

# Informational Leaflet 40

## SPAWNING GROUND SURVEY OF RED SALMON EGGS AND LARVAE IN BRISTOL BAY, 1963

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## BACKGROUND

Extremely mild weather prevailed in Bristol Bay throughout much of the winter. This caused apprehension that rapid development of eggs and larvae would lead to early emergence and consequent high mortality. A survey of egg and larvae development and survival in the gravel was made to determine the extent to which this condition existed.

## METHODS

Equipment used was extremely simple, consisting of ice picks, shovels, and a collecting net. This made it possible to collect samples over a wide area in a short time. Samples were labeled by area and examined at a later time.

## SAMPLING LOCATIONS

The criteria used to determine sampling locations were: (1) spawning density; (2) availability of samples. Samples taken in areas of high spawning density were preferred, since each sample would represent a larger proportion of the spawning population. Several such areas were not available for sampling, however, because of impossible landing conditions, extremely thick ice, or water too deep for sampling. Spawning streams and beaches examined are shown in Figure 1 and 2. Estimated spawning populations of areas examined are shown in Table 1.

## WOOD RIVER LAKES

Lakes Aleknagik and Nerka were surveyed on February 16, Lakes Beverley, Mikchalk, and Kulik on February 19. The same general method was followed in sampling each beach or stream. Samples were taken in shallow and deep water and over a stretch of spawning ground. For the most part, egg development was remarkably similar in all areas of a particular spawning ground.

### Lake Aleknagik

Samples were taken in Bear Creek. No difference in development was observed between the lower and upper creek samples. Egg mortality was less than 1 percent in the samples obtained. There was no indication of flooding or gravel scouring by ice.

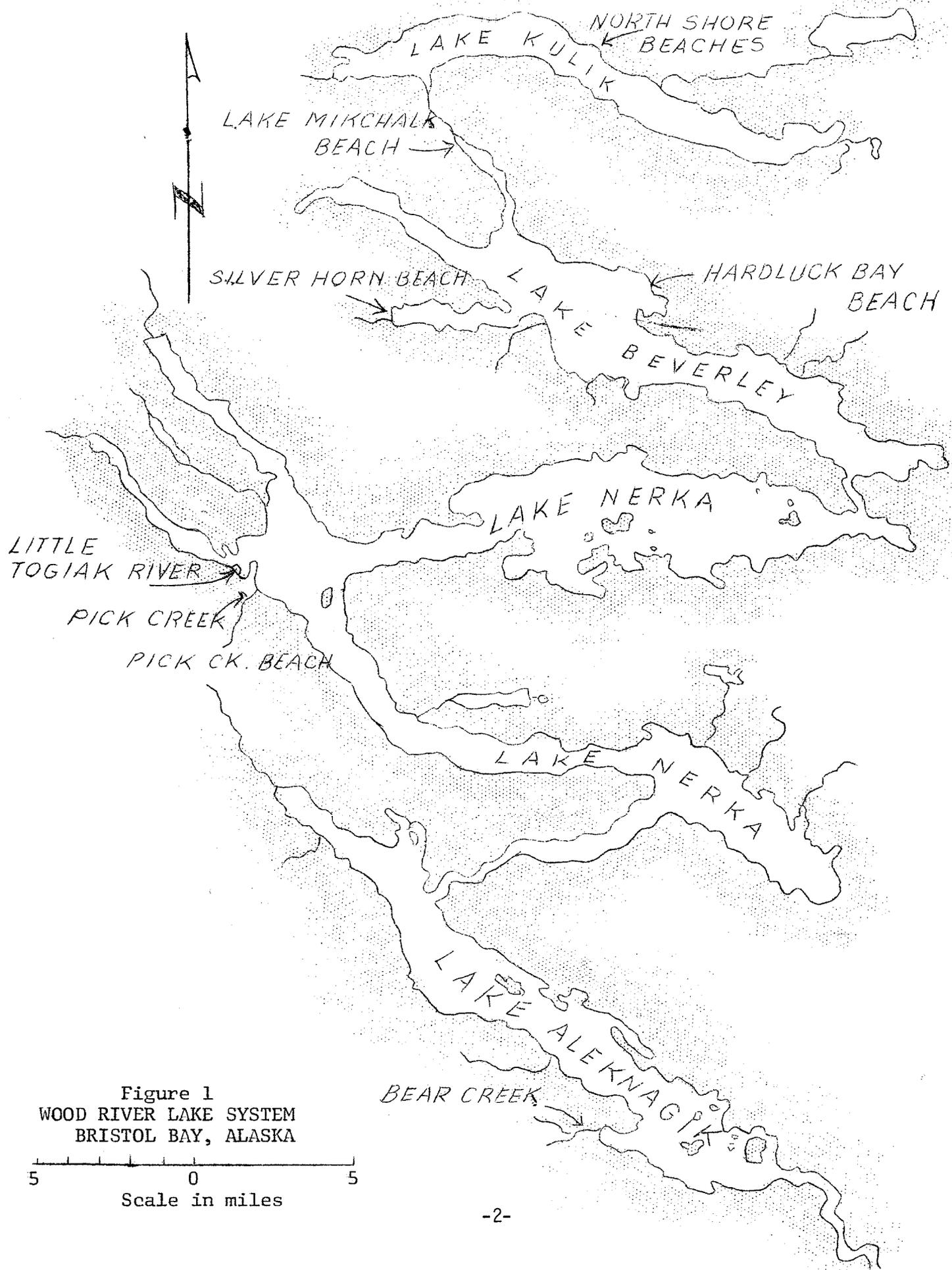


Figure 1  
WOOD RIVER LAKE SYSTEM  
BRISTOL BAY, ALASKA

5 0 5  
Scale in miles

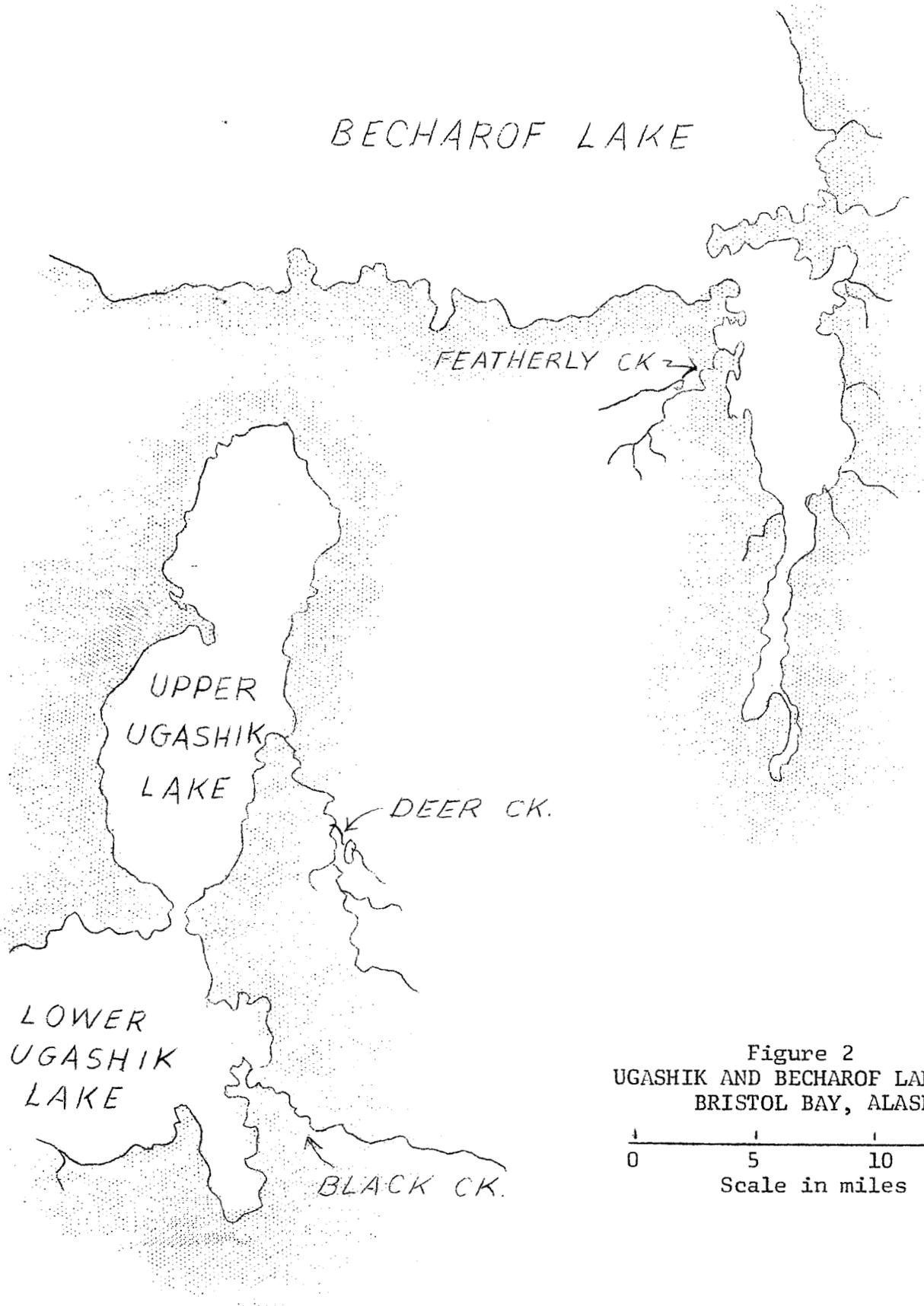


Figure 2  
UGASHIK AND BECHAROF LAKE SYSTEM  
BRISTOL BAY, ALASKA

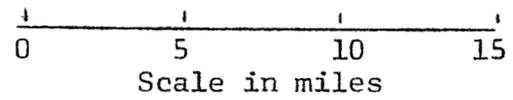


Table 1. Number of red salmon spawning in sampling areas<sup>1</sup>.

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Bear Creek, Lake Aleknagik	1,240
Pick Creek, Lake Nerka	12,000
Pick Creek Beach, Lake Nerka	1,350
Little Togiak River, Lake Nerka	3,000
Silver Horn Beach, Lake Beverley	79,000
Hardluck Bay Beach, Lake Beverley	41,400
Lake Mikchalk Beach	26,500
North Shore Beach, Lake Kulik	29,830
Black Creek, Lake Ugashik	14,000
Deer Creek, Lake Ugashik	11,100
Featherly Creek, Lake Becharof	50,000

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<sup>1</sup> Estimated by aerial surveys which do not account for all the fish in an area. Actual populations are two to three times those given.

Approximately 50 percent of the eggs were hatched, indicating that sampling took place about midway in the hatching period. This stage of development is not exceptionally advanced for the area and time of year. There is no reason to expect that the time of emergence will be unfavorable to survival.

#### Lake Nerka

Samples were taken in Pick Creek, Little Togiak River, and at Pick Creek Beach. Gravel scouring as a result of ice movement occurred in Pick Creek and Pick Creek Beach, but no mortality was observed from this cause. Undoubtedly, there was some damage to eggs, but it was believed to be minor, particularly on Pick Creek Beach where most of the scouring occurred at a higher beach level than where eggs were recovered. Observed egg mortality in all three areas was less than one percent.

Hatching was in progress in Pick Creek, slightly in advance of Bear Creek, with approximately 75 percent of the eggs hatched. Hatching was apparently completed at Pick Creek Beach. No eggs were found, but it was evident that the larvae had only recently emerged from the egg. This is very nearly the normal stage of development for both areas.

Development in Little Togiak River ranged from recently hatched larvae to those with nearly healed yolk sacs. The stage of development was related to the location of the redds in relation to the river current. Redds located directly in the channel contained almost fully developed larvae, while those in shallow water were least developed. An estimated 25 percent of the Little Togiak River larvae will emerge from the gravel at a time considered unfavorable to survival.

#### Lake Beverley

Samples were taken on Silver Horn beach and Hardluck Bay beaches. Lake Beverley received a larger spawning population in 1962 than any of the Wood River Lakes, and these two areas are the most important spawning grounds of that lake.

Ice movement resulting in gravel scouring had occurred in Hardluck Bay, but no mortality was observed from this source. No similar significant movement was observed to have taken place in Silver Horn. Observed mortality in Silver Horn was less than one percent. Egg survival was similar in Hardluck Bay, with the exception of two redds with 100 percent mortality, apparently resulting from freezing in the gravel. Particular efforts were made to discover other similar mortalities. Since no others were found, this was discounted as a significant source of mortality.

No hatching was observed in either area, but it is certain that it was about to occur. Live eggs transported to home refrigerators began hatching almost immediately. This is slightly earlier than the normal time of hatching in these areas, but probably not sufficiently ahead of the season to lead to abnormally early emergence from the gravel.

#### Lake Mikchalk

The most important of the spawning beaches on Lake Mikchalk were examined. Observed mortalities in a majority of the redds sampled was less than one percent,

similar to other areas. However, heavy mortalities ranging from 25 percent to 50 percent were observed in other samples. This is believed to have been caused by over-deposition of eggs, since the dead eggs were at a very early stage of development and a large spawning population was known to have utilized the area.

Egg development was similar to that observed in Lake Beverley. There is no reason to expect an exceptionally early emergence from the gravel in the area.

#### Lake Kulik

Examinations of the spawning beaches were made along the north shore of Lake Kulik, where the majority of the population of that lake spawned. Conditions were identical to those found on the beaches of Lake Beverley. Prospects for good survival were apparently excellent.

### UGASHIK AND EGEGIK SYSTEMS

Surveys of Becharof and Ugashik Lakes spawning systems were made on February 21. The same methods were used as in the Wood River Lakes system. An undesirable feature of the survey was the impossible landing conditions at or near some of the best spawning streams. It is believed, however, that the samples taken were representative, since all were remarkably similar.

#### Ugashik Lakes

Black Creek and Deer Creek were examined. There were many indications of high water and flooding. The gravel was very dirty and muddy in several areas of both creeks. In Black Creek, two redds with approximately 90 percent mortality were found. In both redds the dead were newly hatched. Since this is a very critical stage of development, the mortality cannot definitely be ascribed to dirty gravel conditions. Other redds with the same apparent gravel conditions were found to have mortalities similar to the low percentages found in the Wood River Lakes.

Egg development was found to be identical to that observed in the creeks of the Wood River Lakes. Since the peninsula lakes are ice-free somewhat earlier than those to the north there is no apparent danger of too-early emergence in the area.

#### Becharof Lake

Featherly Creek was the only creek examined in Becharof Lake; conditions did not permit landings near other creeks. However, Featherly Creek is believed to be representative because it contained a large spawning population, and because all Becharof spawning creeks are limited to a relatively small area.

Conditions existing in Featherly Creek were similar to those in the Ugashik Creeks. Nothing can be added to the description of either the gravel conditions or egg development beyond that given above concerning Black Creek and Deer Creek.

## OTHER BRISTOL BAY SPAWNING AREAS

Observations of previous years indicate that winter egg development in the Iliamna - Lake Clark system closely parallels that of the Wood River Lakes. In view of the favorable findings of the Wood River system survey, it was considered unnecessary to conduct a like survey in the Iliamna area.

An additional consideration is the fact that two other agencies are conducting studies which include egg development; one agency maintains a winter station in the Naknek system, while the other has a program in the Iliamna system.

### SUMMARY

1. A survey was made to determine the effect of exceptionally mild winter weather on red salmon eggs and larvae.
2. Simple equipment, consisting of ice picks, shovels, and collecting net was used.
3. Representative spawning areas were examined in Lakes Aleknagik, Nerka, Beverley, Mikchalk, Kulik, Ugashik, and Becharof.
4. Egg survival was excellent in a majority of the samples, with mortalities found in a few instances which were ascribed to various reasons: freezing, over-deposition, and possibly flooding.
5. Sampling coincided with the hatching period in most areas. Hatching was just beginning, was in progress, or was just completed, in all but one sampling area.
6. Hatching was slightly earlier than in a normal year, but it was considered unlikely that emergence from the gravel would occur sufficiently ahead of the season to cause reduced survival of fry.
7. In the one area of exceptionally early hatching, Little Togiak River, it was estimated that 25 percent of the larvae will emerge from the gravel at a time unfavorable to good survival.
8. In general, mortalities were low in all areas with excellent prospects for continued high survival in the future. In view of this, it was considered unnecessary to conduct a similar survey in the Iliamna and Naknek systems.

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