



# Polar Bear Non-invasive Genetic Sampling Methods (*eDNA*)

**Objective:** This is an ongoing project in which we are refining the methods used to non-invasively monitor polar bears by sampling *environmental DNA (eDNA)*. This is DNA that the bear “sheds” into the environment. This work seeks to supplement existing polar bear data sets gathered from USGS and others, while also addressing concerns of North Slope subsistence communities about other (more invasive) polar bear research methods. In response to these concerns, we have been developing a method that can genetically “capture” a bear from this environmental DNA that is left behind in its footprints.

**Method:** Skin cells are shed as a polar bear walks through the snow (Fig. 1). Scooping up bear tracks in the snow, allowing it to melt, and filtering out the cells (Figs. 2a and 2b) provides the genetic materials that can be used in genetic population estimates. This method is in its earliest stages, but once it has been refined, it will be completely NON-invasive. It will also be possible for local residents to collect the snow from tracks as part of a large scale regional approach to monitoring polar bear abundance, movements, and habitat use. A larger sample size improves the population estimate.

**Importance:** This exciting new method has great potential to decrease the direct impact of research on polar bears, as well as allow local subsistence users to participate in collecting the data that will better inform decision makers on how best manage polar bears.



**Figure 1 – Polar bear foot pad as source of DNA.** The skin on the foot pads of polar bears is worn off by crusty abrasive snow. This leaves shed skin cells behind in the tracks. If the skin cells can be collected, and the DNA extracted, then the bear’s identity and sex can be determined using standard genetic methods.



a) Collecting the snow from polar bear tracks.

**Figure 2 – Collecting and isolating skin cells for DNA extraction.**

Polar bear tracks are located. From each set of tracks, the upper-most layer of snow is scooped from 10-20 footprints (a). This snow (which fills a 2-gallon plastic bag) is brought inside and allowed to thaw slowly. Once fully melted, the water is then pumped through a filter (b) to isolate the skin cells. The filters can then be shipped to an outside lab for genetic analysis.



b) Filtering the melted tracks to collect the skin cells

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