UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
P.O. Box 21668
Juneau, Alaska 99802-1668

February 27, 2007

John Lang
Fisheries Biologist
U.S. Forest Service
Ketchikan-Misty Fiord Ranger District
3031 Tongass Ave.
Ketchikan, AK 99901-5743

Re: Bakewell Lake Coho Salmon Project

Dear Mr. Lang:

The National Marine Fisheries Service (NMFS) has reviewed an Environmental Assessment (EA) for the above referenced project. This cooperative project between the Ketchikan-Misty Fiords Ranger District (USFS) and the Southern Southeast Regional Aquaculture Association (SSRAA) will net-pen rear juvenile coho salmon in Bakewell Lake. The project will release up to 500,000 pre-smolts into the lake per year for three to ten years. The stated purpose of this project is to: "jump-start recolonization of the Bakewell/Badger lake system with a locally adapted coho salmon stock, increase adult returns and increase nutrient levels (carcasses)."

Background

Bakewell Lake is located 40 miles west of Ketchikan, Alaska in Misty Fiords National Monument, Tongass National Forest. Most of the watershed is federally designated wilderness. The watershed area is approximately 29 square miles and contains two large lakes: Bakewell Lake (665 acres) and Badger Lake (540 acres). Badger Lake (the upper lake) is connected to Bakewell Lake by 3.5 miles of stream considered suitable habitat for salmon spawning and rearing; six tributary streams provide additional spawning and/or rearing habitat. The outlet of Bakewell Lake flows one-half mile to saltwater and contains barriers to salmon migration. A fish ladder was constructed on the outlet stream in 1958/59. The fish ladder has been reconstructed multiple times since the mid 1960s to improve fish passage, most recently in 2001 and 2005. The ladder currently functions as originally planned.

Prior to construction of the fish ladder, the Bakewell Lake watershed contained resident cutthroat trout, Dolly Varden char, kokanee, and three-spine stickleback. From the mid-1950s through 1990, sockeye salmon adults, fry, and eyed eggs were planted in Bakewell Lake and Badger Creek. Coho fry were also planted during this period. Coho fry originated from the Crystal Lake hatchery in Petersburg, Deer Mountain hatchery in Ketchikan, Hugh-Smith Lake (south of Bakewell Lake), and Cascade Lake in Oregon. Coho have been naturally reproducing in the Bakewell Lake watershed since the 1960s.

Adult salmon escapement to the watershed has been much lower than expected. Escapement records from counts of adult salmon at the fish ladder are available for 20 years between 1963 and 2006. Returns of adult sockeye and pink salmon to the watershed in 2003 were 369 and 652 fish, respectively. Coho escapements have averaged 597 adults, ranging from 101 to 1,350 adults, since the late 1980s. In 2005, the last year adult coho were counted, 946 adults passed through the ladder. According to the EA, habitat capability models suggest that the watershed can support 20,000 to 30,000 adult coho. In 1980 the U.S. Forest Service surveyed spawning and rearing habitat in Bakewell Creek and estimated the watershed could support runs of 102,500 sockeye salmon and 41,333 coho.[1] The EA cites three factors that are preventing coho from fully exploiting the watershed: 1) a prolonged period of site-specific interception of Bakewell Lake coho in the commercial fishery in the mid- to late-1980s, 2) a prolonged period with a poorly operating fish ladder, and 3) poor lake nutrient levels.

In 2004 Bakewell Lake was selected by SSRAA as one of the top three watersheds out of 300 watersheds evaluated in southeastern Alaska for coho enhancement. The EA states that the project has the potential to produce approximately 40,000 adult coho per year, of which approximately 28,000 coho will be available to the commercial, sport, and subsistence users throughout southeastern Alaska. It is anticipated that the project will result in a self-sustaining coho run larger than the one that currently exists. The larger population is expected to be sustained by an increase in overall freshwater ecosystem productivity from the infusion of organic marine nutrients in the form of salmon carcasses.

Proposed Action and Essential Fish Habitat (EFH) Determination

Starting in 2007, up to 500,000 coho will be net-pen reared in Bakewell Lake from the fry stage (~45 mm) to the pre-smolt stage (~120 mm). Fry will be transported from the Whitman Lake Hatchery to Bakewell Lake and reared in two to four net-pen enclosures (40 X 40 X 40 feet) from early June to November. Salmon will be fed daily; an estimated 9% of labile carbon in the feed will be lost to the lake environment in the form of uneaten feed or feces. Coho pre-smolts will be released into the lake in November, or upon reaching optimal size, to overwinter within the Bakewell/Badger system before emigrating from the system the following spring. The project will last for three to ten years. The EA anticipates that the project will result in a self-sustaining coho run larger than the one that currently exists, sustained by an increase in overall freshwater ecosystem productivity from the infusion of organic marine nutrients in the form of salmon carcasses. The USFS has determined that the proposed action will have no adverse effect on EFH.

NMFS Comments

[1]Undated Forest Service memo (2620) from P. Michael Pease, Fisheries Biologist, Tongass National Forest S.O. to Paul Novak, Fisheries Biologist, Alaska Department of Fish and Game, FRED.

Section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) requires federal agencies to consult with NMFS on all actions that may adversely affect Essential Fish Habitat (EFH). NMFS is required to make EFH Conservation Recommendations, which may include measures to avoid, minimize, mitigate or otherwise offset adverse effects. The Bakewell Lake watershed currently supports runs of coho, sockeye, and pink salmon. The nearby Blossom and Wilson Rivers support runs of coho, sockeye, chum, pink, and king salmon. The proposed project may adversely affect EFH of some of these populations. These effects may include competition and interbreeding between hatchery origin and wild coho, or predation on local native salmonid populations.

NMFS questions whether the expected benefits of the project outweigh the potential risks. Of particular concern is the lack of a clear need to supplement the existing coho population. Of the three project justification factors cited in the EA, excessive harvest rates and poor access to the watershed are no longer factors that likely can limit coho production. A coho run is presently established in this watershed, and has persisted for nearly 50 years. With a fully operational fish ladder, this population should persist well into the future. Although habitat capability models suggest the watershed can support more coho, the EA provides no evidence that coho have not fully exploited the available habitat in the watershed over the past several decades, nor is there any evidence that poor nutrient levels are limiting coho production.

Coho are well known to rapidly and fully exploit new habitats. An example is their rapid colonization of the Margaret Lake watershed near Ketchikan following the construction of a fish ladder on Margaret Creek in 1991 (Bryant et al. 1999). In the same year the ladder was constructed, 111 adult coho naturally occurring in Margaret Creek moved through the ladder. The following year nearly 2,000 adult coho passed through the ladder, of which most were from a pre-smolt release in 1991 intended to jump-start colonization of the newly accessible habitat. From 1993 to 1997, the coho run averaged 330 fish and by 1996 the progeny of the original early-run pre-smolts comprised less than a third of the returning adults. This study demonstrated that pre-smolt introductions to new habitats can help to jump-start and temporarily elevate adult returns, but the contribution of the hatchery fish to the population diminishes over time, probably due to better genetic fitness of local natural populations to local habitat conditions.

The EA does not present any evidence that the current coho population is not self-sustaining or not fully utilizing available habitat. The release of 500,000 pre-smolts into the watershed each year will almost certainly increase adult returns; however, considering that the current population has had several decades to fully seed the watershed, it is likely that any increase will be sustained only as long as pre-smolt releases continue. Generally, supplementation of coho populations is inadvisable in cases where any natural spawning is occurring because relatively few spawners are needed to fully seed available rearing habitat with fry (Leon Shaul, ADFG, personal communication). There is no indication that wild stocks in the vicinity of Bakewell Lake have not fully utilized available rearing habitat in recent years. The biological escapement goal for neighboring streams in the district (District 101) where the Badger-Bakewell system is located has been within or above goal since 1991 and was above the recently established goal range during 2001-2004 (Shaul and Tydingco 2006). Coho smolt production in nearby Hugh Smith Lake has been stable at an average of about 31,400 smolts, resulting in average total returns of

about 4,000 adults and escapements ranging from 433 to 3,291 spawners (average 1,305). The Hugh Smith system is somewhat smaller than Badger-Bakewell, but also receives substantially more nutrients from pink and sockeye salmon carcasses. A comparison of escapement observations between the two systems suggests the Bakewell Lake watershed is fully utilized by coho salmon.

The EA states that enhanced adult returns will increase nutrient loading in the watershed and improve food web productivity and ultimately the production and survival of rearing coho. Both Badger and Bakewell Lakes are considered unproductive, oligotrophic systems (Koenings 1983). If nutrient loading does increase due to increasing adult returns, it is not known whether additional nutrient inputs will support food webs that sustain rearing coho, especially for lake-rearing coho. Moreover, more spawners will result in more fry so that a net increase in food availability per individual fish may not be realized. Although salmon carcasses have been shown to increase growth rates of juvenile coho in artificial streams (Wipfli 2003), the influence of coho carcasses on coho growth and production in natural systems is inconclusive (Lang 2006). Even if a large increase in carcasses results from stocking hatchery pre-smolts, it appears unlikely that benefits will be self-sustaining as the population returns to an equilibrium dictated by limitations in the natural habitat after smolt releases are discontinued.

Coho smolts leaving the Bakewell Lake watershed will likely prey on pink and chum salmon smolts outmigrating from area streams. Coho smolts are known to prey on pink and chum salmon smolts in the marine environment (Hargreaves 1985, Hoffmeister 1987, 1988). To minimize impacts to pink salmon stocks from coho predation, the SSRAA Neets Bay hatchery is required to release coho smolts in June when juvenile pink salmon have dispersed from inside waters and are less vulnerable to predation. The release of 500,000 pre-smolts per year from this project could have significant impacts on pink and chum salmon outmigrating from the nearby Blossom and Wilson Rivers.

NMFS is concerned about the potential negative consequences of introducing large numbers of highly domesticated hatchery coho into a system currently supporting a long-term, self-sustaining, wild (naturally spawning) coho population. NMFS disagrees with the EAs reference to Whitman Lake Hatchery coho as a "locally adapted stock." Although originating from a local brood stock, coho from the Whitman Lake Hatchery have been propagated for multiple generations in an artificial environment. Genetic differences between hatchery and wild Pacific salmon have been well documented. In reviewing several studies that compared the genetic differences in behavior and physiology of hatchery and wild salmon, Reisenbichler and Rubin (1999) concluded that "fitness for natural spawning and rearing can be rapidly and substantially reduced by artificial propagation." The annual return of 12,000 or more hatchery-origin adult coho will likely swamp the existing, naturalized coho run with fish of reduced fitness for survival in the natural environment. This swamping effect could reverse the presumed benefits of decades of straying by neighboring wild stocks into the watershed. Interbreeding between the two groups of coho could reduce the productivity of the existing population, potentially resulting in lower returns once supplementation ends. Ultimately, the project will likely disrupt and reverse the process of adaptation and improved fitness for survival of coho in the watershed.

In addition to genetic impacts, direct competition for rearing habitat and food resources between hatchery and wild stocks could also occur. For example, if the watershed is currently at capacity for rearing coho, the progeny of pen-reared coho will compete with the existing population for habitat and food resources. Similarly, Whitman Lake hatchery coho straying into the Blossom and Wilson Rivers may compete with or interbreed with wild stocks.

In summary, supplementing the Bakewell Lake coho population with highly domesticated broodstock could have serious consequences for the productivity and viability of the existing population that may, over the long term, defeat the stated purpose of improving production. Generally, supplementing existing populations should only be considered if the population is at risk of extinction or substantially below the habitat carrying capacity (Flemming 1994, Waples 1991).

The proposed project would adversely impact EFH. These impacts may include reduced fitness as a result of genetic introgression, competition for limited habitat and food resources, and predation on pink and chum smolts by pen-reared coho salmon in the marine environment. The project is likely to contribute to the fisheries in the short-term but we expect those benefits would be limited to the life of the pre-smolt release program. As discussed above, the project will likely cause negative effects for the existing coho population over the long term. In accordance with Section 305(b)(4)(A) of the MSA, NMFS makes the following EFH Conservation Recommendations:

1. The proposed coho colonization project should be delayed pending the results of studies to determine what factors currently limit coho production in the watershed. These studies should focus on the use and availability of spawning and rearing habitat, predation by resident fishes, and food web productivity.

2. If such studies determine that supplementation is warranted, pre-smolts from brood stock obtained from the existing Bakewell Lake coho population should be used.

Under section 305(b)(4)(B) of the MSA, the USFS is required to respond to NMFS EFH Conservation Recommendations in writing within 30 days. If the USFS will not make a decision within 30 days of receiving NMFS EFH Conservation Recommendations, the USFS should provide NMFS with a preliminary response within 30 days, and indicate when a full response will be provided.

If you have any questions regarding our recommendations for this project, please contact John Hudson at 907-586-7639 or john.hudson@noaa.gov.

Sincerely,

Robert D. Mecum
FR Acting Administrator, Alaska Region

cc: ADFG, Rocky Holmes*
ADNR, Mark Minnillo*
USFWS Juneau, Richard Enriquez*
OHMP, Erin Allee*

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