

Coastal/Puget Sound Bull Trout

“The Coastal/Puget Sound bull trout distinct population segment is thought to contain the only anadromous form of bull trout in the coterminous United States.”

FR64; November 1, 1999

Bull Trout Life History

Bull trout are members of the char group of the salmon family. They have light-colored spots on a darker background—the opposite pattern of trout and salmon. Bull trout have a large, flattened head and pale-yellow to crimson body spots on an olive green to brown background. They lack teeth in the roof of their mouth.

Bull trout have more specific habitat requirements than most other salmonid species. Although bull trout are found primarily in cold streams, occasionally these fish are found in larger, warmer river systems and may use certain streams and rivers in the fall and winter when water temperatures have seasonally dropped. Because bull trout inhabit side channels and the margins of streams, they are highly sensitive to flow patterns and channel structure. They need complex forms of cover such as large woody debris, undercut banks, boulders, and pools to protect them from predators and to provide prey. Unlike chum and Chinook salmon, bull trout survive to spawn year after year. Since many populations of bull trout migrate from their natal tributary streams to larger water bodies such as rivers, lakes and saltwater, bull trout require two-way passage for repeat spawning as well as foraging.



Photo courtesy King County Department of Natural Resources & Parks.

Spawning, Emergence, Rearing and Migration

While some bull trout are migratory, spending portions of their life cycle in larger rivers, lakes or marine waters before returning to smaller streams to spawn, other bull trout reside in a particular stream where they complete their entire life cycle. Migratory bull trout spawn in cold upstream tributaries and rear there for one to four years before migrating to a river, lake or estuary/near-shore area. Resident bull trout are

smaller than their migratory counterparts, with an average size of six to twelve inches. Migratory bull trout are typically 24 inches or more. The largest bull trout ever verified was 32 lbs., caught in Lake Pend Oreille, Idaho in 1949.

Spawning occurs in the late summer and early fall. Bull trout spawn in the low gradient sections of high gradient streams with clean, loose gravel and water temperatures of five to nine degrees Celsius (41-48 F). Bull trout can use habitat that is not available to Chinook because of their small size and their ability to inhabit colder water. Depending on water temperature, egg incubation is 100 to 145 days. The fry emerge from gravel in early April to May, depending on temperature and flow conditions. After one to three years in an upper watershed, migratory bull trout travel downstream, usually in the spring months, where they enter a larger body of water. Bull trout have a high degree of fidelity to their natal streams and straying is rare.

While all bull trout are opportunistic eaters, feeding on insects, macrozooplankton, and crayfish, migratory bull trout are primarily “piscivorous”—they prey mostly on juvenile trout, salmon and other species of fish. Like other salmonids, the availability of food sources for newly hatched bull trout is particularly important. An adequate food base is critical to sustaining migratory bull trout in freshwater systems as well as saltwater forage areas.

Bull trout are repeat spawners, and may live 12 years or more, spawning annually or bi-annually in headwater areas, and returning to larger rivers, lakes or estuaries to forage. Repeat spawners are extremely important to the long term persistence of bull trout populations; they typically have greater fecundity, and these survivors have multiple opportunities to contribute to the gene pool.

Migratory corridors which link the various habitats at different seasons for all of the life history stages are also essential to the persistence of bull trout populations. Bull trout are thought to have metapopulations, i.e. a network of local subpopulations with an interchange of migration and gene

flow. The alteration of habitat, primarily through the construction of impoundments, dams and water diversions, has fragmented habitats, eliminated migratory corridors, and isolated bull trout local populations.

Characteristics of Coastal/Puget Sound Bull Trout

Although both resident and migratory forms of bull trout are present in the Coastal/ Puget Sound bull trout population segment, it is the only known segment of bull trout in the United States that includes the anadromous life history form (spawns in freshwater, migrates to saltwater and returns to freshwater to spawn). Technically, Coastal/Puget Sound bull trout are “amphidromus”—unlike strict anadromy, amphidromus individuals often return seasonally to freshwater as sub-adults, sometimes for several years, before returning to their natal tributary to spawn. These sub-adult bull trout move into marine waters and return to freshwater to take advantage of seasonal forage opportunities to feed on salmonid eggs, smolts or juveniles. Bull trout in the Coastal/Puget Sound population segment also move through the marine areas to gain access to independent streams to forage or take refuge from high flows.

Bull trout target a variety of estuarine and near-shore marine forage fish such as sandlance, surf smelt and herring, and depend on the persistence of productive forage fish spawning beaches and intertidal habitats such as eelgrass beds and large woody debris. These populations can migrate extensively while in the marine waters of Puget Sound, the Strait of Juan de Fuca and the Pacific Ocean; but there is currently no evidence that they make long off-shore migrations similar to other salmon.

Also unique to the Coastal/Puget Sound bull trout population segment is the overlap in distribution with Dolly Varden, another native char species. The two species are genetically distinct, but very difficult to differentiate visually. Within the Coastal/ Puget

Bull Trout Core Areas

A **“core area”** represents the closest approximation of a biologically functioning unit for bull trout. A core area is a combination of core habitat (i.e. habitat with all necessary components for spawning, rearing, foraging, migrating and overwintering) and a core population. The designation of core areas is an update from the classification of sub-populations that was used by the US Fish and Wildlife Service in the 1999 listing information (64FR 58910).

The term **“local population”** is similar to the definition used by NMFS as a group of fish of the same species that spawns in a particular lake or stream (or portion thereof) that is reproductively isolated to a substantial degree. USFWS defines a **“potential local population”** as a local population that likely exists but has not been adequately documented, or that is likely to develop through re-colonization following habitat restoration.

Sound region, Dolly Varden tend to be isolated populations located in tributaries above natural barriers, while bull trout are found below the barriers.

Status of the Coastal/Puget Sound Bull Trout Distinct Population Segment

Although specific data on population abundance, trends and spatial distribution is scarce, ample information exists to indicate that the bull trout are threatened. Population abundance and distribution has declined within many individual river basins, and habitat is severely fragmented in many instances. Bull trout display a high degree of sensitivity to environmental disturbance and have been significantly impacted by habitat degradation similar to other listed and sensitive species. In addition to migratory barriers, such as dams or diversion structures which isolate populations, bull trout are threatened by poor water quality, sedimentation,

harvest and the introduction of non-native species. Although several populations lie completely or partially within national parks or wilderness areas, these local populations are threatened by the presence of introduced brook trout or from habitat degradation outside of the park boundaries.

Based on biological and genetic information, the US Fish and Wildlife Service has delineated two management units in the Coastal/Puget Sound population segment. Olympic Peninsula bull trout populations are thought to differ from those in the Puget Sound management unit, which originate in watersheds on the western slopes of the Cascade Mountains. Although the two units are connected by marine waters, there is currently no evidence that bull trout from Puget Sound migrate to the Strait of Juan de Fuca or Hood Canal.

Olympic Peninsula Management Unit

The Olympic Peninsula Management unit includes all watersheds within the Olympic Peninsula and the nearshore marine waters of the Pacific Ocean, Strait of Juan de Fuca, and Hood Canal. Six core areas are contained within this management unit, with a total of 10 local populations and 2 potential local populations (Figure 2.14).

The six identified core areas all play a critical role in the recovery of bull trout in the Olympic Peninsula Management Unit, and are vital to maintaining the overall distribution of bull trout in the Coastal/Puget Sound region. The Skokomish core area is the only core area on the eastern portion of the Olympic Peninsula and the only core area draining into Hood Canal. Additionally, it is the only population with long term monitoring data on abundance trends and distribution within the Olympic Peninsula Management Unit. Due to the low abundance of local populations and the fragmentation of habitat from dams, the Skokomish core area is considered to be the most depressed core area within the Olympic Peninsula management unit. The Dungeness and Elwha are the only core areas connected to the Strait of Juan de Fuca. Little is known about

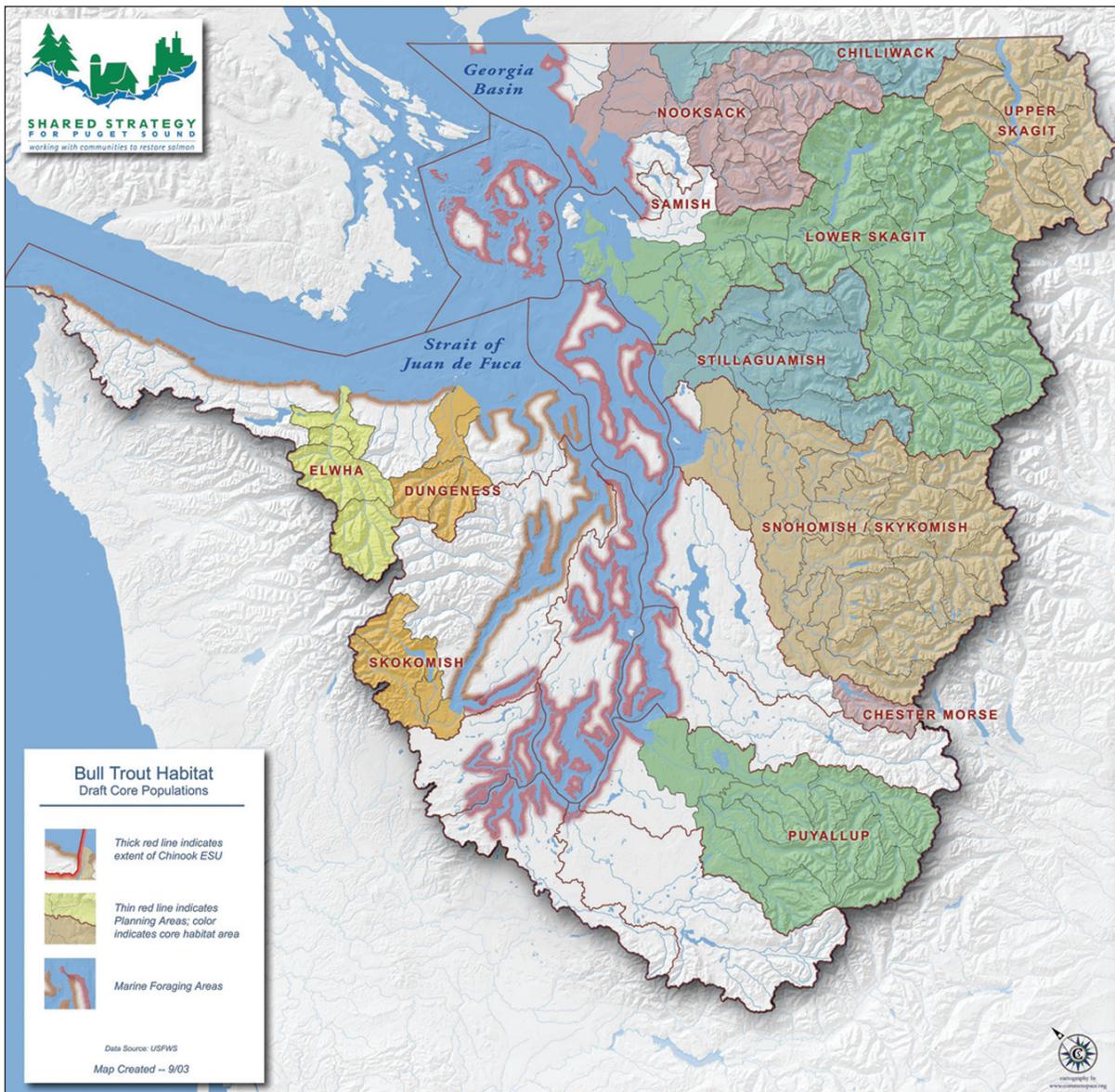


Figure 2.13 Indicates where bull trout core areas overlap with the Puget Sound Chinook ESU. Hoh, Quinalt, and Queets core areas are located along the Pacific Coast of the Olympic Peninsula and are not included on this map.

spawning abundance or distribution within these systems, but it is believed that most of the spawning and rearing habitat for the Elwha core area is in the Olympic National Park. Of the Pacific coastal streams, the Hoh has had the highest number of observed redds, with 24 redds in 1998. This low abundance is fewer than what is believed to be necessary to reduce the risk from genetic inbreeding. Due to the lack of information on bull trout abundance and trends in all of the core areas other than the Skokomish, the status of these areas is classified as unknown.

Several independent tributaries (streams which empty directly to saltwater) on the Olympic Peninsula are used by bull trout for forage and refuge, but are not believed to support spawning populations. These tributaries include Bell, Morse, Ennis, and Siebert Creeks in the Strait of Juan de Fuca; Goodman, Cedar, Kalaloch, Steamboat, Mosquito, and Joe Creeks, and the Raft, Moclips, and Copalis Rivers on the coast; and Wishkah and Humpstulips Rivers in Grays Harbor. Snorkeling surveys conducted as recently as the 1980's in independent tributaries to Hood Canal documented the pres-

Core Areas	Local and Potential Local Populations	Information on Abundance, Trends and Distribution	Status
Skokomish	S. Fork Skokomish	S. Fork Skok: <60 documented adults.	Depressed
	N. Fork Skokomish	N. Fork Skok: Approx 100 documented adults; population declined 1993 to 2002	
	Brown Creek (potential)	Cushman dam has isolated and fragmented populations.	
Dungeness	Middle Dungeness & tribs. to river mile 24	Multiple age classes have been documented in the middle Dungeness.	Unknown
	Gray Wolf River	Spawning has been documented in the Gray Wolf River.	
Elwha	Elwha	Limited information on abundance or trends. Dams have isolated and fragmented Elwha population.	Unknown
	Little River (potential)		
Hoh	Upper Hoh	S. Fork Hoh had 236 adults in 2002. The Hoh River appears to have the highest number of redds of Pacific coastal streams.	Unknown
	S. Fork Hoh		
Quinault	N. Fork Quinault	The Quinault basin appears to support all life history forms of bull trout.	Unknown
	E. Fork Quinault		
Queets	Queets	Bull trout in the Queets River are considered to be healthy by WDFW.	Unknown

Figure 2.14 Olympic Peninsula Bull Trout Core Areas, Local Populations and Status

ence of bull trout in several rivers including the Quilcene, Dosewallips, Duckabush and Hamma Hamma; however recent surveys by Olympic National Park detected no bull trout in independent tributaries to Hood Canal. Anadromous bull trout usage of nearshore marine waters and estuaries for migration, overwintering and foraging has been confirmed throughout the Olympic Peninsula Management Unit.

Puget Sound Management Unit

The Puget Sound Management Unit encompasses all watersheds within the Puget Sound basin and the Chilliwack River watershed, a transboundary system flowing into British Columbia, Canada and discharging into the Fraser River. The management

unit is bounded by the Cascade Mountain crest on the east, the Kitsap Peninsula on the west, and the Canadian border to the north. The US Fish and Wildlife Service has identified eight core areas with 57 local populations and five potential local populations (see Figure 2.15). In addition to the core areas, important forage, migration and overwintering habitat are found in the Samish River, Lake Washington system, Lower Green River, Lower Nisqually River; however, no spawning populations have currently been detected in these systems. These areas in addition to the marine areas of Puget Sound, are essential to

the unique migratory requirements of anadromous bull trout.

Each of the eight core areas is vital to maintaining the overall distribution of bull trout within the management unit. However, the Lower Skagit is distinctive in its geographic size and population abundance, making it central to the maintenance of anadromous bull trout within the Puget Sound Management Unit. Additionally, the Nooksack, Stillaguamish, Snohomish-Skykomish, and Puyallup core areas are critical for maintaining the distribution of the anadromous life history form. The Puyallup core area is the only major watershed in south Puget Sound supporting a population.

Bull trout are present in nearly all of the water-

sheds in Puget Sound where they historically occurred, with the probable exception of the Nisqually River where few observations are reported in the recent past. Dolly Varden are confirmed only in the Upper Skagit and Nooksack core areas.

All life history forms are present within the Puget Sound unit. Two naturally-occurring adfluvial populations (migrate to lakes) are present—the Chester Morse Lake in the upper Cedar River, and Chilliwack Lake in upper Chilliwack. Prior to the modification of the Skagit system for hydroelectric production, adfluvial forms are unknown, but there are now adfluvial populations in Gorge, Diablo and Ross Lakes in the Upper Skagit.

Generally, bull trout distribution has contracted and abundance declined in the southern portion of the Puget Sound Management Unit. Data on abundance is limited throughout the unit. The US Fish and Wildlife Service has evaluated the level of risk from stochastic events for each of the core areas (risk to continued survival of the populations from floods, landslides and other events affecting the population and its habitat), and their findings are summarized in Figure 2.15.

Bull trout have declined due to many of the same threats facing other listed salmonid species, including habitat degradation and fragmentation, blockage of migratory corridors, poor water quality and past fisheries management. They are particularly vulnerable to activities that warm their spawning and rearing waters, and have been heavily impacted by the introduction of non-native species such as brown, lake and brook trout. Although bull trout occur over a large geographic area, many of the populations are small and isolated from each other, making them more susceptible to local extinctions. Threats for each core area are described in the draft Coastal/Puget Sound Bull Trout Recovery Plan (USFWS, 2004).

Evaluation of Risk to Bull Trout Populations in the Puget Sound Unit

In general, populations were considered to be at **“diminished risk of adverse effects”** by the USFWS where spawning populations are numerous and well distributed, abundance is high enough to avoid genetic drift, and a migratory life form was present and had connectivity with other local populations.

Populations at **“intermediate risk”** generally have low numbers of local populations, and spawning areas are few and not widespread. Another criterion was the presence of a migratory life form in at least some local populations with a partial ability to connect with other local populations.

Those populations with low levels of abundance, few known spawning areas, and/or where a migratory life form was absent from the local population, or was present and lacked connectivity, were considered to be at an **“increased level of risk.”**

Core Areas	Local and Potential Local Populations	Information on Abundance, Trends and Distribution	Risk from Stochastic Events
Chilliwack	Little Chilliwack River	Chilliwack Lake is an important source of rearing and forage for most local populations.	Intermediate risk if only the US populations are considered. Diminished risk if both US and Canadian populations are considered.
	Upper Chilliwack River		
	Selesia Creek (British Columbia & US)		
	Depot Creek (BC & US)		
	Airplane Creek (BC)		
	Borden Creek (BC)		
	Centre Creek (BC)		
	Foley Creek (BC)		
	Nesakwatch Creek (BC)		
Paleface Creek (BC)			
Nooksack	Lower Canyon Creek	Spawning occurs in all three forks of the Nooksack River and its tributaries. Fewer than 1000 spawners; most local populations have less than 100 adults.	Intermediate Risk
	Glacier Creek		
	Lower Middle Fork Nooksack R		
	Upper MF Nooksack River		
	Lower North Fork Nooksack R		
	Middle NF Nooksack River		
	Upper NF Nooksack River		
	Upper South Fork Nooksack R		
	Lower SF Nooksack River		
Wanlick Creek			
Lower Skagit	Bacon Creek	Bull trout are known to spawn and rear in at least 19 streams/ stream complexes. This core area supports a spawning population of migrating bull trout numbering in the thousands. Connectivity and diversity of habitats are excellent except portions modified by dams. High abundance of pink salmon for forage.	Diminished Risk
	Baker Lake		
	Buck Creek		
	Cascade River		
	South Fork Cascade River		
	Downey Creek		
	Goodell Creek		
	Illabot Creek		
	Lime Creek		
	Milk Creek		
	Newhalem Creek		
	Forks of Sauk River		
	Upper South Fork Sauk River		
	Straight Creek		
	Upper Suiattle River		
	Sulphur Creek		
	Tenas Creek		
	Lower White Chuck River		
	Upper White Chuck River		
Sulphur Creek -Lake Shannon (potential local population)			
Stetattle Creek-Gorge Lake (potential local population)			
Upper Skagit	Big Beaver Creek	Populations are well distributed. British Columbia portion presumed healthy; status is generally unknown. 2 areas of concern due to lack of connectivity: Diablo Lake and Gorge Lake.	Intermediate risk if only the US populations are considered. Diminished risk if both US and Canadian populations are considered.
	Little Beaver Creek		
	Lightning Creek		
	Panther Creek		
	Pierce Creek		
	Ruby Creek		
	Silver Creek		
	Thunder Creek (Diablo Lake)		
	Deer Creek (Diablo Lake) (potential local population)		
	Skagit River (BC)		
	East Fork Skagit River (BC)		
	Klesilkwa River (BC)		
	Nepopekum Creek (BC)		
	Skaist River (BC)		
Sumallo River (BC)			
Stillaguamish	Upper Deer Creek	Few known spawning areas. Fewer than 1000 spawners; most local populations have less than 100 adults. Snorkel surveys have found greater than 100 adults in the North Fork Stillaguamish R.	Increased risk
	South Fork Canyon Creek		
	North Fork Stillaguamish River		
	South Fork Stillaguamish River		

Core Areas	Local and Potential Local Populations	Information on Abundance, Trends and Distribution	Risk from Stochastic Events
Snohomish-Skykomish	North Fork Skykomish River	Area has few known spawning areas and total number of adult spawners is 500-1000.	Increased risk
	South Fork Skykomish River	System has no lakes. Large portion of migratory segment are anadromous.	
	Salmon Creek	North Fork Sky considered healthy by WDFW with 470-650 individuals on average, based on redd counts.	
	Troublesome Creek (primarily a resident population)	South Fork Sky considered healthy by WDFW due to increasing numbers, and recolonization is occurring.	
Chester Morse Lake	Boulder Creek	Area has few known spawning areas.	Increased risk
	Upper Cedar River	Surveys in 2000-2002 documented 236-504 redds, with estimated 500-1000 spawners.	
	Rex River	Upper Cedar River and Rex River are the primary local populations in this core area. Upper Cedar River is the only known self-sustaining population in the Lake WA basin.	
	Rack Creek		
	Shotgun Creek (potential local population)		
Puyallup	Carbon River	Fewer than 1000 spawners; most local populations have less than 100 adults.	Intermediate risk
	Greenwater River	Known spawning areas are few and not widespread.	
	Upper Puyallup and Mowich Rivers	Area has a low number of local populations.	
	Upper White River		
	West Fork White River	Portions within the National Park and wilderness area provide pristine habitat.	
	Clearwater River (potential local population)		

Figure 2.15 Bull Trout Core Areas, Local Populations and Risk Levels for the Puget Sound Management Unit

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