ENSURING HEALTHY ALASKA SALMON IN A CHANGING CLIMATE

Understanding the Influence of Changing Climate & Landscape Trends on Fish Habitat & Stream Temperatures

ABSTRACT

The Cook Inlet watershed is the most populated and fastest-growing region in Alaska; it is also home to the state's renowned wild salmon runs that are at greatest risk from the effects of climate and land-use change. For the past five years, Cook Inletkeeper and its partners have documented warming trends in local salmon streams, with summer temperatures routinely exceeding state water quality standards established to protect spawning and migrating fish. Fisheries scientists warn that high stream temperatures make fish increasingly vulnerable to pollution, predation and disease. Yet despite the association between warming water temperatures and reduced salmonid survivorship - there is little or no consistent, long-term temperature data for salmon streams in Alaska. Without such basic information, it is impossible to gauge the health of Cook Inlet's salmon habitats and resources, and equally difficult to develop management responses to improve watershed resiliency to climate and landscape change. Now, Inletkeeper is working to expand it temperature data logger network throughout Cook Inlet, to give policy makers, resource managers and academics the information they need to ensure Alaska's wild salmon populations remain healthy and sustainable in the face of rapid ecological change.

BACKGROUND: Water temperature is one of the most important factors in the health of stream ecosystems and the fish they support. Temperature affects salmon egg and fry incubation, fish metabolism, resistance to disease, and availability of oxygen and nutrients. Starting in 2002, Cook Inletkeeper has used data loggers to collect continuous temperature data in salmon streams on the lower Kenai Peninsula. The results have been dramatic; monitoring has revealed that salmon streams on the lower Kenai Peninsula are warming, frequently above state-assigned standards set to protect spawning and passing fish. In 2002, temperatures exceeded Alaska's standards for egg and fry incubation on more than 50 summer days. By 2005, exceedances occurred on more than 80 days. This is not just a local concern for residents of the lower Kenai Peninsula: recent studies in tributaries of the Kenai River and Susitna River also show consistently high water temperature.

CONNECTION TO CLIMATE CHANGE: 73 years of daily climate data from the Homer Airport reveals an upward air temperature trend that began worldwide in 1977 and appears to be accelerating. Results from a linear regression analysis suggest a very tight relationship between water and air temperatures collected in the lower Kenai Peninsula's salmon streams. Climate models tell us that air temperatures will continue to increase between 13°F and 15.5°F for the Cook Inlet basin by 2100. Water temperatures are predicted to follow suit and rise 5.4°F in the coming years.

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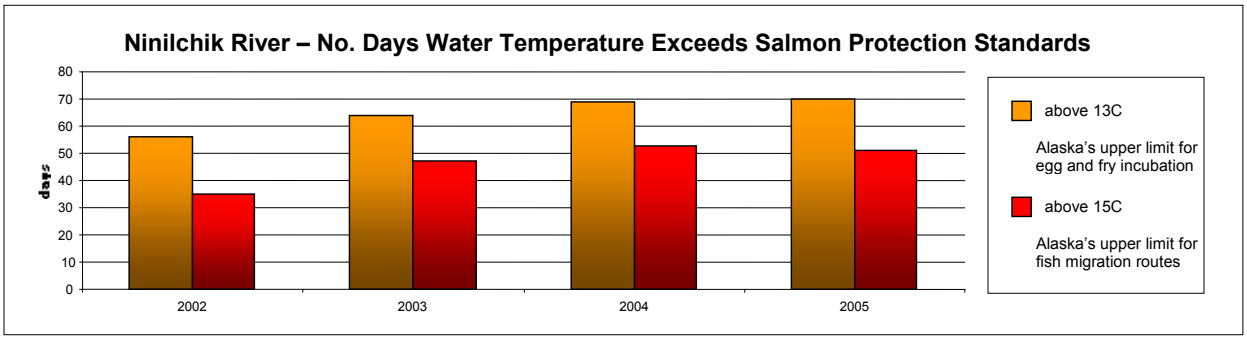

CONNECTION TO LAND-USE CHANGE: Impervious or hardened surfaces on a landscape change the way water is transported and stored in local watersheds. Importantly, these changes can result in degraded fish and wildlife habitat, decreased water quality, and increased water temperatures. With impervious land cover emerging as an important environmental indicator, Cook Inletkeeper recently completed a timely analysis of impervious surface cover on the lower Kenai Peninsula's salmon streams to detect relative effects of land-use activities on water quality, water quantity, and fish habitat. Based on previous studies in Alaska and other States, the percent of impervious cover in these watersheds (average = 1.1%) is less than the level associated with water quality and habitat degradation.

This impervious cover analysis provides evidence that increasing air temperatures, rather than land-use activities, are having a greater influence on water temperatures on lower Kenai Peninsula's salmon streams. However, future increases in impervious cover may help to accelerate stream warming by reducing each watershed's resilience to rising air temperatures. Watershed resilience can be affected by a loss of shade by removal of stream-side vegetation, lower stream flows due to water withdrawals, loss of floodplain connectivity due to channel straightening, increasing sedimentation by removal of upland vegetation, and less water storage due to wetland loss. If resource managers understand when our activities in these valuable watersheds are playing a role in increasing stream temperatures beyond the effect of rising air temperature, they are better-equipped to make informed decisions about how much additional stress these important salmon streams can bear while they are undergo significant climate change.

SALMON STREAM RESILIENCE: Our natural systems can adapt to a wide variety of changes. But the changes witnessed over the past few decades – and the changes anticipated in the coming years – are unlike most changes encountered before. As a result, Cook Inletkeeper's goal is to ensure the biological resilience of salmon streams to a changing climate by protecting and restoring salmon habitat; partnering with organizations to collect and distribute stream water temperature data for all of Cook Inlet; and educating Alaskans about the implications of climate change to the health of salmon and their habitat.

COOK INLETKEEPER is a community-based nonprofit organization formed in 1995 to protect Alaska's Cook Inlet watershed and the life it sustains. Cook Inletkeeper relies on citizen-based science, grassroots organizing, targeted media strategies and effective hands-on advocacy to work toward a vision that guarantees clean water for abundant fish and wildlife; strong communities; lasting jobs and renewable energy. For more information about Cook Inletkeeper's Salmon Stream Monitoring Program, contact us at: 907.235.4068 x24; sue@inletkeeper.org; www.inletkeeper.org.