

### 3. AON: Vision Statements and Calls for Action

There is broad consensus for developing enhanced, coordinated and sustained observing sites, systems and networks in the Arctic. This consensus is represented by two widely-quoted reports: the SEARCH Implementation Plan (SEARCH, 2005) and a US National Academies report on AON (NRC, 2006). They are vision statements and calls for action, and the main focus of this section.

The Arctic Climate Impact Assessment (ACIA) and the Second International Conference on Arctic Research Planning (ICARP II) also call for improved observations and monitoring. These are summarized briefly at the end of this section.

#### *a. SEARCH*

SEARCH is a US Federal inter-agency program that relies on a strong partnership with academia. The SEARCH Implementation Plan is presented as a point of reference for IPY and AON planning. The implementation activities are organized into three categories: Observing; Understanding; Responding. The report also describes a data management strategy and the importance of education and outreach.

The SEARCH Implementation Plan (SEARCH, 2005) identifies seven key scientific questions that lie at the heart of SEARCH:

1. Is the Arctic system moving to a new state?
2. To what extent is the Arctic system predictable, i.e., what are the potential accuracies and/or uncertainties in predictions of relevant Arctic variables over different time scales?
3. To what extent can recent and ongoing climate changes be attributed to anthropogenic forcing rather than to natural modes of variability?
4. What is the direction and relative importance of system feedbacks?
5. How are terrestrial and marine ecosystems and ecosystem services affected by environmental change and its interactions with human activities?
6. How do cultural and socio-economic systems interact with Arctic environmental change?
7. What are the most consequential links between the Arctic and Earth systems?

The SEARCH Implementation Plan identifies a wide range of observing activities required to aid in answering these questions: improvement of observation density, co-location and integration; improvement of coverage to close observation gaps; development of optimal observation and sampling strategies; observation of key processes and studies of feedbacks; acquisition of paleoenvironmental data over critical time periods; development of networks; data rescue; development of data archival and distribution systems; and, utilization of innovative and effective technology.

The SEARCH Implementation Plan begins to define the components of AON and places them in priority locations regardless of national boundaries. The priorities are summarized in six maps, which are reproduced here as Figures 6 through 11. Each map has a disciplinary focus – Atmosphere, Ocean and Sea Ice, Hydrology and Cryosphere, Terrestrial Ecosystems, Human Dimensions, and Paleoenvironment – and is intended to provide general guidance to the geographic priorities of each of the six disciplinary topics.

The SEARCH Implementation Plan recognizes that the development of AON as envisioned (Figures 6 through 11) will require close coordination and collaboration among US and international programs. To further international cooperation in the development of AON during IPY, SEARCH scientists entered into a Memorandum of Understanding with the leadership of DAMOCLES (Developing Arctic Modelling and Observing Capabilities for Long-term Environmental Studies), an EU-funded IPY study of Arctic air-ice-ocean interactions. The SEARCH for DAMOCLES (S4D) partnership contributes to the development of ISAC.

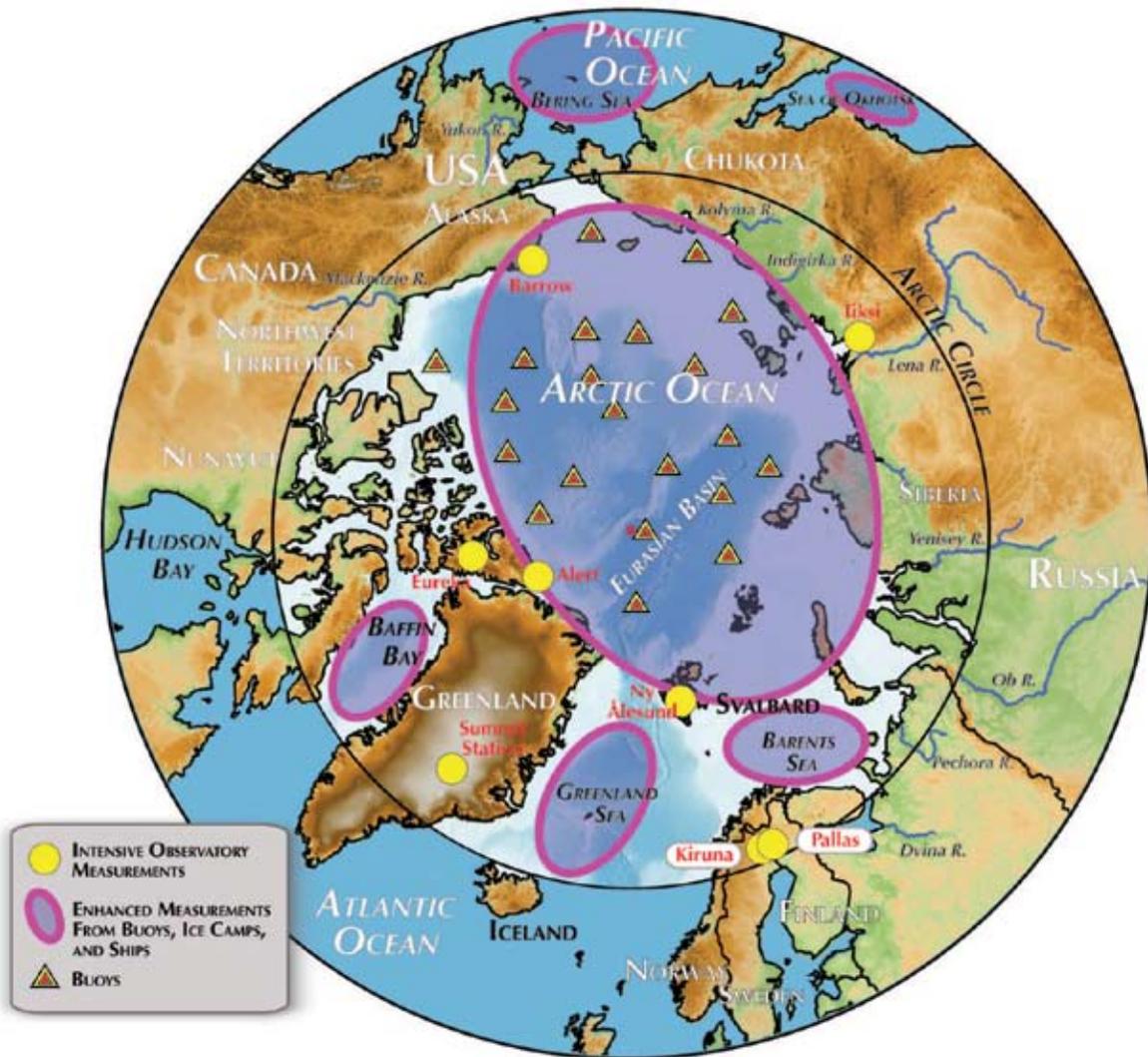


Figure 6. Priorities for atmospheric observing activities as illustrated in the SEARCH Implementation Plan.

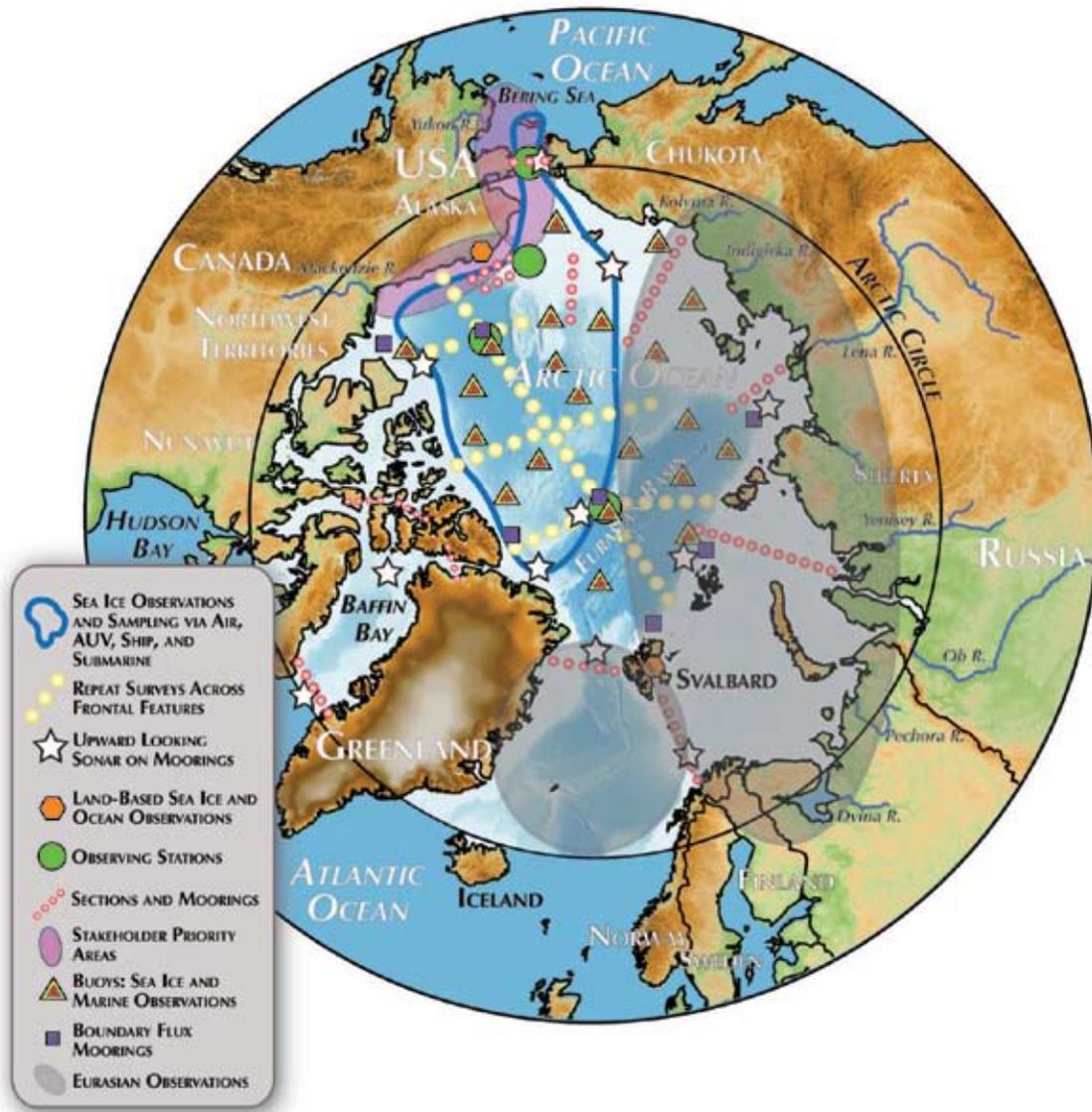


Figure 7. Priorities for ocean and sea ice observing activities as illustrated in the SEARCH Implementation Plan. The locations of all the sections, buoys and moorings are intended only as general suggestions for deployment schemes.



Figure 8. Priorities for hydrological and cryosphere observing activities as illustrated in the SEARCH Implementation Plan.

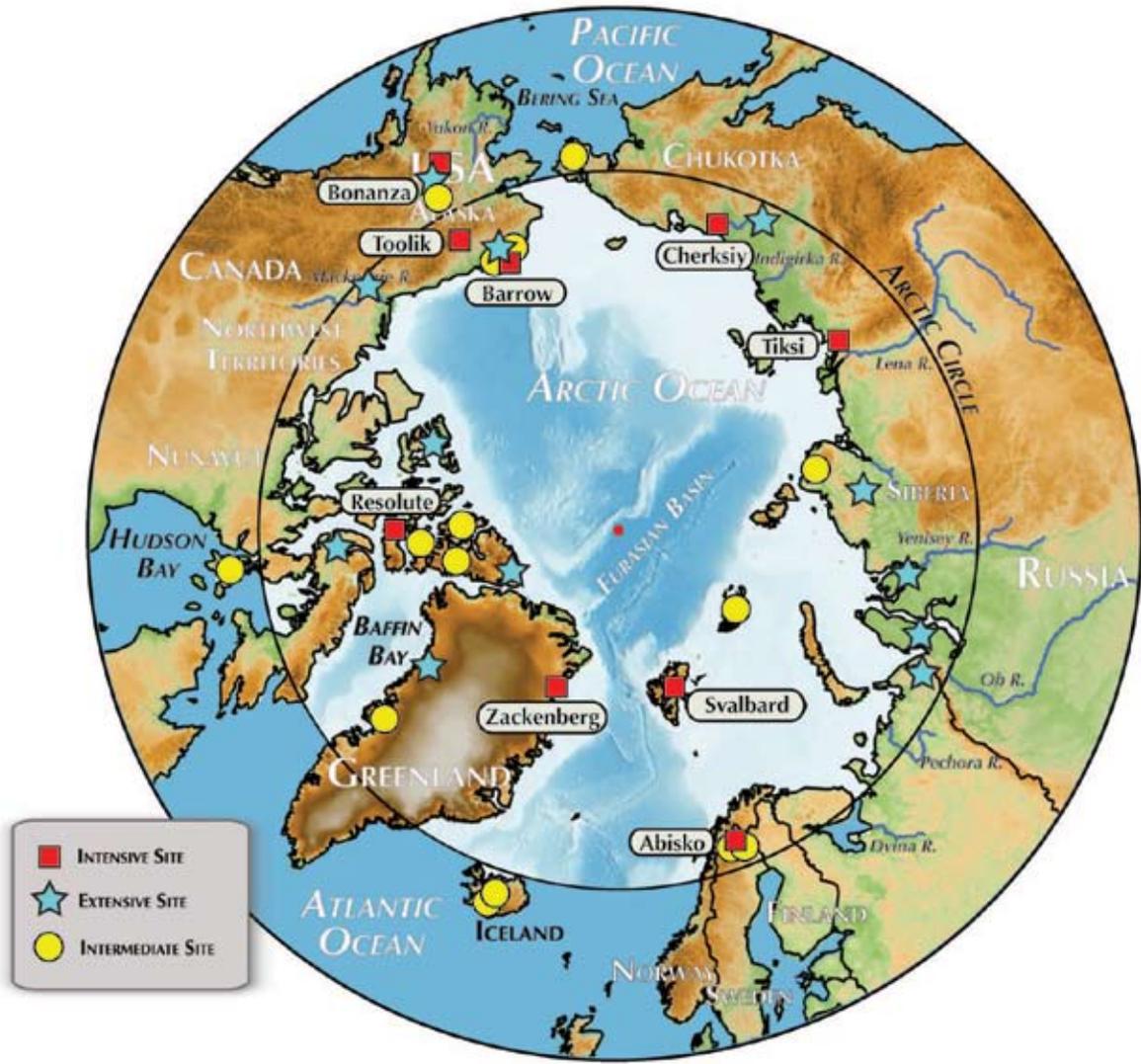


Figure 9. Priorities for terrestrial ecosystem observing activities as illustrated in the SEARCH Implementation Plan. Not all potential sites are shown. Observatories range from intensive, integrated “flagship” observatories to intermediate or extensive sites where only a few variables are measured.



Figure 10. Priorities for human dimensions observing activities as illustrated in the SEARCH Implementation Plan. The yellow line generally follows the boundary of the Arctic as used by the Arctic Monitoring and Assessment Program. Inside that boundary the SEARCH Implementation Plan calls for the compilation of data on the following: vital statistics and demographic measures; livelihood and economic data; health, education and other indicators of well-being; trends related to transportation, tourism, fisheries, mining, energy and other natural resource development.

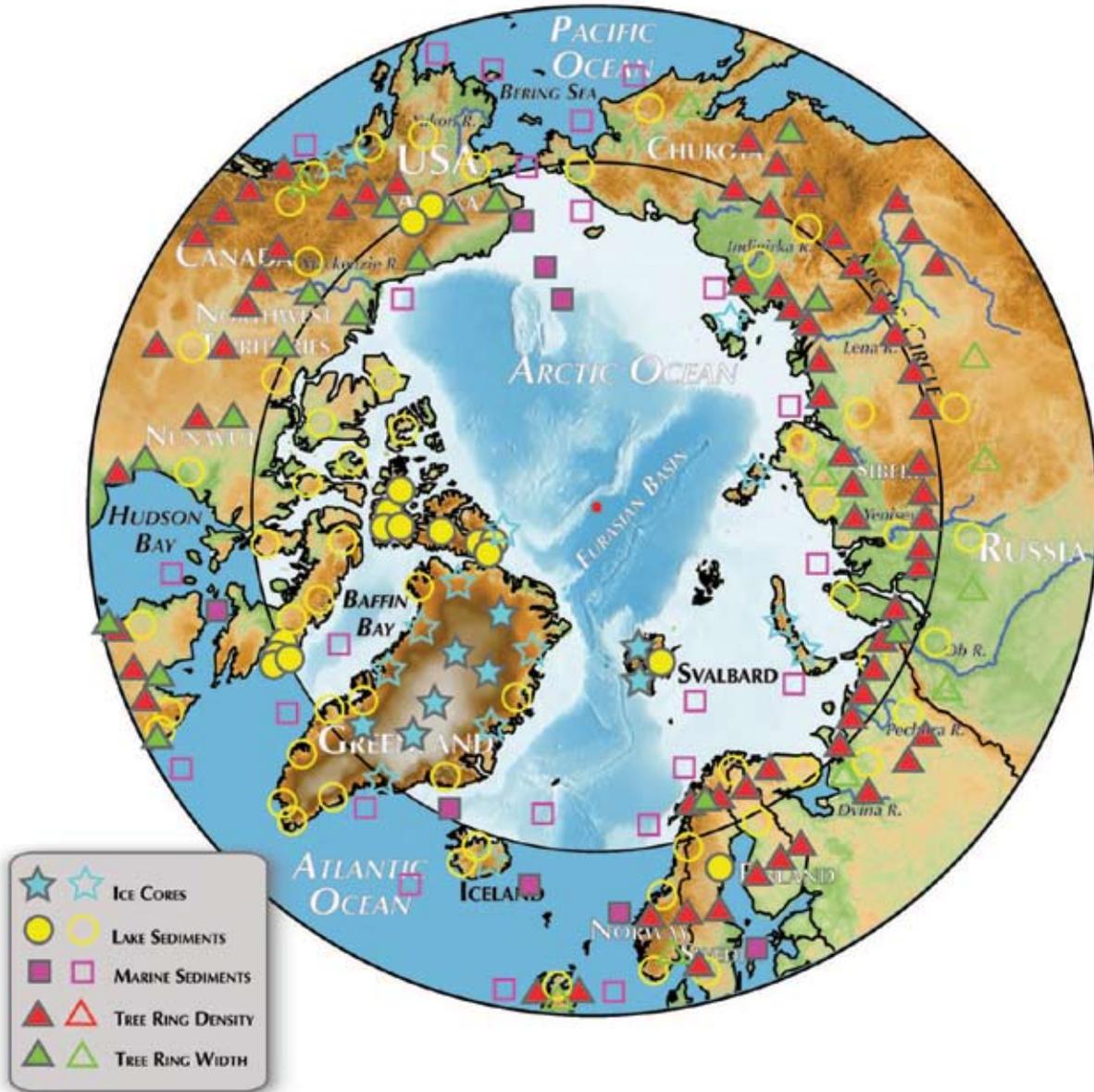


Figure 11. Priorities for paleoenvironment observing activities as illustrated in the SEARCH Implementation Plan. Solid symbols indicate locations of existing records. Open symbols indicate idealized distributions of records necessary for confident multi-proxy assessment of past natural climate variability.

Research-based initiatives such as SEARCH, S4D and ISAC, working with operational agencies and Arctic residents, have an important role to play in defining and coordinating an international approach to comprehensive Arctic observing.

## ***b. Toward an Integrated AON***

The SEARCH Implementation Plan was followed by a US National Academies report - *Toward an Integrated Arctic Observing Network*. The over-arching recommendations of the report (National Research Council, 2006: p. 96) are:

“An Arctic Observing Network should be initiated using existing activities and with the flexibility and resources to expand and improve to satisfy current and future scientific and operational needs. In its initial phase, the network should monitor selected key variables consistently across the arctic system.”

“Work to design and implement an internationally coordinated Arctic Observing Network should begin immediately to take advantage of a unique window of opportunity created by a convergence of international activities during the International Polar Year that focus on observations.”

The NRC report recognizes that AON must be based on long-term, coordinated, international resources and efforts that are dedicated to sustaining the network. It calls for a “system design assessment” as an early step, along with efforts to sustain existing observing capabilities. AON would be continuously improved and enhanced through user feedback and infusion of new technologies and understanding. It would include a data and information management system, and involve Arctic residents in a meaningful way.

As noted at the beginning of this previous section, the SEARCH Implementation Plan and the NRC AON report are vision statements and calls for action. This IARPC report is a first step toward a

coordinated, integrated and sustained AON based on a partnership among US Federal agencies, academia, Arctic residents and other stakeholders, and other countries.

## ***c. ACIA and ICARP II***

ACIA (2005) priorities include the “collection of data ranging from satellite, surface to paleo data on the climate and physical environment, to rates and ranges of change in arctic biota, and to the health status of people.” ACIA notes that long-term time series of climate and climate-related parameters are available for only a few locations in the Arctic, and states that “continuing long-term acquisition of data is crucial, including upgrading of the climate observing system throughout the Arctic and monitoring snow and ice features, the discharge of major arctic rivers, ocean parameters, and changes in vegetation, biodiversity, and ecosystem processes.”

ICARP II (2007) recommends “that an observation strategy be developed that integrates remote sensing, in situ observations/monitoring data, and modeling from the beginning, and enable feedbacks among them. This would involve development of calibration/validation strategies and effective sampling strategies, use models to inform observations and data to initialize, validate and improve models.” ICARP II calls for “observations and models to describe how the Arctic system works, how it is changing and what those changes mean for the future.”