



The Vegetation Structure (Background) on the Territory of Planned Coal Mine (Irkutsk Region)

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How to cite this paper: Sizikh, A.P. (2017) The Vegetation Structure (Background) on the Territory of Planned Coal Mine (Irkutsk Region). *Open Access Library Journal*, 4: e3849.
<https://doi.org/10.4236/oalib.1103849>

Received: July 26, 2017

Accepted: August 13, 2017

Published: August 16, 2017

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Abstract

Within investigations for project and establishing of a coal mine, preliminary survey aimed to revealing of modern state of vegetation at the territory of establishing of projected coal mine was performed. The information of the structure of phytocenoses modern state can be a reference position for the assessment of a possible impact of technical activities on the state of phytocenoses around the territory of the mine establishment.

Subject Areas

Biogeography

Keywords

Vegetation Structure, Planned Coal Mine, Irkutsk Region

1. Introduction

The aim of studies is to find out the modern structure of vegetation on the territory related to the category of potential different exploitation forms; in this case, this is an organization of a coal mine as a first stage of a coal yield in the whole region. Technogenic impact onto the vegetation at coal mine exploration, besides a complete destruction of soil and vegetation cover, can influence negatively the phytocenoses of the adjacent surroundings of the explored territory in such forms as roads construction, warehouses building and accumulating of gasoline and related materials for machinery and creating of fire-dangerous situations during the mine exploitation. Due to this fact, it is necessary to determine the most optimal sites for establishment of the infrastructure of the planned

mine to minimize its impact onto the vegetation, mainly to keep basic forests (subtaiga) with emphasis to use secondary (small-leaf) forests and cenoses of reconstruction series. It is as well very important to limit maximally (or to exclude) the use of the territory of water protection zones of water flows in the area of mine. This territory ($N52^{\circ}33'25''$ - $E103^{\circ}02'35''$; $N52^{\circ}34'36''$ - $E103^{\circ}02'45''$; $N52^{\circ}34'46''$ - $E103^{\circ}04'39''$; $N52^{\circ}33'53''$ - $E103^{\circ}04'45''$, by the type of land use in the studied area, according to the map of land use of the south of the East Siberia [1], belongs to the category of exploited land (Figure 1).

According to the performed ecological zoning [2], the studied territory is included to the zone of atmospheric impact of low danger (up to 1%, zone B) with plain-valley pre-mountain type of climate at regulated intensive type of the territory development.

According to the correlational ecological-phytocenotic [3] map, the background vegetation of the studied area and of its surrounding area consists of subtaiga, south-taiga, somewhere low-mountain forests containing pine (*Pinus sylvestris* L.) and larch (*Larix sibirica* Ledeb.)—pine, mainly with cowberry (*Vaccinium vitis-idea* L.) and cowberry—motley grasses and grasses; sometimes there are steppified forests with fragments of meadow steppes of higher productivity.

The Atlas of Irkutsk Region [4] according to the vegetation map ([4], p. 42) for the studied area and its surroundings shows the characteristic forests. They contain pine (*Pinus sylvestris* L.) and larch (*Larix sibirica* Ledeb.)—pine cowberry (*Vaccinium vitis-idea* L.)—grasses at graded slopes everywhere; this fact correlates with data on the structure of phytocenoses shown on the maps of the south of the East Siberia [5] characteristic for the surroundings of the studied area.

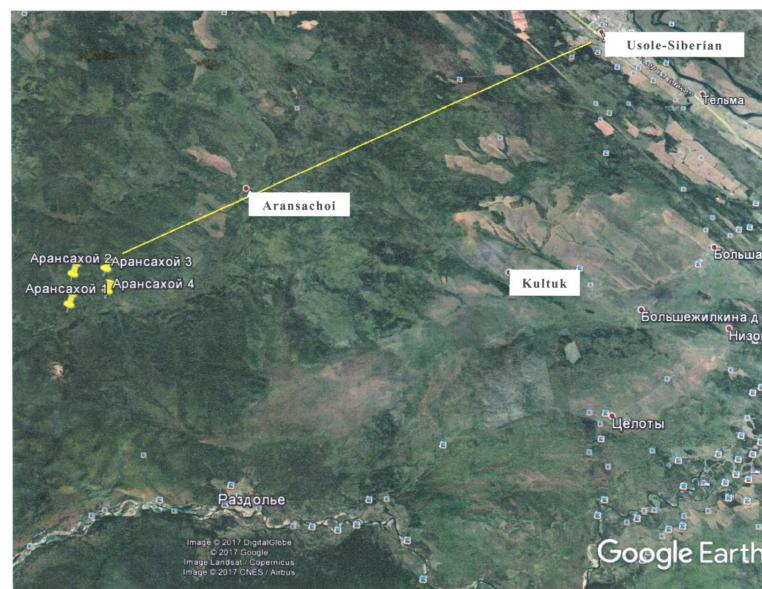


Figure 1. Area of study—marked by yellow color (Irkutsk region). The picture of the studied territory is borrowed from Google Earth site for better obviousness and spatial orientation.

2. Methods

Main research method is geobotanical survey together with the analysis of fund materials (forestry and agriculture) by vegetation state during different years of land use in the whole region. As the materials of studies are background ones (for survey), the revealing of plants indicating cenoses and setting of main (characteristic) plants species are sufficient at this studies stage.

3. Results

Due to performed field studies, it is stated that basic vegetation of the area are pine (*Pinus sylvestris* L.) and birch (*Betula pendula* Roth)—pine (*Pinus sylvestris* L.) with larch (*Larix sibirica* Ledeb.) forests of subtaiga type jointly with second birch forests including light-coniferous trees species (*Pinus sylvestris* L., *Larix sibirica* Ledeb.). Such communities form at moderately cold, long-time frosted sod-podzol soils on plain-hillside sites of the studied territory itself and of its surroundings [6]. The pictures present typical communities of the studied area (see Figures 2-4).

The undergrowth of such communities is often dominated by pine (*Pinus sylvestris* L.) and larch (*Larix sibirica* Ledeb.), there is a large fraction of birch



Figure 2. Birch (*Betula pendula* Roth)—pine (*Pinus sylvestris* L.) forests with motley grasses at graded slopes.



Figure 3. Pine (*Pinus sylvestris* L.) forests with inclusions of birch (*Betula pendula* Roth.), cowberry (*Vaccinium vitis-idea* L.) and motley grasses at the bottoms of graded slopes.



Figure 4. Pine (*Pinus sylvestris* L.) forests of different age (pine timber stand varies from 80 to 120 y.o. in the first synfolium; up to 40 - 50 y.o. in the second synfolium (very rarely); there are very few trees aged from 5 to 15 - 25 y.o. due to frequent fires during different years; at some sites, especially at ones of total cutting, there are pines up to 2 - 3 y.o. with undergrowth up to 10 y.o.) with motley grasses surrounded by old forest cuts where undergrowth of pine (*Pinus sylvestris* L.) and birch (*Betula pendula* Roth) is formed.



Figure 5. Second growth of birch (*Betula pendula* Roth.) with inclusion of pine (*Pinus sylvestris* L.) with pine timber stand varies from 80 to 120 y.o. in the first synfolium and there are pines up to 2 - 3 y.o., just very rarely by fire reason, sedge (*Carex macroura* Meinh.)—and motley grasses at true surfaces.



Figure 6. *Larix* (*Larix sibirica* Ledeb.)—spruce (*Picea obovata* Ledeb.) shrubby forests with sedge and motley grasses at low terraces above the flood plains, rarely swampy.

(*Betula pendula* Roth.). This suggests a primary stage of reconstitution of poly-dominant larch-pine forests with birch inclusion everywhere.

There are abundant second forests of birch (*Betula pendula* Roth.) with motley grasses and inclusions of pine (*Pinus sylvestris* L.) and with a very rare undergrowth consisting mainly of birch ((*Betula pendula* Roth.). The soil cover is

formed of overgrowth of small reed (*Calamagrostis neglecta* (Fhrh.) Gaertner, Meyer et Scheber) with sedge (*Carex macroura* Meinh.) and forest motley grasses as *Veratrum lobelianum* Bernh., *Paris quadrifolia* L., *Iris ruthenica* Ker-Gawler, *Dianthus versicolor* Fisch. ex Link, *Aconitum barbatum* Pers., *Anemoneoides reflexa* (Steph.) Halub., *Aquilegia sibirica* Lam., *Atragene sibirica* L., *Pulsatilla multifida* (Z. Pritzel) Juz., *Trollius asiatica* L., *Sanguisorba officinalis* L., *Lathyrus humilis* (Serg.) Spreng., *Lupinaster pentaphyllus* Moensh., *Vicia cracca* L., *Geranium wlassavianum* Fiisch. ex Link, *Geranium sibiricum* L., *Carum carvi* L., *Pulmonaria mollis* Wulfen ex Hornem., *Achillea asiatica* Serg., *Antennaria dioica* (L.) Gaertn., *Scorzonera radiata* Fisch., *Tanasetum vulgare* L., *Cacalia hastata* L., *Crepis sibirica* L., *Hieracium umbellatum* L. (see [Figure 5](#)).

On the banks of water flows, main vegetation consists of larch (*Larix sibirica* Ledeb.)—spruce (*Picea obovata* Ledeb.), often shrubby (*Salix caprea* L., *Salix hastata* L.) motley grasses (*Angelica anomala* Ave-Lall., *Heracleum dissectum* Ledeb.)—sedge (*Carex rhynchosperma* C.A. Mey, *Carex acuta* L., *Carex meyeriana* Kunth, *Carex shmidtii* Meinh.) communities developing sustainably due to a high resistance of habitats for a long time ([Figure 6](#)).

At the former burnt-out forests ([Figure 7](#)) and along roads, second growth is formed. It consists of birch (*Betula pendula* Roth.) with inclusion of pine (*Pinus sylvestris* L.), often with birch undergrowth. Soil cover mainly consists of salty-bloom (*Chamaenerion angustifolium* (L.) Scop.), small reed (*Calamagrostis neglecta* (Fhrh.) Gaertner, Meyer et Scheber) and forest motley grasses with inclusion of sedge (*Carex macroura* Meinh.) characteristic for small-leaf forests under such development conditions ([Figure 8](#)).



Figure 7. Rare undergrowth of pine (*Pinus sylvestris* L.) with birch (*Betula pendula* Roth.) young growth at the site of burnt-out forests with pine, cowberry (*Vaccinium vitis-idaea* L.) and motley grasses of the graded slopes.



Figure 8. Second growth of birch (*Betula pendula* Roth.) with inclusion of pine (*Pinus sylvestris* L.) and motley grasses along the transport communications at the studied territory.

Due to the performed studies, we obtained data on the modern state of the phytocenoses in the studied area and in its surroundings. A considerable part of the territory is occupied by second growth forests containing pine, birch and grasses of reconstitutional series; this is characteristic for vegetation of subtaiga type with small sites of meadows and forests in low terraces above flood plains, where larch-spruce shrubby, rarely swampy forests of riverine valleys are formed.

4. Conclusion

According to the recommendations [1] [2] and data resulting from the studies of modern state of vegetation on the territory reserved for a coal mine, the area can be used for such purposes. The information of the structure of phytocenoses modern state can be a reference position for the assessment of a possible impact of technical activities on the state of phytocenoses around the territory of the mine establishment. At the same time, it can serve a base of forecast models of the development of vegetation under the condition of technogenic impact of this area of Irkutsk Region as a whole.

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