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СИБИРСКИЙ ФЕДЕРАЛЬНЫЙ УНИВЕРСИТЕТ  
SIBERIAN FEDERAL UNIVERSITY



Russian State  
Hydrometeorological  
University

# Course Presentation

Introduction to the Arctic environment and permafrost zones, with an overview of biophysical, social and economic systems, available knowledge and science-policy interfaces

The main tools of the platform Moodle used by the student when studying the training course are:

- General Course Description Tool
- Tool "Training Schedule" (instruction on the use of an educational resource)
- Lecture, video lecture, presentation and information page tools (theoretical material)
- Video Resources tool (additional training video on course sections)
- Forum tool (for presenting and discussing practical assignments)
- Additional Resources tool (links to additional educational materials and information resources)
- Tool "Tests" (control of assimilation of the studied material)
- The teacher can control the learning process using the "Electronic journal" tool.

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# Introduction to the Arctic environment and permafrost zones, with an overview of biophysical, social and economic systems, available knowledge and science-policy interfaces



Dashboard Courses Каталог курсов Институты Институт экологии и географии каф. Экологии и природопользования SUNRAISER IntroArctic

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ТОПИС 5. SOILS OF ARCTIC AND SUBARCTIC ZONES / ТЕМА 5. ПОЧВЫ АРКТИКИ И СУБАРКТИКИ

Борисова Ирина Викторовна, канд. геогр. наук, доцент кафедры экологии и природопользования, СФУ

Soils of Arctic and Subarctic zones

Soils of Arctic and Subarctic zones

Video lecture "Macromorphological properties of soils in the southern taiga subzone"

Lecture: Soils of Arctic and Subarctic territories

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Soils of Arctic and Subarctic zones

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Soils of arctic and subarctic zones

In high-latitude regions, along with intense physical weathering, chemical destruction of rocks with the participation of living organisms and the formation of primary primitive soils are observed. At the same time, there is a certain similarity between the weathering and soil formation products of cold periglacial arctic deserts and the hot deserts of the world.

It manifests itself in the wide distribution on the surface of massive rocks of ferruginous and ferruginous-manganese crusts, as well as in the formation of salt crusts and accumulations of salts (calcium carbonates, gypsum, chlorides and sodium sulfates, etc.) both on rocky surfaces and in loose sediments. The accumulation of salts in the soils of Arctic deserts is associated with a dry climate, the absence of liquid precipitation and the introduction of salts from the oceans.

Arctic desert soils are fragmented - in ice-free oases on the coast of the continent. Oases occupy only about 0.06% of the area of Antarctica. Precipitation, falling in the form of snow even in summer, evaporates to a large extent. The vegetation of the oases is very sparse: on the rocks in places, various species of scale and leafy lichens and mosses settle. On a fine-grained substrate - moraines, fluvio-glacial and lake sediments - mosses settle more often.

Soils of the Arctic deserts thaw over the summer by 30-40 cm. They are characterized by a reddish-brown or orange color, associated with the presence of iron hydroxides, and boiling under the action of hydrochloric acid from the surface (the presence of calcium carbonates). Along the shores of brackish lakes, the soil surface is covered with a white crust of salts.

In the Northern Hemisphere, the southern border of the Arctic deserts runs along 73-76°. These are severe arid regions of the northern Arctic, where most of the land is covered by glaciers, and weathering and soil formation processes are localized in narrow glacial zones between the edge of the glaciers and the coastline.

The age of landscapes and the duration of soil formation on such islands are greater than directly at the edge of glaciers, where their repeated movements and deposits of new material periodically update the surface. In the polar deserts there is not a single flowering plant, in the arctic deserts flowering plants (saxifrage, dryads, polar bluegrass, etc.) form a closed cover in places in the depressions and areas protected from the wind. On most of the elevated relief elements, the soil surface is covered with crushed stone shell; between the gravel there are individual low-growing plants, mainly lichens.

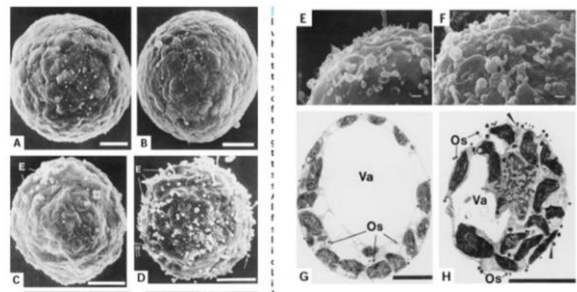
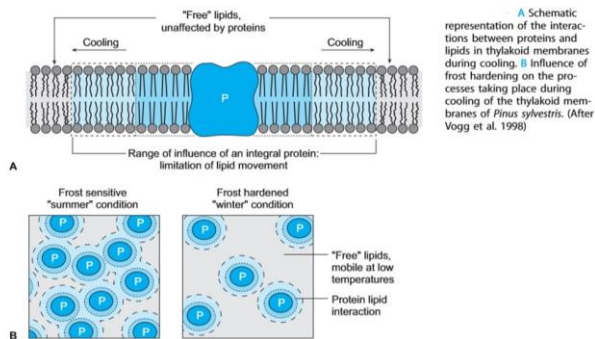
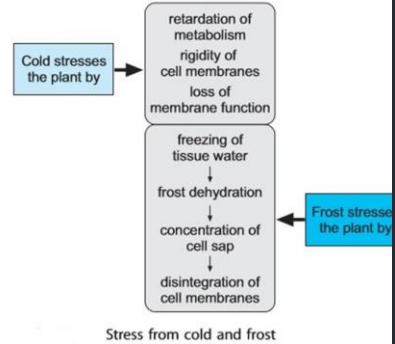
*Arctic soils (cryozems)  $A_{ca} - B_{ca} - C(ca)$  (CDSR, 2004) *leptic* CRYOSOLS (WRB, 2014). They develop in separate spots under disconnected curtains of grass-lichen-moss*

# Presentation

## Stress from cold and frost

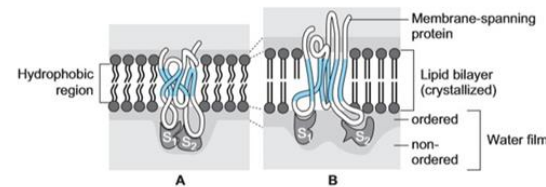
On about two-thirds of the land mass of the earth the annual minimum temperatures fall to below 0°C, on half of the land mass to -10 °C.

Thus it is not surprising that cold is the best studied of any abiotic stressor for plants and animals, and it is of enormous economic importance.



(After Steponkus et al. 1983, 1988)

- At the subcellular level, chilling damage occurs through metabolic imbalances and membrane "stiffening".



Model of a bio-membrane in cross section, in a fluid (active A) and in a rigid (inactive B) state.  $S_1$ ,  $S_2$  substrates. (After Wolfe 1978)

## TOPIC 6. FLORA OF THE ARCTIC / ТЕМА 6. ФЛОРА АРКТИКИ

Глушкова Наталья Борисовна, ст. преподаватель кафедры геоэкологии, природопользования и экологической безопасности, РГГМУ

Пахарькова Нина Викторовна, канд. биол. наук, доцент кафедры экологии и природопользования, СФУ

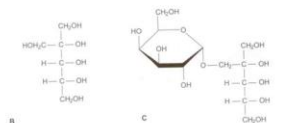
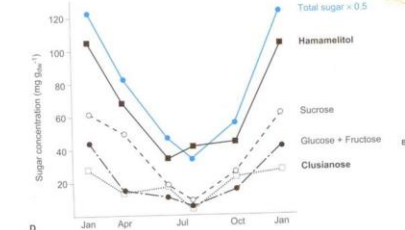
- Video lecture: Plants adaptation to cold and frost (voice)
- Presentation "Plants adaptation to cold and frost"
- Ecology of Arctic plants
- Plants of the Arctic
- Flora of the Arctic

### Recommended Literature

- Bigras FJ, Colombo SJ (2001) Conifer cold hardiness. Kluwer, Dordrecht
- Guy CL (1990) Cold acclimation and freezing stress tolerance: role of protein metabolism. Annu Rev Plant Physiol Plant Mol Biol 41:187-223
- Hughes MA, Dunn MA (1996) The molecular biology of plant acclimation to low temperature. J Exp Bot 47:291-305
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- Thomashow MF (1999) Plant cold acclimation: freezing tolerance genes and regulatory mechanisms. Annu Rev Plant Physiol Plant Mol Biol 50:571-600

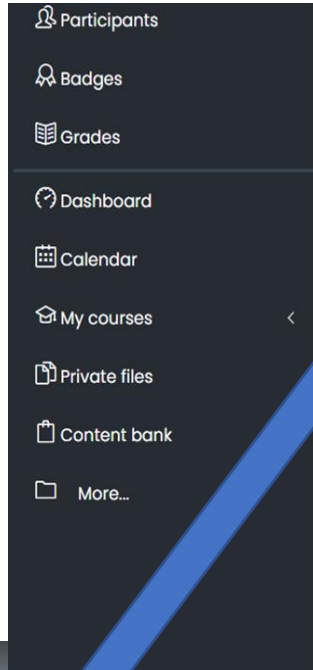


Frost protection in the *Primula clusiana*





# Video lecture



## TOPIC 6. FLORA OF THE ARCTIC / ТЕМА 6. ФЛОРА АРКТИКИ

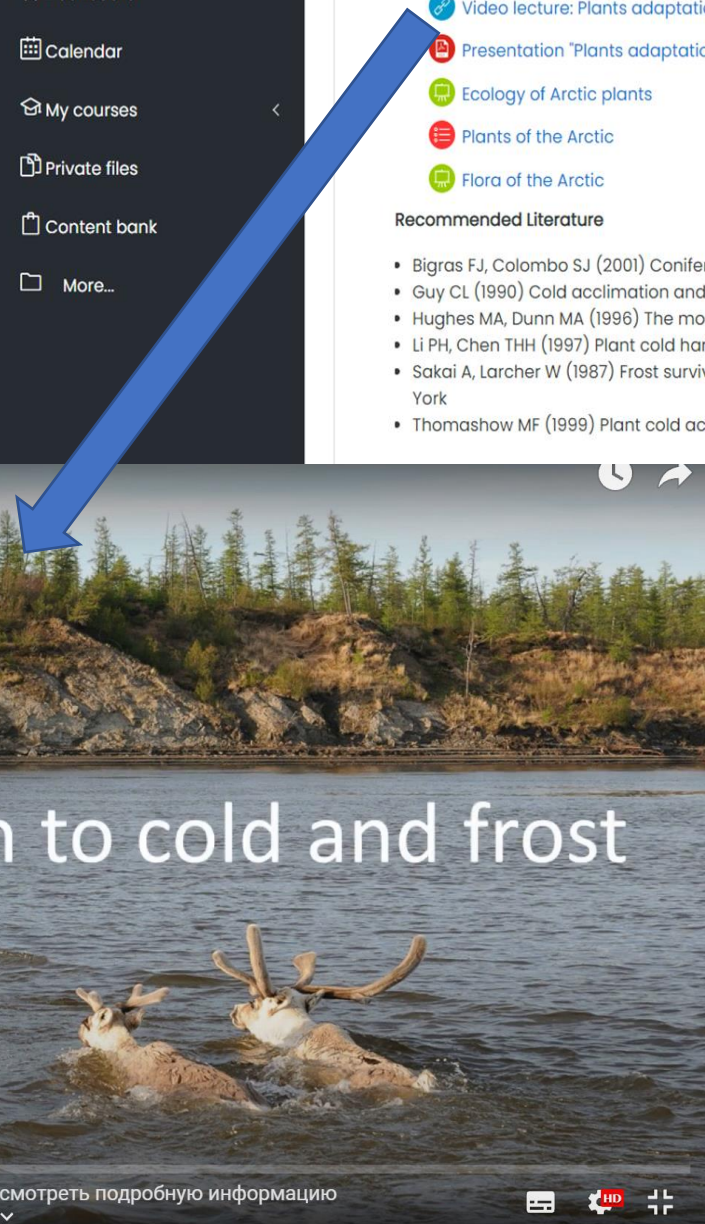
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## Plants adaptation to cold and frost

Introduction to the Arctic environment and permafrost zones, with an overview of biophysical, social and economic systems, available knowledge and science-policy



0:21



0:30 / 10:18

Прокрутите экран вниз, чтобы посмотреть подробную информацию



# Educational video resources

← → ↻ e.sfu-kras.ru/course/view.php?id=23119

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## TOPIC II. TRADITIONAL NATURE USE OF INDIGENOUS POPULATION IN THE NORTH / ТЕМА II. ТРАДИЦИОННОЕ ПРИРОДОПОЛЬЗОВАНИЕ НАРОДОВ СЕВЕРА

Гренадерова Анна Валентиновна, канд. геогр. наук, доцент кафедры экологии и природопользования, СФУ

- Traditional nature use of indigenous population in the North
- Traditional nature use
- The peoples of the north of Khanty

The film of the RTG channel (Russian Travel Guide) about the peoples of the north of Khanty

- Lecture Traditional nature use of indigenous population in the North



PEOPLES OF THE NORTH. THE KHANTY  
Народы Севера. Ханты  
WESTERN SIBERIA

RTG TV

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Flora of the Arctic

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каф. Экологии и природопользования

SUNRAISER

IntroArctic

Topic 6. Flora of the Arctic / Тема 6. Флора Арктики

Plants of the Arctic

Preview

Question 1

Not yet answered

Marked out of 1.0

Flag question

Edit question

Morphological adaptations of plants for cold:

☐ a. Big size

☐ b. Intense coloring and protective felt-like coating

☐ c. The number of stomata per unit of leaf surface increases, and their size decreases

☐ d. Cell sizes decrease, tissue density increases

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Quiz navigation

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Finish attempt ...


Start a new preview


PREVIOUS ACTIVITY


NEXT ACTIVITY





# Recommended Literature


 Participants


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
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