



September 17, 2014

U.S. Environmental Protection Agency
Mail Code: 2822T
1200 Pennsylvania Ave., NW
Washington, DC 20460
OW-Docket@epa.gov

Re: Water Docket #EPA-R10-OW-2014-0505
Support for 404(c) Proposed Determination for Bristol Bay

Dear Administrator McCarthy:

The Bristol Bay Regional Seafood Development Association (BBRSDA) supports the U.S. Environmental Protection Agency's (EPA) Proposed Determination on the US Environmental Protection Agency Region 10 Pursuant to section 404(c) of the Clean Water Act, released on July 21st, 2014. We urge your agency to finalize a 404(c) determination that will protect the aquatic ecosystems, including the salmon resources, of Bristol Bay generally, and Alaska's Nushagak and Kvichak River watersheds in particular, from all adverse impacts generated by metallic sulfide mining. This document details our recommendations for a final 404(c) determination in Bristol Bay.

The BBRSDA is a trade association consisting of all 1,863 Bristol Bay drift gillnet permit holders and their crews. In total, the BBRSDA represents approximately 7,000 commercial fishermen who earn their living harvesting Bristol Bay's wild salmon and who tax themselves in support of BBRSDA's mission – to maximize the value of the fishery by improving seafood quality and supporting research, marketing, education, and the sustainability of Bristol Bay's salmon runs.

Our commitment to protecting the sustainability of Bristol Bay's commercial fishery is what led us to make a formal request to the EPA on June 10, 2010 to initiate the 404(c) process under the CWA as it pertains to discharges from proposed mining activity in the Bristol Bay region. Then, in support of the findings in EPA's *Bristol Bay Watershed Assessment* (BBWA) in 2014, our association passed a formal resolution requesting that the EPA invoke its authority under section 404(c) of the CWA to protect the aquatic ecosystems of the Nushagak and Kvichak watersheds, as defined in the draft BBWA.

EPA Watershed Assessment

Because of the global importance of Bristol Bay's salmon resource¹ and the potential risks to it posed by the development of Pebble Mine, Bristol Bay residents and tribes, commercial fishermen and public interest groups have requested the EPA to use its authority under the CWA to prohibit the discharge of dredge and fill materials in areas surrounding the Pebble Deposit. Prior to taking that action EPA undertook an exhaustive, three-year evaluation of waters draining the Pebble Deposit; the known and potential impacts of hard-rock copper mining to the Bristol Bay salmon resource; and the effects of sulfide mining on aquatic resources, including salmon.

During that multi-year effort EPA rigorously reviewed hundreds of peer-reviewed scientific articles in addition to the Pebble Limited Partnership's (PLP's) *Environmental Baseline Document*, government reports, and local knowledge. Subsequent to finalizing the first draft of its review, *An Assessment of Potential Impacts of Salmon Ecosystems of Bristol Bay, Alaska* (the BBWA),² the document underwent unprecedented scrutiny. The BBWA passed two rounds of peer review by a diverse panel of twelve experts in their respective fields and was the subject of extensive public comment provided in writing and through public hearings held throughout Bristol Bay and elsewhere.

In the initial draft, the BBWA evaluated potential impacts of the smallest two mining scenarios described by the PLP in documents submitted to the U.S. Securities and Exchange Commission—2.0 and 6.5 billion metric tons of ore.³ This rendered the first draft of the BBWA extremely conservative, given that the known amount of ore at the deposit is documented to be at least 10.8 billion tons. Because the massive size of the Pebble Deposit is nearly unprecedented, some peer reviewers balked at the size of the mine scenarios evaluated in the initial draft. Consequently, in response to those reviewers, EPA evaluated a third mine scenario, equal to the median size of copper sulfide mines worldwide, at just 0.25 billion tons of ore—more than 40 times smaller than the known deposit, rendering the final BBWA even more conservative than the initial draft.

Other factors which make the final document conservative include: underestimates of stream length; wetland extent; fish distribution and abundance; omission of accident and failure scenarios; impacts of additional mine infrastructure (port, power generation facilities, etc); development of the entire 11+ billion ton ore body; and the compounding factors associated with multiple mines that would most likely develop subsequent to Pebble.

¹ Ruggeroni, G. T., R. M. Peterman, B. Dorner, and K. W. Myers. 2010. *Magnitude and trends in abundance of hatchery and wild pink salmon, chum salmon, and sockeye salmon in the North Pacific Ocean. Marine and*

² USEPA (U.S. Environmental Protection Agency). 2014. *An Assessment of Potential Mining Impacts on Salmon Ecosystems of Bristol Bay, Alaska. Region 10, Seattle, WA. EPA 910-R-14-001.*

³ Ghaffari, H., R. S. Morrison, M. Andre de Ruijter, A. Zivkovic, T. Hantelmann, D. Ramsey, and S. Cowie. 2011. *Preliminary Assessment of the Pebble Project, Southwest Alaska. Vancouver, B.C.*

Despite these factors which made the BBWA extremely conservative, EPA predicted the following impacts based on the smallest, 0.25 billion ton mining scenario:

- Direct loss of 24 miles of streams;
- Stream flow alterations exceeding 20% would adversely affect habitat in an additional 9.3 miles of streams;
- Direct loss of 1,200 acres of wetlands, and 100 acres of ponds and lakes;
- Increases in acidity and metals concentrations in area waters, which would degrade important salmon habitat;
- Leaching of copper which could cause salmon to avoid 15 miles of streams, and decrease invertebrate reproduction (i.e., fish food) in 13 miles of streams; and
- Catastrophic effects on fishery resources in the event of a tailings dam failure that released only a partial volume of stored tailings.⁴

BBRSDA supports the findings in the BBWA that given the global importance of the Bristol Bay fishery, the importance of maintaining intact habitat and biodiversity to sustain salmon fisheries, and the sensitive nature of the waters surrounding the deposit, even these conservative estimates represent unacceptable adverse impacts to Bristol Bay fisheries.

Bristol Bay: A Fisheries Resource of National Importance

There is no doubt that Bristol Bay is home to one of Alaska's and the nation's most valuable and sustainable fisheries. The jobs and economy dependent on this fishery require stable management and marketing rooted in sustainability of the salmon resource.

The Economic Importance of the Bristol Bay Fishery to the Nation's Economy

Bristol Bay supports the world's most valuable wild sockeye salmon fishery, providing almost half of the global supply of wild sockeye salmon. In 2010, the harvesting, processing, and retailing of salmon from Bristol Bay created \$1.5 billion in output or sales value across the U.S.⁵

Economic impacts of the Bristol Bay salmon industry include the jobs, income, and output value created by the fishery, which would not exist if the industry ceased to exist. *Direct* economic impacts include the jobs, income, and output value in businesses directly involved in the harvesting, processing, and retailing of Bristol Bay salmon. *Indirect*, or *multiplier* economic impacts include the jobs, income, and output value created in other industries as Bristol Bay fishermen, processors, and downstream industries purchase supplies and services, and as their employees spend their income.⁵

⁴ USEPA. 2014. *An Assessment of Potential Mining Impacts on Salmon Ecosystems of Bristol Bay, Alaska. Region 10, Seattle, WA. EPA 910-R-14-001.*

⁵ Knapp, G., M. Guetttabi, and S. Goldsmith. 2013. *Report by the Institute of Social and Economic Research at University of Alaska Anchorage for the Bristol Bay Regional Seafood Development Association: The Economic Importance of the Bristol Bay Salmon Industry.*

The value of Bristol Bay salmon increases at each stage in the distribution chain. Since a large share of the salmon is exported, most of the increase in value in the U.S. occurs in fishing and processing at facilities in Bristol Bay. Value is added to the product as it is processed, whether frozen, canned, sold fresh, or for roe. In 2010, Bristol Bay fishermen harvested a total of 29 million sockeye salmon worth \$165 million in ex-vessel value, which is the price paid to fishermen for their catch at the time of delivery. The 2010 figure falls in the mid-range for ex-vessel value over the past decade; the 2014 ex-vessel value exceeded \$197 million. The total value of Bristol Bay salmon product exports in 2010 was about 6% of the total value of U.S. seafood exports, at \$252 million.⁵

The significance of the Bristol Bay salmon fishery for job creation in the U. S. is summarized in this quote from the *Economic Importance of the Bristol Bay Salmon Industry* report:

“In 2010, the Bristol Bay sockeye salmon fishery supported 12,000 fishing and processing jobs during the summer salmon fishing season. Measuring these as year-round jobs, and adding jobs created in other industries, the Bristol Bay salmon fishery created the equivalent of almost 10,000 year-round American jobs across the country, and brought Americans \$500 million in income. For every dollar of direct output value created in Bristol Bay fishing and processing, more than two additional dollars of output value are created in other industries, as payments from the Bristol Bay fishery ripple through the economy. These payments create almost three jobs for every direct job in Bristol Bay fishing and processing.”⁶

An examination of the population demographics of permit holders for the salmon gillnet fishery in Bristol Bay offers insights into the broad reach of the fishery’s economic impacts across the nation. In 2010, out of the combined total of 2,777 limited entry commercial fishing permits (including both set and drift gillnet) designated for the Bristol Bay area, 43% of permit holders were residents of states other than Alaska. Also in 2010, 58% of the total catch was caught by permit holders residing outside Alaska, adding to economic impacts in other states.⁵ In 2013, a total of 1,862 limited entry drift gillnet permits were actively fished. Of the active permits, 862 were issued to Alaska state residents and 1,000 were issued to non-residents.⁷ In 2013, a total of 978 limited entry set gillnet permits were actively fished. Of the active permits, 646 were issued to Alaska state residents, and 332 were issued to non-residents.⁸ Although the fishery itself takes place in Alaska, in 2013, permit holders in the Bristol Bay salmon gillnet fishery held residence in 37 total states in the U.S.⁹

⁶ Knapp, G., M. Guetttabi, and S. Goldsmith. 2013. *Report by the Institute of Social and Economic Research at University of Alaska Anchorage for the Bristol Bay Regional Seafood Development Association: The Economic Importance of the Bristol Bay Salmon Industry. Page 1 of Executive Summary.*

⁷ State of Alaska Commercial Fisheries Entry Commission. 2013. *Permit Status Report by Fishery Code, All Years.* Retrieved from: http://www.cfec.state.ak.us/pstatus/x_s03t.htm

⁸ State of Alaska Commercial Fisheries Entry Commission. 2013. *Permit Status Report by Fishery Code, All Years.* Retrieved from: http://www.cfec.state.ak.us/pstatus/x_s04t.htm

⁹ State of Alaska Commercial Fisheries Entry Commission. 2013. *CFEC Public Lookup Database.* Retrieved from: <http://www.cfec.state.ak.us/plook/>

The Bristol Bay sockeye salmon fishery is the world's most valuable wild salmon fishery. It contributes about \$1.5 billion in value and more than 10,000 jobs to the U. S. economy annually. The fishery stimulates the economies of states outside Alaska, providing jobs and income to residents of 36 other states. The fishery has operated continuously for more than 130 years and will continue to provide widespread, significant economic benefits across multiple industries and states for the foreseeable future as long as the habitat that supports the fishery is maintained and the State of Alaska has the resources to continue its sustainable fisheries management regime.

The Economic Importance of the Bristol Bay Salmon Fishery in the Bristol Bay Region and the State of Alaska

The Bristol Bay sockeye salmon fishery provides revenue for the State of Alaska's General Fund, as well as funds to the local borough governments adjacent to the fishery. The State of Alaska levies a fisheries business tax (AS 43.75.015) on fisheries businesses and persons who process fisheries resources in, or exports unprocessed fisheries resources from, Alaska. The tax is based on the price paid to commercial fishermen for the raw resource, and the tax rate is based on the location and type of the processing activity. The Tax Division of the State of Alaska's Department of Revenue deposits all revenue derived from the fisheries business tax into the state's General Fund.¹⁰

Under the fisheries business tax, (also known as raw fish tax) salmon processors pay the state:

- 5.0% of the ex-vessel value of salmon processed on floating facilities;
- 4.5% of the ex-vessel value of salmon canned at shore-based facilities; and
- 3.0% of the ex-vessel value of other salmon processed at shore-based facilities (e.g., salmon processed frozen, fresh, or in other ways except for canning).¹¹

Local governments in the Bristol Bay region also impose raw fish taxes on the ex-vessel value of salmon processed within their jurisdictions.¹² For example, in 2013, the Bristol Bay Borough collected a 3% raw fish tax, generating revenue of \$1,775,993. The Lake and Peninsula Borough also collected a 3% raw fish tax in 2013, creating borough revenues of \$1,769,957.¹³ Revenues collected by the boroughs are critical funding sources for school districts and other borough services in the Bristol Bay area.

¹⁰ State of Alaska Department of Revenue Tax Division. 2013. 2013 Annual Report. Retrieved from: <http://www.tax.alaska.gov/programs/documentviewer/viewer.aspx?1038r>

¹¹ Knapp, G., M. Guetttabi, and S. Goldsmith. 2013. Report by the Institute of Social and Economic Research at University of Alaska Anchorage for the Bristol Bay Regional Seafood Development Association: The Economic Importance of the Bristol Bay Salmon Industry.

¹² USEPA (U.S. Environmental Protection Agency). 2014. An Assessment of Potential Mining Impacts on Salmon Ecosystems of Bristol Bay, Alaska. Region 10, Seattle, WA. EPA 910-R-14-001.

¹³ State of Alaska, Department of Commerce, Community, and Economic Development, Office of the State Assessor, Division of Community and Regional Affairs. 2013. Municipal Taxation Data from the Alaska Taxable for the year 2013 - Table 02: Borough Sales Taxes, Special Taxes and Revenues. Retrieved from: <http://commerce.alaska.gov/DNN/Portals/4/Repository/Taxable/13Taxable-Table02-BOR.pdf>

The Bristol Bay sockeye salmon fishery not only helps fund important infrastructure projects within the region, it is also a large source of employment in the State of Alaska. During the period 2001–2009, peak Bristol Bay commercial fishing employment averaged 33% of overall peak Alaska commercial fishing employment statewide. Put differently, in July—the busiest month for Alaska commercial fishing—about one third of all the people fishing commercially in Alaska were fishing in Bristol Bay.¹⁴ The majority of households in the Bristol Bay region (70%) are involved in commercial fishing.¹⁵

Significant seasonal economic stimulation occurs when fishermen and processor employees travel to the towns in the Bristol Bay region during the commercial fishing season. Earnings generated from commercial fishing are circulated in the local economies through property and sales taxes, and purchases of homes, rentals, hotels, electricity, entertainment, fuel, vehicles, food, repair and maintenance parts, transportation, travel, medical, and other services. In addition to direct harvesting and processing workers, fisheries-related jobs include fuel suppliers, accountants, consultants, air and water travel, hardware and marine repair and supply businesses, advocacy and marketing organizations, air cargo crew, freight agents, and scientists. Government-related jobs created by the fishery include: Alaska Department of Fish and Game, Alaska Department of Public Safety/Fish and Wildlife Protection, docks and harbors, U.S. Coast Guard, University of Alaska - School of Fisheries, Alaska Sea Grant Marine Advisory program, and more.¹⁶

In summary, the Bristol Bay fishery provides critical funding for the local, regional, and state tax bases. The regional raw fish tax collected by the different boroughs and census areas participating in the Bristol Bay fishery helps fund important community resources such as schools and other community development and infrastructure. The busy months of June and July are vital to the residents of Bristol Bay who rely on the economic stimulation that occurs when fishermen, processors, and other workers travel to the region. This influx of fishery-based workers provides significant increases in seasonal jobs and revenue to the region and to towns where job opportunities are limited during much of the year.

The Importance of Safeguarding the Alaskan Sustainable Seafood Brand

Alaska is the first and only state in the nation to have sustainability written into its state constitution. Sustainable fisheries are those that are managed and fished using practices to ensure there will always be healthy harvests available in the future. Article 8, Section 4 of the Alaska State Constitution declares, “fish... belonging to the State shall be utilized... and

¹⁴ USEPA 2014. *An Assessment of Potential Mining Impacts on Salmon Ecosystems of Bristol Bay, Alaska. Appendix E: Bristol Bay Wild Salmon Ecosystem: Baseline Levels of Economic Activity and Values. Region 10, Seattle, WA. EPA 910-R-14-001.*

¹⁵ Bristol Bay Native Association. 2011. *Comprehensive Economic Development Strategy for 2011–2016.* Retrieved from: http://www.bbna.com/website/BBCEDS_2011-10-31.pdf

¹⁶ United Fishermen of Alaska. 2013. *Commercial Fishing and Seafood Processing Facts – Version 3.2.* Retrieved from: http://www.ufa-fish.org/CFF/2013/07_Bristol_Bay_Borough_CFF_V2013.3.2.pdf

maintained on the sustained yield principle.”¹⁷ According to the recently released *Status of the Stocks 2013*, an annual report published by NOAA’s National Marine Fisheries Service, no Alaskan salmon stocks are classified as overfished, subject to overfishing, or approaching overfishing.¹⁸

Many organizations exist in Alaska for the purpose of supporting wild salmon fisheries, healthy economies based on renewable salmon resources, and promoting sustainability within the Alaska Seafood brand. For example, the Alaska Seafood Marketing Institute (ASMI) is a marketing organization with the mission of increasing the economic value of Alaska seafood resources by increasing positive awareness of the Alaska Seafood brand. ASMI is proud to represent Alaskan fisheries as sustainably practiced, and reports that no species of Alaska seafood has ever been listed as endangered under the Endangered Species Act.¹⁹

Numerous other organizations exist to promote a healthy Alaskan salmon economy and support sustainability in salmon fisheries that could be threatened by development of large-scale mining in the Bristol Bay watershed. The Pacific Seafood Processors Association (PSPA) represents seafood processing companies operating throughout coastal Alaska. PSPA states that it recognizes the importance of economic diversification and resource development in Alaska, and the association and its member companies are supportive of resource development projects when and where there is reasonable certainty that they can be developed, operated, and concluded without damage to Alaska’s ecosystems and fishery resources. It is also important to PSPA that the market perception of the purity, wholesomeness, and health benefits of Alaska’s seafood is untarnished. PSPA acknowledges the potential short-term economic benefits of the proposed Pebble project, but concludes the risk posed by the Pebble Mine is simply too high, and sees no way the project could be developed, operated, and concluded without causing irreparable harm to the watersheds, ecosystems, fishery resources, business, people, and communities of the region.²⁰

As mentioned previously, BBRSDA is a trade association consisting of all Bristol Bay drift gillnet permit holders. The association’s core purpose is to maximize the value of the Bristol Bay salmon fishery, and the fishery’s economic viability is clearly based on clean waters and productive habitat. The long-term, sustained benefits of this healthy, renewable resource must be judged against short-term benefits that may be gained through extractive mine development. The BBRSDA has determined that large-scale mine development in the

¹⁷ *State of Alaska State Constitution, Adopted February 1956 and Operative with Statehood in January, 1959.* Retrieved from: <http://ltgov.alaska.gov/treadwell/services/alaska-constitution/entire-constitution-text.html>

¹⁸ *National Oceanic and Atmospheric Administration National Marine Fisheries Service. 2013. Status of Stocks 2013: Annual Report To Congress on the Status of U.S. Fisheries.* Retrieved from: http://www.nmfs.noaa.gov/sfa/fisheries_eco/status_of_fisheries/archive/2013/status_of_stocks_2013_w eb.pdf

¹⁹ *Alaska Seafood Marketing Institute. 2008. Alaska Seafood: A Model for Sustainability.* Retrieved from: http://alaskaseafood.org/sustainability/pdf/Sustainability_Brochure.pdf

²⁰ *Pacific Seafood Processors Association. 2011. Position on the Pebble Mine Project.* Retrieved from: <http://www.pspafish.net/Nov11Pebble.html>

Bristol Bay watershed does not align with the association's core purpose of raising the economic value of the fishery.²¹

Another organization promoting Bristol Bay's salmon industry is Commercial Fishermen for Bristol Bay (CFBB). CFBB is a national coalition of fishermen working to protect the 130 year-old sustainable salmon industry in Bristol Bay. CFBB recognizes the need for sustainability to protect Bristol Bay, the world's most valuable remaining sockeye salmon fishery, and accepts that it is the responsibility of commercial fishermen and fisheries managers to continue to harvest in a sustainable manner. CFBB also acknowledges that Bristol Bay fishermen recognize it is a privilege to be stewards of the abundant salmon resource and the pristine spawning habitats that the resource depends on.²² The organization asserts that proposed mining activity in the headwaters of Bristol Bay will jeopardize spawning and rearing habitat and could nullify over 50 years of sustained yield management. It is well known that the long-term sustainability of the salmon fisheries requires healthy and abundant habitat for spawning and rearing.²³

A statewide organization, United Fishermen of Alaska (UFA), is a trade association comprised of 35 Alaska commercial fishing organizations that collectively represents the interests of commercial fishermen throughout the state. UFA's mission is to promote and protect the common interests of Alaska's commercial fishing industry, as a vital component of Alaska's social and economic well being.²⁴ UFA has a keen interest in maintaining environmental quality that allows for sustainable production, harvest, and marketing of Alaska's fisheries resources. UFA recognizes that the Bristol Bay region's salmon resources typically account for more than a quarter of the state's ex-vessel salmon value and are integral to an economy that provides for fishermen, tenders, processing, support businesses, communities, and families. Because of this, it is critically important for the commercial fishing industry to ensure that industrial development does not disrupt or degrade the area's fishing economy.²⁵ The scope of likely future mining operations, construction, and support activities are large and complex enough that negative impacts to the Bristol Bay salmon fishery are unlikely to be avoided, and consequently, UFA opposes development of the Pebble Mine.²⁵

Organizations across Alaska have worked to promote sustainability. Clean waters and healthy habitats are key to safeguarding Alaska's sustainable salmon branding. Mining

²¹ Bristol Bay Regional Seafood Development Association. *BBRSDA Statement on Large-Scale Mining in the Bristol Bay Watershed*. Feb 2008. Retrieved from: <http://www.bbrsda.com/2013/11/statement-on-large-scale-mining-in-the-bristol-bay-watershed/>

²² Commercial Fishermen for Bristol Bay. 2014. *About CFBB*. Retrieved from: <http://fishermenforbristolbay.org/bristol-bay/>

²³ Hilborn, R., T. P. Quinn, D. E. Schindler, and D. E. Rogers. 2003. *Biocomplexity and fisheries sustainability*. *Proceedings of the National Academy of Sciences* 100:6564–6568.

Schindler, D. E., R. Hilborn, B. Chasco, C. P. Boatright, T. P. Quinn, L. A. Rogers, and M. S. Webster. 2010. *Population diversity and the portfolio effect in an exploited species*. *Nature* 465:609–612.

²⁴ United Fishermen of Alaska. 2014. *About UFA*. Retrieved from: <http://www.ufa-fish.org/about.htm>

²⁵ United Fishermen of Alaska. 2007. *UFA Statement in Opposition to Development of the Pebble Mine*. Retrieved from: [http://www.ufa-fish.org/doc/UFA Statement opposing Pebble Mine 091807.pdf](http://www.ufa-fish.org/doc/UFA%20Statement%20opposing%20Pebble%20Mine%20091807.pdf)

projects such as the proposed Pebble Mine do not align with the missions of many Alaskan associations and organizations, and do not reflect the interests of those organizations that focus on maintaining vital habitat and viable salmon-producing ecosystems. Protecting the sustainability of the Bristol Bay sockeye salmon fishery is not only mandated by the state constitution, it is crucial to the integrity of the Alaska Seafood sustainability brand.

Essential Salmon Habitat in Bristol Bay is Key for a Sustainable and Productive Salmon Fishery

The commercial fishery in Bristol Bay has remained sustainable for more than 130 years, thanks in large part to fully intact river systems that support spawning and rearing salmon populations.

Bristol Bay Fishery Management

The Bristol Bay salmon commercial gillnet fishery is managed by the State of Alaska's Department of Fish and Game (ADF&G), with the goal of achieving and maintaining sustained salmon production. Salmon management in Bristol Bay is primarily directed at sockeye salmon harvested commercially by gillnet fishermen in five fishing districts: the Ugashik, Egegik, Togiak, Nushagak, and Naknek-Kvichak. Bristol Bay salmon fisheries are strictly managed on an emergency order basis from mid June through late July, with the intent of achieving escapement objectives in key river systems that produce large annual runs of sockeye salmon, including the Naknek, Kvichak, Branch, Nushagak, Igushik, and Wood Rivers.²⁶

Timely catch and escapement data is essential in the high volume and condensed sockeye seasons of Bristol Bay. Attaining escapement goals is achieved by emergency order adjustments of fishing time and area.²⁶ Emergency order announcements supersede any other published opening or closing announcements and are a way of managing fishing times and areas in as efficient a manner as possible. An excerpt from a report published by ADF&G in 2005 explains how catch and escapement data are used to effectively manage the fishery during the season:

“Early in the fishing season, fishery management decisions are based on pre-season forecasts of abundance. However, very quickly in the fishing season, stock assessment data that is collected in-season is used to update and supplant the pre-season forecast. In-season fishery management is dependent upon timely in-season run strength data and analysis by stock that is provided by a broad array of stock assessments projects. Such assessment efforts include: test fishing, catch analysis, run modeling, aerial surveys, sonar and tower counts of escapement, and age composition of catches and escapements. Rapid in-season analysis of such data provides the necessary management capability and response time to continuously adjust

²⁶ Source: Clark, J. 2005. *Bristol Bay Salmon, A Program Review. Special Publication No. 05-02 for Alaska Department of Fish and Game, Division of Commercial Fisheries.*

fishing time and area in order to attain escapement objectives for component spawning stocks of salmon while allowing commercial fishing opportunity at an adequate level to harvest salmon surplus to reproductive needs.”²⁶

The ADF&G has been monitoring total abundance by stock and age for the major sockeye salmon runs in Bristol Bay since Alaska became a state in 1959. Commercial harvests are monitored by fishing district and catch date through a fish ticket system. Both spawning escapements and harvests are sampled to estimate annual age, sex, and size composition. The Bristol Bay sockeye salmon fishery is one of the very few major salmon fisheries in the world with a good quality, long-term set of brood tables by stock.

The “Portfolio Effect” in Bristol Bay

Population diversity within the stock complex of Bristol Bay sockeye salmon is immense; each river’s stock contains tens to hundreds of locally adapted populations distributed among tributaries and lakes. Biological diversity stabilizes ecosystem processes and the services they provide, leading to a more temporally stable population dynamic. This biodiversity concept can be looked at as analogous to the “portfolio effect” whereby asset diversity contributes to the stability of financial portfolios. Research on five decades of sockeye salmon data in Bristol Bay has found that variability in Bristol Bay salmon runs would be 2.2 times lower if the system consisted of a single homogenous population rather than several hundred discrete populations of salmon.²⁷

A healthy Bristol Bay sockeye salmon economy is based on a complex system of management tools that ensure enough salmon return to their natal streams to spawn, encouraging biological diversity and sustainable stock recruitment. Without strict management, or with the occurrence of population-damaging disturbances, the Bristol Bay sockeye salmon run could face increased variability resulting in lost fishing time or complete fisheries closures. A sustainably managed fishery allows for a more reliable supply and, therefore, a more economically stable fishery.

Even after decades of study, scientists are still conducting research to understand ecological elements that comprise a thriving salmon ecosystem. Bristol Bay is the site of the world’s longest-running effort to monitor salmon and their ecosystems, dating back to 1946.²⁸ Consequently, many of the ecological concepts that underpin salmon ecology were first discovered in Bristol Bay. One of the primary concepts established is the portfolio effect referenced earlier, which describes the importance of maintaining biological diversity and habitat complexity as analogous to an investment strategy that spreads risk.²⁹

²⁷ Schindler, D. E., R. Hilborn, B. Chasco, C. P. Boatright, T. P. Quinn, L. A. Rogers, and M. S. Webster. 2010. Population diversity and the portfolio effect in an exploited species. *Nature* 465:609–612.

²⁸ Alaska Salmon Program history. <http://fish.washington.edu/research/alaska/history.html>. Accessed 22 Aug 2014.

²⁹ Hilborn, R., T. P. Quinn, D. E. Schindler, and D. E. Rogers. 2003. Biocomplexity and fisheries sustainability. *Proceedings of the National Academy of Sciences* 100:6564–6568.

Schindler, D. E., R. Hilborn, B. Chasco, C. P. Boatright, T. P. Quinn, L. A. Rogers, and M. S. Webster. 2010. Population diversity and the portfolio effect in an exploited species. *Nature* 465:609–612.

Biological diversity includes multiple characteristics of salmon that vary between and within species, including saltwater and freshwater residence times, run timing and genetic variation. Habitat complexity includes variability in stream temperatures, channel types, in-stream structures (e.g., beaver dams, woody debris, undercut banks, etc.). Together, that diversity buffers the variability of overall salmon returns. For example, a stream that experiences unusually low water flows in one year may prevent access to spawning for an entire stock of later-run sockeye salmon, although earlier run sockeye may have had access to spawning runs during higher spring water flows, to some extent mitigating the impact of the lost late run for that year. Ultimately, spreading the risk of losing some select stocks across a complex landscape that can be offset by gains in other habitat reduces overall variability of sockeye returns. Because of the portfolio effect, sockeye returns to *all* of Bristol Bay's rivers and streams are less variable than for individual rivers.³⁰ Without the buffering effect that salmon biodiversity and habitat complexity provide, complete fisheries closures would occur every two to three years in Bristol Bay, a tenfold increase over current conditions.

The loss of habitat and bio-complexity—in other words, the degradation of the portfolio effect—has resulted in significant declines of salmon fisheries in the Lower-48 states, where salmon populations are currently at 7% of historic levels.³¹ To date, efforts to mitigate those declines have met with little success. The hundreds of millions of dollars spent in the Columbia River Basin alone,³² and the failure to delist a single salmon stock under the Endangered Species Act, are strong evidence that science has yet to replicate or re-create natural salmon habitat and productivity. In our attempts to mitigate losses, we often compound salmon declines with unintended, often deleterious consequences. Existing reviews of restoration effectiveness virtually all conclude that the majority of restoration projects either 1) are never measured for effectiveness, or 2) do not meet their restoration objectives.³³ Consequently, relying on mitigation to replace or restore the complexity that is fundamental to sustaining Bristol Bay's globally significant salmon populations is a flawed strategy at best.

³⁰ Schindler, D. E., R. Hilborn, B. Chasco, C. P. Boatright, T. P. Quinn, L. A. Rogers, and M. S. Webster. 2010. Population diversity and the portfolio effect in an exploited species. *Nature* 465:609–612.

³¹ Nehlsen, W., J. E. Williams, and J. A. Lichatowich. 1991. Pacific salmon at the crossroads: Stocks at risk from California, Oregon, Idaho, and Washington. *Fisheries* 16:4–21.

³² GAO. 2002. Columbia River Basin salmon and steelhead: Federal agencies' recovery responsibilities, expenditures and actions. Report to the Ranking Minority Member, Subcommittee on fisheries, Wildlife, and Water, Committee on Environment and Public Works, U.S. Senate. Page 94, Washington, D.C.

³³ Bernhardt, E. S., M. Palmer, J. Allan, G. Alexander, K. Barnas, S. Brooks, J. Carr, S. Clayton, C. Dahm, and J. Follstad-Shah. 2005. Synthesizing U. S. river restoration efforts. *Science (Washington)* 308:636–637.

Quigley, J. and D. Harper. 2006a. Compliance with Canada's Fisheries Act: A Field Audit of Habitat Compensation Projects. *Environmental Management* 37:336–350.

Quigley, J. and D. Harper. 2006b. Effectiveness of Fish Habitat Compensation in Canada in Achieving No Net Loss. *Environmental Management* 37:351–366.

Roni, P., T. J. Beechie, R. E. Bilby, F. E. Leonetti, M. M. Pollock, and G. R. Pess. 2002. A Review of Stream Restoration Techniques and a Hierarchical Strategy for Prioritizing Restoration in Pacific Northwest Watersheds. *North American Journal of Fisheries Management* 22:1–20.

Roni, P., K. Hanson, and T. Beechie. 2008. Global Review of the Physical and Biological Effectiveness of Stream Habitat Rehabilitation Techniques. *North American Journal of Fisheries Management* 28:856–890.

Salmon Habitat in Bristol Bay

The area in and around the Pebble Deposit was little explored prior to the discovery of copper and gold ore. In the last ten years, however, industry contractors, government, and independent scientists have strived to characterize salmon populations and other aquatic communities (e.g., macroinvertebrates, diatoms), water chemistry, and physical habitat. In 2012, the PLP released its *Environmental Baseline Document*³⁴ that summarized hundreds of millions of dollars worth of data collected by the company's contractors from 2004–2008. Despite the great expense and effort that went into producing the document—which was ostensibly intended to determine baseline conditions for the purpose of predicting impacts of mining—the document contains very little information of value. For example, Pebble contractors failed to quantify adult salmon returns or juvenile densities in the streams draining the deposit;³⁵ misidentified macroinvertebrate species;³⁶ and generally presented data in a format that was difficult (and at times impossible) to interpret or repeat.³⁷ Smaller scale investigations conducted by independent consultants, however, concluded that fish inhabit virtually all of the small, headwater streams draining the deposit. Data indicate salmon presence in three of every four headwater streams surveyed. Non-salmon species important to subsistence and sport fishing were found in 97% of streams surveyed.³⁸ Information from these studies was used to increase legal protection to more than 100 miles of salmon streams under the State of Alaska's *Fishway Act* and *Anadromous Waters Catalog*.³⁹

This work underscores both the importance of headwater streams as essential salmon rearing habitat and the surprising lack of data for two of the world's most productive salmon ecosystems. Headwater streams comprise more than twice the stream kilometers of mainstem habitat in and near the Bristol Bay mining claims,⁴⁰ but are often unmapped and overlooked due to their small size and sometimes intermittent flows.⁴¹ Because they vary in physical, chemical, and biological characteristics, headwaters provide diverse and abundant habitats crucial to maintenance of aquatic ecosystem function downstream and

³⁴ PLP (Pebble Limited Partnership). 2011. *Environmental Baseline Document 2004 through 2008*. Anchorage, AK.

³⁵ Woody, C.A. 2012. *Assessing Reliability of Pebble Limited Partnership's Salmon Escapement Studies*. Fisheries Research & Consulting. Anchorage, AK. 25 pp.

³⁶ O'Neal, S.L. 2012. *A review of PLP Environmental Baseline Documents: Aquatic macroinvertebrates (Bristol Bay drainages)*. Fisheries Research & Consulting. Anchorage, AK. 13 pp.

³⁷ O'Neal, S.L. 2012. *A review of PLP Environmental Baseline Documents Resident fish and juvenile salmon habitat, distribution, and assemblage*.

³⁸ Woody, C. A. and S. L. O'Neal. 2010. *Fish Surveys in Headwater Streams of the Nushagak and Kvichak River Drainages Bristol Bay, Alaska 2008–2010*. 39, Anchorage, AK.

³⁹ ADF&G. 2014. *Anadromous Waters Catalog overview*. <https://www.adfg.alaska.gov/sf/SARR/AWC/>. Accessed 1 September 2014.

⁴⁰ USGS and EPA. 2012. *The national hydrography dataset*.

⁴¹ Meyer, J. L. and J. B. Wallace. 2001. *Lost linkages and lotic ecology: Rediscovering small streams*. Pages 295–318 in M. C. Press, N. J. Huntly, and S. Levin, editors. *Ecology: Achievement and Challenge The 41st Symposium of the British Ecological Society jointly sponsored by the Ecological Society of America held at Orland, Florida, USA 10-13 April 2000*. Blackwell Science Ltd., Oxford, UK.

to the portfolio effect overall.⁴² Moreover, headwaters provide protection from predators and competitors, rich feeding grounds, and thermal refuge.⁴³ In terms of potential mine development, absence of an accurate understanding of baseline conditions draining from the Pebble Deposit is problematic, as it precludes measurement of actual impacts from mining.

Effects of Copper on Salmon

In addition to studying biological communities, both PLP contractors and independent scientists examined water chemistry in areas surrounding the Pebble Deposit.^{40,44} They found that waters supporting fishes are exceptionally pure, exhibiting low levels of alkalinity; metals, including copper; and dissolved organic carbon. Because of the low alkalinity, pH will drop easily if small amounts of acid drainage are released during the course of mining—a significant, known risk of developing the Pebble Deposit.⁴⁵ Low pH (caused by acid drainage), in turn, dissolves metals, such as copper, which is unearthed during mine development. Further, low organic matter in headwaters draining the Pebble Deposit limits assimilation of copper in regional headwaters, meaning toxic metals would remain dissolved in area streams, thereby posing a greater threat to fisheries habitat.⁴⁶

Slight increases in background copper concentrations—below limits commonly used to set water quality standards—are potentially harmful to salmon and other aquatic life. These slight increases—allowable under Alaska’s water quality criteria—can have significant impacts to salmon and other aquatic biota. Dissolved copper is one of the most toxic elements to not only fish, but also other components of the food web upon which salmon rely, including freshwater algae, zooplankton, and insects. Increases of just 2–10 parts per

⁴² Meyer, J. L., D. L. Strayer, J. B. Wallace, S. L. Eggert, G. S. Helfman, and N. E. Leonard. 2007. *The contribution of headwater streams to biodiversity in river networks*. *Journal of the American Water Resources Association* 43:86–103.

Vannote, R. L., G. W. Minshall, K. W. Cummins, J. R. Sedell, and C. E. Cushing. 1980. *The River Continuum Concept*. *Canadian Journal of Fisheries and Aquatic Sciences* 37:130–137.

Wipfli, M. S., J. S. Richardson, and R. J. Naiman. 2007. *Ecological linkages between headwaters and downstream ecosystems: Transport of organic matter, invertebrates, and wood down headwater channels*. *JAWRA Journal of the American Water Resources Association* 43:72–85.

⁴³ Brown, T. G. and G. F. Hartman. 1988. *Contribution of seasonally flooded lands and minor tributaries to the production of coho salmon in Carnation Creek, British Columbia*. *Transactions of the American Fisheries Society* 117:546–551.

Meyer, J. L., D. L. Strayer, J. B. Wallace, S. L. Eggert, G. S. Helfman, and N. E. Leonard. 2007. *The contribution of headwater streams to biodiversity in river networks*. *Journal of the American Water Resources Association* 43:86–103.

⁴⁴ Zamzow, K.L. 2011. *Investigations of surface water quality in the Nushagak, Kvichak, and Chulitna, Southwest Alaska 2009–2010*. Center for Science in Public Participation. Sutton, AK. 42 pp.

⁴⁵ PLP. 2011. *Environmental Baseline Document 2004 through 2008*. Anchorage, AK.

⁴⁶ MacRae, R. K., D. E. Smith, N. Swoboda-Colberg, J. S. Meyer, and H. L. Bergman. 1999. *Copper binding affinity of rainbow trout (*Oncorhynchus mykiss*) and brook trout (*Salvelinus fontinalis*) gills: Implications for assessing bioavailable metal*. *Environmental Toxicology and Chemistry* 18:1180–1189.

Craven, A., A. Maest, J. Ryan, G. Aiken, J. Lipton, J. Morris, and K. L. Zamzow. *In prep. Laboratory estimation of Cu-dissolved organic matter complexation and its relevance to fish toxicity in streams draining the Pebble Deposit in Alaska*.

billion (ppb) of copper can impair salmon olfaction, which can interfere with their ability to navigate home to natal sites to spawn, increase their susceptibility to predators, and impair their ability to recognize mates and kin.⁴⁷ Any one of those impacts can reduce overall survival of salmon.

In addition to directly impacting salmon, copper can impact other components of the aquatic food web, ultimately leading to decreased productivity of salmon. Copper is one of the most toxic metals to unicellular algae, which form the base of the aquatic food chain. Photosynthetic algae production (*Chlorella* spp.) can decline at just 1–2 ppb of copper and photosynthesis can be inhibited at 5.0 to 6.3 ppb.⁴⁸ Zooplankton feed on algae so their growth and reproduction can decline concurrently with declines in algae production.⁴⁹ Zooplankton is a preferred food item of sockeye salmon and an important component of the rest of the aquatic food web. Legally allowable increases in copper can also directly kill zooplankton like *Daphnia*.⁵⁰

Risks of Mineral Development in the Bristol Bay Watershed

Much of Bristol Bay’s uplands lack necessary protections for salmon. The majority of the area addressed in the watershed assessment is open to mineral development, with over a dozen sites nearly ‘drill ready’. Current Alaskan state governance is trending toward encouraging mineral development in the region and a loosening of regulations and protections for salmon. Meanwhile, mineral claims in the area continue to expand, as does intensive mineral exploration.

Bristol Bay Area Plan – 2005 Land Reclassifications

Alaska state law requires the Department of Natural Resources (DNR) to adopt management plans for specific areas of state-owned lands.⁵¹ The first *Bristol Bay Area Plan* (BBAP) was adopted in 1984. The 1984 BBAP classified most state land for the protection

⁴⁷ Baldwin, DH, JF Sandahl, JS Labenia, and NL Scholz. 2003. Sublethal effects of copper on coho salmon: impacts on non-overlapping receptor pathways in the peripheral olfactory nervous system. *Environmental Toxicology and Chemistry*. 22(10):2266–2274.

Hecht, S. A., D. H. Baldwin, C. A. Mebane, T. Hawkes, S. J. Gross, N. L. Scholz. 2007. An overview of sensory effects on juvenile salmonids exposed to dissolved copper: Applying a benchmark concentration approach to evaluate sublethal neurobehavioral toxicity. U.S. Dept. of Commerce, NOAA Tech. Memo, NMFS-NWFSC-83, 39 pp.

⁴⁸USEPA (US Environmental Protection Agency). 1980. Ambient water quality criteria for copper. USEPA Report 440/5-80-036. 162 pp.

Franklin NM, Stauber JL, Markich SJ and Lim RP. 2000. pH-dependent toxicity of copper and uranium to a tropical freshwater alga (*Chlorella* sp.). *Aquat. Toxicol.* 48: 275–289.

⁴⁹ Müller-Navarra, D and W Lampert. 1996. Seasonal patterns of food limitation in *Daphnia galeata*: separating food quantity and food quality effects. *Journal of Plankton Research*.7: 1137–1157. Urabe, J. 1991. Effect of food concentration on growth, reproduction and survivorship of *Bosmina longirostris* (Cladocera): An experimental study. *Freshwater Biology* (25)1:1–8.

⁵⁰ Eisler, R. 1998. Copper hazards to fish, wildlife, and invertebrates: A synoptic review. USGS. Laurel, MD. 120 pp.

⁵¹ State Law on Area Plans. <http://dnr.alaska.gov/mlw/planning/areaplans/bristol/>. Accessed September 2, 2014.

of habitat, allowing for public use of lands for commercial, subsistence, and sport fishing, and hunting. In 2005, DNR revised and published a new BBAP. It eliminated the “habitat” classification from 93% of lands in favor of a “general use” or “mineral development” classification.⁵² This reduction of over 10 million acres of habitat left only tidelands, shoreland, and submerged land areas with a “habitat” designation.⁵³ Specific to state land at the Pebble Deposit, lands were designated with “mineral development” as the primary and expected use. The 1984 “habitat” designation was removed entirely and with it, the requirement for compatibility among classifications as development is considered.

In 2009, following successful litigation brought by the tribal councils of Nondalton, Koliganek, New Stuyahok, Ekwok, Curyung, Levelock, the Alaska Independent Fishermen’s Marketing Association, and Trout Unlimited, Inc.; DNR was ordered by the court to rework the 2005 BBAP and take public comment into consideration. Although through this review some habitat designations were restored, the lands at the Pebble Deposit, Kemuk Mountain, and adjacent areas have retained “mineral development” as their primary designations.⁵⁴

Mining Claims in Bristol Bay

The risks to Bristol Bay from large-scale mining can be defined today based on the known ore bodies in the region. As noted in the BBWA, multiple mines and their associated infrastructures may be developed in the Bristol Bay watershed. At imminent risk for development are 14 separate deposits, including the Pebble South/PEB, Big Chunk South, Big Chunk North, Groundhog, AUDN/Iliamna, and Humble claims in the Nushagak and Kvichak rivers’ watersheds.

Each mine would pose risks similar to those identified in the mine scenarios developed at the Pebble Deposit.⁵⁵ Exploration has been ongoing for several years at the Humble claims, less than 10 miles upstream from the mainstem of the Nushagak River. The deposit has been described as an ore body with geophysical and geochemical properties similar to the Pebble Deposit, and is considered “drill ready” by Millrock Resources, the claim holders.⁵⁶ Conservative estimates in the BBWA predict cumulative mine footprints of the “drill ready” copper ore bodies to be between 9,000 and 14,000 acres. Potential streams lost could total as much as 43 miles and cumulative wetlands lost as much as 6,700 acres. These potential impacts to habitat in the Bristol Bay watershed would result in diminished genetic

⁵² *The Citizen’s Alternative Bristol Bay Area Plan for State Lands. May 2013. p1.*
http://www.bristolbaylandtrust.org/wp-content/uploads/2013/05/BBAP_May_final.pdf. Accessed September 2, 2014.

⁵³ DNR. 2005. *Bristol Bay Area Plan. p. 105.* www.dnr.ak.gov. Accessed September 2, 2014

⁵⁴ *Bristol Bay Area Plan Amendment 2013.* <http://dnr.alaska.gov/mlw/planning/areaplans/bristol/amend/>. Accessed September 3, 2014.

⁵⁵ *Bristol Bay Watershed Assessment. Executive Summary. P27.*
http://www.epa.gov/ncea/pdfs/bristolbay/bristol_bay_assessment_final_2014_ES.pdf. Accessed September 2, 2014.

⁵⁶ *Millrock Resources. Humble.* <http://www.millrockresources.com/projects/humble/>. Accessed September 3, 2014.

diversity of salmon stocks and increased annual variability in salmon returns in the same manner assessed at the Pebble Deposit.⁵⁷

State Permitting Process and the Risks of Permittable Mines

A permittable open-pit mine is not synonymous with a mine that can operate without damaging surrounding salmon habitat. Alaska's permitting process contains key drawbacks that prevent it from adequately guaranteeing that Bristol Bay's fishery would be safe from the potential impacts of large-scale mining.

As we have seen clearly from the recent Mount Polley tailings pond failure in British Columbia's (B.C.'s) Fraser River watershed, even permittable mines can pose unacceptable risks in sensitive salmon-rearing areas. The Fraser River fishery, and the mines in its headwaters – Mount Polley specifically – have been used repeatedly by mining interests as prime examples of successful 'co-existence' between mines and fisheries. The firm that engineered the Mount Polley tailings pond, in comments critical of the EPA's BBWA published prior to the Mount Polley failure, asserted that "Modern dam design technologies are based on proven scientific/engineering principles and there is no basis for asserting that they will not stand the test of time."⁵⁸

The Mount Polley copper and gold mine tailings pond failure on August 4, 2014 released an estimated 10 million cubic meters of wastewater, plus more than four million cubic meters of sediment into Polley Lake that subsequently washed down Hazeltine Creek into nearby Quesnel Lake. On Sept. 4, 2014, Imperial Metals updated that initial estimate to nearly 25 million cubic meters of contaminated water and mine waste that spilled into surrounding waterways, about 78% more than initial estimates. That total includes:

- 10 million cubic meters of water;
- 13.8 million cubic meters of tailings slurry; and
- 0.6 million cubic meters of construction waste from the dam.⁵⁹

The spill occurred in a tributary of the Fraser River, a productive wild Canadian sockeye salmon-producing system. The Quesnel-Horsefly river system is one of the Fraser's four largest salmon-producing tributaries and about 1.5 to 2 million sockeye salmon are headed for spawning beds in the Quesnel Lake region. The exact concentration of pollutants they will encounter from the August 4 breach is unknown. What is known, from Imperial Mines' records, is that the tailings pond contained a toxic brew of phosphorus, copper, zinc, cobalt, selenium, arsenic, lead, cadmium, and mercury. The Fraser River is a vital salmon stream to

⁵⁷ *Bristol Bay Watershed Assessment. Executive Summary. P27.*

http://www.epa.gov/ncea/pdfs/bristolbay/bristol_bay_assessment_final_2014_ES.pdf. Accessed September 3, 2014.

⁵⁸ *Knight Piesold Memorandum Re: Review of the Bristol Bay Assessment; EPA Docket ID No. EPA-HQ-ORD-2013-0189.* http://corporate.pebblepartnership.com/files/documents/PLP-Knight_Piesold_Ltd.pdf. Accessed September 7, 2014.

⁵⁹ *Mount Polley mine spill 78% larger than 1st estimates. CBC News. September 4, 2014*

<http://www.cbc.ca/news/canada/british-columbia/mount-polley-mine-spill-78-larger-than-1st-estimates-1.2755974>. Accessed September 12, 2014.

Aboriginal First Nations in Canada, as well as Puget Sound-area Indian tribes and non-native harvesters in several fisheries.

The B.C. Ministry of Environment said Imperial Metals has applied for two amendments to its operating permit in recent years to allow the mine to discharge an increasing amount of wastewater. The first of these, in 2009, prompted the company to commission an independent review of the proposed increase after the ministry raised concerns. The second, submitted during the summer of 2014, was under consideration by the ministry at the time of the August 4 breach. Brian Olding, the environmental consultant who carried out the 2009 assessment⁶⁰ for the company and local First Nations groups, reported five years ago that the pond levels were already getting too high.

In 2012, the mine was granted the permit amendment it had requested, allowing the company to discharge 1.4 million cubic meters of wastewater per year into nearby Hazeltine Creek. In summer 2014, the firm applied to amend its permit again, this time to allow a discharge of three million cubic meters of treated wastewater or ditch water into Polley Lake, which overflows into Hazeltine Creek. The approval of that change is still pending.

The B.C. Ministry of Environment says it has conducted 14 inspections of the Mount Polley mine since its 2012 permit amendment was granted; Imperial Metals had been warned by the B.C. government five times prior to the August 4th disaster about the state of the tailings pond, the most recent in May 2014 for exceeding the permitted height of wastewater within its tailings pond. These involved the following warnings, none of which resulted in enforcement:

- 1) January 2012 – failure to submit monitoring data for one of the groundwater monitoring wells.
- 2) April 2012 – failure to submit monitoring data for one of the groundwater monitoring wells.
- 3) August 30, 2012 – failure to report exceedance of the height of effluent for the perimeter pond, which overflowed, releasing about 150 cubic meters of effluent over 13 hours to ground.
- 4) April 18, 2014 – bypass of authorized treatment works. The site experienced high flows due to spring freshet that caused the pump system to become blocked and resulted in an overflow of effluent, which was diverted into a pit.
- 5) May 24, 2014 – excessive water levels in the tailings pond.

The B.C. province has ordered Imperial Metals to halt the pollution and assess the damage from its failed Mount Polley mine tailings dam, with deadlines and legal threats for non-compliance. Jennifer McGuire, executive director of the regional operations branch for the Ministry of Environment, said Imperial Metals was to file a preliminary environmental

⁶⁰ *Independent Review of the Mount Polley Mine. June 2011.*

<http://www.documentcloud.org/documents/1262983-final-report-mpmc-master-ta-review-jun21-2011.html>. Accessed September 7, 2014.

assessment report by August 13th providing details on monitoring, initial impacts, and the types of substances released. A more comprehensive report on the failure was due August 15th that was to detail the long-term impacts, including on fish habitat, water quality, and sediments. Failure to comply with the pollution abatement order could result in fines of up to \$300,000 and six months in jail. To date, there is no information available indicating that either report was submitted or that legal action for non-compliance has occurred.

Imperial Metals has built a discharge pipe to Hazeltine Creek downstream from the tailings blockage and is now pumping water from Polley Lake. The goal is for the four pumps to operate at maximum capacity, pumping a minimum of 8,000 gallons per minute per pump. The water then flows downstream into Quesnel Lake where the company and the ministry are collecting frequent samples from the discharge pipe to ensure consistent and acceptable water quality standards are achieved. Water is also being pumped out of Polley Lake into Wight and Springer Pits, two open pits on the mine. Once the water level is reduced to a safe level, the company will commence mitigation and restoration actions in Hazeltine Creek.⁶¹

As of August 30, the breach had not been repaired and heavy-metals sludge continued moving down Hazeltine Creek toward Quesnel Lake. A large cloudy plume of suspended solids in the water, visible from the air, continues to move into and down Quesnel Lake. The B.C. government initially lifted the drinking water ban for the town of Likely and then reinstated it after community members sounded the alarm that the sediment plume had moved to the waters around the town and salmon expert and advocate, Alexandra Morton, found a mysterious blue sheen on the water. At a community meeting on August 27th, Imperial Metals revealed that the sediment plume tests showed elevated iron, turbidity, and manganese within the plume, and is now offering to pay for and install water filters in homes of people who are on wells from lake water.

The most recent governmental water and fish tests revealed that while metal levels are within their guidelines for human consumption in most areas, acute copper and iron levels for aquatic life were “significantly exceeded” at some depths of Quesnel Lake, while fish tissue showed elevated levels of selenium—above guidelines for human consumption—in the liver and gonads. The B.C. Ministry of Environment also found copper, iron, manganese, arsenic, silver, selenium, and vanadium in concentrations that exceeded provincial standards, as well as seven different chemicals, during testing near the Mount Polley mine August 12th and August 15th.⁶² On September 4th the Mount Polley mining facility was inspected by staff from the Ministry of Environment and was found to be out of compliance with the *Environmental Management Act* because effluent was still discharging from the tailings storage facility into Hazeltine Creek.⁶³

⁶¹ Mount Polley tailings pond situation update. August 14, 2014. http://www2.news.gov.bc.ca/news_releases_2013-2017/2014ENV0069-001196.htm. Accessed September 7, 2014.

⁶² Mount Polley Sediment and Water Quality Results. <http://www.newsroom.gov.bc.ca/2014/08/mount-polley-sediment-and-water-quality-results.html>. Accessed September 7, 2014.

⁶³ Non Compliance Advisory Letter. September 9, 2014. [http://www.env.gov.bc.ca/eemp/incidents/2014/mount-polley/pdf/20140909/Order-107461-Non-Compliance-Advisory-LetterV2\(3\).pdf](http://www.env.gov.bc.ca/eemp/incidents/2014/mount-polley/pdf/20140909/Order-107461-Non-Compliance-Advisory-LetterV2(3).pdf). Accessed September

Imperial Metals has stated that it cannot begin cleanup until it deals with the dangerous conditions at Polley Lake, meaning it must drain water from the lake--which it is doing--supposedly into pits and definitely via Hazeltine Creek into Quesnel Lake. It is saying this could take up to six months. At a recent community meeting with government and mine representatives in the town of Likely, concerned community members asked the Imperial Metals representative why the breach hadn't been plugged yet--three weeks and counting after the breach. The company has claimed that it is currently 65% done with dike construction to catch and stop any more debris coming from the tailings pond. An Imperial Metals representative recently mentioned at a community meeting that the "best solution" for cleaning up the tailings may be to just leave them in place.

The debate over whether mining and productive fisheries can co-exist has been a longstanding source of disagreement between PLP's mining proponents and the BBRSDA (and others). The Fraser River fishery, and the mines in its headwaters, Mount Polley specifically, have repeatedly been used as prime examples of successful 'co-existence'.

PLP's (former) CEO John Shively, in comments submitted to the EPA regarding the BBWA:

"While these mines [on the Fraser River, including specifically Mount Polley] have localized effects to fish and fish habitat, there is no evidence to suggest these mines present a past, present, or future risk to the fishery resources of the Fraser River watershed. These mines are examples, with proven track records, of sustainable low impact operation adjacent to important fish habitat in the Fraser River drainage."⁶⁴

He further submitted:

"The Fraser River can provide valuable lessons for development within Bristol Bay."⁶⁵

Track Record at Pebble

Even in the exploration stage, the PLP and State of Alaska have a track record that does not instill confidence in their potential to develop to a higher standard than exemplified at other modern mines. The State of Alaska required no water use permits at all from Pebble or its predecessors from 1988 to 2006, despite Pebble's use of hundreds of millions of gallons of water from anadromous streams and ponds. The state claimed this was a

12,

⁶⁴ *White Paper Series No. 1 – Technical and Regulatory Issues Related to Modern Mining in Alaska. John Shively, CEO, PLP. July 23, 2012. White Paper No. 3: Active Metal Mines of the Fraser River Basin and Fish – Case Studies, pg. 2.*

⁶⁵ *White Paper Series No. 1 – Technical and Regulatory Issues Related to Modern Mining in Alaska. John Shively, CEO, PLP. July 23, 2012. pg. 4.*

misinterpretation and the Superior Court found that it raised questions regarding the state's "diligence to perform duties as stewards of the State of Alaska's public lands". The state began issuing permits for water use in 2007.

In July 2009, several Bristol Bay individuals and organizations filed a lawsuit challenging the constitutionality of the State of Alaska's decision to issue exploration and temporary water use to Pebble. The lawsuit sought public notice and a public interest analysis under Article VIII of Alaska's constitution by the state for these exploration activities. That lawsuit went to trial in December 2010.⁶⁶

After a ten-day trial, despite the significant and compelling evidence of the actual and potential impacts at the Pebble Project, in September 2011 the judge ruled in favor of Pebble and the state. Through the investigation and trial, many water-use violations were discovered at the Pebble site. In 2010, the state fined Pebble \$45,000 for 45 water-use violations that occurred during every year they held their permit. Additionally, DNR admitted to not accurately checking on water use and permit requirements. These violations occurred, in some cases, thousands of feet from where the DNR permits allowed water usage.⁶⁷

These water-use permits are the only permits Pebble has been issued to date. They were violated every year of operation since issuance, and state oversight was unsuccessful in monitoring for violations. With this track record, there is no reason to believe this situation would improve with an operating mine.

⁶⁶ *Nunamta Aulukestai et al, vs. State of Alaska, Pebble Limited Partnership*. Accessed at: <http://www.law.state.ak.us/pdf/press/092811-Nunamta.pdf>

⁶⁷ *The Clean Water Act 404 Protection our Fish, Jobs, and Culture in Bristol Bay*. Nunamta Aulukestai. Steelbird Productions. 2014.

Recommendations for a Final 404(c) Determination that would Protect the Bristol Bay Watershed from Discharges Associated with Mining

Please find below BBRSDA's responses to the questions posed by EPA, Region 10, in its proposed determination:

1. Should the Proposed Determination be finalized?

For the reasons outlined above, the BBRSDA supports the proposed determination that seeks to restrict the discharge of dredged or fill materials that would result in any of the following activities:

1. Loss of streams
 - a. Five or more linear miles of streams with documented anadromous fish occurrence; or
 - b. The loss of 19 or more linear miles of streams where anadromous fish are not currently documented, but that are tributaries of streams with documented anadromous fish occurrence; or
2. Loss of wetlands, lakes or ponds of more than 1,100 acres contiguous with streams or tributaries with documented anadromous fish occurrences; or
3. Stream flow alterations greater than 20% of daily flow in nine or more linear miles of streams with documented anadromous fish occurrence.

The BBRSDA has determined the above restrictions at the Pebble Deposit should be recommended and finalized without delay. The restrictions outlined in the proposed determination are based on conservative estimates of potential impacts associated with mining the Pebble Deposit. BBRSDA asserts that given the global importance of the Bristol Bay fishery, the importance of maintaining intact habitat and biodiversity to sustain salmon fisheries, and the sensitive nature of the waters surrounding the deposit as outlined above, even these conservative estimates represent unacceptable adverse impacts to Bristol Bay fisheries, and therefore warrant a final action under section 404(c) of the CWA.

2. Do you have additional information on potential impacts on the North Fork Kuktuli River, South Fork Kuktuli River, and Upper Talarik Creek watersheds, and downstream reaches of the Nushagak and Kvichak Rivers resulting from mining of the Pebble deposit? Specifically information about: Fish and other ecological resources, Water quality, flora, fauna and hydrology, Wildlife species, Recreation, Drinking water?

The BBWA was a comprehensive look at the existing data and studies already completed in our watershed. Please also take into account the additional information provided above on the value of the Bristol Bay fishery, its sustainable management and marketing, potential risks associated with mining of a copper ore body, and potential cumulative impacts of paving roads for mining in a highly mineralized region. This

information is provided as a narrative from the perspective of thousands who depend on a commercial fishery, and would feel both the literal and figurative 'downstream effects' resulting from mining of the Pebble Deposit.

3. Can you suggest potential mitigation actions that could compensate for the damage caused by mining the Pebble deposit?

For reasons stated above, mitigation of habitat loss or the potential impacts of a spill at the Pebble Deposit are not acceptable considerations for the BBRSDA. It is clear that society, science and technology have yet to achieve the ability to replicate or re-create natural salmon habitat and productivity. The level of development required to mine the Pebble Deposit is an unacceptable activity within our watershed. The BBRSDA therefore cannot suggest potential mitigation actions that could compensate for the damage caused by mining the Pebble deposit.

4. Should the discharge of dredged or fill material be completely prohibited, restricted as proposed, restricted in another manner or not restricted at all at this time? In particular, the EPA Region 10 is seeking comment on whether environmental effects associated with other mine stages or scenarios could provide a basis for alternative or additional restrictions.

In Bristol Bay, no particular section of habitat is more or less important than another; it is the cumulative effect of an entire, intact watershed portfolio that makes Bristol Bay's fishery the dependably sustainable and productive fishery it has been for more than 130 years.

The risks of mineral development to the habitat at the Pebble Deposit can therefore be translated to all similar habitat in Bristol Bay at potential risk from similar development. Mining at a large scale poses a significant risk to aquatic life in Bristol Bay.

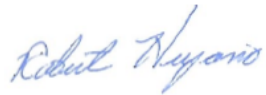
The Bristol Bay fishery, and the \$1.5 billion a year sustainable economy it supports, requires assurance that the resource will be protected in order to remain viable and grow. Restrictions or prohibitions that will guarantee protection of essential salmon habitat from mineral development are a vital way to provide these assurances.

A mine that can be permitted under current state and federal permitting processes would still pose an unacceptable risk to the Bristol Bay watershed. Neither state protections nor the standard federal permitting process are adequate to ensure proper protections. BBRSDA respectfully submits that the Mount Polley tailings dam collapse is living proof that modern dam technologies, permissible under current standards, do not stand the test of time. As predicted by Pebble's former CEO, the Fraser River has provided valuable lessons for development in Bristol Bay. This situation has clearly demonstrated that large-scale mines cannot be safely built and maintained in salmon-rearing watersheds.

In conclusion, proactive restrictions or prohibition of dredge and fill material associated with large-scale mining that would impact fishery habitat should be applied to any 404(c) permits in the Bristol Bay watershed as defined and studied in the BBWA. These prohibitions or restrictions should be rooted in the resource they are aimed at protecting: the Bristol Bay salmon fishery, and not limited to the currently defined risks to it.

The BBRSDA sincerely thanks the EPA for the time and effort involved in the thorough public process it has undertaken to arrive at its proposed determination. In summary, BBRSDA strongly supports the proposed determination and encourages the EPA to finalize it expeditiously.

Sincerely,



Robert Heyano
President