Fish and Wildlife of Alaska's North Slope

FRESHWATER FISH

Eleven species of freshwater fish are year-round residents of the streams, rivers, and lakes in the Arctic Coastal Plain oilfields. Twelve additional species spend some portion of their life in this freshwater environment and some portion in the Beaufort Sea. Arctic grayling (*Thymallus arcticus* or *sulukpaugaq*) is one of the more common freshwater resident species, while northern Dolly Varden (*Salvelinus malma* or *iqalukpik*) is an example of Coastal Plain fish that migrate between fresh and marine waters.

Least cisco (Coregonus sardinella *or* iqalusaaq).

Oilfield activities have the potential to affect these freshwater and migratory fish by impeding movements in streams and rivers or by altering habitat quality. Because of these concerns, ConocoPhillips has been working closely with the Alaska Department of Fish and Game to ensure that new oilfield facilities are constructed under state guidelines designed to eliminate impacts to fish and their environments.

To better understand if facilities were causing problems for fish, a series of studies were conducted during the 1980s and 1990s to evaluate if and how different designs were causing impacts. Studies evaluated stream-crossing structures such as pipelines, roadways, culverts, and bridges. These reviews showed that these structures must be engineered on a site-specific basis to accommodate that location's unique physical and biological characteristics. Issues of permafrost, thermokarsting, ice-rich soils, and complex stream-flow patterns had to be understood.

After years of engineering and biological review, ConocoPhillips has learned how to evaluate and work in these arctic conditions, while protecting the permafrost tundra and also providing unimpeded local drainage that allows for the uninterrupted passage of fish to and from feeding, spawning, and overwintering areas.

Movement and Migration

A potential impediment to freshwater fish movement and migration is the construction of roadways across streams and rivers. Roadway construction in the oilfields requires culverts large enough to accommodate variable seasonal flow rates in individual streams while still allowing the passage of fish. Obstructions to movement are most common when culverts are not properly sized to allow fish passage during peak periods of migration and during peak or minimum stream flows.

Researchers prepare netted fish for identification and measuring.

In the early years of oilfield development on the North Slope, undersized culverts sometimes blocked the upstream spawning migrations of arctic grayling. Early culverts also failed due to thaw settling, or they were not placed at correct depths to allow juvenile fish to pass at low flows. The use of larger culverts specifically designed around the seasonal swimming performance of grayling alleviated the problem. Another culvert design modification from the early Prudhoe Bay design included better placement of culverts into the tundra soil with improved insulation to prevent thawing of the permafrost and subsequent settling of the culvert. More recent information has identified that low flow during late summer can also restrict movements to critical wintering habitats. Stream crossings must also be designed to ensure that flow patterns needed to pass fish during late summer are not altered.

Using lessons learned from these modifications, ConocoPhillips now designs roadways and stream crossings to allow freshwater adult and juvenile fish free access throughout the stream and river systems located in North Slope oilfields. For each new development, stream-crossing designs are evaluated by the state, and stream crossings are required to be constructed and maintained according to specific permit stipulations. When isolated fish-passage problems are identified, structural modifications are made to alleviate the problem.

Habitat Quality and Enhancement

To protect the quality of fish habitats, ConocoPhillips has, for many years, operated under a zero discharge policy which prohibits the discharge of effluent and contaminants to all local waterbodies. Hence, water quality is still judged to be excellent in all lakes and streams in the oilfields. Many of these lakes are used as potable water sources for oilfield camps and facilities.

The Alaskan Arctic Coastal Plain contains an abundance of lakes and steams, giving the impression that habitat for freshwater fish is abundant as well. However, many of the coastal plain lakes are shallow and freeze to the bottom during winter, and thus do not support populations of most types of fish. The lack of overwintering habitat significantly limits the distribution of fish in this region. This limitation provided an opportunity for ConocoPhillips to enhance local fish populations by turning abandoned gravel mine sites into overwintering areas.

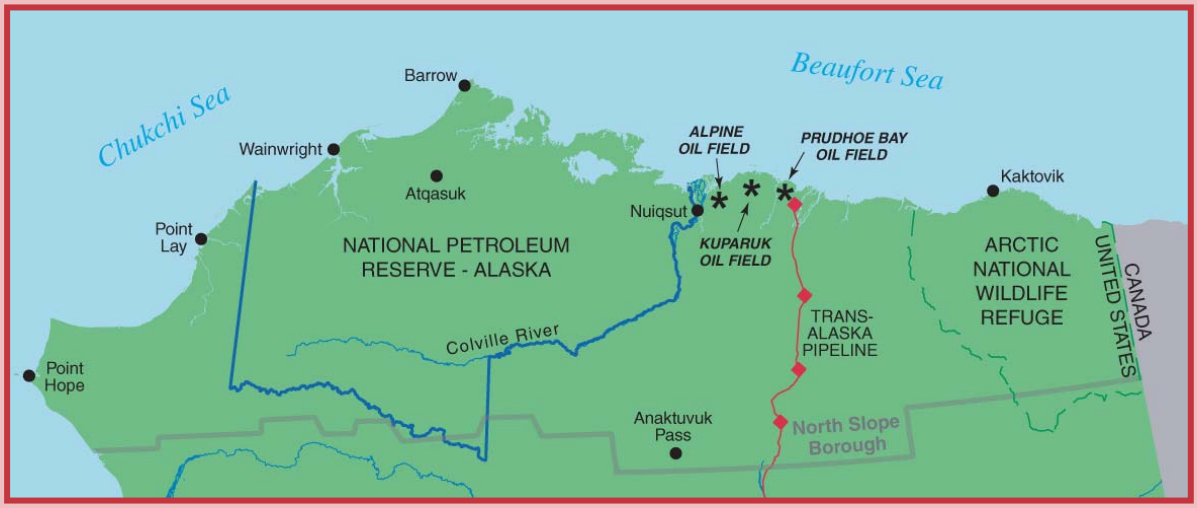
With cooperation and support from ConocoPhillips scientists, the Alaska Department of Fish and Game has studied habitat suitability in oilfield streams where lack of overwintering habitat has restricted fish distribution. Several local tundra streams contain ideal seasonal habitat for arctic grayling, but because these streams freeze to the bottom in winter, fish were not present. Several of these streams have an old gravel pit located within their floodplains. These pits have been rehabilitated into deep water ponds connected to these streams. When suitable spawning and feeding habitat in a stream is judged to be plentiful adjacent to one of these pits, freshwater fish have been transplanted to that stream. The deep water in the gravel pit provides the overwintering habitat needed to maintain healthy fish populations in that drainage. To date, Fish and Game has successfully transplanted arctic grayling into two streams where these fish did not previously occur. These streams are in the ConocoPhillips Kuparuk oilfield.

Comparing juvenile fish of three species. From top to bottom:
Least cisco (Coregonus sardinella *or* `iqalusaaq`)
Humpback whitefish (Coregonus pidschian *or* `pikuktuuq`)
Broad whitefish (Coregonus nasus *or* `aanaakjiq`)

Oil Spill Protection

If a major oil spill reaches a sensitive fish habitat, it has the potential to cause significant impacts to fish populations and subsistence lifestyles. ConocoPhillips has long recognized the need to prevent such impacts from occurring and for years has conducted studies to record and map sensitive fish spawning, juvenile-rearing, and overwintering habitats in streams and lakes near its facilities. Physical and biological studies identify seasonal stream-flow patterns, stream substrate types, bank characteristics, and fish and bird activity and normal seasonal patterns. These data are used to establish a fish-habitat protection plan that is incorporated into each operating area's spill prevention and response plan.

In recent years, ConocoPhillips has also used a strategy of prestaging equipment and predeploying containment booms to further prevent any spilled oil from reaching sensitive fish habitats. This program uses the collected knowledge of each stream's characteristics and selects containment sites based on that stream's flow rates and the most likely volume of spilled oil that might enter that stream. Using bank characteristics and tundra access options, sites that would allow the very best collection and containment of spilled oil are located, and the correct type of equipment for that location is staged at these spots. At some locations, containment booms or other equipment is actually deployed during the summer open-water season. Immediate spill-response teams train and practice mobilizing equipment and containing fluid at these locations. The selection of these locations is also coordinated with local subsistence activity.



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