TERRESTRIAL ECOSYSTEMS STUDIES

November 11 2020

Laboratory of Terrestrial Ecosystems

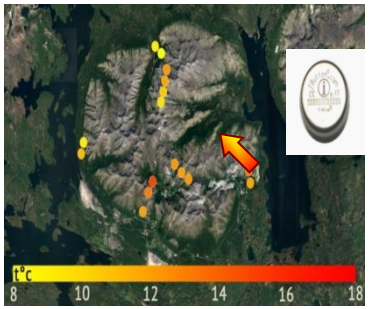
The main purpose of the laboratory is to solve the fundamental problem of studying the patterns of functioning of terrestrial ecosystems: biodiversity, structure and functions of northern taiga forests, development of methodology and methods for their monitoring, rational use, conservation and restoration in conditions of changing natural and anthropogenic factors.

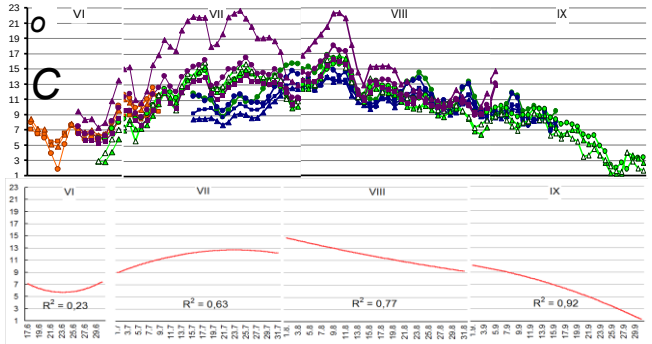
- Study of the links between biodiversity and ecosystem functions of forests of the North;
- Assessment of key anthropogenic and natural factors affecting ecosystem functions;
- Study of biogeochemical cycles of carbon and nutrients in forests and forest-tundra ecotones under conditions of the combined action of anthropogenic factors and climate change;
- Development of a methodology for monitoring terrestrial ecosystems in the North: northern taiga forests and forest-tundra ecotones, taking into account international standards and approaches;
- Development of a methodology for restoring disturbed terrestrial ecosystems;
- Development of scientific bases for territorial nature protection, design and maintenance of the functioning of specially protected natural areas in the North.

VULNERABILITY OF LAND ECOSYSTEMS IN THE EURO-ARCTIC REGION TO ENVIRONMENTAL AND CLIMATE CHANGE

Modern problems of the terrestrial ecosystems

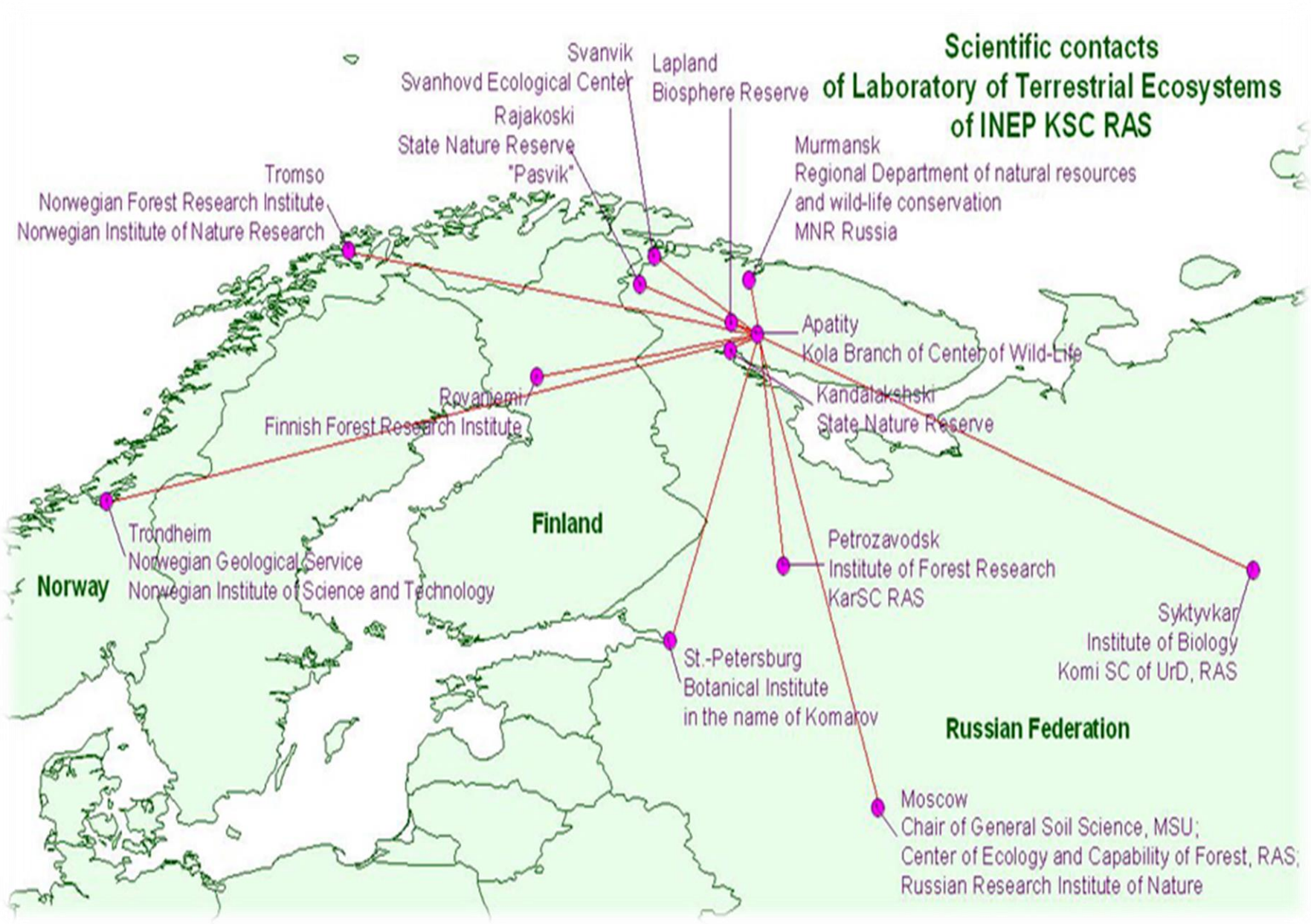
- Influence of natural and anthropogenic factors (felling, fires, environmental pollution)
- Climate change
- Invasions of new species, emergence of forest diseases
- Reduction of biodiversity
- Unorganized tourist flows





Temperature dynamics in the organogenic horizon of mountain soils in the Khibiny

Laboratory of Terrestrial Ecosystems



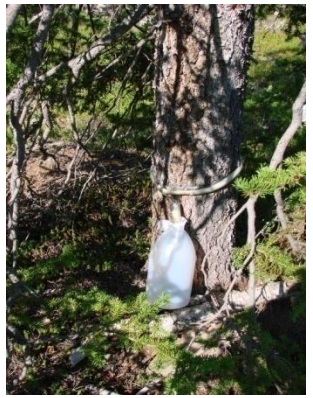
Aerial pollution

Long-term monitoring studies of terrestrial ecosystems (since 1991)

The plots are equipped at the level of European standards and are located along the gradient of Cu-Ni smelter in pine and spruce forests of varying degrees of digression.

Chemical conditions transformation of main monitoring objects









Development of methods to restoration of disturbed territories

In the vicinity of the Monchegorsk rehabilitated technogenic wastelands (more than 80 hectares) disturbed by the impact of the Severonickel copper-nickel plant.

Development of methods to restoration of disturbed territories

In the vicinity of the Nickel and Zapolyarny rehabilitated technogenic wastelands (more than 20 hectares) disturbed by the impact of the Pechenganickel copper-nickel plant.

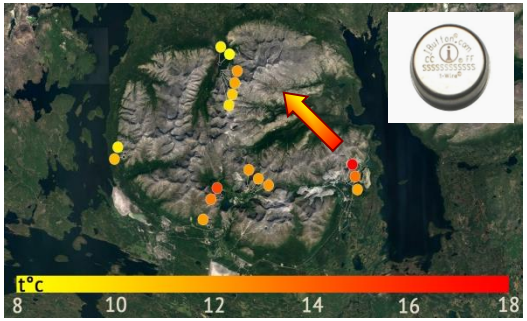
SOIL-ZOOLOGICAL RESEARCHES

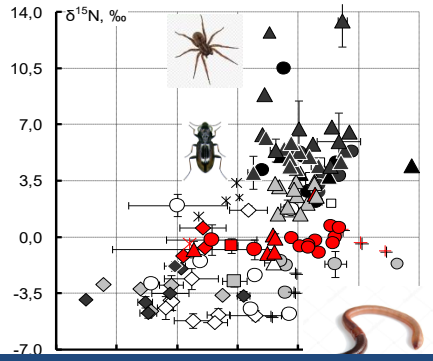
The **main goal** is a study of **invertebrate fauna diversity** and **habitat conditions** in natural and disturbed soils at the in Murmansk Region

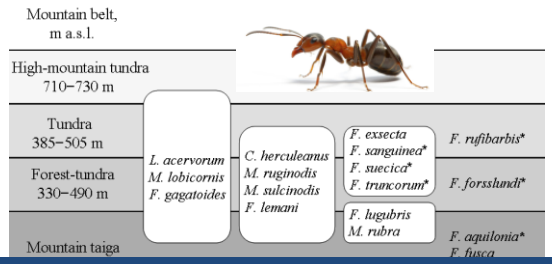
- Native zonal ecosystems
- Mountain ecosystems
- Disturbed areas (logging, burning, industrial pollution)

SOIL FAUNA

- Species richness and abundance
- Seasonal and many-years dynamics
- Trophic structure (according to isotope analysis)
- Zoogenic destruction of litter
- Rare, protected and indicator species
- Morphological features
- Northern limits of distribution
- Biotopes and soil preferendums
- Soil temperature regime







LAND MYCO, LICHENO AND PHYTOBIOTA

The **main goal** is a study of **main groups of northern biota** and **habitat conditions** in natural and disturbed ecosystems in Murmansk Region

- Protected areas
- Mountain ecosystems
- Disturbed areas (industrial pollution)

LICHENS
AFILLOFOROID FUNGI
LIVERWORTS
VASCULAR PLANTS

- Biodiversity
- Rare, protected and indicator species
- Morphological features
- Northern limits of distribution
- Biotopes
- Taxonomy

Leptosporomyces mundus
(H.S.Jacks. et Dearden) Jülich

The study of forest diseases

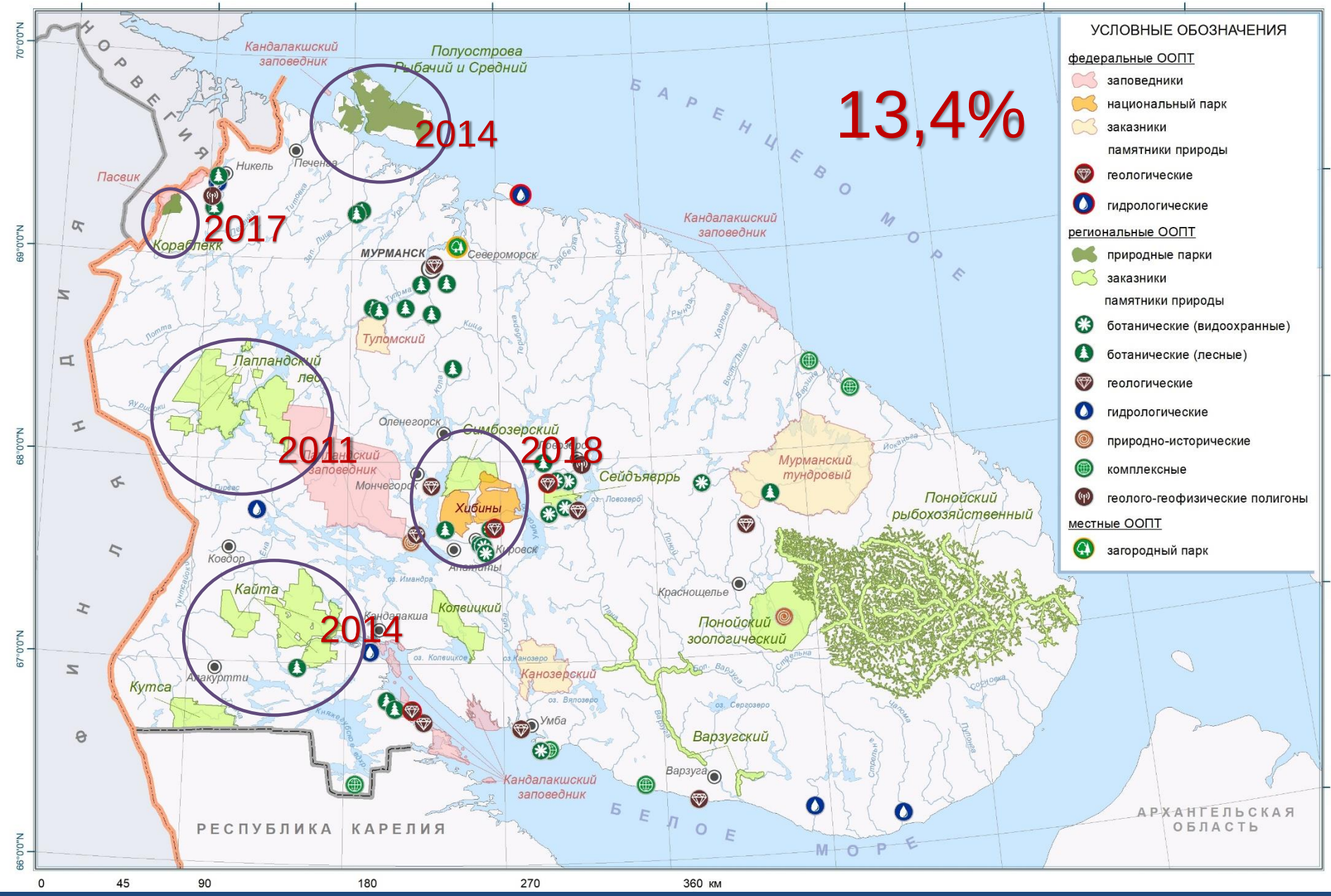




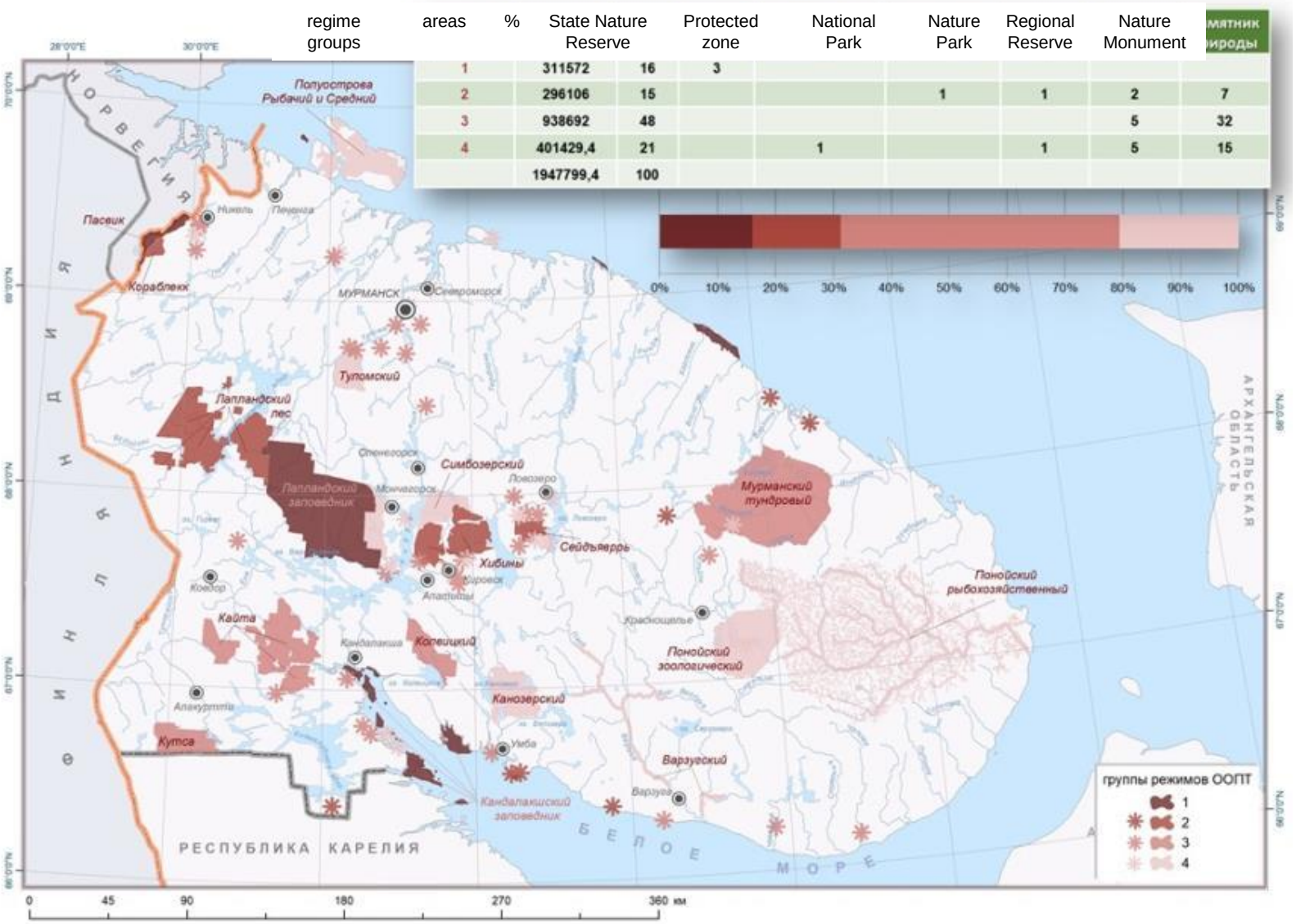


Climate change in the region has caused an increase in some forest diseases in the form of epiphytotics.

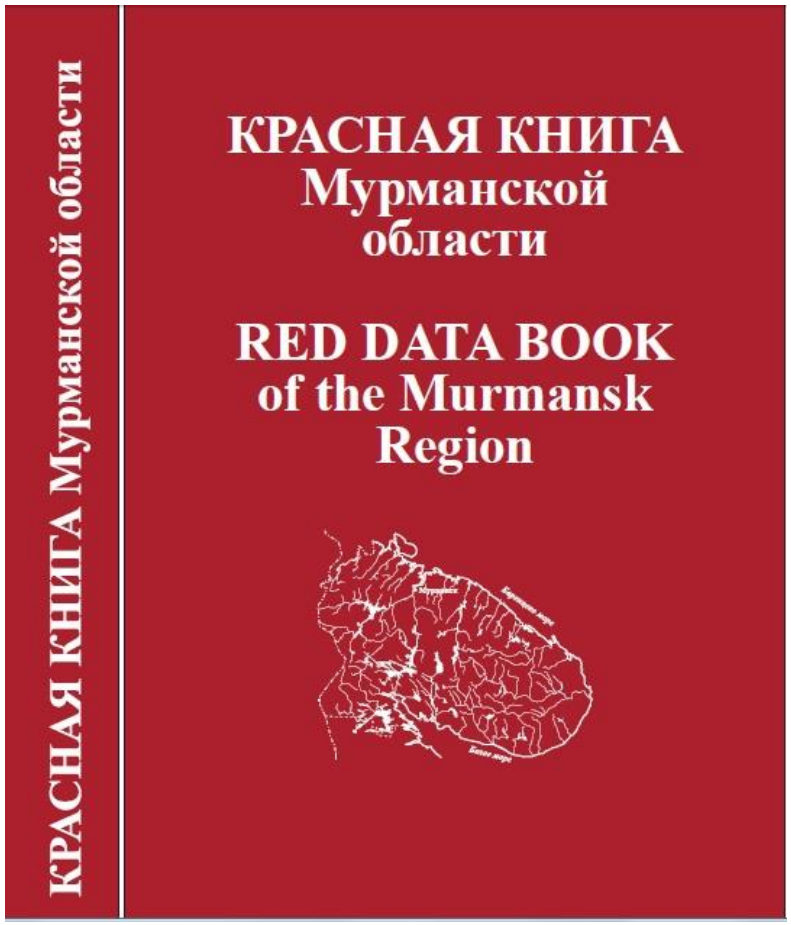
The network of PAs in the Murmansk Region (November 2020)



We assessed the effectiveness of protected area based on the correspondence of the protection regimes to the threats to these territories.



PA's regime must practically contribute conservation of protected objects



An important result in the study of biodiversity was the preparation of the second edition of «Red Book of the Murmansk Region» (2014)

In 2019 Yearbook "Materials on the management of the Red Book of the Murmansk region“ was founded .

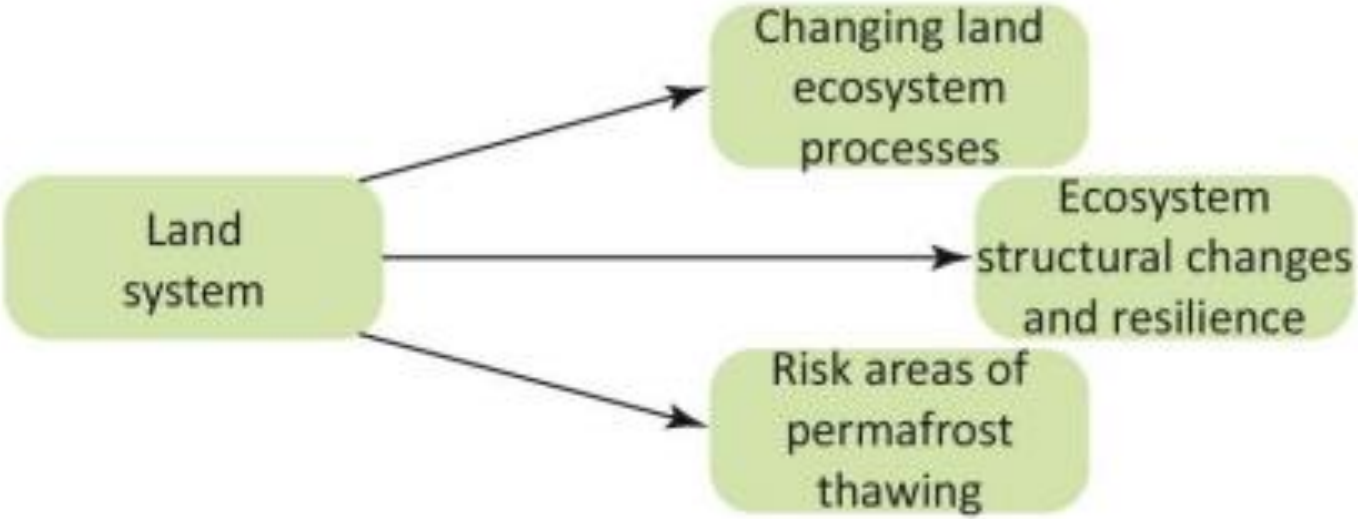
Monitoring of regionally protected species of plants, fungi and animals is held annually.

LARGE-SCALE RESEARCH QUESTIONS LAND SYSTEM

Q-1 How could the land regions and processes that are especially sensitive to climate change be identified, and what are the best methods to analyze their responses? Key topic: shifting of vegetation zones, Arctic greening

Q-2 How fast will permafrost thaw proceed, and how will it affect ecosystem processes and ecosystem–atmosphere feedbacks, including hydrology and greenhouse gas fluxes? Key topic: risk areas of permafrost thawing

Q-3 What are the structural ecosystem changes and tipping points in the future evolution of the Pan-Eurasian ecosystem? Key topic: Ecosystem structural changes



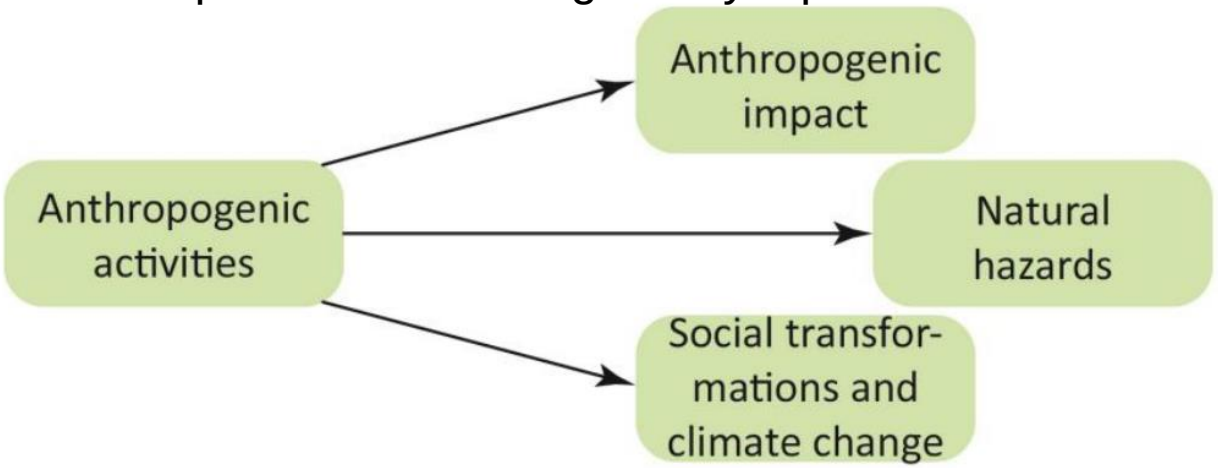
Substructure of land system research agenda from PEEX project

ANTHROPOGENIC ACTIVITIES

Q-10 How will human actions such as land-use changes, energy production, the use of natural resources, changes in energy efficiency and the use of renewable energy sources influence further environmental changes in the region? Key topic: Anthropogenic impact

Q-11 How do the changes in the physical, chemical and biological state of the different ecosystems, and the inland, water and coastal areas affect the economies and societies in the region, and vice versa? Key topic: Environmental impact

Q-12 In which ways are populated areas vulnerable to climate change? How can their vulnerability be reduced and their adaptive capacities improved? What responses can be identified to mitigate and adapt to climate change? Key topic: Natural hazards



Substructure of anthropogenic activities research agenda from PEEX project

THANK YOU FOR YOUR ATTENTION!