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## A retrospective look at the physiological stress response of polar bears: implications for health and reproduction

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## Data Management Plan

### 1. Types of data, samples, and other materials to be produced

Two types of data will be generated by this project:

- a) Archived biological hair samples are in individually labeled dry sealed envelopes. Samples are kept dry and organized at USGS facilities in Alaska. We will maintain a digital database of all tissue (*i.e.*, hair) samples retained in the laboratory. Once extracted from the hair, hormones will be retained in a -80°C freezer until analysis. Remaining sample extracts and hair samples will be retained in a -80°C freezer or in original sample envelopes in the laboratory for no less than 5 years following collection. Resulting data from these samples will be scanned and archived in BOX.com after the data has been transcribed into spreadsheets within BOX.com and checked for accuracy. Box.com is a cloud storage system used by Utah State University. Files are backed up nightly at multiple sites. Box.com ensures data integrity, includes version control, and is password controlled, encrypted and HIPAA compliant.
- b) Hair samples: Once initial processing is complete, samples will be transferred to cryogenic vials to prevent evaporation, and stored in an -80°C padlocked freezer until needed. These vials will be kept in clearly labeled sample boxes organized in chronological order and by study number for easy relocation. The freezer has a backup alarm to protect and preserve samples. Once hair samples are analyzed, resulting data will be entered into a database that can be related to the field-based studies. Samples will be maintained in the -80°C freezer for no less than 5 years following collection.

### 2. Standards to be used for data and metadata format and content

*Findability* - All data and metadata generated from this project will persist with unique identifiers in the Dryad Data Repository or USU Digital Commons. Data can be easily searched, accessed, and cited from each of these repositories.

*Accessibility* - Data and metadata will be openly accessible at the Dryad Data Repository, or USU Digital Commons. Data may be embargoed until publication or 3 years after the end of the funding period, whichever comes first.

*Interoperability* - The project "Open Science Framework Wiki" includes instructions on standards for file naming, spreadsheet organization, file management, and coding, and these will be based on recommendations from the USU Research Data Management Systems. Archived data, will conform to metadata standards of each repository. Both Dryad and Digital Commons repositories are based on the Dublin Core metadata standard

*Reusability* - Each of the archival repositories we have selected perform validity checks and version control, thus enhancing long-term reusability. Metadata will accompany all data.

### **3. Policies for access and sharing**

Data will be disseminated using the following methods:

- a) Upon completion of the study and initial analyses, data related to published articles will be posted on Dryad Data Repository. Dryad is an international repository of data underlying peer-reviewed manuscripts in the biological sciences. This repository allows scientists to validate published findings, explore new analysis methodologies, repurpose data for research questions unanticipated by the original authors, and perform synthetic studies. Any other relevant auxiliary data will be deposited in USU digital commons.
- b) Investigators will present data and discussion of results at national and international meetings in the fields of physiology, ecology, conservation, and natural resource management.
- c) Investigators will publish results in peer-reviewed journals in the fields of physiology, ecology, conservation, and natural resources enabling broad distribution of the data across disciplines.
- d) Following publication, the PI and co-PIs will report findings on their laboratory/institution websites. This will expose this and related work to the general public and colleagues, potentially enhancing distribution of raw data through the other described means.

### **4. Policies and provisions for re-use, re-distribution, and the production of derivatives**

All research products will be freely distributed in the repositories described above. There are no privacy, copyright, or confidentiality issues associated with the project data. Specifically, following publication of results, the PI will allow access to any remaining blood/tissue samples collaborators and researchers with an established track record or suitable references. Additionally, established researchers who may be interested in the generated electronic data for meta-analysis or modeling will also be allowed access.

We will also provide a synopsis of the work and the data supporting it to the Alaskan USGS. The researchers will be available to work with this groups to best use the data for conservation planning and decision making. The data will also be helpful in informing policy related to potential regulation of climate change.

### **5. Plans for archiving data, samples, and other research products**

Final versions of both intramural and extramural publications will be retained in the USGS IPDS and will be identified as permanent records in the USGS NARA Records schedule. Dr. French will be responsible for retaining all resulting endocrine data and samples collected for the proposed studies. Following the completion of the proposed studies, remaining sample extracts and tissues may be transferred back to Alaska USGS upon their request. To ensure the entire data set remains compiled, Dr. French will maintain copies of all data sets.