July 7, 2008

United States Fish and Wildlife Service
National Office
Division of Policy and Directive's Management
4401 N. Fairfax Drive, Suite 222
Arlington, VA 22203

RE: Comments by Snoqualmie Tribe and Trout Unlimited in Response to Notice of 12-Month Status Review on Petition for listing of Lake Sammamish Kokanee.

FWS-R1-ES-2008-0048; 1111 FY07 MO B2
June 24, 2008

In July of 2007, several co-petitioners petitioned the US Fish and Wildlife Service (FWS) for protection of the Lake Sammamish kokanee under the Endangered Species Act (ESA), 16 U.S.C. §§ 1531-1544 (1973). On Tuesday, May 6, 2008, the FWS published notice in the Federal Register indicating that, based on the petition, substantial information exists to warrant further review and it solicited any additional information and data regarding this species. We are pleased that FWS will undertake this review and believe that convincing data exists to support the conclusion that the kokanee's biological vulnerability is such that a listing is warranted for this species.

In addition to the information presented in our original petition for listing (dated July 2007), The Snoqualmie Indian Tribe and Trout Unlimited respectfully submit the following additional information for consideration during the 12-month review process:

- 2007/08 Spawner Survey Data and Summary collected by Washington Department of Fish and Wildlife (WDFW);
- 2008 Fry trap data collected by Trout Unlimited
- Additional comments related to proposed urban development

We provide these comments and new information in support of the FWS's initial finding that listing the Lake Sammamish Kokanee population as endangered or threatened under ESA may be warranted and we urge the Secretary of the Interior (hereafter referred to as "Secretary") to make his 12-month status review in accordance with this initial determination.[1]

I. SUMMARY

[1] The scientific information referenced in these comments comes from the Petition to List the Lake Sammamish Kokanee as Threatened or Endangered under the Federal Endangered Species Act. When referencing to the Petition, these comments in turn reference to the citations found in the Petition. These comments incorporate, by reference, the Petition and all its attachments and appendices.

When Congress enacted the ESA, it made a commitment to conserve and protect those species facing serious threats to their continued existence, stating clearly that it is "the policy of Congress that all Federal departments and agencies shall seek to conserve endangered species and threatened species and shall utilize their authorities in furtherance of the purposes" of the ESA. 16 U.S.C. § 1531(c)(1). The native kokanee population of Lake Sammamish, Washington, (hereafter referred to as the Lake Sammamish Population) a formerly plentiful resident fish, today stands on the brink of extinction. In the past, the Lake supported three distinct runs of native kokanee, an early/ summer-run, a middle/ fall-run, and a late/ winter run. Petition from the Petitioners to the U.S. Fish and Wildlife Serv. to List the Lake Sammamish Kokanee (Oncorhynchus nerka) as Threatened or Endangered Under the Fed. Endangered Species Act, at 8 (June 29, 2007) (hereinafter referred to as the "Petition") (on file with U.S. Fish and Wildlife Service). Today the only viable native run occurs in the winter; the early run is already considered functionally extinct and, although more investigation is needed, the native middle run might also have met the same fate. Berge, Hans B., and Kollin Higgins. 2003. The Current Status of Kokanee in the Great Lake Washington Watershed. King County Dept. of Natural Resources and Parks, Water and Land Resources Division. Seattle, WA. October 2003. 50 pp. at I, 6.

To aid in the determination of whether the Lake Sammamish Population warrants classification as endangered or threatened under the ESA, the Snoqualmie Tribe and Trout Unlimited submit these comments to the Secretary and request that he find: (1) that the Lake Sammamish Population represents a Distinct Population Segment (DPS) and is thus a listable species under the ESA; (2) that the best scientific and commercial data supports the conclusion that the Lake Sammamish Population warrants designation as endangered or threatened based upon the five listing factors established by the ESA; and (3) that the Lake Sammamish Population holds cultural significance to the Snoqualmie people, which although incapable of scientific measure, is worthy of protection as well. Additionally, we request that the Secretary propose designated critical habitat for this species as part of any listing determination.

II. COMMENTS

A. The Lake Sammamish Population constitutes a DPS and is eligible for listing under the ESA

Species being considered for possible designation as endangered or threatened must first meet the requirements of the statutory definition. The ESA defines species as including "any subspecies of fish or wildlife or plants, and any distinct population segment of any species of vertebrate fish or wildlife which interbreeds when mature." 16 U.S.C. § 1532(16). Three elements are considered when assessing whether a candidate species represents a distinct population segment. Those elements are: (1) the discreteness of the population segment in relation to the rest of its taxon; (2) the significance of the population segment to its taxon; and (3) the population segment's conservation status as determined by the five listing factors under the ESA § 1533(a)(1). 61 Fed. Reg. 4722, 4725 (1996).

1. Discreteness

A population segment can meet the discreteness requirement if it is either (1) "markedly separated" from other populations of the same taxon in terms of physical, physiological, ecological, or behavioral factors, as evidenced by genetic or morphological discontinuity, or (2) delimited by international boundaries, resulting in significant differences in control of exploitation, management of habitat, conservation status, or regulatory mechanisms. *Id*.

The Lake Sammamish Population differs ecologically, genetically, and physiologically from both the kokanee populations that have been introduced into Lake Sammamish, those artificially produced as well as the wild non-native populations, and also from its anadromous relative, the sockeye, which spends time in the Lake Washington-Sammamish watershed as well. Petition at 11, 12. First, the Lake Sammamish Population's ecological discreteness is evidenced by its unique three-run spawning cycle. *Id*. at 13. Although two of the three runs are now considered functionally extinct, all three have been included in the petition since possible remnants of the now extinct runs are crucial to the recovery of the Lake Sammamish Population. Second, studies have also shown that the runs are genetically discrete relative to each other and to other kokanee and sockeye populations throughout the West. *Id*. Third, there is also evidence of physiological differences among the Lake Sammamish Population. *Id*. Relying on historic data for the two extinct runs, studies show that the three run timings display different average lengths, each one corresponding to their unique ecological settings. *Id*. Finally, it appears that both the wild and artificially produced kokanee that have been introduced into the Lake from other watersheds have been unable to persist in Lake Sammamish as evident by the absence of a genetic signal from those introduced populations. *Id*. This highlights the Lake Sammamish Population's high degree of adaptability to the particular ecological circumstances of its surroundings. Taken together, this data supports the conclusion that the Lake Sammamish Population fulfills the discreteness requirement.

2. Significance

Once a species has been designated as discrete, its biological and ecological significance is then evaluated in accordance with the Congressional decree "that the authority to list DPS's be used 'sparingly' while encouraging the conservation of genetic diversity." 61 Fed. Reg. at 4725. Consideration is given, but not limited to, the following factors:

> 1. Persistence of the discrete population segment in an ecological setting unusual or unique for the taxon;
> 2. Evidence that the loss of the discrete population segment would result in a significant gap in the range of the taxon;
> 3. Evidence that the discrete population segment represents the only surviving natural occurrence of a taxon that may be more abundant elsewhere as an introduced population outside its historic range; or
> 4. Evidence that the discrete population segment differs markedly from other populations of the species in its genetic characteristics.

Id. This is a case by case analysis that should rely upon the best scientific and commercial data available. 16 U.S.C. § 1533(b)(1)(A). However, when making such a determination the Secretary "may not ignore evidence simply because it falls short of absolute scientific certainty." *N.W. Ecosystem Alliance v. U. S. Fish and Wildlife Serv.*, 475 F.3d 1136 (9th Cir. 2007).

The best scientific and commercial data available supports the conclusion that the Lake Sammamish Population is significant to the species to which it belongs. First, as discussed above, the three Lake Sammamish Population cycles have shown the ability to persist in their unique ecological settings whereas other introduced kokanee populations have been unable to obtain a lasting foothold. Petition at 13. Second, taking into consideration both the apparent inability of other non-native kokanee populations to persist in the Lake Sammamish system and the functional extinction of two of the three spawning cycles, the loss of the third cycle poses a significant threat to the continued existence of kokanee in the Lake Washington-Sammamish watershed. *Id*. The loss of the remaining cycle would create a significant gap in the range of the taxon. Third, as mentioned above, studies show that the three groups comprising the Lake Sammamish Population differ genetically in relation to each other, and in relation to other kokanee populations. *Id*. Since preservation of genetic diversity is one of Congress' stated goals, preserving the ecologically and genetically distinct and significant Lake Sammamish Population would help to accomplish such a task. 61 Fed. Reg. at 4423.

Given the scientific evidence in support of the Lake Sammamish Population's classification as both discrete and significant to its taxon, a conclusion given initial support by the FWS, 73 Fed. Reg. 24915 (May 6, 2008), its designation as a DPS is warranted.

B. The Lake Sammamish Population Warrants Designation as Endangered or Threatened Based Upon the Five Listing Factors in the ESA

After establishing that the species in question is eligible for listing under the ESA, the Secretary shall then determine whether the species is endangered or threatened based upon the following five factors: (A) the present or threatened destruction, modification, or curtailment of its habitat or range; (B) overutilization for commercial, recreational, scientific, or educational purposes; (C) disease or predation; (D) the inadequacy of existing regulatory mechanisms; or (E) other natural or manmade factors affecting its continued existence. 16 U.S.C. § 1533(a)(1). The Secretary is to make this determination based solely upon the best scientific and commercial data available to him after conducting a status review of the species and after giving consideration to those efforts, if any, being made by any State, foreign nation, or political subdivision thereof, to protect the species. 16 U.S.C. § 1533(b)(1)(A). The FWS, in its initial evaluation of the Lake Sammamish Population along these five factors, concluded that the listing of this DPS may be warranted, and the Petitioners believe that this conclusion is supported by the scientific evidence. 73 Fed. Reg. at 24922.

1. The Present and Threatened Destruction, Modification, and Curtailment of the Lake Sammamish Population's Habitat and Range

Perhaps the greatest threat to the survival of the Lake Sammamish Population comes from the loss of habitat it has suffered, continues to suffer, and is threatened to suffer in the future. The initial Petition to list the Lake Sammamish Population identified 4 main alterations to Lake Sammamish and its tributaries that have adversely affected the DPS: (1) the loss and degradation of available kokanee habitat as a result of the channelization of the Sammamish River for flood control; (2) the degradation of lake and tributary water quality as a result of pollution and continued urbanization; (3) the alteration of stream hydrology (ie, water levels and temperatures) due to urbanization; and (4) the inability of kokanee to access upstream spawning

habitat due to manmade fish passage barriers. Petition at 21-23. In addition to these manmade alterations, climate change poses a serious threat to the ability of the kokanee to survive in its remaining habitat (for a discussion of climate change, see (B)(5)).

First, the major channelization of the Sammamish River that occurred after Lake Washington was permanently connected to Puget Sound in 1917 transformed the once 28 mile meandering marshland into a narrow, steep sided, and faster moving channel. *Id*. at 21. As a result, rearing ponds and areas of slack water where the kokanee could take refuge from predators were destroyed. *Id*. The continued alteration of the River and its banks has led to increased sediment in the water, debris that superimposes upon the kokanee's egg beds, or redds, leading to their death. *Id*. Also, the channelization has resulted in a straightening of the river, intensifying flooding and leading to the scattering of kokanee redds and interference with potential spawning. *Id*. Impacts of such alternations to the Lake Sammamish Population's habitat are reflected in the dismal population figures for 2008. These impacts create a new level of threat from otherwise naturally occurring conditions owing to a reduced ability of streams to absorb natural processes. The streams are flashier and faster in storm events – an impact which was clearly seen on December 3rd, 2007, when a winter storm caused severe flood conditions in the Lake Sammamish tributaries, washing out the bulk of the newly formed redds. The WDFW notes in its 2007/08 spawning survey report that it is "unlikely that any of the redds constructed prior to the flood event survived the scour and sedimentation effects." WDFW Spawner Escapement Survey Summary 2007/08. [2] This storm came during a year of already low returns (the results of the spawner survey provide reason for concern. The results indicate that the total combined escapement for Vasa, Lewis, Laughing Jacobs, Ebright and Pine Lake creeks was only 143 fish, which represents a mere 15.1% of the 1996/97 – 2006/07 average of 946 fish) and spawner surveys indicate that more than 80 percent of the run was recorded prior to the December 3rd storm event. *Id.* As an example of this loss suffered by the kokanee, in Lewis Creek, of the total 118 live fish recorded, only 9 were recorded after the flood event. *Id.* The extremely low escapement numbers provide reason for concern, and the unexpectedly low number is even more dire when considering the harm caused by the December 3rd storm event. Given the timing, there is reason to believe that the returns in 2011-2012 will be reduced due to this loss of spawners. The impact of this storm and the low spawner counts was reaffirmed during the 2008 count of outmigrating fry. Newly emerged kokanee fry migrate from their natal rivers and creeks into a lake in April and May (Berge 2003). A fry trap study conducted by Trout Unlimited during this period (late March through the end of May) reported only 195 kokanee fry leaving from Lewis Creek, compared to 2272 reported during this same period in 2007. Lewis Creek Fry Collection data 2008, attached as Appendix A. Of these numbers, all 195 were counted after April 30th, a very late date compared to previous years.

A second factor identified in the listing petition is the past, present, and threatened future urbanization of the Lake Washington-Sammamish watershed, and the increased levels of pollution this activity generates, has led to the degradation of the water quality of Lake Sammamish and its tributaries. In the 1960's, effluent from a wastewater treatment plant, a milk processing plant, a hatchery, and mining operations was being channeled into Lake Sammamish from Issaquah Creek, its largest tributary. Petition at 21, 22. Also, continued urbanization in the Lake Sammamish basin has led to the conversion of original riparian groundcover into

[2] See WDFW Spawner Escapement Survey Summary, attached as Appendix B, which includes data recorded from November 8, 2007 through January 31, 2008. Surveys were conducted in Vasa, Lewis, Laughing Jacobs, Ebright and Pine Lake Creeks.

impervious surfaces, which increases the flow of polluted runoff water into the Sammamish area streams. *Id*.

Since the time of our petition, development around Lake Sammamish and its tributaries has increased, with a couple of notable developments on the horizon that, if constructed, would pose a significant threat of destruction, modification, or curtailment of the Lake Sammamish Population's habitat and range. For example, the proposed Town Center Plan for the City of Sammamish currently threatens to create a significant source of pollution to Ebright Creek, one of the last and strongest remaining tributaries of Lake Sammamish that supports native kokanee.[3] PNWLocalNews.com, Sammamish Council ups commercial space in Town Center Plan, *available at* http://www.pnwlocalnews.com/east_king/iss-s/news/19533414.html (last visited June 30, 2008). If approved, this Plan calls for the construction of up to 600,000 square feet of commercial space, all impervious surfaces acting as a conduit for contaminated water to flow directly into the Creek. *Id*. Additionally, the Central Issaquah Plan, expected to be adopted in the winter of 2009, is another proposed construction project intended to transform the 900 plus acre city core into a "vibrant community." Seattletimes.com, Issaquah mapping its future, *available at* http://seattletimes.nwsource.com/html/eastsidenews/2004166877_issaquah06e.html (last visited July 2, 2008). The city's planning manager, Trish Heinonen, stated that "[t]he intent is to move from a suburban area to an urban area," with one of the project's goals being to integrate development with the city's natural settings, such as the creeks and views. *Id*. One such natural setting is Issaquah Creek, the largest tributary to Lake Sammamish and the former spawning ground of the now extinct summer run kokanee. *Id*. If this development goes through, it stands to contribute substantially to the continued degradation of the Lake Sammamish Population's habitat. *Id*.

A third factor identified in the listing petition is that in addition to the degradation of the water quality of Lake Sammamish and its tributaries, urbanization and the accompanying increase in impervious surfaces have also affected the water hydrology throughout the basin. Increasing water temperatures, reduced levels of dissolved oxygen, increased levels of water turbidity, water withdrawals and water surges have all been associated with increased levels of urbanization in the Lake Sammamish basin. Petition at 22. In addition to the increased impervious surface concerns posed by the proposed Town Center Plan and the Central Issaquah Plan, which threaten to increase run off into Ebright and Issaquah Creek, both the Lewis Creek and Laughing Jacobs Creek subbasins, which act as spawning ground for native kokanee, also face threatening levels of impervious surface area, a level almost double that shown to have a demonstrable destructive effect on area stream channels. 73 Fed. Reg. at 24920.

A fourth factor described in the petition is that past and present manmade fish passage barriers continue to prevent the Lake Sammamish Population from accessing critical spawning habitat, a serious obstacle that must be overcome in order for the native kokanee to persist in Lake Sammamish. Currently the longest stretch of spawning habitat is located in Lewis Creek and measures only 0.75 miles before it is cut off by the I-90 corridor. Berge, H.B. at 37. A hatchery on Issaquah Creek currently blocks 32 miles of potential spawning habitat. Petition at 23. As for Ebright Creek, in 1973 local property owners installed a fish weir that blocked passage to spawning ground upstream. *Id*. Although the weir was removed later that year, remnants may have continued to prevent passage. *Id*. Low water levels caused by urbanization might also create a de facto fish passage barrier to upstream spawning habitat. *Id*.

[3] The full text of the Town Center Plan can be found by going to http://www.ci.sammamish.wa.us/, and clicking on the "Town Center" tab on the left side of the screen.

These four factors, each supported by the scientific and commercial data currently available, demonstrate the present and threatened destruction, modification, and curtailment of the Lake Sammamish Population's habitat and range.

2. The Overutilization of the Lake Sammamish Population for Recreational, Scientific or Educational Purposes

Although most of the data showing this factor's effect on the Lake Sammamish Population relates to events that took place in the past, overutilization still played a significant part in the vast decline of native kokanee in the Lake Washington-Sammamish watershed. The plain language of the ESA does not preclude the inclusion of historical data, nor does it require that the five factors in question be the result of present, and not past, activities. Section 1533(a)(1) simply states that the Secretary will make the determination of whether a species is endangered or threatened "because of the following factors," including "(B) overutilization for commercial, recreational, or educational purposes." As such, evidence that overutilization played a demonstrable role in the dramatic decline of native kokanee should warrant the conclusion that this factor is present in the Lake Sammamish region.

One example of overutilization of the Lake Sammamish Population is the vast collection of native kokanee eggs that occurred after 1917, when Lake Washington was made a tributary of Puget Sound. Berge, H.B. at 4. As many as 14 million eggs were collected from Bear Creek in the 1940's and transported outside of the Sammamish water system, an act which may have contributed to the middle/ fall-run's eventual designation as functionally extinct. *Id*. at 6.

Another example of overutilization is the past use of a fish weir to trap migrating kokanee in Issaquah Creek, the spawning ground for the now extinct early/ summer run. In 1937 a hatchery was constructed on Issaquah Creek and it began using a fish weir to channel kokanee into holding tanks and prevent them from reaching the 32 miles of spawning territory beyond. Petition at 21. When it was determined that there was no commercially viable use for the kokanee and that the ponds could be used for another more lucrative fish, they were drained, leaving all the trapped kokanee to die. *Id*. The precise year that this occurred is not known, but if it happened to coincide with a particularly strong return of kokanee to spawn, then its effects could have significantly impaired the early run's ability to recover. *Id*.

Even though these instances of overutilization occurred in the past, their effects are still felt today. Given that, the Secretary should still consider this factor when assessing the Lake Sammamish Population's potential designation as endangered or threatened.

3. Disease or Predation Threatening the Lake Sammamish Population

The FWS found that neither the petition nor its files presented any evidence that disease currently poses a threat to the Lake Sammamish Population. 73 Fed. Reg. at 24921. However, given the non-traditional pollutants that are now entering the Sammamish water-ways in increased amounts, coupled with the lack of scientific investigation into the possible deleterious effects they may have on resident fish populations, the potential for disease is present. Petition at 22. The relative impacts of disease and predation will only increase in magnitude as the population declines.

Predation is another area in which further investigation would benefit the Lake Sammamish Population. There is some evidence that predation is a current threat to the native

kokanee of Lake Sammamish and its tributaries, however additional information is needed to better understand the magnitude of this threat. Factors indicating that predation is of concern are described in the initial listing petition. First, the channelization of the Sammamish River, as discussed earlier, has eliminated many areas of slow moving slack water previously used by the kokanee as refuge from predators. Petition at 21. Second, kokanee eggs are vulnerable to superimposition by chinook, sockeye, and coho salmon present in Lake Sammamish tributaries. Berge, H.B. at 38. Chinook salmon have been observed spawning on top of kokanee redds in Issaquah Creek, bringing about the destruction of the kokanee embryos. *Id*. Although not directly observed, it is presumed that the sockeye and coho engage in this activity as well. *Id*. In its 90-day response to the petition to put the Lake Sammamish Population on the endangered or threatened species list, the FWS conceded that its files indicated that predation was a potential threat to the native kokanee. 73 Fed. Reg. at 24921. However, due to a lack of adequate scientific investigation and data on the rates of predation, it did not find that there was substantial information indicating that this factor was a present threat to the Lake Sammamish kokanee. *Id*.

4. Inadequacy of Existing Regulatory Mechanisms

Although great effort has been made to regulate the Lake Sammamish Population, existing regulatory mechanisms are inadequate to protect these fish. Primarily, it appears that the existing mechanisms are lacking in one of two ways; namely, they either focus too much on conservation alone without any proactive measures to ensure recovery, or they fail to place the primary focus on the native kokanee, instead concentrating on other protected species. First, the WDFW has, to the extent that resources allow, committed to monitoring the spawning population and the hydrological conditions in the three known spawning streams. Petition at 24, 25. However, while monitoring these conditions will no doubt help inform the creation of future management options and decision making, monitoring alone falls short of assuring the recovery of Lake Sammamish kokanee. *Id*. at 25. Second, the WDFW is considering a more proactive supplementation plan for the late run kokanee population. *Id*. However, as the petitioners point out, this proposed plan is not certain to occur. *Id*. Third, some proactive measures are likely to take place as part of the recently adopted Shared Strategy for Puget Sound, a federally adopted recovery plan for the threatened Puget Sound chinook. *Id*. Although this plan is likely to indirectly benefit the Lake Sammamish Population, it was not drafted with the native kokanee in mind and therefore falls short of the comprehensive recovery plan necessary to prevent the continued decline of Lake Sammamish kokanee. *Id*.

Given that the Lake Washington-Sammamish watershed has the highest human population in the State, and projections estimate an increase of 24 percent between 2002 and 2022, 73 Fed. Reg. at 24921, programs that aim at conservation and monitoring alone without an eye toward restoration and recovery, or programs that fail to place their major emphasis on the kokanee, will not likely be enough for the Lake Sammamish Population to recover. These concerns, coupled with the current and upcoming development pressures discussed above, indicate that there is currently a lack of adequate regulatory mechanisms.

5. Other Natural and Manmade Factors Affecting the Lake Sammamish Population's Continued Existence

There are two primary additional threats to the Lake Sammamish Population that fall into this factor; (1) competition with other species of fish introduced into the Sammamish system, and (2) climate change.

First, competition for food and spawning resources has long been a problem for the native kokanee of Lake Sammamish. Between 1937 and 1963, 3,656,606 sockeye were introduced into the Lake Sammamish system. Petition at 20, Table 2. Even greater than that, 67,361,153 non-native kokanee were introduced between 1917 and 1979. *Id*. Although, as discussed earlier, the non-native kokanee did not succeed in persisting in Lake Sammamish, they still represented competition for food and spawning grounds. *Id*. at 20. As for the sockeye, a study conducted in 2004 found that instead of mere competition, the sockeye succeeded in replacing the middle run kokanee through genetic superimposition. *Id*. Also, the kokanee and sockeye fry compete for the same food resources in Lake Sammamish, namely the lake's phytoplankton and zooplankton. Berge, H.B. at 34. Other species of fish that were introduced into the system include the pikeminnow, cutthroat trout, bass, and yellow perch, all of which are known to feed on young kokanee in the Lake. Petition at 21.

Not only were other species of fish introduced from outside areas, but starting in 1937 with the opening of the Issaquah Creek Hatchery, chinook and coho salmon were produced for introduction into the Lake Washington-Sammamish watershed. *Id*. As mentioned earlier, chinook have been observed superimposing on the kokanee redds and it is hypothesized that the coho do the same. Berge, H.B. at 38.

The impact from the introduction of other species of fish was only compounded by the removal of an estimated 14 million kokanee eggs from the system in the 1940's, *Id*. at 6, and the collection by the WDFW of nearly 36 million kokanee fry for dispersal across the State. Petition at 20.

Second, climate change within the region is a major threat to the continued survival of the native kokanee. Although the impact of climate change on salmonids generally is currently the subject of several scientific studies, but the effect it will have on kokanee has not been specifically addressed. *Id*. at 23. Increases in water temperature leads to lower levels of dissolved oxygen and can create thermal barrier preventing the necessary migration of kokanee. *Id*. at 24. *See also*, Williams et. al., 2007. Also, the petitioners stress that increased temperatures may also alter chemical processes, food web dynamics, lake stratification, and nutrient cycling. *Id*. Also, increased regional temperatures can lead to increasing drought in the summer months, which could increase precipitation and intensity and result in scouring of kokanee redds. *Id*. The effects of climate change are hard to gauge and harder to predict, but in order to ensure the continued survival of the Lake Sammamish Population, this is an area that must be addressed.

Taking into consideration the above mentioned facts, and including the new and existing information related to the severity of impact from storm events due to human impacts discussed in previous sections, the best scientific information available supports the conclusion that there are other manmade and natural factors affecting the Lake Sammamish Population.

6. Summary of the Five Factors

From the information provided above, and in accordance with the initial findings of the FWS, we believe that an analysis of the five listing factors of the ESA warrants listing the Lake Sammamish Population as endangered or threatened.

C. The Lake Sammamish Population Holds Cultural Significance to the Snoqualmie People

Section 1533(b)(1)(A) of the ESA directs the Secretary, when making his determination as to the five listing factors, to base his decision "solely on the basis of the best scientific and commercial data available." However, that does not mean that there are other reasons one may have for wanting to protect the continued survival of a species.

The lands of the Snoqualmie Tribe historically stretched from the Cedar River to the Skykomish River, and from Snoqualmie Pass to Puget Sound, an area which clearly envelopes the native habitat of the Lake Sammamish Population. The lakes and streams of the Sammamish basin were and continue to be an important part of the Snoqualmie culture. To this day, important ceremonies are still held at Sammamish State Park. Oral history reveals that at one time the kokanee were so abundant that Tribal members could stand in the tributaries of Lake Sammamish and scoop up the "little red fish" in their hands.

There is no way to quantify cultural attachment to a species or measure the amount of loss a people would feel if part their history went extinct. There is ample scientific evidence to support placing the Lake Sammamish Population on the endangered or threatened species list, but it is important to remember that when making this determination one is in essence computing the value of a living thing. It is not an exact science and as such, consideration should be paid to those factors not amenable to calculation.

III. RECOMMENDATIONS

Listing as Threatened or Endangered

The Petitioners urge the Secretary to recommend that the Lake Sammamish Population of native kokanee be added to the endangered or threatened species list. While conducting the 12 month status review, it is our belief that the best scientific and commercial data available will support our recommendation.

Designation of Critical Habitat

The ESA requires that the Secretary designate critical habitat concurrent with listing decisions. The notice published on May 6th requested additional information for consideration in determining, if the species is listed, what habitat should be designated under the act as critical for this species. Critical habitat, as defined by the act, includes:

i. Specific areas within the geographical area occupied by the species, at the time it is listed…on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management considerations or protections;
ii. Specific areas outside the geographical area occupied by the species at the time it is listed…upon a determination by the Secretary that such areas are essential for the conservation of the species.

The code of federal regulations further clarifies what physical and biological features are essential to the conservation or may require special management or protection. Among the non-exclusive list of requirements are:

(1) space for individual and population growth and for normal behavior;
(2) food, water, air light, minerals or other nutritional or physiological requirements;
(3) cover or shelter;
(4) sites for breeding, reproduction, rearing of offspring, germination, or seed dispersal; and generally;
(5) habitats that are protected from disturbance or representative of the historic geographical and ecological distributions of a species.

The code also requires that, when considering the designation of critical habitat, the Secretary focus on "primary constituent elements" (PCEs), the primary biological or physical constituent elements within the defined area that are essential to the conservation of the species. PCE's include spawning sites, feeding sites, water quality or quantity, and tides.

Based on the above definitions and requirements, we provide the following recommendations and information regarding critical habitat designation for the Lake Sammamish Kokanee. These recommendations are based on a review of information included in the July 2007 petition, primarily Berge, H.B. 2003, as well as WDFW's recent spawning escapement summary report (2007-08) attached to this filing. These areas are included as a non-exclusive list of areas that should be considered as part of the review and additional information gathering during the 12-month review process.

A. Specific areas *within* the geographical area occupied by the species.

The following areas are "essential to the conservation of the species," and also are areas, which based on the discussion of impacts previously in these comments, "may require special management considerations or protections."

- Lewis Creek – one of the best remaining spawning areas for kokanee, the 2007-2008 spawner surveys found a total of 118 live and 18 dead kokanee in the reach. This total escapement in Lewis was estimated at 111 fish. This total was 18.3% of the 1996/97 – 2006/07 average.

- Ebright Creek– one of the best remaining spawning areas for kokanee, the 2007/08 spawner surveys estimated total escapement to be 17 fish. This total is only 7% of the 1996/97 – 2006/07 average of 243 fish. Of the 17 fish, 11 were observed prior to the December 3, 2007 storm, indicating that well over half (nearly 65%) of the production from this year may have been lost.

- Laughing Jacobs – kokanee currently use this Creek for spawning. The 2007/08 spawner surveys estimate total escapement at 15 fish, a total that is only 15.5% of the 1996/97 – 2006/07 average. [4] Of the 14 live fish counted in the reach, 7 were observed prior to the

[4] Id.

December 3, 2007 storm, indicating that nearly half of the production from this year may have been lost.

- Vasa and Tibbets Creeks and the East Fork of Issaquah Creek – all three of these areas provide spawning habitat for kokanee. In Vasa Creek, the 2007-2008 spawner surveys failed to identify any kokanee present in the reach, however kokanee have been observed previously in the portion of Vasa Creek downstream of West Lake Sammamish Drive. It is possible that returning kokanee move above this area as well. While the 2007/8 spawning survey does not report on Tibbets Creek or the East Fork of Issaquah Creek, spawning has been previously observed in both areas.

- Pine Lake Creek – spawning of kokanee has been documented in this reach starting in 1996.

- Lake Sammamish proper – particularly near shore areas and areas with groundwater upwelling. Kokanee may use the shorelines of the Lake for spawning habitat. Additionally, kokanee also rely on the Lake habitat for most of their life-cycle, until reaching sexual maturity (sometimes at age 4 or 5), in the lake habitat eating, growing and preparing for the return to spawn.

- Areas below natural migration barriers on Bear and Little Bear Creek, Evans Creek, Issaquah Creek and Tibbetts Creek and their major, perennial tributaries. This includes stream reaches above the passage barrier at the Issaquah hatchery weir. These areas have high potential for supporting new spawning aggregations, which may be needed to return the population to viable status.

- Cottage Lake Creek – kokanee have been known to spawn occasionally in Bear and Cottage lake Creeks, although it is unknown if these aggregations are related to kokanee or if they align with the introduced Baker Lake Sockeye ("middle run").

- Sammamish River, North Creek and Swamp Creek – should also be included in the evaluation of potential habitat.

Because spawning habitat has been identified as a primary limiting factor for kokanee, and considering that much of the current spawning area located within developing subbasins, it is essential that current and potential spawning habitat be adequately protected and restored.

These areas need special management or protection given that they are located within an urban growth area and there are insufficient mechanisms currently in place to keep that development from irreversibly harming these habitats.

B. Specific areas *outside* the geographical area occupied by the species.

From a watershed scale perspective, a critical habitat designation should consider all areas over which the ecological processes required to sustain the habitat quality and structure essential to the various life-stages of kokanee occur. Given this perspective, all subbasins draining to Lake Sammamish and the Bear/Evans Creek drainage into Sammamish River, whose

hydrology and water quality inputs are critical to the function of streams and the Lake, should be considered during this review process.

These areas are essential to the conservation of the species. Without protection of the upstream habitats, ensuring protection of the downstream system becomes more difficult. Fish need healthy, high quality habitat, which requires not only that the rivers and streams containing that habitat be healthy, but also that the headwater streams, lakes and upstream river corridors are also healthy and able to provide high quality water to the downstream habitats. This is particularly important considering changing climate conditions. *See:* Williams, et. al, 2007.

These areas may require special management considerations or protections considering the pressures for growth and development in this area. Identifying these areas as critical for the protection of kokanee would help ensure that development and growth occur in a way that accounts for the aquatic needs of the river and of the kokanee populations.

IV. Conclusion

Since the time our groups petitioned for protection of this species, conditions limiting the survival and recovery of the lake Sammamish kokanee have worsened. Spawner surveys and Fry trap data and collected by WDFW and Trout Unlimited, respectively, report counts of spawning adults (2007/08) and outmigrating fry (2008) both at dangerously low numbers. Commercial and residential development continues to surge forward around the Lake and its critical tributaries, deteriorating the stream conditions and further limiting the ability of this population to sustain and rebound. Finally, devastating storm events highlight concerns related to development impacts on channel formation and stream health generally. We request the Secretary take this new information under consideration, along with the data provided in the July 2007 petition, and make a determination that the Lake Sammamish kokanee warrant protection under the ESA.

We also encourage the Secretary to consider emergency protection for this stock during the time the listing review is underway. Given the steep decline in returns this year, this stock faces a significant risk of harm from ongoing impacts as well as new or increased impacts from development and other manmade causes as discussed above. As the population size reduces, the ability of the population to overcome challenges and be resilient in the face of these impacts decreases, enhancing the risk of decline for this already imperiled population.

We appreciate the opportunity to submit these comments and references for consideration and review.

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Appendix A
Lewis Creek Fry Collection data 2008 (Trout Unlimited 2008):

Methods:
The trap was initially placed in Lewis Creek on March 28, 2008. It was fished from 1-2 hour 3 nights a week. The trap fished for 30 minutes to an hour and then raised out of the water to check the catch basin for fry. Debris was gently removed and any fry in the catch basin were carefully counted in the basin. The plug in the bottom of the basin was then removed and the fry were released downstream of the trap with a minimum of handling. The water temperature, in deg. Fahrenheit, was taken after the trap was initially placed in the stream. The trap was operated the first 1-3 hours of darkness with expanded hours on 3 occasions to check later out migration. Sampling was 3 nights a week to more closely follow WDFW procedures and spare the volunteers.

Date	Time in	Time Out	Kokanee Fry	Dead	Other	#	Temp	Flow	Weather	Hours
3/28/08	19:45:00	20:15:00	**0**	**0**	0	0	44	High w/debris	Snow	**8**
	20:20:00	21:00:00	**0**	**0**	0	0		Higher		
3/30/08								**Too High**		**0**
4/2/08	20:08:00	21:00:00	**0**	**0**	Cutt/Sculpin	2/7	47	Low Clear		**8**
	21:05:00	22:00:00	**0**	**0**	0	0				
4/4/08	20:00:00	20:30:00	**0**	**0**	0	0	47	Low Clear		**9**
	20:35:00	21:45:00	**0**	**0**	Sculpin	1				
4/6/08	20:45:00	21:20:00	**0**	**0**	Sculpin	2	47	Low Clear		**6**
	21:25:00	21:48:00	**0**	**0**	Sculpin	1				
4/9/08	18:00:00	21:15:00	**0**	**0**	0	0	47	Low Clear		**4**
4/11/08	20:15:00	20:45:00	**0**	**0**	Cutt/Sculpin	1/1	50	Low Clear		**10**
	20:50:00	21:20:00	**0**	**0**	Sculpin	1				
	21:25:00	21:50:00	**0**	**0**	Sculpin	1				
	21:55:00	22:30:00	**0**	**0**	Sculpin	2				
4/13/08	20:20:00	21:20:00	**0**	**0**	Sculpin	1	50	Low Clear		**10**
	21:25:00	21:50:00	**0**	**0**	Sculpin	1				
	21:55:00	22:25:00	**0**	**0**	Sculpin	1				
4/16/08	20:00:00	20:30:00	**0**	**0**	Sculpin	1	50	Low Clear		**6**
	20:33:00	21:00:00	**0**	**0**	0	0				
	21:05:00	21:30:00	**0**	**0**	Tadpole	1				
4/18/08	20:00:00	21:04:00	**0**	**0**	0	0	46	Low Clear	Snow	**4**
	21:08:00	7:00:00	**0**	**0**	Cutthroat	1				
4/20/08	20:00:00	22:00:00	**0**	**0**	0	0	46	Low Clear	Cold	**6**
4/23/08	18:30:00	21:15:00	**0**	**0**	0	0	50	Low Clear	Lt. Rain	**8**
	21:20:00	22:00:00	**0**	**0**	Cutt/Sculpin	1/1				
	22:02:00	22:30:00	**0**	**0**	Sculpin	2				
4/26/08	20:00:00	22:00:00	**0**	**0**	0	0	50	Low Clear		**4**
4/28/08	20:00:00	22:00:00	**0**	**0**	Sculpin	2	53	Low Clear	Rainy	**6**
4/30/08	22:00:00	21:00:00	**0**	**0**	Sculpin	1	50	Low Clear		**8**
	21:05:00	21:30:00	**1**	**0**	0	0	50			
	21:35:00	22:20:00	**3**	**0**	Sculpin	1				

5/2/08	20:00:00	21:00:00	**0**	**0**	0	0	50	Low Clear	**7**
	21:05:00	22:00:00	**35**						
	22:05:00	7:30:00	**67**	**3**	Cutt/Sculpin	1/1			
	Ran efficiency tests w/100 frozen peas 1st test recovered 39/100: second test 69/100								
5/4/08	20:05:00	21:05:00	**0**	**0**	0	0	55	Low Clear	**10**
	21:10:00	22:00:00	**58**	**1**	0	0			
	22:05:00	22:30:00	**24**	**0**	0	0			
5/7/08	20:00:00	21:00:00	**0**	**0**	0	0	51	Low Clear	**10**
	21:05:00	21:30:00	**1**	**0**	Sculpin	1			
	21:35:00	22:30:00	**2**	**0**	0	0			
5/9/08	20:00:00	21:00:00	**0**	**0**	0	0	56	Low Clear	**6**
	21:05:00	22:00:00	**0**	**0**	Sculpin	1			
5/11/08	21:14:00	22:00:00	**1**	**0**	0	0	50	Low Clear	**6**
	22:07:00	22:40:00	**1**	**0**	0	0			
5/14/08	21:47:00	22:30:00	**0**	**0**	Lamprey	1	58	Low Clear	**4**
5/16/08	20:40:00	21:46:00	**1**	**0**	Lamprey	1	59	Low Clear	**6**
	21:50:00	**8:00:00**	**1**	**0**	Scutt/	1/1			
			Kokanee Fry	**Dead**					**Hours**
		Totals	**195**	**4**					**146**
								Trap Building & Installation	**50**
								Total Hours	**196**

Appendix B:
Washington Department of Fish and Wildlife
2007 - 2008 Late Run Kokanee Escapement Summary

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INTRODUCTION

The Lake Washington-Sammamish Watershed is one of five watersheds in Washington (Baker, Whatcom, Wenatchee, and Chelan) that support native populations of resident *Oncorhynchus nerka* or kokanee. There are three distinct kokanee populations within the Lake Washington-Sammamish Watershed, including the early, middle, and late-runs. Late-run kokanee are known to be present in south Lake Sammamish tributaries, such as Lewis, Ebright, Laughing Jacobs, Vasa, and Pine Lake creeks.

The Washington Department of Fish and Wildlife Region 4 Fish Program, with assistance from King County Department of Natural Resources and Parks and volunteer stream walkers, annually survey late-run kokanee spawner escapement within selected Lake Sammamish tributaries from November through January. Annual spawner escapement surveys allows the Washington Department of Fish and Wildlife and other interested entities to better monitor late-run kokanee escapement trends and make timely decisions regarding the management and/or conservation of this species.

METHODS

Selected Lake Sammamish tributary streams known to have late-run kokanee spawning were surveyed weekly from November through January. Tributaries surveyed included Vasa, Lewis, Laughing Jacobs, Ebright, and Pine Lake creeks. Surveyors walked upstream in each tributary counting all live and dead fish observed. All dead fish encountered were processed for biological data. Biological data collected included fork length (mm), sex, otoliths, and percent of unspawned eggs for females.

Typically, late-run kokanee escapement is determined by using area under the curve (AUC) methodology. AUC consists of graphing live fish counts (y-axis) over survey dates (x-axis) and then finding the area underneath that curve. The calculated AUC value, termed fish-days, is then divided by the stream life value of a fish to determine total escapement. For Lake Sammamish

kokanee a stream life value of 10 days is used. Stream life of Lake Sammamish kokanee is an estimated value based on stream life values for kokanee and sockeye identified in the literature and from past field observations in the tributaries. For the 2007/08 late-run kokanee spawning season a stream life value of 5 days was used, because observed stream life of live and dead kokanee was noticeably shorter than in years past. For example, in Lewis Creek 60 live kokanee were observed on November 20th, but six days later no live kokanee were observed. On November 28th, 2 days later, 26 live kokanee were observed during surveys. Furthermore, these 26 kokanee appeared to be fresh fish and not spawn-outs from the previous 60 fish observed. While escapement estimates derived from AUC are presented in summary tables within the results section of this document for comparison purposes, AUC was not used to determine kokanee escapement in tributary streams for 2007/08. Due to the low number of kokanee observed in tributary streams and the observed short stream life this spawning season, escapement for tributary streams was instead determined by enumerating live and/or some dead kokanee counted during surveys.

RESULTS

Vasa Creek:
Vasa Creek was surveyed once per week from November 28th, 2007 through January 31st, 2008. No live or dead kokanee were observed during those surveys. In speaking with the landowner who lives along the survey reach, he informed me that he observed no live or dead kokanee during the spawning season. It is possible that any returning kokanee moved above the index area to spawn. However, kokanee observed in the past have always been located in the portion of Vasa Creek downstream of West Lake Sammamish Drive.

Lewis Creek:
Lewis Creek was surveyed twice and sometimes three times per week from November 8th, 2007 through January 31st, 2008. Peak spawning occurred in mid-November when 60 live fish were observed on November 20th, 2007. A total of 118 live and 18 dead kokanee were observed during surveys. Total escapement in Lewis Creek was estimated to be 111 fish. Escapement of kokanee into Lewis Creek was calculated by enumerating the live fish observed on November 20th, November 28th, and December 6th and the dead fish observed on November 15th, November 20th, November 28th, and January 7th. The live fish observed on November 15th (n=23) are assumed to be part of the 60 live fish counted on November 20th. The 2007/08 escapement was 18.3% of the 1996/97-2006/07 average (606). Figure 1 summarizes all the survey data.

A total of 18 kokanee carcasses were processed for biological information. Of the 18 total carcasses processed, 11 (61.1%) were female and 7 (38.9%) were male. Average fork length of female and male kokanee was 428mm and 406mm, respectively. Otoliths were extracted from 15 of the 18 carcasses, of which 5 were male and 10 were female. Otoliths have not been read to determine ages of kokanee. Female kokanee carcasses were examined to determine the percent of unspawned eggs. Of the 11 females examined all except one were completely spawned out. The one female with eggs was determined to be 100% unspawned and appeared to have been recently killed by a predator.

On December 3rd, 2007 an extremely large flood event occurred in Lake Sammamish tributaries. It is unlikely that any of the redds constructed prior to the flood event survived the scour and sedimentation effects. Most of the live fish and redds in Lewis Creek were observed prior to December 3rd, 2007 flood event. Of the total 118 live fish observed, only 9 were recorded after the flood event.

Figure 1. Summary of Lewis Creek late-run kokanee spawning ground surveys and escapement.

SURVEY DATE	LIVE FISH	DEAD FISH	FISH DAYS	MOD. LIVE FISH
Nov-08	0	0	0	0
Nov-15	23	9	81	9
Nov-20	60	3	208	63
Nov-26	0	2	180	0
Nov-28	26	2	26	28
Dec-04	0	0	78	0
Dec-06	9	0	9	9
Dec-10	0	0	18	0
Dec-11	0	0	0	0
Dec-13	0	0	0	0
Dec-17	0	0	0	0
Dec-18	0	0	0	0
Dec-27	0	0	0	0
Dec-31	0	0	0	0
Jan-03	0	0	0	0
Jan-07	0	1	0	1
Jan-10	0	0	0	0
Jan-14	0	0	0	0
Jan-17	0	1	0	1
Jan-25	0	0	0	0
Jan-31	0	0	0	0
TOTAL:	**118**	**18**	**599**	**111**
ESCAPEMENT:	**--**	**--**	**120**	**111**

Laughing Jacobs Creek:

Laughing Jacobs Creek was surveyed twice a week from November 8th, 2007 through January 31st, 2008. Peak spawning occurred in mid-November when 7 live fish were observed on November 20th, 2007. A total of 14 live and 1 dead kokanee were observed during surveys. Total escapement in Laughing Jacobs Creek was estimated to be 15 fish. Escapement of kokanee into Laughing Jacobs Creek was calculated by enumerating the live fish observed on November 20th, December 6th, and January 14th and the dead fish observed on December 28th. The 2007/08 escapement was 15.5% of the 1996/97-2006/07 average (97). Figure 3 summarizes all the survey data.

Only one kokanee carcass was found and processed for biological information during surveys. The dead kokanee was a male measuring 381mm fork length. No otolith was extracted from the carcass.

Of the 14 live kokanee counted in Laughing Jacobs Creek, 7 of those fish were observed prior to the December 3rd, 2007 flood. Similar to Lewis Creek, the scouring and sedimentation effects of the flood likely destroyed all redds constructed before December 3rd, 2007.

Figure 3. Summary of Laughing Jacobs Creek spawning ground surveys and escapement.

SURVEY DATE	LIVE FISH	DEAD FISH	FISH DAYS	MOD. LIVE FISH
Nov-08	0	0	0	0
Nov-15	0	0	0	0
Nov-20	7	0	18	7
Nov-26	0	0	21	0
Dec-04	0	0	0	0
Dec-06	6	0	6	6
Dec-10	0	0	12	0
Dec-13	0	0	0	0
Dec-17	0	0	0	0
Dec-24	0	0	0	0
Dec-27	0	0	0	0
Dec-28	0	1	0	1
Dec-31	0	0	0	0
Jan-03	0	0	0	0
Jan-07	0	0	0	0
Jan-10	0	0	0	0
Jan-14	1	0	2	1
Jan-17	0	0	2	0
Jan-25	0	0	0	0
Jan-31	0	0	0	0
TOTAL:	**14**	**1**	**60**	**15**
ESCAPEMENT:	**--**	**--**	**12**	**15**

Ebright Creek:

Ebright Creek was surveyed twice a week from November 8th through January 31st, 2008. Peak spawning occurred in late-November with 11 fish observed on November 26th, 2007. A total of 17 live and zero dead kokanee were observed during surveys. Total escapement in Ebright Creek was estimated to be 17 fish. Escapement of kokanee into Ebright Creek was calculated by enumerating the live fish observed on November 26th, December 24th, and December 28th. The 2007/08 escapement was 7.0% of the 1996/97-2006/07 average (243). Figure 4 summarizes all the survey data.

No kokanee carcasses were found in Ebright Creek.

Of the 17 live kokanee counted in Ebright Creek, 11 of those fish were observed prior to the December 3rd, 2007 flood. Similar to Lewis and Laughing Jacobs creeks, the scouring and sedimentation effects of the flood likely destroyed all redds constructed before December 3rd, 2007.

Figure 4. Summary of Ebright Creek spawning ground surveys and escapement.

SURVEY DATE	LIVE FISH	DEAD FISH	FISH DAYS
Nov-08	0	0	0
Nov-15	0	0	0
Nov-20	0	0	0
Nov-26	11	0	33
Dec-04	0	0	44
Dec-06	0	0	0
Dec-07	0	0	0
Dec-10	0	0	0
Dec-13	0	0	0
Dec-17	0	0	0
Dec-24	5	0	18
Dec-27	0	0	8
Dec-28	1	0	1
Dec-31	0	0	2
Jan-03	0	0	0
Jan-07	0	0	0
Jan-10	0	0	0
Jan-14	0	0	0
Jan-17	0	0	0
Jan-25	0	0	0
Jan-31	0	0	0
TOTAL:	**17**	**0**	**104**
ESCAPEMENT:	**17**	**0**	**21**

Pine Lake Creek:
Pine Lake Creek was surveyed daily by a volunteer stream walker from November 4th, 2007 through January 14th, 2008. No live or dead kokanee were observed during surveys.

Late-Run Kokanee Escapement Trends:
Total combined escapement for Vasa, Lewis, Laughing Jacobs, Ebright, and Pine Lake creeks was 143 fish, which is only 15.1% of the 1996/97-2006/07 average (946). This collapse in spawning escapement is surprising considering that basin wide escapement in 2003/04 was 4,591 fish. The 2007/08 escapement was expected to be much larger. This extremely low basin-wide escapement is disconcerning for the 2010-11 run, especially considering the impacts of the December 3rd, 2007 flood event. Figures 5 and 6 summarize late-run kokanee escapement trends.

Figure 5. Escapement trends and average escapement levels of late-run kokanee.

LATE-RUN KOKANEE ESCAPEMENT TRENDS				
YEAR	LEWIS	EBRIGHT	L.J.	COMBINED
1996-97	219	70	170	459
1997-98	10	15	29	54
1998-99	43	40	0	83

1999-00	247	134	27	408
2000-01	143	362	92	597
2001-02	722	110	2	834
2002-03	1,002	319	384	1,705
2003-04	3,296	1,063	232	4,591
2004-05	442	134	18	594
2005-06	217	135	44	396
2006-07	330	292	65	687
2007-08	111	17	15	143
AVE (96-07):	**606**	**243**	**97**	**946**
AVE (w/o 03-04):	**567**	**236**	**68**	**870**
4-YEAR AVE (03-07):	**1,071**	**406**	**90**	**1,567**

Figure 6. Escapement trends of late-run kokanee.