



# ECOLOGY OF THE COPPER RIVER DELTA

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### THE COPPER RIVER FLATS

Where the Copper River Delta meets the northern Gulf of Alaska, a vast mudflat has formed, creating a complex habitat called an estuary. Influenced by both fresh water drainage and tidal fluctuations, this intertidal mudflat is bisected by an intricate network of subtidal channels. Within the sediments, benthic invertebrates reside. Clams, worms, and tiny crustaceans provide an abundance of food for fish, crabs, birds and marine mammals.

In addition to the ecological importance of this estuary, there is also huge economic importance. It is here that commercial fishermen fish for the famed Copper River salmon. Fishing the flats is a livelihood that drives the economy of Cordova and other Prince William Sound communities. The wildlife found here also supports a subsistence lifestyle.

The Copper River Delta, is at risk to both anthropomorphic and naturally occurring disasters. The Trans Alaska Pipeline crosses six major tributaries of the Copper River. A



*Aerial photo of the Copper River Flats.*

breach of the pipeline at one of these sites, or a tanker spill in Prince William Sound or in the Gulf of Alaska would pose a severe threat to the ecology of the Copper River Delta. Rising global temperatures could potentially have a negative effect on certain species in the region. And, as evidenced from the 1964 earthquake, this region is susceptible to upheaval and sinking, changing the landscape and destroying habitat.

### OUR STUDY

In the wake of such a disaster, baseline data from this habitat would be beneficial for recovery efforts, monitoring, and management. At the Science Center, we conducted the first detailed study of the Copper River Delta estuary.

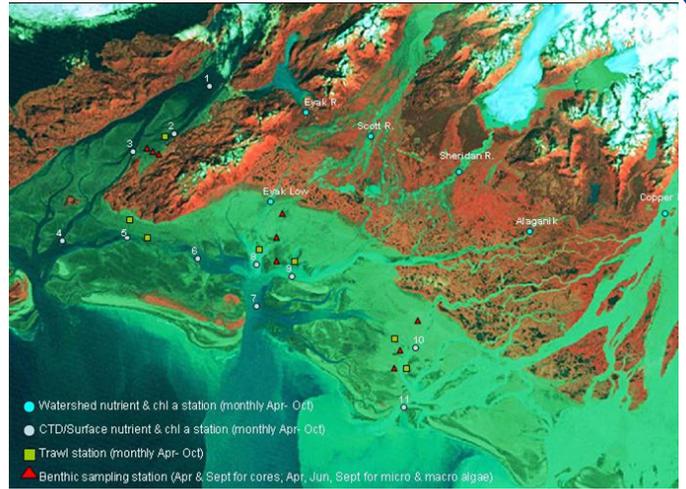
Our main goal was to estimate the distribution, abundance and production of benthic invertebrates residing in intertidal sediments of the Copper River Delta. In order to better understand the benthic invertebrate community, we also wanted to look at the top-down (predator) and bottom-up (nutrient and primary production) processes, that affect them.



*Invertebrate samples collected at one of the intertidal plots. Access to these remote sites was made possible by a hovercraft. Photo by Rob Eckley.*

## OUR APPROACH

We developed a comprehensive sampling program on the western Copper River Delta and southeast Prince William Sound (Orca Inlet). Between 2001 and 2006, we sampled the intertidal benthic invertebrate community at a series of plots. In 2002 we established a series of seven stations to sample the fish and crab communities that inhabit the Delta's intertidal and subtidal waters. Starting in 2003 we sampled the temperature, salinity, and turbidity at 11 estuarine stations. We also documented nutrient and chlorophyll a levels at the 11 stations, as well as five major rivers and sloughs entering the estuary.



*Aerial image of the western Copper River Delta showing the spatial extent of the Copper River outflow and the network of mudflats throughout the brackish water portions of the Delta and Orca Inlet.*



*Collecting water samples for nutrient and chlorophyll a analysis.*

## WHAT WE LEARNED

Our study documented an abundant benthic animal community that supports many economically important species (e.g. salmon smolt, juvenile halibut, lingcod, and dungeness crabs) as well as wildlife (e.g. shorebirds, waterfowl, and sea otters).

The most dominant species of benthic invertebrates are *Macoma balthica* (clams), corophium (amphipods), and spionids and phyllodocids (polychaete worms). Species diversity and density increased with distance from the Copper River. Salinity and turbidity (water clarity) are variable throughout the year in the Copper River Delta estuary; this leads to limited

species composition, since fewer species are capable of adapting to fluctuating water conditions. In Orca Inlet, salinity levels are stable and turbidity is low. These conditions support a more diverse group of invertebrates at higher densities.

Our trawl surveys for benthic fish and mobile invertebrates revealed that the estuary is critical habitat for many animals. Over the course of five sampling seasons, we captured 49 species of fish and five species of invertebrates. The most common groups of fish were the flatfish (10 species), sculpins (10 species), and lingcod/greenling (five species). The most dominant species were starry flounder, snake prickleback, Pacific staghorn sculpin, and dungeness crab.

## CONCLUSION

This region is well known for shorebird migration and the commercial salmon fishery. We now have the data to show that this estuary is a very complex system. It is home to many benthic invertebrates and fish, which reside here year-round. Changes in the water conditions from season to season, year to year, have a profound effect on these animals. If a natural or human-caused catastrophe occurred, the benthic community would likely be disrupted and have a lingering affect on those which depend upon them.