The Barrow Area Information Database (BAID) and Suite of Online Interactive Maps:
A Cyberinfrastructure Supporting Science in Northern Alaska

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Abstract

BAID provides a suite of tools and services to support Arctic science with a focus on the National Science Foundation research hubs of Barrow, Atqasuk and Ivotuk on Alaska's North Slope. BAID includes the locations and other information related to over 9,600 research plots and instrument locations. This ongoing effort incorporates both new research locations and sampling sites dating back to the 1940s. An overview of project activities and application development since 2000 will be covered including: student participation, DGPS data collection, the BAID Internet Map Server (BAID-IMS), lightweight interfaces developed with ArcGIS Server API for Flex, Keyhole Markup Language (KML) development, the publication of interoperable Open Geospatial Consortium services and Federal Geographic Data Committee metadata.

BAID

The BAID database currently includes the locations of over 9,600 research plots and instrument locations. This ongoing effort incorporates both new research locations and sampling sites dating back to the 1940s. BAID is considered a projecting tracking system that includes high level information about who is doing what, when and where in the Barrow area.


Cyberinfrastructure

Cyberinfrastructure (CI) is the technical infrastructure, organizational practices, and social norms required to collectively provide for the smooth operation of work in which interactions may be distributed across time and geographic location. (Edwards, et al., 2007; Cyberinfrastructure Vision for 21st Century Discovery, March 2007).

Environmental change is affecting the sustainability of ecosystem goods and services globally and there is an urgent need to predict the future state of the Earth System and understand how humans will need to adapt. This urgency is driving paramount programmatic and operational changes in the ecological and environmental sciences. Increasingly, the environmental sciences are:

- Shifting towards more data drive science.
- Increase usage of advanced field-based instrument technology.
- Requiring data management, optimization, integration, verification, and visualization.

By using CI, BAID facilitates environmental data collection, transmission, optimization, archival, visualization, and discovery.
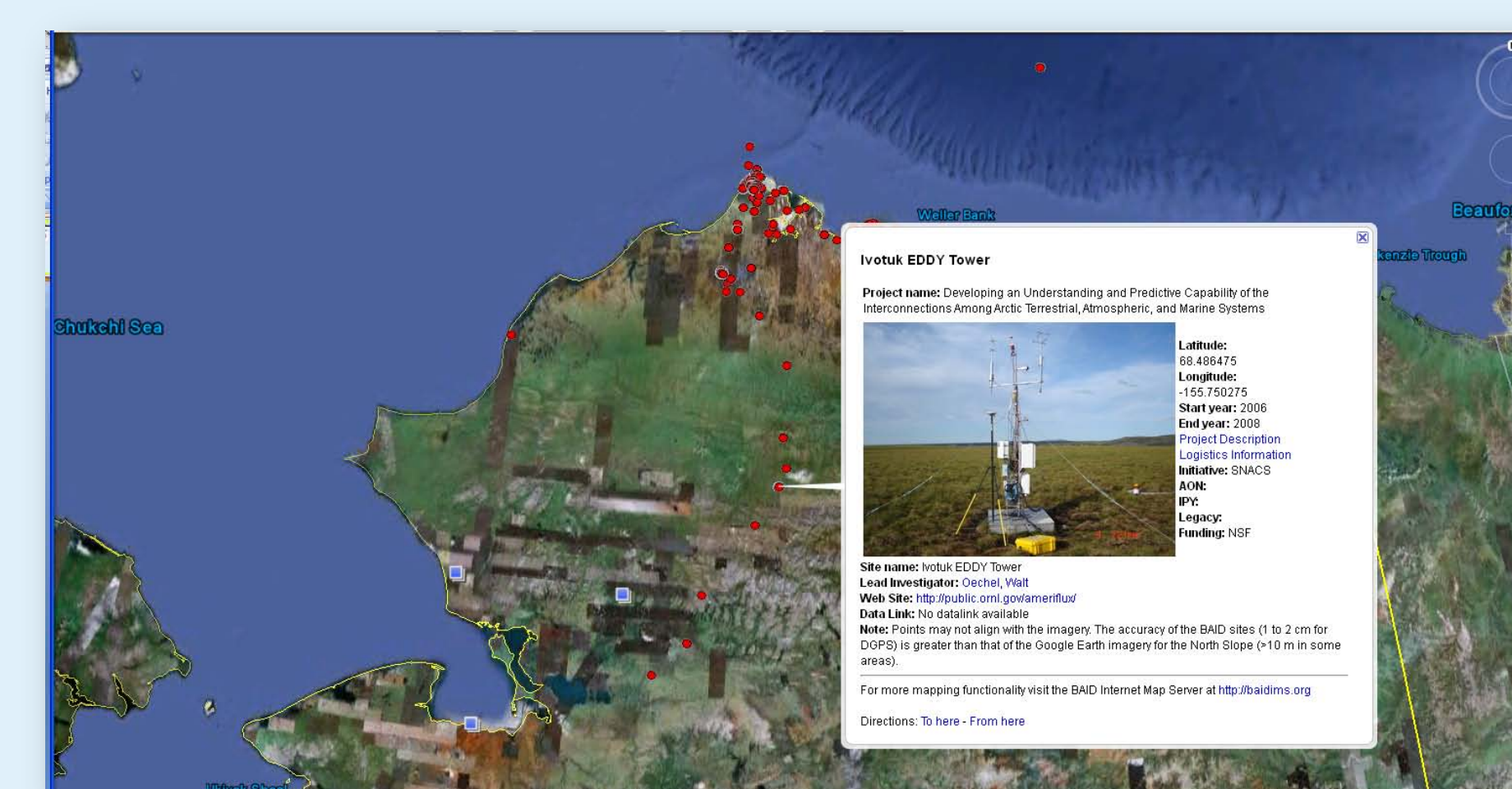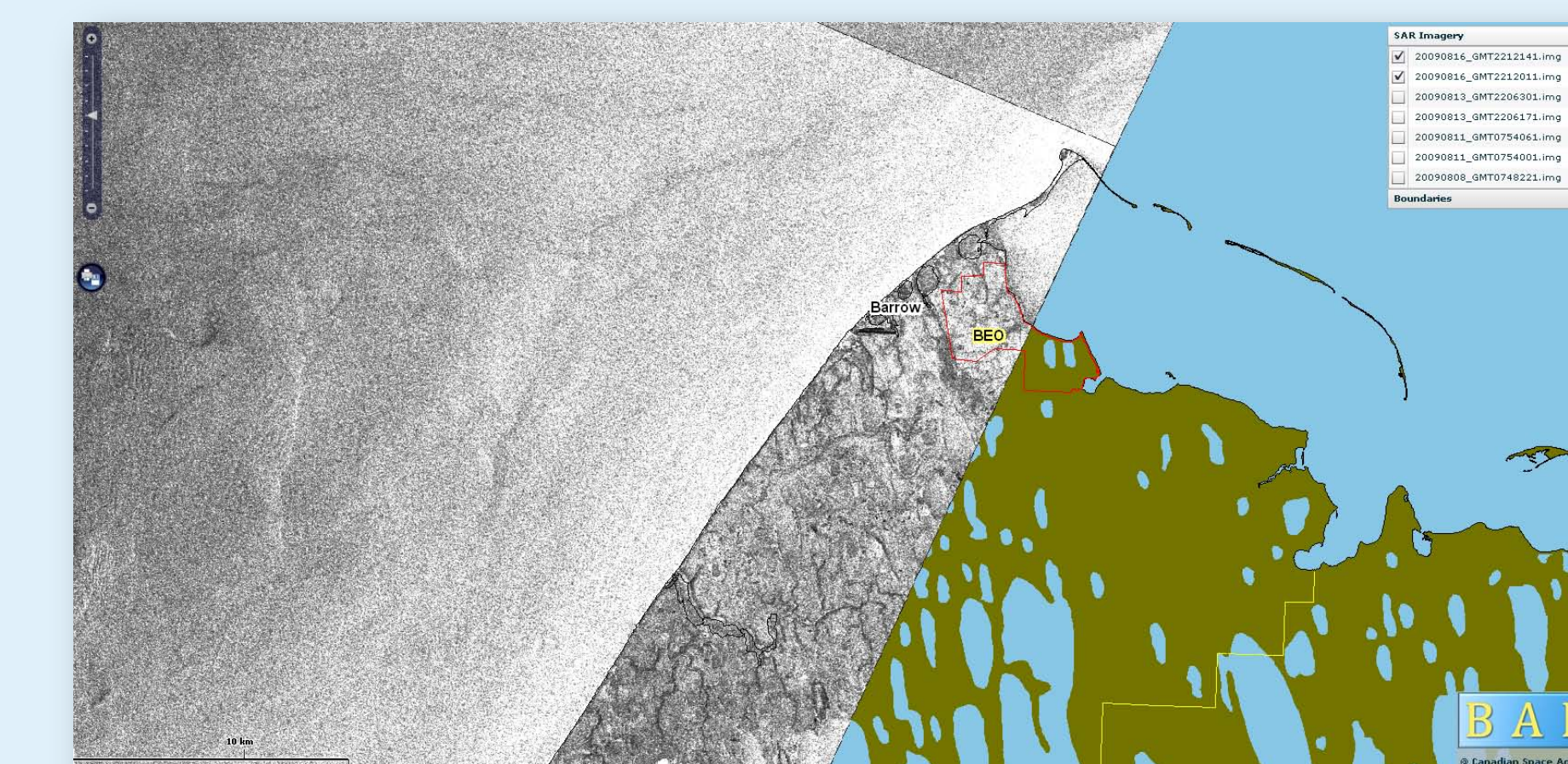
Application Suite
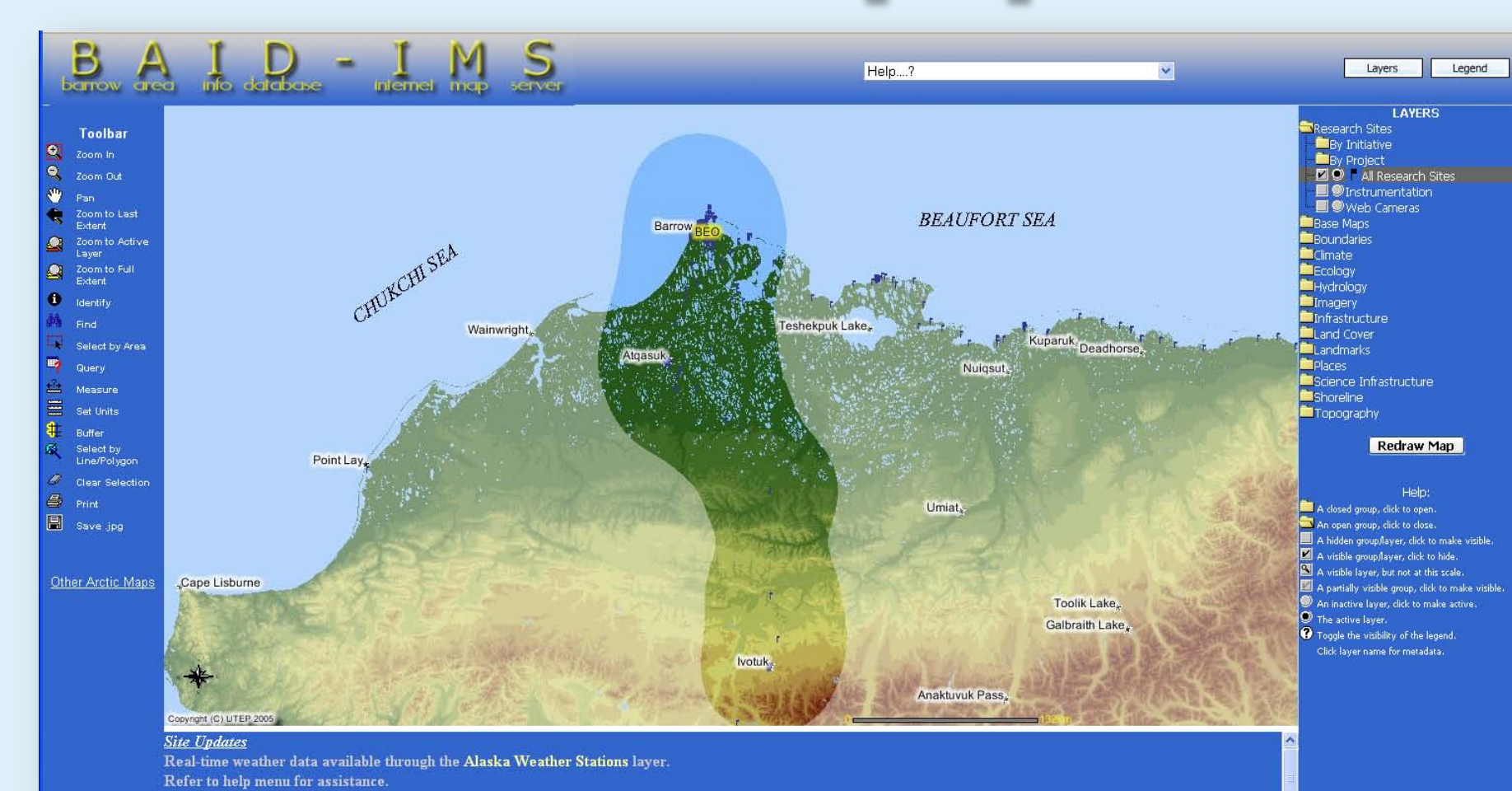
BAID IMS – This application features more map layers and has greater GIS (Geographic Information System) functionality, such as the ability to search for projects by discipline, keywords, and other types of information.

BAID in Google Earth – This application is for those users that would prefer viewing research site information in Google Earth.

BAID Instrumentation Browser – This application allows users to search for instrumentation and browse information about associated projects.


BAID Synthetic Aperture Radar (SAR) Imagery Viewer – This simple application is used to browse and print SAR imagery.

Data Collection

Barrow Arctic Science Consortium (BASC) and UNAVCO operate a high-precision Trimble GPS (RTK and Post-process) surveying system in Barrow and Atqasuk in support of National Science Foundation sponsored research. The system provides centimeter level differential corrections to properly equipped users in the vicinity of the Barrow Environmental Observatory (BEO), allowing for stake-out surveys and real-time survey data collection. The equipment may also be used for post-processed static and kinematic surveys, and post-processing software is available from BASC. The system is not compatible with hand-held GPS navigation receivers.
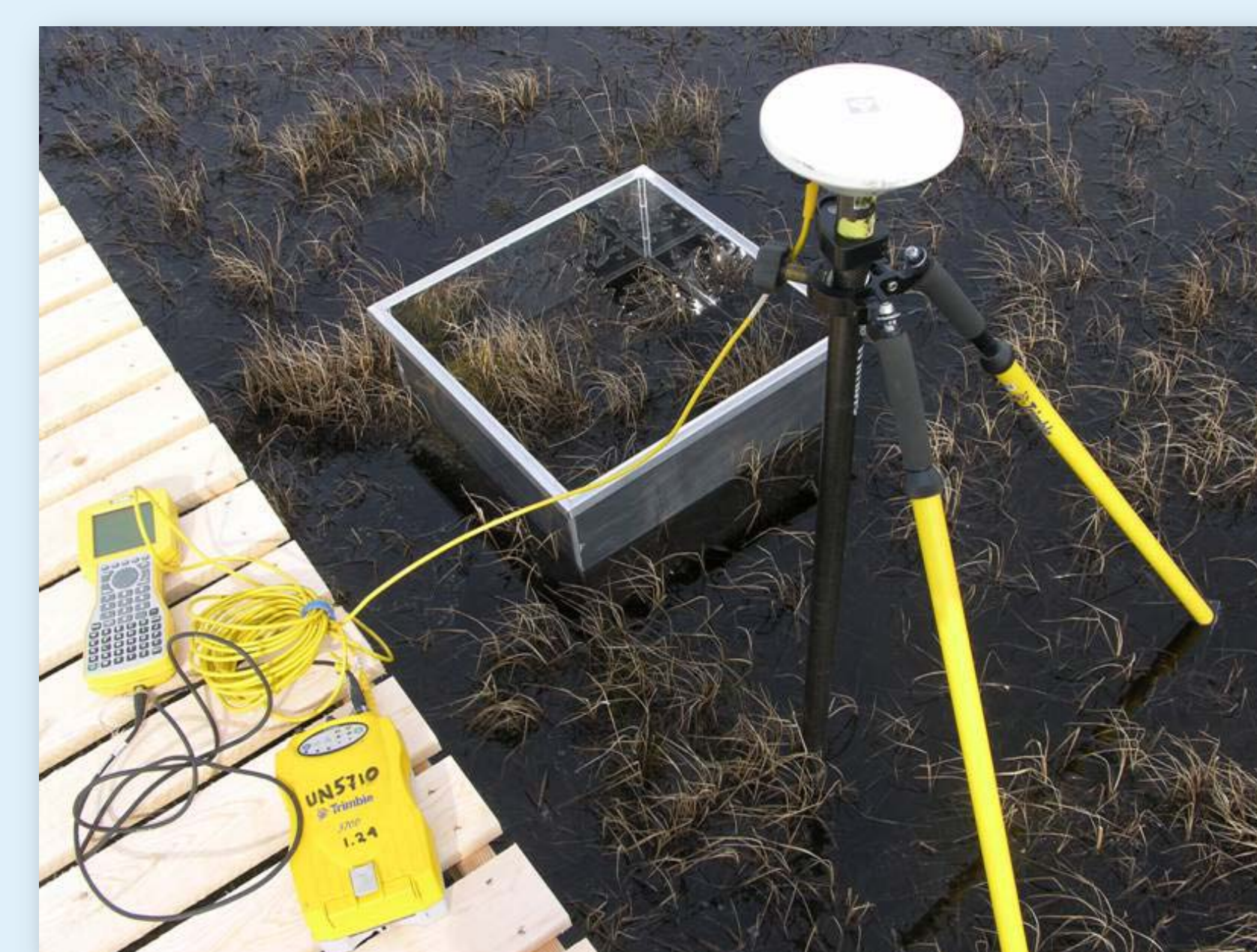
Data Interoperability

Each of the BAID visualization tools integrates project information from a central database. Open Geospatial Consortium web services and best practices for data archiving with Federal Geographic Data Committee standard metadata have been implemented to ensure the information is useful for years to come.

Arctic Science

BAID helps preserve the legacy of research at Barrow which dates back to the first International Polar Year (1882-1883). BAID is used for logistics support and planning. Field scientists utilize BAID for co-locating instrumentation with infrastructure, such as power and roads or other synergistic projects. BAID has been used to avoid disturbance of old research sites and has aided researchers seeking to re-sample old sites.

Student Participation

BAID has involved over 20 undergraduate and graduate students in the field data collection, processing and programming since its inception. "Young Scientists" are often paired with experienced long-time area researchers to help locate old sites and perform data rescue tasks. BAID has given numerous students an opportunity to gain real world experience with scientific field work, Differential GPS, GIS and web-based mapping technologies.

This Cyber-ShARE subproject is training the next generation of environmental scientist in cyberinfrastructure and ecoinformatics research using novel case-driven approaches that meet key challenges in the environmental sciences.

Web Map Technology

The BAID web map application suite was created using the following:

- Adobe Flex – An open source framework for building Rich Internet Applications for Adobe Flash Player. By using Flex, rich content can be delivered consistently across different web browsers that have the player installed.

- ESRI ArcGIS – A suite of GIS software products used to author and publish map data in a variety of formats. These formats include REST map services, KMZ files, Web Feature/Map Services, among others.

- ESRI ArcIMS – Internet Map Server applications run on web browsers and allow users to perform GIS functions on several data layers. IMS technology is declining in popularity due to falling short against newer web mapping technologies, which offer better look & feel, speed, usability, and cross-platform support.

- KMZ – A compressed KML file that contains geographic visualization data in XML (Extensible Markup Language). KMZs can be displayed in Google Earth, ArcGIS Explorer, or other GIS software. A KML network link can be used to provide the latest version of data layers.