

# EMISSIONS OF GREENHOUSE GASES FROM THE ISOLATED WETLANDS OF OB'-TOM' INTERFLUVE AREA

Egor A. Dyukarev  
Evgenia A. Golovatskaya  
Elena E. Veretennikova

# Isolated wetlands



- An isolated wetland does not have a formal definition, but rather it is been defined by what it lacks. According the to US EPA's June 2007 Guidance, an isolated wetland does not have a significant nexus to a navigable waterway, or in everyday terms, no readily identifiable surface connection to a larger body of water.

# Isolated wetland size

- Small sized wetlands are difficult to delineate at satellite images.
- Small wetlands are more vulnerable to external influence (climate change, water table lowering, pollution, anthropogenic impact) than big stable peatlands with huge water and carbon storages.



## Size Does Matter: The Value of Small Isolated Wetlands

*While the regulatory landscape values larger wetlands over smaller ones, the ecological landscape presents a different view. Research in Carolina bays shows that small isolated wetlands play a crucial role in the biodiversity of wetland-dependent species, especially for amphibians.*

by Raymond D. Semlitsch

Ob' River

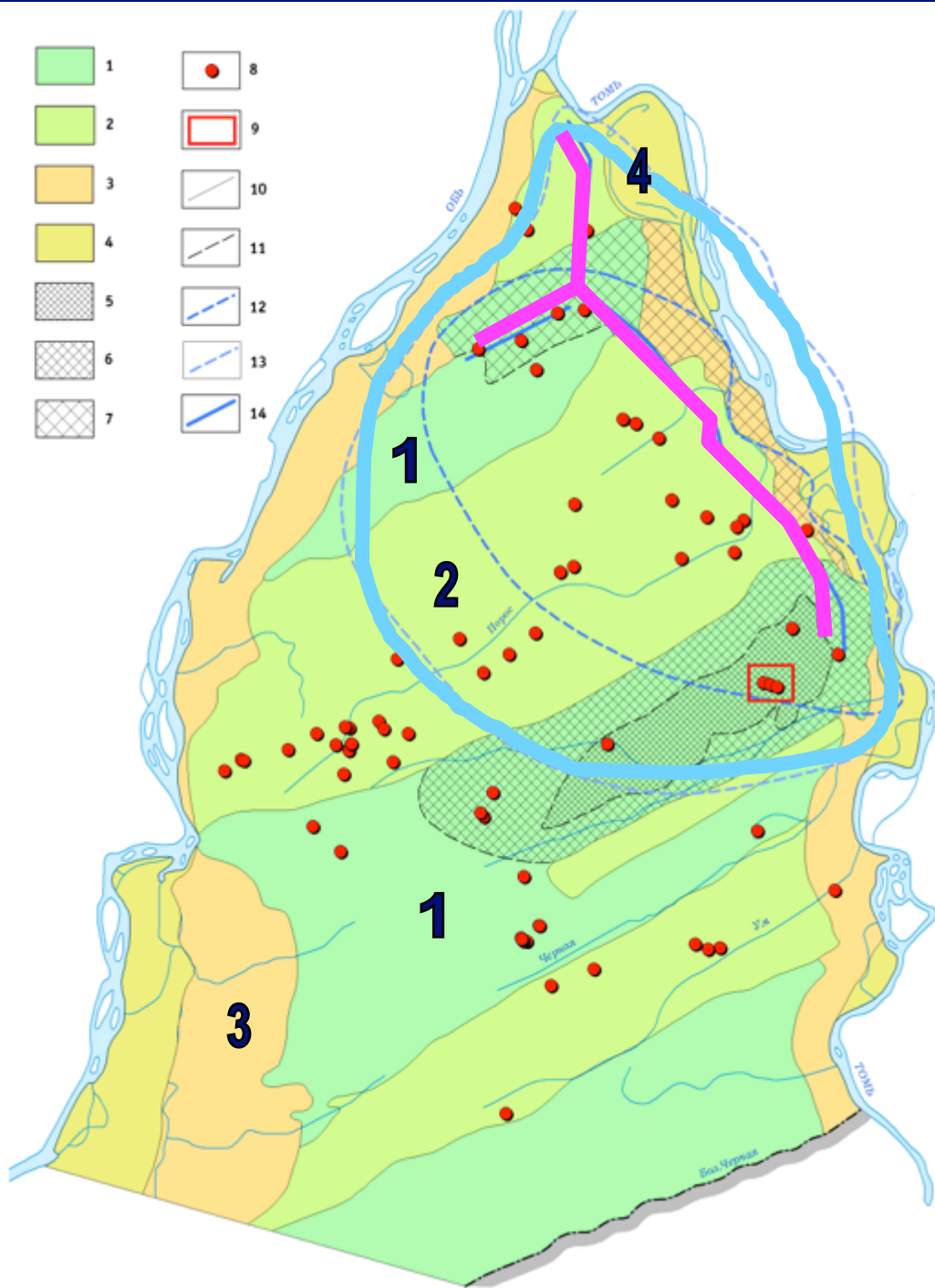
Tom' River



**Tomsk**

**83 x 52 km**

# Landscape structure

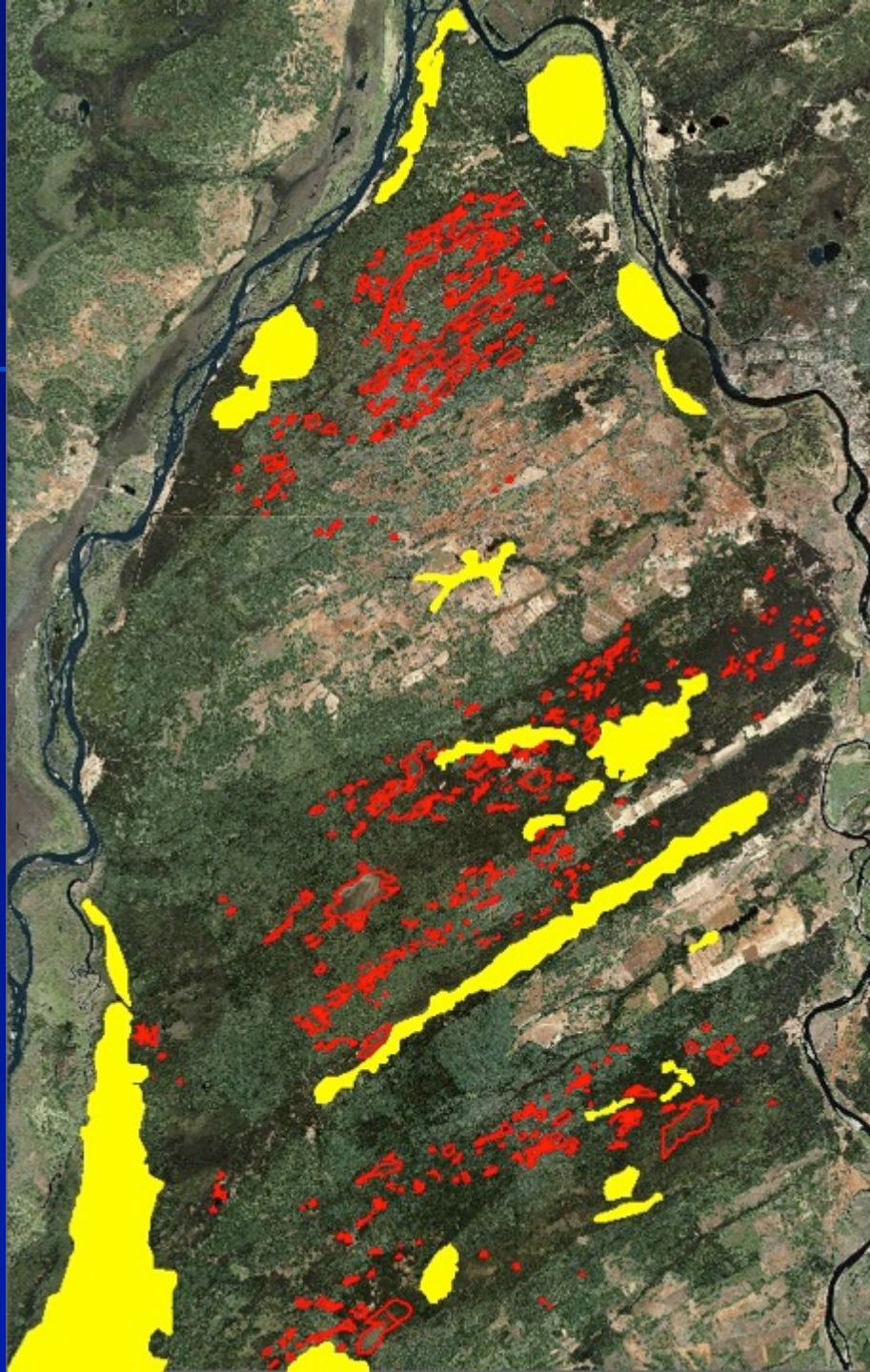


- 1 – ancient river valley;
- 2 – denudation-accumulation plain;
- 3 – fluvial terrace,
- 4 – floodplain.

- Water wells line
- Depression in aquifer

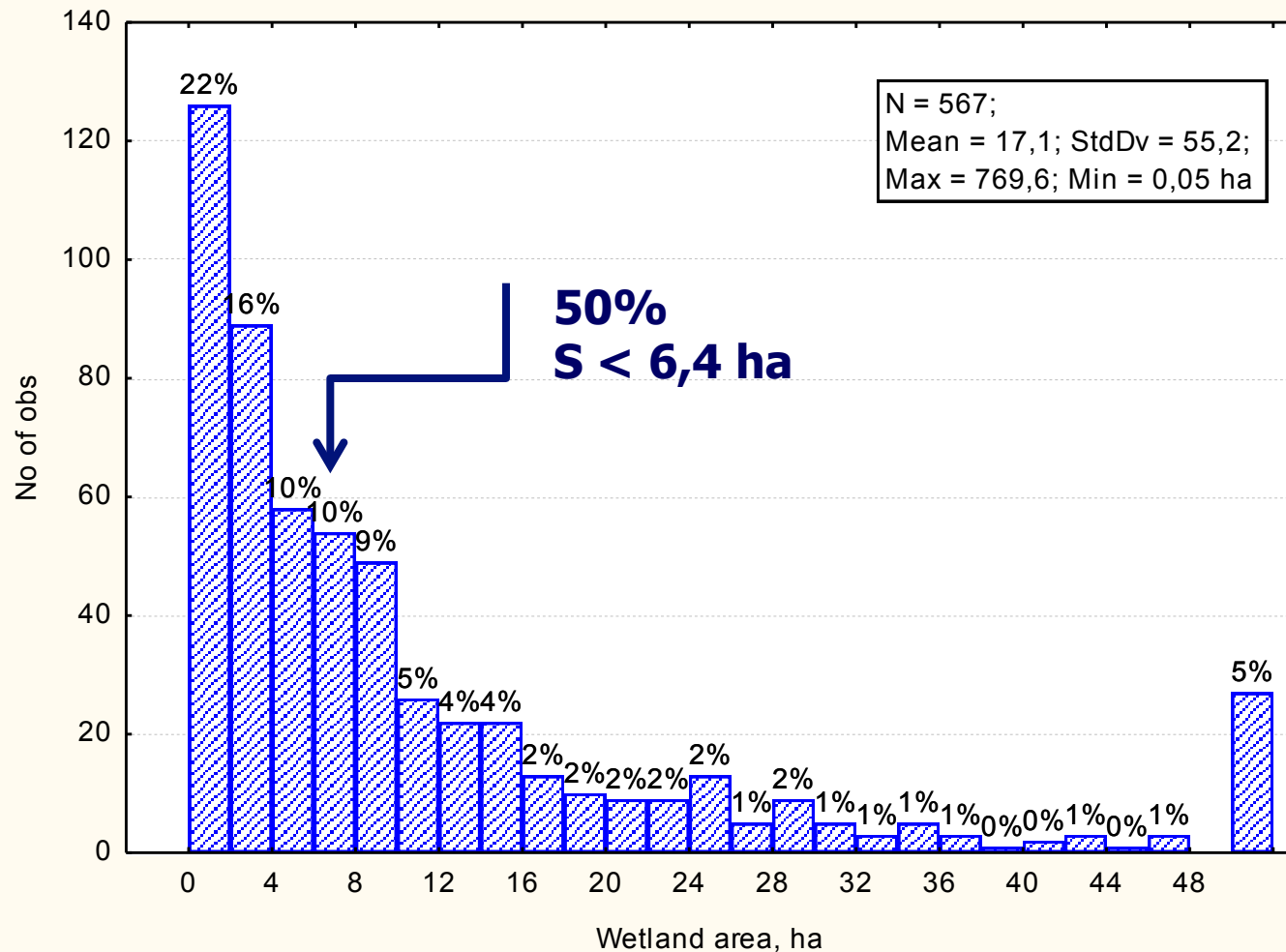
177 water wells  
250 000 m<sup>3</sup> water daily

*A. G. Dyukarev, N. N. Pologova State of Natural Environment in the Tomsk Water Intake Area // Contemporary Problems of Ecology, 2011, Vol. 4, No. 1*

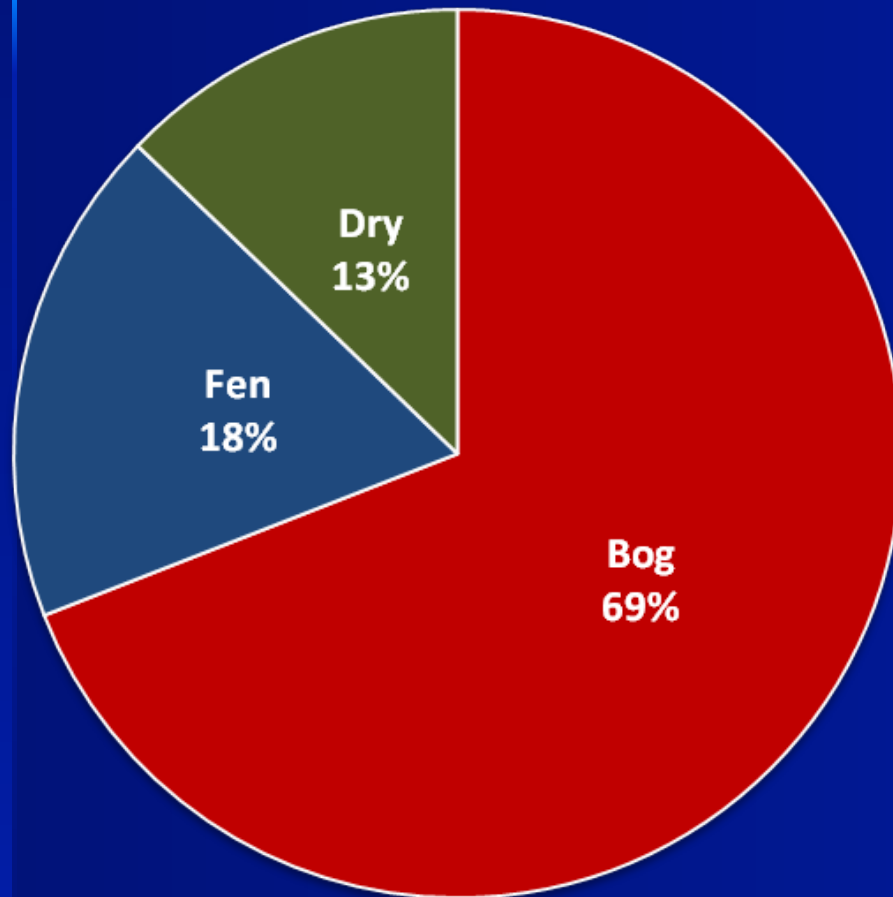


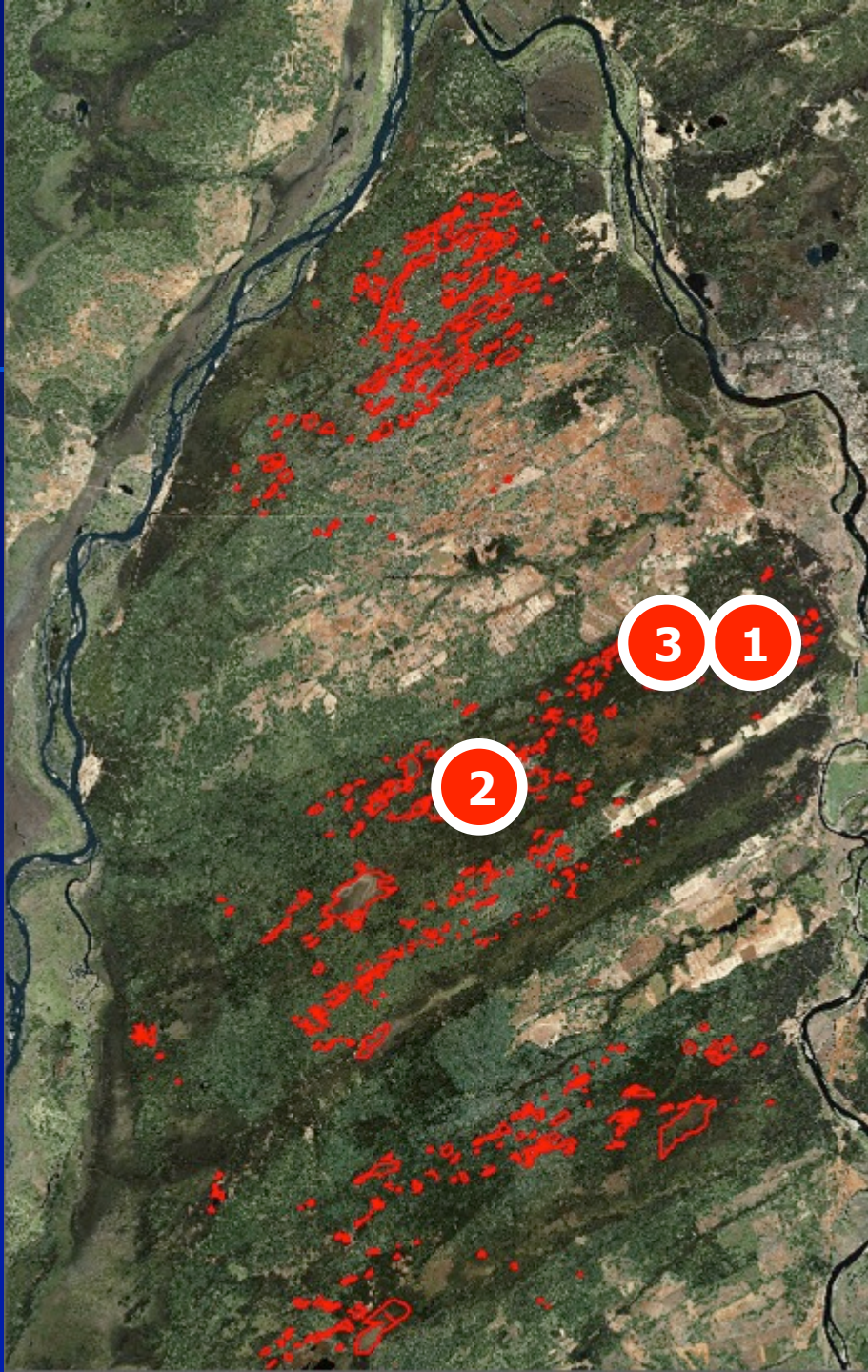
**567 - isolated wetlands**  
**Total area – 9 714 ha**  
**2,51 %**

# Isolated wetland size distribution



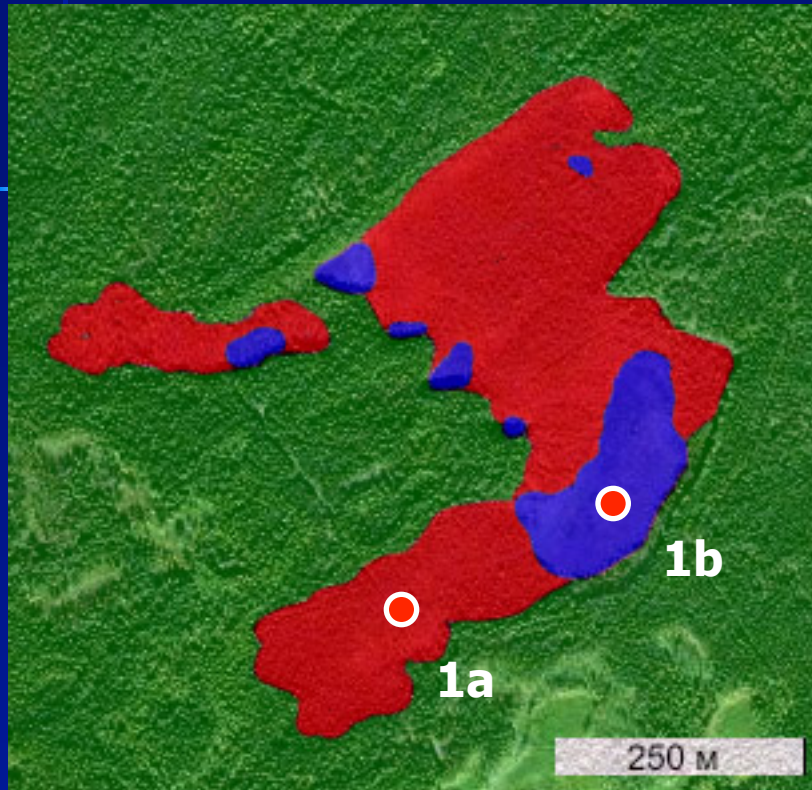
# Isolated wetland classification





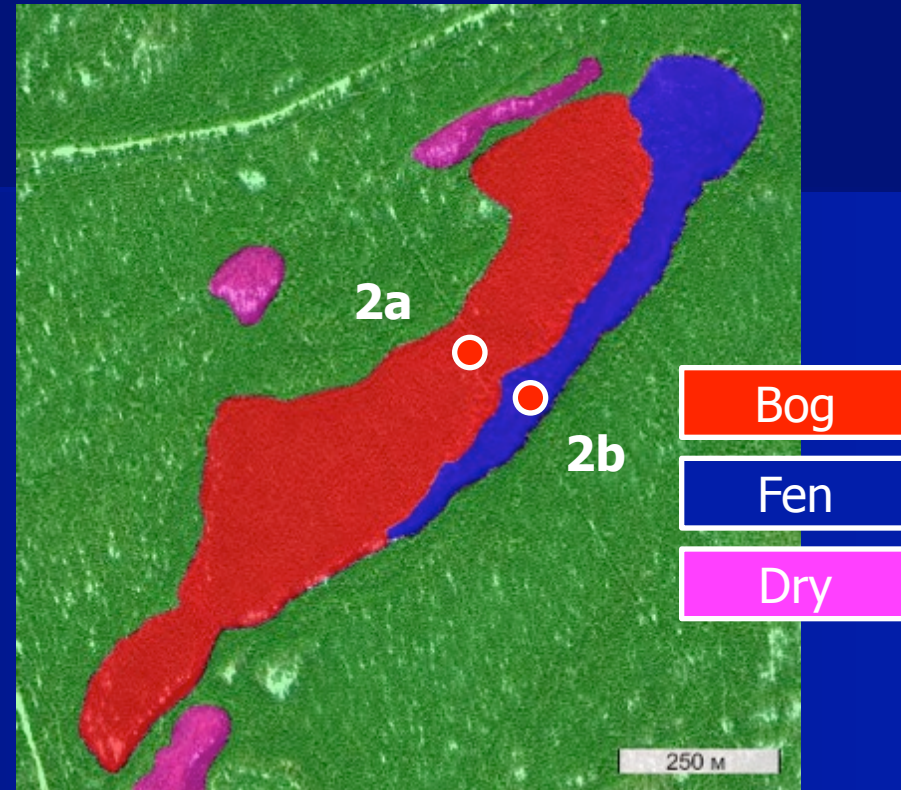
- Site 1 –  
“Timiryazevskoe”  
wetland
- Site 2 –  
“Kirsanovskoe”  
wetland
- Site 3 – Dry  
peatland

# Site 1



- 1a – pine-shrub-sphagnum community – oligotrophic bog. 420 cm,  $C^{14}$  age – 5880 yr.
- 1b – open sedge-sphagnum fen. 320 cm,  $C^{14}$  age – 4000 yr

# Site 2



- 2a – pine-shrub-sphagnum community – oligotrophic bog. 310 cm,  $C^{14}$  age – 5300 yr
- 2b – open sedge-sphagnum fen. 100 cm,  $C^{14}$  age – 3050 yr

# Site 1

- 1a – pine-shrub-sphagnum community – oligotrophic bog



- 1b – open sedge-sphagnum fen



# Site 2

- 2a – pine-shrub-sphagnum community – oligotrophic bog



- 2b – open sedge-sphagnum fen



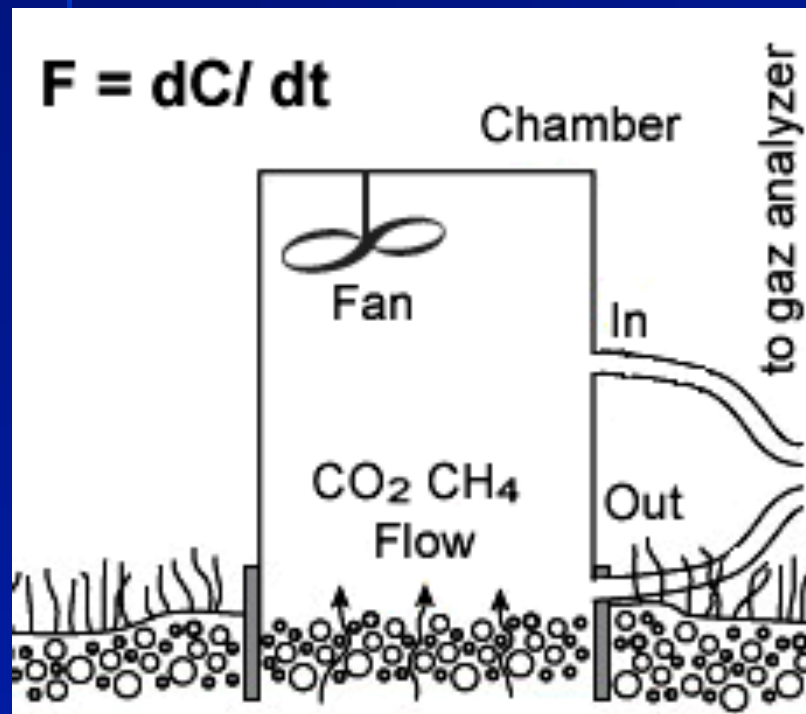
# Site 3

## ■ Dry peatland

Peatland with low level of bog waters and compacted peat. Surface vegetation transformed. Fire dangerous area.



# CO<sub>2</sub> and CH<sub>4</sub> emission measurement



- Static dark chamber method
- $dt = 30 \text{ min}$
- Twice per month
- May – October
- 2008 – 2012

# Carbon dioxide and methane emission

$\text{CO}_2$



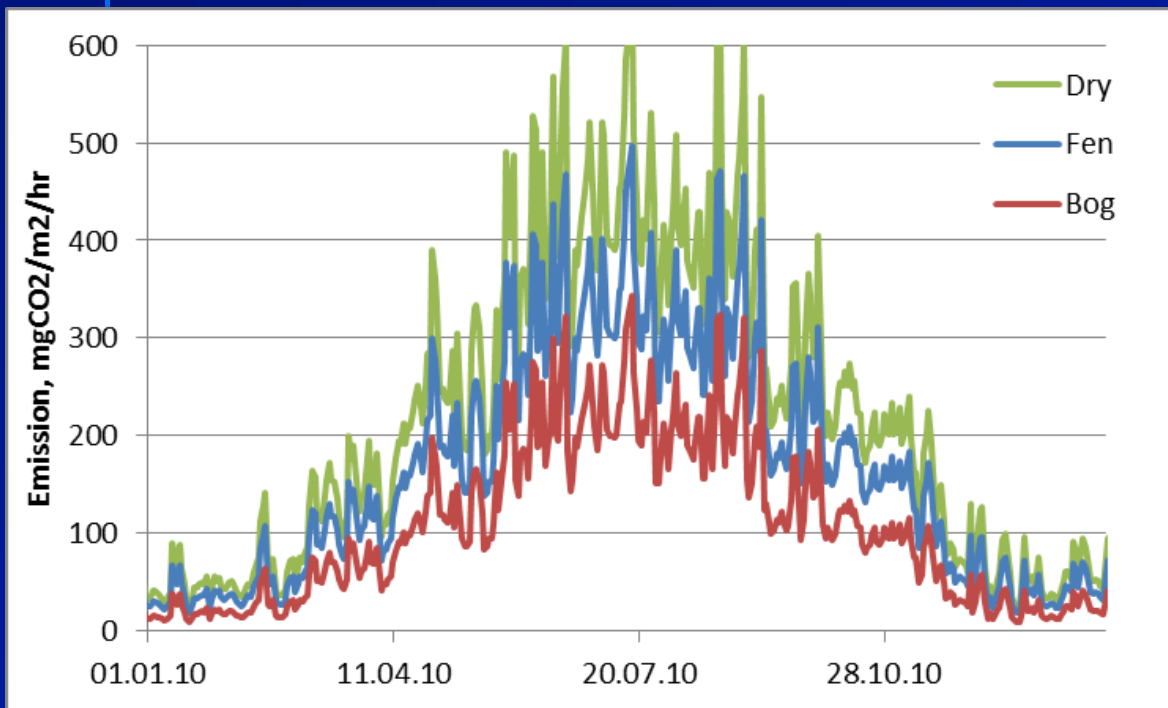
- Fluxes of the  $\text{CO}_2$  emission from the surface of peat deposits were measured by the traditional dark chamber method with an infra-red gas analyzer OPTOGAZ-500.4. The opaque chamber was placed on the moss surface.

$\text{CH}_4$

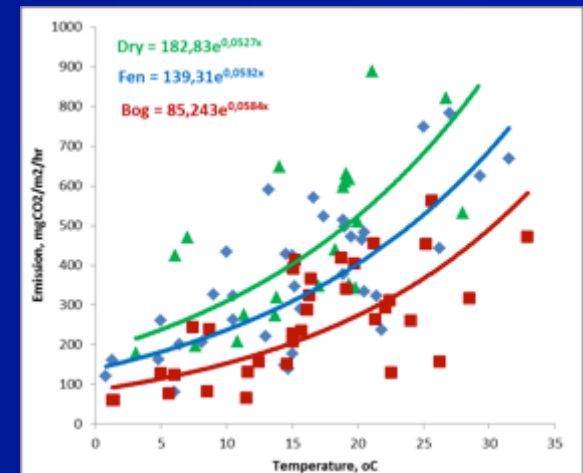


- Air sampled from the chamber was analyzed by SHIMADZU GC-14b gas chromatograph at flame-ionization detector. Methane emission was calculated from concentration rise within the chamber.

# Seasonal variations of CO<sub>2</sub> emission

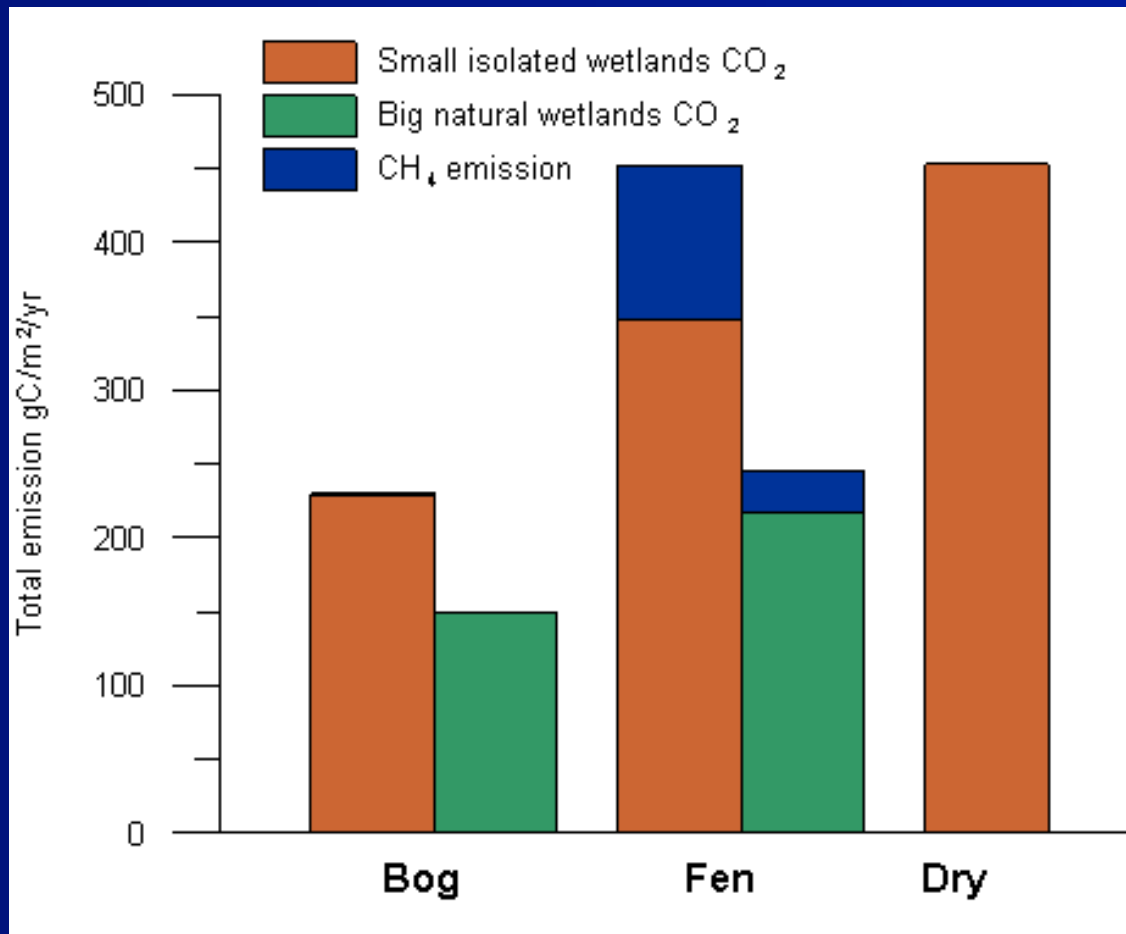


Reconstruction from  
air temperature  
dependence  
 $F = a \exp (b T)$



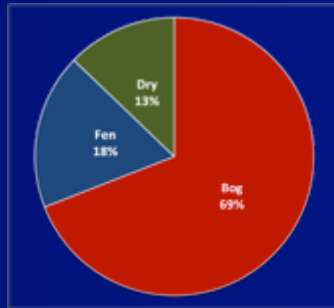
Q10            Dry = 1.69  
Fen = 1.70    Bog = 1.79

**Total C emission from small isolated wetlands under antropogenic impact is 50-80% higher than from big natural wetlands.**

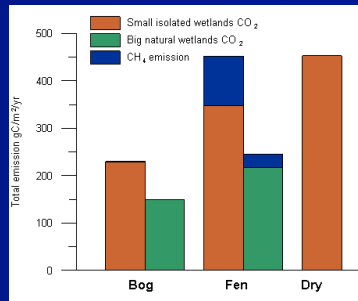


# Total annual C emission from isolated wetlands of the study area

Wetland area      x      CO<sub>2</sub> + CH<sub>4</sub> flux      =      Total C flux



**X**



**= F<sub>Tot</sub>**

$$F_{\text{Tot}} = 2,91 \cdot 10^4 \text{ ton of C/yr}$$



# **ISTC project #4079**

## **Identification, Characterization, and Functional Assessments of Isolated Wetlands of the Former Soviet Union**

- Institute of Monitoring of Climatic and Ecological Systems SB RAS, Tomsk
- Institute of Chemical Biology and Fundamental Medicine SB RAS, Novosibirsk
- Sukachev' Institute of Forest SB RAS, Krasnoyarsk
- US Environmental Protection Agency, Cincinnati, USA

**Спасибо за внимание!**