Chapter 1

The Bristol Bay Basin

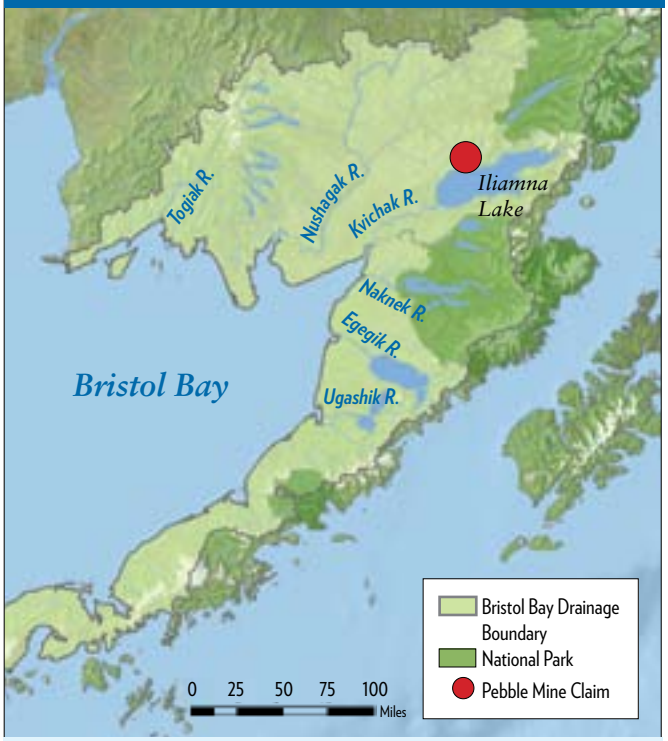
Bristol Bay is a large gulf of the southeastern Bering Sea, extending from Cape Newenham in the north to the largest and easternmost island in the Aleutian chain, Unimak Island, in the south (Orth 1971). Fresh water flowing into Bristol Bay drains six distinct ecoregions characterized by diverse topography, ranging from rugged, glaciated mountains to broad coastal plains (Wahrhaftig 1965, Viereck et al. 1992, Nowacki et al. 2001). Pleistocene glaciers descending from the encircling Ahklun Mountains and Aleutian Range shaped the landscape, depositing moraines and gravelly glacial till and carving large lakes. Today, lakes such as Lake Clark and Iliamna Lake are vital to the region's ecosystems, local culture, and economy (Manley and Kaufman 2002).

Wild Pacific salmon have traversed the salt and fresh waters of the Bristol Bay ecosystem for thousands of years, and the Bristol Bay basin today is one of the top salmon-producing systems in the North Pacific Ocean, rivaled only by a few rivers on Russia's Kamchatka Peninsula (Augerot 2005). The Bristol Bay basin annually produces hundreds of millions of juvenile salmonids, yielding tens of millions of adults (Eggers and Yuen 1984, Salomone et al. 2007).

The Bristol Bay basin is made up of six major watersheds—the Togiak, Nushagak, Kvichak, Naknek, Egegik, and Ugashik—and numerous smaller ones (Figure 1). Together, two of these watersheds—the Nushagak and Kvichak—comprise over half of the land area of the Bristol Bay basin and produce more than half of its salmon (ADFG 2010b). In total, the Nushagak and Kvichak's unique wetland and riverine complex supports 35 fish species in 11 families, including five salmon species, five whitefish species, three smelt species, lake trout, Dolly Varden, rainbow trout, arctic char, arctic grayling, northern pike, and burbot (Mecklenburg et al. 2002, ADFG 2008b). The Pebble Mine is being considered for development at the headwaters of these two systems.

About 80% of sockeye salmon production in the Kvichak River watershed occurs in Iliamna Lake and its associated tributaries. Almost twice the area of Louisiana's Lake Pontchartrain, Iliamna is Alaska's largest lake (2,622 km^2) and the largest undeveloped lake in the United States. In addition to supporting one of only two freshwater harbor seal populations in North America, the lake is the world's largest sockeye salmon nursery, supporting millions to billions of rearing fry annually (Withrow and Yano 2008). Below Iliamna Lake, the lower Kvichak mainstem is a key spawning area for not only sockeye, but also chum, pink, and Chinook salmon and rainbow trout.

Figure 1. Major Bristol Bay Watersheds, Alaska. The Bristol Bay drainage is made up of six major watersheds: the Togiak, Nushagak, Kvichak, Naknek, Egegik, and Ugashik.



The Bristol Bay Region is one of Alaska's most varied, beautiful, and bountiful. From Togiak to Nondalton and south to Ivanof Bay, it is home to myriad mountains, lakes, and islands. Situated 150 miles southwest of Anchorage, the region's communities are geographically isolated from the rest of the state – and in most cases from one another. Most of the communities in the Bristol Bay region are self-reliant, operating without the benefit of interconnected road and utility systems. The vast majority of households rely on subsistence fishing and hunting for a large percentage of their food… The watershed of the Bristol Bay is a sprawling, permeable, porous network of creeks and streams perfectly designed to produce salmon.

—Letter from the Bristol Bay Native Corporation to the USEPA (BBNC 2010)

As detailed in chapter 4, Bristol Bay salmon play a unique and critical role in maintaining the health and productivity of the rich Bristol Bay ecosystem. Salmon begin life as eggs in a *redd*, a nest dug into stream or lake bottom gravel. The eggs hatch into fry that grow into juveniles and migrate to the ocean, where they develop into adult salmon. Individuals may spend one to five

years in the ocean before making the difficult journey upstream to spawn in the stream or lake in which they were born. The death and decomposition of adult salmon after spawning provides marine-derived nutrients to the system, which drives primary and secondary production in streams, lakes, and terrestrial habitats. Bristol Bay salmon—and the nutrients that they deliver to their natal streams—are essential to the health and ecological function of the entire watershed (Kline et al. 1993, Willson and Halupka 1995, Wipfli et al. 2003).

In addition to this function as a *keystone species*, salmon drive the health and well-being of many of Bristol Bay's human communities as well. As described in this report's Introduction, salmon are woven into the fabric of Native Alaskan culture. For thousands of years, tribal members living in and around Bristol Bay have subsisted on salmon (and other native fish), contributing to a subsitance harvest of up to 2.1 million pounds of salmon annually (Duffield 2009). When surveyed, native people in Alaska indicated that subsistence activities and the social relationships they promote, were the most important reasons they choose to stay in native communities like those found in Bristol Bay (Goldsmith 2007, Haley et al. 2008).

The extraordinary productivity of the Bristol Bay ecosystem also supports Alaska's richest commercial fishery. According to ADFG (2011a), between 1990 and 2009, the average annual sockeye salmon harvest in Bristol Bay totaled 25.8 million fish, with 8.2 and 5.5 million fish harvested within the Kvichak-Nanek and Nushagak Districts respectively. Over this 20-year period, the estimated ex-vessel value of the commercial sockeye fishery throughout the bay averaged almost $115 million. The strong 2010 run, which produced a harvest of 28.6 million sockeye, yielded an ex-vessel value of just under $150 million. The unparalleled and sustained harvest of wild sockeye complements harvests of four other species of wild salmon, including average annual harvests (between 1990-2009) of 987,000 chum, 182,000 pink (every other year), 88,000 coho, and 64,000 Chinook salmon (ADFG 2011a).

Recreational angling is also an important contributor to the region's economy and culture. More than 40 commercial fishing lodges dot Bristol Bay tributaries, and based on 2008 estimates, non-resident anglers take an estimated 16,000 fishing trips annually to Bristol Bay, spending $66 million (Duffield (2009). These expenditures drive a recreation and tourism industry in the Bristol Bay region that contributes over $100 million annually to the Alaska economy, generating over 1,200 full time equivalent jobs (Duffield 2009).

Lydia Olympic of Igiugig hangs salmon to dry (photo by Ben Knight).