

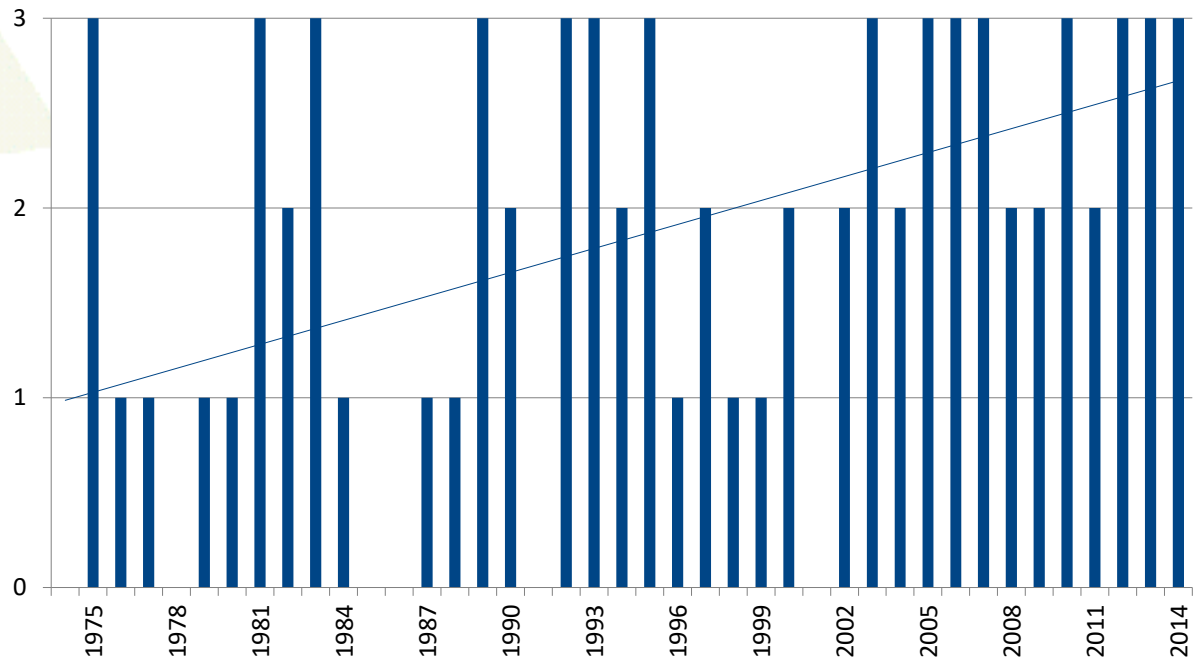
Forest protection against harmful insects in Latvia in the context of climate change

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Successful development of *Ips typographus* second generation



- 0- only 1 generation
- 1- unsuccessful development of 2nd generation
- 2- partly successful 2nd generation
- 3- successful development of second generation



Forest pest monitoring program



Forest pest monitoring program is part of the National Forest Monitoring Program and was initiated in 2014.

Forest pest monitoring program is carried out in Latvian State Forest Research Institute «Silava».

Program consists of five major activities:

- Count of overwintering insect stages in the litter
- Use of pheromone traps
- Assessment of *Ips typographus* damage to the forest stands
- Forest health monitoring (FutMon)- identification of defoliation agent
- Survey of suspicious stands based on signals from forest owners, society or governmental institutions

Forest pest monitoring program



When critical pest densities are observed or local mass outbreaks detected, information is sent to State Forest Service, state forest company «Latvijas valsts meži», and Forest department of the Ministry of Agriculture.

Litter control



Litter control is carried out in May in 26 sample plots across the country to assess the count of overwintering insect pest stages.

In each sample plot 10 m² of litter are surveyed.

Following pest species are monitored in this activity:

- *Bupalus piniarius*
- *Panolis flammea*
- *Hyloicus pinastry*
- *Diprion pini*
- *Acantholyda posticalis**
- *Dendrolimus pini***

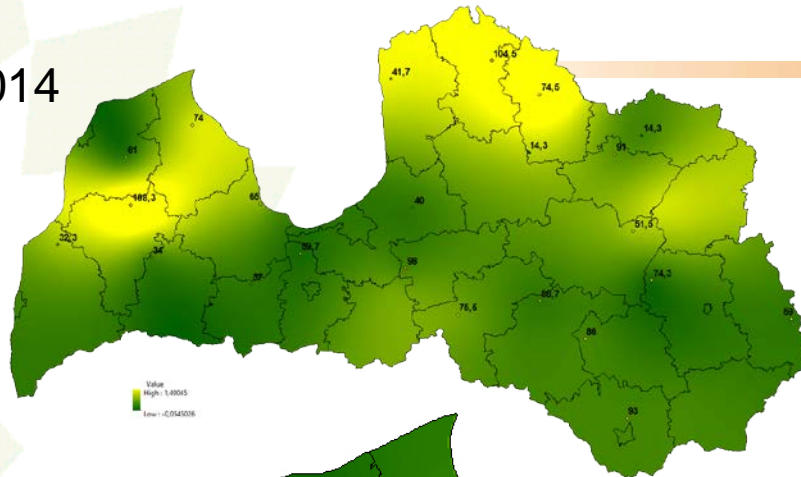
* only in one region where outbreaks of *Acantholyda posticalis* have been observed

** currently is not monitored- additional litter control must be performed in autumn in order to monitor this pest

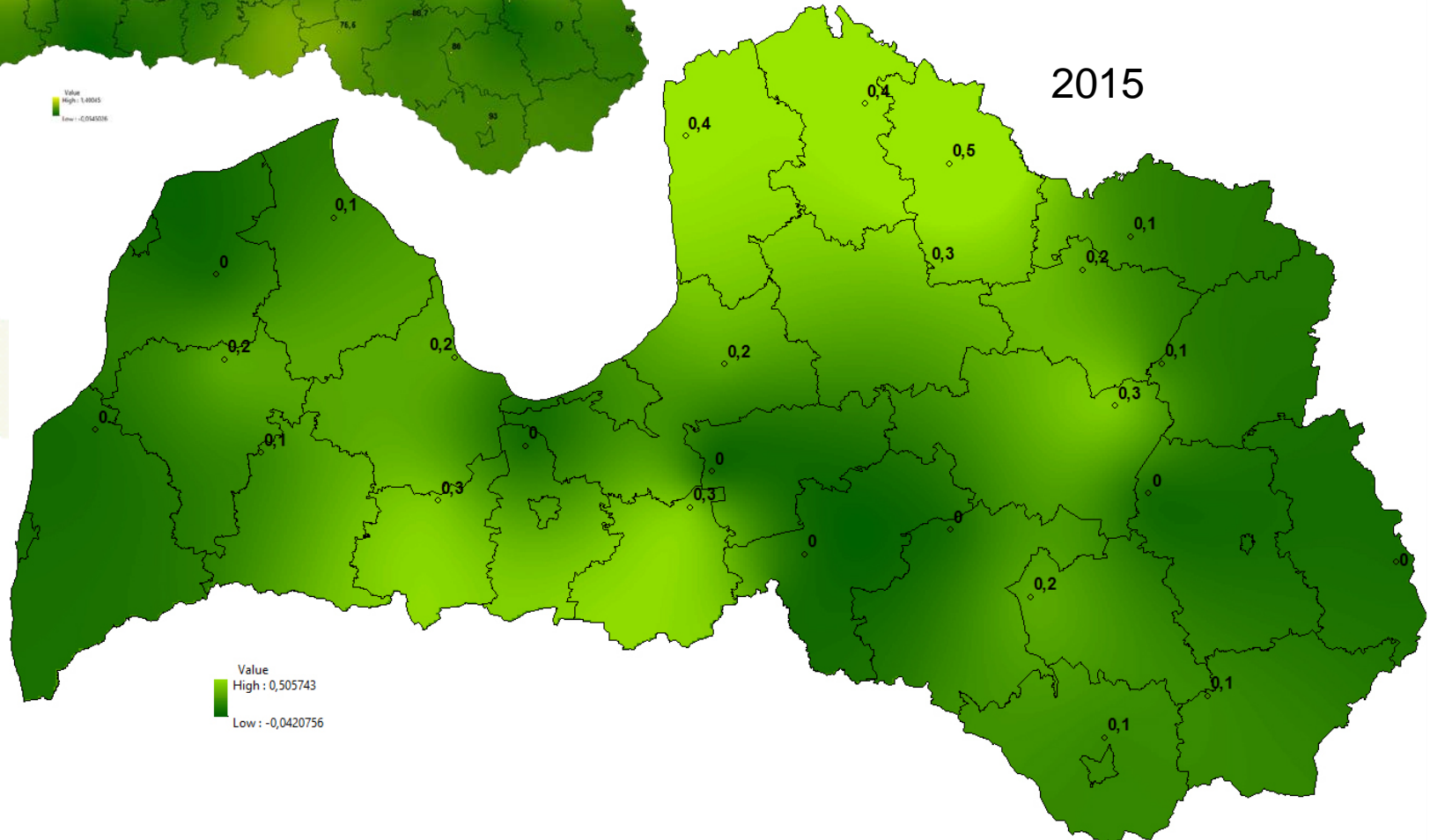
Litter control- *Bupalus piniarius* pupae per 1 m²



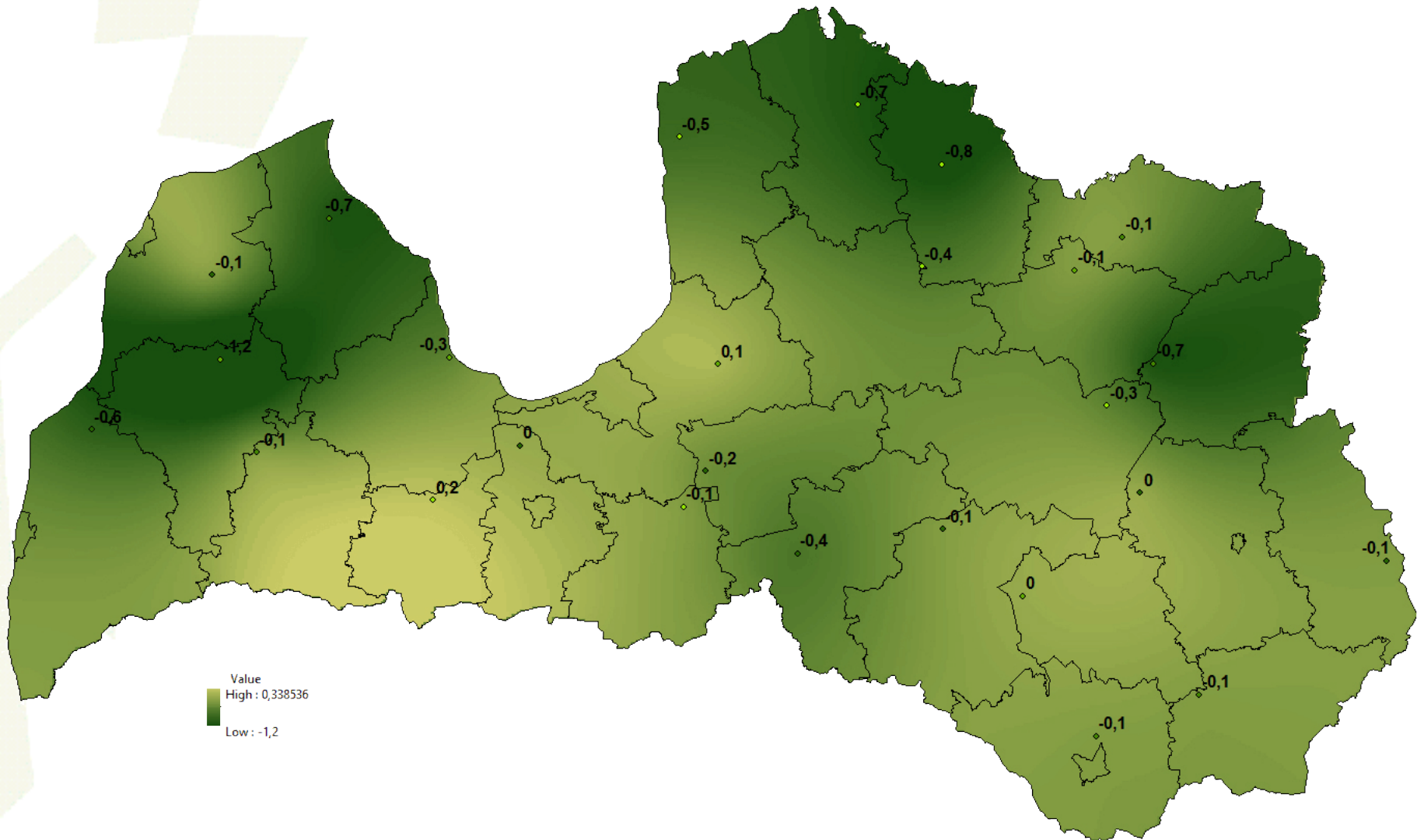
2014



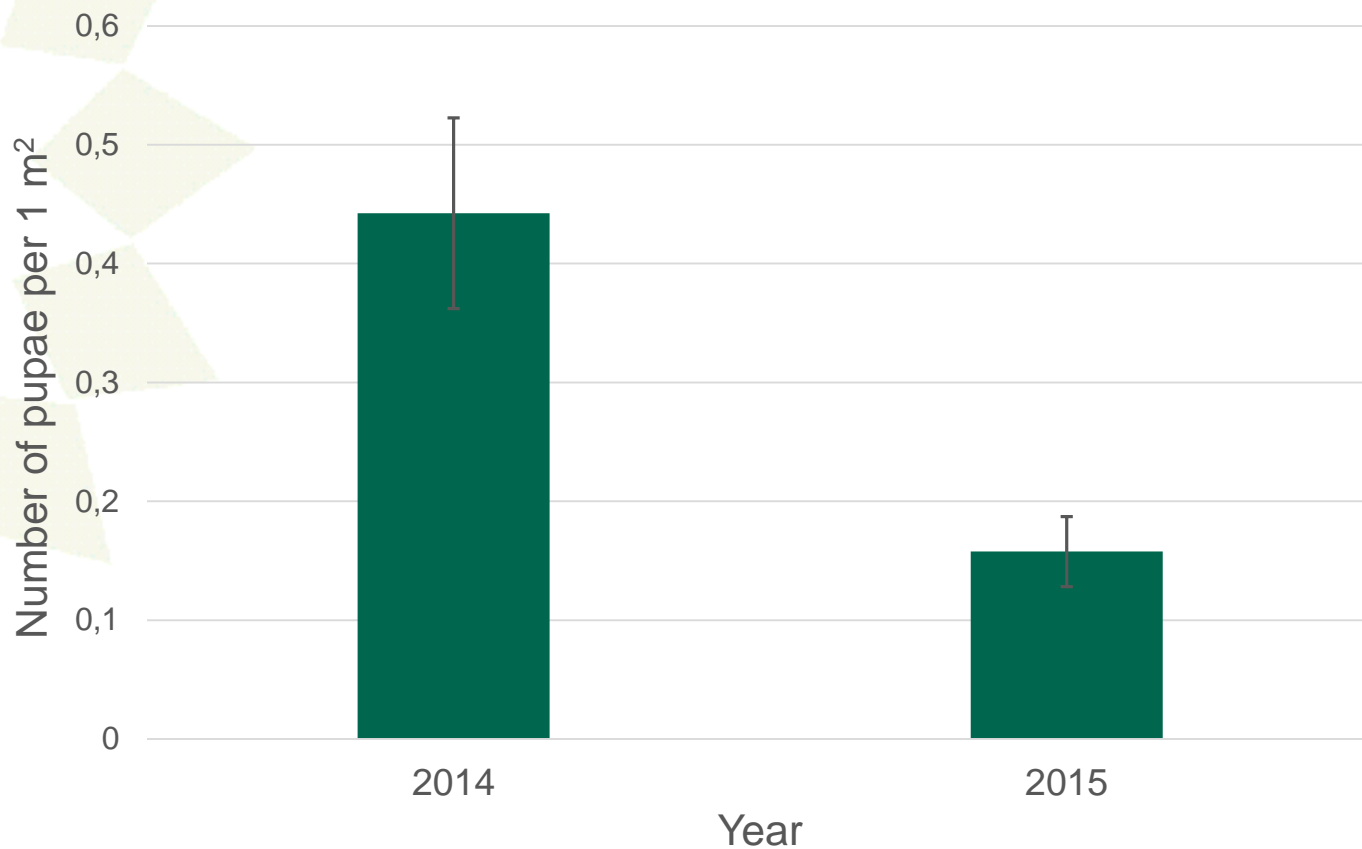
2015



Changes in *Bupalus piniarius* population densities



Changes in *Bupalus piniarius* population densities



Use of pheromone traps



Same sample plots as in litter control are used to monitor *Lymantria monacha* and *L. dispar*. One attractant (Lymodor A) is used to attract both species. Three volume traps are used in each sample plot.

In addition, a transect of 8 sample plots are placed in western part of the country

Volume traps are placed into forest on 1st of July and removed on 1st of October. Total count of moth caught per trap is obtained at the end of adult flight. Species are sorted according to wing veins in the laboratory.

Use of pheromone traps

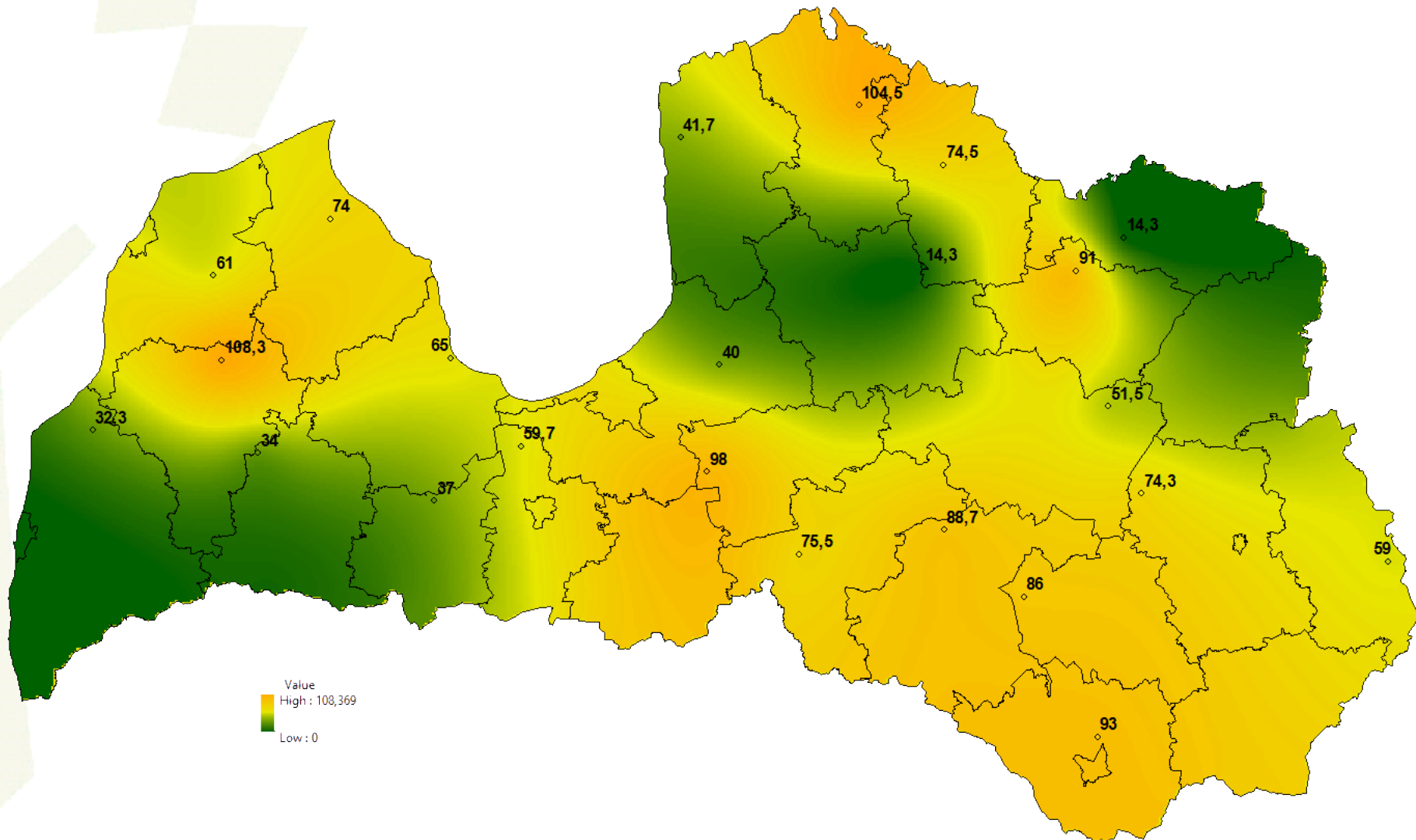


26 sample plots

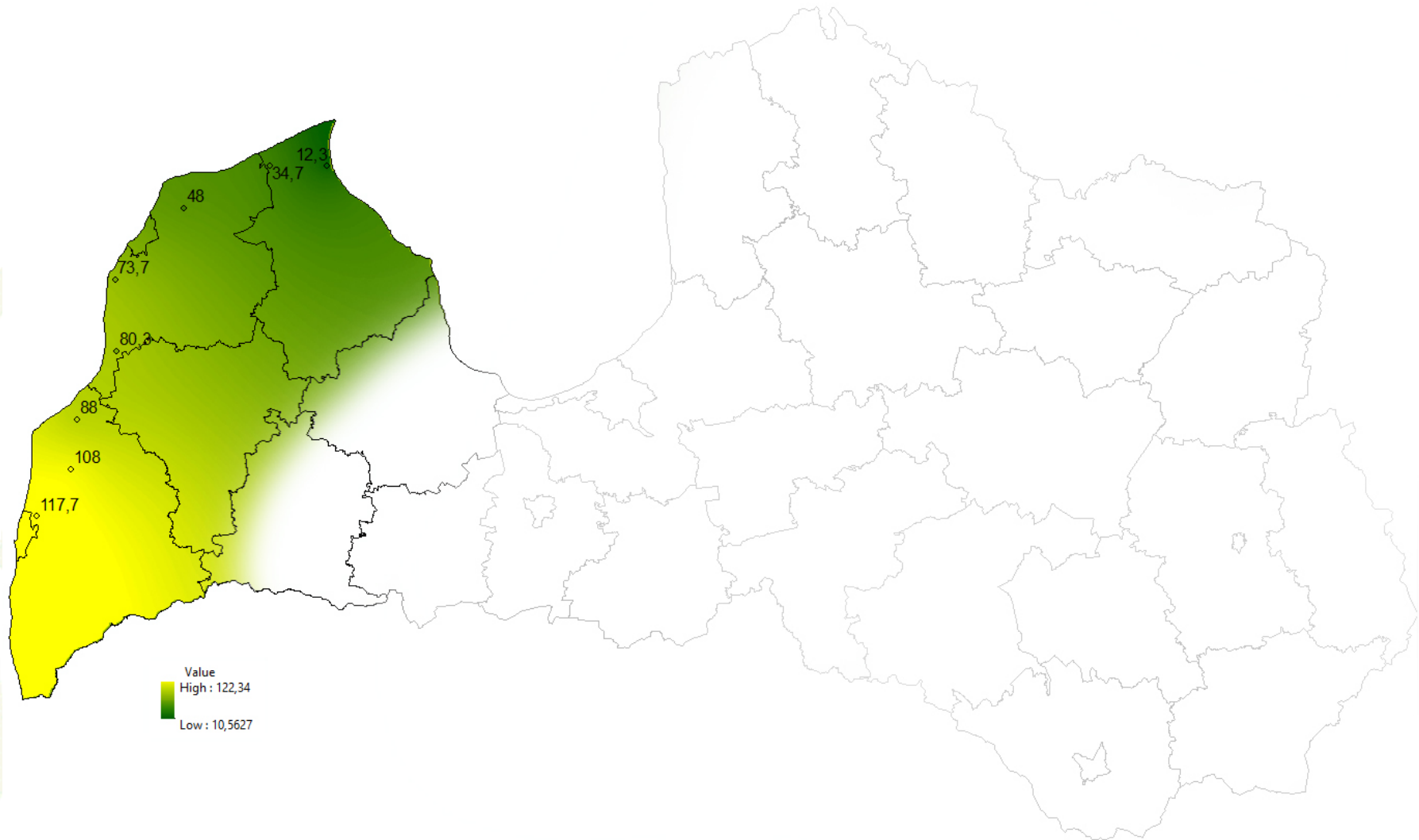
78 traps

4 sample plots
destroyed

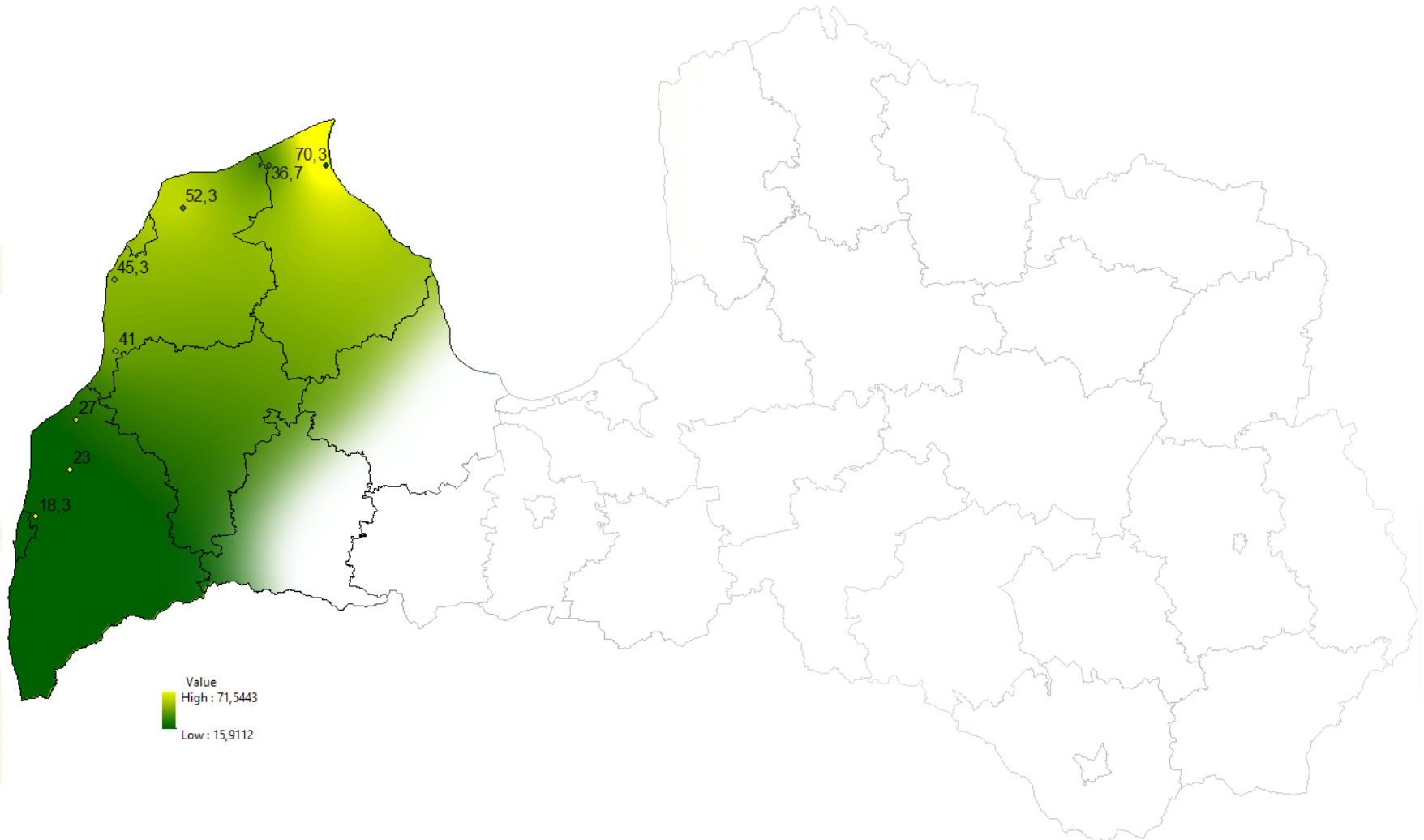
Average number of nun moth (*Lymantria monacha*) caught per trap in 2014



Average number of gypsy moth (*Lymantria dispar*) caught per trap in 2014



Average number of nun moth (*Lymantria monacha*) caught per trap in 2014 in broad leaf tree stands



Use of pheromone traps- *Ips typographus*



26 sample plots with three traps in each are placed in fresh conifer clearcuts throughout the country to monitor spruce bark beetle flight activity. Traps are placed in to clearcuts on 1st of May and removed in 1st of September.

Traps are monitored weekly. Number of beetles are measured indirectly by volume.



Pheromone traps for *Ips typographus*



Critical numbers of *Ips typographus* beetles per trap

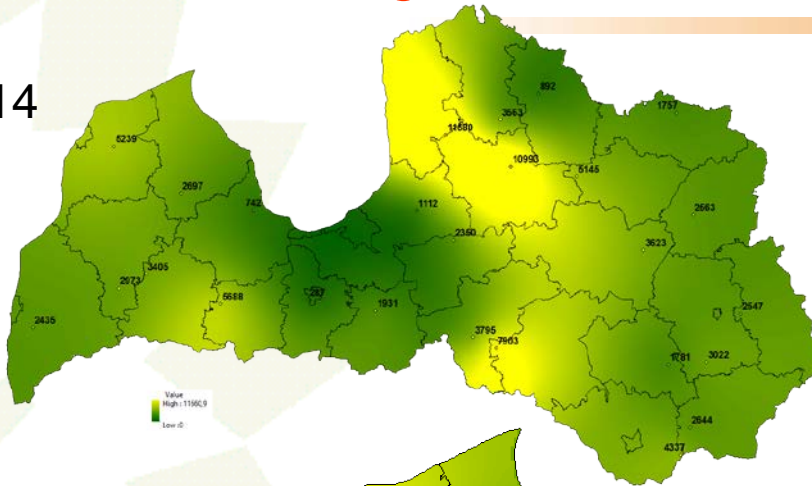


Number of beetles per trap		Risk to living spruce stands
1 day	30 days	
100>	500>	non
100-200	500-3000	small
200-1000	3000-8000	moderate
1000-2000	8000-20000	significant
2000<	20000<	Very significant

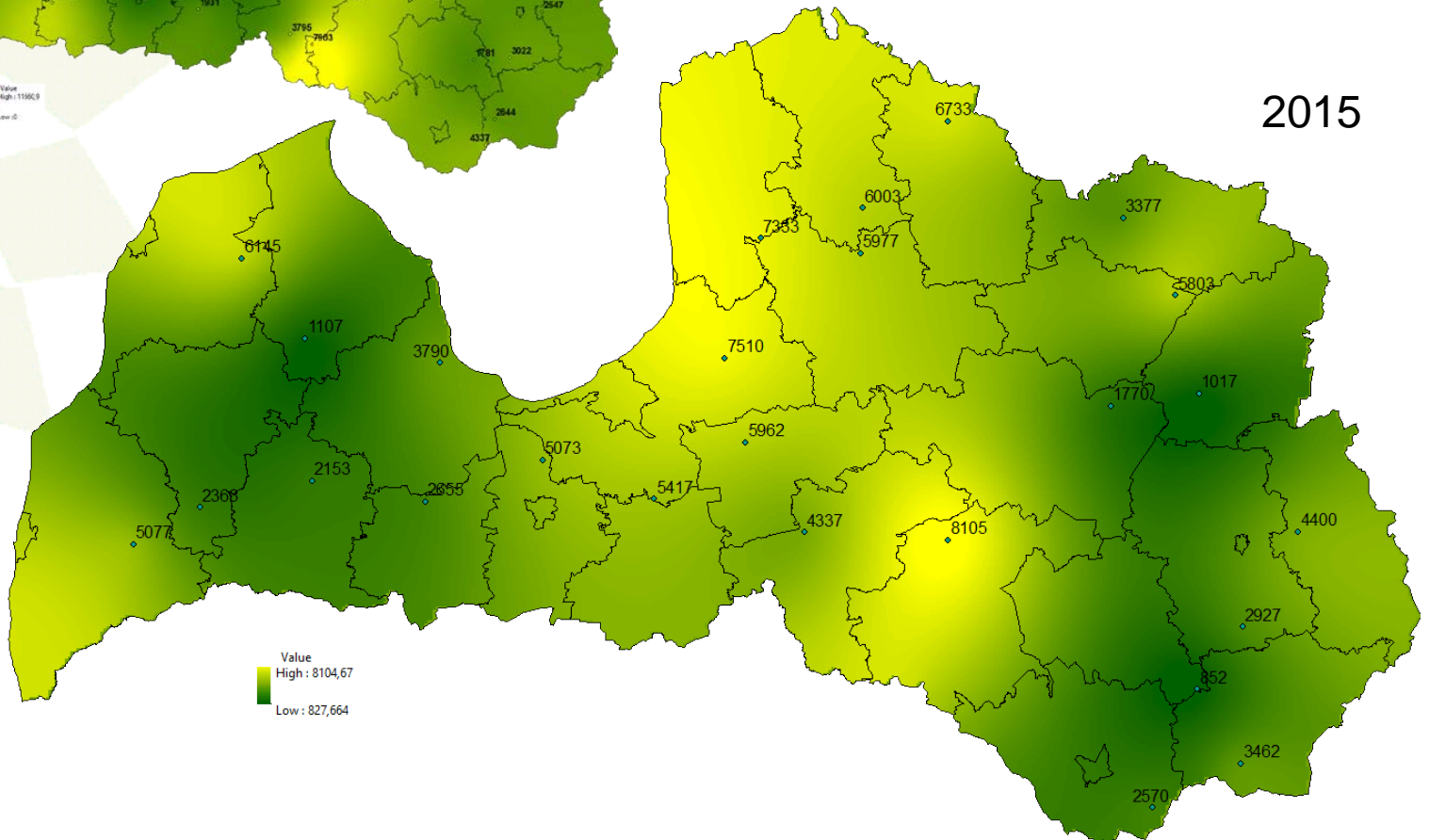
Number of first generation Ips typographus beetles per trap in 2015 caught from 1st of May to 15th of June



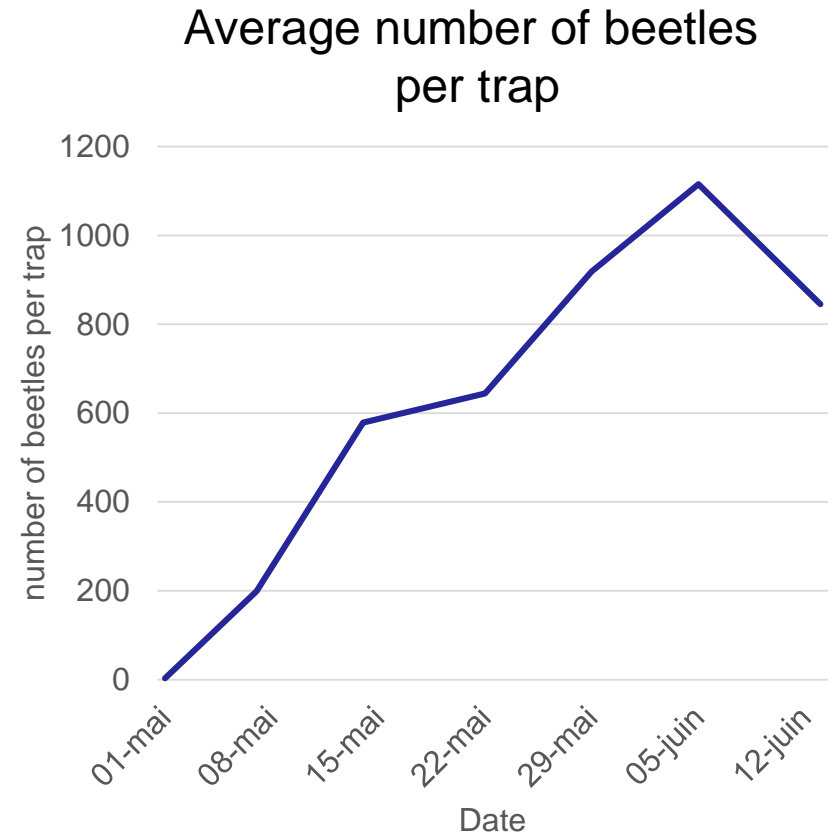
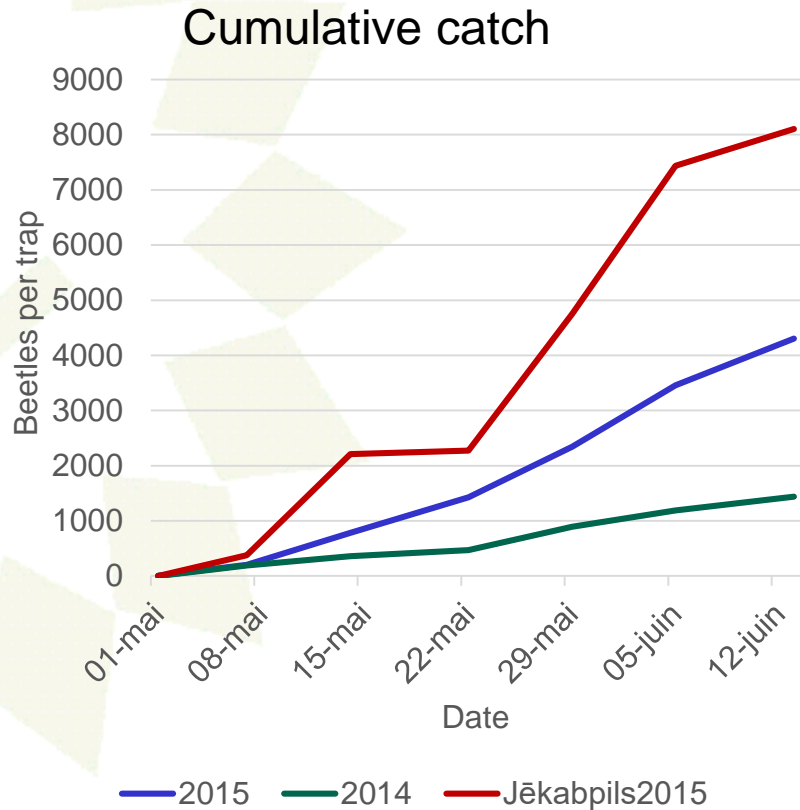
2014



2015



Flight dynamics of *Ips typographus* in 2015



Assessment of *Ips typographus* damage to the forest stands



To assess *Ips typographus* damage to living trees about 300 spruce stands are surveyed yearly from 1st of July to 1st of November.

Spruce stands older than 50 years with spruce comprising more than 70% by basal area are selected for survey.

In each selected stand one transect with 30 sampling spots with 3 trees in each spot are examined for presence of current year bark beetle attack (entrance) holes.

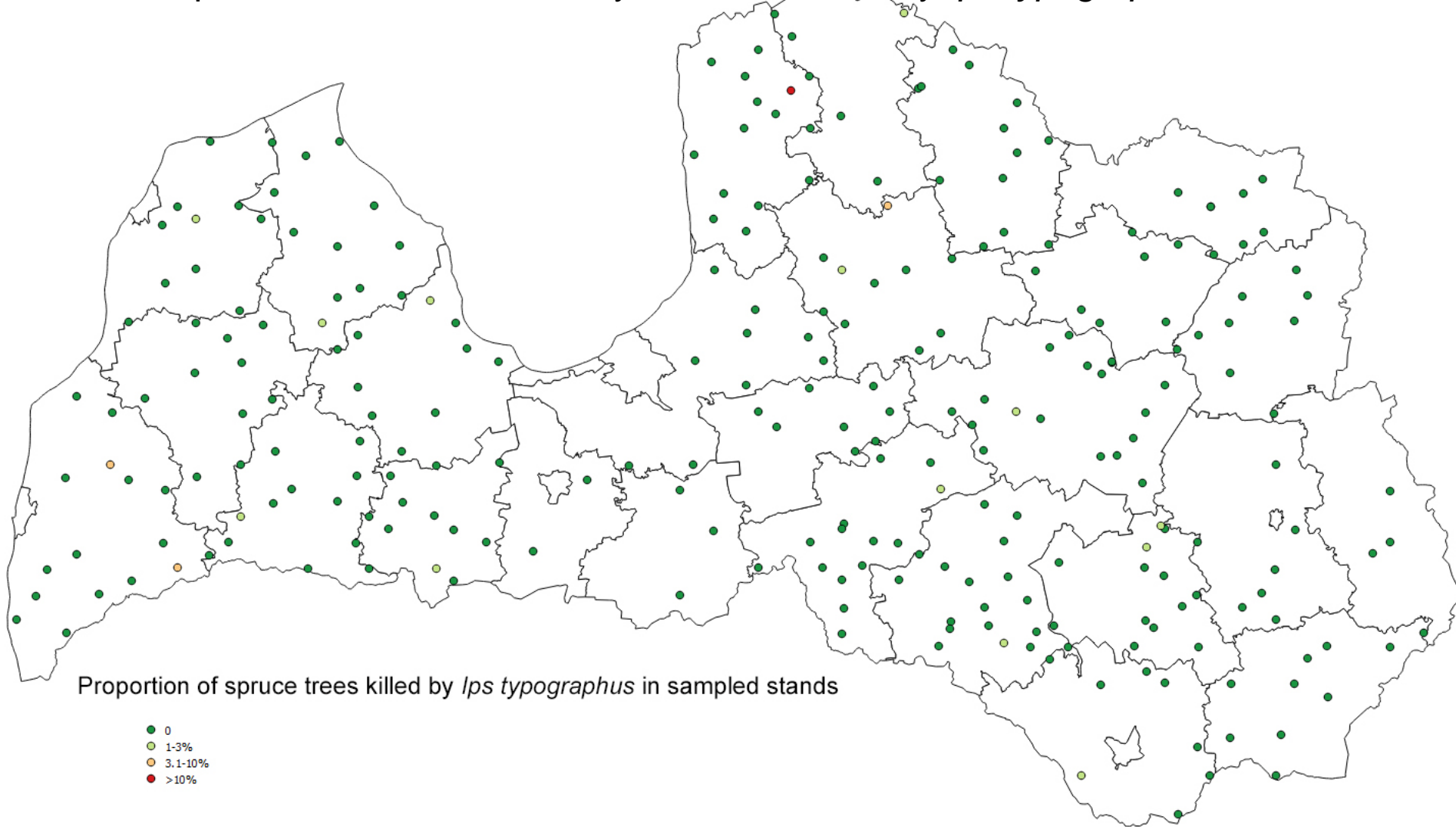
Ips typographus entrance holes



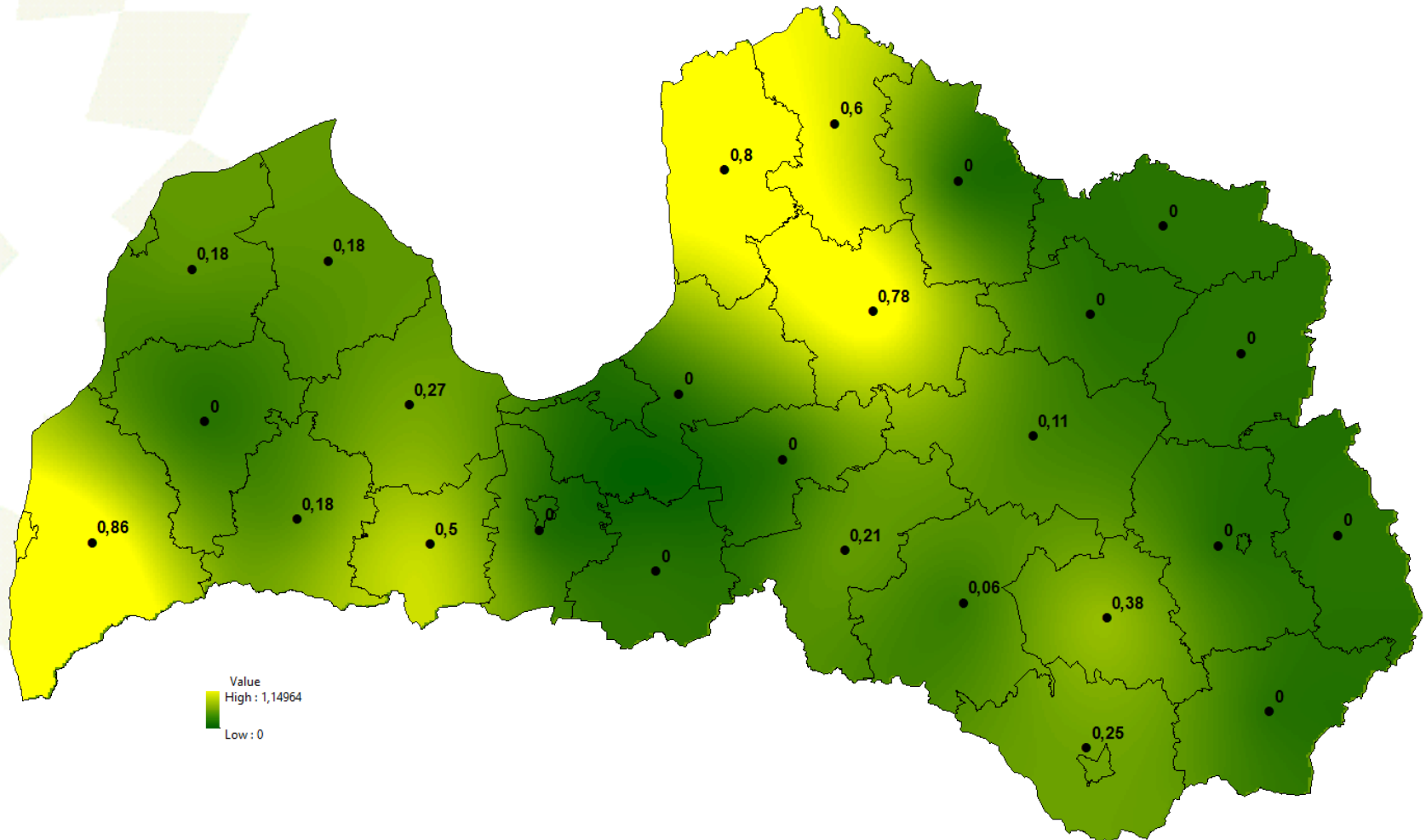
Assessment of *Ips typographus* damage to the forest stands in 2014



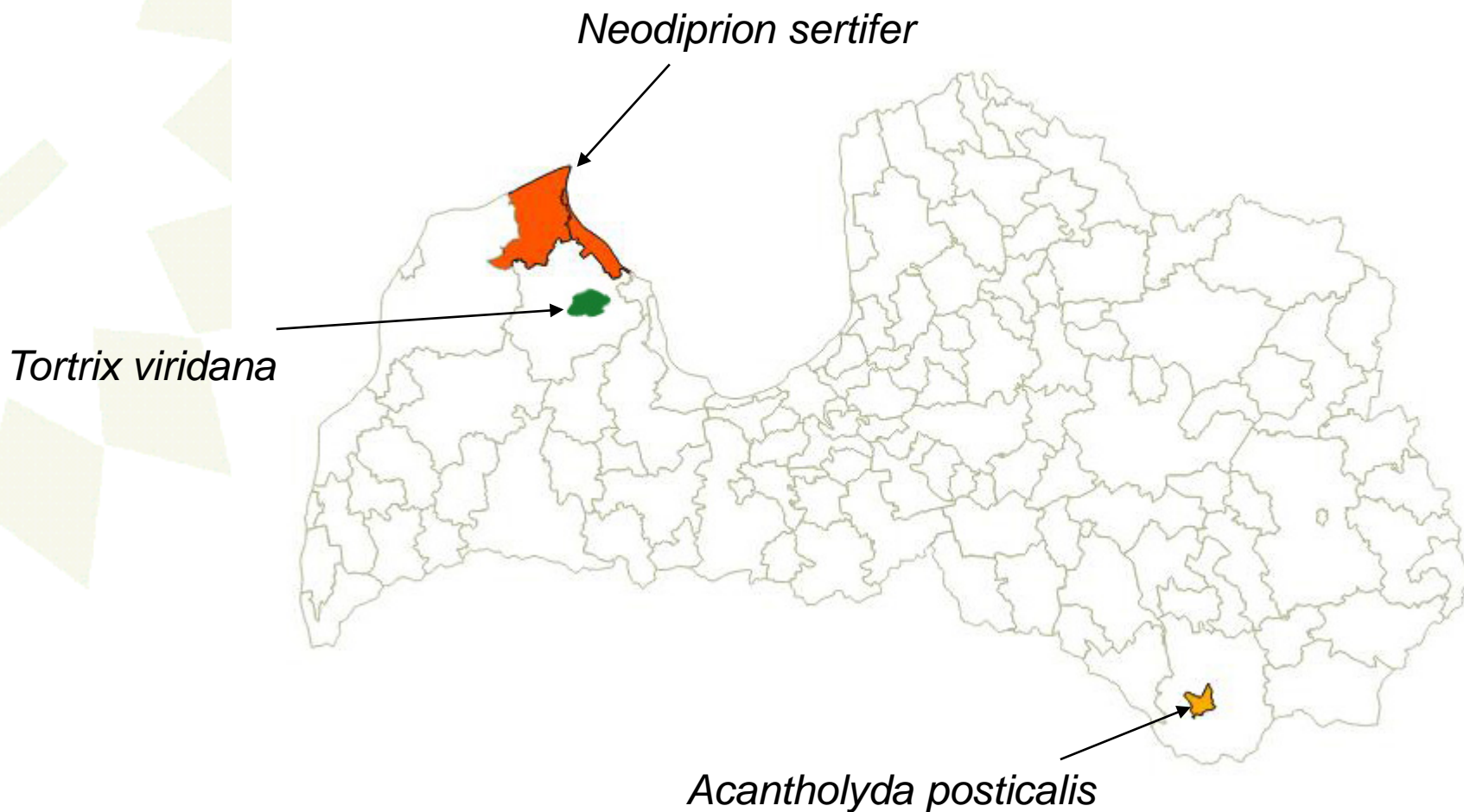
0,21% of spruce trees older than 50 years were killed by *Ips typographus* in 2014



Assessment of *Ips typographus* damage to the forest stands in 2014



Survey of suspicious stands based on signals from forest owners, society or governmental institutions



Great web spinning sawfly *Acantholida posticalis* outbreak examined in the South-East part of Latvia

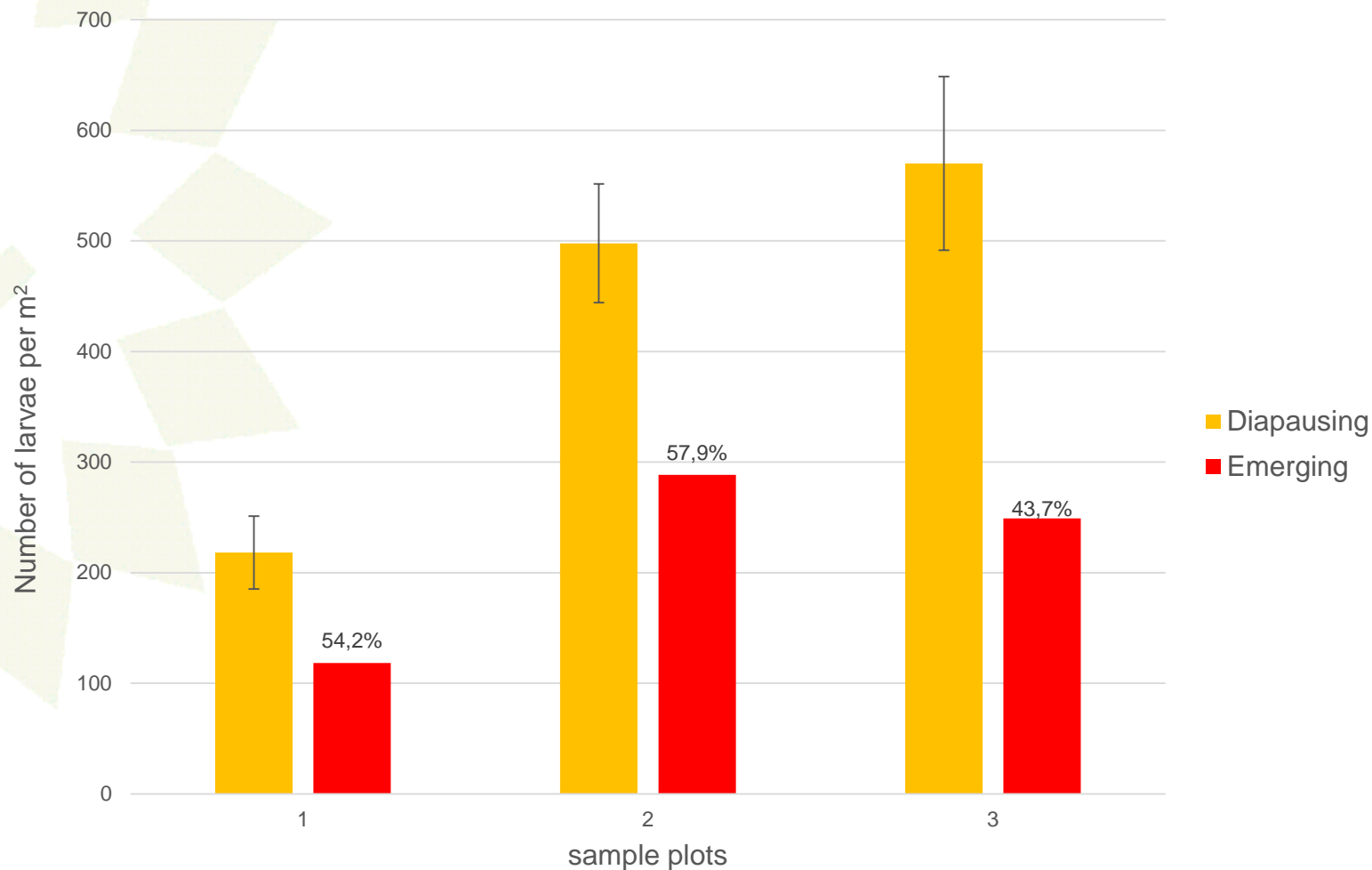


Great web spinning sawfly *Acantholida posticalis* outbreak examined

- Number of overwintering larvae surpass 400 per 1m².
- Proportion of diapausing larvae in 2014 was 99% but in 2015 was about 50%



Ziemojošās tīklapsenes 2014.gadā



Acknowledgement



ERAF project carried out in Forest Competence Center «Meža kapitāla apsaimniekošanas ekoloģiskie riski – novērtēšanas metodes un rekomendācijas to samazināšanai»



Thank you for your attention!