MAB NORTHERN SCIENCES NETWORK

NEWSLETTER

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MAB NSN RESEARCH ACTIVITIES

INTERNATIONAL TUNDRA EXPERIMENT

NORDTEX meeting in Copenhagen

The Nordic ITEX (NORDTEX) meeting in Copenhagen, from the 5th to 6th of February, gathered twenty-four participants not only from Nordic countries but also from the USA and United Kingdom. The meeting was hosted by the Danish Polar Center.

The main goals of the meeting were to discuss the experiences of preliminary field work, to standardize methods, and to plan future activities, cooperation and coordination.

The ITEX project was designed to obtain information on the responses of specific arctic and alpine plant species to expected climate change in northern areas. Permanent monitoring sites will be established over the circumpolar area. In Nordic countries there will be two ITEX sites in Finland (Kevo and Kilpisjärvi Biological Research Stations), two in Sweden (Abisko Scientific Research Station and Latnjajaure field station) and one in Norway (Ny Ålesund in Svalbard). Iceland is looking for appropriate sites. The USA has proposed three areas (Barrow and Toolik Lake in Alaska and Niwot Ridge in Colorado) and Canada five (Churchill Northern Studies Centre, Inuvik-Tuktoaktuk, Baker Lake, AINA Research Station in Truelove Lowland and Hot Weather Creek in Ellesmere Island).

Participants of the ITEX meeting at the Danish Polar Center

Field work has already begun in 1991 at Latnjajaure in Sweden, where Dr. Ulf Molau has marked *Cassiope tetragona* and *Saxifraga oppositifolia* individuals for monitoring of plant phenology and reproductive success. Temperature and snow-melt manipulations were also made to investigate their effects on reproduction. ITEX-related studies have also been done in Svalbard by Dr. Ann-Marie Odasz and in Abisko by Dr. Mats Havström. Dr. Jarle Holten is conducting an interesting transplantation experiment in Norway. The effects of temperature stress on plant communities will be followed in transplanted soil blocks that are moved to lower altitude vegetation zones.

Dr. Per Mølgaard (Denmark) has gathered phenological observations from Greenland by using a questionnaire that was handed out to Greenland expeditions before the 1991 field season. He has also made experiments in which the

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temperature is raised by using simple angular shields of translucent plastic. These shields (named by meeting participants as ITEX corners) have been successful in raising the inside temperature 2 to 3 degrees C°.

Dr. Terry V. Callaghan from United Kingdom described a retrospective analysis of climate-related plant growth in three widespread plant species in the circumpolar arctic (*Hylocomium splendens*, *Huperzia selago* and *Cassiope tetragona*). The growth pattern of these species, when compared to climate data, can provide data on the effects of climate on growth for periods extending back 20 years. Material for this study has been collected from Alaska, Greenland, Iceland, Svalbard and Sweden. The United Kingdom has also started an arctic terrestrial ecology research program that will be conducted mainly in Svalbard and Abisko, Sweden. The program consists of five projects aimed principally at understanding the potential effects of global change on terrestrial ecosystems (see a more detailed description of the project on page 8 of this Newsletter).

U.S. ITEX plans have been formulated into a five-year proposal to the National Science Foundation. Population responses to warming will be examined in detail for two species at each site, one species of which occurs at all three sites. Two experiments are proposed at each site with each species. In the first experiment intact natural communities will be subjected to experimental warming using Reemay fabric-covered 'greenhouses.' Environmental changes and the resulting phenotypic selection and population response of the target species will be followed and measured. In the second experiment plants of each species will be cloned under controlled conditions, and then planted in field transplant gardens where they will be subjected to control and warming treatments. The objective of this experiment is to determine the ability of tundra plants to adjust to climatic warming through acclimation or through adaptation (genetic change).

Dr. Steve McLean (University of Alaska Fairbanks), has tested the effects of several materials used to raise the temperature like clear plastic, fiberglass and acrylic fabrics like Ayla and Reemay. Many materials caused not only raise on a mean temperature but a great increase in extreme temperatures and changes in the CO_2 and H_2O balances as well. Different materials also have different light transmission properties. Reemay and clear plastic were recommended. A lively discussion about the properties and effects of different materials followed. Standardizing methods for obtaining comparable results was seen as essential. The usefulness of ITEX-corners will be studied further. The advantages of the corners are that they are cheap, simple to construction, and the open structure does not cause as many side-effects as greenhouses.

Drs. Jarle Nilsen and Oddvar Skre from Norway gave presentations on subarctic-subalpine mountain birch studies. These studies have many similarities to the ITEX project. Their main objective is to obtain information on the eco-physiological responses of mountain birch to global warming. Cooperation between these two projects could be possible, for example, in Kilpisjärvi, where both ITEX and mountain birch projects have field sites.

Dr. Kari Laine from Finland described the Finnish tree-line monitoring project. This monitoring, started in 1983, will follow alterations in the tree-line over ten-years periods. Cooperation with this project will also be considered. The overall recommendation to ITEX members is to establish sites in the vicinity of the tree-line so that alterations in the tree-line can be monitored, too.

Dr. Laine also gave a presentation of long-term monitoring in Kilpisjärvi Biological Research Station in Northern Finland. The phenology of about 15 plant species has been followed since 1973. Monitoring of animal species has been done for an even longer period: small mammals since 1946, birds since the 1950's and predators from the 1970's. Climate data extends back to 1964. The meeting found this kind of information very relevant for ITEX, and a questionnaire will be sent to ITEX sites, and other northern field stations, to obtain information on their past and present monitoring activities.

The Danish Polar Center (DCP) houses the Secretariat of ITEX. Dr. Per Mølgaard will be Secretary and will coordinate methods of standardization, data sharing and communication. Coordination will also include organizing annual meetings. The resulting proceedings and synthesis volumes should have long-term value, judging from the experience of the International Biological Program Tundra Biome Project.

Affiliation of ITEX with other organizations should be made more concrete than it is at present. The Northern Sciences Network (NSN) of the UNESCO Man and the Biosphere (MAB) Programme recognizes ITEX as one of its programs. The MAB Secretariat will explore the formalization of ITEX as a MAB International Comparative Study. Recognition, endorsement or even inclusion in larger organizations or programs,

THE PRINCIPLES OF ITEX

* The science of global change requires international cooperation and coordination. This is especially true for studies in the northern circumpolar lands. ITEX is a vehicle to foster international science and cooperation.

* ITEX is a coordinated international program to assess the effects of temperature warming on arctic and alpine plant populations by using a network of northern, circumpolar sites which are beyond altitudinal and latitudinal treeline.

* At each ITEX site a basic, common experiment will be performed. Other experiments will also be carried out but this may be done at only a few sites. Taken together, these experiments seek to quantify the potential ecological and evolutionary responses of representative tundra plant populations to the increased growing season temperatures predicted for northern regions.

* The overall objective of ITEX is to determine the potential of tundra plants to adjust to climate warming through acclimation or through adaptation (genetic change) and to partition the effect of climatic warming on key phenological, morphological, and physiological traits into environmental and genetic components.

* It is intended that ITEX will function as a model program for other aspects of global change research. It is also intended that ITEX will emphasize the need for population level research in global change research programs. The ITEX sites and the ITEX approach will be useful for many aspects of global change research. Further, it is intended that ITEX, by virtue of the simplicity of its basic design and focus, can be implemented in a shorter time frame than larger total system studies.

THE RECOMMENDATIONS OF ITEX

* Participation in ITEX requires the establishment of a standard temperature warming experiment which uses small ventilated greenhouses erected during the growing season. Standard climatic variables will also be measured at a site. It also requires a commitment to data sharing and to allow access to a site and its biological resources.

* Encouragement is given to scientists at each participating ITEX site to develop other more sophisticated experiments and observations. It will be necessary that studies to assess the genetic variability of plant populations and their genetic potential to respond to temperature warming be carried out at some sites or at central locations and laboratories. Studies of trace gas balance for the various experiments would also be fruitful at a few sites. Retrospective analysis of biological material containing historical proxy data, such as, annual growth markers, is also encouraged. Such material could be sent to a single laboratory for analysis.

* The following questions will drive the common ITEX warming experiment and the transplantation studies. Are populations of arctic and alpine species able to accommodate to warmed climatic conditions over the long term?

  How will the selective environment change as a result of experimental warming? Will experimental warming result in a shift in the selective regime?

  Is phenotypic variability in warmed and control plots due to environmental effects, genetic variability, or a combination of the two?

such as IASC (International Arctic Science Committee) or IGBP (International Geosphere Biosphere Programme), should be explored. Such recognition will help obtain funding for ITEX.

Immediate review must be made of relevant literature, of existing proven methods of manipulation and measurements, and of available site data bases and documentation. Such reviews will prevent unnecessary duplication of past efforts and will result in better experimental methods and faster implementation of ITEX.

Immediate attention must be given to producing a precise 'Methods Manual' for the basic, common experimental design. This document should contain details of site selection, materials to be used, climate and response variables to be measured, and measurement methods and standards. This standard Methods Manual must be completed by the start of the 1992 northern field season.

Boulder meeting decisions:
At the general ITEX meeting in Boulder, Colorado, March 10, a new Steering Committee was appointed for ITEX. Dr. Ulf Molau (Sweden) was elected chairman of the Committee and Dr. Marilyn Walker (USA) as a co-chair. Other members of the Steering Committee are Dr. Patrick

Webber (USA), Dr. Josef Svoboda (Canada) and Dr. Per Mølgaard (Executive secretary, Denmark).

The principles of ITEX and recommendations of the meetings are listed on page 3. If you want to have more detailed information or want to be on the mailing list, contact Dr. Per Mølgaard, Danish Polar Center, Hausergade 3, DK-1112, København K, Denmark.

MEETINGS

CLASSIFICATION OF CIRCUMPOLAR ARCTIC VEGETATION

Attendees at the International Workshop on Classification of Circumpolar Arctic Vegetation signed the following resolution on the preparation of an arctic circumpolar database, classification and vegetation map. The meeting was held at the Institute of Arctic and Alpine Research, Boulder, Colorado, 5-9 March, 1992. The resolution states:

Whereas, the distribution, characteristics, and history of arctic flora and vegetation are of essential importance with regard to

(1) knowledge of how circumpolar terrestrial ecosystems interact with climate and contribute to the changing earth system,

(2) conservation of the biodiversity of these regions, and

(3) increasing exploration and development in the circumpolar nations;

and whereas, our knowledge of arctic regions and the environmental constraints on arctic vegetation has increased;

and whereas, no single existing classification or map accurately portrays the synthesis of existing knowledge of the vegetation of the circumpolar Arctic;

Be it resolved that the international community of arctic vegetation scientists undertakes the joint tasks of:

(1) Creating a database of type releves for phytosociological analysis, followed by a comprehensive database of releve data, using the Panarctic Flora database as a common taxonomical base;

(2) Developing a comprehensive synthesis of phytosociological information through the publication of a Prodromus of arctic vegetation syntaxa, publication of a bibliography of arctic vegetation studies, and development of a revised syntaxonomical classification for the circumpolar region;

(3) Compiling, editing, and publishing an arctic circumpolar vegetation map depicting the distribution and boundaries of arctic vegetation north of the arctic tree line at a scale of approximately 1:7,500,000 and a legend that is accepted and understood by the international community of plant scientists;

Furthermore, we request the endorsement of the Man and the Biosphere Northern Sciences Network (MAB/NSN) for this project and ask their assistance in announcing that the cooperation, interest, and scientific expertise of the international community is welcome in the development of these products.

Finally, be it resolved that the undersigned scientists begin the task of developing the organizational mechanism to accomplish these tasks and a schedule that will produce draft products by the Arctic Workshop in 1995, when we will again convene as a group.

DECLARATION ON THE PROTECTION OF THE ARCTIC ENVIRONMENT:

First meeting of the Arctic Monitoring and Assessment Task Force

by E.P. Myers (National Oceanic and Atmospheric Administration)

The first meeting of the Arctic Monitoring and Assessment Task Force (AMATF) was held during the 2-6 December 1991 in Tromsø, Norway. The U.S. Delegation to the Task Force was led by Dr. Edward P. Myers (National Oceanic and Atmospheric Administration) and included Dr. Paul Dunn (U.S. Forest Service) and Dr. Dan Jaffee (representing the Governor's Office, State of Alaska). Other countries and organizations that were represent at the meeting were Canada, Denmark, Finland, Iceland, Norway, and Sweden. Observing countries were Germany, Poland, and the United Kingdom. Other observers were the Barents Sea Delegation, International Arctic Science Committee (IASC), ICES, Inuit Circumpolar Conference, Nordic Sami Council, and the United Nations (UNEP and ECE).

The Task Force's objective was to set the guidelines for the future operation of AMAP. The meeting was chaired by Mr. Lars O. Reierson and co-chaired by Mrs. Carola Björklund, both of Norway. Key agenda items were to develop the mandate, rules, and procedures for AMAP; discuss cooperation between AMAP and IASC; discuss the contents and harmonization of existing programs and the initiation of additional work, including the development of an assessment program; discuss practical work that needed to be undertaken; discuss quality control and data archival; and elect a Chair and Vice-Chair, each to have 2-year terms.