RUSSIAN FEDERATION

Terrestrial ecosystems with high carbon content – Tundra, Peatlands and Steppe

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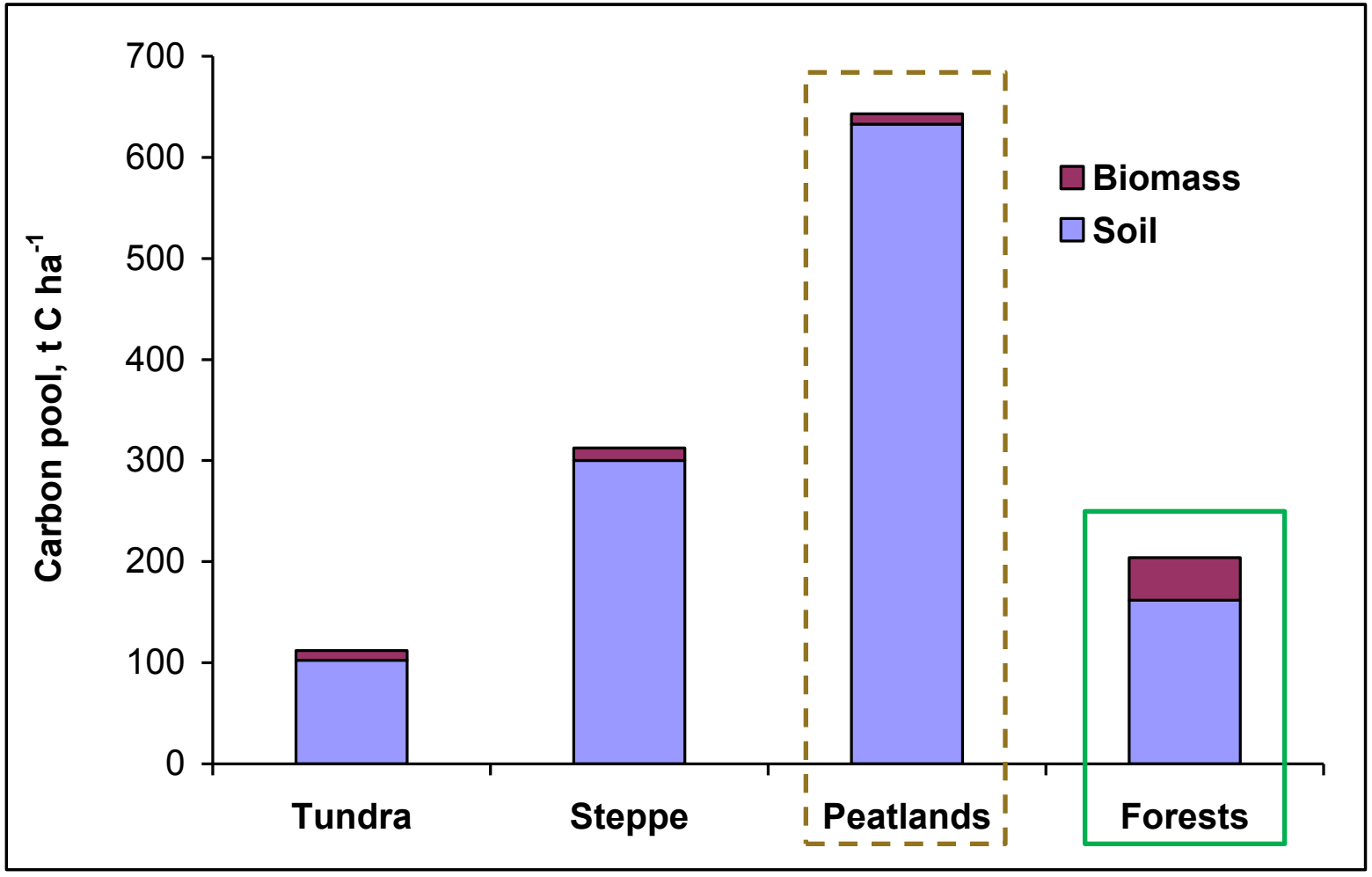
UNFCCC Workshop on technical and scientific aspects of ecosystems with high-carbon reservoirs, Bonn, 24-25 October, 2013

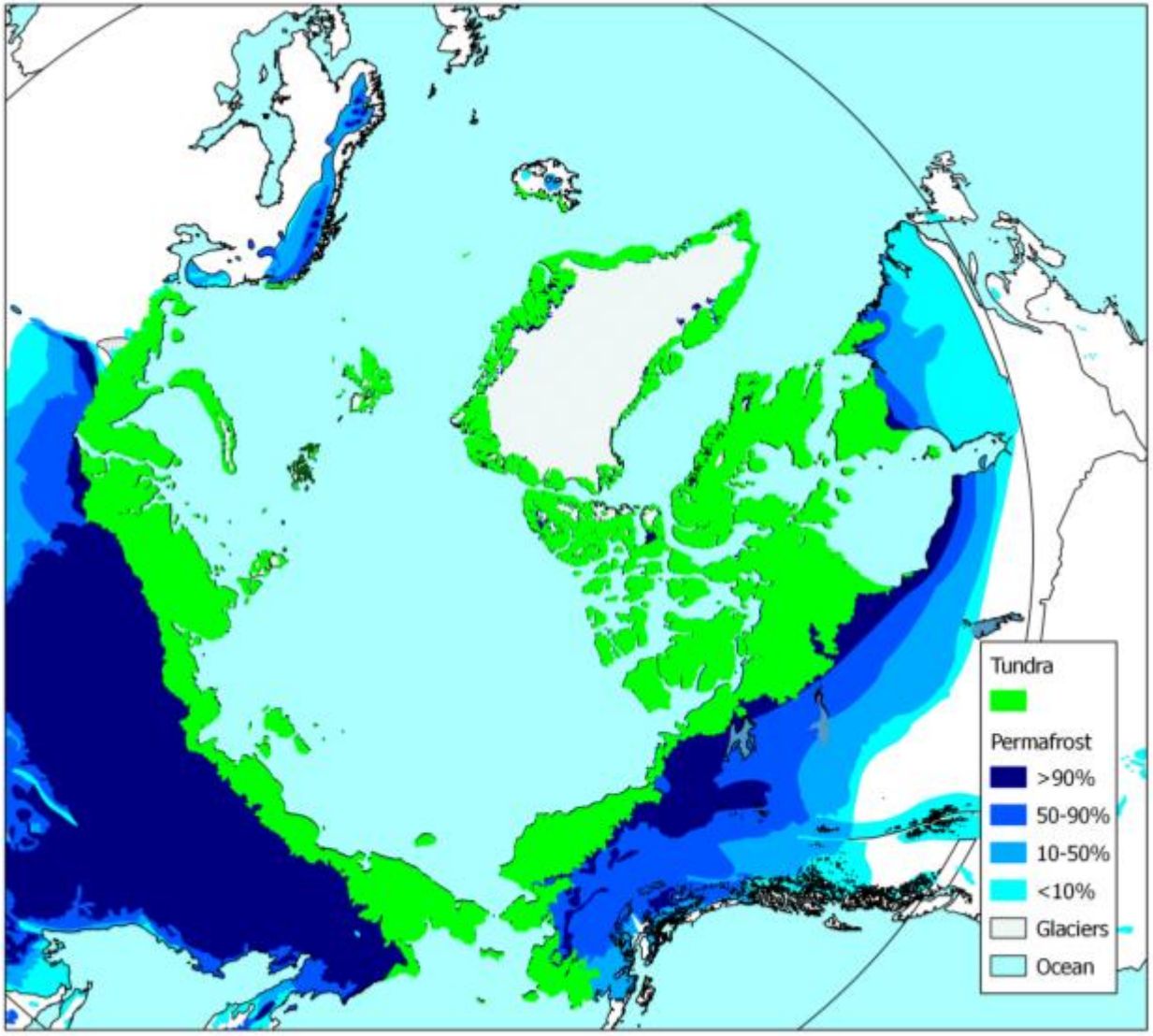
Carbon pools in biomass and soil in different terrestrial ecosystems of Russia



Vompersky et al., 1994, Karelin et al., 1994, Chestnykh et al., 2004, Zamolodchikov et al., 2011

Tundra

Tundra ecosystems



- 7% of the worlds terrestrial ecosystems area
- 15% of terrestrial carbon storage are in tundra soil and plants
- Permafrost at depths from 0.4 to 1.2 m
- Average carbon storage in permafrost 4.2 kg C m^{-3} (up to 15 kg C m^{-3}) [1,2]
- GHGs buried in permafrost, including CH_4-hydrates[2]

[1] *Brown et al., 2002 Circum-Arctic Map of Permafrost and Ground Ice Conditions 1:10M*
[2] *CAVM Team, 2003 Circumpolar Arctic Vegetation Map 1:7.5M*

[1] *Shmelev et al., in print*
[2] *Rivkina et al., 2007*

Permafrost degradation: environmental change

- Main reason of vulnerability is underground ice
- Rise in permafrost temperature and active layer depth are observed[1,2]

- Deeper thawing results in destructive processes – thermal erosion, thermokarst
- Degradation of permafrost = additional flux of unburied carbon to the atmosphere[3,4]

[1] *www.calm.gwu.edu, 2013*
[2] *Romanovsky et al., 2010*

[3] *Zimov et al., 2006*
[4] *Schuur et al., 2010*

Thermokarst in Alaska, www.iab.uaf.edu

Thermal erosion of Kolyma banks, A.L. Kholodov

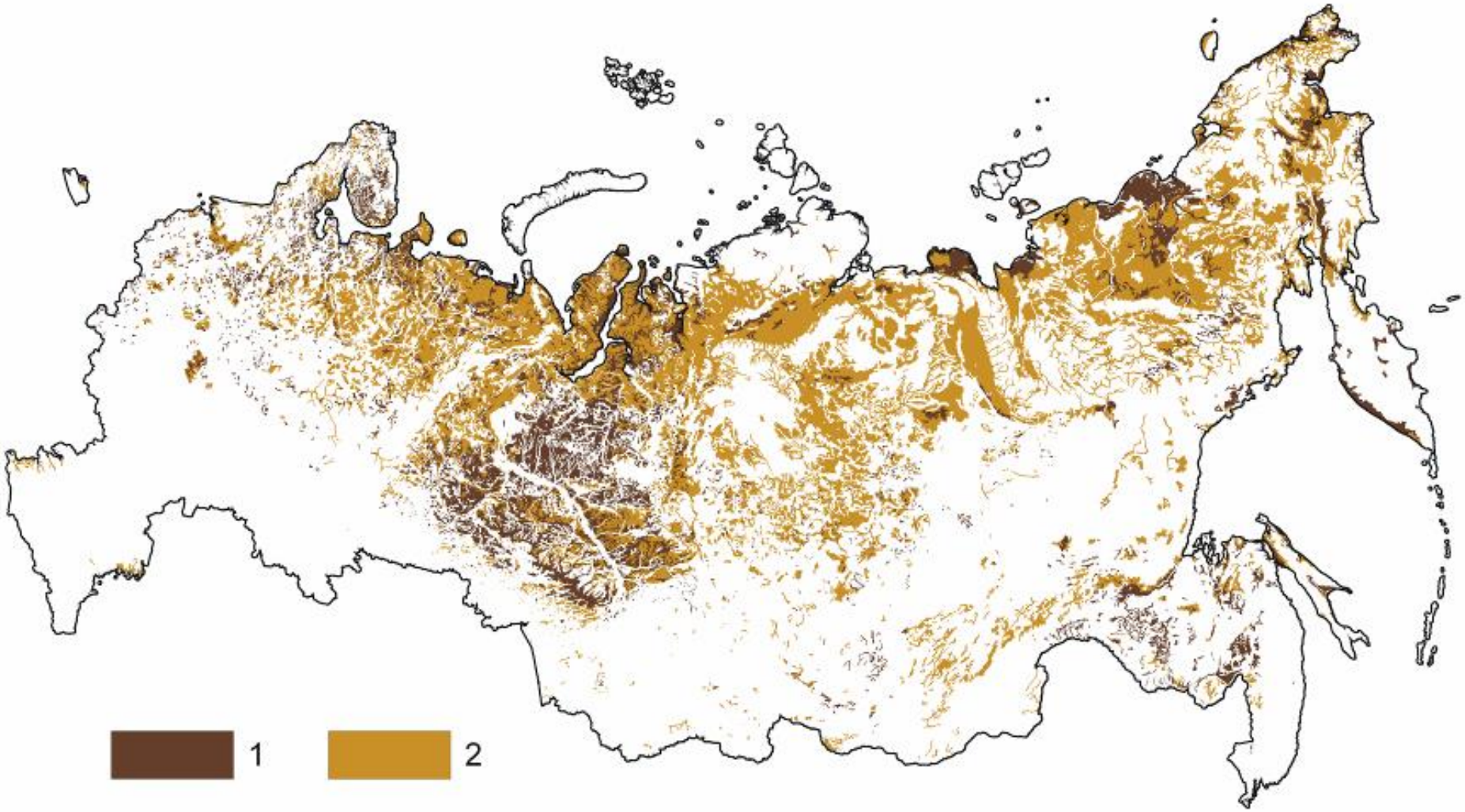
Human impact on permafrost

- More than 0.3 mln people live in communities in tundra, including natives
- Permafrost is used as the basement for
  - constructions
  - Industrial objects
  - Infrastructure

- Human impact imbalances thermal regime of permafrost
- Heat flow from constructions leads to
  - carbon flux from permafrost;
  - destabilization of foundations

Peatlands

Peatlands (peat >30 cm) make up over 8% ($1.39 \cdot 10^6$ km) and with shallow peat lands (< 30 cm) up to 22% ($2.30 \cdot 10^6$ km) of Russia



Vompersky et al., 1994, 1996, 2011

Russia presents high diversity of peatlands

Polygon and Palsa mires

Raised bogs and Aapa mires

Treeless mires and Forested mires

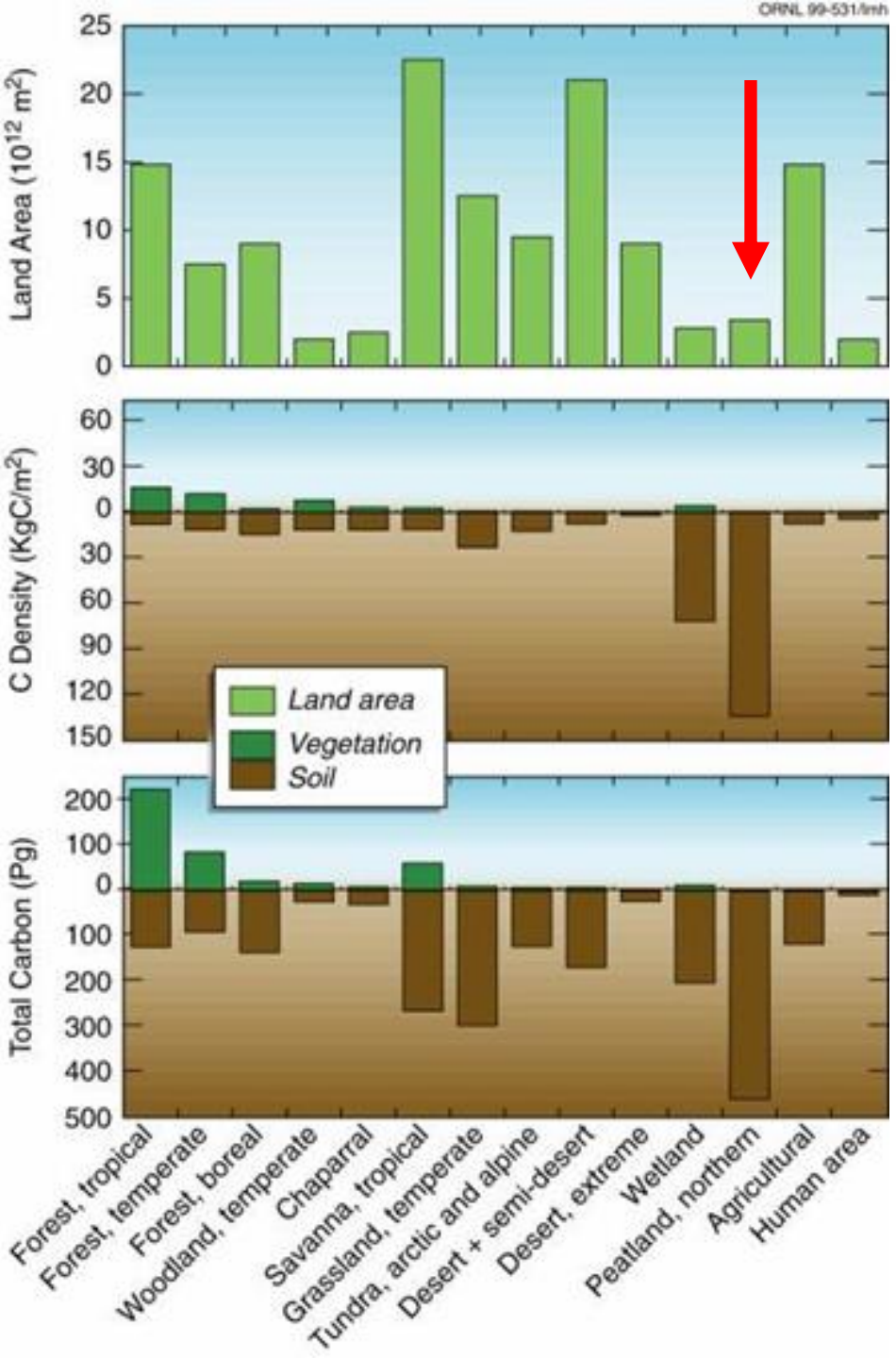
Vompersky et al., 2005, 2011

Peatland ecosystems (including peat and vegetation) contain disproportionally more organic carbon than other terrestrial ecosystems on mineral soils:

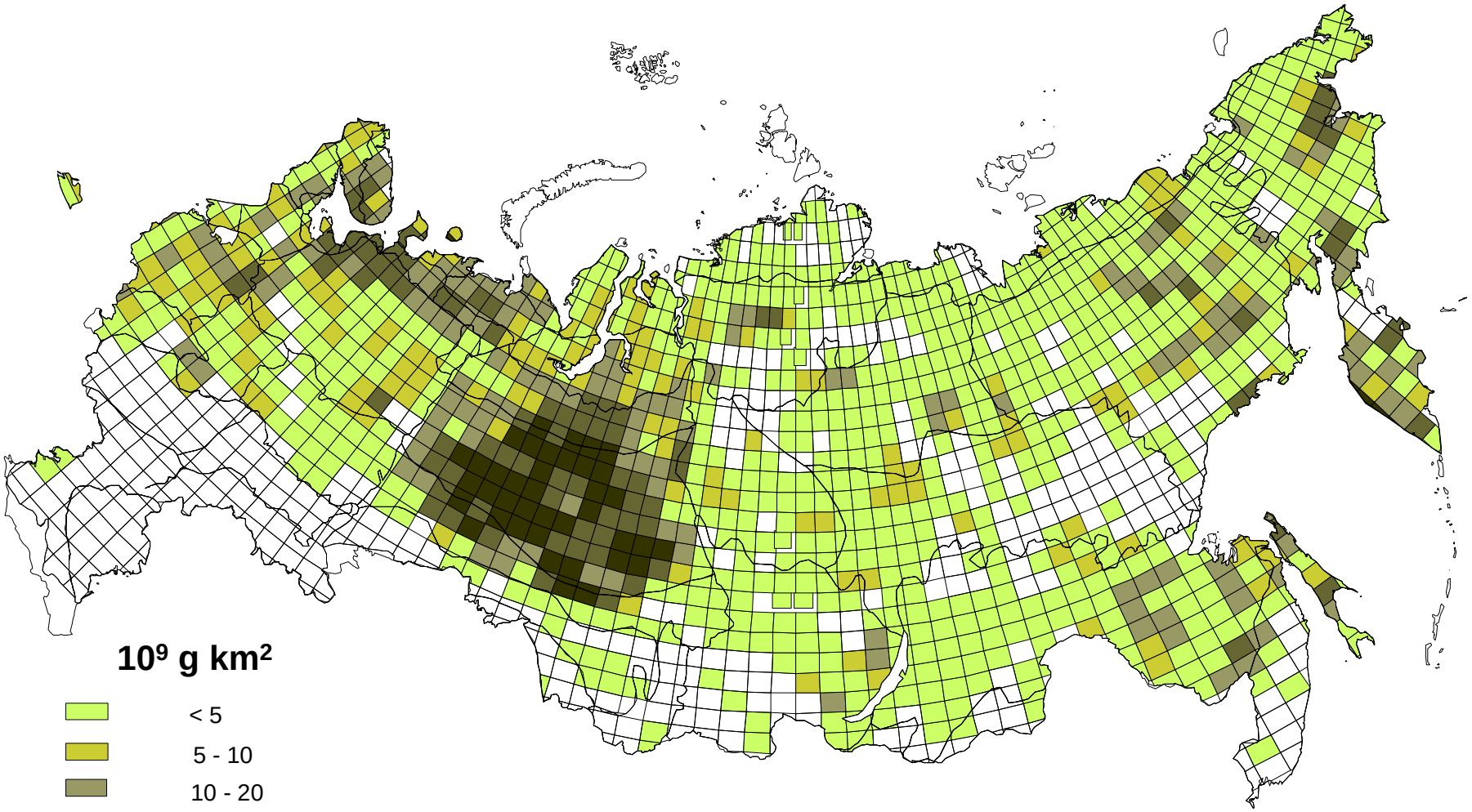
- ***in the sub)polar zone 3.5 times***
- ***in the boreal zone 7 times***
- ***in humid tropics 10 times***

Assessment of Peatlands, Biodiversity and Climate Change, 2008

(Adopted by CBD COP 10 (2008)



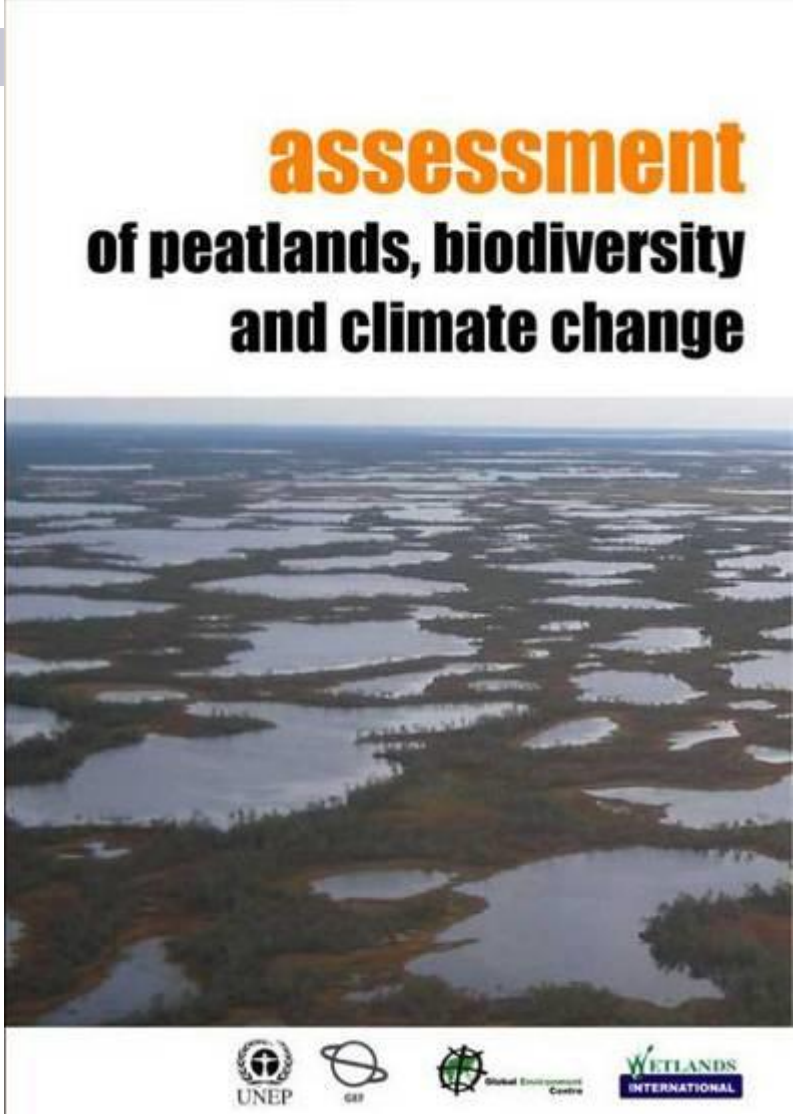
Estimates of Carbon Pool in Russian Peatlands and shallow peat lands: 113,5 (Vompersky et al., 1994) – 210 G t (Botch et al., 1994) thus Russian Peatlands could make from 1/4 to 1/2 of World peat carbon.



At least 15% or 21,8 10^9 tons of peat carbon is related to permafrost palsa and polygon mires, and to tundra with shallow peat.

CBD

Welcomed by CoP 7 Convention on Biological Diversity (February 2004)
Adopted by CBD SBSTTA 12 (July 2007)
and accepted by CBD CoP 9 (May 2008, Bonn, Germany)



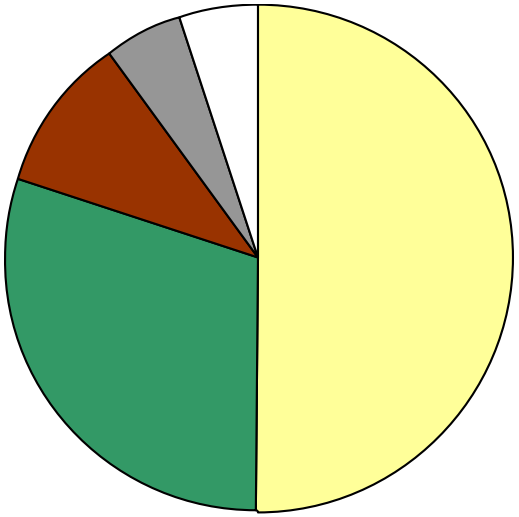
Parish, F. Sirin, A., Charman, D., Joosten, H., Minayeva, T. , Silvius, M., Stringer L. (eds.) Assessment on Peatland Biodiversity and Climate Change: Full report. Global Environment Centre, Kuala Lumpur and Wetlands International, Wageningen. 2008. 179 pp.

www.geonet.org

Man induced Peatland Losses

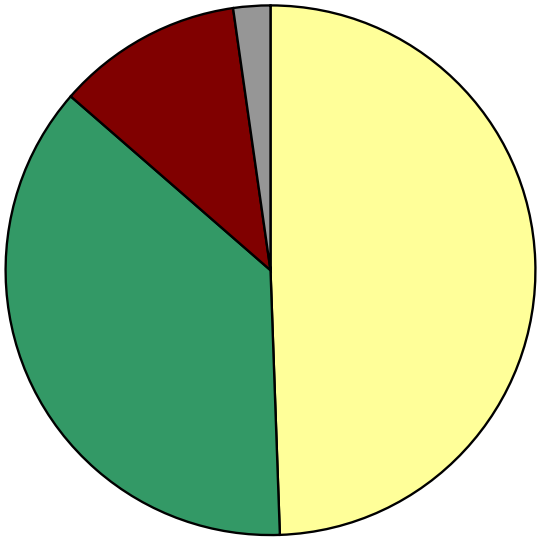
Nontropical World Areas

(Joosten, 1999)



Russian Federation

(Sirin, Minayeva, 2001)



Human disturbances to peatlands in Russian Federation

- Peat extraction > 250 000 ha
- Drainage for Agriculture > 3 000 000 ha
- Forest Drainage > 3 000 000 ha

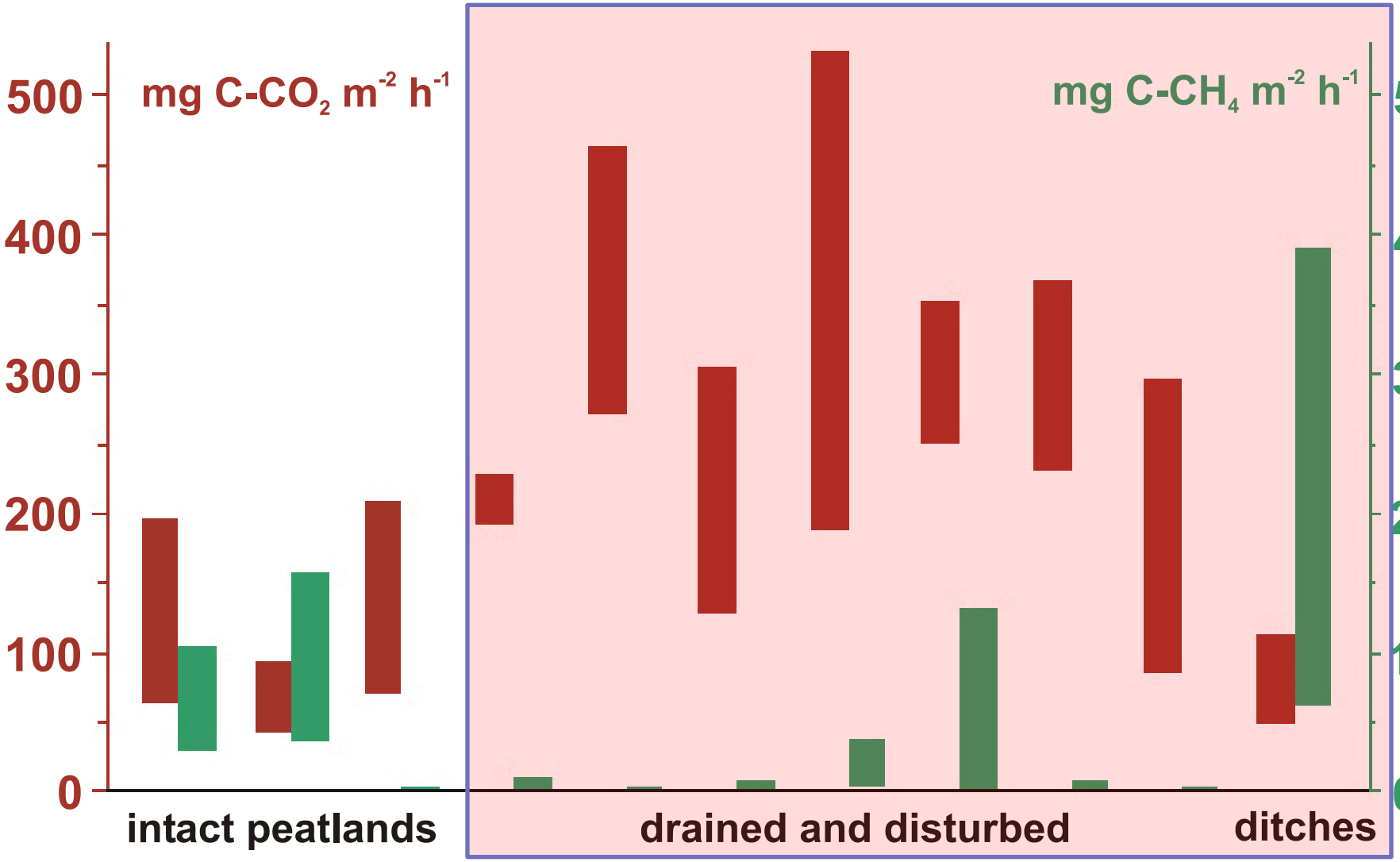
Indirect impacts:

- linear constructions (roads, pipe lines, etc.)
- water contamination and air pollution
- others

Minayeva, Sirin, Bragg, 2009

Carbon dioxide and methane fluxes from intact and disturbed peatlands

(observed from over 70 sites in Tomsk Oblast (southern part of West Siberia).

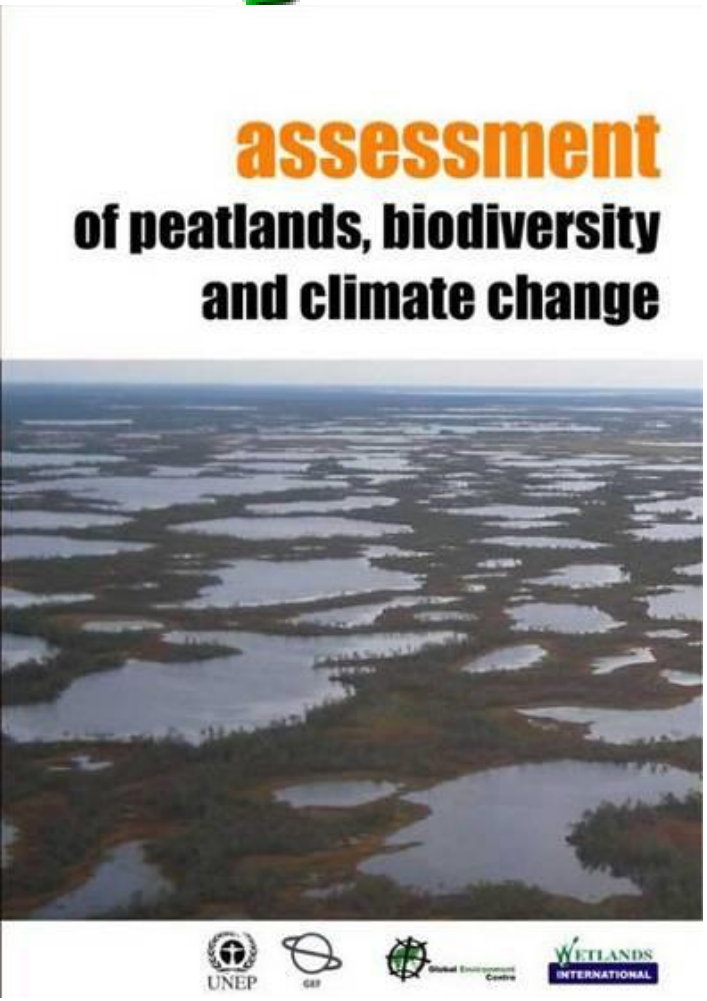


Figures represent gross emissions; GHG sequestration by peat and vegetation growth not included.

Glagolev et al. 2008

Peatlands – most vulnerable to climate change

CBD



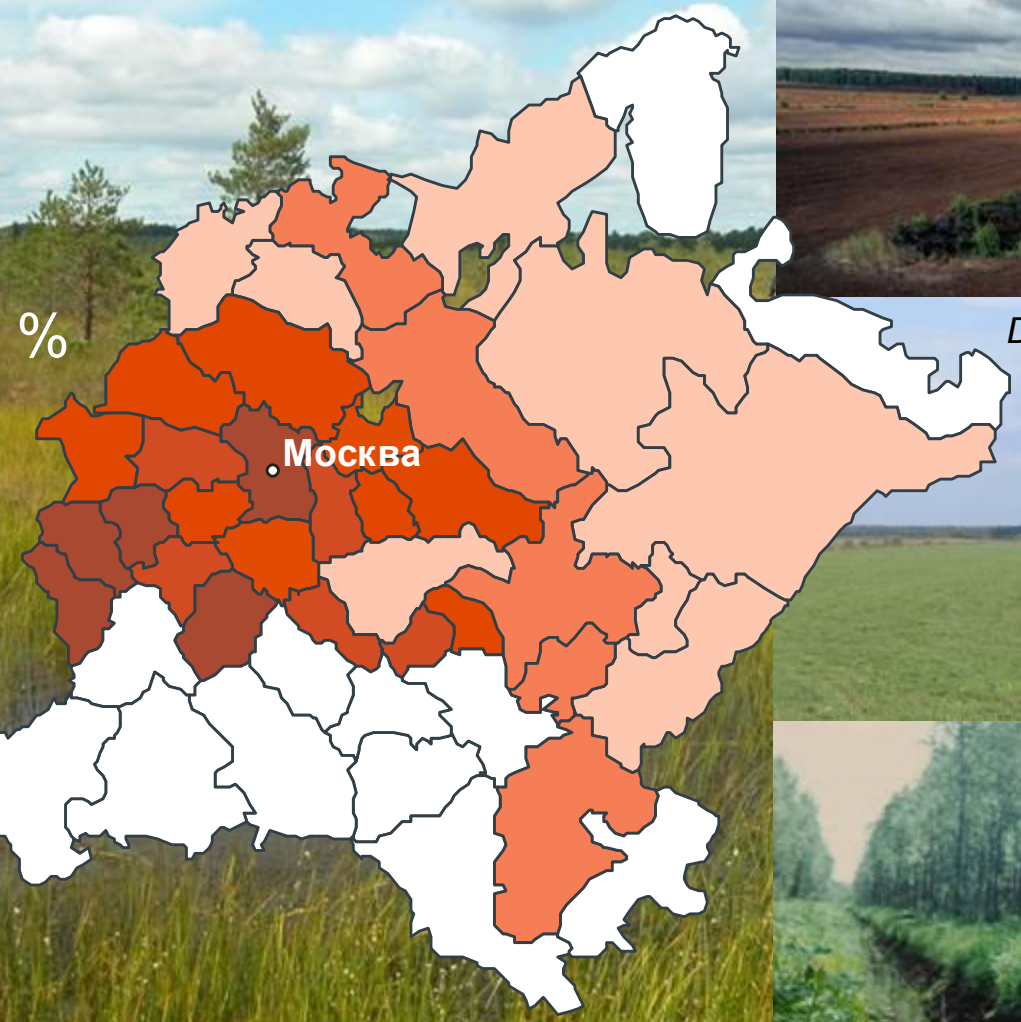
- **Peatlands in steppe and forest-steppe**
- **Permafrost peatlands**
- **Mountain peatlands**
- **Floodplain peatlands**
- **Drained and abandoned**

Biodiversity Conservation of Natural Ecosystems in Russia, 2004

Adopted by CBD COP 10 (2008)
www.geonet.org

The Scale of Disturbances to Peatlands in European Part of Russia

Russian Academy of Sciences
INSTITUTE OF FOREST SCIENCE



Peat extraction

Drainage for agriculture

Forest drainage

Abandoned peatlands used for milled peat extraction (Vladimir and Moscow Provinces)

Drained for extraction peat fields and not used nowadays are most fire dangerous territories

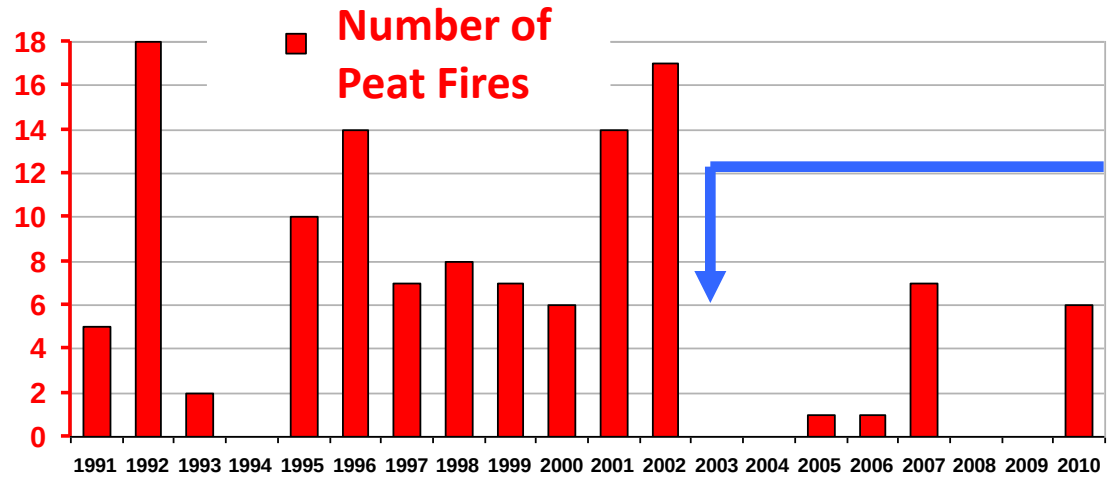
Forest-peat fires 2010

Photo: NASA, 9 August, 2010

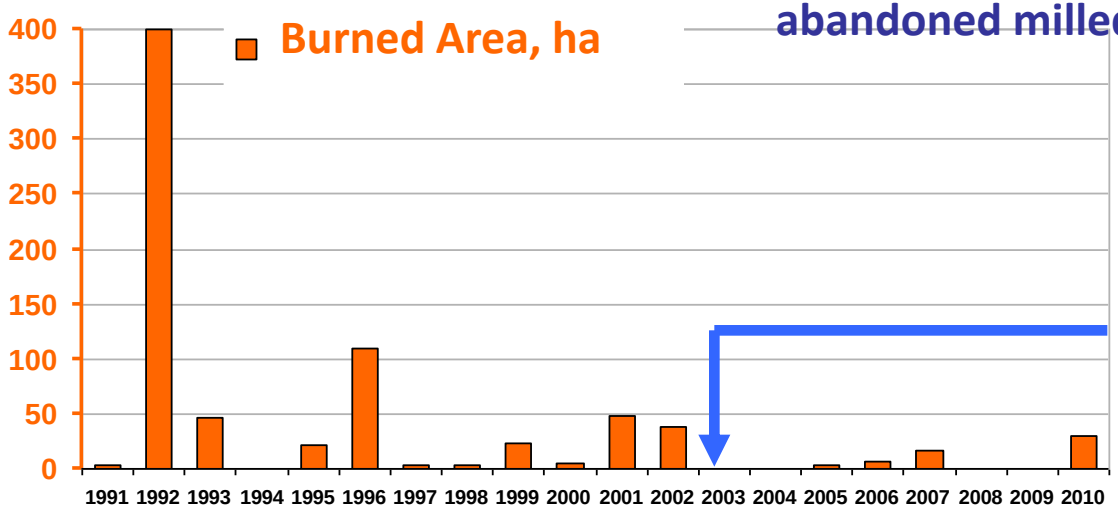
MOSCOW

SAMARA

Peat fires in Meschera National Park in 1991-2010



During 2003 – 2010 over 2000 ha from 7500 ha of abandoned milled extracted peatlands were rewetted

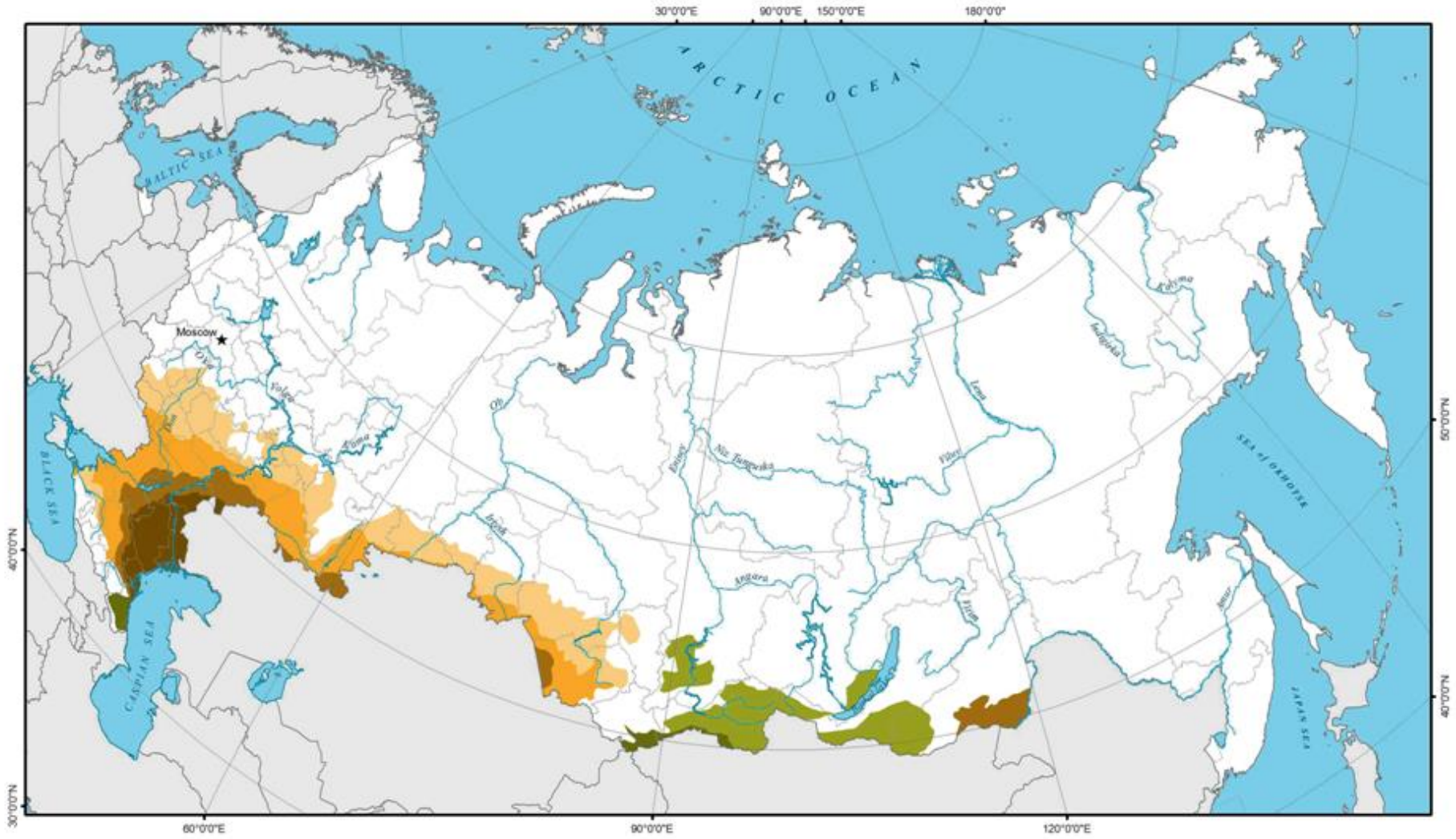


Abandoned peat excavated site with dry periodically burning bare peat surface 4 years after re-wetting,

Meschera National Park, Vladimir Province

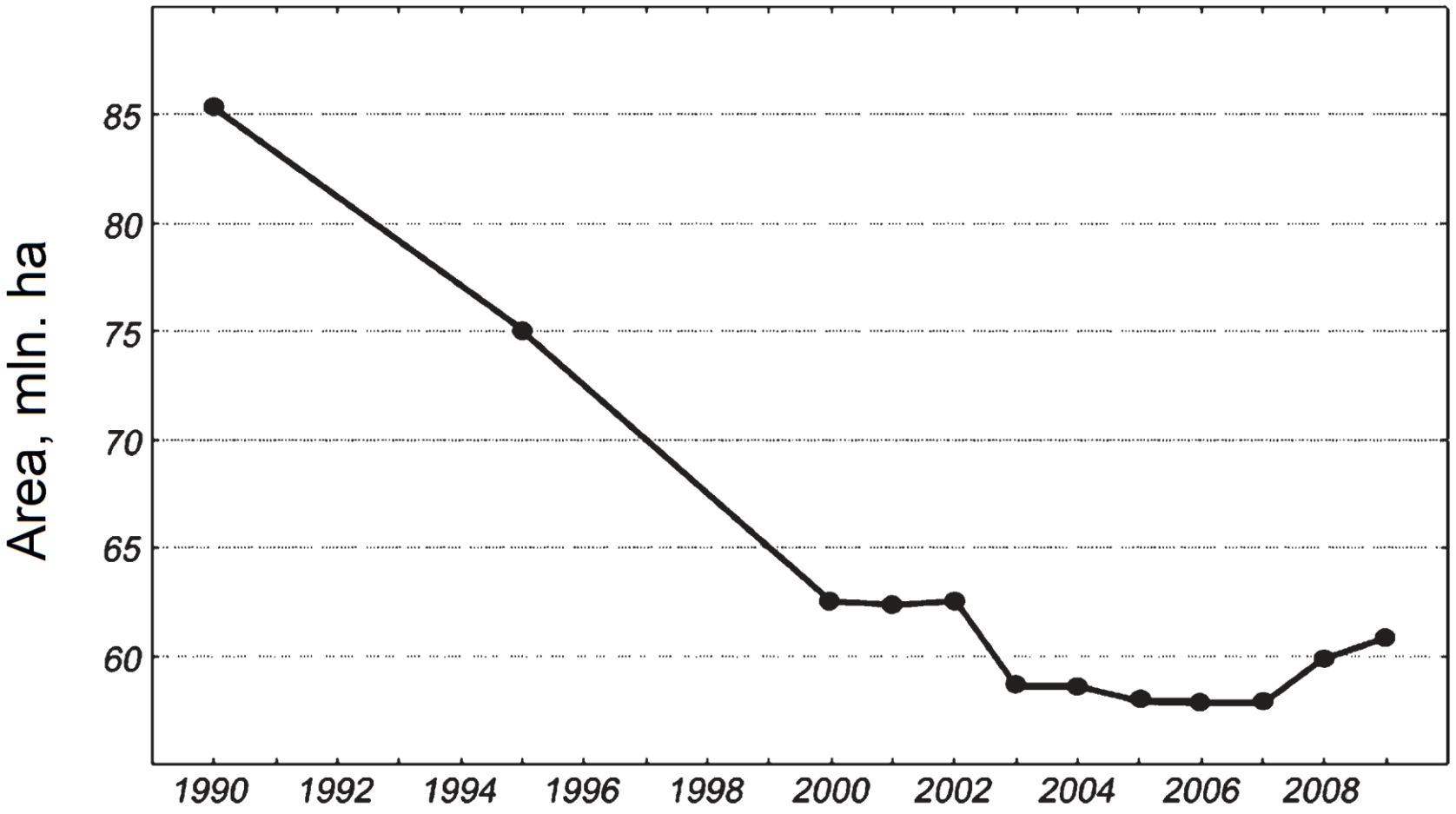
Steppe

Steppe biom in Russian Federation



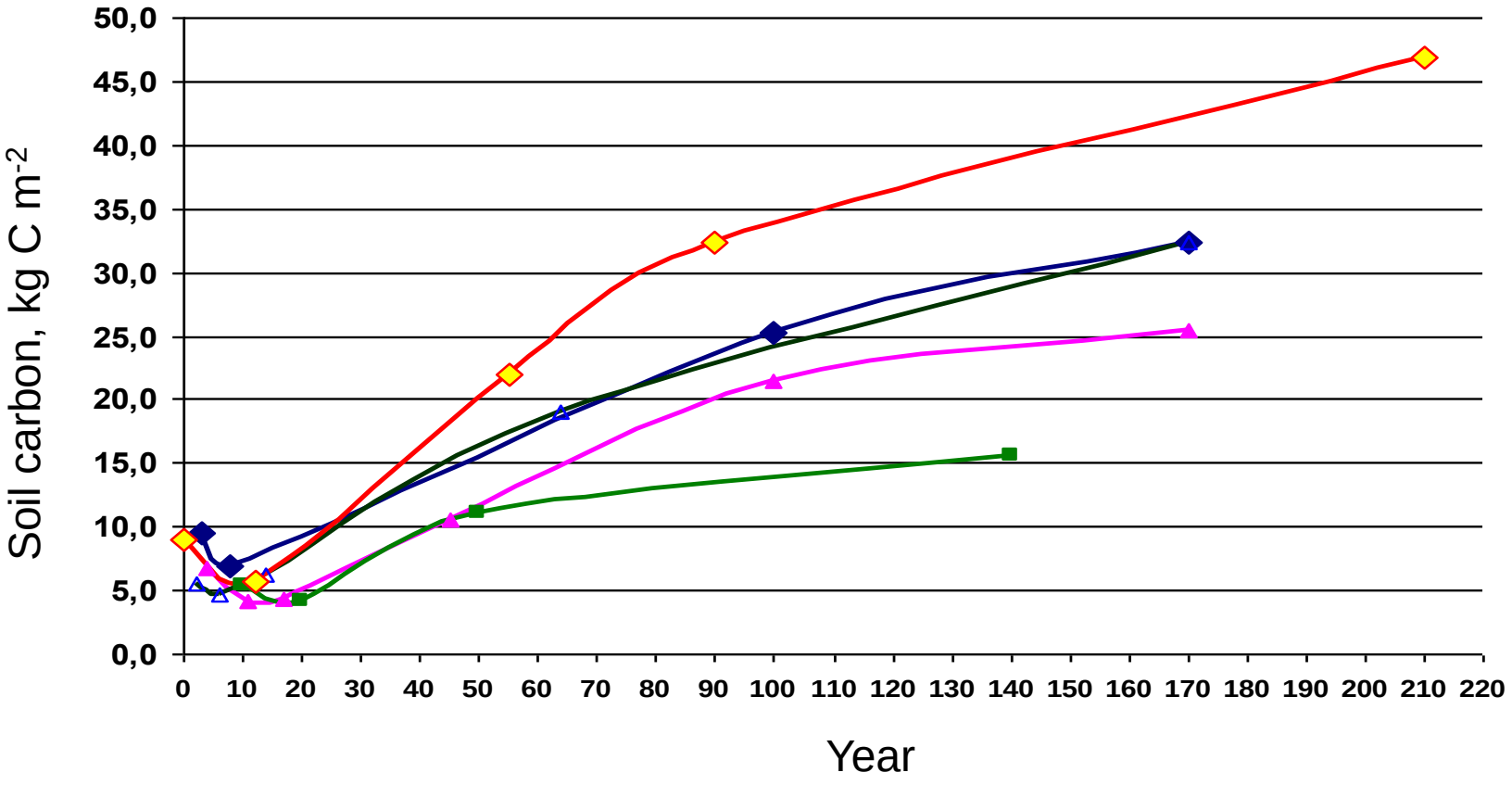
Smelansky, Tishkov, 2012

Cropland area in steppe regions of Russia

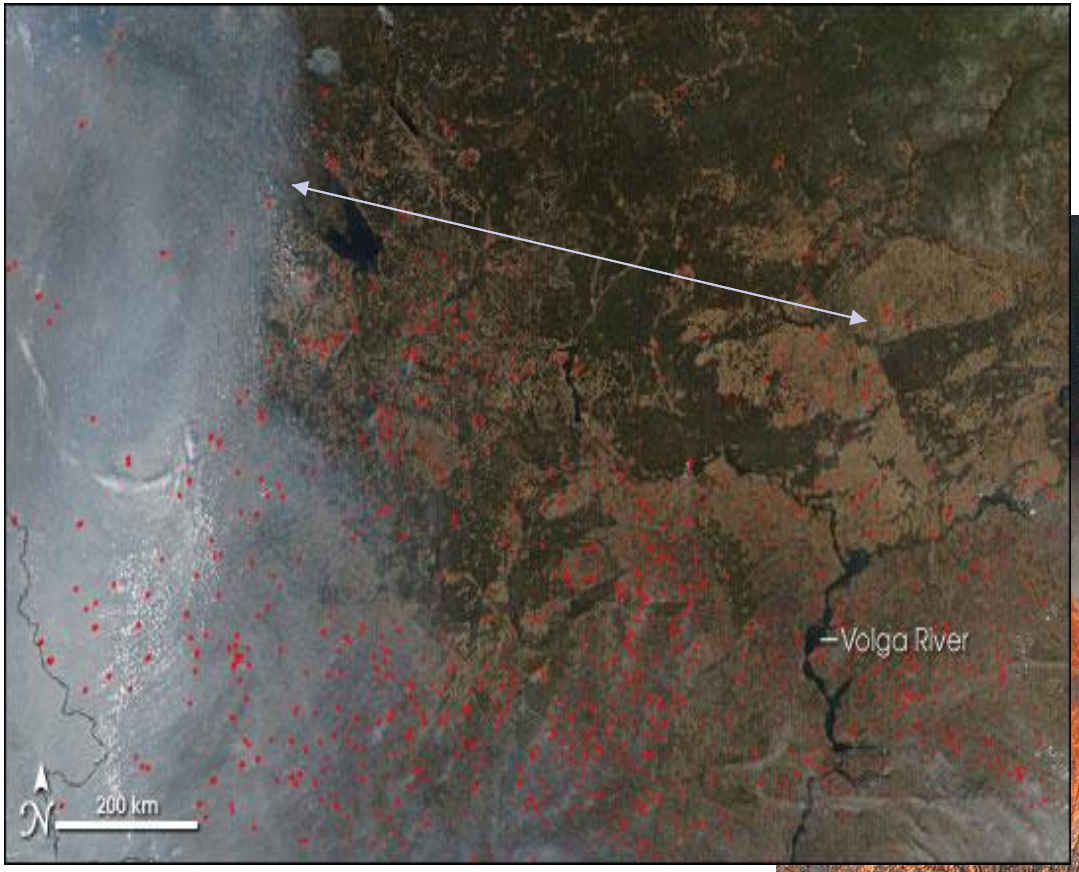


Smelansky, Tishkov, 2012

Carbon pool dynamics in soil of abandoned agricultural lands

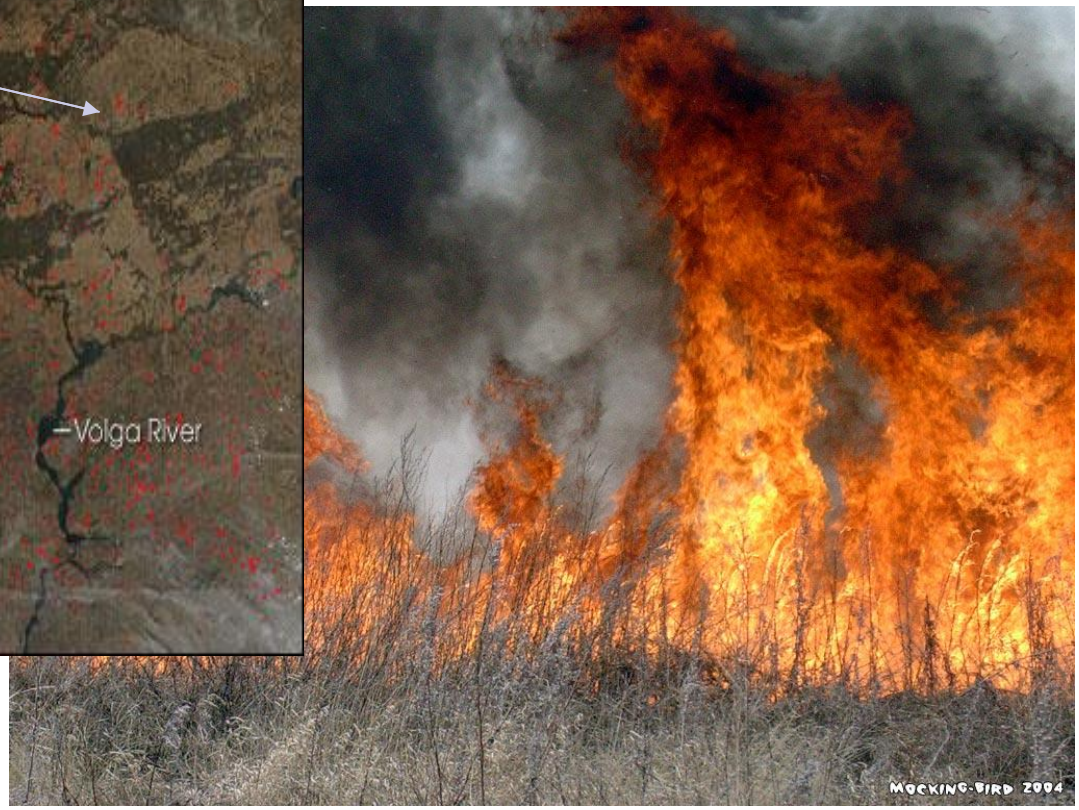


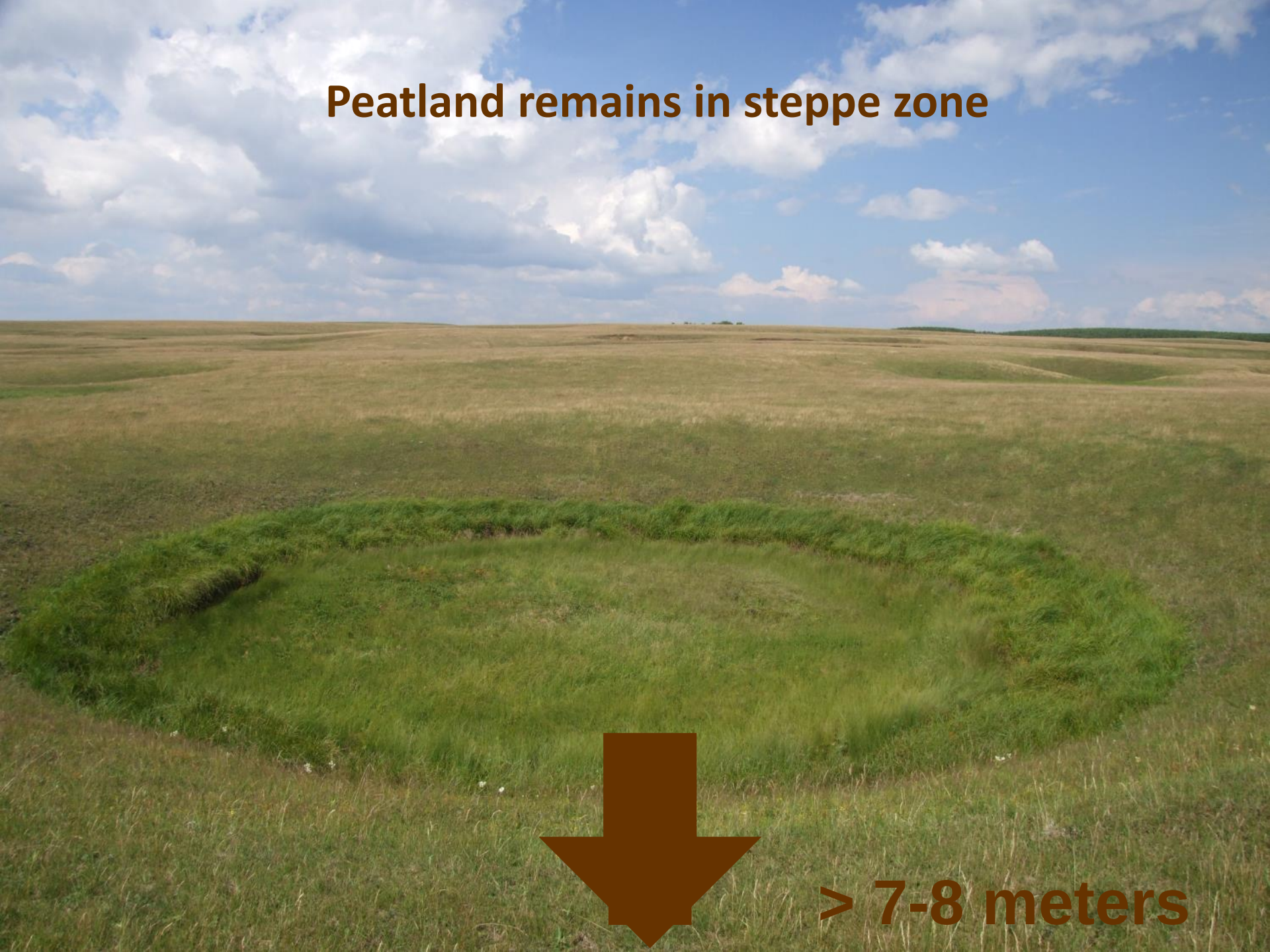
Fire areas in Russia are concentrated in steppe regions



Fires in steppe regions of European Russia

Fire in steppe ecosystem




Peatland remains in steppe zone
> 7-8 meters

Significant issues:

- assessment of carbon balance in tundra, steppe and peatlands considering various human impacts:
  - mechanical disturbance and pollution in tundra;
  - drainage and changes of water regime for peatlands;
  - plowing, grazing, fallow successions in steppe;
- development of methods and techniques for monitoring of greenhouse gases emissions and carbon losses resulting from natural and anthropogenic fires especially in steppe fallows and drained peatlands;

Significant issues:

- development of schemes and mechanisms for economical stimulation of nature protection and restoration in steppe, tundra, and peatlands for carbon sequestration and reduction of greenhouse gases emissions;
- evaluation of potential input from specially protected areas (SPAs) of different types to national activities in reduction of carbon losses and greenhouse gases emissions in tundra, steppe and peatlands.

United Nations
Framework Convention on
Climate Change

COP 19, Warsaw, Poland

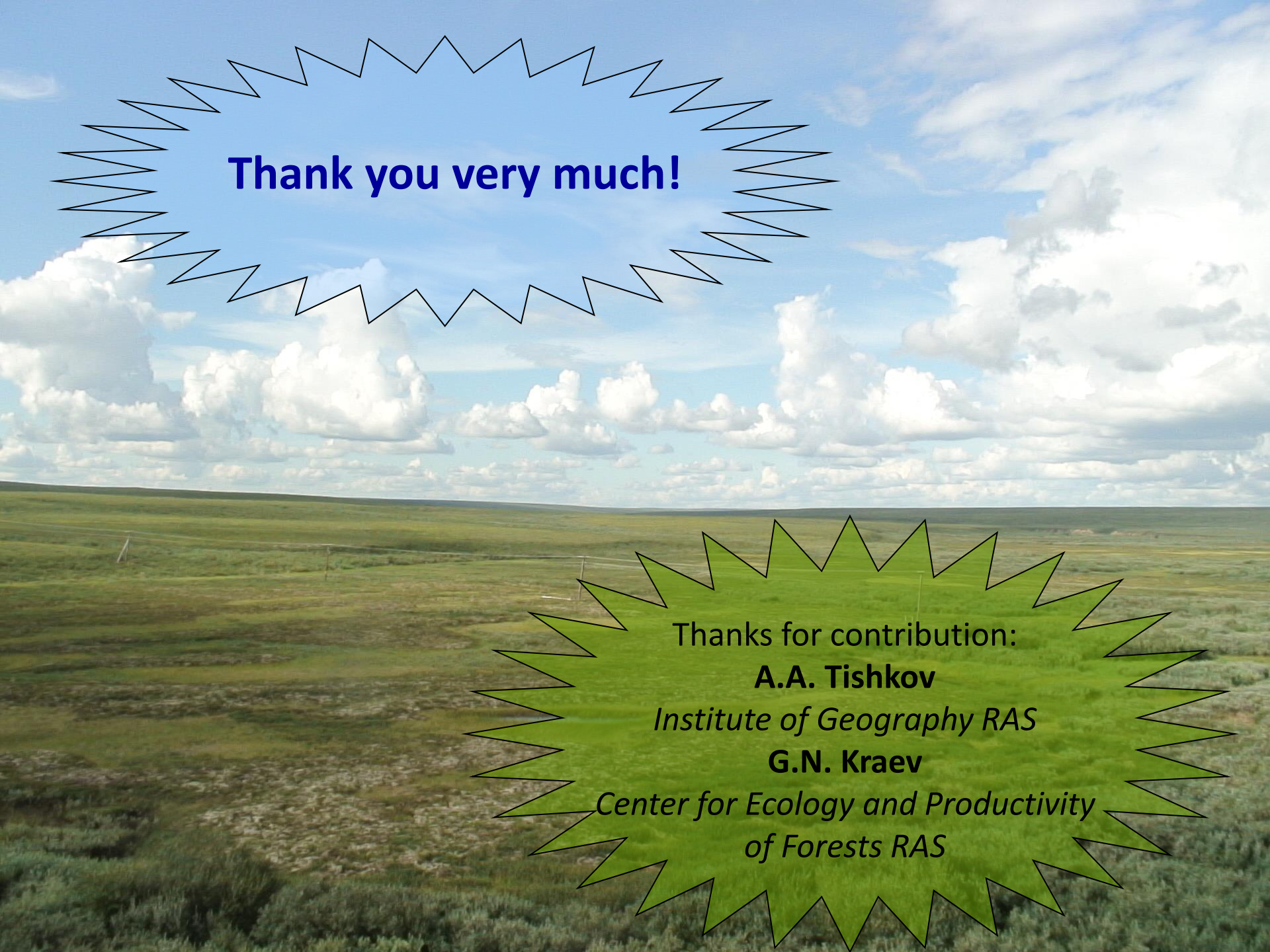
Side-event **Wednesday, 13 Nov 2013 13:15—14:45**

WETLANDS INTERNATIONAL

Terrestrial Ecosystems - Steppe, Peatlands and Tundra: Carbon Balance Assessment and Management

Russian Federation together with **Wetlands International** present outcomes of the studies of terrestrial ecosystems with high carbon content - steppe, peatlands and tundra. Special consideration is given to on-going greenhouse gas emission assessment and mitigation projects for wetlands and tundra.

Speakers: representatives of the Russian Federation Government, Wetlands International, academic research institutions and universities


Thank you very much!
Thanks for contribution:
A.A. Tishkov
Institute of Geography RAS
G.N. Kraev
Center for Ecology and Productivity of Forests RAS