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BULL TROUT USE OF SWINOMISH RESERVATION WATERS

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This report describes how bull trout use Swinomish Reservation waters based on existing data collected by the Skagit River System Cooperative (SRSC) Research Program. The same general relationships between fish and habitat use and Skagit Bay bull trout population trends have been provided as a draft report (Beamer and Henderson 2004) to the Puget Sound Bull Trout Technical Recovery Team (TRT) via Fred Goetz of the TRT and United States Army Corps of Engineers (USACOE).

Current bull trout population size within the Swinomish Reservation waters has increased 4-fold since 1995. Age structure of bull trout in Skagit Bay has also become older and more complex. From 1996 through 1998, 95% of the population was sub-adult sized, and too young to reproduce. From 1999 through 2003, a tri-modal length distribution of fish indicates sub-adult, first year spawner, and mature spawner sized fish are present. Together, these population factors (more abundance and multiple age classes) should make the current Skagit Bay bull trout population more resilient to threats to its population than a decade ago. Since we are also investigating habitat use by bull trout during a time where more individual bull trout are present, we are more likely to be detecting true habitat preferences by bull trout rather than making random observations of presence or absence.

We describe bull trout use for four habitat areas found within the Swinomish Reservation. They are: freshwater streams (Figure 1), lagoon or saltmarsh dominated “pocket” estuaries (Figure 2), shoreline areas in Skagit Bay (also Figure 2), and historic delta areas within and along Swinomish Channel (Figure 3). We also describe the potential importance of habitat in terms of its direct or indirect use by bull trout. Direct use refers to the idea that bull trout are present in a specific habitat area performing a necessary life cycle function such as spawning, rearing/foraging, or seeking refuge (e.g., from predation and/or environmental stressors). Indirect use refers to habitats that support food-web elements/organisms upon which bull trout depend. Indirect use conclusions are established by observing abundant prey resources (known to be regionally consumed by anadromous bull trout) within specific habitat types.

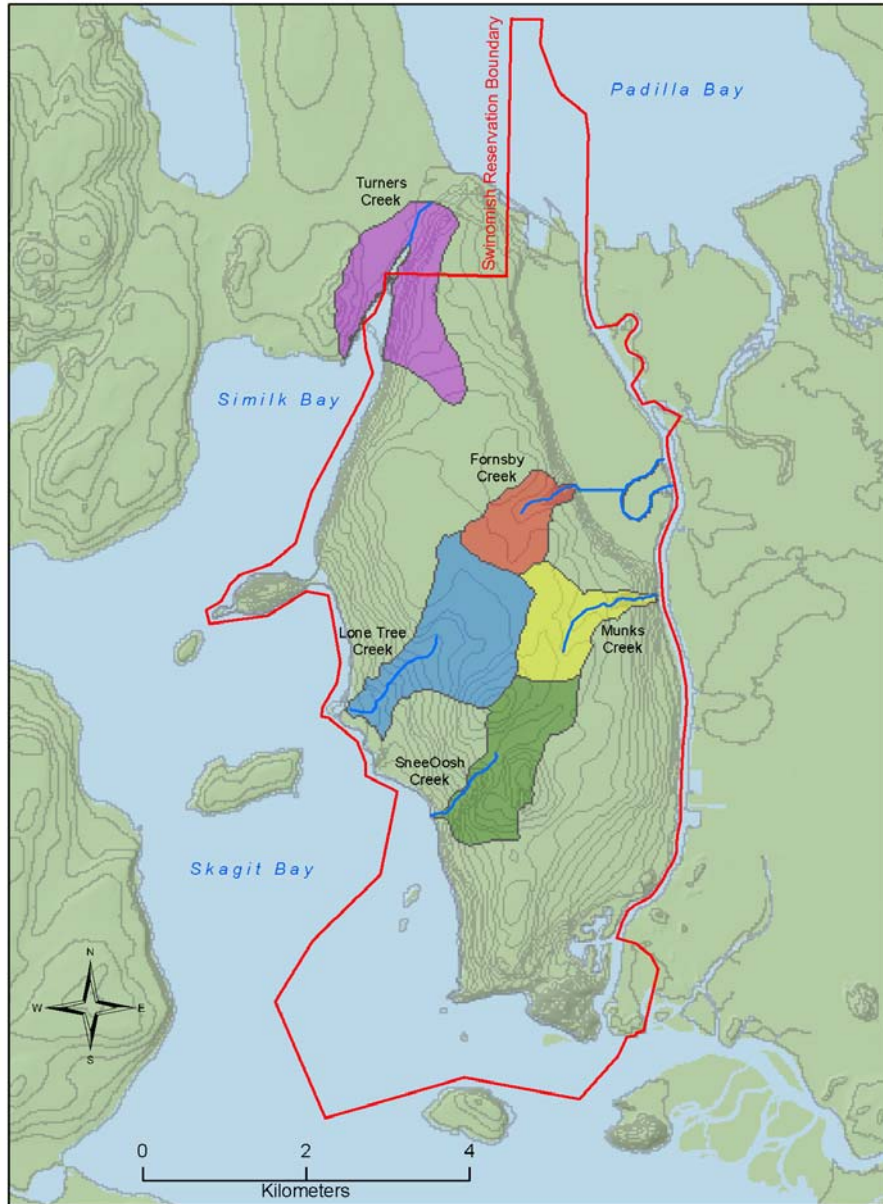


Figure 1. Location of freshwater streams and their watershed boundaries within the Swinomish Reservation.

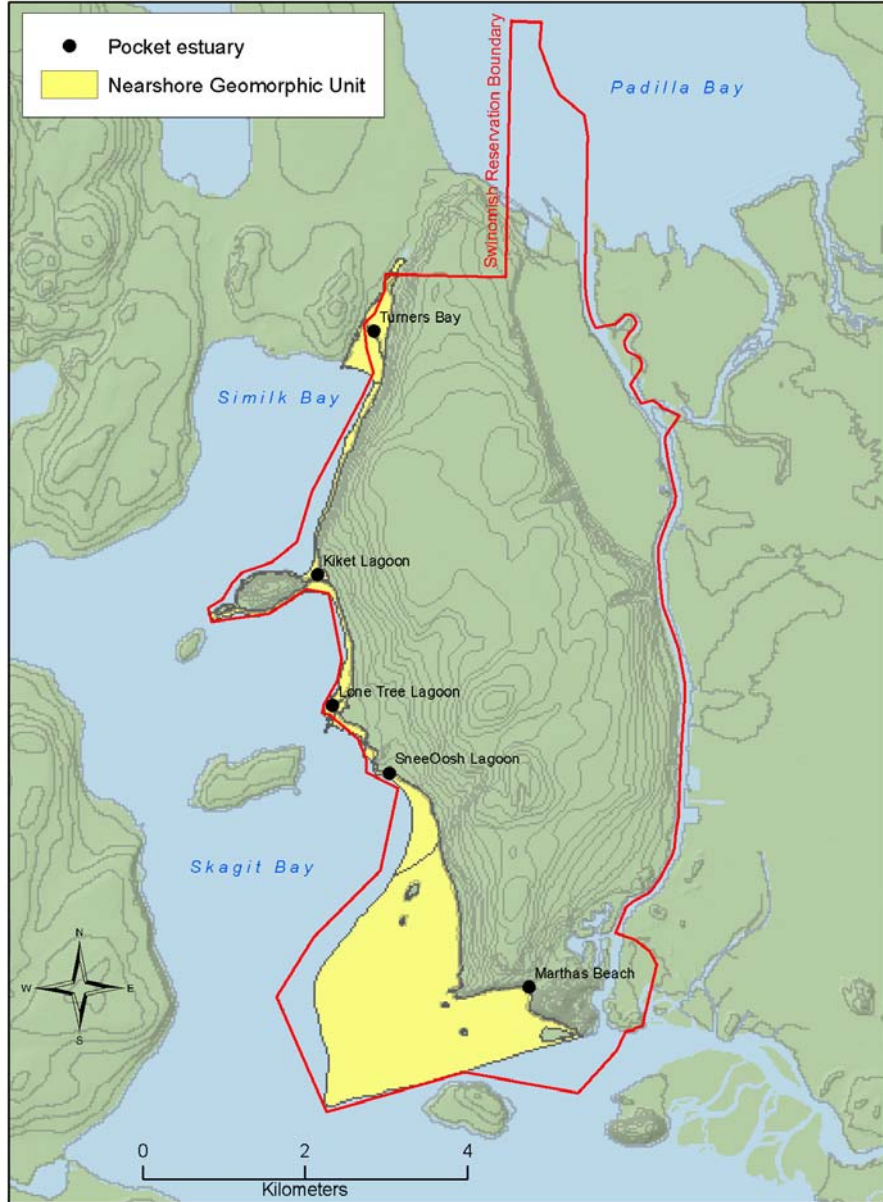


Figure 2. Location of current and historic pocket estuaries and nearshore habitats along the western Fidalgo Island shoreline of Skagit Bay and within the Swinomish Reservation.

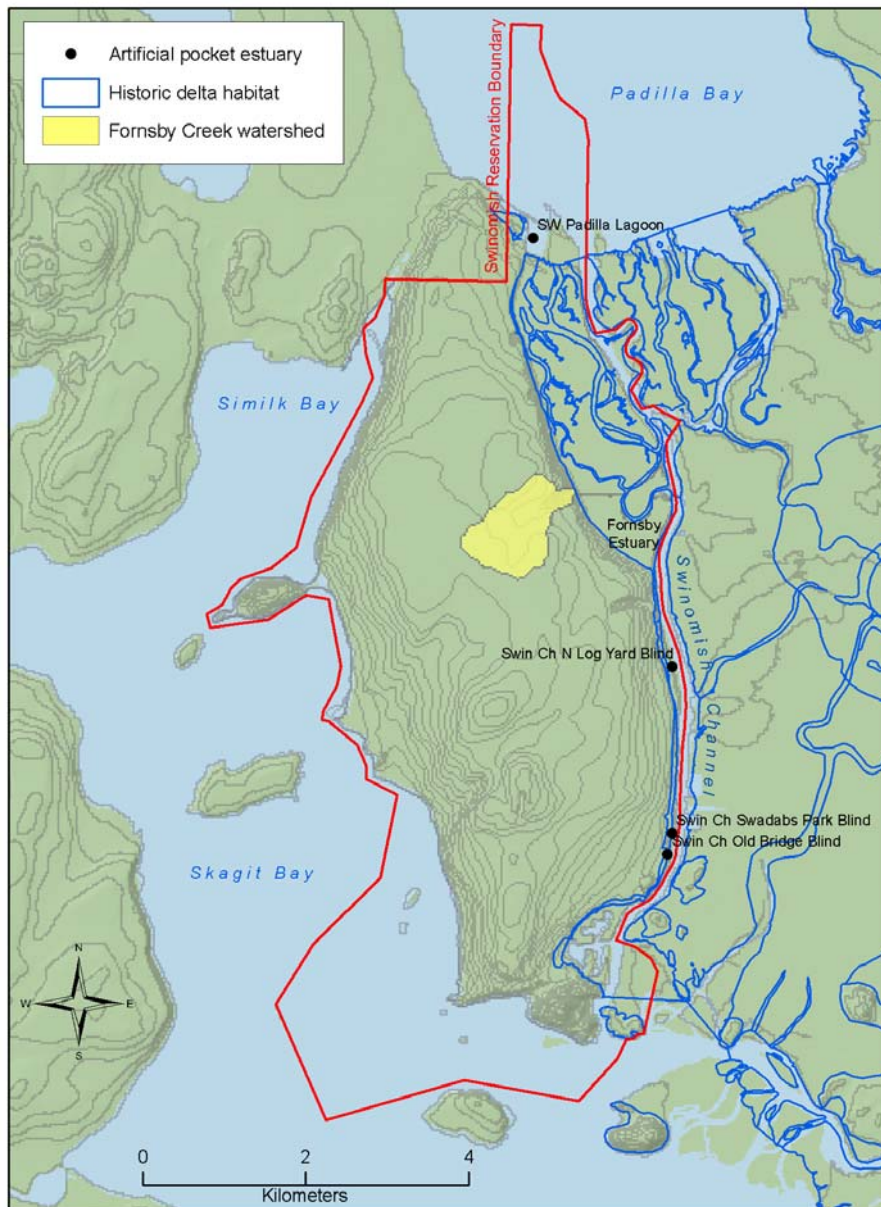


Figure 3. Location of historic delta habitat along Swinomish Channel within the eastern boundary of Swinomish Reservation.

BULL TROUT USE OF FRESHWATER STREAMS

There are five streams at least partially within the Swinomish Reservation (Figure 1). Electro fishing surveys have not provided any evidence of direct bull trout use in any of the five streams. The streams are all very small with rain-dominated hydrographs. Four of the five have ephemeral flow, having no surface flow generally from late June to early September most years. The watersheds are also very low in elevation. These streams are not suitable for bull trout spawning because they do not have sufficient flow during the spawning migration period or cool enough temperatures needed to trigger bull trout spawning or successfully incubate eggs. There is also no evidence of non-natal origin bull trout occupying these streams for foraging or refuge purposes.

Lacking specific bull trout data some fish management agencies have used juvenile coho salmon range as a surrogate for a presumed bull trout range. Juvenile coho are known to exist in the three streams entering Skagit Bay. This method might be a reasonable way to estimate the range of foraging juvenile and sub-adult bull trout in tributary watersheds within their larger natal river basins. However, we would not advise this approach for the small, independent watersheds that drain directly into Skagit Bay based on the larger size of bull trout that enter estuarine delta and nearshore waters compared to the smaller size of juvenile coho found in the Swinomish Reservation freshwater streams. The larger sized fish would be expected to utilize a different ecological niche than the smaller fish due to differences in predator-prey size relationships and metabolic needs.

Anadromous bull trout that migrate to estuarine and nearshore habitats are rarely smaller than 150 mm in length (Figure 4). They are much larger than 60-80 mm sized coho parr migrating to non-natal streams during summer/fall months or 90-110 mm sized coho smolts migrating to estuarine and nearshore habitats

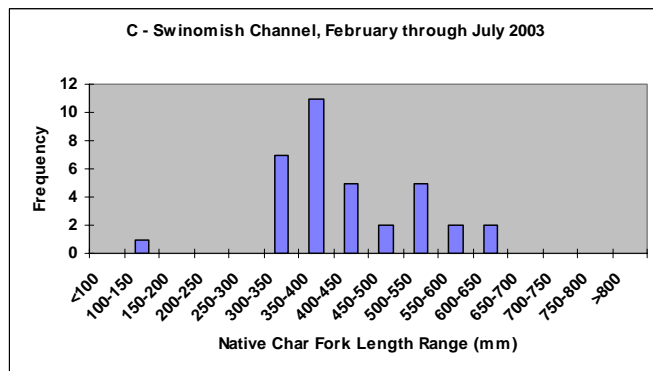
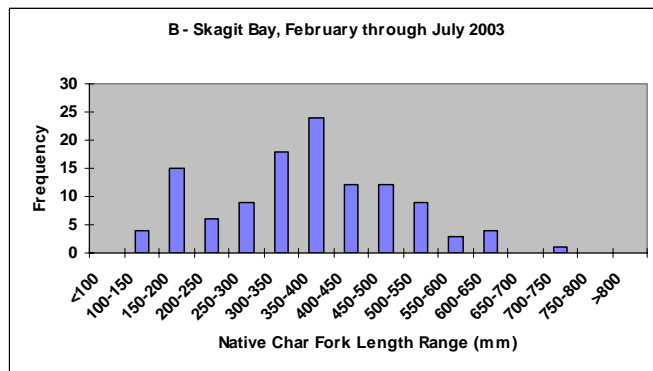
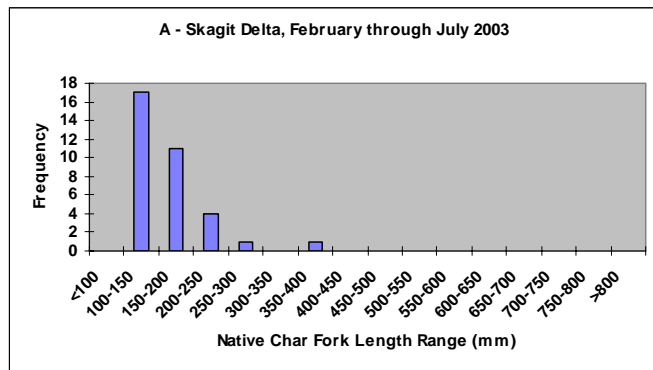


Figure 4. Size of bull trout found in estuarine waters adjacent to the Swinomish Reservation.

during spring. Therefore, it is unlikely that bull trout would directly use (i.e., spend time in) the freshwater stream habitat found within the Swinomish Reservation.

Indirect use of freshwater streams may be important for bull trout utilizing nearshore areas by providing the necessary freshwater flow to adjacent wetland and estuarine areas receiving these waters. Local jurisdictions should protect and restore these functions by ensuring that the natural hydrographs of these watersheds are not altered, and that source and/or non-point pollutants do not find their way into these watersheds.

BULL TROUT USE OF LAGOON AND SALTMARSH DOMINATED “POCKET” ESTUARIES

Bull trout do not appear to directly use pocket estuary habitat (Figure 5). In 2003, we caught one bull trout in Turner’s Bay, the largest pocket estuary located on the Swinomish Reservation. Since the 2001 season (when our pocket estuary research began) we have captured only one bull trout in pocket estuary habitat out of 269 times sampling within five different pocket estuaries. Conversely, bull trout do appear to congregate along the spit beaches that often help form lagoon-type pocket estuaries (Figure 5). It is likely that bull trout congregate in these areas due to the high forage potential that is associated with pocket estuary ecology.

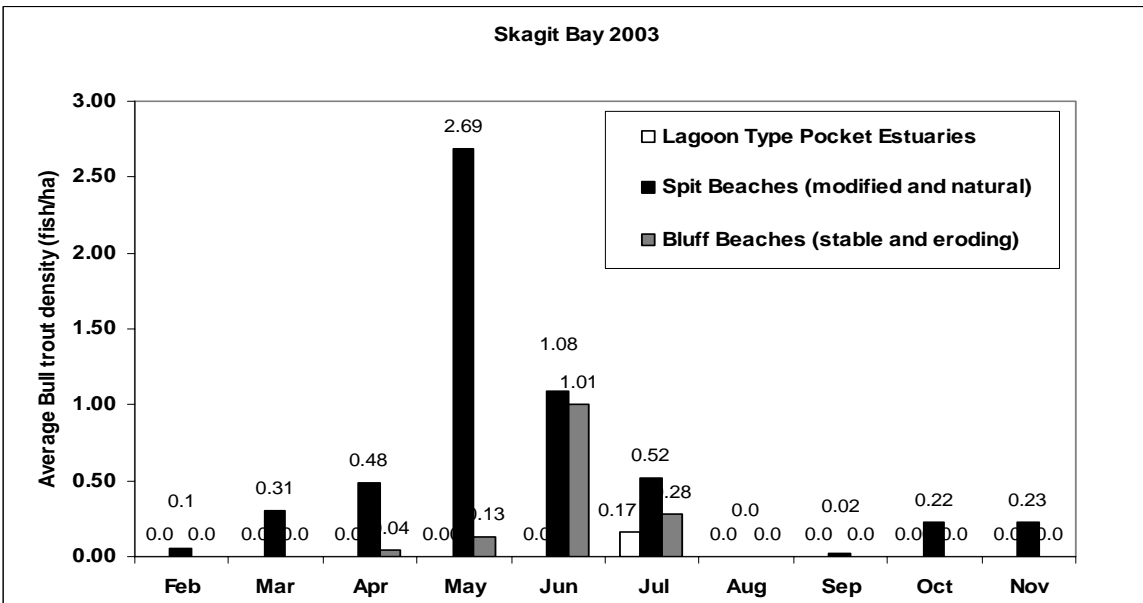


Figure 5. Bull trout use of Skagit Bay nearshore by geomorphic habitat types.

Indirect use of pocket estuaries is important for bull trout utilizing nearshore areas, mainly by providing habitat for prey species important to bull trout. Bull trout in the nearshore environment prey on juvenile salmon, shiner perch, and forage fish (smelt, sandlance, herring, anchovy) of all ages. Pocket estuary habitat appears to provide a nursery function for not only juvenile Chinook salmon (Beamer et al. 2003) but also surf smelt, a dominant forage fish species within Skagit Bay (Figure 6). Adult surf smelt were associated with all nearshore habitat types except pocket estuaries (coastal lagoon in Figure 6) during the summer spawning period (top figure). Juvenile surf smelt (larval and post-larval) appear in the nearshore environment approximately one month later than the curve for spawning adults, and show strong preference for pocket estuaries (coastal lagoon in Figure 6) compared to other nearshore habitat types, especially when you consider where the surf smelt had spawned. Since there is essentially no spawning by surf smelt within the lagoons we sampled, the juvenile surf smelt had to either swim or drift with the tidal currents into the lagoon areas. We do observe peaks of juvenile surf smelt in other geomorphic beach types, however overall abundance is lower than lagoon areas.

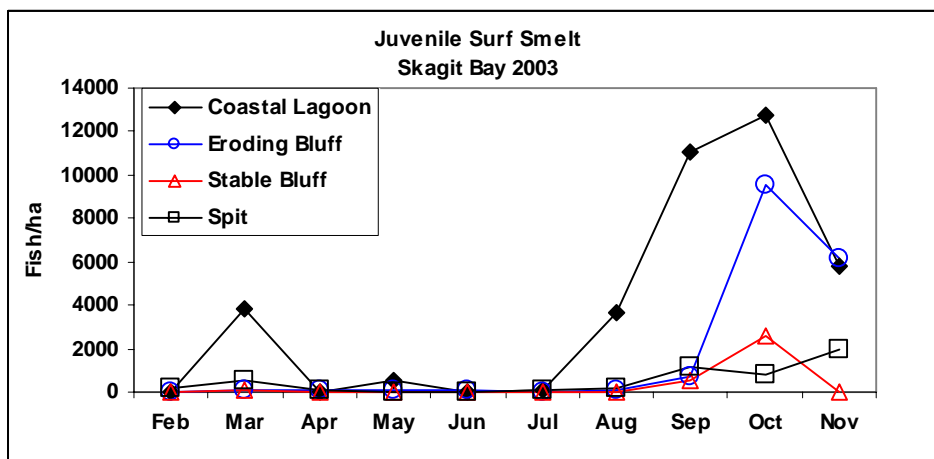
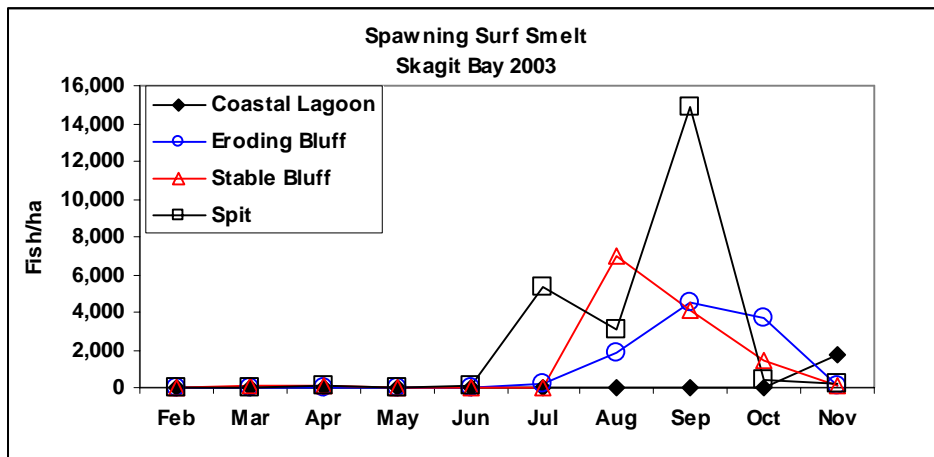


Figure 6. Adult (top figure) and juvenile (bottom figure) surf smelt associations with nearshore habitat types in Skagit Bay.

Pocket estuary habitat has been identified as a wild Chinook salmon recovery priority (Beamer et al. 2003) and is therefore considered within the Skagit Bay region as a habitat type to protect and restore. Local jurisdictions should protect existing pocket estuaries and the functions that form and sustain them. The Swinomish Tribal Community is currently involved in restoring the Lone Tree Creek Pocket Estuary. These actions are expected to improve food-web relationships for bull trout.

BULL TROUT USE OF SHORELINE AREAS IN SKAGIT BAY

Bull trout directly use the nearshore areas within the Swinomish Reservation along Skagit Bay (shaded yellow in Figure 2). Bull trout are most commonly caught in nearshore habitat deeper than 1.5 meters. These areas are present throughout the Swinomish Reservation nearshore waters, even at low tide. Bull trout are typically more abundant in May and June, but could be expected to be present year round (Figure 7). The general pattern of use by nearshore habitat type has already been shown in Figure 5. Bull trout seem to congregate along the spit beaches that form lagoon type pocket estuaries. It is likely that bull trout congregate in these areas due to the high forage potential that is associated with pocket estuary ecology or forage fish spawning beaches. Spit beaches are associated with the named pocket estuary sites shown in Figure 2.

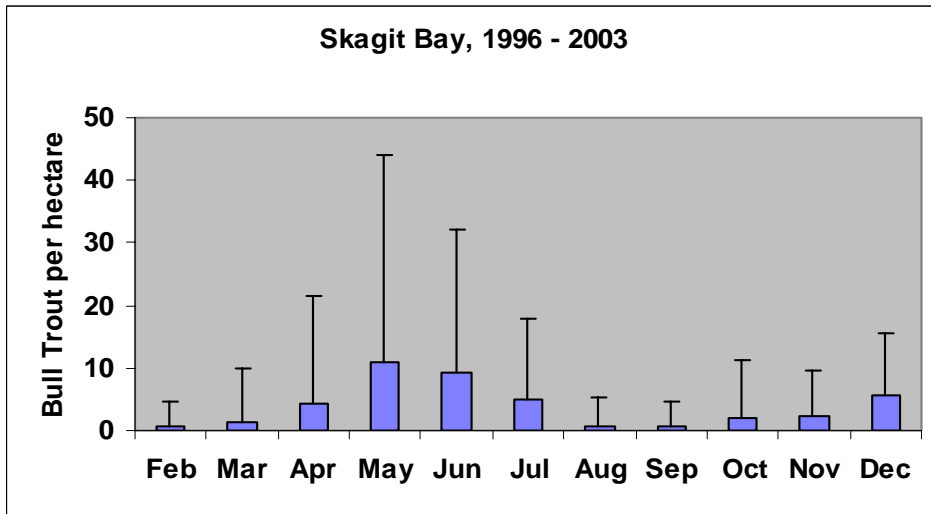


Figure 7. Average timing of bull trout in Skagit Bay, 1996-2003. Error bars are standard deviation.

Local jurisdictions should protect existing nearshore habitat along Skagit Bay by protecting and restoring coastal processes that form and maintain healthy nearshore habitat. The Swinomish Tribal Community’s interest in restoring pocket estuaries includes nearshore restoration or protection because coastal processes form and maintain pocket estuaries. For example, feeder bluffs are the source of sediment to maintain spit beaches that help form lagoon type pocket estuaries. Therefore, sediment processes in the nearshore need to be protected and/or restored to protect these lagoons.

BULL TROUT USE OF SWINOMISH CHANNEL

Historically, Swinomish Channel was a well-connected branch of the larger Skagit River delta estuary (Collins and Montgomery 2001). Currently, it is isolated from the Skagit River by a rock jetty at its southern end. It has also been dredged for vessel navigation purposes. These modifications have changed both Swinomish Channel and its fringing estuarine marsh habitat from a delta estuary to a marine channel with “artificial pocket estuary” habitat in areas where dike setbacks allow for tidal inundation and where freshwater inputs occur. SRSC has sampled several of these fringing locations (shown in Figure 3) as well as within Swinomish Channel. Our sampling has shown the same basic bull trout use pattern in Swinomish Channel as observed in Skagit Bay. Namely, bull trout are directly using Swinomish Channel (Figure 7) and indirectly using the “artificial pocket estuary” habitat along Swinomish Channel.

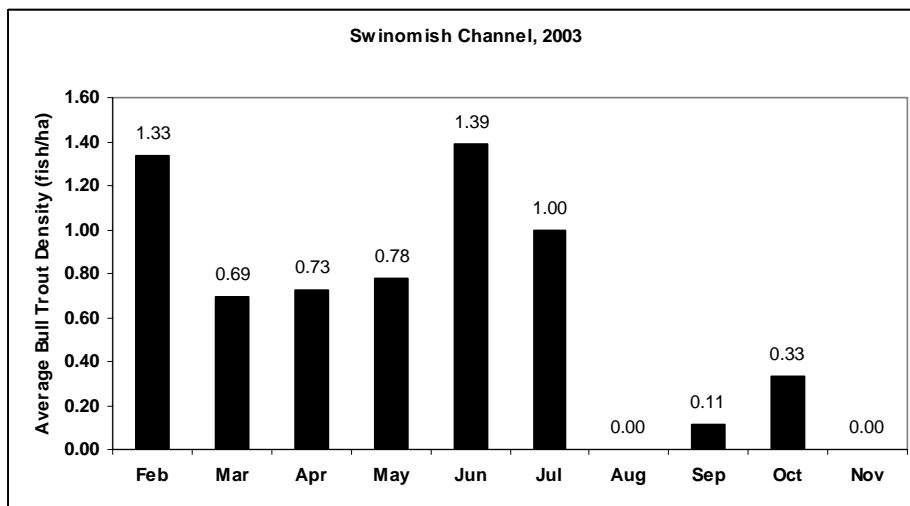


Figure 7. Bull trout use of Swinomish Channel, 2003.

Local jurisdictions should protect existing habitat along and within the Swinomish Channel and restore additional habitat where opportunities exist. The Swinomish Tribal Community and others are currently pursuing several restoration opportunities. Two existing projects (Swinomish Channel Reconnection and Fornsby Creek Estuary Restoration) are discussed briefly below.

Skagit Wild Chinook salmon recovery will require significant amounts of delta habitat to be restored as part of its recovery plan. Much of this restoration will occur off the Swinomish Reservation and outside of the Swinomish Channel corridor. However, delta habitat restoration opportunity is significant along the Swinomish Channel corridor if the southern end of Swinomish Channel is reconnected to the Skagit River. The Swinomish Tribal Community is currently involved with SRSC and USACOE in developing alternatives to reconnect the southern end of Swinomish Channel with the Skagit River. The tribe is also restoring the Fornsby Creek estuary (shown in Figure 3). These actions can be expected to improve habitat conditions for bull trout within and along the Swinomish Channel corridor.

CONCLUSIONS

The anadromous bull trout population in Skagit Bay (adjacent to and including nearshore habitat within the Swinomish Reservation) has increased 4-fold since 1995 and is more complex in its age structure. Together, these factors (higher abundance and multiple age classes) should make the current Skagit Bay bull trout population more resilient to threats to its population than a decade ago.

Anadromous bull trout utilize some aquatic habitats found within the Swinomish Reservation. Specifically,

1. Bull trout don't directly use the freshwater watersheds on the reservation.
2. Bull trout do use the nearshore habitat directly and pocket estuaries indirectly.
3. Bull trout do use Swinomish Channel directly and the fringing marsh habitat indirectly.

The tribe's existing protection and restoration efforts include restoration of delta and pocket estuary habitat on the Swinomish Reservation. These actions will benefit anadromous bull trout by increasing habitats that improve bull trout forage in estuarine and nearshore habitats.

Regional plans for Chinook salmon recovery include restoration of delta and pocket estuary habitat both on and off the Swinomish Reservation. These actions will benefit anadromous bull trout by increasing habitats that improve bull trout forage in estuarine and nearshore habitats.

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