EXTENDED ABSTRACTS
FOR AN
INTERNATIONAL CONFERENCE ON

"THE DEVELOPMENT OF THE NORTH AND PROBLEMS OF RECULTIVATION"

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EDITOR'S NOTE:

This compendium of abstracts was assembled from post conference, Russian to English, translations done in Syktyvkar. I have tried to confine the editing of these translations to smoothing the English without altering the intent or sense of the original. Where I have failed in this I accept full responsibility and offer apology to the author(s) and to the reader.

City names and country designation have been changed to conform to current usage, except for the conference resolutions accepted by the attendees. Currency values remain as they were in 1991. Plant and animal taxonomic designations have not been altered nor have volumetric, granmetric or scalar values.

For the readers convenience the abstracts have been organized under broad topic headings rather than in alphabetical sequence as they were formulated originally.

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promote the natural recovery (temperature over 10°C; sunshine; thunderstorms etc.) There are regions with normal, low, and very low degrees of self-purification. The European northeast has a low or very low potential for self-purification.

Accumulation of contaminants in the North is more intensive than in mid-Russia, due to low energetic climatic factors. With every year of development in this region the process of contamination becomes more acute with new contaminants added to old undecayed pollutants in soil, vegetation and river beds. It is necessary to define the permissable concentrations of pollutants.

APPLICATION OF GEOGRAPHIC INFORMATION SYSTEMS TO THE PROBLEM OF CUMULATIVE IMPACTS IN THE PRUDHOE BAY OIL FIELD, ALASKA

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Much of the future energy resources of the world will come from existing and new oil fields in arctic regions. The Prudhoe Bay Oil Field (PBOF) in northern Alaska was the first major arctic oil field in large-scale development in other parts of the Arctic. Cumulative impacts are defined in regulations published by the Council on Environmental Quality (CEQ) as:

> ...the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR 1508.7).

Although environmental legislation in the USA requires evaluation of cumulative impacts (CEQ 1978), very few environmental impact statements treat the problem adequately because standard methods and a comprehensive approach to address cumulative impacts are largely lacking. Existing methods fail to consider indirect effects which may occur years after the direct disturbance. The first step towards predicting future events of development must be based on historical models. Other published studies have emphasized the importance of examining large landscapes and of using long-term historical case studies (Horak et al. 1983, Beanlands et al. 1987, Bedford and Preston 1988).

This analysis utilizes geographic information systems to trace the history of development from 1968 to 1983. We mapped three 22 km^2 areas of intensive development at 1:6000 scale, and the entire field (500 km^2) at 1:24,000 scale. Recent advances in computerized cartography and geographic information systems (GISs) lend themselves well to such "historical" studies of terrain change. Maps of natural geobotanical characteristics (including vegetation, soil landforms, surface forms, and percentage open water; anthropogenic disturbance into a single master map termed an 'integrated geobotanical and historical disturbance map' (IGHDM). Using the ARC/INFO GIS software, a great variety of maps can be produced, including: (a) maps of single geobotanical characteristics, (b) derived maps based on combinations of geobotanical characteristics (e.g., landscape sensitivity maps), (c) maps depicting historical natural and anthropogenic changes, and (d) maps utilizing complex models based on experimental and observational data. Methods of making integrated maps are described in Dangermond and Harndon (1990). Complete methods of making the IGHDM are described in Walker et al., (1986, 1987).

Analyses of the maps show several important trends: (1) Within the entire field, 350 km of roads were constructed; 21 km^2 of tundra were covered by gravel; another 14 km^2 were flooded because of road and gravel-pad construction. (2) The pace of development was nearly constant throughout the 15 years of the study. (3) Within the three areas of intensive development, an average of 29% of the areas had some form of disturbance by 1983. (4) Within an individual map area, road construction tended to level off after about five years, but construction of new and expanded gravel pads continued in a linear fashion throughout the period of study. (5) On the 'flat thaw-lake plains' landscape unit, indirect impacts (those that are unplanned for, such as flooding, thermokarst, dust effects, construction debris, and off-road vehicle trails) exceeded the direct impacts (roads, gravel pads, and gravel mines) (840 ha vs. 560 ha). In the wettest portions of the oil field, indirect impacts (mainly flooding) were more than double those of direct impacts (522 ha vs. 223 ha).

In the 'floodplains and terraces' landscape unit, direct impacts (mostly gravel mines) were dominant. (6) In the flat thaw-lake plains, dry and moist sites were disproportionately selected as construction sites. This has important implications for wildlife species, particularly waterfowl and shorebirds, that utilize these areas as nesting sites in wetland complexes. (7) Anthropogenic impacts within the study areas ere two orders of magnitude greater than natural disturbances within the same area from 1949 to 1983 (746 ha vs 8 ha per 66 km^2). Flooding and thermokarst are important aspects of cumulative impacts in arctic wetlands. For roads on elevated berms. Thermokarst appears to be a synergetic impact. Prior to 1977 there were low levels of thermokarst, but it increased thereafter, probably due to many interacting causes such as road dust, the slow death of vegetation near the rods, and flooding of roadside environments.

Proposed development in the Arctic National Wildlife Refuge (ANWR) in northeast Alaska raises serious concerns regarding the prospect of several very large oilfields in this pristine region. The oil industry has stated that the PBOF is not a good example of the type of development that could be expected in ANWR because of new technology developed during and since exploration of the PBOF and the different type of terrain likely to be encountered in ANWR (rolling foothills in ANWR vs. flat thaw-lake plains in the PBOF) (Robertson 19898). A newer field, called the Kuparuk Oil Field (KOF), in the rolling terrain west of

Prudhoe Bay may be a better analogue, and identical methods should be used to compare the two networks are similar and the combined effects of the two fields essentially doubled the rate of development on the North Slope after 1978 when development began in the KOF. IGHDM techniques could be employed in the Soviet arctic if accurate base maps, preferably at a scale of 1:6000, and a series of aerial photographs showing the history of development are available.

GEOBOTANICAL CHRONITORING AND RECLAMATION PROBLEMS OF THE NORTH

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At present it is necessary to have ecological mapping as a basis for nature preservation measures. Maps must be both large scale to make it possible to single out separate biots and sufficiently small scale to document the ecology and plan nature preservation on vast areas.

In this respect geobotany (applied geobotany to be exact) is of considerable interest. It differs from other biological sciences because, for all practical purposes, it includes all ecotops that are already understood, i.e., agrocenoses, natural range lands, regions of solonchacks (saline soils), forest reserves and improved lands. Researches of *giprozems* study only agrocenoses, scientists of forest institutes are engaged in the study of forest reserves, scientists of ecological preserves and national parks study standard areas that are usually not large in size.

Geobotanical mapping is done according to a regional administrative standard which makes it easier to collaborate with local authorities and to have base maps from Agroprom and VISHAGI. The scale of mapping depends on the natural zone and the need of detailing biotopes (community habitat). It may range from 1:10,000 to 1:500,000. For instance, at the scale of 1:10,000 it is possible to single out areas of 0.1 ha., i.e., very small biots (for example, separate big trees). Scales of 1:500,000 can be used for a long term planning of nature preservation measures.

The idea of "geobotanical chronitoring" means that periodic inspections (once in every 10 to 15 years) can play a considerable role in nature preservation. Thus, comparing the results of the last two inspections it is possible to learn if there is any damage done to the environment by the activities of people. During the inspection it is easy to see symptoms (indications) of disturbances to the ecology. These symptoms are: an intensive growth of some types of plants (or a group of species) that may have been brought from other regions, the appearance of paths, pits, hillocks and other features caused by anthropomorphic pressure.