Cool forests at risk?

The critical role of boreal and mountain ecosystems for people, bioeconomy, and climate

17-20 September 2018 @ IIASA, Laxenburg, Austria

Disturbances impact on carbon emissions in forest ecosystems of Ukrainian Polissya

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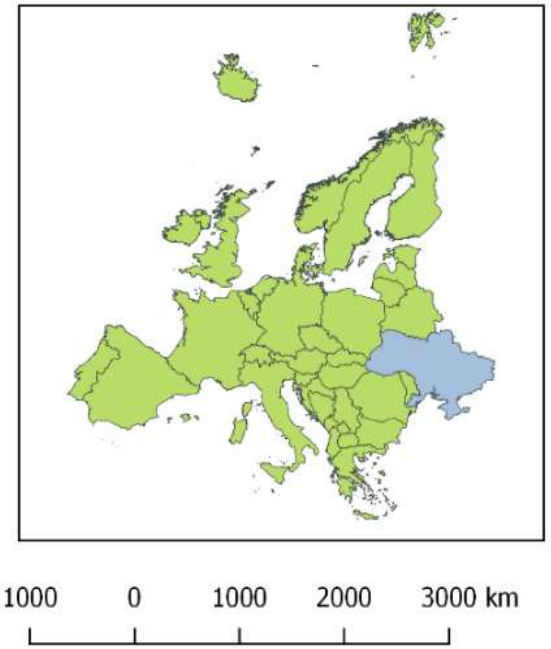
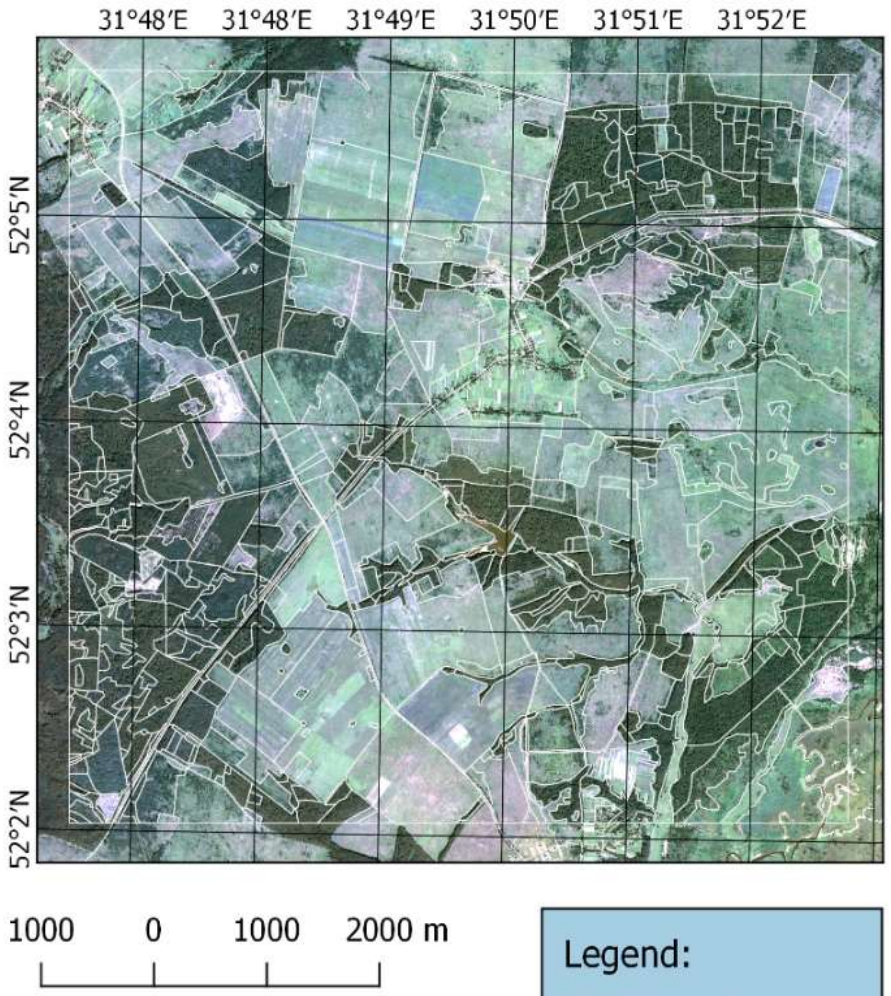
Research Area





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Research peculiarities

Aim: to examine carbon flows by means of pool-based and flux-based methods at the study site with 5-years temporal scale.

Input data sources: forest inventory and remote sensing.

Special focus: on the role of natural and anthropogenic disturbances in forest carbon cycle on the regional spatial level.

Research Methods and Data

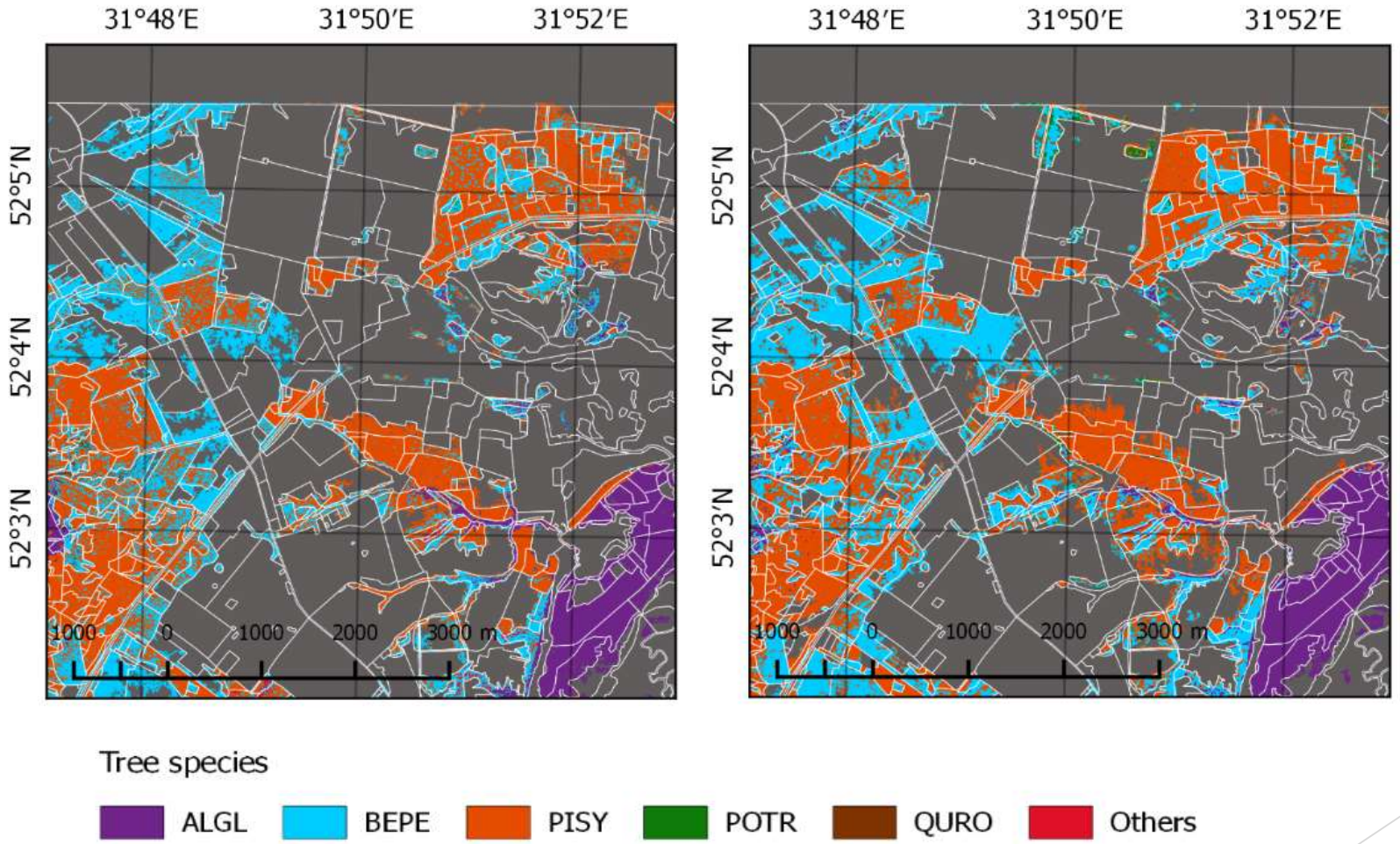
- 443 sample plots

- RAPIDEYE
  IKONOS

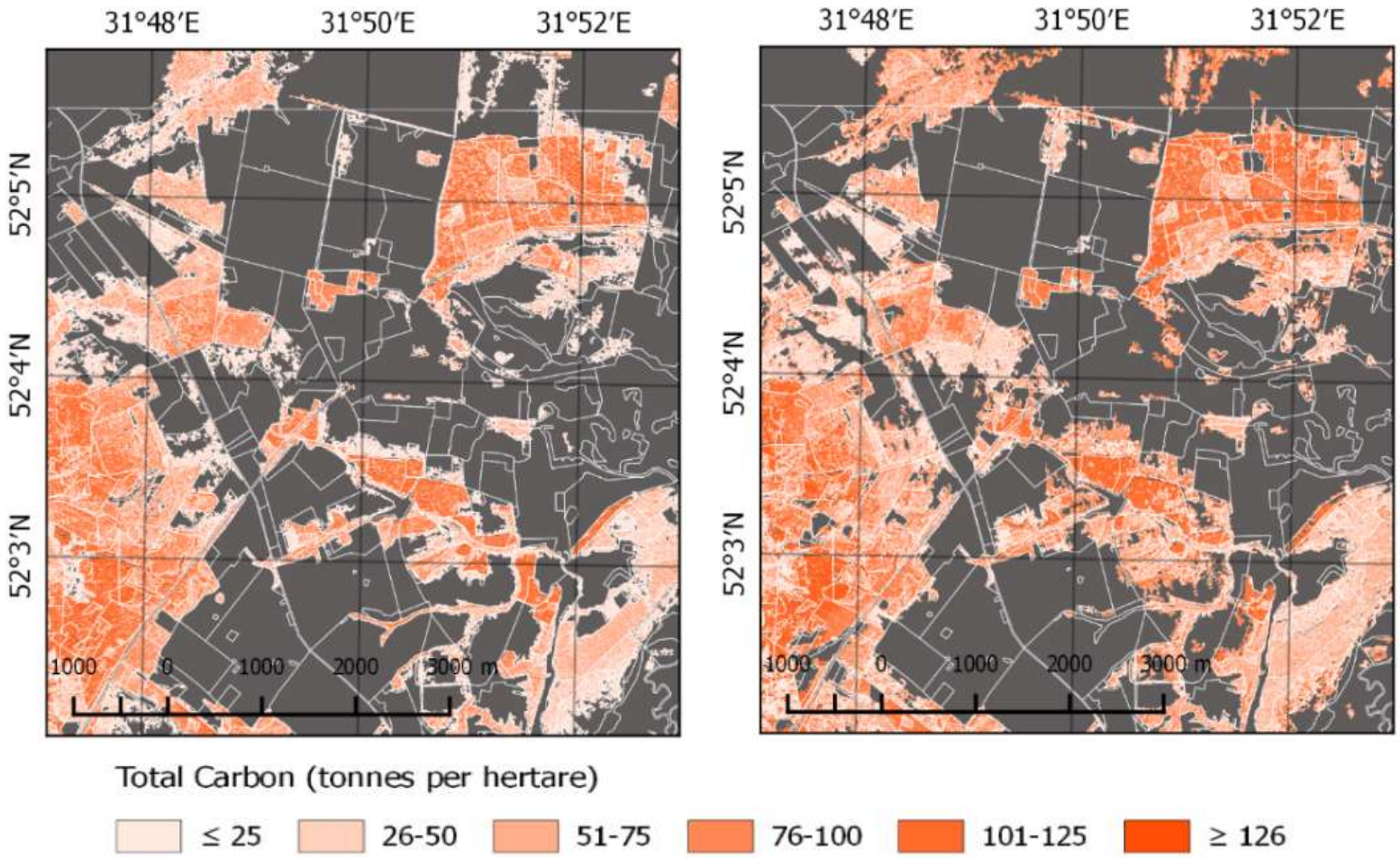
- 10 m DEM

- Random Forest
  k-Nearest Neighbor

Dominant tree species according to RF model



Carbon stock, 2010 and 2015



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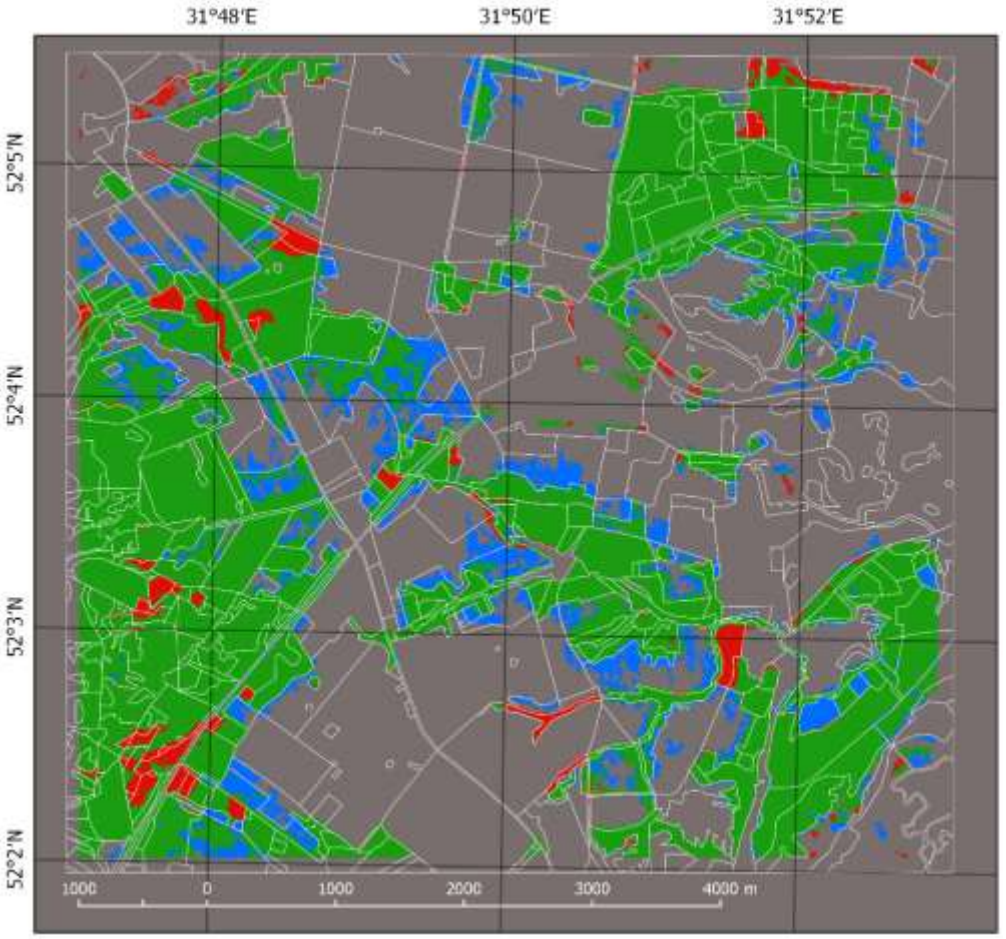
Forest gain and loss, 2010-2015

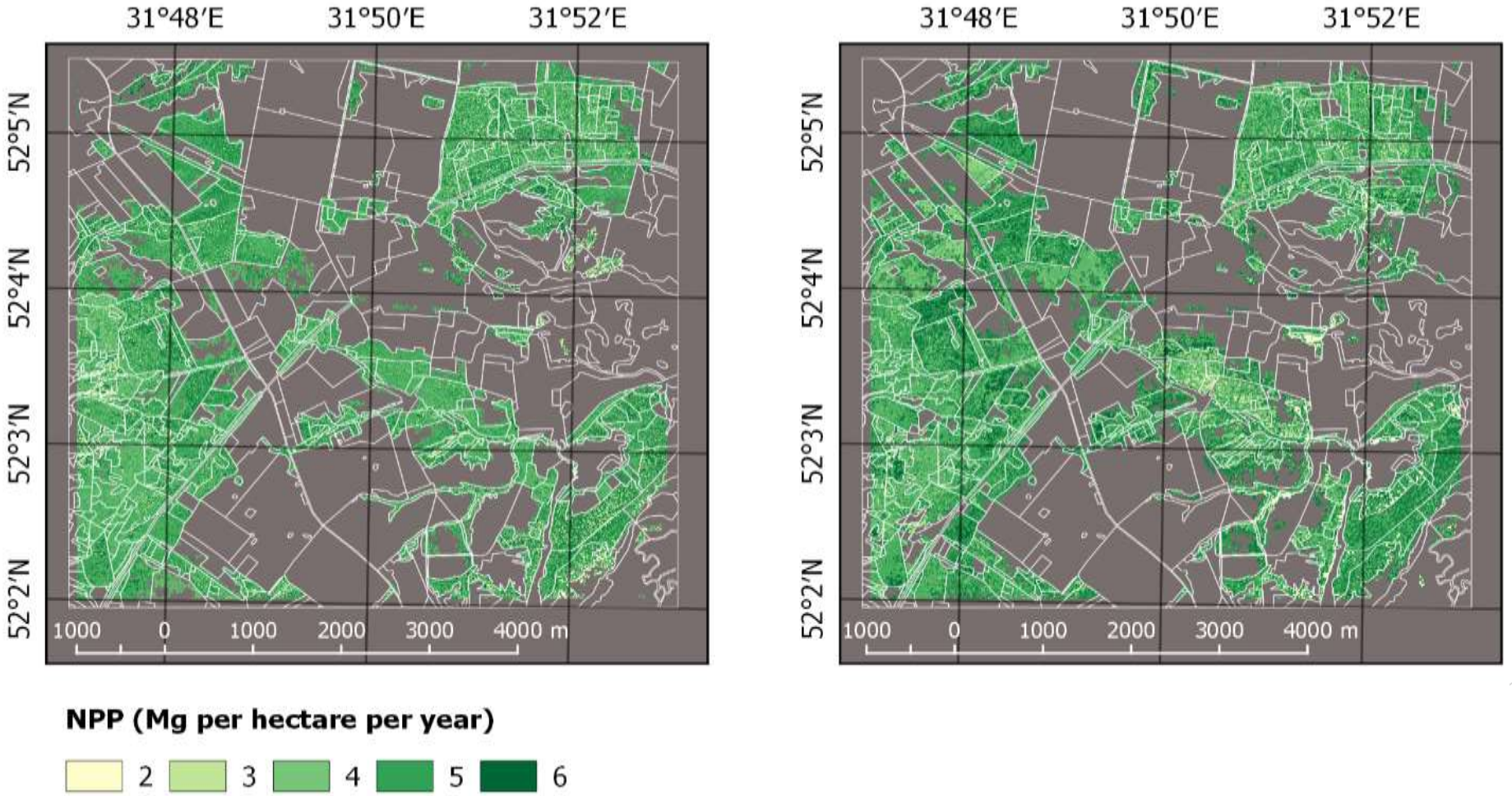


		Gain	Loss	Net
Area, ha	FID	68	103	-35
	RS	304	108	196
Carbon, Gg C	FID	0,7	8,2	-7,5
	RS	17	7,1	9,9

Legend

Forest Cover | Forest Loss | Forest Gain

Net Primary Production, 2010 and 2015

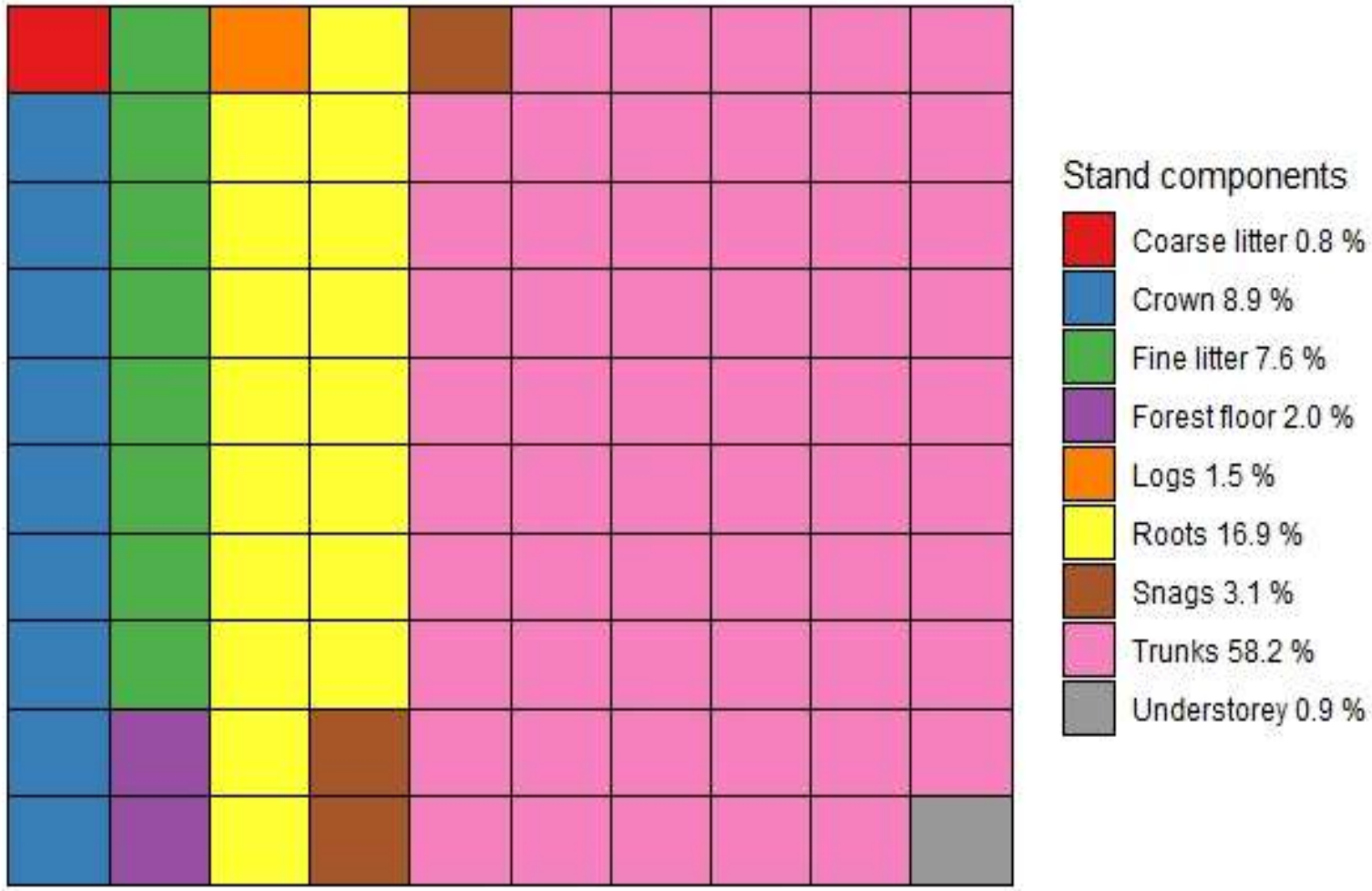


Stock-based C changes, 2010-2015

Sink	Sequestered carbon, Gg C			
	FID		RS	
	2010	2015	2010	2015
Live biomass	96.3	103.0	87.6	116.2
Woody detritus	6.0	6.2	5.4	7.2
Soil	461.0	458.2	416.2	468.4
Total	563.3	567.4	509.2	591.8

C share in biomass*

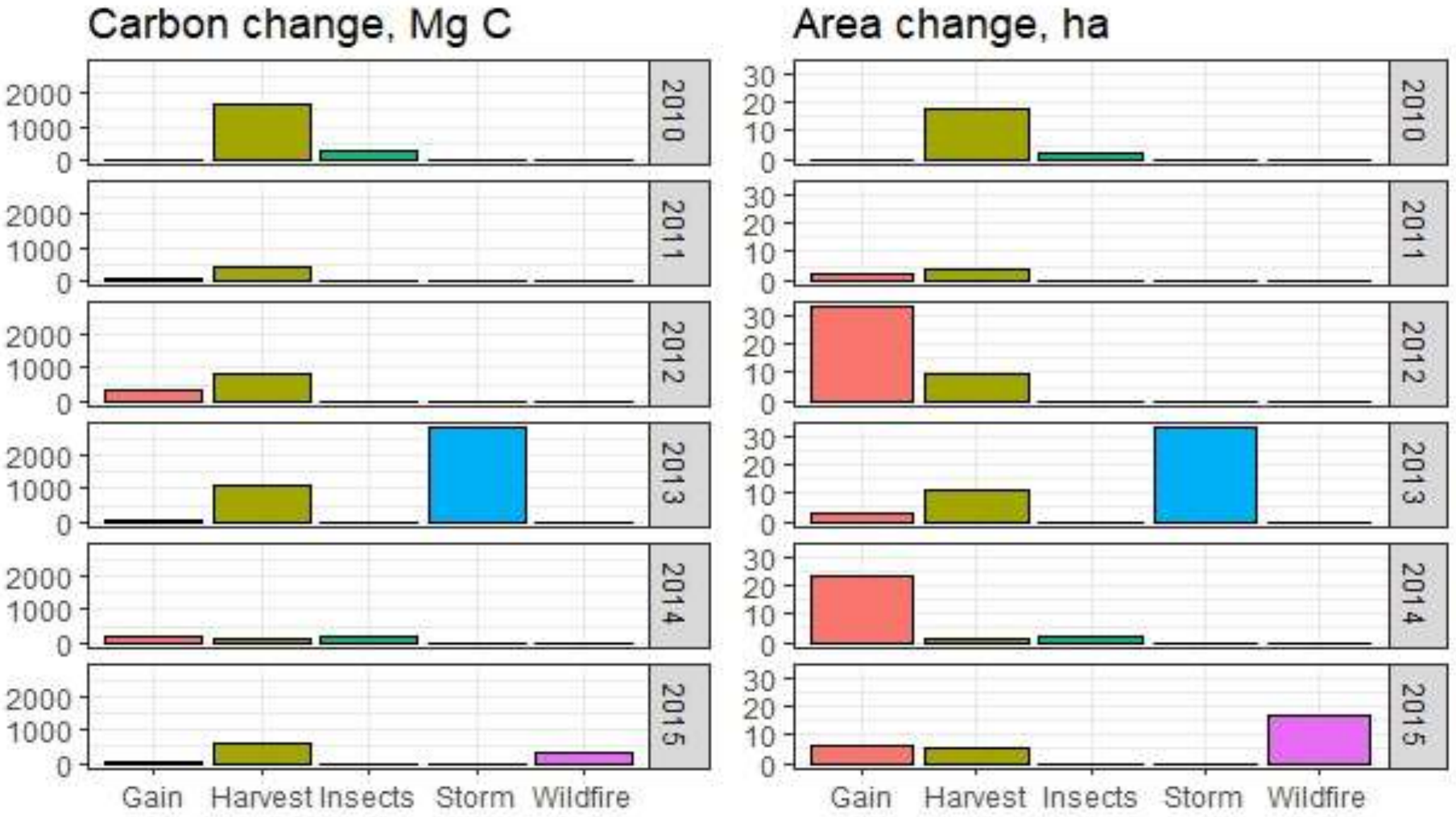
* - 1 cell ≈ 1 percent



Flux-based C changes, 2010-2015

Sink	Carbon loss/gain, Mg C			
	FID		RS	
	2010	2015	2010	2015
Net primary production (NPP)	8886	8750	7748	9008
Heterotrophic soil respiration (HSR)	5340	5320	4778	5371
Decomposition of CWD (DEC)	297	303	336	360
Lateral fluxes into lithosphere and hydrosphere (LAT)	444	438	387	450
Loss caused by nature disturbances and harvest (DIST)	8311		7073	
Net	+5426		+5610	

Temporal distribution of biomass C loss and gain on study site during 2010-2015



Conclusions

- The studied temporal scale represents typical disturbances regime for Ukraine's flatlands;
- Distribution of C loss caused by nature agents is rather uneven;
- Insect outbreaks account for an unusually small portion of biomass and C loss as compared to the general situation in Ukraine;
- Major extreme weather events resulting in large-scale windthrows and windbreaks are capable of turning forests into C source for a substantial time period;

Focus of Research

Our project focuses on specific biotic, abiotic and anthropogenic disturbances impact on carbon cycle of forests growing in ultimate borderland between Forest and Steppe zones. This may help to systematically analyze disturbances patterns and their impact on carbon cycle.

Key Challenges

We have found a considerable disturbances impact on carbon cycle of forest ecosystems. From the main threats for forests, there were estimated the negative trend of increasing wildfires, storms, pests and diseases severity, which cause logging enlargement related to those.

Suggestion to Address these Challenges

In the future efforts for mapping and detection of specific current changes in the forests, assessment of their ecosystem services must be increased.

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Thank you for attention!

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