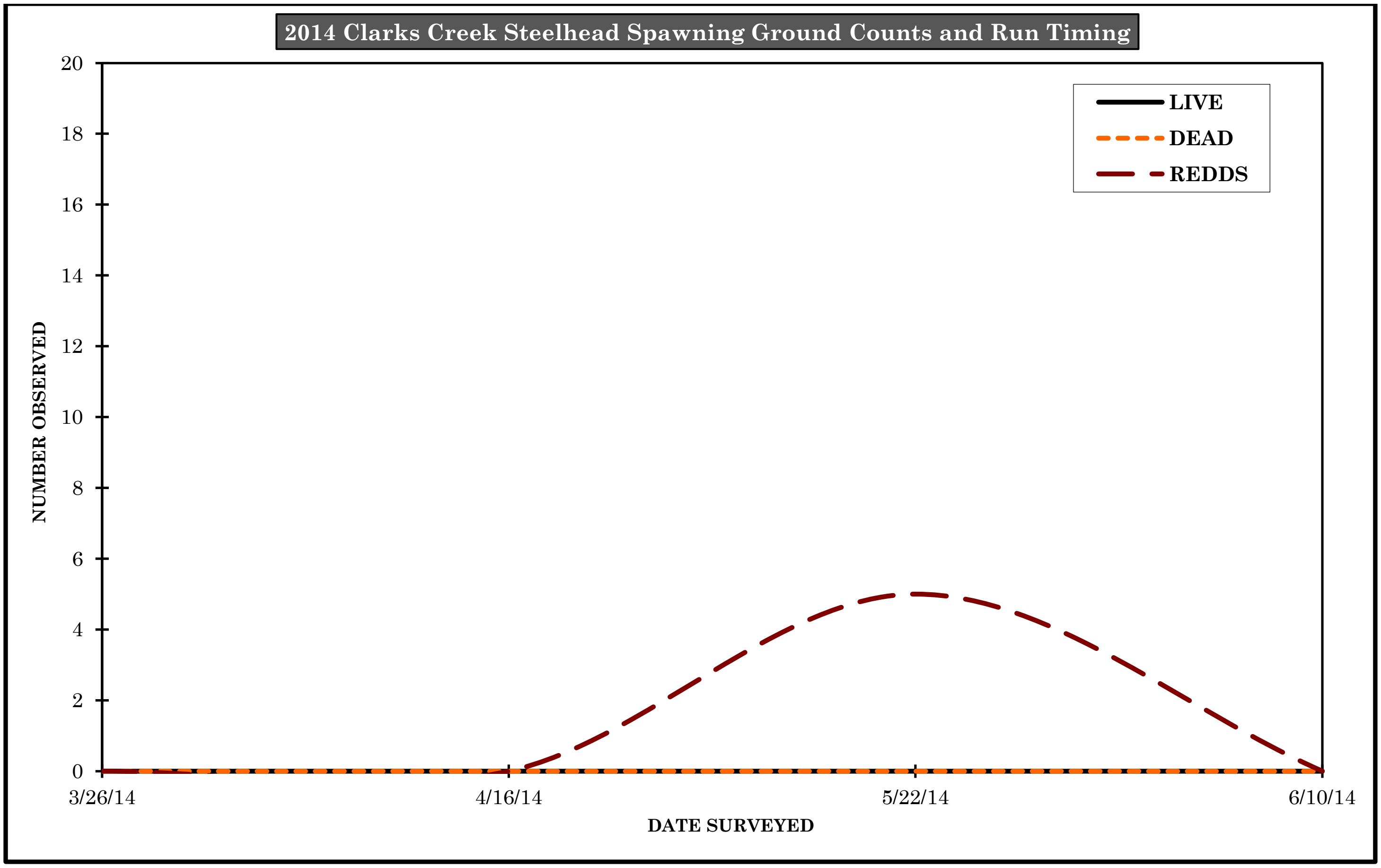

Clarks Creek Pink Salmon Spawning Ground Seasonal Comparisons (2001-2013)
NUMBER OBSEREVED
SEASON SURVEYED
LIVE
DEAD
0
200
400
600
800
1,000
1,200
1,400
1,600
1,800
2,000
2001
2003
2005
2007
2009
2011
2013
3
1
17
11
6
4
1,207
182
1,662
307
136
68
140
71

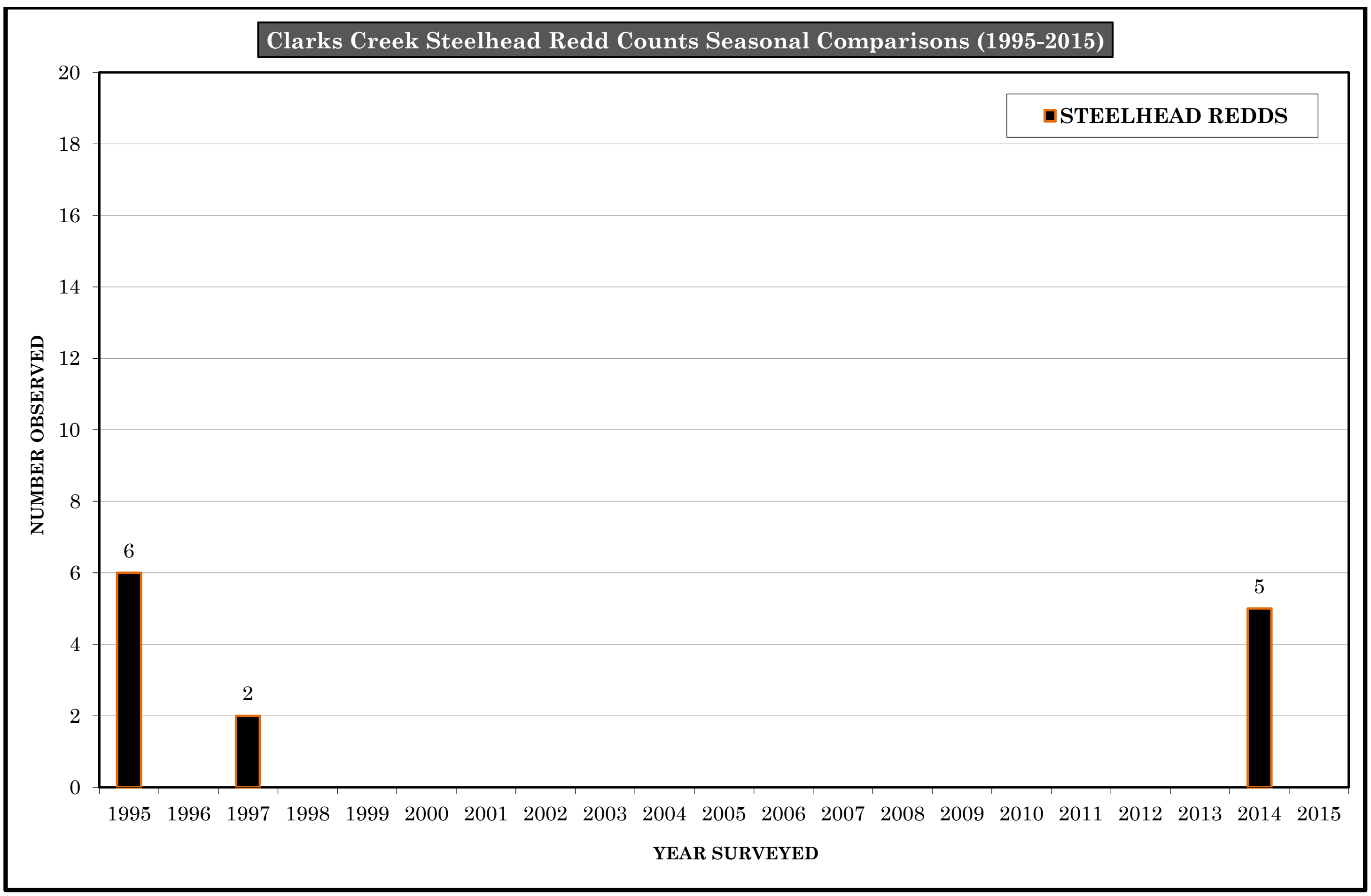

2014 Clarks Creek Coho Salmon Spawning Ground Counts and Run Timing
LIVE
DEAD
NUMBER OBSERVED
0
1
2
3
4
5
6
7
8
9
10
10/7/14
10/20/14
10/30/14
11/7/14
11/18/14
11/24/14
12/4/14
12/12/14
DATE SURVEYED


Clarks Creek Coho Salmon Spawning Ground Seasonal Comparisons (1993-2014)
LIVE
DEAD
NUMBER OBSERVED
0
20
40
60
80
100
120
140
160
14
22
11
43
26
27
24
7
24
1
46
6
8
4
2
3
107
82
5
2
4
2
8
9
3
5
6
1
5
2
5
138
63
122
7
2
15
6
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
YEAR SURVEYED


2014 Clarks Creek Chum Salmon Spawning Ground Counts and Run Timing
LIVE
DEAD
NUMBER OBSERVED
DATE SURVEYED
0
50
100
150
200
250
300
350
400
450
500
11/7/14
11/18/14
11/24/14
12/4/14
12/12/14
12/19/14
12/29/14
1/8/15
1/20/15
2/2/15
2/12/15


Clarks Creek Chum Salmon Spawning Ground Seasonal Comparisons (1991-2014)
LIVE
DEAD
NUMBER OBSERVED
SEASON SURVEYED
0
500
1,000
1,500
2,000
2,500
3,000
1991 311 411
1992 97 163
1993 136 246
1994 531 479
1995 374 352
1996 528 255
1997 215 254
1998 675 633
1999 403 352
2000 198 237
2001 390 866
2002 936 2,433
2003 628 794
2004 1,174 1,552
2005 1,207 2,067
2006 1,040 864
2007 544 466
2008 368 296
2009 196 263
2010 391 81
2011 372 372
2012 290 267
2013 302 381
2014 1,309 1,064


2014 Clarks Creek Steelhead Spawning Ground Counts and Run Timing
LIVE
DEAD
REDDS
NUMBER OBSERVED
0
2
4
6
8
10
12
14
16
18
20
3/26/14
4/16/14
5/22/14
6/10/14
DATE SURVEYED


Clarks Creek Steelhead Redd Counts Seasonal Comparisons (1995-2015)
STEELHEAD REDDS
NUMBER OBSERVED
0
2
4
6
8
10
12
14
16
18
20
6
2
5
1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015
YEAR SURVEYED

CLARKS CREEK Salmon Hatchery

Puyallup Tribe of Indians Salmon Hatchery

Clarks Creek Salmon Hatchery is a Puyallup Tribe of Indians facility located at RM 1 on Clarks Creek *(10.0027)*, a tributary to the Puyallup River. The Clarks Creek hatchery *(below)* was constructed in order to address several fish management, and water supply issues including; minimizing the straying of adult Fall Chinook reared by the tribe; providing space for rearing and acclimating White River Spring Chinook, chum and winter steelhead if necessary; creating an independent and self sustaining fall and Spring Chinook program for the tribe; as well as providing a reliable water supply to rear and expand fish production.

Water is supplied from five vertical turbine pumps, each 20-horsepower. Each pump has a flow capacity of 1,600 gpm. Each pump is capable of supplying one of four ponds with approximately 3.6 cfs. Each of the four ponds has approximately 12,000+ cubic feet of water volume, two ponds are concrete lined and designed to hold adult and juveniles, while the other two are natural acclimation ponds.

In addition, the Puyallup Tribe operates several acclimation ponds in the Puyallup Watershed. Two of the acclimation ponds are used for reestablishing Fall Chinook and coho into a 30-mile reach in the Upper Puyallup River above Electron Dam *(Cow Skull & Rushingwater)*. A fish ladder was constructed and completed in fall of 2000; for 97 years prior to the completion of the fish ladder the Electron diversion dam had been an anadromous barrier. Three additional acclimation ponds are located in the Upper White River drainage. The fourth, and newest pond located on 28 Mile Creek *(Greenwater River)* is slated for completion in the fall of 2015. These ponds are used for reestablishing White River Spring Chinook and steelhead back into their endemic range. All ponds have approximately 25,000 cubic feet of rearing space and between 1 to 3 cubic feet per second flow. A 35,000 cu. ft. Spring Chinook acclimation pond was completed in the summer of 2007 near George Creek *(Greenwater River)*. Capable of holding over 500,000 Spring Chinook, the construction of the acclimation pond was funded by the City of Tacoma as a result of a mitigation settlement.

The Puyallup Tribe's restoration goal is to rebuild depressed Chinook and steelhead stocks and remove them from ESA listing. Using acclimation ponds, limiting harvest, and making substantial gains in habitat restoration, the tribe will be able to accomplish this task. Levee setbacks, oxbow reconnections both inter tidal and upland, Commencement Bay cleanup, and harvest cutbacks have already been initiated. Only the jump-starting of Chinook in habitat areas devoid of fish has remained one of our biggest challenges. Acclimation ponds are a proven method in increasing fish numbers on the spawning grounds. Hatchery rearing 200,000 Fall Chinook for release on station and 200,000 for acclimation ponds in the upper Puyallup River for a combined 6,857 pounds of fish. Historically, Fall Chinook have been reared since 1980 with a variety of stocks, goals, and objectives.

Spring Chinook Hatchery Production

The Puyallup Tribe operates several acclimation ponds in the Puyallup/White River Watershed designed to reestablish and enhance Spring/Fall Chinook, winter steelhead and coho stocks. Each of two acclimation ponds *(Cowskull & Rushingwater)* on the Puyallup may receive as many as 100K+ hatchery origin Spring/Fall Chinook and/or coho. Additional acclimation ponds located in the Upper White River drainage *(Huckleberry, George & Jensen Creeks)* would be planted collectively with up to 900K+ White River Spring Chinook and 25K+ White River winter steelhead pre-smolts. The Jensen Creek Pond *(Clearwater River)* was completed in the fall of 2012. The newest pond located on 28 Mile Creek *(Greenwater River)* is slated for completion in the fall of 2015.

Current Fall Chinook Hatchery Production

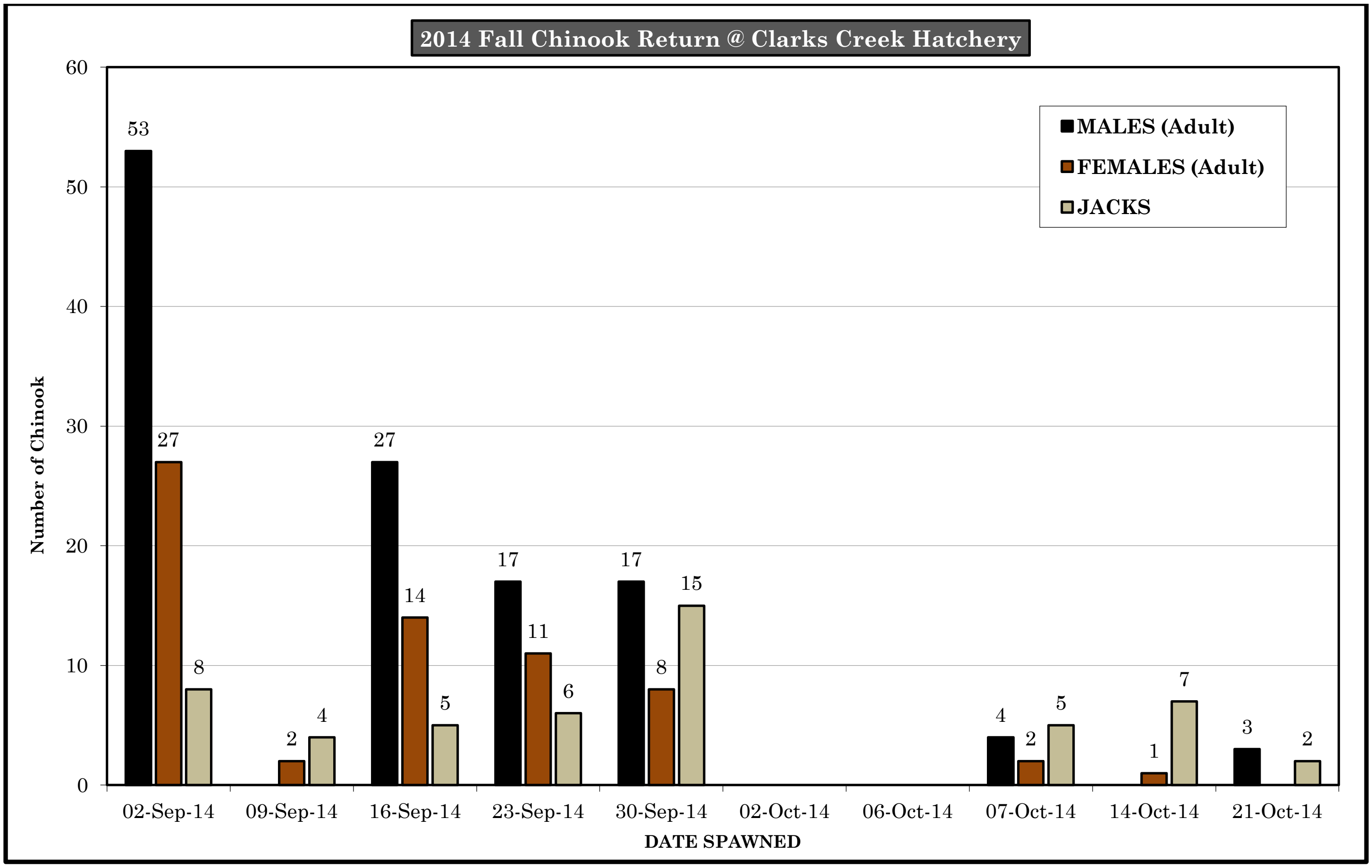
In 2004, the Puyallup Tribal Fisheries Department began acclimating and releasing Fall Chinook from the Clarks Creek facility; thus, discontinuing all Chinook releases from the Diru Creek hatchery. Adult and jack Chinook begin moving into the hatchery holding pond in September, and continue to arrive well into late October. Ripe *(ready to spawn)* adults are collected 2-3 times a week. Eggs and sperm, at a 1male-to-1 female ratio, are mixed in a small bucket to induce fertilization *(above)*. Once the eggs have been fertilized, they are placed into an incubator tray until they hatch. In early 2005, construction of a new incubation building was completed at Clarks Creek. The incubation building houses 32 incubator stack capable of holding up to 77,000 Chinook eggs, for a total capacity of approximately 2.5 million eggs *(lower left)*. Once fish are ready to be moved from the incubators, they can be place in one of the 16 aluminum raceway-troughs and hand feeding can begin *(upper right)*. The troughs are 16 feet in length with a flow rate of up to 25 gpm. When the fish are approximately 500/lbs., they are transferred to one of the cement lined ponds.

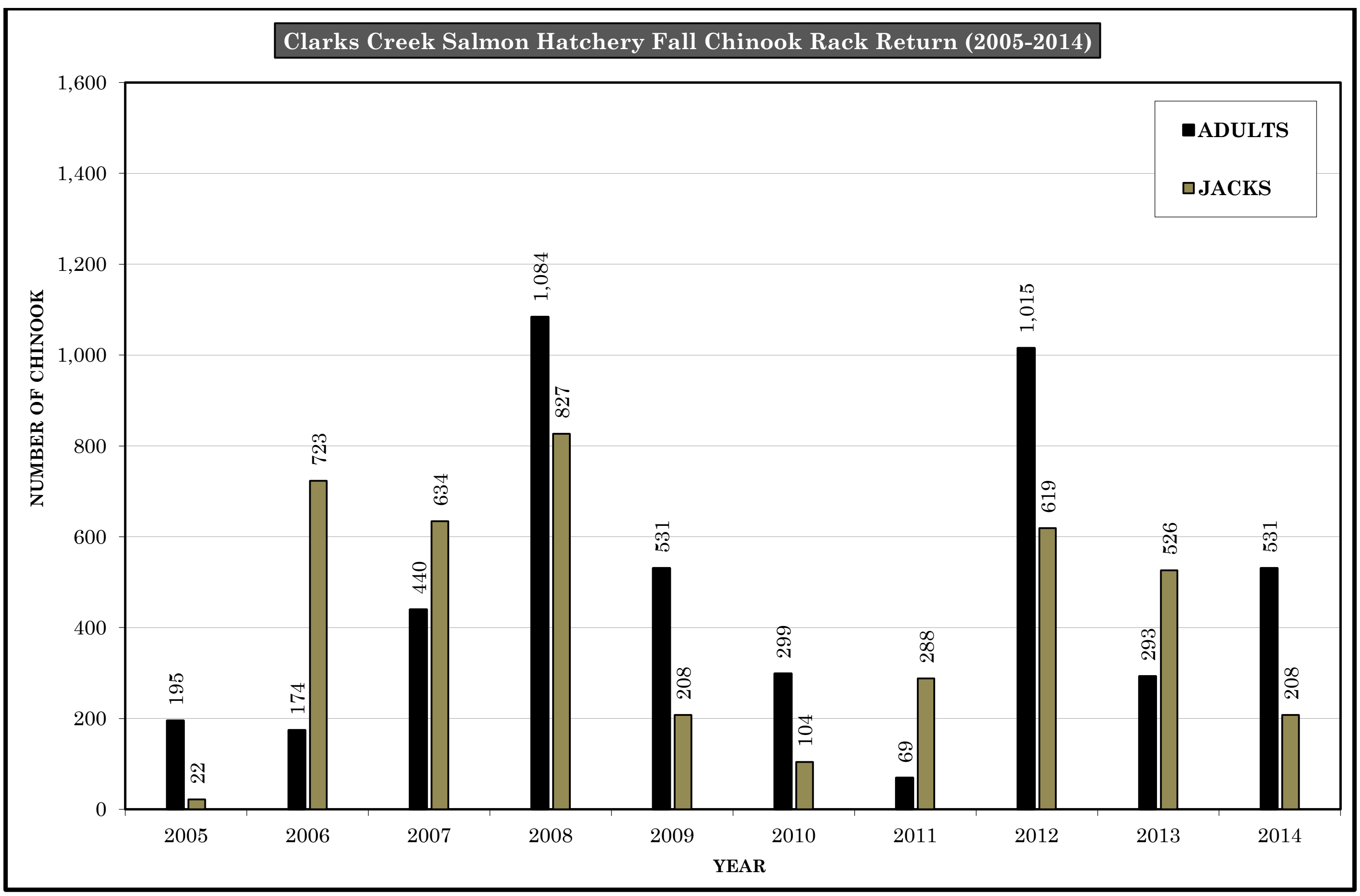
Egg incubators

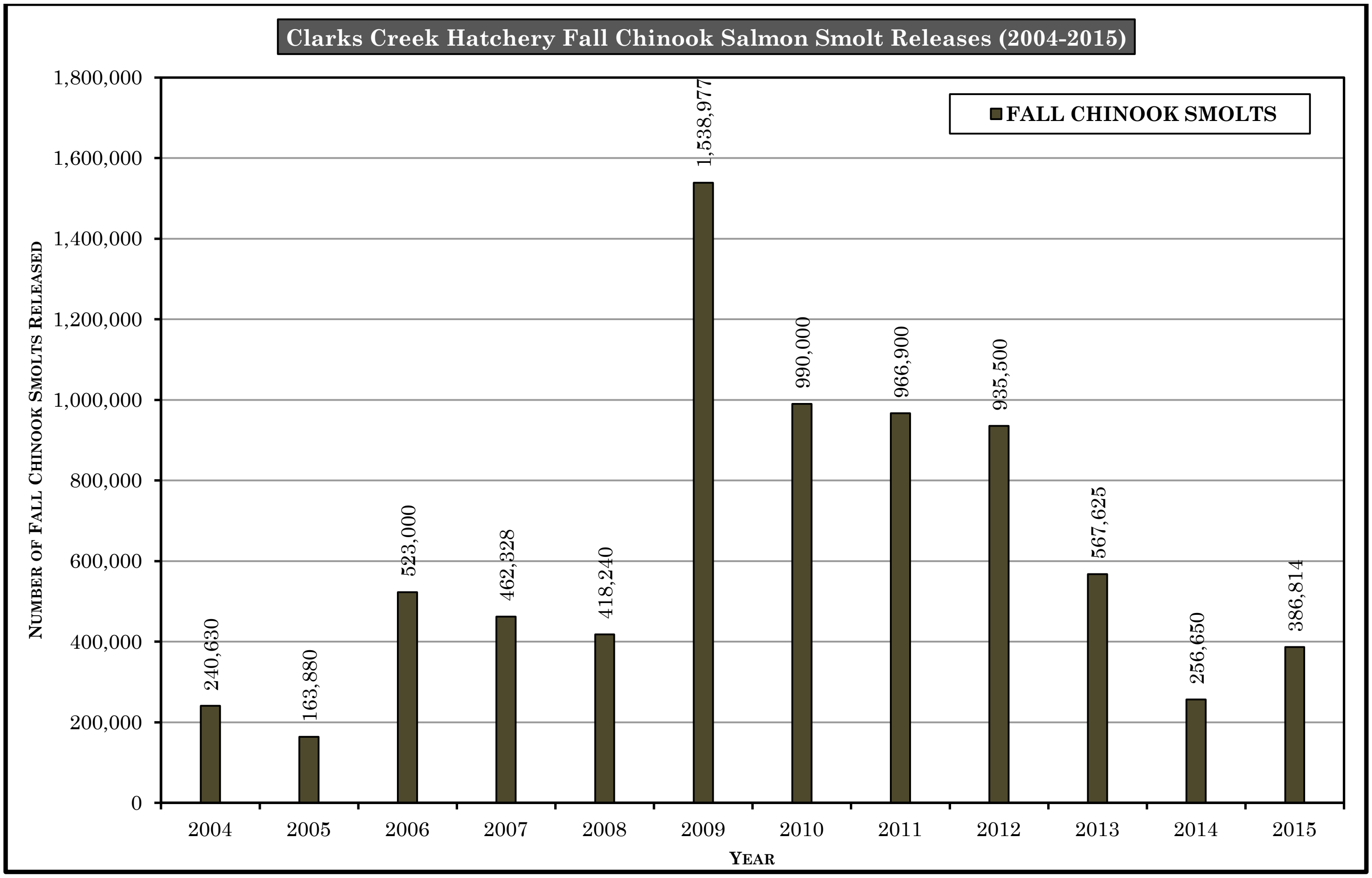
Holding the Chinook in the cement pond is only temporary until they are up to a large enough size, usually sometime during late March to early April, to be massed marked with an automated tagger *(lower right)*. The automated fish tagging trailer is operated by the Northwest Indian Fisheries Commission *(NWIFC)* out of Olympia. A proportion of the young Chinook are implanted with a coded wire tag *(CWT)* and the adipose fin is removed. The remaining fish are all massed marked by removing the adipose fin only. The markings and CWT's will be used to identify these Chinook as hatchery origin fish in the future when they return to the hatchery, are caught by fisherman, or are observed on the spawning grounds. The CWT is inscribed with a specific code that will identify the particular hatchery where the fish was tagged. Once tagged, fish are planted in one of the two natural acclimation ponds. The young Chinook are fed regularly to increase their size until they are ready to be released into the creek in late May or early June.

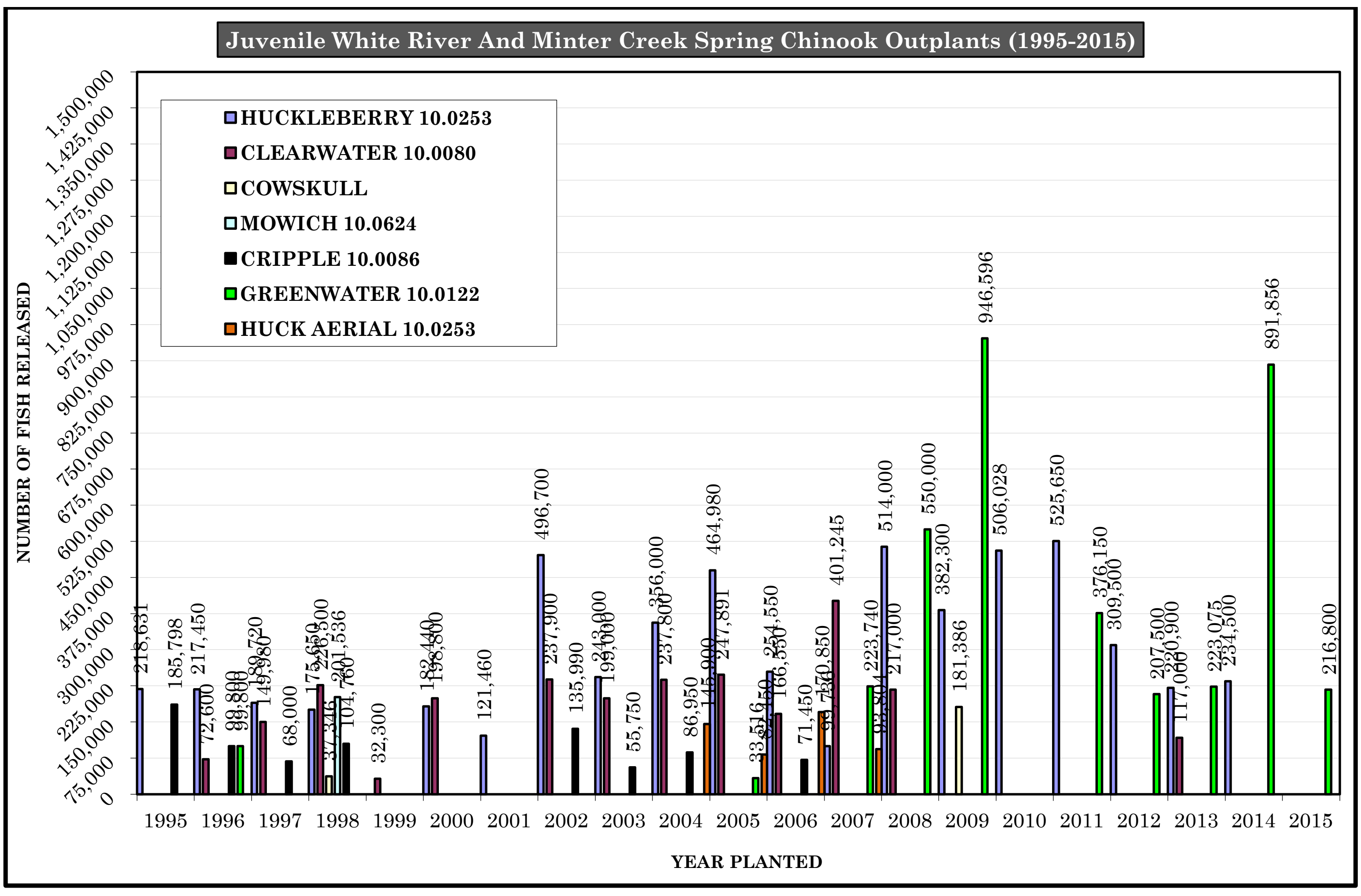
Raceway troughs

Automated fish tagger


2014 Fall Chinook Return @ Clarks Creek Hatchery
MALES (Adult)
FEMALES (Adult)
JACKS
Number of Chinook
DATE SPAWNED
02-Sep-14
09-Sep-14
16-Sep-14
23-Sep-14
30-Sep-14
02-Oct-14
06-Oct-14
07-Oct-14
14-Oct-14
21-Oct-14
53
27
8
2
4
27
14
5
17
11
6
17
8
15
4
2
5
1
7
3
2


Clarks Creek Salmon Hatchery Fall Chinook Rack Return (2005-2014)
ADULTS
JACKS
NUMBER OF CHINOOK
YEAR
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
195
22
174
723
440
634
1,084
827
531
208
299
104
69
288
1,015
619
293
526
531
208


Clarks Creek Hatchery Fall Chinook Salmon Smolt Releases (2004-2015)
FALL CHINOOK SMOLTS
NUMBER OF FALL CHINOOK SMOLTS RELEASED
0
200,000
400,000
600,000
800,000
1,000,000
1,200,000
1,400,000
1,600,000
1,800,000
240,630
163,880
523,000
462,328
418,240
1,538,977
990,000
966,900
935,500
567,625
256,650
386,814
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
YEAR


Juvenile White River And Minter Creek Spring Chinook Outplants (1995-2015)
HUCKLEBERRY 10.0253
CLEARWATER 10.0080
COWSKULL
MOWICH 10.0624
CRIPPLE 10.0086
GREENWATER 10.0122
HUCK AERIAL 10.0253
NUMBER OF FISH RELEASED
0
75,000
150,000
225,000
300,000
375,000
450,000
525,000
600,000
675,000
750,000
825,000
900,000
975,000
1,050,000
1,125,000
1,200,000
1,275,000
1,350,000
1,425,000
1,500,000
218,631
185,798
217,450
72,600
68,000
32,300
121,460
496,700
237,900
135,990
55,750
356,000
237,800
86,950
464,980
247,891
254,550
71,450
401,245
223,740
217,000
514,000
550,000
382,300
181,386
946,596
506,028
525,650
376,150
309,500
207,500
220,900
117,000
223,075
234,500
891,856
216,800
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
YEAR PLANTED

CLEAR CREEK 10.0022

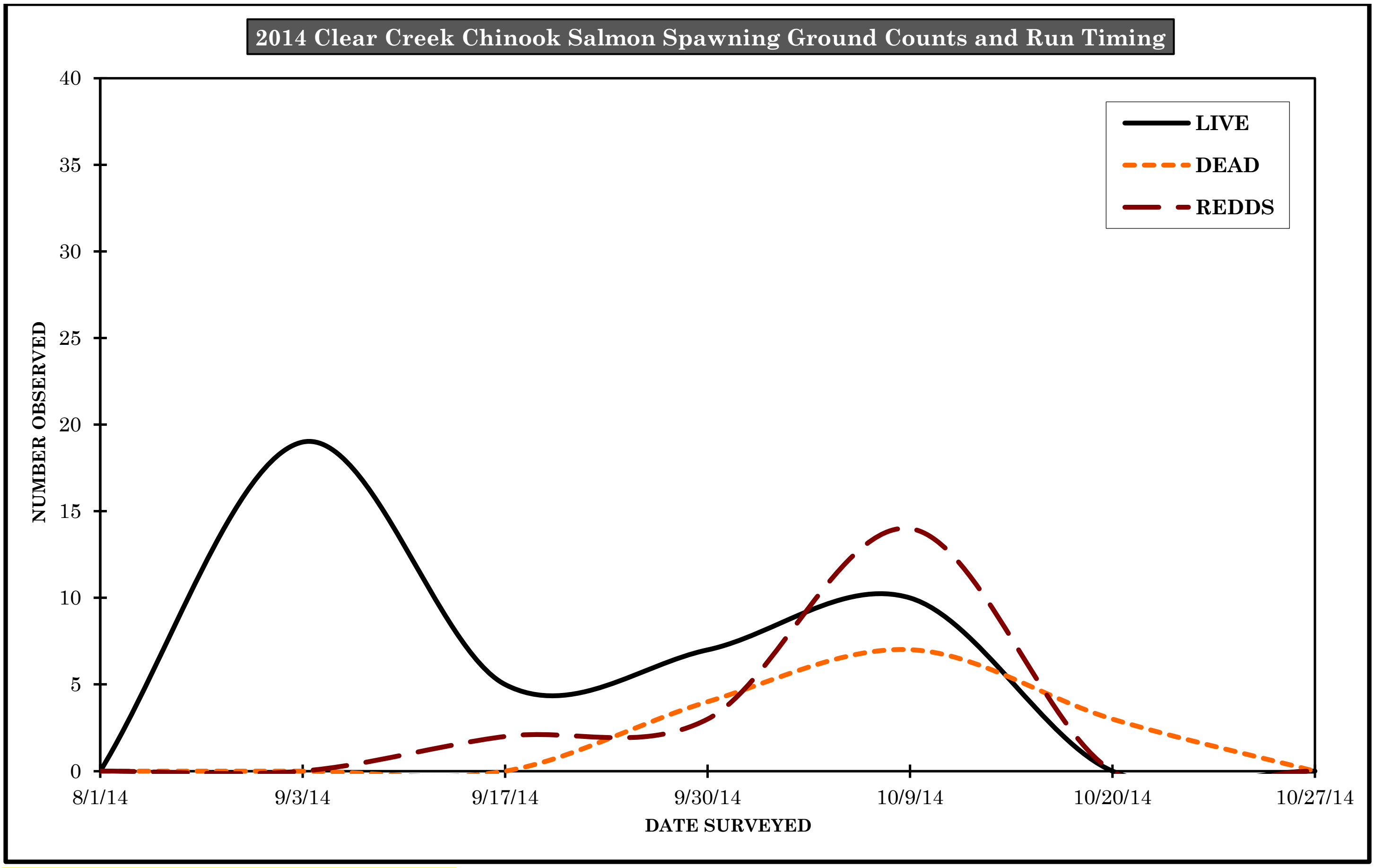
Clear Creek is a tributary to the lower Puyallup River, joining with the Puyallup at RM 2.9. The Clear Creek Basin *(12.1 mi²)* drains the plateaus and flatlands running along the southern valley of the lower Puyallup River, between the cities of Puyallup and Tacoma. Clear Creek has several tributaries which include; Swan Creek entering at RM 0.2 on the left bank; Squally Creek inflowing at RM 1.4 on the left bank; Canyon Creek at RM 1.6; and an unnamed tributary entering at RM 3.05 on the right bank. Only Swan, Squally and Canyon creeks are accessible to adult salmon.

Several salmonid species are known to utilize Clear Creek for spawning, rearing and foraging. This includes ESA threatened Chinook, steelhead and bull trout; as well as, non-listed species including coho, pink, chum and cutthroat trout. Various limiting factors involved with Clear Creek include; low flows, channel confinement *(top)*, an anadromous barrier, lack of spawning habitat, aquatic noxious weeds, flooding and channel erosion, conveyance of storm water run-off, water quality *(D.O. & bacteria)*; as well as, absent or poor riparian cover.

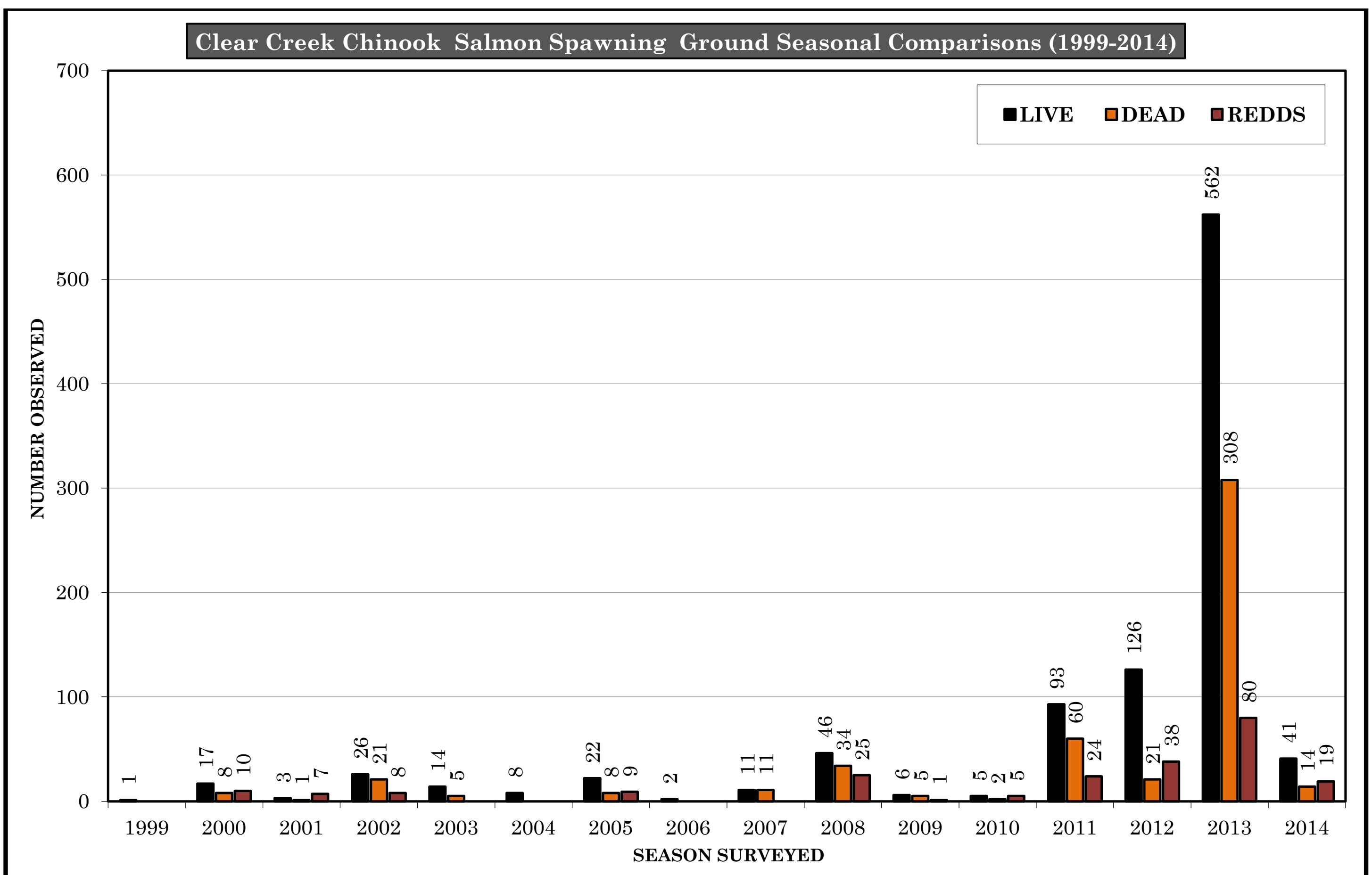
Above Pioneer Way, Clear Creek flows as a low-to-moderate gradient pool-riffle stream before paralleling the road for several hundred feet. The upper anadromous reach contains good spawning gravel from RM 1.7 to 1.9. Although a significant section of the riparian area is not intact, there are undercut banks and moderate amounts of in-stream cover. A high density of reed canary grass (*Phalaris arundinacea)* and other vegetation *(watercress)* chokes approximately 300 feet of the spawning channel every summer; effectively trapping a significant amount of fine sediment which covers the available spawning gravel by several inches.

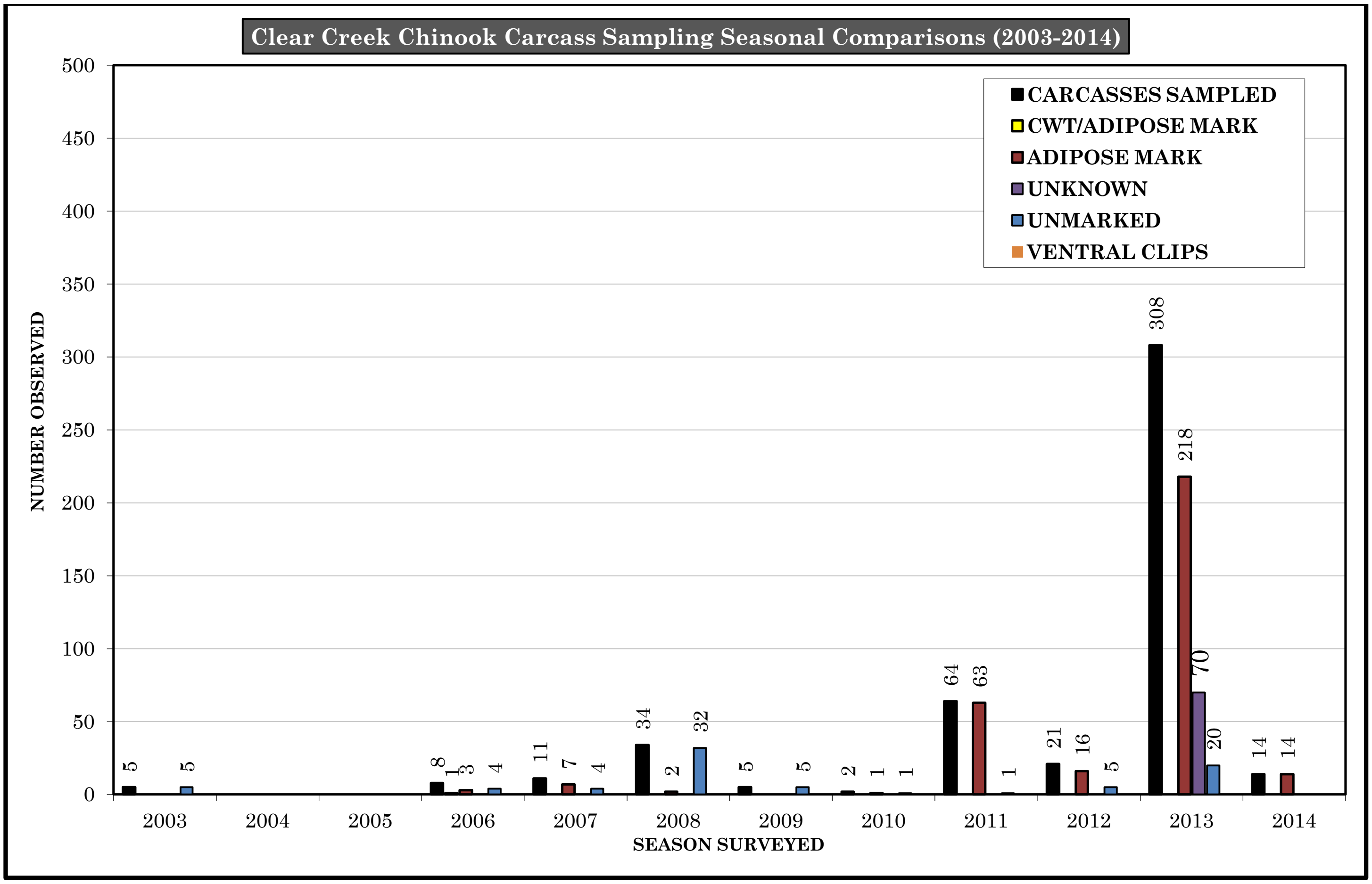
An anadromous blockage in the form of a cement diversion dam is located at RM 1.9; the dam is in place to ensure pathogen free water for hatchery raised rainbow trout at the Trout Lodge facility. Consequently, this also prevents the fluvial movement of gravel downstream to vital spawning areas. The reach above the dam is not surveyed; however, suitable spawning habitat does exist and could be utilized if access were established. The draw off of water by the hatchery, specifically during the summer and fall seasons, significantly reduces the water throughout the bypass reach. The bypass reach is the section of stream from the water intake for the hatchery, to its discharge point downstream. Chinook are often observed holding in a large pool located at the hatchery discharge outlet. Unfortunately, the low flows resulting from the hatchery draw regularly prevent Chinook from accessing the bypass reach where suitable spawning habitat is available.

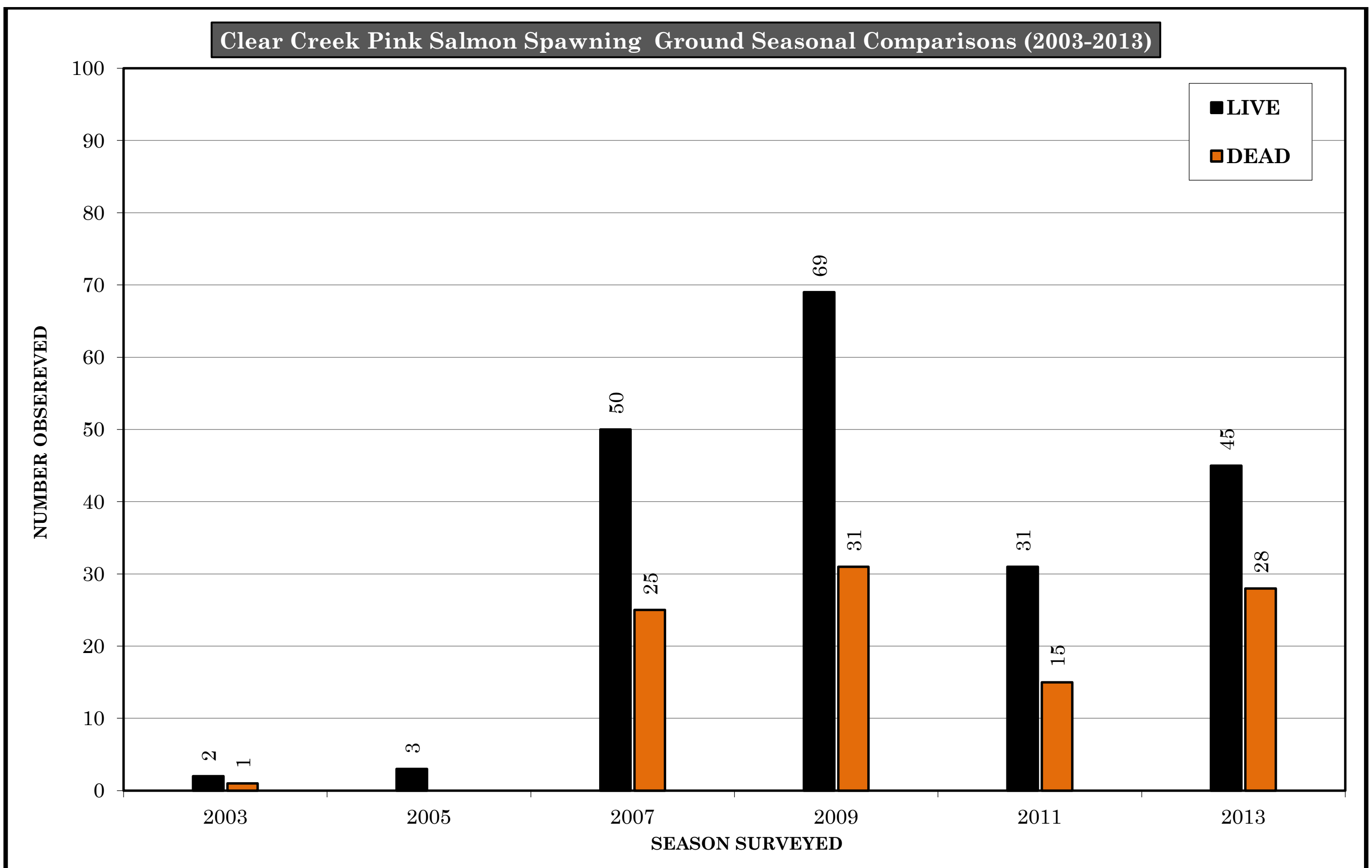
Late fall and winter flows are regularly sufficient for chum salmon *(left)* to spawn in the 0.2 miles of available habitat below the dam. Adult steelhead and coho also utilize Clear Creek; however, escapement for theses two species is low. The lower Puyallup tributaries often experience an abundance of chum fry during the spring, as well as coho fry throughout spring and summer for cutthroat, steelhead, and juvenile Chinook to feed on. Adult fluvial bull trout are also known to forage in the smaller tributaries of the lower Puyallup, including Clear Creek, which offers excellent foraging and overwintering opportunities.

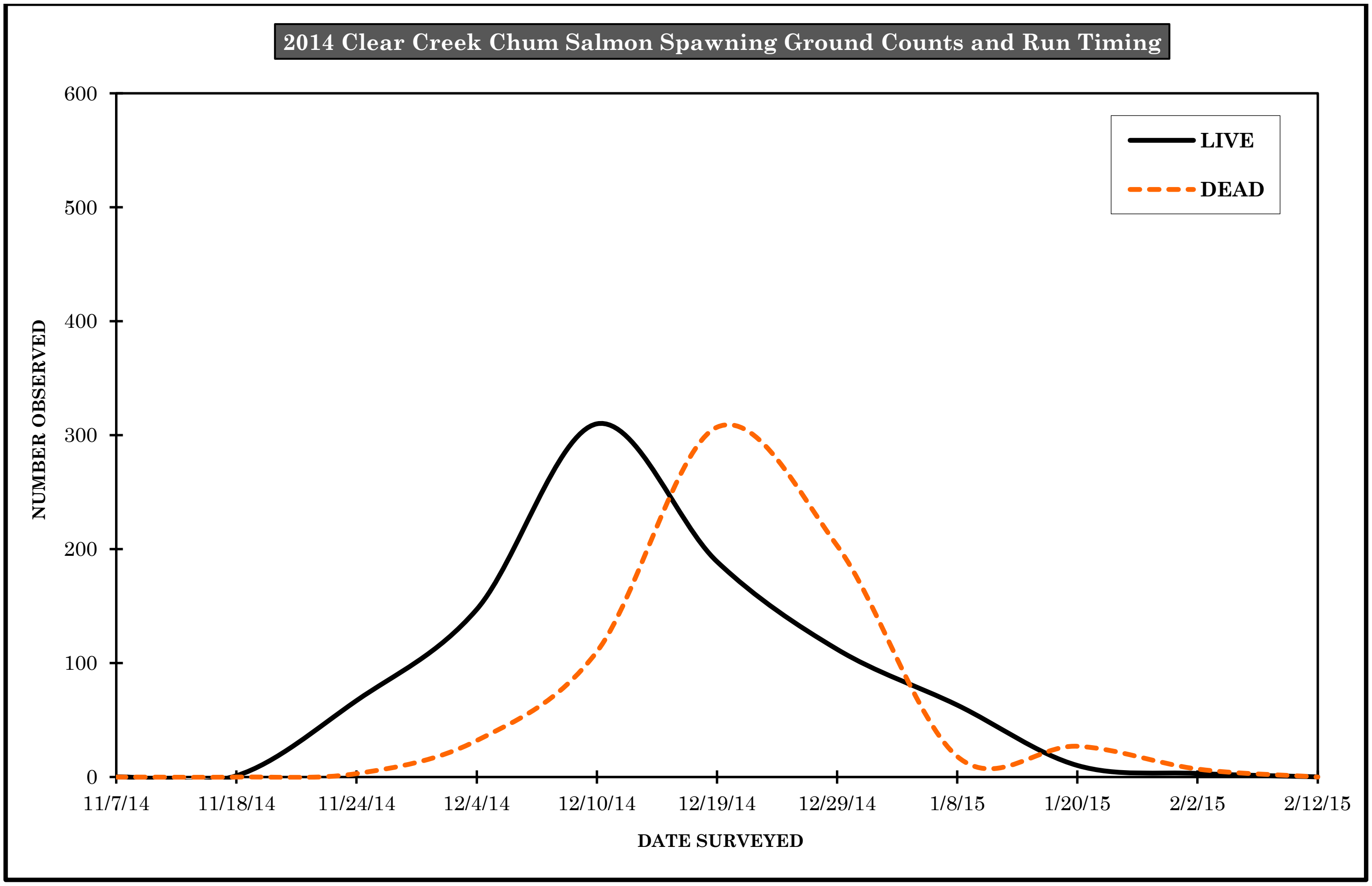


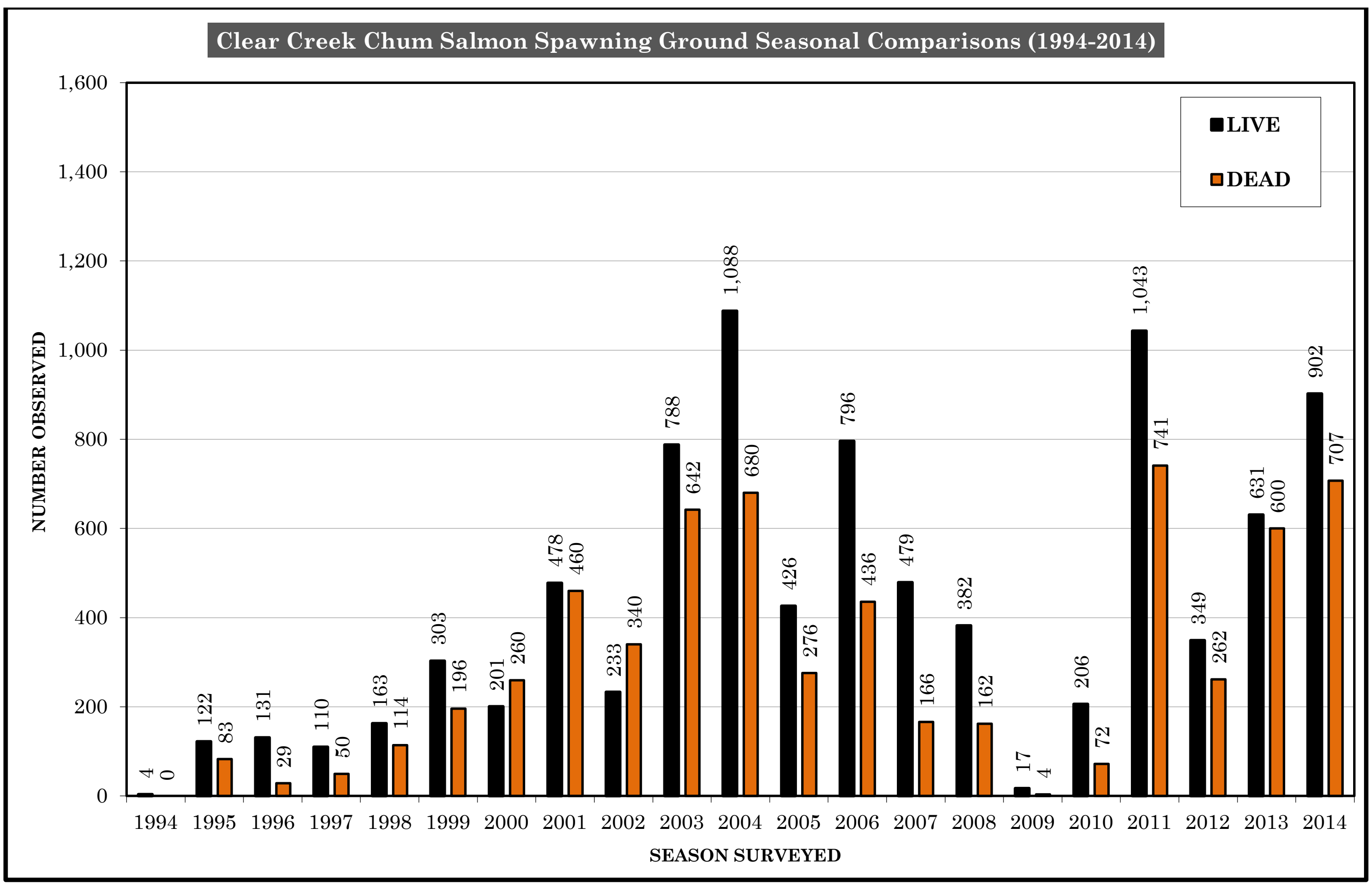
See Appendix B for Chinook redd locations.




Clear Creek Chinook Carcass Sampling Seasonal Comparisons (2003-2014)
CARCASSES SAMPLED
CWT/ADIPOSE MARK
ADIPOSE MARK
UNKNOWN
UNMARKED
VENTRAL CLIPS
NUMBER OBSERVED
SEASON SURVEYED
0
50
100
150
200
250
300
350
400
450
500
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
5
5
8
1
3
4
11
7
4
34
2
32
5
5
2
1
1
64
63
1
21
16
5
308
218
70
20
14
14


Clear Creek Pink Salmon Spawning Ground Seasonal Comparisons (2003-2013)
LIVE
DEAD
NUMBER OBSEREVED
SEASON SURVEYED
0
10
20
30
40
50
60
70
80
90
100
2003
2005
2007
2009
2011
2013
2
1
3
50
25
69
31
31
15
45
28


2014 Clear Creek Chum Salmon Spawning Ground Counts and Run Timing
LIVE
DEAD
NUMBER OBSERVED
600
500
400
300
200
100
0
11/7/14
11/18/14
11/24/14
12/4/14
12/10/14
12/19/14
12/29/14
1/8/15
1/20/15
2/2/15
2/12/15
DATE SURVEYED


Clear Creek Chum Salmon Spawning Ground Seasonal Comparisons (1994-2014)
LIVE
DEAD
NUMBER OBSERVED
1,600
1,400
1,200
1,000
800
600
400
200
0
4
0
122
83
131
29
110
50
163
114
303
196
201
260
478
460
233
340
788
642
1,088
680
426
276
796
436
479
166
382
162
17
4
206
72
1,043
741
349
262
631
600
902
707
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
SEASON SURVEYED

CLEARWATER RIVER 10.0080

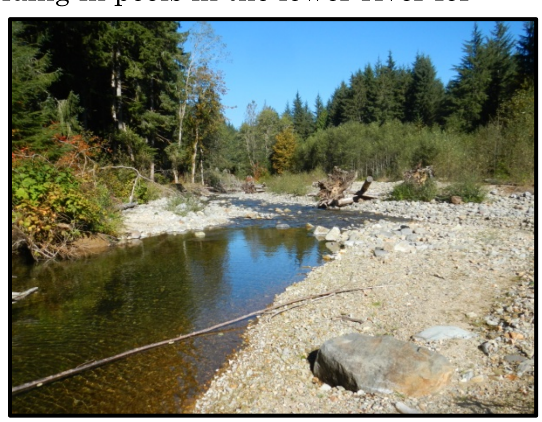
The Clearwater River is a large tributary to the Upper White River, draining an area of nearly 40 mi². The Clearwater is a non-glacial river and originates on Bear Head Mountain, just west of the White River *(south of Greenwater)*. From Bear Head Mountain, the river flows just over 10.5 miles to its confluence with the White River at RM 35.3. The upper 5 miles of the river runs through a steep narrow channel within the Snoqualmie National Forest. The lower 5.5 miles of the Clearwater flows within a broader valley plain located within the privately owned White River tree farm *(owned by Muckleshoot Indians)*; currently managed by Hancock Forest Management.

Chinook

Limited amounts of LWD are present in the lower channel, and much of what is present is undersized or hardwood in origin. There are a series of cascades just above Lyle Creek at approximately RM 4.5; these cascades are considered a block to further upstream migration. However, much of the spawning takes place in the lower 2 miles of the river, although fish and redds are often observed and documented in the upper reaches later in the season.

The substrate throughout much of the lower reach of the river consists of small cobbles and flat angular stone, with smaller spawning size gravel in the many of the lower gradient riffles and tail-outs. The riparian area is primarily second growth conifer forest; however, recent clear cutting is evident along several areas of the upper and lower survey reach. The Clearwater River hosts several tributaries; such as, Falls, Mineral, Byron, Lyle, Lilly, and Milky creeks. There is some limited coho and pink spawning in both Byron and Mineral creeks.

Some of the habitat and fish limiting factors associated with the Clearwater River include, water quality issues, timber harvesting *(heavier silt load introduction)* and channel confinement by logging roads which continues to affected the rivers natural morphology. Channel confinement has reduced the adequacy of off channel habitat critical for adult spawning, as well as overwintering for juvenile Chinook, steelhead and coho. In addition, low instream flows are often encountered during the late summer and early fall, often preventing Chinook from advancing beyond the lower 1 or 2 miles of the river to spawn. Chinook, pink and coho are often seen holding in pools in the lower river for extended periods of time before increased flows *(freshet)* allow further upstream migration.



Despite these deficiencies, the Clearwater River continues to support a substantial number of Chinook, coho, pink and steelhead spawners. Bull trout utilization is unknown, but presumed. Predation and scavenging is common along the Clearwater. Observations and signs of black bear *(Ursus americanus [photo below])* and river otter (*Lutra canadensis)* are prevalent.

It's important to note that all adult salmon and steelhead that spawn in the Clearwater River were captured at the USACE fish trap in Buckley, and transported above Mud Mountain dam. Since precise escapement numbers for the upper White River drainage are known, surveys are conducted to determine fish distribution and spawning success. This is especially important regarding Spring Chinook, since adult production monitoring is part of the White River Spring Chinook Recovery Plan. Puyallup tribal fisheries biologists survey the Clearwater annually for Chinook, coho and pink *(odd years)* salmon. Coho have been observed in the Clearwater since surveys began for Chinook in 1991, but were not surveyed for until 2002. Coho survey data is often incomplete because it's often difficult to survey the river when late autumn and winter flows increase. The first pink salmon surveys were conducted beginning in 2003. Prior to 2003, few or no pinks were captured at the Buckley trap to be transported upriver to spawn. Biologists with WDFW or MIT regularly survey the Clearwater for steelhead spawning activity in the spring.

As part of the Spring Chinook recovery plan, the Puyallup Tribe has operated a Spring Chinook acclimation pond since 1995. Prior to 2009, approximately 200,000 plus Spring Chinook from the Muckleshoot White River hatchery were transported to the Clearwater pond on Mineral Cr. in early spring, and released in late May. All spring Chinook destined for acclimation ponds fish are mass marked with left or right ventral fin clips. Odd brood years are marked with left ventral clips, and even years with right ventral clips. These acclimation pond fish are easily identified in the future when caught as adults or jacks at the USACE fish trap in Buckley, and can be passed above Mud Mountain dam to spawn naturally. Unfortunately, the road accessing the Mineral Cr. acclimation pond was washed out in January, 2009. The active river channel currently occupies the old road base; preventing future repairs and access to the pond site and the acclimation pond has since been decommissioned. Construction of a new acclimation pond, located approximately one mile downstream near Jensen Creek, began in July 2012 *(lower right)*, and was completed in late August. The new pond will be utilized to enhance both White River spring Chinook and winter steelhead. In addition, a large woody debris enhancement project through SPSSEG slated for the lower Clearwater in 2012, was initiated during the summer of 2013 *(see following page)*. Also, the installation of a USGS flow gauge at the 6050 road bridge in 2011 will help correlate fish spawning density, and upstream access extent, with instream flows.

Jensen Creek acclimation pond

Clearwater River Floodplain Restoration Project 2013 Annual Report

Written by Kristin Williamson
Salmon Restoration Biologist
South Puget Sound Salmon Enhancement Group
(Reprinted with Permission)

Project Description

The Clearwater River Floodplain Restoration Project is planned to address major limiting habitat factors and impaired processes on the Clearwater River through strategic placement of large wood structures and removal of nearly a mile of road from the historic floodplain. Historically, the Clearwater River meandered through a forested valley floor with large trees, a dense canopy, and a system of branching channels. The advent of timber harvest in the watershed and construction of a rail line (now road) in the Clearwater River floodplain for transport of timber in the early 1900s removed critical riparian structure from the valley floor and confined the floodplain. Loss of the riparian buffer has resulted in easily erodible banks due to root loss and associated soil cohesion, dramatic reductions in large wood debris recruitment to the stream channel, and loss of overhanging vegetation.

Project efforts would install up to 39 wood structures of varying types and sizes to meter natural wood through the system, trap sediment, and aggrade incised sections of the channel for the long term reconnection of a network of 19 side channels in the floodplain. The project would also decommission nearly a mile of road and remove 10 associated culverts. Removal of three of the culverts would provide immediate improved passage to wall-based wetland channels, and the removal of the other 7 would provide long term access to spring fed channels and alluvial fans currently impounded by the road.

The Puyallup and White River Salmon Recovery Strategy specifically identifies the Clearwater River as a high priority geographic area for White River spring Chinook recovery, as determined by Mobrand EDT modeling. By extension, this project will also benefit other native stocks, including coho and pink salmon, steelhead, and bull trout. This project will specifically address strategic priorities identified within the strategy including: increasing the quantity and quality of instream habitat through input of wood structures and improving the riparian conditions in the watershed through abandonment and decompaction of a stream adjacent road prism and active plantings.

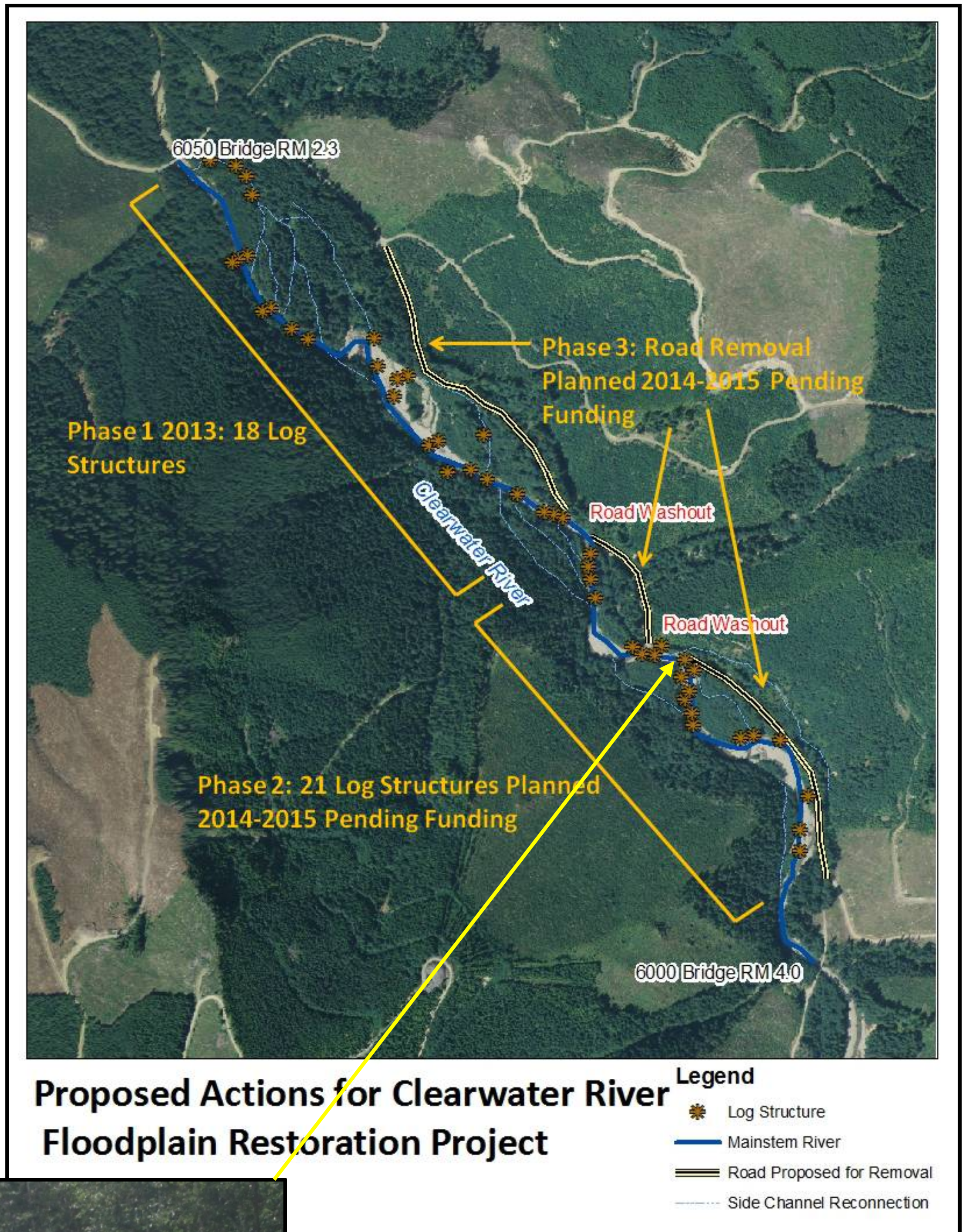
Watershed and Aquatic Benefits:

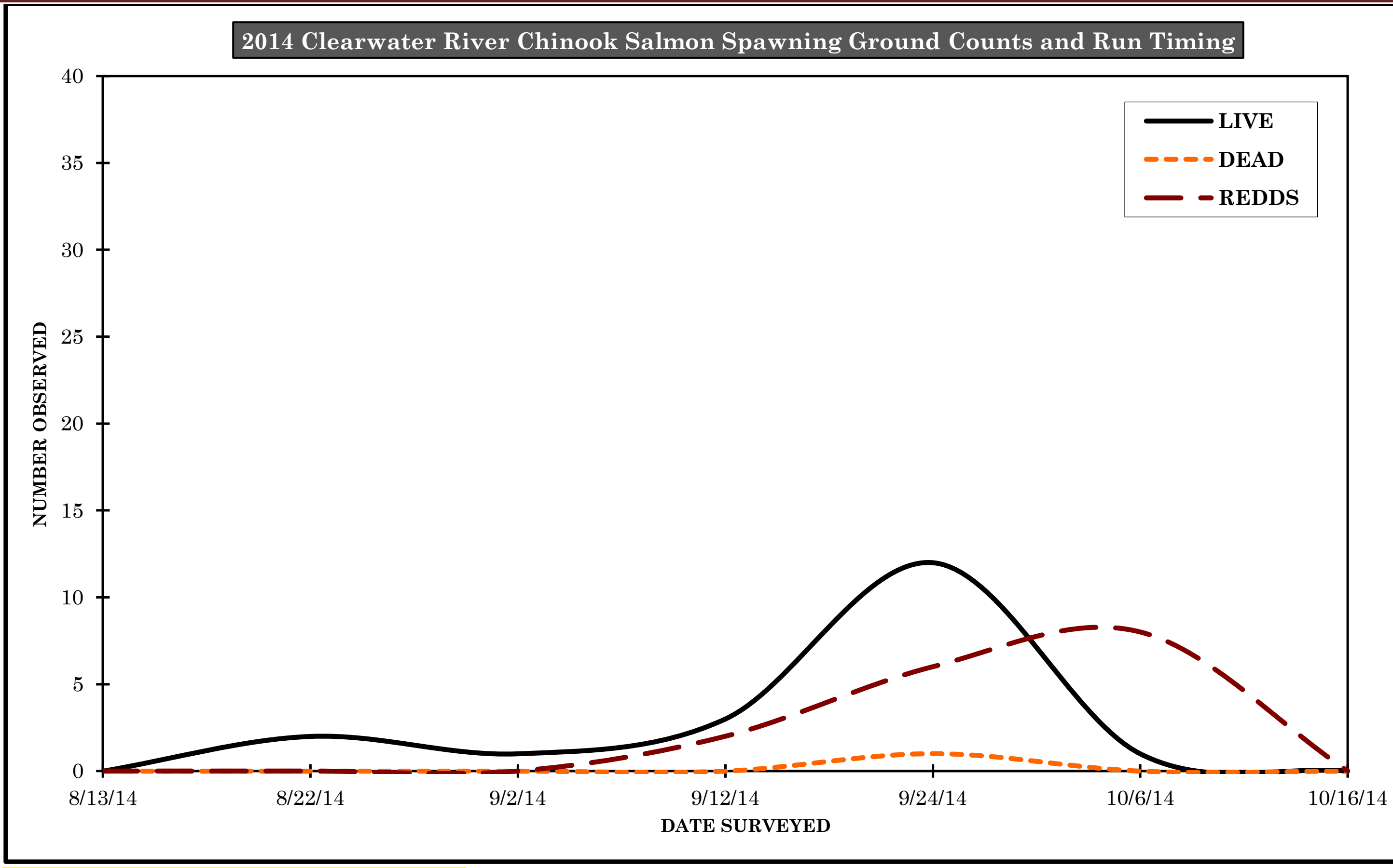
The overall goal of the project is to increase spawning and rearing capacity of the watershed for Spring Chinook, steelhead, coho, pink, and coastal and resident cutthroat trout species. Realized benefits from project actions will include:

- Activate 14.5 acres of historic floodplain through road decommissioning and removal of 10 culverts.
- Active 70 acres of floodplain through placement of wood structures and subsequent aggradations of the channel bed.
- Activate 19 existing side channels and promote the formation of new side channels through channel migration.
- Dissipate flood energy through placement of wood structures to partition sheer stress.
- Increase quantity and quality of instream, pool, and refuge habitat through placement of wood structures.
- Improve riparian function through abandonment/ripping of a stream adjacent road.
- Establish a riparian corridor on former road prism through planting of 2,500 native trees.

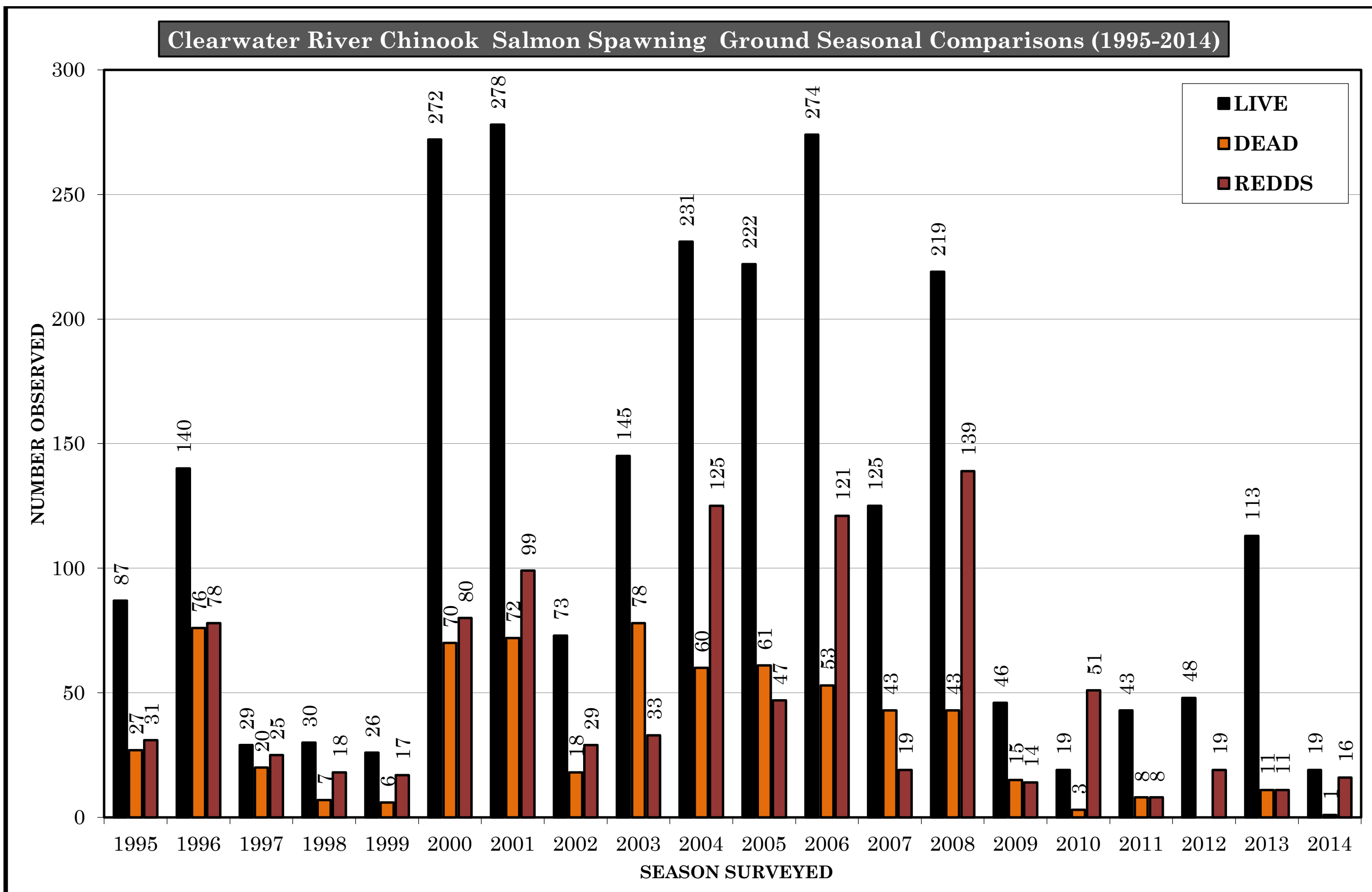
Progress to Date

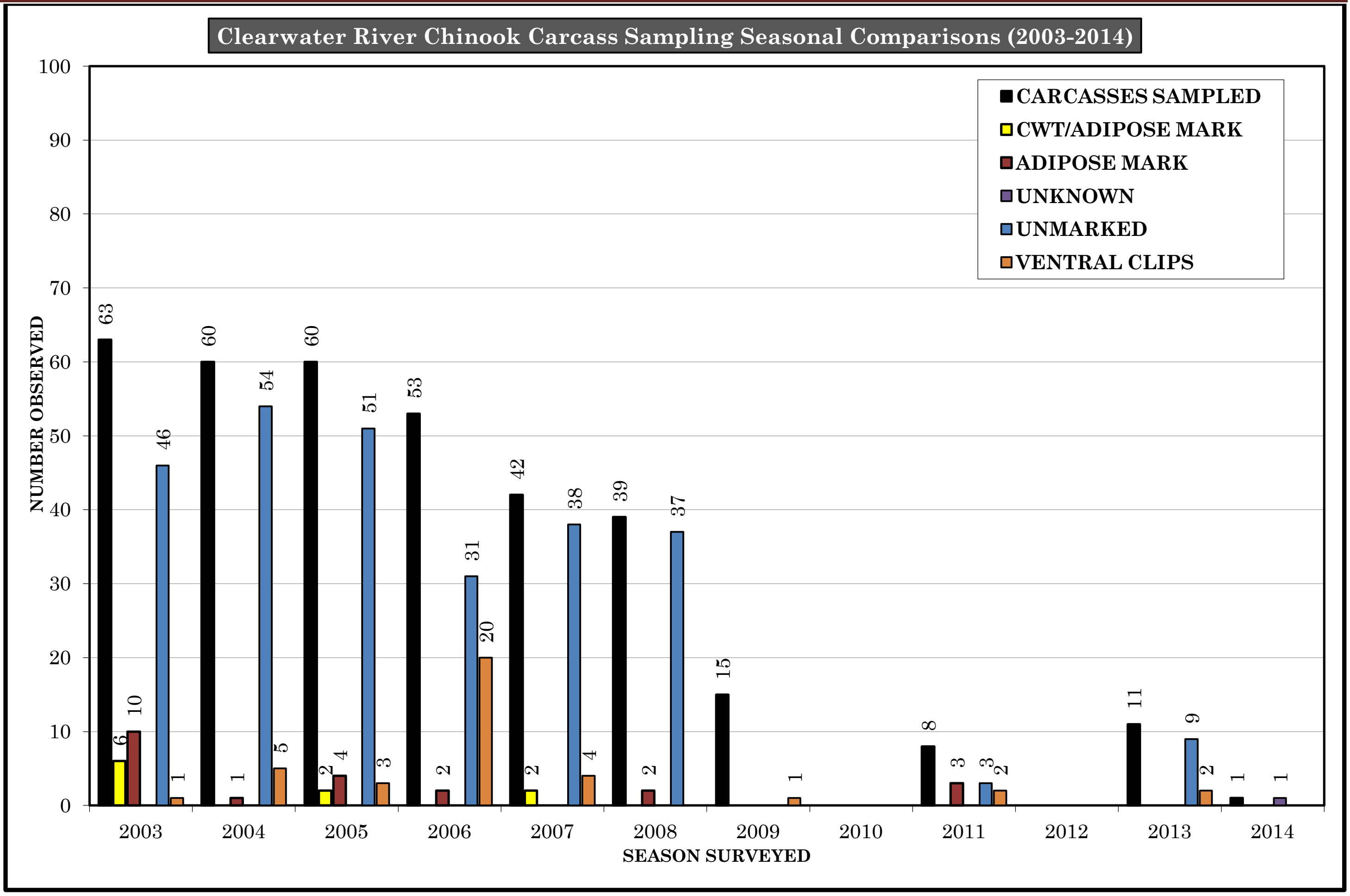
A total of 18 large and small engineered log jams were installed in the Clearwater River between river mile 2.3 and 3.1 in summer 2013. Placement of these log jams will activate flows to a network of 11 existing side channels, dissipate flood flows, and increase instream structure and cover in the river. This work completes about half of the proposed work plan. An additional 10 ELJ's *(below)* were installed during the summer of 2015; as well as the decommissioning of the old roadway from the 6000 bridge to the lower washout *(phase 2&3)*.

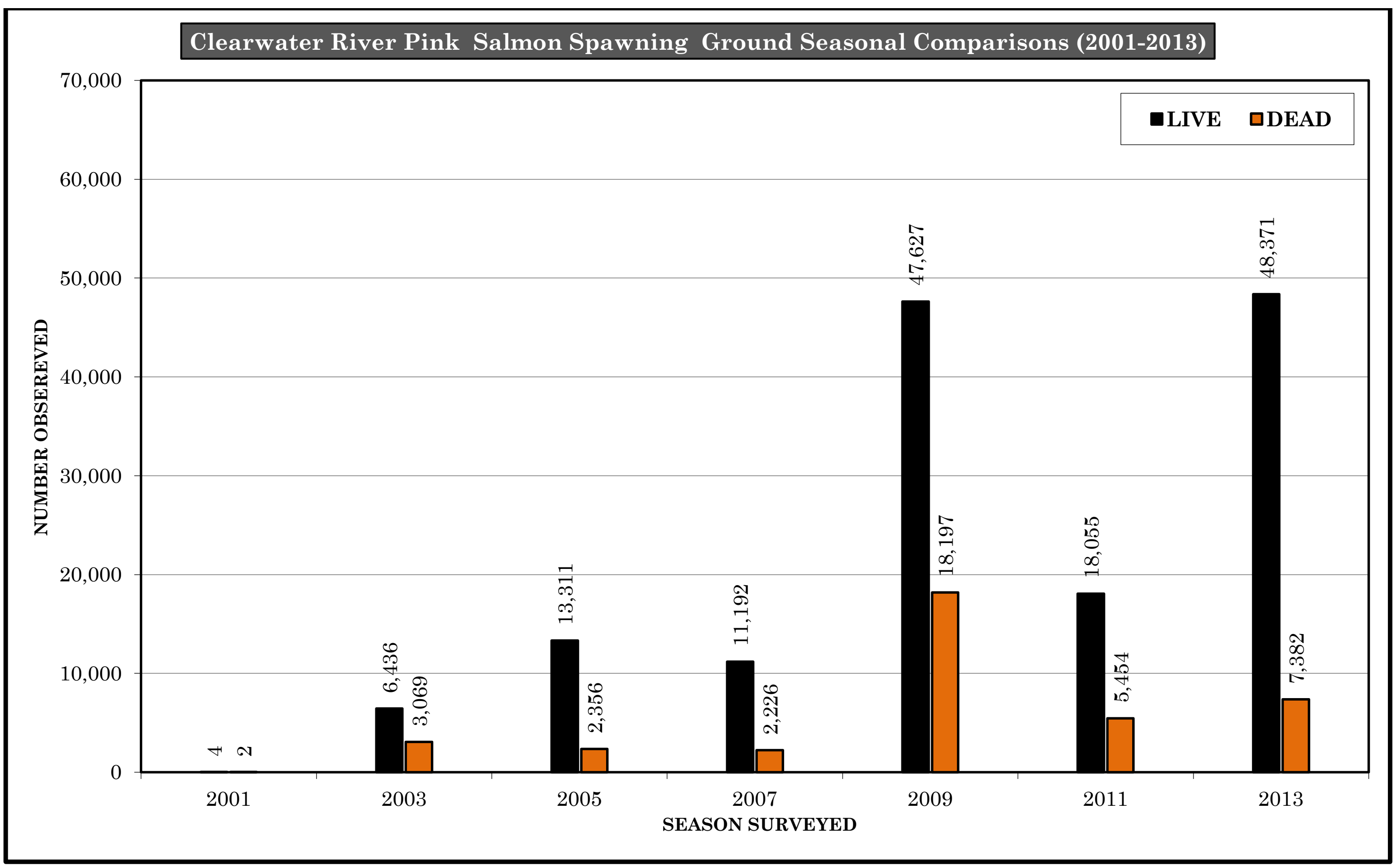


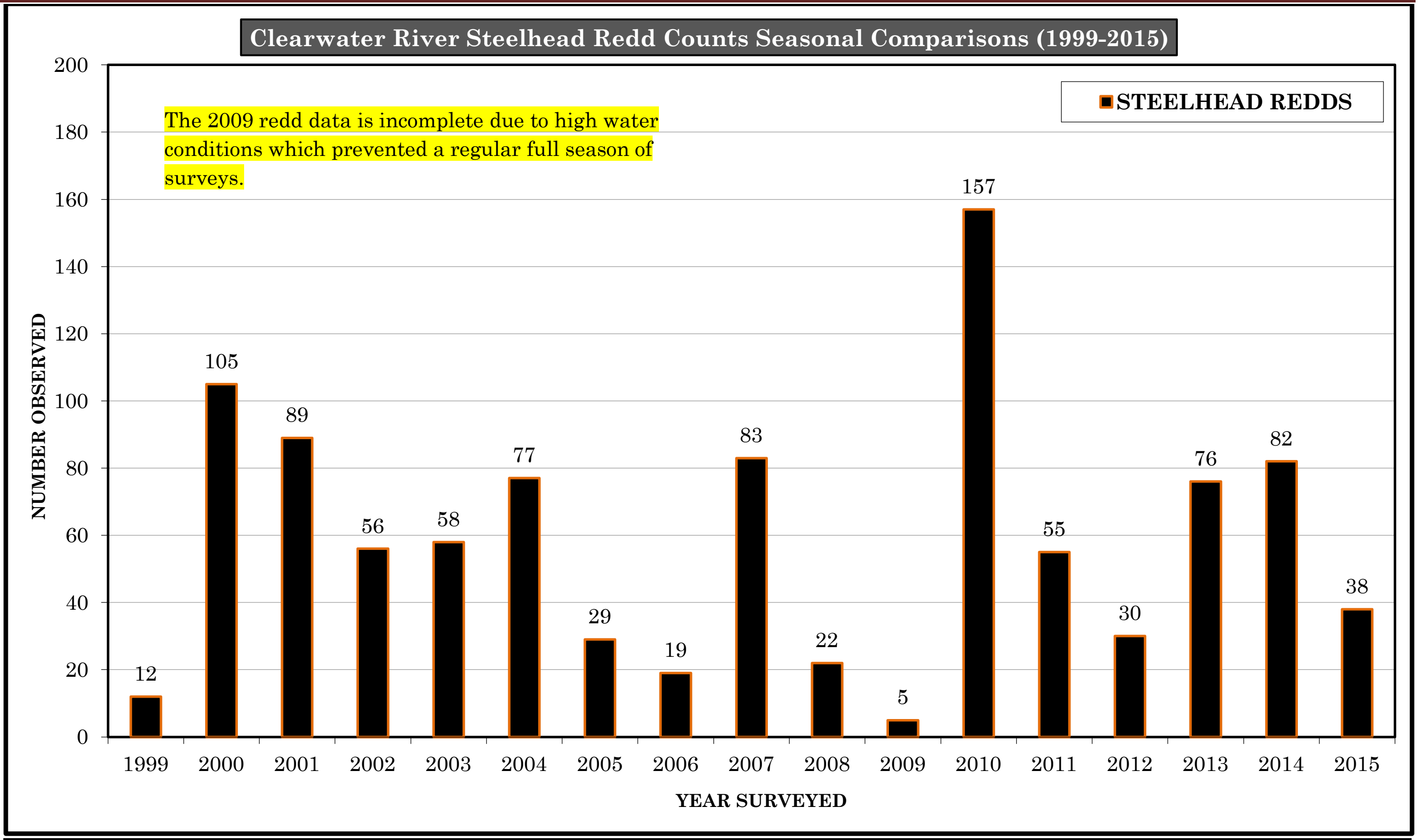


See Appendix B for Chinook redd locations.

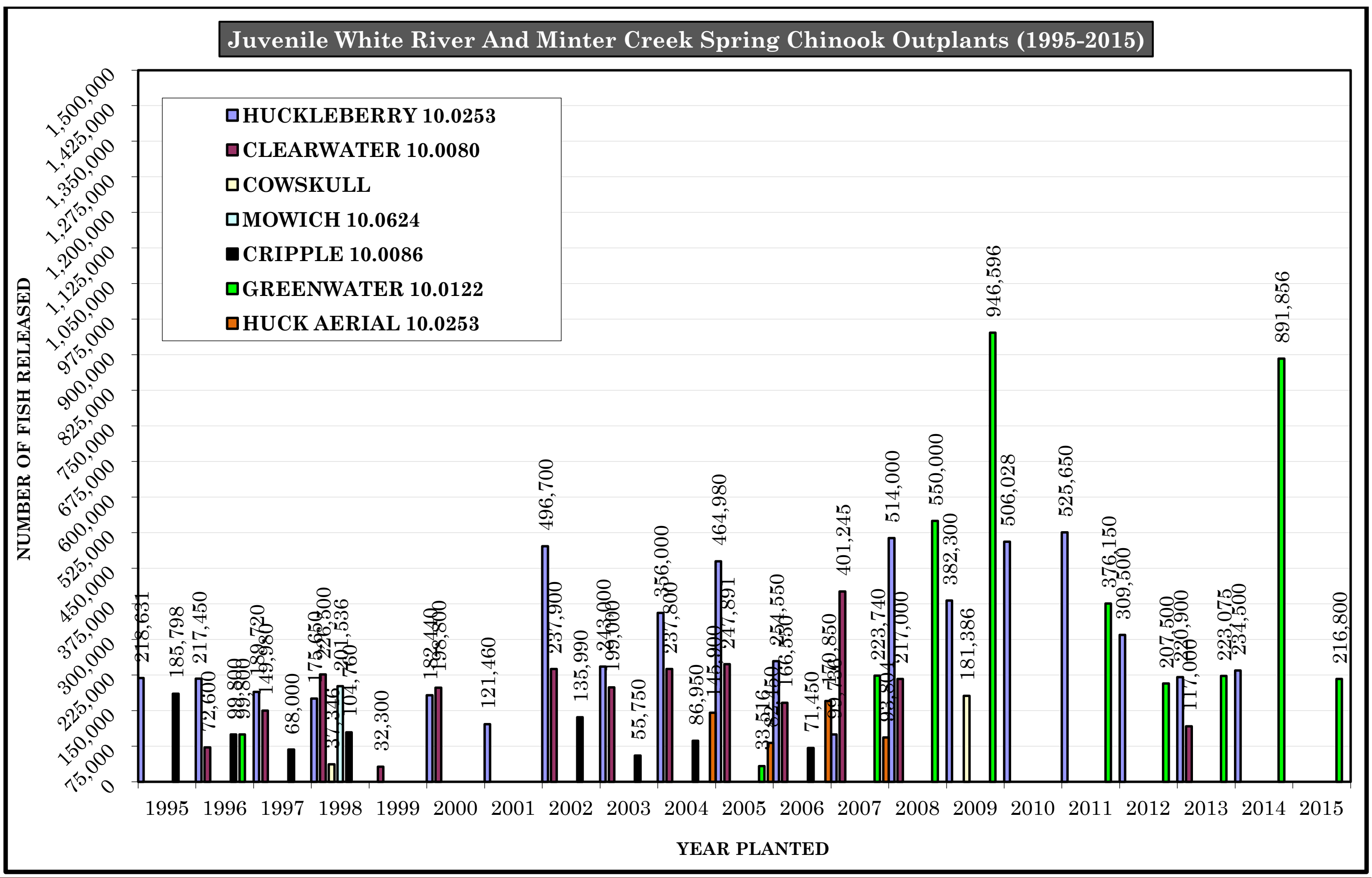


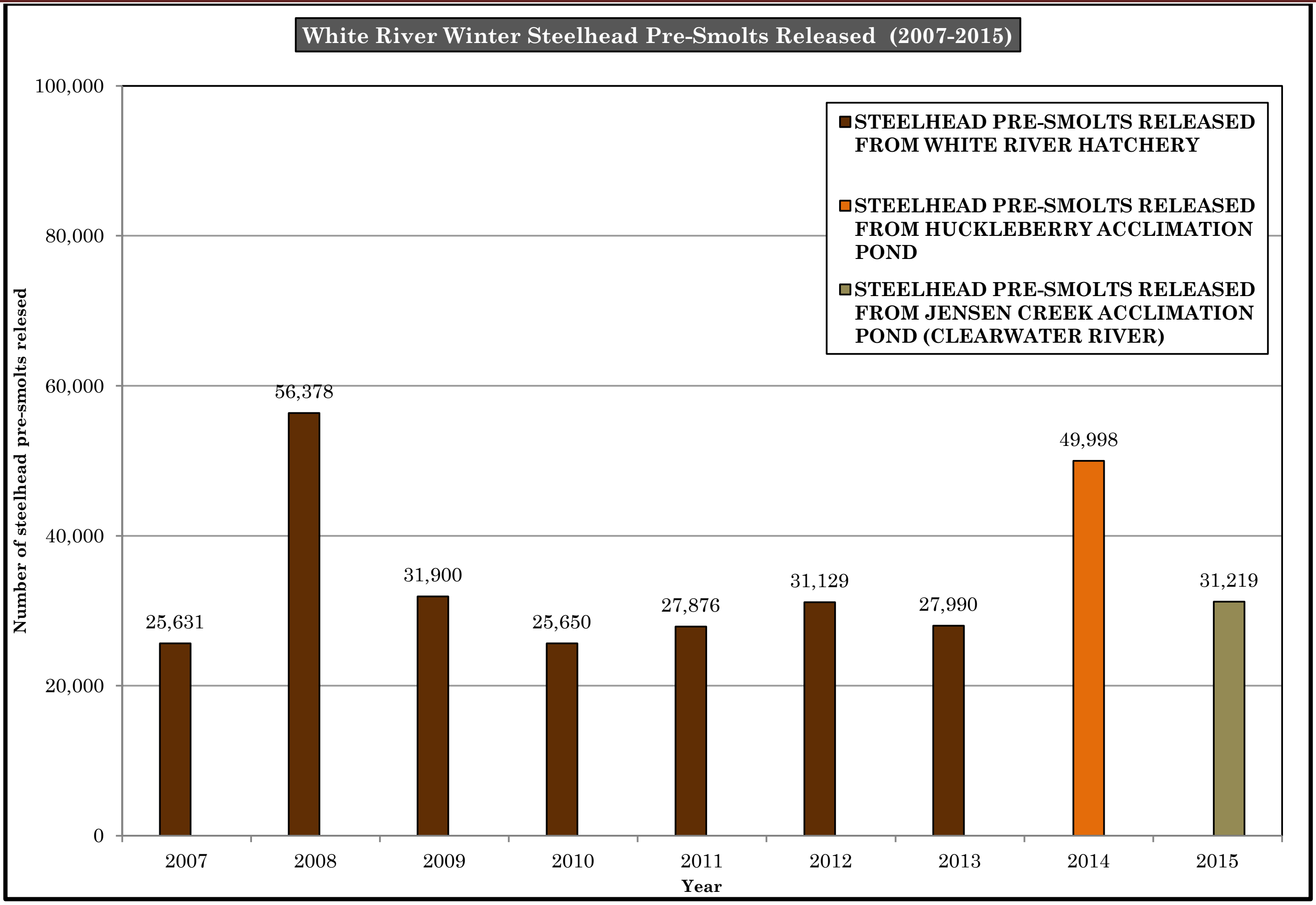

Clearwater River Chinook Carcass Sampling Seasonal Comparisons (2003-2014)
CARCASSES SAMPLED
CWT/ADIPOSE MARK
ADIPOSE MARK
UNKNOWN
UNMARKED
VENTRAL CLIPS
NUMBER OBSERVED
SEASON SURVEYED
2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014
63 6 10 46 1
60 1 54 5
60 2 4 51 3
53 2 31 20
42 2 38 4
39 2 37
15 1
8 3 3 2
11 9 2
1 1


Clearwater River Pink Salmon Spawning Ground Seasonal Comparisons (2001-2013)
LIVE
DEAD
NUMBER OBSEREVED
SEASON SURVEYED
2001 2003 2005 2007 2009 2011 2013
4 2
6,436 3,069
13,311 2,356
11,192 2,226
47,627 18,197
18,055 5,454
48,371 7,382



All adult salmon and steelhead that spawn in the Clearwater River were captured at the USACE fish trap in Buckley, and transported above Mud Mountain dam. Since precise escapement numbers for the upper White River drainage are known, surveys are conducted to determine fish distribution and spawning success. All survey data from 1999-2014 was collected by WDFW/MIT biologists.




White River Winter Steelhead Pre-Smolts Released (2007-2015)
100,000
80,000
60,000
40,000
20,000
0
Number of steelhead pre-smolts relesed
STEELHEAD PRE-SMOLTS RELEASED FROM WHITE RIVER HATCHERY
STEELHEAD PRE-SMOLTS RELEASED FROM HUCKLEBERRY ACCLIMATION POND
STEELHEAD PRE-SMOLTS RELEASED FROM JENSEN CREEK ACCLIMATION POND (CLEARWATER RIVER)
25,631
56,378
31,900
25,650
27,876
31,129
27,990
49,998
31,219
2007
2008
2009
2010
2011
2012
2013
2014
2015
Year

COAL MINE CREEK 10.0432A

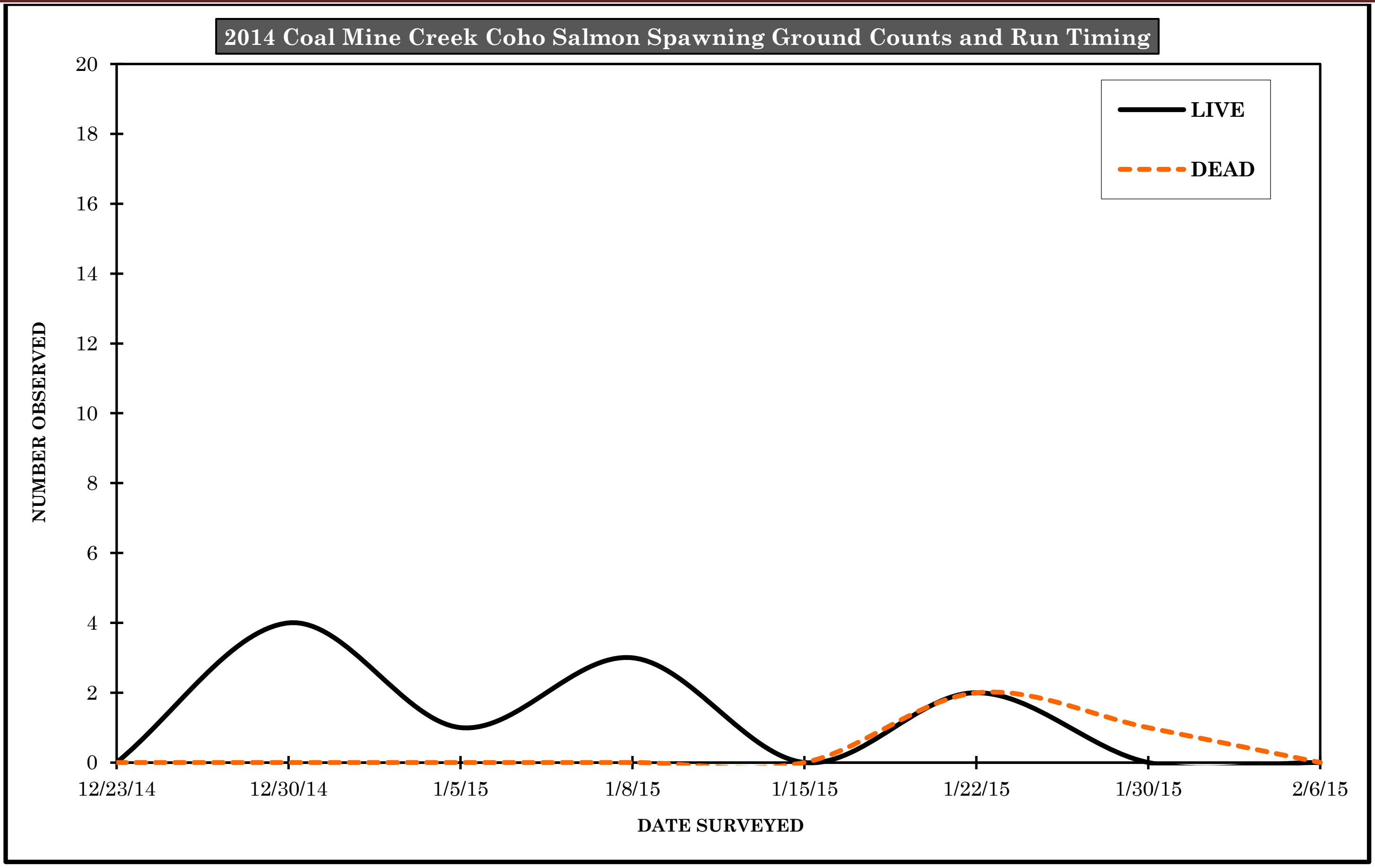
Coal Mine Creek, which derived its name from the local areas profound history in the coal mining industry, is a small tributary to Wilkeson Creek *(10.0432)*. Wilkeson Creek in turn is a major tributary to South Prairie Creek *(10.0429)*. The creek flows southwest for just over a mile before entering Wilkeson Creek near RM 5.7, just south of the community of Wilkeson.

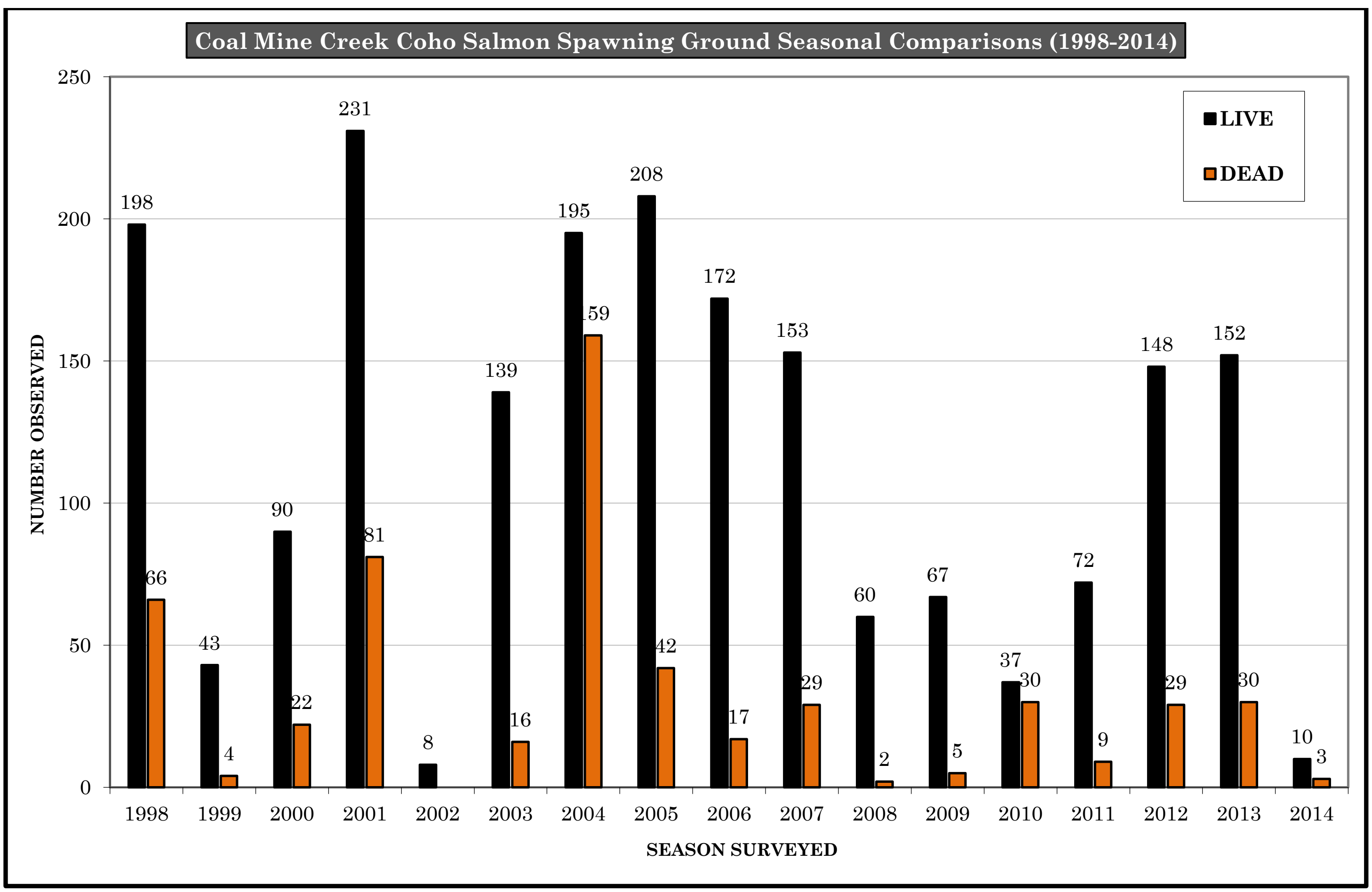
Coal Mine is one of 5 index streams in the Puyallup Watershed that is surveyed for coho by the Washington Department of Fish and Wildlife. State biologists use the coho escapement from five "Index" tributaries *(Coal Mine, Spiketon, Fiske, Fennel and Canyonfalls)* to estimate the total escapement for the Puyallup River. Surveys of the creek over the past decade have yet to document adult Chinook or steelhead spawning utilization. Low instream seasonal flows in Wilkeson, as well as Coal Mine, are likely the strongest limiting factors preventing these species from reaching the stream to spawn. Although inconsistent from season to season, small numbers of chum have been observed spawning in Coal Mine during the month of December. Bull trout utilization within this small stream is unknown.

Coal Mine is a small order short run stream with moderately low gradient; making it somewhat ideal for coho, pink and chum. Unfortunately, the majority of the steam has little complexity; several portions of the creek have minimal natural bank protection, little or no instream woody debris or quality spawning gravel. However, the creek does provide good quality rearing and overwintering conditions for juvenile salmonids. Coho juveniles are frequently observed throughout the entire surveyed reach of the creek. Cutthroat trout are also ever-present in this small rural stream. It is likely that juvenile steelhead, the offspring from adult spawners in Wilkeson Creek, utilize Coal Mine for rearing, foraging and overwintering as well.

Moderate rural development exists along the lower 0.5 mile section of the creek; consisting primarily of private family homes, county and private roads, as well as a rock quarry and public school. The creek flows through a fish passable cement box culvert approximately 0.15 miles up from the mouth, and a second culvert near RM 0.6. When the fish passable box culvert was installed under Railroad Avenue several years ago, some complexity had been added to the creek via a small restoration project which included the placement of small sill logs, root wads, boulders, along with native tree and vegetative plantings. The alder along the banks have since grown to provide improved coverage of the stream *(top left photo)*.

Spawning opportunities are noticeably reduced downstream of the culvert crossing at Railroad Ave. due to a narrow confined channel, in addition to a absence of suitable spawning gravel *(right photo)*. Most of the substrate through this section consists of fine silt, sand, and exceedingly small patches of undersized gravel; however, relatively abundant spawning gravel exists above the culvert. Nevertheless, several silt deposits exist throughout the entire surveyed section. The rock and gravel quarry site located near the creek is one of the suspected sources of the silt.





Coal Mine Creek coho graphs were generated using survey data collected and provided by WDFW biologists.

COW SKULL CREEK

SALMON ACCLIMATION POND

Cow Skull Creek is not officially named by the Washington State Board on Geographic Names; however, for easy identification the creek is referred to as "Cow Skull" by PTF staff. Cow Skull Creek is a small left bank tributary to the upper Puyallup River, entering the Puyallup at RM 45.5. Unfortunately, anadromous salmon were unable to access Cow Skull for nearly a century due to the streams location upstream of the Electron diversion dam. With the completion of the Electron fish ladder *(@ RM 41.7)* in the fall of 2000, anadromous fish passage was restored for the first time since 1904. Restoring anadromous access to the upper Puyallup River has made approximately 26+ miles of spawning, rearing, and foraging habitat above the diversion available for several species, including Chinook, coho, pink, steelhead, and bull trout. Cow Skull is the location of one of two acclimation ponds used for reestablishing coho, and occasionally Chinook *(spring & fall)*, into a 26+ mile reach of the Upper Puyallup River. Acclimation ponds are a proven method in increasing fish numbers on the spawning grounds. The pond is located just off the main channel of the Puyallup at RM 0.1. The pond holds approximately 14,000 cu. ft. of water with a flow rate of 1-3 cfs; in past years (2001-2007), 20,000 to 100,000+ coho yearlings were imprinted and released from Cow Skull annually. Coho yearlings originated from Voights Creek Hatchery, where they were adipose clipped and coded wire tagged for future identification. Fish were released at 20 fish per pound, for a total biomass of 10,000 pounds. When available, fall Chinook are acclimated in Cowskull as well. During the summer of 2015, the pond was given its first maintenance dredging since it was originally constructed. This was necessary due to more than half of the ponds capacity being lost due to sediment build-up.

The Cow Skull drainage flows within the Kapowsin tree farm, which is private timber property managed by Hancock. This high mountain stream originates from snowpack accumulations near 3,400'; as well as, surface and groundwater from the surrounding valley. Cow Skull is non-glacial and flows northwest through a steep narrow valley for much of its 1.2 mile length. The gradient decreases substantially over the lower 0.46 miles; in so doing, provides beneficial habitat for fish rearing, foraging and spawning. Cow Skull supports juvenile Chinook *(planted)*; as well as juvenile and adult coho *(planted and NOR),* and cutthroat. Steelhead and bull trout utilization is unknown. However, bull trout utilization is presumed, to some degree, since the upper Puyallup is a documented occupied habitat area.

Watershed Fish Enhancement Program

Project Description: The Puyallup Tribe oper-

ates several acclimation ponds in the Puyallup/White River Watershed designed to reestablish and enhance Spring/Fall Chinook, winter steelhead and coho stocks. Each of two acclimation ponds *(Cowskull & Rushingwater)* on the Puyallup would receive as many as 100K+ hatchery origin Spring/Fall Chinook and/or coho. Three additional acclimation ponds located in the Upper White River drainage *(Huckleberry Creek, Greenwater River (George Creek) & Jensen Creek)* would be planted collectively with up to 900K+ White River Spring Chinook and 25K+ White River winter steelhead pre-smolts. The newest pond located on 28 Mile Creek *(Greenwater River)* is slated for completion in the fall of 2015. The Jensen Creek pond, in the Clearwater River drainage, was completed in the fall of 2012. When obtainable, the Puyallup Tribe will collect, haul and plant surplus adult hatchery fall Chinook and coho from WDFW's Voights Creek hatchery to spawn naturally in minor spawning or underutilized areas.

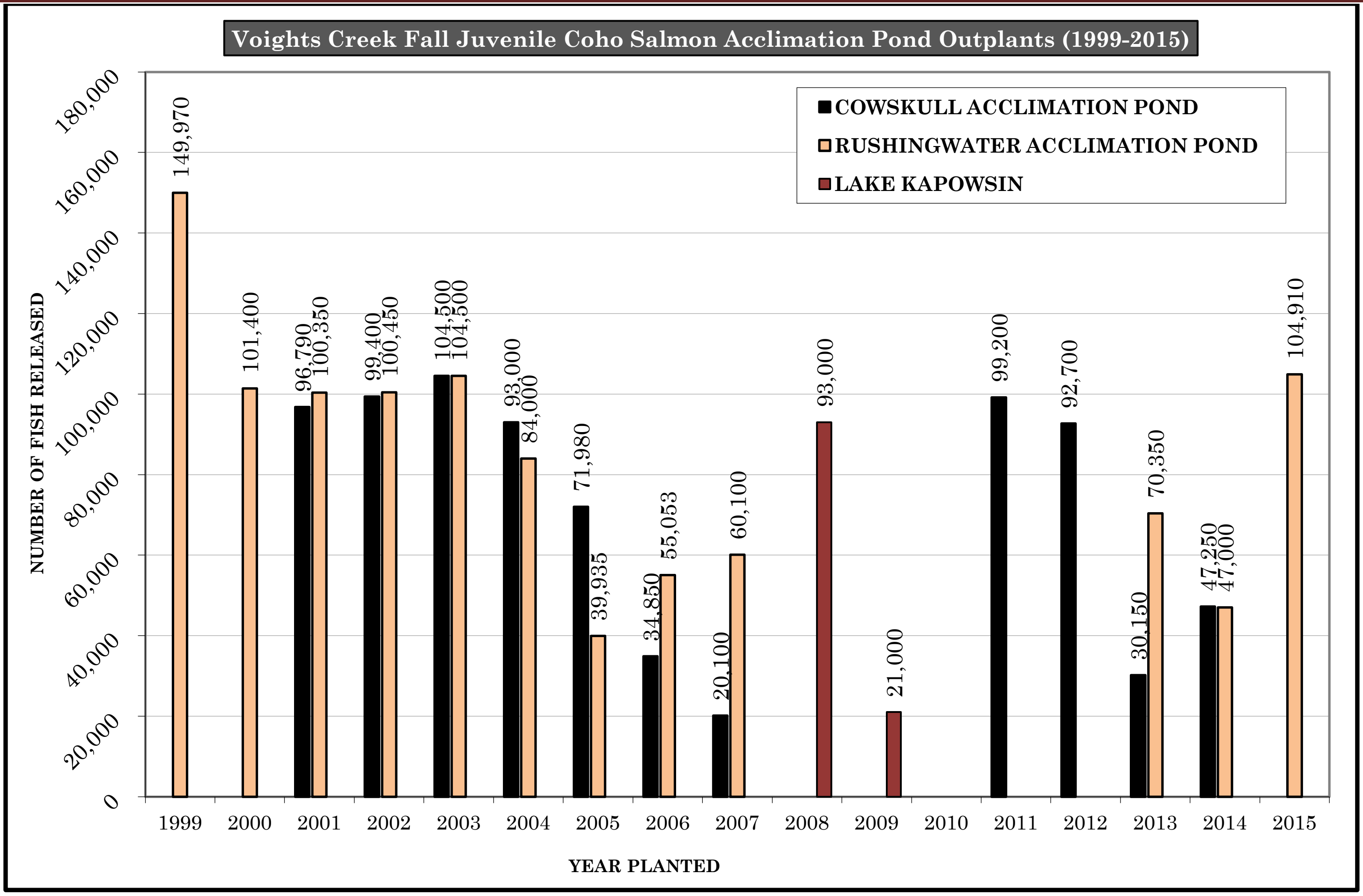
Goals, Purpose and Expected Benefits: One of the Puyallup Tribe's most significant restoration goals is to rebuild depressed Chinook and steelhead stocks and remove them from ESA listing. Acclimation ponds, juvenile in-stream plants and adult surplus fish plants are a proven method for increasing fish stocks, and are key component to restoration goals. Using acclimation ponds, limiting harvest and creating substantial gains in habitat restoration, the tribe will be able to accomplish restoration goals. Levee setbacks, oxbow reconnections both inter tidal and upland, Commencement Bay cleanup, and harvest cutbacks have already been initiated.

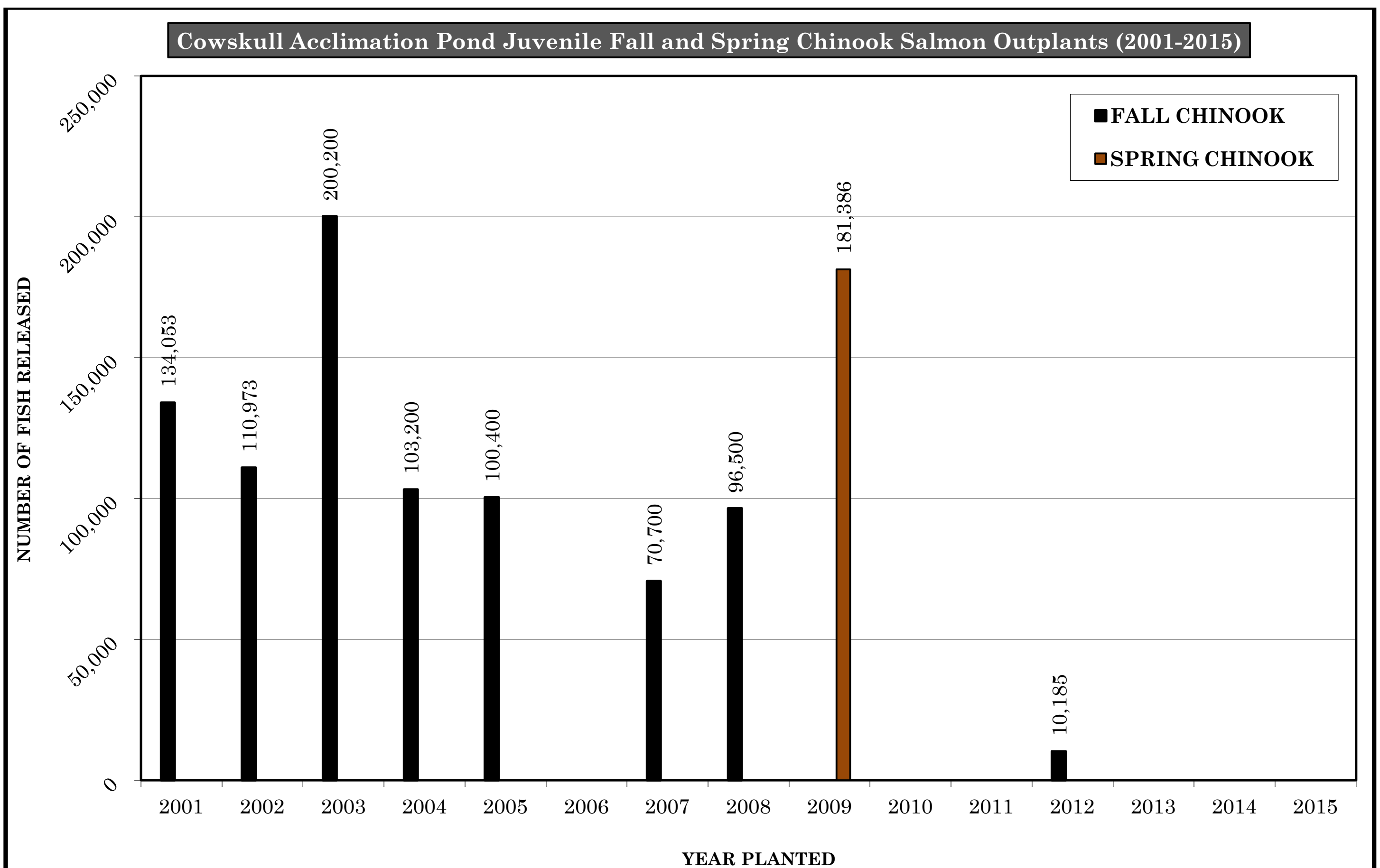
Purpose:

- Produce Spring/Fall Chinook, winter steelhead and coho for the Puyallup/White River salmon conservation and harvest programs.
- Establish a total annual return of Spring Chinook Natural Origin Recruits (NORs) that meets the escapement goals for White River Spring Chinook Recovery.
- Provide sustainable harvest for tribal and non-tribal fisheries on Fall Chinook and non ESA listed coho.
- Optimize hatchery and natural production consistent with the conservation of naturally produced native fish.
- Maintain genetic makeup of Chinook and steelhead populations spawned or reared in captivity.

Benefits:

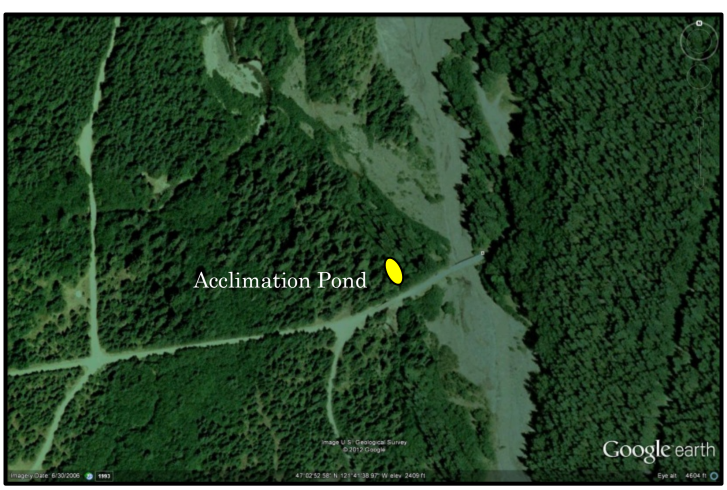
- Reestablish and enhance ESA listed Spring/Fall Chinook and steelhead; as well as non-listed coho into their endemic range.
- Increased total abundance of the composite natural/hatchery population.
- Increased spawning ground escapement and trend of Natural Origin Recruits (NORs).
- Improve distribution *(out planting of live fish)* of salmon to minor spawning and underutilized rearing habitat areas.
- Provide future tribal and sport harvest opportunities.
- Nutrient enhancement in oligotrophic *(nutrient-poor)* streams.


Voights Creek Fall Juvenile Coho Salmon Acclimation Pond Outplants (1999-2015)
COWSKULL ACCLIMATION POND
RUSHINGWATER ACCLIMATION POND
LAKE KAPOWSIN
NUMBER OF FISH RELEASED
0
20,000
40,000
60,000
80,000
100,000
120,000
140,000
160,000
180,000
149,970
101,400
96,790
100,350
99,400
100,450
104,500
104,500
93,000
84,000
71,980
39,935
34,850
55,053
20,100
60,100
93,000
21,000
99,200
92,700
30,150
70,350
47,250
47,000
104,910
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
YEAR PLANTED

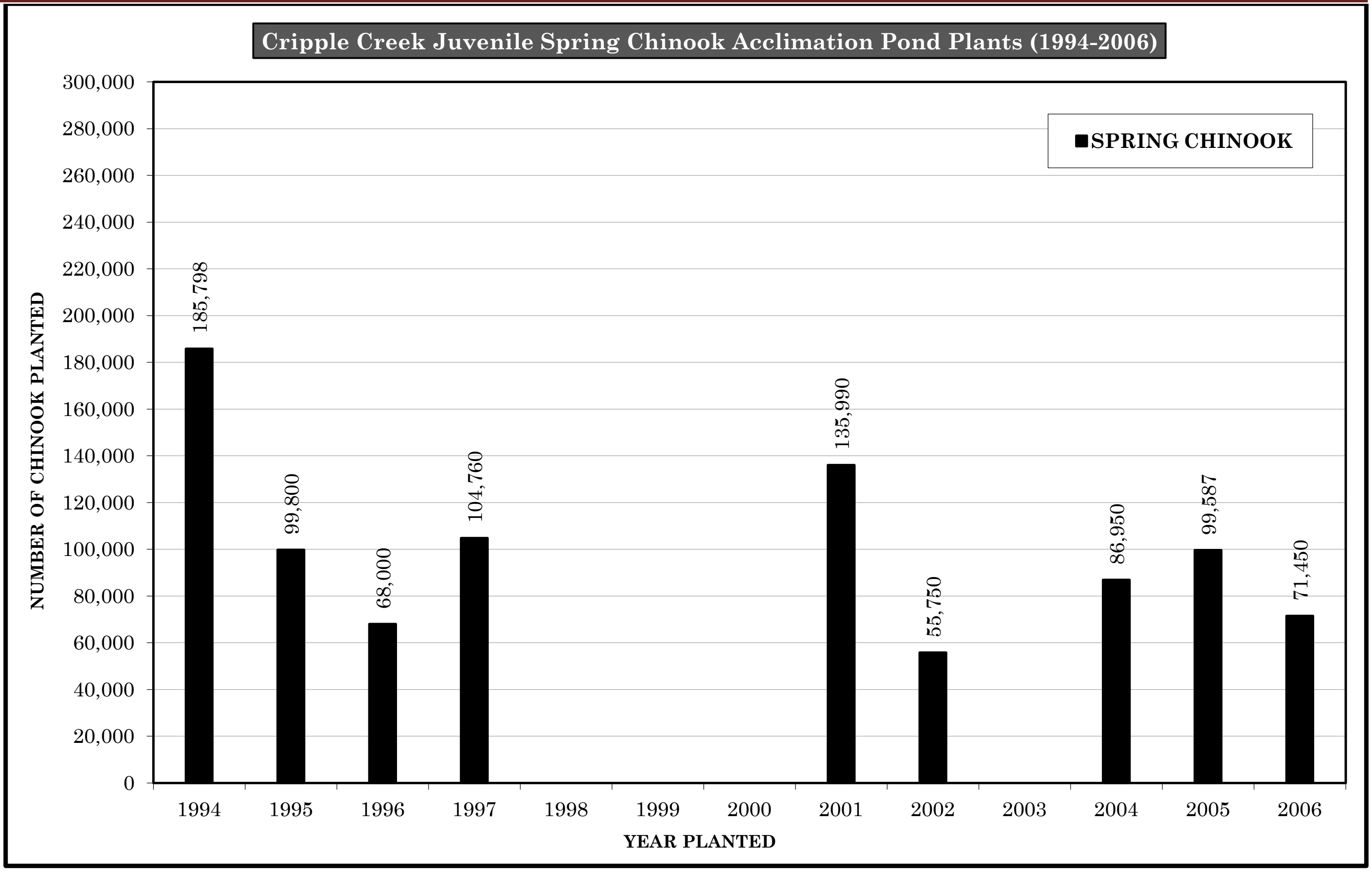

Cowskull Acclimation Pond Juvenile Fall and Spring Chinook Salmon Outplants (2001-2015)
FALL CHINOOK
SPRING CHINOOK
NUMBER OF FISH RELEASED
0
50,000
100,000
150,000
200,000
250,000
134,053
110,973
200,200
103,200
100,400
70,700
96,500
181,386
10,185
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
YEAR PLANTED

CRIPPLE CREEK

Cripple Creek is a short-run tributary that flows within the West Fork White River flood plain. The stream channel has a moderate amount of stream complexity created by a few well placed pieces of LWD; in addition to the stream natural sinuosity. Cripple quickly joins Pinochle Creek approximately 0.5 miles above Pinochle's confluence with the West Fork White River. Cripple Creek flows through a low gradient pool riffle channel with generally thick, brushy riparian cover; as well as a mix of coniferous and deciduas trees. The substrate contains a large amount of fine materials, but several small patches of suitable spawning gravel exist throughout the entire reach. Coho frequently spawn within the lower 0.3 miles of the creek; however, low flows often prevent Chinook from accessing the creek to spawn in August and early September. Other species known to utilize the creek include pink, sockeye, cutthroat, rainbow trout and bull trout.



Cripple was surveyed for adult salmon escapement, and is the site for one of the Puyallup Tribe's acclimation ponds. Unfortunately, flood damage to Forest Service Road 74 has prevented access to the creek since 2006; so, no escapement surveys or fish plants have occurred since. All adult salmon that spawn in Cripple Creek were initially captured at the USACE fish trap in Buckley, and transported above Mud Mountain dam. Specific escapement numbers for the upper White River drainage are known; therefore, surveys were conducted to determine fish distribution and spawning success. This is especially important regarding Spring Chinook, since adult production monitoring is part of the White River Spring Chinook Recovery Plan. Also, as part of the recovery plan, the Puyallup tribe operated a Spring Chinook acclimation pond located at RM 0.3 *(right)*. Spring Chinook were reared and released from Cripple Creek for several years *(1994-2006)*. Approximately 50,000 plus Spring Chinook from the Muckleshoot White River hatchery were transported annually to the Cripple Creek acclimation pond in early spring, and released in late spring. Returns to this small stream, as well as Pinochle and Wrong creeks, are likely the result of these earlier plantings. The current state of the acclimation pond is unknown; however, when access is reestablished, it is anticipated that the pond can be reutilized and spawning surveys will resume. Although the ponds capacity is relatively small, its low elevation makes it ideal in terms of accessibility during seasons of high snowfall.


Cripple Creek Juvenile Spring Chinook Acclimation Pond Plants (1994-2006)
SPRING CHINOOK
NUMBER OF CHINOOK PLANTED
YEAR PLANTED
300,000
280,000
260,000
240,000
220,000
200,000
180,000
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
0
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
185,798
99,800
68,000
104,760
135,990
55,750
86,950
99,587
71,450

DEADWOOD CREEK 10.0355

Deadwood Creek is a significant right bank headwater tributary to the White River. The creek is exclusively surveyed for bull trout from late August through early October, and is not surveyed for other species because, with the exception of steelhead, its elevation is likely too high for most salmon. In 2007, PTF biologists observed pink salmon in Sunrise Creek *(elev. 2800')* which is located just inside the National Park boundary, approximately 4.5 miles downstream of Deadwood. This is the highest point on the White River that adult salmon have been documented by the Puyallup Tribe since surveys began in 2000.

Deadwood Creek is a phenomenal nonglacial stream, originating from the Deadwood Lakes *(elev. 5236')* near Yakima Peak *(Chinook Pass)*. Deadwood is a north facing stream flowing entirely within Mt. Rainier National Park. Deadwood enters the White River at approximately RM 67.5, roughly 0.4 miles downstream from Klickitat Creek. The creek is surrounded by old growth and the water temperature is tempered by cold clear water year round.

Deadwood flows for approximately 2.5 miles from upper Deadwood Lake to its convergence with the White River; however, only the lower 0.45 miles provides spawning and rearing opportunities. A single unnamed tributary adds flow to Deadwood; unfortunately, it does not contribute any beneficial spawning or rearing habitat given it is located above natural anadromous barriers.

Deadwood provides exceptional habitat conditions for bull trout rearing and spawning. The first 0.1 miles is low gradient, with significant fines and sparse spawning gravel; as well as significant amounts of in-channel LWD *(center)*. The next 0.44 miles flows through the perimeter of the forested area along the White River channel. The creek channel contains several pieces of LWD *(left)* and abundant spawning gravels, in addition to a heavily mixed conifer riparian overstory. Numerous pools and side channels provide excellent habitat for all life history stages of bull trout; from newly emerged fry to adults. At approximately RM 0.45, the creek curves and swiftly climbs up the valley wall. At this point the stream quickly develops into a series of impassable cascades preventing any further upstream migration. Numerous surveys have been conducted above this point; however, no fish or redds have been observed, nor have any other salmon species been observed spawning in the creek. Fluvial and residential bull trout are observed spawning in the creek during late summer and early fall. In addition, juvenile bull trout have been observed within pools and lateral habitats during annual surveys. The few dead bull trout encountered during surveys appear to be pre-spawned mortalities due to predation.

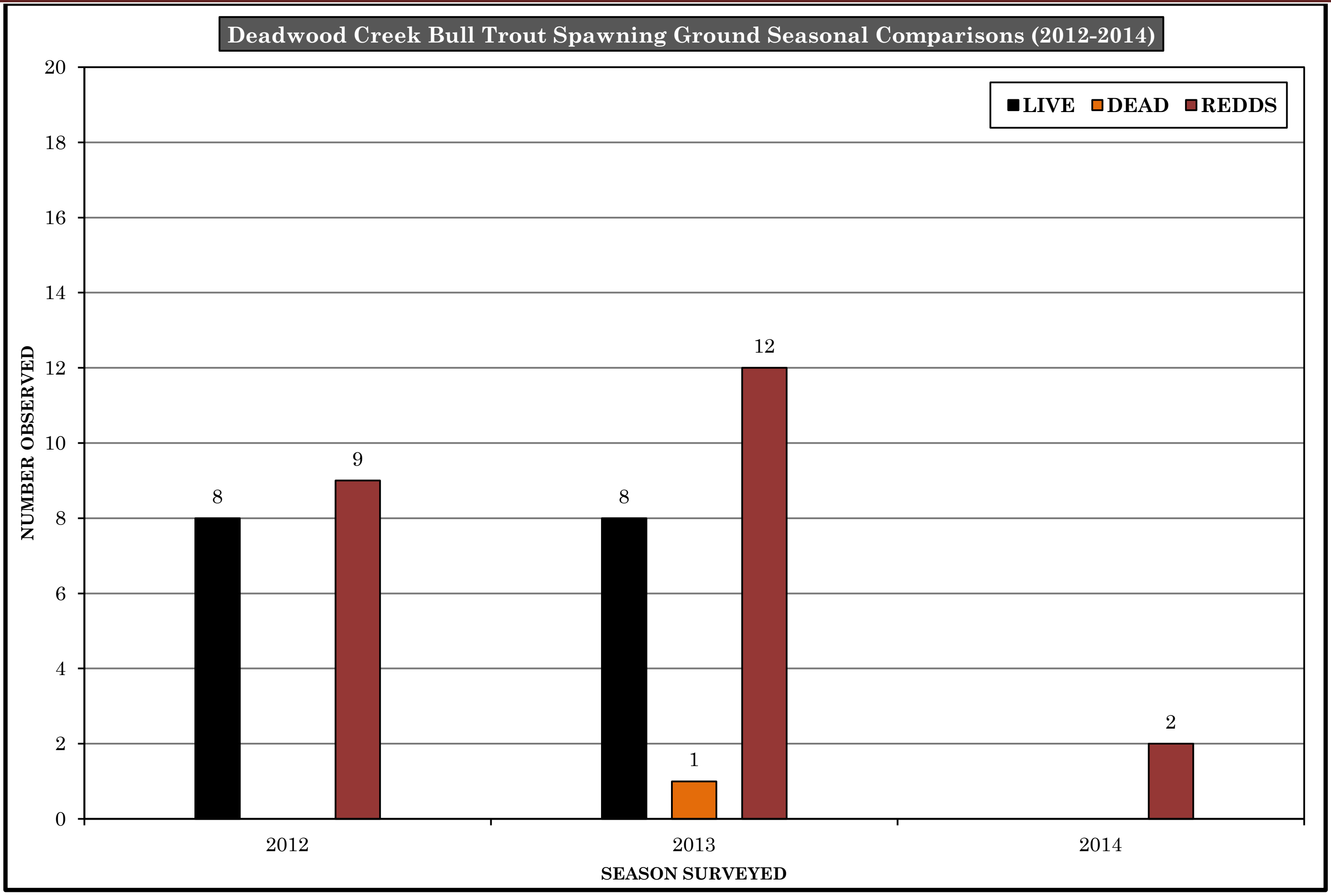
For three seasons *(2005-2007)*, PTF biologists conducted extensive bull trout migration telemetry studies in conjunction with redd surveys along the upper White River and West Fork White River. The study focused heavily on the headwater tributaries located within and adjacent to Mt. Rainier National Park. Study results showed that the cold high mountain streams located within the park provide the majority of the critical bull trout spawning habitat within the basin.

Resident bull trout reside in smaller headwater tributaries, while fluvial bull trout frequently travel long distances; utilizing the mainstem rivers and larger tributaries to forage and overwinter. During the fall, migratory forms of bull trout journey from spawning and rearing habitats in the upper watershed to foraging and overwintering habitats located lower in the river system. Beginning in spring and early summer, they begin the return journey back to spawning and rearing areas high in the watershed. In response to changing habitat and reproductive needs, migratory bull trout in the White River travel up to 75 miles or more between the lower river and headwaters located in or near Mt. Rainier N.P. To accomplish this, bull trout require unobstructed migration corridors and connectivity of streams and rivers in order to provide them with access to spawning, rearing, foraging, and overwintering habitats.

Bull trout spawning occurs primarily during the first three weeks in September, however, spawning has been observed taking place from the last week of August through the first week of October. Bull trout are iteroparous *(have the ability to spawn more than once)*; therefore, recovering pre-or-post spawn mortalities for examination is extremely rare. Spawners in the upper White River tributaries are observed utilizing various sized substrate from small gravels to small cobble. Redds are often constructed in the tail-out of pools and along channel margins. Embryonic development is slow *(depending on water temperatures)*; it may take between 165-235 days for eggs to hatch and for alevin to absorb their yolk (Pratt 1992). Bull trout fry emerge in late winter and early spring. Young fry can be seen by mid March foraging in the lateral habitat along the upper mainstem White River and associate tributaries.

Bull trout habitat throughout the Puyallup and White rivers has been severely impacted by over a century of land and water resource exploitation; including, damming and substantial water diversions, considerable riparian alterations *(deforestation)*, dewatering and low instream flow regimes, as well as significant channel manipulation. These impacts have lead to a marked deterioration in land and hydrological behavior within these river systems by causing water flow of poorer quality, quantity and timing. Several limiting factors are involved with regards to the healthy function of stream habitat and bull trout populations in the watershed; including lost or diminished habitat connectivity and migration corridors *(human-made fish passage barriers)*, fragmentation and reduction of habitat quality *(entrainment, transportation networks, forest management practices and operations, direct water withdrawal)*; in addition to, water quality, fish entrainment and entrapment, unknown species interactions, and potential climate change impacts *(changes in flow regimes, scour effects, thermal variations, changes in water chemistry)*.

Bull trout are primarily piscivorous *(fish eaters)*; however, they are opportunistic feeders, feeding on a variety of prey items depending on their particular life history strategy and stage of development. Adults feed almost exclusively on other fish, including a range of salmon and trout species; as well as other resident fish species. Juveniles feed on aquatic invertebrates, including stoneflies *(Plecoptera)*, caddisflies *(Trichoptera)*, and mayflies *(Ephemeroptera)*. Bull trout require a healthy aquatic environment in order to survive and flourish. They need an environment that provides the necessary prey base; in addition to the rearing and reproductive habitat essential to ensure their continued survival and reproductive success.


Deadwood Creek Bull Trout Spawning Ground Seasonal Comparisons (2012-2014)
LIVE
DEAD
REDDS
NUMBER OBSERVED
SEASON SURVEYED
0
2
4
6
8
10
12
14
16
18
20
2012
2013
2014
8
9
8
1
12
2

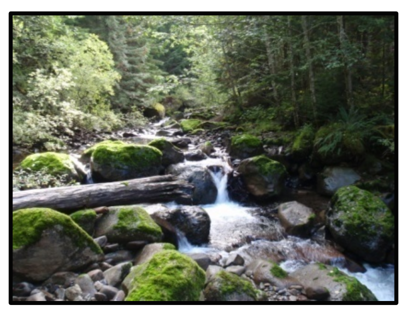
DEER CREEK 10.0865

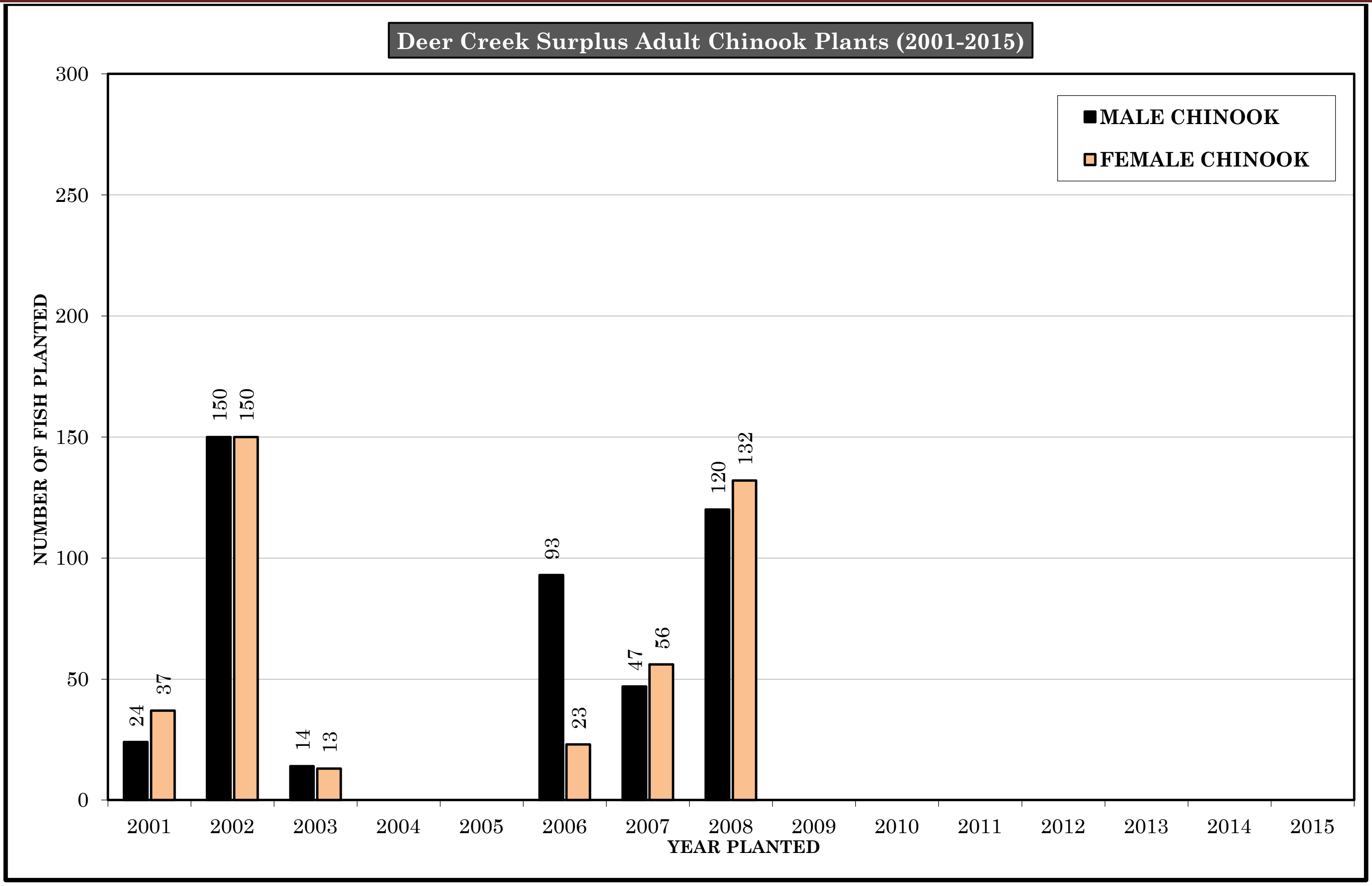
Deer Creek is a left bank headwater tributary to the Puyallup River; entering the upper Puyallup at mile 45.7, approximately 0.6 miles below Swift Creek. This high mountain stream flows northwest through a steep narrow glacial valley along the lower western slope of Mt. Rainier. Nearly the entire 6.5 miles of the Deer Creek drainage flows within the Mount Baker-Snoqualmie National Forest and is non-glacial in origin. Instead, its sources originate from snowpack accumulations; as well as other surface and groundwater sources from the surrounding valley. The additional surface water sources consist of three tributaries including Big Creek, and two unnamed tributaries. Unfortunately, these tributaries do not add any beneficial spawning or rearing habitat given their locations well above natural anadromous barriers.

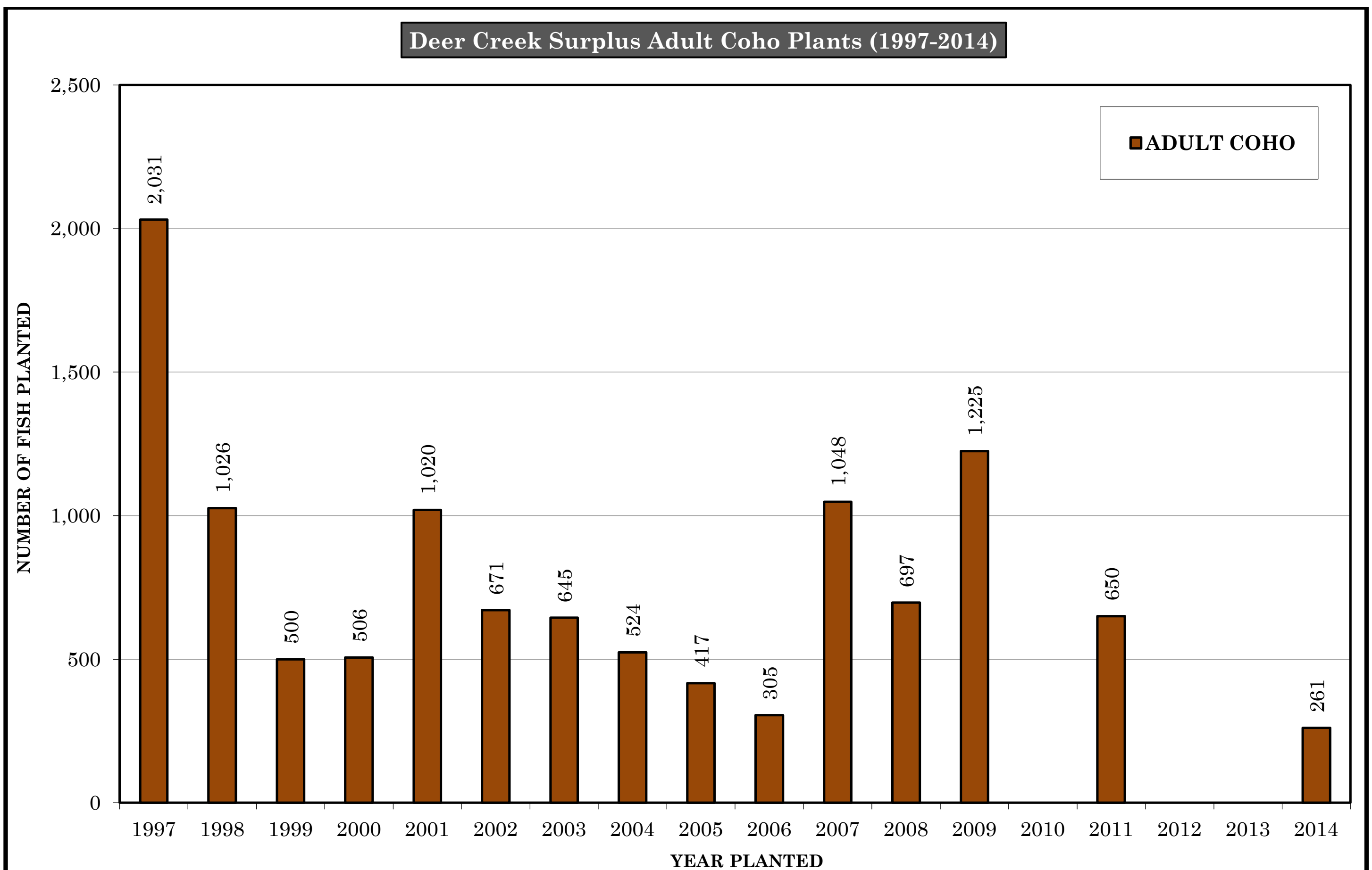
Past forestry operations along the creek, primarily timber harvesting and road construction, have had negative impacted on portions of the stream. Currently, a beneficial riparian buffer zone of conifers and mixed deciduous trees exists along the majority of the creek. The creek channel is confined by moderate to steep valley walls, with an impassable falls located at approximately RM 2.7. Spawning is significantly reduced upstream of RM 1.2 due to the substantial increase in gradient, flow velocities, and the lack of suitable spawning substrate *(right)*. The gradient along the lower 1.2 miles is moderate with numerous deep pools. The substrate throughout a great deal of this spawning reach consists of small boulders, cobble, and flat angular stone; though, several pockets of good spawning medium are often located along the stream margins and pool tail-outs.

Unfortunately, anadromous salmon were unable to access Deer Creek for nearly a century due to the streams location upstream of the Electron diversion dam on the Puyallup River. With the completion of the Electron fish ladder *(@ RM 41.7)* in the fall of 2000, anadromous fish passage was restored for the first time since 1904. Restoring anadromous access to the upper Puyallup River has made approximately 26+ miles of spawning, rearing, and foraging habitat above the diversion available for several species, including Chinook, coho, pink, steelhead, and bull trout.

Deer Creek is part of the surplus adult Chinook and coho planting program. Deer Creek is one of the few streams in late summer and early fall with adequate water flow to plant adult Chinook. Surplus adult Chinook from the WDFW hatchery located on Voights Creek are planted during late summer to early fall, and coho in late fall when available. The Puyallup Tribe has been hauling surplus adults from Voights Creek and planting them in the upper Puyallup Watershed since1997; unfortunately no natural returns of Chinook or coho have been documented in Deer Creek as a result of these efforts. However, natural returns of adult coho have occurred in Rushingwater, Cow Skull, Niesson, and Kellog creeks. Deer Creek is not surveyed regularly; rather, it is spot checked to see how successful the adult plants were. The creek does; on the other hand, have a resident population of cutthroat trout. It is also suspected that bull trout may be present, since they are known to populate the Mowich River and upper Puyallup; however, bull trout utilization is unknown, but presumed.




Deer Creek Surplus Adult Chinook Plants (2001-2015)
MALE CHINOOK
FEMALE CHINOOK
NUMBER OF FISH PLANTED
YEAR PLANTED
300
250
200
150
100
50
0
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
24
37
150
150
14
13
93
23
47
56
120
132


Deer Creek Surplus Adult Coho Plants (1997-2014)
ADULT COHO
NUMBER OF FISH PLANTED
YEAR PLANTED
2,500
2,000
1,500
1,000
500
0
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2,031
1,026
500
506
1,020
671
645
524
417
305
1,048
697
1,225
650
261

DIRU CREEK

Puyallup Tribe of Indians
Salmon Hatchery 10.0029

Diru Creek Hatchery is located on Diru Creek *(Rainbow Springs)*, a tributary to Clarks Creek in Puyallup. Water for the hatchery is supplied from two pumped wells (*800 gpm*); as well as gravity flow from of Diru Creek (*200-500 gpm*). Incubation consists of 20 vertical stacks of 12 trays. Initial rearing uses 16 shallow troughs in the hatchery building. Additional rearing containers include four 50'x5'x5' raceways, two 6696 cubic foot ponds (*UP1 and UP2*), and one 13,000 cubic foot pond (*below, left*) that are also used for holding returning adults, as well as juveniles.

In addition, the Puyallup Tribe operates several acclimation ponds in the Puyallup Watershed *(with the completion of the Jensen Cr. Pond fall 2012)*. Two of the acclimation ponds *(Cowskull & Rushingwater)* are used for reestablishing Spring/Fall Chinook and coho into a 30-mile reach in the Upper Puyallup River above Electron Dam. Electron Dam has been an anadromous barrier for 97 years. A fish ladder was constructed, and completed in fall of 2000. The other acclimation ponds are located in the Upper White River drainage. These ponds are used for reestablishing White River Spring Chinook back into their endemic range. All ponds have approximately 25,000 cubic feet of rearing space and between 1 to 3 cubic feet per second flow. A 35,000 cu. ft. acclimation pond was completed in the summer of 2007 near George Creek. Capable of holding over 500,000 Spring Chinook, the construction of the acclimation pond was funded by the City of Tacoma as a result of a mitigation settlement.

The Puyallup Tribe's restoration goal is to rebuild depressed Chinook and steelhead stocks and remove them from ESA listing. Using acclimation ponds, limiting harvest, and making substantial gains in habitat restoration, the tribe will be able to accomplish this task. Levee setbacks, oxbow reconnections both inter tidal and upland, Commencement Bay cleanup, and harvest cutbacks have already been initiated. Only the jump-starting of Chinook in habitat areas lacking, or devoid of fish, remains the largest challenge. Acclimation ponds are a proven method in increasing fish numbers on the spawning grounds. Hatchery rearing 200,000 Fall Chinook for release on station and 200,000 for acclimation ponds in the upper Puyallup River for a combined 6,857 pounds of fish. Historically, Fall Chinook have been reared since 1980 with a variety of stocks, goals, and objectives.

Spring Chinook Hatchery Production

The Puyallup Tribe operates several acclimation ponds in the Puyallup/White River Watershed designed to reestablish and enhance Spring/Fall Chinook, winter steelhead and coho stocks. Each of two acclimation ponds on the Puyallup would receive as many as 100K+ hatchery origin Spring/Fall Chinook and/or coho. Three additional acclimation ponds located in the Upper White River drainage *(Huckleberry Creek, Greenwater River (George Creek) & Jensen Creek)* would be planted collectively with up to 900K+ White River Spring Chinook and 25K+ White River winter steelhead pre-smolts. The Jensen Creek in the Clearwater River drainage was completed in the fall of 2012.


Chum salmon fry

Fall Coho Hatchery Production

Currently, up to 200,000 coho yearlings are Acclimated *(imprinted)* and released in the Upper Puyallup Watershed *(acclimation ponds)*. Coho originate from Voights Creek Hatchery where 100,000 are adipose clipped and coded wire tagged. Fish are released at 20 fish per pound, for a total biomass of approximately 10,000 pounds.

Winter Chum Hatchery Production

The Puyallup Tribe currently raises 1.5 to 2.3 million chum smolts for release into the lower Puyallup River. This program significantly augments a Tribal river fishery and All Citizen purse seine fishery in East and West Pass in Puget Sound. This stock originated initially from Chambers Creek. Puyallup Tribal Fisheries releases 1,000 to 3,000 pounds annually based on available brood- stock returns to Diru Creek Hatchery. The program was started in 1991 and has become self-sustaining.


Fertilizing chum eggs

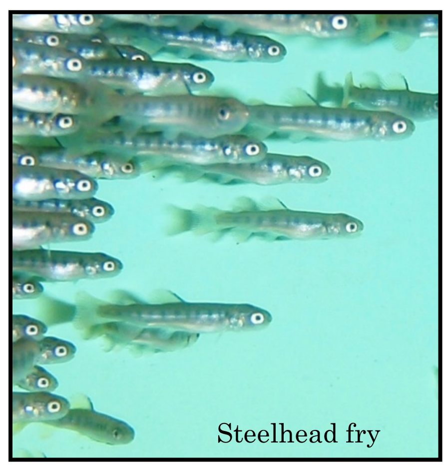
Fall Chinook Hatchery Production

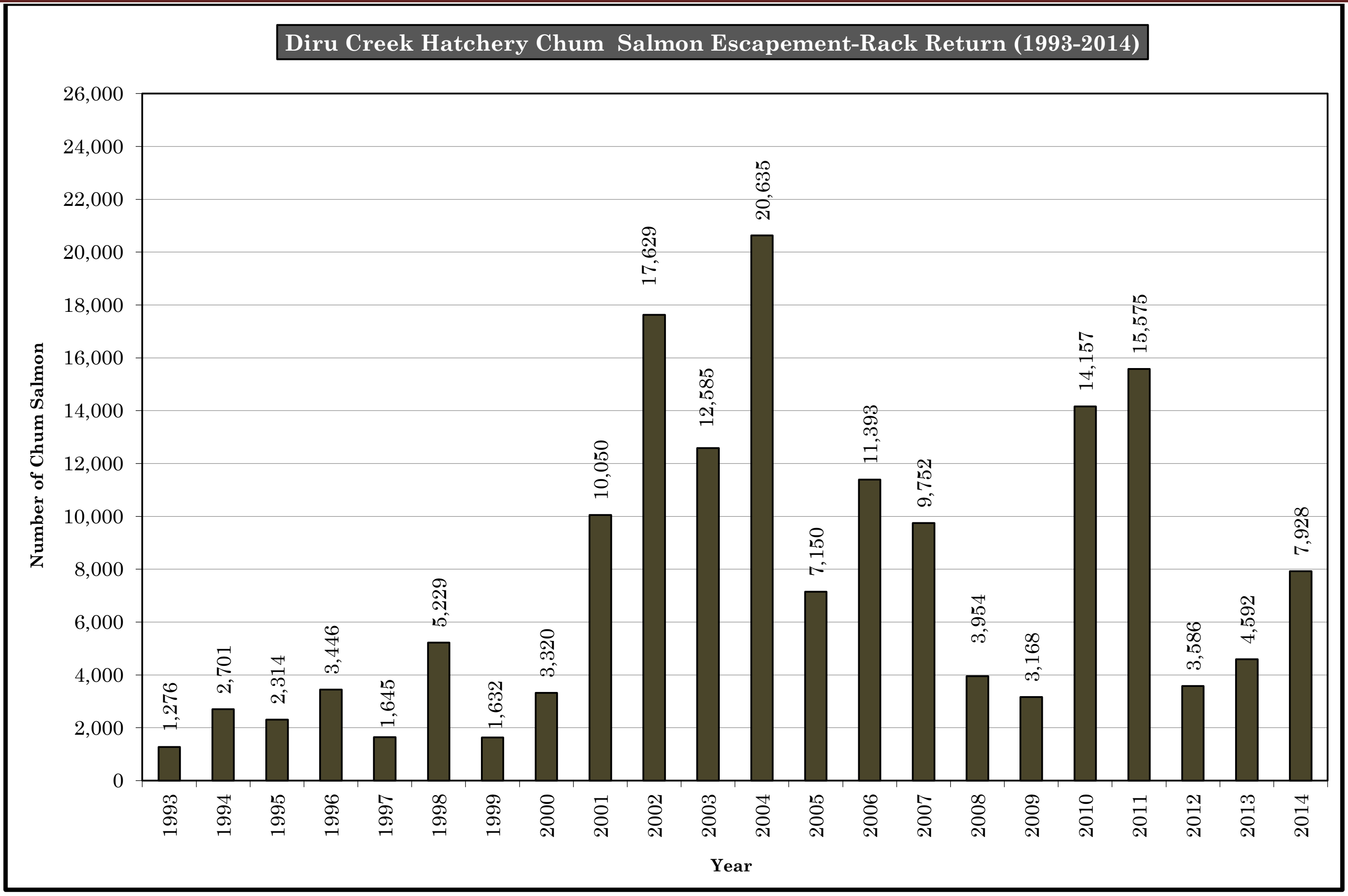
In 2004, the Puyallup Tribal Fisheries Department began acclimating and releasing Fall Chinook from its Clarks Creek facility, thereby discontinuing all Chinook releases from the Diru Creek Hatchery. In early 2005, construction of a new incubation building was completed at Clarks Creek. The incubation building houses 32 incubator stack; each stack is capable of holding up to 77,000 Chinook eggs. This provides for a total capacity of approximately 2.5 million eggs. Once fish are ready to be moved from the incubators, they can be place in one of the 16 aluminum raceway-troughs and hand feeding can begin. The troughs are 16 feet in length with a flow rate of up to 25 gpm. When the fish are approximately 500 to the pound, they are transferred to one of two cement lined rearing ponds. Holding the Chinook in the cement pond is only temporary until they are up to a large enough size, usually in late April, to be massed marked via an automated tagger. Once tagged, the fish are planted in one of the two natural acclimation ponds until they are released in late May or early June.

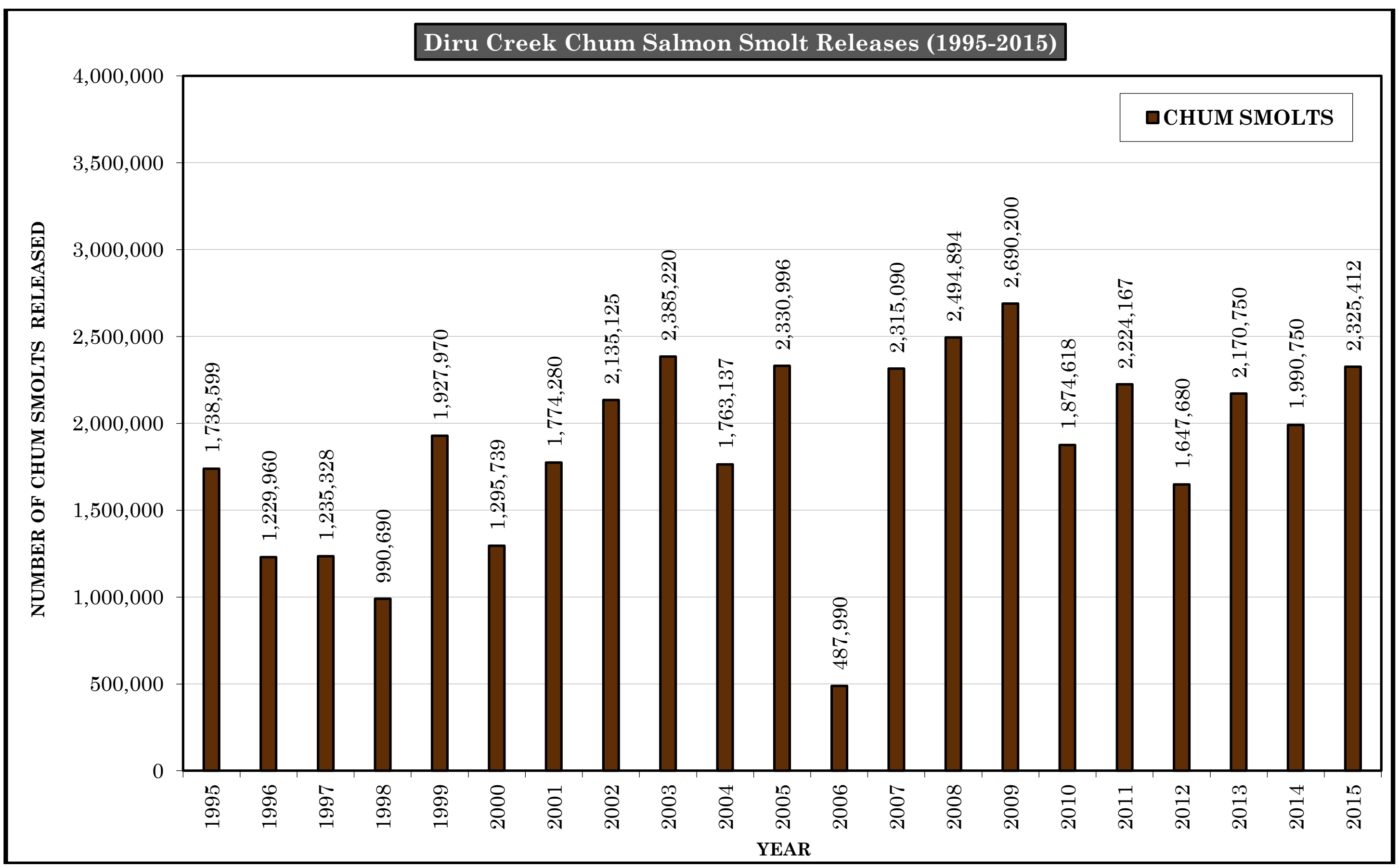
White River Winter Steelhead Production

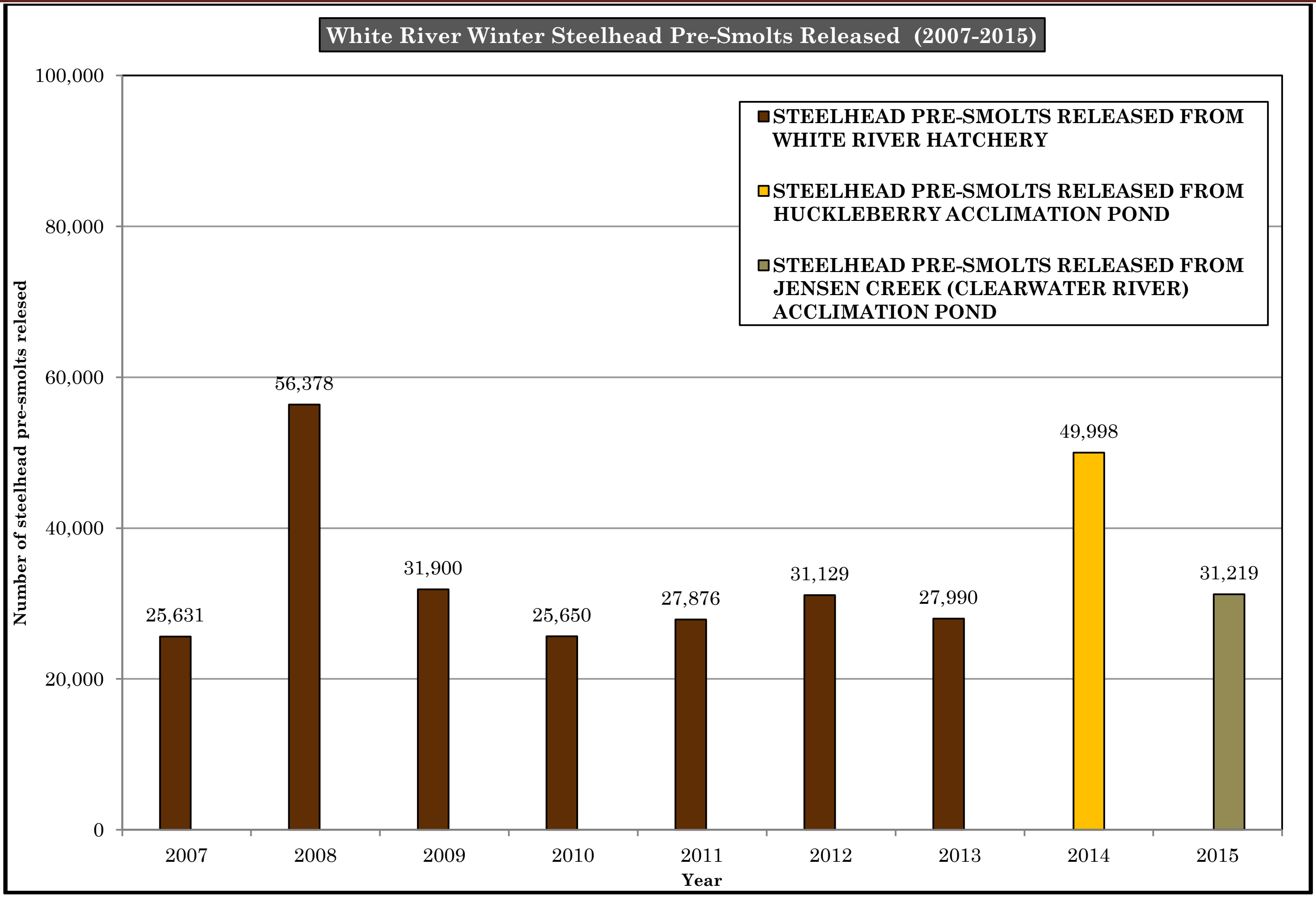
In 2006, the Puyallup Tribe, in partnership with WDFW and the Muckleshoot Tribe, began artificially propagating White River winter steelhead. Rearing young steelhead is an integral part of the White River winter steelhead pilot project, a program designed to increase winter steelhead escapement in the White River. Beginning in 2009, the Puyallup Tribe assumed the majority of responsibility for continuing this important restoration effort. Steelhead brood-stock *(approximately 10 males and 10 females)* are collected from the White River USACE fish trap in Buckley and are held, spawned *(right)*, incubated, and reared at the Puyallup Tribe's Diru Creek hatchery for a year. Each fish is implanted with a coded wire tag for later identification. After rearing for a year and fish are of size *(approximately 17 fish per pound)*, the pre-smolts are transported to the Muckleshoot hatchery on the White River to acclimate before being released into the White River *(fish were acclimated and released from the Huckleberry pond in 2014)*. The project goal is to release between 35,000-40,000 steelhead pre-smolts annually. This project has already seen some success; several hundred marked *(coded wire tag)* steelhead have been captured and passed above Mud Mountain dam since 2009 *(see the Buckley section in this report for more information, and appendix G for data)*.

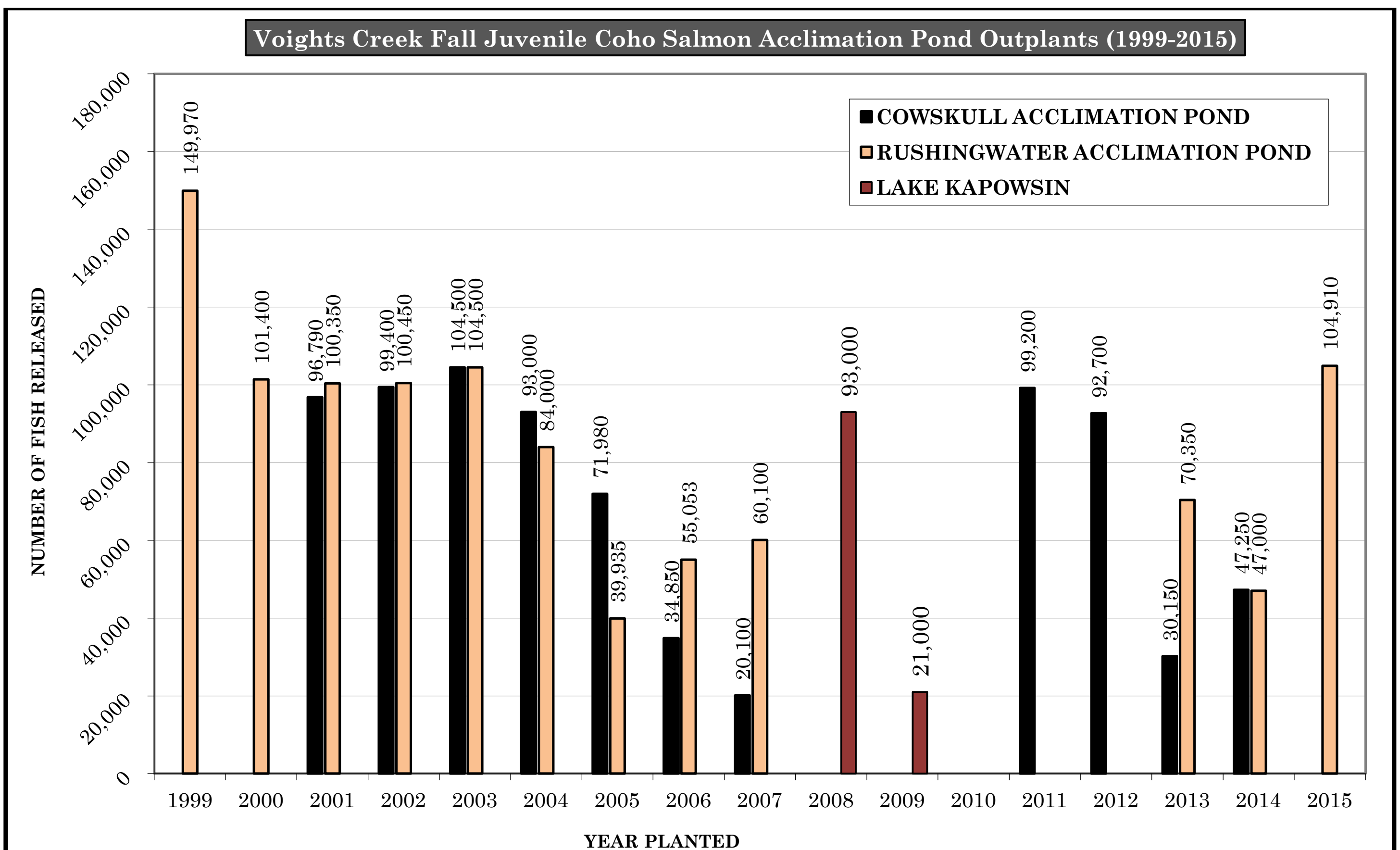

Live spawning of steelhead

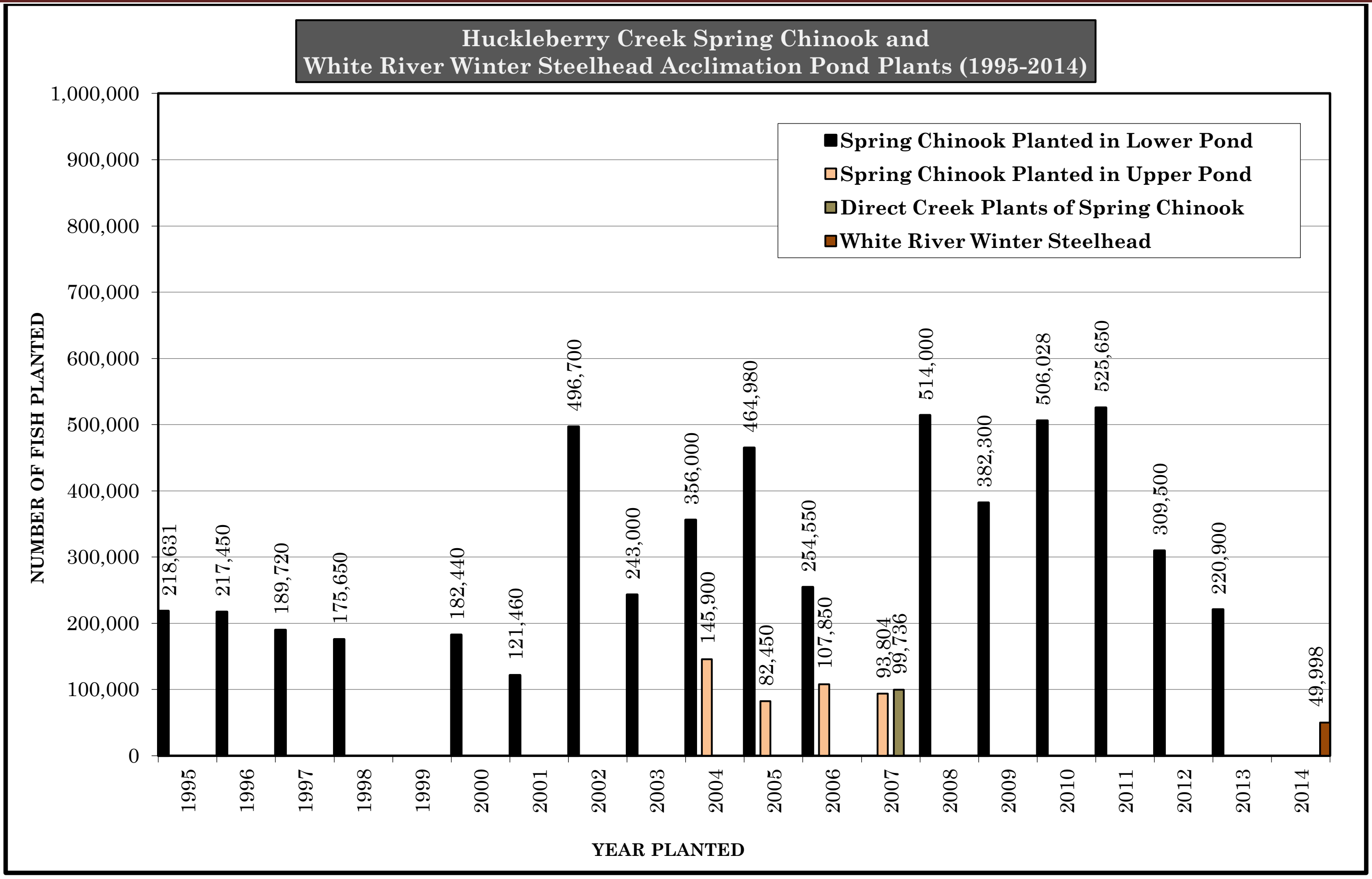

Steelhead fry

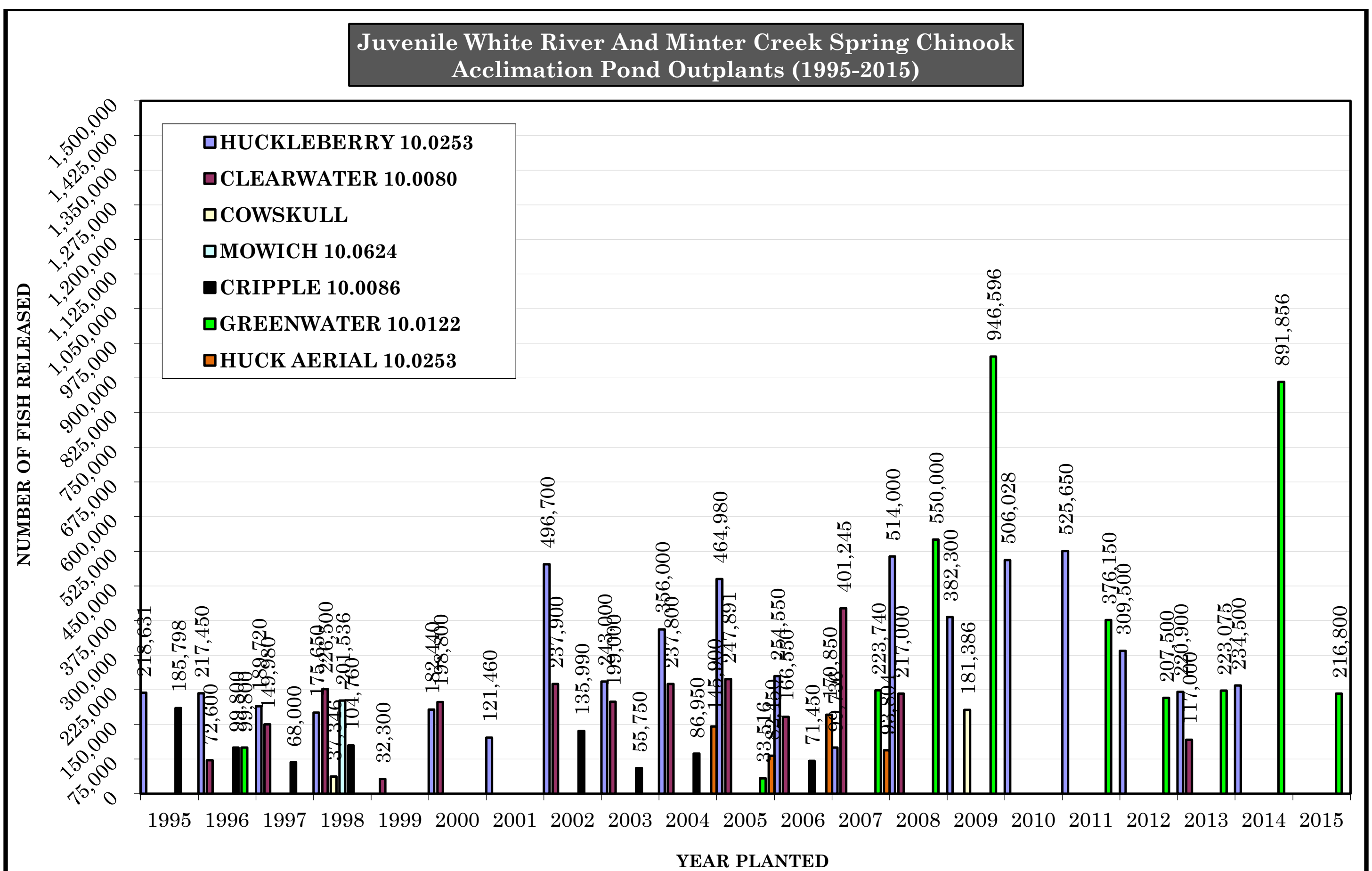

Diru Creek Hatchery Chum Salmon Escapement-Rack Return (1993-2014)
Number of Chum Salmon
Year
26,000
24,000
22,000
20,000
18,000
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014
1,276
2,701
2,314
3,446
1,645
5,229
1,632
3,320
10,050
17,629
12,585
20,635
7,150
11,393
9,752
3,954
3,168
14,157
15,575
3,586
4,592
7,928

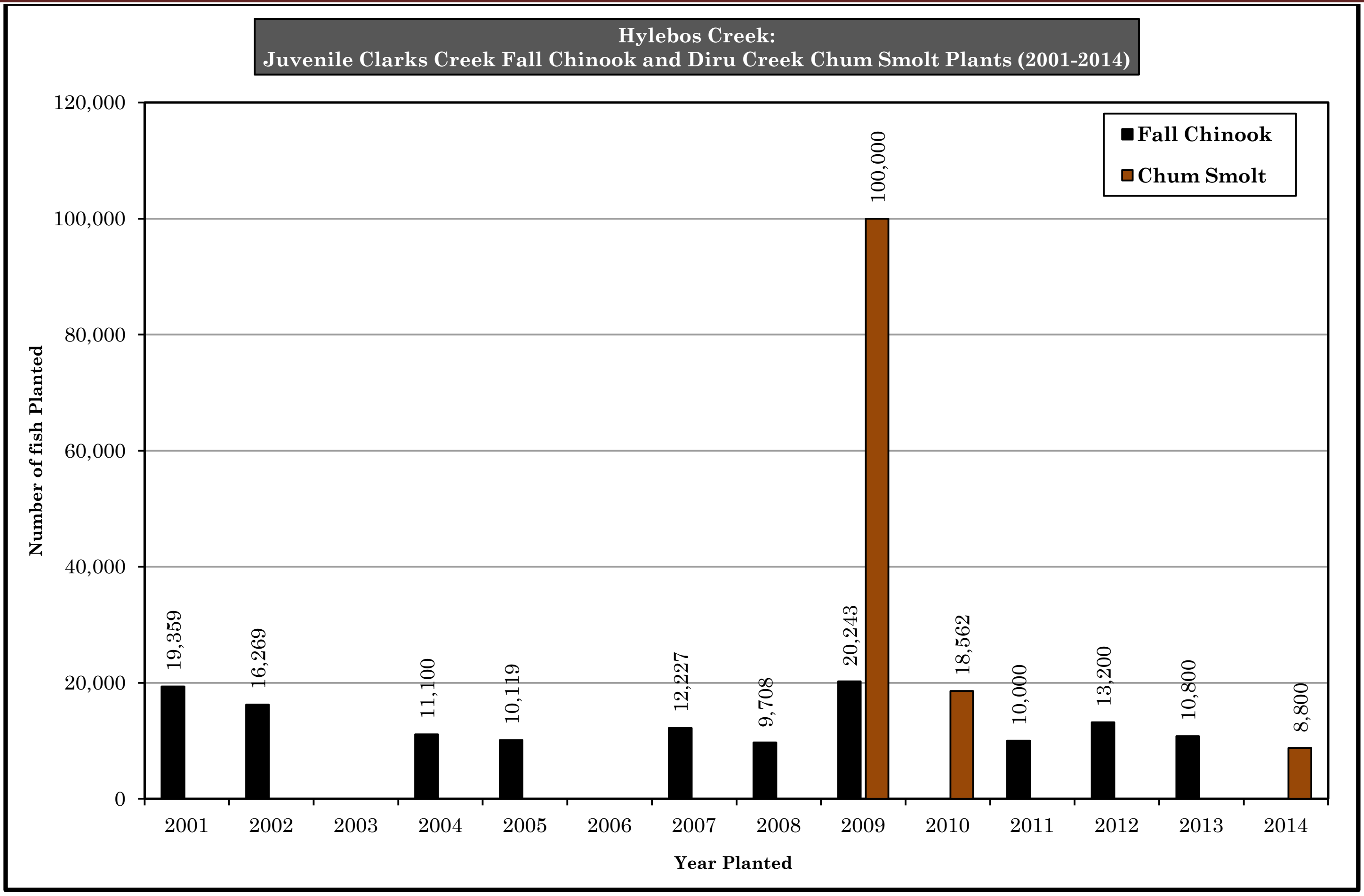

Diru Creek Chum Salmon Smolt Releases (1995-2015)
CHUM SMOLTS
NUMBER OF CHUM SMOLTS RELEASED
YEAR
4,000,000
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015
1,738,599
1,229,960
1,235,328
990,690
1,927,970
1,295,739
1,774,280
2,135,125
2,385,220
1,763,137
2,330,996
487,990
2,315,090
2,494,894
2,690,200
1,874,618
2,224,167
1,647,680
2,170,750
1,990,750
2,325,412


White River Winter Steelhead Pre-Smolts Released (2007-2015)
STEELHEAD PRE-SMOLTS RELEASED FROM WHITE RIVER HATCHERY
STEELHEAD PRE-SMOLTS RELEASED FROM HUCKLEBERRY ACCLIMATION POND
STEELHEAD PRE-SMOLTS RELEASED FROM JENSEN CREEK (CLEARWATER RIVER) ACCLIMATION POND
Number of steelhead pre-smolts relesed
100,000
80,000
60,000
40,000
20,000
0
25,631
56,378
31,900
25,650
27,876
31,129
27,990
49,998
31,219
2007
2008
2009
2010
2011
2012
2013
2014
2015
Year


Voights Creek Fall Juvenile Coho Salmon Acclimation Pond Outplants (1999-2015)
COWSKULL ACCLIMATION POND
RUSHINGWATER ACCLIMATION POND
LAKE KAPOWSIN
NUMBER OF FISH RELEASED
180,000
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
0
149,970
101,400
96,790
100,350
99,400
100,450
104,500
104,500
93,000
84,000
71,980
39,935
34,850
55,053
20,100
60,100
93,000
21,000
99,200
92,700
30,150
70,350
47,250
47,000
104,910
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
YEAR PLANTED


Huckleberry Creek Spring Chinook and
White River Winter Steelhead Acclimation Pond Plants (1995-2014)
Spring Chinook Planted in Lower Pond
Spring Chinook Planted in Upper Pond
Direct Creek Plants of Spring Chinook
White River Winter Steelhead
NUMBER OF FISH PLANTED
YEAR PLANTED
1,000,000
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
218,631
217,450
189,720
175,650
182,440
121,460
496,700
243,000
356,000
145,900
464,980
82,450
254,550
107,850
93,804
99,736
514,000
382,300
506,028
525,650
309,500
220,900
49,998


Juvenile White River And Minter Creek Spring Chinook
Acclimation Pond Outplants (1995-2015)
HUCKLEBERRY 10.0253
CLEARWATER 10.0080
COWSKULL
MOWICH 10.0624
CRIPPLE 10.0086
GREENWATER 10.0122
HUCK AERIAL 10.0253
NUMBER OF FISH RELEASED
YEAR PLANTED
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
185,798
217,450
72,600
68,000
32,300
121,460
496,700
237,900
135,990
55,750
356,000
86,950
464,980
247,891
254,550
71,450
401,245
223,740
514,000
217,000
550,000
382,300
181,386
946,596
506,028
525,650
376,150
309,500
207,500
220,900
117,000
223,075
234,500
891,856
216,800

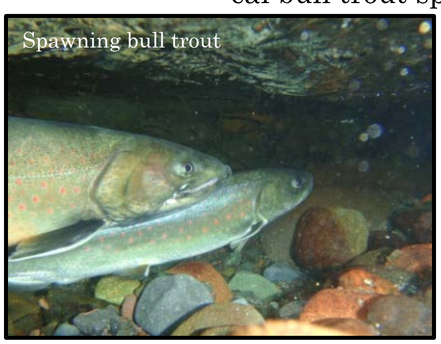

Hylebos Creek:
Juvenile Clarks Creek Fall Chinook and Diru Creek Chum Smolt Plants (2001-2014)
Fall Chinook
Chum Smolt
Number of fish Planted
Year Planted
0
20,000
40,000
60,000
80,000
100,000
120,000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
19,359
16,269
11,100
10,119
12,227
9,708
20,243
100,000
18,562
10,000
13,200
10,800
8,800

DISCOVERY CREEK

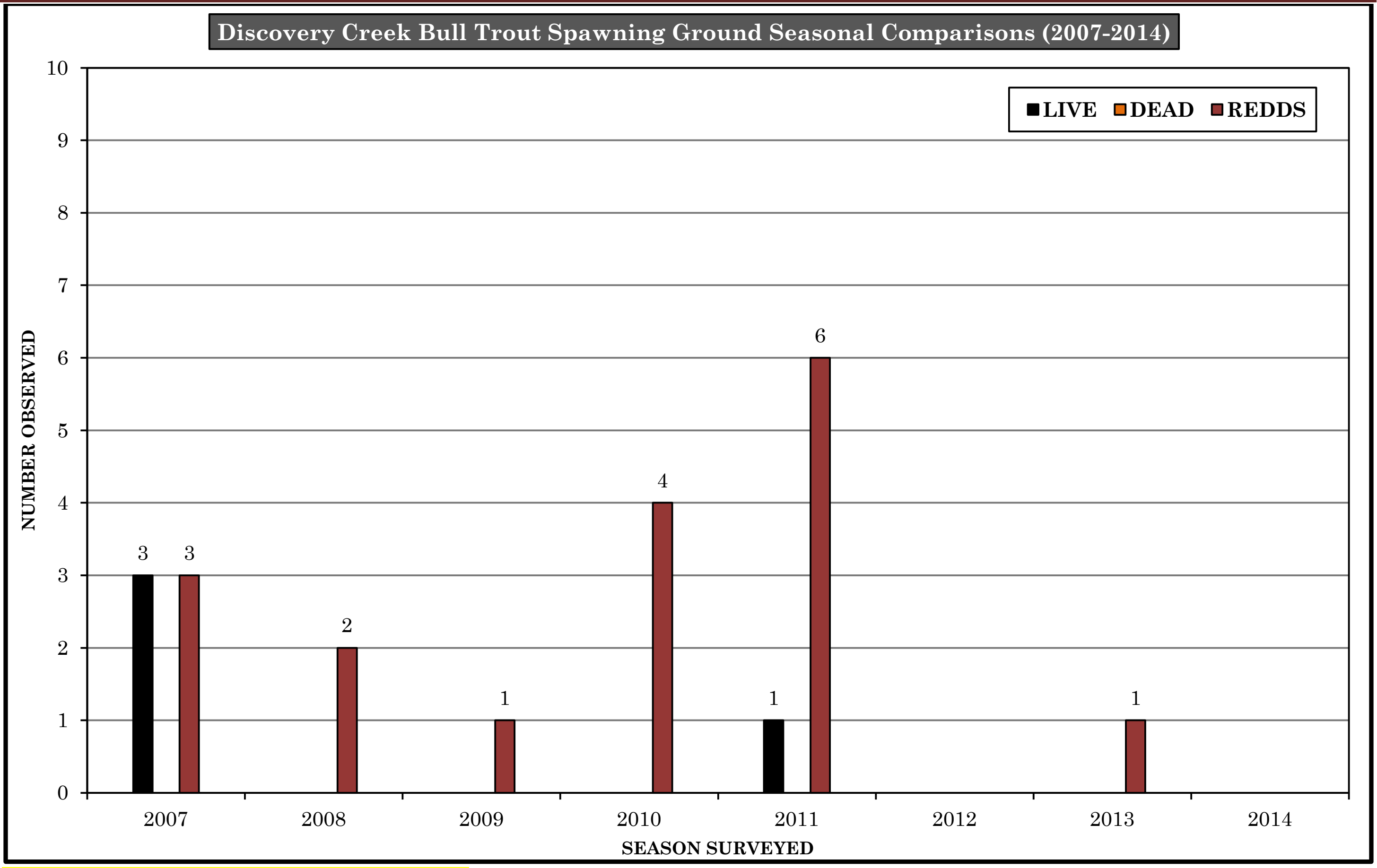
Discovery Creek is not officially named by the Washington State Board on Geographic Names, nor is it identified on most topological or hydrological maps; however, for easy identification the creek is referred to as "Discovery Creek" by PTF staff. Discovery Creek is a small right bank tributary to the upper White River; this small creek was discovered in 2007 while conducting telemetry and spawning ground surveys for bull trout, hence the name. As with most of the headwater tributaries of the White, the elevation of this creek is likely too high for Chinook, coho and pink salmon. Discovery Creek originates from a spring at the base of a small ridge running parallel to the White River access road. Discovery Creek enters the White River just upstream of Shaw Creek at approximately RM 69.5, and provides 0.5 miles of exceptional habitat conditions for bull trout rearing and spawning.

The first 150-200 feet of the creek is low gradient and flows within the channel migration zone of the White River. The habitat within this section offers suitable spawning conditions for bull trout. However, during the 2007-2009 survey seasons, a 2-3 foot jump in the creek channel, combined with the low summer flow *(approx. 2-3 cfs.)* prevented bull trout from migrating beyond this point. However, higher flows would undoubtedly provide access to the upper reach above this bench. The remaining 0.5 miles of the creek meanders through the edge of the forested area along the White River floodplain. The creek channel gradient increases slightly, as well as the stream complexity due to some small debris jams and LWD input. The surrounding riparian consists of primarily mature conifers with a limited number of mixed deciduous trees. Near RM 0.5 the creek turns sharply into the base of a small valley ridge.

From 2005-2007, PTF biologists conducted extensive bull trout migration telemetry studies and redd surveys along the upper White River and West Fork White River; focusing heavily on the headwaters located within Mt. Rainier National Park. The study results determined that the cold high mountain streams located within the National Park, including Discovery, provide the majority of the critical bull trout spawning habitat in the basin. In addition, bull trout spawning was less frequent in this tributary compared to that observed in several significant headwater tributaries located along the White River, such as Klickitat and No Name.


Spawning bull trout

Spawning activity has been observed in the lower 150-200 feet during the 2007-20012 seasons. During the 2007 season, bull trout were observed spawning in Discovery Creek during mid September. Two of the bull trout observed spawning were part of the migration telemetry study. Both bull trout were surgically implanted with LOTEK® Wireless Inc.'s NanoTag Series transmitters *(NTC-4-2L)* and released near the Greenwater River (*RM 45*) in late June. The fish were then tracked to the creek where they were observed spawning together beneath a channel spanning piece of LWD in the lower 75 feet of the creek.



See Appendix B for bull trout redd locations.

ELECTRON FISH COLLECTION FACILITY

Electron Hydro LLC

PUYALLUP RIVER DIVERSION & HYDRO PROJECT

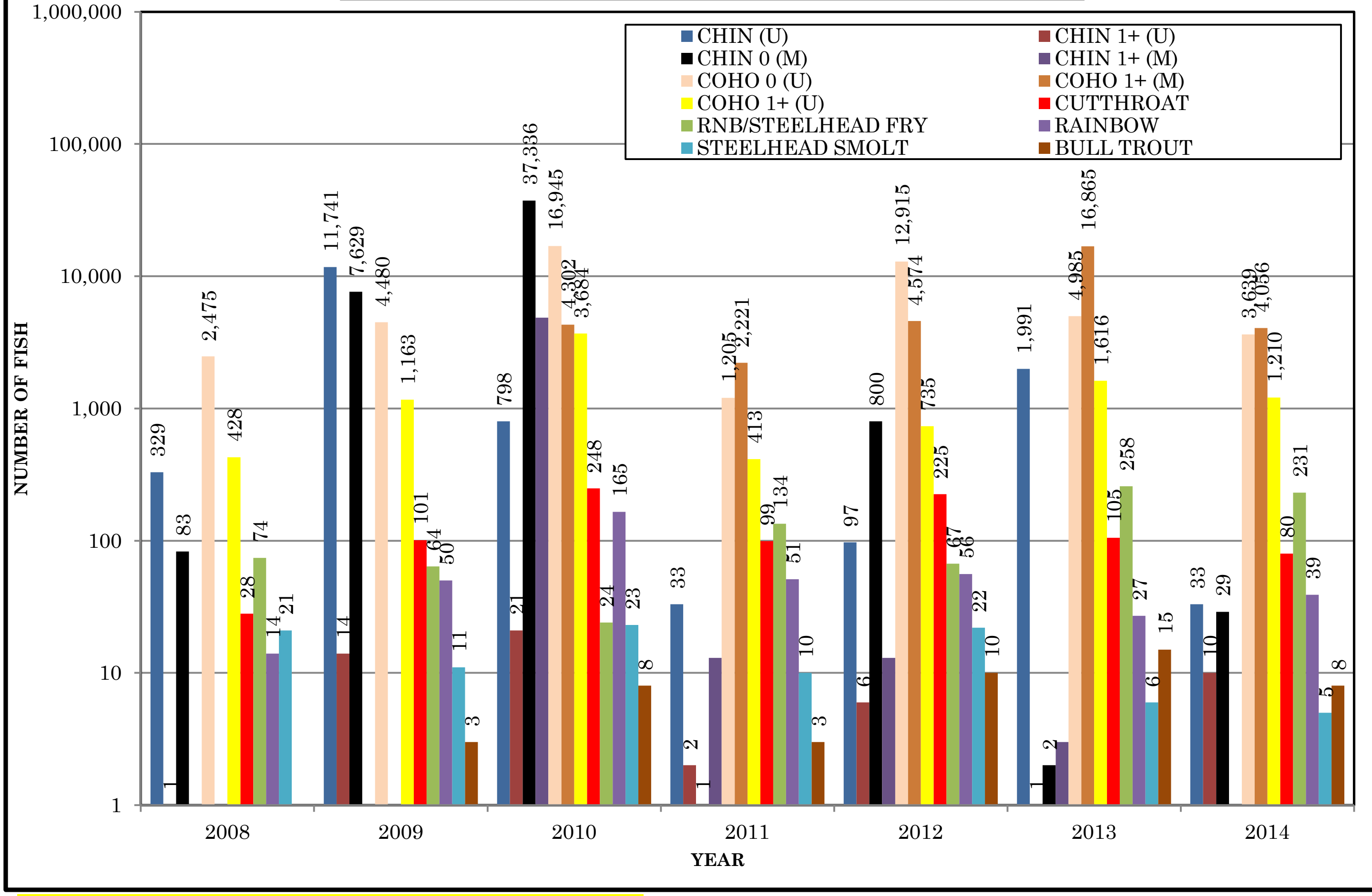
Electron Hydro LLC's hydroelectric facility *(formally operated by Puget Sound Energy)* utilizes water diverted from the Puyallup River at RM 41.7 *(bottom photo)*. The diverted water is channeled 10.1 miles through a flume and settling pond before collecting into a small reservoir, or forebay (*upper left*). The water held in the forebay is used to generate power via four turbines located in the power house approximately 800 feet below the forebay. Thousands of salmonids, including threatened Chinook, bull trout, and steelhead; as well as non ESA listed coho, cutthroat and rainbow trout are diverted down the flume and into the fore bay annually. Juvenile fish diverted into the fore bay, and are able to migrate beyond the exclusionary guide net are likely drawn to the penstocks (*intake*) of the powerhouse and are subsequently destroyed. Adults are too large to pass through the penstock screens.

In 2001, PSE completed construction of a fish collection facility to help address the fish losses in the forebay. Even after the fish trap went on-line, Chinook and coho losses have continued; with coho rates being slightly higher than Chinook.

Upon entering the forebay, water flow is diverted towards the fish trap by large steel plates suspended by buoys. An exclusionary guide net is also in place across the fore bay, and is maintained and kept in place year-round. Many of the smolts caught in the fish collection facility are fish that have escaped from holding ponds above the diversion dam. The above mentioned efforts are made to direct the fish into the trap, where they are then crowded into a hopper, and then deposited into a large holding tank. Fish are dip-netted from the holding tank and placed into a smaller container and anesthetized, identified and measured. Finally, fish are placed into a water trailer for transport down to the powerhouse where they are released back into the Puyallup River at RM 31.2.

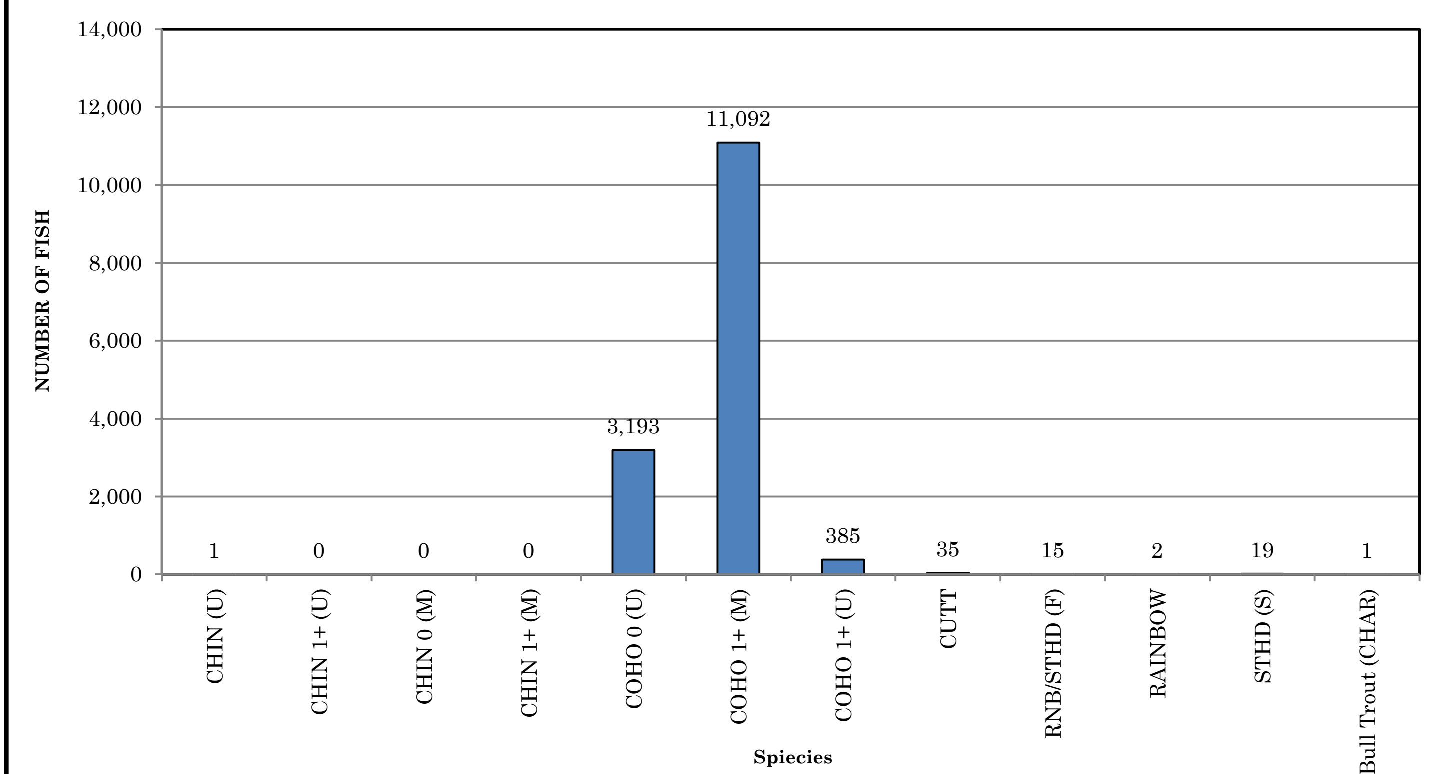
The Electron fish ladder *(left side of photo)*, diversion dam *(right side)*, and headworks.

Electron Fish Collection Facility
Composition of Salmonids Captured and Sampled (2008-2014)



NOTE: ESA listed mortalities are not included in sampling charts.

Number of Fish Captured at Electron Fish Collection facility January thru June (2015)



FENNEL CREEK 10.0406

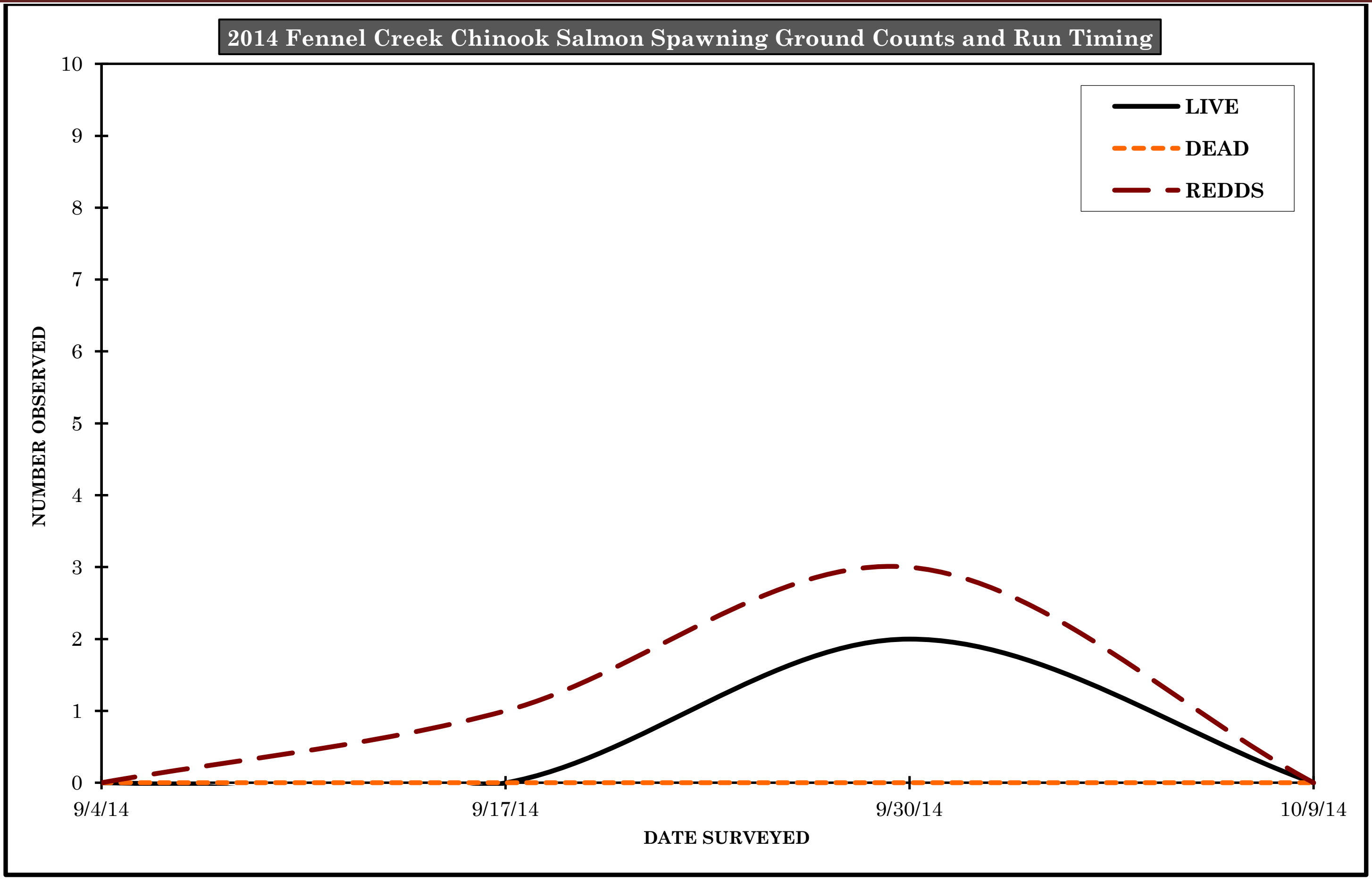
Fennel Creek (*Kelly Cr.*) flows nearly 8 miles from its source of wetlands and lowland lakes located on the plateau near Bonney Lake and HWY 410; to its eventual convergence with the Puyallup River near Alderton at RM 15.5. With a drainage area of over 6.5 square miles, Fennel Creek provides approximately 2 miles of anadromous usage. A natural 100 foot barrier falls (*Victor Falls*) is located at river mile 1.9. The anadromous reach provides abundant suitable habitat for Chinook *(top photo)*, coho, pink, chum, and steelhead. Pink and chum salmon are undoubtedly the most prolific species to spawn in the creek; unfortunately, steelhead escapement has dropped precipitously over the past decade. Bull trout utilization in Fennel Creek is unknown; however, it is assumed that Adult fluvial bull trout which are often caught in the Puyallup River near Fennel, and are known to forage in the smaller tributaries of the lower Puyallup, likely exploit prey species in Fennel Creek as well. Other species present throughout Fennel include cutthroat trout, sculpins, sticklebacks, and lamprey.

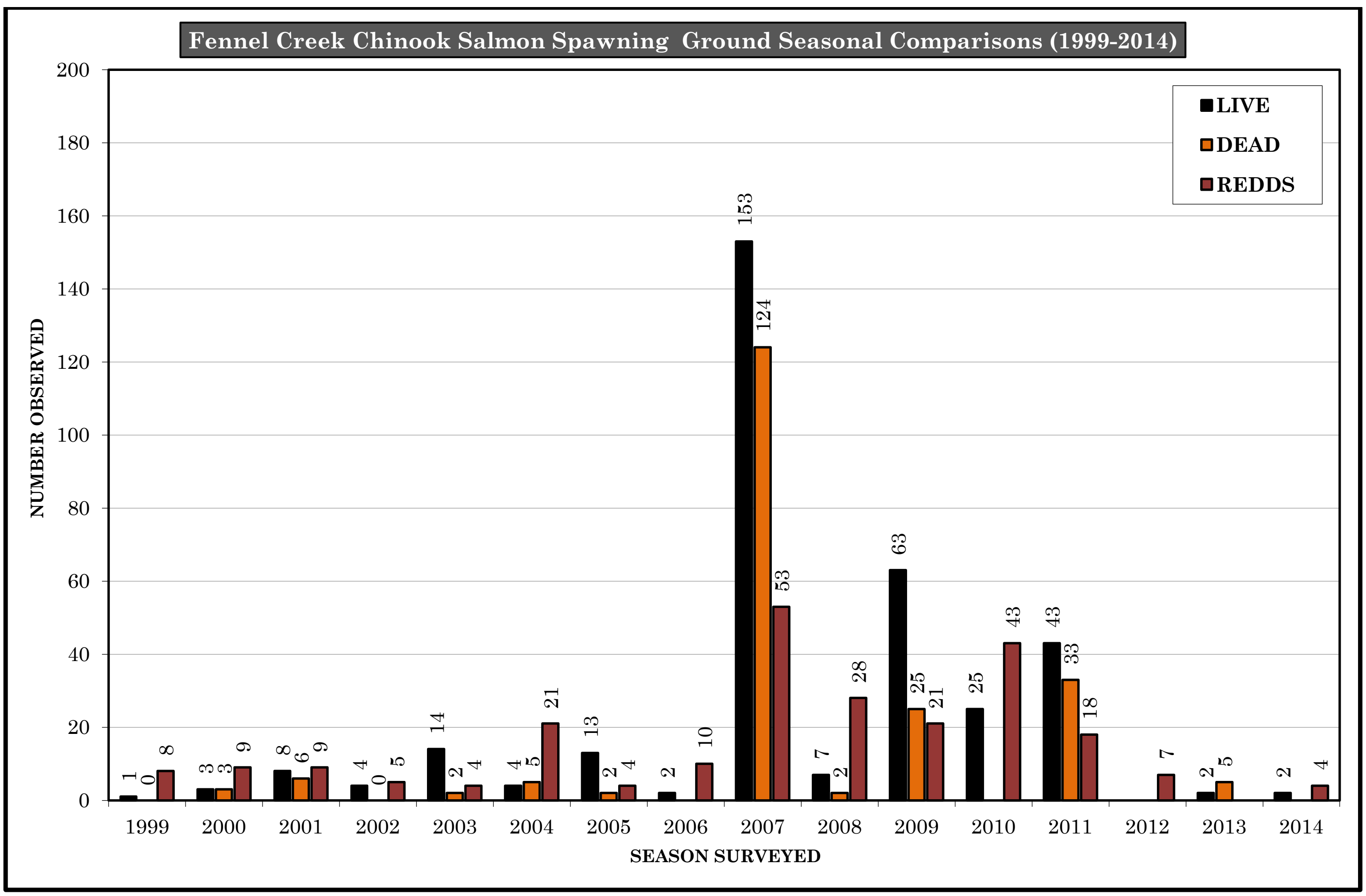
The lowest reach of the creek, extending from the mouth to McCutcheon Rd. Bridge (*0.3 miles*), flows primarily within the Puyallup River flood plain. This section of the creek consists of a low gradient channel containing excellent, if somewhat unstable spawning gravels; as well as much lower amounts of LWD and less channel complexity then what is found upstream. Approximately 0.2 miles upstream of the McCutcheon Bridge is a short run spring fed tributary, Fennel Tributary, which contains excellent spawning gravel and has supported high densities of adult chum spawners in the past.

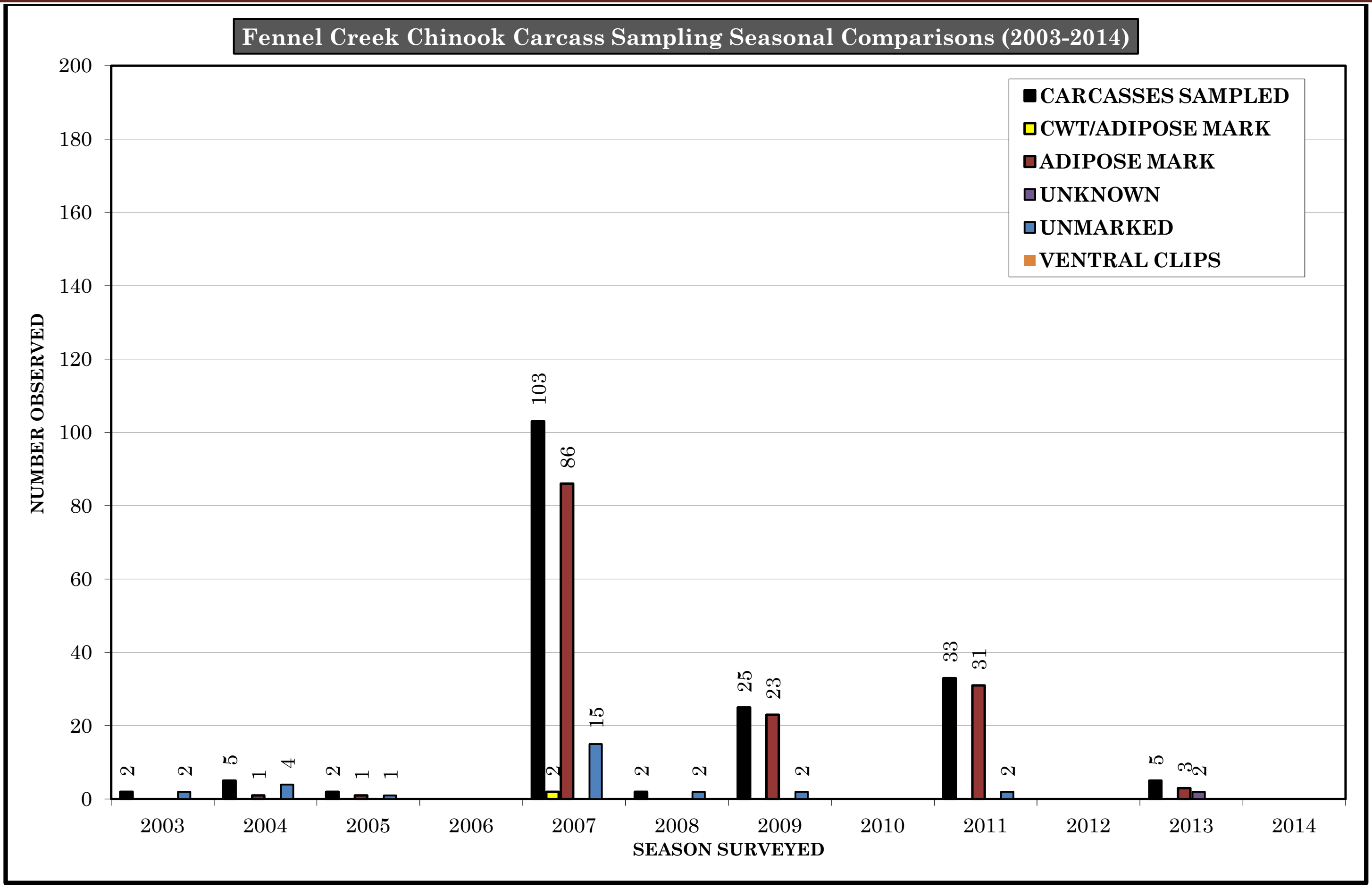
The upper anadromous reach of Fennel Creek is a complex, moderate gradient, pool-riffle/step-pool stream flowing through a broad valley. Victor falls, at RM 1.9, blocks any further upstream migration. The riparian zone is well intact due to little or no agricultural or residential land use development along most of the creek channel; the overstory riparian consists of a mature hardwood and conifer forest with a dense understory of salmonberry and vine maple. Throughout the upper 1.5 mile anadromous stretch, abundant LWD lies in and adjacent to the channel; as well as several small in-stream logjams. Spawning gravel is abundant and excellent throughout this reach, as are numerous deep resting pools for juveniles and adult migrants.

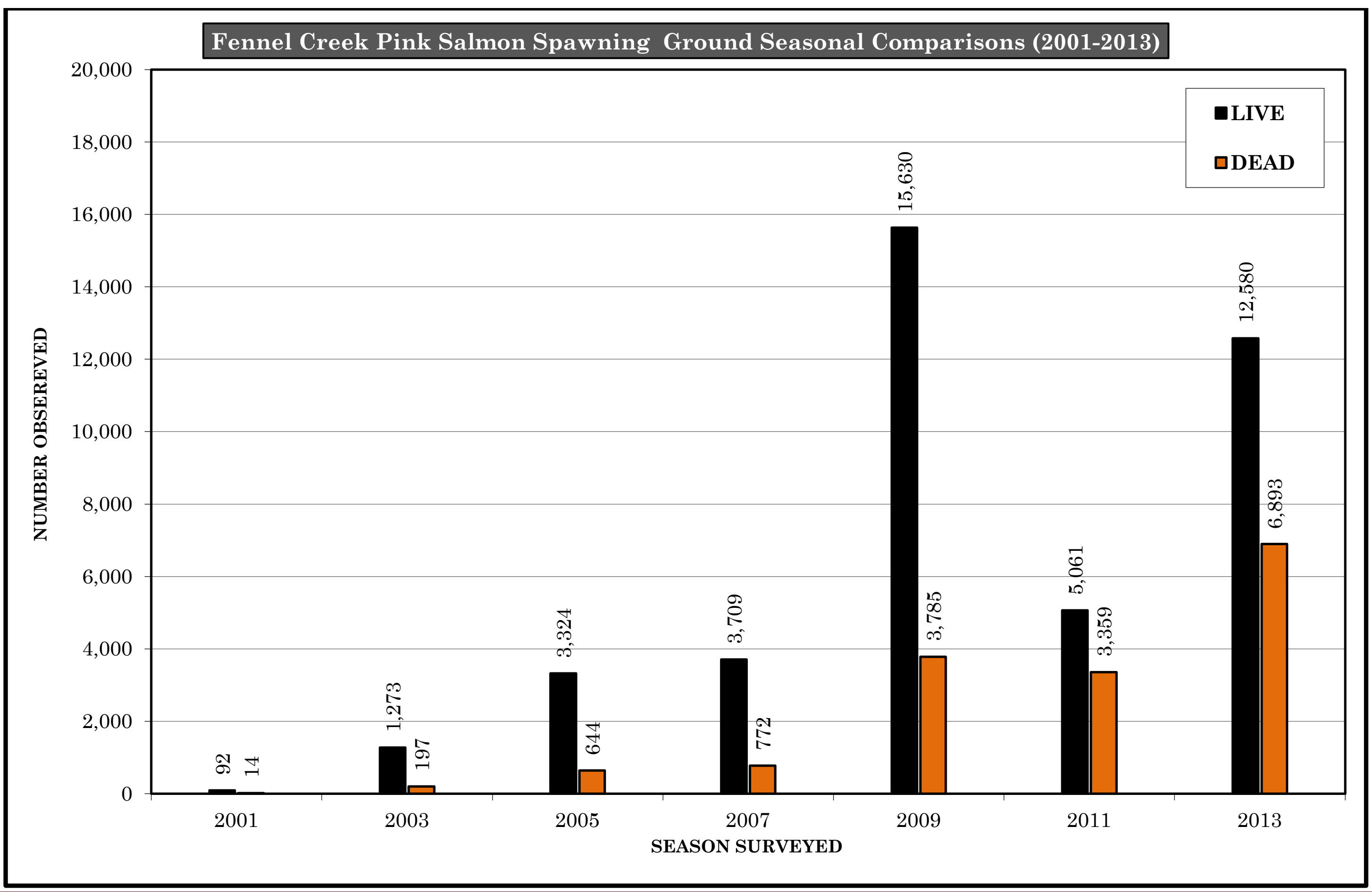
Uniquely, Fennel Creek experiences an early run of chum salmon each year; with fish often entering the creek in late October, nearly three weeks earlier than most lower Puyallup tributaries. Also noteworthy, is the unprecedented number of Chinook adults observed spawning in the creek during the 2007 season. Although carcass sampling showed that around 85% were hatchery origin; over 150 adult Chinook were counted in the creek, dwarfing the average seasonal count. Coho and chum seasonal totals on the following pages include both Fennel Creek, and Fennel Tributary data combined.

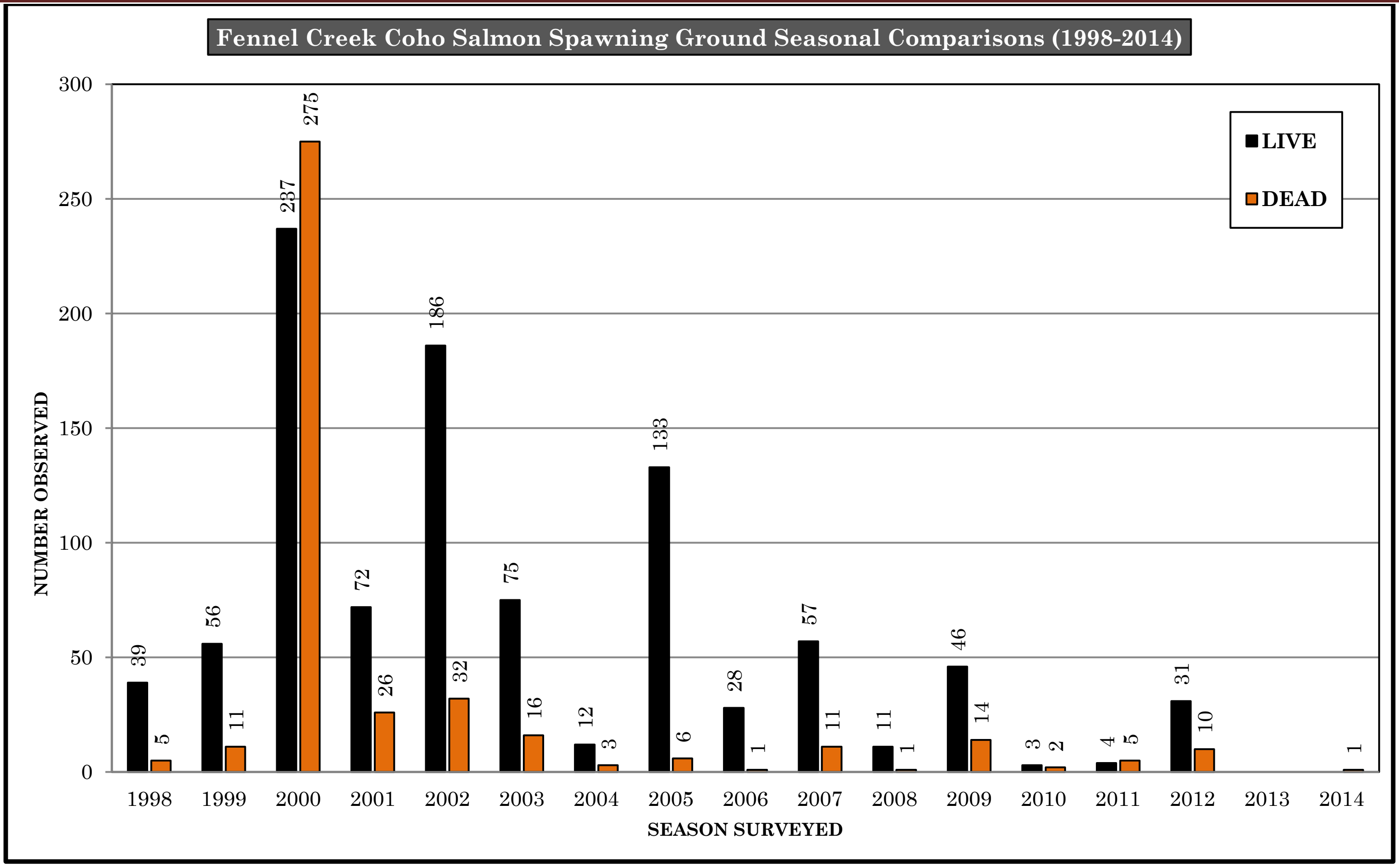
In May of 2009, a 9.75-acre land conservation area along Fennel Creek in Bonney Lake was created through a cooperative partnership between Pierce County, the City of Bonney Lake, and the Cascade Land Conservancy. The land conservancy will protect habitat along Fennel Creek and will eventually be the location of the Fennel Creek Trailhead. For more information on Fennel Creek, or if you would like to support preservation efforts on the creek, go to *www.fennelcreek.org*.


2014 Fennel Creek Chinook Salmon Spawning Ground Counts and Run Timing
NUMBER OBSERVED
0
1
2
3
4
5
6
7
8
9
10
9/4/14
9/17/14
9/30/14
10/9/14
DATE SURVEYED
LIVE
DEAD
REDDS

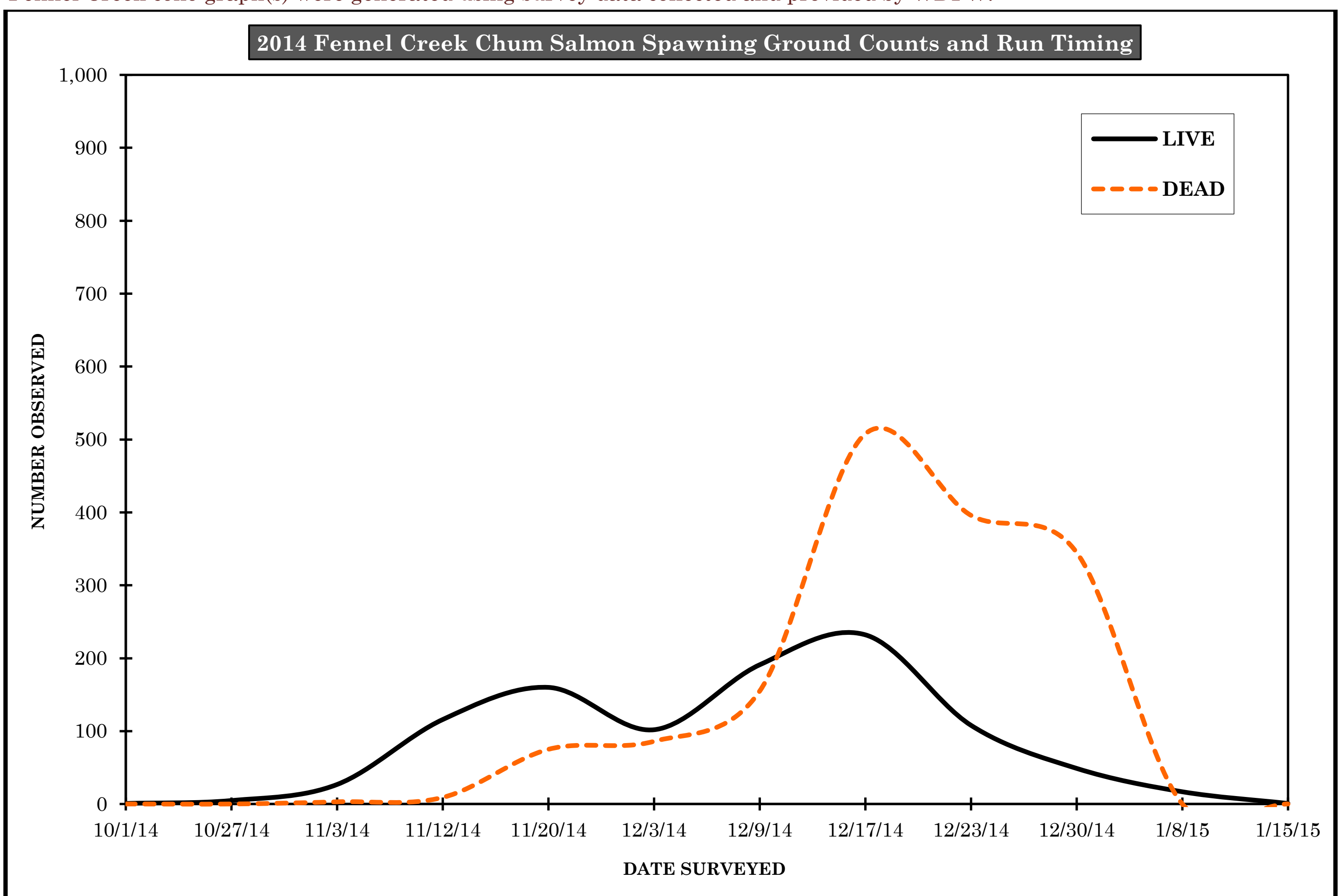

Fennel Creek Chinook Salmon Spawning Ground Seasonal Comparisons (1999-2014)
NUMBER OBSERVED
0
20
40
60
80
100
120
140
160
180
200
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
SEASON SURVEYED
LIVE
DEAD
REDDS
1 0 8
3 3 9
8 6 9
4 0 5
14 2 4
4 5 21
13 2 4
2 10
153 124 53
7 2 28
63 25 21
25 43
43 33 18
7
2 5
2 4

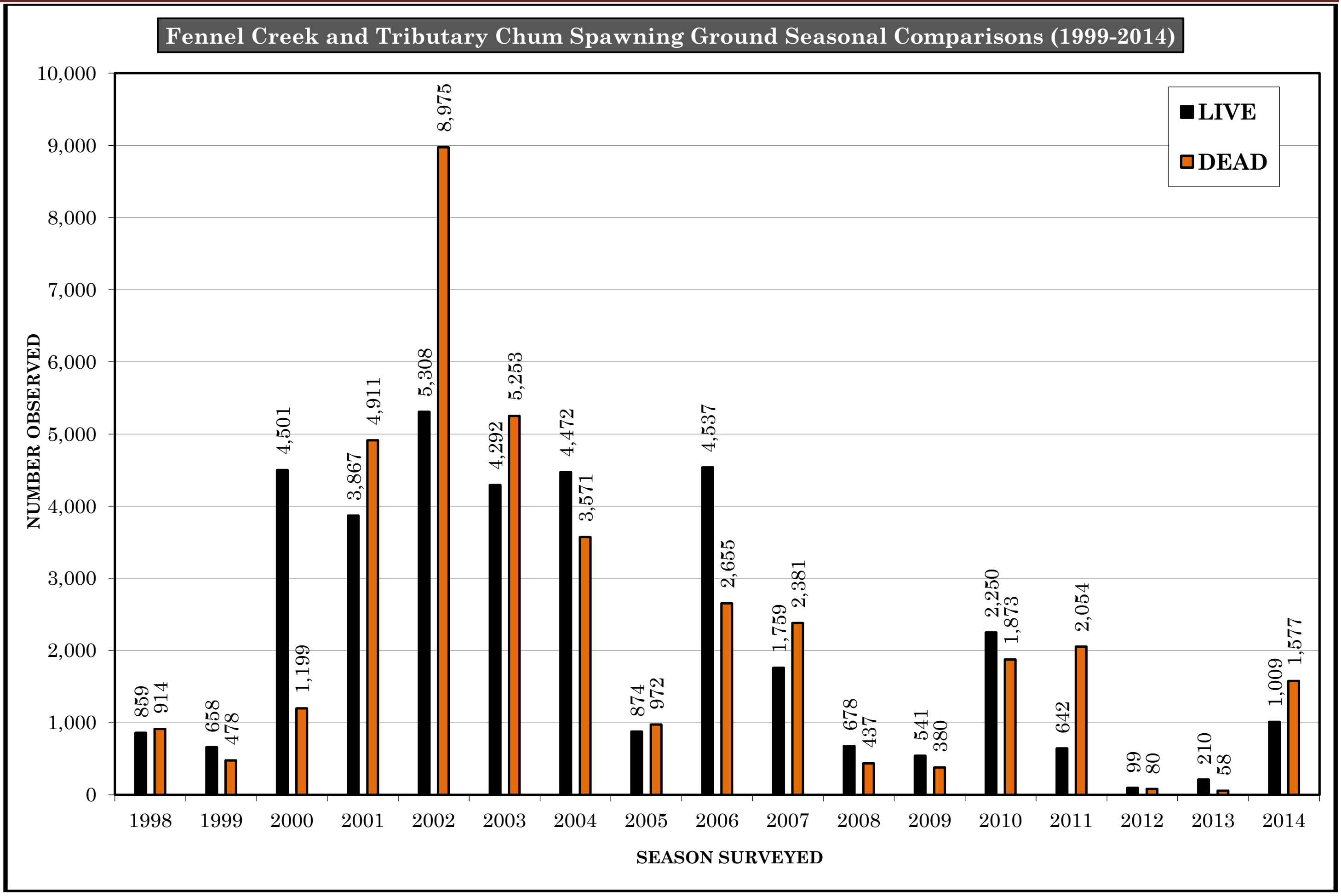

Fennel Creek Chinook Carcass Sampling Seasonal Comparisons (2003-2014)
CARCASSES SAMPLED
CWT/ADIPOSE MARK
ADIPOSE MARK
UNKNOWN
UNMARKED
VENTRAL CLIPS
NUMBER OBSERVED
SEASON SURVEYED
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014


Fennel Creek Pink Salmon Spawning Ground Seasonal Comparisons (2001-2013)
LIVE
DEAD
NUMBER OBSEREVED
SEASON SURVEYED
2001
2003
2005
2007
2009
2011
2013

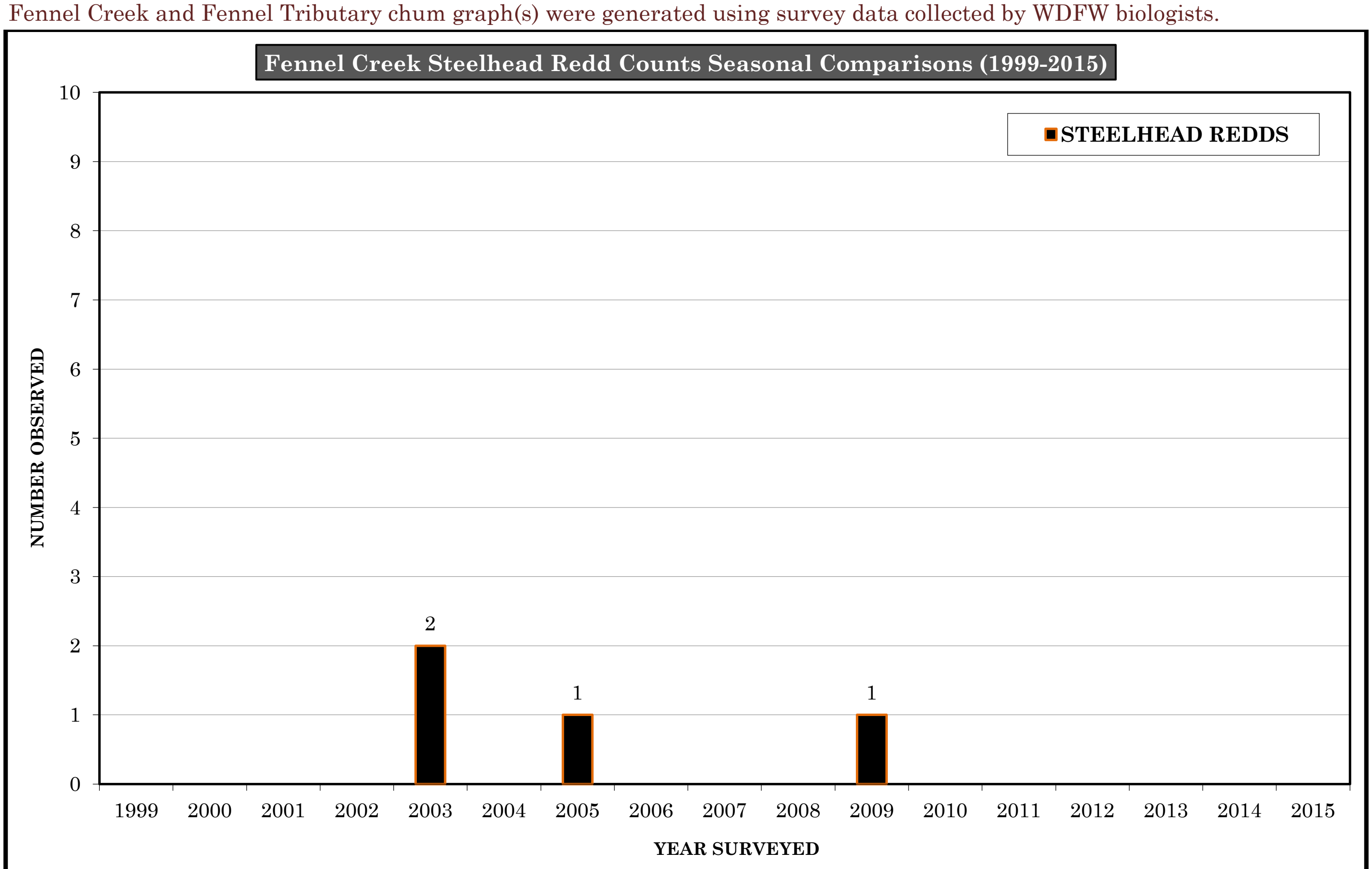


Fennel Creek coho graph(s) were generated using survey data collected and provided by WDFW.





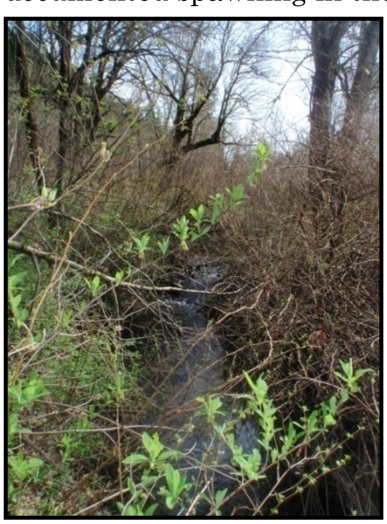
Fennel Creek and Fennel Tributary chum graph(s) were generated using survey data collected by WDFW biologists.



FISKE CREEK 10.0596

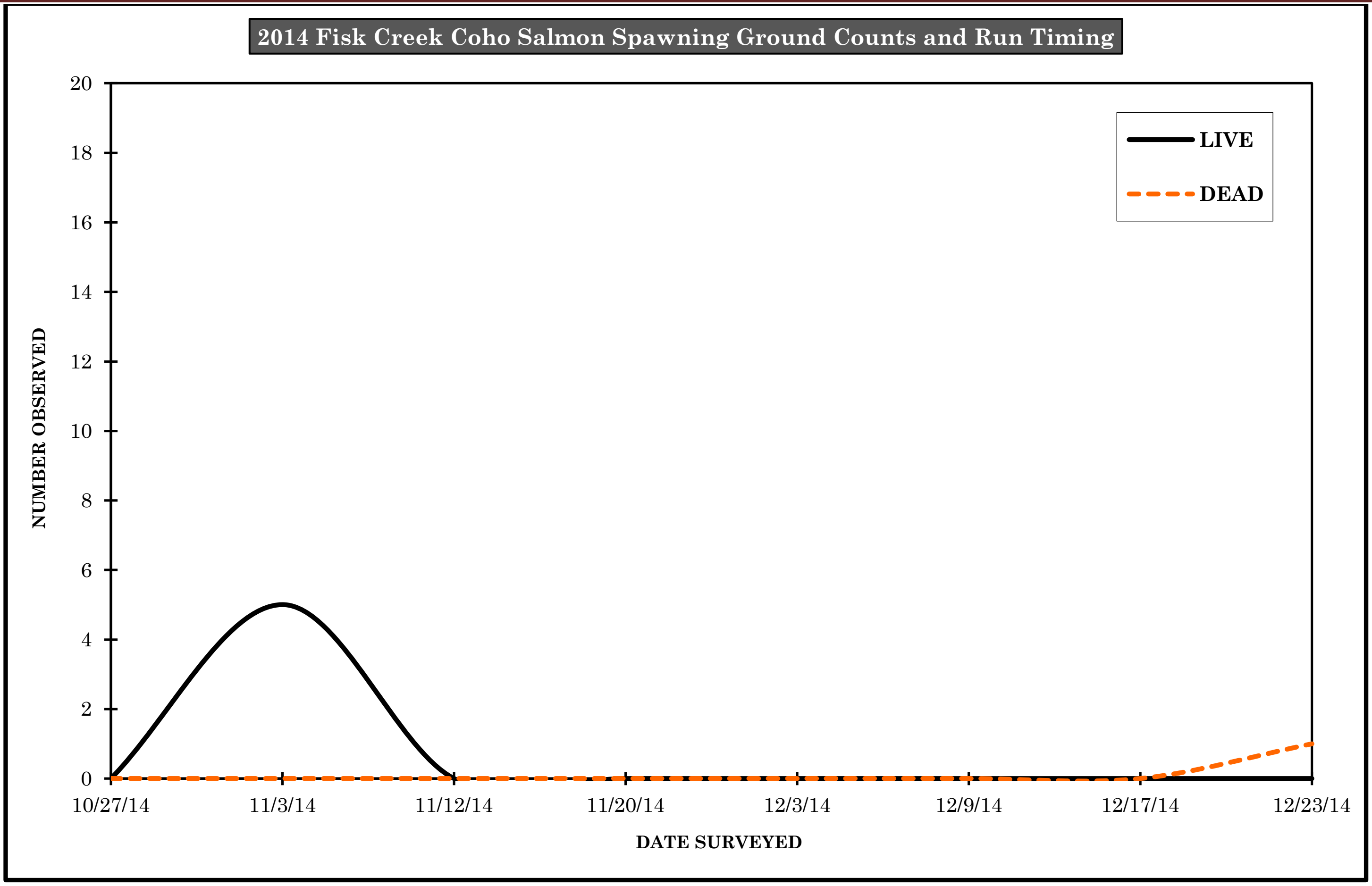
Fiske Creek is a small tributary to the Puyallup River, entering the Puyallup at approximately RM 26.6. Fiske Creek, (*fiske is a Swedish word meaning "fish"*) is one of 5 index streams in the Puyallup Watershed surveyed for coho by the Washington Department of Fish and Wildlife. State biologists use the coho escapement from five "index" tributaries (*Coal Mine, Spiketon, Fiske, Fennel and Canyonfalls creeks*) to estimate the total escapement for the Puyallup River.

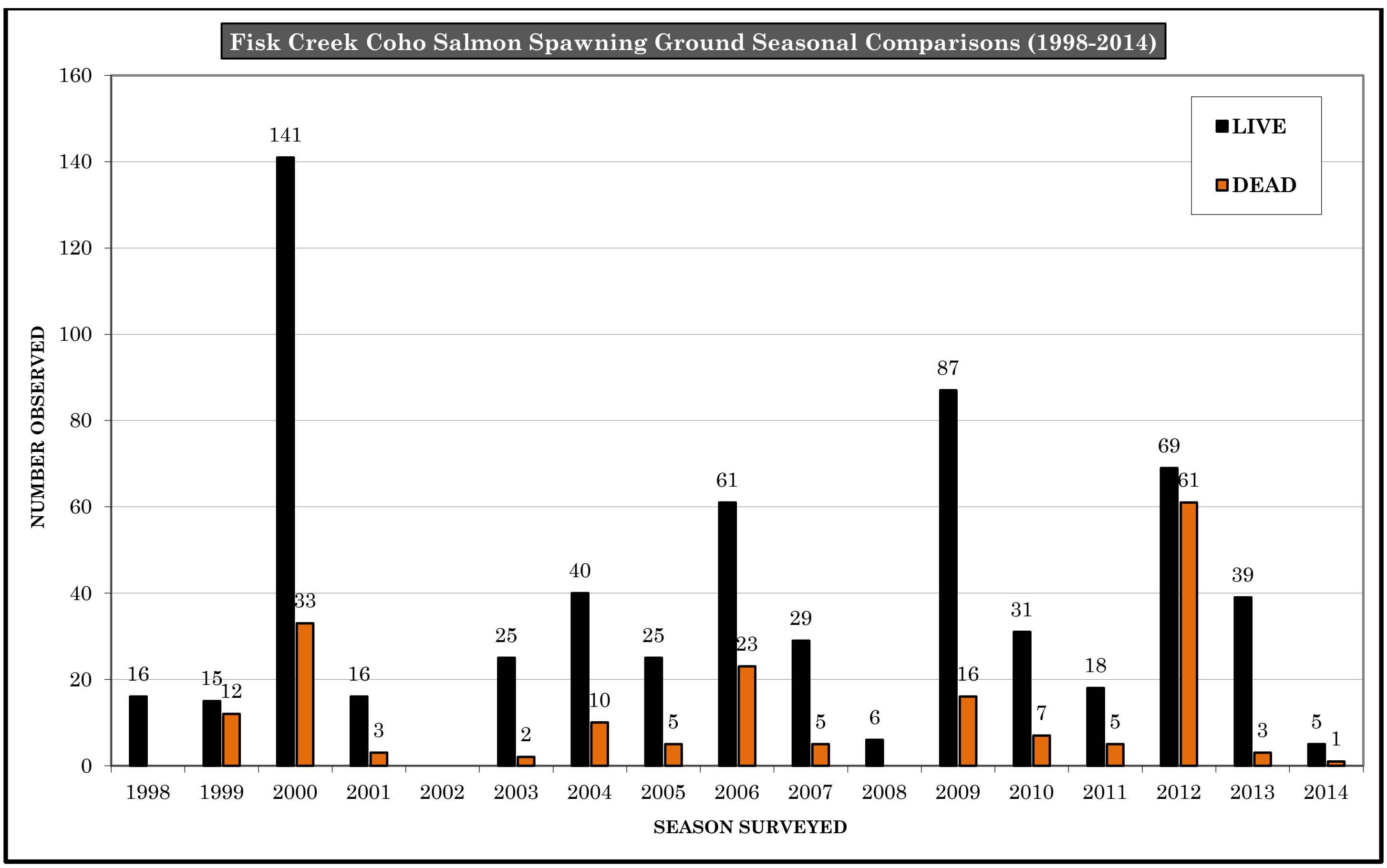
Coho are the only species observed spawning within Fiske Creek in significant numbers, although those numbers are relatively low *(average 37, range 0-141)*. In the past, steelhead and chum have been documented spawning in the creek as well. Unfortunately, seasonal flows within Fiske Creek are often inadequate to allow access for Chinook or steelhead to spawn. Furthermore, the streams location in the watershed, nearly 27 miles from Commencement Bay, make is less than ideal for chum. Bull trout are known to utilize the mainstem river; however, it's currently unknown what bull trout utilization is, if any, within Fiske.



Fiske Creek is a small stream flowing just over 2 miles, with a small unnamed tributary entering its right bank at RM 1.0. The upper headwaters reach is primarily cascades/step pool, with a substrate consisting primarily of large cobble and boulders. The lower reach of the creek consists of a low to moderate gradient pool-riffle channel with moderate riparian cover from the surrounding conifer and deciduous forest. Relatively abundant spawning gravel exists throughout most of the stream, but is somewhat compacted in the lower portion of the channel

There are several limiting factors affecting fish and habitat within Fiske. The creek channel is confined due to natural channel cutting, steep banks and rip-raped banks. Along the road and within the boundaries of private property, the channel is slightly incised and lacks any real complexity or off-channel habitat such as wetlands, side channels, or large woody debris. Moderate amounts of residential and other land use development exist along the creek, including private forest management. Land use along the lower reach consists mostly of private family residences and a county road (*Brooks Road*) which often traverses the creek. In addition, water is regularly diverted from the creek into a private pond on the lower reach. The creek passes through a couple of small, yet fish passable culverts *(right)*, as well as a low narrow bridge located approximately 0.3 miles up from its mouth. Several years ago, some complexity was added to the creek via a small restoration project which included the placement of small sill logs and boulders. However, tremendous improvements are possible to stream channel habitat and instream flows.



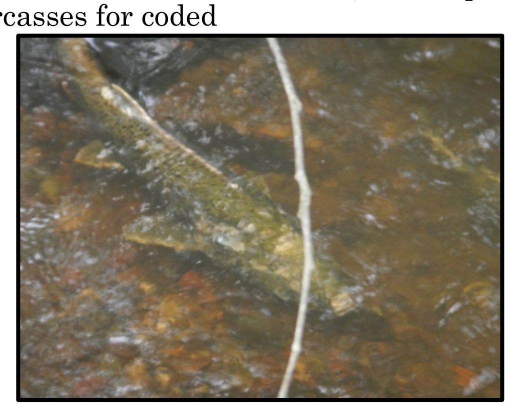


Fiske Creek coho graphs were generated using survey data collected and provided by WDFW biologists.

FOX CREEK 10.0608

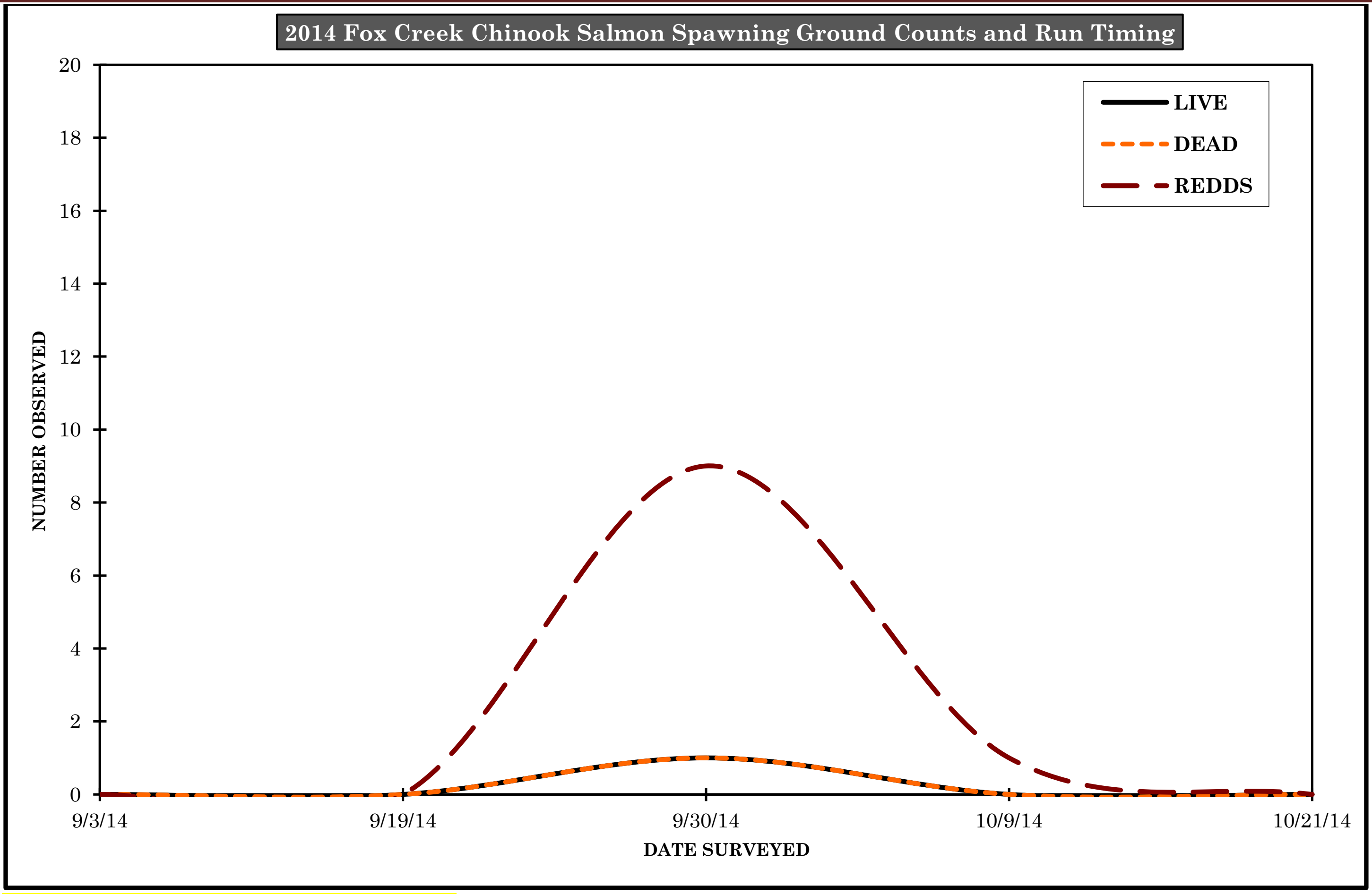
Fox Creek joins the Puyallup River at RM 29.5. Fox Creek is primarily a coho stream *(above)*, with fish likely ascending as far up as the 6 Road; however, the majority of spawning occurs within the first mile of the creek. Fox Creek flows within the Kapowsin tree farm (*Hancock Forest Resource Group*); where roads and timber harvesting have impacted several portions of the stream in the past. The most suitable spawning habitat exists from the mouth, up to the Road 1 Bridge. The first significant pink salmon escapement was observed during the 2009 season. Although sporadic, chum and steelhead spawning activity has been observed in the past; as well as a Chinook *(below)*.

Extensive sampling of coho carcasses for coded wire tags and fin clips has revealed that a large percentage of the spawners in Fox are Voights Creek hatchery origin fish. As juveniles, these fish were relocated from Voights Creek hatchery to acclimation ponds in the upper Puyallup River (*Cowskull and Rushingwater*) or Lake Kapowsin. Each spring, as many as 200,000+ coho yearlings are imprinted and released from the acclimation ponds, or are planted directly into the lake. All fish are marked with an adipose fin clip and approximately half are implanted with a coded wire tag, in addition to an adipose fin clip.

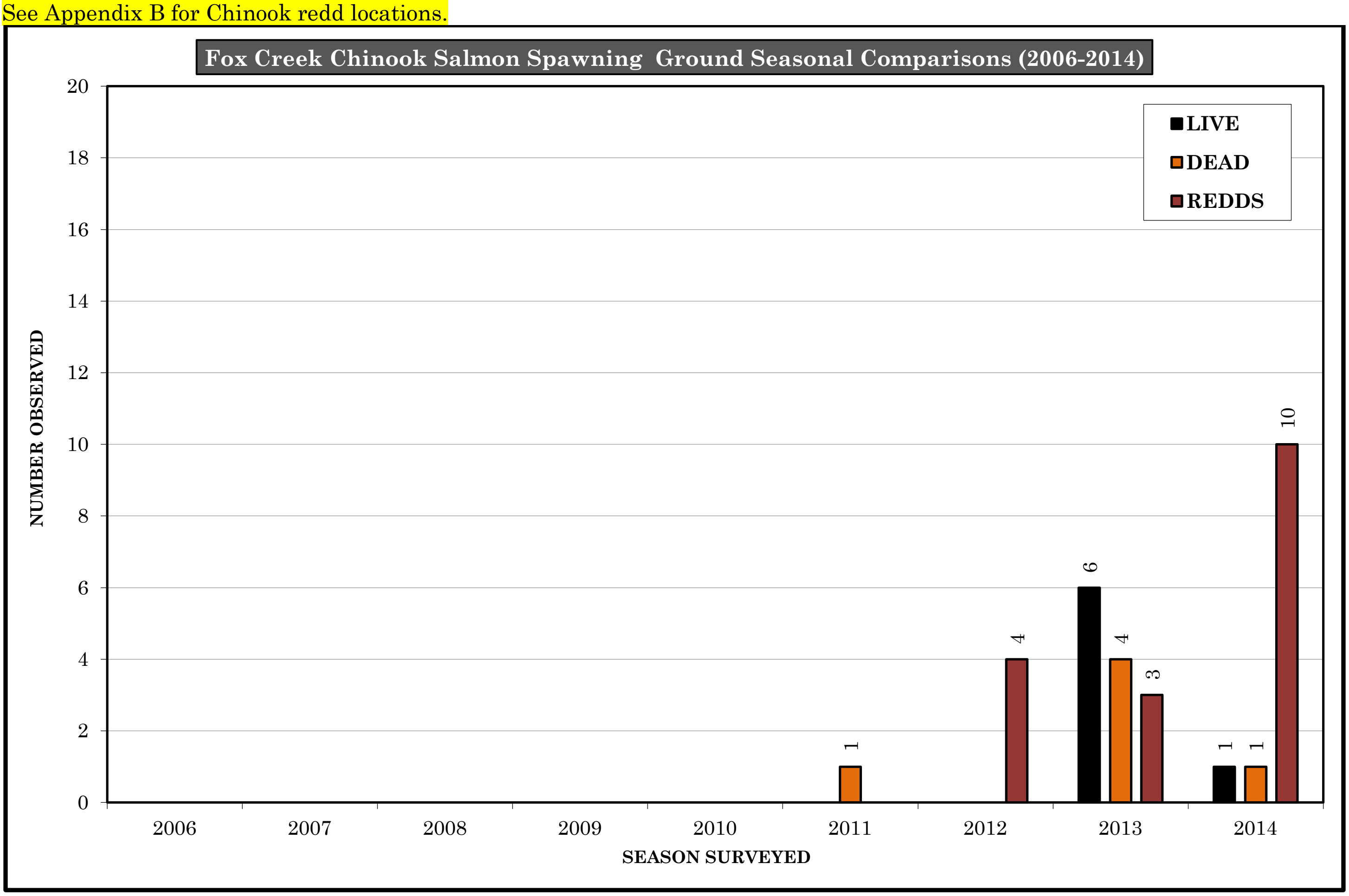


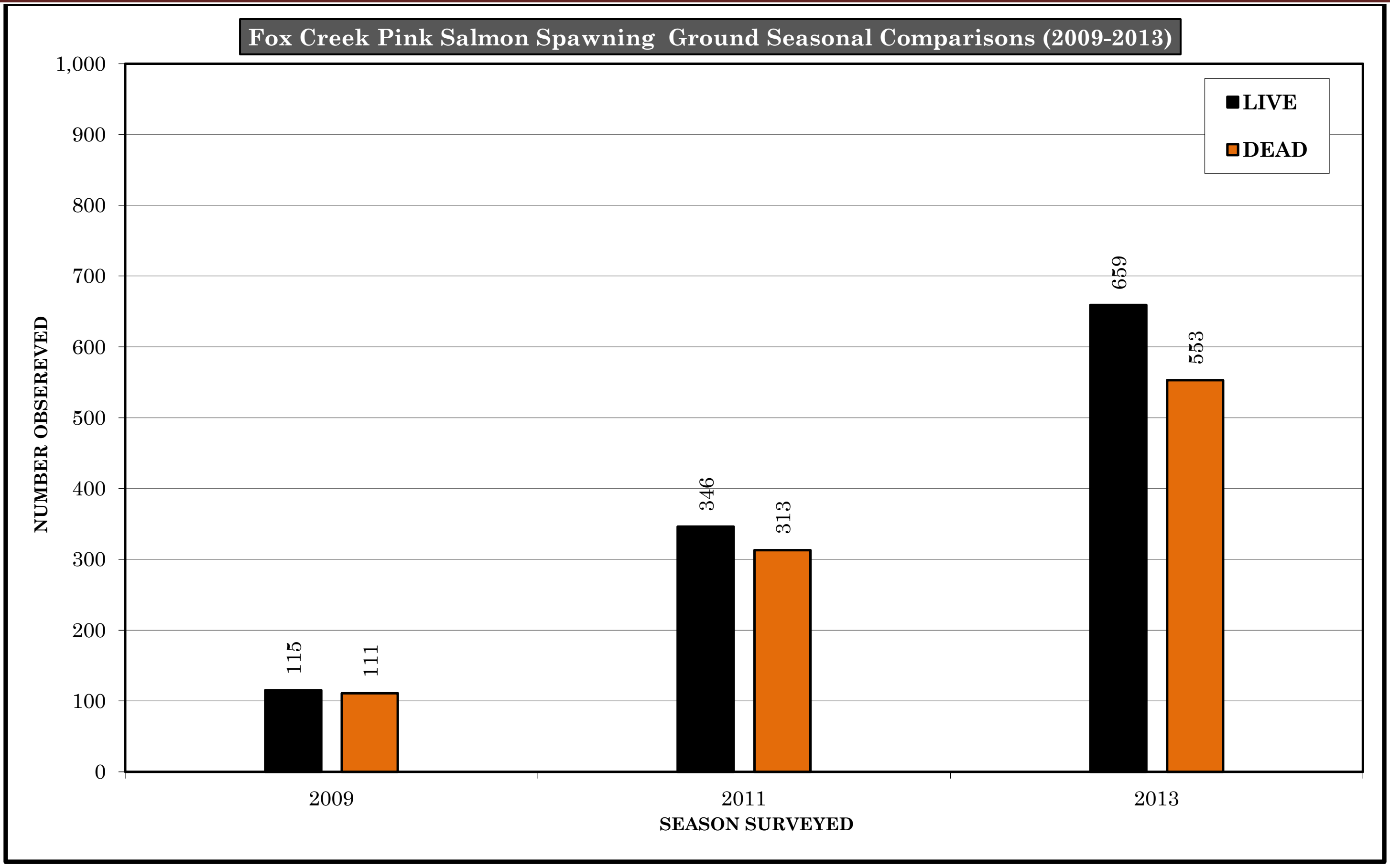
From its confluence with the Puyallup River, to approximately RM 0.3, Fox is a low gradient pool-riffle stream flowing through a moderately dense forested area consisting mostly of alders. There's abundant spawning habitat available throughout the lower 1 mile reach. Spawning activity by pink, coho, chum and steelhead have been observed within this lower reach. An adipose clipped Chinook jack was observed in 2011. Beyond this, from RM 0.3 to 0.5 the creek meanders through a grassy area with little riparian cover and moderate amounts of fine materials obscuring the gravelly substrate. The channel is relatively narrow and incised, yet coho spawning is prolific throughout the entire segment. This "middle reach" often has the highest spawning densities. Beyond RM 0.5, Fox becomes a moderate gradient step-pool/riffle stream with good pool frequency, along with adequate small conifer and hardwood riparian cover. There are few mature conifers in this reach, although many young Grand firs were planted as a part of a past restoration project.

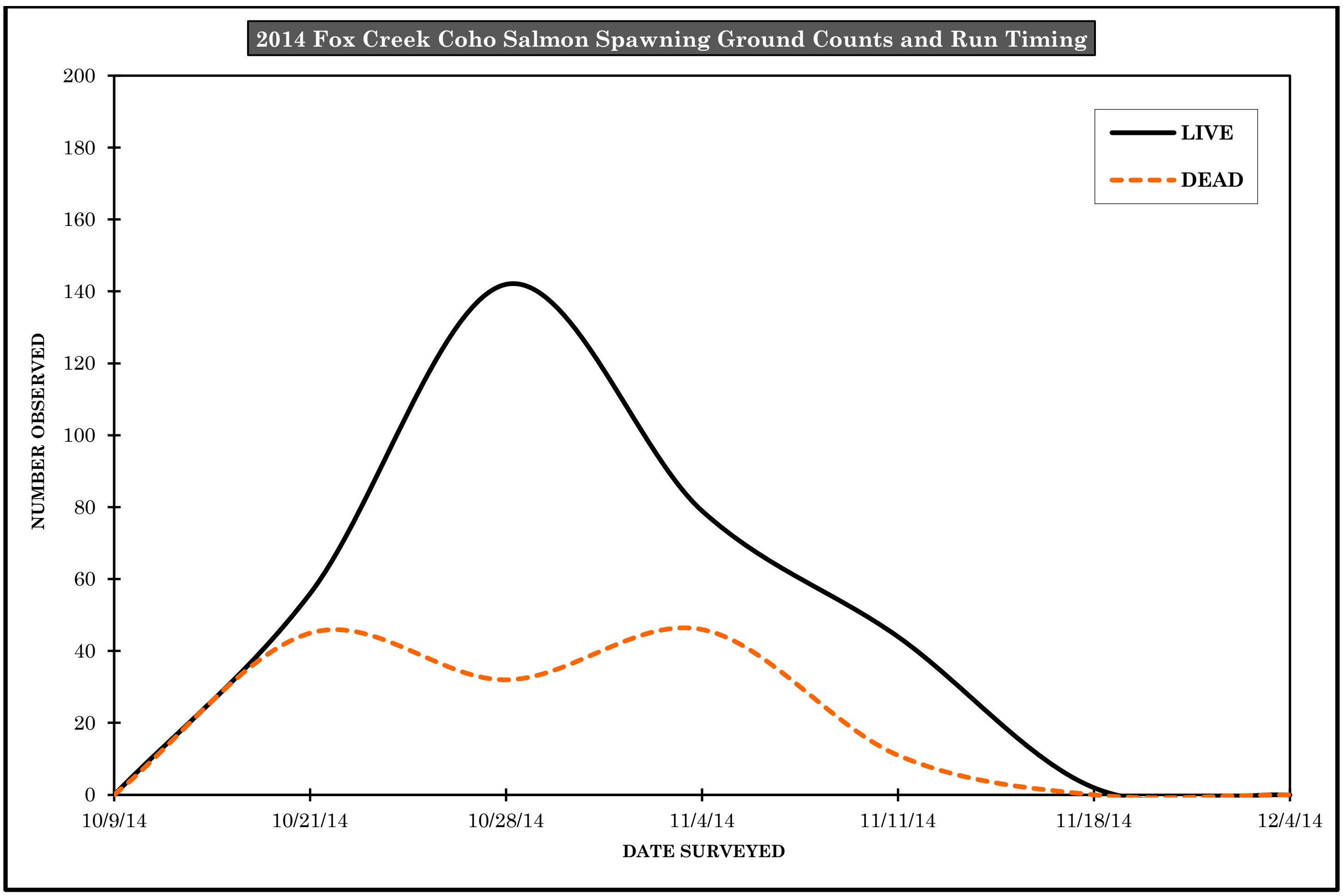
A substantial amount of beaver (*Castor canadensis*) activity exists throughout Fox Creek. Beaver dams, some up to six feet in height, often completely block and prevent fish from migrating upstream. Dams located along the lower mile of the creek are often breached during the beginning of the coho season to allow fish access to the spawning habitat above. Currently, the lower reach of the creek *(RM 0-0.15)* is a low gradient channel flowing within the open channel migration zone of the Puyallup River; a section repeatedly manipulated by mainstem river incursions.

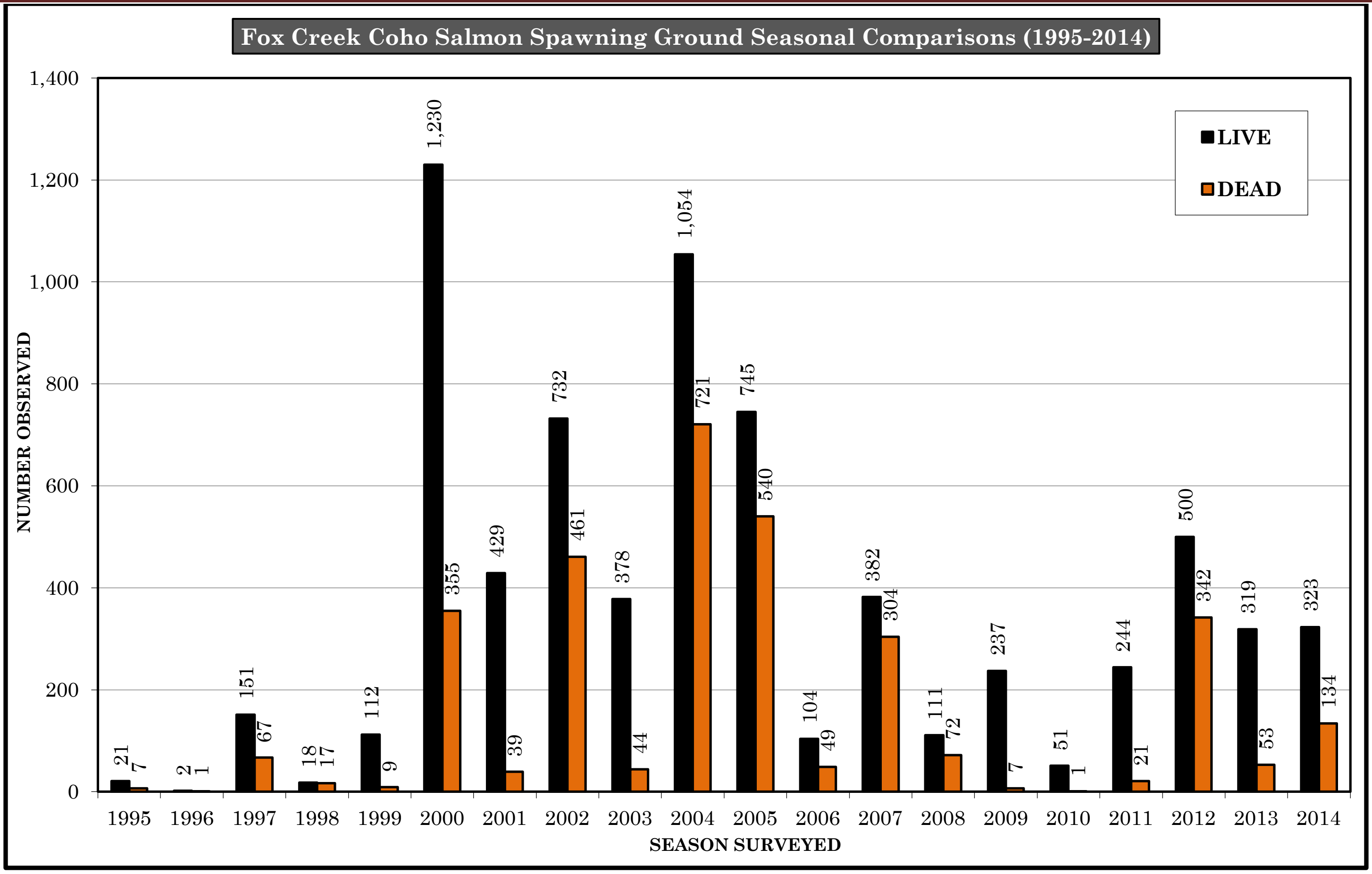


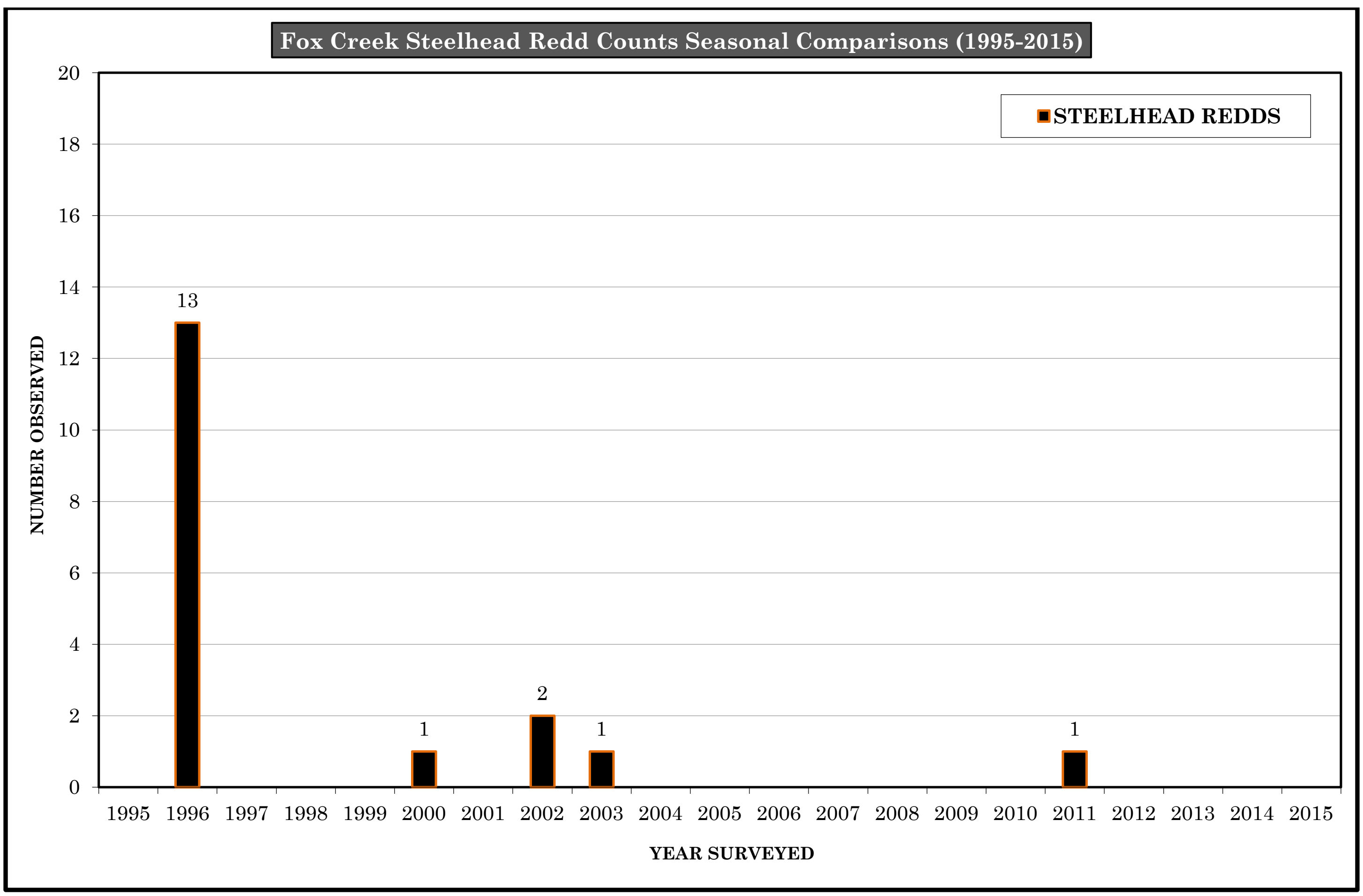
See Appendix B for Chinook redd locations.




Fox Creek Pink Salmon Spawning Ground Seasonal Comparisons (2009-2013)
LIVE
DEAD
NUMBER OBSEREVED
SEASON SURVEYED
2009
2011
2013
115
111
346
313
659
553
0
100
200
300
400
500
600
700
800
900
1,000


2014 Fox Creek Coho Salmon Spawning Ground Counts and Run Timing
LIVE
DEAD
NUMBER OBSERVED
DATE SURVEYED
10/9/14
10/21/14
10/28/14
11/4/14
11/11/14
11/18/14
12/4/14
0
20
40
60
80
100
120
140
160
180
200


Fox Creek Coho Salmon Spawning Ground Seasonal Comparisons (1995-2014)
LIVE
DEAD
NUMBER OBSERVED
SEASON SURVEYED
1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014
21 7 2 1 151 67 18 17 112 9 1,230 355 429 39 732 461 378 44 1,054 721 745 540 104 49 382 304 111 72 237 7 51 1 244 21 500 342 319 53 323 134


Fox Creek Steelhead Redd Counts Seasonal Comparisons (1995-2015)
STEELHEAD REDDS
NUMBER OBSERVED
YEAR SURVEYED
1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015
13 1 2 1 1

FRYINGPAN CREEK 10.0369

Fryingpan Creek is a moderate sized right bank tributary to the Upper White River. This headwaters creek is surveyed for bull trout from late August through September. Unfortunately, the 3700'+ elevation is likely too high for most salmonids; however, steelhead are quite capable of ascending to this headwater tributary to spawn; therefore, this should not preclude the possibility of steelhead utilization within this stream. Fryingpan does host a population of resident cutthroat and bull trout *(above)*; providing excellent rearing and spawning habitat for these two species.

Fryingpan enters the White River north of Sunrise Park Road at approximately RM 70.5. Fryingpan provides approximately 1.7 miles of anadromous usage. A falls *(below)* located at approximately RM 1.7 blocks any further upstream migration. The creek is almost entirely bordered by an old growth coniferous forest, and the water is cooled year round by glacial melt water from Fryingpan Glacier. In addition to the glacial influenced mainstem flow, there are several smaller nonglacial tributaries contributing flow along Fryingpan's nearly 4.7 mile length.

Typical of headwater streams, substrate bedding consists mainly of Tertiary sedimentary rock and other products created by ancient volcanic activity. Substrate size within active river channels is typically large; consisting primarily of large gravels, cobble and boulders. Significant quantities of LWD are present within the channel migration zone; however, a considerable amount of the larger wood which is deposited during high flow events and settles on the higher bars is detached from, or perched well above active channels during average flow regimes, thereby reducing any habitat creating interactions. The first 1.4 miles of Fryingpan consists of a large active braided channel that is low-to-moderate gradient. Several patches of excellent spawning gravel are available throughout this lower reach of the creek. Considerable amounts of LWD are present in the channel, although a great deal of it doesn't interact with the stream during average seasonal flows. Nevertheless, ample amounts of LWD are embedded in the creek channel creating beneficial fish habitat. In addition to spawning habitat, numerous pools and side channels are located throughout this lower reach; providing excellent rearing habitat for juvenile fish. Wright Creek and an unnamed tributary *(see Winzig Cr. in this report)*, both right bank tributaries located at RM 1.5 and 1.3, provide additional spawning habitat for bull trout.

From approximately RM 1.4 to the falls, the channel begins to narrow considerably due to the confinement created by steep upper valley walls. The channel assumes a step-pool configuration from this point on. Throughout this final reach of fish utilization, spawning opportunities are reduced due to the increased gradient, predominately larger substrate and rapid flows encountered. Bull trout have been documented ascending as far as the base of the falls. In 2006 and 2007, Puyallup Tribal Fisheries staff radio tagged bull trout (*9 fish in 2006 & 19 fish in 2007*) captured in the USACE fish trap near Buckley. Subsequently, a few of these bull trout were tracked from their release site at RM 45 on the White River (*near the town of Greenwater*) to Fryingpan Creek and its tributary Wright Creek. Spawning was observed in both creeks during the month of September.

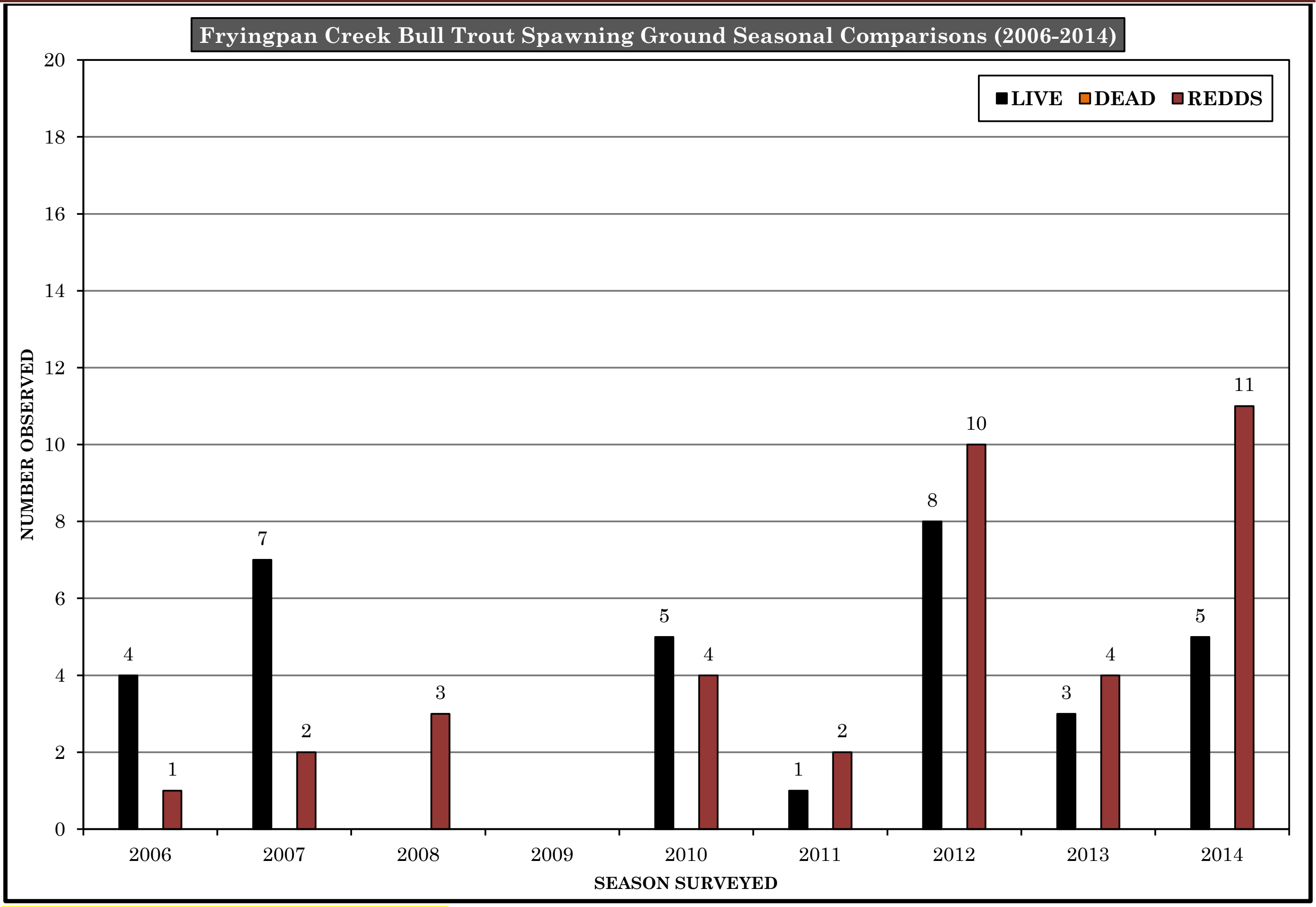
Resident bull trout reside in smaller headwater tributaries, while fluvial bull trout frequently travel long distances; utilizing the mainstem rivers and larger tributaries to forage and overwinter.

During the fall, migratory forms of bull trout journey from spawning and rearing habitats in the upper watershed to foraging and overwintering habitats located lower in the river system. Beginning in spring and early summer, they begin the return journey back to spawning and rearing areas high in the watershed. In response to changing habitat and reproductive needs, migratory bull trout in the White River travel up to 75 miles or more between the lower river and headwaters located in or near Mt. Rainier N.P. To accomplish this, bull trout require unobstructed migration corridors and connectivity of streams and rivers in order to provide them with access to spawning, rearing, foraging, and overwintering habitats.

Bull trout spawning occurs primarily during the first three weeks in September, however, spawning has been observed taking place from the last week of August through the first week of October. Bull trout are iteroparous *(ability to spawn more than once)*; therefore, recovering pre-or-post spawn mortalities for examination is extremely rare. Spawners in the upper White River tributaries are observed utilizing various sized substrate from small gravels to small cobble. Redds are often constructed in the tail-out of pools and along the channel margins. Embryonic development is slow *(depending on water temperatures)*; it may take between 165-235 days for eggs to hatch and for alevin to absorb their yolk (Pratt 1992). Bull trout fry emerge in late winter and early spring. Young fry can often be seen by mid March foraging in the lateral habitat along the upper mainstem White River and associate tributaries.

Bull trout habitat throughout the Puyallup and White rivers has been severely impacted by over a century of land and water resource exploitation; including, damming and substantial water diversions, considerable riparian alterations *(deforestation)*, dewatering and low instream flow regimes, as well as significant channel manipulation. These impacts have lead to a marked deterioration in land and hydrological behavior within these river systems by causing water flow of poorer quality, quantity and timing. Several limiting factors are involved with regards to the healthy function of stream habitat and bull trout populations in the watershed; including lost or diminished habitat connectivity and migration corridors, fragmentation and reduction of habitat quality *(entrainment, transportation networks, forest management practices and operations, direct water withdrawal)*; in addition to, water quality, fish entrainment and entrapment, unknown species interactions, and potential climate change impacts *(changes in flow regimes, scour effects, thermal variations and water chemistry).*

Bull trout are primarily piscivorous *(fish eaters)*. However, they are extremely opportunistic feeders, feeding on a variety of prey items depending on their particular life history strategy and stage of development. Adults feed almost exclusively on other fish, including a range of salmon and trout species; as well as other resident fish species. Juveniles feed on aquatic invertebrates, including stoneflies *(Plecoptera)*, caddisflies *(Trichoptera)*, and mayflies *(Ephemeroptera)*. Bull trout require a healthy aquatic environment in order to survive and flourish. Furthermore, they need an environment that provides the necessary prey base; in addition to the rearing and reproductive habitat essential to ensure their continued survival and reproductive success.



See Appendix B for bull trout redd locations.

GREENWATER RIVER 10.0122

The Greenwater River is a right bank tributary to the upper mainstem White River. The Greenwater originates in the Norse Peaks Wilderness area on Castle Mountain and flows westerly until it converges with the White River (*RM 46*) near the small town of Greenwater. The Greenwater basin drains an area over 73 square miles with an average water discharge of 210 cfs (*USGS gauge #12097500*). Several significant tributaries contribute flow along the Greenwater River's 21 mile course, including Pyramid, Lost, Maggie, Slide, and Twenty-eight Mile creeks. Historically, the Greenwater River has supported ESA listed Spring Chinook *(1999 listing)* and steelhead (*2007 listing*). In addition to Chinook and steelhead, the Greenwater supports large runs of pink and coho salmon. Other species present include bull trout *(1999 ESA listing)*, rainbow trout and cutthroat. Traditionally, the Greenwater Basin has also supported a substantial amount of recreational use, which has had its impacts on fish and wildlife.

The Greenwater is a modest sized, low gradient pool-riffle stream with abundant high quality spawning gravel. Much of the river flows through U.S. Forest Service land and the riparian zone consists primarily of second growth conifers, and hardwoods. Forestry operations along the river, primarily timber harvesting and road construction, have negatively impacted portions of the stream. Only limited amounts of LWD exist in the channel, and the average size reflects the surrounding young forest and is therefore generally small in nature. Unfortunately, large key pieces of timber are located too far from the river channel; thus, the need for additional ELJ projects.

The Greenwater has been surveyed in the past for both Chinook and steelhead by the Washington Department of Fish and Wildlife; however, surveys are not conducted for coho. As with all upper White River surveys; adult salmon and steelhead that spawn in the Greenwater River were captured at the USACE fish trap in Buckley, and transported above Mud Mountain dam. Since precise escapement numbers for the upper White River drainage are known, surveys are conducted to determine fish distribution and spawning success. The Upper White River coho escapement is derived from counts made at the Army Corps of Engineers' Buckley trap.

In the spring of 2007, the Puyallup tribe transported 223,740 juvenile Spring Chinook from WDFW's Minter Creek facility, to the Greenwater River. These fish were planted directly into the creek since there was no acclimation pond available on the Greenwater prior to 2007. To address this issue, a Spring Chinook acclimation pond was completed in the summer of 2007, near George Creek (*center photo*). Capable of holding over 500,000 Spring Chinook; the construction of the acclimation pond was funded by the City of Tacoma as a result of a mitigation settlement. Design engineering was funded by the Pacific Coast Salmon Recovery Fund (*PCSRF*).

Watershed Fish Enhancement Project: The Puyallup Tribe operates up to several acclimation ponds in the Puyallup/White River Watershed designed to reestablish and enhance Spring/Fall Chinook, winter steelhead and coho stocks. Each of two acclimation ponds *(Cowskull & Rushingwater)* on the Puyallup would receive as many as 100K+ hatchery origin spring/fall Chinook and/or coho. The additional acclimation ponds located in the Upper White River drainage *(Huckleberry, Greenwater & Jensen Creeks)* can be planted collectively with up to 900K+ White River Spring Chinook and 25K+ White River winter steelhead pre-smolts. When obtainable, the Puyallup Tribe will collect, haul and plant surplus adult hatchery fall Chinook and coho from WDFW's Voights Creek hatchery to spawn naturally in minor spawning or underutilized areas. When available, the Puyallup Tribe will in-stream plant juvenile hatchery fall Chinook and chum from the Tribe's Clarks and Diru Creek hatchery facilities to underutilized habitat areas.

Goals, Purpose and Expected Benefits: One of the Puyallup Tribe's most significant restoration goals is to rebuild depressed Chinook and steelhead stocks and remove them from ESA listing. Acclimation ponds, juvenile in-stream plants and adult surplus fish plants are a proven method for increasing fish stocks, and are key component to restoration goals.

Purpose:

- Produce Spring/Fall Chinook, winter steelhead and coho for the Puyallup/White River salmon conservation and harvest programs.
- Establish a total annual return of Spring Chinook Natural Origin Recruits (NORs) that meets the escapement goals for White River Spring Chinook Recovery.
- Provide sustainable harvest for tribal and non-tribal fisheries on Fall Chinook and non ESA listed coho.
- Optimize hatchery and natural production consistent with the conservation of naturally produced native fish.
- Maintain genetic makeup of Chinook and steelhead populations spawned or reared in captivity.

Benefits:

- Reestablish and enhance ESA listed Spring/Fall Chinook and steelhead; as well as non-listed coho into their endemic range.
- Increased total abundance of the composite natural/hatchery population.
- Increased spawning ground escapement and trend of Natural Origin Recruits (NORs).
- Improve distribution *(out planting of live fish)* of salmon to minor spawning and underutilized rearing habitat areas.
- Provide future tribal and sport harvest opportunities.
- Nutrient enhancement in oligotrophic *(nutrient-poor)* streams.

In 2011, an extensive floodplain restoration project was completed on the Greenwater River. The following aptly describes the project that restored a two mile reach along the lower river.

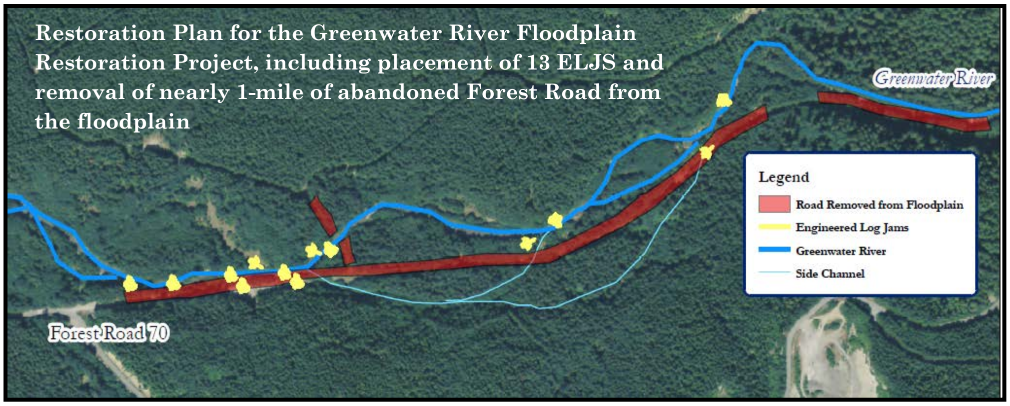
Greenwater River Floodplain Restoration Project

Written by Kristin Williamson
-South Puget Sound Salmon Enhancement Group
(Reprinted with Permission)

Project Description

The objective of the Greenwater River Floodplain Restoration Project is to restore aquatic and riparian habitat within a 2 mile reach of the Greenwater River. The project reach is River Mile 5.0 to 7.0 within the Mount Baker-Snoqualmie National Forest, adjacent to Forest Service Road 70. Restoration is focused on the re-introduction of functional wood and the removal of .8miles/4,500 linear feet of the abandoned Forest Service Road 7000 located within the Greenwater River Floodplain.

Historically, the Greenwater River was one of the principle spawning and rearing areas in the White River watershed for spring Chinook, bull trout, steelhead and coho. Based upon the old-growth forest in the Greenwater Valley floor, evident in the 1956 aerial photographs, recruitment



of large trees to the floodplain was likely the primary factor maintaining salmon habitat in the River. Early photos show the River to be in pristine condition, characterized by sinuous channels with many large, deep pools associated with log jams. Pool habitat is critical for rearing salmon, bull trout, and other resident fishes to provide cool places for forage and refuge from predators.

A legacy of timber harvest altered the Greenwater River between the late 1950s and late 1960s. During this period, the majority of the trees in the Greenwater River were removed from the valley all the way to the banks of the River. These practices effectively stripped the Greenwater River of all instream wood, removed the forest structure from the floodplain, and subsequently increased channel incision, stream velocities, and river bed scour. The current channel is incised with very few pools, little holding and rearing habitat available to salmonids, and almost no functional stream side cover to provide shade, structure,

input of nutrients, and recruitment of woody debris.

Given these impacts and the current lack of large woody debris, the young age of the existing stream-side forest, and large volumes of sediment available in the Greenwater River, it could take centuries for the system to return to a river sustained by natural processes. To help reestablish the natural conditions needed to sustain salmon and other species utilizing the system, a restoration plan was developed to rehabilitate the lost processes of wood recruitment, forest canopy, and floodplain connection through strategic placement of Engineered Log Jams (ELJs) and removal of road fill and armor from the floodplain.

Watershed and Aquatic Benefits

Overall, project efforts will increase flood storage within the project reach and reduce downstream peak flows, thereby providing greater stability and balance to the watershed. The proposed log jam structures will accelerate and maintain system-wide natural processes while reducing sediment loading, stabilizing banks for establishment of stream-side forest, and providing habitat for salmon and other fish. The species benefiting from this project include: White River Spring Chinook, Puget Sound steelhead, pink salmon, coho salmon, bull trout, and coastal and resident cutthroat trout.

Specifically, project efforts will:

- Create large, persistent structures that will trap mobile wood and sediment
- Reduce erosion and sedimentation sources within the project reach by dampening peak flow velocities
- Aggrade the existing river bed elevation to reconnect stream flows to the floodplain to increase flood storage, and provide backwater, flood refuge for rearing juvenile fish
- Increase side channel rearing capacity and spawning opportunity for juvenile and adult salmon

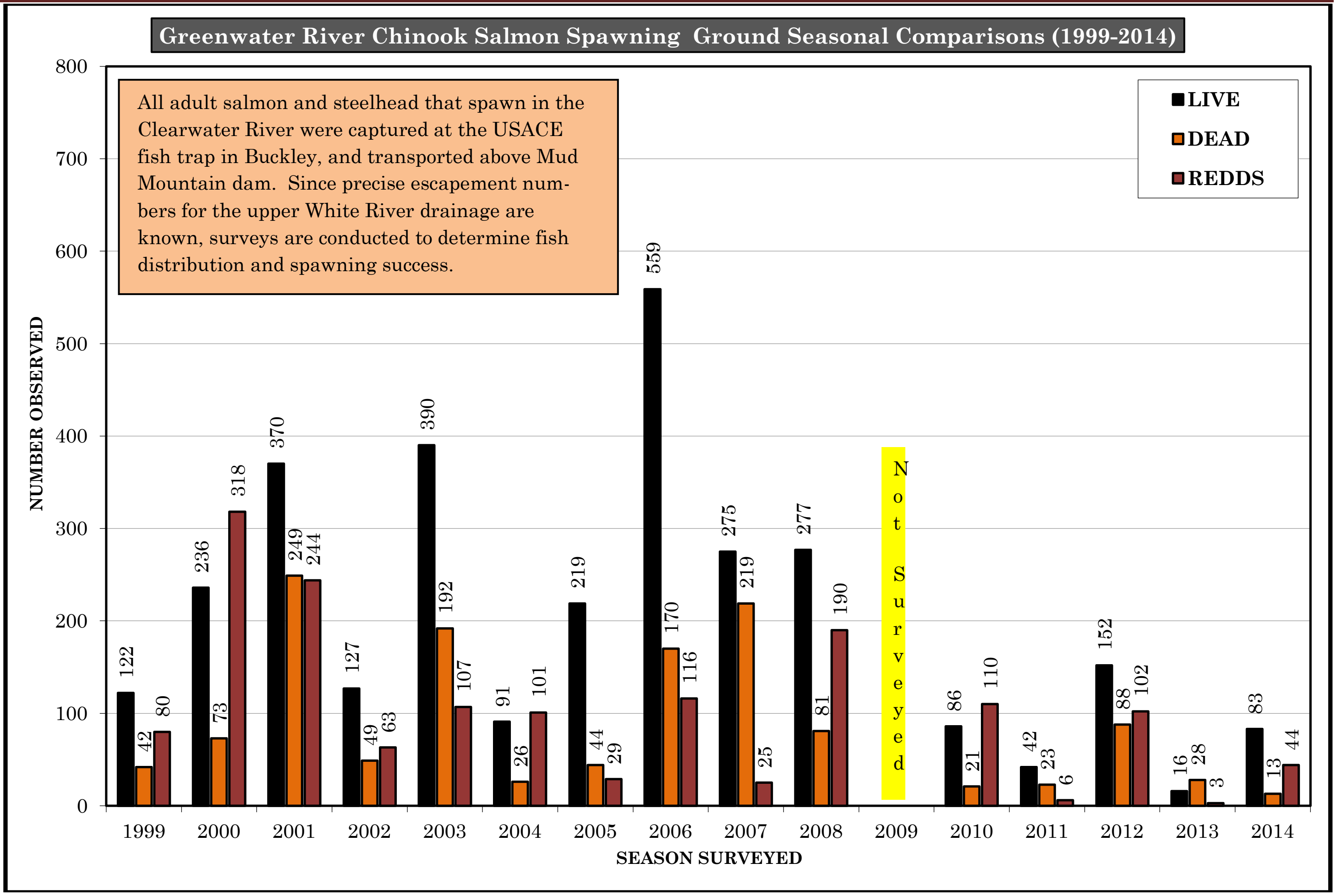
- Encourage trapping and sorting of spawning gravels within the main stream channel to increase spawning opportunity
- Improve salmon egg retention and survival by reducing scour stress of the river
- Increase the quantity and quality of pools with lots of overhead, woody cover for predator avoidance for juvenile salmon, and for staging of upstream-migrating adult salmon.
- Provide interim, instream structure and stability to allow the Greenwater valley forest to regenerate to a size that will naturally stabilize the River.

Project Partners

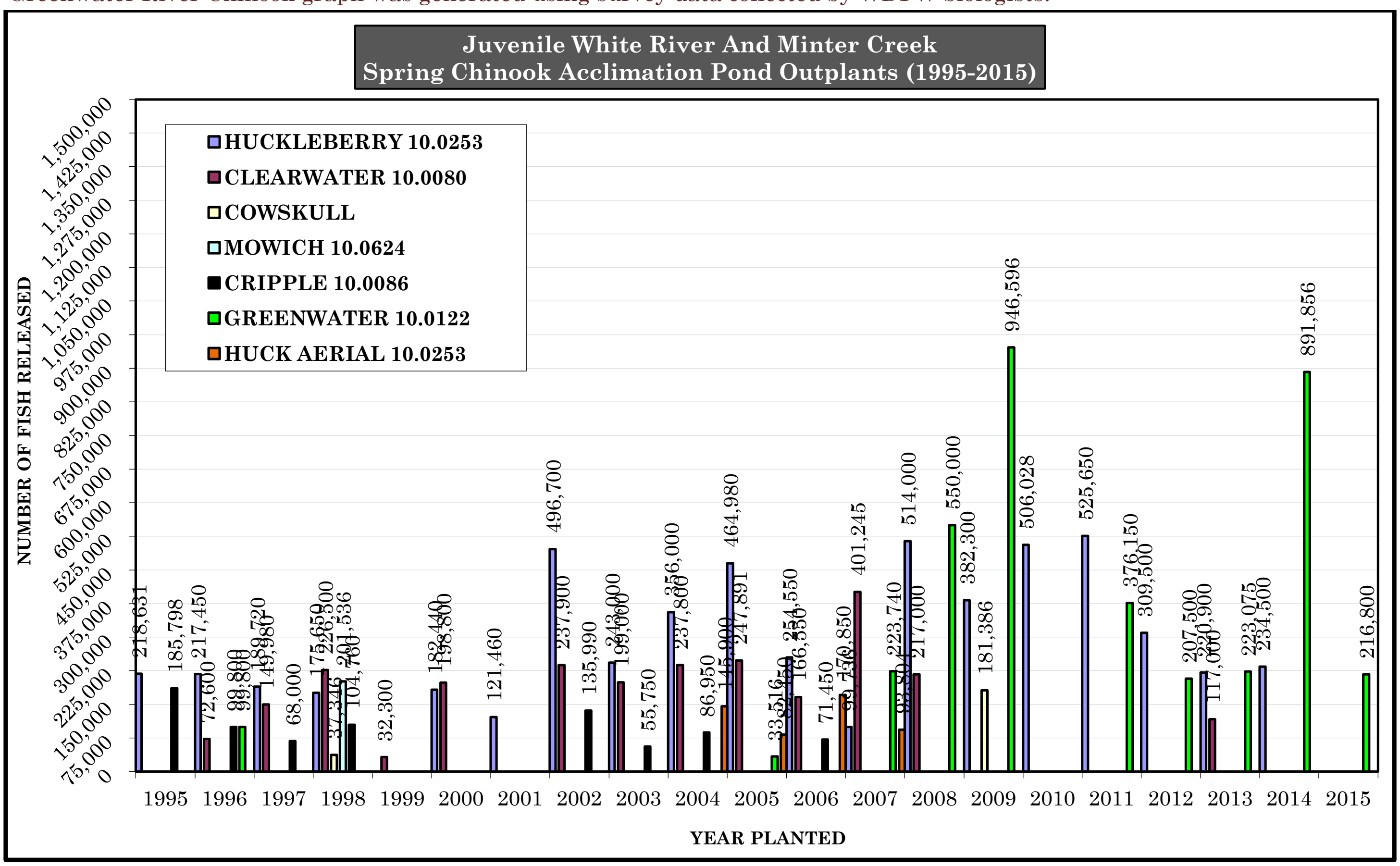
- **Project Managers:** South Puget Sound Salmon Enhancement Group
- **Engineers**: Herrera Environmental Consultants, Cardno ENTRIX, Olympic Region Engineering Cluster
- **Contractors**: RV Associates, McClung Construction, Southworth and Sons
- **Stakeholders**: US Forest Service, Muckleshoot Tribe, Puyallup Tribe, Community of Greenwater
- **Funding Partners**: Salmon Recovery Funding Board, Forest Service, Puyallup Tribe and Puget Sound Partnership, Natural Resource Damage Assessment Trustees, Washington State Department of Transportation.

Funding: Collective funding for the project totaled $1.9million in salmon recovery and mitigation dollars.

Source	Amount
SRFB/RCO 06-2223	485,000
SRFB/RCO 07-1867	590,000
Forest Service RAC Grant	10,300
EPA/PSP-Puyallup Tribe	101,300
Donated Wood, Forest Service and USACE	145,100
WSDOT Mitigation	287,000
NRDA Funds-PSE Spill	313,000
Total Funding	**$1,931,700**



Greenwater River Chinook graph was generated using survey data collected by WDFW biologists.



HUCKLEBERRY CREEK 10.0253

Huckleberry Creek is a tributary to the Upper White River. The creek originates from the Huckleberry basin along the North Slope of Mt. Rainier and is non-glacial. The creek flows through the National Park and Snoqualmie National Forest lands before meeting the West Fork of the White at RM 53.1. The lower 0.5 miles consists of a low gradient, occasionally braided channel with a large side channel complex breaking off around RM 0.3. The surrounding riparian is a mixture of conifers and deciduous trees. The spawning gravel is excellent in the first half mile reach, which consistently supports the highest densities of Spring Chinook and coho spawners each season; as well as, a significant escapement of pinks on odd years. Steelhead usage has also been documented in Huckleberry; however, steelhead surveys have not been conducted for several years. Bull trout presence has been documented; however, the extent of utilization is unknown. The gradient increases slightly From RM 0.5 to 1.5, but the gravel quality remains excellent, although slightly larger and patchy in nature. The riparian corridor consists of old growth conifers upstream of the acclimation pond at RM 0.5, offering excellent LWD recruitment. In-stream LWD is moderate throughout the entire creek, creating several logjams, as well as free and fixed channel spanning structures.

As with all upper White River tributaries, adult salmon and steelhead that spawn in Huckleberry Creek were captured at the USACE fish trap in Buckley, then transported and released approximately 4 miles above Mud Mountain Dam. Since precise adult fish escapement for the upper White River drainage is known, spawning surveys are conducted to determine fish distribution and spawning success. This is important regarding Spring Chinook, since adult production monitoring is part of the recovery plan process.

The Puyallup Tribe currently operates a single acclimation pond used for acclimating Spring Chinook *(center)*. Juveniles are planted in March, and released in late May or early June. The Spring Chinook plants are an integral part of the White River Spring Chinook Recovery Plan. The juvenile Spring Chinook originated from the Muckleshoot White River Hatchery and WDFW's hatchery on Minter Creek. Unfortunately, WDFW terminated fish contribution to the Spring Chinook restoration project in 2012. Production levels have been around 400,000 smolts; although, it fluctuates based on available brood-stock. They have a production capacity of 837,000 zero age smolts. Between 100,000 to 500,000+ Spring Chinook are transported to the Huckleberry Creek acclimation ponds in early spring, and released in late spring. All fish are mass marked with left or right ventral fin clips. Odd brood years are marked with left ventral clips, and even years with right ventral clips. These fish can later be identified when caught at the USACE fish trap in Buckley and passed above the Mud Mountain dam to spawn.

Watershed Fish Enhancement Project: The Puyallup Tribe operates several acclimation ponds in the Puyallup/White River Watershed designed to reestablish and enhance Spring/Fall Chinook, winter steelhead and coho stocks. Each of two acclimation ponds *(Cowskull & Rushingwater)* on the Puyallup would receive as many as 100K+ hatchery origin spring/fall Chinook and/or coho. The additional acclimation ponds located in the Upper White River drainage *(Huckleberry Cr., Greenwater River (George Cr,) & Jensen Creek)* could be planted collectively with up to 900K+ White River Spring Chinook and 25K+ White River winter steelhead pre-smolts *(The Jensen Creek in the Clearwater River drainage was completed in the fall of 2012).* When obtainable, the Puyallup Tribe will collect, haul and plant surplus adult hatchery fall Chinook and coho from WDFW's Voights Creek hatchery to spawn naturally in minor spawning or underutilized areas. When available, the Puyallup Tribe will in-stream plant juvenile hatchery fall Chinook and chum from the Tribe's Clarks and Diru Creek hatchery facilities to underutilized habitat areas.

Chinook smolt (top)
Coho smolt (bottom)

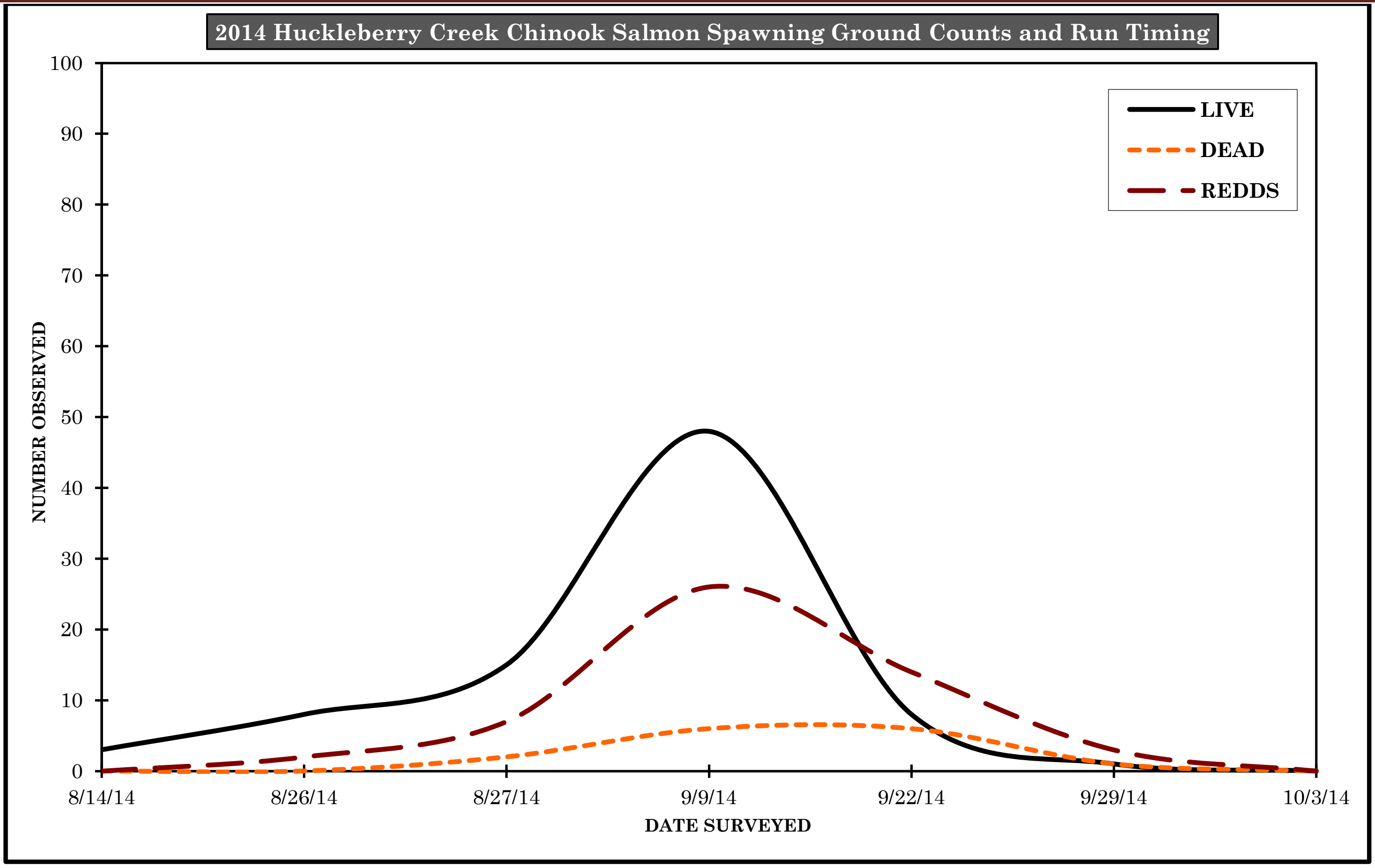
Goals, Purpose and Expected Benefits: One of the Puyallup Tribe's most significant restoration goals is to rebuild depressed Chinook and steelhead stocks and remove them from ESA listing. Acclimation ponds, juvenile in-stream plants and adult surplus fish plants are a proven method for increasing fish stocks, and are key component to restoration goals.

Purpose:

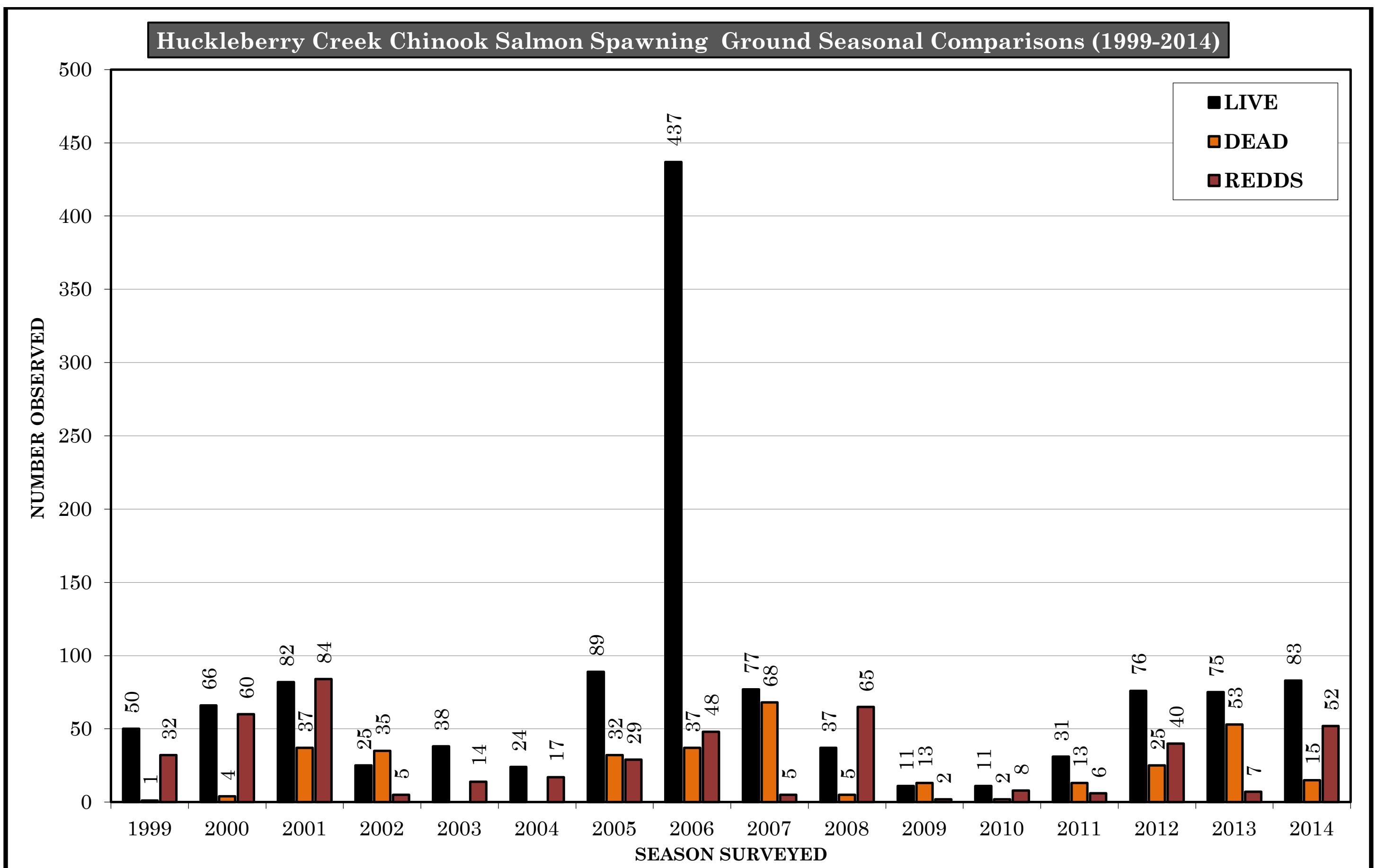
- Produce Spring/Fall Chinook, winter steelhead and coho for the Puyallup/White River salmon conservation and harvest programs.
- Establish a total annual return of Spring Chinook Natural Origin Recruits (NORs) that meets the escapement goals for White River Spring Chinook Recovery.
- Provide sustainable harvest for tribal and non-tribal fisheries on Fall Chinook and non ESA listed coho.
- Optimize hatchery and natural production consistent with the conservation of naturally produced native fish.
- Maintain genetic makeup of Chinook and steelhead populations spawned or reared in captivity.

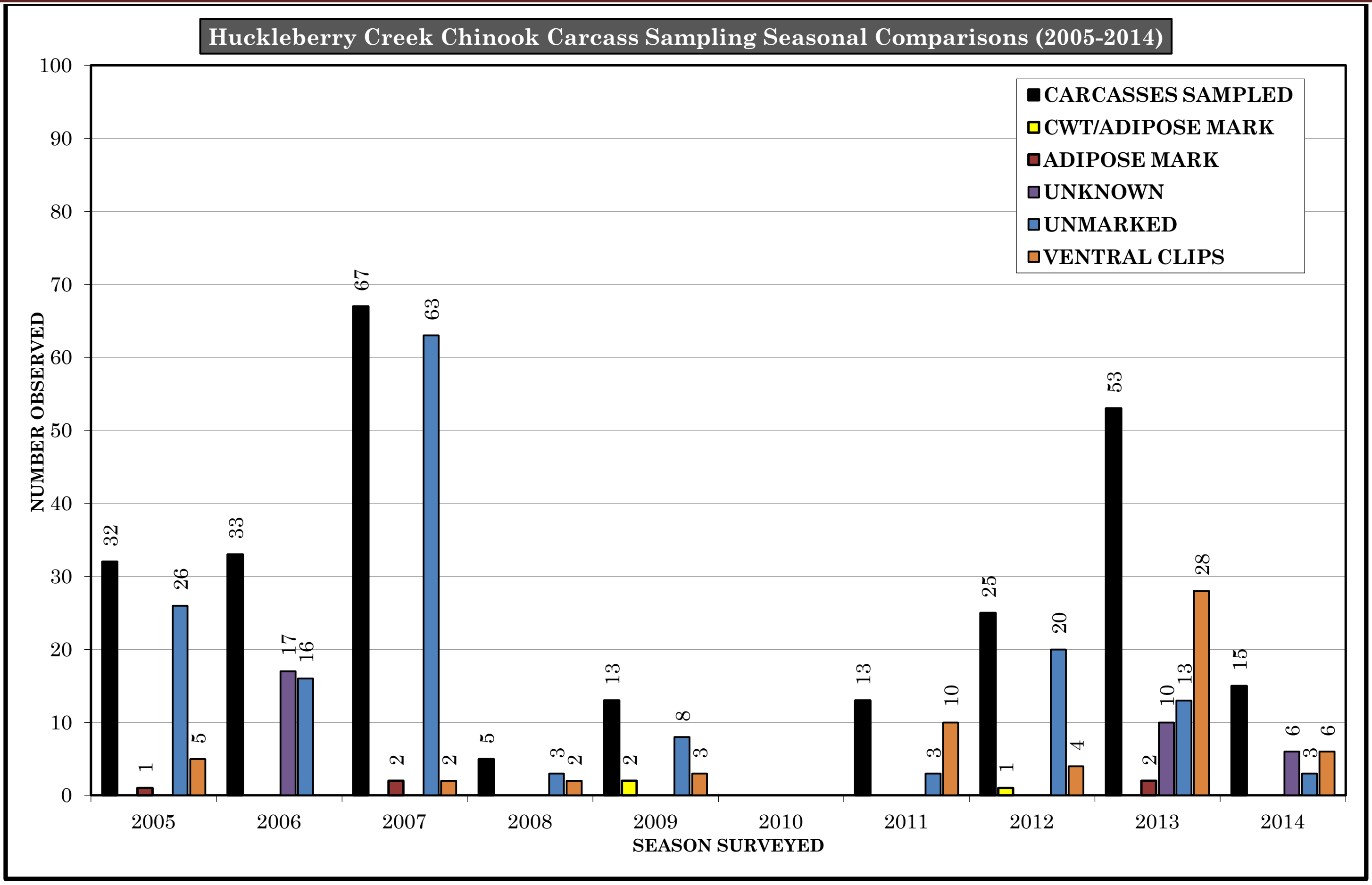
Benefits:

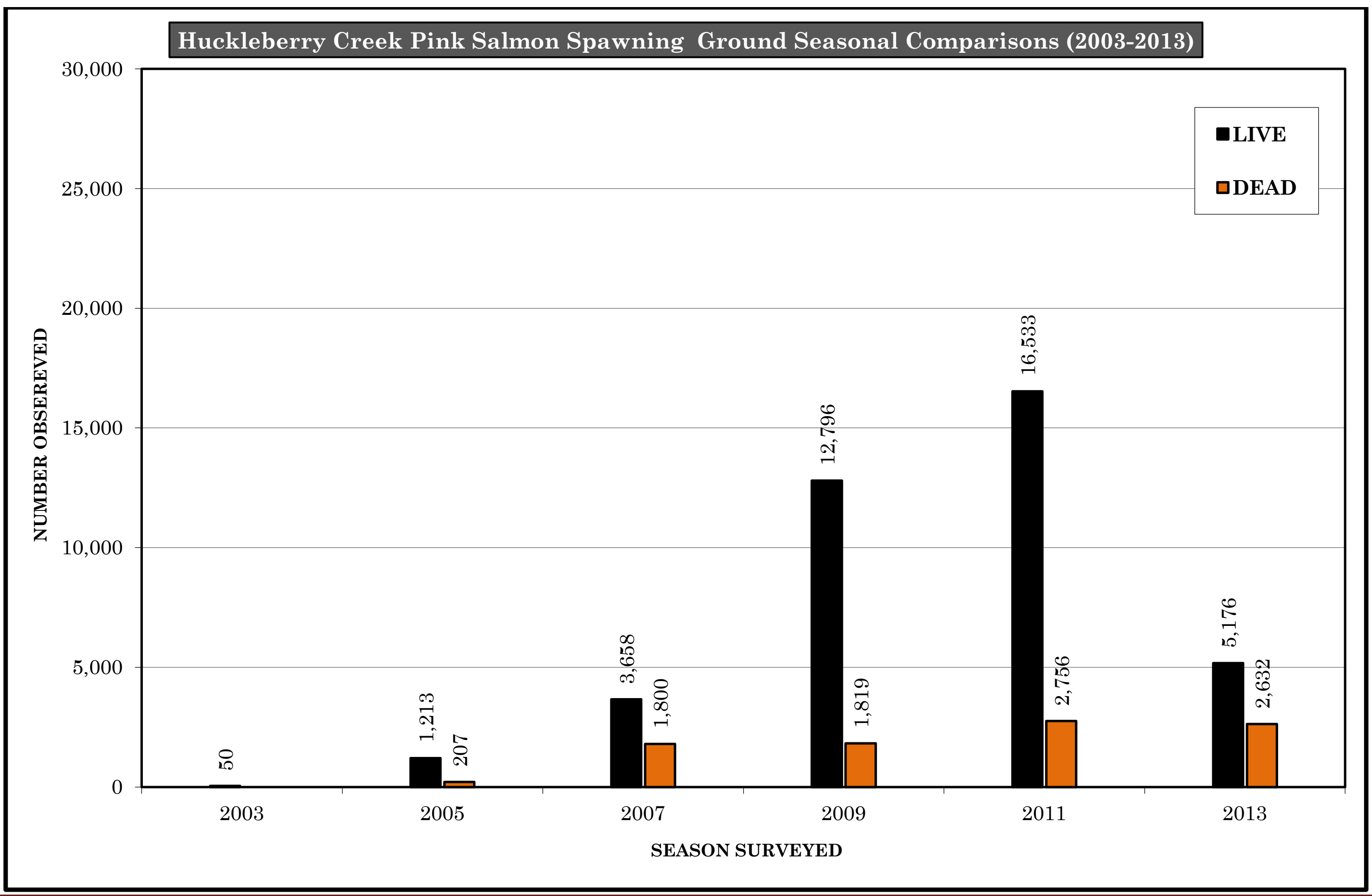
- Reestablish and enhance ESA listed Spring/Fall Chinook and steelhead; as well as non-listed coho into their endemic range.
- Increased total abundance of the composite natural/hatchery population.
- Increased spawning ground escapement and trend of Natural Origin Recruits (NORs).
- Improve distribution *(out planting of live fish)* of salmon to minor spawning and underutilized rearing habitat areas.
- Provide future tribal and sport harvest opportunities.
- Nutrient enhancement in oligotrophic *(nutrient-poor)* streams.

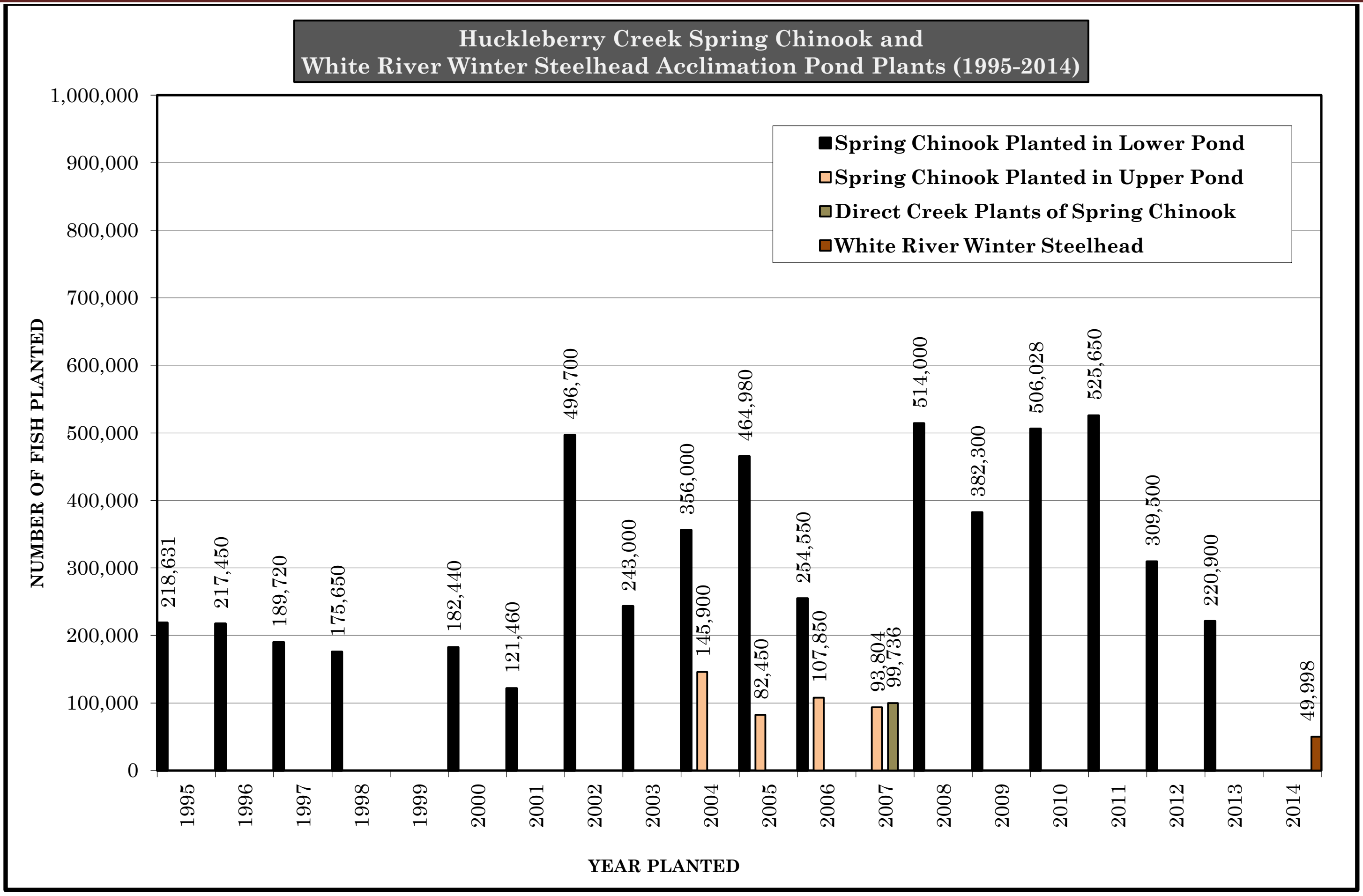


Upper White River surveys show distribution and timing. Actual escapement totals are known from the USACE trap counts.




Huckleberry Creek Chinook Carcass Sampling Seasonal Comparisons (2005-2014)
CARCASSES SAMPLED
CWT/ADIPOSE MARK
ADIPOSE MARK
UNKNOWN
UNMARKED
VENTRAL CLIPS
NUMBER OBSERVED
SEASON SURVEYED
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
32 1 26 5
33 17 16
67 2 63 2
5 3 2
13 2 8 3
13 3 10
25 1 20 4
53 2 10 13 28
15 6 3 6


Huckleberry Creek Pink Salmon Spawning Ground Seasonal Comparisons (2003-2013)
LIVE
DEAD
NUMBER OBSEREVED
SEASON SURVEYED
2003
2005
2007
2009
2011
2013
50
1,213 207
3,658 1,800
12,796 1,819
16,533 2,756
5,176 2,632


Huckleberry Creek Spring Chinook and
White River Winter Steelhead Acclimation Pond Plants (1995-2014)
Spring Chinook Planted in Lower Pond
Spring Chinook Planted in Upper Pond
Direct Creek Plants of Spring Chinook
White River Winter Steelhead
NUMBER OF FISH PLANTED
YEAR PLANTED
1,000,000
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
218,631
217,450
189,720
175,650
182,440
121,460
496,700
243,000
356,000
145,900
464,980
82,450
254,550
107,850
93,804
99,736
514,000
382,300
506,028
525,650
309,500
220,900
49,998
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014

HYLEBOS CREEK 10.0006


The West Fork of Hylebos Creek just downstream of the Spring Valley Ranch restoration site.

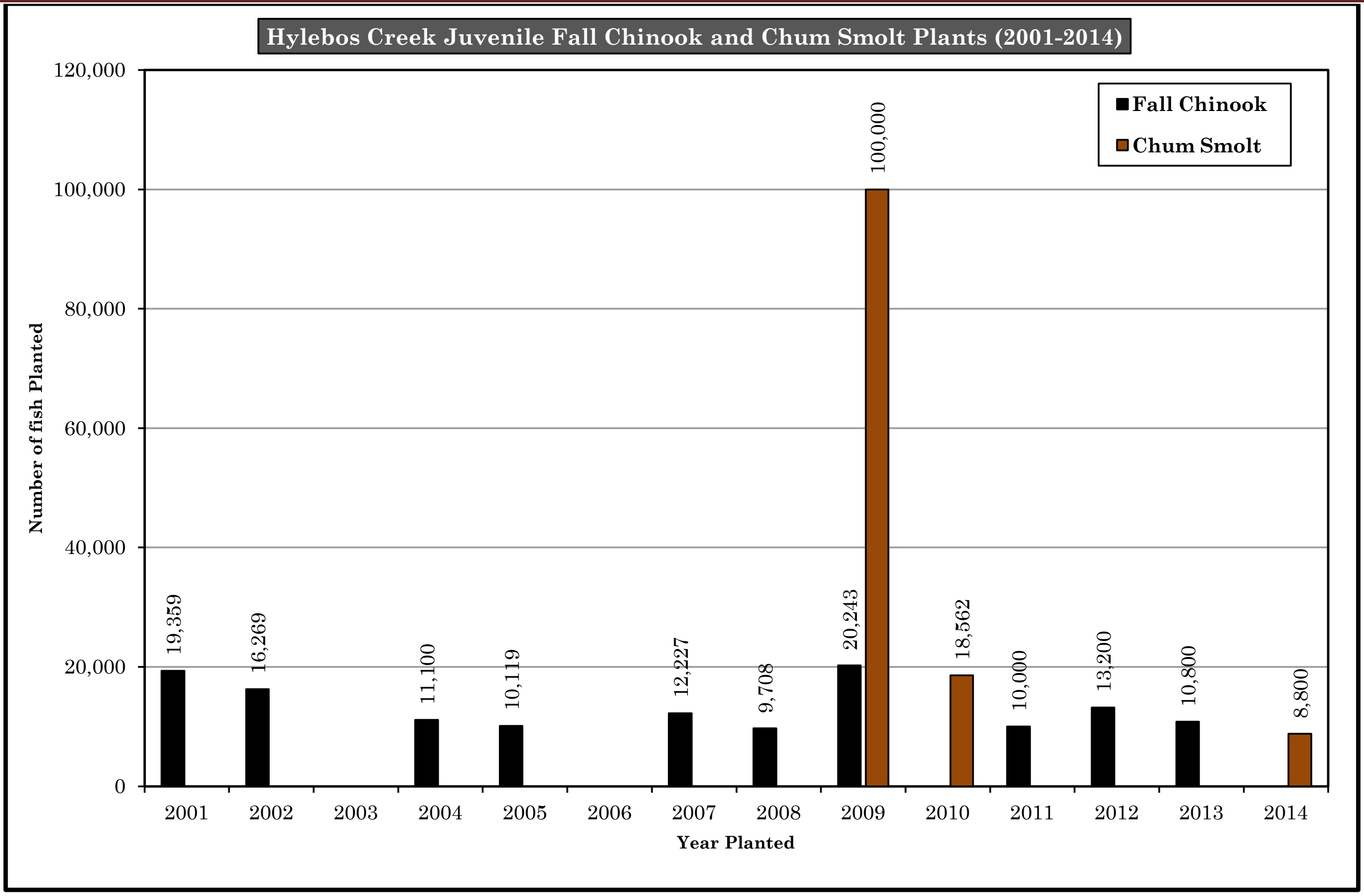
Hylebos Creek *(Named after Peter Francis Hylebos (1848-1918),original native name haxtl', also called "Koch" by early natives)*[1] is an large, independent drainage from that of the Puyallup/White River system. Draining an area of over 18 square miles, the headwaters of the Hylebos system originate in the city of Federal Way and flow southwest until it empties into the Hylebos Waterway; one of several waterways located in Commencement Bay within the city of Tacoma. The East and West Forks of the Hylebos comprise two of the three basins within this system, and make up the upper part of the watershed. The East and West Forks converge just east of I-5 to form the Lower Hylebos.

The Hylebos Watershed has been severely impacted by urban development. Land uses over the past several decades has resulted in an extensive loss of estuarine and wetland habitats, reduction of water quality (*303(d) listed*) and fish production, as well as diminished instream flows and stream channel continuity. Nevertheless, the watershed does have protected areas, and substantial parcels of the creek and surrounding land have been acquired in recent years for protection and restoration.

Although spawning frequency is low for all species and inconsistent for some; Chinook, chum, pink, coho, and steelhead have all been observed spawning within the surveyed area of Hylebos Creek. In addition, Hylebos Creek also host a large population of cutthroat trout, as well as other native and nonnative species including sticklebacks, sculpins, lamprey and bass. The stream section most often surveyed by the Puyallup Tribe is the Lower West Fork Hylebos extending from 373rd St., upstream to the Montessori school at Hwy. 99 and downstream from 373rd to the East Fork. The upper extent of Chinook spawning is generally a half mile past the convergence of the East and West Forks. Passage beyond this is often difficult due low instream flows preventing Chinook from migrating far up either fork. Higher instream flows experienced during the fall and winter often allow coho and chum to access the upper reaches of the Hylebos.

As part of the continuing fish and habitat restoration efforts, the Puyallup Tribe regularly released between 10 and 20 thousand juvenile Fall Chinook into the West Fork of Hylebos Creek during the spring *(lower right)*. Spawning surveys over time have identified these fish on the spawning grounds due to fin clips administered at the hatchery prior release. In addition, the 27 acres above 373rd St., known as the Spring Valley Ranch, was purchased by the Washington State Department of Transportation (*WSDOT*) in 2004. Restoration efforts for this site were completed in 2007. The restoration project restored nearly a quarter mile of creek channel and wetland habitat. The project will also establish a riparian buffer zone comprised of native trees and plants. In 2008, the City of Federal Way acquired the 22 acre Goldmax property. This acquisition will preserve 1,200 feet of creek channel and surrounding land located on the West Fork of the Hylebos. For more information about Hylebos Creek, contact Friends of the Hylebos at www.hylebos.org.

[1] Caster, D. 2003. Father Hylebos, St. George's Indian School and Cemetery, and St. Claire's Mission Church. Prepared for the Historical Society of Federal Way. 18pp.


Hylebos Creek Juvenile Fall Chinook and Chum Smolt Plants (2001-2014)
Fall Chinook
Chum Smolt
Number of fish Planted
Year Planted
120,000
100,000
80,000
60,000
40,000
20,000
0
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
19,359
16,269
11,100
10,119
12,227
9,708
20,243
100,000
18,562
10,000
13,200
10,800
8,800

IPSUT CREEK 10.0550

Ipsut Creek is a left bank tributary to the upper Carbon River; entering at RM 28.3. Typical of many headwater tributaries, Ipsut Creek is non-glacial and is characterized by confined steep valley channels with a comparatively short, low-to-moderate gradient anadromous reach. This mountain stream flows for just over 2.8 miles through a steep glacial valley originating near Castle Peak along the Alki Crest. Ipsut flows entirely within Mt. Rainier National Park. Headwater sources are derived from snowpack accumulations; as well as other surrounding surface and groundwater sources including Doe Creek *(right bank- RM 1.2)* and an unnamed tributary *(right bank- RM 0.8)*. Neither tributary is accessible by fish. The creek continues to drop precipitously from through much of its length until it reaches the lower channel migration zone of the Carbon River, at which point the creek channel is reduced to a low-moderate gradient pool-riffle channel capable of supporting salmonids.

Past surveys have verified bull trout utilization within Ipsut; furthermore, the creeks 2300' elevation makes it one of the lowest elevation streams known to support bull trout spawning and is quite capable of supporting Chinook, coho, pink and steelhead as well. Other species including cutthroat, non-native brook trout and sculpins are known to inhabit the creek. However, salmonid migration upstream to reach headwater tributaries in the upper Carbon Basin, including Ipsut, is assumed to be extremely limited due to substantial cascades present throughout the roughly 5 mile long Carbon River Gorge. The Puyallup Tribe conducted salmon, steelhead and bull trout spawning surveys during 2000 and 2001; yet, no salmon or steelhead were observed. However, surveyors did observe several redds early in the spawning season *(September)*, but their timing matched the bull trout spawning documented in other headwater tributaries in the watershed including Ranger Creek and several Upper White River tributaries.

The riparian zone along Ipsut consists primarily of old growth cedar, fir and hemlock which contributes greatly to the large woody debris in the stream; as well as diversity to the channel habitat. Unfortunately, spawning opportunities are limited due to the size and makeup of the substrate material; much of which consists of flat and angular stones not conducive to movement, especially by smaller fish such as bull trout. However, small patches of suitable gravel do exist. The lower anadromous reach of the creek is also subject to, and has frequently experienced disturbances caused by Carbon River flood events. These intrusions often deposit significant amounts of fine material and woody debris. An impassable falls at approximately RM 0.7 prevents any further upstream migration.

Unfortunately, no substantial data is available on bull trout spawning escapement or population size within the upper Carbon River. Currently, the Carbon River bull trout population is considered one-of-five local populations identified and managed within the Puyallup River Watershed Core Area.

KAPOWSIN CREEK 10.0600

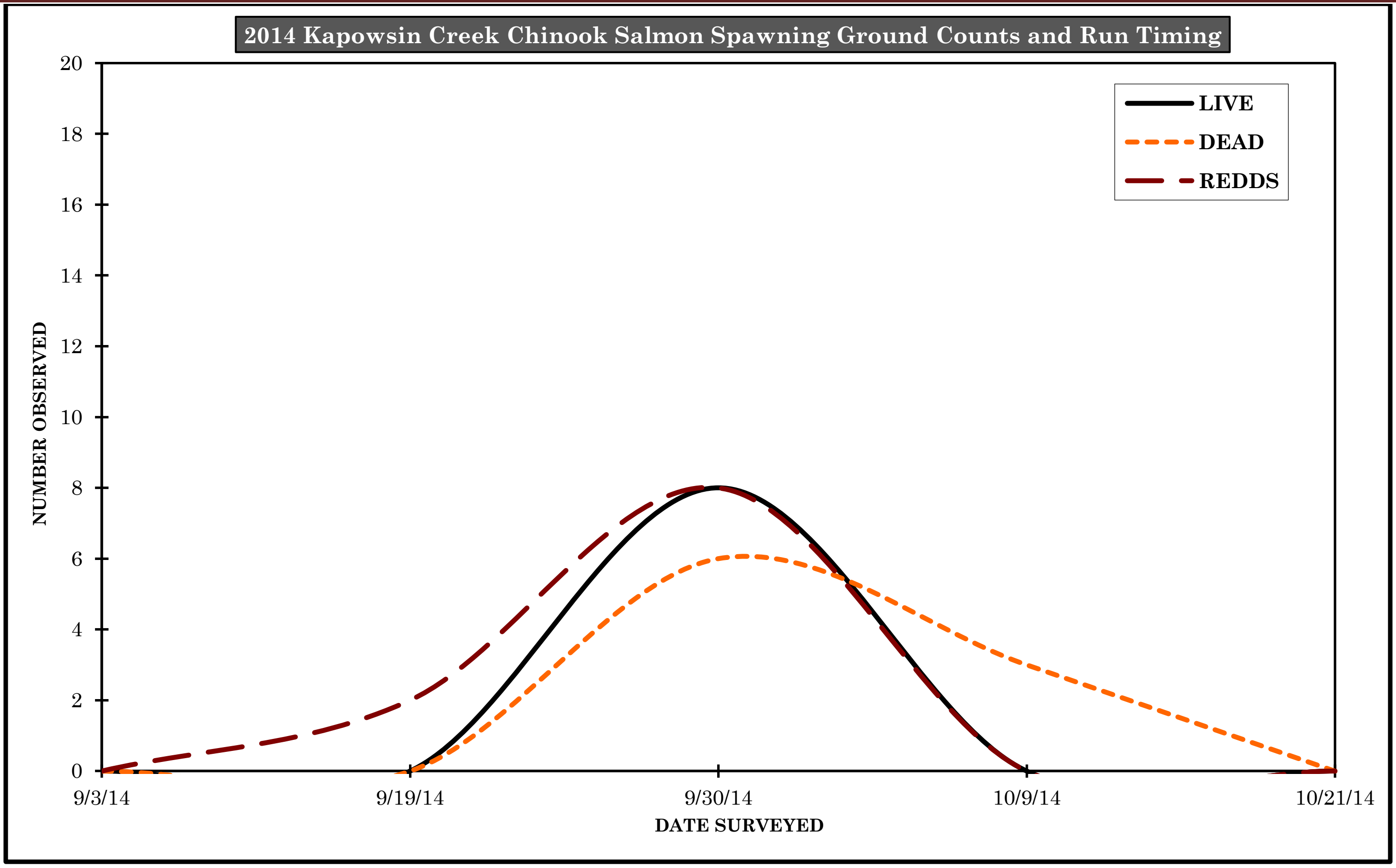
Kapowsin Creek is a tannic stream originating at the north shore of Lake Kapowsin, which sits approximately 3.6 miles upstream from the creeks confluence with the Puyallup River. Kapowsin Creek supports a host of adult salmon species including; Chinook *(above)*, pink, coho, steelhead, bull trout and occasionally a few chum. Chinook have not been observed beyond the top of Kapowsin Creek where it enters the lake. On the other hand, coho, and occasionally a few steelhead move through Kapowsin Lake into Ohop Creek to spawn. Ohop Creek, which enters the south end of the lake, is technically considered the continuation of Kapowsin creek. Lake Kapowsin supports a large population of game fish including: bluegill, largemouth bass, black crappie, yellow perch and pumpkinseed. WDFW also stocks the lake annually with rainbow trout.

Unfortunately, steelhead escapement in Kapowsin is low, however, this drop in escapement is not uncommon; winter steelhead stocks in the Puyallup basin have been declining since 1990. The precipitous decline within just the past few years has created serious concern among fisheries managers. Factor(s) responsible for the decline in steelhead escapement are unknown, especially when other salmon species are experiencing relatively good success.

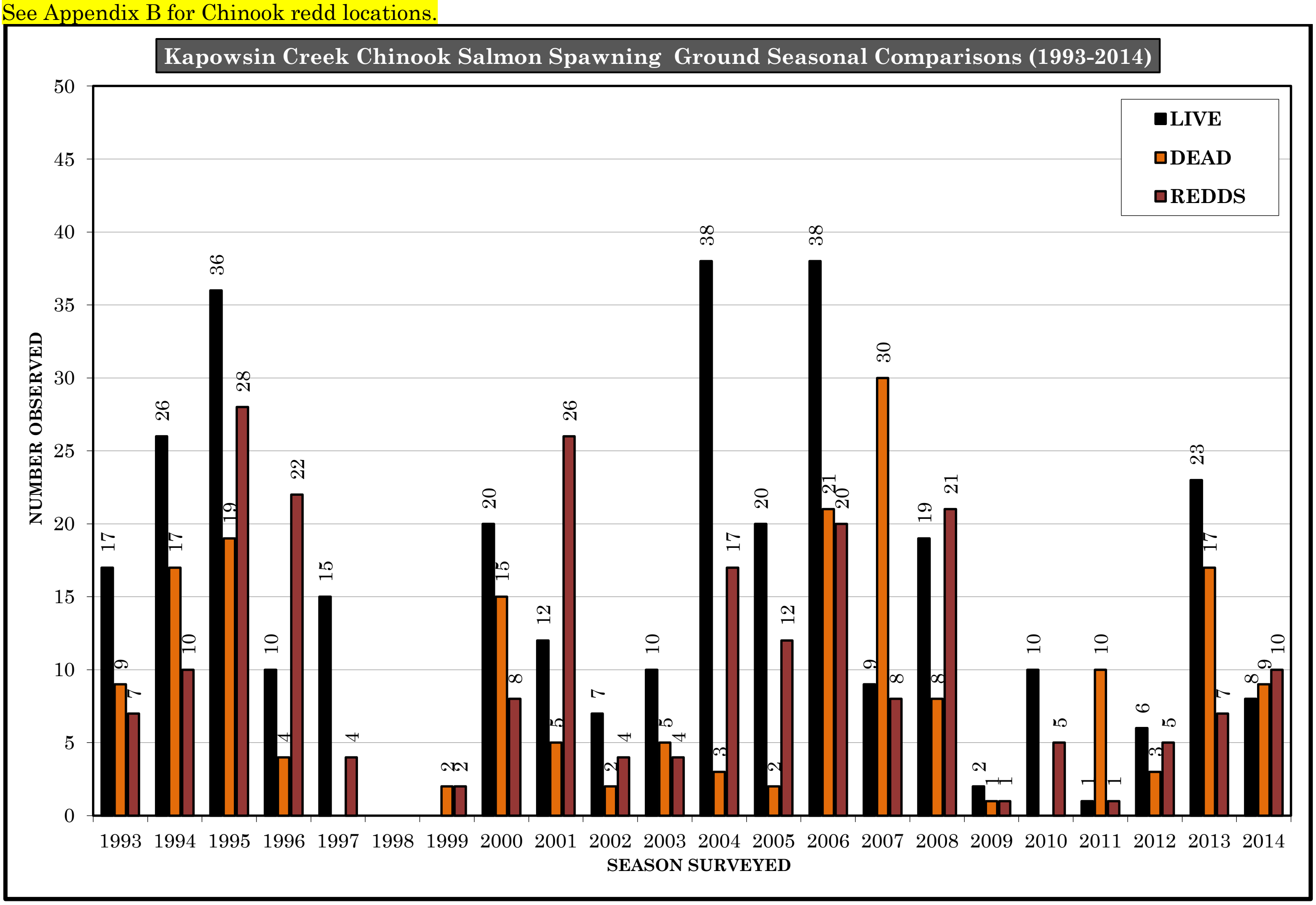
Coho are the predominate species in the creek. Recovered CWT data has shown that many of the coho spawning in Kapowsin are fish that were released a couple of years earlier as juveniles from the upper Puyallup acclimation ponds (*Cowskull and Rushingwater*), or are descendants of the net-pen acclimation project in Kapowsin Lake. From 1993 to 1997, the Puyallup Tribe fisheries staff transported juvenile coho from WDFW's Voights Creek hatchery to four net-pens in Kapowsin Lake to acclimate. Prior to this fish restoration project, few or no coho were observed in Kapowsin or Ohop.

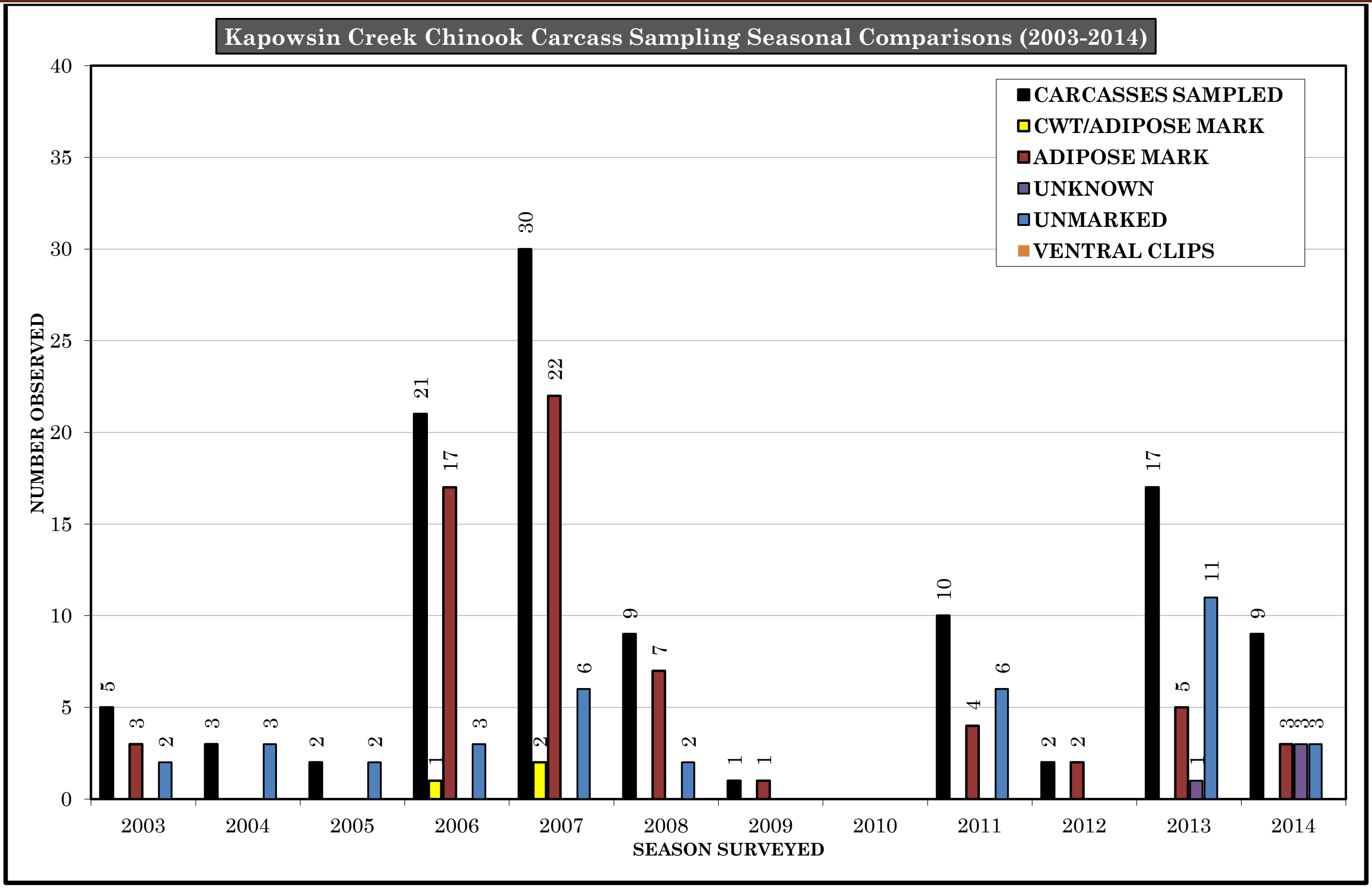
Suitable spawning gravel is available throughout the 3.6 mile survey reach of Kapowsin, although much of it is sporadic. A number of downed trees within the channel along with several sizable logjams create complexity throughout the stream. Cattle and other livestock have been allowed access to the stream channel at approximately RM 1.7. Homes and outbuilding are frequently present along the creek between RM 0.5 and RM 2.0. Human-made rock dam structures; as well as sill logs, span the creek and alter the channel hydrology along this stretch. During the summer and fall when water levels are low, these formations often cause upstream migration issues for adult salmon. In addition to human-made obstacles, the creek experiences frequent beaver (*Castor canadensis*) activity. Beaver dams, often constructed during the low summer flow, regularly occlude the entire creek channel preventing upstream migration. Most of the stream has a dense riparian zone consisting of fir, cedar, alder, cottonwood, and salmonberry.

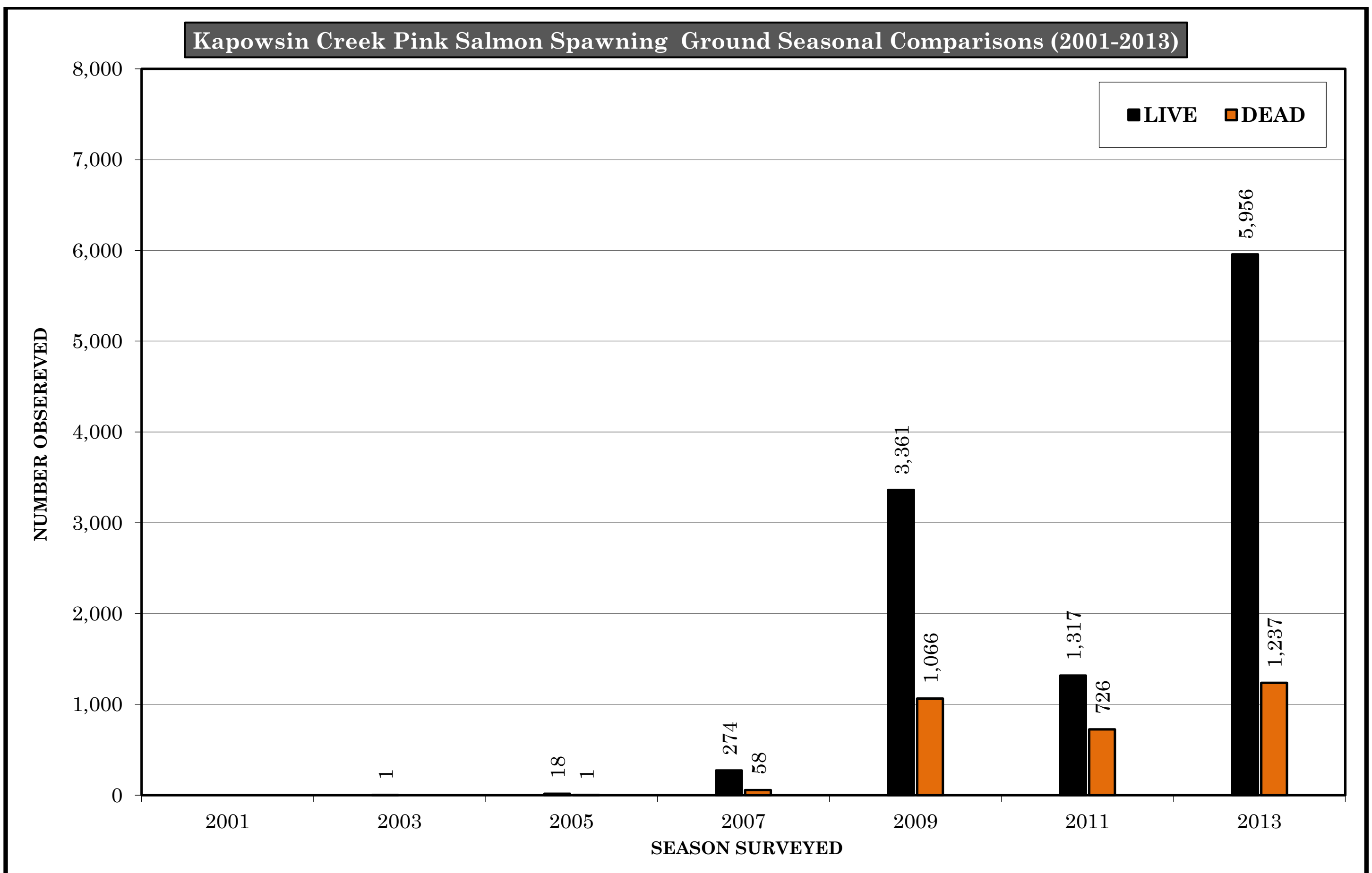
Pierce County completed construction of the new Orville road bridge over the head of Kapowsin Creek in early 2006. In addition, the 2006 flood event destroyed extended portions of the levee along Orville Rd. near Kapowsin Creek. Currently, the lower segment of the creek *(RM 0-0.2)* is a low gradient channel flowing within the open channel migration zone of the Puyallup River, and is repeatedly occupied by mainstem river incursions.

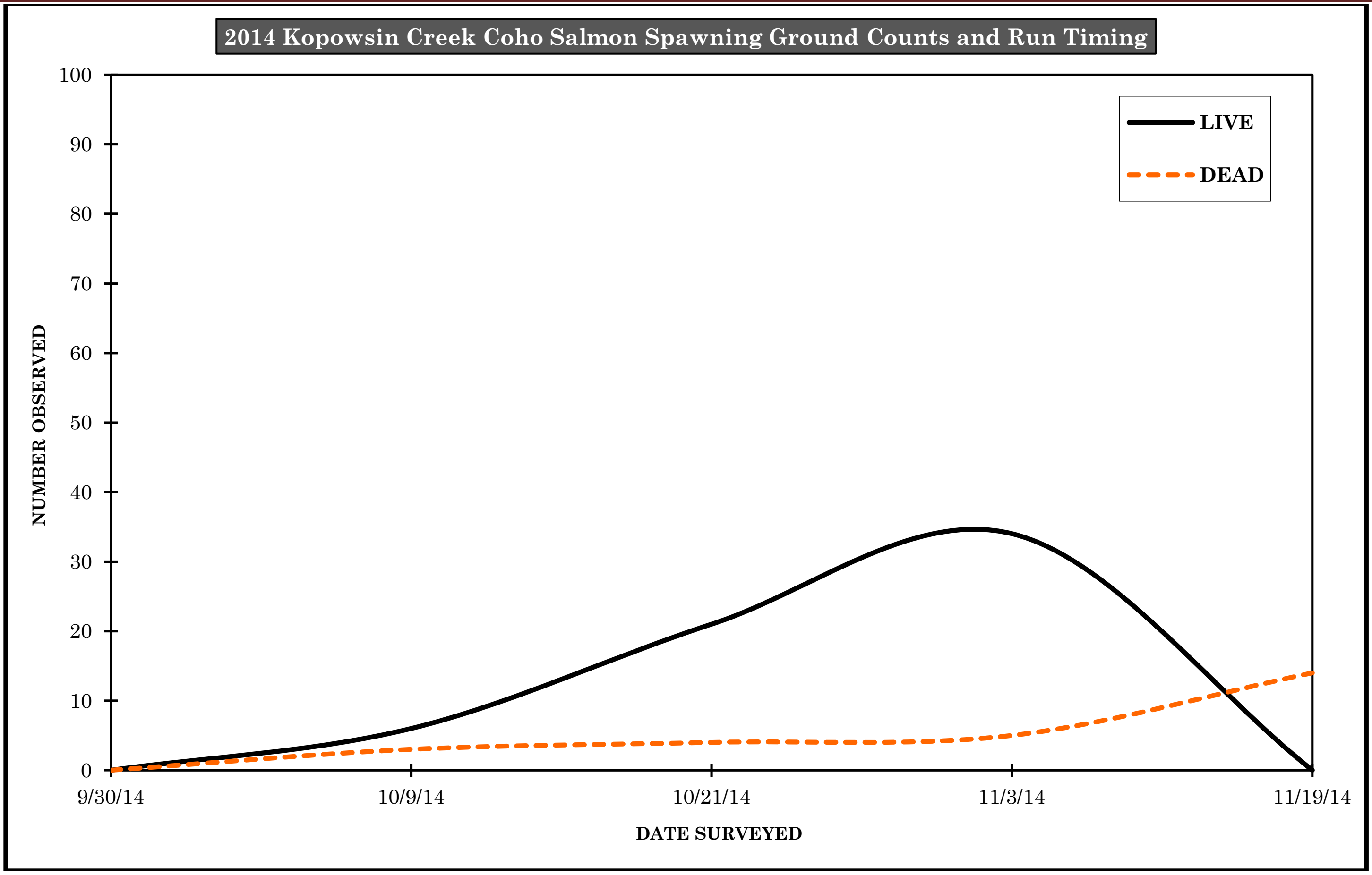


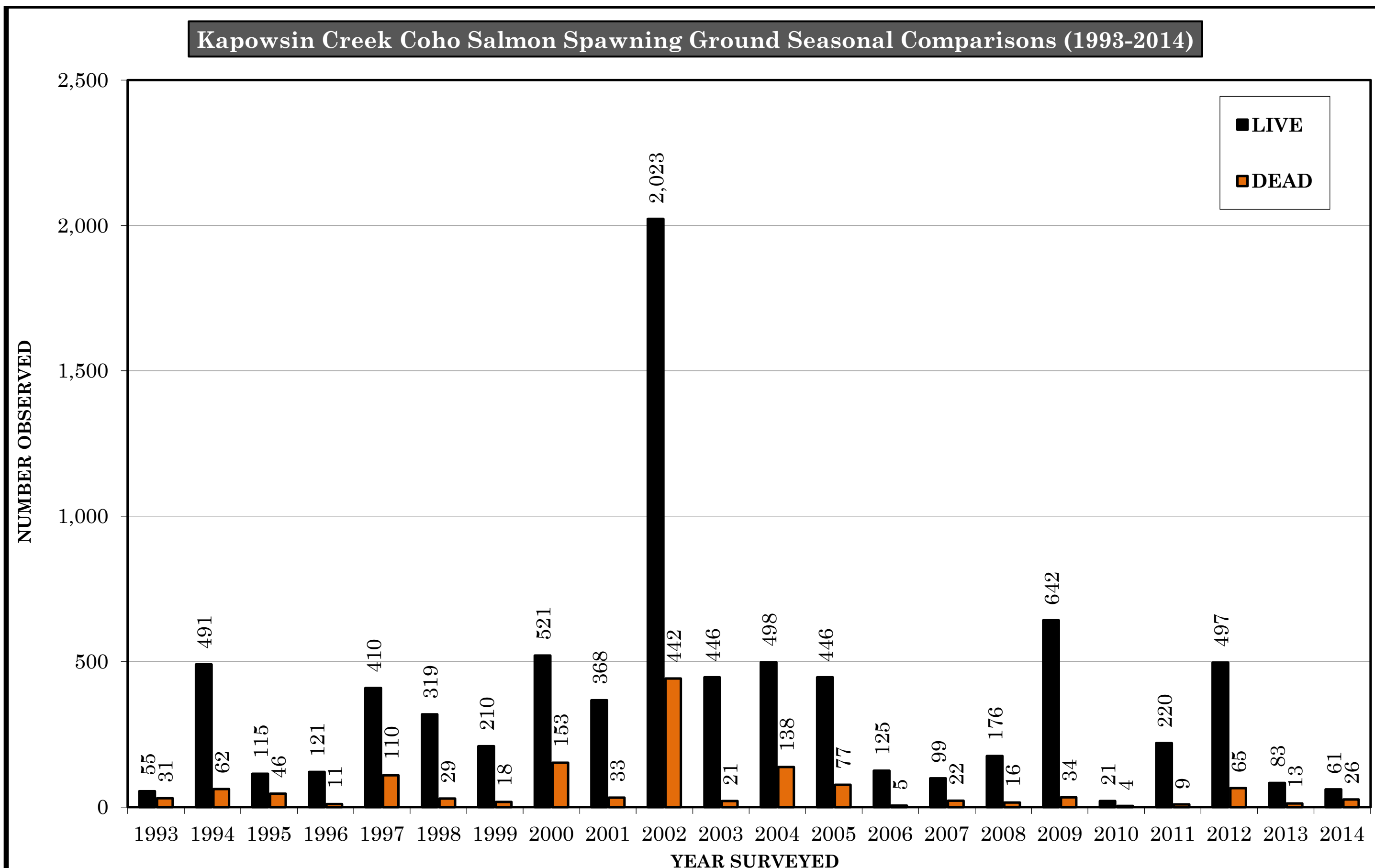
See Appendix B for Chinook redd locations.



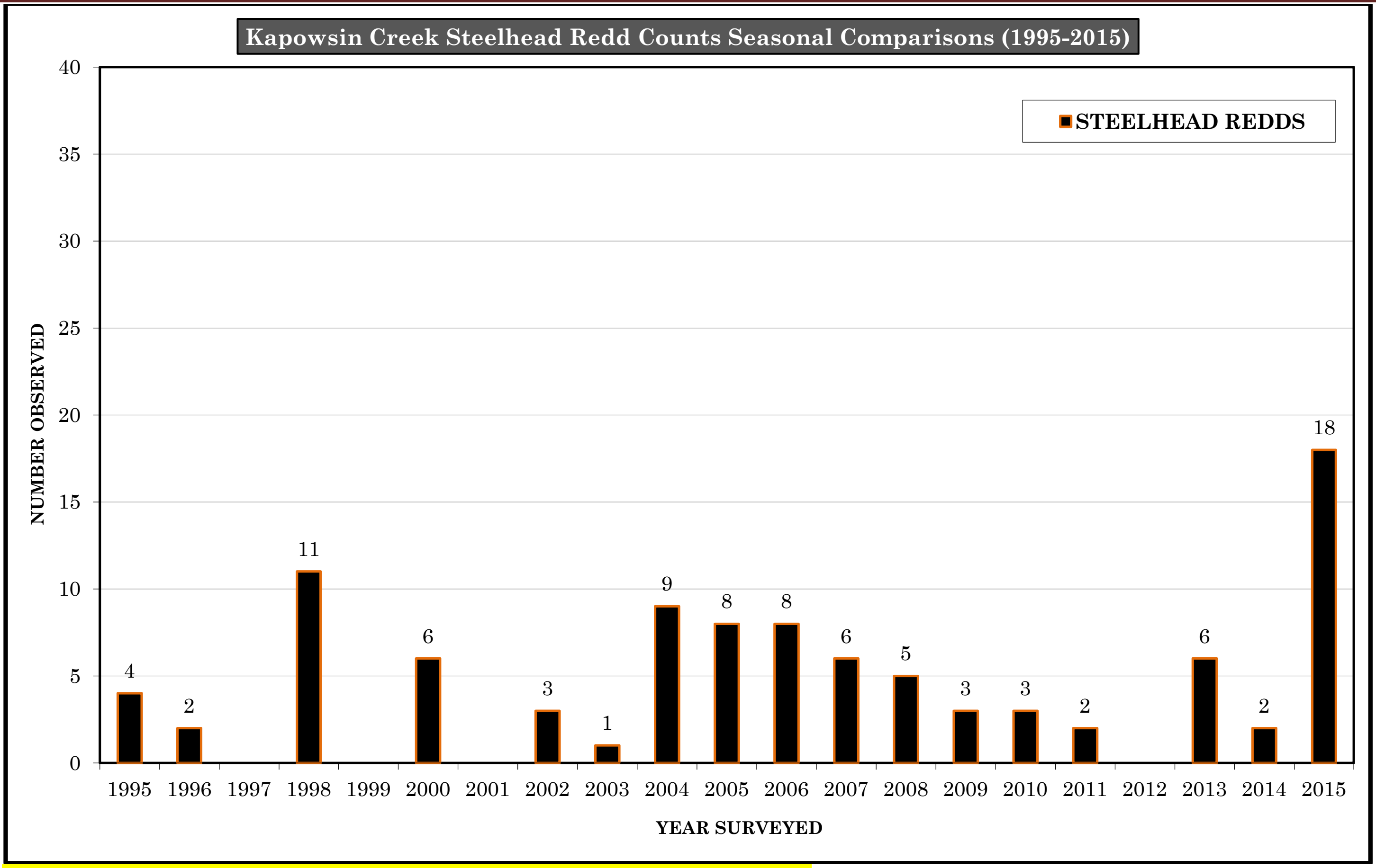

Kapowsin Creek Chinook Carcass Sampling Seasonal Comparisons (2003-2014)
CARCASSES SAMPLED
CWT/ADIPOSE MARK
ADIPOSE MARK
UNKNOWN
UNMARKED
VENTRAL CLIPS
NUMBER OBSERVED
SEASON SURVEYED
0
5
10
15
20
25
30
35
40
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014


Kapowsin Creek Pink Salmon Spawning Ground Seasonal Comparisons (2001-2013)
LIVE
DEAD
NUMBER OBSEREVED
SEASON SURVEYED
0
1,000
2,000
3,000
4,000
5,000
6,000
7,000
8,000
2001
2003
2005
2007
2009
2011
2013
1
18
1
274
58
3,361
1,066
1,317
726
5,956
1,237





2010 Survey data is incomplete due to extreme high water and poor visibility.



2010 Survey data is incomplete due to extreme high water and poor visibility.

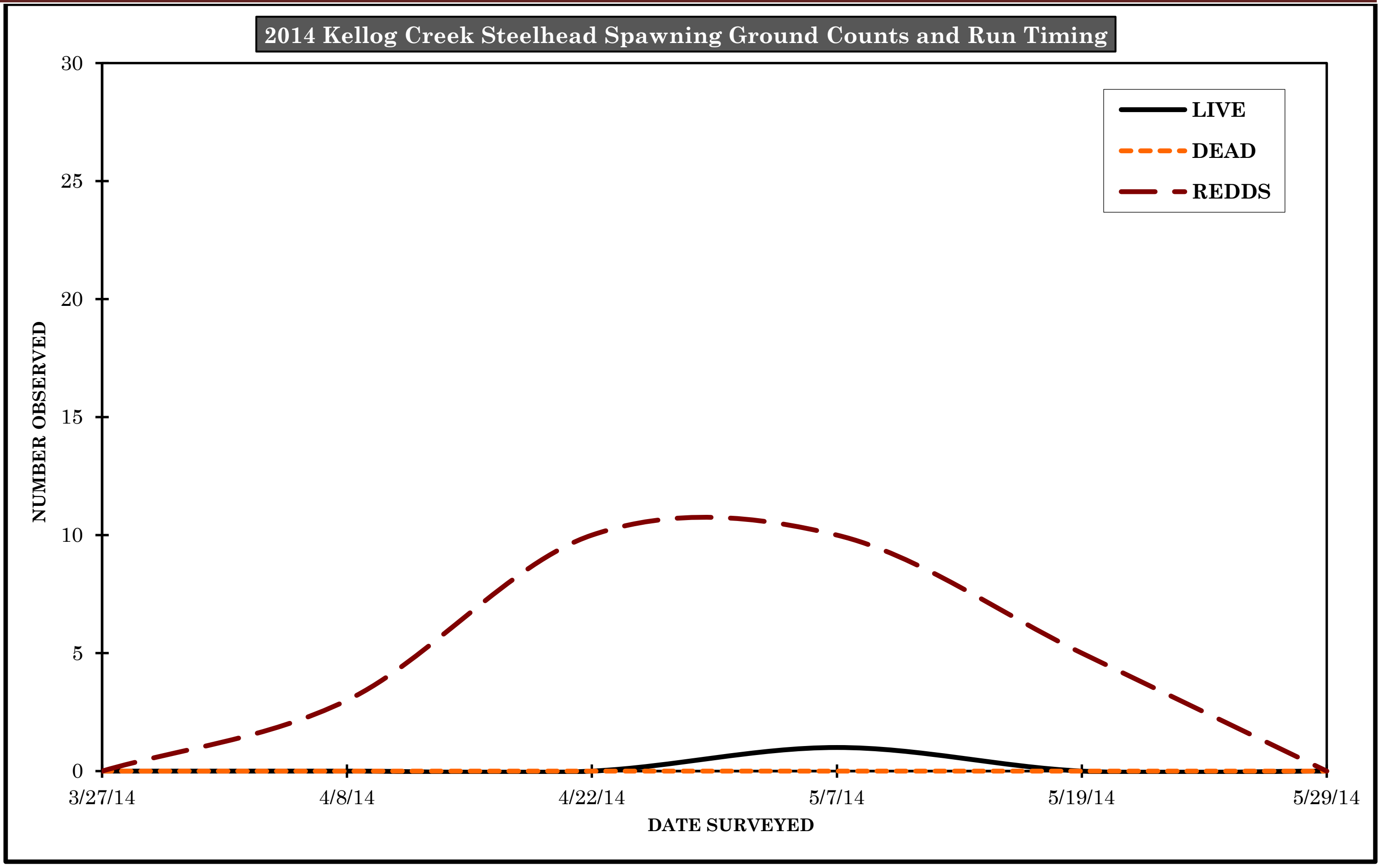
KELLOG CREEK 10.0621

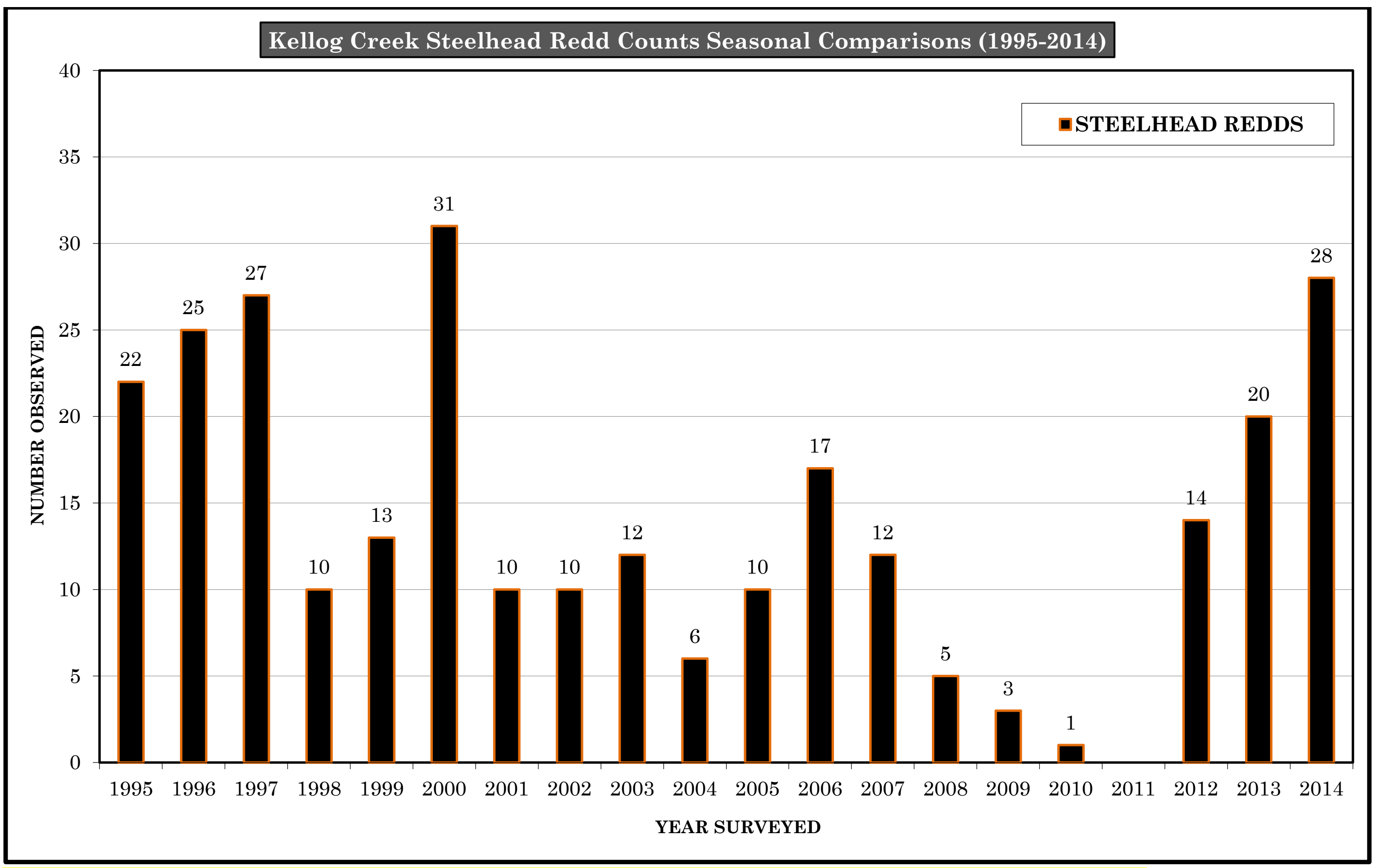
Kellog Creek is a headwater tributary to the Puyallup River, entering the Puyallup at approximately RM 39.7. Kellog is a short run stream with nearly three miles of accessible habitat; however, the anadromous spawning usage extends approximately the first 2 miles of the creek. At RM 2.5, Kellog passes through a large fish passage culvert *(installed 2008)* running under the Mainline 2 Road within the Kapowsin tree farm currently managed by Hancock (*Hancock Timber Resource Group)*. Kellog Creek flows entirely within the privately owned Kapowsin tree farm where roads and past timber harvests have negatively impacted several portions of the stream.

Kellog provides spawning and rearing habitat for adult; as well as juvenile steelhead, cutthroat, coho and Chinook. Wild steelhead maintained a small foothold in Kellog Creek prior to 2000 due to the fact that the mouth of the creek is located downstream of the Electron diversion dam. Flows over the past century have often been sufficient during late winter and spring; thereby allowing steelhead access to tributaries located downstream of the diversion dam at RM 41.7. Naturally returning coho were observed in Kellog Creek in 2004. These were the first natural spawners seen since adult and juvenile coho plants began in the upper Puyallup basin in 1997. Coho activity has been observed as high as RM 1.4, whereas steelhead activity is often observed as high as RM 2.1. Bull trout utilization is unknown; however, it is suspected that they use the creek for overwintering and foraging. The first adult Chinook spawner was observed in 2013.

Upstream of the culvert, the creek assumes a moderate to high gradient step-pool composition unsuitable for larger adult spawners such as coho or steelhead. Steelhead surveys are conducted from the culvert, downstream to the mouth. From the culvert at RM 2.5, downstream to RM 1.6, the creek flows through a moderate gradient step-pool/cascade channel containing patchy gravel. Several sections of the surrounding banks are comprised of exposed compacted glacial debris; contributing both fine and small course materials to the stream. Due to timber harvesting, the riparian zone throughout this reach consists of a thin mature 2nd growth conifer buffer on both sides. However, there is a significant amount of wind-throw in the channel associated with this insufficient riparian buffer. Steelhead spawning activity is occasionally observed in this segment; however, steelhead spawning commonly begins below RM 1.6. At this point, substantial flow from a left bank tributary, and the reduction in gradient, create a more conducive spawning environment.

Below RM 1.5, the gradient relaxes for the next mile and excellent spawning gravel is consistently available all the way to the confluence with the Puyallup River. The majority of steelhead spawning activity is observed within this lower 1.5 miles. The RMZ is more intact along this lower reach as well. In addition to a few substantial debris jams, there are several interactive pieces of LWD present in the stream channel. The gradient increases near RM 0.5 as the creek drops down into the Puyallup River flood plain. A large, structurally complex section of the channel exists just below the Electron flume line. This complex was created by historic amounts of course materials moved during the 1996 flood event. Near the mouth of Kellog, the creek initially drops into the Puyallup River channel migration zone and may flow for an additional 0.1-0.5 miles before dumping into the active main river channel.





The 2008 redd data is incomplete due to extremely poor survey conditions which prevented a regular full season of surveys.

KLICKITAT CREEK 10.0357

Klickitat Creek is a significant right bank headwater tributary to the White River. The word Klickitat is a native word meaning “beyond” or “prairie people”. The creek is exclusively surveyed for bull trout from late August through early October. The creek is not surveyed for other species because, with the exception of steelhead, the creeks 3300’ elevation at its mouth is likely too high for most salmon. In 2007, PTF biologist observed pink salmon in Sunrise Creek *(elev. 2800’)* which is located just inside the National Park boundary, approximately 5 miles downstream of Klickitat. This is the highest point on the White River that adult salmon have been documented by the Puyallup Tribe since surveys have been conducted.

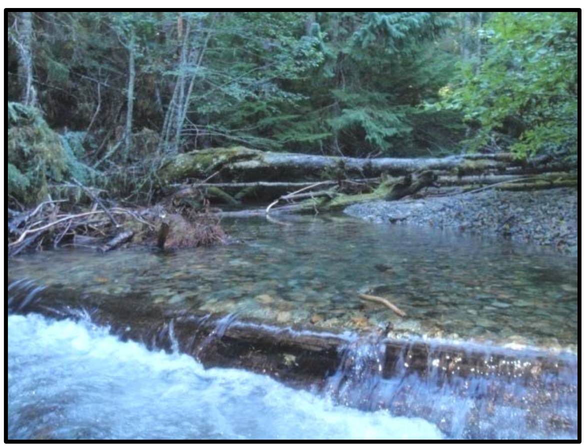
Klickitat Creek is a phenomenal nonglacial stream, originating from Ghost Lake *(elev. 4396’)* near Cayuse Pass. Klickitat is a north facing stream flowing entirely within Mt. Rainier National Park, and is the source of drinking water for the NPS White River compound. Klickitat enters the White River north of Sunrise Park Road at approximately RM 67.9. The creek is surrounded by old growth and the water temperature is tempered by cold clear water year round *(three year average summer temperature from 2006-2008 was 6.56 ^{O}C [range 3.8-8.5 ^{O}C]).* The only drawback being, there is only about 0.3 miles of anadromous usage. Three significant unnamed tributaries add flow to Klickitat; unfortunately, they do not contribute any beneficial spawning or rearing habitat given they are located well above natural anadromous barriers.

Lower Klickitat provides exceptional habitat conditions for bull trout (*char*) and cutthroat rearing and spawning. The first 0.3 miles is low gradient, with excellent spawning gravel and significant amounts of in-channel LWD *(lower right).* Numerous pools and side channels provide excellent habitat for all life history stages of bull trout; from newly emerged fry to adults. A series of bedrock falls and cascades at RM 0.3 blocks any further upstream migration. Numerous surveys have been conducted above the falls; however, no fish or redds have been observed. The Puyallup Tribe has surveyed Klickitat for bull trout escapement since 1999; thus far, no other salmon species have been observed spawning in the creek. Bull trout from the mainstem White River are observed spawning in the creek early in the fall, and juvenile bull trout have been observed in the pools and lateral habitat during these surveys. The few dead bull trout encountered during surveys appear to be pre-spawned mortalities due to predation.

Klickitat Creek has been recognized as a key index stream for bull trout spawning. During the 2002 through 2007 survey seasons, bull trout floy tagged at the USACE trap in Buckley were observed spawning in the creek. For three seasons, from 2005-2007, PTF biologists conducted extensive bull trout migration telemetry studies; as well as redd surveys along the upper White River and West Fork White River. The study focused heavily on the headwater tributaries located within Mt. Rainier National Park. Study results showed that the cold high mountain streams located within the park provide the majority of the critical bull trout spawning habitat within the basin. Two of the bull trout observed spawning in 2007were part of the

migration telemetry study. Both fish had been implanted with radio tags and released near Greenwater *(RM 45)* in late June, and were observed spawning together in Klickitat during September just below the falls.

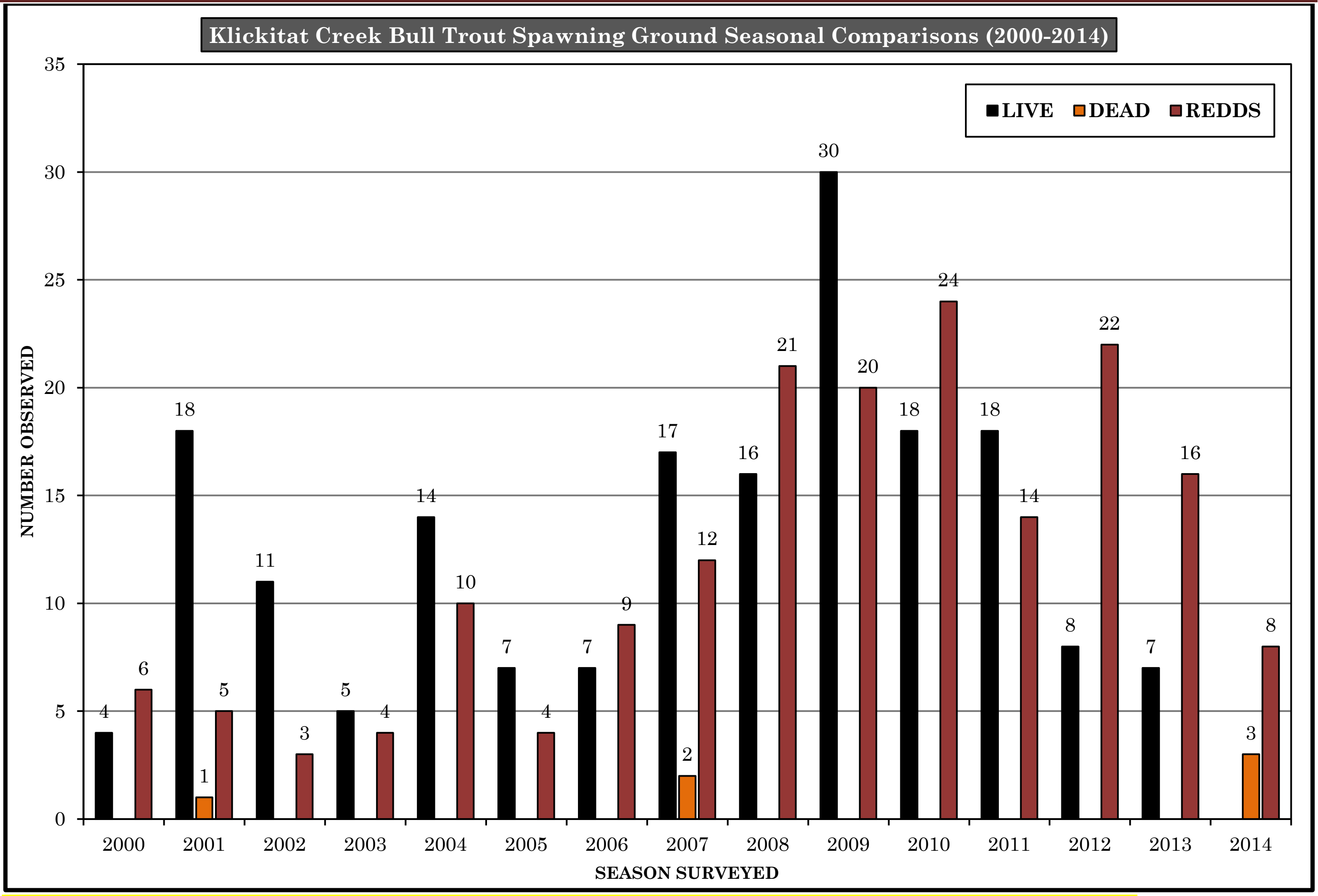
Resident bull trout reside in smaller headwater tributaries, while fluvial bull trout frequently travel long distances; utilizing the mainstem rivers and larger tributaries to forage and overwinter. During the fall, migratory forms of bull trout journey from spawning and rearing habitats in the upper watershed to foraging and overwintering habitats located lower in the river system. Beginning in spring and early summer, they begin the return journey back to spawning and rearing areas high in the watershed. In response to changing habitat and reproductive needs, migratory bull trout in the White River travel up to 75 miles or more between the lower river and headwaters located in or near Mt. Rainier N.P. To accomplish this, bull trout require unobstructed migration corridors and connectivity of streams and rivers in order to provide them with access to spawning, rearing, foraging, and overwintering habitats.



Bull trout spawning occurs primarily during the first three weeks in September, however, spawning has been observed taking place from the last week of August through the first week of October. Bull trout are iteroparous *(have the ability to spawn more than once)*; therefore, recovering pre-or-post spawn mortalities for examination is extremely rare. Spawners in the upper White River tributaries are observed utilizing various sized substrate from small gravels to small cobble. Redds are often constructed in the tail-out of pools and along channel margins. Embryonic development is slow *(depending on water temperatures)*; it may take between 165-235 days for eggs to hatch and for alevin to absorb their yolk (Pratt 1992). Bull trout fry emerge in late winter and early spring. Young fry can often be seen by mid March foraging in the lateral habitat along the upper mainstem White River and associate tributaries.

Bull trout habitat throughout the Puyallup and White rivers has been severely impacted by over a century of land and water resource exploitation; including, damming and substantial water diversions, considerable riparian alterations *(deforestation)*, dewatering and low instream flow regimes, as well as significant channel manipulation. These impacts have lead to a marked deterioration in land and hydrological behavior within these river systems by causing water flow of poorer quality, quantity and timing. Several limiting factors are involved with regards to the healthy function of stream habitat and bull trout populations in the watershed; including lost or diminished habitat connectivity and migration corridors *(human-made fish passage barriers)*, fragmentation and reduction of habitat quality *(entrainment, transportation networks, forest management practices and operations, direct water withdrawal)*; in addition to, water quality, fish entrainment and entrapment, unknown species interactions, and potential climate change impacts *(changes in flow regimes, scour effects, thermal variations, changes in water chemistry).*

Bull trout are primarily piscivorous *(fish eaters)*; however, they are opportunistic feeders, feeding on a variety of prey items depending on their particular life history strategy and stage of development. Adults feed almost exclusively on other fish, including a range of salmon and trout species; as well as other resident fish species. Juveniles feed on aquatic invertebrates, including stoneflies *(Plecoptera)*, caddisflies *(Trichoptera)*, and mayflies *(Ephemeroptera)*. Bull trout require a healthy aquatic environment in order to survive and flourish. They need an environment that provides the necessary prey base; in addition to the rearing and reproductive habitat essential to ensure their continued survival and reproductive success.



Raw spawning data for Klickitat Creek can be found in Appendix C. See Appendix B for bull trout redd locations.

LE DOUT CREEK 10.0620

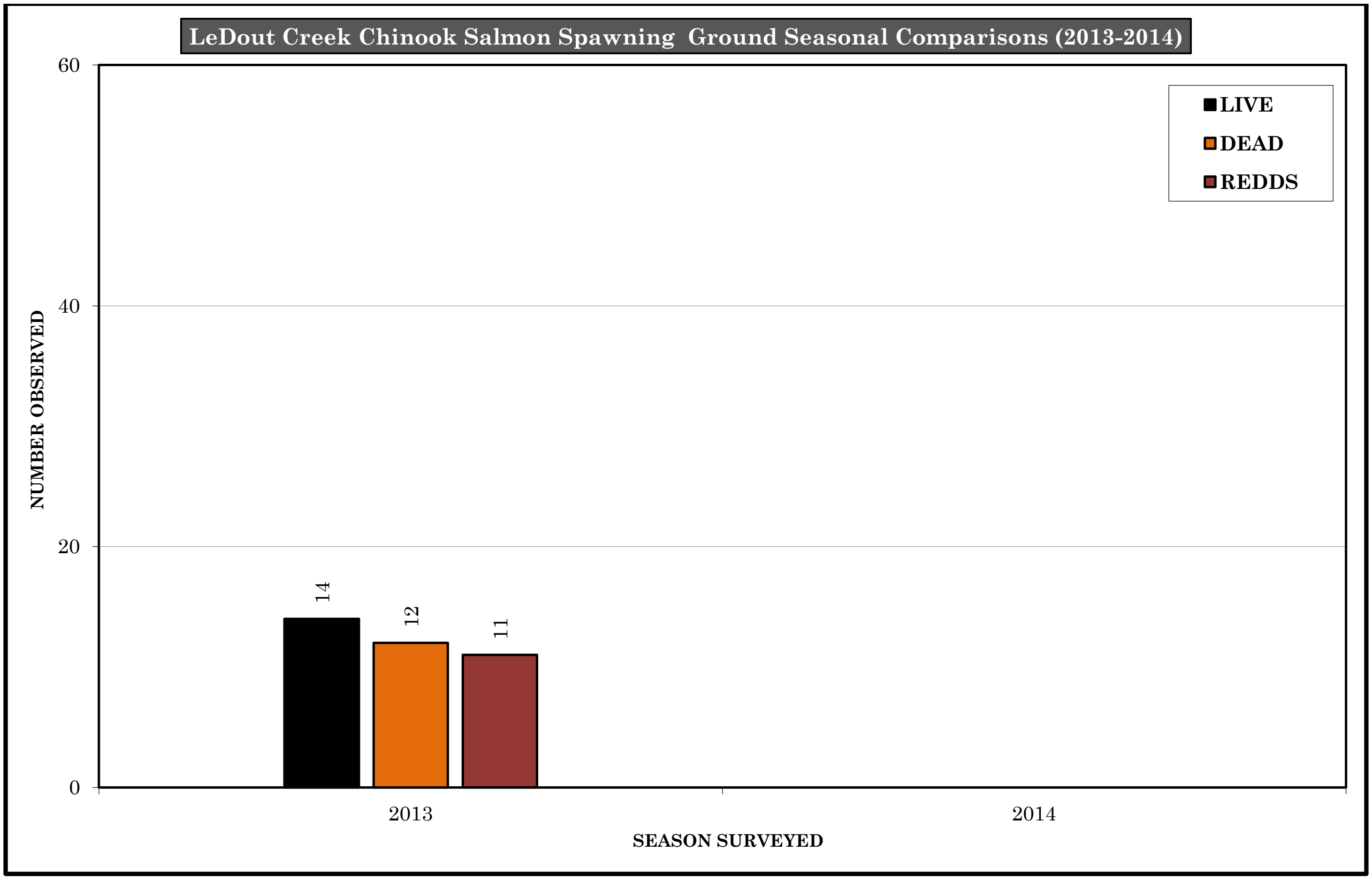
Le Dout Creek is a small tributary to the Upper Puyallup River, entering the mainstem river channel at RM 39.2. This small order stream drains a wetland area at just over 1,800 feet, and flows northwest for approximately 2.5 miles before meeting the Puyallup. Unfortunately, low flows *(major factor)* often prevent adult salmon from ascending past the first 0.45 miles. Le Dout is located within the Kapowsin tree farm currently managed by Hancock (*Hancock Timber Resource Group).* Several areas along the upper reach have undergone several timber harvests in the past. Le Dout Creek supports an exceptionally limited number of coho and steelhead spawners.

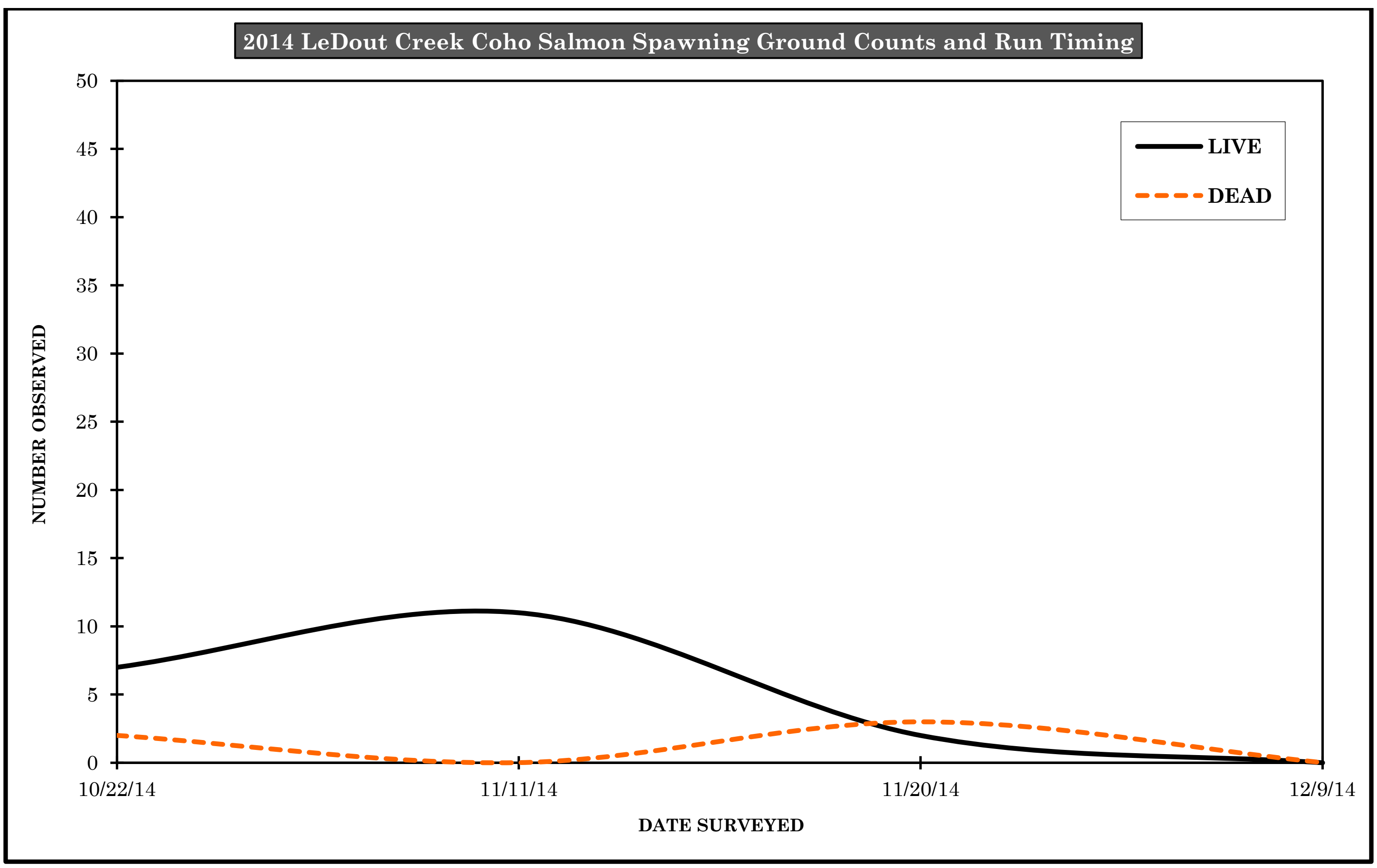
The creek is often too shallow in late summer to allow Chinook *(left)* access to spawn; however, higher than average flow allowed the first significant number of adult Chinook to enter the creek in 2013. Bull trout utilization is unknown.

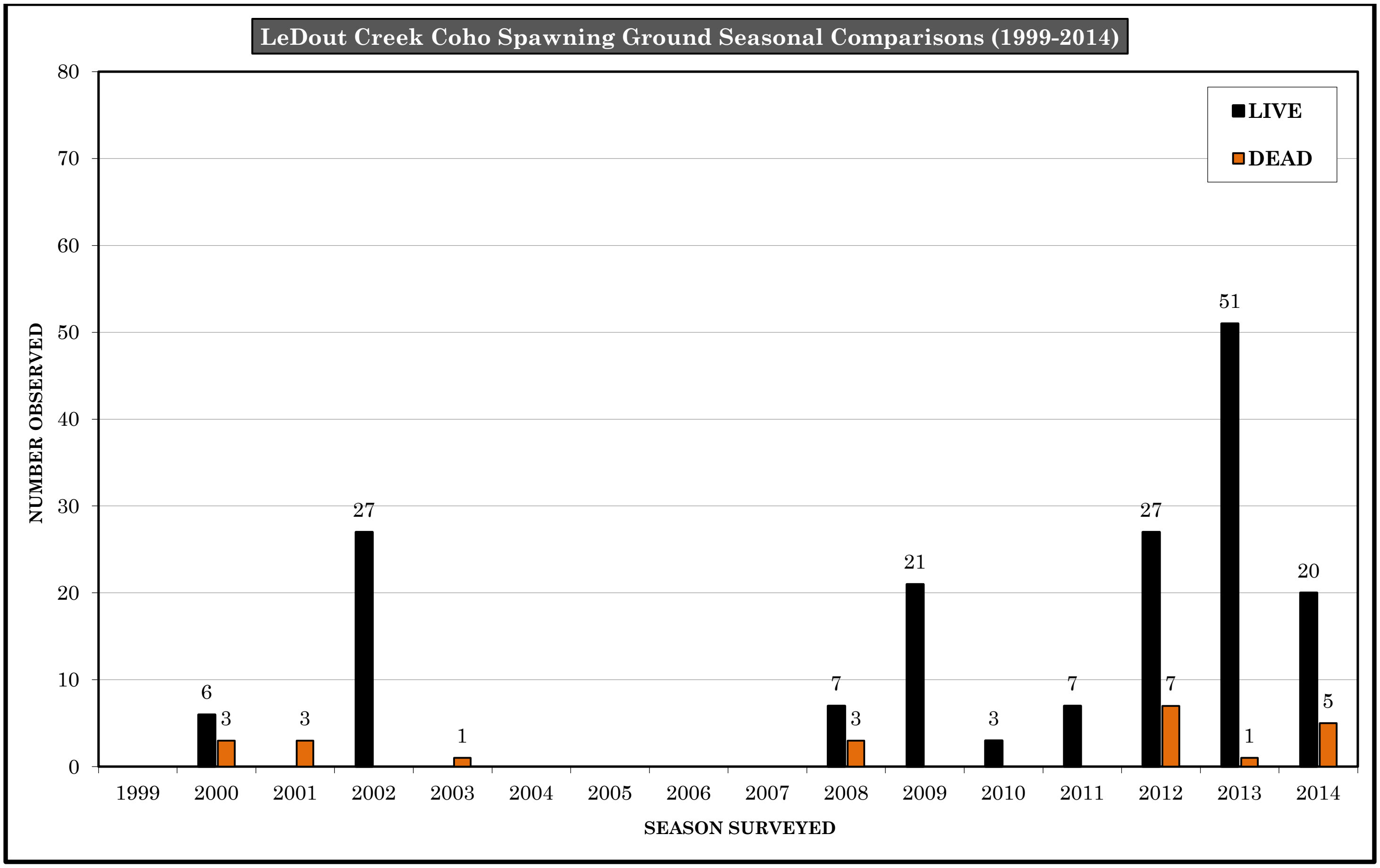
Le Dout is a stream with moderate complexity, and habitat that is well suited for coho and steelhead adult spawners, as well as juveniles. To a large extent the substrate present throughout Le Dout consists of small and large cobble; yet, good quality patches of spawning gravels are available *(lower left).* The channel habitat consists mostly of low gradient pools and riffles. The creek contains a substantial proportion of small and medium size woody debris, and the surrounding riparian zone consists mostly of alder and Douglas fir. Logging activities occurred along the lower reach of Le Dout in the past; however, there is currently a good RMZ along the majority of the lower spawning reach of the creek. A split in the channel at RM 0.45 often prevents adult fish from migrating further upstream due an increase in the gradient along with a reduction in flow. The upper reach of the creek is steep with impassable cascades. The 62 Rd. crosses Le Dout Creek approximately 0.45 miles from its confluence with the Puyallup River.

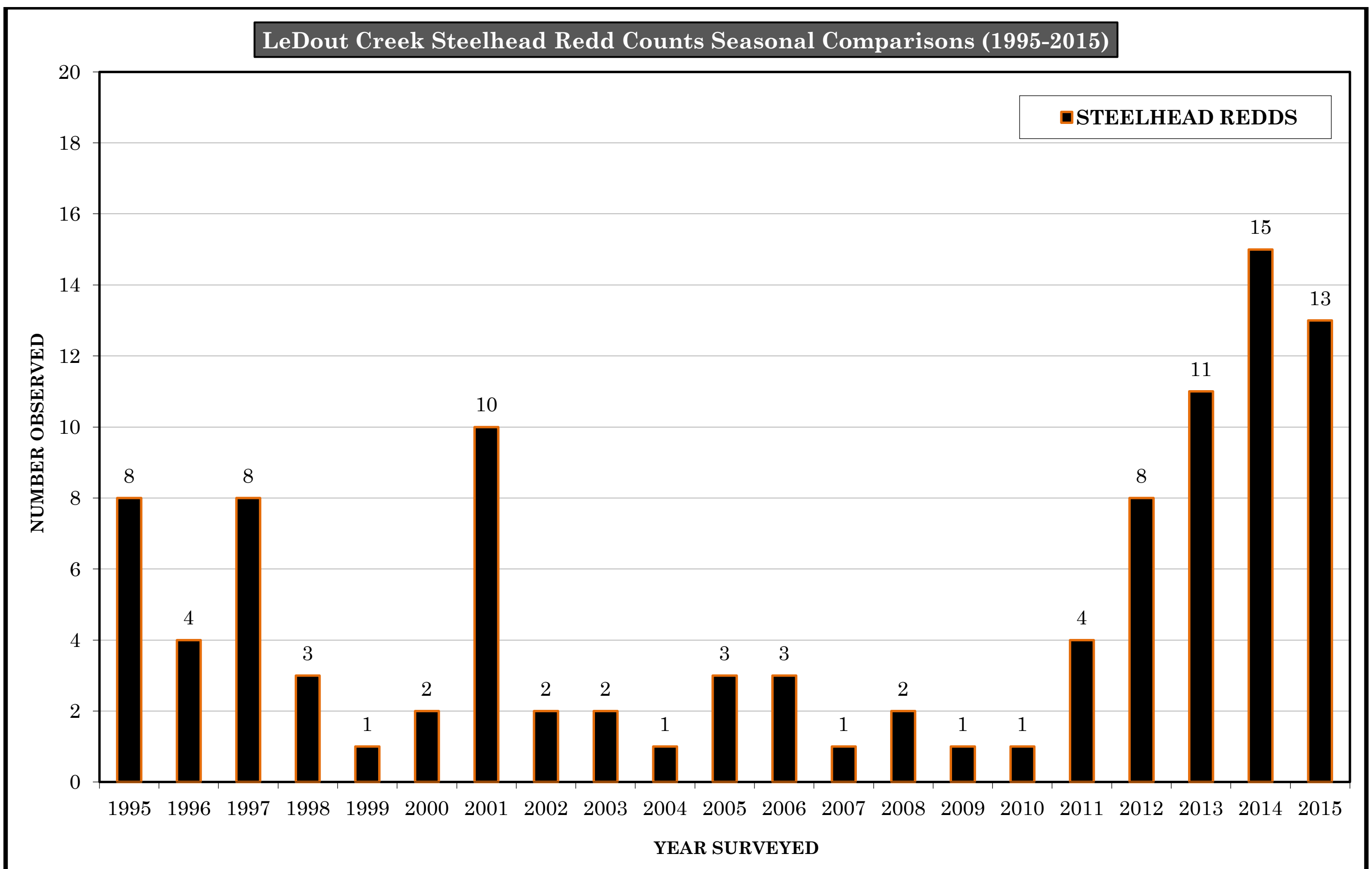
The mouth of Le Dout *(lower right)* is located about 2.6 miles below the Electron diversion dam. Given that the creek is downstream of the diversion dam, and river flows over the past century have often been high enough during late winter and spring to prevent the mainstem channel of the Puyallup River from being drawn dry, wild steelhead have managed to maintain a minute foothold in Le Dout Creek. Despite generally low escapement numbers, steelhead surveys in Le Dout are conducted annually by the Puyallup Tribe. Winter steelhead stocks in the Puyallup basin have experienced a dramatic decline since 1990 *(ESA listed in 2007).* The precipitous decline within just the past few years has created serious concern among fisheries managers.

Factor(s) responsible for the decline in steelhead survival are unknown, especially when other salmon species are experiencing relatively good success.

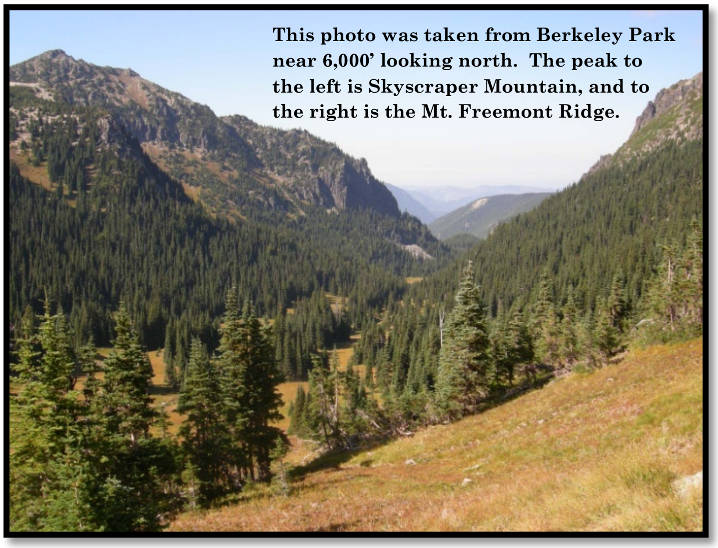

LeDout Creek Chinook Salmon Spawning Ground Seasonal Comparisons (2013-2014)
NUMBER OBSERVED
0
20
40
60
14
12
11
2013
2014
SEASON SURVEYED
LIVE
DEAD
REDDS


2014 LeDout Creek Coho Salmon Spawning Ground Counts and Run Timing
NUMBER OBSERVED
0
5
10
15
20
25
30
35
40
45
50
10/22/14
11/11/14
11/20/14
12/9/14
DATE SURVEYED
LIVE
DEAD


LeDout Creek Coho Spawning Ground Seasonal Comparisons (1999-2014)
LIVE
DEAD
NUMBER OBSERVED
SEASON SURVEYED
0
10
20
30
40
50
60
70
80
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
6
3
3
27
1
7
3
21
3
7
27
7
51
1
20
5


LeDout Creek Steelhead Redd Counts Seasonal Comparisons (1995-2015)
STEELHEAD REDDS
NUMBER OBSERVED
YEAR SURVEYED
0
2
4
6
8
10
12
14
16
18
20
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
8
4
8
3
1
2
10
2
2
1
3
3
1
2
1
1
4
8
11
15
13

LODI CREEK 10.0227


This photo was taken from Berkeley Park near 6,000' looking north. The peak to the left is Skyscraper Mountain, and to the right is the Mt. Freemont Ridge.

Lodi Creek is a significant right bank headwater tributary to the West Fork White River. The name Lodi apparently originated from early mineral prospectors in the region. This high mountain stream flows northwest through a steep glacial valley, bordered by Skyscraper Mountain to the west and the Mount Fremont ridgeline running along the east *(top left)*. Lodi flows entirely within Mt. Rainier National Park *(NPS stream designation #f09-00a)*, the creek is non-glacial in origin; rather, its sources are derived from snowpack accumulations within Berkeley Park, located at 6,400+ feet of elevation *(top left)*; as well as other surrounding surface and groundwater sources. Berkeley Park is nestled into the northern slopes of the Burroughs Mountain Range. Lodi Creek flows for just over 4 miles from its headwaters before entering the White River at approximately RM 13.7; situating it about a mile upstream of Van Horn Creek *(RM 12.65)*.

The lower reach of Lodi provides excellent habitat conditions for bull trout rearing and spawning. Various surveys have verified both resident and fluvial bull trout utilization within this stream. However, the creeks 3400' elevation is likely too high for Chinook, coho and pink salmon. PTF surveys the creek for bull trout spawning during the month of September. From 2005-2007, PTF biologists conducted extensive bull trout migration telemetry studies and redd surveys along the upper White River and West Fork White River; focusing heavily on the headwaters located within Mt. Rainier National Park. The study results showed that the cold high mountain streams located within the National Park, including Lodi, provide the majority of the critical bull trout spawning habitat in the basin. In addition, bull trout spawning was less consistent and frequent in this tributary compared to that observed in several significant headwater tributaries located along the White River.

During the 2007 season, several bull trout redds were documented in Lodi from mid-to-late September. During the 2008 season, no bull trout spawning activity was observed. The only bull trout observed spawning during 2006 was part of the migration telemetry study. This bull trout had been implanted with radio a tag and released near Greenwater *(RM 45)* in early June, and was observed spawning in the creek on September 8th.

Characteristic of many headwater tributaries, the lower reach of the creek is a low gradient channel flowing within the open channel migration zone of the West Fork White River floodplain, and is repeatedly manipulated by mainstem river incursions. There is little significant LWD present in this portion of the channel and the high solar exposure results in significant algae mats accumulating over the substrate *(right)*. Although spawning does occur within this small stretch, it can be limited due the lack of quality spawning substrate created by the alluvial deposits *(fine sand and silt)* from the West Fork White River. Beyond the open floodplain, the creek enters the forested lower slope of the valley floor as it parallels the West Fork White River channel. From this point, the creek assumes a pool-riffle configuration for approximately the next 0.8 miles before climbing its way up the steep valley wall; an impassable falls prevent any further upstream migration. The forested reach provides quality spawning and rearing opportunities.

MEADOW CREEK 10.0630

Meadow Creek is a tributary to the Mowich River, entering the Mowich at RM 3.9. The creek was named by Bailey Willis *(1857-1949)* in 1883. Willis was a geological engineer who played an essential role in establishing Mt. Rainier as a national park. Meadow originates from Eunice Lake *(elev. 5353')*, deep within Mt. Rainier National Park. With exception of the Mountain Meadows habitat area below Eunice Lake, the creek flows through a high gradient, frequently confined channel for most of its 4.6 mile length. Meadow Creek has one significant tributary, Hayden Creek, at RM 2.5. Pristine spawning and rearing habitat exists within the lower one-mile reach of the creek. This anadromous reach consists of a low to moderate gradient channel, with a pool-riffle character, abundant spawning gravel, LWD; as well as an intact mature riparian zone along the entire creek. Several pieces of LWD along with stable log jams have created remarkable stream complexity throughout the lower reach of the creek.

Meadow Creek is unspoiled in many ways and has incredible potential to be a highly productive salmon and steelhead stream. Unfortunately, anadromous salmon were unable to access the creek for nearly a century due to the streams location above the Electron diversion dam on the Puyallup River. With the completion of the Electron fish ladder *(@ RM 41.7)* in the fall of 2000, anadromous fish passage was restored for the first time since 1904. Restoring anadromous access to the upper Puyallup River has made approximately 26+ miles of spawning and rearing habitat above the diversion available for several species including Chinook, coho, pink, steelhead, and bull trout. The creek does; however, have a resident population of cutthroat trout. It is also suspected that bull trout may be present in the creek, since they are known to populate the Mowich River; however, bull trout utilization has not been documented to date.

Due to the lengthy absence of anadromous fish usage and the poor rate of natural fish reestablishment, Meadow Creek is only occasionally surveyed to determine if salmon or steelhead are utilizing the stream. Disappointingly, many of the fish enhancement techniques employed by the Puyallup Tribe such as adult, juvenile, or fry plants; as well as the use of acclimation ponds, are not possible due to the creeks remote location and lack of vehicle access. Therefore, one of the Puyallup Tribe's short term goals continues to be the reintroduction of Chinook, and possibly coho via remote site incubators *(RSI)*. The obvious need for RSI's is due to the limited accessibility to the creek. Upwards of 40,000 Chinook and coho could be incubated and released into the creek annually; however, this has not been accomplished as of the printing of this report. Currently, no proposals exist for reestablishing steelhead into Meadow Creek or the Upper Puyallup system. Yet, the need for action is paramount due to the steeply declining stock of wild steelhead in the Puyallup Watershed. The first documented steelhead redd was made in May 2014 *(a single redd was observed-center photo)*.

MOWICH RIVER 10.0624

The upper Mowich River

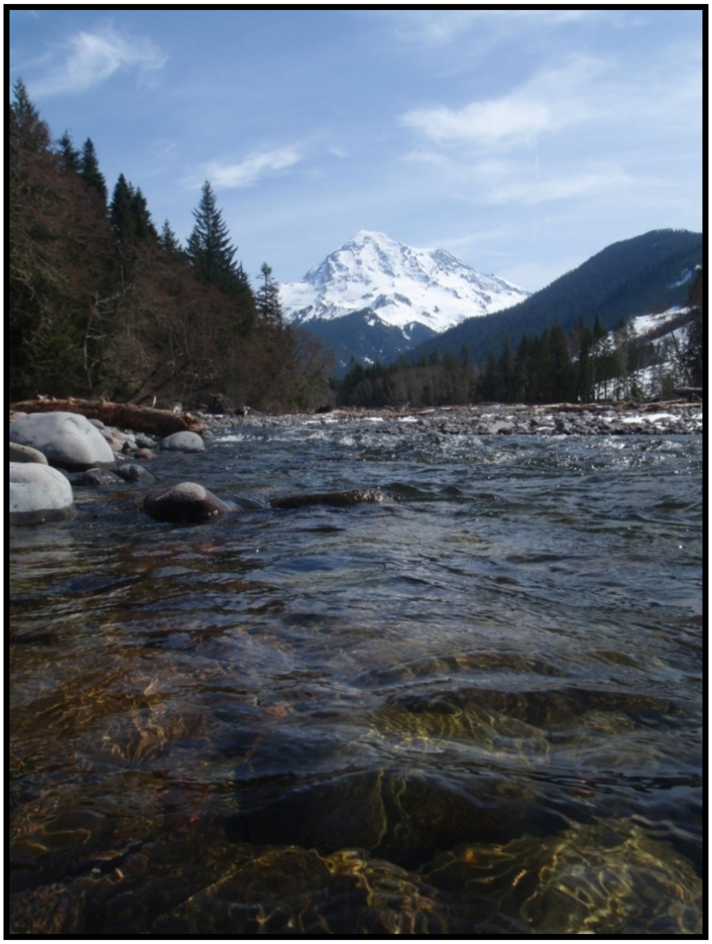
The Mowich River converges with the Puyallup River at RM 42.3, this is approximately 0.6 miles above the Electron diversion dam. The glacial headwaters of the Mowich River originate from the Edmunds, and the North and South Mowich glaciers on the west slope of Mt. Rainier. Significant tributaries to the Mowich include; Crater, Spray, Meadow, and Rushingwater creeks. Meadow originates from Eunice Lake, deep within Mt. Rainier National Park and enters the Mowich at RM 3.9. The creek flows through a high gradient, frequently confined channel for most of its 4.6 mile length. Meadow Creek has one significant tributary, Hayden Creek, at RM 2.5. However, the lower mile of the creek has a low to moderate gradient, with a pool-riffle character, abundant spawning gravel, LWD, and riparian cover along the entire channel. Several pieces of LWD along with stable log jams have created remarkable stream complexity throughout the lower reach of the creek.

The upper Mowich River

Rushingwater Creek originates from the Golden Lakes in Mt. Rainier National Park. Rushingwater flows over 5 miles to its confluence with the Mowich River at RM 0.6. Most of Rushingwater flows within the Kapowsin tree farm *(Hancock Forest Management)* where roads and timber harvesting have impacted several portions of the stream. The upper survey reach of the creek is mostly comprised of pools and glides, with fine and medium sized substrate. Abundant in-stream woody debris and a moderate to dense canopy cover extend throughout most of this reach.

The North and South Mowich forks flow though Mt. Rainier National Park and reach their convergence at RM 7.5 to form the main stem Mowich River. The upper 4-5 miles of the Mowich River consist of steep and moderate gradients, with a largely cobble and boulder substrate. There is little spawning habitat available, yet some suitable spawning conditions exists in the outlying side channels below RM 7.5. The channels of the North and South Mowich are bordered by mature dense conifer and mixed deciduous forests.

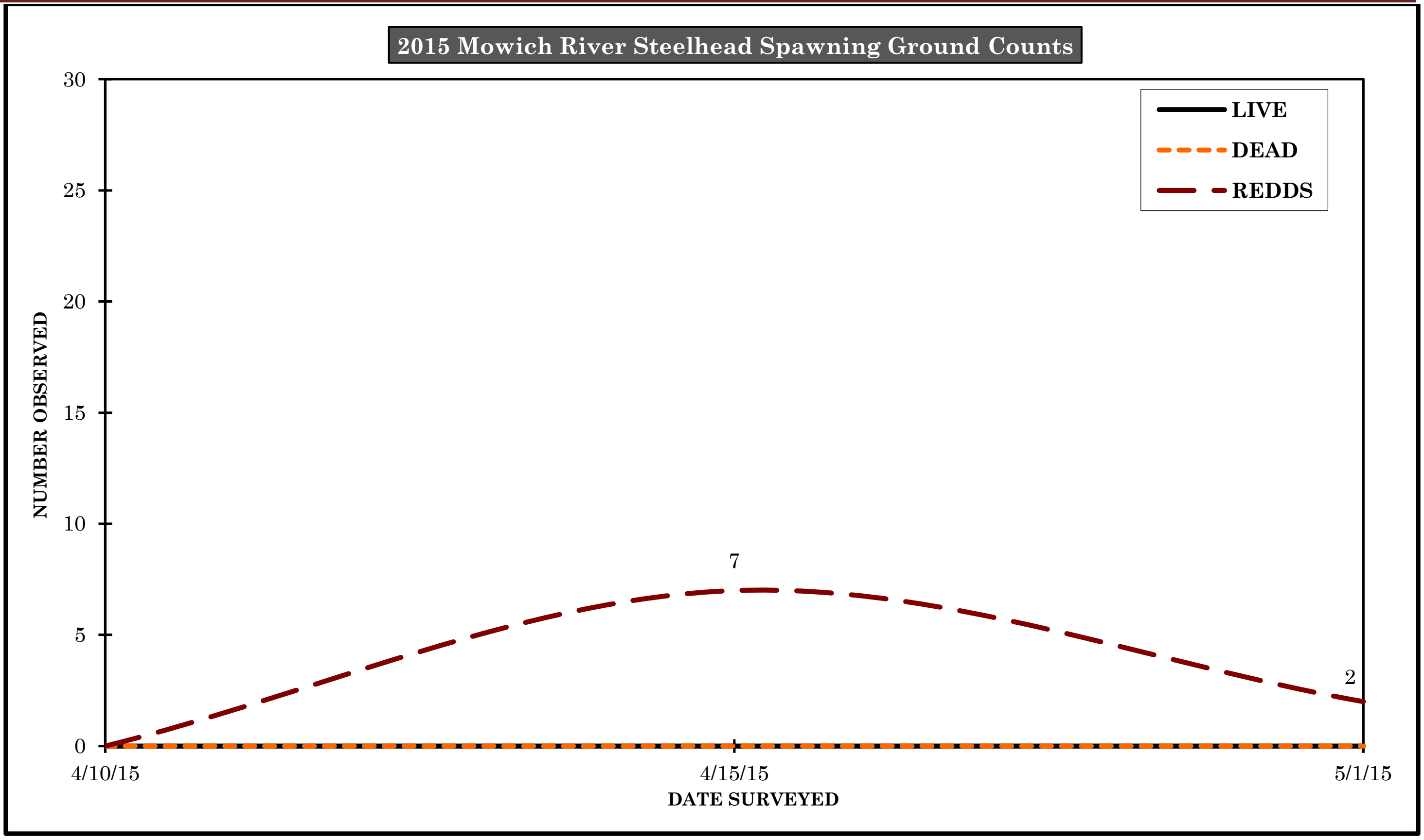
From RM 6.5 to 3.1, the Mowich River is comprised of more complex habitat. The gradient decreases along this reach, resulting in a more pool-riffle character where smaller spawning substrate is deposited and resting pools are available for upstream migrants. The lower three mile of the river flows within the Kapowsin tree farm managed by Hancock. Most of the lower three miles of the channel becomes confined and narrowed by the steepening valley walls. Fortunately, much of the channel retains its complexity and spawning opportunities are abundant for both salmon and steelhead. Juvenile coho have been observed as high as RM 5.0, whereas adult and juvenile bull trout have been documented as high as RM 7.5. Of special note is the first documented spawning of naturally returning Chinook in the Mowich



River in 97 years. Two females on separate redds were observed spawning in the lower reach *(RM 1.0)* on September 7, 2001.

With the completion of the Electron fish ladder *(RM 41.7)* in the fall of 2000, anadromous fish passage was restored for the first time since 1904. Surplus Chinook and coho salmon from Voights Creek Hatchery were planted in the Mowich River, and Rushingwater Creek for several years in efforts to jump start the Upper Puyallup. One of two acclimation ponds used for reestablishing coho *(prior to 2008)* into a 26+ mile reach of the Upper Puyallup River is located just off the main channel of Rushingwater Creek at RM 0.6. The pond holds 14,000 cu. ft. of water with a flow rate of 1-3 cfs, in past years, 40,000 to 100,000+ coho yearlings were imprinted and released from Rushingwater annually. Coho yearlings originated from Voights Creek Hatchery where they were adipose clipped and coded wire tagged. Fish were released at 20 fish per pound, for a total biomass of 10,000 pounds. There was also a natural acclimation pond on the Mowich used for rearing Fall Chinook, located at RM 0.1. Unfortunately, the water intake was destroyed during a flood event, rendering this pond nonoperational.

The Puyallup Tribe's restoration goal is to rebuild depressed Chinook and steelhead stocks and remove them from ESA listing. Historically, Fall Chinook have been reared since 1980 with a variety of stocks, goals, and objectives. Using acclimation ponds, limiting harvest, and making substantial gains in habitat restoration, the tribe will be able to accomplish this task. Levee setbacks, oxbow reconnections both inter tidal and upland, Commencement Bay clean-up, and harvest cutbacks have already been initiated. Only the jump-starting of Chinook in habitat areas devoid of fish is left. Acclimation ponds are a proven method in increasing fish numbers on the spawning grounds. Hatchery rearing Fall Chinook for acclimation ponds in the upper Puyallup River is a key component to restoration goals.


2015 Mowich River Steelhead Spawning Ground Counts
LIVE
DEAD
REDDS
NUMBER OBSERVED
DATE SURVEYED
0
5
10
15
20
25
30
4/10/15
4/15/15
5/1/15
7
2

NIESSON CREEK 10.0622

Niesson Creek is a tributary to the Upper Puyallup River. Originating from snowpack run-off and ground water, the creek runs northerly for approximately 5.3 miles before meeting the Puyallup at RM 41.1. Anadromous usage extents throughout the first 2.2 miles of the creek; supporting Chinook *(planted)*, coho *(NOR & hatchery plants)*, steelhead *(top left)* and bull trout. The most recent bull trout observation was in April of 2012.

Beyond RM 2.2, the creek climbs steeply along the remaining 3.1 miles to its origin at just over 4,000 feet. Niesson Creek is located within the Kapowsin tree farm currently managed by Hancock. The overstory riparian zone consists of mixed conifers and deciduous trees. Continuing timber harvesting activities have reduced the riparian zone to the state required minimum along several extended segments of the lower creek.

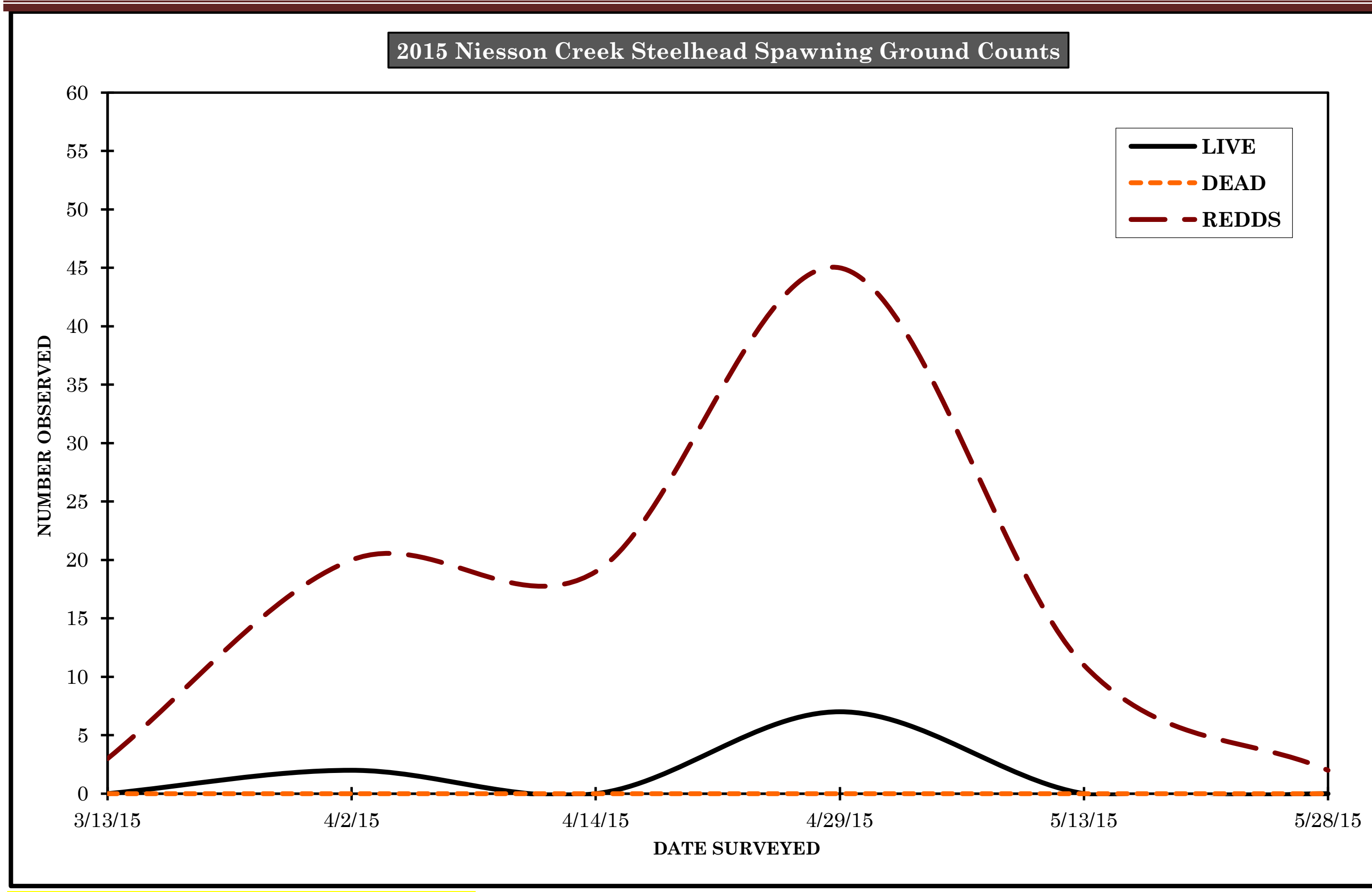
Lower Niesson

Niesson is a complex, moderate sized stream, which varies between a pool-riffle and forced pool-riffle character. The creek contains excellent and frequent spawning gravel, as well as significant LWD and debris jams throughout the 2.2 mile anadromous reach.

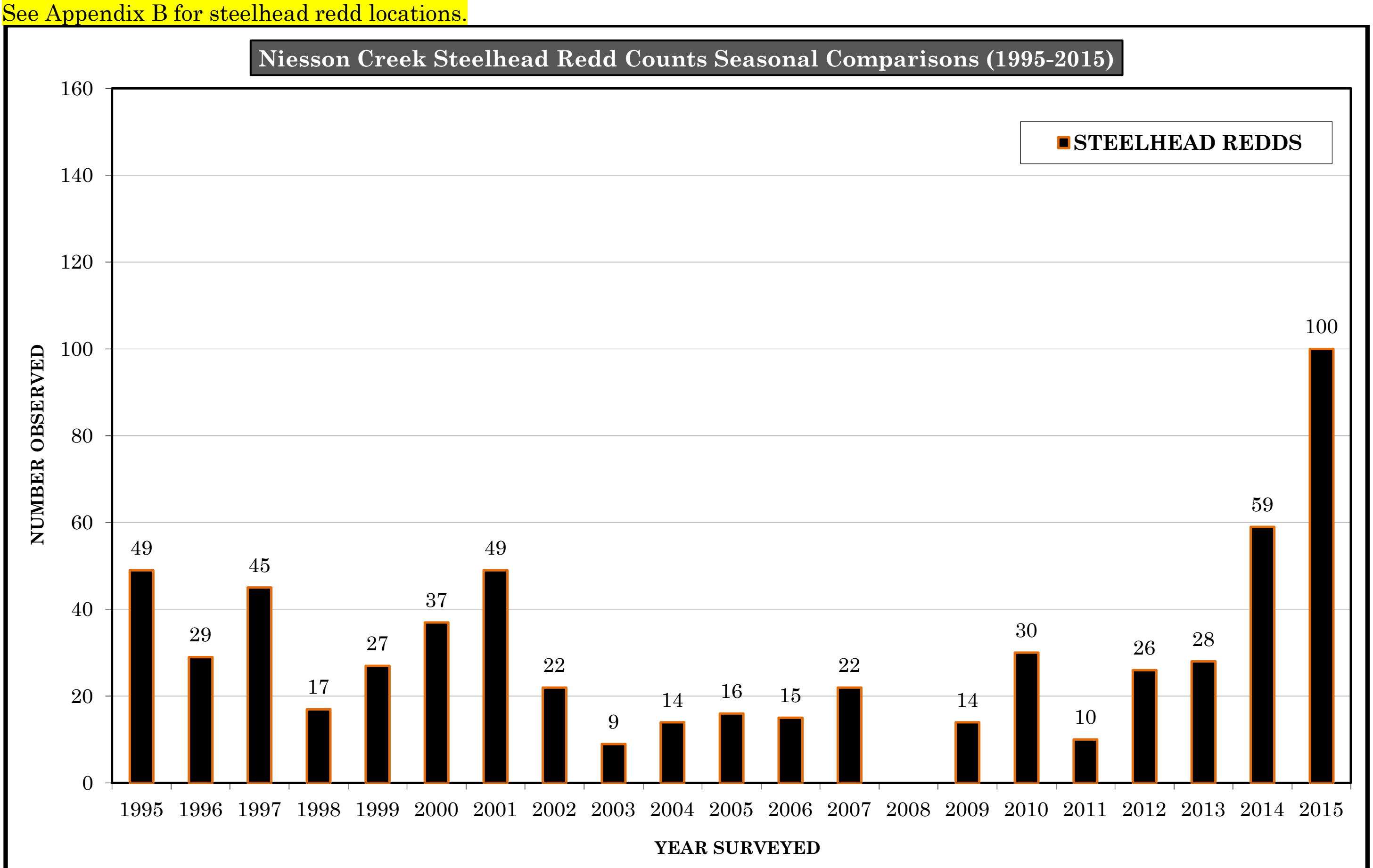
Niesson Creek is surveyed consistently for wild steelhead and spot checked for coho. Steelhead have been observed spawning as high as RM 2.2 near the abandoned 22 Rd. Naturally returning coho were observed for the first time in 2002. The natural returns are a result of live adult plantings and juvenile acclimation projects conducted by the Puyallup Tribal Fisheries Department. Since 1998, the Puyallup Tribe has been transporting live surplus adult coho from the WDFW's Voights Creek Hatchery in Orting; however, no fish were planted in 2004 or 2007. Instead, naturally retuning adult coho were allowed to spawn without intrusion from hatchery planted coho. Adult surplus Fall Chinook have been planted in the past when fish were available and creek flows allowed; unfortunately, the creek flow is often too low to allow naturally returning Chinook access to the creek in late summer and early fall.

Like Kellog and Le Dout creeks, the mouth of Niesson Creek is located downstream of the Electron diversion dam. Flows over the past century have often been high enough during late winter and spring to prevent the mainstem channel of the Puyallup River from being drawn dry; the higher winter/spring flows have thereby allowed wild steelhead to maintain a foothold in Niesson Creek. Unfortunately, escapement in Niesson has decreased significantly over the past several years. The winter steelhead stocks in the Puyallup basin have been declining since 1990. The precipitous decline within the past several years has created serious concern among fisheries managers. Factor(s) responsible for the decline in steelhead escapement are unknown, especially when other salmon species are experiencing relatively good success. Unlike the White River, there are currently no enhancement or supplementation programs for steelhead on the Puyallup River.

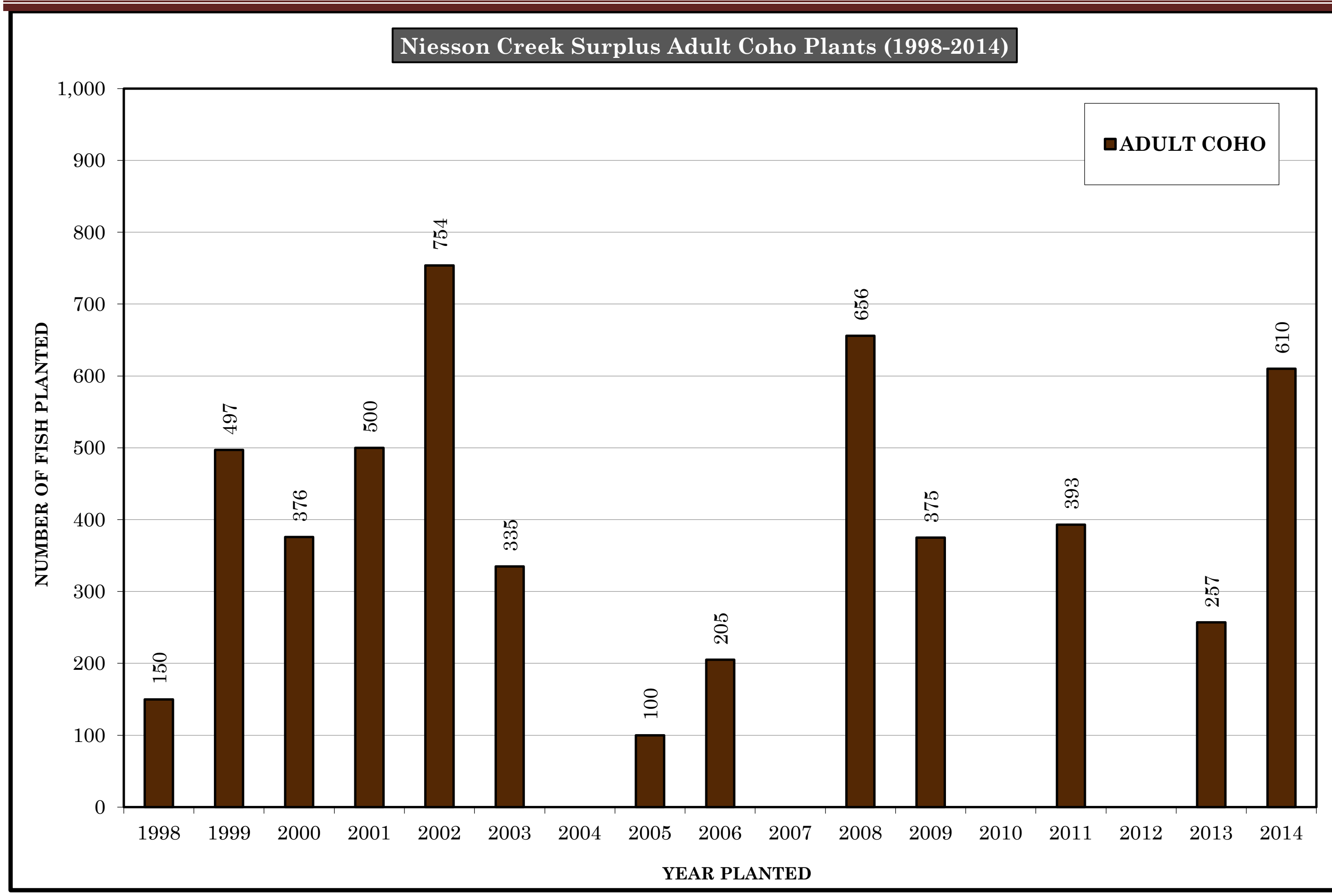
Upper Niesson



See Appendix B for steelhead redd locations.

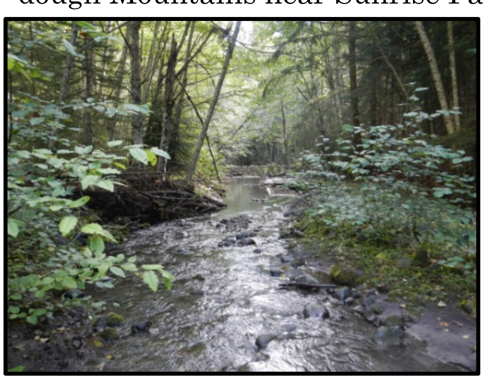


The 2008 redd data is incomplete due to extremely poor survey conditions which prevented a regular full season of surveys.


Niesson Creek Surplus Adult Coho Plants (1998-2014)
ADULT COHO
NUMBER OF FISH PLANTED
YEAR PLANTED
1,000
900
800
700
600
500
400
300
200
100
0
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
150
497
376
500
754
335
100
205
656
375
393
257
610

NO NAME CREEK 10.0364

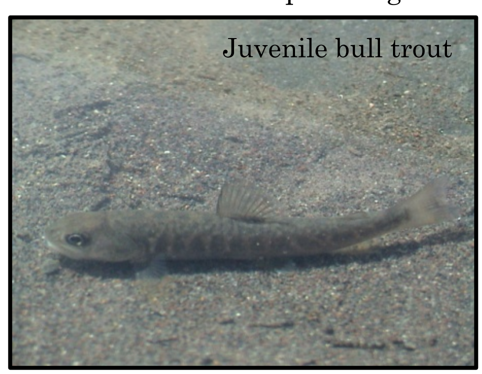
NO Name is not the officially designated name for this stream as established by the Washington State Board on Geographic Names; however, it's regularly referred to as "No Name Creek" by PTF staff *(NPS designation W14-00a)*. No Name is a small south facing left bank headwater tributary of the White River; at nearly 3.5 miles in length, only the first 0.7 miles offers exceptional habitat conditions for rearing and spawning. The creek supports all bull trout life history stages, as well as residential and fluvial life history types. No Name is surveyed for bull trout from late August through early October; unfortunately, the creeks 3300' elevation is likely too high for Chinook, coho and pink salmon. No Name Creek, like Klickitat Creek, is pristine in many ways. Originating along the slopes of the Sourdough Mountains near Sunrise Park, the creek flows entirely within Mt. Rainier National Park. No Name Creek enters the White River north of Sunrise Park Road at approximately RM 68.1.



The first 0.34 miles of the creek is low gradient and flows within the channel migration zone of the White River *(photo on following page)*. The habitat within this section is the least conducive to spawning due to a primarily sandy substrate; however, pools and side channels provide excellent habitat for juvenile bull trout which are often observed in the pools and lateral habitat during adult spawning surveys. In addition, this reach of the creek is highly subjected to the possibility of redd scouring or heavy silt deposition due to the influence of the mainstem White River.

The next 0.12 miles flows through the edge of the forested area along the White River channel. At this point the channel gradient increases slightly, as do the spawning opportunities. Although the substrate throughout this section is somewhat sandy, several pockets of suitable spawning gravel exist. Stream complexity increases due to some small debris jams and limited LWD. The surrounding riparian consists of primarily alder with some small to moderate sized Douglas fir and cedar; even so, solar exposure is still high through this portion of the creek.

The final quarter mile of anadromous usage contains the best habitat. The channel contains several pieces of LWD and spawning gravels, in addition to a heavy riparian zone consisting of fir and cedar. At approximately RM 0.71 the creek turns sharply and rapidly climbs up the valley wall. At this point the stream quickly develops into a series of impassable cascades preventing any further upstream migration. Bull trout have been observed spawning in the creek from late August through September.



Juvenile bull trout

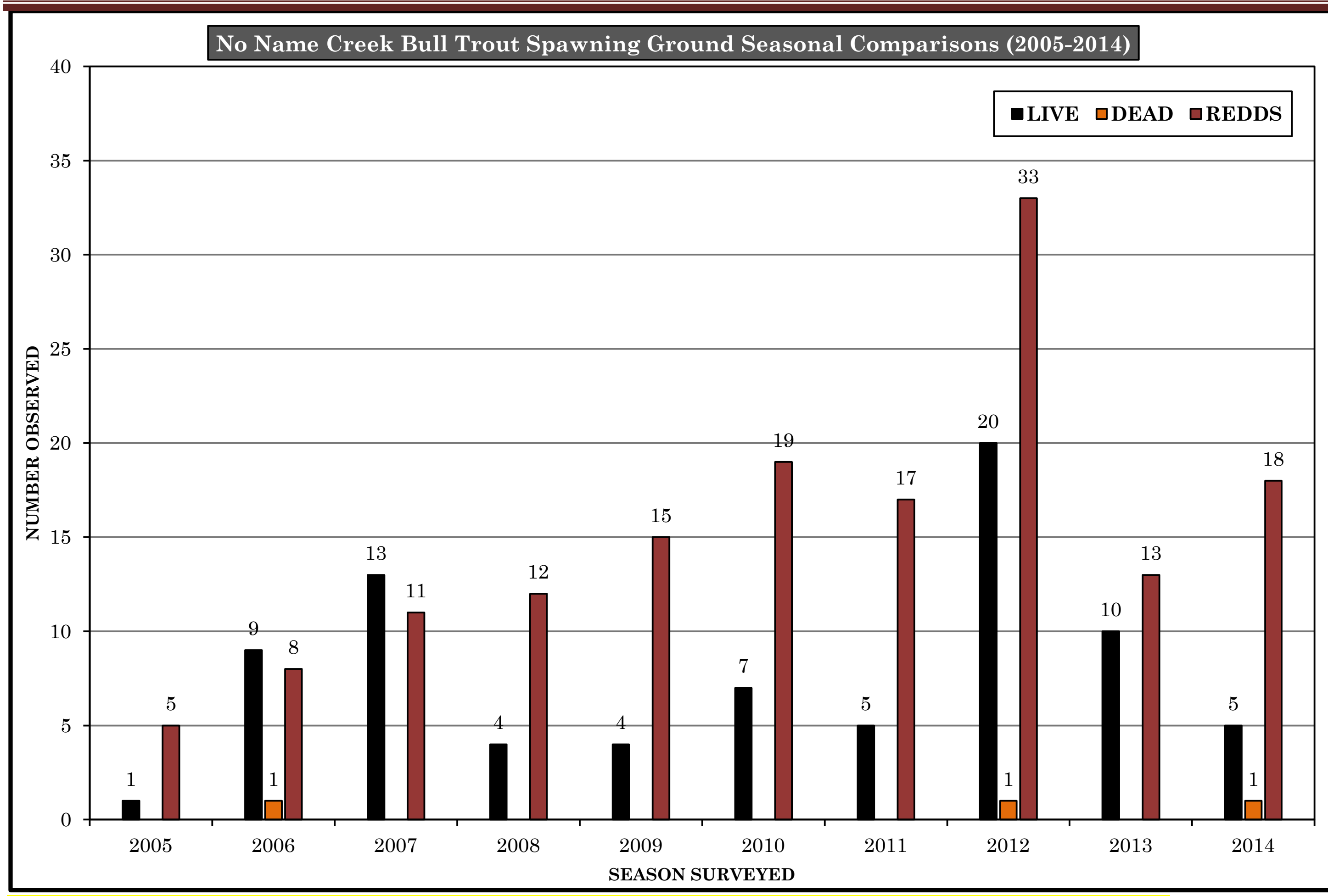
In 2006 and 2007, PTF biologist conducted extensive bull trout radio telemetry and redd surveys along the upper White River; focusing heavily on the headwaters located within Mt. Rainier National Park. During the 2007 season, several bull trout were observed spawning in No Name Creek from early to late September. One of the bull trout observed spawning in the creek was part of the migration telemetry study. This bull trout was surgically implanted with LOTEK® Wireless Inc.'s NanoTag Series transmitters *(NTC-4-2L)* and released near the Greenwater River (*RM 45*) in late June, and was observed spawning in late September.

Resident bull trout reside in smaller headwater tributaries, while fluvial bull trout frequently travel long distances; utilizing the mainstem rivers and larger tributaries to forage and overwinter. During the fall, migratory forms of bull trout journey from spawning and rearing habitats in the upper watershed to foraging and overwintering habitats located lower in the river system. Beginning in spring and early summer, they begin the return journey back to spawning and rearing areas high in the watershed. In response to changing habitat and reproductive needs, migratory bull trout in the White River travel up to 75 miles or more between the lower river and headwaters located in or near Mt. Rainier N.P. To accomplish this, bull trout require unobstructed migration corridors and connectivity of streams and rivers in order to provide them with access to spawning, rearing, foraging, and overwintering habitats.

Bull trout spawning occurs primarily during the first three weeks in September, however, spawning has been observed taking place from the last week of August through the first week of October. Bull trout are iteroparous *(have the ability to spawn more than once)*; therefore, recovering pre-or-post spawn mortalities for examination is extremely rare. Spawners in the upper White River tributaries are observed utilizing various sized substrate from small gravels to small cobble. Redds are often constructed in the tail-out of pools and along channel margins. Embryonic development is slow *(depending on water temperatures)*; it may take between 165-235 days for eggs to hatch and for alevin to absorb their yolk (Pratt 1992). Bull trout fry emerge in late winter and early spring. Young fry can often be seen by mid March foraging in the lateral habitat along the upper mainstem White River and associate tributaries.

Bull trout habitat throughout the Puyallup and White rivers has been severely impacted by over a century of land and water resource exploitation; including, damming and substantial water diversions, considerable riparian alterations *(deforestation)*, dewatering and low instream flow regimes, as well as significant channel manipulation. These impacts have lead to a marked deterioration in land and hydrological behavior within these river systems by causing water flow of poorer quality, quantity and timing. Several limiting factors are involved with regards to the healthy function of stream habitat and bull trout populations in the watershed; including lost or diminished habitat connectivity and migration corridors *(human-made fish passage barriers)*, fragmentation and reduction of habitat quality *(entrainment, transportation networks, forest management practices and operations, direct water withdrawal)*; in addition to, water quality, fish entrainment and entrapment, unknown species interactions, and potential climate change impacts *(changes in flow regimes, scour effects, thermal variations, changes in water chemistry)*.

Bull trout are primarily piscivorous *(fish eaters)*; however, they are opportunistic feeders, feeding on a variety of prey items depending on their particular life history strategy and stage of development. Adults feed almost exclusively on other fish, including a range of salmon and trout species; as well as other resident fish species. Juveniles feed on aquatic invertebrates, including stoneflies *(Plecoptera)*, caddisflies *(Trichoptera)*, and mayflies *(Ephemeroptera)*. Bull trout require a healthy aquatic environment in order to survive and flourish. They need an environment that provides the necessary prey base; in addition to the rearing and reproductive habitat essential to ensure their continued survival and reproductive success.



Raw spawning data for No Name Creek can be found in Appendix C. See Appendix B for bull trout redd locations.

OHOP CREEK 10.0600

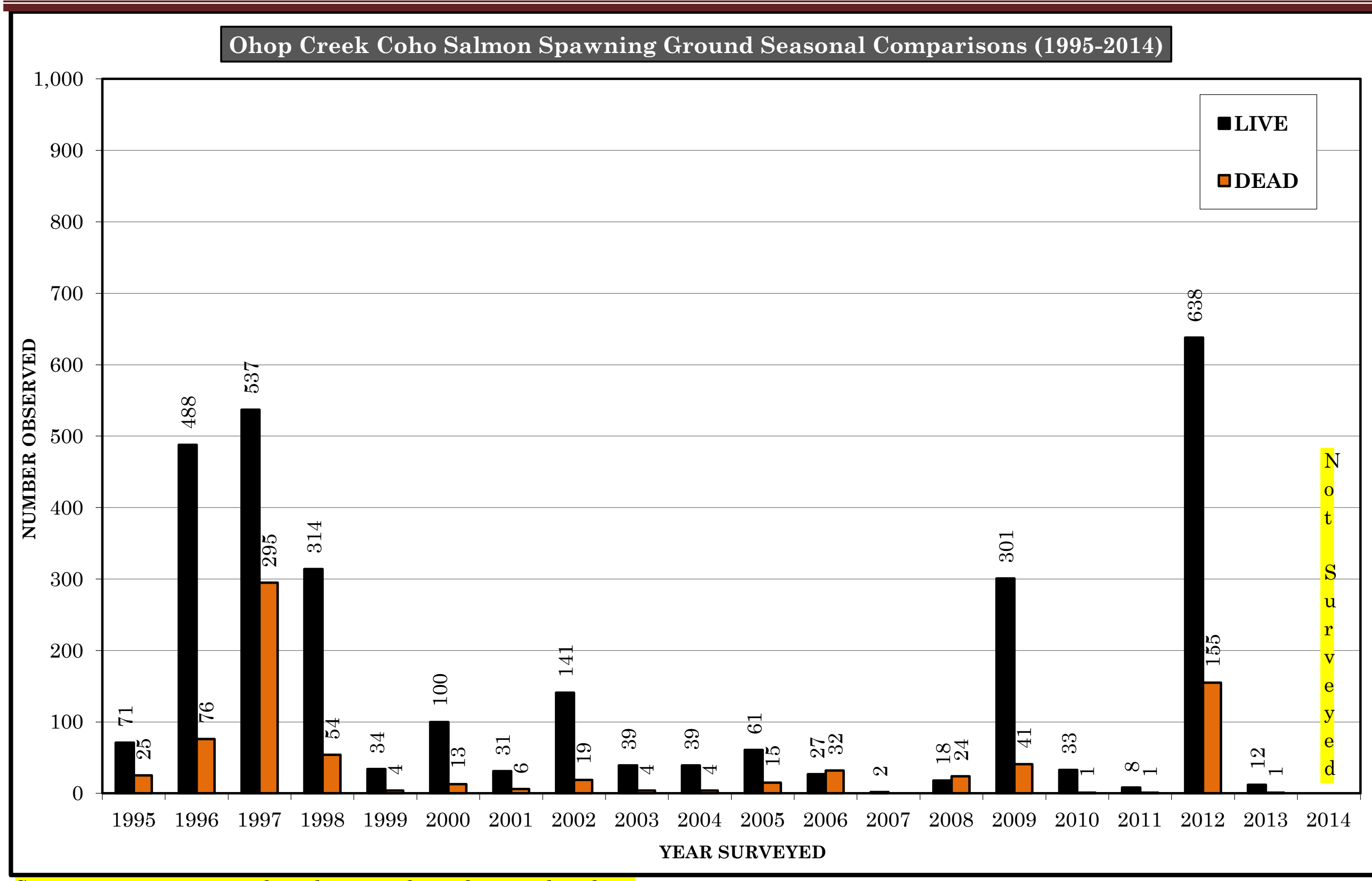
Ohop Creek is the primary feeder stream to Lake Kapowsin; not to be mistaken for the Ohop Creek which is a tributary to the Nisqually. Ohop Creek is considered a continuation of Kapowsin Creek; therefore, it shares the same WRIA designation *(10.0600)*. Continuing for nearly 8.5 miles beyond Lake Kapowsin, the creek currently supports primarily coho *(top left photo)*. In addition to coho, the creek likely continues to support a limited number of steelhead as well.

The lower 0.2 miles of Ohop Creek flows through a narrow and incised wetland boundary at the south end of Lake Kapowsin. This initial stretch is nonconductive to spawning and is heavily vegetated *(mostly reed canary grass [Phalaris arundinacea])*, and is commonly the site of recurrent beaver (*Castor canadensis*) activity. From RM 6.5 to RM 7.0, the creek assumes a low gradient pool-riffle structure; containing excellent spawning gravel, as well as several deep pools and moderate amounts of in-stream woody debris. The channel meanders through a forest of cedar, fir, alder and maple that is fairly dense along much of the lower reach *(RM 6.5 to 8)*. Several side channels branch off along this reach, offering additional spawning and rearing habitat. High water events often reestablish some significantly long complex side channels located above RM 0.4. These side channels are often utilized by coho. Cattle occasionally have access to the creek, but they have had minor impact.

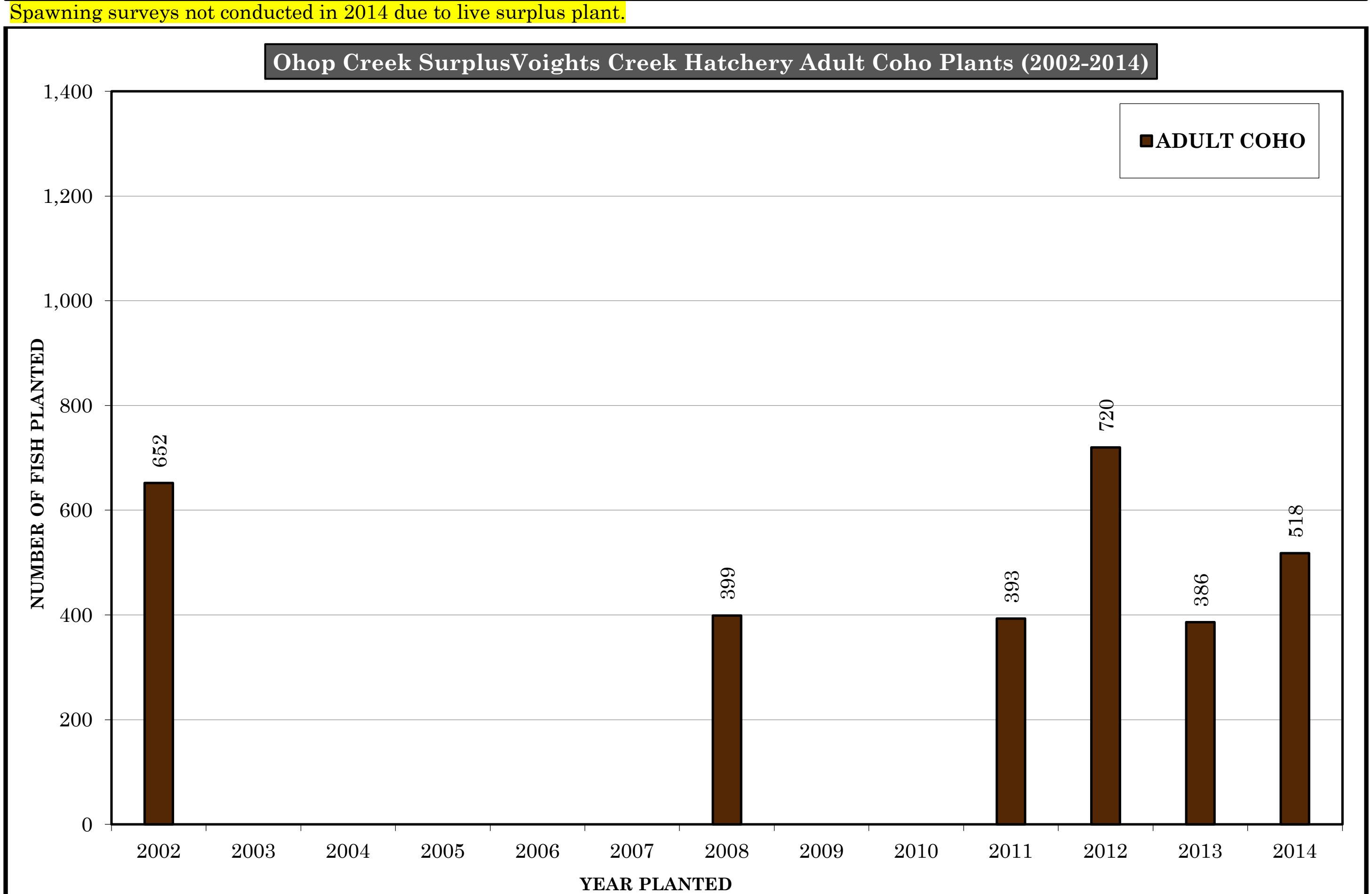
The upper reaches of Ohop Creek extend well into the Kapowsin tree farm currently managed by Hancock (*Hancock Timber Resource Group)*. Logging roads and timber harvesting have impacted several portions of the stream including; sedimentary inputs, windthrow, increased solar exposure, as well as confinement and constriction of the stream channel.

Coho are the only species surveyed for on a consistent basis. Adult coho escapement has dropped precipitously in Ohop Creek; as well as Kapowsin Creek over the last several years despite the 5 year coho net-pen project employed in Lake Kapowsin by the Puyallup Tribe during the 90's, in addition to the surplus adult plants from Voights Creek. Steelhead surveys have been reduced to periodic spot checks during the spring since none have been observed for several years. However, it's likely that a small number of steelhead may continue to spawn in the creek above the survey area since they are observed consistently in Kapowsin Creek.

The winter steelhead stocks in the Puyallup basin have been declining since 1990. The precipitous decline within just the past few years has created serious concern among fisheries managers. Factor(s) responsible for the decline in steelhead escapement are unknown, especially when other salmon species are experiencing relatively good success. Although documented in Kapowsin Creek, Chinook, chum and pink salmon have not been observed in Ohop.



Spawning surveys not conducted in 2014 due to live surplus plant.

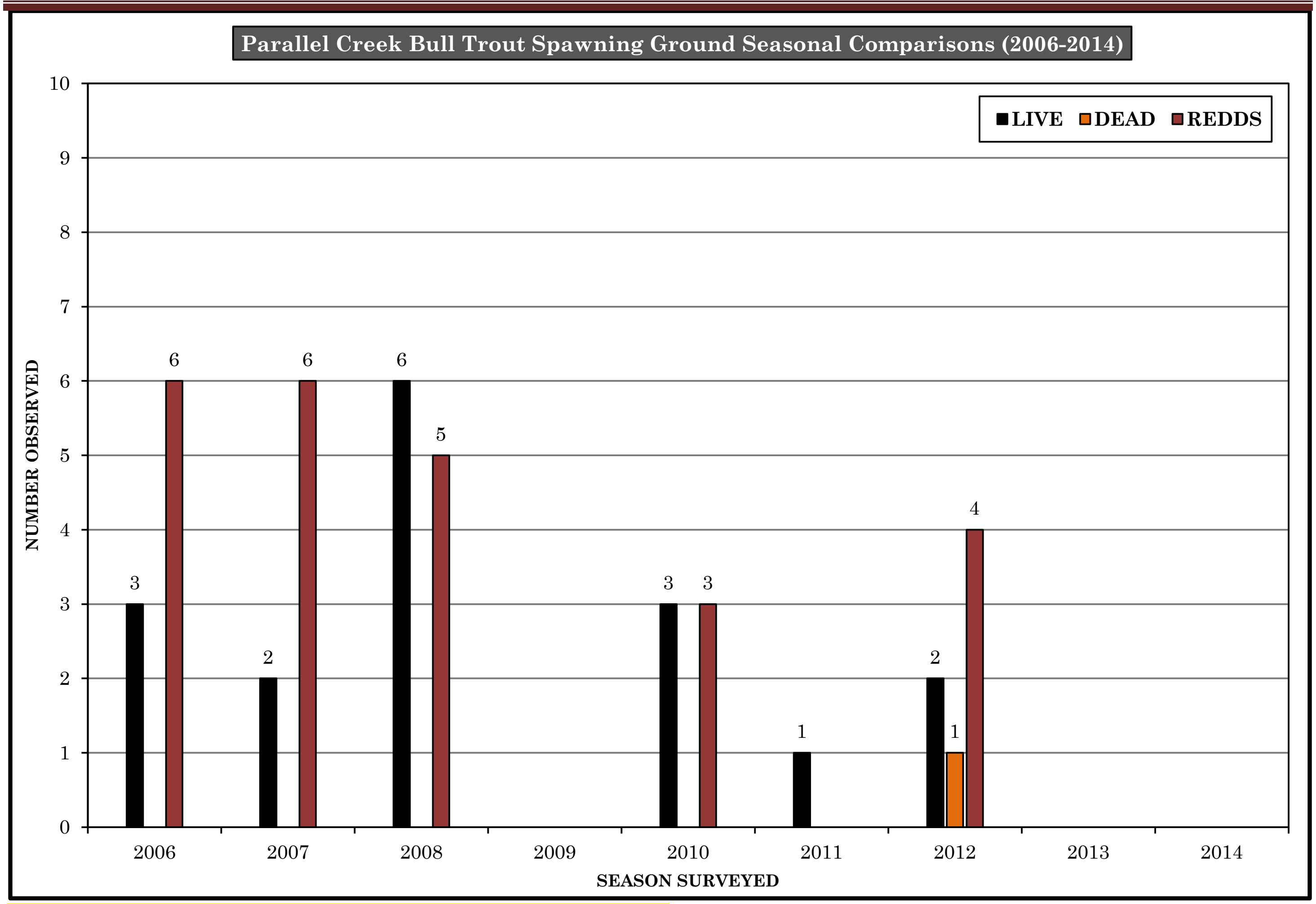


PARALLEL CREEK

Parallel Creek is not officially named by the Washington State Board on Geographic Names, nor is it identified on most topological or hydrological maps; however, for easy identification the creek is referred to as "Parallel" by PTF staff. Parallel is a small south facing left bank headwater tributary to the White River; with the lower 0.6 miles flowing parallel *(hence the name)* to the White River channel. Parallel Creek, like other bull trout streams such as Klickitat Creek and No Name, is pristine in many ways. The creek provides exceptional habitat conditions for bull trout *(center)* rearing and spawning. Since 2006, the Puyallup Tribe has surveyed the creek for bull trout spawning activity from late August through early October, with peak spawning occurring around the third week in September. Unfortunately, the creeks elevation *(mouth @ 3290')* is likely too high for Chinook, coho and pink salmon. Originating along the slopes of Sunrise Ridge, the creek flows entirely within Mt. Rainier National Park, entering the White River approximately at approximately RM 67.9; which is directly across the river channel from Klickitat Creek.

Characteristic of many headwater tributaries, the mouth of the creek is frequently translocated due to its position within the open channel migration zone of the White River floodplain. As a result of the mainstem river incursions, the creeks lower channel and riparian habitat is frequently altered. The habitat within this section is the least conducive to spawning due to a primarily sandy substrate. In addition, this reach of the creek is highly subjected to the possibility of redd scouring or heavy silt deposition due to the influence of the mainstem White River.

Nearly the entire anadromous reach of the creek is low gradient, and the channel is somewhat narrow and incised *(top left & right)*. The surrounding riparian near the mouth consists primarily of alder *(pioneer species)* with some small to moderate sized Douglas fir and cedar; even so, solar exposure is still low through this portion of the creek during the summer. The approximately 0.5 miles of stream channel upstream of the mainstem area of influence flows through a heavily forested area along the White River channel. Stream complexity within this section increases due to small debris jams and moderate amounts of LWD *(top)*. Throughout the majority of the anadromous reach, the channel gradient remains low as the stream meander significantly through the forest. Due to the low gradient and tranquil flow throughout this reach, the substrate consists mainly of fine material; however, several pockets of suitable spawning gravel exist, providing adult spawning opportunities. At approximately RM 0.6 the creek rapidly climbs up the valley wall. At this point the stream quickly develops into a series of impassable cascades preventing any further upstream migration.



Raw spawning data for Parallel Creek can be found in Appendix C.

PINOCHLE CREEK 10.0198

Pinochle Creek is a moderate sized tributary to the West Fork White River, located on the left bank at RM 6.8, and flows within USFS Snoqualmie National Forest managed area. Coho are the most abundant and common species observed in Pinochle Creek. Other species known to utilize the creek include Chinook, pink, sockeye, cutthroat and rainbow trout. Bull trout and steelhead utilization is unknown. Low flows often make it problematic for Chinook to access the creek in August and September to spawn; as a result, Chinook escapement in Pinochle is often low or absent. A bedrock falls about 0.3 miles upstream of the bridge over Pinochle blocks further upstream migration. From the falls, to the confluence with the West Fork, there exists excellent spawning and rearing habitat for all species. The channel is low gradient, unconfined, and pool-riffle in character with. In addition, there is abundant woody debris from the surrounding old-growth forest. Wrong Creek and Pinochle Creek are two small tributaries to Pinochle, entering near RM 0.2.

In the past, Pinochle was surveyed for adult salmon escapement; unfortunately, flood damage to Forest Service Road 74 has prevented access to the creek since 2006; so, no escapement surveys or fish plants in the nearby acclimation pond located on Cripple Creek have occurred since. When escapement surveys were conducted, coho were often observed each season holding in two large pools just below the confluence with Pinochle and Wrong Creeks. Many of these coho would ascend Cripple and Wrong a couple of weeks after entering Pinochle. Spawning activity for all species occurs predominately within in the lower 0.2 miles. Prior to 2006, the creek was a popular recreational site; unfortunately, this often had a negative impact on the creek including human biological waste, garbage and toxic materials, anadromous blockages and fish harassment.

All adult salmon that spawn in Pinochle Creek were originally captured at the USACE fish trap in Buckley, and transported above Mud Mountain dam. Specific escapement numbers for the upper White River drainage are known; therefore, surveys were conducted to determine fish distribution and spawning success. This is especially important regarding Spring Chinook, since adult production monitoring is part of the White River Spring Chinook Recovery Plan. Also, as part of the recovery plan, the Puyallup tribe operated a Spring Chinook acclimation pond located at RM 0.3 on Cripple Creek. Spring Chinook were reared and released from Cripple Creek for several years *(1994-2006)*. Approximately 50,000 plus Spring Chinook from the Muckleshoot White River hatchery were transported annually to the Cripple Creek acclimation pond in early spring, and released in late spring. Returns to Pinochle; as well as Cripple and Wrong creeks, are likely associated with these earlier plantings. The current state of the acclimation pond is unknown; however, when access is reestablished, it is anticipated that the pond can be reutilized and spawning surveys will resume.

PUYALLUP RIVER 10.0021

The Puyallup Watershed is identified as Water Resource Inventory Area 10 *(WRIA 10)* by the Washington State Department of Ecology. The Puyallup River Watershed provides over 1,300 linear river miles *(RM)* of drainage over an area greater than 1,000 square miles. The three major river drainages include the Puyallup, White, and Carbon rivers which flow almost entirely within Pierce County and part of South King County. All three river systems originate from glaciers along the north and west slopes of Mt. Rainier, located entirely within Mt. Rainier National Park. The Carbon and White rivers converge with the Puyallup River at RM 17.8 and RM 10.4 respectively.

The White River is a significant tributary, with a drainage area nearly twice that of the Puyallup River. However, the White and Puyallup drainages are often viewed and managed as two distinct and separate entities. This management approach is due in part because prior to 1906, the White River did not flow into the Puyallup. Salo and Jagielo (1983) described that prior to 1906; the majority of the White River flowed north towards Elliot Bay. Yet, some of the water from the White often flowed south to the Puyallup through the Stuck River channel. In November of 1906, a flood event mobilized a tremendous amount of wood debris that blocked the north flowing channel in what is now downtown Auburn. The blockage forced the river to avulse and find a new channel. This newly created diversion sent nearly the entire White River flow down through the Stuck River channel into the Puyallup; more than doubling the size of the Puyallup River drainage. In 1915, a concrete structure was constructed, thereby permanently diverting the White River into the Puyallup.

The Puyallup River continues to flow west from its confluence with the White until it reaches Commencement Bay in Tacoma. An extensive system of levees, approximately 90 miles, was constructed along the Puyallup, White and Carbon rivers beginning in the early through mid 20th century. There are a significant number of large tributaries that feed these mainstem rivers including the Clearwater River, Greenwater River, Mowich River, as well as Huckleberry and South Prairie creeks.

In addition to the White River, the Carbon River is also key tributary of the Puyallup River, entering the Puyallup at RM 17.9; just north of the city of Orting. The Carbon River and its associated tributaries provide excellent spawning and rearing opportunities for salmon, steelhead, and bull trout. In the past, steelhead have been documented as high as the Mt. Rainier National Park boundary. However, the majority of spawning for all species within this drainage, with the exception of bull trout, occurs in South Prairie Creek and the lower 11 miles of the mainstem Carbon.

The mean annual flow of the Puyallup River over the first 86 year gauged history was 2,922 cfs. The largest flood of record was 57,000 cfs and occurred in December 1933. The majority of the large flood events have occurred in the months of November and December in response to heavy rains on a substantial snow pack. The minimum low flow defined as the 90%-exceedance level for the Puyallup was 1,156 cfs. Over the past two decades there has been a trend of decreasing low flows (Sumioka 2004). The Puyallup River at Puyallup flow gage *(#12101500)* was activated in 1915 and is located at RM 6.6.

The systems glacial origin is responsible for the turbid conditions that are most noticeable during warmer weather in late spring and summer. The

White, Carbon, and Puyallup rivers carry a tremendous volume of bed load material which contributes to the dynamic nature of the system. The high sediment loads are responsible for the braided channel morphology characteristic of broad valley segments. This condition is most prevalent in the upper reaches within and immediately outside the National Park boundaries.

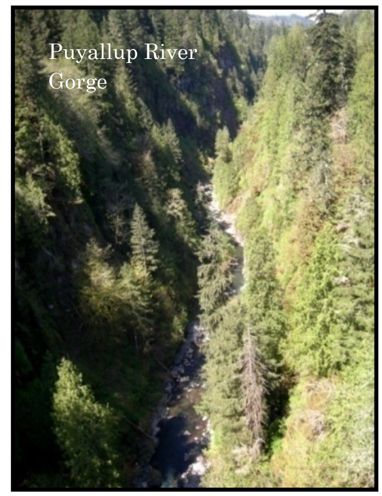
Outside the Park boundaries, the rivers course through industrial forestlands including national forest but primarily private timber company ownership. Much of these forestlands have been harvested at least once and in many cases twice. Lands in timber production are densely roaded with some sections approaching six lineal miles per square mile. Roads have contributed to many of their trademark problems such as landslides, slope failures, altered hydrology, culvert and bridge projects that can effect upstream migration, and of course high levels if sedimentation within effected drainages.

The lowest section of the Puyallup River, from the confluence with the White River at RM 10.4 to Commencement Bay is confined by levees and the habitat lacks complexity *(lower left)*. The small amount of suitable gravel present is often compacted and offers little spawning opportunity. Steelhead have been observed spawning just upstream from the White River confluence; the lowest documented spawning of any species in the river. In the fall of 2008, the Puyallup Tribe completed construction of one of its most prevalent watershed restoration projects to date. The Sha Dadx *(Frank Albert Road-top left)* wetland restoration project, located on the lower Puyallup River, created an accessible 12-acre off-channel wetland habitat for salmonids and other freshwater resident fish. The project was instrumental in reestablishing an old disconnected oxbow and low lying wetland to the mainstem river. The reclaimed habitat was lost during the construction of the lower river levee system in the early 1900's. In response to the loss of nearly an entire estuarine ecosystem that once existed, the creation of this critical and necessary lower river environment will provide overwintering, as well as foraging opportunities for young juvenile salmon. In addition, this habitat will offer the benefits that the estuaries once provided to out migrating *(smolting)* salmon during the transition from fresh water to salt water. An extensive side channel restoration project *(scheduled for completion in 2016)* conducted by Pierce County near the community of Alderton, will result in over 4,000 linear feet of off channel fish habitat and flood protection. For more information about this restoration project, go to: www.co.pierce.wa.us/southfork.

The Puyallup continues to be tightly confined by levees on both sides with the expected lack of channel complexity *(center right)*. These levee constraints continue from the White River confluence to approximately RM 25, just south of the town of Orting. This reach is similar to the lower Puyallup, but does support sporadic spawning by chum, Chinook and steelhead during their respective seasons. Along Orville Rd., upstream of Orting, a levee setback project was completed in the summer of 1999. Approximately 2 miles of new levee was built back from the original levee, adding over a hundred acres to the floodplain in this reach. In 2013, Pierce County completed the installment of a unique Engineered Log Jam *(ELJ)* revetment project in the

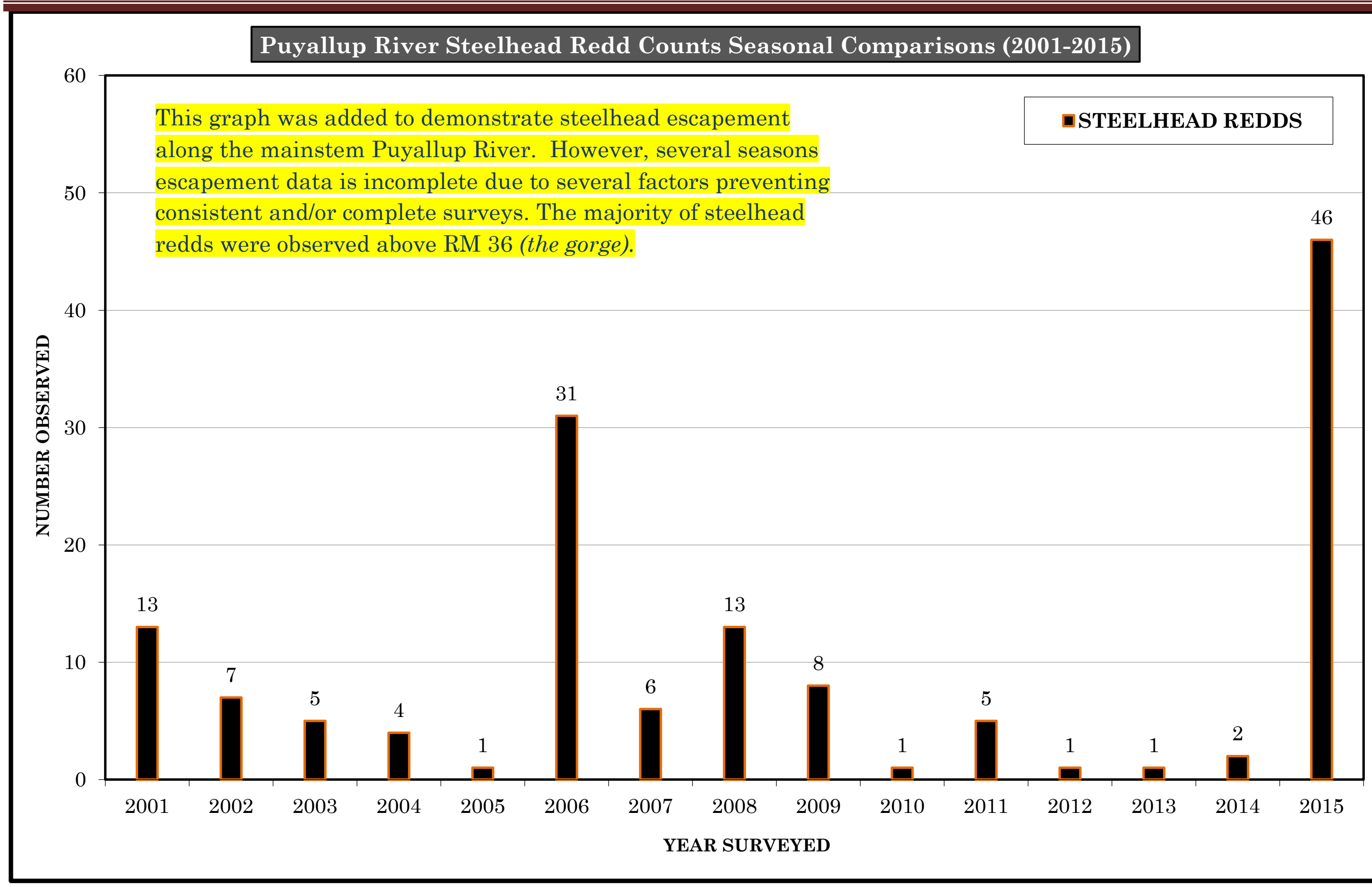
Puyallup River along Orville Road *(RM 27)*. The ELJs utilize large concrete dolosse *(top left)* to tether large timbers and other woody material. Dolosse were used for the first time in 2009, to reinforce the North Levee on the lower Puyallup River in the city of Fife.

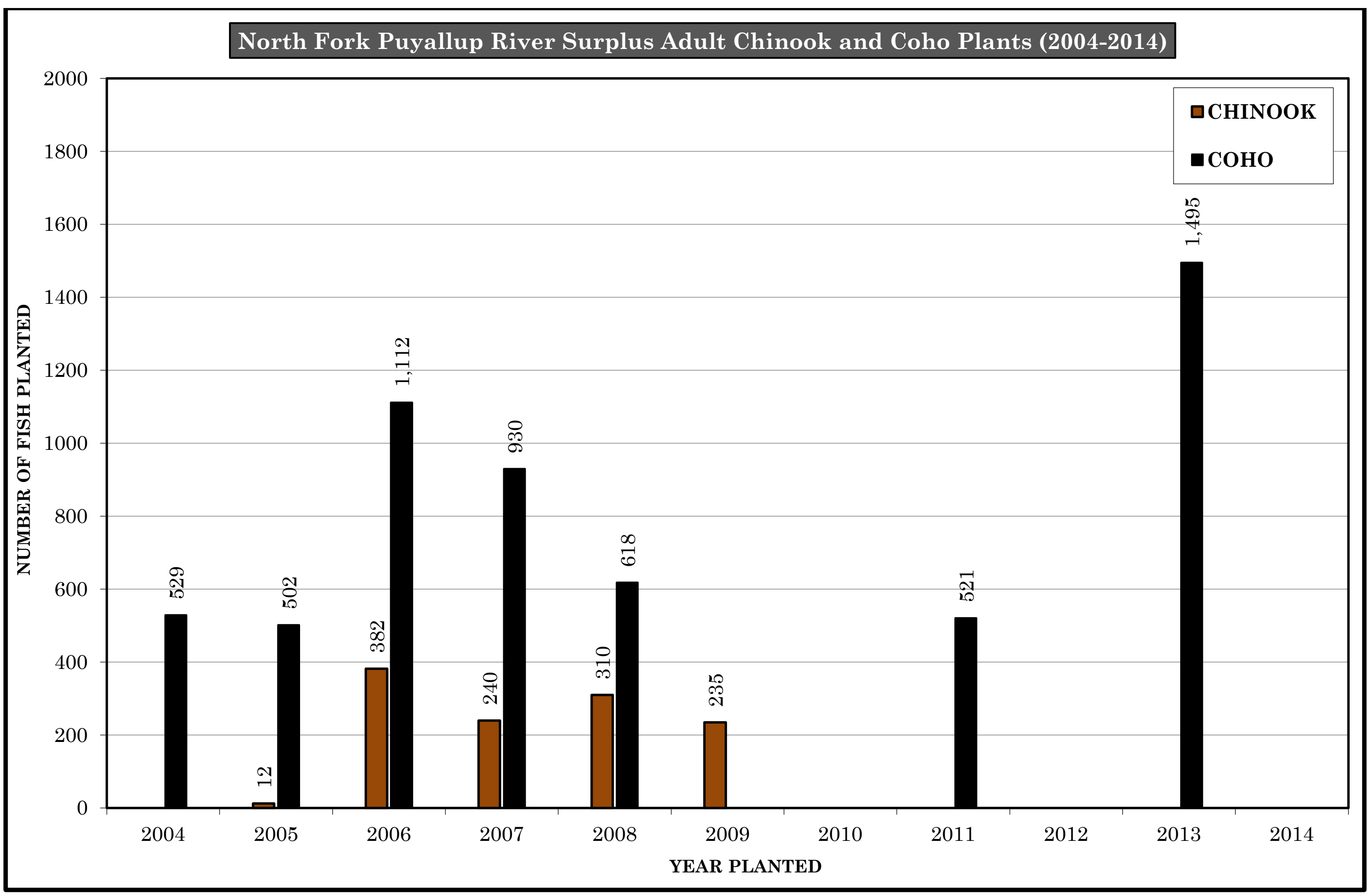
The Puyallup continues to be tightly confined by levees on both sides with the expected lack of channel complexity. These levee constraints continue from the White River confluence to approximately RM 25, just south of the town of Orting. This reach is similar to the lower Puyallup, but does support sporadic spawning by chum, Chinook and steelhead during their respective seasons. Along Orville Rd., upstream of Orting, a levee setback project was completed in the summer of 1999. Approximately 2 miles of new levee was built back from the original levee adding over a hundred acres to the floodplain in this reach. Several high water events later, many side channels have formed and spawning gravel has been retained but only adult chum use has been documented. In late 2006, a 6,000 foot levee set-back was completed upstream of the Calistoga Bridge in the town of Orting. This set-back added over 55 acres to the floodplain within this reach. The latest levee setback project slated for the Puyallup River will add 46 acres of floodplain; as well as 55 acres of wetland. The project will setback 1.5 miles of levee, while removing over 5,700' of existing levee. The new levee will be constructed from the Calistoga Bridge in Orting, upstream. From RM 25.5 to 30.8 the channel is only partially contained by levees and there are several accessible side channels. There is little spawning activity within this reach due to the higher gradient and resulting increase in average substrate size. Upstream from Electron *Hydro's (formally owned and operated by Puget Sound Energy)* Electron powerhouse at RM 30.8 *(bottom left)* the river flows through a deep, narrow canyon *(lower right)*. There are many small vertical drops and bedrock cascades within this 6 mile canyon, all of which are passable to salmon and steelhead. There are frequent spawning opportunities in the tail-outs of the many deep pools located within this upper river reach.



From the top of the canyon, to the diversion dam at RM 41.7, the river is moderately confined and provides several high quality spawning opportunities *(center left)*. The highest densities of steelhead spawning in the Puyallup River occur within this reach. With the completion of the Electron fish ladder *(RM 41.7-center)* in the fall of 2000, anadromous fish passage was restored for the first time since 1904. There are approximately 26+ miles of exploitable habitat above the diversion and surveys are conducted occasionally in response to the Puyallup Tribes live surplus hauls each fall.

The Mowich River converges with the Puyallup River at RM 42.3; this is approximately 0.5 miles above the Electron diversion dam. The glacial headwaters of the Mowich River originate from the Edmunds, and the North and South Mowich glaciers on the west slope of Mt. Rainier. Significant tributaries to the Mowich include; Crater, Spray, Meadow and Rushingwater creeks. Species documented utilizing this basin include Chinook, coho, steelhead/rainbow trout, cutthroat and bull trout.


Puyallup River Steelhead Redd Counts Seasonal Comparisons (2001-2015)
This graph was added to demonstrate steelhead escapement along the mainstem Puyallup River. However, several seasons escapement data is incomplete due to several factors preventing consistent and/or complete surveys. The majority of steelhead redds were observed above RM 36 (the gorge).
STEELHEAD REDDS
NUMBER OBSERVED
YEAR SURVEYED
0
10
20
30
40
50
60
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
13
7
5
4
1
31
6
13
8
1
5
1
1
2
46


North Fork Puyallup River Surplus Adult Chinook and Coho Plants (2004-2014)
CHINOOK
COHO
NUMBER OF FISH PLANTED
YEAR PLANTED
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
529
12
502
382
1,112
240
930
310
618
235
521
1,495

PUYALLUP RIVER PRJSPA PROJECT

PUYALLUP RIVER JUVENILE SALMONID PRODUCTION ASSESSMENT PROJECT

Prepared by:
Andrew Berger & Justin Paul

The Puyallup River Juvenile Salmonid Production Assessment Project began in 2000. The Puyallup Tribal Fisheries Department started the project to estimate juvenile production of native salmonids, with an emphasis on natural Fall Chinook salmon production and survival of hatchery and acclimation pond Chinook. In 2011, a newly constructed trapping platform employing an E. G. Solutions 8-ft diameter rotary screw *(formally 5')* was put into place on the lower Puyallup at RM 10.6, just upstream of the confluence with the White River.

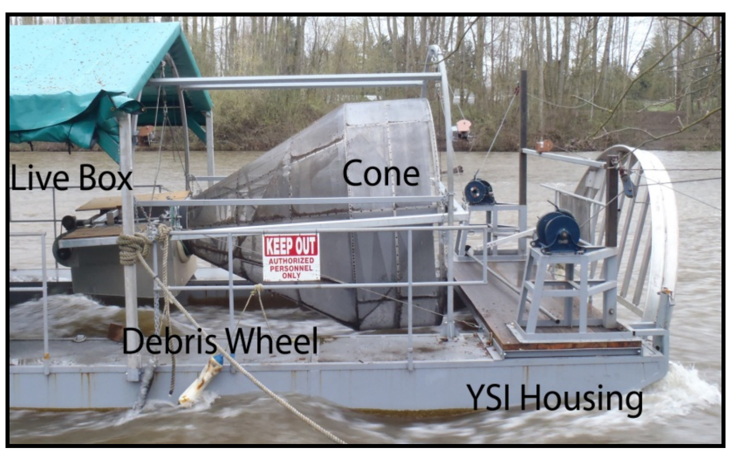
As more data becomes available, juvenile production estimates may provide baseline information allowing managers to meet escapement objectives in the watershed create a production potential-based management strategy and accurately forecast future returns of hatchery and naturally produced adults. In addition, a basin spawner/recruit analysis will indicate stock productivity, helping to determine the overall health of the watershed and evaluate the contribution of enhancement projects.

Trapping Gear and Operations

The rotary screw-trap used in this study consists of a rotary cone suspended within a steel structure on top of twin, 40-foot pontoons. The opening of the rotary cone is 8 feet in diameter, allowing for a sampling depth of 4 feet. The cone and live box assembly are attached to a steel frame and may be raised or lowered by hand winches located at the front and rear of the assembly.

Three five-ton bow-mounted anchor winches with 3/8" steel cables were used to secure and adjust the direction of the trap and keep it in the thalweg. The cables were secured to trees on opposite banks.

The 8-ft diameter rotary screw trap was installed in the lower Puyallup River (RM 10.6) just above the confluence with the White River. Trap operation continue, when feasible, 24 hours a day, seven days a week throughout the trapping season. The trap was checked for fish twice a day at dawn and dusk. In some instances, the trap was checked plus or minus two hours of dusk or dawn due to the availability of personnel. During hatchery releases and high flow events, personnel remained onsite through the night to clear the trap of debris and to keep fish from overcrowding.



Revolutions per minute (rpm), water temperature, secchi depth (cm), turbidity (NTU), weather conditions, and stream flow (cfs) were described for each completed trap check. A cross sectional area of the river at the smolt trap was taken to monitor channel morphology at the site.

Goals and Objectives

The goal of this project is to report production estimates, characterize juvenile migration timing, describe length distribution for all wild salmonid, out-migrants and fulfill the objectives of the Puyallup River Fall Chinook Recovery Plan.
To reach these goals, this study will produce population estimates of out-migrating smolts, estimate species specific migration timing, compare natural versus hatchery production and run timing, analyze mean fork length of wild smolts and detail species composition of the sample population. The objectives of this project are to:

1. Estimate juvenile production for salmonids in the Puyallup River and determine freshwater survival for unmarked juvenile Chinook.

2. Estimate in-river mortality of hatchery and acclimation pond Chinook.

3. Investigate physical factors such as, light (day vs. night), flow and turbidity and their importance to trap efficiency.

Sampling Procedures

Smolts were anesthetized with MS-222 (tricaine methanesulfonate) for handling purposes and subsequently placed in a recovery bin of river water before release back to the river. Juveniles were identified as natural or hatchery origin as unmarked or marked respectively. Fork length (mm) was measured and recorded for unmarked fish. When possible, 50 chum, 50 pinks, 50 age1+ coho, 25 age 0+ coho, 25 age 0+ Chinook, and 25 steelhead were measured per day. Scale samples were additionally taken on all wild steelhead smolts.

Species were separated by size/age class. Coho were identified as fry, age 0+ (<70mm) or smolts, age 1+ (>70mm). Chinook smolts were separated by age 0+ (<150mm) or age 1+ (>150mm). All chum and pinks were identified as age 0+. Trout fry age 0+ (<60mm) were not differentiated to species.

Hatchery origin fish were identified in three ways: 1) by visual inspection for adipose fin clips, 2) with a Northwest Marine Technology "wand" detector used for coded wire tag detection, and 3) with a Destron Fearing Portable Transceiver system for Passive Integrated Transponder (PIT) tagged fish. To request a full copy of previous reports, contact the Puyallup Tribal Fisheries Department, or download it at ***www.scribd.com***.

Summary of 2014 Results

* For the 2014 migration season production estimates were completed for Chinook, coho and chum migrants.

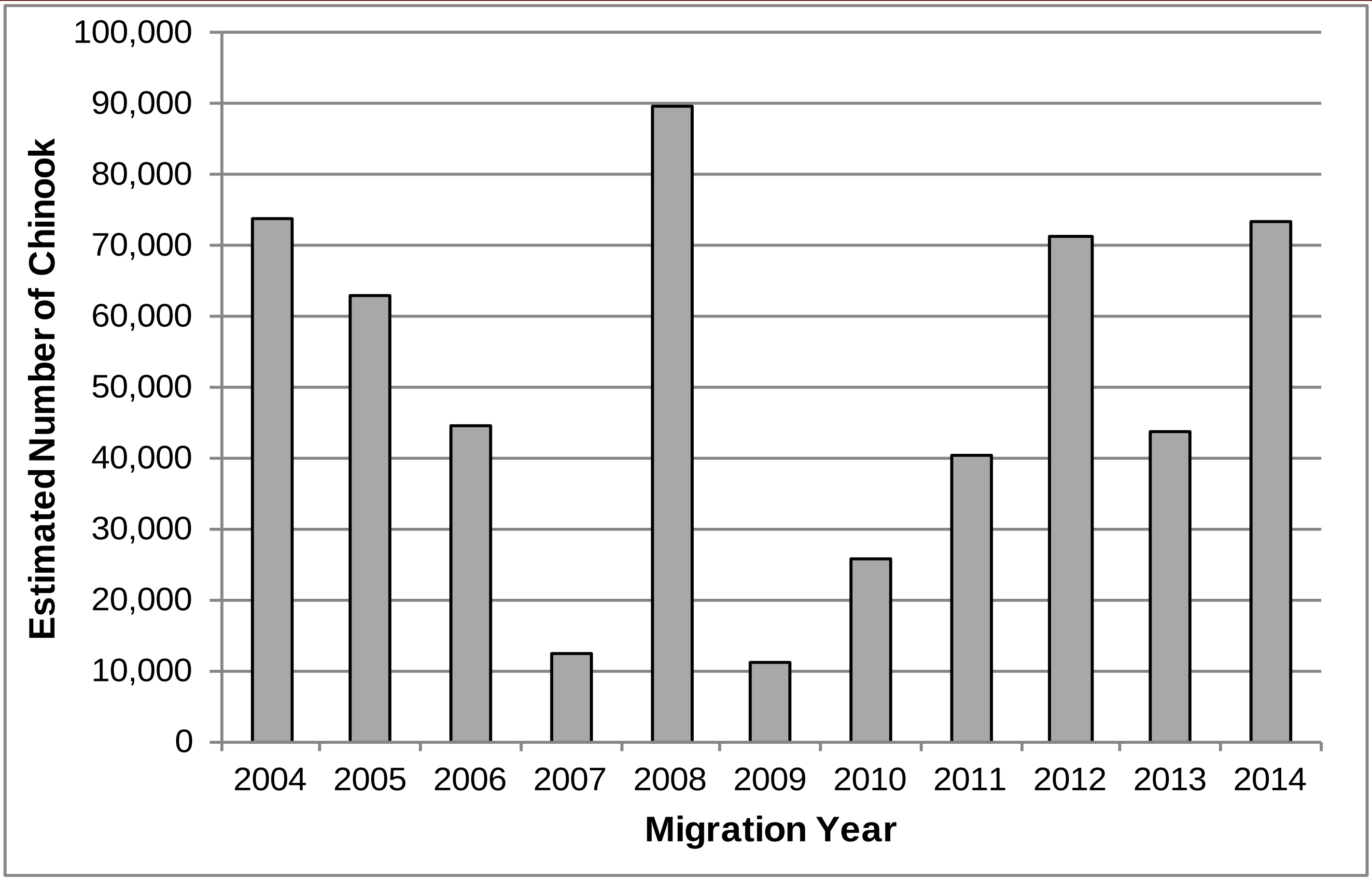
* Natural Chinook production was estimated at **73,256** unmarked migrants.

* Chum production was estimated at **27,062** migrants passing the trap in 2014 from a catch of 611 chum fry.

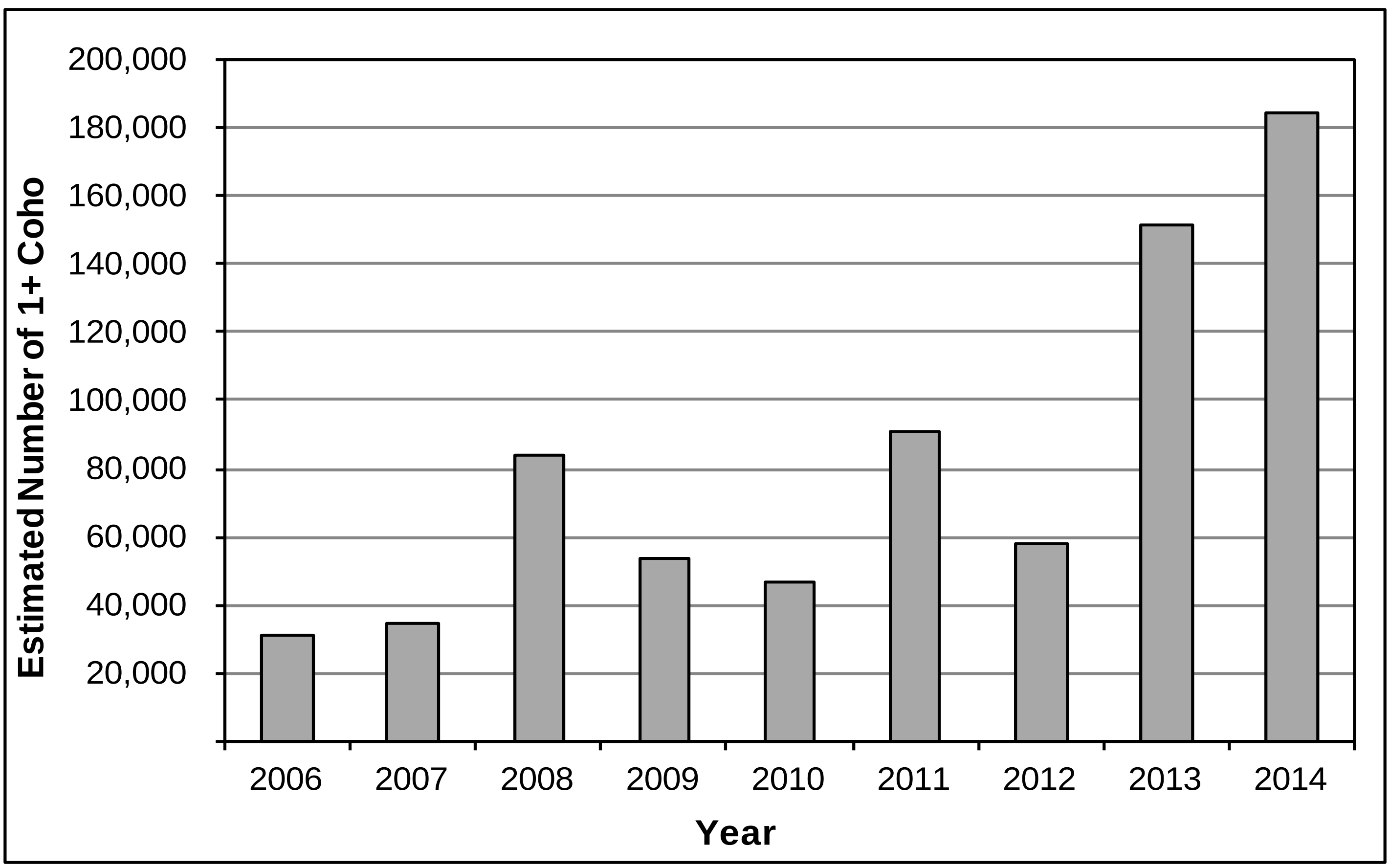
* A total of 3,286 unmarked coho smolts were captured. The production estimate for wild unmarked coho for the 2014 smolt trap season was **184,997**.

* Pink production was estimated at **7,674,152** migrants passing the trap in 2014.

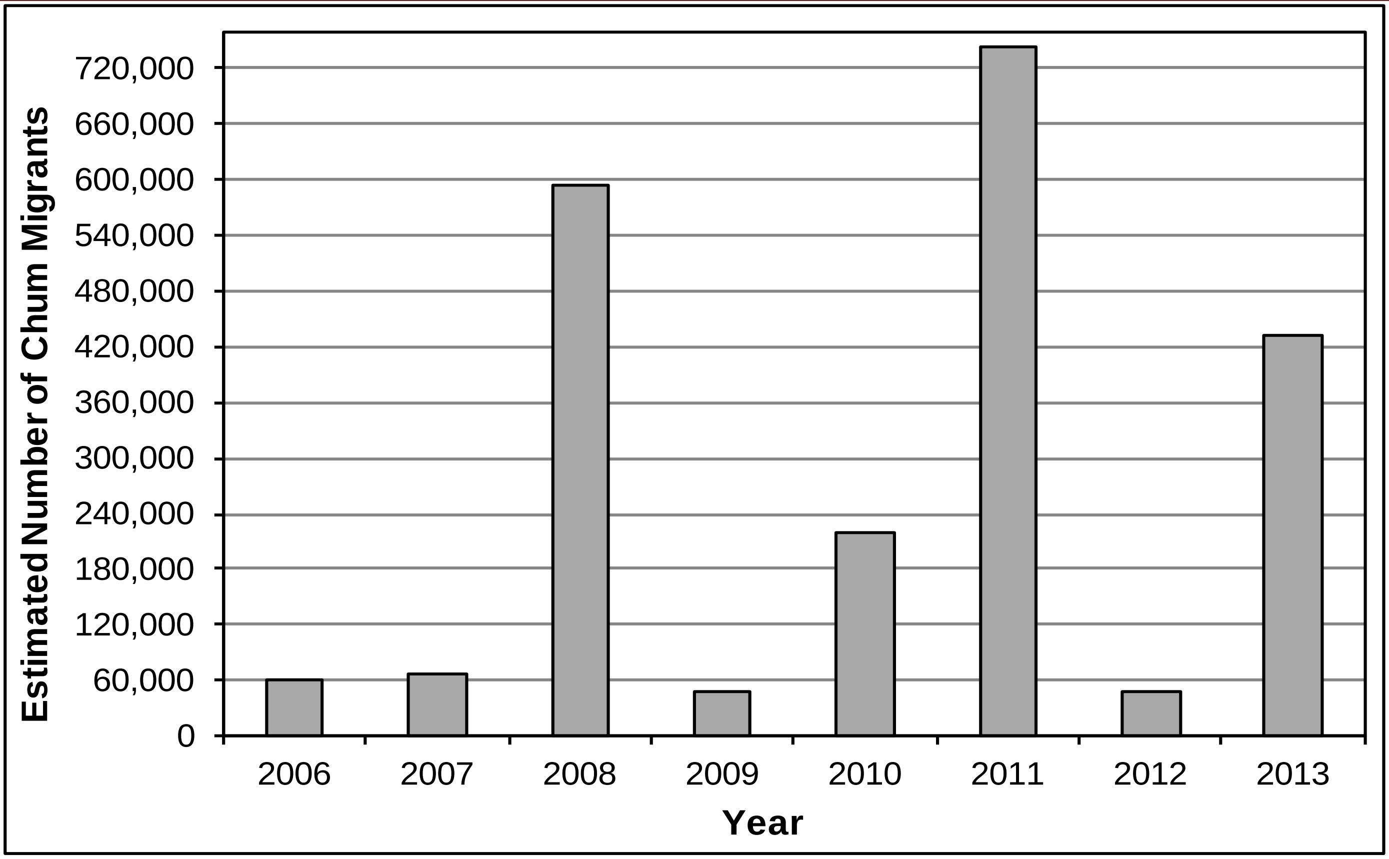
* A total of 700 unmarked steelhead were caught in the smolt trap in 2014. No production estimates were completed for steelhead migrants.



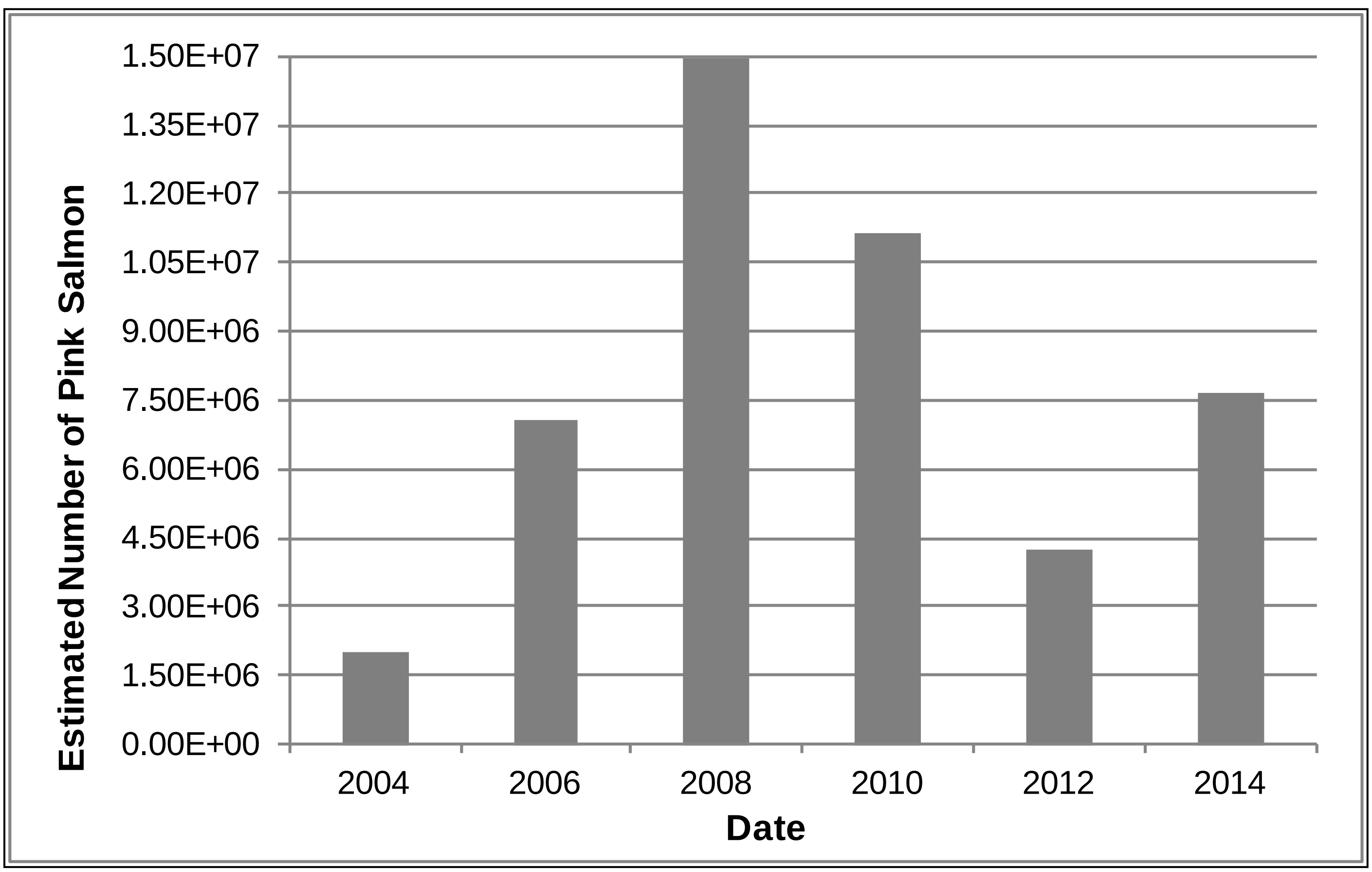
Annual production estimates of unmarked age 0+ Chinook smolts, 2004 – 2014.



Annual production estimates of unmarked age 1+ coho, 2006 - 2014.



Annual production estimates of chum smolts, 2006 - 2013.



Annual production estimates of pink smolts, 2004 - 2014.

RANGER CREEK 10.0530

Ranger Creek is a left bank tributary to the upper Carbon River; entering at RM 26.8. Typical of many headwater tributaries, Ranger Creek is non-glacial and is characterized by confined steep valley channels with a comparatively short, low-to-moderate gradient anadromous reach. This mountain stream flows for just over 3 miles through a steep glacial valley originating between Howard and Tolmie Peaks along the Alki Crest. Ranger flows entirely within Mt. Rainier National Park. Headwater sources are derived from snow-pack accumulations and outflow from Lake Tom *(elev. 4400')*; as well as other minor surrounding surface and groundwater sources. These headwater sources all feed the creek until it reaches Green Lake *(elev. 3185')* at approximately RM 1.3. The creek continues to drop precipitously from Green Lake until it reaches the channel migration zone of the Carbon River, at which point the creek channel is reduced to a low gradient pool-riffle channel capable of supporting salmonids.

Various survey methods have verified both resident and fluvial bull trout utilization within Ranger; furthermore, the creeks 2,080' elevation makes it one of the lowest elevation streams known to support bull trout spawning and is quite capable of supporting Chinook, coho, pink and steelhead as well. However, salmonid migration upstream to reach headwater tributaries in the upper Carbon Basin, including Ranger, is assumed to be extremely limited due to substantial cascades present throughout the roughly 5 mile long Carbon River Gorge. The Puyallup Tribe conducted salmon, steelhead and bull trout spawning surveys during 2000 and 2001; yet, no salmon or steelhead were observed. However, surveyors did observe several redds early in the spawning season *(September)*, but their small size and timing matched the bull trout spawning documented in other headwater tributaries in the watershed. Other species including cutthroat, non-native brook trout and sculpins are known to inhabit the creek.

The anadromous reach of Ranger Creek provides excellent habitat conditions for bull trout rearing and spawning. With approximately 0.5 miles of anadromous habit, Ranger is an excellent salmonid stream in several ways. The riparian zone consists of old growth cedar, fir and hemlock which contribute essential woody debris and diversity to the channel. The lower 0.4 miles is low gradient with several deep pools; as well as numerous pockets of spawning gravel. The Carbon River Road crosses the creek at approximately RM 0.35. Due to recurrent flood damage, the road is been closed to vehicular traffic beyond the park entrance. Above 0.4 miles the gradient of the creek increases significantly, and beyond RM 0.5, steep cascades preventing any further upstream migration. However, NPS data specified the presence of cutthroat and sculpins at the outlet to Green Lake *(Samora, personal communication, February 16, 2012)*.

Unfortunately, no substantial data is available on bull trout spawning escapement or population size within the upper Carbon River. Currently, the Carbon River bull trout population is considered one-of-five local populations identified and managed within the Puyallup River Watershed.

ROCKY RUN CREEK 10.0117

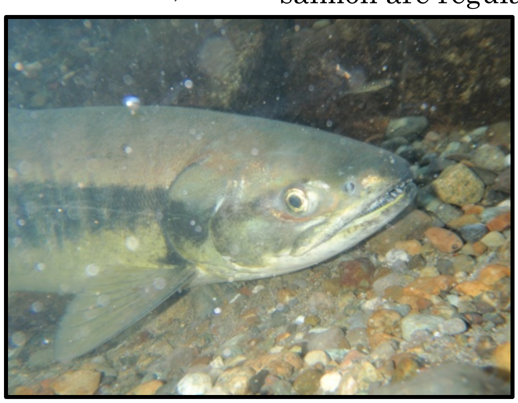
Rocky Run Creek is a left bank tributary of the upper White River (RM 44.5), located near the community of Greenwater. Rocky Run is approximately 3.1 miles in length; however, only the lower 0.6 miles is anadromous. The creek supports ESA listed spring Chinook, steelhead and bull trout; as well as non-listed coho, pink and cutthroat, by providing foraging, spawning and overwintering habitat for all life stages. However, insufficient flows often prevent adult Chinook from accessing the creek in late summer and early fall. Therefore, the creek is surveyed essentially for adult steelhead spawning activity. All adult salmon and steelhead that spawn in the Upper White River and its tributaries are initially captured in the USACE fish trap in Buckley; then transported above Mud Mountain dam *(RM 29.6)*. Since precise escapement numbers for the Upper White River drainage are known, surveys are conducted to determine fish distribution and spawning success. This is especially important regarding Spring Chinook and steelhead, given that adult production monitoring is an essential part of recovery planning.

Typical of many upper river tributaries, the mouth of the creek frequently drifts due to its position within the open channel migration zone of the White River. As a result of mainstem river incursions, the creeks lower channel *(0.15 miles)* and riparian habitat are frequently altered. The habitat within this section is the least conducive to spawning due to a primarily sandy substrate. In addition, this reach of the creek is highly subjected to the possibility of redd scouring or heavy silt deposition due to the influences of the mainstem White River.

Nearly the entire anadromous reach of the creek *(approximately 0.6 miles)* is low gradient *(top photo)*. Although spawning does occur within this small stretch *(depending on mainstem influence),* it is often limited due the lack of quality spawning substrate created by the fine alluvial deposits *(sand & silt)* from the White River. In addition, adult salmon spawning has been less consistent and frequent in this tributary compared to that observed in more significant upper river tributaries located along the White River such as Camp Creek, located 1.2 miles downstream. Small quantities of undersized instream woody debris is present, as well as a beneficial riparian buffer zone of primarily conifers and alder along the majority of the creek. Upstream of the anadromous reach, the creek enters the heavily forested lower slope of the valley floor as it begins to climbs up the valley wall. From this point, the creek assumes a pool-riffle-cascade configuration as it ascends the lower valley slope *(center)*.

RODY CREEK 10.0028

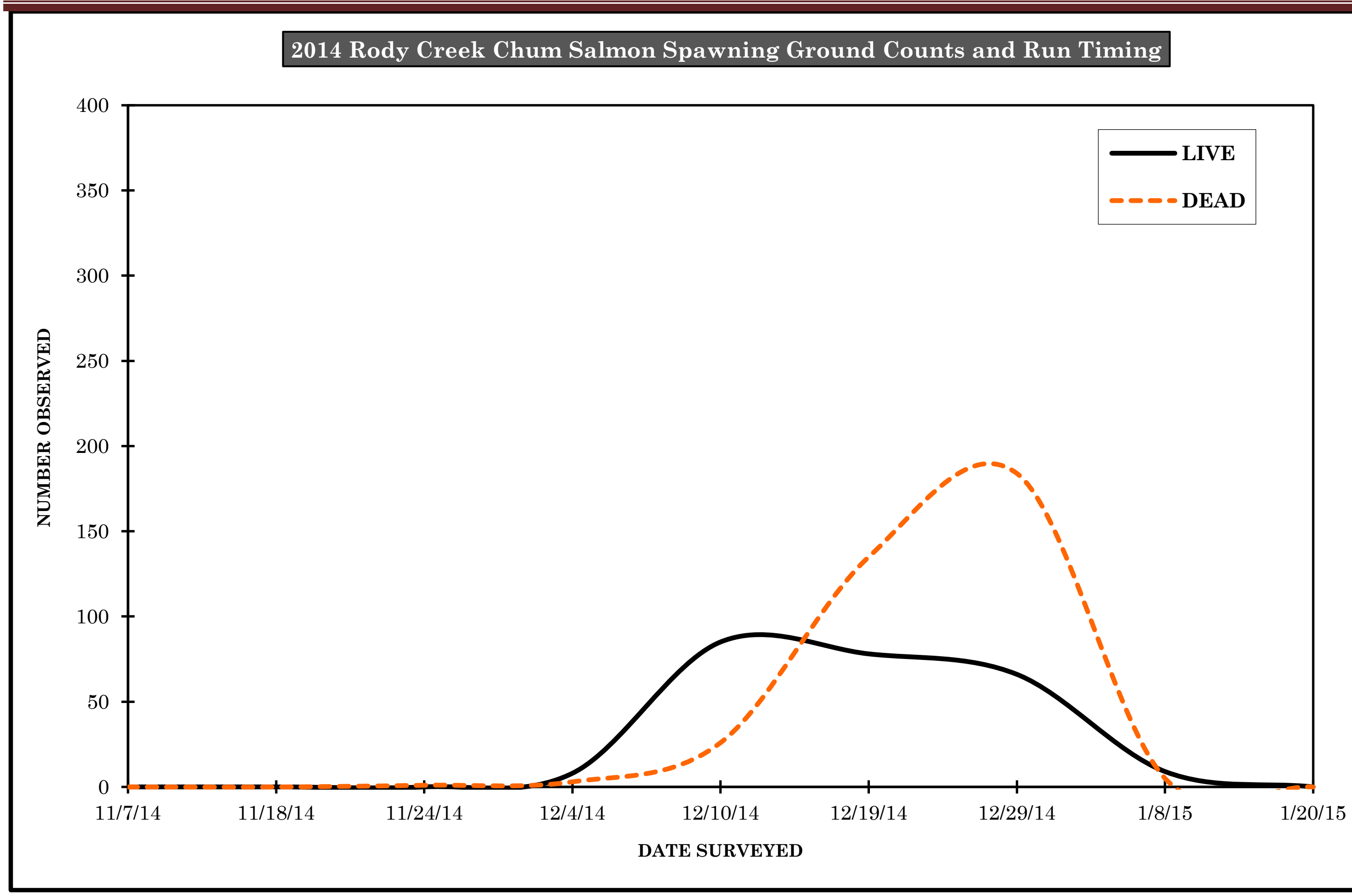
Rody Creek, a tributary to Clarks Creek, is part of the lower Puyallup River drainage system. Rody is approximately 1.6 miles in length; however, only the lower 0.6 miles is accessible to adult spawners. Rody Creek is located just northeast of downtown Puyallup. The creek passes under Pioneer Way E. through an undersized, yet generally fish passable culvert at RM 0.5. Rody has numerous deficits including, but not limited to; a confined and straightened channel, intermittent or complete fish barriers, no off-channel habitat, flooding and channel erosion, absent or deficient riparian cover, and the infestation of reed canary grass *(Phalaris arundinacea).*

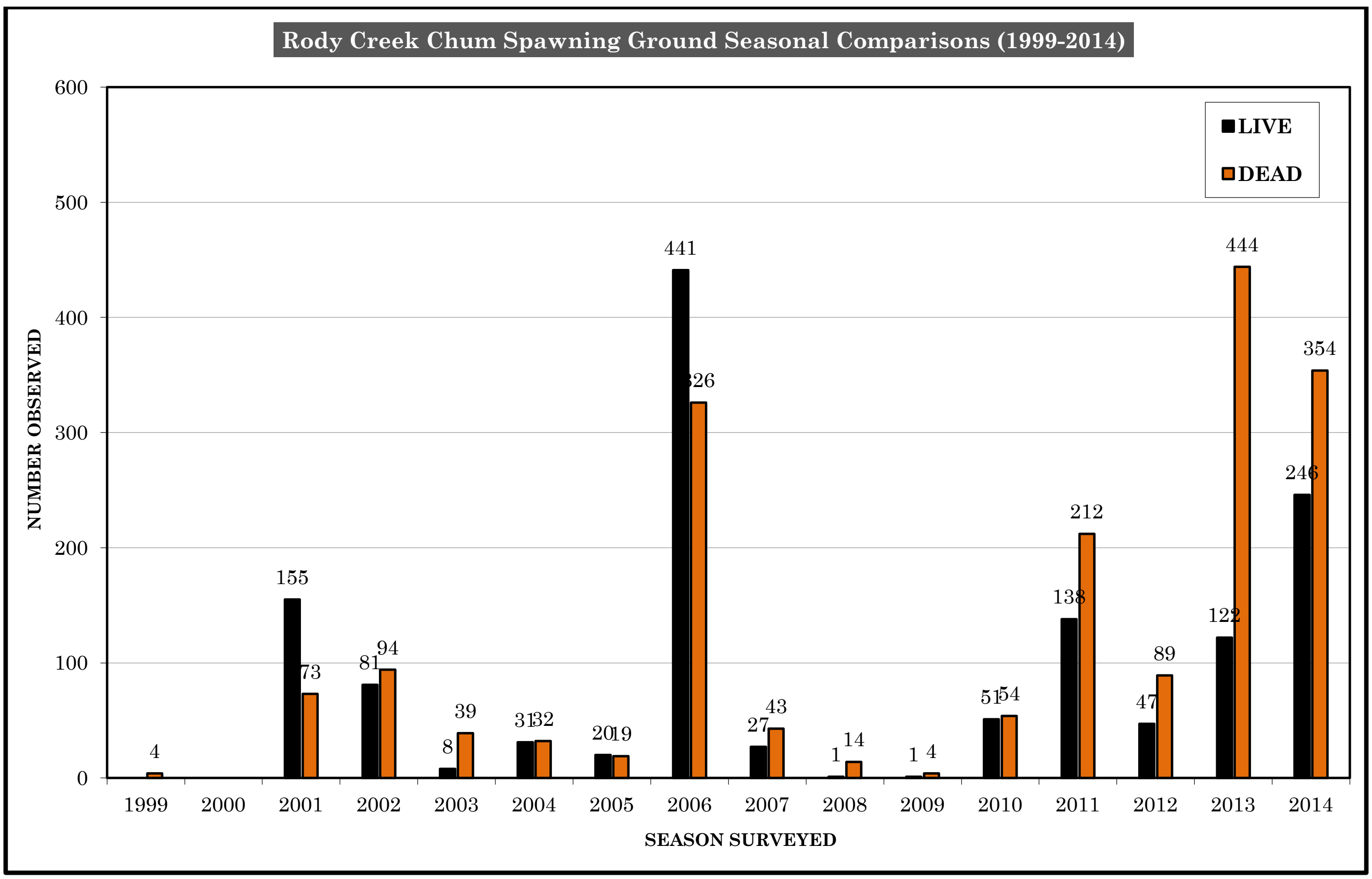


Rody Creek primarily supports adult chum spawners *(center)*; however, adult coho are occasionally observed as well. Insufficient flows prevent adult Chinook from accessing the creek in late summer and early fall. Although present in the drainage, adult steelhead have not been observed spawning in Rody. Juvenile coho; as well as Chinook and steelhead forage and rear in the creek. Adult fluvial bull trout are known to forage in the smaller tributaries of the lower Puyallup; however, bull trout utilization in Rody is currently unknown. Cutthroat trout are also present.

Approximately 300-400 feet of anadromous usage is available above the culvert under Pioneer Way *(left)*; however, a 3 foot high stone barrier prevents fish passage above this point. Above the stone barrier, additional habitat is available and could be utilized if the blockage were removed. In sharp contrast to the reach below Pioneer Way E., the upper reach of the creek has the only intact riparian zone which consists largely of alder.

Downstream, from Pioneer Way E. to the mouth, Rody flows through a channel that is best described as an incised and straightened drainage ditch *(left).* The habitat throughout most of the lower half mile reach of Rody Creek is remarkably poor; much of the accessible channel has no suitable spawning gravel, and the riparian consist more or less entirely of blackberry, turf grass, and reed canary grass. The reed canary grass, as well as watercress, can be overwhelming during some seasons; often choking extended lengths of the channel and trapping or preventing fish from migrating through. In addition, the grass traps and holds large amounts of fine materials, consequently covering the spawning substrate. The channel generally becomes surveyable after the first freshet of the season. However, chum salmon are regularly observed spawning in the stream when the channel clears. Chum spawn each season in a section of available habitat just below Pioneer. An extremely high water event in the January of 2006 redistributed a large quantity of gravel throughout the channel for approximately 300 feet below Pioneer Way; however, a hydraulics violation was committed when this section of stream was illegally excavated by a land owner in fall of 2010. A half mile downstream of the culvert passage under Pioneer, Rody Creek passes under 66th and dumps into Clarks Creek, a tributary of the Puyallup River. A future restoration project is currently being engineered *(Pierce County)* for the section of creek running from just above, to just below Pioneer.


2014 Rody Creek Chum Salmon Spawning Ground Counts and Run Timing
NUMBER OBSERVED
0
50
100
150
200
250
300
350
400
LIVE
DEAD
11/7/14
11/18/14
11/24/14
12/4/14
12/10/14
12/19/14
12/29/14
1/8/15
1/20/15
DATE SURVEYED


Rody Creek Chum Spawning Ground Seasonal Comparisons (1999-2014)
NUMBER OBSERVED
0
100
200
300
400
500
600
LIVE
DEAD
4
155
73
81
94
8
39
31
32
20
19
441
326
27
43
1
14
1
4
51
54
138
212
47
89
122
444
246
354
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
SEASON SURVEYED

RUSHINGWATER CREEK 10.0625

Rushingwater Creek originates from the Upper and Lower Golden Lakes located in Mt. Rainier National Park. Rushingwater flows over 5 miles from the lower lake to its confluence with the Mowich River at RM 0.6. Approximately the first 2 miles of the creek are anadromous. Downstream of the NPS boundary the creek flows through the Mt. Baker-Snoqualmie National Forest before reaching private timber property. The lower reach of Rushingwater flows within the Kapowsin tree farm currently managed by Hancock (*Hancock Forest Management).* Logging roads and timber harvesting have impacted sections of the stream, specifically windthrow located along the lower reach. Rushingwater supports adult and juvenile Chinook *(planted& NOR)* and coho *(planted and NOR).* Steelhead and bull trout utilization is unknown. However, bull trout utilization is assumed, to some degree, since they are well documented in the Mowich and Puyallup. Surveys for steelhead conducted in 2009 did not reveal any spawning activity.

One of two acclimation ponds used for reestablishing coho, and occasionally Chinook *(spring & fall)*, into a 30-mile reach of the Upper Puyallup River is located just off the main channel of Rushingwater at RM 0.6. The pond *(next page)* holds 14,000 cu. ft. of water with a flow rate of 1-3 cfs; in past years (1999-2007), 40,000 to 100,000+ coho yearlings were imprinted and released from Rushingwater annually. Coho yearlings originated from Voights Creek Hatchery where coho were adipose clipped and coded wire tagged. Fish were released at 20 fish per pound, for a total biomass of 10,000 pounds. In addition to the acclimation of juvenile coho and Chinook, adult surplus coho and Chinook from Voights Creek Hatchery have been planted in Rushingwater when available. However, no adult fish were planted in 2004. Instead, the first naturally retuning adult coho were allowed to spawn without intrusion from hatchery planted coho. Future live plants may be reduced or eliminated based on the number of NORs.

Dividing this stream into four reaches, the lowest reach covers the first mile of the creek. This initial reach consists of a complex riffle-pool system *(top left)* with considerably large substrate; consisting of large gravel, cobble and boulders. Several wind-blown trees, the result of poor RMZ management, span the channel the length of this stretch. Abundant in-stream woody debris and a moderate to dense canopy cover extend through most of this reach. Beaver (*Castor canadensis*) activity is frequent throughout the upper portion. Beyond this, in reach 2, the creek climbs nearly 1,000 feet over the next 2 miles. An impassable cascade is located within this reach preventing any further upstream migration.


Steelhead redd in 3rd reach of Rushingwater

The 3rd reach harbors significantly different habitat *(center)*. For roughly the next mile the creek assumes a placid flow and contains excellent spawning habitat, as well as considerable amounts of beaver activity and LWD structures. This reach is one of the sites where adult surplus coho are planted. The final reach of

Rushingwater once again climbs swiftly *(2,000 feet)* over the next 1.6 miles to the outlet of Golden Lake at 4,500 feet.

Fish Enhancement Project Description: Operate several acclimation ponds in the Puyallup/White River Watershed designed to reestablishing and enhance Chinook, coho and steelhead stocks. Each of the two acclimation ponds *(Cowskull & Rushingwater)* on the Puyallup would receive as many as 100K+ hatchery origin spring/fall Chinook and/or coho. Three additional acclimation ponds located in the Upper White River drainage *(Huckleberry, Greenwater& Jensen Cr. on the Clearwater R.)* would be planted collectively with as many as 900K+ White River Spring Chinook and 25K+ White River winter steelhead pre-smolts. When available, the Puyallup Tribe will collect, haul and plant surplus adult hatchery fall Chinook and coho from WDFW Voights Creek hatchery. During the summer of 2015, the pond was given its first maintenance dredging since it was originally constructed. This was necessary due to more than half of the ponds capacity being lost due to sediment build-up.

Planting surplus adult coho in Rushingwater Creek.

Goals, Purpose and Expected Benefits: One of the Puyallup Tribe's most significant restoration goals is to rebuild depressed Chinook and steelhead stocks and remove them from ESA listing. Acclimation ponds are a proven method for increasing fish stocks, and are a key component to restoration goals.

Purpose of Project:

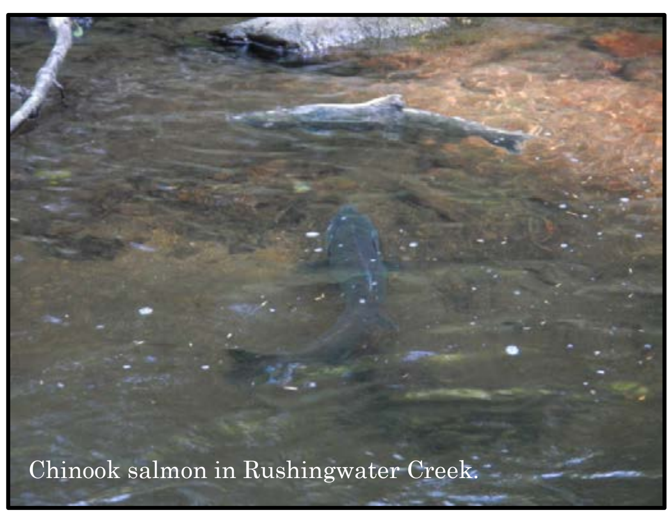
1. Supplementing ESA listed salmonid spawning.
2. Increasing weak or depressed wild salmonids *(non-ESA listed)*.
3. Sustaining/enhancing a fishery population.

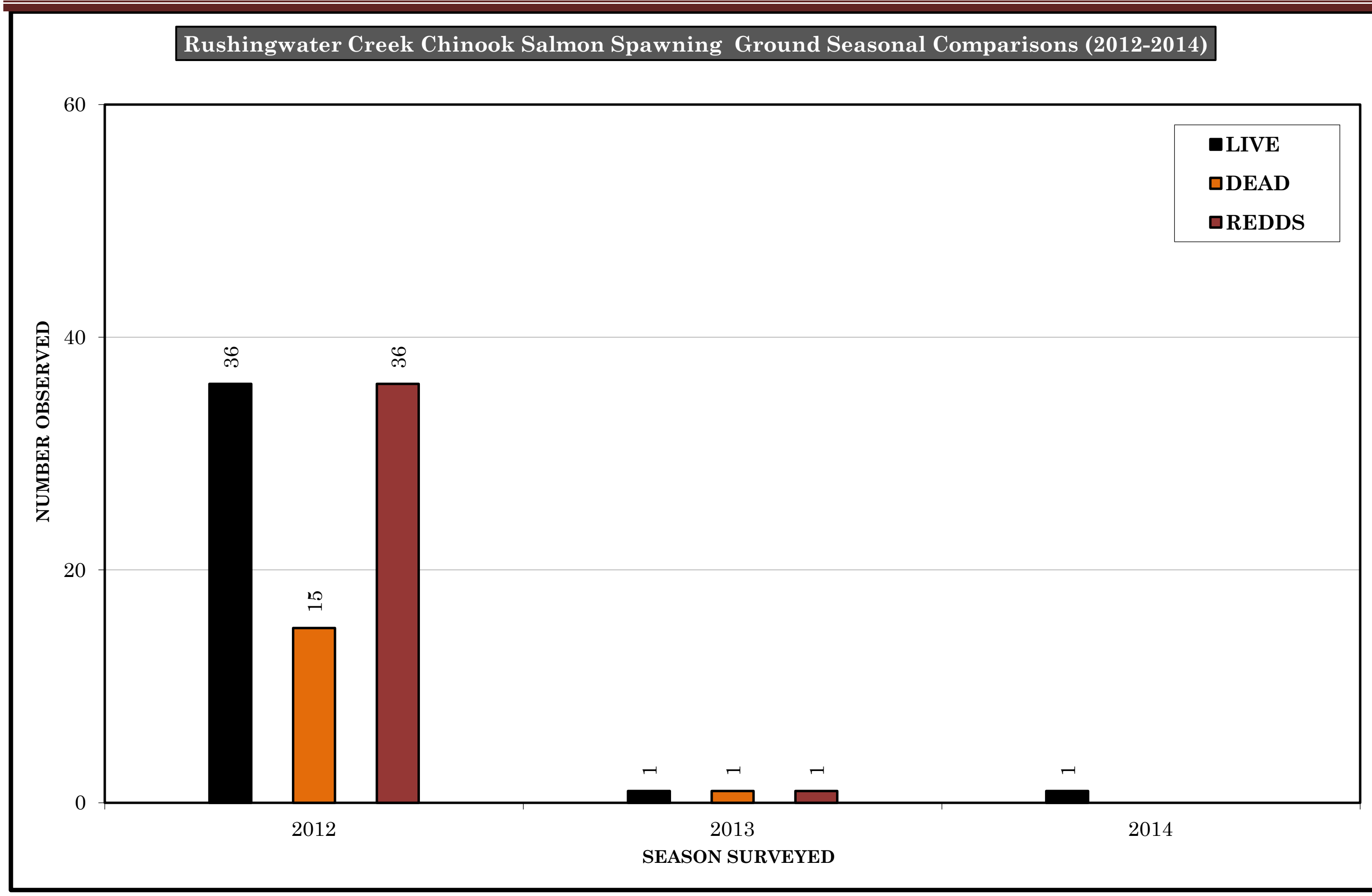
Expected Benefits Include:

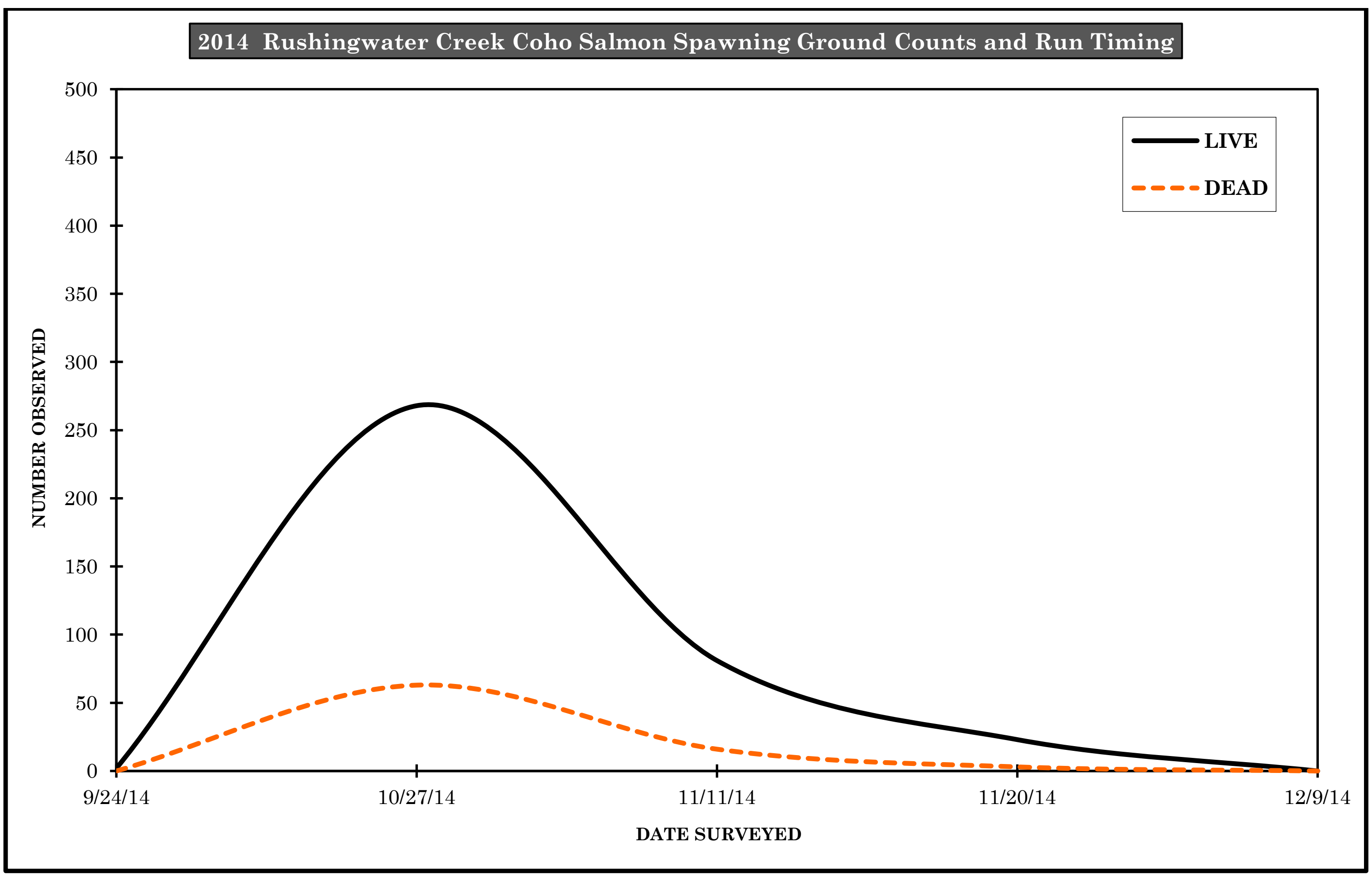
- Reestablishing Chinook and coho into their endemic range.
- Increased total abundance of the composite natural/hatchery population.
- Increased spawning ground escapement and trend of Natural Origin Recruits (NORs).
- Improve distribution (out planting of live fish) to minor spawning and underutilized rearing habitat areas.
- Nutrient enhancement in oligotrophic *(nutrient-poor)* streams.

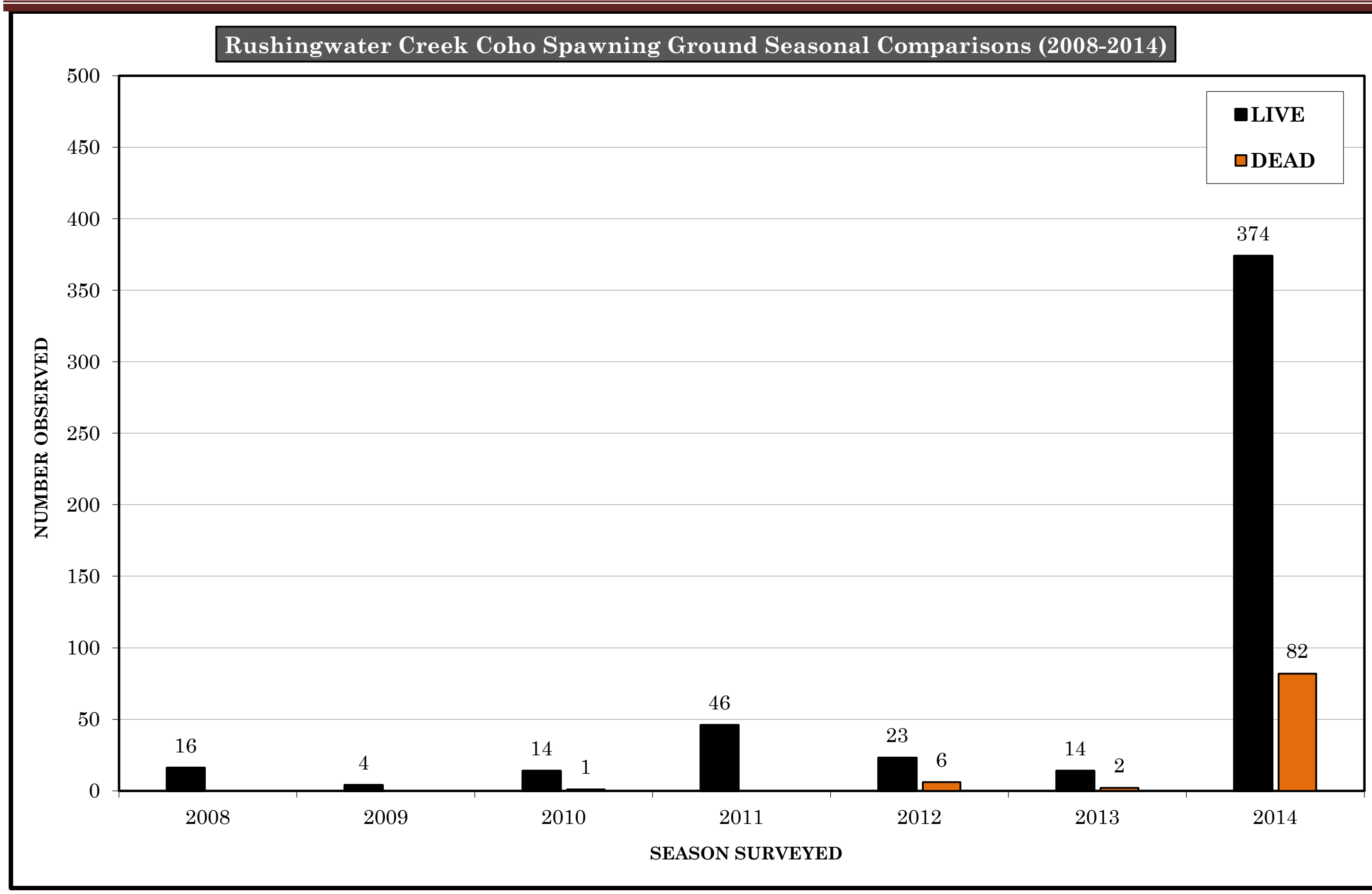

Acclimation pond.

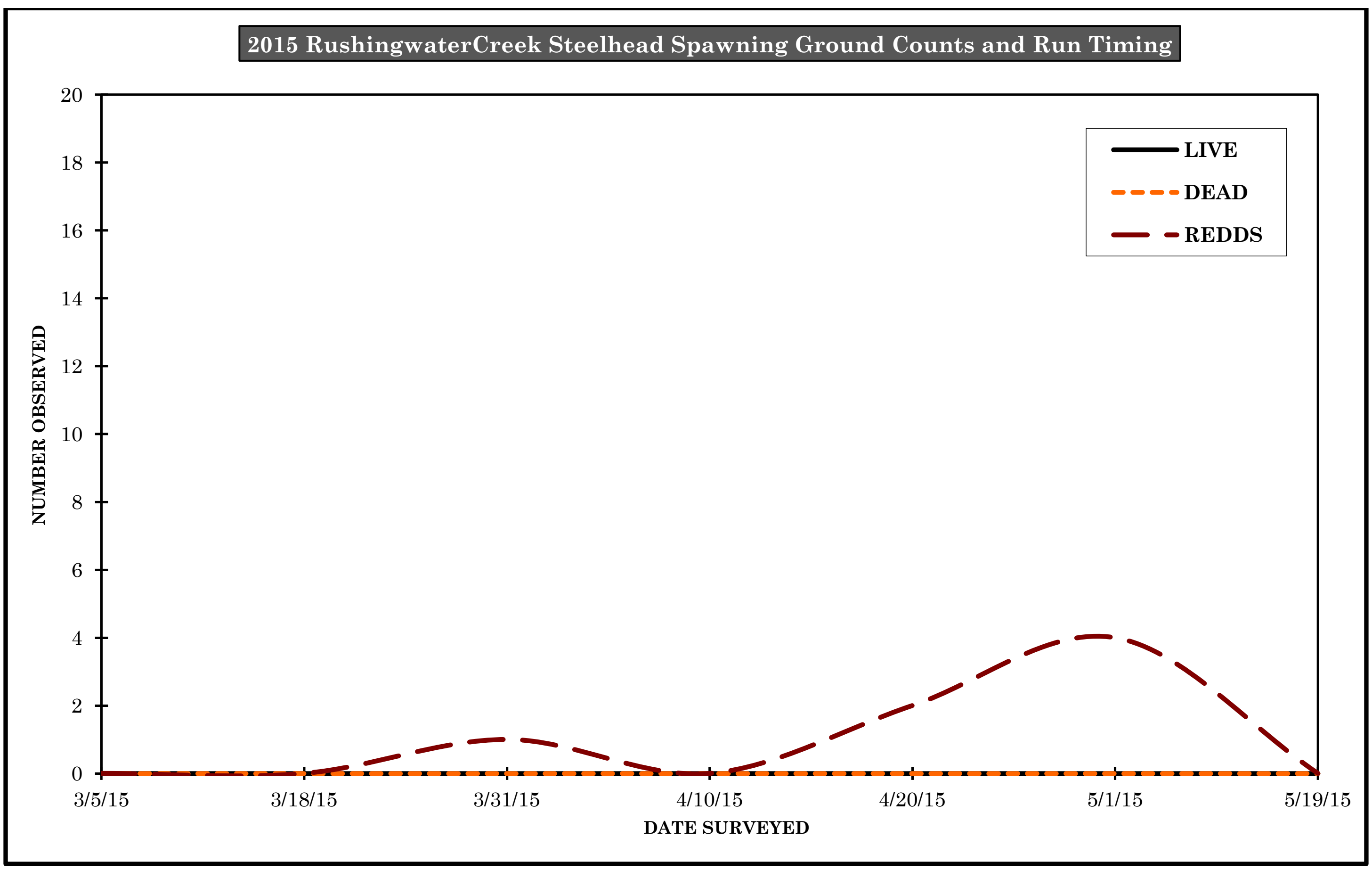
The 2012 season was the first year a significant escapement of Chinook was observed spawning in Rushingwater Creek *(right)*. Sampling data *(ventral fin clips)* showed many of the Chinook were survivors from juvenile spring Chinook released from the Rushingwater *(n=133,486)*, or Cowskull *(n=181,386)* acclimation ponds in 2009 *(2008 brood year)*.

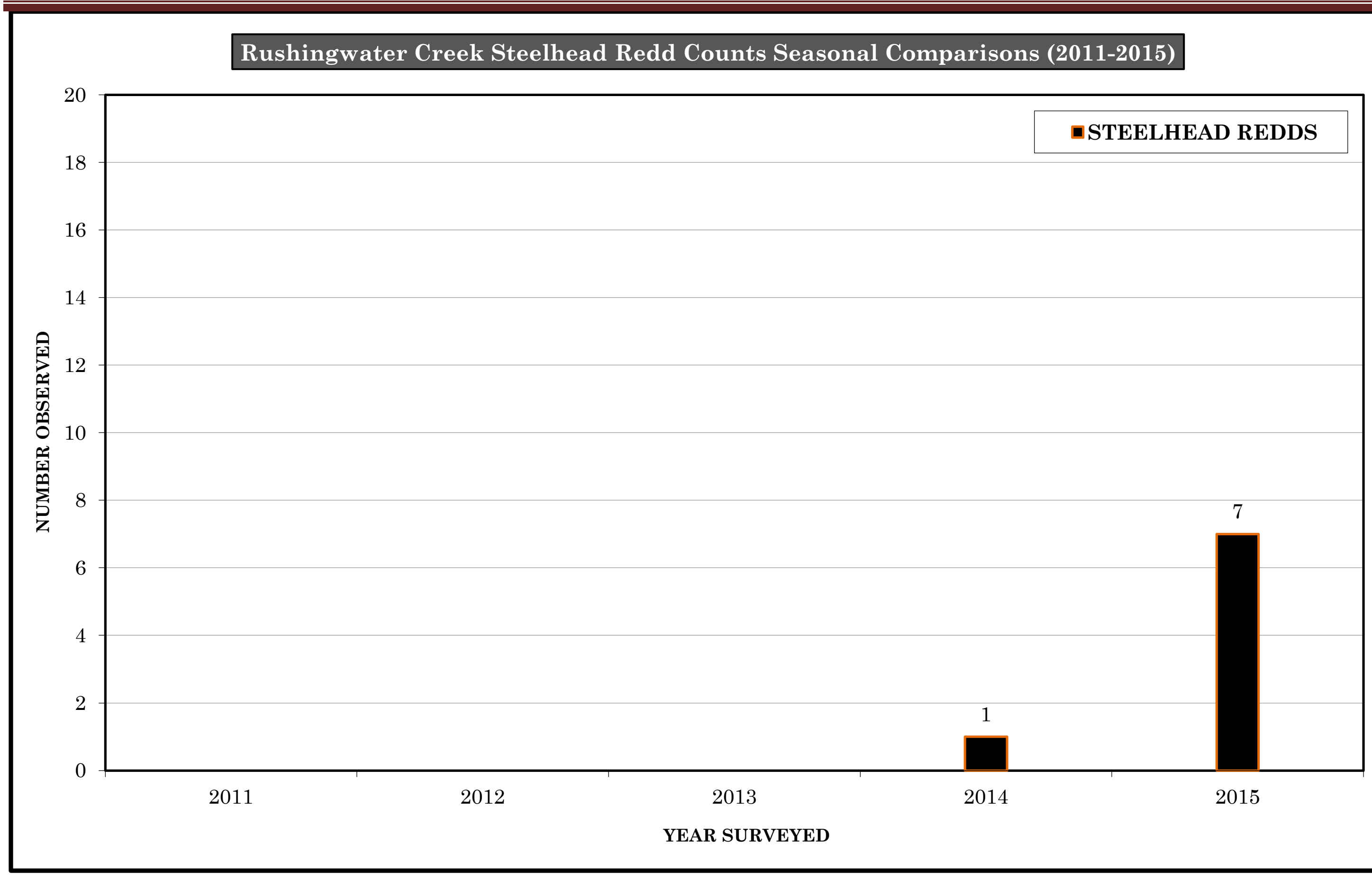

Chinook salmon in Rushingwater Creek.

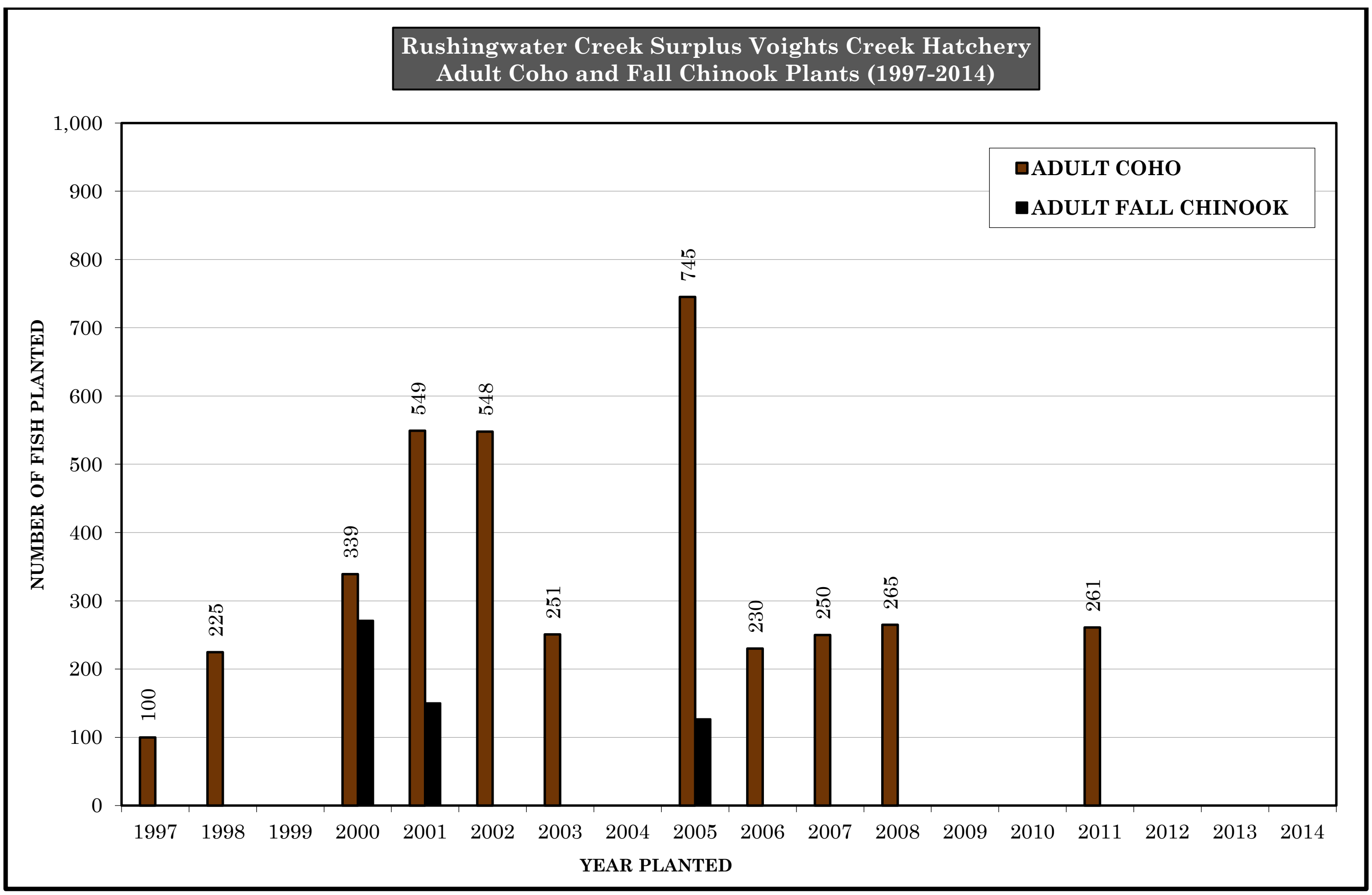

Rushingwater Creek Chinook Salmon Spawning Ground Seasonal Comparisons (2012-2014)
NUMBER OBSERVED
60
40
20
0
36
15
36
1
1
1
1
LIVE
DEAD
REDDS
2012
2013
2014
SEASON SURVEYED

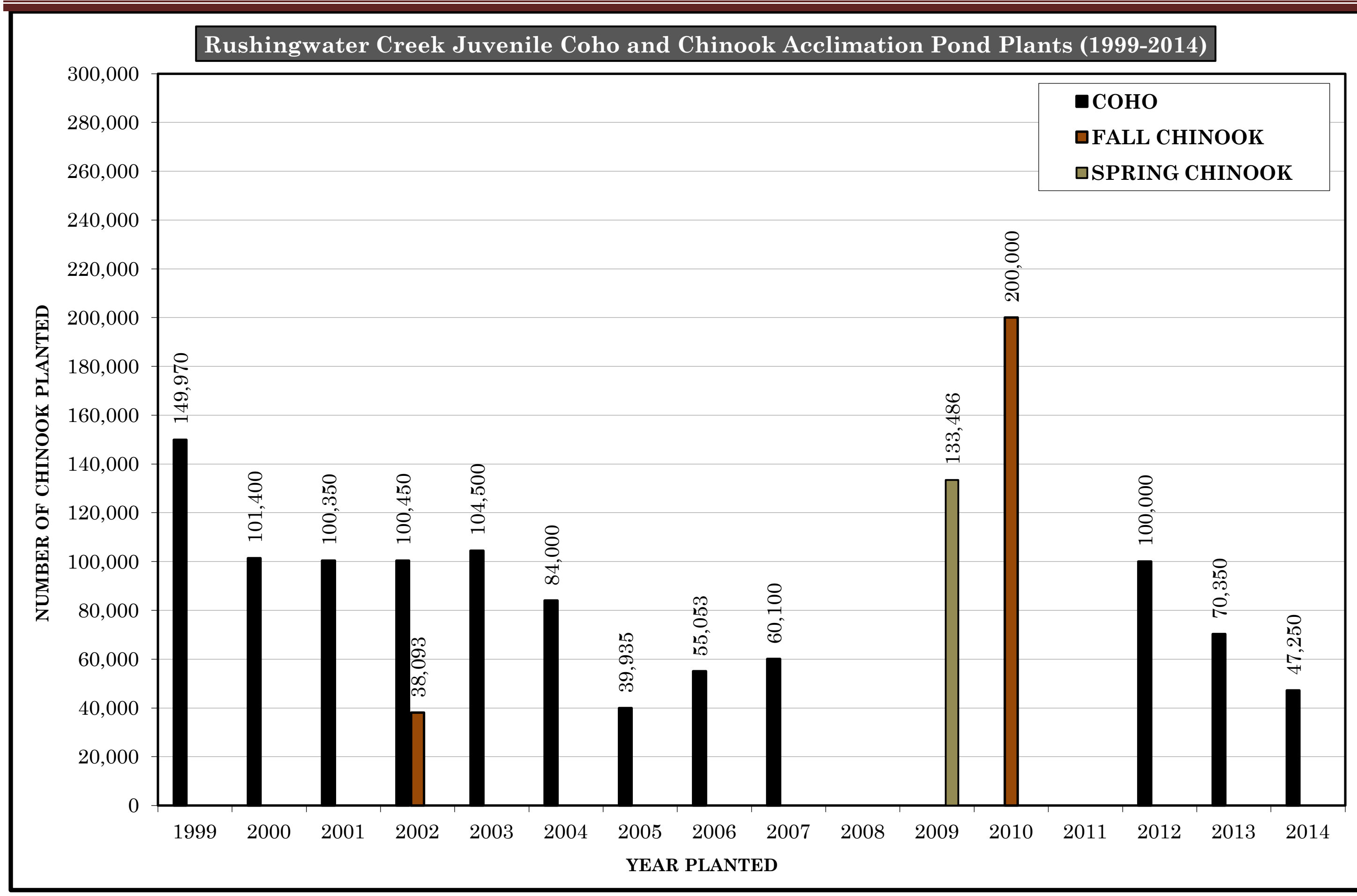

2014 Rushingwater Creek Coho Salmon Spawning Ground Counts and Run Timing
NUMBER OBSERVED
500
450
400
350
300
250
200
150
100
50
0
LIVE
DEAD
9/24/14
10/27/14
11/11/14
11/20/14
12/9/14
DATE SURVEYED


Rushingwater Creek Coho Spawning Ground Seasonal Comparisons (2008-2014)
NUMBER OBSERVED
SEASON SURVEYED
LIVE
DEAD
0
50
100
150
200
250
300
350
400
450
500
2008
2009
2010
2011
2012
2013
2014
16
4
14
1
46
23
6
14
2
374
82


2015 RushingwaterCreek Steelhead Spawning Ground Counts and Run Timing
NUMBER OBSERVED
DATE SURVEYED
LIVE
DEAD
REDDS
0
2
4
6
8
10
12
14
16
18
20
3/5/15
3/18/15
3/31/15
4/10/15
4/20/15
5/1/15
5/19/15


Rushingwater Creek Steelhead Redd Counts Seasonal Comparisons (2011-2015)
STEELHEAD REDDS
NUMBER OBSERVED
0
2
4
6
8
10
12
14
16
18
20
1
7
2011
2012
2013
2014
2015
YEAR SURVEYED


Rushingwater Creek Surplus Voights Creek Hatchery
Adult Coho and Fall Chinook Plants (1997-2014)
ADULT COHO
ADULT FALL CHINOOK
NUMBER OF FISH PLANTED
0
100
200
300
400
500
600
700
800
900
1,000
100
225
339
549
548
251
745
230
250
265
261
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
YEAR PLANTED


Rushingwater Creek Juvenile Coho and Chinook Acclimation Pond Plants (1999-2014)
COHO
FALL CHINOOK
SPRING CHINOOK
NUMBER OF CHINOOK PLANTED
YEAR PLANTED
300,000
280,000
260,000
240,000
220,000
200,000
180,000
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
0
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
149,970
101,400
100,350
100,450
38,093
104,500
84,000
39,935
55,053
60,100
133,486
200,000
100,000
70,350
47,250

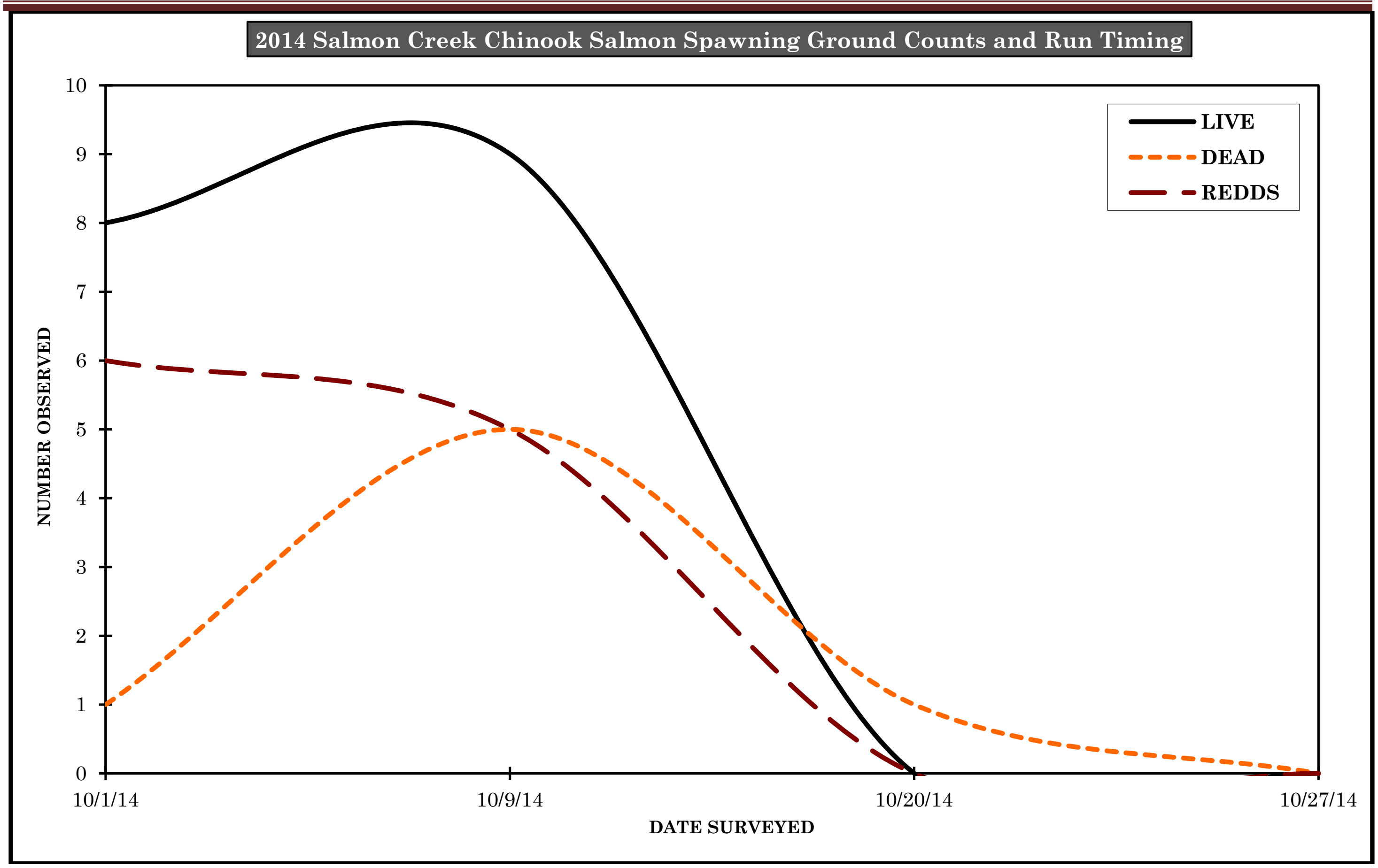
SALMON CREEK 10.0035

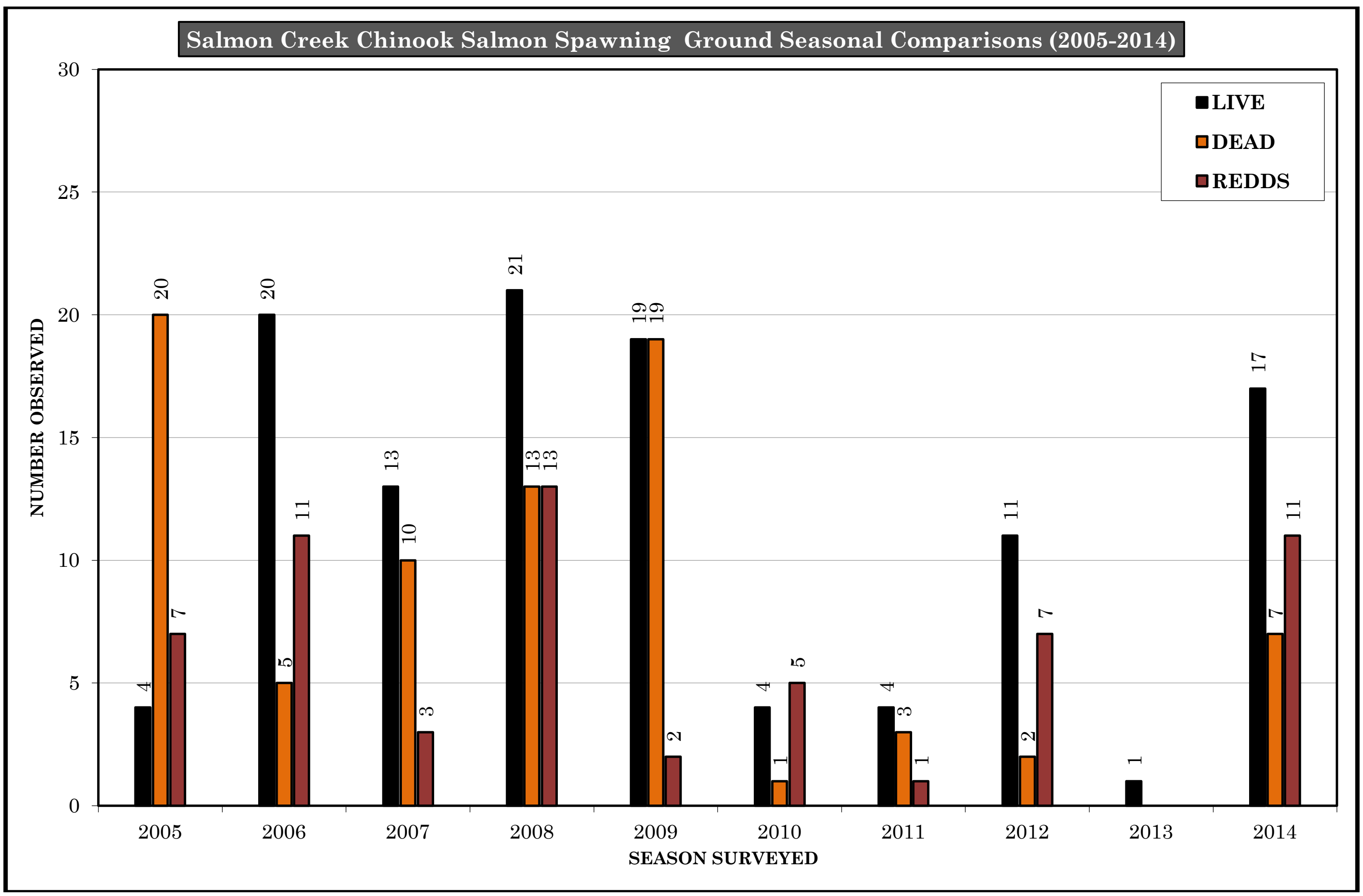
Salmon Creek, also known as Strawberry Creek, flows just north of downtown Sumner. The creek channel is narrow and incised, especially along the lower 0.5 miles *(below)*. Most of the creek flows through moderately developed private and commercial properties before entering the White River at RM 2.1. In 2004, the City of Sumner completed a large wetland restoration project adjacent to the lower reach of Salmon Creek *(RM 0.4)*. The 11 acre site was the result of a mitigation settlement with Davis Properties and Fred Myers.

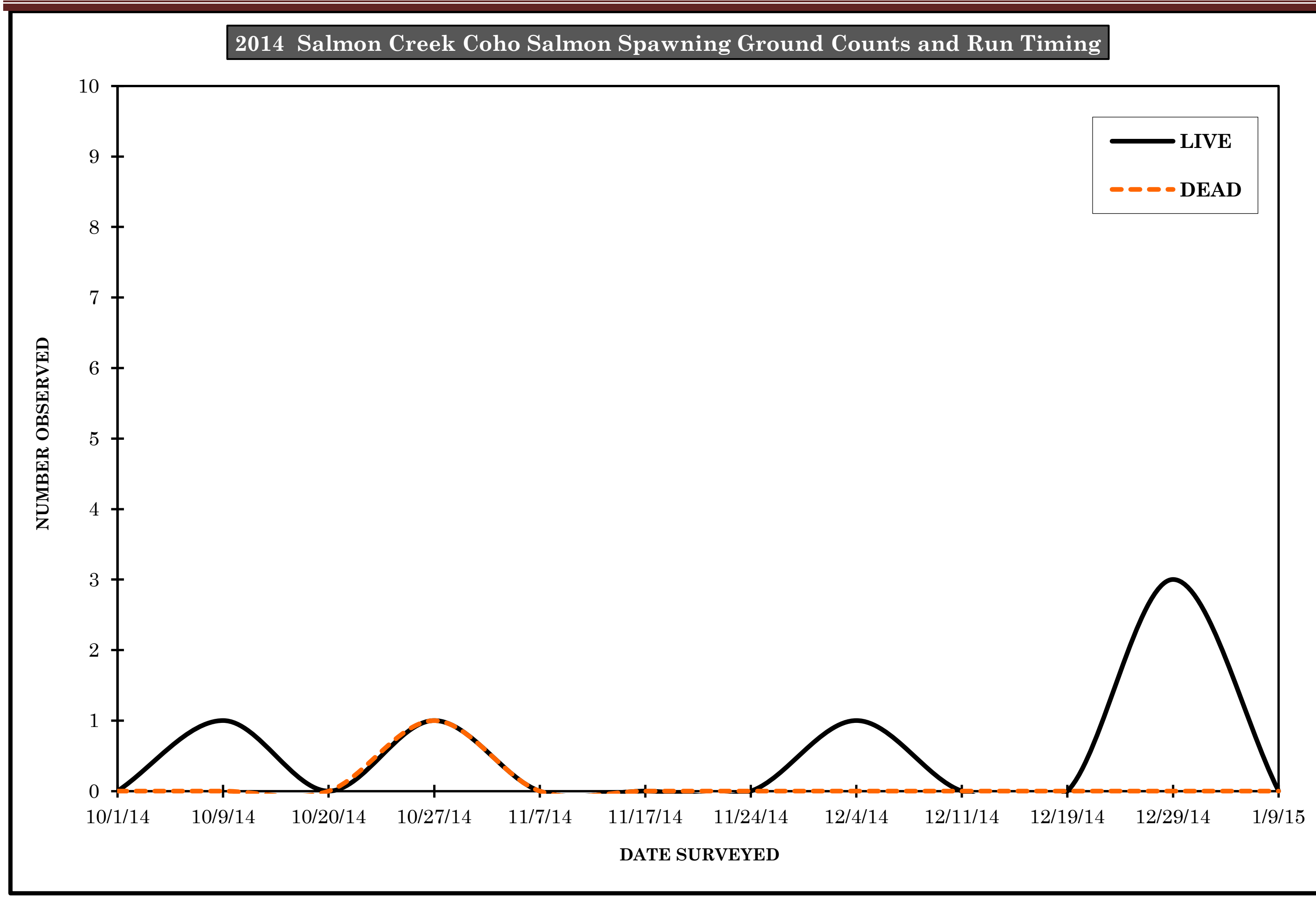
Several of the limiting factors impacting fish production in Salmon Creek include; a confined and straightened stream channel, disconnected floodplain, channel erosion, absent or deficient riparian cover, as well as low summer and fall seasonal flows. High sediment inputs, industrial discharge, and lack of channel habitat are additional limiting factors.

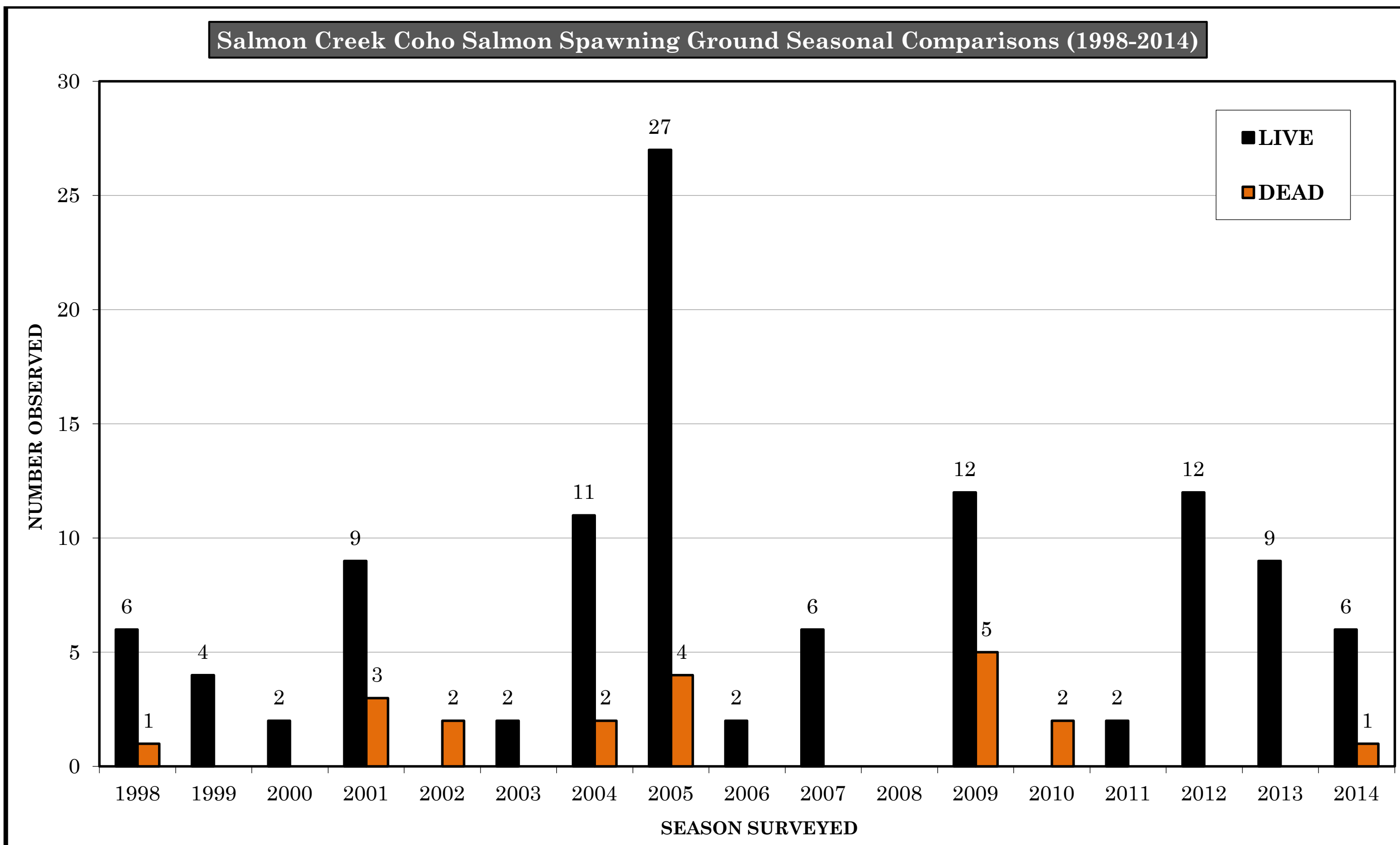
The riparian along portions of the creek consist of sparse stands of alder, fir and maple. Unfortunately, large sections of the stream riparian consist of nothing other than blackberry, turf grass, and reed canary grass *(Phalaris arundinacea)* which provide little or nothing in the way of shade or LWD inputs. The substrate is largely fine sediment, clay, and undersized gravel; however, limited patches of adequate sized spawning gravel, principally throughout the lower section of the creek, are available. Most of the spawning habitat within the creek, although quite limited, exists in the lower 0.5 miles of the creek. It's likely that a great deal of the gravel present throughout the lower reach is recruited from Salmon Tributary. Fish do ascend above the first half mile despite the fact that spawning opportunities are few and the habitat is considerably poorer in quality. In response to the limited spawning habitat available, several of the chum salmon observed in Salmon Creek are likely to be ascending to the spring fed tributary, Salmon Tributary, which enters Salmon Creek at RM 0.5 on the right bank. The consistent flow into Salmon Creek from this perennial tributary contributes greatly to the accessibility of Chinook during the late summer and early fall when instream flows in many streams are too low for Chinook to enter.

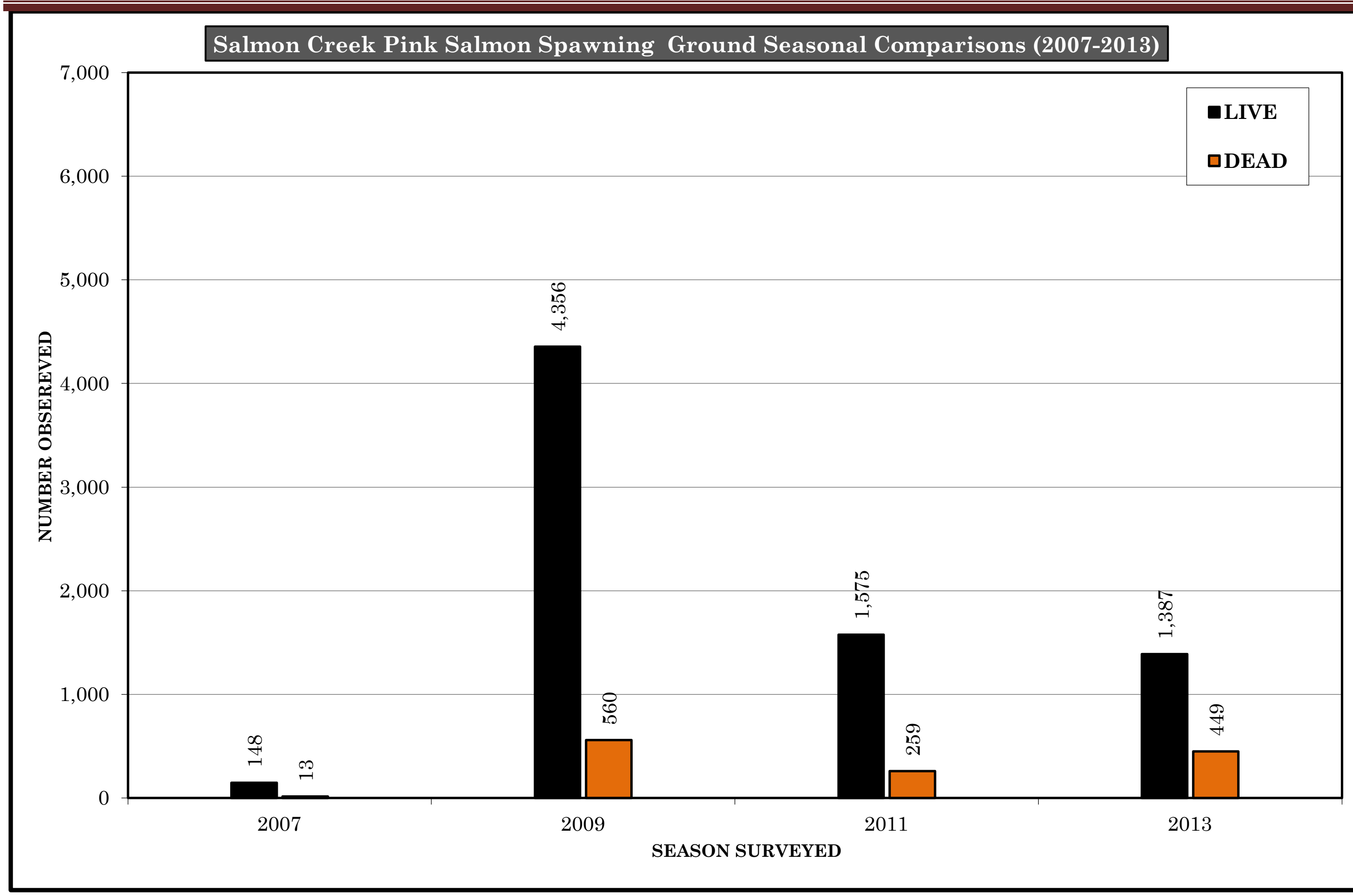
Salmon Creek supports adult Chinook, pink, coho, and chum spawners; with chum being the most abundant species present. Coho are observed spawning; however, their numbers continue to be low. Steelhead and bull trout utilization is unknown. Prior to 2005, Salmon Creek was not regularly surveyed for Chinook since they were seldom observed. However, a few Chinook carcasses were observed within the lower 300 feet of the creek while conducting coho surveys. Annual Chinook surveys conducted since 2005 have documented spawning as high as to the old Weber plant *(Elm St. E & 160th Ave E)*; however, the majority of spawning occurs in the lower 0.5 miles of the creek. Adult coho have been observed as high as 60th St. E. A new oversized culvert was installed near the mouth in 2007, and another culvert and road crossing was installed upstream in 2009.

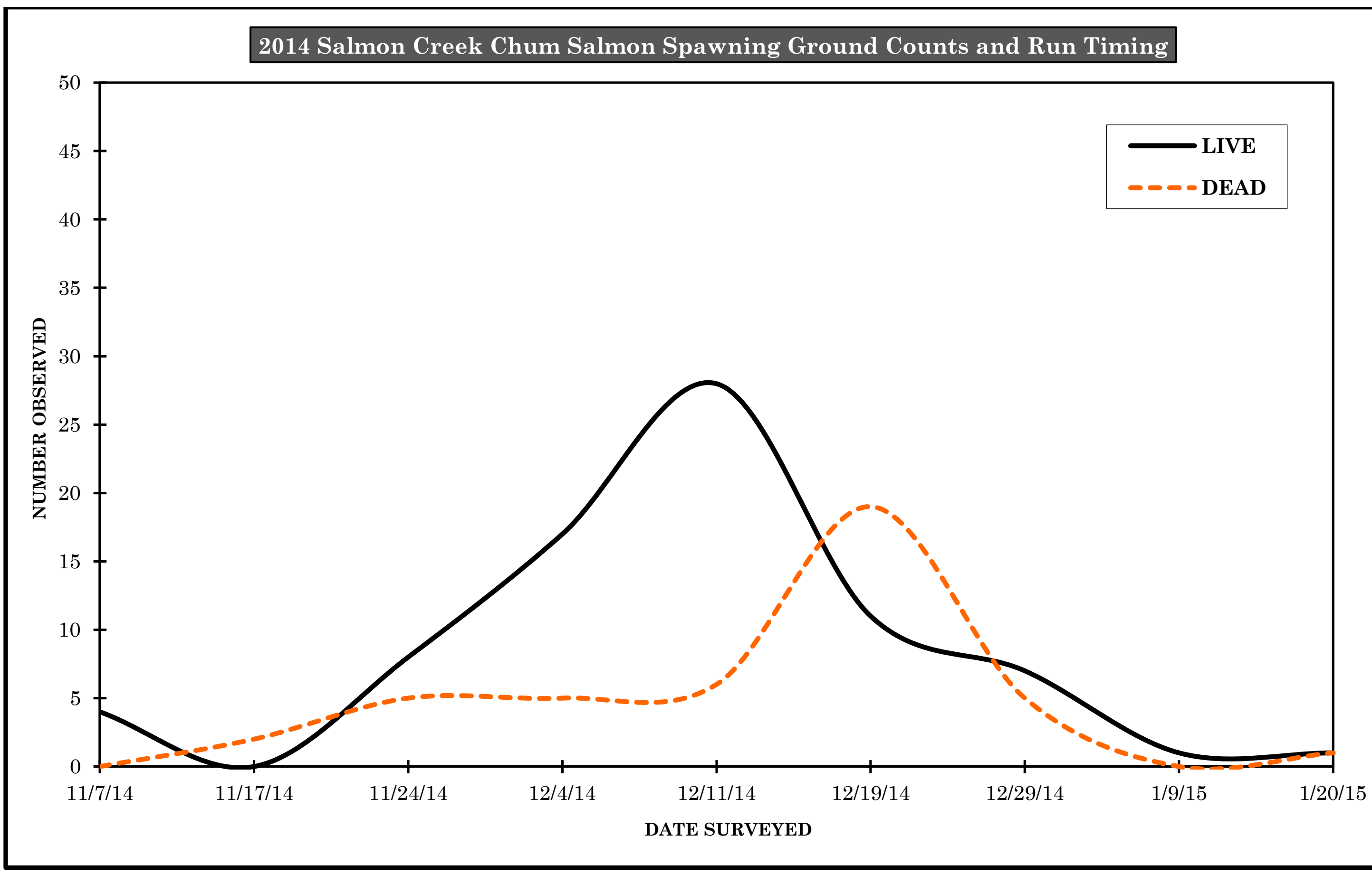

2014 Salmon Creek Chinook Salmon Spawning Ground Counts and Run Timing
NUMBER OBSERVED
DATE SURVEYED
10/1/14
10/9/14
10/20/14
10/27/14
LIVE
DEAD
REDDS

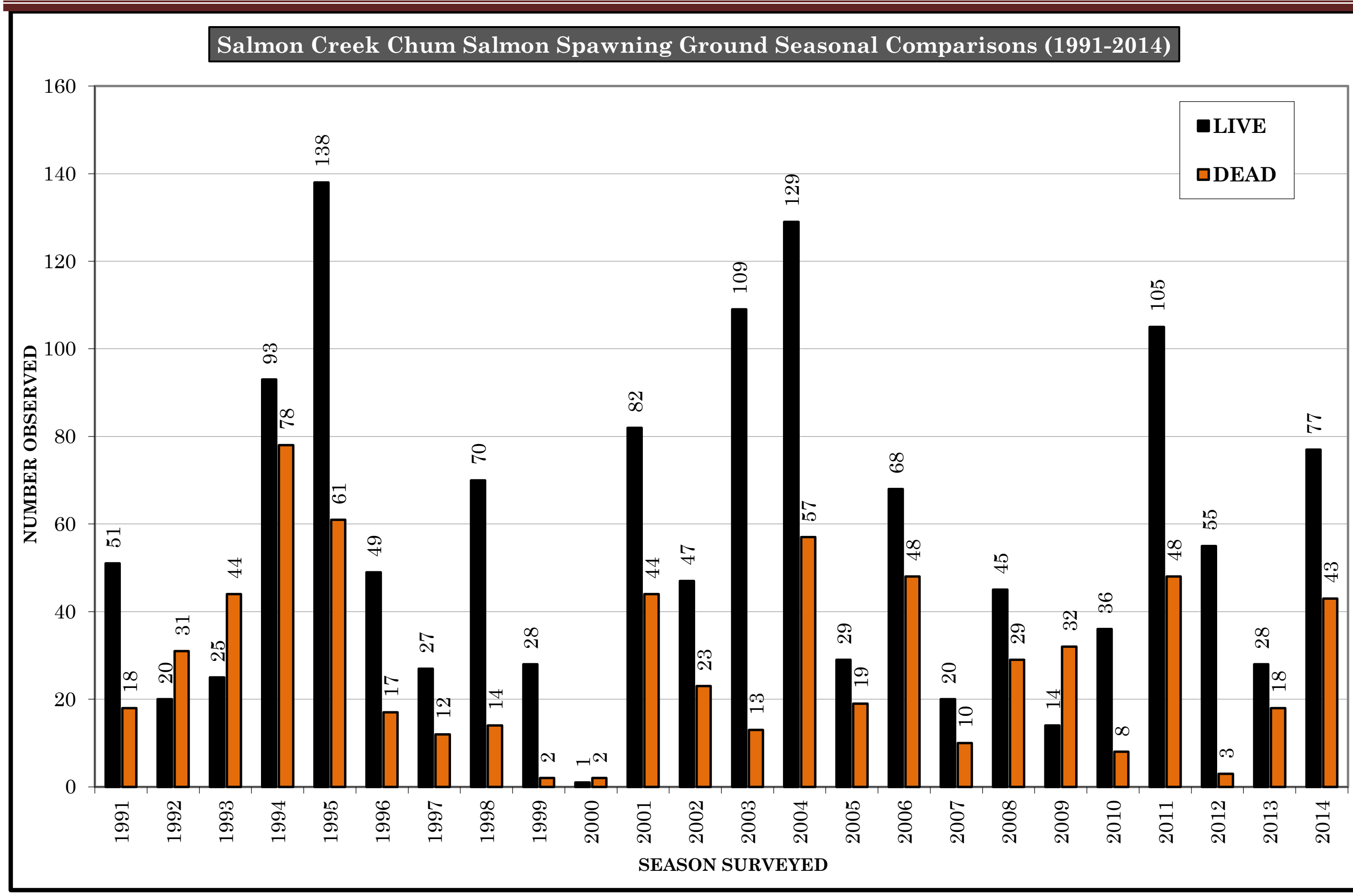

Salmon Creek Chinook Salmon Spawning Ground Seasonal Comparisons (2005-2014)
NUMBER OBSERVED
SEASON SURVEYED
LIVE
DEAD
REDDS
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014


2014 Salmon Creek Coho Salmon Spawning Ground Counts and Run Timing
NUMBER OBSERVED
DATE SURVEYED
LIVE
DEAD
0
1
2
3
4
5
6
7
8
9
10
10/1/14
10/9/14
10/20/14
10/27/14
11/7/14
11/17/14
11/24/14
12/4/14
12/11/14
12/19/14
12/29/14
1/9/15


Salmon Creek Coho Salmon Spawning Ground Seasonal Comparisons (1998-2014)
NUMBER OBSERVED
SEASON SURVEYED
LIVE
DEAD
0
5
10
15
20
25
30
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
6
1
4
2
9
3
2
2
11
2
27
4
2
6
12
5
2
2
12
9
6
1


Salmon Creek Pink Salmon Spawning Ground Seasonal Comparisons (2007-2013)
LIVE
DEAD
NUMBER OBSEREVED
SEASON SURVEYED
2007
2009
2011
2013
148
13
4,356
560
1,575
259
1,387
449


2014 Salmon Creek Chum Salmon Spawning Ground Counts and Run Timing
LIVE
DEAD
NUMBER OBSERVED
DATE SURVEYED
11/7/14
11/17/14
11/24/14
12/4/14
12/11/14
12/19/14
12/29/14
1/9/15
1/20/15


Salmon Creek Chum Salmon Spawning Ground Seasonal Comparisons (1991-2014)
NUMBER OBSERVED
SEASON SURVEYED
LIVE
DEAD
0
20
40
60
80
100
120
140
160
1991 51 18
1992 20 31
1993 25 44
1994 93 78
1995 138 61
1996 49 17
1997 27 12
1998 70 14
1999 28 2
2000 1 2
2001 82 44
2002 47 23
2003 109 13
2004 129 57
2005 29 19
2006 68 48
2007 20 10
2008 45 29
2009 14 32
2010 36 8
2011 105 48
2012 55 3
2013 28 18
2014 77 43

SALMON TRIBUTARY 10.0036

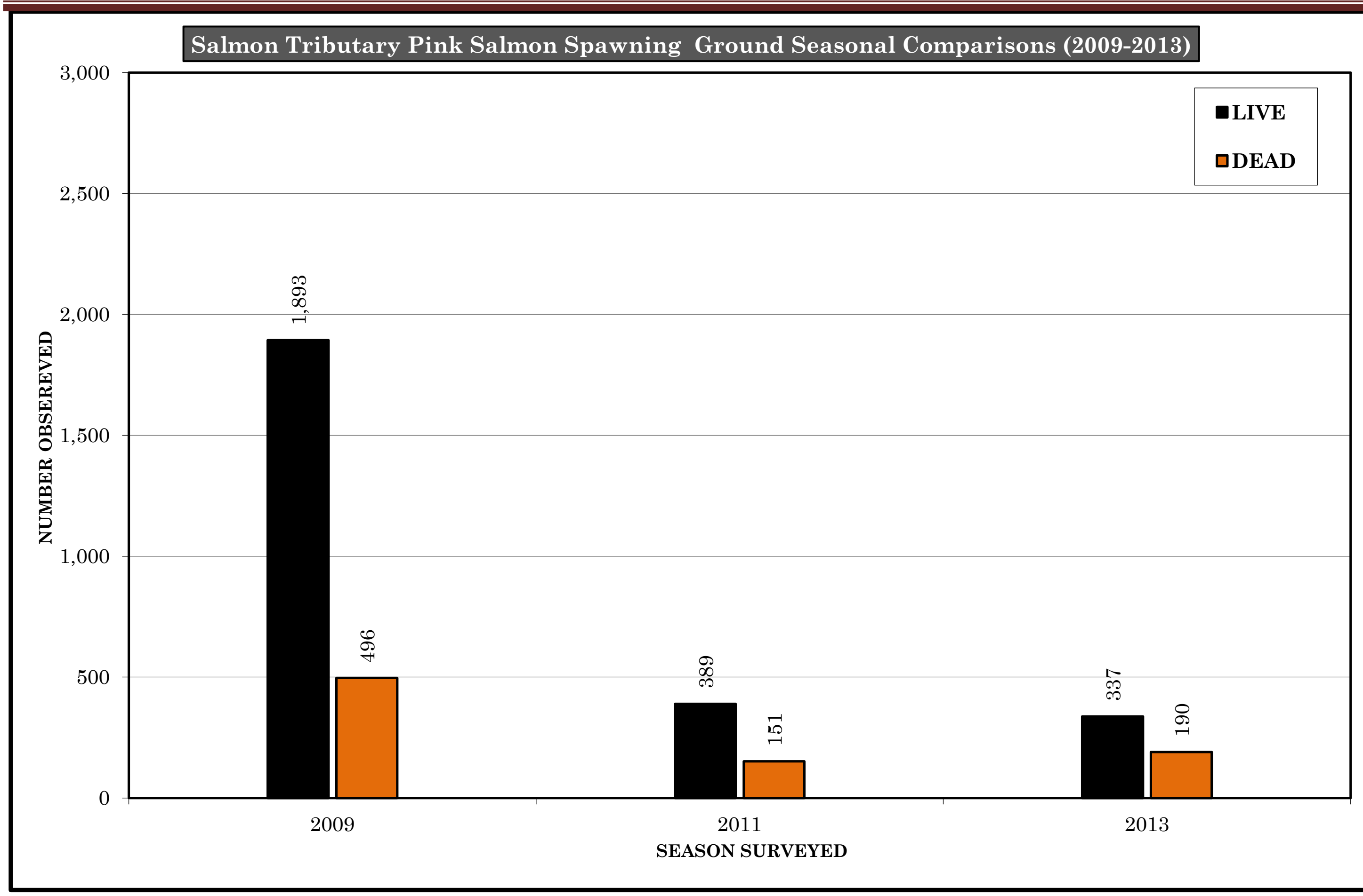
Salmon Tributary is a short run, spring-fed stream entering Salmon Creek *(Strawberry Creek)* at RM 0.5. Salmon Tributary has approximately 0.13 miles *(700 feet)* of highly productive spawning habitat. The lower anadromous reach consists of a low to moderate gradient channel with excellent spawning gavel available throughout its length *(lower left & center right)*. Although the creek lacks significant structure, it manages quit well in supporting adult spawners including chum, pink, coho, and the occasional Chinook; as well as providing limited overwintering opportunities for juvenile coho and Chinook.

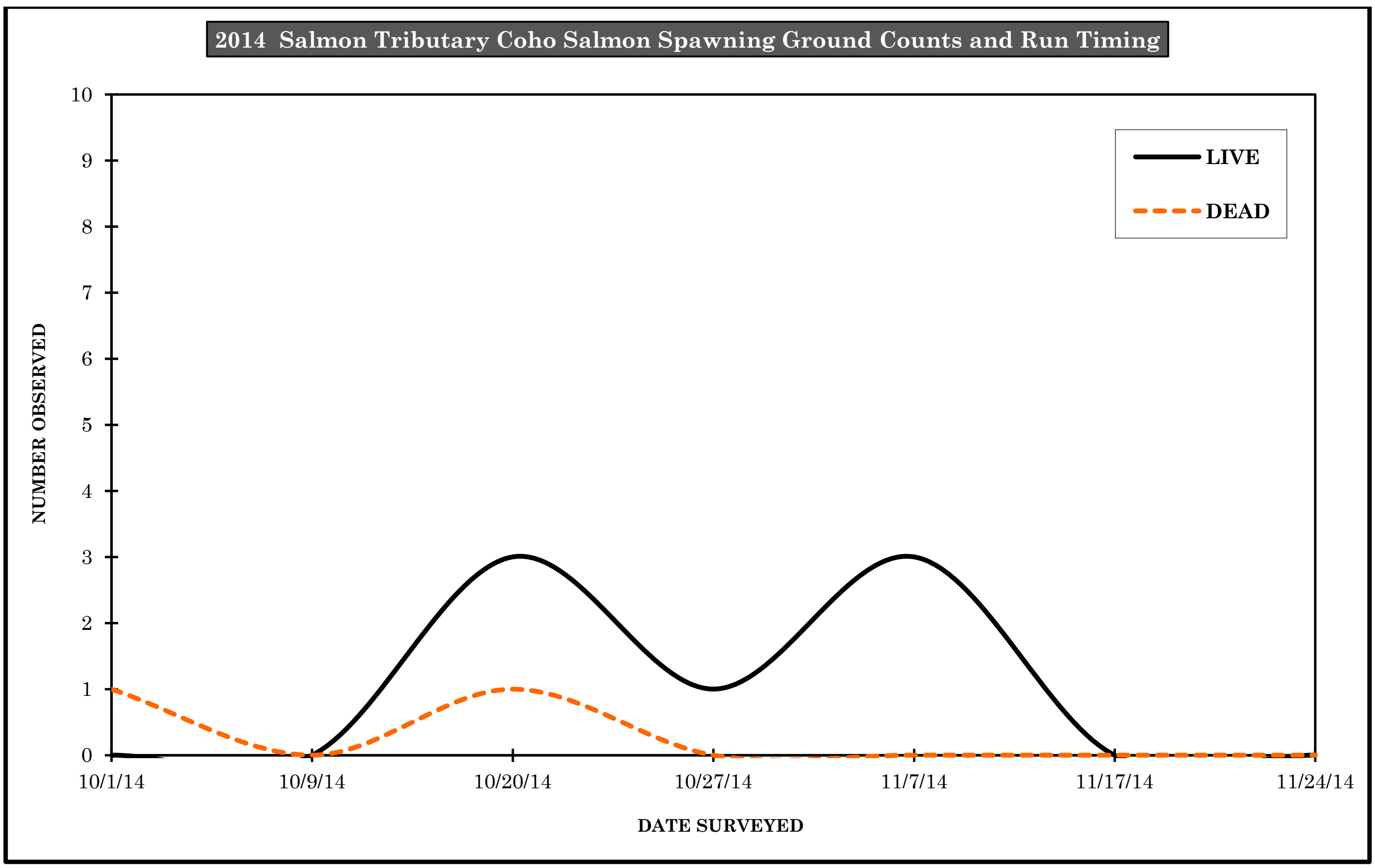
Beyond the anadromous reach the creek climbs quickly to a point where impassable cascades prevent any further upstream migration. The riparian along the lower reach of the creek consists largely of alder, as well as a few conifers and holly. A few pieces of small in-stream woody debris are present; however, LWD recruitment is limited and undersized. The riparian zone along the upper non-anadromous reach is well intact.

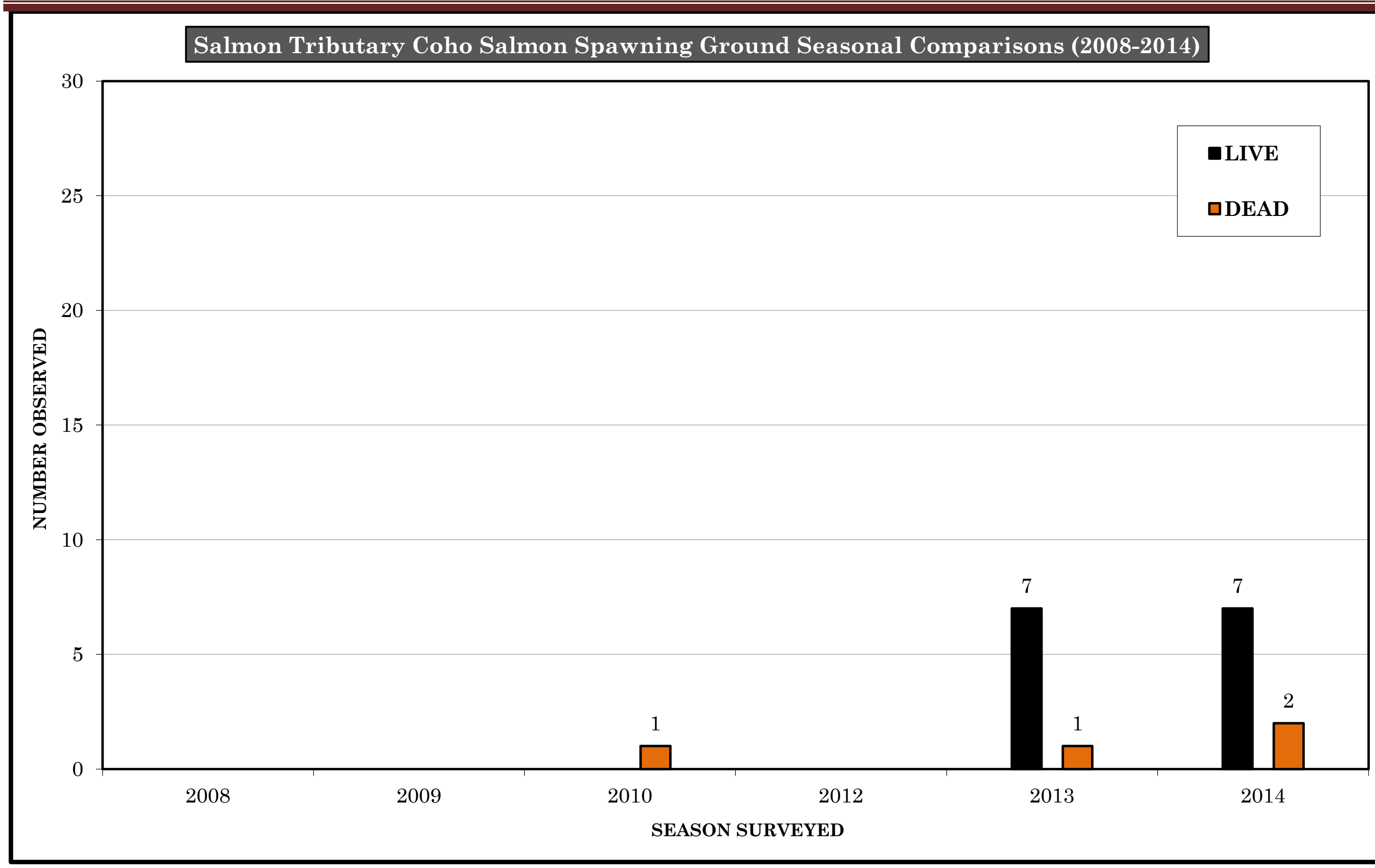
In the past, two perched culverts located on Salmon Creek have been responsible for periodically preventing adult salmon, primarily chum, from accessing Salmon Tributary. The upper culvert on Salmon Creek often created a significant fish passage problem until late 2007, when bank erosion permitted the creek to breech the culvert. During the fall of 2008, the two lower undersized cement culverts that had long been responsible for fish passage issues were removed.

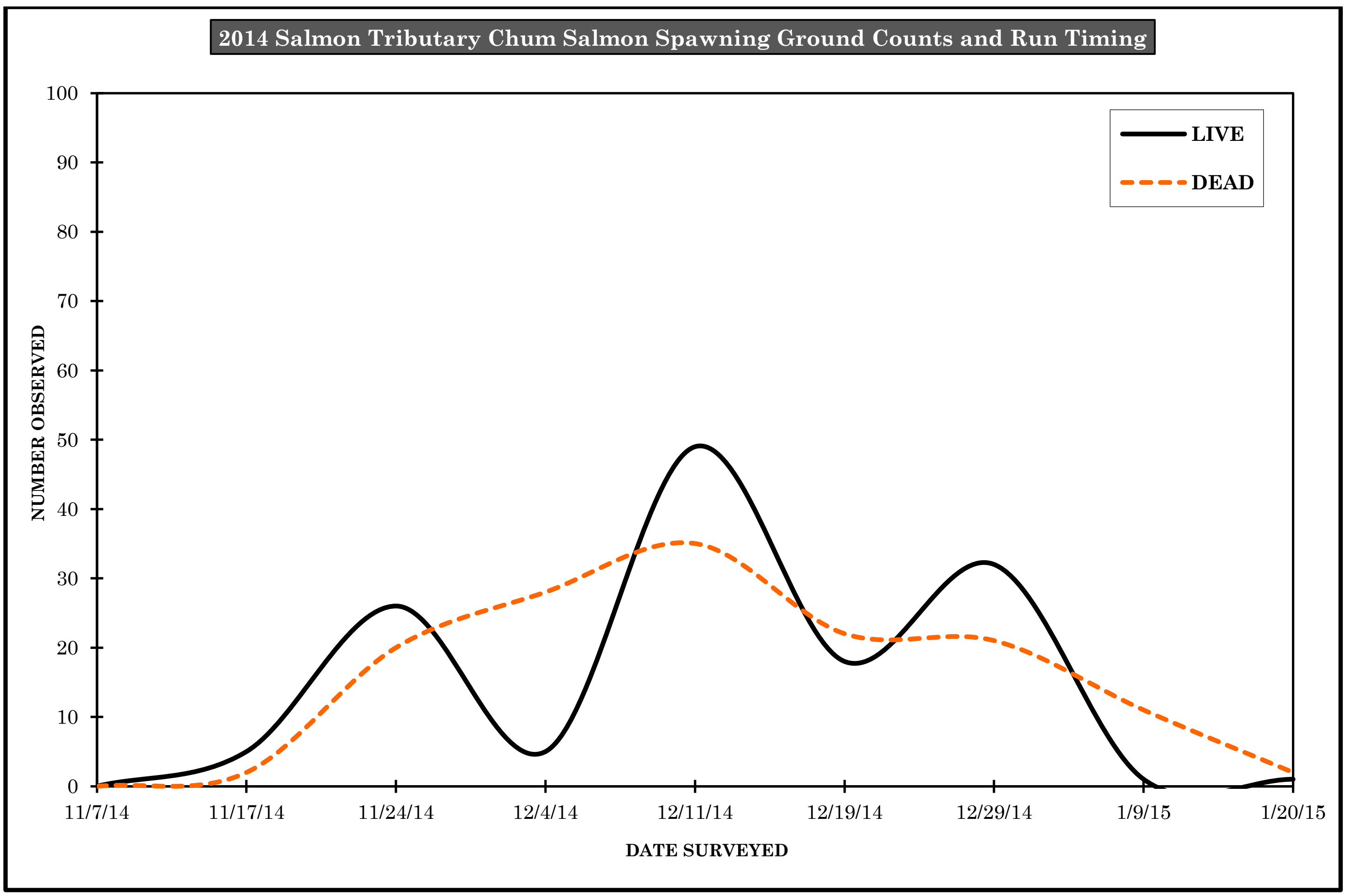
Beyond RM 0.13, the gradient increases substantially and the channel narrows. The increase in gradient and flow is by and large an obstacle to chum, which are the most abundant species to spawn in the creek. Salmon Tributary regularly supports a large run of chum salmon for a stream of its size. Chum fry will spend a brief time rearing in the creek. The process of smoltification occurs quickly and the chum will migrate towards marine waters shortly after emerging from the gravel. Prior belief that significant pre-spawning mortalities were caused by predators has proven to be incorrect. Observations over the past couple of seasons have concluded that many of the pre-spawn mortalities are associated with local dogs accessing the creek and harassing the fish by chasing them *(stranding and exhausting)* and pulling them out of the creek. Many of these fish are then preyed upon by wild animals.

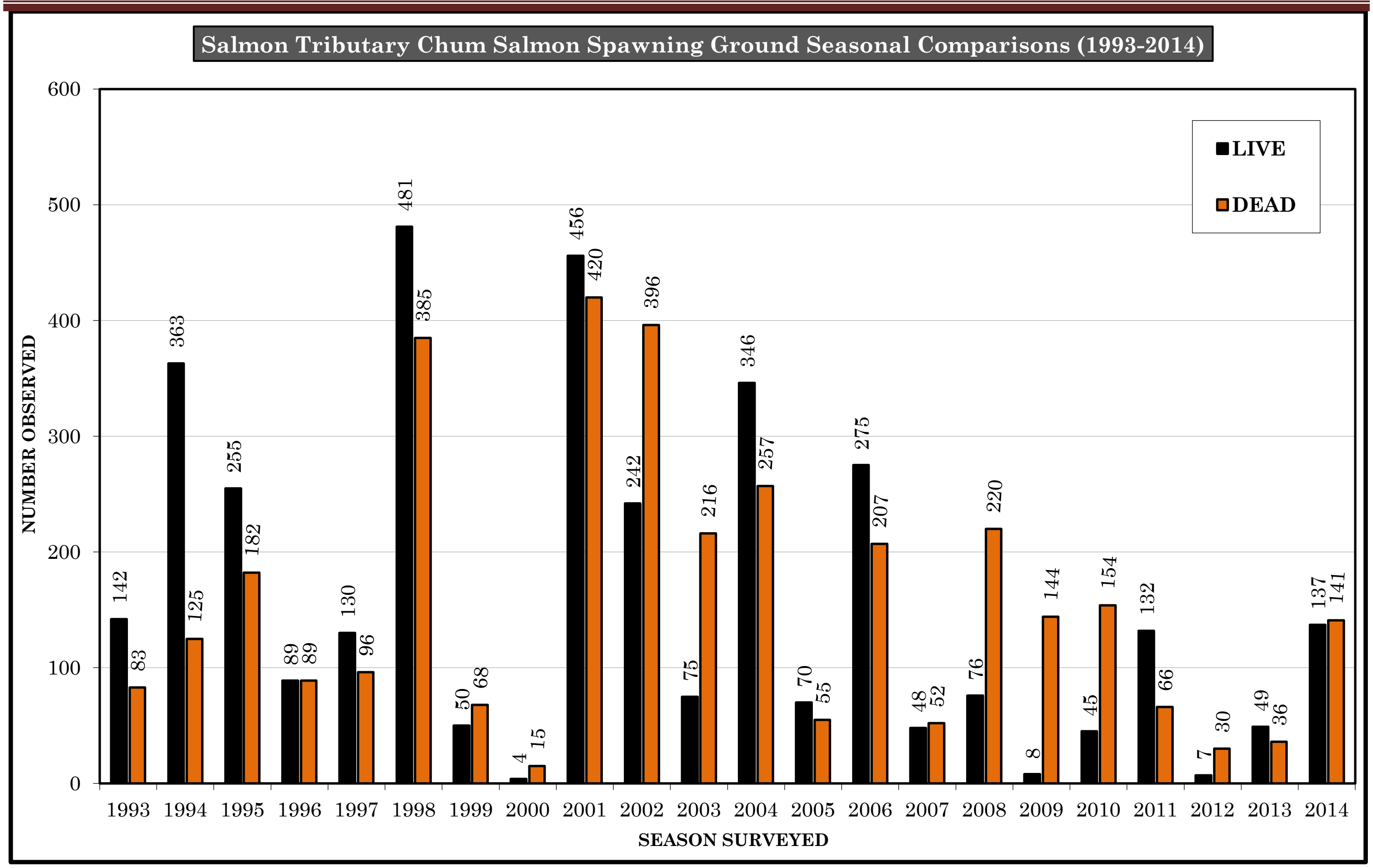
Coho are often observed in the fall spawning in the lower 250 feet of the creek. Flow in Salmon Tributary is generally too low to provide Chinook or steelhead access to spawn, yet Chinook have been observed spawning in Salmon Creek at the mouth of Salmon Tributary. Small, low gradient pools at the mouth provide excellent habitat for young Chinook and coho; newly emerged coho fry are regularly observed in late January and early February during the later part of chum surveys.


Salmon Tributary Pink Salmon Spawning Ground Seasonal Comparisons (2009-2013)
LIVE
DEAD
NUMBER OBSEREVED
3,000
2,500
2,000
1,500
1,000
500
0
1,893
496
389
151
337
190
2009
2011
2013
SEASON SURVEYED


2014 Salmon Tributary Coho Salmon Spawning Ground Counts and Run Timing
LIVE
DEAD
NUMBER OBSERVED
10
9
8
7
6
5
4
3
2
1
0
10/1/14
10/9/14
10/20/14
10/27/14
11/7/14
11/17/14
11/24/14
DATE SURVEYED


Salmon Tributary Coho Salmon Spawning Ground Seasonal Comparisons (2008-2014)
NUMBER OBSERVED
30
25
20
15
10
5
0
LIVE
DEAD
1
7
1
7
2
2008
2009
2010
2012
2013
2014
SEASON SURVEYED


2014 Salmon Tributary Chum Salmon Spawning Ground Counts and Run Timing
NUMBER OBSERVED
100
90
80
70
60
50
40
30
20
10
0
LIVE
DEAD
11/7/14
11/17/14
11/24/14
12/4/14
12/11/14
12/19/14
12/29/14
1/9/15
1/20/15
DATE SURVEYED


Salmon Tributary Chum Salmon Spawning Ground Seasonal Comparisons (1993-2014)
NUMBER OBSERVED
SEASON SURVEYED
LIVE
DEAD
0
100
200
300
400
500
600
1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014
142 83
363 125
255 182
89 89
130 96
481 385
50 68
4 15
456 420
242 396
75 216
346 257
70 55
275 207
48 52
76 220
8 144
45 154
132 66
7 30
49 36
137 141

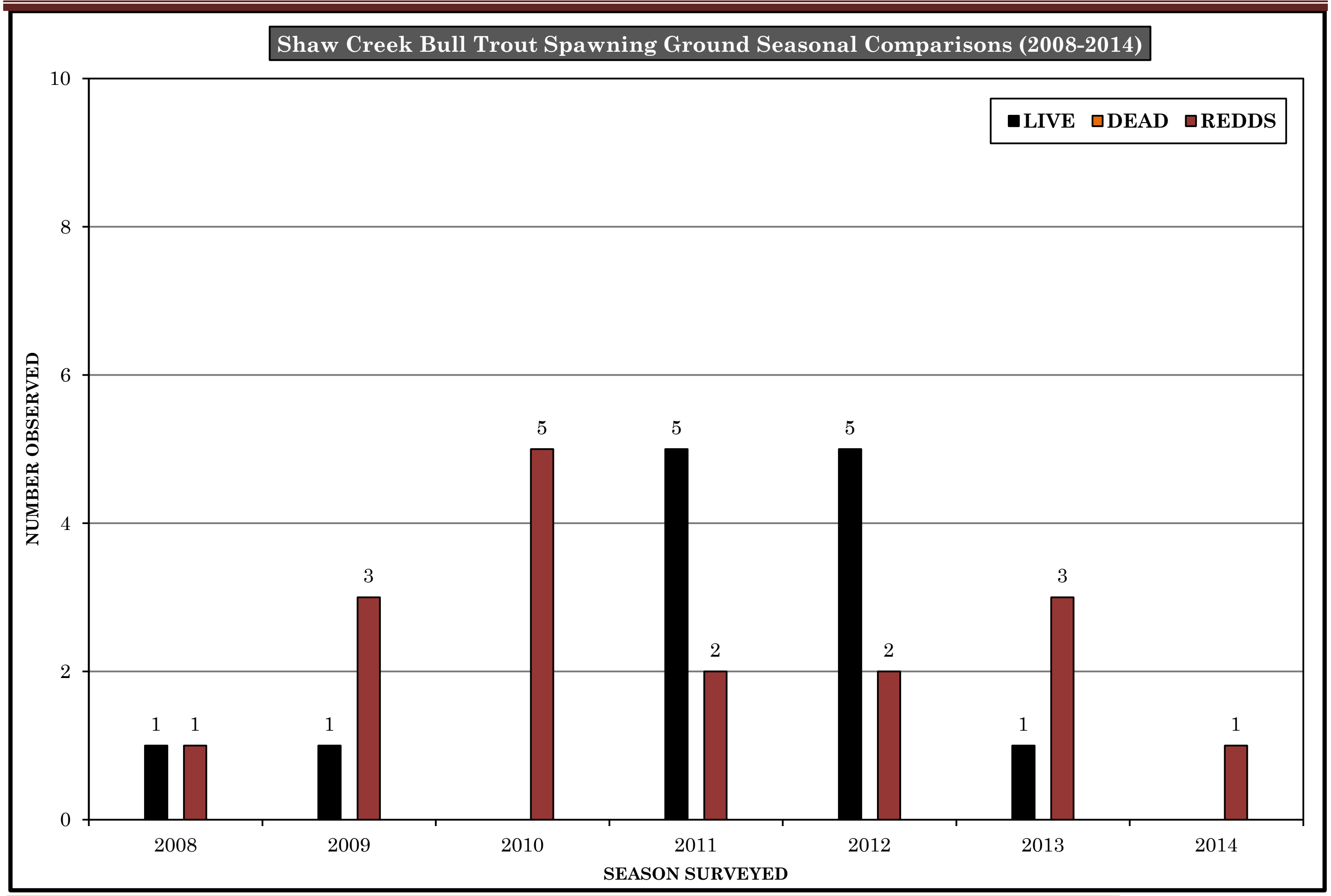
SHAW CREEK 10.0365

Shaw Creek is a small right bank headwater tributary of the White River. This high mountain drainage is a north facing stream flowing through the Shaw Creek Valley, between Tamanos Mountain to the west, and Governors Ridge to the east. Located entirely within Mt. Rainier National Park, the creek is nonglacial in origin; rather, its source comes from the Owyhigh Lakes located at nearly 5,200'. Shaw Creek flows for approximately 3.5 miles from Owyhigh Lakes plateau before entering the White River at approximately RM 68.8, just upstream of Klickitat Creek.

Shaw provides vital habitat conditions for bull trout *(center)* rearing and spawning. PTF surveys the creek for bull trout from late August through early October. Although bull trout spawning is consistent in this tributary, it does not experience the spawning frequency comparable to that observed in Klickitat or No Name creeks. Analogous to many headwater tributaries within the park, the lower 300-400 feet of the creek is comprised of a narrow, low gradient channel flowing within the open channel migration zone of the White River floodplain. There is no significant LWD present in this portion of the channel. Although spawning does occur within this small stretch, it is acutely limited due the lack of quality spawning substrate created by the fine alluvial deposits from the White River, and is repeatedly manipulated and affected by mainstem river incursions.

Beyond the open floodplain, Shaw Creek enters the heavily forested lower slope of the valley floor as it parallels the White River. From this point, the creek channel assumes a pool-riffle configuration for approximately the next 0.65 miles. Unfortunately, only about 0.5 miles of this reach provides quality spawning and rearing opportunities. Frequently, during periods of lower flows, the creek water becomes hyporheic approximately 0.5 miles after entering the forested area; creating a provisional yet significant barrier. Furthermore, if flows are low enough, additional barriers are created throughout the wetted channel by small jumps in channel height due to bedload built-up behind LWD embedded in the channel. Fortunately, this wetted channel section provides excellent habitat for rearing; as well as spawning when flows are sufficient. Spawning gravel is abundant; as are significant logjams and in-channel LWD. In addition, numerous deep pools and side channels provide excellent habitat for juvenile and adult fish utilizing this creek.

The seasonally dry channel reach section continues beyond the Sunrise Park Road Bridge, located at approximately RM 0.62. Beyond the bridge crossing, the gradient begins to increase significantly as the stream channel begins to climb up the valley wall toward the high lakes. At this point, a series of impassable cascades marks the permanent upper extent of anadromy. The stream continues to course its way through the steep Shaw Creek Valley until reaching the Owyhigh Lakes plateau. Several small unnamed tributaries contribute additional flow to Shaw along this upper reach; unfortunately, they do not add any beneficial spawning or rearing habitat given that they are located well above the anadromous barriers.



Raw spawning data for Shaw Creek can be found in Appendix C. See Appendix B for bull trout redd locations.

SILVER CREEK 10.0313

Silver Creek is a right bank headwaters tributary of the White River located at RM 60.5, just outside of the northern boundary of Mt. Rainier National Park. Silver Creek originates along the Crystal Mountain Ridge within the Wenatchee National Forest, and flows for over 7 miles through steep mountainous terrain, dropping nearly 3,000 feet from its source until reaching its confluence with the White River immediately West of Highway 410. Silver Creek has one major tributary; 4.4 mile Goat Creek *(10.0314)*, which enters on the right bank of Silver Creek 0.2 miles up from its mouth. Upstream of Goat Creek there are numerous smaller named and unnamed tributaries contributing flow to Silver Creek as well.

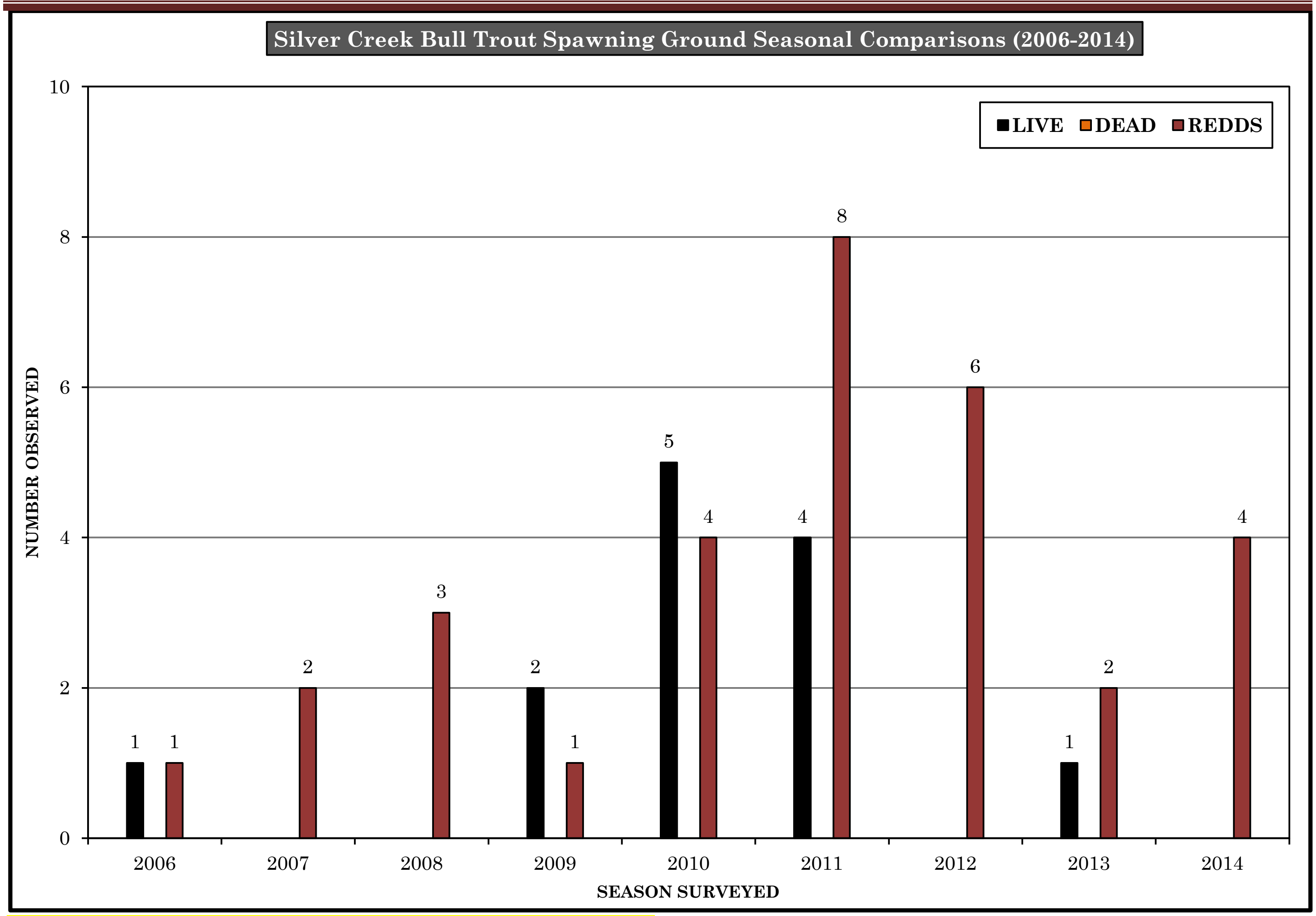
The surrounding riparian zone consists of some old growth conifers, and a mixture of younger coniferous and deciduous trees. The in-stream habitat throughout the lower 0.5 miles of Silver Creek consists of mostly moderate to high gradient cascades with shallow and moderately deep scour pools. The scour pools and some low energy pocket areas provide what

little spawning habitat is available along the lower creek. Incredibly, the few spawning habitat areas available are utilized each season by bull trout. In 2007, the South Puget Sound Salmon Enhancement Group *(SPSSEG)*, with funding from the USFWS and the USFS, completed the removal of an old diversion dam suspected of causing a barrier to migrating salmon and bull trout. The removal of this aged structure has enhanced access to available spawning habitat upstream.

Bull trout, which are often observed spawning in Silver Springs, were not surveyed for in Silver Creek prior to 2006. However, in 2006 and 2007, a bull trout migration and spawning ground telemetry study was conducted by PTF on the White River. In support of the project, several bull trout captured in the USACE Buckley trap were implanted with radio transmitters. The radio tagged fish were then tracked over the next 6 months from their release site at RM 45 near the community of Greenwater, to several spawning sites located in the upper White River including Silver Creek. A bull trout tagged during the 2006 study was observed holding in Silver Creek prior to spawning at a site approximately 200 feet upstream from the mouth.

Although entirely feasible, steelhead utilization is currently unknown since no surveys have been conducted to determine usage. However, coho, Chinook, pink and sockeye are frequently observed in nearby Silver Springs; yet, with the exception of an occasional coho and pink salmon, PTF biologist have not observed any other salmon species spawning in Silver Creek.

Intriguingly, Silver Creek is also the final resting place of Henry C. Allen *(1848-1898)*; a civil war veteran and Purple Heart recipient who fought with the 16th Wisconsin Infantry, then relocated to the region after the war. He was found frozen near his trap lines in the winter of 1898, and was subsequently buried on site.



Raw spawning data for Silver Creek can be found in Appendix C.

SILVER SPRINGS CREEK 10.0332A

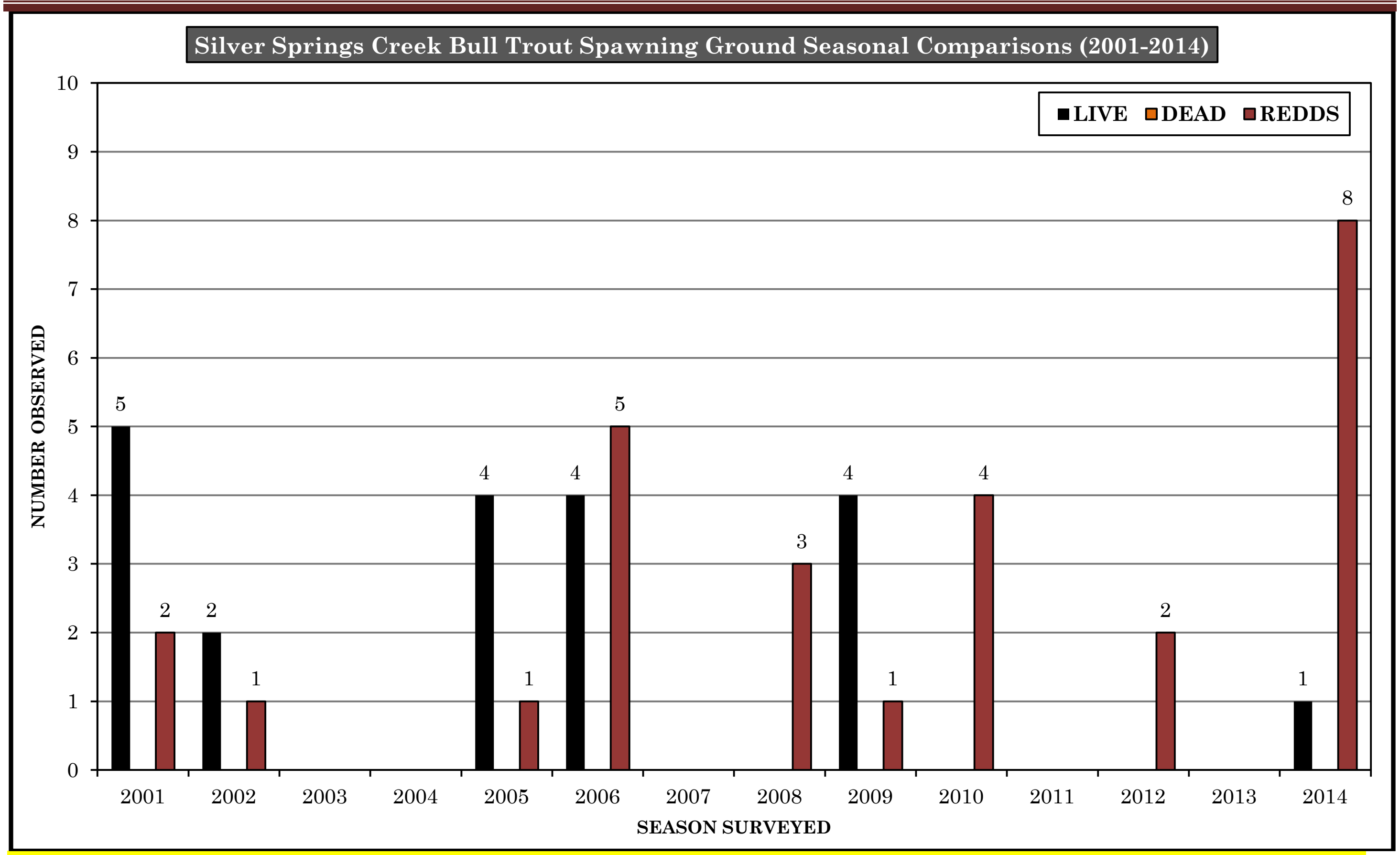
Silver Springs is a short, spring-fed headwater tributary to the White River *(RM 60.5)*. With its clear and consistent flow, this cool spring offers excellent spawning and rearing habitat for several species of salmonids. Erupting from a small bench along the forest floor within the Silver Springs Campground; this spring creek runs adjacent to Hwy. 410, approximately 0.5 mile north of the Mt. Rainier National Park boarder. Silver Springs flows for approximately 0.3 miles within a low gradient pool riffle channel. At a point along the lower creek, the channel passes through an undersized, yet fish passable culvert.

The creek contains a moderate amount of interactive in-stream LWD, in addition to one significant long-term woody debris jam located in the lower channel. The overstory riparian consists largely of mature conifers, in addition to several hardwoods located near the confluence with the White River and Silver Creek. Typical of this type of stream, the substrate is made up primarily of sand and small gravel. However, several pockets of excellent spawning gravel are present throughout the reach, although it is frequently obscured by fine sand. The entire channel of Silver Springs runs within the channel migration zone of the White River, and has on occasion been inundated by silt and woody debris from the White during high-water and flood events. In addition, the mouth of Silver Creek has frequently been relocated a couple of hundred feet due to mainstem river incursions.

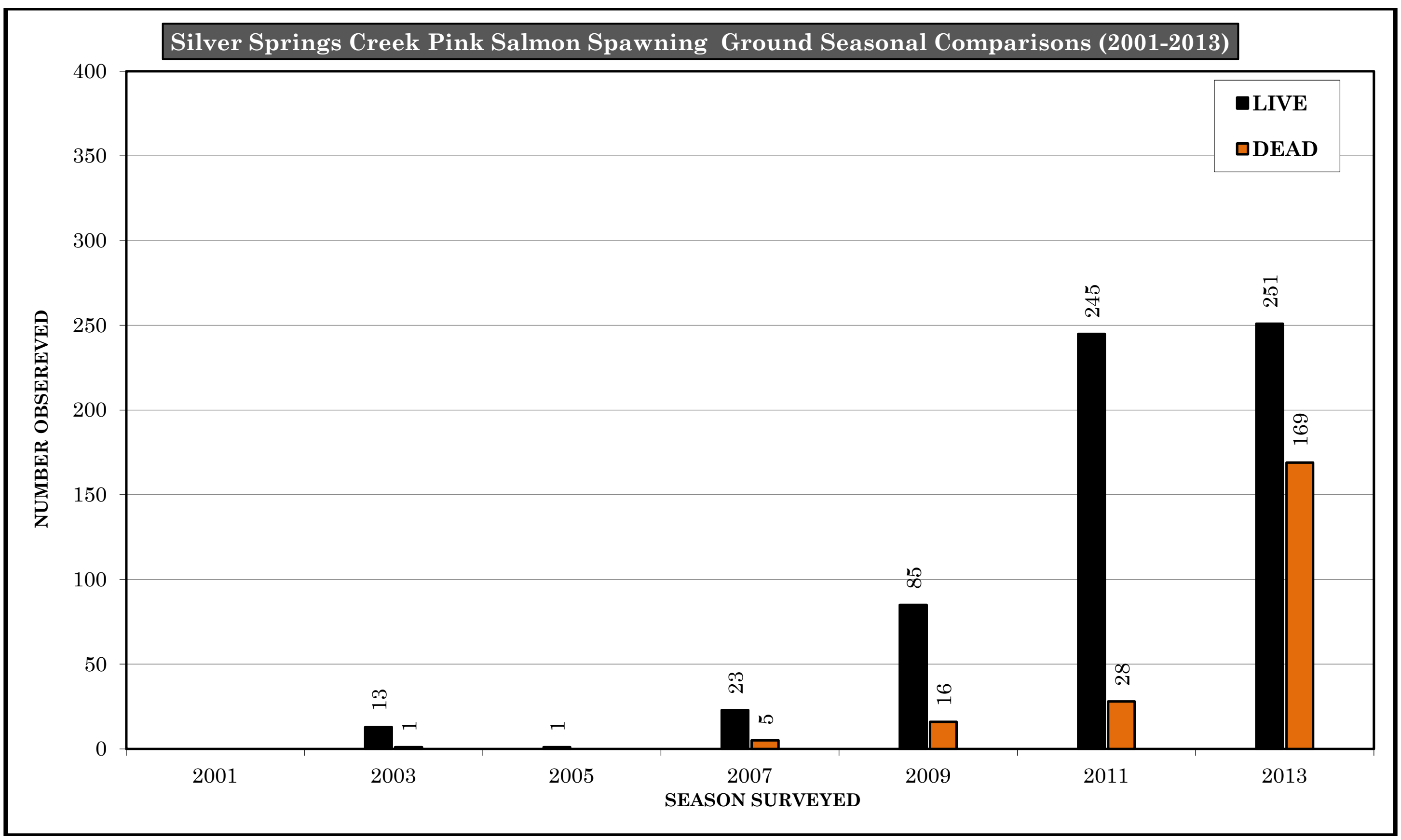
Silver Springs is principally a coho stream; however, several species including Spring Chinook, sockeye, pink salmon, and bull trout have been documented spawning in the creek. Although steelhead are present in the upper watershed, their utilization of Silver Springs is unknown. With the exception of coho, other species documented in the creek have not been observed spawning on consistent annual basis. A small number of Chinook have been observed spawning over the past decade *(`01, `06, `07 & 2011)*. Pink salmon have been observed spawning in the creek on odd years since 2003; as well as a couple of sockeye *(`03, `04, `05, `07 & `09)*.

Adult salmon spawning in Silver Springs Creek were previously captured at the USACE fish trap in Buckley, and transported above Mud Mountain dam. Since precise escapement numbers are known, surveys are conducted to determine fish distribution and spawning success. Silver Springs is the second highest point at which adult salmon are observed; several dead pink salmon were observed in Sunrise Creek in 2007. Sunrise is located 2.5 miles upstream, inside Mt. Rainier National Park, making it the highest salmon migration point documented by PTF staff.

Bull trout spawning in Silver Springs generally commences in early September. However, bull trout spawning in Silver Springs is somewhat inconsistent. It's conceivable the creeks proximity to campsites, as well as two foot bridges plus a road crossing, and the presence of campers may disrupt bull trout spawning. The campground is open and active through the first week of October; then closes for the season just as coho are arriving. Determining bull trout escapement in Silver Springs Creek on odd years is extremely difficult due the presence of pink salmon spawning in the creek as well. Bull trout spawning is based on the observations of redds; when other species utilize the same habitat, redds are indistinguishable between these species unless bull trout are observed on a redd.



Determining bull trout escapement in Silver Springs Creek on odd years is extremely difficult due the presence of pink salmon spawning in the creek as well. Bull trout spawning is based on the observations of redds; when other species utilize the same habitat, redds are indistinguishable between these species unless bull trout are observed on a redd. *Raw spawning data for Silver Springs Creek can be found in Appendix C.



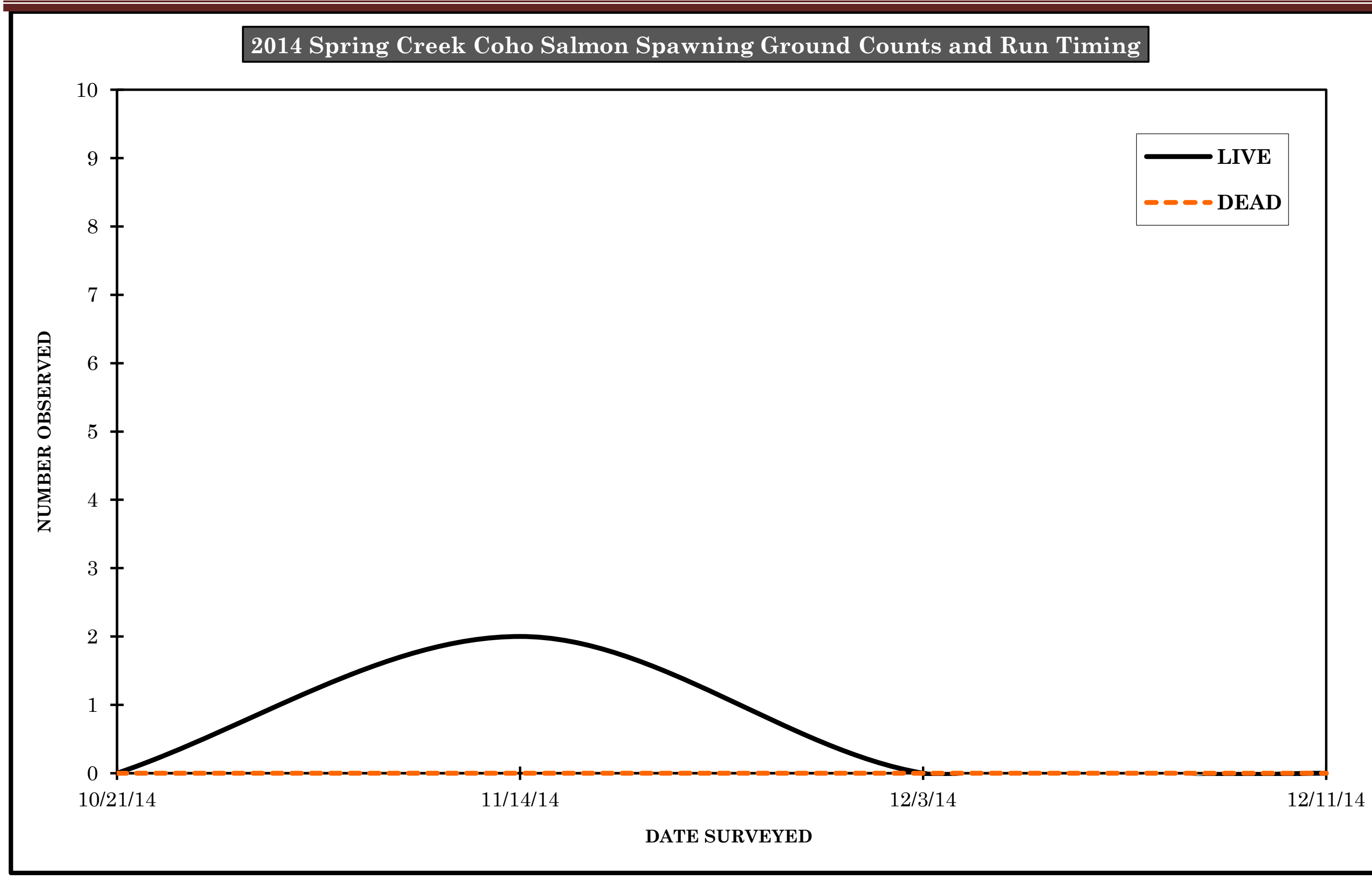
SPRING CREEK 10.0430

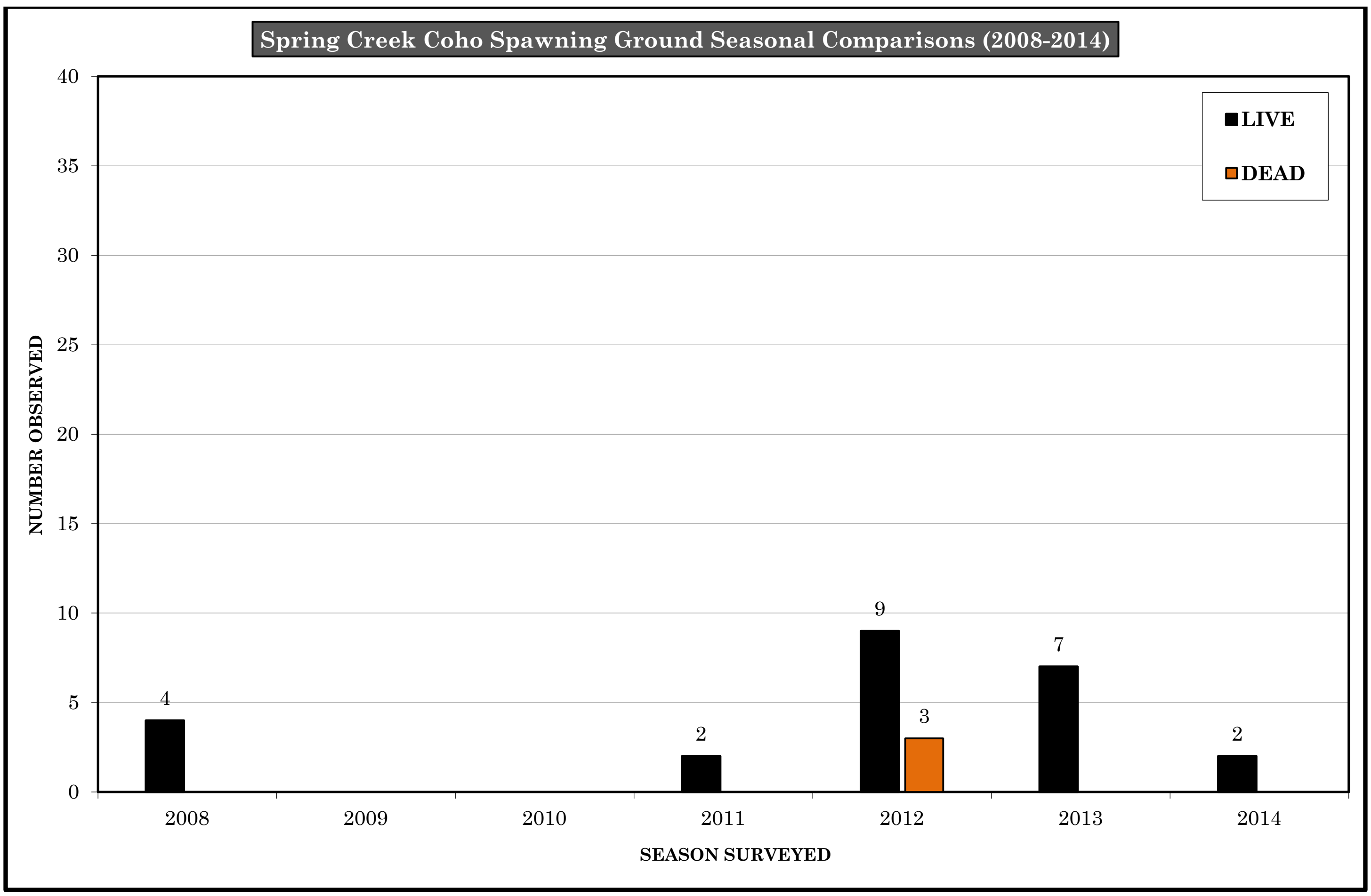
Spring Creek, also known as, South Silver Springs Creek, is a short spring-fed tributary to South Prairie Creek *(RM 4)*. Prior to the fall of 2010, the majority of the creek was inaccessible to adult and juvenile salmon. In addition to the lack of fish access, the lower reach of the creek was void of any suitable spawning habitat for salmon due to decades of agricultural and commercial land use *(U-fish trout farm)*.

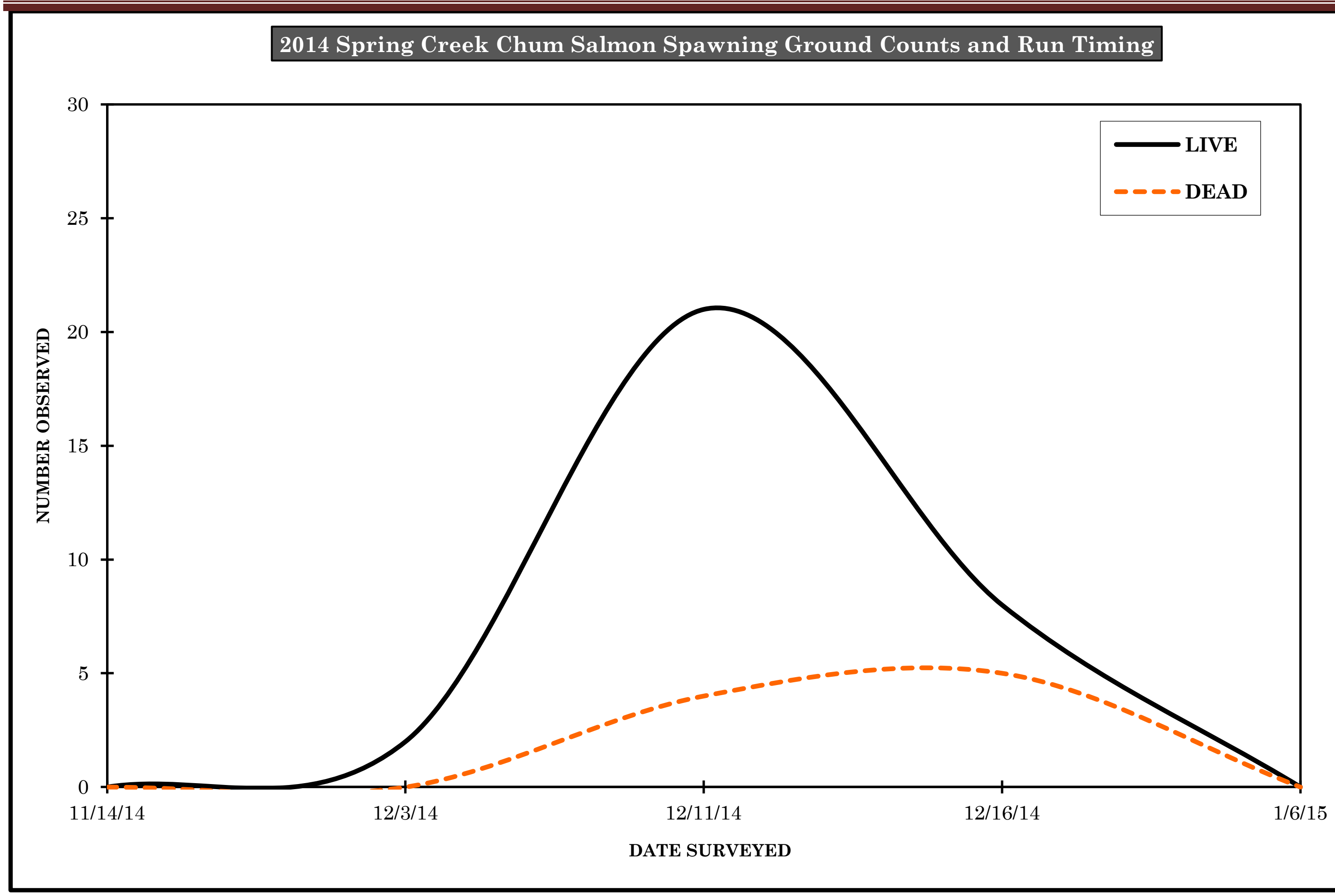
As part of a significant restoration project conducted by Pierce County; a new channel was completed along the lower stream reach in September 2010. The restoration project included increasing the mainstem channel and off-channel length by nearly 1,300'. In addition to increasing channel length, significant improvements were made to stream complexity, spawning and rearing habitat; as well as, the connectivity to tributaries and surrounding floodplain. The project involved regrading and enhancing nearly 13 acres of adjacent wetland habitat via the removal of non-native invasive weeds and plants, then instituting a substantial planting plan of native trees and ground cover.

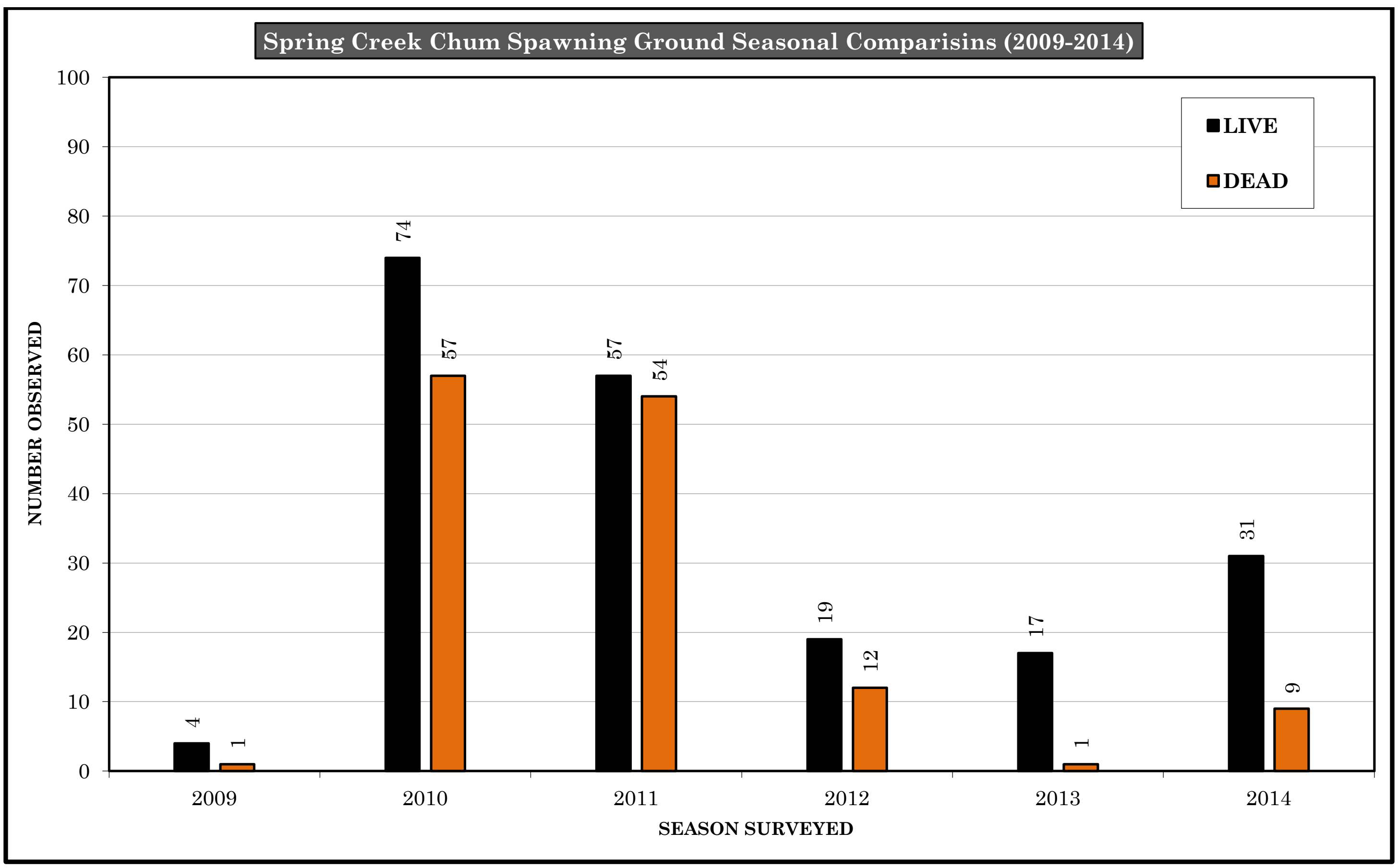
The spring currently offers improved spawning and rearing habitat for several species of salmonids including coho, chum, pink, rainbow and cutthroat. Adult chum have utilized the creek since the initial 2010 fall/winter spawning season; yet, the first adult pink and coho were not observed until the 2011 spawning season. However, the creek has already proven to be an invaluable overwintering source for juvenile coho since its restoration.

Erupting from a small bench along the forest floor; Spring Creek runs adjacent to Spring Site Rd E, just south of the town of South Prairie. Spring Creek flows for approximately 0.4 miles within a low gradient pool riffle channel. The creek contains a moderate amount of interactive in-stream LWD; in addition to significant long-term woody debris jams toed into the lower channel reach *(top photo)*. Additional flow is contributed via a small spring tributary flowing under Spring Site Rd. and entering Spring Creek at approximately RM 0.15. The overstory riparian along the upper reach consists largely of mature hardwoods and conifers; however, the lower reach is void of riparian cover until plantings from winter of 2011 mature. Since the project's completion, several hundred feet of the lower channel within the restoration area has become subjected to periodic influxes of watercress (*center right)*. Typical of this stream type, the substrate is made up largely of fines and small gravel; though, several pockets of excellent spawning gravel are present throughout the lower spawning reach. The reach upstream of the restoration is heavily forested and vegetated, and is commonly the site of recurrent beaver (*Castor canadensis*) activity. This upper reach is dominated by cutthroat trout, which had been the primary species in the creek for many years.


2014 Spring Creek Coho Salmon Spawning Ground Counts and Run Timing
NUMBER OBSERVED
DATE SURVEYED
LIVE
DEAD
0
1
2
3
4
5
6
7
8
9
10
10/21/14
11/14/14
12/3/14
12/11/14


Spring Creek Coho Spawning Ground Seasonal Comparisons (2008-2014)
NUMBER OBSERVED
SEASON SURVEYED
LIVE
DEAD
0
5
10
15
20
25
30
35
40
4
2
9
3
7
2
2008
2009
2010
2011
2012
2013
2014


2014 Spring Creek Chum Salmon Spawning Ground Counts and Run Timing
LIVE
DEAD
NUMBER OBSERVED
0
5
10
15
20
25
30
11/14/14
12/3/14
12/11/14
12/16/14
1/6/15
DATE SURVEYED


Spring Creek Chum Spawning Ground Seasonal Comparisins (2009-2014)
LIVE
DEAD
NUMBER OBSERVED
0
10
20
30
40
50
60
70
80
90
100
4
1
74
57
57
54
19
12
17
1
31
9
2009
2010
2011
2012
2013
2014
SEASON SURVEYED

SOUTH PRAIRIE CREEK 10.0429

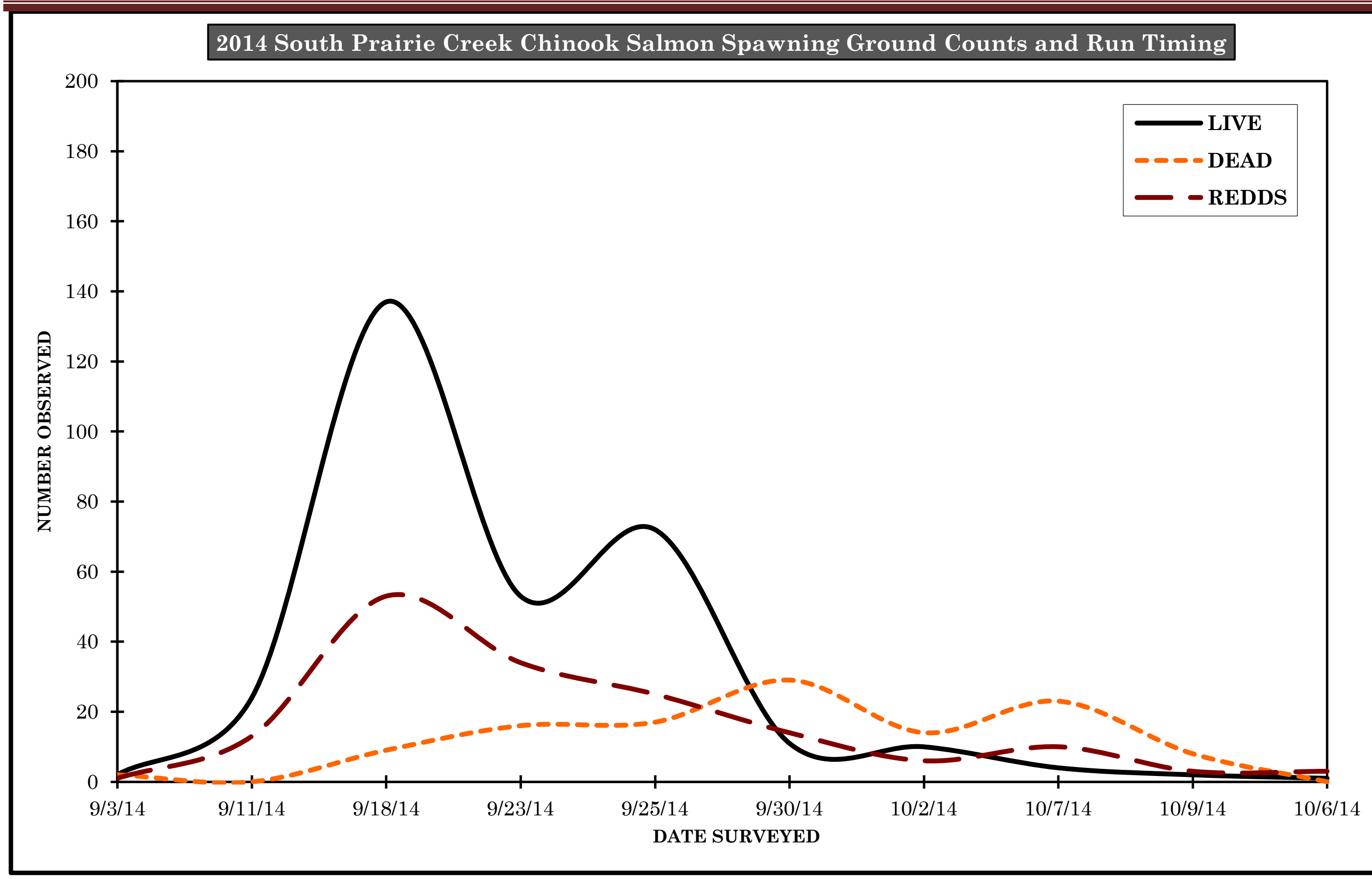
South Prairie Creek is a major tributary of the Carbon River, entering the Carbon near RM 6, just downstream of the Highway 162 and Foothills Trail bridge crossings. With a drainage area over 90 mi^2, South Prairie Creek is considered one of the most productive drainages in the Puyallup/White River Watershed. The headwaters originate along the northwest foothills of Mt. Rainier within the Mt. Baker-Snoqualmie National Forest. The mainstem creek flows for over 21.5 miles; coursing its way through or near the communities of Wilkeson, Burnett and South Prairie. The creek offers critical spawning and rearing habitat for adult and juvenile salmonids including; Chinook, pink, coho, chum and steelhead. Bull trout have been observed and captured in the creek; however, distribution, population size and overall utilization are unknown. Limiting factors associated with South Prairie include; low summer flows, channel confinement and narrowing, bank erosion, disconnected floodplain, water quality *(303 (d) listed for temperature)*, areas of deficient riparian cover, and invasive plant species.

The anadromous range extends roughly the first 15 miles of the mainstem; a series of impassable falls near RM 15.4 prevents any further upstream migration. Tributaries including Wilkeson, Spiketon, Beaver, plus several unnamed tributaries add miles of additional spawning and rearing habitat, as well as flow contributions.

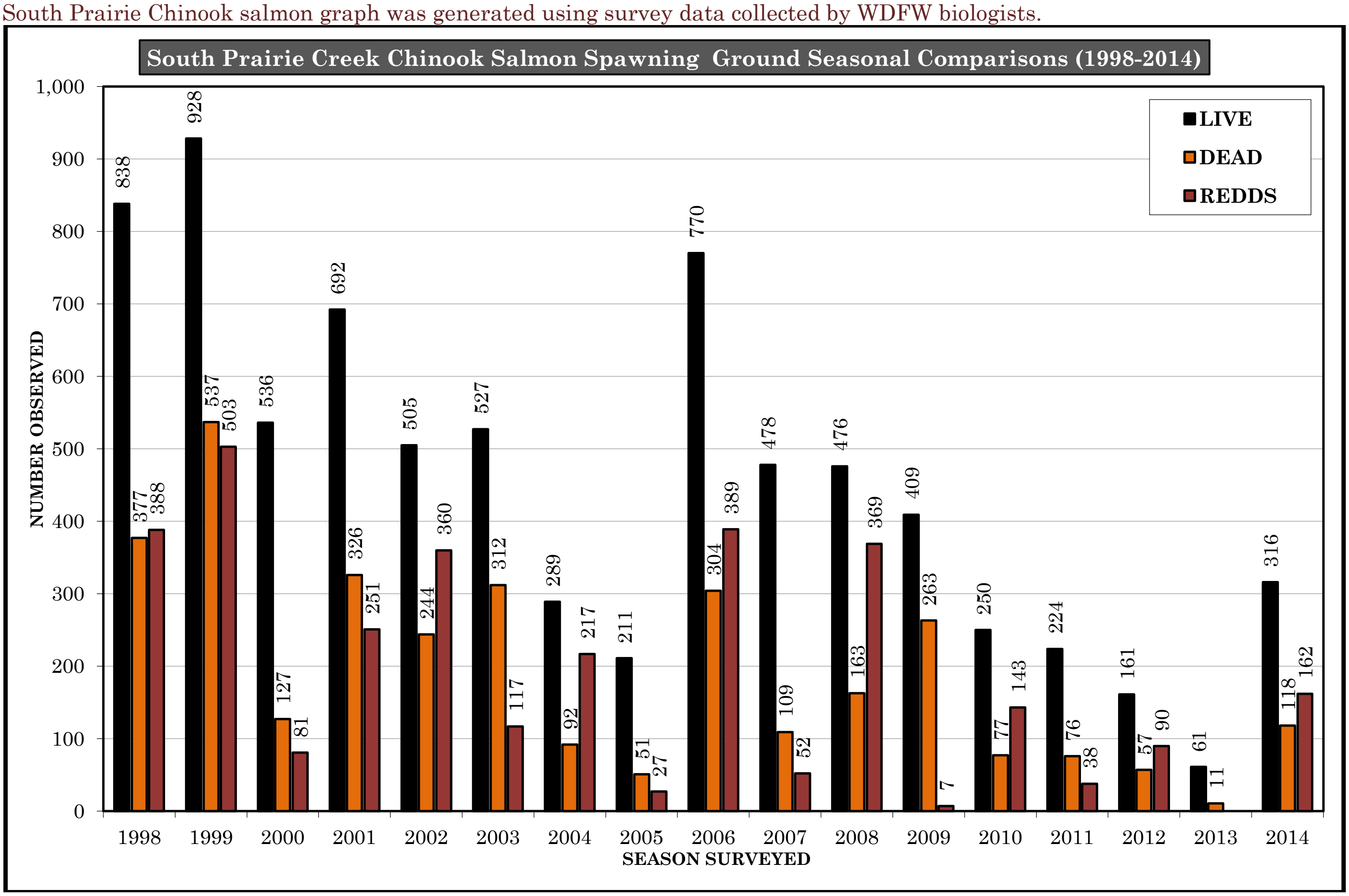
From the mouth, upstream to RM 12.6, the stream is typically a low to moderate gradient pool-riffle channel with many deep pools and a few short low gradient cascades. The lower 8 miles flows within a broad valley floor and spawning opportunities for all species is abundant throughout. Land use along this section is mainly agricultural and recreational. Chinook spawning occurs primarily within the lower 8 miles, while coho show increased usage throughout the middle and upper reaches of the 15 mile anadromous section of the creek. South Prairie experiences a unique late-run of coho, which often spawn into late February and early March. Chum regularly utilize the lower 3 miles heavily but are frequently observed well above RM 10. Steelhead utilize areas along the entire stream below the barrier falls; however, usage is reduced in the canyon reach below the falls. The valley walls narrow significantly above RM 8; at this point the creek channel becomes more confined and the gradient increases. Spawning and rearing opportunities are still prevalent here, as is the increase in LWD and LWD inputs from the surrounding forest.

From RM 12.6 to the falls at RM 15.4, the channel gradient increases substantially and the creek channel becomes moderately to extremely confined within a steep canyon. Spawning and rearing opportunities are severely reduced or non-existent. Spawning gravel is scarce in this upper reach and many heavily scoured bedrock segments exist.

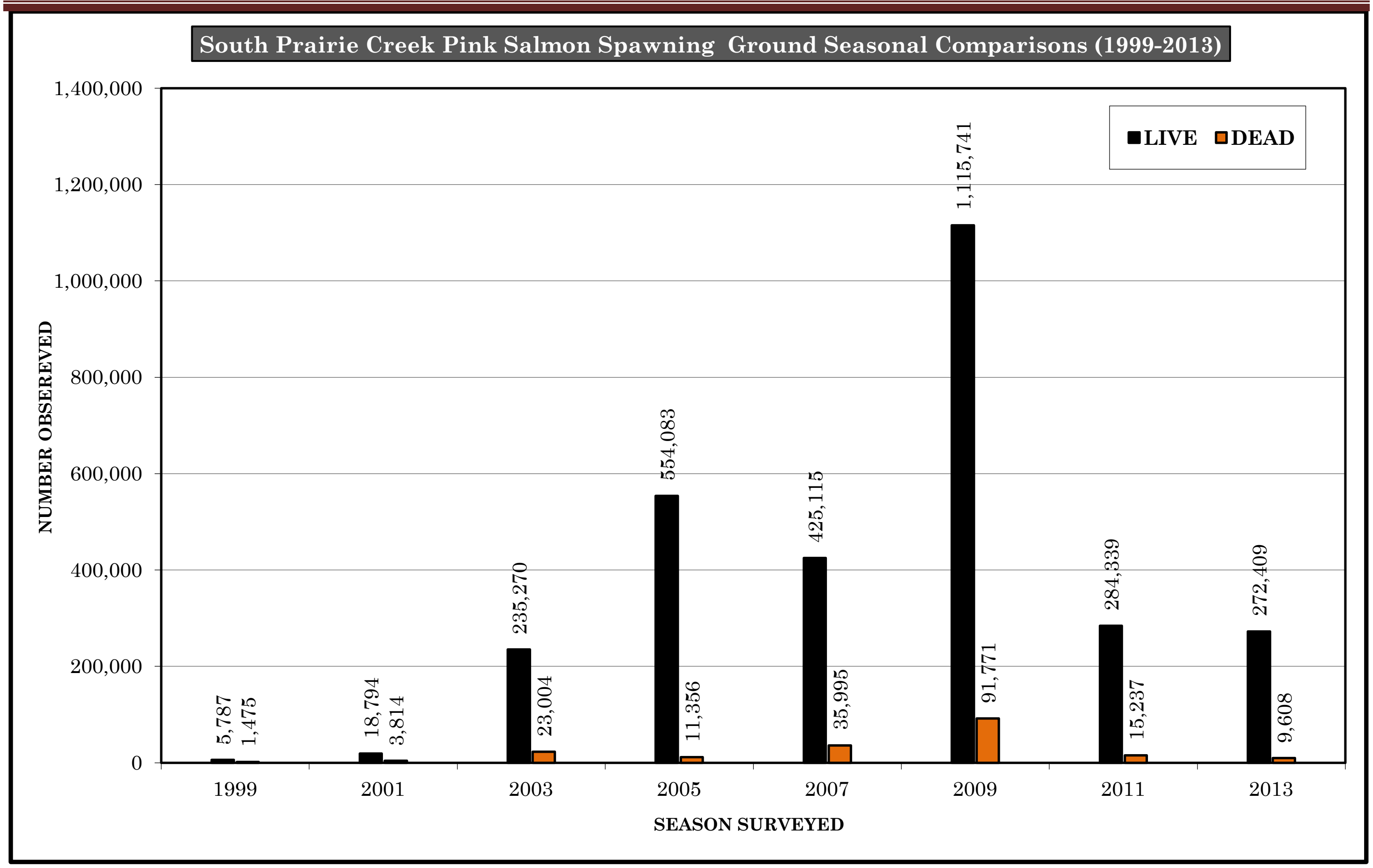
The riparian zone changes dramatically throughout the 15.4 miles of anadromous access. The upper canyon reach flows through a commercial forest and streamside vegetation consists of second growth fir and alder. Buffer widths along recent harvest areas are generally wider than the state regulated minimum due to steep, potentially unstable slopes along the canyon. From RM 12.6 down to RM 6.0, the riparian zone is relatively intact, consisting of mature hardwoods and firs. Below this point, to the confluence, significant portions of the banks are armored and streamside residential development is common. Much of the lower 6 miles flows through active agricultural land where alder and cottonwood are the most common streamside tree species.



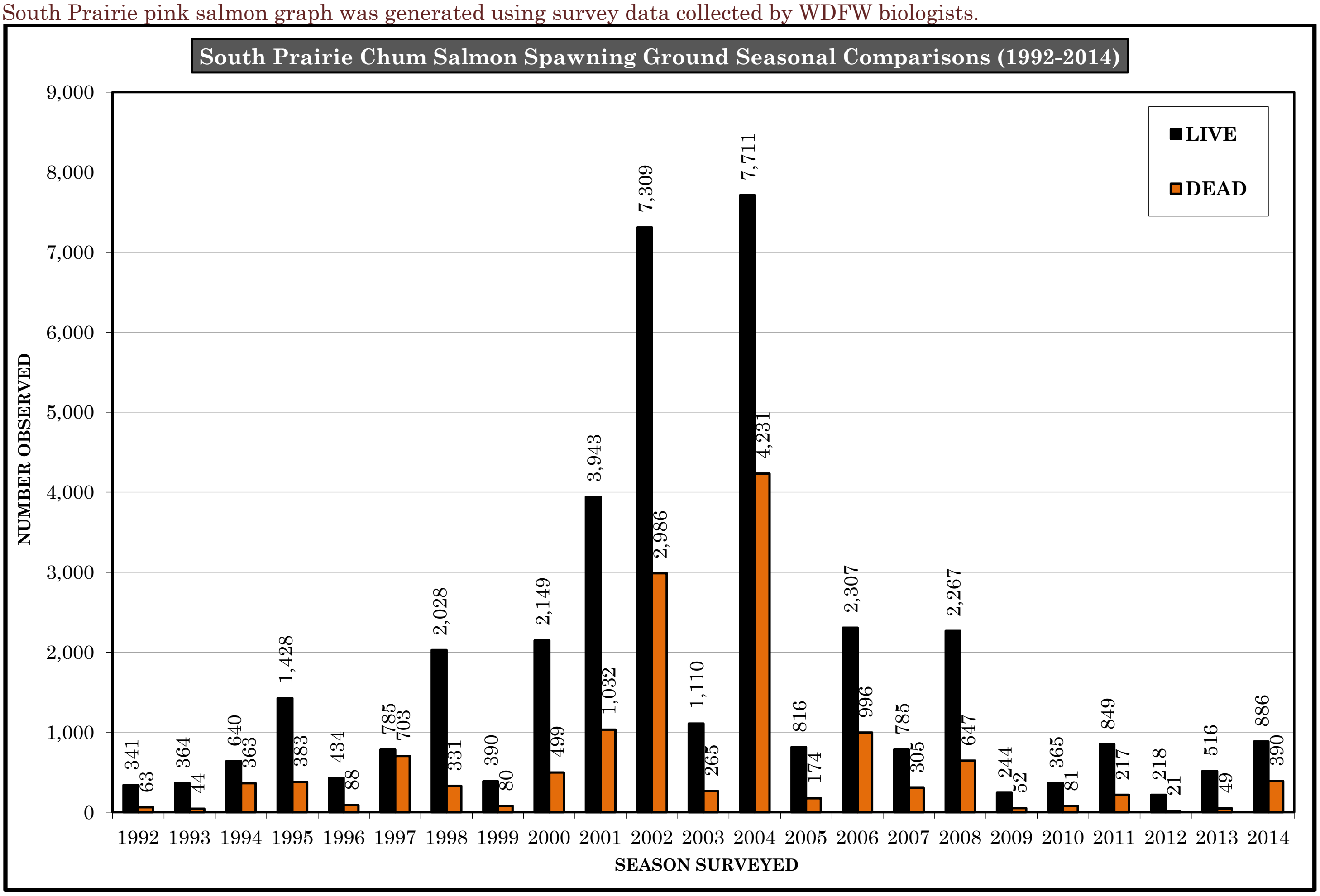
South Prairie Chinook salmon graph was generated using survey data collected by WDFW biologists.

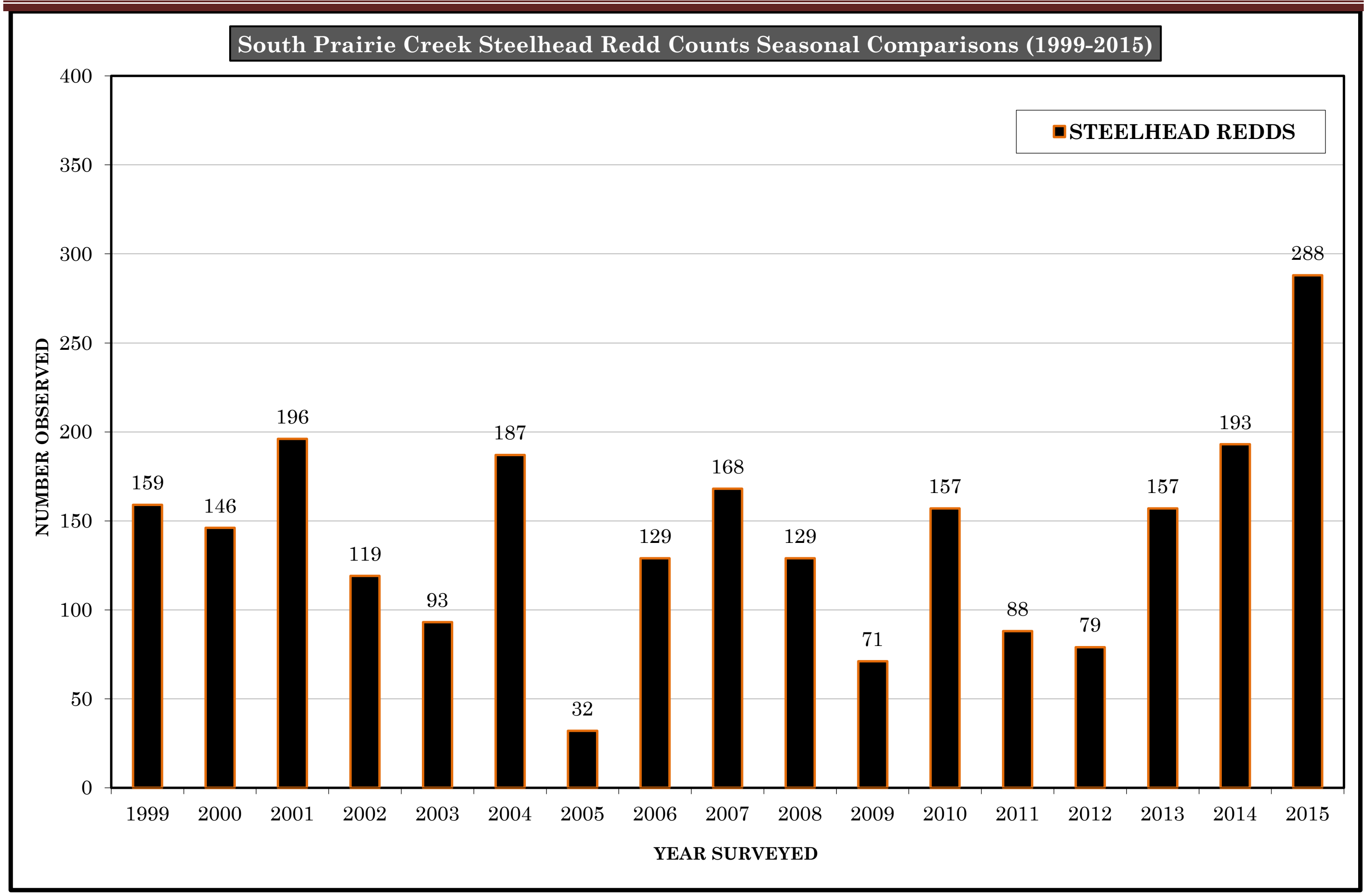


South Prairie Chinook salmon graph was generated using survey data collected by WDFW biologists.



South Prairie pink salmon graph was generated using survey data collected by WDFW biologists.





South Prairie steelhead graphs were generated using survey data collected by WDFW biologists.

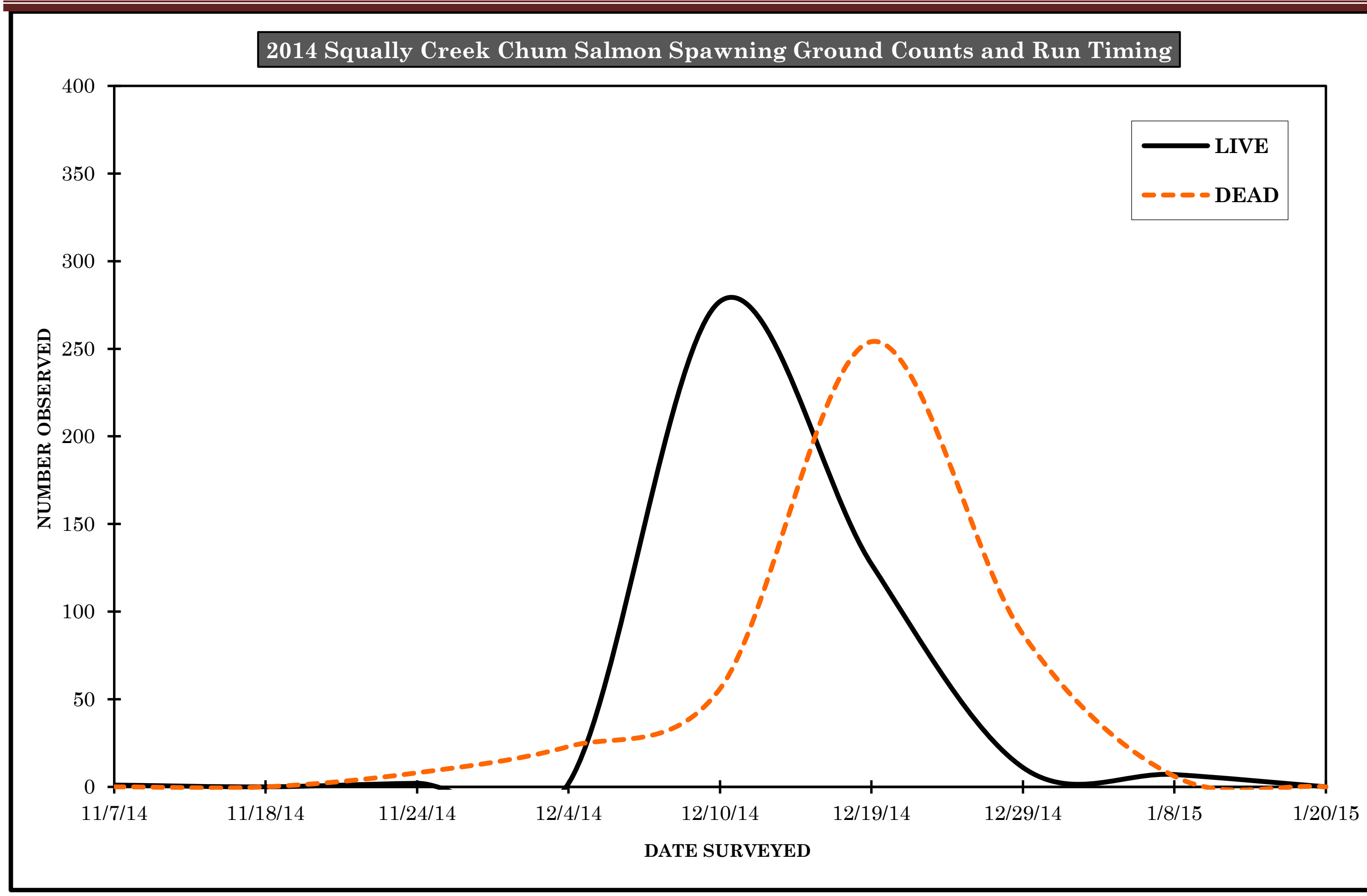
SQUALLY CREEK 10.0024

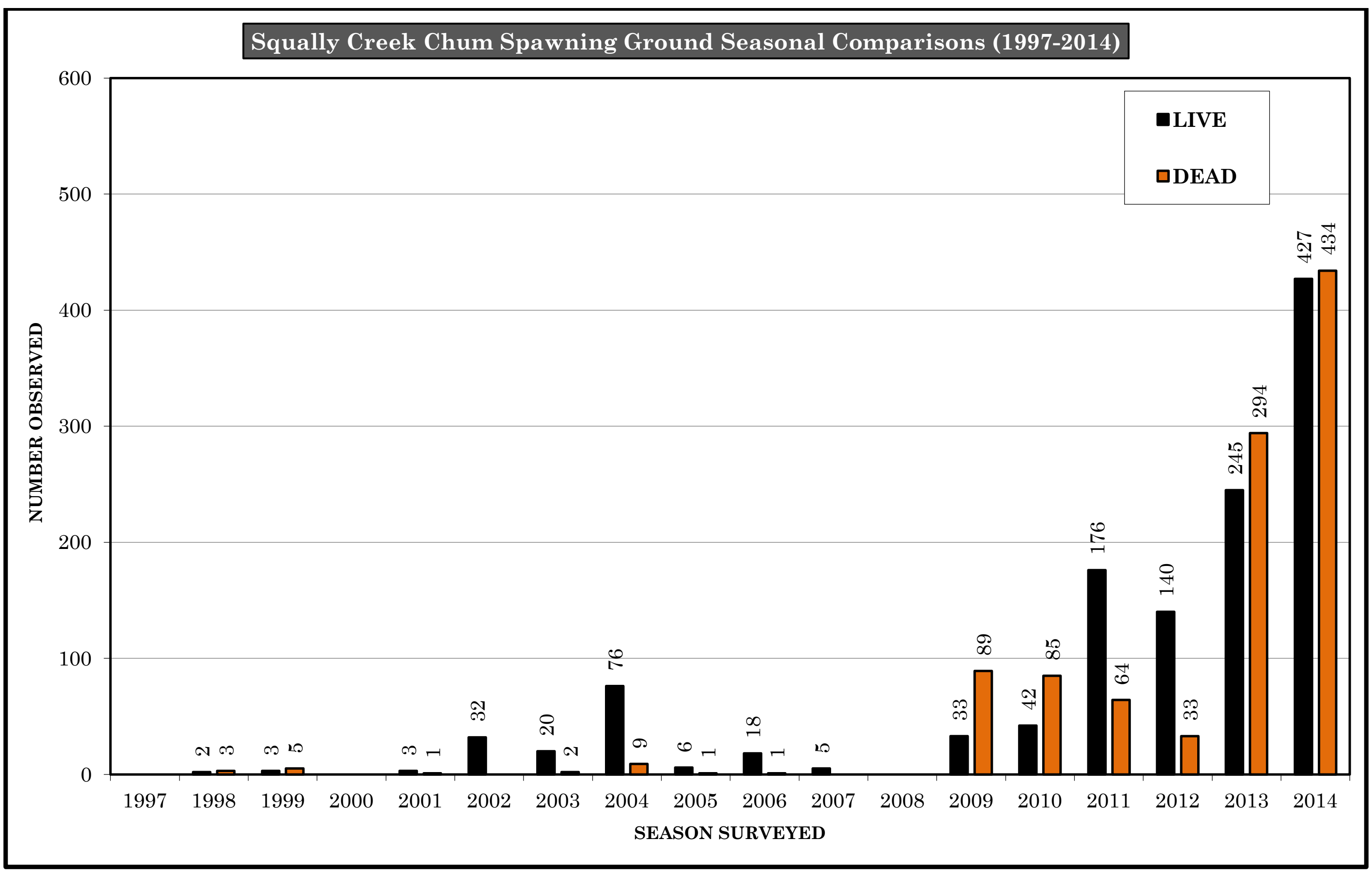
Squally Creek is a small tributary located within the larger 12.1 mi^2 Clear Creek Basin *(10.0022)*. The Clear Creek Basin drains the plateaus and flatlands running along the southern valley of the lower Puyallup River, just west of the city of Puyallup. Encompassing an area of nearly 1 square mile, Squally Creek is the smallest of three main tributaries feeding Clear Creek. Squally originates along the upper valley plateau near 72nd Street East and flows north, dropping through a steep narrow canyon along the valley wall. Near the foot of the valley the creek passes under Pioneer Way and the BNSF rail line before reaching Clear Creek.

Several of the fish and habitat limiting factors involved with Squally including; channel confinement, intermittent or complete fish barriers, no off-channel habitat, compacted substrate, flooding and channel erosion, absent or deficient riparian cover, and the influx of reed canary grass *(Phalaris arundinacea)* and blackberry. In addition, there is some development along the creek; primarily private residential, as well as storm run-off that is channeled into the creek. A large detention pond built by Pierce County is located on the western tributary of upper Squally. The pond was constructed to address excessive storm run-off and sediment issues.

The anadromous reach has two short distinct segments, one below and one above Pioneer Way. Downstream of Pioneer Way, the channel is deeply incised with a substrate consisting of moderately compacted gravel, clay, and abundant fines. This substrate type is typical of the entire basin; a result of glacial deposits and compaction. Natural channel cutting through this hardened substrate created a two foot jump in the channel, preventing chum from ascending beyond the lower 200 feet for several seasons *(2002-2008)*. The riparian is sparse along the lower 300 feet, consisting mainly of a few small alders, blackberry, and reed canary grass. The last 80 feet of the creek runs through a culvert passing under the BNSF rail line, where Squally finally meets with Clear Creek *(below)*. Squally is mainly utilized by chum, although, a few coho are occasionally observed spawning in the lower stretch of the creek during December. Chum frequently spawn within the culvert where accumulations of gravel can be several inches deep. No adult Chinook or steelhead usage has been documented.

Upstream of where the creek passes under Pioneer Way, the gradient increases and the less confined channel quickly becomes braided. Due to the channel braiding in this reach, the stream depth is often shallow. However, there are several pieces of hardwood debris present, as well as moderate quantities of suitable spawning gravel. The riparian along this section consists mostly of alder. Since 2009, chum escapement in Squally has increased significantly.


2014 Squally Creek Chum Salmon Spawning Ground Counts and Run Timing
LIVE
DEAD
NUMBER OBSERVED
0
50
100
150
200
250
300
350
400
11/7/14
11/18/14
11/24/14
12/4/14
12/10/14
12/19/14
12/29/14
1/8/15
1/20/15
DATE SURVEYED

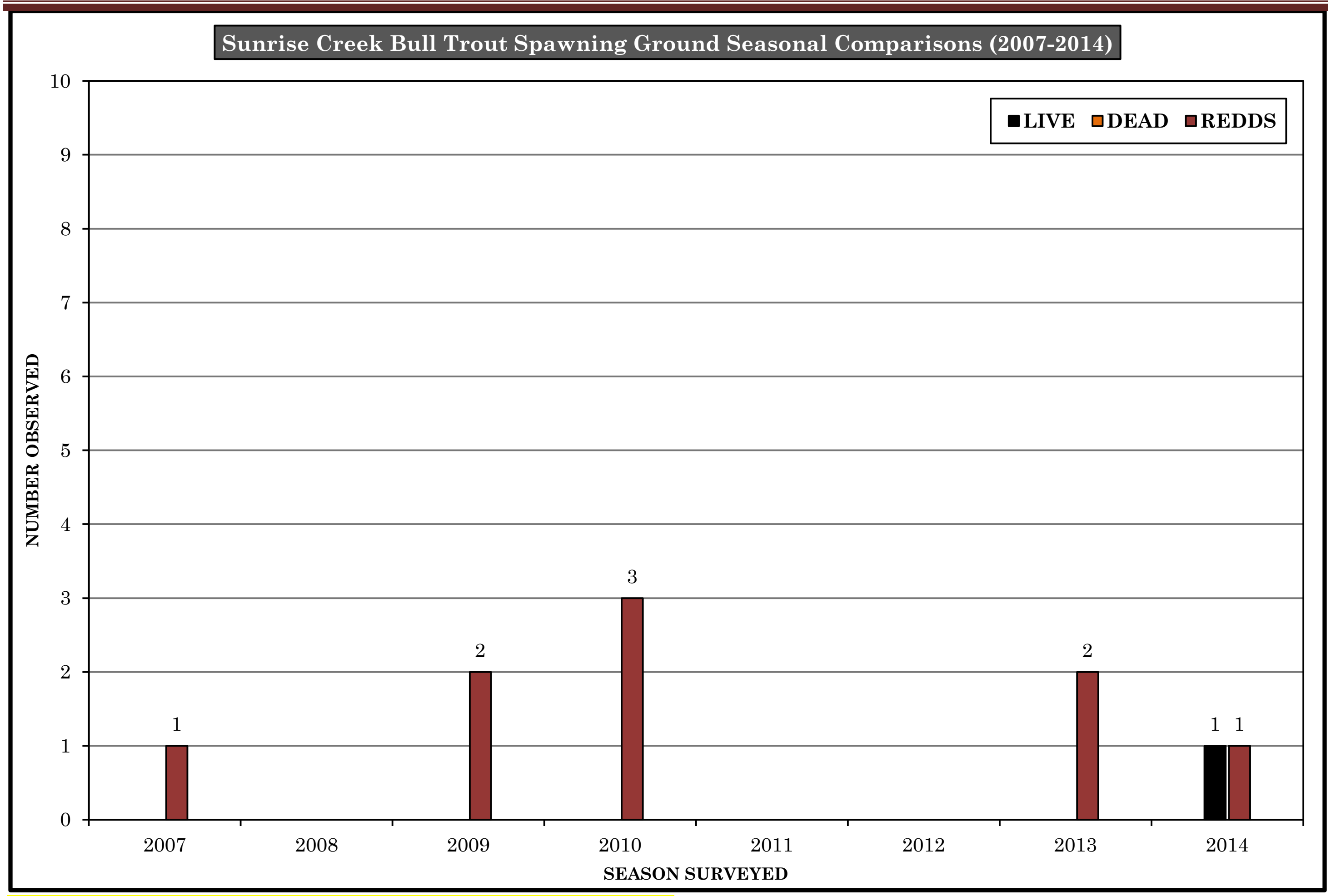

Squally Creek Chum Spawning Ground Seasonal Comparisons (1997-2014)
LIVE
DEAD
NUMBER OBSERVED
0
100
200
300
400
500
600
2
3
3
5
3
1
32
20
2
76
9
6
1
18
1
5
33
89
42
85
176
64
140
33
245
294
427
434
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
SEASON SURVEYED

SUNRISE CREEK 10.0337

Sunrise Creek is a left bank headwater tributary to the White River. This mountain stream *(lowest elev. 2800')* flows northeast through the steep Sunrise Creek Valley, between the Sourdough Mountains to the northwest and Sunrise Ridge along the southeast. Located entirely within the boundaries of Mt. Rainier National Park *(NPS stream designation #W06-00a)*, the creek is nonglacial in origin; rather, its sources comes from several sub-alpine lakes including Clover Lake *(elev. 5732')* and Hidden Lake *(elev. 5915')*; as well as, snowpack accumulations within the White River Park region. White River Park is nestled into the eastern slopes of the Sourdough Mountain Range located along the northeastern edge of the park. Sunrise Creek flows for 4.5 miles from its headwaters before entering the White River at approximately RM 63; positioning the mouth of the creek just inside the National Park boarder.

PTF surveys the creek for bull trout spawning activity from late August through early October. Bull trout telemetry studies and redd surveys were conducted during 2006 and 2007 along the upper White River and West Fork White River; the projects focused heavily on the headwater tributaries located within Mt. Rainier National Park. The study results showed that the cold high mountain streams located within the National Park, including Sunrise, provide the majority of the critical bull trout spawning habitat in the basin. In addition, bull trout spawning has been less frequent in this tributary compared to that observed in more significant headwater tributaries located along the White River, such as Klickitat Creek *(elev. 3300')* located 5 miles upstream. Other species known to utilize the creek include cutthroat trout, brook trout, and pink salmon. The brook trout are likely descendents from fish plants in Hidden and Clover lakes during the early to mid part of the last century. Pink salmon were observed in the creek in 2007. Although this creek has not been surveyed for coho; it is reasonable to assume that coho have or do utilize this creek since it is located a short distance upstream from Silver Springs which is consistently exploited by adult coho spawners. Chinook and steelhead use in Sunrise is unknown.

The anadromous reach of Sunrise provides suitable habitat conditions for bull trout rearing and spawning. The lower reach of the creek *(RM 0-0.15)* is a low gradient channel flowing within the White River channel migration zone *(CMZ)*, and is repeatedly influenced by mainstem river incursions. There are moderate quantities of LWD present; as well as a beneficial riparian buffer zone of conifers and mixes deciduous trees along the majority of the creek. Although spawning does occur within this small stretch, it can be limited due the lack of quality spawning substrate created by the alluvial deposits *(sand & silt)* from the White River. Upstream of the CMZ, the creek enters the heavily forested lower slope of the valley floor, and then rapidly begins to climbs up the valley. From this point, the creek assumes a pool-riffle-cascade configuration up into the steep valley; this forested reach provides quality rearing habitat, but few spawning opportunities. An impassable falls at approximately RM 0.26, prevents any further upstream migration *(right)*.



Raw spawning data for Sunrise Creek can be found in Appendix C.

SWAN CREEK 10.0023

Swan Creek is a moderate sized tributary located within the larger Clear Creek Basin *(10.0022)*. The Clear Creek Basin drains the plateaus and flatlands running along the southern valley of the lower Puyallup River, between the cities of Puyallup and Tacoma. The head waters of Swan Creek originate just south of Highway 512, and flow just over 6 miles north to meet up with Clear Creek near Pioneer Way E. The Swan Creek basin drains a moderately developed land area of nearly 4 mi^2. The land use along the creek is largely rural residential and recreational. The average water discharge recorded by the USGS flow gauge *(#12102190)* for a five year period *(1990-1991, 1995-1997)* was 4.78 ft^3/second.

Several of the fish and habitat limiting factors involved with Swan Creek including; channel confinement, intermittent or complete fish barriers, unstable substrate, flooding and channel erosion, absent or deficient riparian cover, invasive non-native plants, and water quality *(bacteria)*. In addition, there is some development present along the creek; primarily private residential, as well as storm runoff that is channeled into the creek. A large detention pond built by Pierce County is located on the lower reach of the creek. The pond was constructed to address excessive sediment and gravel movement issues.

Although Swan Creek has been surveyed for several salmon species including Chinook, pink, coho, chum and steelhead; only chum are observed in relatively abundant numbers. In addition to chum, limited numbers of coho are observed spawning in the creek in December. However, substantial numbers of coho juveniles are often observed in the spring. Unfortunately, most summer and early fall flows are too low to allow Chinook access to the creek; however, a few Chinook have spawned successfully. Although bull trout utilization is unknown within Swan Creek; adult fluvial bull trout are known to forage in the smaller tributaries of the lower Puyallup. Swan also supports a large population of cutthroat trout, which can be observed spawning in the spring. Two steelhead redds were observed during the April 2004 survey season. They were the first steelhead redds seen in Swan Creek in several years. However, no steelhead redds have been observed since. Other species present in the creek include catfish, lamprey and sculpins.

From its origins, the creek flows within a narrow distinct channel for approximately 3 miles through the upland plateau south of 72nd Street East. Near 72nd, the creek begins to drop into an increasingly narrow valley. The creek passes through a large concrete box culvert under 64th Street E.; then drops nearly three feet back into the creek channel. This jump in elevation is an upstream barrier to all species; with the exception of steelhead, which may be able to pass if flows are high enough. However, spawning opportunities are

extremely limited and the habitat quality is poor upstream of this point.

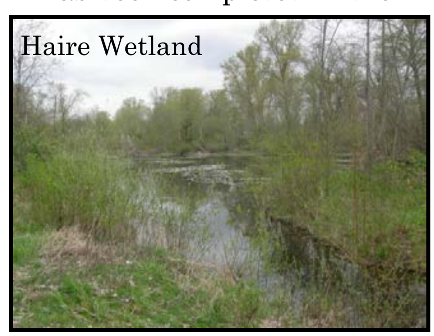
Downstream of the culvert, the next 0.2 miles of the creek flows though a well defined channel with little spawning habitat or complexity. Beyond this, the creek channel takes on more complexity due to the placement of sill logs which hold back bed load and create pool habitat through this narrow valley section *(previous page-lower right)*. Unfortunately, one of the structures has developed into a likely barrier to upstream migration during low flows. This narrow valley reach continues for approximately the next 1.8 miles until the gradient and the valley walls begin to ease around RM 0.8. The channel

dynamics change considerable through this reach; from a single well defined channel to braided sections. There are several pieces of instream LWD; as well as several smaller pieces of wood and woody debris jams *(center left)*. Several sections of the banks consist of actively eroding compacted glacial debris; contributing fine and small course materials into the stream channel. Spawning habitat is available throughout; yet, the substrate is largely made up of fine sand and undersized gravel. The RMZ is well intact along the valley section; consisting largely of mature Doulas fir, alder, cottonwood and maple. A rapid shift in the RMZ occurs around RM 1.5; at this point the surrounding forest consists primarily of a much thinner stand of alder, cottonwood and maple. To a large extent, the lower part of Swan Creek passes through the 290-acre Swan Creek Park. The park is largely undeveloped with a hiking trail paralleling the creek.

A gravel and sediment detention pond on Swan Creek is located at RM 0.5.

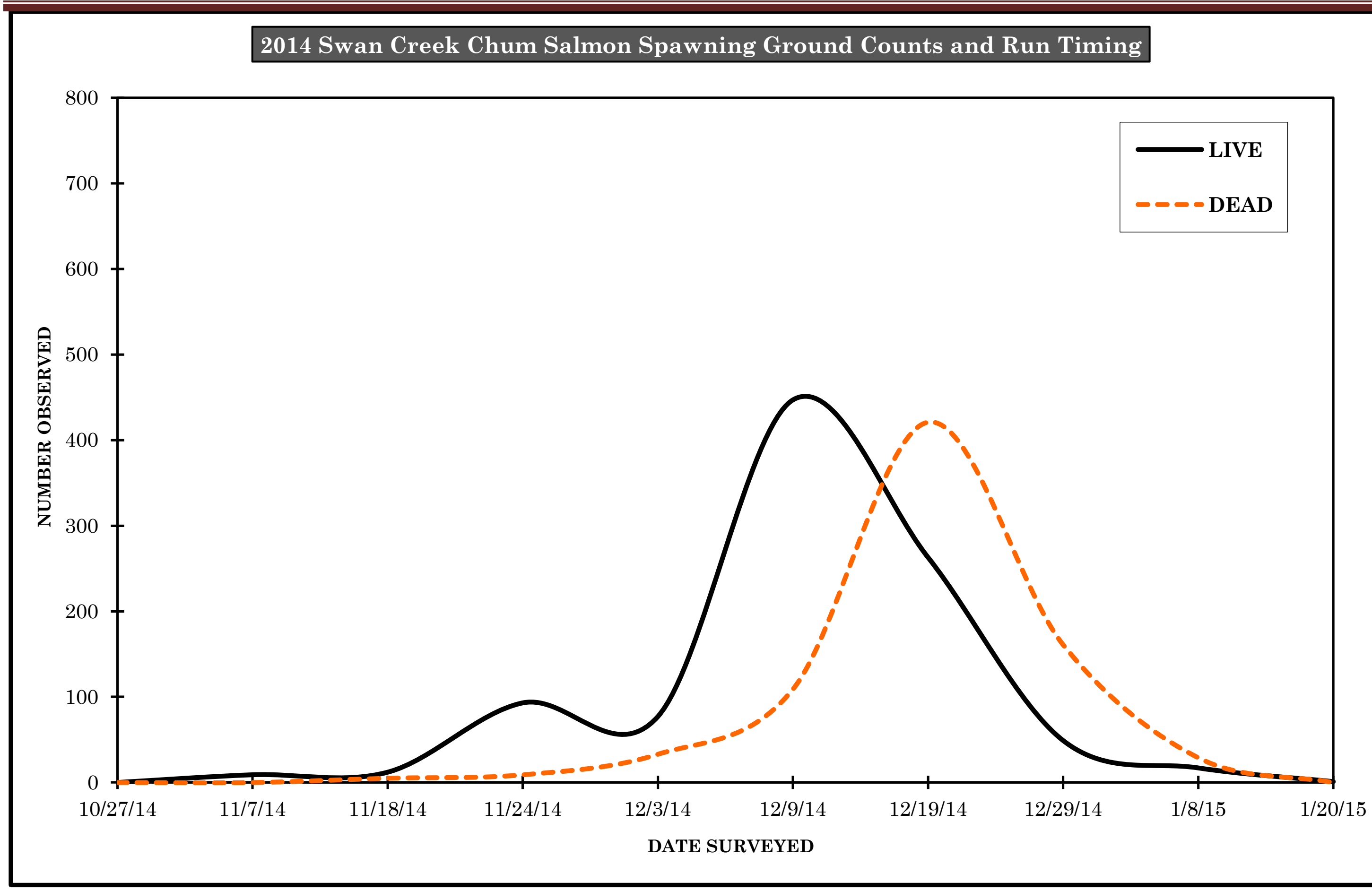
From RM 0.8 to 0.5, the stream is pool-riffle in character and contains good spawning gravel, riparian diversity and channel complexity. There is also a noticeable decrease in LWD and woody debris in the channel. Swan Creek is prone to high water events however, and the substrate is only moderately stable. A sediment detention pond is located at RM 0.5 *(bottom left)* and is dredged annually or bi-annually by Pierce County. During these events, fisheries staff from the Puyallup Tribe seines the pond before dredging to remove the majority of fish present, and relocates the fish captured downstream of the work site. A large wooden wing wall is in place at the head of the pond to direct the creek towards the detention pond.

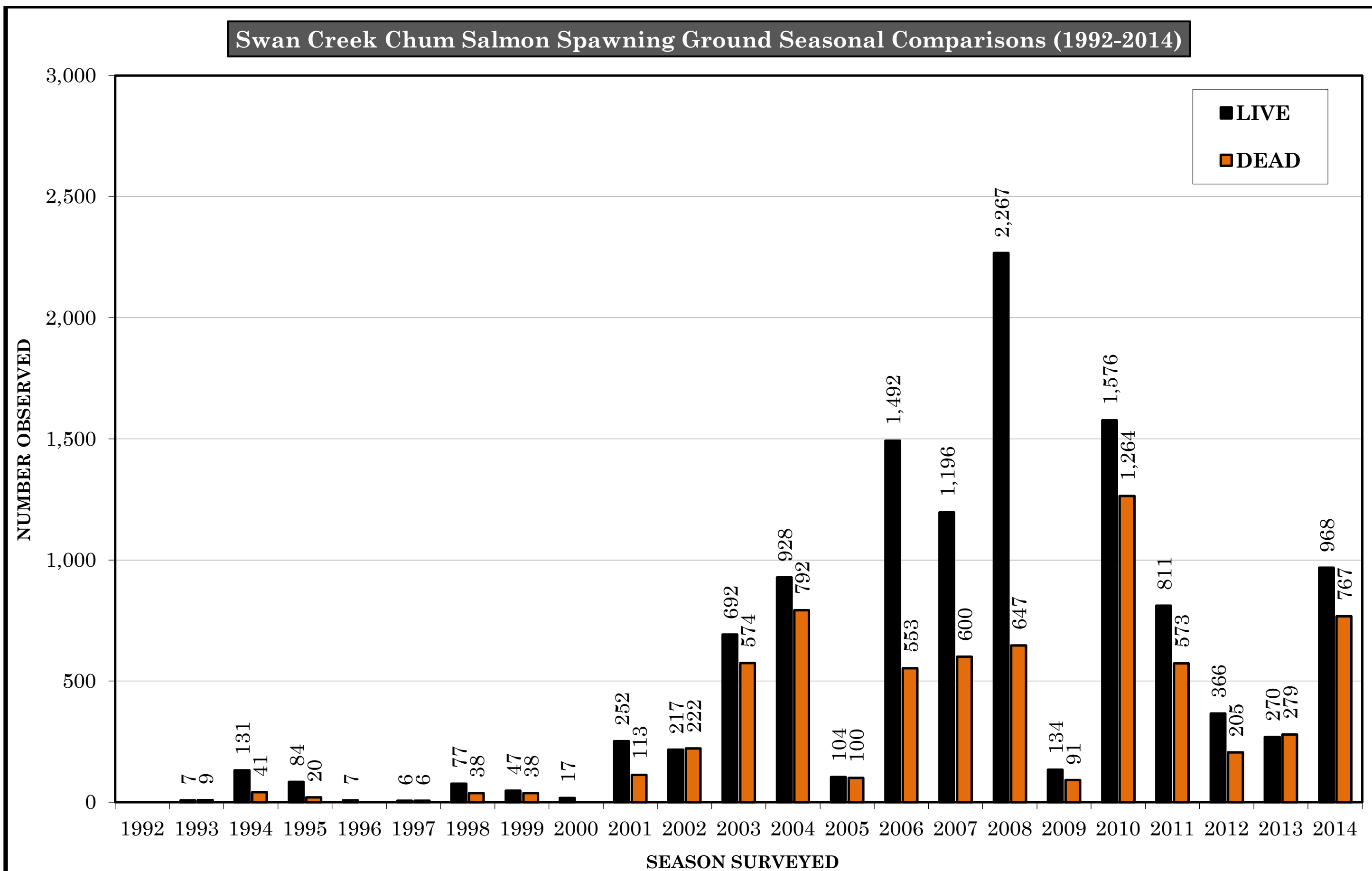
Just downstream of the detention pond, the creek flows through a short narrow channel and under Pioneer Way E. Much of the channel is confined by rip-rap. The RMZ along this short stretch is extremely poor and heavy erosion is occurring along the left bank. The creek then flows a few hundred feet before reaching the Haire Wetlands *(right)*. Some restoration work has been completed in the past on the lower reach of the creek. In 2001, a 12-acre site located just downstream of Pioneer Way was utilized to develop a side channel for



Haire Wetland

overwintering juveniles and as a means of reconnecting Swan Creek to the Haire Wetlands. In addition, the restoration included the removal of invasive and non-native plant species, and replanting the area with native trees and shrubs. The City of Tacoma financed the Haire Wetlands restoration site along Clear and Swan creeks through the Natural Resource Damages Assessment Program (NRDA).


2014 Swan Creek Chum Salmon Spawning Ground Counts and Run Timing
NUMBER OBSERVED
800
700
600
500
400
300
200
100
0
10/27/14
11/7/14
11/18/14
11/24/14
12/3/14
12/9/14
12/19/14
12/29/14
1/8/15
1/20/15
DATE SURVEYED
LIVE
DEAD


Swan Creek Chum Salmon Spawning Ground Seasonal Comparisons (1992-2014)
NUMBER OBSERVED
3,000
2,500
2,000
1,500
1,000
500
0
LIVE
DEAD
7 9
131 41
84 20
7
6 6
77 38
47 38
17
252 113
217 222
692 574
928 792
104 100
1,492 553
1,196 600
2,267 647
134 91
1,576 1,264
811 573
366 205
270 279
968 767
1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014
SEASON SURVEYED

SWIFT CREEK 10.0697

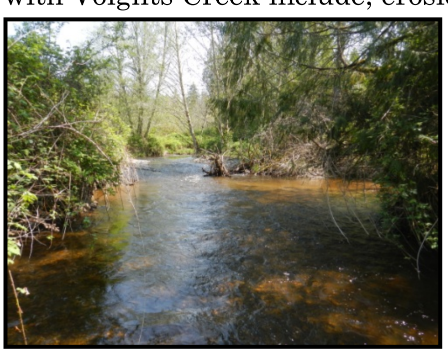
Swift Creek is a right bank tributary to the Upper Puyallup River. Swift originates from the Sunset Park region located along the west slope of Mt. Rainier. Swift flows approximately 2.8 miles from its origin at 5400' to its confluence with the Puyallup River at RM 46.8 *(elev. 2180')*. Downstream of the NPS boundary *(RM 2.6)* the creek flows through the Mt. Baker-Snoqualmie National Forest before reaching the Puyallup, approximately .85 miles downstream from the confluence of the North and South Forks. Swift drops rapidly for the majority of its 2.8 mile run. The greater component of the creek consists of a moderate to high gradient channel with a cobble and boulder substrate; as well as moderate amounts of small and large instream woody debris. The riparian zone, which is comprised of mature conifers and mixed deciduous trees, is well intact along the entire creek corridor

Currently, little spawning habitat exists for adult salmon or steelhead to utilize. What habitat is available is present in the lower 0.2 miles of the creek. Unfortunately, the creek channel climbs steeply approximately 0.2 miles from its confluence with the Puyallup River; a series of high gradient cascades prevents further upstream migration for most species. The lower creek is repeatedly influenced by mainstem river incursions. Prior to 2006, the first 450 to 600 feet of the stream was a low gradient channel with good spawning gravel. However, the Puyallup River overtook this short reach, eliminating nearly all the available spawning habitat. Anadromous salmon utilization in Swift Creek was absent for nearly a century due to the streams location above the Electron diversion dam. With the completion of the Electron fish ladder *(@ RM 41.7)* in the fall of 2000, anadromous fish passage was restored for the first time since 1904. Restoring anadromous access to the upper Puyallup River has made approximately 26+ miles of spawning and rearing habitat above the diversion available for several species including Chinook, coho, pink, steelhead, and bull trout.

Swift Creek is not regularly surveyed for spawning activity, but rather had been the location of annual surplus adult coho plants *(1997-2003)* from the WDFW Voights Creek Hatchery. Adult plants were started in 1997 as a means to reintroduce coho and jump-start the upper reach of the Puyallup. From 1997 to 2003, between 116 and 513 adult coho were planted annually in Swift Creek from the 710 rd. bridge which crosses the creek approximately 0.3 miles upstream from its confluence with the Puyallup *(lower right photo)*. Yet, the majority of the coho planted would fall downstream and spawn in the lower spawning reach of the creek when it existed. The loss of this habitat was one of the reasons surplus plants of coho were discontinued in Swift. In response to this loss, coho and Chinook surplus plants have since been transported up to the North Fork of the Puyallup and planted from a bridge constructed in 2004. In addition to coho and cutthroat, steelhead utilization within this stream has also been documented; though currently, bull trout utilization is unknown.

VOIGHTS CREEK 10.0414

Voights Creek is a tributary to the lower Carbon River, entering the Carbon at RM 4.0 just southeast of the community of Orting. Voights Creek originates along the northwest foothills of Mt. Rainier, just west of Martin Peak and north of the Mowich River. The creek flows for nearly 20 miles in a northwest direction until it joins the Carbon River. Encompassing a drainage area of nearly 23 mi², the mainstem creek offers nearly 4 miles of anadromous usage; in addition, a little spawning and rearing habitat is available in Coplar Creek, a small tributary entering Voights at RM 0.7. However, Coplar Creek is generally only accessible during the increased flows associated with late fall and winter snows and rainfall. The anadromous habitat available in Voights supports Chinook, coho and steelhead; as well as occasional pink and chum spawners. A range of fish and habitat limiting factors associated with Voights Creek include; erosion, flooding, water quality *(temperature)*, channel confinement, loss of off channel habitat and a disconnected flood plain on the lower reach, an intermittent fish barrier created by a water diversion dam *(prior to 2009)*, and water withdrawal *(prior to 2009)*.



The Washington Department of Fish and Wildlife operates a hatchery located at RM 0.5; however, this facility was non-operational for much of 2009 due to significant damage caused by severe flooding during the January, 2009 flood event. WDFW made repairs, and the hatchery became operational again by mid August, 2009. Prior to this unfortunate shut down, the department had conducted a Fall Chinook *(entire 2008 brood year lost)*, coho, and winter steelhead program at this location *(steelhead program was terminated in 2009)*.

The WDFW hatchery on Voights Creek has artificially propagated coho since 1917, having in the past incorporated fry and smolts from other drainages, including Big Soos Creek, Minter Creek, Garrison Springs, George Adams Creek; as well as the Skagit and Washougal rivers. Voights Creek currently produces approximately 800,000 *(formally 1.2 million)*, 100% mass marked *(adipose fin clip)* coho pre-smolts annually; of which, 100,000 to 200,000 are customarily transferred to acclimation ponds in the upper Puyallup Watershed when available. In addition, hatchery rearing 200,000+ Fall Chinook for acclimation ponds in the upper Puyallup River is a key component to restoration goals. The Puyallup Tribe currently operates two acclimation ponds in the Puyallup/White River Watershed. Acclimation ponds are a proven method for increasing fish numbers on the spawning grounds. The acclimation ponds are used for reestablishing Fall Chinook *(reared at PTI's Clarks Cr. hatchery)* and coho reared at WDFW's Voights Creek hatchery, into a 26+ mile reach of the Upper Puyallup River above Electron Dam *(RM 41.7)*. The Electron diversion dam had been an anadromous barrier for 97 years *(1904-2000)*.

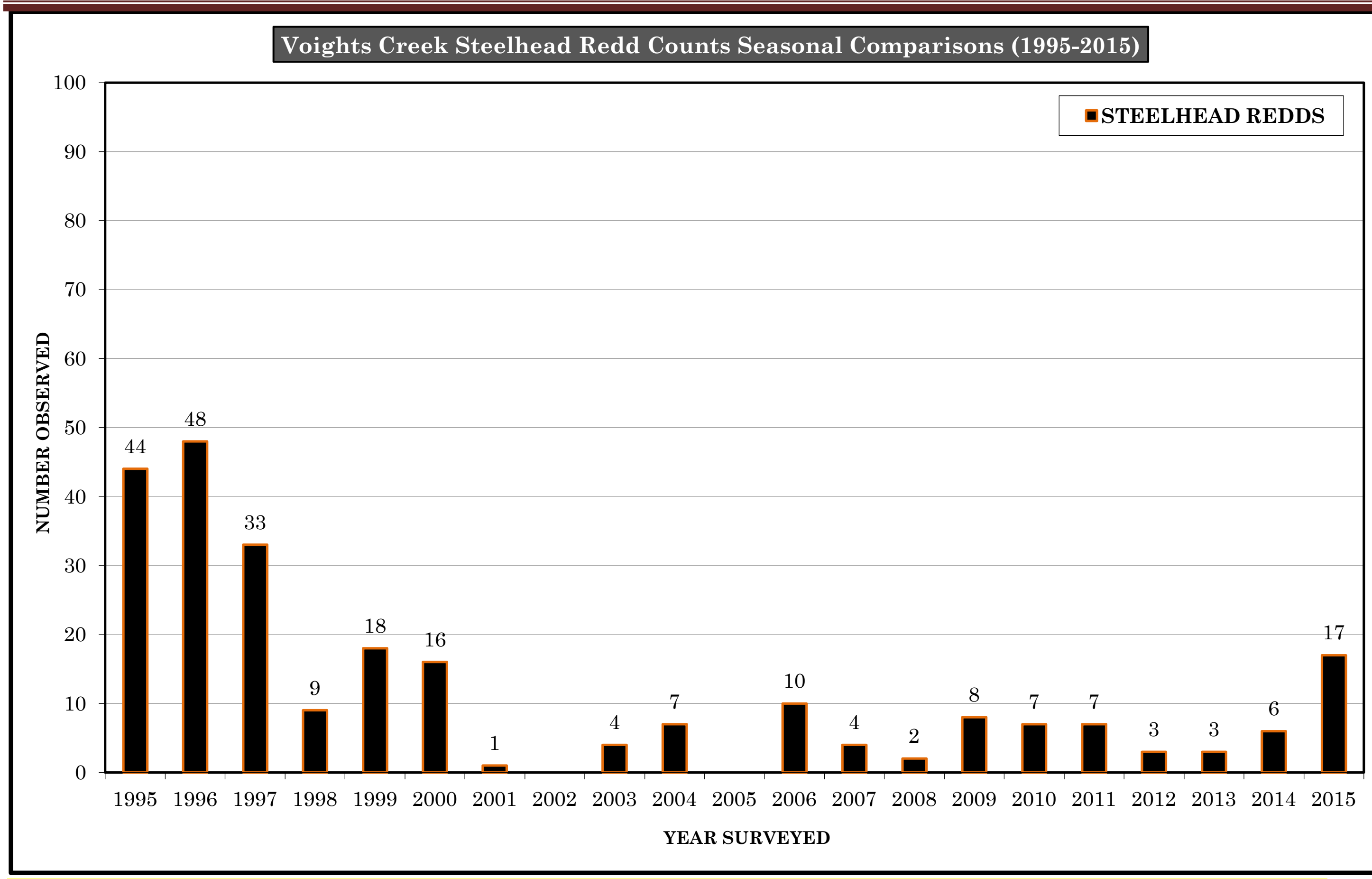
In addition to the rearing and acclimation of juveniles, surplus live adult Fall Chinook and coho from the WDFW Voights Creek hatchery were planted in the upper Puyallup River drainage when surplus fish were available. The Puyallup Tribe has been hauling surplus adults from Voights Creek and planting them in the upper Puyallup Watershed since1997.

Puyallup River Fall Chinook are endemic throughout the Puyallup River, Carbon River, Lower White River, as well as several of the tributaries associated with these mainstem river systems. A large component of adult fall Chinook spawners are hatchery origin from the WDFW Fall Chinook program operated on Voights Creek. In addition, over the past several operational seasons, the weir designed to prevent fish passage above the hatchery had proven to be ineffective, therefore, allowing hatchery fish to access the upper 3.4 miles of the creek to spawn naturally. Voights Creek is currently surveyed for steelhead only.

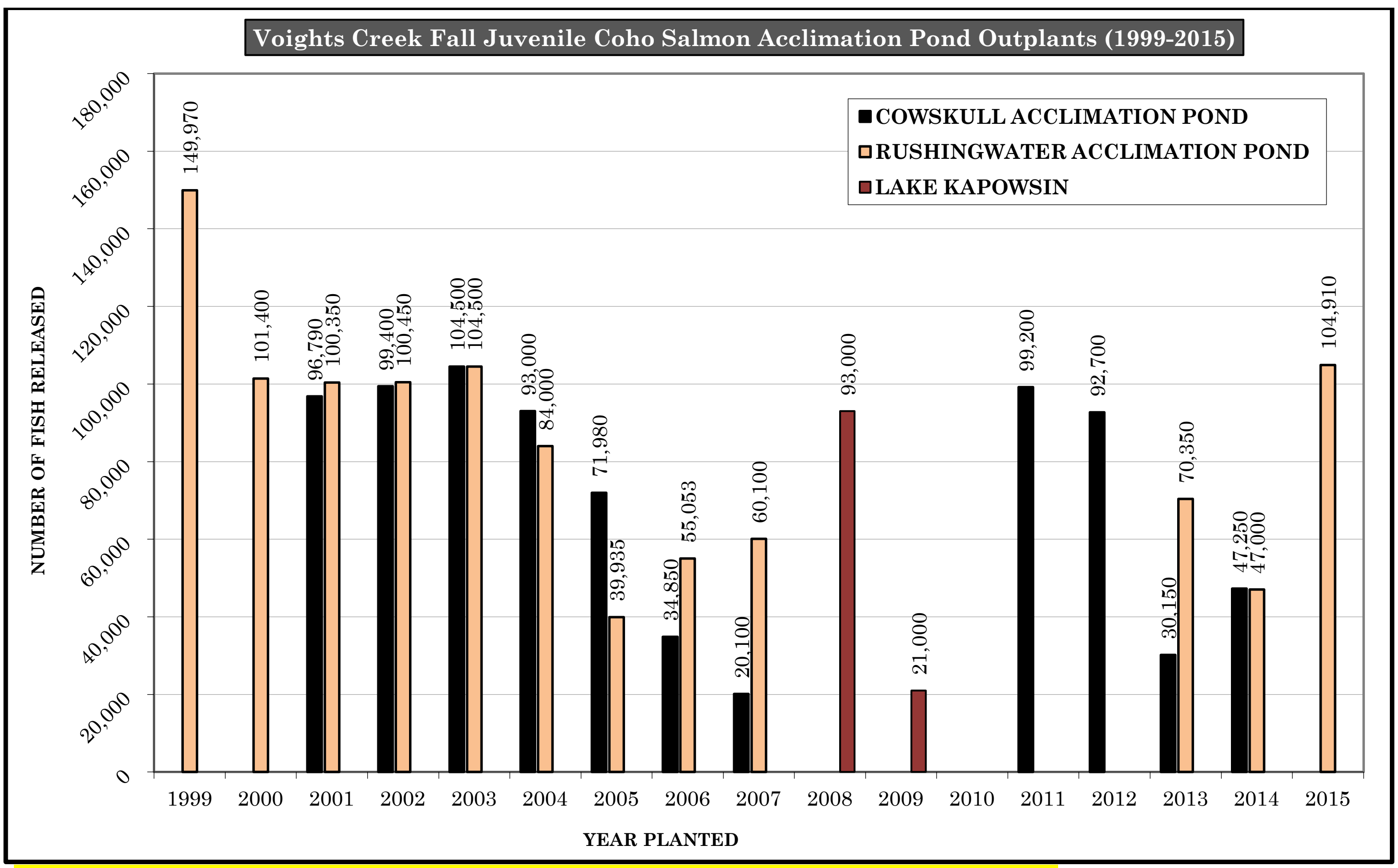
An impassable falls located at RM 3.9 blocks any further upstream migration *(top left)*. Steelhead are frequently observed spawning throughout the entire 3.4 mile stretch above the hatchery. Unfortunately, steelhead escapement in Voights Creek has fallen considerably over the past decade. Winter steelhead populations in the Puyallup basin have been declining for nearly the past two decades. The steep decline observed in steelhead escapement over the past several years has created serious concern among fisheries managers. Factor(s) responsible for the decline in steelhead escapement are unknown.

The stream channel varies a great deal in complexity throughout its length. The lower mile is confined by armored banks and levees, with large segments of significantly deficient riparian cover and negligible instream LWD. The extreme high water event of 2009 caused the creek channel to avulse just upstream of the former diversion dam/ hatchery water intake. The new channel currently runs just north of the old channel; then reconnects with the older established channel just upstream of Hyw162. The new channel provides few spawning opportunities. Continuing upstream, the channel begins to encounter the influences caused by increasing elevation as it ascends out of the valley floor. The gradient increases slightly; however, the channel is no longer confined, thereby allowing the creek to branch out creating several braids and significant side channels over the next 0.8 miles. The riparian throughout this section is well intact and there is a significant increase in LWD and debris jams.

Near RM 2, the valley walls close in tightly and the channel is naturally restricted to a defined, moderate sized channel and with narrow gorges. The surrounding riparian is primarily a mix of 2nd growth conifer and deciduous trees. Nearly the entire 2 mile reach, from the diversion to the falls, is a moderate gradient channel containing excellent, although somewhat sporadic patches of gravel. Several pieces of LWD and significant log jams are present throughout this reach as well. Several large mass wastings *(bottom photo)* are present along the hills and slopes of the upper reach above the gorge, contributing substantially to LWD and gravel inputs downstream.



The 2008 redd data is incomplete due to extremely poor survey conditions and access issues which prevented a regular full season of surveys.



No 1+ coho were available for out-planting in 2010 due to losses sustained in the 2009 flood event.

WHITE RIVER 10.0031

The White River *(Stuck)* is a vast and dynamic glacially driven river system. The headwaters of the White originate from the Emmons and Fryingpan glaciers on the north face of Mt. Rainier. Flowing 76.7 miles from its mountain source to its eventual confluence with the Puyallup River; the White River Watershed drains an area of nearly 494 mi^2, nearly twice that of the Puyallup River. However, the White and Puyallup drainages are often viewed and managed as two distinct and separate entities. This management approach is due in part because prior to 1906, the White River did not flow into the Puyallup. Salo and Jagielo *(1983)* described that prior to 1906; the majority of the White River flowed north towards Elliot Bay. Yet, some of the water from the White often flowed south to the Puyallup through the Stuck River channel. In November of 1906, a flood event mobilized a tremendous amount of wood debris that blocked the north flowing channel in what is now downtown Auburn. The blockage forced the river to avulse and find a new channel. This newly created diversion sent nearly the entire White River flow down through the Stuck River channel into the Puyallup, more than doubling the size of the Puyallup River drainage. In 1915, a concrete structure was constructed, thereby permanently diverting the White River into the Puyallup.

Significant tributaries of the White include the West Fork White River, Huckleberry Creek, Boise Creek, Clearwater River, and the Greenwater River. The White River Watershed provides critical spawning and rearing habitat for several salmonids including several ESA listed species which include; native White River Spring Chinook, winter steelhead, and bull trout. Other non-threatened species include coho, pink, chum, sockeye, rainbow trout, cutthroat, and whitefish. These tributaries, with the exception of the West Fork, are described in this report.

All adult salmon and steelhead that spawn in the Upper White River and its tributaries are initially captured in the USACE fish trap in Buckley; then transported above Mud Mountain dam *(RM 29.6)*. Since precise escapement numbers for the Upper White River drainage are known, surveys are conducted to determine fish distribution and spawning success. This is especially important regarding Spring Chinook, since adult production monitoring is part of the recovery plan.

The systems glacial origin is responsible for the turbid conditions that are most noticeable during warmer weather experienced during late spring and summer. The White River conveys a tremendous volume of bed load material which contributes to the dynamic nature of the system. The high sediment loads are responsible for the braided channel morphology characteristic of broad valley segments. This condition is most prevalent in the upper reaches within and immediately outside the National Park boundaries *(river mile 56 to 71)*. Although this upper headwater segment provides little or nothing in the way of mainstem spawning opportunities, its pristine and unspoiled tributaries provide a great deal of the critical bull trout spawning and rearing habitat in the system. Sunrise Creek *(RM 63)*, located 2.5 miles inside Mt. Rainier National Park, marks the highest salmon migration point documented by PTF staff.

Downstream of the NPS boundary near RM 61, the mainstem river, as well as many of its tributaries course through industrial forestlands including National Forest, but primarily within private timber company ownership. Much of these forestlands have been harvested at least once and in many cases twice. Lands in timber production areas are often densely roaded with some sections approaching six lineal miles per square mile. Roads have contributed to many of their trademark problems such as landslides, slope failures, altered hydrology, culvert and bridge projects that can effect upstream migration, and of course high levels if sedimentation within effected drainages. In contrast to the headwaters reach, mainstem spawning opportunities are frequently available throughout much of the upper mainstem from RM 55 downstream to Mud Mountain dam at RM 29.5. Chinook, coho and pink salmon have all been observed spawning in the lower velocity margins of the mainstem within this section.

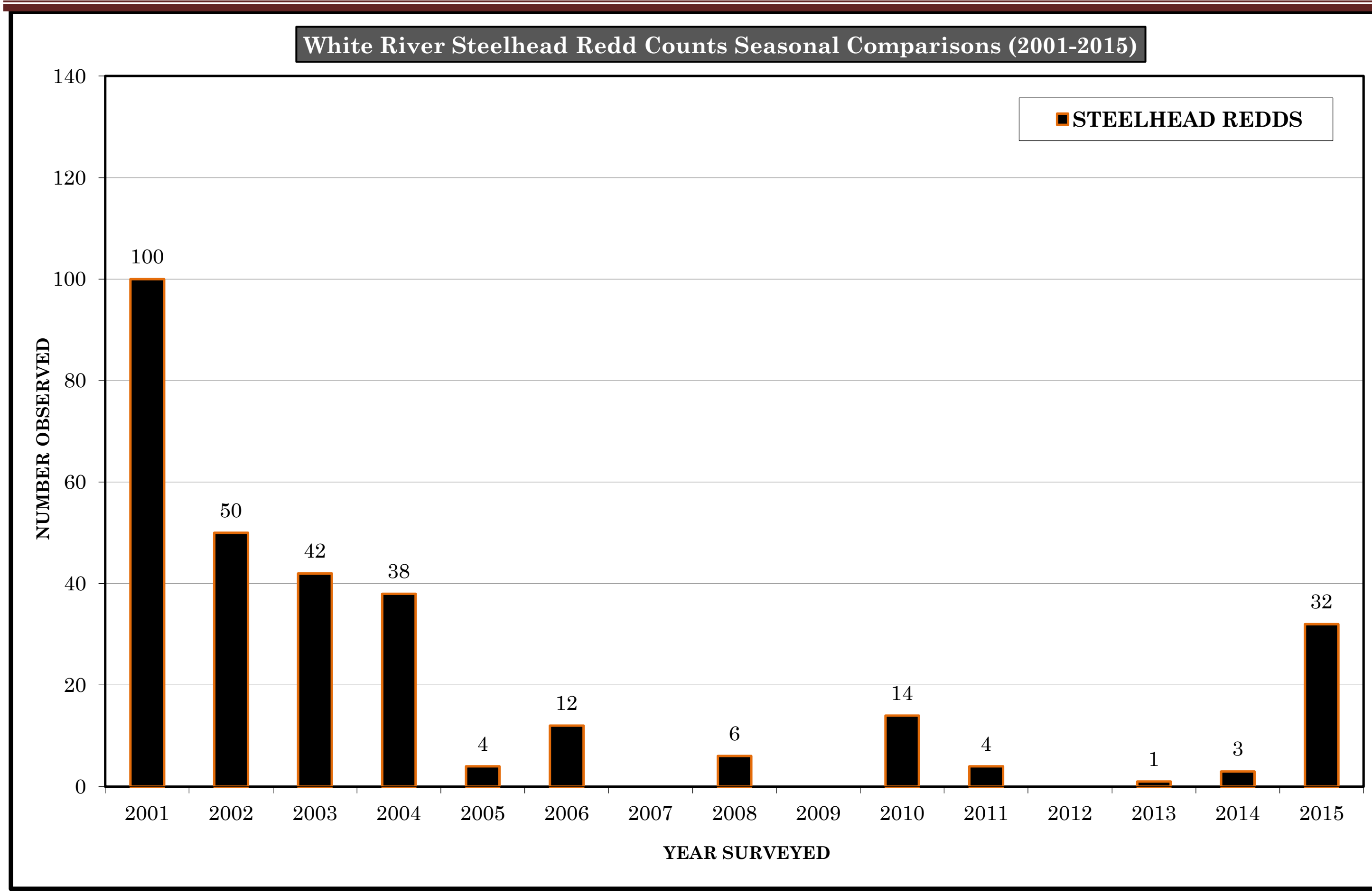
The West Fork White River entering at RM 49.2 on the left bank is glacially driven as well, and is characterized by generally unconfined, often braided and complex channels. Abundant spawning gravels are present in pool tail, as well as the margins and low velocity areas along the lower river. Woody debris is abundant although much of it has been deposited too high to interact with the regular seasonal flows. To a great extent, the overstory riparian zone is either second growth conifer or hardwoods; except for the zone through Mt. National Park with consist of mostly old growth. Several tributaries including Pinochle, Cripple and Wrong creeks; frequently support Chinook, coho and pink spawners. In addition, the clear headwater tributaries of the West Fork; specifically Lodi Creek, provide several key spawning and rearing opportunities for bull trout.

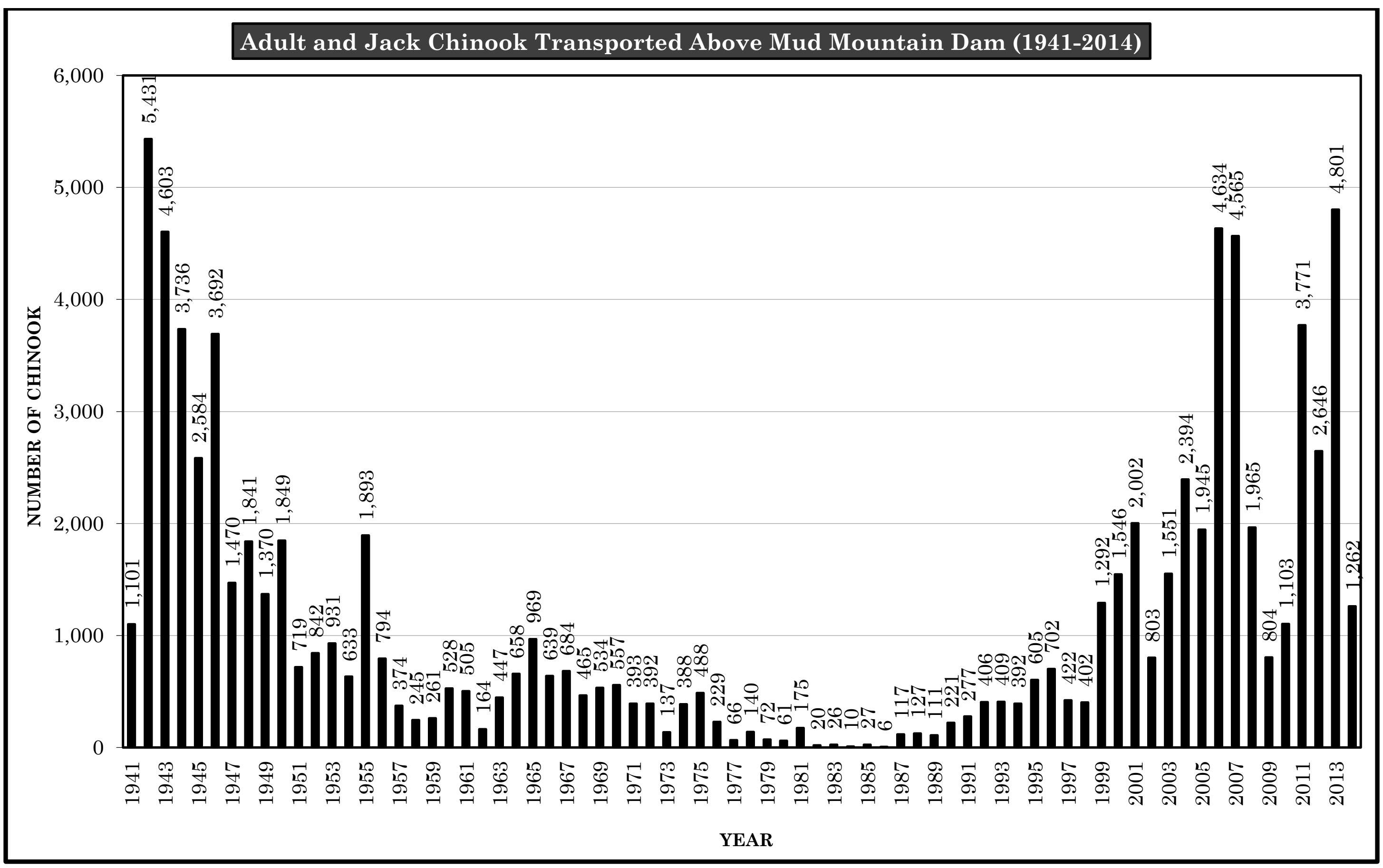
There are approximately 5 miles of suitable habitat between Mud Mountain Dam and the USACE Buckley trap at RM 24.3; unfortunately, only modest spawning at best takes place due to lack of fish access between the two sites. Mud Mountain is an earthen dam built for flood control *(center)*, and is a complete blockage to upstream migration. It is for this reason that fish are captured at the diversion dam in Buckley and transported upstream and released above Mud Mountain. The Corps' trapping facility is uniquely integrated into a diversion dam and flume intake that was, up until January 2004, used to divert water from the White River to generate power. Since Puget Sound Energy *(PSE)* ceased power production, instream flows have increased considerably in the lower river. Thus far, some measure of water has continued to be diverted from the river to maintain the water levels and water quality in Lake Tapps. However, the effect on fish passage is the same; a small percentage of fish will fall back downstream below Mud Mountain; utilizing this disenfranchised reach of the river between the two facilities.

Downstream of the diversion dam at RM 24.3; to approximately RM 11, there is frequent and concentrated use by Chinook, pink, coho and steelhead. Some chum spawning activity takes place within this reach as well; however, the majority of chum spawn below RM 15. There are side channels, as well as LWD and log jams contributing to the complexity of the lower River. This reach provides numerous spawning and rearing opportunities.

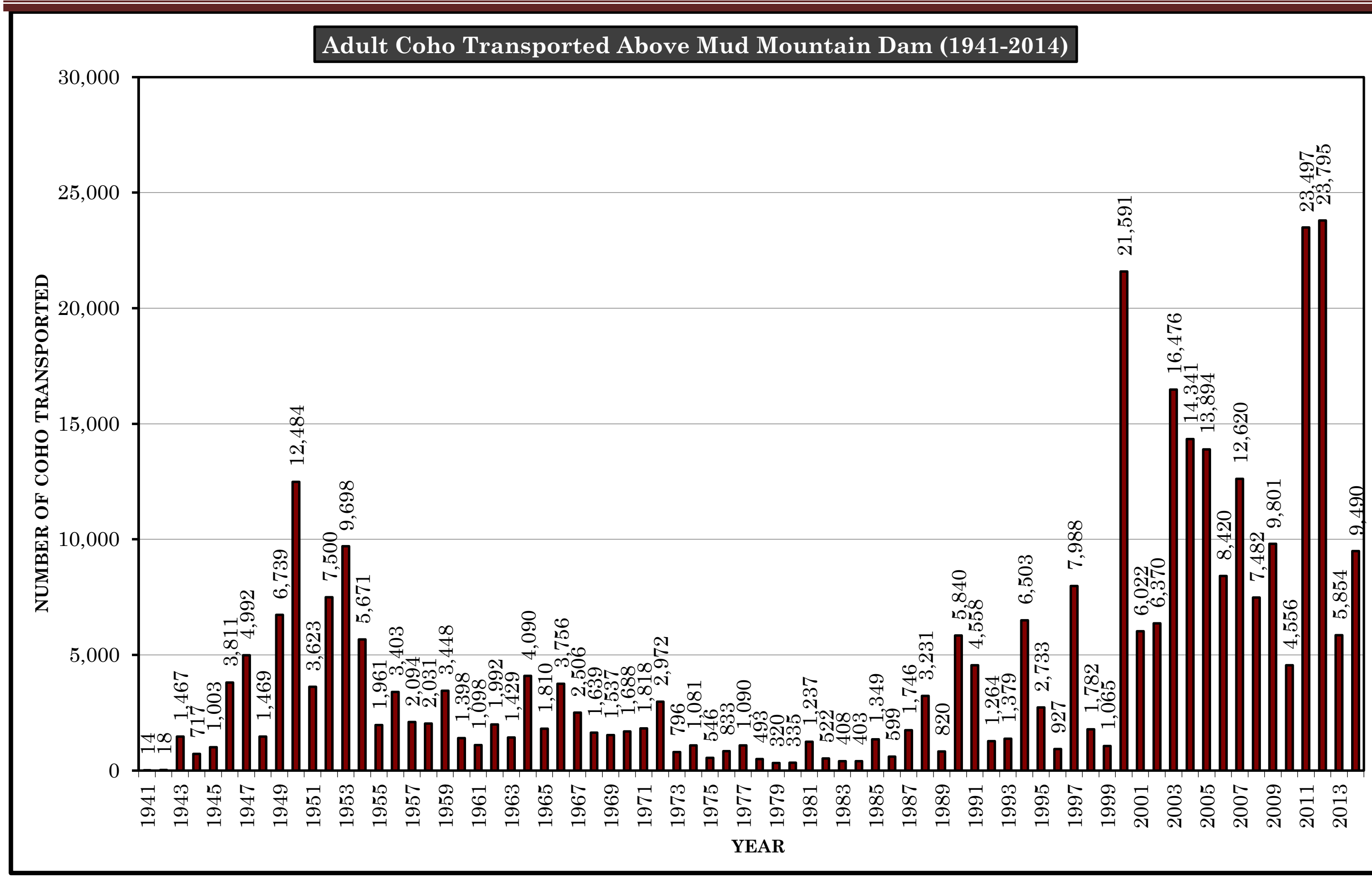
Downstream from approximately RM 11, the channel is constrained by levees *(right photo)*. The channel from this point loses complexity and there is a marked decrease in both spawning gravel and spawning activity of all species.

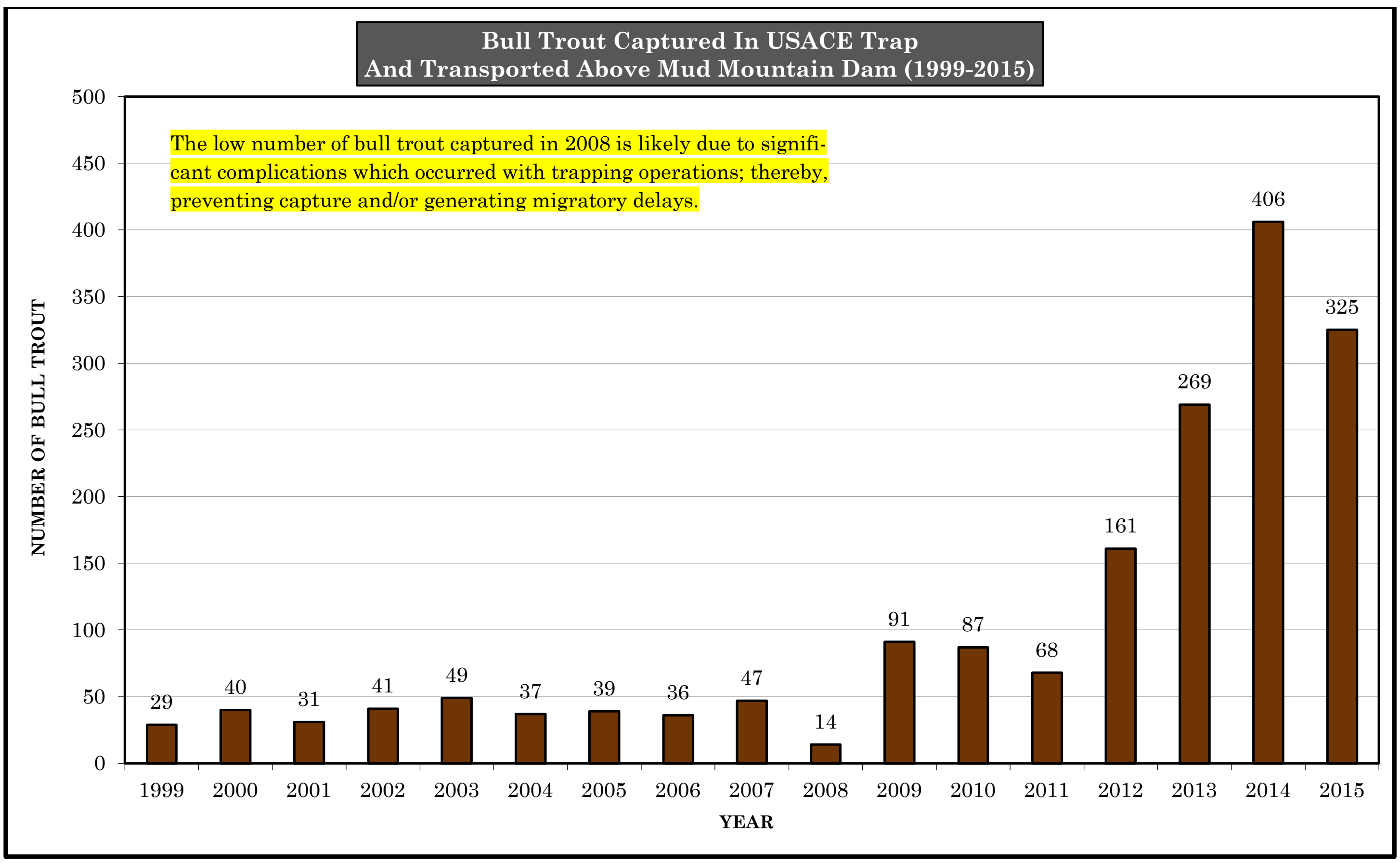
The lower White River



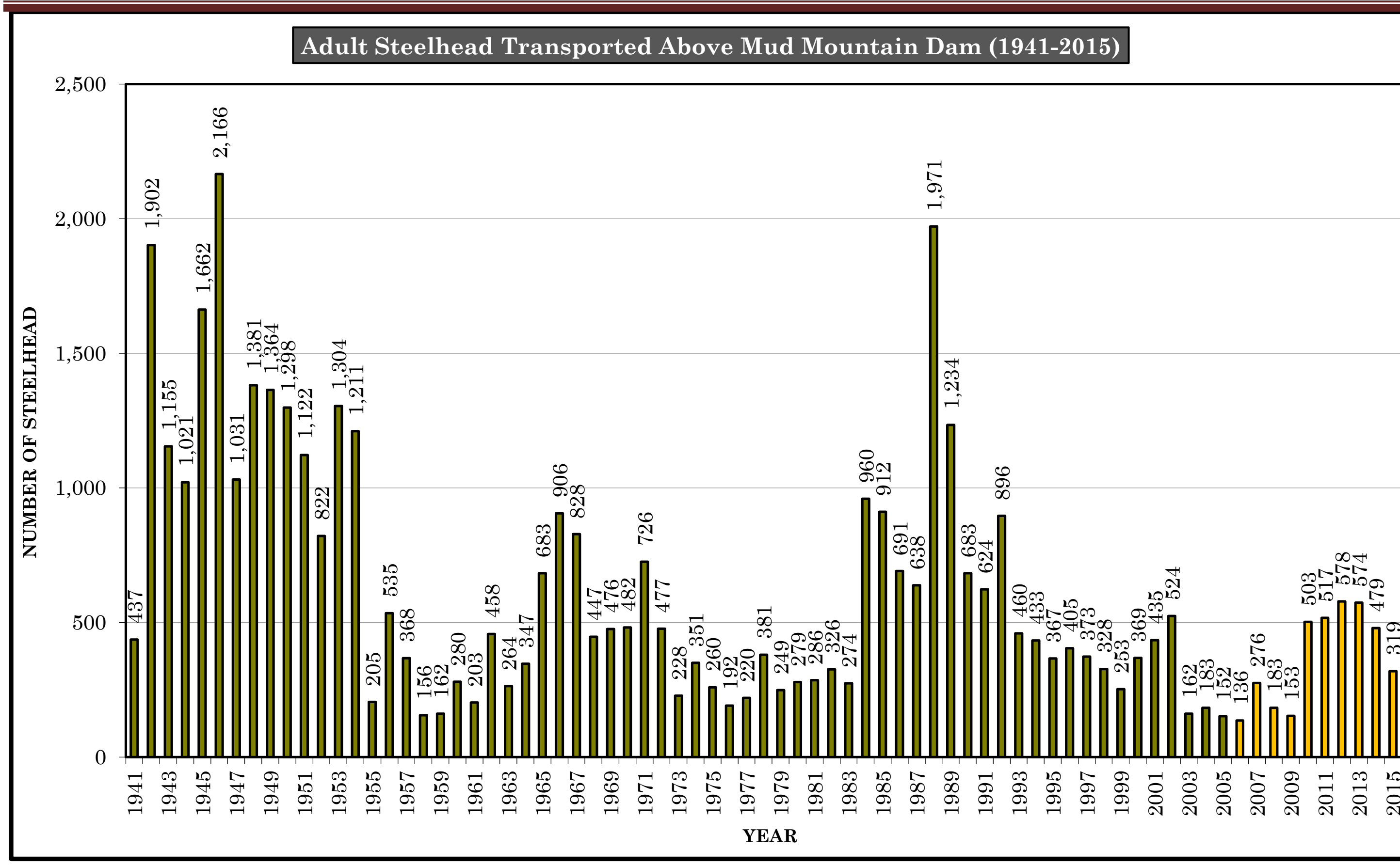


See Appendix F for data on Buckley Trap Chinook return and age composition (NOR & hatchery).

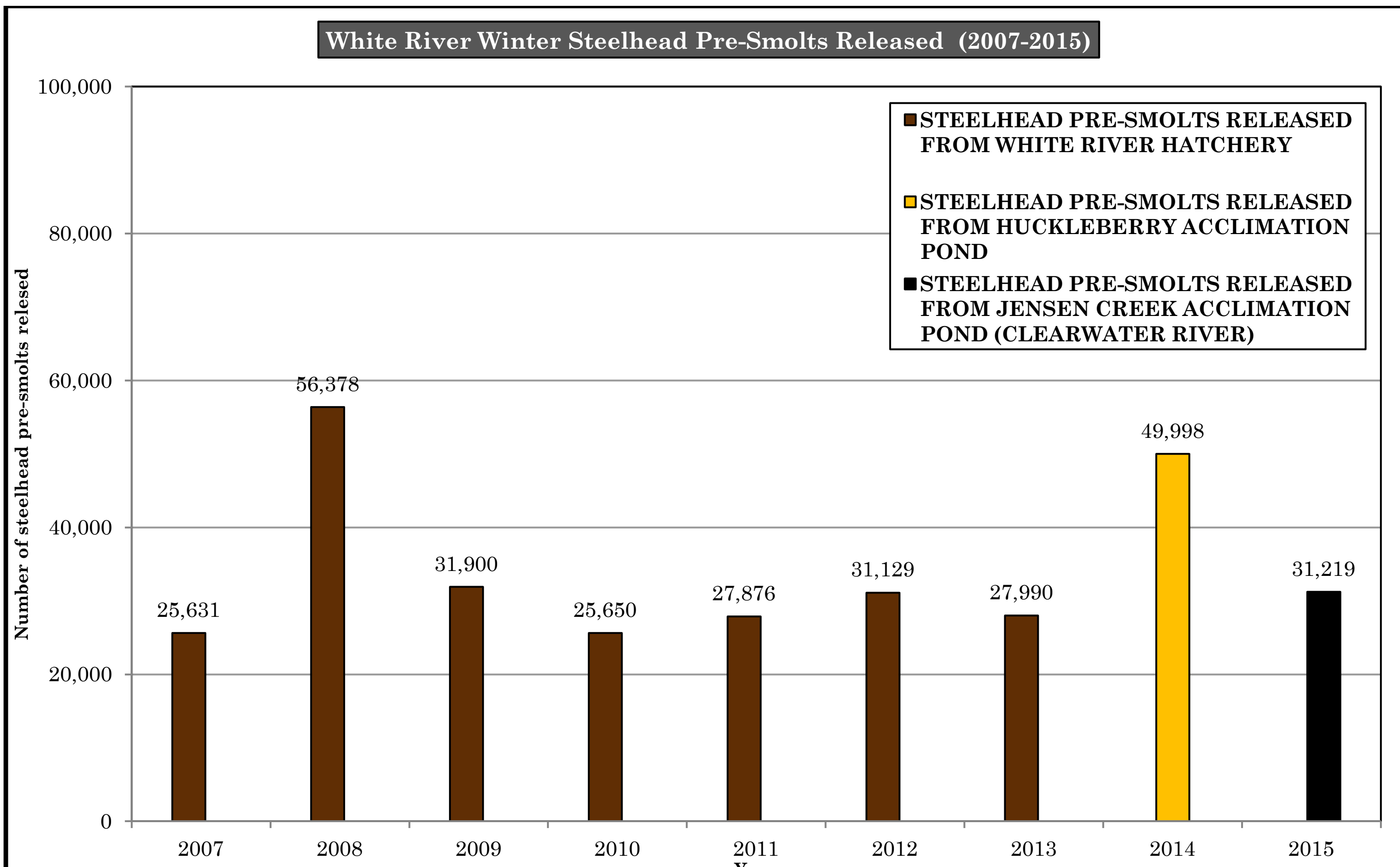


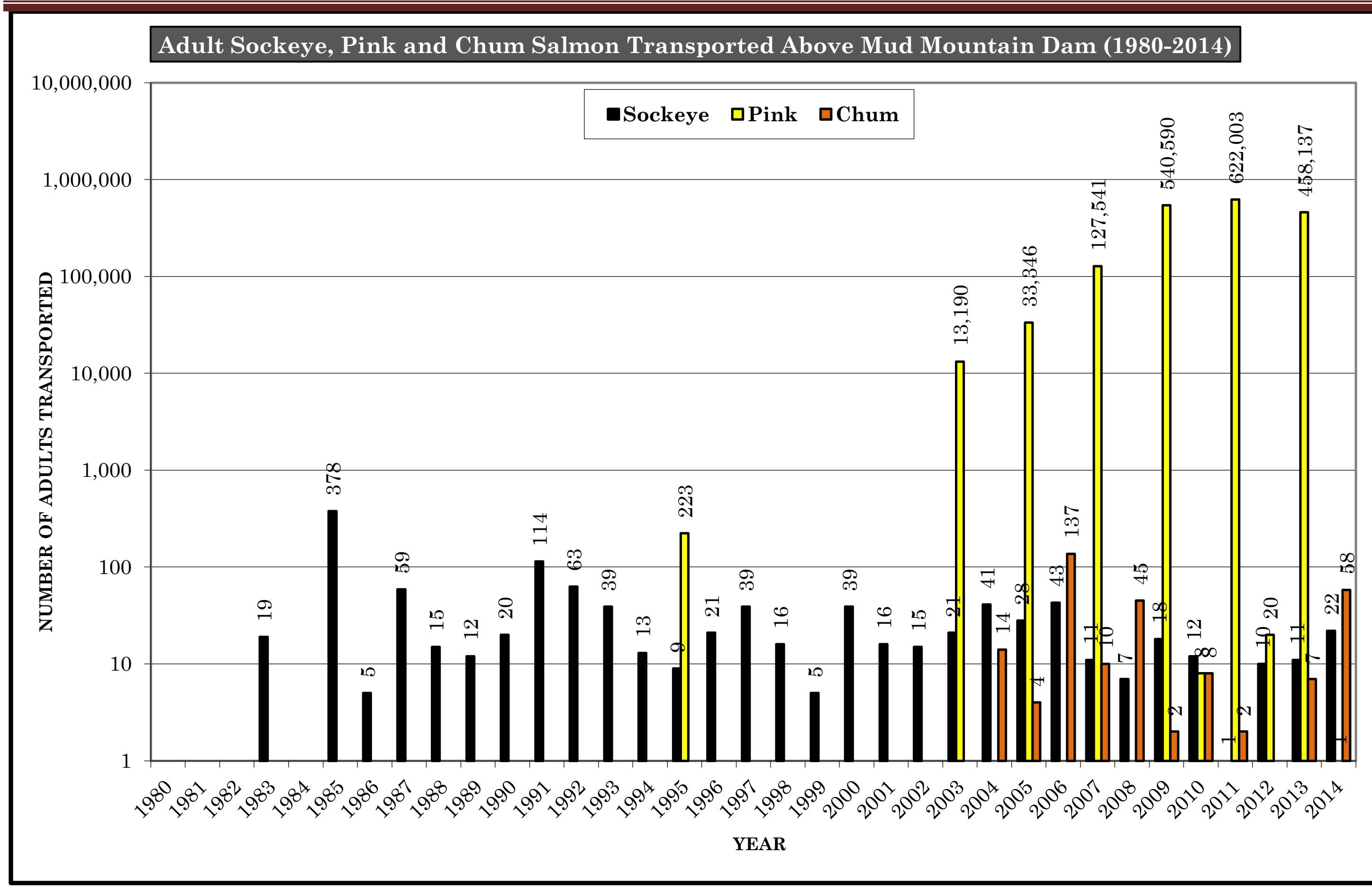


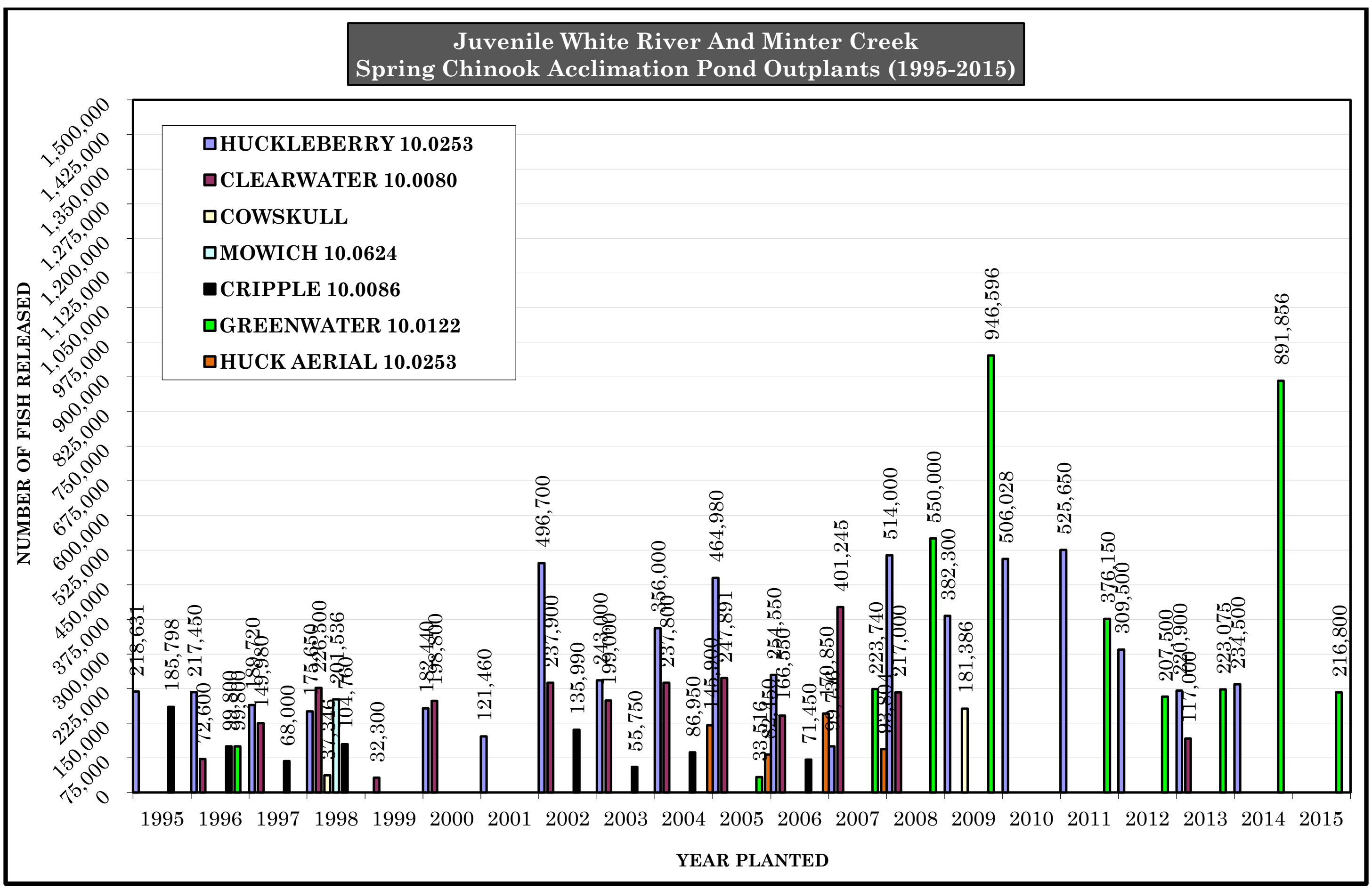
2015 data indicates the number of bull trout transported through September 21st (See Appendix E for data).



The graph above details the number of steelhead transported above Mud Mountain Dam. Additional steelhead captured in the trap since 2006 have been utilized as brood-stock for the White River steelhead supplementation pilot project. See Appendix G for the breakdown of steelhead returns.




Adult Sockeye, Pink and Chum Salmon Transported Above Mud Mountain Dam (1980-2014)
Sockeye
Pink
Chum
NUMBER OF ADULTS TRANSPORTED
YEAR


Juvenile White River And Minter Creek
Spring Chinook Acclimation Pond Outplants (1995-2015)
HUCKLEBERRY 10.0253
CLEARWATER 10.0080
COWSKULL
MOWICH 10.0624
CRIPPLE 10.0086
GREENWATER 10.0122
HUCK AERIAL 10.0253
NUMBER OF FISH RELEASED
YEAR PLANTED

WILKESON CREEK 10.0432

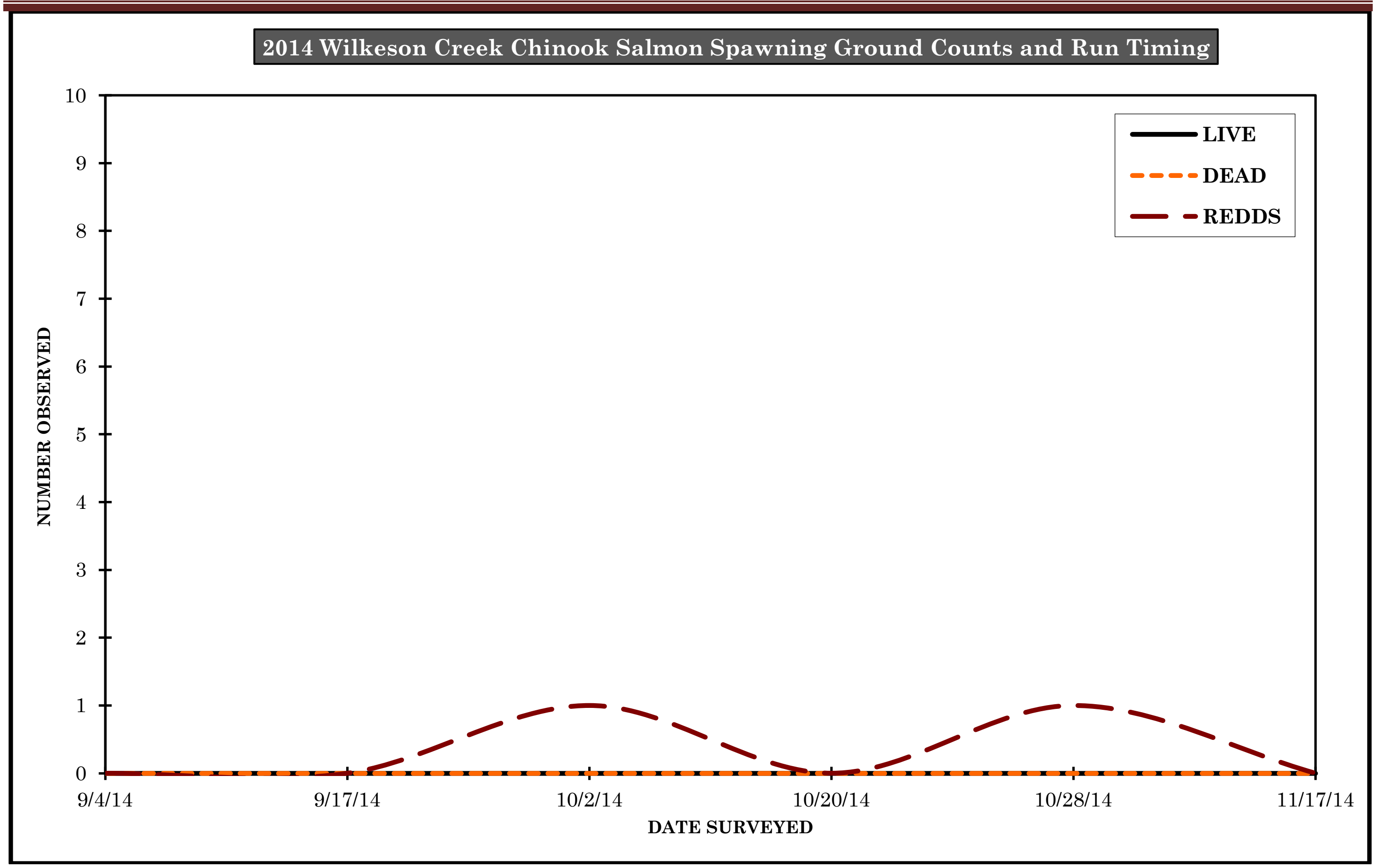
Wilkeson Creek is a large tributary to lower South Prairie Creek *(10.0429)*. Wilkeson flows for 12.3 miles from its source in the Mt. Baker-Snoqualmie National Forest, and then passes through the community of Wilkeson, before meeting South Prairie Creek *(RM 6.7)* just east of the town of South Prairie. Unfortunately, only the lower half of Wilkeson is accessible to salmon; a series of falls at RM 6.2 marks the upper extent of adult salmon and steelhead migration.

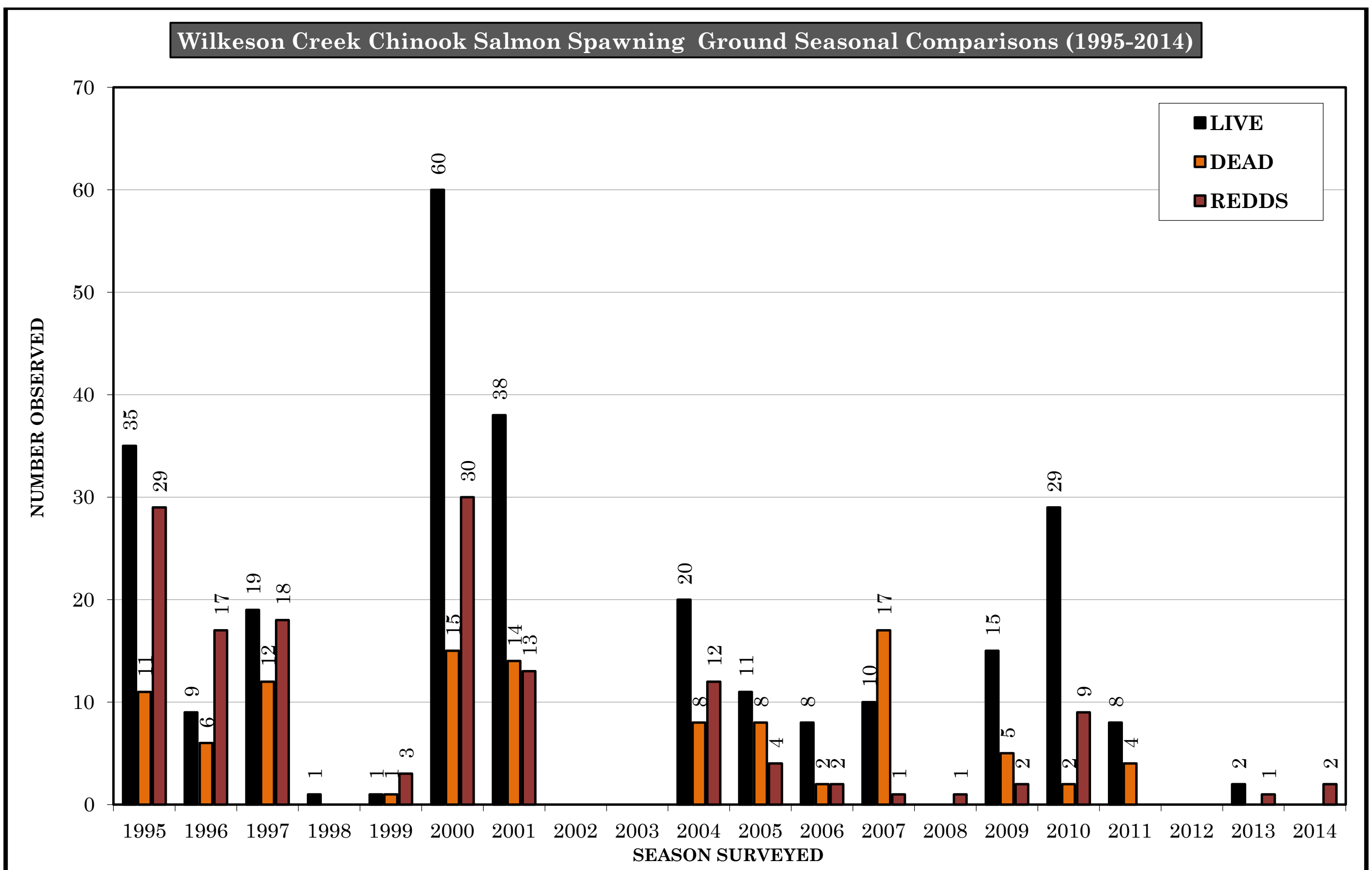
Several fish and habitat related issues associated with Wilkeson Creek include; erosion, water quality *(temp.)*, channel confinement, low flows, water withdrawal, and aquatic noxious weeds (*Japanese knotweed-Polygonum cuspidatum).* In addition, pieces of coal still visible in the creek channel continue to bring to light the regions coal mining history and its lasting impacts on the creek. Currently, the primary land use along Wilkeson is rural residential, recreational, light commercial, and forestry. Despite its limitations, the Wilkeson Creek basin is a productive system, providing suitable spawning and rearing habitat for Chinook, coho, pink, chum and steelhead. However, Chinook use is often limited due to the extremely low flows common during late summer and early fall. Bull trout utilization is unknown, but presumed since bull trout are known to occupy South Prairie Creek.

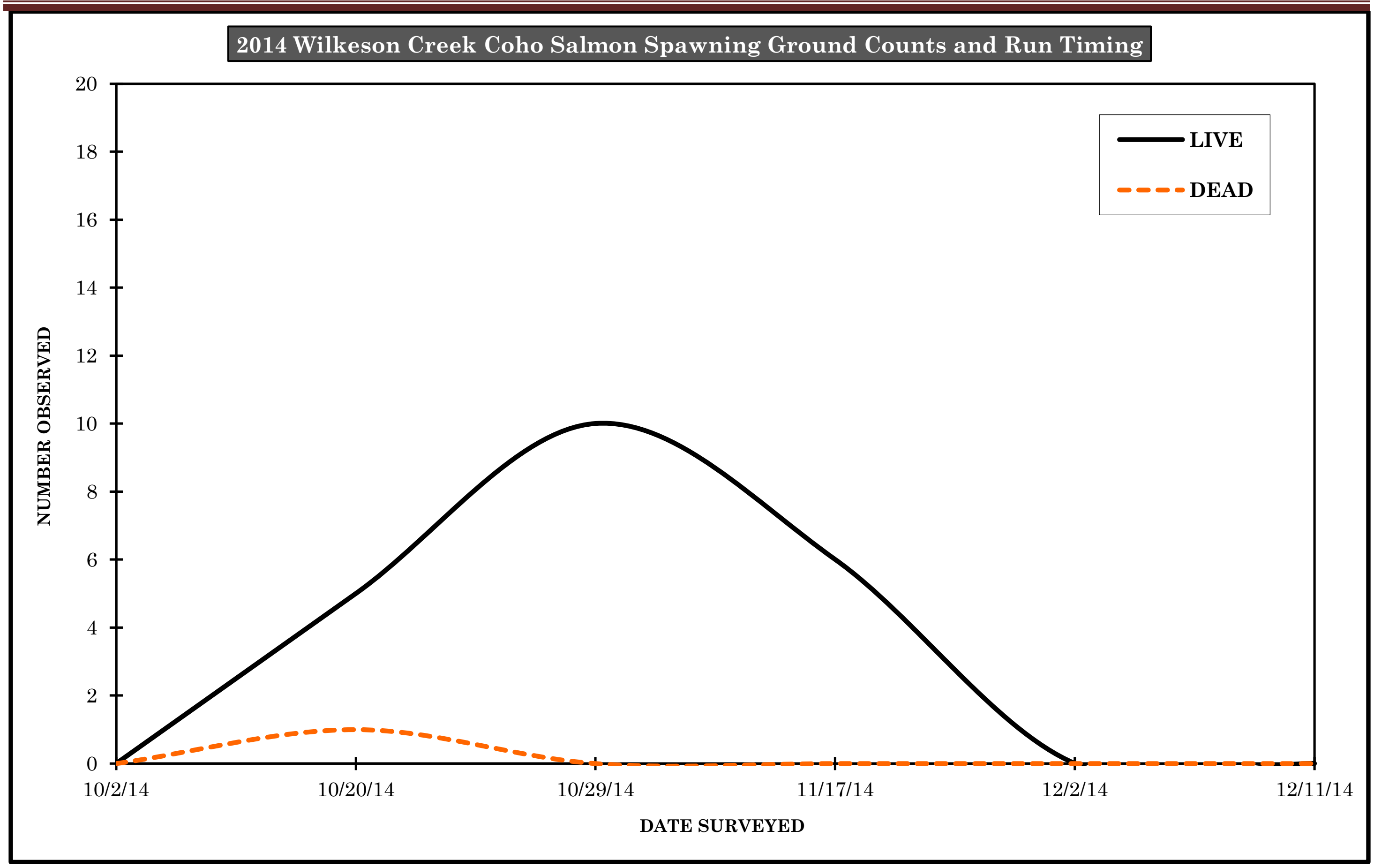
From the barrier falls at RM 6.2, down to approximately RM 5, the creek is confined by valley walls; yet the channel width and gradient are conducive to providing ample spawning opportunities for all species *(lower left)*. Coal Mine Creek, entering near RM 5.7, is the only significant tributary entering the anadromous segment of Wilkeson Creek. Coal Mine supports coho, chum, and pink spawners.

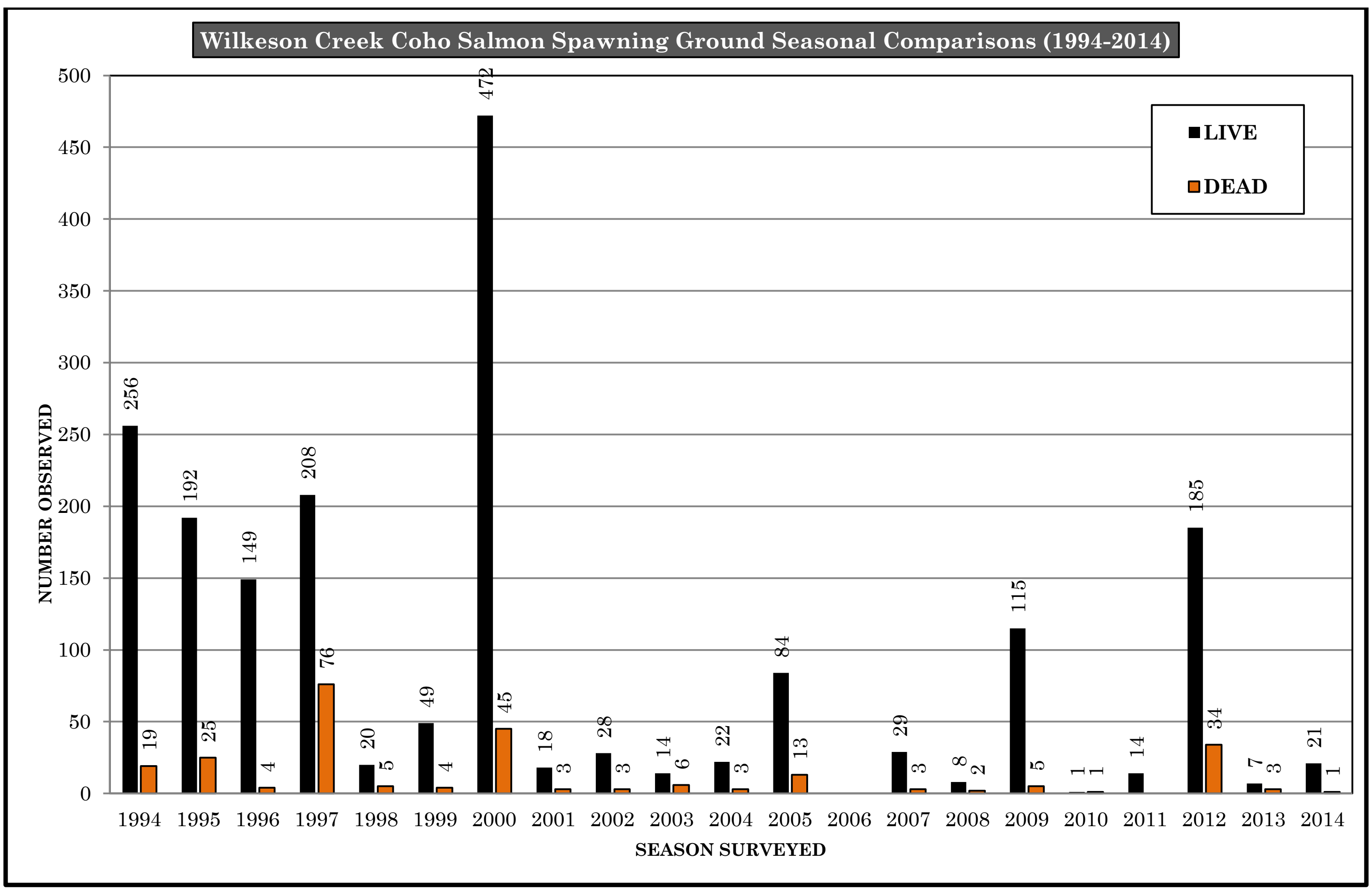
Between RM 5 and 4, Wilkeson Creek meanders through the town of Wilkeson, the channel is often deeply entrenched and the banks are generally riprapped and confined. Spawning opportunities throughout this section are available, although somewhat reduced compared to the rest of the creek. At RM 4.2, the Wilkeson Waste Water Treatment Plant discharges its treated domestic wastewater into the creek.

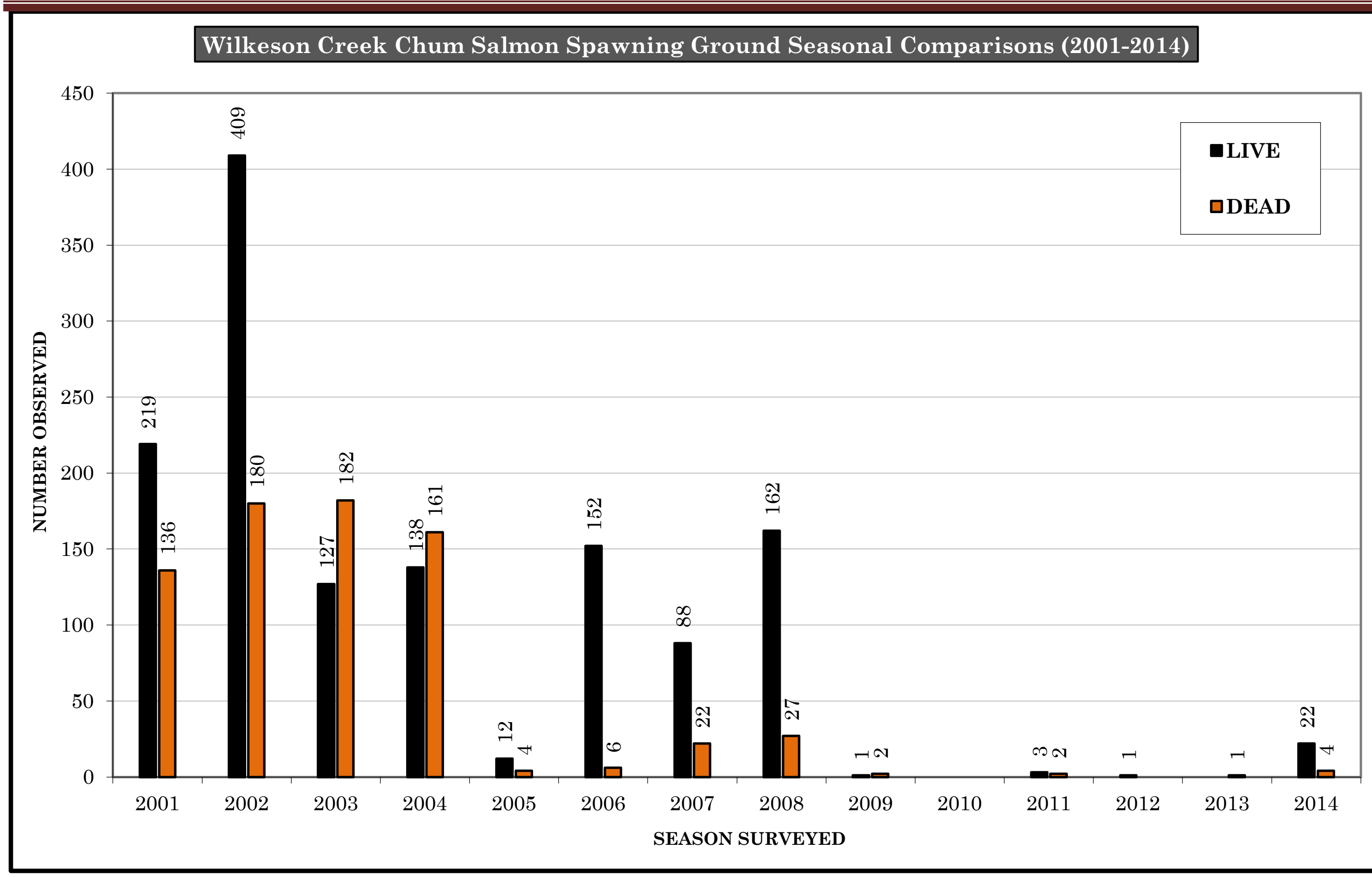
Below river mile 4, and the community of Wilkeson, the creek travels through generally undeveloped forested land until it reaches South Prairie Creek. The lower 4 miles of Wilkeson is a pool-riffle stream with a gravel/cobble substrate. With a few exceptions, abundant spawning gravel is present throughout this reach. The overstory riparian along lower Wilkeson consists of hardwoods and conifers with a diverse understory of native shrubs and vegetation. Large swaths of Japanese knot weed is also present along much of the stream. In-stream woody debris is plentiful providing both channel complexity and cover. The lower 3 miles is very natural, with a heavily wooded riparian zone, debris jams and several side channels offering excellent chum spawning opportunities, as well as overwintering habitat for juvenile coho, Chinook and steelhead. The lower 1.5 miles of the creek often experiences the heaviest spawning effort by Chinook, pink, and chum. Whereas, coho and steelhead focus more on the middle and upper reaches of the creek.

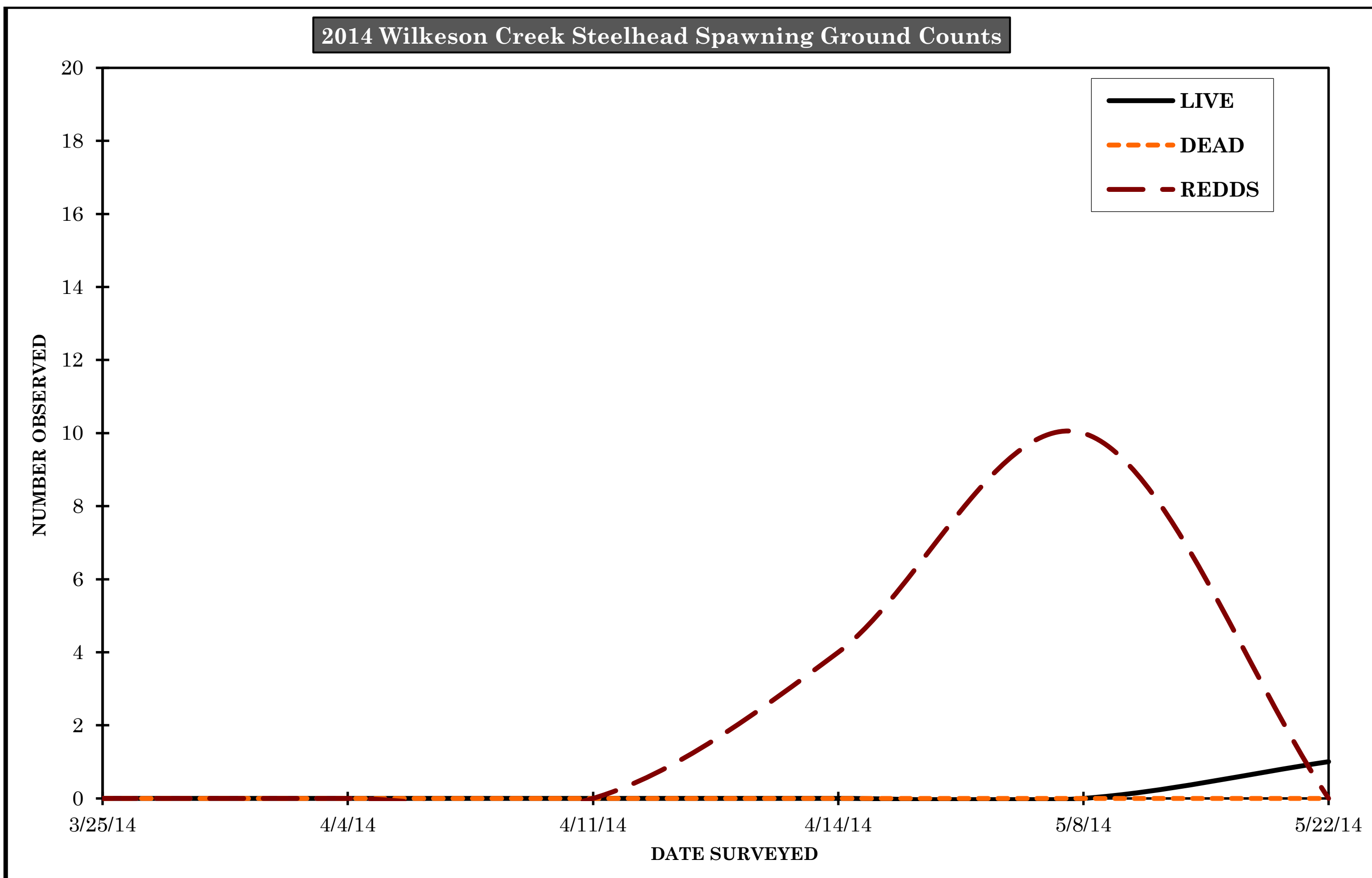

2014 Wilkeson Creek Chinook Salmon Spawning Ground Counts and Run Timing
LIVE
DEAD
REDDS
NUMBER OBSERVED
DATE SURVEYED
9/4/14
9/17/14
10/2/14
10/20/14
10/28/14
11/17/14

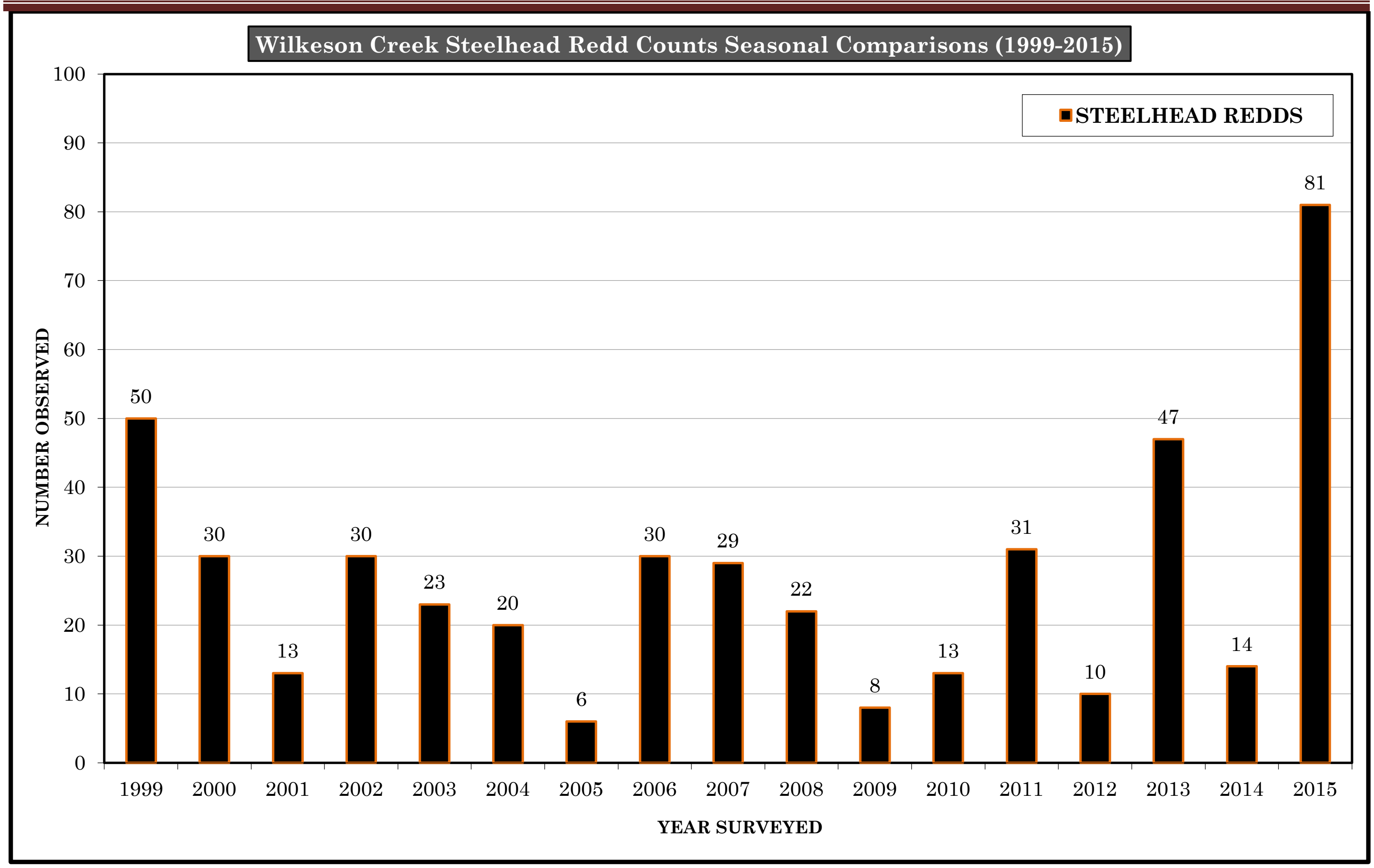

Wilkeson Creek Chinook Salmon Spawning Ground Seasonal Comparisons (1995-2014)
LIVE
DEAD
REDDS
NUMBER OBSERVED
SEASON SURVEYED


2014 Wilkeson Creek Coho Salmon Spawning Ground Counts and Run Timing
LIVE
DEAD
NUMBER OBSERVED
0
2
4
6
8
10
12
14
16
18
20
10/2/14
10/20/14
10/29/14
11/17/14
12/2/14
12/11/14
DATE SURVEYED


Wilkeson Creek Coho Salmon Spawning Ground Seasonal Comparisons (1994-2014)
LIVE
DEAD
NUMBER OBSERVED
0
50
100
150
200
250
300
350
400
450
500
256
19
192
25
149
4
208
76
20
5
49
4
472
45
18
3
28
3
14
6
22
3
84
13
29
3
8
2
115
5
1
1
14
185
34
7
3
21
1
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
SEASON SURVEYED


Wilkeson Creek Chum Salmon Spawning Ground Seasonal Comparisons (2001-2014)
NUMBER OBSERVED
SEASON SURVEYED
LIVE
DEAD
450
400
350
300
250
200
150
100
50
0
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
219
136
409
180
127
182
138
161
12
4
152
6
88
22
162
27
1
2
3
2
1
1
22
4


2014 Wilkeson Creek Steelhead Spawning Ground Counts
NUMBER OBSERVED
DATE SURVEYED
LIVE
DEAD
REDDS
20
18
16
14
12
10
8
6
4
2
0
3/25/14
4/4/14
4/11/14
4/14/14
5/8/14
5/22/14



Wilkeson Creek steelhead graph was generated using survey data collected by WDFW biologists.

WINZIG CREEK

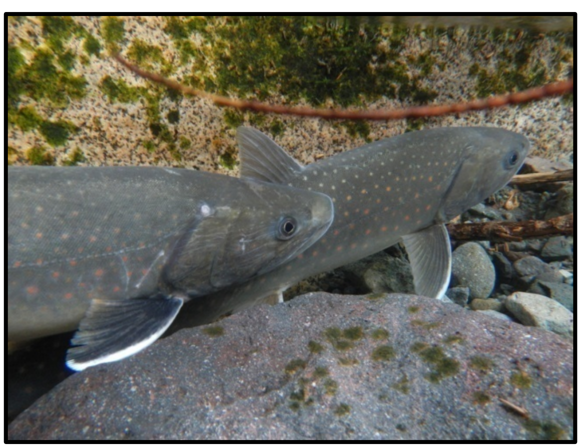
Winzig Creek is not officially named by the Washington State Board on Geographic Names, nor is it identified on topographical maps; however, for easy identification the creek is referred to as "Winzig" by PTF staff. Located within Mt. Rainier National Park, Winzig is a small right bank tributary to Fryingpan Creek. This tiny *(winzig means tiny in German)* mountain stream, likely intermittent or seasonal, did not exist during prior seasonal bull trout surveys and was surveyed for the first time in 2009. The mouth of Winzig Creek, which is located at nearly 4000' elevation, is too high for most Pacific salmon species. Despite its lack of anadromous length or initial bull trout spawner escapement, the lower reach of Winzig does provide suitable habitat for bull trout rearing and spawning.

Nearly the entire anadromous reach of the creek *(approximately 800')* is low gradient. There are small quantities of LWD present within this stretch, in addition to a beneficial riparian buffer zone of primarily conifers exists along the right bank of the creek. Even though spawning was documented within this small stretch *(depending on mainstem influence);* it is limited due the lack of quality spawning substrate created by the alluvial deposits *(sand & silt)* from Fryingpan Creek. The habitat within this section is the least conducive for spawning due to a primarily cobble and sandy substrate. In addition, this reach of the creek is highly subjected to the possibility of redd scouring or heavy silt deposition due to the influence of Fryingpan creek.

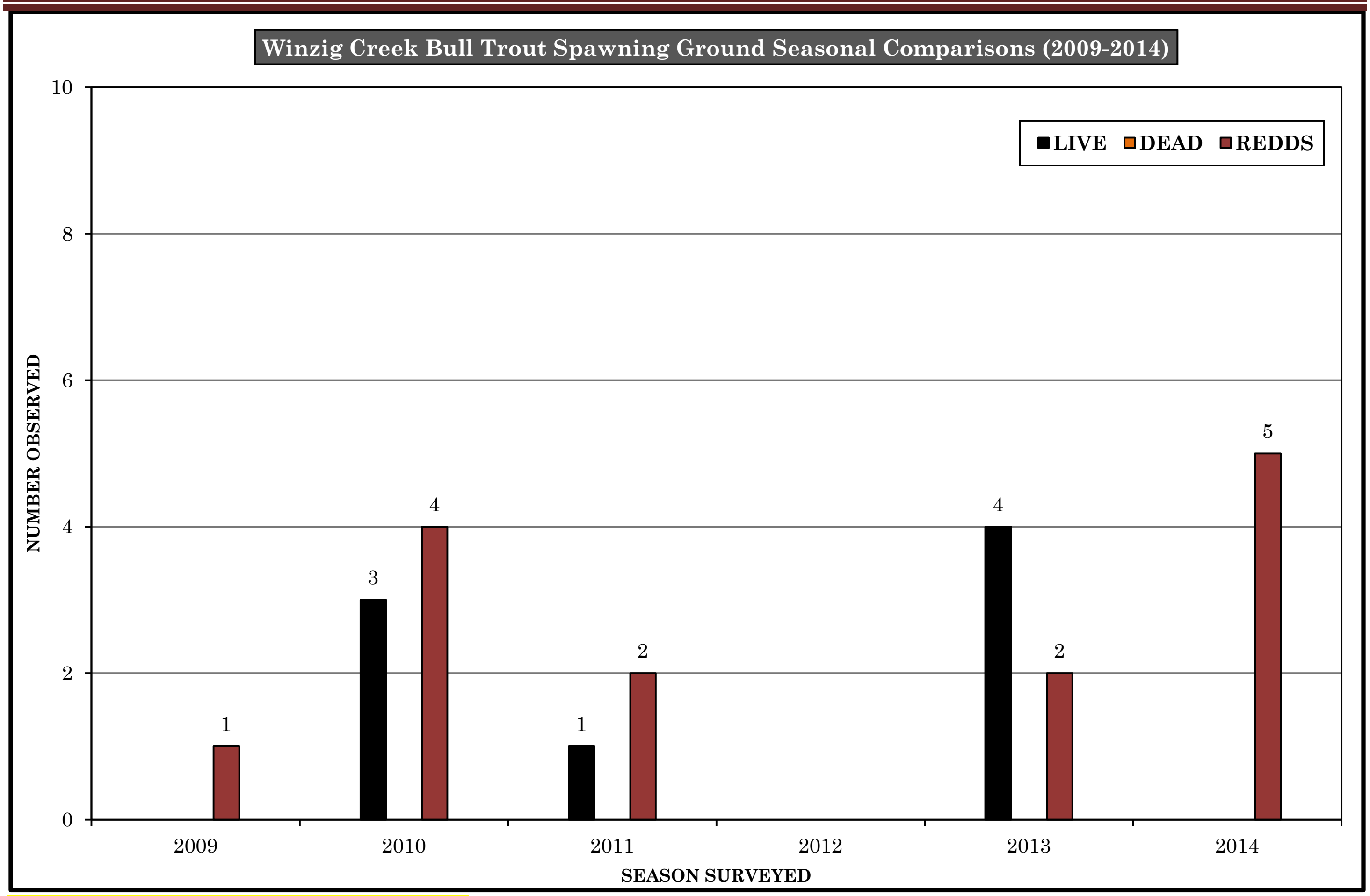
Upstream of the anadromous reach, the creek enters the heavily forested lower slope of the valley as it begins to climbs up the valley wall. From this point, the creek assumes a pool-riffle-cascade configuration up the steepening valley wall.

Winzig Creek enters Fryingpan at approximately RM 1.3; less than a mile upstream of the Sunrise Park Road crossing, and approximately 0.2 miles below Wright creek. The total length of the creek is unknown; however, only the lower 0.15 miles is accessible by salmonids. A series of bedrock cascades and falls blocks any further upstream migration. The lower creek is almost entirely bordered by an old growth coniferous forest.

The first 0.1 mile of the creek consists of a narrow, moderate gradient channel flowing *(late summer flow app. 2-3 cfs.)* within the open Fryingpan Creek channel migration zone. Spawning opportunities in this newly established channel have improved since 2009. There is no significant LWD or natural cover present in this portion of the channel.



Beyond the open channel migration zone, the creek enters the forested slope along Fryingpan. The channel assumes a step-pool configuration from this point on. Throughout this final reach of fish usage, spawning opportunities are reduced due to the increased gradient, predominately larger substrate, and rapid flows encountered. Approximately 0.1 miles after entering the forested area, the creek climbs rapidly up a series of bedrock cascades and small falls; marking the end of fish utilization.



See Appendix B for bull trout redd locations.

WRIGHT CREEK 10.0370

Wright Creek, located within Mt. Rainier National Park, is a small right bank tributary to Fryingpan Creek. This small mountain stream is surveyed for bull trout from late August through the first part of October. The mouth of Wright Creek, which is located at nearly 4000' elevation, is too high for most Pacific salmon species. Wright Creek does provide excellent rearing and spawning habitat for a host of resident and fluvial bull trout. In 2006 and 2007, Puyallup Tribal Fisheries staff radio tagged bull trout captured in the USACE fish trap near Buckley. Subsequently, a few of these bull trout were tracked from their release site at RM 45 on the White River (*near the town of Greenwater*) to Fryingpan Creek and Wright Creek. Spawning was observed in both creeks during September. The telemetry studies and redd surveys along the upper White River and West Fork White River; focused heavily on the headwaters located within Mt. Rainier National Park. The study results showed the cold high mountain streams located within the National Park, including Wright, provide the majority of the critical bull trout spawning habitat in the basin.

Wright Creek enters Fryingpan at approximately RM 1.5; less than a mile upstream of the Sunrise Park Road crossing. Of its 1.7 mile length, Wright Creek provides approximately 0.2 miles of accessible by salmonids usage. A series of bedrock cascades and falls blocks any further upstream migration. The creek is almost entirely bordered by an old growth coniferous forest and the water is cooled year round by snow and glacial melt water from Sarvant Glacier, which is located on the northern slopes of the Cowlitz Chimneys *(Sarvant Glacier is named after Henry M. Sarvant, (1869-1940), an engineer and early surveyor of the mountain).* Additional flow is contributed by a small nonglacial tributary entering on the left bank at RM 1.4.

The first 0.1 mile of the Wright Creek consists of a narrow, moderate gradient channel flowing within the open Fryingpan Creek channel migration zone. Several patches of excellent spawning gravel are available throughout this section of the creek and the majority of spawning has occurred within this segment. There is no significant LWD or natural cover present in this portion of the channel; however, spawning activity is often observed within close proximity of the few pieces of small woody debris present.

Beyond the open channel, Wright Creek enters the heavily forested slope bordering Fryingpan and assumes a step-pool configuration for the next 0.1 miles. Throughout this final reach of fish usage, spawning opportunities are reduced due to the increased gradient, predominately larger substrate, and rapid flows encountered. Although the majority of this short reach provides excellent rearing habitat, it doesn't offer much in the way of spawning opportunities. Approximately 0.1 miles after entering the forested area, the creek climbs rapidly up a series of bedrock cascades and small falls *(lower left)*; marking the end of habitat accessible by salmonids.

Resident bull trout reside in smaller headwater tributaries, while migratory bull trout frequently travel long distances; utilizing the mainstem rivers and larger tributaries to forage and overwinter. During the fall, migratory forms of bull trout journey from spawning and rearing habitats in the upper watershed to foraging and overwintering habitats located lower in the river system. Beginning in spring and early summer *(May-July)*, they begin the return journey back to spawning and rearing areas high in the watershed. In response to changing habitat and reproductive needs, migratory bull trout in the White River travel up to 75 miles or more between the lower river and headwaters located in or near Mt. Rainier N.P. To accomplish this, bull trout require unobstructed migration corridors and connectivity of streams and rivers in order to provide them with access to spawning, rearing, foraging, and overwintering habitats.

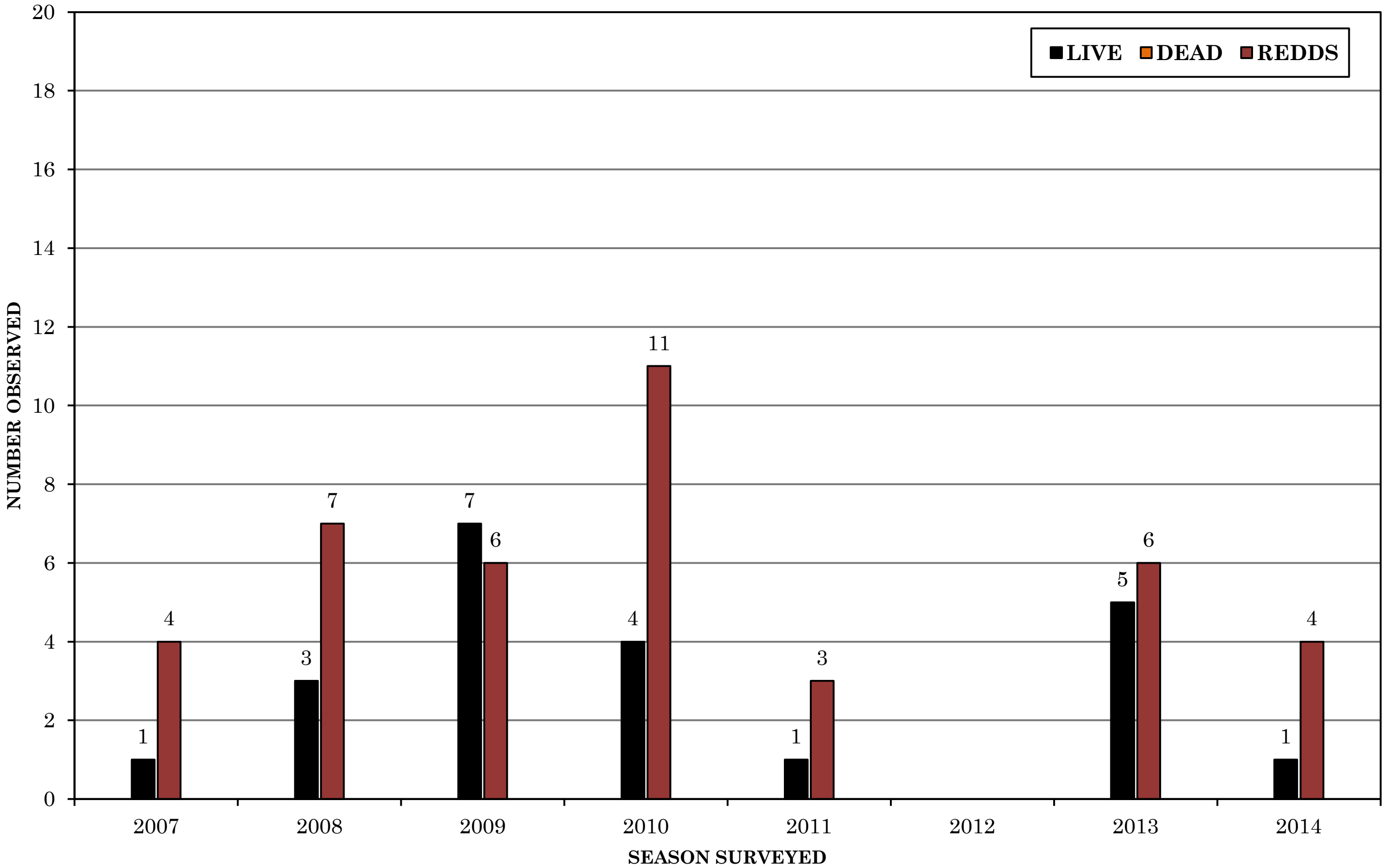
Bull trout are primarily piscivorous *(fish eaters)*. However, they are opportunistic feeders, feeding on a variety of prey items depending on their particular life history strategy and stage of development. Adults feed almost exclusively on other fish, including a range of salmon and trout species; as well as other resident fish species. Juveniles feed on aquatic invertebrates, including stoneflies *(Plecoptera)*, caddisflies *(Trichoptera)*, and mayflies *(Ephemeroptera)*. Bull trout require a healthy aquatic environment in order to survive and prosper. They need an environment that provides the

prey base; in addition to the rearing and reproductive habitat necessary to ensure their continued survival and reproductive success.

Bull trout spawning occurs primarily during the first three weeks in September, however, spawning has been observed taking place from the last week of August through the first week of October. Bull trout are iteroparous *(have the ability to spawn more than once)*; therefore, recovering pre-or-post spawn mortalities for examination is extremely rare. Spawners in the upper White River tributaries are observed utilizing various sized substrate from small gravels to small cobble. Redds are often constructed in the tail-out of pools and along channel margins. Embryonic development is slow *(depending on water temperatures)*; it may take between 165-235 days for eggs to hatch and for alevin to absorb their yolk (Pratt 1992). Bull trout fry emerge in late winter and early spring. Young fry can often be seen by mid March foraging in the lateral habitat along the upper mainstem White River and associate tributaries.

Bull trout habitat throughout the Puyallup and White rivers has been severely impacted by over a century of land and water resource exploitation; including, damming and substantial water diversions, considerable riparian alterations *(deforestation)*, dewatering and low instream flow regimes, as well as significant channel manipulation. These impacts have lead to a marked deterioration in land and hydrological behavior within these river systems by causing water flow of poorer quality, quantity and timing. Several limiting factors are involved with regards to the healthy function of stream habitat and bull trout populations in the watershed; including lost or diminished habitat connectivity and migration corridors *(human-made fish passage barriers)*, fragmentation and reduction of habitat quality *(entrainment, transportation networks, forest management practices and operations, direct water withdrawal)*; in addition to, water quality, fish entrainment and entrapment, unknown species interactions, and potential climate change impacts *(changes in flow regimes, scour effects, thermal variations, changes in water chemistry)*.

Wright Creek Bull Trout Spawning Ground Seasonal Comparisons (2007-2014)



See Appendix B for bull trout redd locations. Raw spawning data for Wright Creek can be found in Appendix C.

WRONG CREEK 10.0205

Wrong Creek is a small tributary entering Pinochle Creek, approximately 0.2 miles above Pinochle's confluence with the West Fork White River. Wrong Creek originates along Clear West Peak around 4,500 feet. The lower, approximately 2.5 miles, flows within the West Fork White River's floodplain. There is no development along Wrong Creek, with the exception of the USFS bridge crossing at approximately RM 0.4. There are small patches of suitable spawning gravel present primarily in the lower 0.5 miles of the creek. The riparian zone consists of mature second growth hardwoods and conifers with an understory of blueberry and salmonberry. Wrong Creek hosts several sizable log jams containing numerous key components. Coho are the most abundant and common species observed in Wrong Creek. Other species known to utilize the creek include Chinook, pink, sockeye, cutthroat and rainbow trout; however, steelhead utilization is unknown. Bull trout utilization is presumed since they are known to occupy several other habitats throughout the West Fork drainage. Unfortunately, low flows often make it problematic for Chinook to access the creek in August and September to spawn; as a result, Chinook escapement in Wrong is often low or absent.

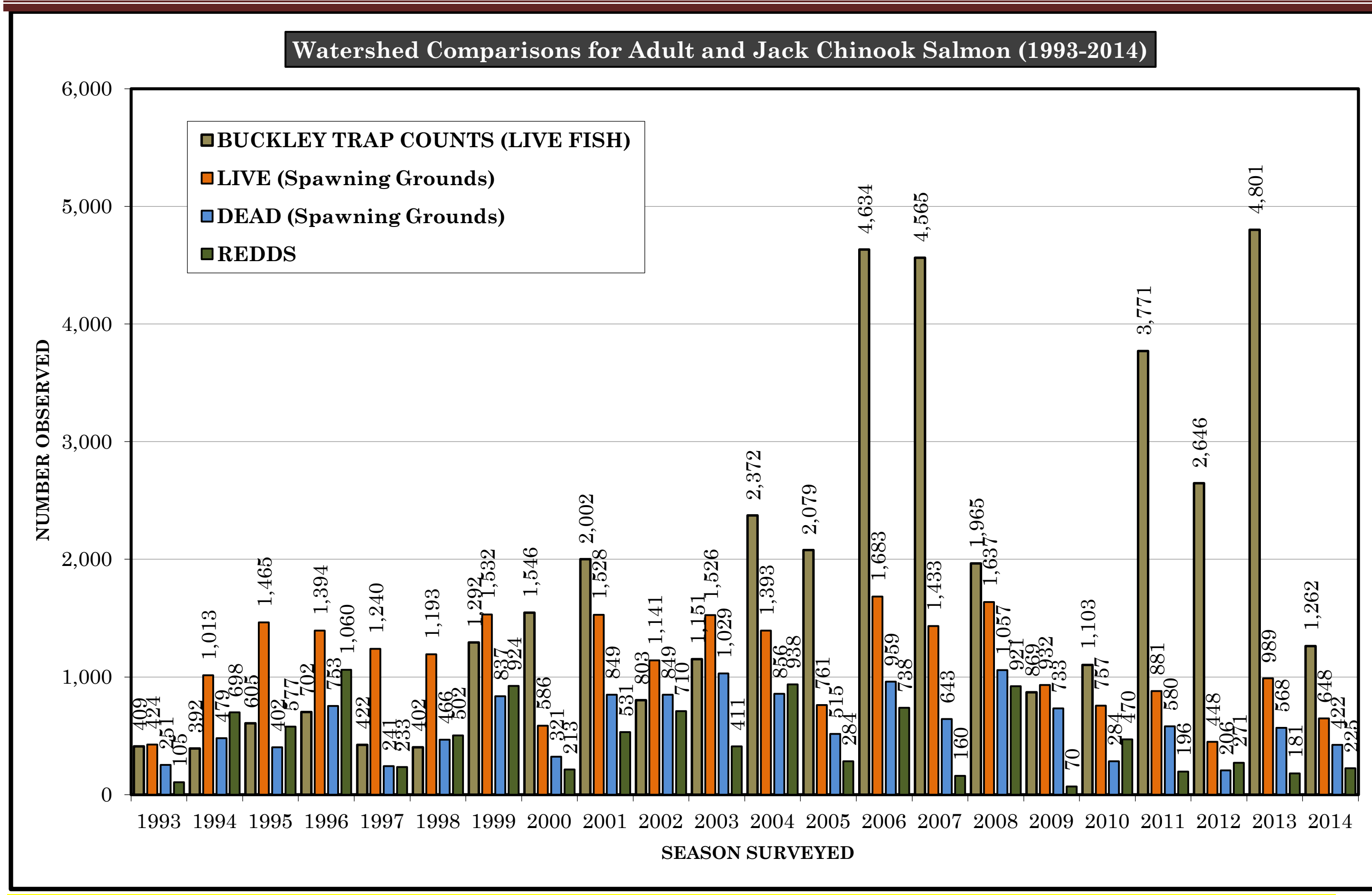
In the past, Wrong was surveyed for adult salmon escapement; unfortunately, flood damage to Forest Service Road 74 has prevented access to the creek since early 2006; so, no escapement surveys or fish plants in the nearby acclimation pond located on Cripple Creek have occurred since. When escapement surveys were conducted, coho were often observed each season holding in two large pools in Pinochle, just below the confluence with Wrong Creek. Many of these coho would ascend Cripple and Wrong a couple of weeks after entering Pinochle Creek.

All adult salmon that spawn in Wrong Creek were initially captured at the USACE fish trap in Buckley, and transported above Mud Mountain dam. Salmonid escapement numbers for the upper White River drainage are known; therefore, surveys were conducted to determine fish distribution and spawning success. This is especially important regarding Spring Chinook, since adult production monitoring is part of the White River Spring Chinook Recovery Plan. Also, as part of the Spring Chinook Recovery Plan, the Puyallup tribe operated a Spring Chinook acclimation pond located at RM 0.3 on Cripple Creek. Spring Chinook were reared and released from Cripple Creek for several years *(1994-2006)*. Approximately 50,000 plus Spring Chinook from the Muckleshoot White River hatchery were transported annually to the Cripple Creek acclimation pond in early spring, and released in late spring. Returns to Pinochle; as well as Cripple and Wrong creeks, is likely the result of these earlier plantings. The current state of the acclimation pond is unknown; however, when access is reestablished, it is anticipated that the pond can be reutilized and spawning surveys will resume.

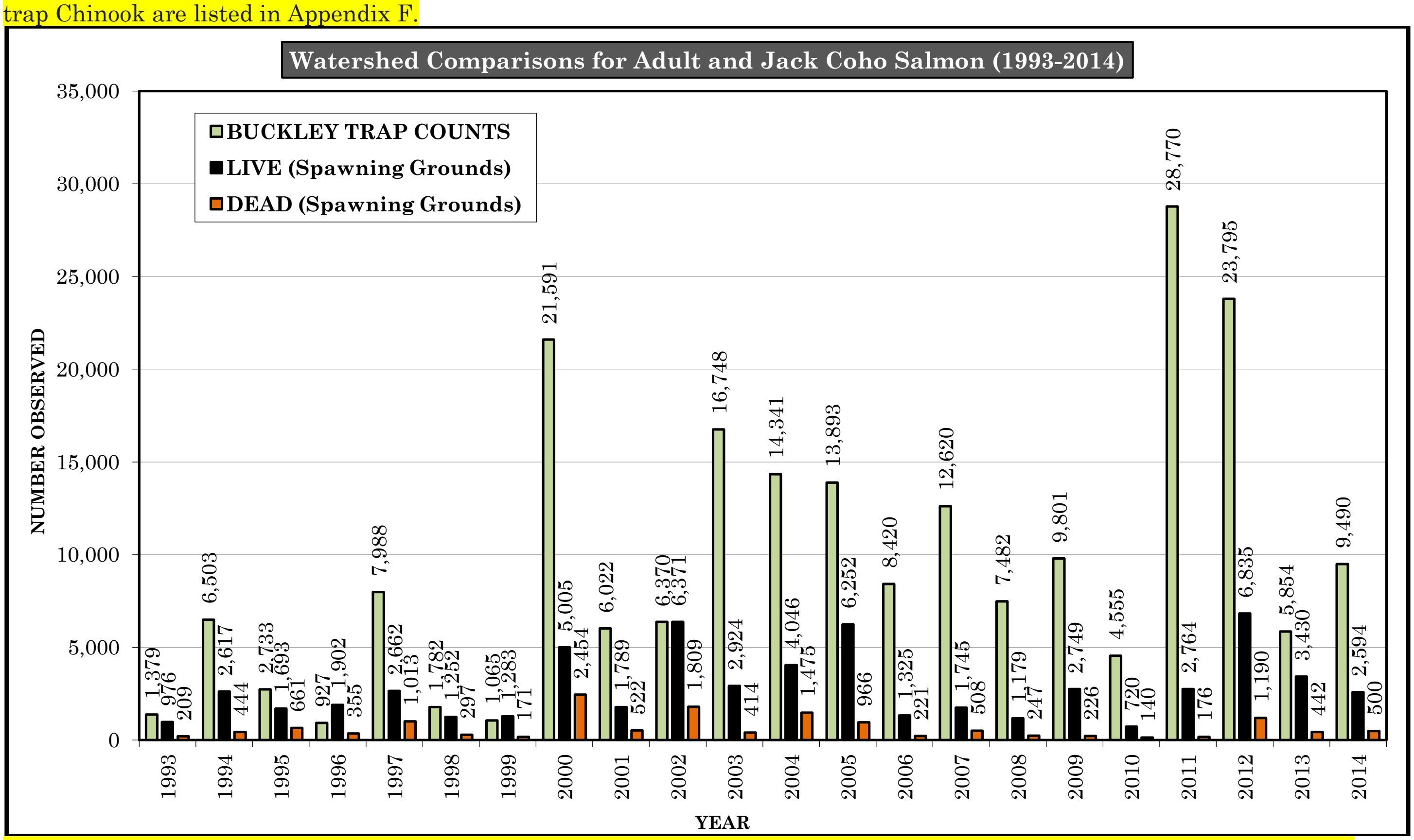
Seasonal Comparisons of Spawning Ground Counts and Buckley USACE Trap Counts for Salmon and Steelhead.

The following charts are separated by species and include both wild and hatchery origin spawning ground escapements. They are a compilation of the yearly survey totals conducted by the Puyallup Tribe Fisheries Department, the Washington Department of Fish and Wildlife, and the Army Corps of Engineers' Buckley trap counts. These data yield an empirical representation of total natural/hatchery escapement for the entire WRIA 10: Puyallup/White River Watershed. It's important to note that the number of live fish observed and represented in the graphs is an accumulation of all fish seen throughout the survey season. The total number of live fish observed does not depict the estimated escapement which is derived through statistical analysis. The live and redds totals in the following graphs do not include the fish or redds observed above RM 24.3 on the White River, since these actual escapement totals are known from the USACE Buckley trap counts.

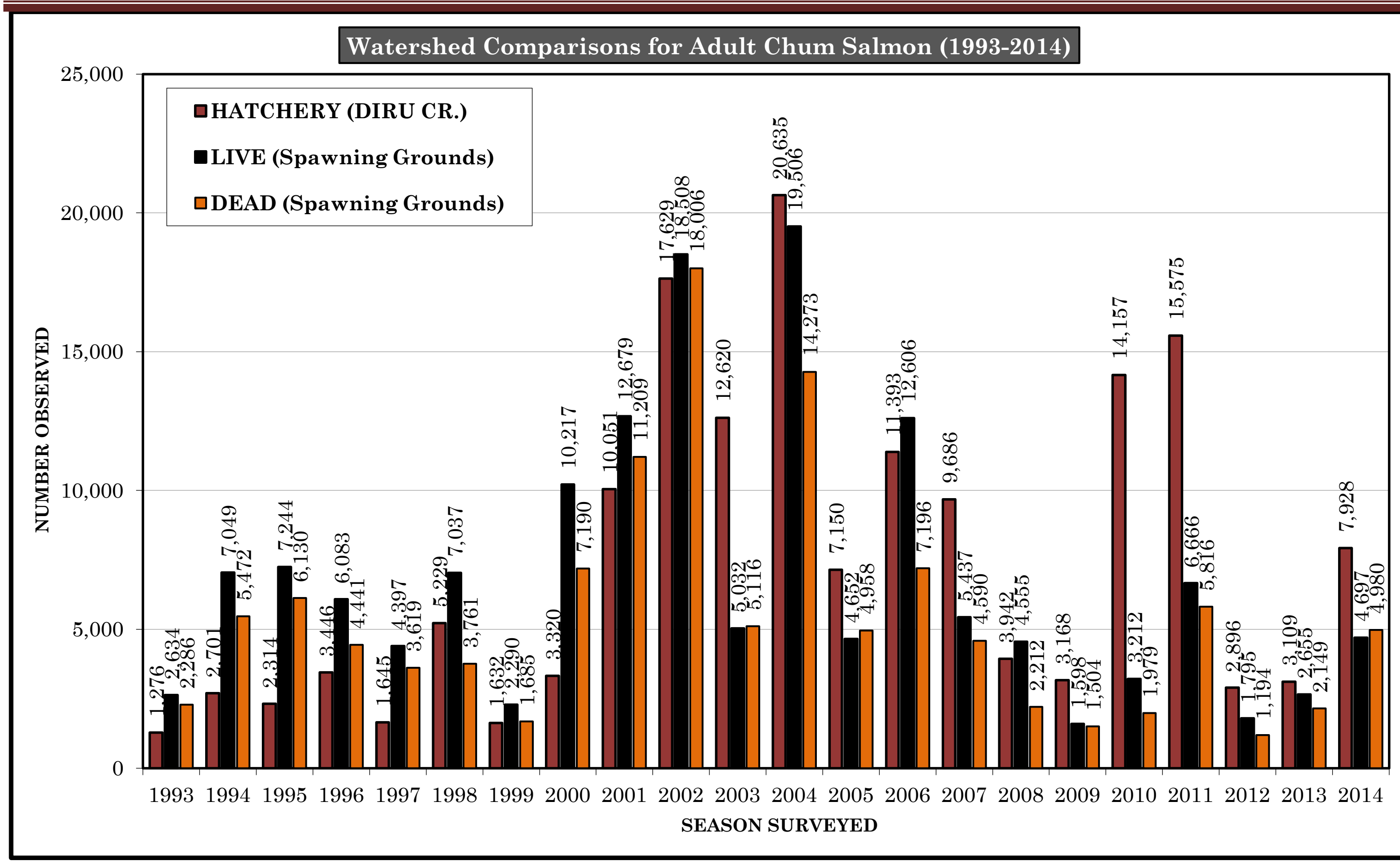
APPENDIX A

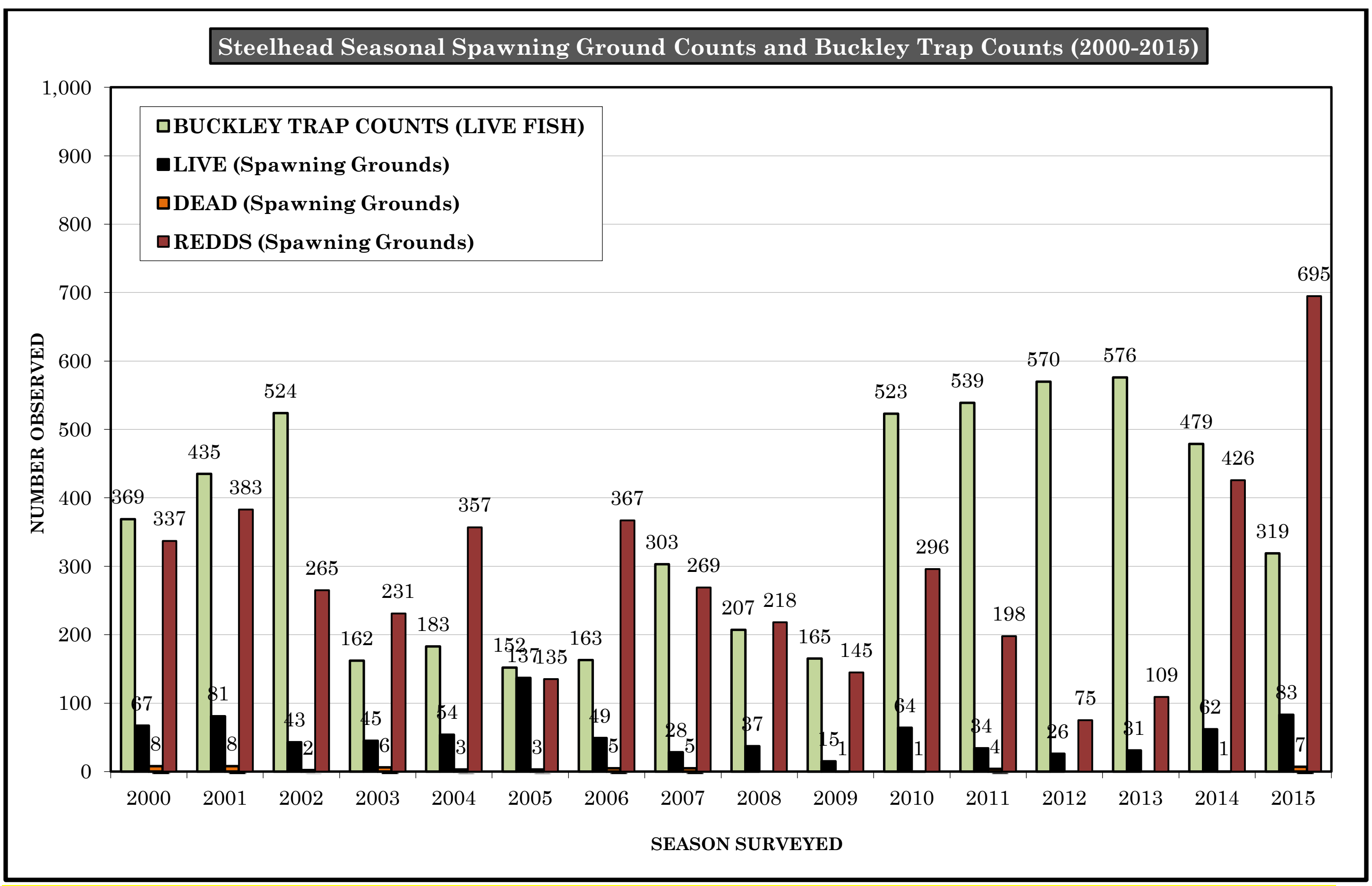


The live, dead, and redds totals in this graph do not include the Chinook or redds observed above RM 24.3 on the White River; actual escapement totals are known from the USACE Buckley trap counts. The return and age composition for sampled Buckley trap Chinook are listed in Appendix F.

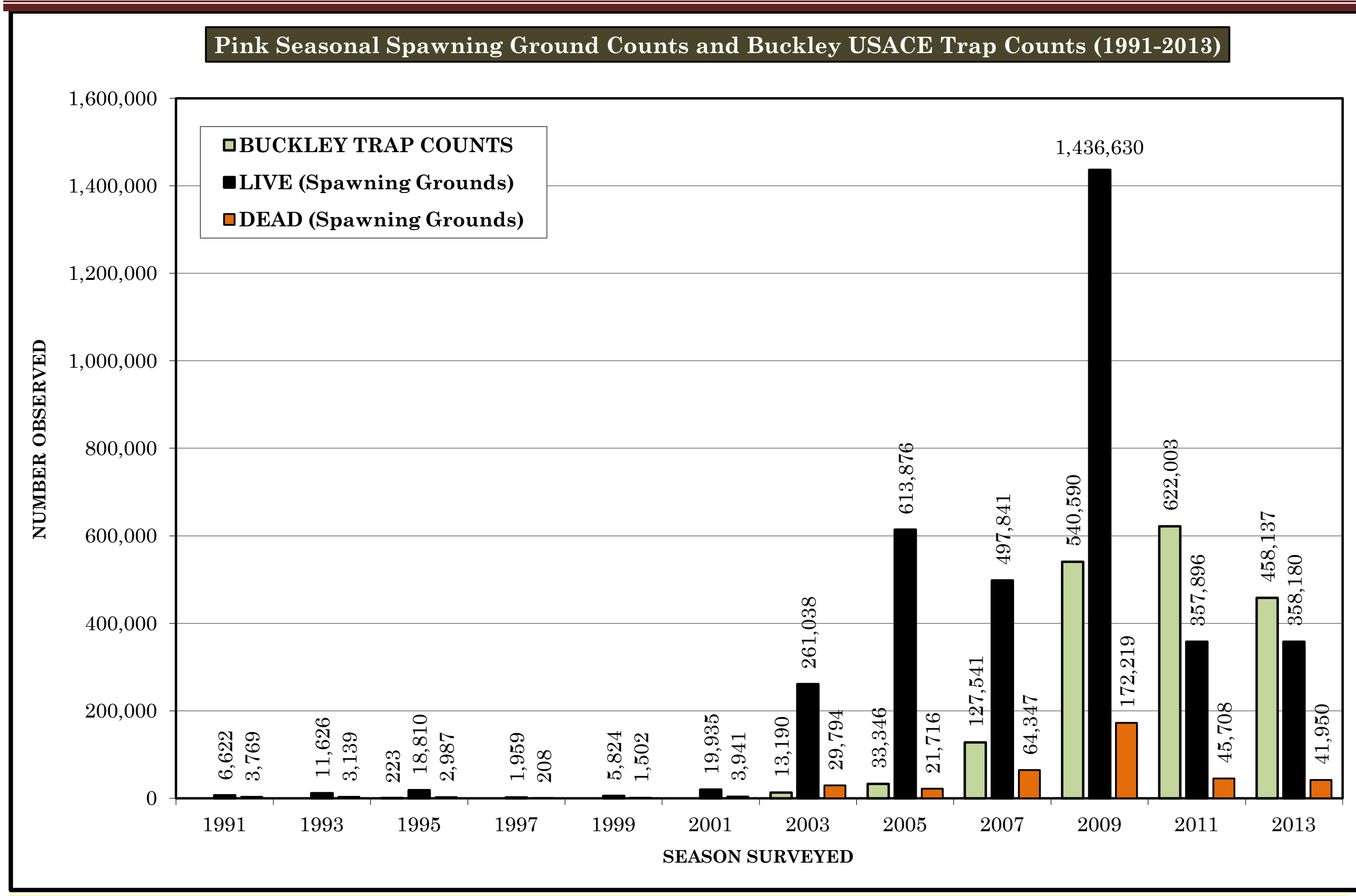


The live and dead totals in this graph do not include the coho observed above RM 24.3 on the White River; actual escapement totals are known from the USACE Buckley trap counts.





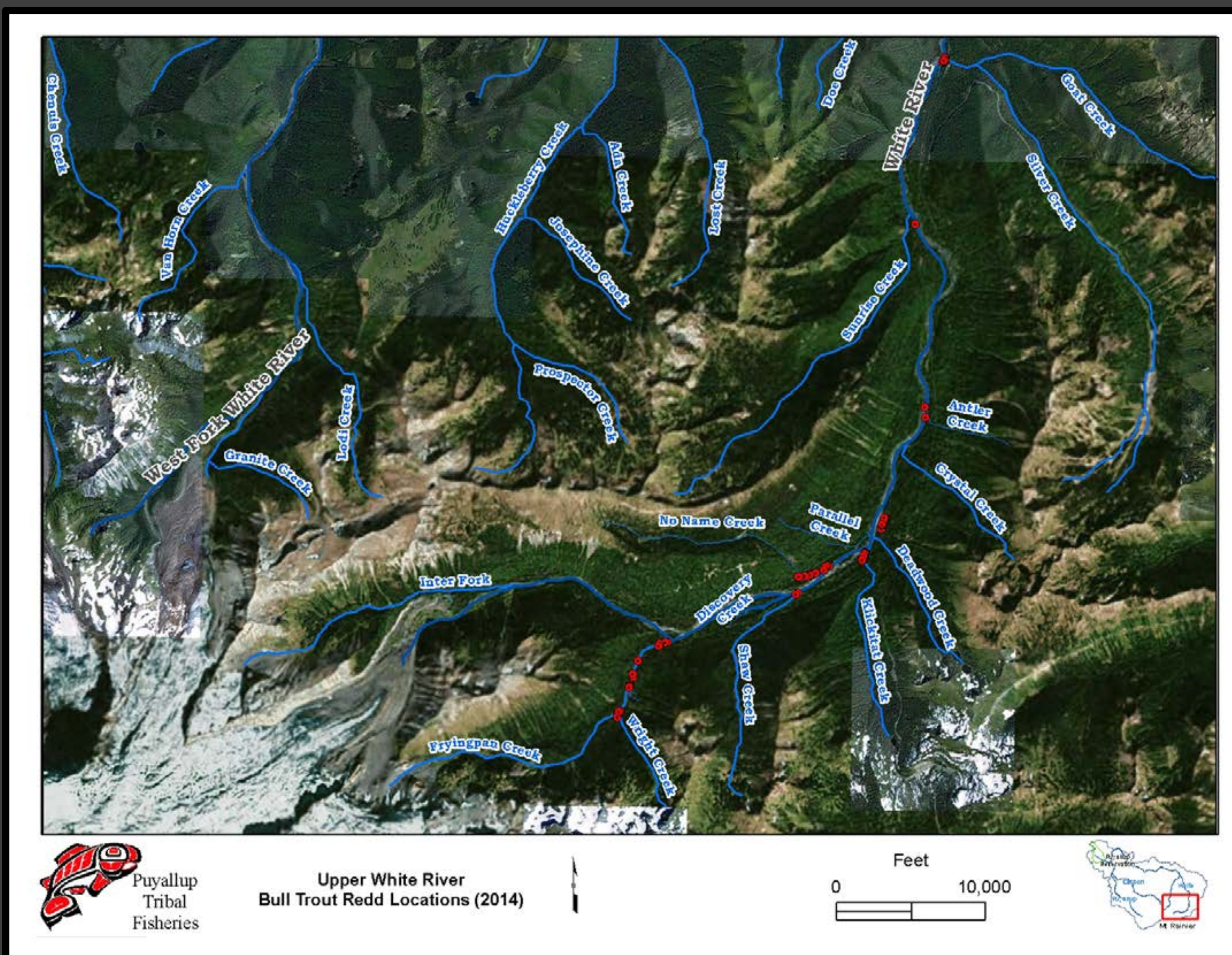
The live, dead, and redds totals in this graph do not include the steelhead or redds observed above RM 24.3 on the White River; actual escapement totals are known from the USACE Buckley trap counts.



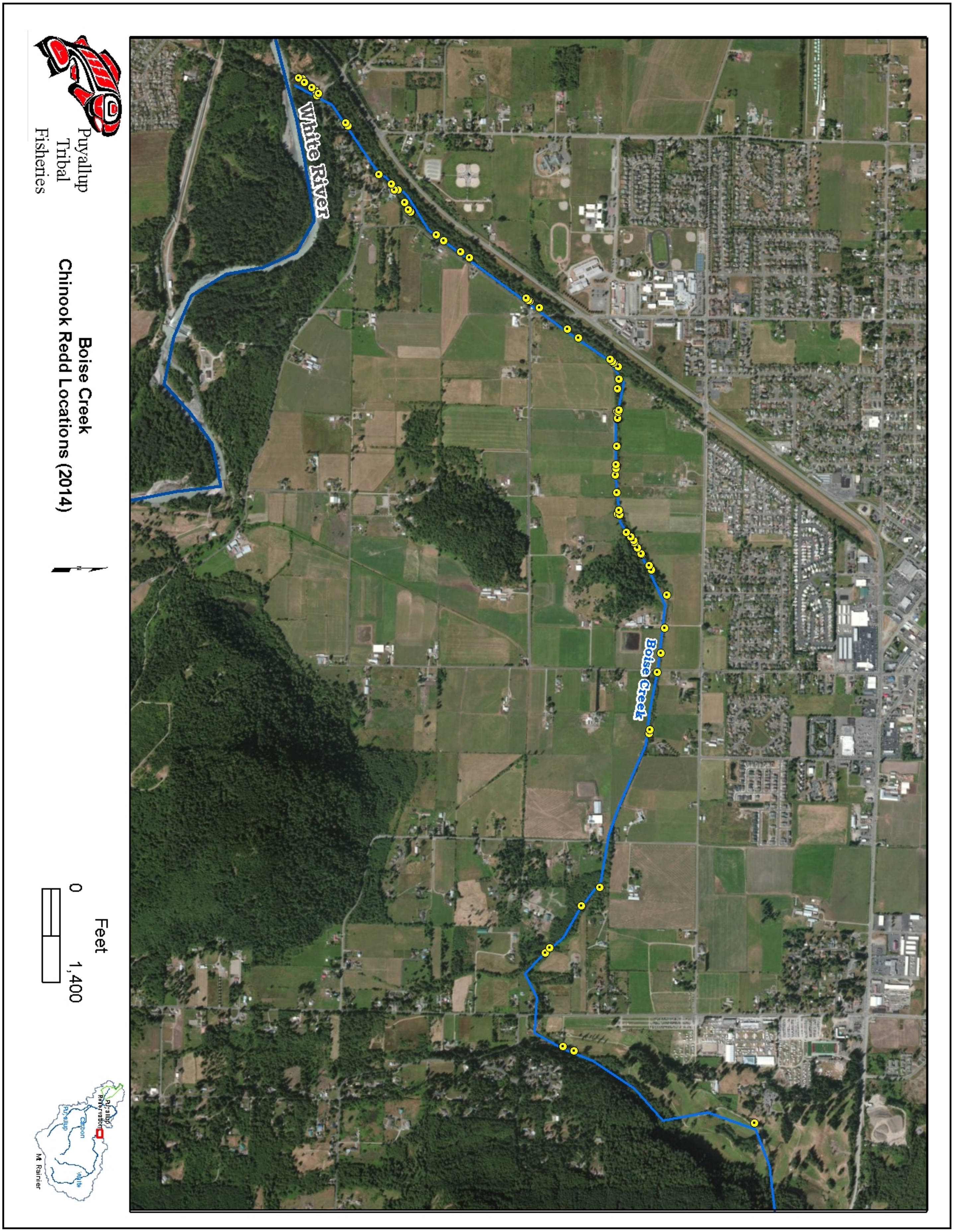
The live and dead totals in this graph do not include the pink salmon observed above RM 24.3 on the White River; actual escapement totals are known from the USACE Buckley trap counts.

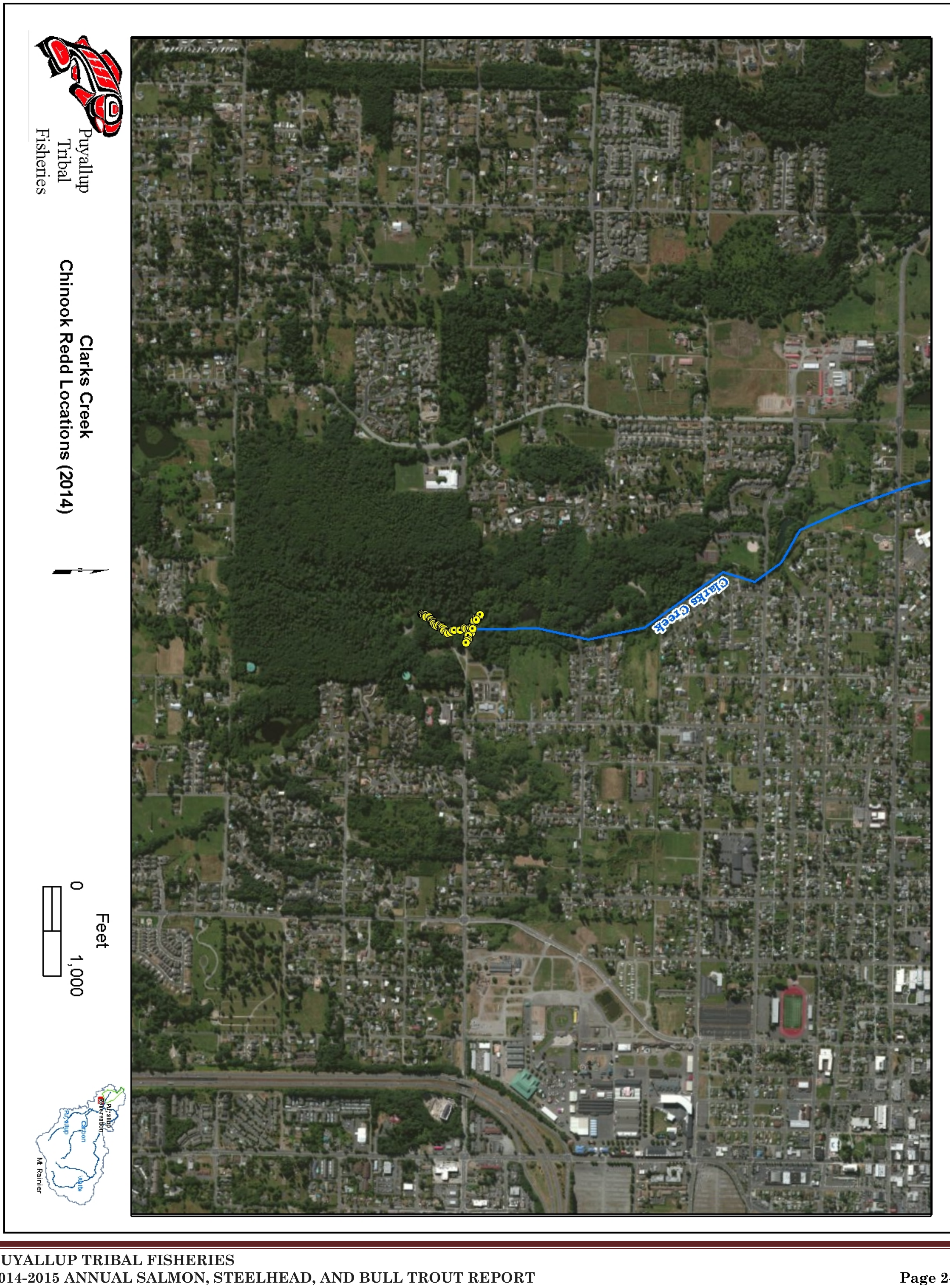
2014-2015

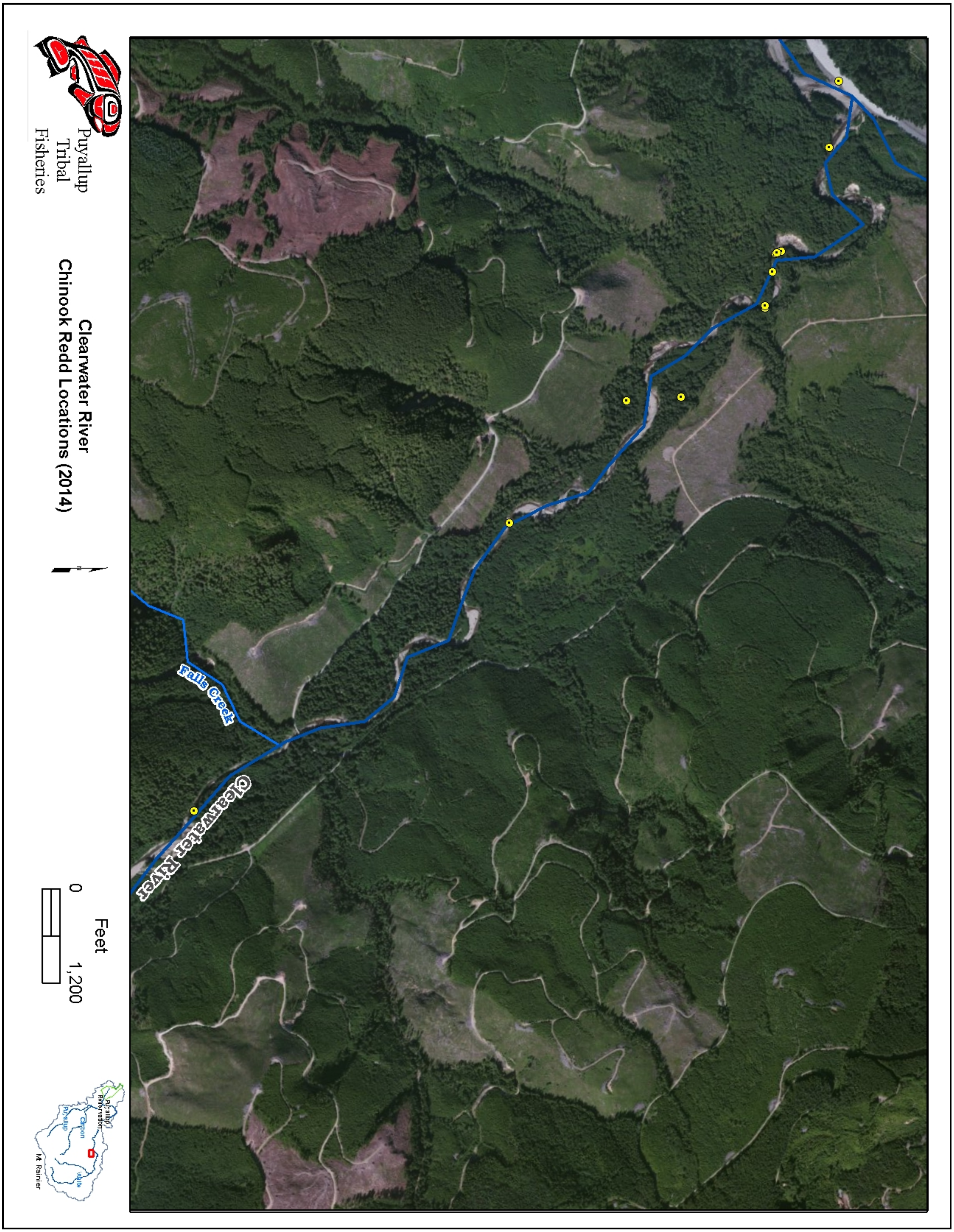
CHINOOK, BULL TROUT AND STEELHEAD REDD LOCATIONS (GPS)

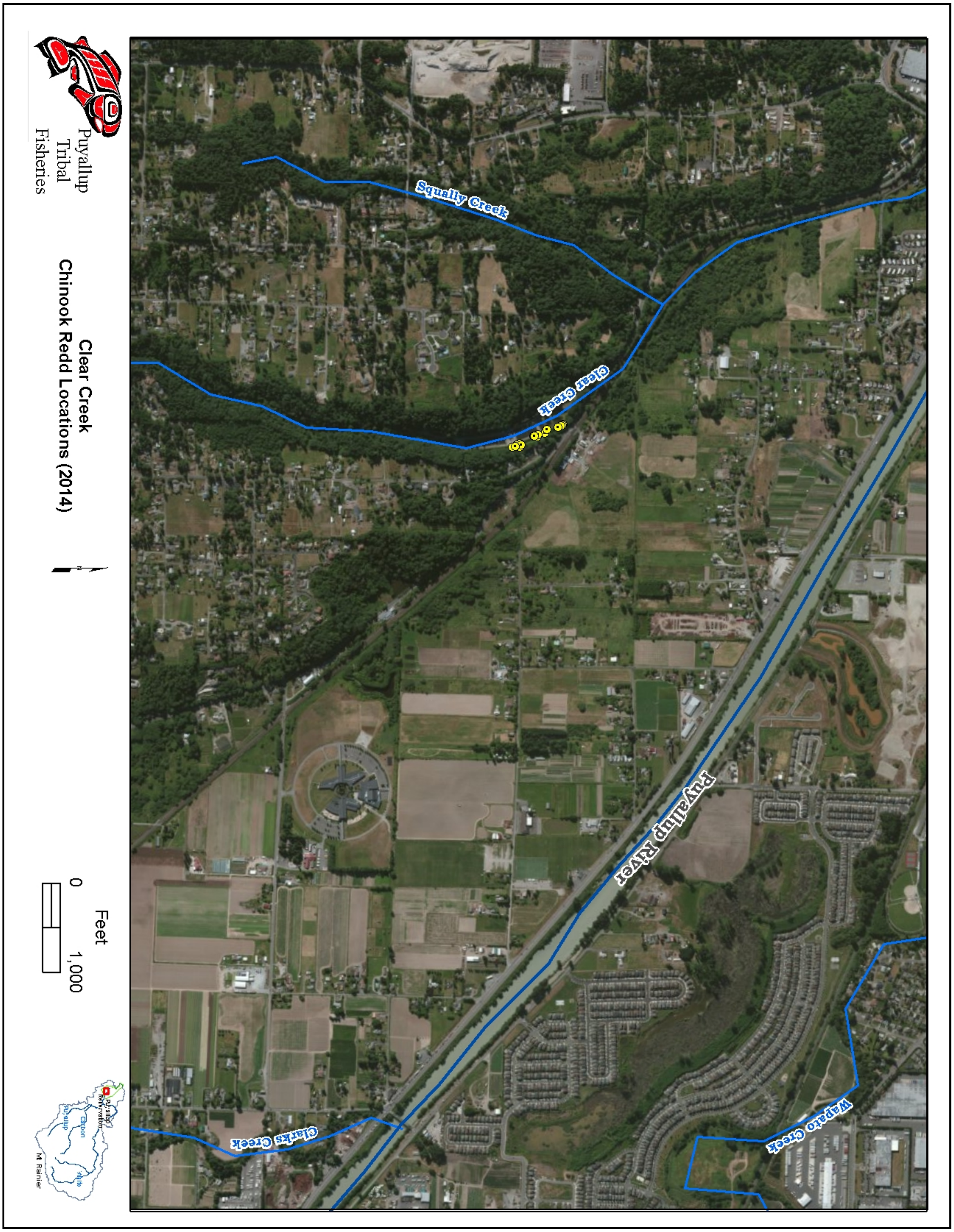


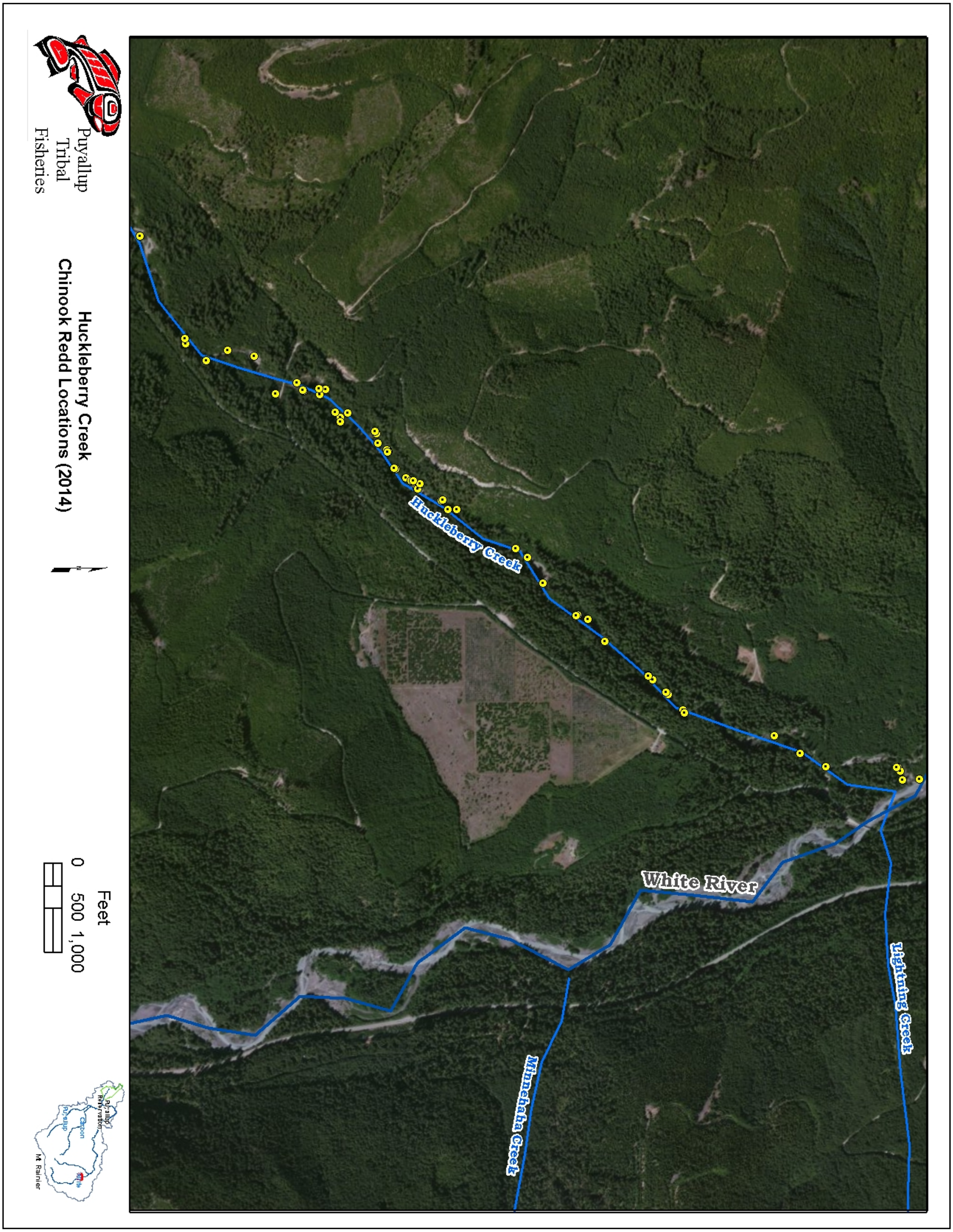
APPENDIX B

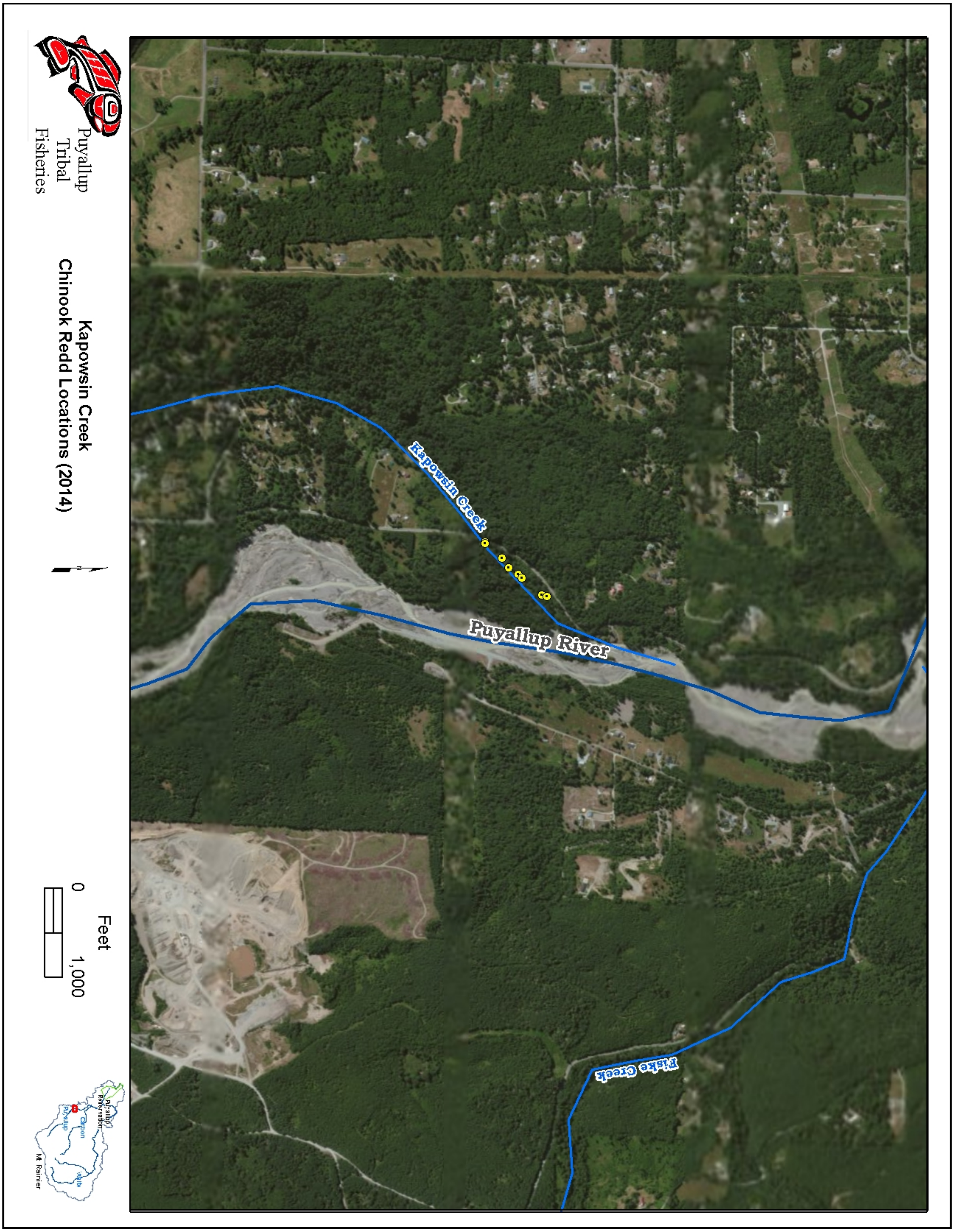

Puyallup
Tribal
Fisheries
Boise Creek
Chinook Redd Locations (2014)
Feet
0
1,400
White River
Boise Creek
Puyallup Reservation
Puyallup
Carbon
White
Mt Rainier


Puyallup
Tribal
Fisheries
Clarks Creek
Chinook Redd Locations (2014)
Feet
0
1,000
Clarks Creek

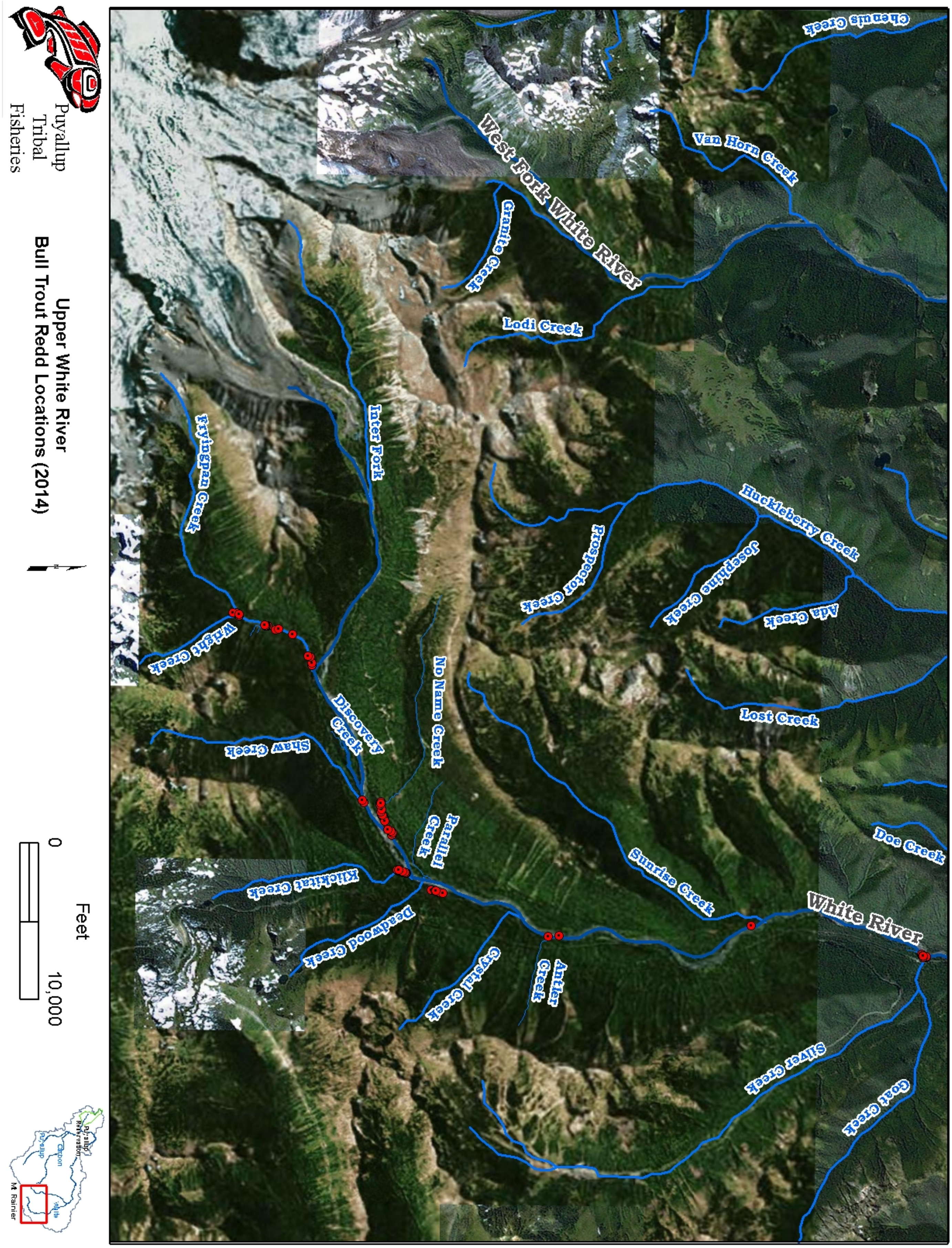

Clearwater River
Chinook Redd Locations (2014)
Puyallup
Tribal
Fisheries
Falls Creek
Clearwater River
Feet
0
1,200
M Rainier

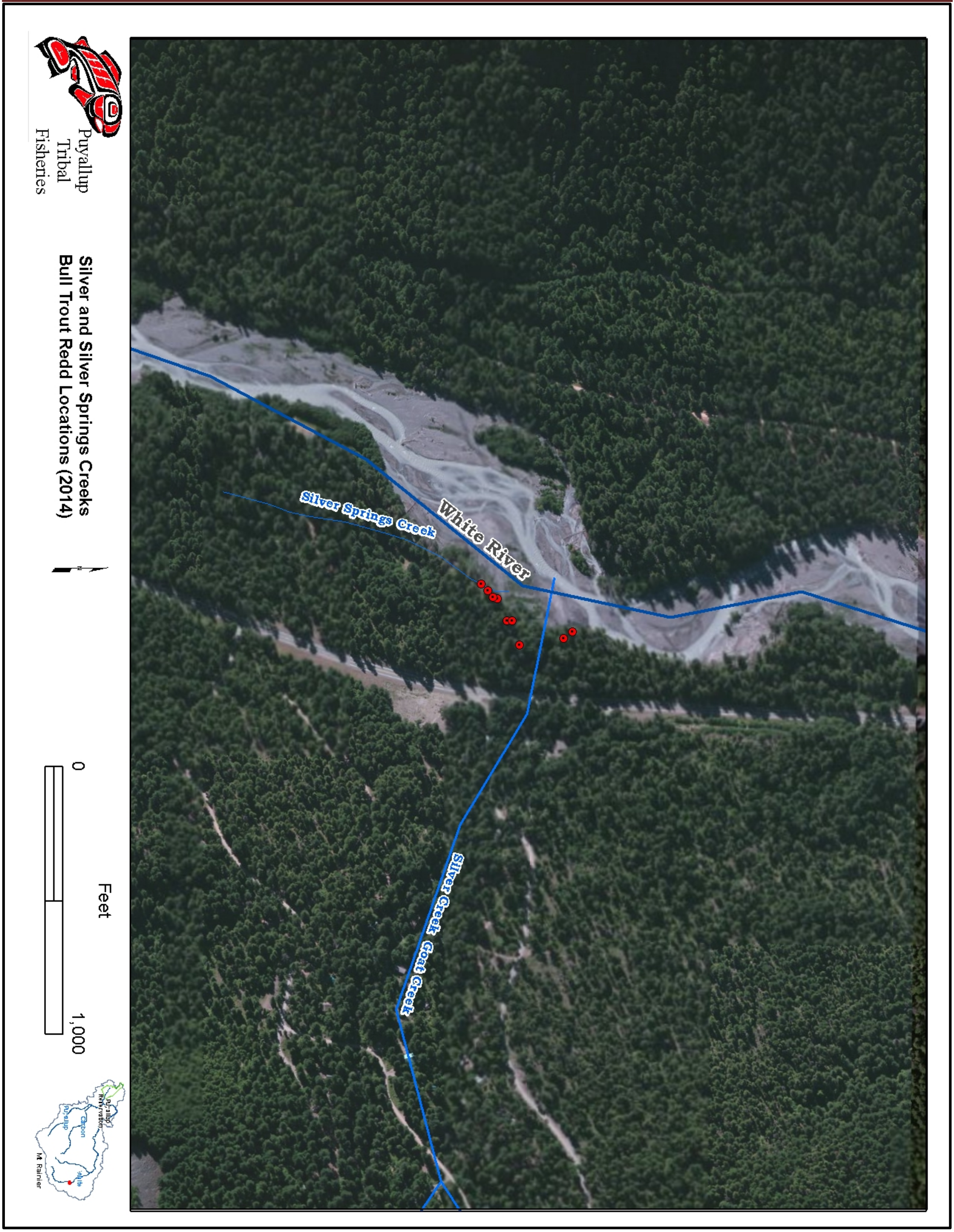

Puyallup
Tribal
Fisheries
Clear Creek
Chinook Redd Locations (2014)
Feet
0
1,000
Squally Creek
Clear Creek
Puyallup River
Clarks Creek
Wapato Creek

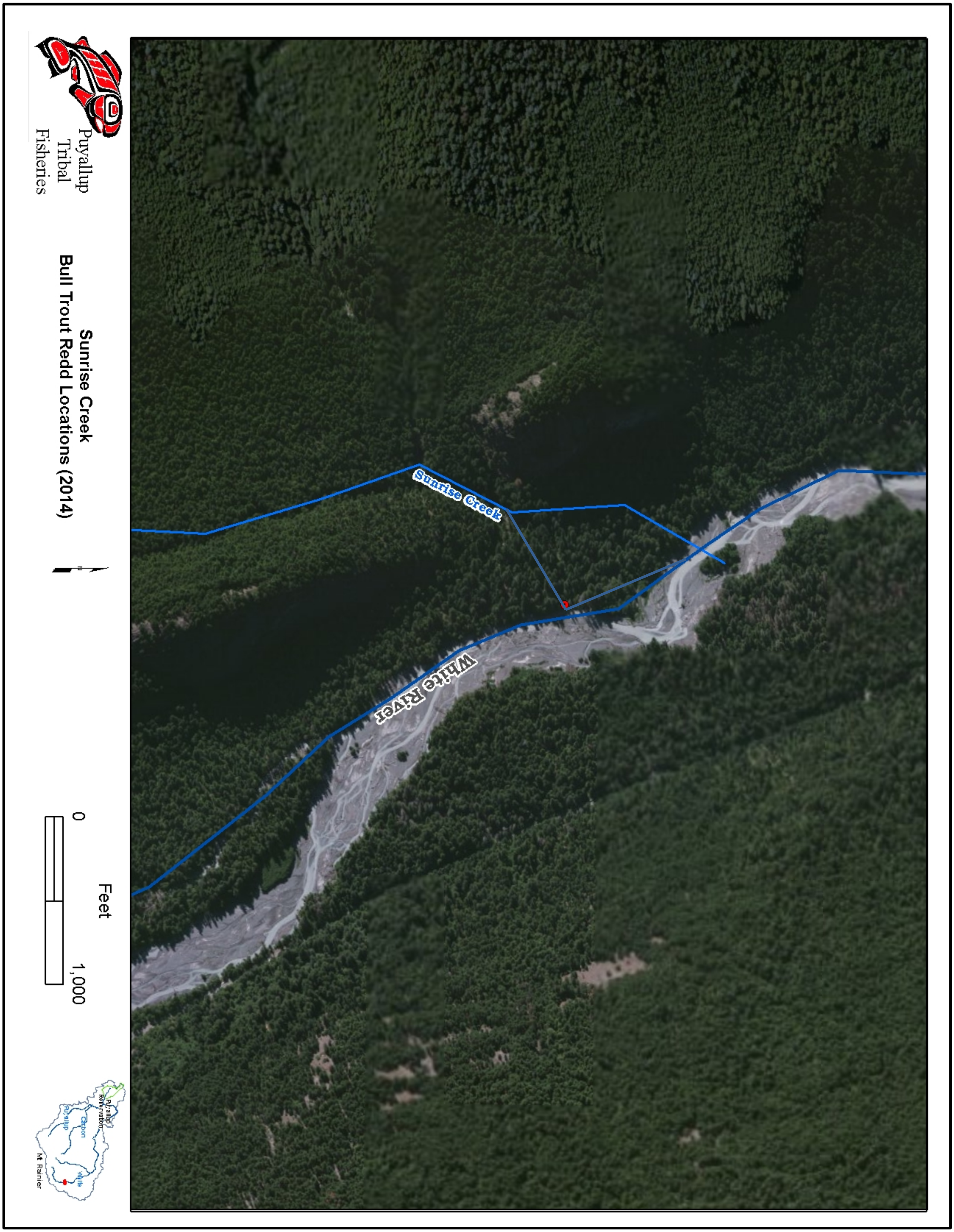

Puyallup
Tribal
Fisheries
Huckleberry Creek
Chinook Redd Locations (2014)
Feet
0 500 1,000
Huckleberry Creek
White River
Lightning Creek
Minnehaha Creek


Puyallup
Tribal
Fisheries
Kapowsin Creek
Chinook Redd Locations (2014)
Feet
0
1,000
Kapowsin Creek
Puyallup River
Fiske Creek

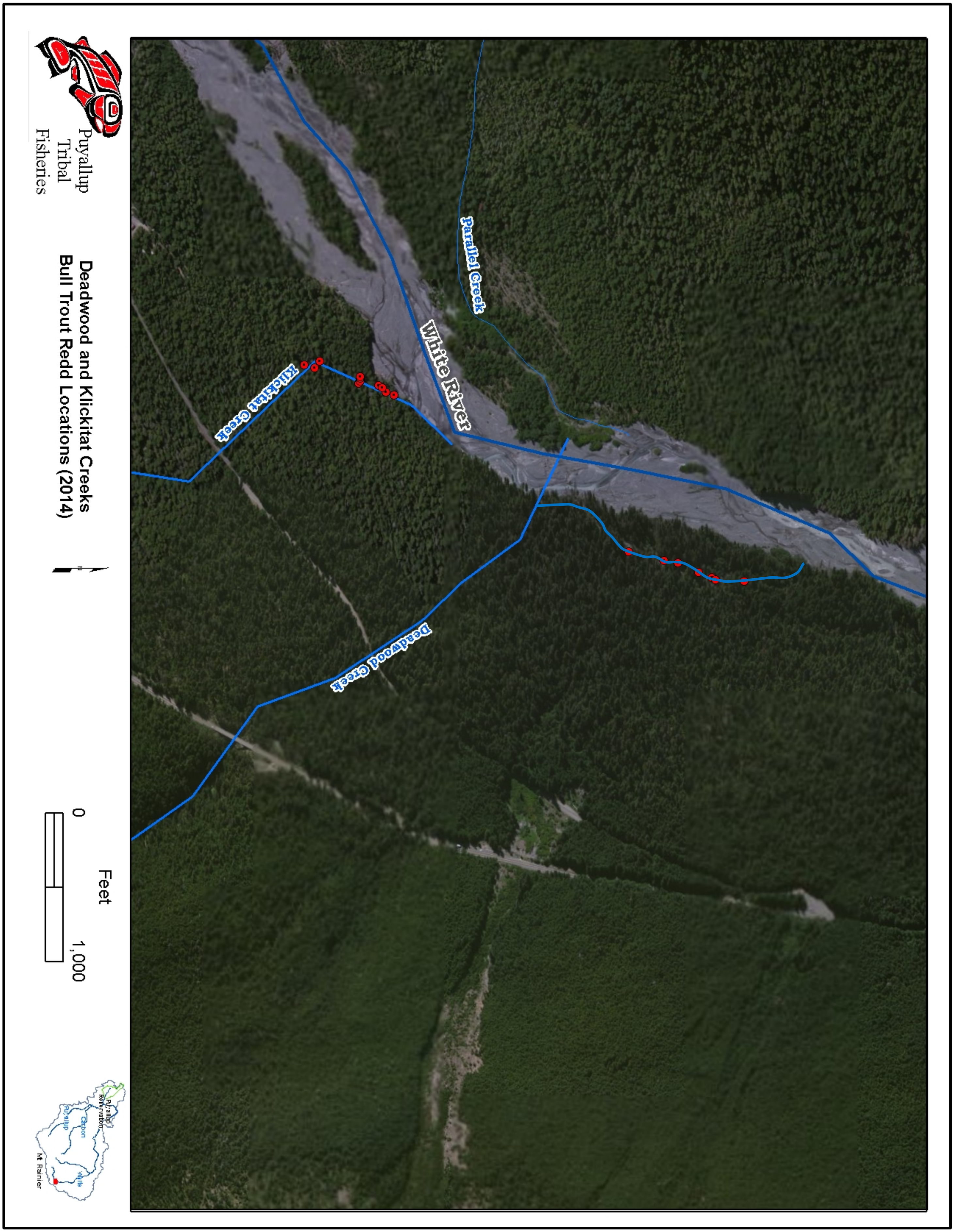

Puyallup
Tribal
Fisheries
Salmon Creek
Chinook Redd Locations (2014)
White River
Salmon Creek
Feet
0
1,000

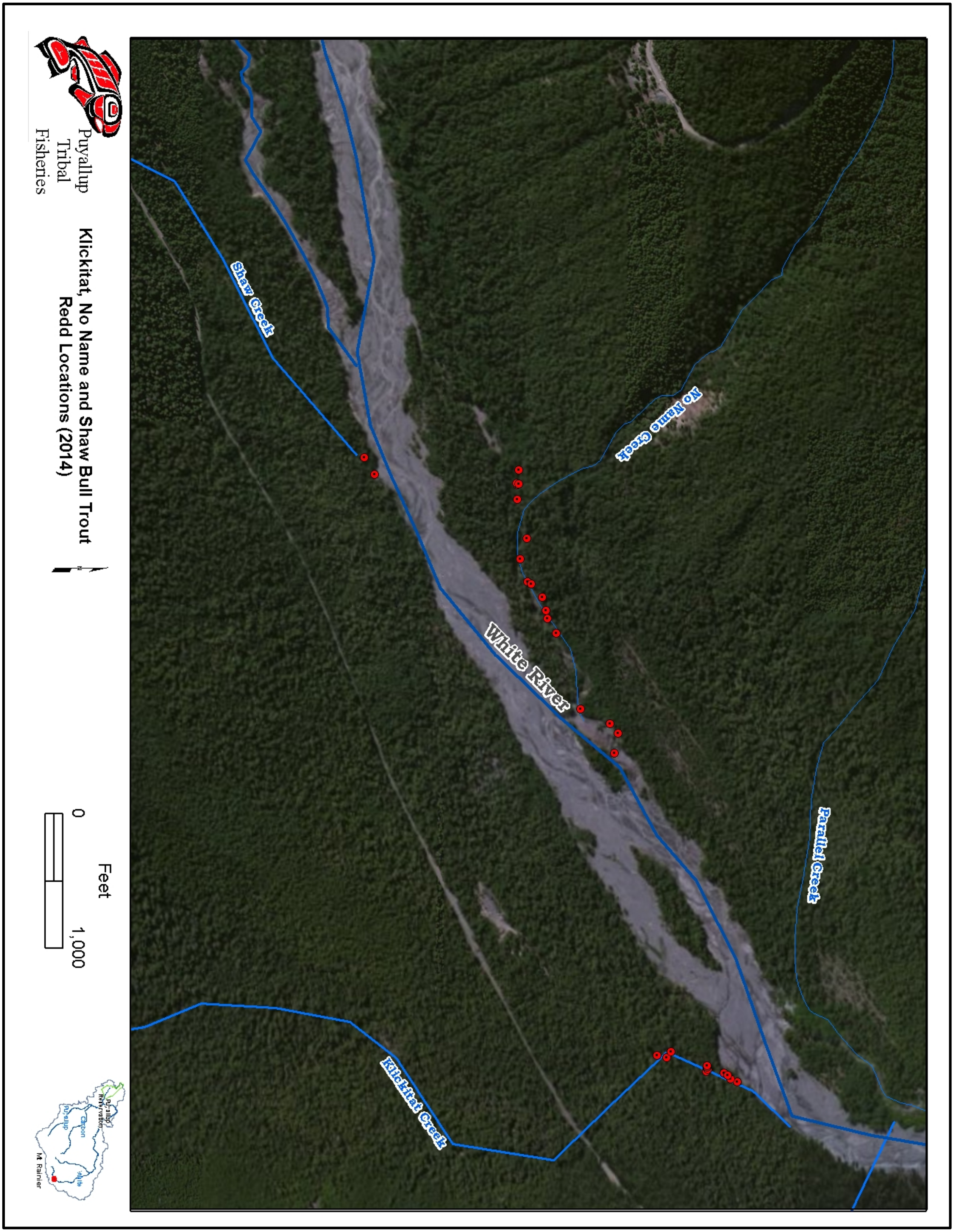

Puyallup
Tribal
Fisheries
Upper White River
Bull Trout Redd Locations (2014)
Feet
0
10,000
West Fork White River
White River
Chenuis Creek
Van Horn Creek
Granite Creek
Lodi Creek
Inter Fork
Fryingpan Creek
Huckleberry Creek
Prospector Creek
Josephine Creek
Ada Creek
Wright Creek
No Name Creek
Lost Creek
Discovery Creek
Shaw Creek
Parallel Creek
Doe Creek
Sunrise Creek
Klickitat Creek
Deadwood Creek
Antler Creek
Crystal Creek
Silver Creek
Goat Creek
Mt Rainier


Puyallup
Tribal
Fisheries
Silver and Silver Springs Creeks
Bull Trout Redd Locations (2014)
White River
Silver Springs Creek
Silver Creek
Goat Creek
Feet
0
1,000
Puyallup Reservation
Puyallup
Carbon
White
Mt Rainier

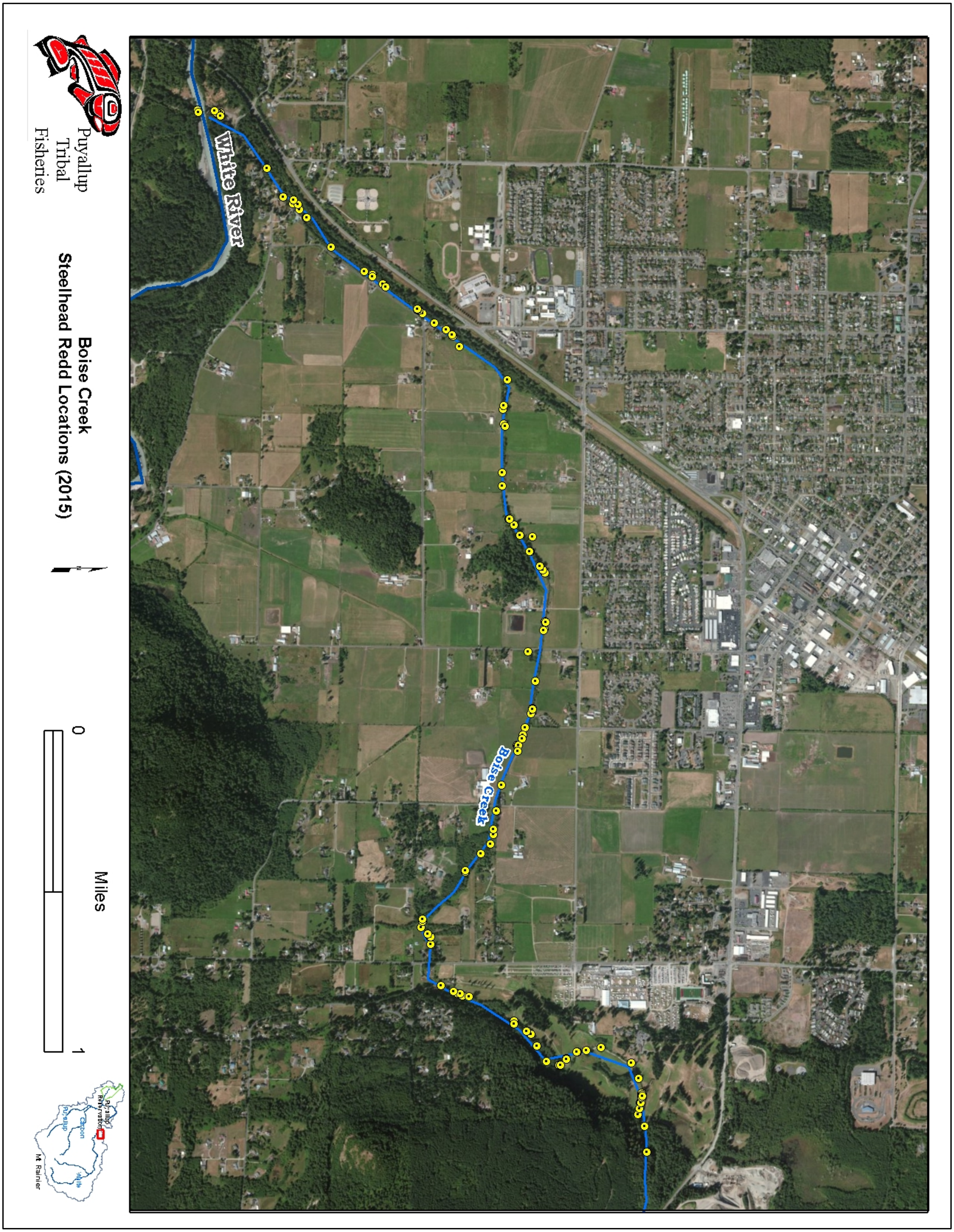

Puyallup
Tribal
Fisheries
Sunrise Creek
Bull Trout Redd Locations (2014)
0
Feet
1,000
Sunrise Creek
White River

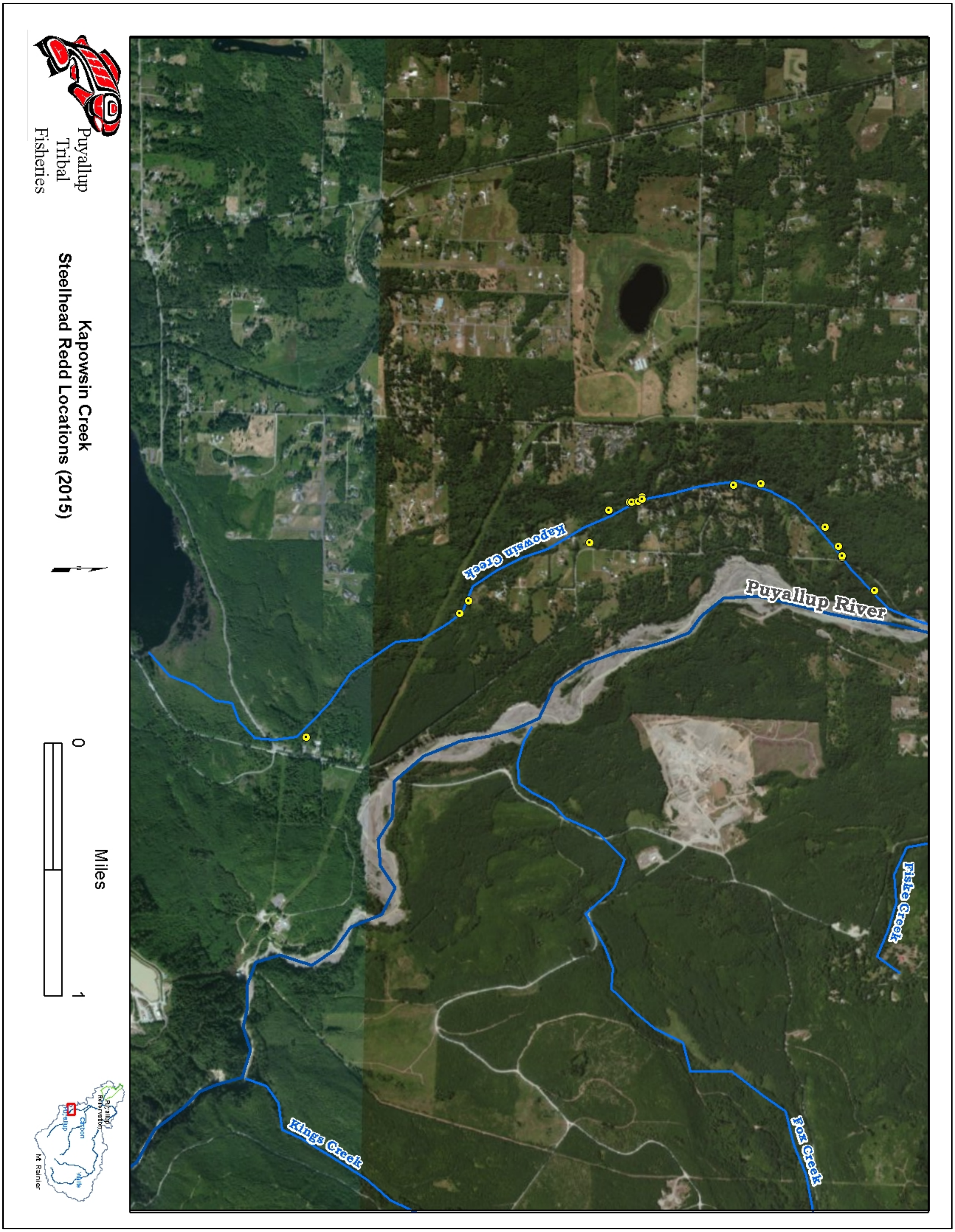

Puyallup
Tribal
Fisheries
Antler Creek
Bull Trout Redd Locations (2014)
0
Feet
1,000
White River
Antler Creek
Mt Rainier

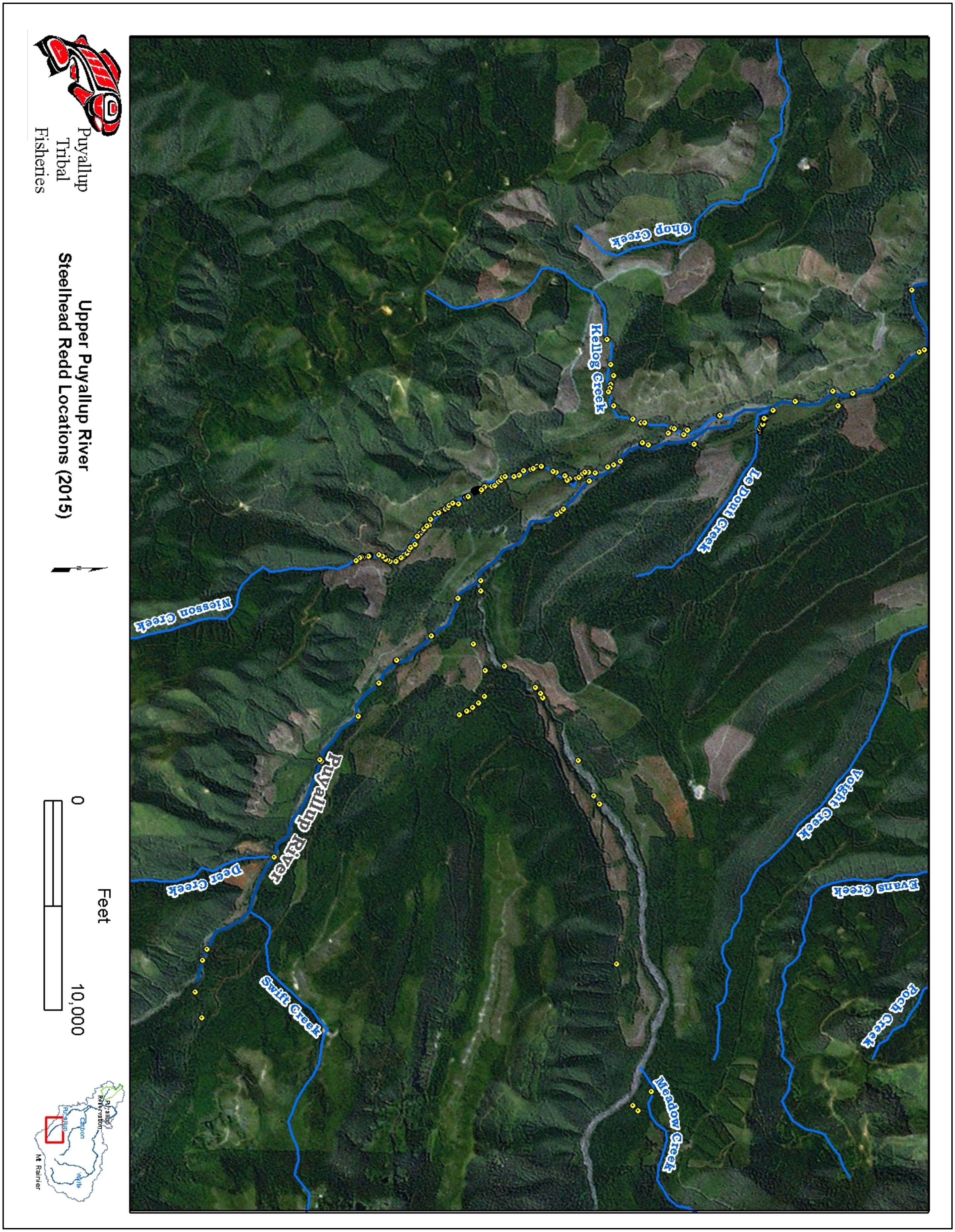

Puyallup
Tribal
Fisheries
Deadwood and Klickitat Creeks
Bull Trout Redd Locations (2014)
White River
Parallel Creek
Klickitat Creek
Deadwood Creek
0
Feet
1,000
Puyallup Reservation
Puyallup
Carbon
White
Mt Rainier

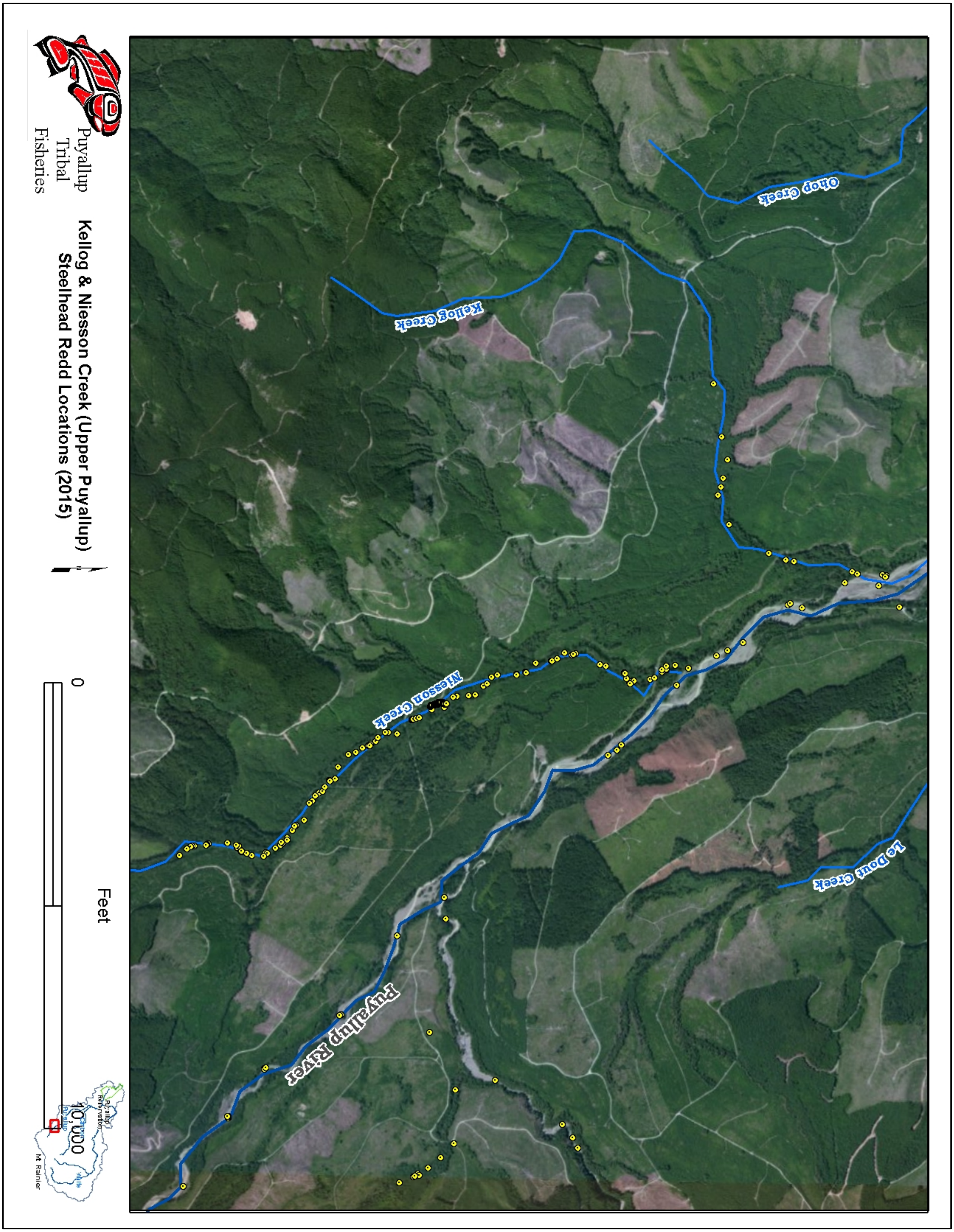

Puyallup
Tribal
Fisheries
Klickitat, No Name and Shaw Bull Trout
Redd Locations (2014)
Feet
0
1,000
Shaw Creek
No Name Creek
White River
Parallel Creek
Klickitat Creek

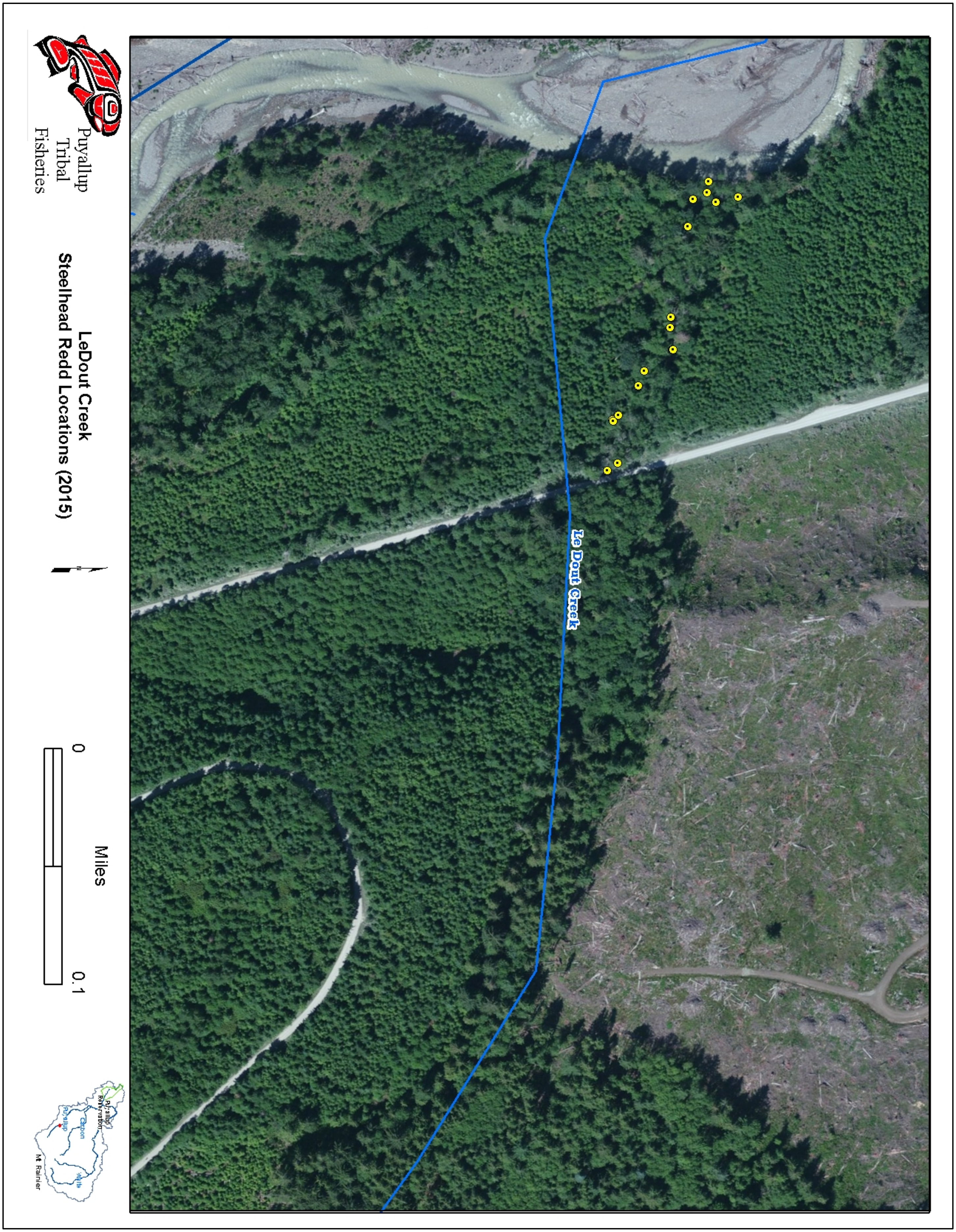

Puyallup
Tribal
Fisheries
Fryingpan, Winzig and Wright Creeks
Bull Trout Redd Locations (2014)
Feet
0
1,000
Wright Creek
Winzig Creek
Fryingpan Creek
White River

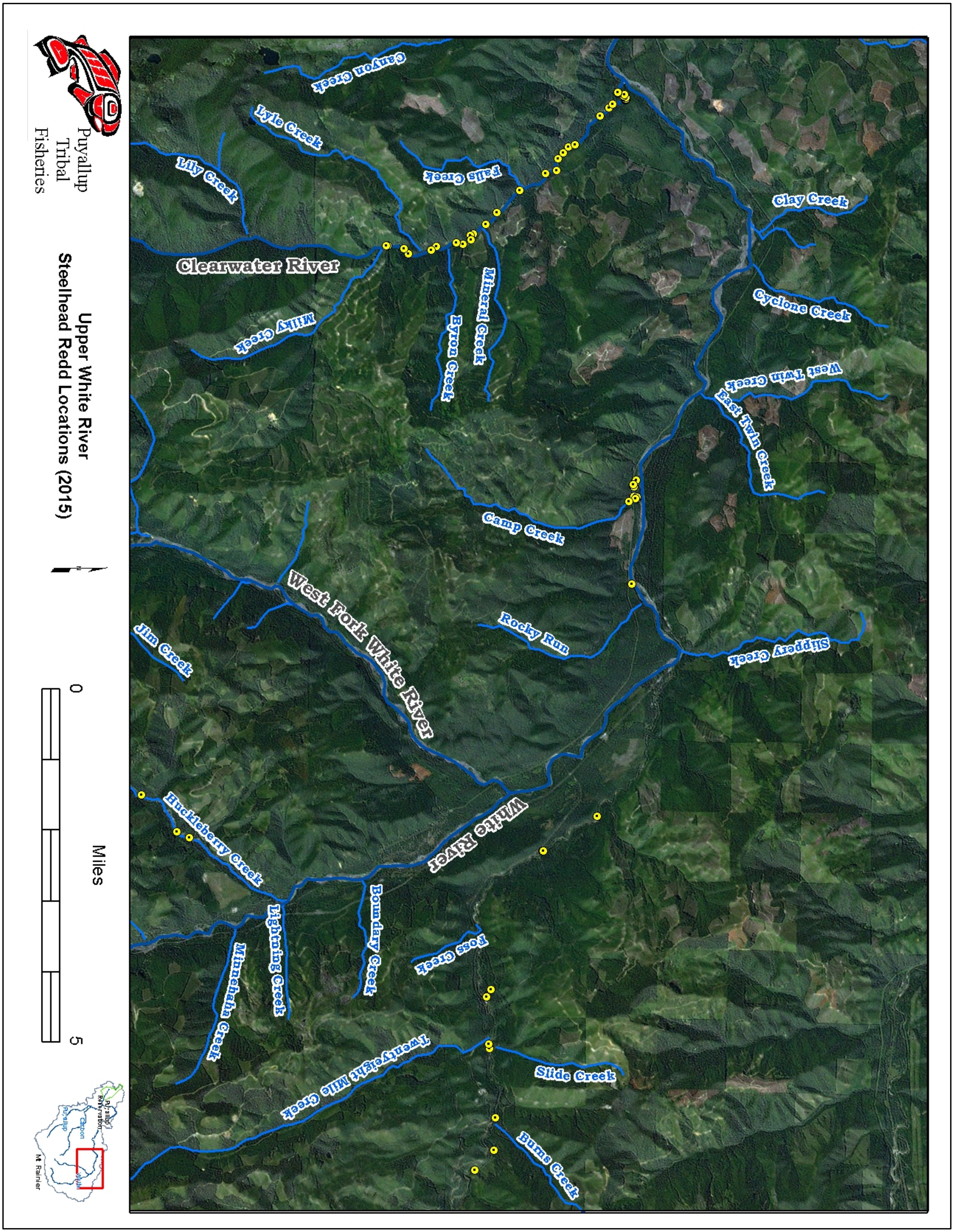

Puyallup
Tribal
Fisheries
Boise Creek
Steelhead Redd Locations (2015)
White River
Boise Creek
0
Miles
1

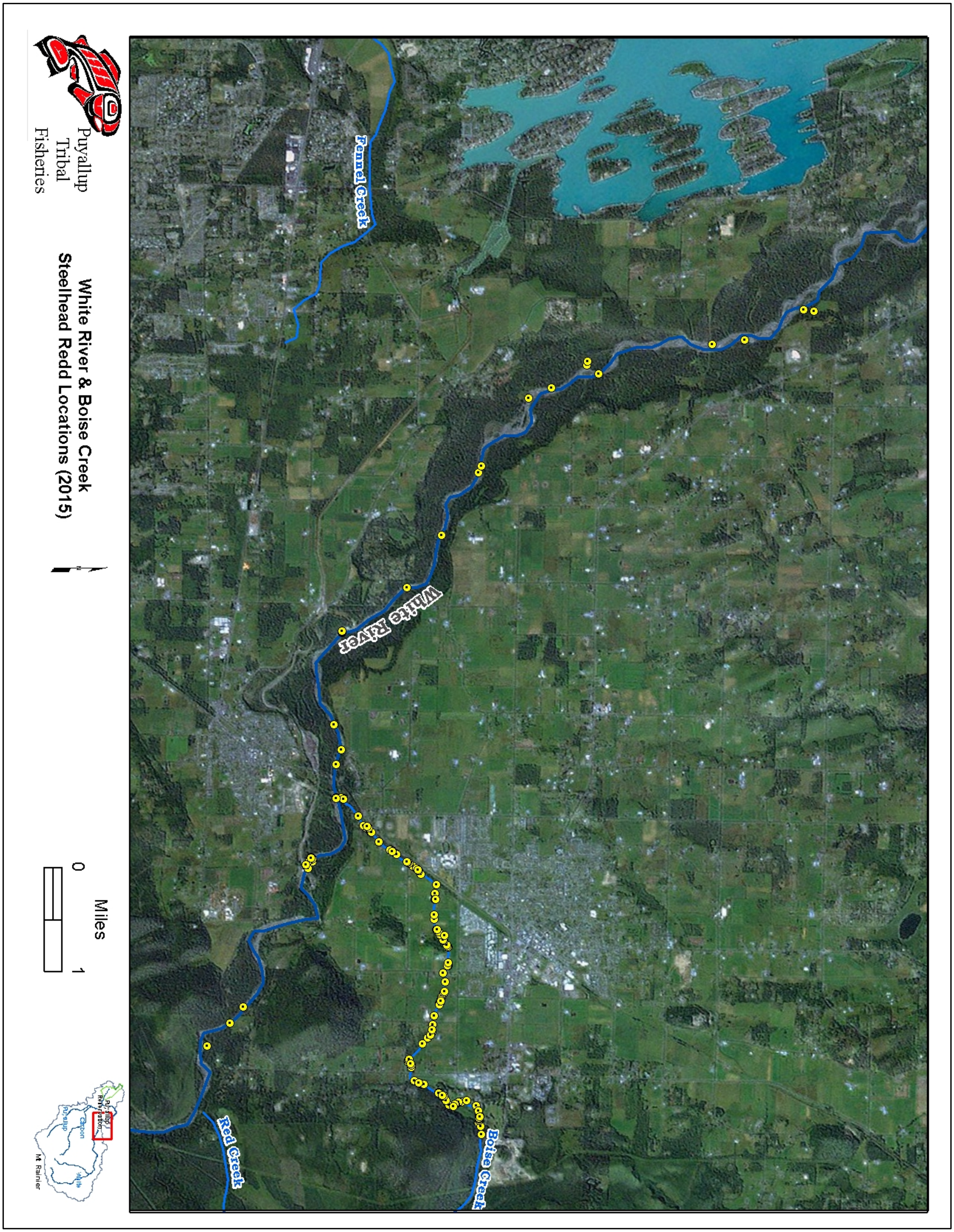

Puyallup
Tribal
Fisheries
Kapowsin Creek
Steelhead Redd Locations (2015)
Kapowsin Creek
Puyallup River
Fiske Creek
Fox Creek
Kings Creek
0
Miles
1
Mt Rainier


Puyallup
Tribal
Fisheries
Upper Puyallup River
Steelhead Redd Locations (2015)
0
Feet
10,000
Ohop Creek
Kellog Creek
Le Dout Creek
Niesson Creek
Puyallup River
Voight Creek
Evans Creek
Deer Creek
Swift Creek
Poch Creek
Meadow Creek
Mt Rainier


Puyallup
Tribal
Fisheries
Kellog & Niesson Creek (Upper Puyallup)
Steelhead Redd Locations (2015)
0
Feet
10,000
Ohop Creek
Kellog Creek
Niesson Creek
Puyallup River
Le Dout Creek
Mt Rainier


Puyallup
Tribal
Fisheries
LeDout Creek
Steelhead Redd Locations (2015)
Le Dout Creek
Miles
0
0.1
Mt Rainier


Puyallup
Tribal
Fisheries
Upper White River
Steelhead Redd Locations (2015)
Miles
0
5
Canyon Creek
Lyle Creek
Lily Creek
Falls Creek
Clearwater River
Milky Creek
Byron Creek
Mineral Creek
Clay Creek
Cyclone Creek
West Twin Creek
East Twin Creek
Camp Creek
West Fork White River
Rocky Run
Slippery Creek
Jim Creek
Huckleberry Creek
White River
Boundary Creek
Lightning Creek
Minnehaha Creek
Ross Creek
Twentyeight Mile Creek
Slide Creek
Burns Creek
M. Rainier


Puyallup
Tribal
Fisheries
White River & Boise Creek
Steelhead Redd Locations (2015)
Miles
0
1
Fennel Creek
White River
Red Creek
Boise Creek

2014-2015
SALMON, STEELHEAD AND BULL TROUT SPAWNING DATA

APPENDIX C

2014 CHINOOK SPAWNING DATA

STREAM	WRIA	DATE	LOWER R.M.	UPPER R.M.	LIVE	DEAD	REDDS
BOISE	10.0057	8/21/14	0.0	2.2	0	0	0
BOISE	10.0057	9/4/14	0.0	4.5	2	0	2
BOISE	10.0057	9/18/14	0.0	4.5	15	2	6
BOISE	10.0057	10/3/14	0.0	4.5	85	80	60
BOISE	10.0057	10/20/14	0.0	4.5	7	9	11
BOISE	10.0057	10/30/14	0.0	4.5	1	1	0
BOISE	10.0057	11/13/14	0.0	4.5	0	1	0
			BOISE	Total	110	93	79
					LIVE	DEAD	REDDS
CANYON	10.XXXX	9/3/14	1.0	1.2	0	0	0
CANYON	10.XXXX	10/3/14	1.0	1.2	0	0	0
CANYON	10.XXXX	10/20/14	1.0	1.2	0	0	0
			CANYON	Total	0	0	0
					LIVE	DEAD	REDDS
CANYON FALLS	10.0410	9/4/14	0.3	0.6	0	0	0
CANYON FALLS	10.0410	9/17/14	0.3	0.6	1	0	0
CANYON FALLS	10.0410	9/30/14	0.3	0.6	0	1	1
CANYON FALLS	10.0410	10/8/14	0.3	0.6	0	1	0
			CANYON FALLS	Total	1	2	1
					LIVE	DEAD	REDDS
CLARKS	10.0027	8/22/14	3.4	3.7	0	0	0
CLARKS	10.0027	9/3/14	3.4	3.7	0	0	0
CLARKS	10.0027	9/17/14	3.4	3.7	40	0	13
CLARKS	10.0027	9/30/14	3.4	3.7	273	82	73
CLARKS	10.0027	10/7/14	3.4	3.7	129	146	0
CLARKS	10.0027	10/20/14	3.4	3.7	21	51	0
CLARKS	10.0027	10/30/14	3.4	3.7	0	17	0
CLARKS	10.0027	11/7/14	3.4	3.7	2	0	1
CLARKS	10.0027	11/18/14	3.4	3.7	0	0	0
			CLARKS	Total	465	296	87
					LIVE	DEAD	REDDS
CLEAR	10.0022	8/1/14	1.7	1.9	0	0	0
CLEAR	10.0022	9/3/14	1.7	1.9	19	0	0
CLEAR	10.0022	9/17/14	1.7	1.9	5	0	2
CLEAR	10.0022	9/30/14	1.7	1.9	7	4	3
CLEAR	10.0022	10/9/14	1.7	1.9	10	7	14
CLEAR	10.0022	10/20/14	1.7	1.9	0	3	0
CLEAR	10.0022	10/27/14	1.7	1.9	0	0	0
			CLEAR	Total	41	14	19
					LIVE	DEAD	REDDS

CLEARWATER	10.0080	8/13/14	0.0	1.0	0	0	0
CLEARWATER	10.0080	8/22/14	0.0	1.0	2	0	0
CLEARWATER	10.0080	9/2/14	0.0	1.0	1	0	0
CLEARWATER	10.0080	9/12/14	0.0	3.1	3	0	2
CLEARWATER	10.0080	9/24/14	0.0	3.1	12	1	6
CLEARWATER	10.0080	10/6/14	0.0	3.1	1	0	8
CLEARWATER	10.0080	10/16/14	0.0	3.1	0	0	0
			CLEARWATER	**Total**	**19**	**1**	**16**
					LIVE	**DEAD**	**REDDS**
FENNEL	10.0406	9/4/14	0.0	0.5	0	0	0
FENNEL	10.0406	9/17/14	0.0	0.7	0	0	1
FENNEL	10.0406	9/30/14	0.0	0.7	2	0	3
FENNEL	10.0406	10/9/14	0.0	0.7	0	0	0
			FENNEL	**Total**	**2**	**0**	**4**
					LIVE	**DEAD**	**REDDS**
FOX	10.0608	9/3/14	0.0	0.5	0	0	0
FOX	10.0608	9/19/14	0.0	1.0	0	0	0
FOX	10.0608	9/30/14	0.0	1.0	1	1	9
FOX	10.0608	10/9/14	0.0	1.0	0	0	1
FOX	10.0608	10/21/14	0.0	1.0	0	0	0
			FOX	**Total**	**1**	**1**	**10**
					LIVE	**DEAD**	**REDDS**
Data collected by WDFW							
GREENWATER	10.0122	8/28/14	0.0	2.1	7	2	7
GREENWATER	10.0122	8/29/14	2.1	5.0	25	1	16
GREENWATER	10.0122	9/4/14	5.0	6.2	8	2	4
***GREENWATER**	***10.0122***	9/8/14	0.0	3.9	30	4	9
***GREENWATER**	***10.0122***	9/15/14	2.1	3.4	11	0	4
***GREENWATER**	***10.0122***	9/29/14	0.0	2.1	2	3	4
***GREENWATER**	***10.0122***	10/15/14	0.0	3.4	0	1	0
			GREENWATER	**Total**	**83**	**13**	**44**
					LIVE	**DEAD**	**REDDS**
HYLEBOS	10.0006	9/29/14	0.1	0.7	0	0	0
			HYLEBOS		**0**	**0**	**0**
					LIVE	**DEAD**	**REDDS**
HUCKLEBERRY	10.0253	8/14/14	0.0	0.5	3	0	0
HUCKLEBERRY	10.0253	8/26/14	0.0	1.0	8	0	2
HUCKLEBERRY	10.0253	8/27/14	1.0	3.0	15	2	7
HUCKLEBERRY	10.0253	9/9/14	0.0	3.0	48	6	26
HUCKLEBERRY	10.0253	9/22/14	0.0	1.9	8	6	14
HUCKLEBERRY	10.0253	9/29/14	0.0	1.9	1	1	3
HUCKLEBERRY	10.0253	10/3/14	0.0	1.0	0	0	0
			HUCKLEBERRY	**Total**	**83**	**15**	**52**
					LIVE	**DEAD**	**REDDS**

KAPOWSIN	10.0600	9/3/14	0.0	0.5	0	0	0
KAPOWSIN	10.0600	9/19/14	0.0	0.5	0	0	2
KAPOWSIN	10.0600	9/30/14	0.0	1.6	8	6	8
KAPOWSIN	10.0600	10/9/14	0.0	0.5	0	3	0
KAPOWSIN	10.0600	10/21/14	0.0	1.2	0	0	0
			KAPOWSIN	**Total**	**8**	**9**	**10**
					LIVE	**DEAD**	**REDDS**
LEDOUT	10.0620	9/24/14	0.0	0.4	0	0	0
LEDOUT	10.0620	10/22/14	0.0	0.4	0	0	0
			LEDOUT	**Total**	**0**	**0**	**0**
					LIVE	**DEAD**	**REDDS**
RUSHINGWATER	10.0625	9/24/14	0.0	1.0	1	0	0
RUSHINGWATER	10.0625	10/27/14	0.0	1.0	0	0	0
			RUSHINGWATER	**Total**	**1**	**0**	**0**
					LIVE	**DEAD**	**REDDS**
SALMON	10.0035	10/1/14	0.0	1.0	8	1	6
SALMON	10.0035	10/9/14	0.0	1.0	9	5	5
SALMON	10.0035	10/20/14	0.0	1.0	0	1	0
SALMON	10.0035	10/27/14	0.0	1.0	0	0	0
			SALMON CREEK	**Total**	**17**	**7**	**11**
					LIVE	**DEAD**	**REDDS**
SALMON TRIB	10.0036	10/1/14	0.0	0.1	2	0	2
SALMON TRIB	10.0036	10/9/14	0.0	0.1	0	0	0
SALMON TRIB	10.0036	10/20/14	0.0	0.1	0	0	0
SALMON TRIB	10.0036	10/27/14	0.0	0.1	0	0	0
			SALMON TRIB	**Total**	**2**	**0**	**2**
					LIVE	**DEAD**	**REDDS**
SILVER SPRINGS	10.0332A	9/23/14	0.0	0.3	0	0	0
SILVER SPRINGS	10.0332A	10/8/14	0.0	0.3	0	0	0
			SILVER SPRINGS	**Total**	**0**	**0**	**0**
					LIVE	**DEAD**	**REDDS**
***Data collected by WDFW**							
***SOUTH PRAIRIE**	***10.0429***	9/3/14	0.3	10.2	2	2	1
***SOUTH PRAIRIE**	***10.0429***	9/11/14	0.3	10.2	24	0	13
***SOUTH PRAIRIE**	***10.0429***	9/18/14	0.3	12.6	137	9	53
***SOUTH PRAIRIE**	***10.0429***	9/23/14	0.3	3.8	53	16	34
***SOUTH PRAIRIE**	***10.0429***	9/25/14	3.8	12.6	72	17	25
***SOUTH PRAIRIE**	***10.0429***	9/30/14	0.3	3.8	11	29	14
***SOUTH PRAIRIE**	***10.0429***	10/2/14	3.8	8	10	14	6
***SOUTH PRAIRIE**	***10.0429***	10/7/14	0.3	12.6	4	23	10

***SOUTH PRAIRIE**	***10.0429***	10/9/14	3.8	8	2	8	3
***SOUTH PRAIRIE**	***10.0429***	10/6/14	0.3	12.6	1	0	3
			SOUTH PRAIRIE	**Total**	**316**	**118**	**162**
					LIVE	**DEAD**	**REDDS**
WILKESON	10.0432	9/4/14	0.0	1.0	0	0	0
WILKESON	10.0432	9/17/14	0.0	1.0	0	0	0
WILKESON	10.0432	10/2/14	0.0	1.0	0	0	1
WILKESON	10.0432	10/20/14	0.0	1.0	0	0	0
WILKESON	10.0432	10/28/14	0.0	5.8	0	0	1
WILKESON	10.0432	11/17/14	0.0	5.8	0	0	0
			WILKESON	**Total**	**0**	**0**	**2**
					LIVE	**DEAD**	**REDDS**

	LIVE	DEAD	REDDS
TOTAL (EXCLUDING COUNTS ABOVE BUCKLEY):	**964**	**540**	**387**

2014 BULL TROUT SPAWNING DATA (WHITE RIVER)

STREAM	WRIA	DATE	LOWER R.M.	UPPER R.M.	LIVE	DEAD	REDDS
KLICKITAT	10.0357	9/12/14	0.0	0.3	0	1	2
KLICKITAT	10.0357	10/2/14	0.0	0.3	0	2	6
			KLICKITAT	Total	0	3	8
					LIVE	DEAD	REDDS
SILVER CREEK	10.0313	9/23/14	0.0	0.2	0	0	3
SILVER CREEK	10.0313	10/8/14	0.0	0.2	0	0	1
			SILVER CREEK	Total	0	0	4
					LIVE	DEAD	REDDS
SILVER SPRINGS	10.0332A	9/23/14	0.0	0.3	1	0	6
SILVER SPRINGS	10.0332A	10/8/14	0.0	0.3	0	0	2
			SILVER SPRINGS	Total	1	0	8
					LIVE	DEAD	REDDS
NO-NAME CREEK	10.0364	9/12/14	0.0	0.7	5	0	9
NO-NAME CREEK	10.0364	10/2/14	0.0	0.7	0	1	9
			NO-NAME CREEK	Total	5	1	18
					LIVE	DEAD	REDDS
FRYINGPAN	10.0369	9/12/14	0.0	1.7	5	0	8
FRYINGPAN	10.0369	10/2/14	0.0	1.7	0	0	3
			FRYINGPAN CREEK	Total	5	0	11
					LIVE	DEAD	REDDS
WINZIG CREEK	Fryingpan Tributary	9/12/14	0.0	0.1	0	0	0
WINZIG CREEK	Fryingpan Tributary	10/2/14	0.0	0.1	0	0	5
			WINZIG CREEK	Total	0	0	5
					LIVE	DEAD	REDDS
WRIGHT CREEK	10.0370	9/12/14	0.0	0.2	1	0	2
WRIGHT CREEK	10.0370	10/2/14	0.0	0.2	0	0	2
			WRIGHT CREEK	Total	1	0	4
					LIVE	DEAD	REDDS
DEADWOOD	10.0355	9/12/14	0.0	0.5	0	0	0
DEADWOOD	10.0355	10/2/14	0.0	0.5	0	0	2
			DEADWOOD CREEK	Total	0	0	2
					LIVE	DEAD	REDDS

ANTLER CREEK	10.0352	9/23/14	0.0	0.2	0	2	3
ANTLER CREEK	10.0352	10/8/14	0.0	0.2	0	0	0
			ANTLER CREEK	Total	0	2	3
					LIVE	DEAD	REDDS
PARALLEL CREEK	UNIDENTIFIED	10/2/14	0.0	0.6	0	0	0
			PARALLEL CREEK	Total	0	0	0
					LIVE	DEAD	REDDS
DISCOVERY	UNIDENTIFIED	9/12/14	0.0	0.6	0	0	0
			DISCOVERY	Total	0	0	0
					LIVE	DEAD	REDDS
SUNRISE CREEK	10.0337	9/23/14	0.0	0.3	1	0	1
SUNRISE CREEK	10.0337	10/8/14	0.0	0.3	0	0	0
			SUNRISE CREEK	Total	1	0	1
					LIVE	DEAD	REDDS
SHAW CREEK	10.0365	9/12/14	0.0	0.1	0	0	1
SHAW CREEK	10.0365	10/2/14	0.0	0.1	0	0	0
			SHAW CREEK	Total	0	0	1
					LIVE	DEAD	REDDS

	LIVE	DEAD	REDDS
Total:	13	6	65

2014 COHO SALMON SPAWNING DATA

STREAM	WRIA	DATE	LOWER R.M.	UPPER R.M.	LIVE	DEAD
BOISE	10.0057	10/3/14	0.0	4.5	0	0
BOISE	10.0057	10/20/14	0.0	4.5	522	14
BOISE	10.0057	10/30/14	0.0	4.5	467	25
BOISE	10.0057	11/13/14	0.0	4.5	294	51
BOISE	10.0057	12/2/14	0.0	4.5	72	14
BOISE	10.0057	12/9/14	0.0	4.5	160	63
BOISE	10.0057	12/16/14	0.0	4.5	18	62
BOISE	10.0057	12/29/14	2.2	4.5	2	0
			BOISE	**TOTAL:**	**1,535**	**229**
					LIVE	**DEAD**
Surveys conducted by WDFW						
CANYONFALLS	10.0410	9/17/14	0.3	0.6	2	0
CANYONFALLS	10.0410	10/1/14	0.3	0.6	3	1
CANYONFALLS	10.0410	10/9/14	0.3	0.6	2	1
CANYONFALLS	10.0410	10/27/14	0.3	0.6	2	0
CANYONFALLS	10.0410	11/3/14	0.3	0.6	8	2
CANYONFALLS	10.0410	11/12/14	0.3	0.6	0	1
CANYONFALLS	10.0410	11/20/14	0.3	0.6	2	0
CANYONFALLS	10.0410	11/26/14	0.3	0.6	0	0
CANYONFALLS	10.0410	12/2/14	0.3	0.6	0	0
CANYONFALLS	10.0410	12/9/14	0.3	0.6	0	0
CANYONFALLS	10.0410	12/17/14	0.3	0.6	0	0
CANYONFALLS	10.0410	12/23/14	0.3	0.6	0	0
CANYONFALLS	10.0410	12/30/14	0.3	0.6	0	0
CANYONFALLS	10.0410	1/5/15	0.3	0.6	0	0
CANYONFALLS	10.0410	1/15/15	0.3	0.6	0	0
CANYONFALLS	10.0410	1/22/15	0.3	0.6	0	0
			CANYONFALLS	**TOTAL:**	**19**	**5**
					LIVE	**DEAD**
CARBON RIVER	10.0027	11/14/14	0.0	6.0	25	0
CARBON RIVER	10.0027	12/3/14	0.0	6.0	0	0
			CARBON RIVER	**TOTAL:**	**25**	**0**
					LIVE	**DEAD**
CLARKS	10.0027	10/7/14	3.4	3.7	0	0
CLARKS	10.0027	10/20/14	3.4	3.7	4	0
CLARKS	10.0027	10/30/14	3.4	3.7	7	2
CLARKS	10.0027	11/7/14	3.4	3.7	3	1
CLARKS	10.0027	11/18/14	3.4	3.7	0	2
CLARKS	10.0027	11/24/14	3.4	3.7	0	1
CLARKS	10.0027	12/4/14	3.4	3.7	1	0
CLARKS	10.0027	12/12/14	3.4	3.7	0	0
			CLARKS	**TOTAL:**	**15**	**6**
					LIVE	**DEAD**

CLEAR	10.0022	10/20/14	1.7	1.9	0	0
CLEAR	10.0022	10/27/14	1.7	1.9	10	1
CLEAR	10.0022	11/7/14	1.7	1.9	3	0
CLEAR	10.0022	11/18/14	1.7	1.9	4	0
CLEAR	10.0022	11/24/14	1.7	1.9	0	0
CLEAR	10.0022	12/4/14	1.7	1.9	0	0
CLEAR	10.0022	12/10/14	1.7	1.9	0	0
			CLEAR	**TOTAL:**	**17**	**1**
					LIVE	**DEAD**
Surveys conducted by WDFW						
COAL MINE	10.0432A	10/22/14	0.0	0.4	0	0
COAL MINE	10.0432A	10/30/14	0.0	0.4	0	0
COAL MINE	10.0432A	11/13/14	0.0	0.4	0	0
COAL MINE	10.0432A	11/20/14	0.0	0.4	0	0
COAL MINE	10.0432A	11/26/14	0.0	0.4	0	0
COAL MINE	10.0432A	12/2/14	0.0	0.4	0	0
COAL MINE	10.0432A	12/9/14	0.0	0.4	0	0
COAL MINE	10.0432A	12/17/14	0.0	0.4	0	0
COAL MINE	10.0432A	12/23/14	0.0	0.4	0	0
COAL MINE	10.0432A	12/30/14	0.0	0.4	4	0
COAL MINE	10.0432A	1/5/15	0.0	0.4	1	0
COAL MINE	10.0432A	1/8/15	0.0	0.4	3	0
COAL MINE	10.0432A	1/15/15	0.0	0.4	0	0
COAL MINE	10.0432A	1/22/15	0.0	0.4	2	2
COAL MINE	10.0432A	1/30/15	0.0	0.4	0	1
COAL MINE	10.0432A	2/6/15	0.0	0.4	0	0
			COAL MINE	**TOTAL:**	**10**	**3**
					LIVE	**DEAD**
Surveys conducted by WDFW						
FENNEL CREEK	10.0406	10/9/14	0.0	0.7	0	0
FENNEL CREEK	10.0406	10/27/14	0.0	1.1	0	0
FENNEL CREEK	10.0406	11/3/14	0.0	1.1	0	1
FENNEL CREEK	10.0406	11/12/14	0.0	1.1	0	0
FENNEL CREEK	10.0406	11/20/14	0.0	1.1	0	0
FENNEL CREEK	10.0406	11/26/14	0.0	1.1	0	0
FENNEL CREEK	10.0406	12/3/14	0.0	1.1	0	0
FENNEL CREEK	10.0406	12/9/14	0.0	1.1	0	0
FENNEL CREEK	10.0406	12/17/14	0.0	1.1	0	0
FENNEL CREEK	10.0406	12/23/14	0.0	1.1	0	0
FENNEL CREEK	10.0406	12/30/14	0.0	1.1	0	0
FENNEL CREEK	10.0406	1/8/15	0.0	1.1	0	0
			FENNEL CREEK	**TOTAL:**	**0**	**1**
					LIVE	**DEAD**
Surveys conducted by WDFW						
FISKE	10.0596	10/27/14	0.2	0.4	0	0
FISKE	10.0596	11/3/14	0.3	1.1	5	0
FISKE	10.0596	11/12/14	0.3	1.1	0	0
FISKE	10.0596	11/20/14	0.3	1.1	0	0
FISKE	10.0596	12/3/14	0.3	1.1	0	0
FISKE	10.0596	12/9/14	0.3	1.1	0	0
FISKE	10.0596	12/17/14	0.3	1.1	0	0

FISKE	10.0596	12/23/14	0.3	1.1	0	1
			FISKE CREEK	TOTAL:	5	1
					LIVE	DEAD
FOX	10.0608	10/9/14	0.0	1.0	0	0
FOX	10.0608	10/21/14	0.0	1.0	56	45
FOX	10.0608	10/28/14	0.0	1.0	142	32
FOX	10.0608	11/4/14	0.0	1.0	79	46
FOX	10.0608	11/11/14	0.0	1.0	44	11
FOX	10.0608	11/18/14	0.0	1.0	2	0
FOX	10.0608	12/4/14	0.0	1.0	0	0
			FOX	TOTAL:	323	134
					LIVE	DEAD
HUCKLEBERRY	10.0253	10/3/14	0.0	1.0	0	0
HUCKLEBERRY	10.0253	10/15/14	0.0	1.0	7	0
			HUCKLEBERRY	TOTAL:	7	0
					LIVE	DEAD
HYLOBOS	10.0014	11/18/14	0.1	0.7	0	0
HYLOBOS	10.0006		0.1	0.7		
HYLOBOS	10.0006		0.1	0.7		
HYLOBOS	10.0006		0.1	0.7		
			HYLOBOS	TOTAL:	0	0
					LIVE	DEAD
KAPOWSIN	10.0600	9/30/14	0.0	1.6	0	0
KAPOWSIN	10.0600	10/9/14	0.0	0.5	6	3
KAPOWSIN	10.0600	10/21/14	0.0	3.2	21	4
KAPOWSIN	10.0600	11/3/14	0.0	3.2	34	5
KAPOWSIN	10.0600	11/19/14	0.0	3.2	0	14
			KAPOWSIN	TOTAL:	61	26
					LIVE	DEAD
LE DOUT	10.0620	10/22/14	0.0	0.4	7	2
LE DOUT	10.0620	11/11/14	0.0	0.4	11	0
LE DOUT	10.0620	11/20/14	0.0	0.4	2	3
LE DOUT	10.0620	12/9/14	0.0	0.4	0	0
			LE DOUT	TOTAL:	20	5
					LIVE	DEAD
PUYALLUP RIVER	10.0021	11/19/14	16.8	26.5	0	1
			PUYALLUP RIVER	TOTAL:	0	1
					LIVE	DEAD
RODY	10.0028	10/27/14	0.4	0.5	0	0
RODY	10.0028	11/7/14	0.4	0.5	0	0
RODY	10.0028	11/18/14	0.4	0.5	0	0
RODY	10.0028	11/24/14	0.4	0.5	0	0
			RODY	TOTAL:	0	0
					LIVE	DEAD

RUSHINGWATER	10.0625	9/24/14	0.0	1.0	2	0
RUSHINGWATER	10.0625	10/27/14	0.0	1.2	268	63
RUSHINGWATER	10.0625	11/11/14	0.0	1.2	81	16
RUSHINGWATER	10.0625	11/20/14	0.0	1.2	23	3
RUSHINGWATER	10.0625	12/9/14	0.0	1.0	0	0
			RUSHINGWATER	**TOTAL:**	**374**	**82**
					LIVE	**DEAD**
SALMON	10.0035	10/1/14	0.0	1.0	0	0
SALMON	10.0035	10/9/14	0.0	1.0	1	0
SALMON	10.0035	10/20/14	0.0	1.0	0	0
SALMON	10.0035	10/27/14	0.0	1.0	1	1
SALMON	10.0035	11/7/14	0.0	1.0	0	0
SALMON	10.0035	11/17/14	0.0	1.0	0	0
SALMON	10.0035	11/24/14	0.0	1.0	0	0
SALMON	10.0035	12/4/14	0.0	1.0	1	0
SALMON	10.0035	12/11/14	0.0	1.0	0	0
SALMON	10.0035	12/19/14	0.0	1.0	0	0
SALMON	10.0035	12/29/14	0.0	1.0	3	0
SALMON	10.0035	1/9/15	0.0	1.0	0	0
			SALMON	**TOTAL:**	**6**	**1**
					LIVE	**DEAD**
SALMON TRIB.	10.0036	10/1/14	0.0	0.1	0	1
SALMON TRIB.	10.0036	10/9/14	0.0	0.1	0	0
SALMON TRIB.	10.0036	10/20/14	0.0	0.1	3	1
SALMON TRIB.	10.0036	10/27/14	0.0	0.1	1	0
SALMON TRIB.	10.0036	11/7/14	0.0	0.1	3	0
SALMON TRIB.	10.0036	11/17/14	0.0	0.1	0	0
SALMON TRIB.	10.0036	11/24/14	0.0	0.1	0	0
			SALMON TRIB	**TOTAL:**	**7**	**2**
					LIVE	**DEAD**
SILVER SPRINGS	10.0032A	10/8/14	0.0	0.3	17	0
			SILVER SPRINGS	**TOTAL:**	**17**	**0**
					LIVE	**DEAD**
SOUTH PRAIRIE	10.0429	11/14/14	0.0	8.0	115	1
SOUTH PRAIRIE	10.0429	12/3/14	0.0	10.2	26	0
SOUTH PRAIRIE	10.0429	12/16/14	0.0	10.2	12	0
			SOUTH PRAIRIE	**TOTAL:**	**153**	**1**
					LIVE	**DEAD**
SPRING CREEK	10.0430	10/21/14	0.0	0.0	0	0
SPRING CREEK	10.0430	11/14/14	0.0	0.0	2	0
SPRING CREEK	10.0430	12/3/14	0.0	0.0	0	0
SPRING CREEK	10.0430	12/11/14	0.0	0.1	0	0
			SPRING CREEK	**TOTAL:**	**2**	**0**
					LIVE	**DEAD**

SWAN	10.0023	10/27/14	0.3	1.3	0	0
SWAN	10.0023	11/7/14	0.3	1.3	0	1
SWAN	10.0023	11/18/14	0.3	1.3	0	0
SWAN	10.0023	11/24/14	0.3	1.3	0	0
SWAN	10.0023	12/3/14	0.3	1.3	0	0
SWAN	10.0023	12/9/14	0.3	1.3	0	0
SWAN	10.0023	12/19/14	0.3	1.3	0	0
			SWAN	**TOTAL:**	**0**	**1**
					LIVE	**DEAD**
SQUALLY	10.0024	10/27/14	0.0	0.3	0	0
SQUALLY	10.0024	11/7/14	0.0	0.3	0	0
SQUALLY	10.0024	11/18/14	0.0	0.3	0	0
SQUALLY	10.0024	11/24/14	0.0	0.3	0	0
SQUALLY	10.0024	12/4/14	0.0	0.3	1	0
SQUALLY	10.0024	12/10/14	0.0	0.8	0	0
			SQUALLY	**TOTAL:**	**1**	**0**
					LIVE	**DEAD**
WILKESON	10.0432	10/2/14	0.0	1.0	0	0
WILKESON	10.0432	10/20/14	0.0	1.0	5	1
WILKESON	10.0432	10/29/14	0.0	5.8	10	0
WILKESON	10.0432	11/17/14	0.0	5.8	6	0
WILKESON	10.0432	12/2/14	0.0	1.0	0	0
WILKESON	10.0432	12/11/14	0.0	1.0	0	0
			WILKESON	**TOTAL:**	**21**	**1**
					LIVE	**DEAD**

2014 CHUM SPAWNING DATA

STREAM	WRIA	DATE	LOWER RM	UPPER RM	LIVE	DEAD
CANYON	10.XXXX	11/7/14	1.0	1.2	0	0
CANYON	10.XXXX	11/18/14	1.0	1.2	0	0
CANYON	10.XXXX	11/24/14	1.0	1.2	0	0
CANYON	10.XXXX	12/4/14	1.0	1.2	0	0
CANYON	10.XXXX	12/11/14	1.0	1.2	4	0
CANYON	10.XXXX	12/19/14	1.0	1.2	1	1
CANYON	10.XXXX	12/29/14	1.0	1.2	0	1
CANYON	10.XXXX	1/8/15	1.0	1.2	0	0
			CANYON	**TOTAL:**	**5**	**2**
					LIVE	**DEAD**
Surveys conducted by WDFW						
CANYONFALLS	***10.0410***	10/27/14	0.3	0.6	0	0
CANYONFALLS	***10.0410***	11/3/14	0.3	0.6	0	0
CANYONFALLS	***10.0410***	11/12/14	0.3	0.6	0	0
CANYONFALLS	***10.0410***	11/20/14	0.3	0.6	0	0
CANYONFALLS	***10.0410***	11/26/14	0.3	0.6	0	0
CANYONFALLS	***10.0410***	12/2/14	0.3	0.6	13	0
CANYONFALLS	***10.0410***	12/9/14	0.3	0.6	33	4
CANYONFALLS	***10.0410***	12/17/14	0.3	0.6	51	26
CANYONFALLS	***10.0410***	12/23/14	0.3	0.6	67	62
CANYONFALLS	***10.0410***	12/30/14	0.3	0.6	65	64
CANYONFALLS	***10.0410***	1/5/15	0.3	0.6	41	126
CANYONFALLS	***10.0410***	1/15/15	0.3	0.6	13	0
			CANYONFALLS	**TOTAL:**	**283**	**282**
					LIVE	**DEAD**
CARBON	10.0413	11/14/14	0.0	6.0	47	0
CARBON	10.0413	12/3/14	0.0	6.0	35	11
			CARBON	**TOTAL:**	**82**	**11**
					LIVE	**DEAD**
CLARKS	10.0027	11/7/14	3.4	3.7	0	0
CLARKS	10.0027	11/18/14	3.4	3.7	31	8
CLARKS	10.0027	11/24/14	3.4	3.7	227	65
CLARKS	10.0027	12/4/14	3.4	3.7	117	85
CLARKS	10.0027	12/12/14	3.4	3.7	363	351
CLARKS	10.0027	12/19/14	3.4	3.7	109	137
CLARKS	10.0027	12/29/14	3.4	3.7	188	144
CLARKS	10.0027	1/8/15	3.4	3.7	104	159
CLARKS	10.0027	1/20/15	3.4	3.7	147	77

CLARKS	10.0027	2/2/15	3.4	3.7	23	34
CLARKS	10.0027	2/12/15	3.4	3.7	0	4
			CLARKS	**TOTAL:**	**1,309**	**1,064**
					LIVE	**DEAD**
CLEAR	10.0022	11/7/14	1.7	1.9	0	0
CLEAR	10.0022	11/18/14	1.7	1.9	1	0
CLEAR	10.0022	11/24/14	1.7	1.9	67	3
CLEAR	10.0022	12/4/14	1.7	1.9	147	32
CLEAR	10.0022	12/10/14	1.7	1.9	310	110
CLEAR	10.0022	12/19/14	1.7	1.9	189	307
CLEAR	10.0022	12/29/14	1.7	1.9	112	203
CLEAR	10.0022	1/8/15	1.7	1.9	63	18
CLEAR	10.0022	1/20/15	1.7	1.9	10	27
CLEAR	10.0022	2/2/15	1.7	1.9	3	7
CLEAR	10.0022	2/12/15	1.7	1.9	0	0
			CLEAR	**TOTAL:**	**902**	**707**
					LIVE	**DEAD**
DIRU	10.0029	11/11/14	0.0	0.5		18
DIRU	10.0029	11/21/14	0.0	0.5		49
DIRU	10.0029	12/2/14	0.0	0.5		198
DIRU	10.0029	12/12/14	0.0	0.5		279
DIRU	10.0029	12/19/14	0.0	0.5		123
DIRU	10.0029	12/23/14	0.0	0.5		134
DIRU	10.0029	12/29/14	0.0	0.5		83
DIRU	10.0029	1/5/15	0.0	0.5		116
DIRU	10.0029	1/12/15	0.0	0.5		86
			DIRU	**TOTAL:**		**1,086**
					LIVE	**DEAD**
Surveys conducted by WDFW						
FENNEL (+tributary)	***10.0406***	10/1/14	0.0	0.7	1	0
FENNEL (+tributary)	***10.0406***	10/27/14	0.0	1.9	5	0
FENNEL (+tributary)	***10.0406***	11/3/14	0.0	1.9	27	3
FENNEL (+tributary)	***10.0406***	11/12/14	0.0	1.9	116	9
FENNEL (+tributary)	***10.0406***	11/20/14	0.0	1.9	160	75
FENNEL (+tributary)	***10.0406***	12/3/14	0.0	1.9	102	86
FENNEL (+tributary)	***10.0406***	12/9/14	0.0	1.9	191	155
FENNEL (+tributary)	***10.0406***	12/17/14	1.7	1.9	232	508
FENNEL (+tributary)	***10.0406***	12/23/14	0.0	1.9	108	396
FENNEL (+tributary)	***10.0406***	12/30/14	0.0	1.9	49	345
FENNEL (+tributary)	***10.0406***	1/8/15	0.0	1.9	17	0

FENNEL (+tributary)	***10.0406***	1/15/15	0.0	1.9	1	0
			FENNEL	**TOTAL:**	**1,009**	**1,577**
					LIVE	**DEAD**
PUYALLUP RIVER	10.0021	11/19/14	16.8	26.5	1	0
			PUYALLUP RIV-ER	**TOTAL:**	**1**	**0**
					LIVE	**DEAD**
RODY	10.0028	11/7/14	0.4	0.6	0	0
RODY	10.0028	11/18/14	0.4	0.6	0	0
RODY	10.0028	11/24/14	0.4	0.6	0	1
RODY	10.0028	12/4/14	0.4	0.6	8	3
RODY	10.0028	12/10/14	0.4	0.6	85	26
RODY	10.0028	12/19/14	0.4	0.6	78	135
RODY	10.0028	12/29/14	0.4	0.6	66	184
RODY	10.0028	1/8/15	0.4	0.6	9	5
RODY	10.0028	1/20/15	0.4	0.6	0	0
			RODY	**TOTAL:**	**246**	**354**
					LIVE	**DEAD**
SALMON	10.0035	11/7/14	0.0	1.0	4	0
SALMON	10.0035	11/17/14	0.0	1.0	0	2
SALMON	10.0035	11/24/14	0.0	1.0	8	5
SALMON	10.0035	12/4/14	0.0	1.0	17	5
SALMON	10.0035	12/11/14	0.0	1.0	28	6
SALMON	10.0035	12/19/14	0.0	1.0	11	19
SALMON	10.0035	12/29/14	0.0	1.0	7	5
SALMON	10.0035	1/9/15	0.0	1.0	1	0
SALMON	10.0035	1/20/15	0.0	1.0	1	1
			SALMON	**TOTAL:**	**77**	**43**
					LIVE	**DEAD**
SALMON TRIB.	10.0036	11/7/14	0.0	0.1	0	0
SALMON TRIB.	10.0036	11/17/14	0.0	0.1	5	2
SALMON TRIB.	10.0036	11/24/14	0.0	0.1	26	20
SALMON TRIB.	10.0036	12/4/14	0.0	0.1	5	28
SALMON TRIB.	10.0036	12/11/14	0.0	0.1	49	35
SALMON TRIB.	10.0036	12/19/14	0.0	0.1	18	22
SALMON TRIB.	10.0036	12/29/14	0.0	0.1	32	21
SALMON TRIB.	10.0036	1/9/15	0.0	0.1	1	11

SALMON TRIB.	10.0036	1/20/15	0.0	0.1	1	2
			SALMON TRIB.	**TOTAL:**	**137**	**141**
					LIVE	**DEAD**
SOUTH PRAIRIE	10.0429	11/14/14	0.0	8.0	353	8
SOUTH PRAIRIE	10.0429	12/3/14	0.0	10.2	376	134
SOUTH PRAIRIE	10.0429	12/16/14	0.0	10.2	157	248
			SOUTH PRAIRIE	**TOTAL:**	**886**	**390**
					LIVE	**DEAD**
Surveys conducted by WDFW						
SPIKETON	**10.0453**	10/22/14	0.0	0.2	0	0
SPIKETON	**10.0453**	10/30/14	0.0	0.2	0	0
SPIKETON	**10.0453**	11/20/14	0.0	0.2	0	0
SPIKETON	**10.0453**	11/26/14	0.0	0.2	1	0
SPIKETON	**10.0453**	12/2/14	0.0	0.2	0	0
SPIKETON	**10.0453**	12/9/14	0.0	0.2	0	1
SPIKETON	**10.0453**	12/17/14	0.0	0.2	0	1
SPIKETON	**10.0453**	12/22/14	0.0	0.2	0	1
SPIKETON	**10.0453**	1/5/15	0.0	0.2	0	0
			SPIKETON	**TOTAL:**	**1**	**3**
					LIVE	**DEAD**
SPRING CREEK	10.0430	11/14/14	0.0	0.0	0	0
SPRING CREEK	10.0430	12/3/14	0.0	0.0	2	0
SPRING CREEK	10.0430	12/11/14	0.0	0.0	21	4
SPRING CREEK	10.0430	12/16/14	0.0	0.1	8	5
SPRING CREEK	10.0430	1/6/15	0.0	0.1	0	0
			SPRING CREEK	**TOTAL:**	**31**	**9**
					LIVE	**DEAD**
SQUALLY	10.0024	11/7/14	0.0	0.3	1	0
SQUALLY	10.0024	11/18/14	0.0	0.3	0	0
SQUALLY	10.0024	11/24/14	0.0	0.3	2	8
SQUALLY	10.0024	12/4/14	0.0	0.3	2	23
SQUALLY	10.0024	12/10/14	0.0	0.8	277	56
SQUALLY	10.0024	12/19/14	0.0	0.8	127	254
SQUALLY	10.0024	12/29/14	0.0	0.3	11	87
SQUALLY	10.0024	1/8/15	0.0	0.3	7	6
SQUALLY	10.0024	1/20/15	0.0	0.3	0	0
			SQUALLY	**TOTAL:**	**427**	**434**
					LIVE	**DEAD**

SWAN	10.0023	10/27/14	0.3	1.3	0	0
SWAN	10.0023	11/7/14	0.3	1.3	9	0
SWAN	10.0023	11/18/14	0.3	1.3	12	5
SWAN	10.0023	11/24/14	0.3	1.3	93	9
SWAN	10.0023	12/3/14	0.3	1.3	77	33
SWAN	10.0023	12/9/14	0.3	1.3	447	109
SWAN	10.0023	12/19/14	0.3	1.4	263	421
SWAN	10.0023	12/29/14	0.3	1.3	49	161
SWAN	10.0023	1/8/15	0.3	1.3	17	29
SWAN	10.0023	1/20/15	0.3	1.3	1	0
			SWAN	**TOTAL:**	**968**	**767**
					LIVE	**DEAD**
WILKESON	10.0432	10/29/14	0.0	5.8	0	0
WILKESON	10.0432	11/17/14	0.0	5.8	17	0
WILKESON	10.0432	12/2/14	0.0	1.0	0	0
WILKESON	10.0432	12/11/14	0.0	1.2	2	3
WILKESON	10.0432	12/19/14	0.0	1.2	3	1
WILKESON	10.0432	12/29/14	0.0	1.2	0	0
			WILKESON	**TOTAL:**	**22**	**4**
					LIVE	**DEAD**

PTF - 2015 STEELHEAD SURVEY DATA

STREAM	WRIA	DATE	LOWER R.M.	UPPER R.M.	LIVE	DEAD	REDDS
BOISE	10.0057	3/3/15	0.0	2.2	0	0	0
BOISE	10.0057	3/20/15	0.0	4.5	6	0	17
BOISE	10.0057	4/1/15	0.0	4.5	7	0	25
BOISE	10.0057	4/13/15	0.0	4.5	1	0	24
BOISE	10.0057	4/22/15	0.0	4.5	5	0	29
BOISE	10.0057	5/4/15	0.0	4.5	2	0	20
BOISE	10.0057	5/18/15	0.0	4.5	0	0	12
BOISE	10.0057	5/27/15	0.0	4.5	0	0	3
			BOISE	TOTAL	21	0	130
					LIVE	DEAD	REDDS
CAMP CREEK*	10.0112	3/25/15	0.0	0.5	0	0	0
CAMP CREEK*	10.0112	4/7/15	0.0	0.5	0	0	3
CAMP CREEK*	10.0112	4/17/15	0.0	0.5	0	0	3
CAMP CREEK*	10.0112	4/27/15	0.0	0.5	0	0	5
CAMP CREEK*	10.0112	5/13/15	0.0	0.5	0	0	1
CAMP CREEK*	10.0112	5/29/15	0.0	0.5	0	0	0
			CAMP CREEK	TOTAL	0	0	12
					LIVE	DEAD	REDDS
CANYONFALLS	10.0410	3/17/15	0.3	0.6	0	0	0
CANYONFALLS	10.0410	4/6/15	0.3	0.6	0	0	0
CANYONFALLS	10.0410	4/17/15	0.3	0.6	0	0	0
CANYONFALLS	10.0410	5/5/15	0.3	0.6	0	0	0
CANYONFALLS	10.0410	5/13/15	0.3	0.6	0	0	0
CANYONFALLS	10.0410	5/19/15	0.3	0.6	0	0	0
			CANYONFALLS	TOTAL	0	0	0
					LIVE	DEAD	REDDS
CARBON	10.0413	3/3/15	6.0	10	0	0	0
CARBON	10.0413	3/12/15	0.0	10.5	3	0	0
CARBON	10.0413	4/8/15	0.0	10.5	0	0	3
CARBON	10.0413	4/24/15	0.0	10.5	0	0	2
CARBON	10.0413	5/12/15	0.0	10.5	0	0	10
			CARBON	TOTAL	3	0	15
					LIVE	DEAD	REDDS
CLARKS	10.0027	3/17/15	3.4	3.7	0	0	0
CLARKS	10.0027	4/7/15	3.4	3.7	0	0	0
CLARKS	10.0027	4/20/15	3.4	3.7	0	0	0
CLARKS	10.0027	5/4/15	3.4	3.7	0	0	0
CLARKS	10.0027	5/13/15	3.4	3.7	0	0	0
CLARKS	10.0027	5/28/15	3.4	3.7	0	0	0
			CLARKS	TOTAL	0	0	0
					LIVE	DEAD	REDDS

CLEAR	10.0022	3/17/15	1.7	1.9	0	0	0
CLEAR	10.0022	4/20/15	1.7	1.9	0	0	0
CLEAR	10.0022	5/4/15	1.7	1.9	0	0	0
CLEAR	10.0022	5/13/15	1.7	1.9	0	0	0
			CLEAR	**TOTAL**	**0**	**0**	**0**
					LIVE	**DEAD**	**REDDS**
CLEARWATER	10.0080	4/23/15	0.0	2.8	0	0	21
CLEARWATER	10.0080	5/5/15	2.8	4.3	0	0	5
CLEARWATER	10.0080	5/14/15	2.8	3.8	0	0	1
CLEARWATER	10.0080	5/29/15	2.8	3.8	0	0	0
CLEARWATER	10.0080	6/10/15	2.8	3.8	0	0	6
CLEARWATER	10.0080	6/17/15	3.8	4.9	0	0	5
			CLEARWATER	**TOTAL**	**0**	**0**	**38**
					LIVE	**DEAD**	**REDDS**
FENNEL	10.0406	3/17/15	0.0	0.9	0	0	0
FENNEL	10.0406	4/6/15	0.0	0.9	0	0	0
FENNEL	10.0406	4/17/15	0.0	0.9	0	0	0
FENNEL	10.0406	5/5/15	0.0	0.9	0	0	0
FENNEL	10.0406	5/19/15	0.0	0.9	0	0	0
			FENNEL	**TOTAL**	**0**	**0**	**0**
					LIVE	**DEAD**	**REDDS**
FOX	10.0608	3/17/15	0.0	1.0	0	0	0
FOX	10.0608	4/7/15	0.0	1.0	0	0	0
FOX	10.0608	4/21/15	0.0	1.0	0	0	0
FOX	10.0608	5/1/15	0.0	1.0	0	0	0
FOX	10.0608	5/19/15	0.0	1.0	0	0	0
			FOX	**TOTAL**	**0**	**0**	**0**
					LIVE	**DEAD**	**REDDS**
GREENWATER*	10.0122	4/22/15	0.0	4.1	0	0	2
GREENWATER*	10.0122	4/28/15	4.1	10.5	0	0	6
			GREENWATER	**TOTAL**	**0**	**0**	**8**
					LIVE	**DEAD**	**REDDS**
HUCKLEBERRY*	10.0253	3/23/15	0.0	1.6	1	0	0
HUCKLEBERRY*	10.0253	4/13/15	0.0	1.6	0	0	0
HUCKLEBERRY*	10.0253	4/27/15	0.0	2.7	0	0	3
			HUCKLEBERRY	**TOTAL**	**1**	**0**	**3**
					LIVE	**DEAD**	**REDDS**
HYLEBOS	10.0006	5/13/15	0.1	0.7	0	0	0
			HYLEBOS	**TOTAL**	**0**	**0**	**0**
					LIVE	**DEAD**	**REDDS**

KAPOWSIN	10.0600	3/11/15	0.0	3.2	1	0	6
KAPOWSIN	10.0600	3/24/15	0.0	3.2	0	0	3
KAPOWSIN	10.0600	4/10/15	0.0	3.2	2	0	7
KAPOWSIN	10.0600	4/21/15	0.0	3.2	0	0	1
KAPOWSIN	10.0600	5/1/15	0.0	3.2	0	0	1
KAPOWSIN	10.0600	5/18/15	0.0	3.2	0	0	0
			KAPOWSIN	**TOTAL**	**3**	**0**	**18**
					LIVE	**DEAD**	**REDDS**
KELLOG	10.0621	3/13/15	0.0	2.0	0	0	3
KELLOG	10.0621	4/2/15	0.0	2.0	0	0	9
KELLOG	10.0621	4/14/15	0.0	2.0	0	0	0
KELLOG	10.0621	4/29/15	0.0	2.0	0	0	6
KELLOG	10.0621	5/13/15	0.0	2.0	0	0	6
KELLOG	10.0621	5/28/15	0.0	2.0	0	0	0
			KELLOG	**TOTAL**	**0**	**0**	**24**
					LIVE	**DEAD**	**REDDS**
LEDOUT	10.0620	3/5/15	0.0	0.4	0	0	0
LEDOUT	10.0620	3/13/15	0.0	0.4	0	0	0
LEDOUT	10.0620	3/31/15	0.0	0.4	3	0	11
LEDOUT	10.0620	4/9/15	0.0	0.4	0	1	0
LEDOUT	10.0620	4/29/15	0.0	0.4	0	0	0
LEDOUT	10.0620	5/4/15	0.0	0.4	0	0	2
LEDOUT	10.0620	5/13/15	0.0	0.4	0	0	0
			LEDOUT	**TOTAL**	**3**	**1**	**13**
					LIVE	**DEAD**	**REDDS**
OHOP	10.0600	4/7/15	6.5	7.5	0	0	0
OHOP	10.0600		6.5	7.5			
			OHOP	**TOTAL**	**0**	**0**	**0**
					LIVE	**DEAD**	**REDDS**
MEADOW	10.0630	4/2/15	0.0	0.6	0	0	0
MEADOW	10.0630	4/15/15	0.0	0.6	0	0	0
MEADOW	10.0630	5/1/15	0.0	0.6	0	0	0
			MEADOW	**TOTAL**	**0**	**0**	**0**
					LIVE	**DEAD**	**REDDS**
MOWICH RIVER	10.0624	4/10/15	0.0	1.0	0	0	0
MOWICH RIVER	10.0624	4/15/15	1.0	4.3	0	0	7
MOWICH RIVER	10.0624	5/1/15	0.0	4.3	0	0	2
			MOWICH RIVER	**TOTAL**	**0**	**0**	**9**
					LIVE	**DEAD**	**REDDS**
NIESSON	10.0622	3/13/15	0.0	2.5	0	0	3
NIESSON	10.0622	4/2/15	0.0	3.2	2	0	20

NIESSON	10.0622	4/14/15	0.0	3.2	0	0	19
NIESSON	10.0622	4/29/15	0.0	3.2	7	0	45
NIESSON	10.0622	5/13/15	0.0	3.2	0	0	11
NIESSON	10.0622	5/28/15	0.0	3.2	0	0	2
			NIESSON	**TOTAL**	**9**	**0**	**100**
					LIVE	**DEAD**	**REDDS**
LOWER PUYALLUP							
PUYALLUP	10.0021	3/12/15	15.5	17.0	0	0	1
PUYALLUP	10.0021	4/8/15	15.5	17.0	0	0	0
			L. PUYALLUP	**TOTAL**	**0**	**0**	**1**
					LIVE	**DEAD**	**REDDS**
UPPER PUYALLUP							
PUYALLUP	10.0021	3/13/15	36	41.9	0	0	8
PUYALLUP	10.0021	4/9/15	36	46.5	0	0	18
PUYALLUP	10.0021	4/15/15	46.5	49.6	0	0	5
PUYALLUP	10.0021	5/4/15	36	41.9	0	0	14
			UPPER PUYALLUP	**TOTAL**	**0**	**0**	**45**
					LIVE	**DEAD**	**REDDS**
ROCKY RUN*	10.0117	3/25/15	0.0	0.6	0	0	0
ROCKY RUN*	10.0117	4/7/15	0.0	0.6	0	0	0
ROCKY RUN*	10.0117	4/17/15	0.0	0.6	0	0	0
ROCKY RUN*	10.0117	4/27/15	0.0	0.6	0	0	0
ROCKY RUN*	10.0117	5/13/15	0.0	0.6	0	0	0
			ROCKY RUN	**TOTAL**	**0**	**0**	**0**
					LIVE	**DEAD**	**REDDS**
RUSHINGWATER	10.0265	3/5/15	0.0	1.0	0	0	0
RUSHINGWATER	10.0265	3/18/15	0.0	1.0	0	0	0
RUSHINGWATER	10.0265	3/31/15	0.0	1.0	0	0	1
RUSHINGWATER	10.0265	4/10/15	0.0	1.0	0	0	0
RUSHINGWATER	10.0265	4/20/15	0.0	1.0	0	0	2
RUSHINGWATER	10.0265	5/1/15	0.0	1.0	0	0	4
RUSHINGWATER	10.0265	5/19/15	0.0	1.0	0	0	0
			RUSHINGWATER	**TOTAL**	**0**	**0**	**7**
					LIVE	**DEAD**	**REDDS**
SALMON	10.0035	3/16/15	0.5	1.0	0	0	0
SALMON	10.0035	4/6/15	0.5	1.0	0	0	0
SALMON	10.0035	4/20/15	0.5	1.0	0	0	0
SALMON	10.0035	5/4/15	0.5	1.0	0	0	0
SALMON	10.0035	5/13/15	0.5	1.0	0	0	0
SALMON	10.0035	5/29/15	0.5	1.0	0	0	0
			SALMON	**TOTAL**	**0**	**0**	**0**
					LIVE	**DEAD**	**REDDS**

Surveys conducted by WDFW							
SOUTH PRAIRIE	10.0429		0.3	12.6			288
			SOUTH PRAIRIE	**TOTAL**	**0**	**0**	**288**
					LIVE	**DEAD**	**REDDS**
SPRING CREEK	10.0430	4/3/15	0.0	0.1	0	0	0
			SPRING CREEK	**TOTAL**	**0**	**0**	**0**
					LIVE	**DEAD**	**REDDS**
SWAN	10.0023	3/17/15	0.3	1.0	0	0	0
SWAN	10.0023	4/7/15	0.3	1.0	0	0	0
SWAN	10.0023	4/20/15	0.3	1.0	0	0	0
SWAN	10.0023	5/4/15	0.3	1.0	0	0	0
SWAN	10.0023	5/13/15	0.3	1.0	0	0	0
			SWAN CREEK	**TOTAL**	**0**	**0**	**0**
					LIVE	**DEAD**	**REDDS**
VOIGHTS	10.0414	3/19/15	0.5	3.4	0	0	1
VOIGHTS	10.0414	4/1/15	0.5	3.4	0	0	1
VOIGHTS	10.0414	4/15/15	0.5	3.4	0	0	0
VOIGHTS	10.0414	4/30/15	0.5	3.4	2	0	14
VOIGHTS	10.0414	5/12/15	0.5	3.4	0	0	1
VOIGHTS	10.0414	5/29/15	0.5	3.4	0	0	0
			VOIGHTS	**TOTAL**	**2**	**0**	**17**
					LIVE	**DEAD**	**REDDS**
WHITE RIVER*	10.0031	4/3/15	24.3	27.9	0	0	1
WHITE RIVER	10.0031	4/6/15	7.0	24.3	0	0	7
WHITE RIVER*	10.0031	4/16/15	24.3	27.9	0	0	2
WHITE RIVER	10.0031	4/17/15	7.0	24.3	1	0	8
WHITE RIVER	10.0031	5/8/15	15.5	24.3	1	0	13
WHITE RIVER*	10.0031	5/20/15	24.3	27.9	0	0	1
			WHITE RIVER	**TOTAL**	**2**	**0**	**32**
					LIVE	**DEAD**	**REDDS**
Surveys conducted by WDFW							
WILKESON	10.0432		0.0	3.0			81
			WILKESON	**TOTAL**	**0**	**0**	**81**
					LIVE	**DEAD**	**REDDS**

*Redd totals do not include redds observed above RM 24.3 (Buckley) on the White River

REDD TOTALS:
695

2011-2015

ADULT & JUVENILE FISH PLANTS AND RELEASES

APPENDIX D

2015 Puyallup Tribal Fisheries: Acclimation Ponds and Hatchery Releases (juveniles)

SPECIES			Chum	
DATE (V)	**DATE (F)**	**Stream**	**WRIA**	**Number of Fish**
5-Mar-15	30-Mar-15	Diru Creek	10.0029	431,800
	16-Mar-15	Diru Creek	10.0029	367,000
	19-Mar-15	Diru Creek	10.0029	387,000
	24-Mar-15	Diru Creek	10.0029	97,250
	24-Mar-15	Diru Creek	10.0029	97,350
	24-Mar-15	Diru Creek	10.0029	94,664
	30-Mar-15	Diru Creek	10.0029	850,348
	13-May-15	Puget Creek	12.0002A	10,000
				2,335,412
SPECIES			**Fall Chinook**	
DATE (V)	**DATE (F)**	**Stream**	**WRIA**	**Number of Fish**
	15-May-15	Clarks Creek	10.0027	386,814
	14-May-15	Hylebos Creek	10.0006	10,189
SPECIES			**Spring Chinook**	
DATE (V)	**DATE (F)**	**Stream**	**WRIA**	**Number of Fish**
20-May-15	20-May-15	Greenwater	10.0122 R01	216,800
SPECIES			**Coho**	
DATE (V)	**DATE (F)**	**Stream**	**WRIA**	**Number of Fish**
3-Feb-15	24-Apr-15	Rushingwater	10.0625	104,910
SPECIES			**Steelhead**	
DATE (V)	**DATE (F)**	**Stream**	**WRIA**	**Number of Fish**
23-Apr-15	23-Apr-15	Jensen	10.0253	31,219

(V) Volitional release **(F)** Forced release

2014 Puyallup Tribal Fisheries: Acclimation Ponds and Hatchery Releases (juveniles)

SPECIES			Chum				
DATE (F)		**Stream**	**WRIA**	**Number of Fish**	**Fish/Lb**	**Weight (g)**	**Length (mm)**
14-Mar-14		Diru Creek	10.0029	435,000	401.2	1.13	52.00
19-Mar-14		Diru Creek	10.0029	96,700	401.0	1.13	52.00
31-Mar-14		Diru Creek	10.0029	705,200	329.4	1.38	56.00
7-Apr-14		Diru Creek	10.0029	72,700	270.44	1.68	59.00
7-Apr-14		Diru Creek	10.0029	76,700	359.42	1.26	54.00
14-Apr-14		Diru Creek	10.0029	96,500	358.9	1.26	55.19
14-Apr-14		Diru Creek	10.0029	406,950	335.9	1.35	55.64
16-Apr-14		Diru Creek	10.0029	101,000	401.0	1.13	52.00
				1,990,750			
SPECIES			**Fall Chinook**				
DATE (V)	**DATE**	**Stream**	**WRIA**	**Number of Fish**	**Fish/Lb**	**Weight (g)**	**Length (mm)**
21-May-14		Clarks Creek	10.0027	265,650	47.5	9.56	96.86
20-May-14	20-May-14	Hylebos Creek	10.0006	5,700	47.5	9.56	96.86
				271,350			

SPECIES			Spring Chinook				
DATE (V)	**DATE**	**Stream**	**WRIA**	**Number of Fish**	**Fish/Lb**	**Weight (g)**	**Length (mm)**
	23-May-14	Greenwater	10.0122 R01	891,856	83.6	5.42	79.88
	23-May-14	Huckleberry	10.0253 H02	234,500	75.4	6.01	84.18
				1,126,356			
SPECIES			**Coho**				
DATE (V)	**DATE**	**Stream**	**WRIA**	**Number of Fish**	**Fish/Lb**	**Weight (g)**	**Length (mm)**
17-Feb-14		Cowskull	10.0680	47,250	26.5	17.12	115.00
25-Apr-14		Rushingwater	10.0625	47,000	24.1	18.82	120.30
				94,250			
SPECIES			**Steelhead**				
DATE (V)	**DATE**	**Stream**	**WRIA**	**Number of Fish**	**Fish/Lb**	**Weight (g)**	**Length (mm)**
23-Apr-14		Huckleberry	10.0253	47,912	14.9	30.50	141.80
				47,912			
		TOTAL SALMON		**3,530,618**			

2013 Puyallup Tribal Fisheries: Acclimation Ponds and Hatchery Releases (juveniles)

SPECIES	Chum		
DATE (F)	**Stream**	**WRIA**	**Number of Fish**
25-Mar-13	Diru Creek	10.0029	579,000
25-Mar-13	Diru Creek	10.0029	480,000
25-Mar-13	Diru Creek	10.0029	120,000
29-Mar-13	Diru Creek	10.0029	123,000
3-Apr-13	Diru Creek	10.0029	570,000
17-Apr-13	Diru Creek	10.0029	213,000
26-Apr-13	Diru Creek	10.0029	85,750
			2,170,750
SPECIES	**Fall Chinook**		
DATE (V)	**Stream**	**WRIA**	**Number of Fish**
16-May-13	Clarks Creek	10.0027	247,630
16-May-13	Clarks Creek	10.0027	319,995
16-May-13	Hylebos Creek	10.0006	10,800
			578,425
SPECIES	**Spring Chinook**		
DATE (V)	**Stream**	**WRIA**	**Number of Fish**
15-May-13	Clearwater	10.0082	117,000
15-May-13	Greenwater	10.0122 R01	223,075
17-May-13	Huckleberry	10.0253 H02	220,900
			560,975
SPECIES	**Coho**		
DATE (V)	**Stream**	**WRIA**	**Number of Fish**
17-Apr-13	Cowskull	10.0680	30,150
17-Apr-13	Rushingwater	10.0625	70,350
	TOTAL SALMON		**3,310,150**

(V) Volitional release **(F)** Forced release

2012 Puyallup Tribal Fisheries: Adult Releases

Adult Coho						
Date	**Location**	**WRIA**	**River Mile**	**Males**	**Females**	**TOTAL**
30-Oct-12	Niesson Creek	10.0622	3	230	153	**375**
30-Oct-12	Kellog Creek	10.0621	5	151	100	**250**
7-Nov-12	North Fork Puyallup River	10.0699	0.5	432	288	**720**
13-Nov-12	Ohop Creek	10.0600	3	231	213	**720**

(V) Volitional release **(F)** Forced release

2012 Puyallup Tribal Fisheries: Acclimation Ponds and Hatchery Releases (juveniles)

SPECIES	**Chum**			
DATE (F)		**Stream**	**WRIA**	**Number of Fish**
27-Mar-12		Diru Creek	10.0029	344,000
27-Mar-12		Diru Creek	10.0029	209,000
3-Apr-12		Diru Creek	10.0029	91,500
10-Apr-12		Diru Creek	10.0029	360,380
11-Apr-12		Diru Creek	10.0029	91,900
13-Apr-12		Diru Creek	10.0029	91,900
16-Apr-12		Diru Creek	10.0029	459,000
20-Apr-12		Clarks Creek	10.0027	815,760
				2,463,440
SPECIES	**Fall Chinook**			
DATE (V)	**DATE**	**Stream**	**WRIA**	**Number of Fish**
16-May-12		Clarks Creek	10.0027	462,750
16-May-12		Cowskull	10.0680	10,185
17-May-12		Clarks Creek	10.0027	472,750
17-May-12		Hylebos Creek	10.0006	13,200
				958,885
SPECIES	**Spring Chinook**			
DATE (V)	**DATE**	**Stream**	**WRIA**	**Number of Fish**
17-May-12		Huckleberry Creek	10.0253 H02	309,500
17-May-12		Greenwater River	10.0122 R01	207,500
				517,000
SPECIES	**Coho**			
DATE (V)	**DATE**	**Stream**	**WRIA**	**Number of Fish**
16-May-12		Cowskull	10.0680	92,700
		TOTAL SALMON		**4,032,025**

(V) Volitional release **(F)** Forced release

Puyallup Tribal Fisheries Adult Salmon Plants 2011

Adult Chinook

Date	Location	WRIA	River Mile	Males	Females	TOTAL
06-Oct-11	**Puyallup River**	10.0021	22	63	86	149
06-Oct-11	**Fox Creek**	10.0608	0.5	24	27	51
06-Oct-11	**Kapowsin Creek**	10.0600	0.5	47	53	100
					Total:	**300**

Adult Coho

Date	Location	WRIA	River Mile	Males	Females	TOTAL
7-Nov-11	**Niesson Creek**	10.0622	3	72	59	131
7-Nov-11	**Deer Creek**	10.0685	0.5	358	292	650
9-Nov-11	**Rushingwater Creek**	10.0625	2.8	144	117	261
9-Nov-11	**North Fork Puyallup River**	10.0699	0.5	287	234	521
14-Nov-11	**Ohop Creek**	10.0600	3	216	177	393
14-Nov-11	**Kellog Creek**	10.0621	5	72	59	131
14-Nov-11	**Niesson Creek**	10.0622	3	144	118	262
					Total:	**2,349**

2010-2015
BULL TROUT SAMPLED IN USACE FISH TRAP, WHITE RIVER

APPENDIX E

2010 Buckley Trap Bull Trout

Date Captured	Fork Length (mm)/ Weight (g) / Sex	Recapture	Original Date(s) Captured
April 21, 2010	481mm / 1448g / F	N	
April 23, 2010	460mm / 1050g	N	
April 30, 2010	450 mm / 1161g	N	
May 14, 2010	480mm / 1309g / M	N	
May 17, 2010	505mm / 1599g / M	Y	July 6, 2009
May 19, 2010	500mm / 1408g / M	N	
May 26, 2010	473mm / 1275g / F	N	
June 4, 2010	498mm / 1575g / F	N	
June 7, 2010	492mm / 1473g / F	Y	July 1, 2009
June 11, 2010	496mm / 1377g / M	Y	July 6, 2009
June 11, 2010	520mm / 1634g / M	N	
June 11, 2010	429mm / 1036g / F	N	
June 11, 2010	378mm / 621g / F	N	
June 14, 2010	343mm / 437g / M	N	
June 16, 2010	415mm / 900g / M	N	
June 16, 2010	535mm / 1800g / F	N	
June 16, 2010	442mm / 1100g / F	N	
June 16, 2010	505mm / 1500g / M	N	
June 16, 2010	565mm / 2200g / M	N	
June 23, 2010	465mm / 1100g / F	N	
June 25, 2010	500mm / 1580g	N	
June 25, 2010	390mm / 700g	N	
June 29, 2010	418mm / 817g / F	N	
June 29, 2010	434mm / 953g	Y	July 22, 2009
June 29, 2010	403mm / 797g	N	
June 29, 2010	446mm / 1075g / M	N	
June 29, 2010	433mm / 946g	N	
June 29, 2010	439mm / 973	Y	July 1, 2009
June 29, 2010	417mm / 895g	N	
July 1, 2010	514mm / 1437g / M	Y	July 10, 2009
July 1, 2010	418mm / 852g / F	N	
July 8, 2010	496mm / 1251g / M	Y	June 30, 2008 & July13, 2009
July 8, 2010	530mm / 1741g / F	Y	July 8, 2009
July 8, 2010	406mm / 770g / F	N	
July 8, 2010	498mm / 1279g /M	Y	July 15, 2009
July 8, 2010	491mm/ 1341g / F	N	
July 8, 2010	385mm / 678g / M	N	
July 9, 2010	436mm / 1022g / F	N	
July 9, 2010	536mm / 1716g / F	Y	July 10, 2009
July 9, 2010	566mm / 1795g / M	Y	July 7, 2009
July 9, 2010	548mm / 1695g / F	N	
July 9, 2010	401mm / 778g / F	N	

July 12, 2010	571mm / 2054g / F	Y	July 6, 2009
July 12, 2010	468mm / 1186g	N	
July 13, 2010	520mm / 1550g / M	N	
July 13, 2010	421mm / 850g / M	N	
July 13, 2010	480mm / 1300g / M	N	
July 13, 2010	483mm / 1350g / M	N	
July 13, 2010	484mm / 1336g / F	N	
July 13, 2010	486mm / 1273g	N	
July 13, 2010	420mm / 823g / F	N	
July 13, 2010	388mm / 664g	N	
July 16, 2010	394mm / 690g / M	N	
July 16, 2010	401mm / 714g / M	N	
July 19, 2010	491mm / 1321g / M	N	
July 19, 2010	404mm / 737g / F	N	
July 19, 2010	366mm / 507g / F	N	
July 21, 2010	425mm / 877g / M	N	
July 21, 2010	413mm / 874g / M	N	
July 21, 2010	360mm / 476g / M	N	
July 21, 2010	525mm / 1539g / M	Y	July 15, 2009
July 21, 2010	390mm / 671g / F	N	
July 23, 2010	420mm / 829g / F	N	
July 26, 2010	374mm / 594g / M	N	
July 26, 2010	421mm / 846g	N	
July 26, 2010	417mm / 824g	N	
July 26, 2010	544mm / 1689g / M	Y	July 17, 2009
July 26, 2010	528mm / 1677g / M	Y	July 2, 2009
July 26, 2010	452mm / 1036g	N	
July 26, 2010	419mm / 803g / F	N	
July 26, 2010	543mm / 1734g / F	N	
July 26, 2010	494mm / 1357g / F	N	
July 26, 2010	416mm / 804g	N	
July 26, 2010	447mm / 1091g / M	N	
July 28, 2010	429mm / 813g / M	N	
July 30, 2010	404mm / 681g / F	N	
July 30, 2010	403mm / 756g / M	N	
July 30, 2010	455mm / 1030g / M	Y	July 7, 2009
August 2, 2010	536mm / 1664g / M	Y	July 27, 2009
August 4, 2010	390mm / 627g / M	N	
August 4, 2010	413mm / 753g / F	N	
August 6, 2010	456mm / 1050g / F	N	
August 11, 2010	385mm / 608g / M	N	
August 13, 2010	448mm / 941g	N	
August 16, 2010	505mm / 1321g / M	Y	July 2, 2009
August 16, 2010	380mm / 590g / F	N	
August 23, 2010	No data available		

2011 Buckley Trap Bull Trout

Date Captured	Fork Length (mm)/ Weight (g) / Sex	Recapture	Original Date(s) Captured
January 27,2011	455mm / 756g / M	N	
January 27,2011	459mm / 967g / M	N	
March 30, 2011	451mm / 915g / M	N	
April 15, 2011	275mm / 201g	N	
April 22, 2011	337mm / 387g / M	N	
June 8, 2011	485mm / 1282g / F	N	
June 8, 2011	505mm / 1595g / M	N	
June 20, 2011	528mm / 1712g / F	N	
June 22, 2011	441mm / 1004g / M	N	
June 22, 2011	520mm / 1561g / M	Y	July 26, 2010
June 24, 2011	490mm / 1353g / F	N	
June 27, 2011	481mm / 974g / M	N	
June 29, 2011	471mm / 1167g / F	N	
June 29, 2011	483mm / 1299g / F	Y	July 26, 2010
June 29, 2011	565mm / 1725g / M	Y	7/7/09 & 7/9/10
July 1, 2011	483mm / 1265g / M	N	
July 5, 2011	539mm / 1875g / M	N	
July 5, 2011	411mm / 740g / M	N	
July 5, 2011	521mm / 1563g / M	N	
July 5, 2011	491mm / 1424g	N	
July 5, 2011	478mm / 1279g	N	
July 5, 2011	485mm / 1307g	N	
July 5, 2011	437mm / 912g	N	
July 5, 2011	510mm / 1422g /M	Y	May 14, 2010
July 5, 2011	480mm / 1209g	Y	April 30, 2010
July 6, 2011	481mm / 1171g / F	N	
July 6, 2011	450mm / 1102g / F	N	
July 8, 2011	428mm / 894g	N	
July 8, 2011	552mm / 1691g	Y	9/2/08 & 9/13/09
July 8, 2011	476mm/ 1148g / F	Y	July 19, 2010
July 8, 2011	462mm / 1072g	N	
July 8, 2011	395mm / 662g	N	
July 11, 2011	525mm / 1518g	N	
July 11, 2011	472mm / 1175g / M	N	
July 13, 2011	505mm / 1370g / M	Y	6/30/08 & 7/13/09 & 7/8/10
July 13, 2011	456mm / 987g / F	Y	June 11, 2010
July 18, 2011	469mm / 1039g / M	N	
July 18, 2011	461mm / 1158g / F	N	
July 18, 2011	463mm / 1163g / F	N	
July 20, 2011	490mm / 1274g / F	N	

July 20, 2011	464mm / 1120g / M	Y	July 21, 2010
July 27, 2011	465mm / 1028g / M	N	
July 27, 2011	458mm / 1139g / M	N	
July 27, 2011	510mm / 1381g / F	Y	
July 27, 2011	567mm / 1937g / F	N	
July 27, 2011	501mm / 1262g / M	N	
July 27, 2011	384mm / 638g / F	Y	August 23, 2010
July 27, 2011	438mm / 852g / M	N	
July 27, 2011	453mm / 967g / M	N	
July 27, 2011	348mm / 430g / M	Y	August 23, 2010
August 2, 2011	400mm / 715g / F	N	
August 3, 2011	450mm / 990g / F	N	
August 3, 2011	509mm / 1455g / M	N	
August 3, 2011	444mm / 947g / M	N	
August 4, 2011	NOT SAMPLED		
August 4, 2011	NOT SAMPLED		
August 4, 2011	NOT SAMPLED		
August 5, 2011	480mm / M	N	
August 5, 2011	542mm / 1615g / M	N	
August 5, 2011	380mm / 568g / M	N	
August 5, 2011	565mm / 1863g / M	Y	July 13, 2009
August 5, 2011	435mm / 835g / M	Y	July 26, 2010
August 5, 2011	379mm / 614g / M	N	
August 8, 2011	512mm / 1447g / M	Y	July 13, 2010
August 8, 2011	338mm / 391g / M	N	
August 10, 2011	370mm / 505g / M	N	
August 11, 2011	454mm / 993g / M	Y	7/22/09 & 6/29/10
August 12, 2011	524mm / 1500g / F	N	

2012 Buckley Bull Trout

	Date Captured	Fork Length (mm)/ Weight (g) / Sex	Recapture	Original Date(s) Captured
1	March 16, 2012	410mm / 783g / M	N	
2	April 30, 2012	360mm / 469g / M	N	
3	April 30, 2012	420mm / 812g / F	N	
4	April 30, 2012	373mm / 505g / M	N	
5	May 4, 2012	356mm / 463g	N	
6	May 14, 2012	475mm / 524g	N	
7	May 14, 2012	571mm / 1382g	N	
8	May 16, 2012	432mm / 891g / F	N	
9	May 16, 2012	430mm / 862g / F	N	
10	May 16, 2012	479mm / 1349g /F	N	

11	May 16, 2012	336mm / 390g / M	N	
12	May 16, 2012	392mm / 329g /M	N	
13	May 16, 2012	312mm / 329g / M	N	
14	June 6, 2012	463mm / 1102g / F	N	
15	June 18, 1012	470mm / 1455g / F	N	
16	June 18, 1012	595mm / 2281g /M	Y	August 5, 2011
17	June 18, 1012	442mm / 958g	N	
18	June 18, 1012	349mm / 438g / F	N	
19	June 22, 2012	491mm / 1365g / F	N	
20	June 22, 2012	390mm / 627g / M	N	
21	June 22, 2012	372mm / 627g / M	N	
22	June 29, 2012	439mm / 953g / M	N	
23	June 29, 2012	476mm / 1299g / F	N	
24	June 29, 2012	350mm / 465g / M	N	
25	June 29, 2012	368mm / 564g / M	N	
26	June 29, 2012	558mm / 1952g / F	Y	July 27, 2011
27	June 29, 2012	411mm / 798g / M	N	
28	June 29, 2012	520mm / 1612g / F	N	
29	June 29, 2012	460mm / 993g / M	N	
30	June 29, 2012	510mm / 1585g / F	Y	July 8, 2011
31	June 29, 2012	476mm / 1185g / M	N	
32	June 29, 2012	418mm / 789g / M	N	
33	June 29, 2012	370mm / 548g / F	N	
34	June 29, 2012	425mm / 936g / F	N	
35	July 2, 2012	367mm / 498g / M	N	
36	July 2, 2012	430mm / 889g / M	N	
37	July 2, 2012	552mm / 1920g / M	Y	July 5, 2011
38	July 2, 2012	401mm / 779g / M	N	
39	July 3, 2012	378mm / 519g / M	N	
40	July 6, 2012	410mm / 747g	N	
41	July 9, 2012	403mm / 771g	N	
42	July 9, 2012	490mm / 1714g /M	Y	July 20, 2011 & July 21, 2010
43	July 9, 2012	455mm / 1064g	N	
44	July 10, 2012	415mm / 778g / F	N	
45	July 10, 2012	478mm / 1184g / F	N	
46	July 11, 2012	626mm / 2948g / M	Y	August 9, 2009
47	July 11, 2012	462mm / 1198g / F	N	
48	July 16, 2012	460mm / 946g /M	Y	August 5, 2011 & July 26, 2010
49	July 16, 2012	415mm / 752g / M	N	
50	July 16, 2012	550mm / 1750g / M	Y	July 5, 2011 & May 14, 2010
51	July 16, 2012	385mm / 587g / M	N	
52	July 16, 2012	395mm / 684g / F	N	
53	July 16, 2012	400mm / 672g / M	N	

54	July 16, 2012	450mm / 968g / M	N	
55	July 16, 2012	360mm / 472g / M	N	
56	July 16, 2012	443mm / 902g / F	N	
57	July 19, 2012	523mm / 1627g / F	Y	July 18, 2011
58	July 19, 2012	431mm / 867g / F	N	
59	July 19, 2012	369mm / 530g / M	N	
60	July 19, 2012	466mm / 1177g / F	N	
61	July 19, 2012	400mm / 712g	N	
62	July 19, 2012	402mm / 720g	N	
63	July 19, 2012	474mm / 1172g / M	N	
64	July 19, 2012	389mm / 593g / M	N	
65	July 19, 2012	476mm / 1117g	N	
66	July 19, 2012	502mm / 1469g / M	Y	August 5, 2011
67	July 19, 2012	380mm / 576g / M	N	
68	July 19, 2012	383mm / 631g / M	N	
69	July 19, 2012	416mm / 753g / F	N	
70	July 19, 2012	518mm / 1538g / M	N	
71	July 19, 2012	427mm / 811g / F	N	
72	July 19, 2012	413mm / 719g / M	N	
73	July 19, 2012	304mm / 252g / M	N	
74	July 19, 2012	427mm / 839g / M	N	
75	July 19, 2012	531mm / 1742g / F	Y	July 5, 2011 & April 30, 2010
76	July 19, 2012	394mm / 745g / M	N	
77	July 19, 2012	317mm / 304g / M	N	
78	July 19, 2012	385mm / 637g / M	N	
79	July 20, 2012	433mm / 881g / F	N	
80	July 20, 2012	418mm / 861g / F	N	
81	July 20, 2012	460mm / 1062g /F	N	
82	July 20, 2012	525mm / 1667g / F	N	
83	July 20, 2012	452mm / 1031g / F	N	
84	July 20, 2012	471mm / 1173g / M	N	
85	July 20, 2012	555mm / 1797g / F	N	
86	July 20, 2012	472mm / 1174g / F	N	
87	July 20, 2012	416mm / 816g / M	N	
88	July 23, 1012	342mm / 432g / M	N	
89	July 23, 1012	418mm / 861g / F	N	
90	July 23, 1012	490mm / 1337g / F	N	
91	July 23, 1012	480mm / 1154g / F	N	
92	July 25, 2012	475mm / 1213g / M	N	
93	July 25, 2012	430mm / 879g / F	N	
94	July 25, 2012	484mm / 1175g / F	N	
95	July 30, 2012	427mm / 798g / M	N	
96	July 30, 2012	359mm / 454g / M	N	

97	July 30, 2012	423mm / 773g / F	N	
98	July 30, 2012	505mm / 1451g / F	N	
99	July 30, 2012	415mm / 757g / F	N	
100	July 30, 2012	410mm / 757g / M	N	
101	July 30, 2012	422mm / 805g / M	N	
102	July 30, 2012	380mm / 601g / F	N	
103	July 30, 2012	394mm / 600g / F	N	
104	July 30, 2012	421mm / 819g / M	N	
105	July 30, 2012	409mm / 680g / F	N	
106	July 30, 2012	495mm / 1291g / M	Y	June 29, 2010
107	July 30, 2012	430mm / 818g / M	N	
108	July 30, 2012	422mm / 810g / M	N	
109	July 30, 2012	386mm / 528g / M	N	
110	July 30, 2012	400mm / 715g / M	N	
111	July 30, 2012	445mm / 948g / M	N	
112	July 30, 2012	450mm / 1040g / M	N	
113	July 30, 2012	475mm / 1090g / M	N	
114	July 30, 2012	465mm / 1080g / F	N	
115	July 30, 2012	410mm / 750g / M	N	
116	July 30, 2012	425mm / 805g / M	N	
117	July 30, 2012	575mm / 2221g / F	Y	August 10, 2009
118	July 30, 2012	510mm / 1467g / M	N	
119	July 31, 2012	480mm / 1153g / M	N	
120	July 31, 2012	531mm / 1672g	Y	June 8, 2011
121	July 31, 2012	536mm / 1676g / F	Y	June 29, 2011
122	August 1, 2012	488mm / 1221g / F	N	
123	August 1, 2012	518mm / 1462g / F	Y	June 4, 2010
124	August 1, 2012	401mm / 731g / M	N	
125	August 2, 2012	428mm / 792g / F	N	
126	August 2, 2012	391mm / 646g / M	N	
127	August 2, 2012	409mm / 685g / M	N	
128	August 2, 2012	439mm / 860g / M	N	
129	August 2, 2012	510mm / 1450g / M	N	
130	August 2, 2012	480mm / 1194g / F	Y	July 13, 2011 & June 11, 2010
131	August 2, 2012	387mm / 606g / F	N	
132	August 2, 2012	419mm / 788g / M	N	
133	August 2, 2012	415mm / 801g / M	N	
134	August 2, 2012	381mm / 598g / F	N	
135	August 3, 2012	590mm / 2192g / F	Y	July 9, 2010 & July 10, 2009
136	August 3, 2012	400mm / 667g / F	N	
137	August 3, 2012	418mm / 763g	N	
138	August 3, 2012	423mm / 774g	N	
139	August 3, 2012	521mm / 1597g / M	Y	July 5, 2011

140	August 3, 2012	493mm / 1247g / M	Y	July 8, 2011
141	August 3, 2012	550mm / 1832g / M	Y	June 16, 2010
142	August 3, 2012	404mm / 681g	N	
143	August 7, 2012	460mm / 987g / F	N	
144	August 9, 2012	405mm / 723g / F	N	
145	August 10, 2012	475mm/ 1098g	N	
146	August 10, 2012	478mm / 1138g / M	Y	July 8, 2011
147	August 13, 2012	455mm / 992g / M	N	
148	August 13, 2012	453mm / 991g / M	N	
149	August 13, 2012	410mm / 723g / F	N	
150	August 13, 2012	365mm / 495g / F	N	
151	August 13, 2012	465mm / 999g / M	Y	July 5, 2011
152	August 13, 2012	395mm / 671g / M	N	
153	August 13, 2012	516mm / 1441g / F	Y	July 19, 2010
154	August 13, 2012	417mm / 756g / M	N	
155	August 16, 2012	382mm / 604g / M	N	
156	August 16, 2012	392mm / 602g / F	N	
157	August 16, 2012	381mm / 543g	N	
158	August 17, 2012	415mm / 743g / F	N	
159	August 17, 2012	416mm / 718g / F	N	
160	August 20, 2012	376mm / 573g / F	N	

2013 Buckley Trap Bull Trout

	Date Captured	Fork Length (mm)/ Weight (g) / Sex	Recapture	Original Date(s) Captured
1	May 8, 2013	370mm / 487g / M	N	
2	May 8, 2013	515mm / 1233g / M	Y	May 14, 2012
3	May 10, 2013	400mm / 624g / M	N	
4	May 10, 2013	434mm / 787g / M	N	
5	May 13, 2013	493mm / 1061g	N	
6	May 13, 2013	453mm / 929g	N	
7	May 13, 2013	371mm / 511g / M	N	
8	May 13, 2013	290mm / 257g	N	
9	June 3, 2013	443mm / 977g / M	N	
10	June 3, 2013	432mm / 879g / M	N	
11	June 3, 2013	511mm / 1544g / M	Y	June 29, 2012
12	June 10, 2013	410mm / 830g / F	N	
13	June 13, 2013	483mm / 1281g / F	N	
14	June 19, 2013	460mm / 1076g / M	Y	July 16, 2012
15	June 19, 2013	483mm/1281g / F	N	

16	June 19, 2013	450mm / 1013g / M	**N**	
17	June 19, 2013	420mm / 843g / F	**N**	
18	June 19, 2013	455mm / 1057g / M	**N**	
19	June 19, 2013	420mm / 727g / M	**N**	
20	June 19, 2013	436mm / 951g / M	**N**	
21	June 19, 2013	325mm / 352g / M	**N**	
22	June 19, 2013	TRAP MORTALITY / 510mm / F	**Y**	June 29, 2012
23	June 20, 2013	450mm / 1146g / F	**N**	
24	June 21, 2013	322mm / 346g	**N**	
25	June 24, 2013	460mm / 1002g / M	**N**	
26	June 24, 2013	421mm / 1121g / M	**N**	
27	June 24, 2013	455mm / 1092g / M	**N**	
28	June 24, 2013	402mm / 691g / M	**N**	
29	June 25, 2013	410mm / 837g / M	**N**	
30	June 25, 2013	481mm / 1252g / F	**N**	
31	June 25, 2013	367mm / 505g / M	**N**	
32	June 25, 2013	456mm / 1119g / F	**N**	
33	June 25, 2013	487mm/ 1065g / M	**N**	
34	June 25, 2013	650mm / ~3000g / M	**N**	
35	June 25, 2013	455mm / 1077g / F	**N**	
36	June 25, 2013	415mm / 801g / F	**N**	
37	June 25, 2013	418mm / 824g / F	**N**	
38	June 26, 2013	398mm / 664g / F	**N**	
39	June 26, 2013	403mm / 658g / M	**N**	
40	June 26, 2013	490mm / 1297g / M	**Y**	August 2, 2012
41	June 26, 2013	430mm / 933g / F	**N**	
42	June 26, 2013	470mm / 1207g / M	**N**	
43	June 26, 2013	455mm / 1114g / M	**N**	
44	June 26, 2013	450mm / 974g / F	**N**	
45	June 27, 2013	450mm / 974g / F	**N**	
46	June 28, 2013	481mm / NA / M	**N**	
47	June 28, 2013	454mm / NA / F	**N**	
48	June 28, 2013	461mm / NA / F	**N**	
49	June 28, 2013	510mm / NA / M	**Y**	July 19, 2012
50	July 1, 2013	461mm / 1094g / F	**Y**	August 2, 2011
51	July 1, 2013	505mm / 1426g / F	**N**	
52	July 1, 2013	237mm / 217g / NA	**N**	
53	July 1, 2013	490mm / 1309g / NA	**N**	
54	July 1, 2013	470mm / 1100g / F	**N**	
55	July 1, 2013	410mm / 1088g / M	**N**	
56	July 1, 2013	492mm / 1261g / M	**N**	
57	July 1, 2013	440mm / 992g / NA	**N**	
58	July 1, 2013	488mm / 1077g / M	**N**	
59	July 1, 2013	490mm / 1247g / M	**N**	

60	July 1, 2013	453mm / 989g / M	**N**	
61	July 1, 2013	545mm / 1797g / F	**N**	
62	July 1, 2013	497mm / 1349g / M	**N**	
63	July 1, 2013	492mm / 1295g / F	**N**	
64	July 2, 2013	575mm / 2012g / F	**N**	
65	July 2, 2013	450mm / 1063g / M	**Y**	No Data
66	July 2, 2013	427mm / 1309g / M	**N**	
67	July 2, 2013	427mm / 819g / F	**N**	
68	July 2, 2013	409mm / 802g / NA	**N**	
69	July 2, 2013	372mm / 567g / NA	**N**	
70	July 3, 2013	534mm / 1817g / F	**N**	
71	July 5, 2013	502mm / 1396g / M	**N**	
72	July 5, 2013	412mm / 827g / F	**N**	
73	July 5, 2013	435mm / 884g / M	**N**	
74	July 5, 2013	457mm / 1091g / M	**N**	
75	July 8, 2013	429mm / NA/ F	**N**	
76	July 8, 2013	420mm / NA / NA	**N**	
77	July 8, 2013	463mm / NA / M	**Y**	July 30, 2012
78	July 8, 2013	434mm / NA / M	**N**	
79	July 8, 2013	371mm / NA / M	**N**	
80	July 8, 2013	403mm / NA / F	**N**	
81	July 8, 2013	423mm / NA / NA	**N**	
82	July 8, 2013	450mm / NA / M	**N**	
83	July 8, 2013	404mm / NA / M	**N**	
84	July 8, 2013	500mm / NA / F	**N**	
85	July 8, 2013	459mm / NA / F	**Y**	July 30, 2012
86	July 8, 2013	445mm / NA /F	**N**	
87	July 8, 2013	441mm / NA / M	**N**	
88	July 8, 2013	442mm / NA / F	**N**	
89	July 8, 2013	449mm / NA / M	**N**	
90	July 8, 2013	458mm / NA / M	**N**	
91	July 8, 2013	414mm / NA / F	**N**	
92	July 8, 2013	509mm / NA / M	**N**	
93	July 8, 2013	473mm / NA/ M	**N**	
94	July 10, 2013	398mm / 699g / F	**N**	
95	July 10, 2013	439mm / 899g / M	**N**	
96	July 10, 2013	357mm / 472g / F	**N**	
97	July 10, 2013	472mm / 1135g / M	**N**	
98	July 10, 2013	517mm / 1458g / F	**N**	
99	July 10, 2013	480mm / 1250g / F	**N**	
100	July 10, 2013	297mm / 253g / M	**N**	
101	July 10, 2013	464mm / 1125g / F	**N**	
102	July 10, 2013	440mm / 929g / M	**N**	
103	July 10, 2013	410mm / 759g / F	**N**	

104	July 10, 2013	474mm / 1144g / M	**N**	
105	July 10, 2013	434mm / 838g / M	**N**	
106	July 11, 2013	437mm / 1038g / M	**N**	
107	July 11, 2013	528mm / 1548g / M	**Y**	July 20, 2009
108	July 11, 2013	450mm / 1045g / M	**N**	
109	July 11, 2013	380mm / 658g / NA	**N**	
110	July 11, 2013	373mm / 543g / M	**N**	
111	July 11, 2013	488mm / 1258g / M	**N**	
112	July 11, 2013	442mm / 883g / M	**N**	
113	July 11, 2013	480mm / 1213g / M	**N**	
114	July 11, 2013	378mm / 558g / M	**N**	
115	July 11, 2013	467mm / 1171g / F	**N**	
116	July 11, 2013	438mm / 968g / M	**N**	
117	July 11, 2013	443mm / 941g / F	**N**	
118	July 11, 2013	460mm / 1004g / F	**N**	
119	July 11, 2013	483mm / 1278g / M	**N**	
120	July 12, 2013	450mm / NA / M	**N**	
121	July 12, 2013	364mm / 497g / M	**N**	
122	July 12, 2013	402mm / 616g / M	**N**	
123	July 12, 2013	438mm / 911g / M	**N**	
124	July 12, 2013	398mm / 684g / M	**N**	
125	July 12, 2013	395mm / 670g / M	**N**	
126	July 12, 2013	432mm / 865g / F	**N**	
127	July 12, 2013	391mm / 665g / M	**N**	
128	July 12, 2013	415mm / 816g / M	**N**	
129	July 15, 2013	354mm / 437g / M	**N**	
130	July 15, 2013	465mm / 1026g / M	**N**	
131	July 15, 2013	430mm / 851g / F	**N**	
132	July 15, 2013	390mm / 659g / F	**N**	
133	July 15, 2013	375mm / 509g / M	**N**	
134	July 15, 2013	540mm / 1819g / F	**Y**	July 30, 2012
135	July 15, 2013	355mm / 442g / M	**N**	
136	July 15, 2013	480mm / 1208g / F	**N**	
137	July 15, 2013	475mm / 1284g / F	**N**	
138	July 15, 2013	480mm / 1058g / F	**Y**	June 6, 2012
139	July 15, 2013	438mm / 985g / M	**N**	
140	July 15, 2013	504mm / 1408g / M	**N**	
141	July 15, 2013	460mm / 1108g / F	**N**	
142	July 15, 2013	444mm / 905g / F	**N**	
143	July 15, 2013	473mm / 1137g / M	**N**	
144	July 15, 2013	438mm / 1157g / F	**Y**	June 29, 2012
145	July 15, 2013	433mm / 564g / M	**Y**	July 19, 2012
146	July 15, 2013	482mm / 1242g / F	**Y**	July 30, 2012

147	July 15, 2013	455mm / 1012g / M	**N**	
148	July 15, 2013	503mm / 1378g / M	**N**	
149	July 15, 2013	405mm / 708g / F	**N**	
150	July 15, 2013	478mm / 1094g / NA	**N**	
151	July 15, 2013	456mm / 1005g / M	**N**	
152	July 15, 2013	462mm / 1084g / F	**N**	
153	July 15, 2013	452mm / 994g / F	**N**	
154	July 15, 2013	417mm / 775g / NA	**N**	
155	July 15, 2013	457mm / 954g / M	**Y**	August 16, 2012
156	July 16, 2013	474mm / 1133g / F	**N**	
157	July 16, 2013	580mm / 2124g / F	**N**	
158	July 16, 2013	470mm / 1187g / M	**N**	
159	July 16, 2013	492mm / 1425g / F	**N**	
160	July 16, 2013	462mm / 1036g / M	**N**	
161	July 16, 2013	430mm / 875g / F	**N**	
162	July 16, 2013	464mm / 1037g / M	**Y**	July 30, 2012
163	July 16, 2013	465mm / 1012g / M	**N**	
164	July 16, 2013	457mm / 1022g / M	**N**	
165	July 17, 2013	378mm / 547g / M	**N**	
166	July 17, 2013	417mm / 785g / M	**N**	
167	July 17, 2013	498mm / 1397g / F	**N**	
168	July 17, 2013	560mm / 2141g / M	**Y**	August 3, 2012 & June 16, 2010
169	July 17, 2013	444mm / 920g / M	**N**	
170	July 17, 2013	514mm / 920g / M	**N**	
171	July 17, 2013	510mm / 1404g / F	**N**	
172	July 17, 2013	470mm / 1069g / M	**N**	
173	July 17, 2013	413mm / 818g / F	**N**	
174	July 17, 2013	438mm / 964g / F	**N**	
175	July 17, 2013	455mm / 1072g / M	**N**	
176	July 17, 2013	454mm / 1073g / F	**N**	
177	July 17, 2013	402mm / 733g / M	**N**	
178	July 17, 2013	428mm / 776g / M	**Y**	July 19, 2012
179	July 18, 2013	493mm / 1385g / M	**N**	
180	July 18, 2013	450mm / 1066g / M	**N**	
181	July 18, 2013	434mm / 967g / F	**N**	
182	July 18, 2013	451mm / 985g / F	**N**	
183	July 18, 2013	439mm / 942g / F	**N**	
184	July 18, 2013	444mm / 934g / F	**N**	
185	July 18, 2013	490mm / 1367g / F	**Y**	July 19, 2012
186	July 18, 2013	438mm / 903g / F	**N**	
187	July 18, 2013	409mm 836g / M	**N**	
188	July 18, 2013	395mm / 745g / F	**N**	
189	July 18, 2013	369mm / 564g / F	**N**	

190	July 19, 2013	410mm / 717g / M	**N**	
191	July 19, 2013	425mm / 823g / M	**N**	
192	July 19, 2013	462mm / 1027g / M	**Y**	August 1, 2012
193	July 19, 2013	477mm / 1146g / M	**Y**	July 30, 2012
194	July 19, 2013	397mm / 875g / F	**Y**	July 16, 2012
195	July 22, 2013	395mm / 718g / M	**N**	
196	July 22, 2013	428mm / 817g / F	**N**	
197	July 22, 2013	490mm / 1257g / F	**Y**	July 11, 2012
198	July 22, 2013	473mm / 1188g / M	**N**	
199	July 22, 2013	407mm / 748g / M	**N**	
200	July 22, 2013	553mm / 1794g / M	**Y**	June 29, 2010
201	July 22, 2013	506mm / 1440g / M	**Y**	July 30, 2012
202	July 22, 2013	488mm / 1308g / F	**N**	
203	July 22, 2013	465mm / 1077g / M	**N**	
204	July 22, 2013	467mm / 1144g / F	**N**	
205	July 22, 2013	390mm / 663g / M	**N**	
206	July 22, 2013	435mm / 903g / F	**N**	
207	July 22, 2013	402mm / 729g / F	**N**	
208	July 22, 2013	517mm / 1854g / F	**N**	
209	July 22, 2013	368mm / 539g / F	**N**	
210	July 22, 2013	380mm / 584g / M	**N**	
211	July 23, 2013	482mm / 1219g / F	**Y**	July 30, 2012
212	July 23, 2013	440mm / 999g / M	**Y**	April 30, 2012
213	July 24, 2013	470mm / 1064g / M	**N**	
214	July 24, 2013	445mm / 910g / M	**N**	
215	July 24, 2013	455mm / 1083g / F	**N**	
216	July 24, 2013	435mm / 1016g / F	**N**	
217	July 24, 2013	405mm / 708g / F	**N**	
218	July 24, 2013	367mm / 531g / M	**N**	
219	July 24, 2013	405mm / 710g / F	**N**	
220	July 24, 2013	432mm / 883g / M	**N**	
221	July 24, 2013	420mm / 789g / M	**N**	
222	July 25, 2013	445mm / 1002g / M	**N**	
223	July 25, 2013	414mm / 780g / F	**N**	
224	July 25, 2013	460mm / 997g / M	**Y**	August 2, 2012
225	July 25, 2013	410mm / 736g / M	**N**	
226	July 25, 2013	420mm / 852g / M	**N**	
227	July 25, 2013	400mm / 639g / M	**N**	
228	July 25, 2013	478mm / 590g / F	**N**	
229	July 25, 2013	490mm / 1160g / M	**Y**	August 13, 2012
230	July 29, 2013	495mm / 1399g / F	**N**	

231	July 29, 2013	435mm / 821g / M	**N**	
232	July 29, 2013	435mm / 830g / M	**Y**	August 2, 2012
233	July 29, 2013	482mm / 1257g / M	**N**	
234	July 29, 2013	414mm / 744g / M	**N**	
235	July 29, 2013	446mm / 966g / M	**N**	
236	July 29, 2013	398mm / 703g / F	**N**	
237	July 29, 2013	367mm / 462g / M	**N**	
238	July 29, 2013	427mm / 807g / M	**N**	
239	July 29, 2013	384mm / 600g / M	**N**	
240	July 29, 2013	542mm / 1795g / F	**N**	
241	July 29, 2013	450mm / 1075g / M	**N**	
242	July 29, 2013	415mm / 817g / M	**N**	
243	July 30, 2013	471mm / 1099g / M	**N**	
244	July 30, 2013	479mm / 1101g / F	**N**	
245	July 30, 2013	493mm / 1261g / F	**Y**	August 2, 2012 & July 13, 2011 & June 11, 2010
246	July 30, 2013	437mm / 917g / M	**N**	
247	July 30, 2013	407mm / 708g / M	**N**	
248	July 31, 2013	470mm / 1198g / M	**N**	
249	July 31, 2013	426mm / 833g / F	**N**	
250	July 31, 2013	385mm / 595g / M	**N**	
251	July 31, 2013	553mm 1873g / F	**N**	
252	July 31, 2013	414mm / 797g / F	**N**	
253	July 31, 2013	440mm / 858g / F	**N**	
254	July 31, 2013	414mm / 765g / F	**N**	
255	July 31, 2013	325mm / 343g / M	**N**	
256	August 1, 2013	462mm / 1045g / F	**N**	
257	August 1, 2013	512mm / 1441g / F	**Y**	June 22, 2012
258	August 1, 2013	420mm / 826g / F	**N**	
259	August 2, 2013	434mm / 931g / F	**N**	
260	August 2, 2013	461mm / 996g / F	**N**	
261	August 2, 2013	364mm / 525g / F	**N**	
262	August 5, 2013	458mm / 1063g / F	**N**	
263	August 5, 2013	404mm / 735g / M	**N**	
264	August 5, 2013	430mm / 898g / F	**N**	
265	August 5, 2013	392mm / 676g / M	**N**	
266	August 5, 2013	506mm / 1349g / F	**N**	
267	August 5, 2013	365mm / 617g / F	**N**	
268	August 5, 2013	395mm / 662g / F	**N**	
269	August 7, 2013	500mm / 1325g / F	**Y**	August 1, 2012

2014 Buckley Bull Trout

	Date Captured	Fork Length (mm)/ Weight (g) / Sex	Recapture	Original Date(s) Captured
1	January 29, 2014	290mm / 249g / M	N	
2	January 31, 2014	327mm / 249g / M	N	
3	January 31, 2014	335mm / 393g / M	N	
4	March 5, 2014	382mm / 647g / M	N	
5	March 10, 2014	349mm / 416g / M	N	
6	March 10, 2014	390mm / 675g / F	N	
7	March 17, 2014	339mm / 411g / F	N	
8	April 2, 2014	530mm / 1494g / M	Y	July 5, 2013
9	April 7, 2014	327mm / 330g / M	N	
10	April 7, 2014	339mm / 377g / M	N	
11	April 9, 2014	509mm / 1605g / M	N	
12	April 9, 2014	468mm / 1047g / M	N	
13	April 9, 2014	375mm / 524g / M	N	
14	April 9, 2014	407mm / 691g / M	N	
15	April 11, 2014	345mm / 424g / --	N	
16	April 11, 2014	321mm / 414g / F	N	
17	April 14, 2014	490mm / 1368g / F	N	
18	April 16, 2014	480mm / 1140g / M	N	
19	April 18, 2014	448mm / 902g / M	N	
20	April 23, 2014	398mm / 638g / F	N	
21	May 2, 2014	400mm / 671g / M	N	
22	May 2, 2014	347mm / 453g / M	N	
23	May 9, 2014	510mm / 1487g / F	N	
24	May 14, 2014	382mm / 600g / F	N	
25	May 14, 2014	690mm / 5443g / M	Y	June 18, 1012 & August 5, 2011
26	May 16, 2014	342mm / 371g / F	N	
27	May 16, 2014	302mm / 286g / M	N	
28	May 16, 2014	435mm / 854g / M	N	
29	May 23, 2014	380mm / 549g /M	N	
30	May 23, 2014	608mm / 2590g /F	Y	June 29, 2012 & July 27, 2011
31	May 23, 2014	497mm / 1350g / M	N	
32	May 23, 2014	438mm / 929g / M	N	
33	May 23, 2014	535mm / 1803g / M	Y	July 15, 2013
34	May 23, 2014	400mm / 713g / M	N	
35	May 23, 2014	393mm / 1796 / M	N	
36	May 23, 2014	358mm / 493g / M	N	
37	May 23, 2014	595mm / 2610g / F	Y	July 31, 2013
38	May 23, 2014	534mm / 1796g / M	N	
39	May 23, 2014	480mm / 1368g / M	Y	June 24, 2013
40	May 27, 2014	498mm / 1344g / F	N	
41	May 27, 2014	485mm / 1453g / F	N	
42	May 28, 2014	462mm / 1061g / M	N	

43	May 28, 2014	494mm / 1397g / M	Y	July 1, 2013
44	May 30, 2014	488mm / 1404g / M	N	
45	May 30, 2014	573mm / 2254g / F	N	
46	June 4, 2014	540mm / 1748g / F	Y	June/29/2012 & July 8, 2011
47	June 4, 2014	572mm / 2056g / M	Y	July 19, 2012
48	June 4, 2014	504mm / 1551g / F	N	
49	June 4, 2014	482mm / 1358g / F	N	
50	June 4, 2014	385mm / 637g / M	N	
51	June 4, 2014	510mm / 1461g / F	N	
52	June 4, 2014	512mm / 1682g / F	N	
53	June 6, 2014	494mm / 1343g / M	N	
54	June 9, 2014	506mm/ /1564g / F	N	
55	June 9, 2014	526mm / 1766g / M	Y	June 25, 2013
56	June 9, 2014	469mm / 1192g / F	Y	June 19, 2013
57	June 9, 2014	481mm / 1428g / F	N	
58	June 9, 2014	483mm / 1316g / M	N	
59	June 9, 2014	450mm / 1166g / F	Y	July 12, 2013
60	June 9, 2014	455mm / 1061g / M	N	
61	June 9, 2014	325mm / 355g / M	N	
62	June 11, 2014	539mm / 1926g / F	Y	July 1, 2013
63	June 16, 2014	311mm / 290g / M	N	
64	June 18, 2014	527mm / 1693g / F	N	
65	June 18, 2014	406mm / 710g / M	N	
66	June 20, 2014	427mm / 847g / F	N	
67	June 20, 2014	513mm / 1460g / F	N	
68	June 20, 2014	513mm / 1517g / M	N	
69	June 20, 2014	431mm / 968g / M	N	
70	June 20, 2014	505mm / 1478g / F	N	
71	June 20, 2014	467mm / 1172g / M	N	
72	June 20, 2014	480mm / 1345g / M	N	
73	June 20, 2014	437mm / 933g / M	N	
74	June 20, 2014	542mm / 1762g / M	N	
75	June 20, 2014	483mm / 1322g / M	N	
76	June 20, 2014	521mm / 1701g / F	Y	July 17, 2013
77	June 20, 2014	502mm / 1541g / F	N	
78	June 20, 2014	470mm / 1273g / M	N	
79	June 20, 2014	449mm / 1098g / F	N	
80	June 23, 2014	480mm / 1154g / M	N	
81	June 23, 2014	531mm / 1732g / M	Y	July 9, 2012
82	June 23, 2014	553mm / 2048 / M	N	
83	June 23, 2014	504mm / 1381g / M	Y	July 15, 2013 & August 16, 2012
84	June 23, 2014	511mm / 1533g / M	Y	June 26, 2013
85	June 23, 2014	514mm / 1470g	N	
86	June 23, 2014	601mm / 2763 / M	Y	July 17, 2013 & August 3, 2012 & June 16, 2010
87	June 23, 2014	518mm / 1632g / F	Y	July 30, 2013 & August 2, 2012 & July 13, 2011 & June 11, 2010

88	June 23, 2014	375mm / 472g / F	**N**	
89	June 23, 2014	487mm / 1268g / F	**N**	
90	June 23, 2014	456mm / 1054g / M	**N**	
91	June 23, 2014	410mm / 783g	**N**	
92	June 23, 2014	452mm / 1184g / F	**N**	
93	June 23, 2014	430mm / 850g / M	**N**	
94	June 23, 2014	554mm / 1920g / F	**Y**	July 10, 2013
95	June 23, 2014	465mm / 1072g / M	**N**	
96	June 23, 2014	435mm / 997g / F	**N**	
97	June 25, 2014	456mm / 1039g / M	**N**	
98	June 25, 2014	495mm / 1508g / M	**N**	
99	June 25, 2014	405mm / 734g / M	**N**	
100	June 25, 2014	510mm / 1460g / F	**N**	
101	June 25, 2014	411mm / 654g / M	**N**	
102	June 25, 2014	523mm / 1510g / M	**Y**	July 11, 2013
103	June 25, 2014	400mm / 792g / M	**N**	
104	June 25, 2014	479mm / 1211g / M	**N**	
105	June 25, 2014	445mm / 1035g / F	**N**	
106	June 25, 2014	438mm / 936g / F	**N**	
107	June 25, 2014	417mm / 890g / M	**N**	
108	June 25, 2014	415mm / 714g / M	**N**	
109	June 25, 2014	370mm / 531g / F	**N**	
110	June 25, 2014	428mm / 951g / F	**N**	
111	June 27, 2014	570mm / 1995g / M	**N**	
112	June 27, 2014	345mm / 442g / M	**N**	
113	June 27, 2014	541mm / 1778g / F	**Y**	August 1, 2013 & June 22, 2012
114	June 27, 2014	383mm / 570g / M	**N**	
115	June 27, 2014	385mm / 576g / M	**N**	
116	June 27, 2014	502mm / 1430g / F	**N**	
117	June 27, 2014	470mm / 1117g / M	**Y**	July 31, 2013
118	June 27, 2014	480mm / 1178g / F	**N**	
119	June 27, 2014	419mm / 768g / M	**N**	
120	June 27, 2014	368mm / 498g / F	**N**	
121	June 27, 2014	530mm / 1511g / F	**N**	
122	June 27, 2014	460mm / 1055g / F	**N**	
123	June 27, 2014	480mm / 1239g / F	**Y**	July 1, 2013
124	June 27, 2014	412mm / 794g / F	**N**	
125	June 27, 2014	420mm / 865g / F	**N**	
126	June 27, 2014	466mm / 1187g / M	**N**	
127	June 27, 2014	433mm / 944g / F	**N**	
128	June 27, 2014	488mm / 1396g / F	**N**	
129	June 27, 2014	375mm / 592g / M	**N**	
130	June 27, 2014	538mm / 1800g / F	**N**	
131	June 27, 2014	422mm / 749g / F	**N**	
132	June 27, 2014	525mm / 1539g / M	**Y**	July 19, 2013 & July 30, 2012

133	June 27, 2014	500mm / 1440g / M	**N**	
134	June 27, 2014	480mm / 1249g / F	**Y**	July 16, 2013
135	June 27, 2014	385mm / 667g / F	**N**	
136	June 27, 2014	430mm / 908g / M	**N**	
137	June 27, 2014	438mm / 1043g / F	**N**	
138	June 27, 2014	374mm / 572g / M	**N**	
139	June 27, 2014	484mm / 1270g / M	**N**	
140	June 27, 2014	475mm / 1217g / F	**N**	
141	June 27, 2014	452mm / 1010g / F	**N**	
142	June 27, 2014	481mm / 1353g / F	**N**	
143	June 27, 2014	498mm / 1384g / M	**N**	
144	June 27, 2014	430mm / 833g / F	**N**	
145	June 27, 2014	485mm / 1216g / F	**N**	
146	June 27, 2014	410mm / 801g / F	**N**	
147	June 27, 2014	430mm / 813g / M	**Y**	June 25, 2013
148	June 27, 2014	387mm / 692g / F	**N**	
149	June 27, 2014	520mm / 1461g / M	**Y**	July 16, 2013
150	June 30, 2014	479mm / 1286g / M	**Y**	July 15, 2013
151	June 30, 2014	480mm / 1155g / M	**Y**	July 12, 2013
152	June 30, 2014	454mm / 1140g / F	**Y**	July 11, 2013
153	June 30, 2014	520mm / 1809g / M	**Y**	July 16, 2012
154	July 1, 2014	543mm / 1753g / M	**Y**	July 17, 2013
155	July 2, 2014	473mm / 1117g / M	**Y**	July 11, 2013
156	July 2, 2014	558mm / 1925g / M	**Y**	July 22, 2013 & July 30, 2012
157	July 2, 2014	559mm / 1872g / M	**Y**	July 15, 2013
158	July 7, 2014	380mm / 610g / M	**N**	
159	July 7, 2014	590mm / 2350g / M	**N**	
160	July 7, 2014	470mm / 1080g / M	**Y**	July 19, 2012
161	July 7, 2014	545mm / 1630g / M	**Y**	July 1, 2013
162	July 7, 2014	485mm / 1135g / F	**N**	
163	July 7, 2014	470mm / 1180g / M	**N**	
164	July 7, 2014	480mm / 1150g / M	**N**	
165	July 7, 2014	485mm / 1298g / F	**Y**	July 8, 2013
166	July 7, 2014	535mm / 1570g / M	**Y**	July 29, 2013
167	July 7, 2014	525mm / 1650g / F	**Y**	July 10, 2013
168	July 8, 2014	510mm / 1450g / M	**Y**	June 19, 2013
169	July 8, 2014	505mm / 1320g / M	**Y**	July 18, 2013
170	July 8, 2014	495mm / 1350g / F	**N**	
171	July 8, 2014	480mm / 1150g / F	**N**	
172	July 8, 2014	420mm / 780g / F	**N**	
173	July 8, 2014	500mm / 1480g / F	**N**	
174	July 8, 2014	435mm / 850g / M	**N**	
175	July 8, 2014	530mm / 1550g / M	**Y**	July 15, 2013
176	July 8, 2014	505mm / 1350g / M	**Y**	July 24, 2013
177	July 8, 2014	475mm / 1210g / F	**N**	

178	July 8, 2014	475mm / 1050g / F	Y	July 22, 2013
179	July 8, 2014	440mm / 820g / F	**N**	
180	July 8, 2014	445mm / 950g / M	Y	
181	July 9, 2014	483mm / 1336g / F	Y	July 25, 2013
182	July 9, 2014	494mm / 1284g / M	Y	July 15, 2013 & July 19, 2012
183	July 11, 2014	516mm / 1554g / F	Y	August 1, 2013
184	July 11, 2014	587mm / 2230g / F	Y	July 15,2013 & July 30, 2012
185	July 11, 2014	529mm / 1575g / F	Y	March 30, 2011
186	July 14, 2014	530mm / 1450g / M	Y	
187	July 14, 2014	400mm / 950g / F	**N**	
188	July 14, 2014	425mm / 840g / M	**N**	
189	July 17, 2014	570mm / 1788g / M	Y	July 8, 2013
190	July 17, 2014	455mm / 1020g / F	Y	July 18, 2013
191	July 17, 2014	488mm / 1248g / F	Y	August 2, 2013
192	July 17, 2014	497mm / 1387g / F	Y	July 24, 2013
193	July 18, 2014	475mm / 1200g / M	**N**	
194	July 21, 2014	425mm / 900g / F	**N**	
195	July 21, 2014	490mm / 1350g / M	**N**	
196	July 21, 2014	395mm / 700g / M	**N**	
197	July 28, 2014	455mm 1200g / F	**N**	
198	July 28, 2014	470mm / 1250g / M	Y	June 24, 2013
199	July 28, 2014	455mm / 1150g / M	Y	
200	July 28, 2014	435mm / 900g / M	**N**	
201	July 28, 2014	510mm / 1450g / M	**N**	
202	July 28, 2014	375mm / 400g / F	**N**	
203	July 28, 2014	375mm / 600g / M	**N**	
204	July 28, 2014	430mm / 700g / M	**N**	
205	July 28, 2014	405mm / 610g / M	**N**	
206	July 28, 2014	370mm / 480g / M	**N**	
207	July 29, 2014	463mm / 994g / M	Y	July 25, 2013
208	July 29, 2014	465mm / 1014g / M	Y	June 3, 2013
209	July 29, 2014	508mm / 1267g / M	Y	July 22, 2013
210	July 30, 2014	405mm / 600g / F	**N**	
211	July 30, 2014	435mm / 700g / F	**N**	
212	July 30, 2014	360mm / 375g / F	**N**	
213	July 30, 2014	425mm / 740g / F	**N**	
214	July 30, 2014	410mm / 620g / M	**N**	
215	July 30, 2014	390mm / 480g / M	**N**	
216	August 4, 2014	435mm / 800g / M	**N**	
217	August 4, 2014	450mm / 800g / M	**N**	
218	August 4, 2014	475mm / 1150g / M	**N**	
219	August 4, 2014	485mm / 1240g / M	**N**	
220	August 4, 2014	520mm / 1450g / F	**N**	
221	August 4, 2014	455mm / 1100g / M	**N**	
222	August 4, 2014	425mm / 670g / M	**N**	

223	August 5, 2014	525mm / 1392g / M	Y	July 5, 2011
224	August 8, 2014	580mm / 1985g / F	Y	July 29, 2013
225	August 8, 2014	510mm / 1500g / M	Y	
226	August 11, 2014	530mm / 1300g / F	Y	August 1, 2012
227	August 11, 2014	490mm / 1100g / M	**N**	
228	August 11, 2014	490mm / 1100g / F	**N**	
229	August 20, 2014	525mm / F	Y	July 16, 2013
230	August 21, 2014	510mm / M	Y	July 10, 2013
231	August 22, 2014	496mm / M	Y	July 29, 2013

The 2014 table contains data on bull trout sampled. A total of 406 bull trout were captured and hauled in 2014.

2015 Buckley Trap Bull Trout

	Date Captured	Fork Length (mm) / Sex	Recapture	Original Date(s) Captured	Fork Length/Original Capture
1	March 2, 2015	358mm / M	**N**		
2	March 5, 2015	357mm / M	**N**		
3	March 13, 2015	357mm / M	**N**		
4	May 4, 2015	530mm / F	**N**		
5	May 4, 2015	515mm / M	**Y**	June 9, 2014 **&** July 12, 2013	450mm / 1166g **&** 395mm / 670g
6	May 4, 2015	470mm / M	**N**		
7	May 11, 2015	518mm / M	**Y**	July 12, 2013 **&** June 30, 2014	391mm / 665g **&** 480mm / 1155g
8	May 11, 2015	540mm / M	**Y**	May 30, 2014	488mm / 1404g
9	May 11, 2015	418mm / F	**N**		
10	May 11, 2015	490mm / M	**N**		
11	May 20, 1015	483mm / M	**N**		
12	May 22, 2015	518mm / F	**N**		
13	May 22, 2015	531mm / M	**N**		
14	May 26, 2015	535mm / M	**N**		
15	May 26, 2015	440mm / F	**N**		
16	May 26, 2015	440mm	**N**		
17	May 26, 2015	498mm / M	**N**		
18	May 26, 2015	535mm / M	**Y**	June 20, 2014	513mm / 1517g
19	May 26, 2015	488mm / M	**N**		
20	May 26, 2015	535mm / M	**N**		
21	May 26, 2015	495mm / M	**N**		
22	May 26, 2015	460mm / F	**N**		
23	May 26, 2015	420mm / M	**N**		
24	May 27, 2015	418mm / M	**Y**	May 2, 2014	400mm / 671g

25	May 27, 2015	507mm / F	**N**		
26	May 27, 2015	474mm / F	**N**		
27	May 27, 2015	470mm / F	**N**		
28	May 29, 2015	424mm / F	**N**		
29	May 29, 2015	472mm / F	**N**		
30	May 29, 2015	546mm / M	**N**		
31	May 29, 2015	508mm / M	**N**		
32	May 29, 2015	463mm / F	**N**		
33	May 29, 2015	471mm / M	**N**		
34	May 29, 2015	570mm / F	**Y**	July 30, 2012 **&** July 1, 2013 **&** June 11, 2014	422mm / 810g **&** 490mm/1309g **&** 539mm/1926g
35	May 29, 2015	440mm / M	**N**		
36	May 29, 2015	472mm / F	**N**		
37	June 1, 2015	418mm / F	**N**		
38	June 1, 2015	505mm / M	**Y**	June 27, 2014	430mm / 833g
39	June 1, 2015	545mm / F	**Y**	June 23, 2014	514mm / 1470g
40	June 1, 2015	527mm / F	**N**		
41	June 1, 2015	468mm / F	**N**		
42	June 1, 2015	426mm / M	**N**		
43	June 1, 2015	459mm / F	**N**		
44	June 1, 2015	347mm / M	**N**		
45	June 1, 2015	429mm	**N**		
46	June 1, 2015	467mm	**N**		
47	June 1, 2015	300mm	**N**		
48	June 1, 2015	429mm / M	**N**		
49	June 1, 2015	536mm	**N**		
50	June 1, 2015	402mm	**Y**	June 27, 2014	374mm / 572g
51	June 1, 2015	449mm / M	**Y**	June 4, 2014	385mm / 637g
52	June 1, 2015	524mm / M	**Y**	June 9, 2014	483mm / 1316g
53	June 1, 2015	472mm / M	**Y**	June 27, 2014	385mm / 576g
54	June 2, 2015	505mm / M	**Y**	June 9, 2014	455mm / 1061g
55	June 2, 2015	427mm / M	**Y**	July 30, 2014	405mm / 600g
56	June 2, 2015	515mm / F	**Y**	June 9, 2014 **&** June 19, 2013	481mm/1192g **&** 420mm/843g
57	June 3, 2015	358mm / F	**N**		
58	June 3, 2015	480mm / M	**Y**	July 24, 2013	367mm / 531g
59	June 4, 2015	480mm / F	**N**		
60	June 4, 2015	494mm / F	**N**		

61	June 4, 2015	377mm / F	N		
62	June 4, 2015	292mm / M	N		
63	June 4, 2015	426mm / M	N		
64	June 4, 2015	530mm / M	Y	July 19, 2012	385mm / 637g
65	June 4, 2015	487mm / F	Y	June 27, 2014	466mm / 1187g
66	June 8, 2015	460mm / F	N		
67	June 8, 2015	528mm / M	N		
68	June 8, 2015	452mm / F	N		
69	June 8, 2015	372mm / M	N		
70	June 8, 2015	450mm / M	N		
71	June 8, 2015	432mm / F	N		
72	June 8, 2015	344mm / M	N		
73	June 8, 2015	540mm / M	Y		
74	June 8, 2015	577mm / M	Y	June 18, 2014	527mm / 1693g
75	June 10, 2015	450mm / F	N		
76	June 10, 2015	450mm / F	N		
77	June 10, 2015	415mm / M	N		
78	June 10, 2015	430mm / M	N		
79	June 12, 2015	440mm / F	N		
80	June 12, 2015	500mm / F	N		
81	June 12, 2015	420mm / M	N		
82	June 12, 2015	470mm / M	N		
83	June 12, 2015	452mm / F	N		
84	June 12, 2015	439mm / M	N		
85	June 12, 2015	444mm / M	N		
86	June 12, 2015	397mm / M	N		
87	June 12, 2015	555mm / M	Y	July 16, 2013	474mm / 1133g
88	June 15, 2015	488mm / F	N		
89	June 15, 2015	508mm / M	N		
90	June 15, 2015	545mm / M	N		
91	June 15, 2015	470mm / M	N		
92	June 15, 2015	523mm / M	N		
93	June 15, 2015	479mm / M	N		
94	June 15, 2015	478mm / M	N		
95	June 15, 2015	385mm / M	N		
96	June 15, 2015	490mm / M	N		

97	June 15, 2015	424mm / M	**N**		
98	June 15, 2015	465mm / M	**N**		
99	June 15, 2015	465mm / M	**N**		
100	June 15, 2015	589mm / F	**Y**		
101	June 15, 2015	560mm/ F	**Y**	May 13, 2013	493mm / 1061g
102	June 15, 2015	540mm / M	**Y**	June 27, 2014	502mm / 1430g
103	June 15, 2015	460mm / M	**Y**	June 20, 2014	431mm / 968g
104	June 15, 2015	485mm / M	**Y**	June 23, 2014	430mm / 850g
105	June 17, 2015	399mm / F	**N**		
106	June 17, 2015	449mm / M	**N**		
107	June 17, 2015	303mm / M	**N**		
108	June 17, 2015	550mm / M	**N**		
109	June 17, 2015	505mm / F	**N**		
110	June 17, 2015	492mm / F	**N**		
111	June 17, 2015	440mm / M	**N**		
112	June 17, 2015	432mm / F	**N**		
113	June 17, 2015	455mm / F	**N**		
114	June 17, 2015	420mm / F	**N**		
115	June 17, 2015	328mm / M	**N**		
116	June 17, 2015	544mm / M	**Y**	June 20, 2014	513mm / 1460g
117	June 17, 2015	413mm / M	**Y**	July 30, 2014	360mm / 375g
118	June 17, 2015	545mm / M	**Y**	June 23, 2014 **&** June 26, 2013	511mm/1533g **&** 470mm/1207g
119	June 19, 2015	407mm / M	**N**		
120	June 19, 2015	473mm / F	**N**		
121	June 19, 2015	402mm / M	**N**		
122	June 19, 2015	485mm / M	**N**		
123	June 19, 2015	434mm / F	**N**		
124	June 19, 2015	349mm / M	**N**		
125	June 19, 2015	428mm / F	**N**		
126	June 19, 2015	500mm / F	**N**		
127	June 19, 2015	445mm / F	**N**		
128	June 19, 2015	465mm / M	**N**		
129	June 19, 2015	435mm / F	**Y**	July 8, 2014 **&** July 23, 2014	440mm / 1050g **&** 368mm / 1144g
130	June 19, 2015	490mm / M	**Y**	May 23, 2014	358mm / 493g
131	June 19, 2015	448mm / M	**N**		
132	June 22, 2015	515mm / M	**N**		

133	June 22, 2015	455mm / M	**N**		
134	June 22, 2015	380mm/ M	**N**		
135	June 22, 2015	445mm / M	**N**		
136	June 22, 2015	400mm / M	**N**		
137	June 22, 2015	432mm / F	**N**		
138	June 22, 2015	424mm / F	**N**		
139	June 22, 2015	404mm / M	**N**		
140	June 22, 2015	359mm / M	**N**		
141	June 22, 2015	502mm / F	**N**		
142	June 22, 2015	454mm / M	**N**		
143	June 22, 2015	470mm / M	**Y**	May 23, 2014	400mm / 713g
144	June 23, 2015	478mm / F	**N**		
145	June 23, 2015	419mm / F	**N**		
146	June 23, 2015	475mm / F	**N**		
147	June 23, 2015	428mm / F	**N**		
148	June 23, 2015	408mm / F	**N**		
149	June 23, 2015	370mm / M	**N**		
150	June 23, 2015	482mm / M	**Y**	July 19, 2013	410mm / 717g
151	June 23, 2015	530mm / M	**Y**	August 21, 2014 **&** July 10, 2013	510mm **&** 474mm / 1144g
152	June 24, 2015	467mm / M	**N**		
153	June 24, 2015	401mm / M	**N**		
154	June 25, 2015	532mm / M	**N**		
155	June 25, 2015	425mm / F	**N**		
156	June 25, 2015	480mm / F	**N**		
157	June 25, 2015	480mm / M	**N**		
158	June 25, 2015	420mm / F	**N**		
159	June 25, 2015	454mm / M	**N**		
160	June 25, 2015	412mm / M	**N**		
161	June 25, 2015	474mm / F	**N**		
162	June 25, 2015	520mm / M	**N**		
163	June 25, 2015	365mm / M	**N**		
164	June 25, 2015	493mm / F	**N**		
165	June 25, 2015	383mm / M	**N**		
166	June 25, 2015	434mm/ F	**N**		
167	June 25, 2015	428mm / F	**N**		
168	June 25, 2015	370mm / F	**N**		

169	June 25, 2015	558mm / F	**Y**	June 9, 2014	506mm/ /1564g
170	June 26, 2015	364mm / M	**N**		
171	June 26, 2015	404mm / M	**N**		
172	June 26, 2015	370mm / M	**N**		
173	June 26, 2015	342mm / M	**N**		
174	June 26, 2015	481mm / F	**N**		
175	June 26, 2015	349mm / M	**N**		
176	June 26, 2015	395mm / F	**N**		
177	June 26, 2015	383mm / M	**N**		
178	June 26, 2015	440mm / M	**N**		
179	June 26, 2015	415mm / M	**N**		
180	June 26, 2015	343mm / M	**N**		
181	June 29, 2015	421mm / F	**N**		
182	June 29, 2015	475mm	**N**		
183	June 29, 2015	530mm	**N**		
184	June 29, 2015	455mm	**N**		
185	June 29, 2015	435mm	**N**		
186	June 29, 2015	385mm	**N**		
187	June 29, 2015	430mm	**N**		
188	June 29, 2015	482mm	**N**		
189	June 29, 2015	435mm	**N**		
190	June 29, 2015	445mm	**N**		
191	June 30, 2015	397mm / M	**N**		
192	June 30, 2015	470mm / F	**N**		
193	June 30, 2015	435mm / M	**N**		
194	July 1, 2015	392mm / M	**N**		
195	July 2, 2015	504mm / F	**N**		
196	July 6, 2015	332mm / M	**N**		
197	July 6, 2015	423mm / F	**N**		
198	July 6, 2015	444mm / M	**N**		
199	July 6, 2015	362mm / M	**N**		
200	July 6, 2015	417mm / M	**N**		
201	July 6, 2015	334mm / M	**N**		
202	July 6, 2015	438mm / F	**N**		
203	July 6, 2015	410mm / M	**N**		
204	July 6, 2015	454mm / M	**N**		

205	July 6, 2015	430mm / M	**N**		
206	July 6, 2015	421mm / M	**N**		
207	July 6, 2015	607mm / M	**Y**	June 16, 2010 & August 3, 2012 & July 17, 2013 & June 23, 2014	415mm / 900g & 550mm/1832g & 560mm/2141g & 601mm/2763g
208	July 6, 2015	476mm / M	**Y**	June 25, 2014	456mm / 1039g
209	July 6, 2015	490mm / M	**N**		
210	July 7, 2015	480mm / M	**Y**	August 4, 2014	455mm / 1100g
211	July 7, 2015	410mm /M	**N**		
212	July 7, 2015	310mm / M	**N**		
213	July 7, 2015	410mm / F	**N**		
214	July 8, 2015	438mm / F	**N**		
215	July 8, 2015	395mm / M	**N**		
216	July 8, 2015	291mm / M	**N**		
217	July 8, 2015	393mm / F	**N**		
218	July 8, 2015	424mm / M	**N**		
219	July 8, 2015	465mm / M	**N**		
220	July 10, 2015	422mm / F	**N**		
221	July 10, 2015	373mm / M	**N**		
222	July 13, 2015	420mm / F	**N**		
223	July 13, 2015	348mm / M	**N**		
224	July 13, 2015	410mm / M	**N**		
225	July 13, 2015	405mm / M	**N**		
226	July 13, 2015	430mm / F	**N**		
227	July 13, 2015	427mm / M	**Y**	May 11, 2015	418mm
228	July 13, 2015	505mm / F	**Y**	July 16, 2013 & June 27, 2014	430mm / 875g & 480mm/1249g
229	July 13, 2015	560mm / M	**Y**	July 9, 2012 & June 23, 2014	403mm/771g & 531mm/1732g
230	July 13, 2015	540mm / M	**Y**	June 20, 2014	505mm / 1478g
231	July 14, 2015	395mm / F	**N**		
232	July 14, 2015	420mm / M	**N**		
233	July 15, 2015	362mm / M	**N**		
234	July 15, 2015	348mm / M	**N**		
235	July 16, 2015	423mm / M	**N**		
236	July 16, 2015	385mm / M	**N**		
237	July 16, 2015	417mm / M	**N**		
238	July 20, 2015	450mm / F	**N**		
239	July 20, 2015	422mm / F	**N**		
240	July 20, 2015	434mm / F	**N**		

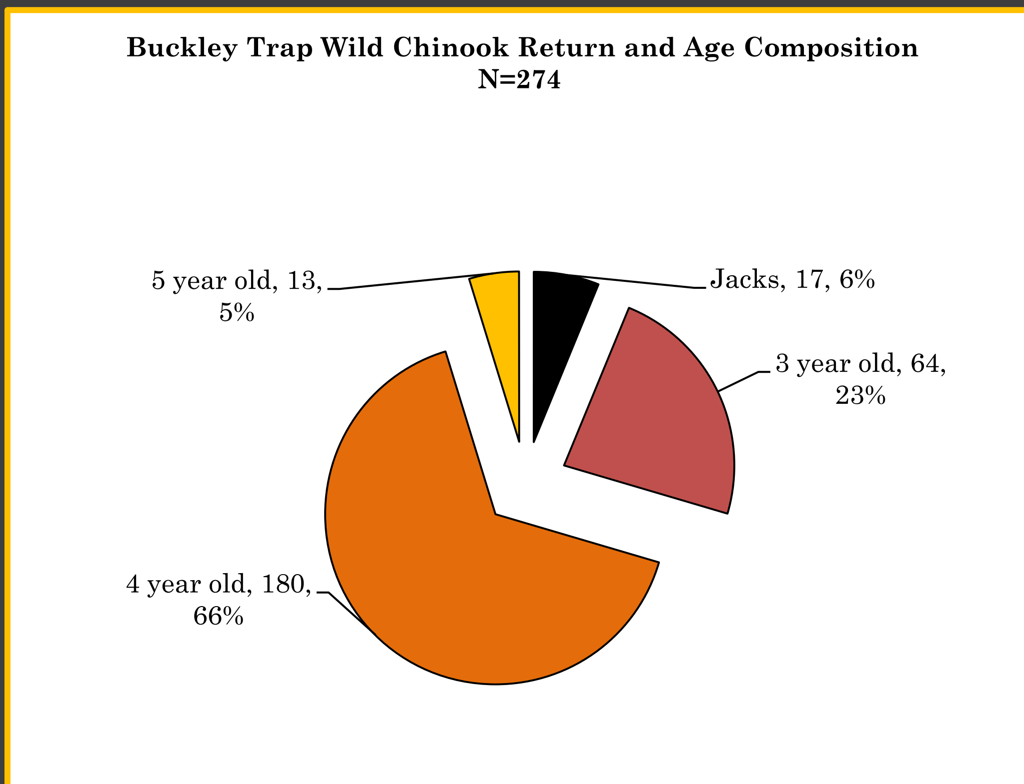
241	July 20, 2015	355mm / F	**N**		
242	July 20, 2015	410mm / F	**Y**	July 28, 2014	375mm / 400g
243	July 20, 2015	483mm / M	**Y**	June 25, 2014	479mm / 1211g
244	July 21, 2015	405mm / M	**N**		
245	July 21, 2015	430mm / F	**N**		
246	July 21, 2015	387mm / M	**N**		
247	July 21, 2015	528mm / M	**Y**	August 1, 2013	462mm / 1045g
248	July 22, 2015	440mm / F	**N**		
249	July 22, 2015	405mm / F	**N**		
250	July 22, 2015	468mm / M	**N**		
251	July 22, 2015	318mm / M	**N**		
252	July 23, 2015	425mm / M	**N**		
253	July 27, 2015	428mm / M	**N**		
254	July 27, 2015	426mm / F	**N**		
255	July 27, 2015	388mm / F	**N**		
256	July 27, 2015	398mm / M	**N**		
257	July 28, 2015	434mm/ M	**N**		
258	July 28, 2015	477mm / M	**Y**	June 20, 2014	470mm / 1273g
259	July 29, 2015	423mm / F	**N**		
260	July 29, 2015	488mm / M	**N**		
261	July 30, 2015	428mm / M	**N**		
262	July 30, 2015	395mm / M	**N**		
263	July 31, 2015	473mm / F	**N**		
264	July 31, 2015	407mm / M	**N**		
265	August 3, 2015	372mm / M	**N**		
266	August 3, 2015	405mm / F	**N**		

The 2015 table contains data on bull trout sampled.

2007-2014

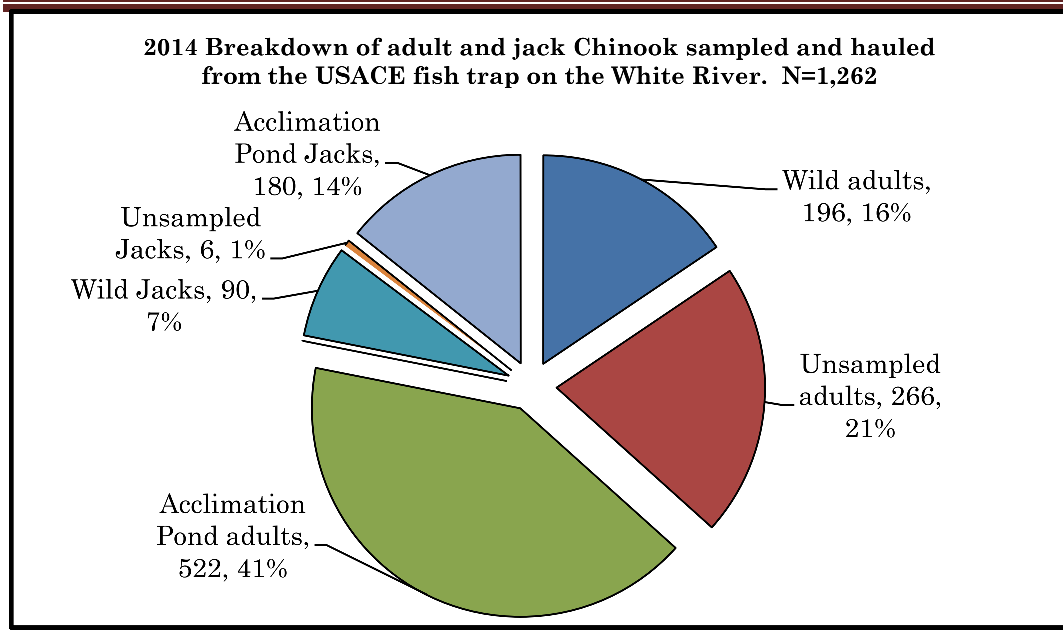
RETURN AND AGE COMPOSITION OF *SAMPLED BUCKLEY TRAP CHINOOK

(NATURAL ORIGIN RETURN (NOR) AND HATCHERY)

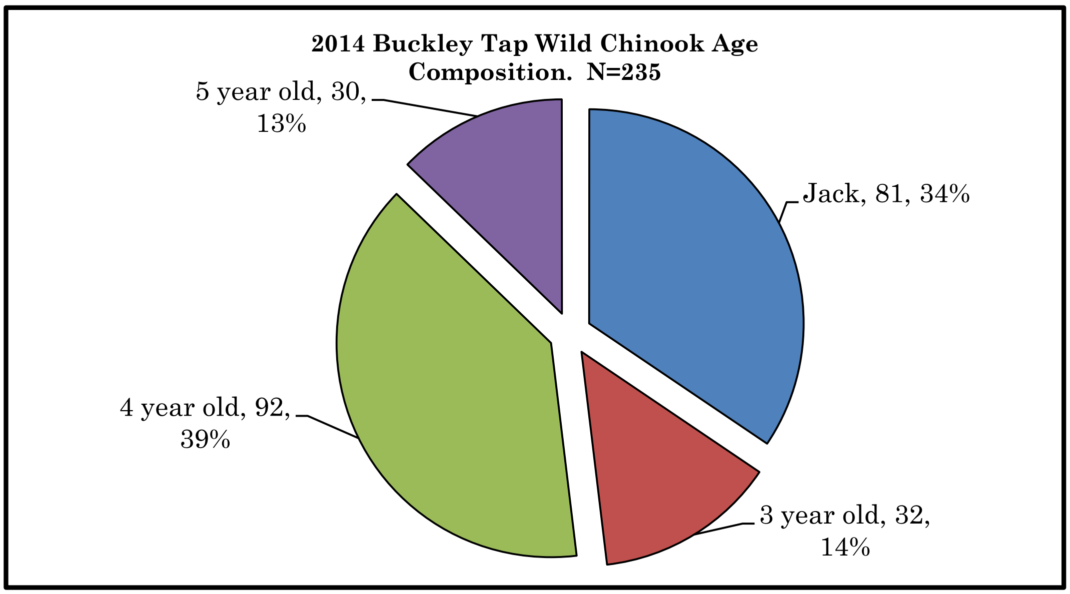


***The following data represents Chinook sampled for CWT's and external fin clips at the USACE fish trap; however, prior reports listed this data as total fish captured which is incorrect. Although efforts are made to sample all Chinook passed, not all fish captured and transported can be physically sampled.**

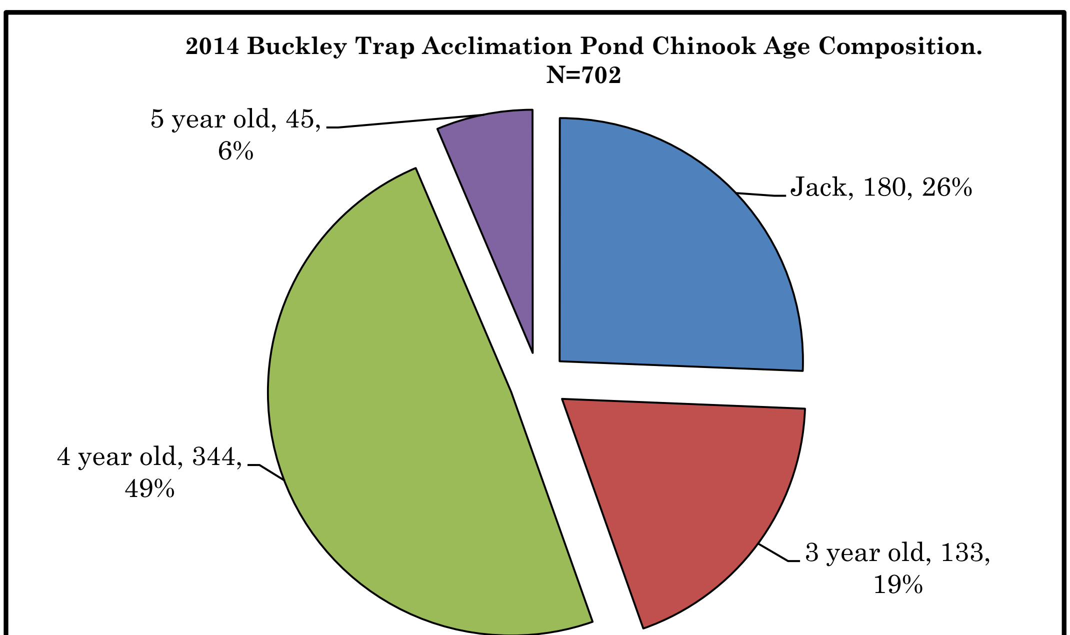
APPENDIX F



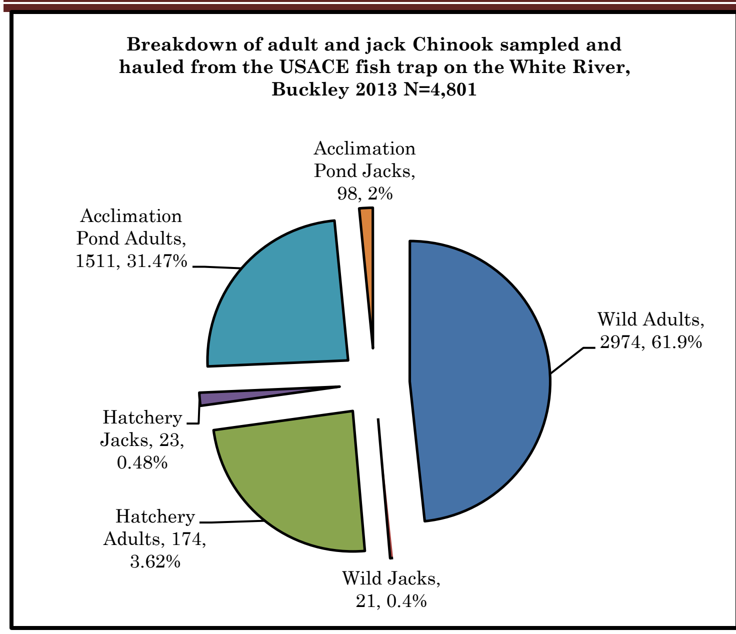
2014: Total number of Chinook sampled/hauled from the USACE fish trap including wild, acclimation and White River hatchery.



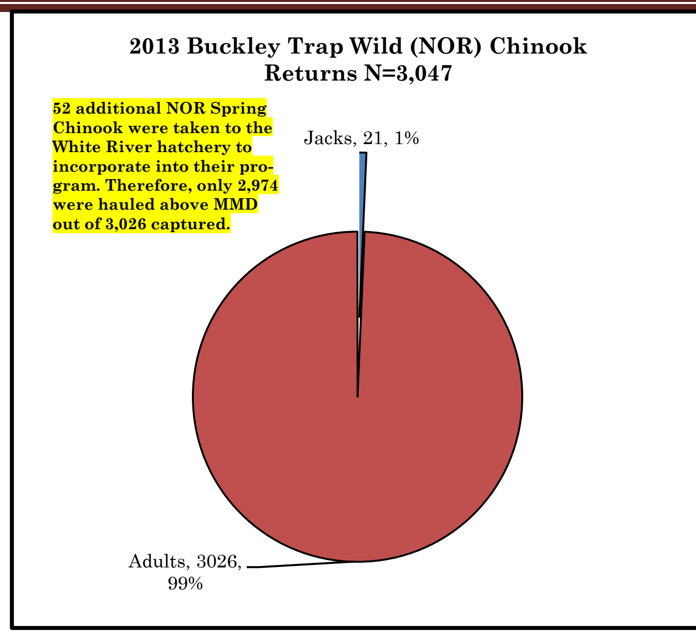
2014: Age breakdown of wild adult and jack Chinook sampled in the USACE fish trap.



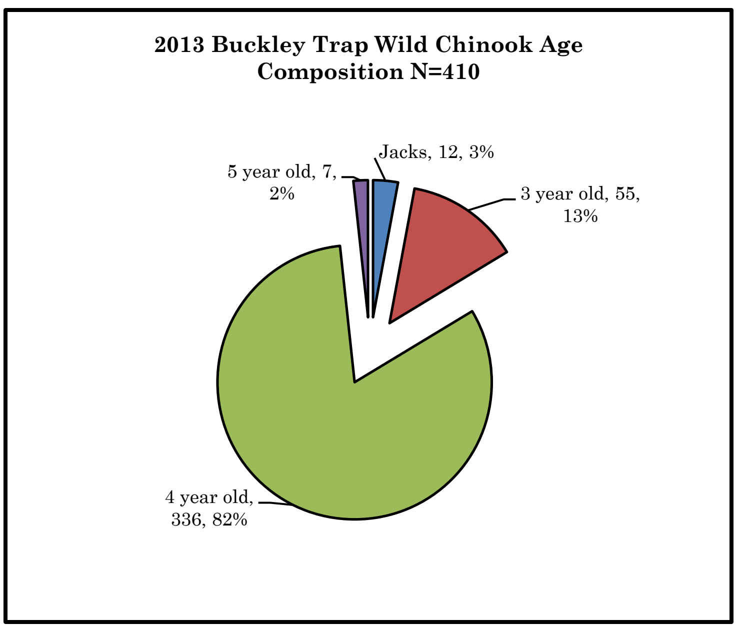
2014: Breakdown of adult and jack acclimation pond Chinook sampled in the USACE fish trap.



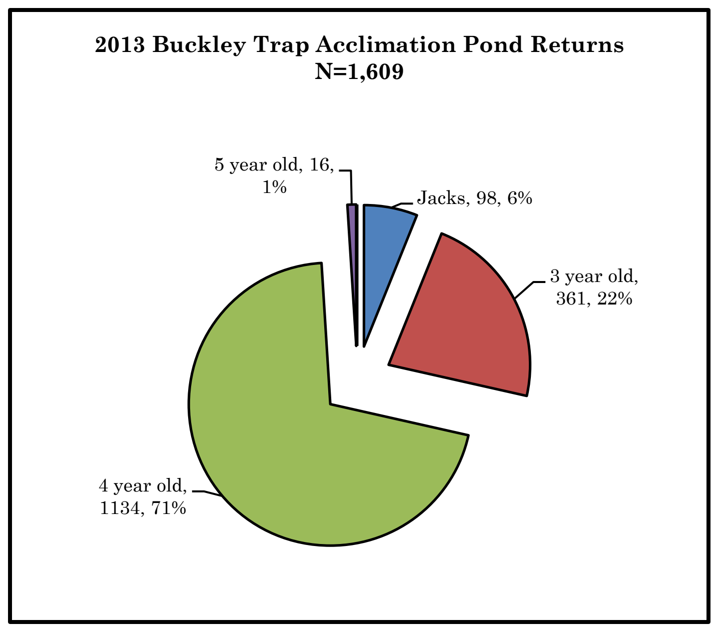
2013: Total number of Chinook sampled in the USACE fish trap including wild, acclimation and White River hatchery.



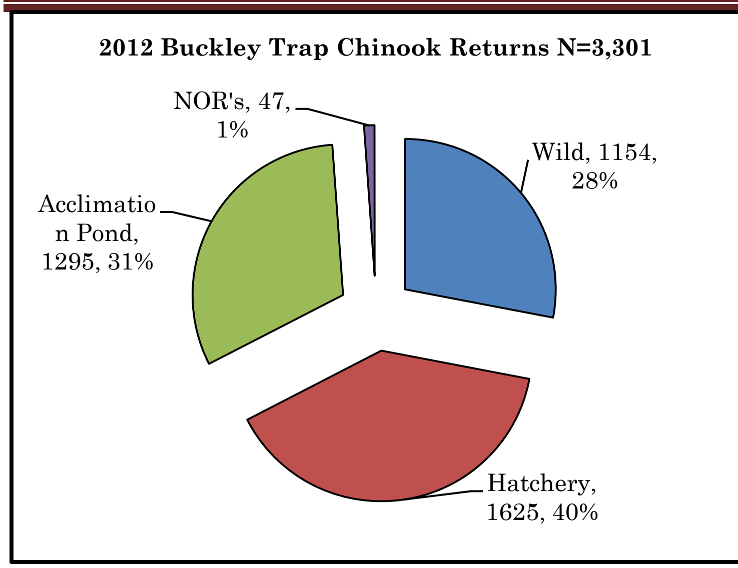
2013: Breakdown of adult and jack NOR's *(natural origin return)* sampled in the USACE fish trap.



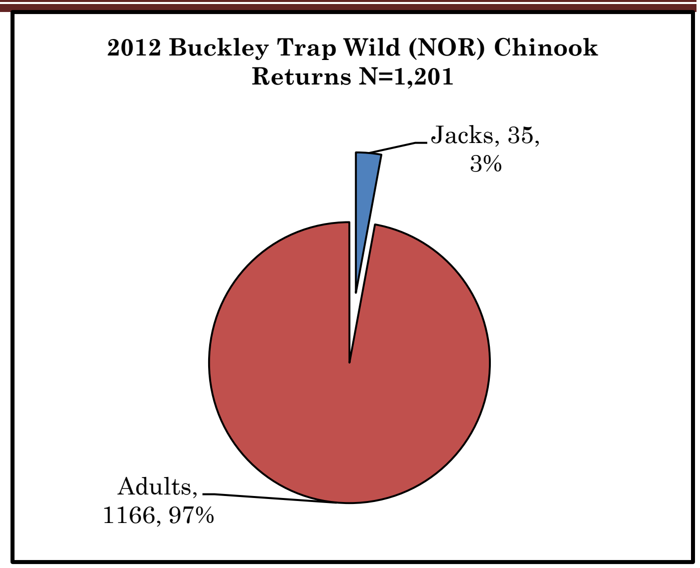
2013: Age breakdown of wild adult and jack Chinook sampled in the USACE fish trap.



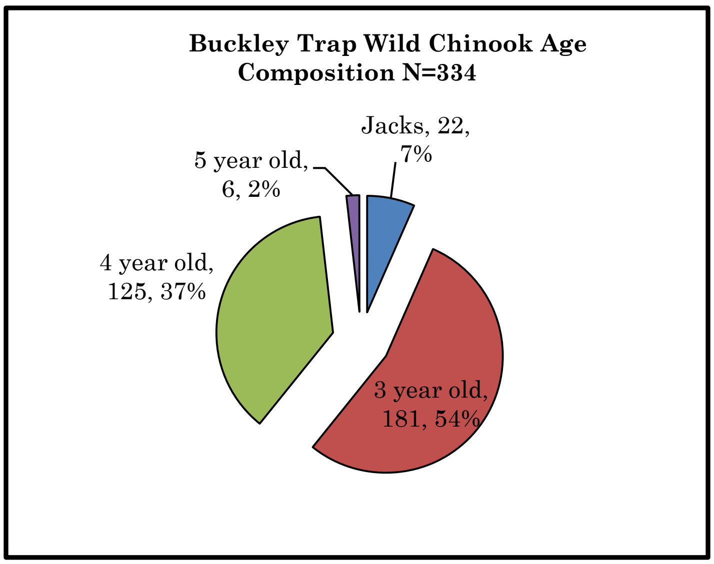
2013: Breakdown of adult and jack acclimation pond Chinook sampled in the USACE fish trap.



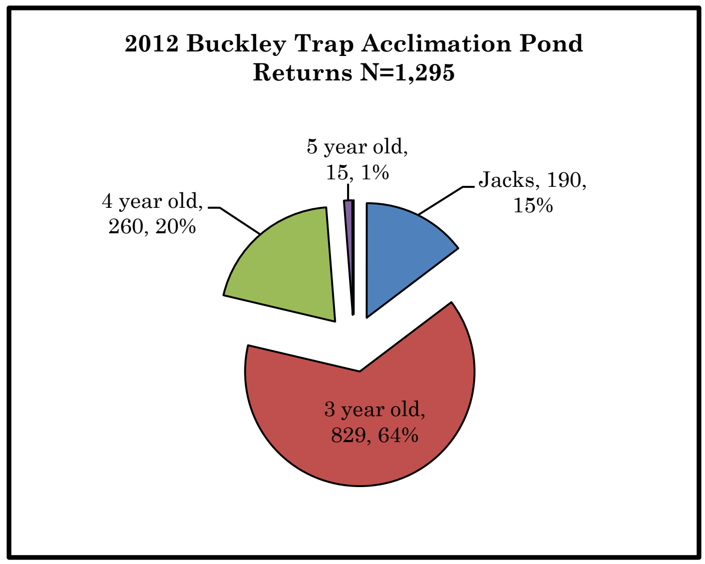
2012: Total number of Chinook sampled in the USACE fish trap including wild, acclimation and White River hatchery.



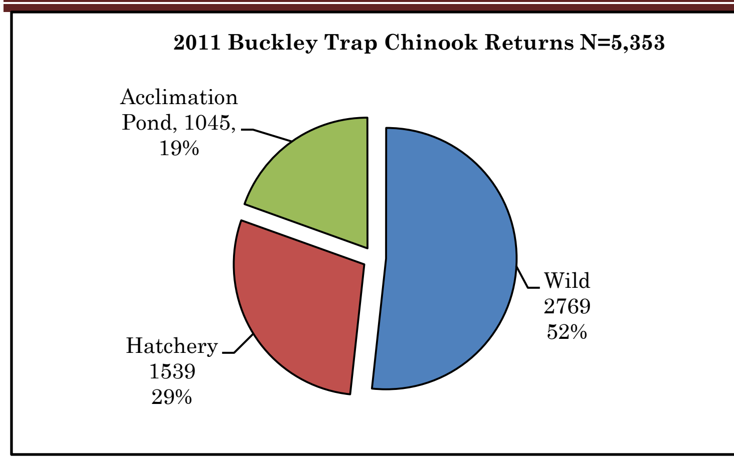
2012: Breakdown of adult and jack NOR's *(natural origin return)* sampled in the USACE fish trap.



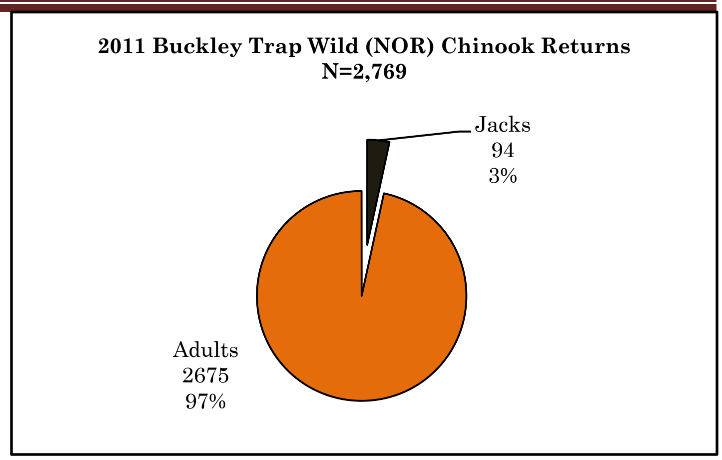
2012: Age breakdown of wild adult and jack Chinook sampled in the USACE fish trap.



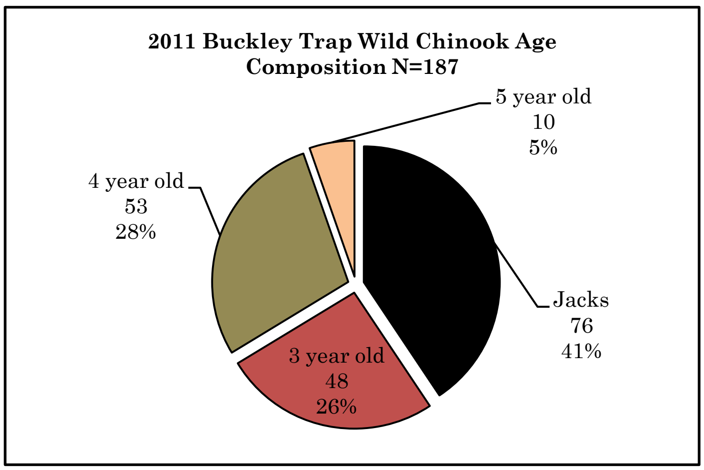
2012: Breakdown of adult and jack acclimation pond Chinook sampled in the USACE fish trap.



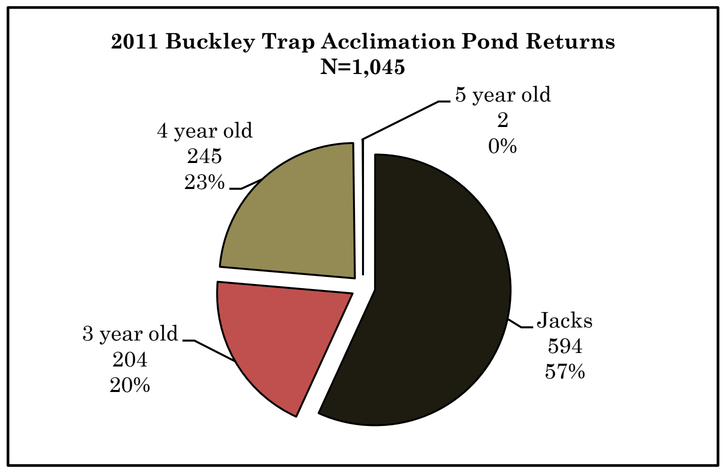
2011: Total number of Chinook sampled in the USACE fish trap including wild, acclimation and White River hatchery.



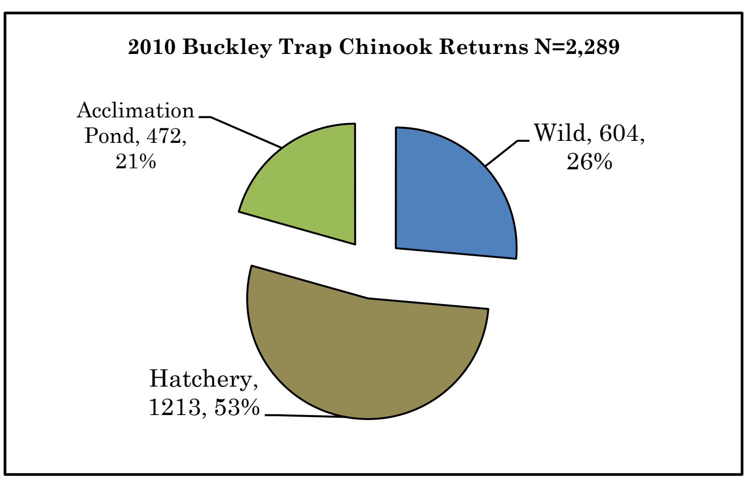
2011: Breakdown of adult and jack NOR's *(natural origin return)* sampled in the USACE fish trap.



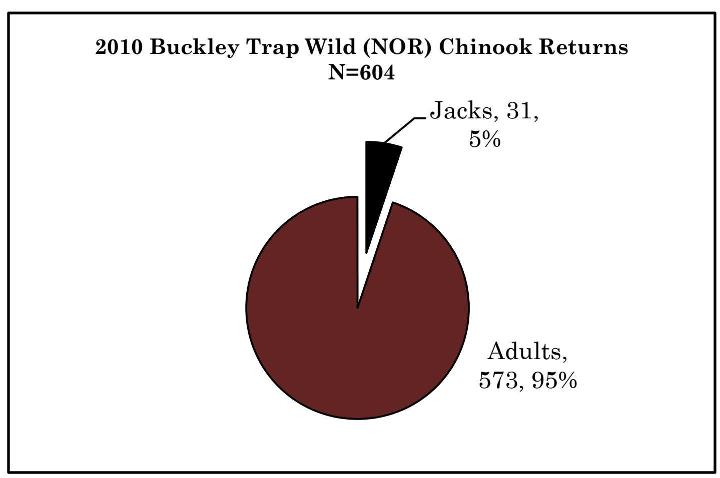
2011: Age breakdown of wild adult and jack Chinook sampled in the USACE fish trap.



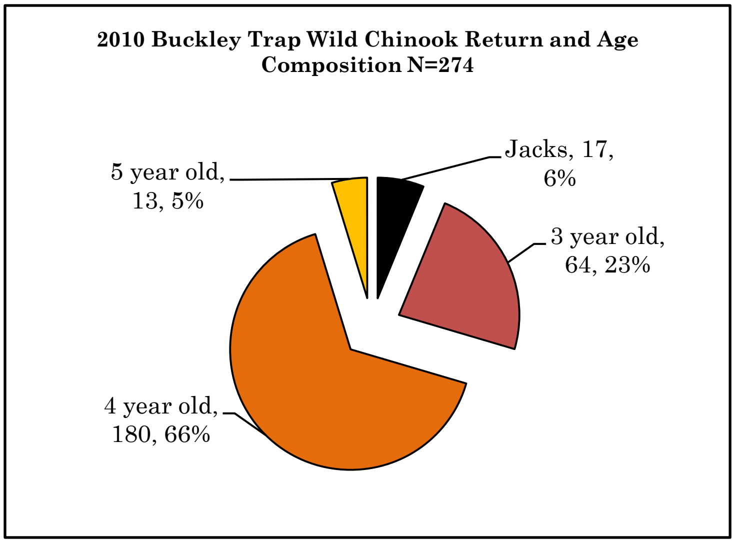
2011: Breakdown of adult and jack acclimation pond Chinook sampled in the USACE fish trap.



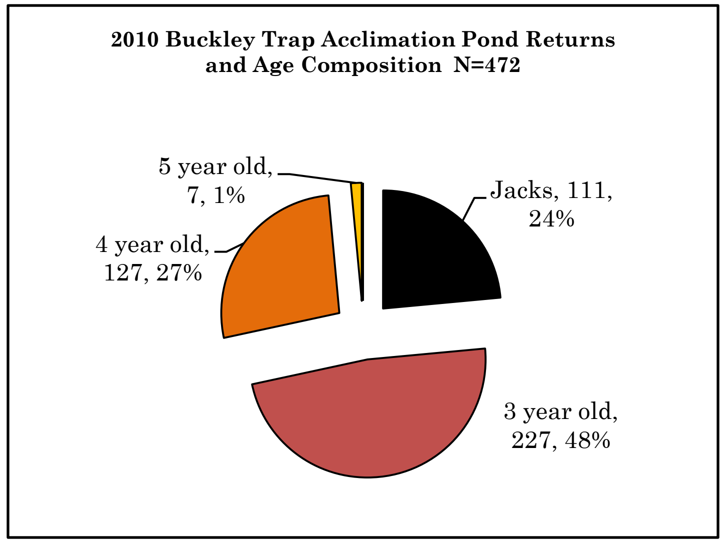
2010: Total number of Chinook sampled in the USACE fish trap including wild, acclimation and White River hatchery.



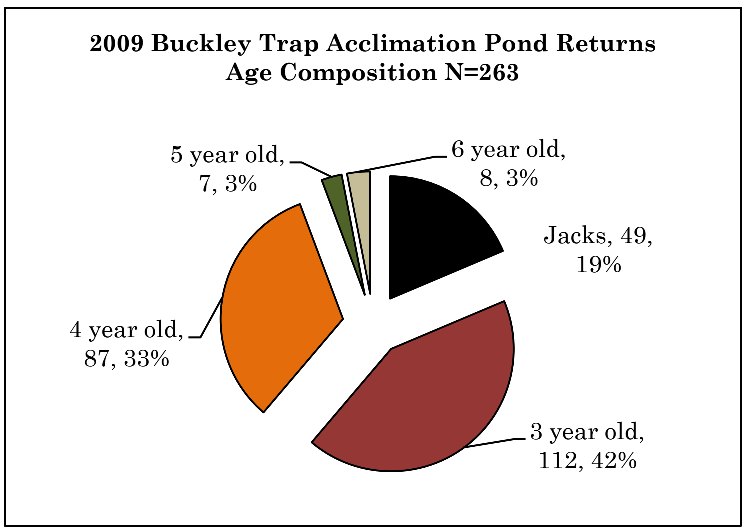
2010: Breakdown of adult and jack NOR's *(natural origin return)* sampled in the USACE fish trap.



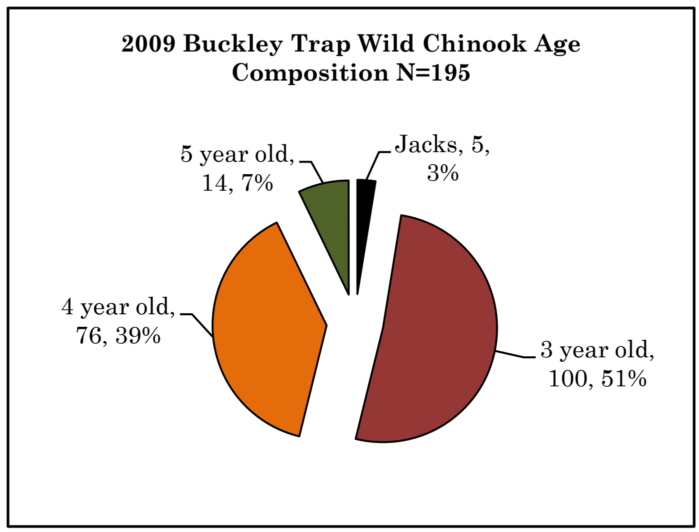
2010: Age breakdown of wild adult and jack Chinook sampled in the USACE fish trap.



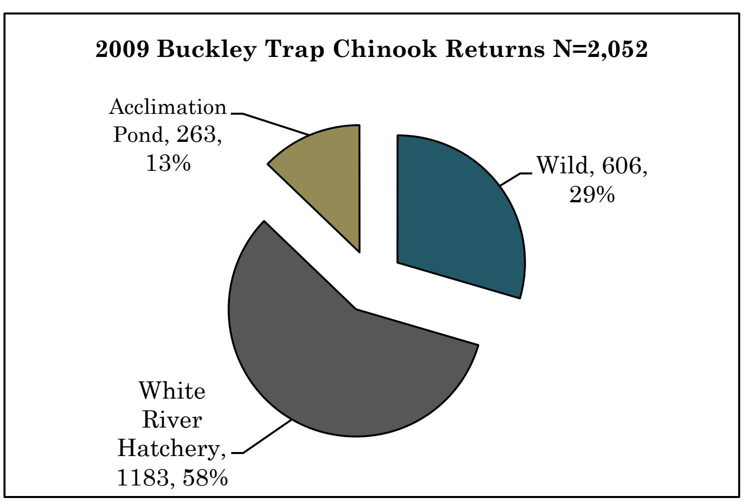
2010: Breakdown of adult and jack acclimation pond Chinook sampled in the USACE fish trap.



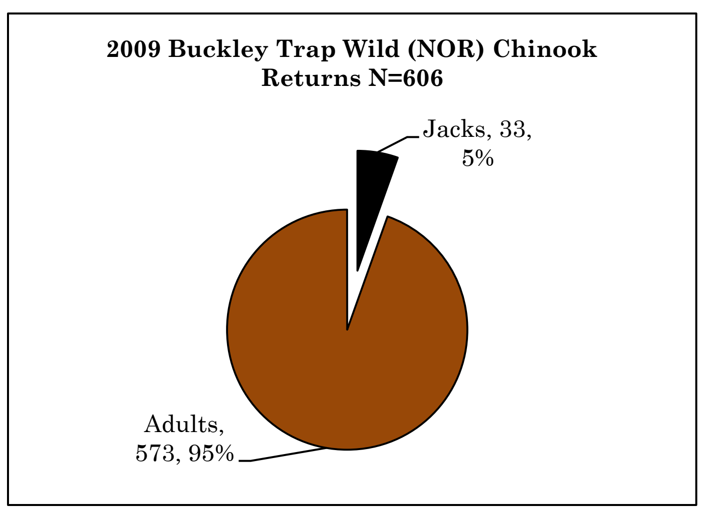
2009: Breakdown of adult and jack acclimation pond Chinook sampled in the USACE fish trap.



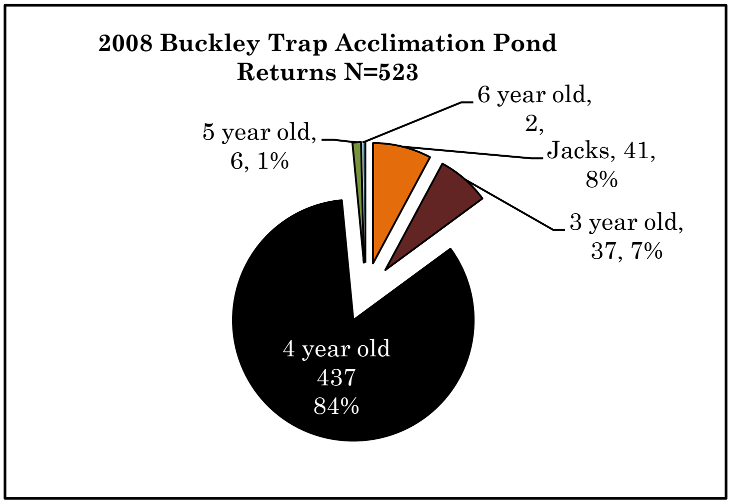
2009: Breakdown of adult and jack NOR's *(natural origin return)* sampled in the USACE fish trap.



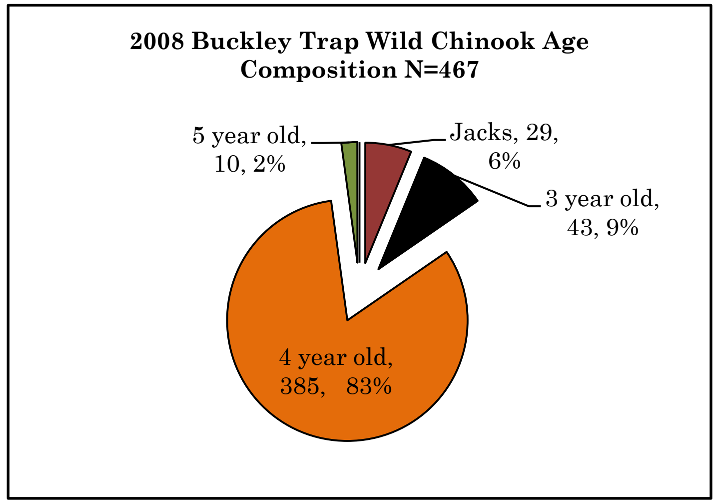
2009: Total number of Chinook sampled in the USACE fish trap including wild, acclimation and White River hatchery.



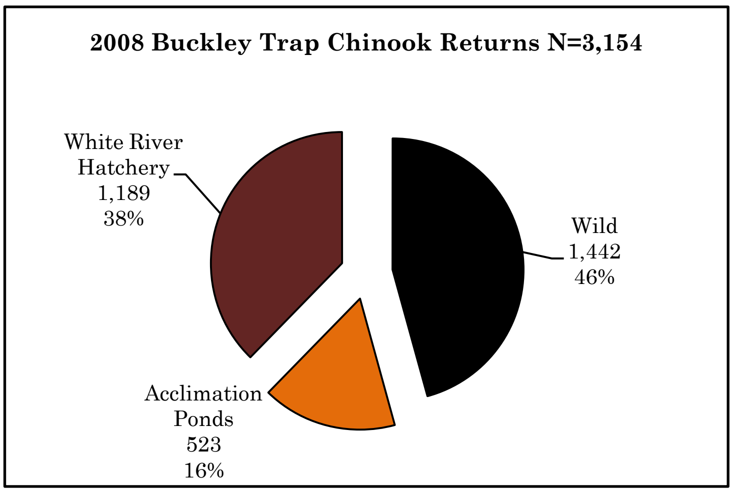
2009: Age breakdown of wild adult and jack Chinook sampled in the USACE fish trap.



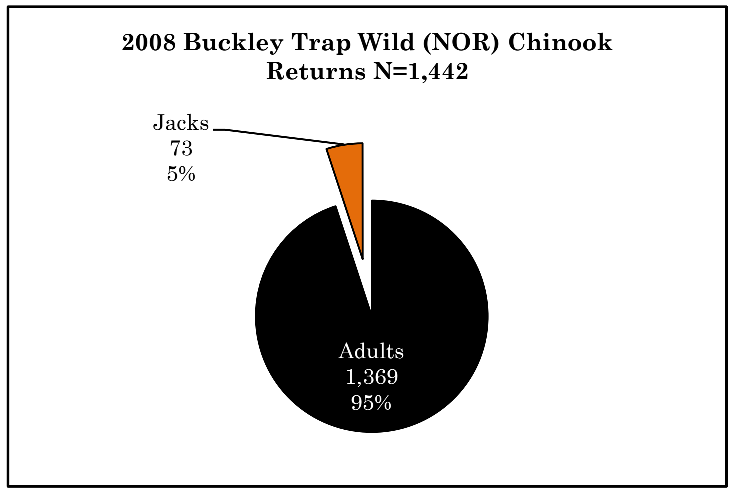
2008: Breakdown of adult and jack acclimation pond Chinook sampled in the USACE fish trap.



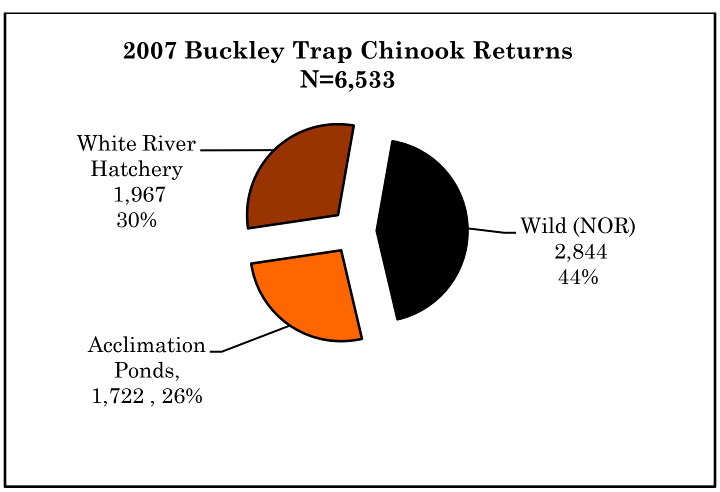
2008: Breakdown of adult and jack NOR's *(natural origin return)* sampled in the USACE fish trap.



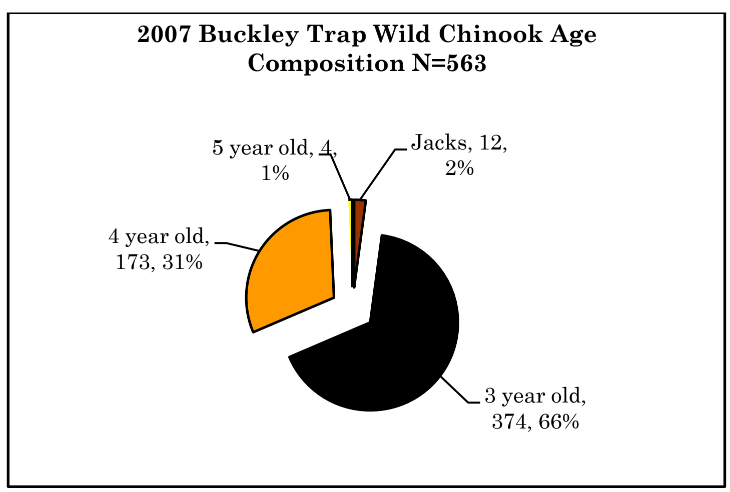
2008: Total number of Chinook sampled in the USACE fish trap including wild, acclimation and White River



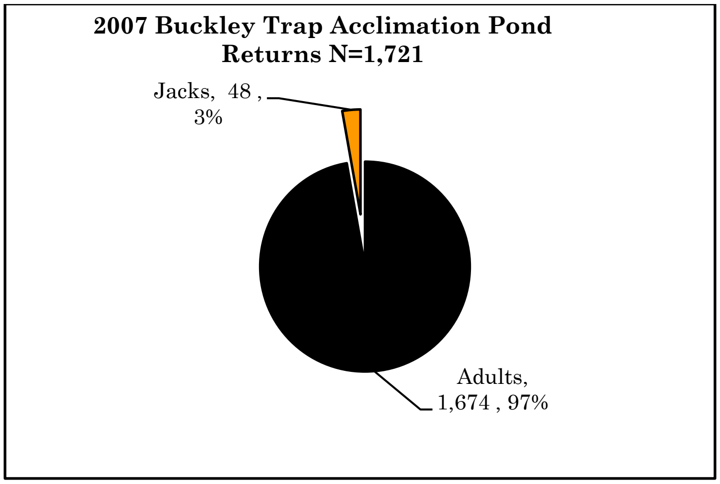
2008: Age breakdown of wild adult and jack Chinook sampled in the USACE fish trap.



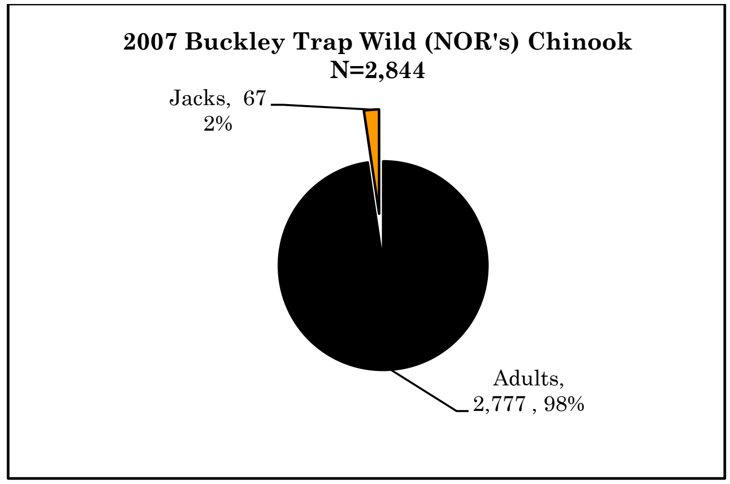
2007: Total number of Chinook sampled in the USACE fish trap including wild, acclimation and White River hatchery.



2007: Breakdown of adult and jack NOR's *(natural origin return)* sampled in the USACE fish trap.



2007: Age breakdown of wild adult and jack Chinook sampled in the USACE fish trap.



2007: Breakdown of adult and jack acclimation pond Chinook sampled in the USACE fish trap.

BREAKDOWN OF WINTER STEELHEAD RETURNS SAMPLED IN THE USACE FISH TRAP, WHITE RIVER (2007-2015)

APPENDIX G

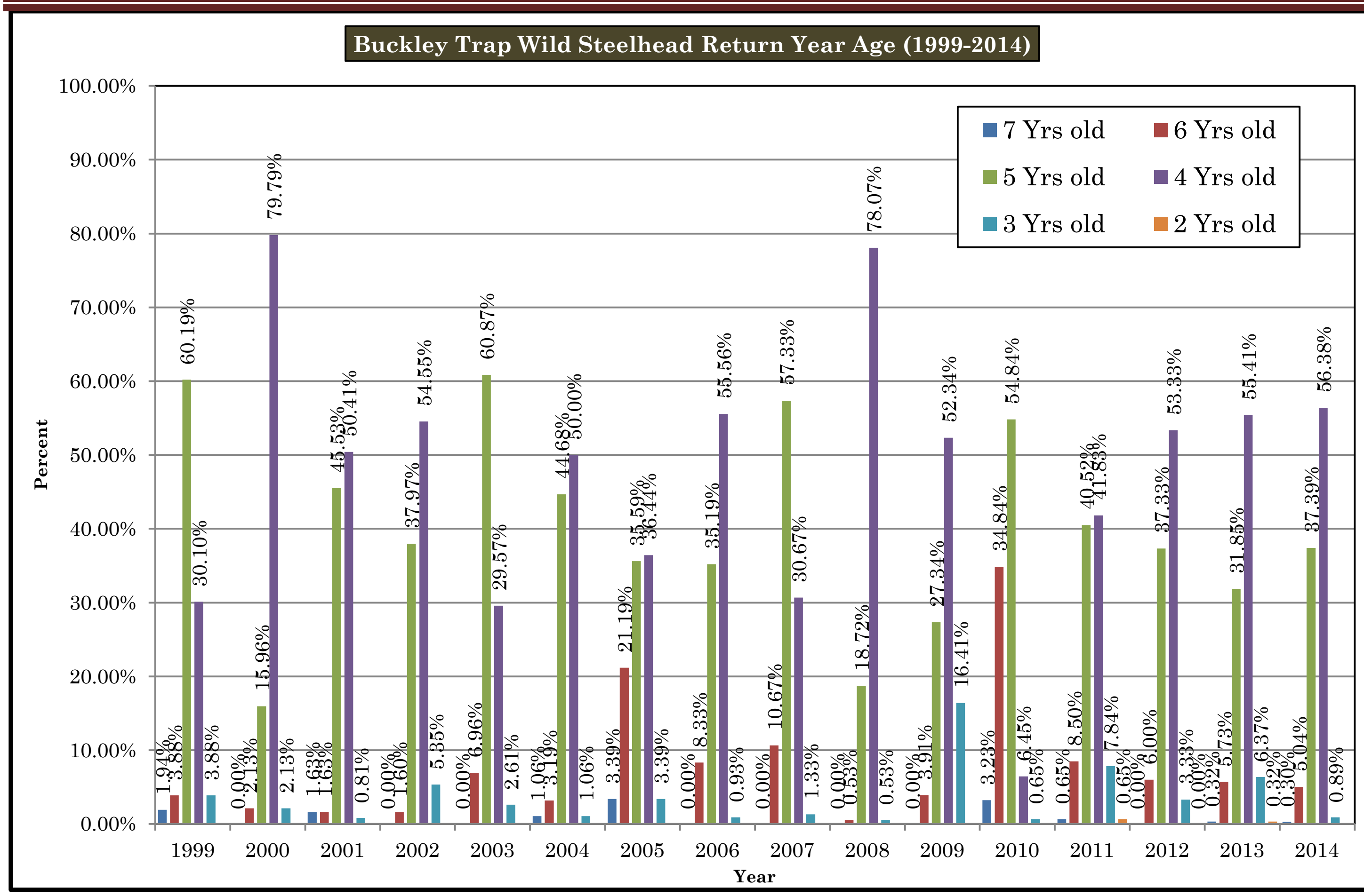
Breakdown of Winter Steelhead Returns Sampled in USACE Fish Trap, White River (2007-2015)

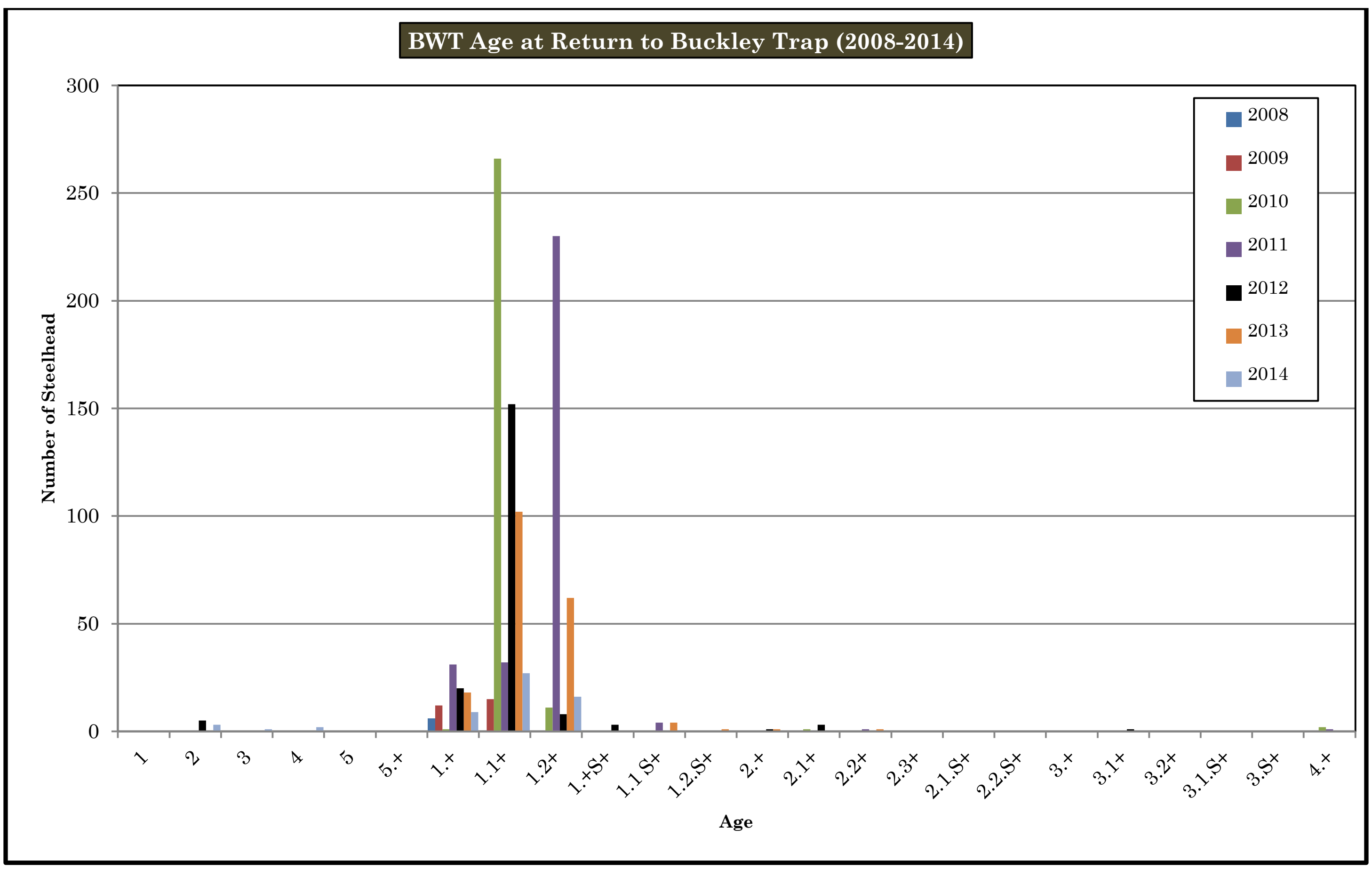
YEAR SAMPLED	N=	WILD/NOR	FISH TAKEN FOR BROODSTOCK PROGRAM	STEELHEAD DETECTED WITH BWT (PROGAM FISH WITH BLANK WIRE TAG)	PRE-SMOLTS RELEASED (BROOD YEAR)
*2015	319	273	26	20	31,219 (2014)
2014	479	392	23	64	49,998 (2013)
2013	574	338	28	208	27,990 (2012)
2012	345	345	24	209	31,129 (2011)
2011	539	164	22	353	27,876 (2010)
2010	523	204	20	299	25,650 (2009)
2009	165	116	19	30	31,900 (2008)
2008	207	177	24	6	56,378 (2007)
2007	303	276	27	0	25,631 (2006)

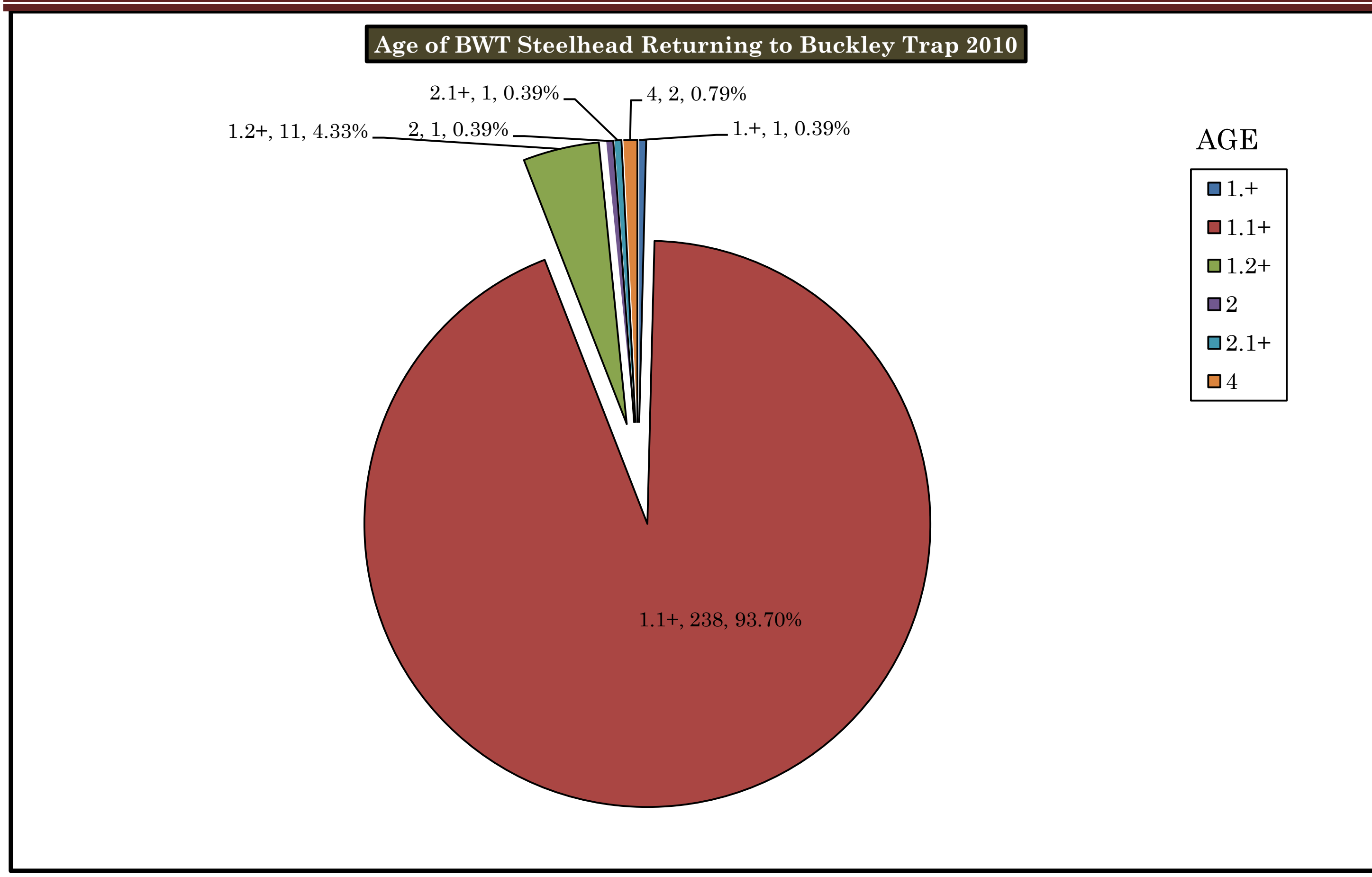
*An undetermined number of adult steelhead ascended above the Buckley diversion dam due to missing panels.

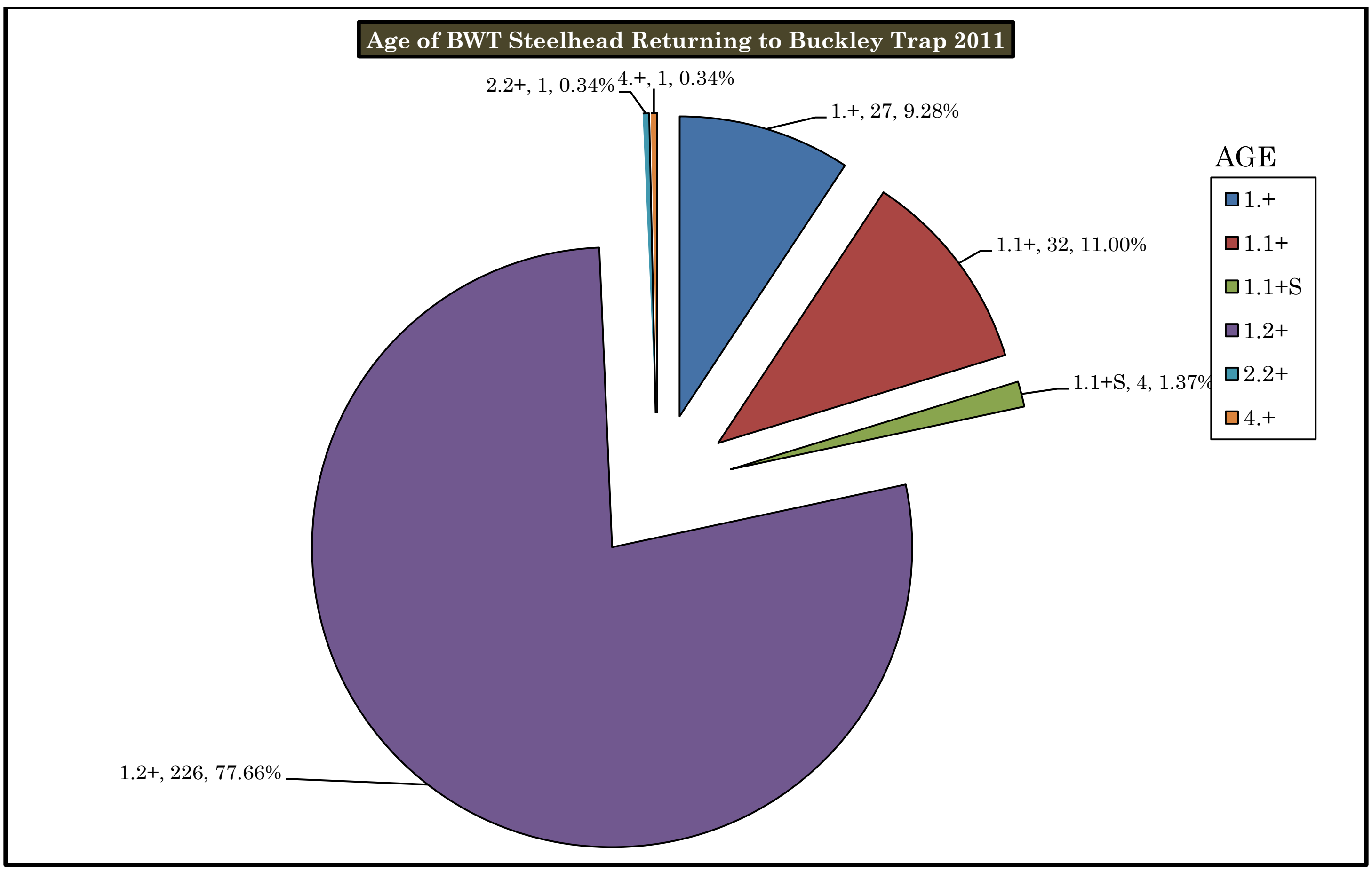
Return and Age Composition of Sampled Buckley Trap Winter Steelhead (1999-2014)

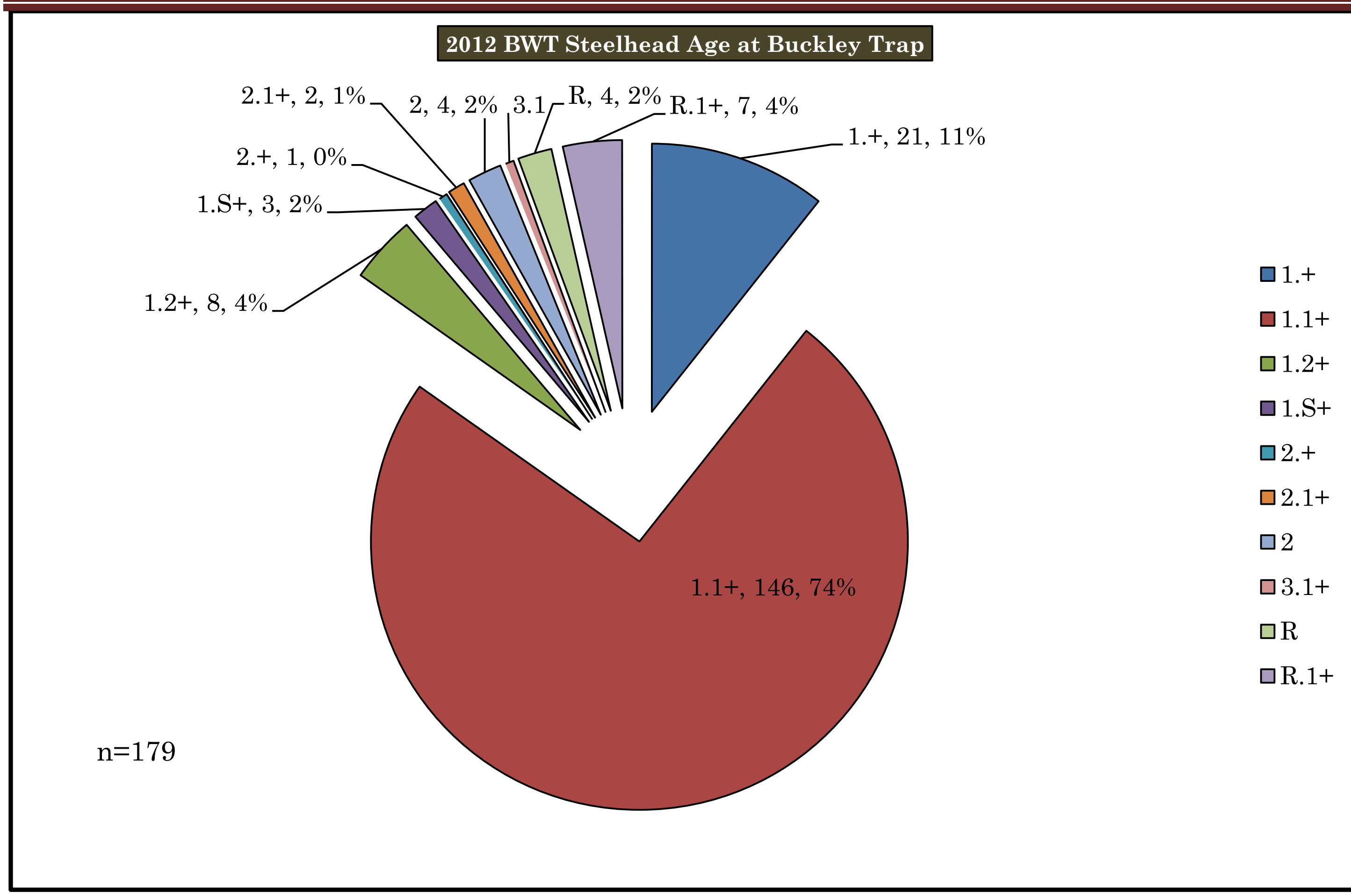
APPENDIX H

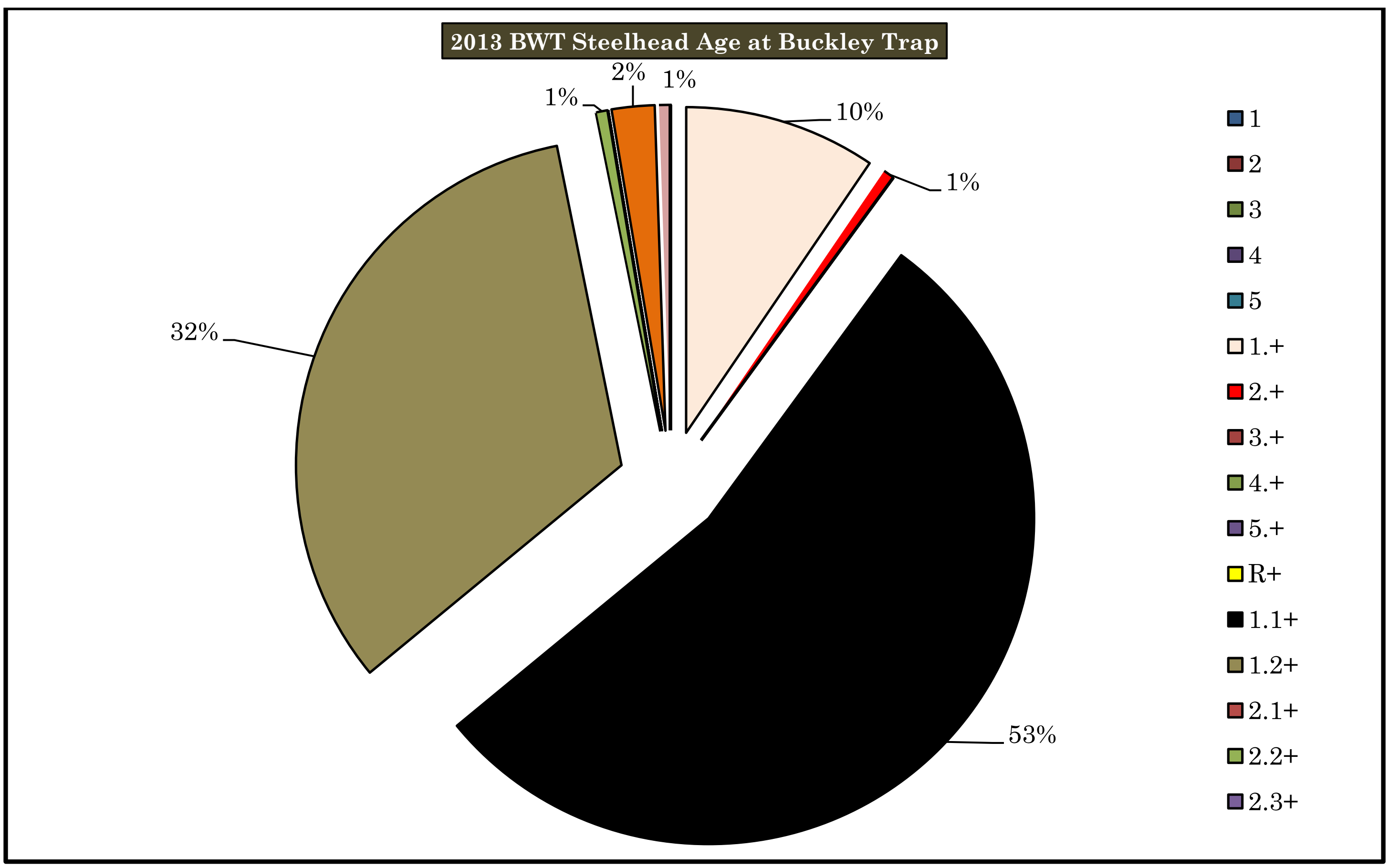

Buckley Trap Wild Steelhead Return Year Age (1999-2014)
Percent
Year
7 Yrs old
6 Yrs old
5 Yrs old
4 Yrs old
3 Yrs old
2 Yrs old
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014

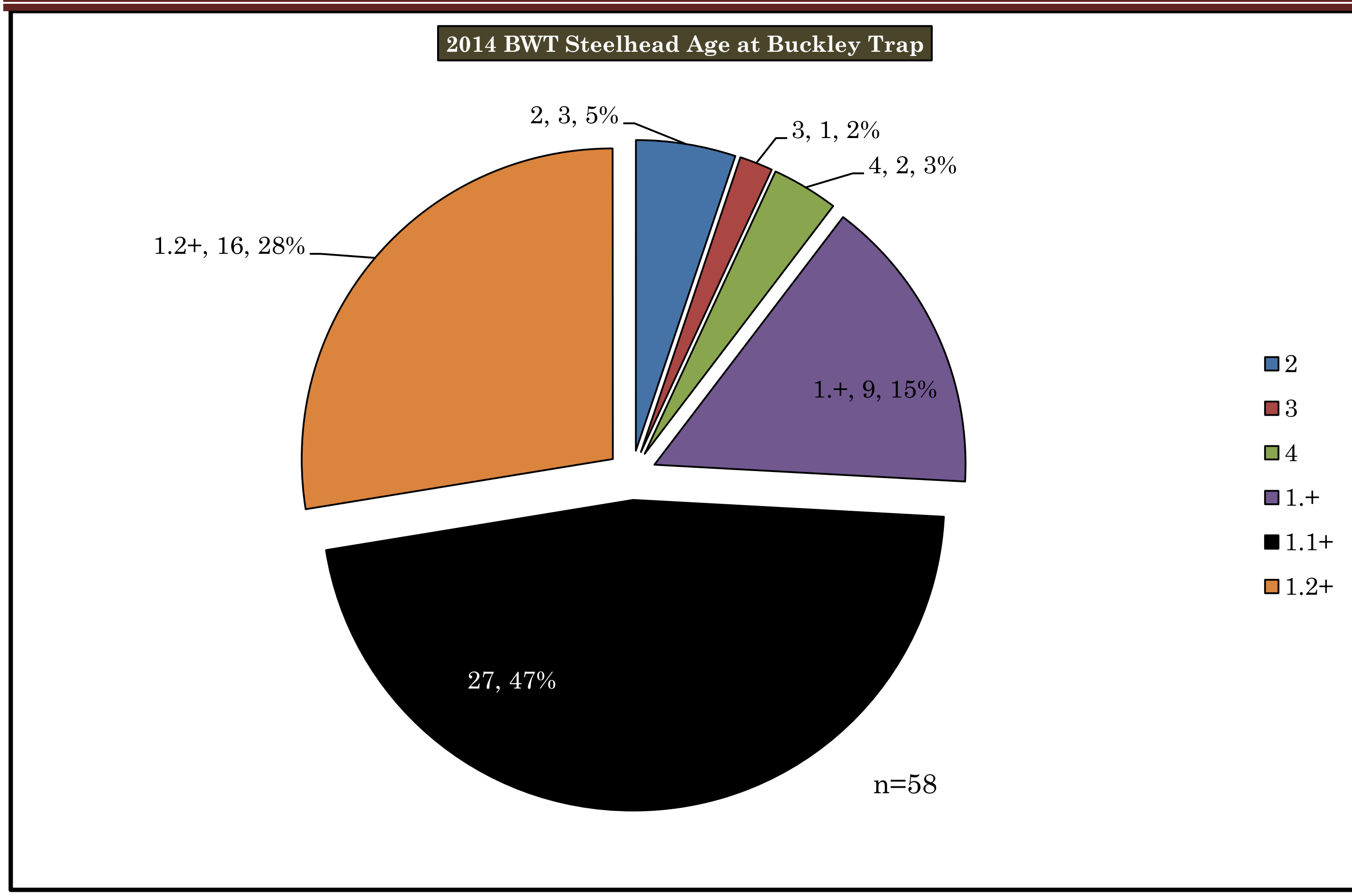

BWT Age at Return to Buckley Trap (2008-2014)
Number of Steelhead
Age
2008
2009
2010
2011
2012
2013
2014


Age of BWT Steelhead Returning to Buckley Trap 2010
2.1+, 1, 0.39%
4, 2, 0.79%
1.2+, 11, 4.33%
2, 1, 0.39%
1.+, 1, 0.39%
1.1+, 238, 93.70%
AGE
1.+
1.1+
1.2+
2
2.1+
4


Age of BWT Steelhead Returning to Buckley Trap 2011
2.2+, 1, 0.34%
4.+, 1, 0.34%
1.+, 27, 9.28%
1.1+, 32, 11.00%
1.1+S, 4, 1.37%
1.2+, 226, 77.66%
AGE
1.+
1.1+
1.1+S
1.2+
2.2+
4.+

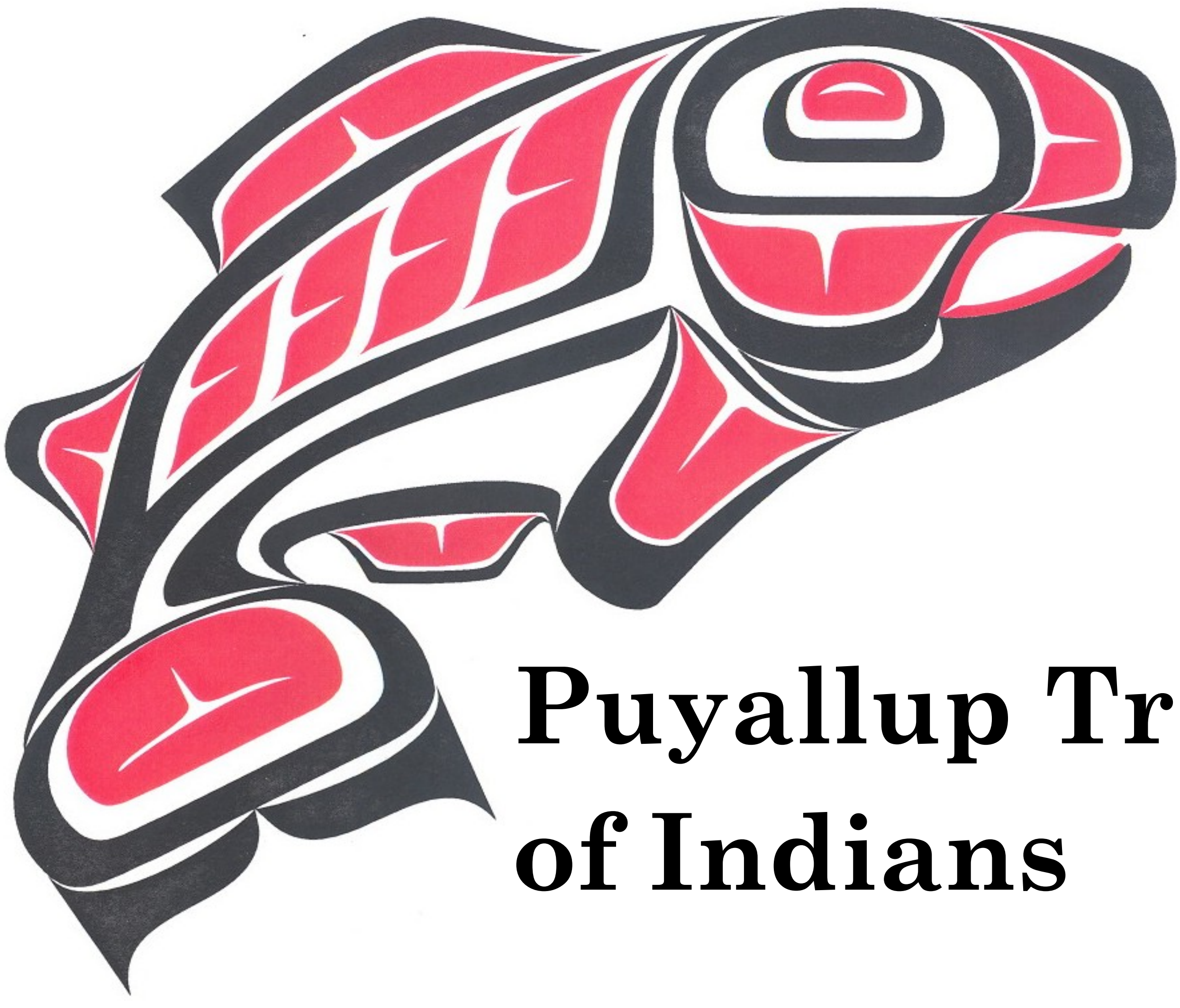

2012 BWT Steelhead Age at Buckley Trap
2.1+, 2, 1%
2, 4, 2%
3.1
R, 4, 2%
R.1+, 7, 4%
1.+, 21, 11%
2.+, 1, 0%
1.S+, 3, 2%
1.2+, 8, 4%
1.1+, 146, 74%
n=179
1.+
1.1+
1.2+
1.S+
2.+
2.1+
2
3.1+
R
R.1+


2013 BWT Steelhead Age at Buckley Trap
2%
1%
1%
10%
1%
32%
53%
1
2
3
4
5
1.+
2.+
3.+
4.+
5.+
R+
1.1+
1.2+
2.1+
2.2+
2.3+


2014 BWT Steelhead Age at Buckley Trap
2, 3, 5%
3, 1, 2%
4, 2, 3%
1.2+, 16, 28%
1.+, 9, 15%
27, 47%
n=58
2
3
4
1.+
1.1+
1.2+

2014-2015
Annual Salmon, Steelhead, and Bull Trout Report:

Puyallup/White River Watershed
Water Resource Inventory Area 10



Puyallup Tribe of Indians

Puyallup Tribal Fisheries
6824 Pioneer Way E.
Puyallup, Washington 98371
253-680-5560