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# VEGETATION RESPONSE TO DRAINAGE AND FIRE IN SAKLAURA MIRE FROM ZIEMEĻU MIRES NATURE RESERVE

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## BACKGROUND OF THE STUDY

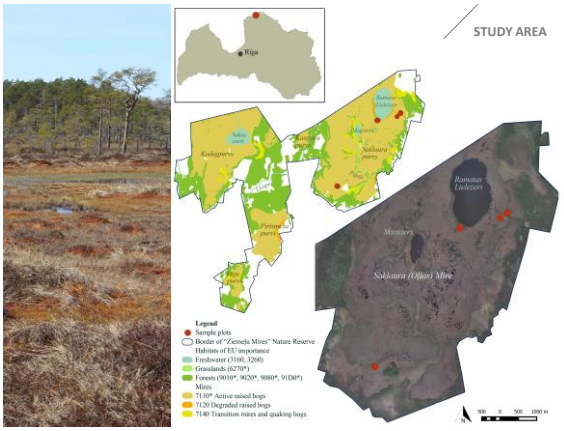
- No studies have investigated the influence of lowered water table position on the vulnerability of northern peatlands to burning (Turetsky et al., 2011).
- Dry conditions induced by drainage would maintain a bog in a precarious state where the vegetation is able to maintain itself, until an additional disturbance (fire) appears and causes a major shift in species assemblages. Drainage alone would have, at least in the short term, a negligible effect on species distribution (Pellerin & Lavoie, 2003).
- At about 13 years after fire, bogs switch from net C sources to net C sinks, mainly because of recovery of the moss and shrub layers (Wieder et al., 2009).
- Peat bulk density increases caused by fire or drainage can limit *Sphagnum* establishment and growth, potentially threatening peatland function. Ash inputs may have direct benefits for some *Sphagnum* species, but are also likely to increase competition from other bryophytes and vascular plants which may offset positive effects (Noble et al., 2017).

**Noble, A., Palmer, S. M., Glaves, D. J., Crowle, A., Holden, J., 2017.** Impacts of peat bulk density, ash deposition and rainwater chemistry on establishment of peatland mosses. Plant and Soil, 419 (1/2): 41–52.
**Pellerin, S., Lavoie, C., 2003.** Reconstructing the recent dynamics of mires using a multitechnique approach. Journal of Ecology, 91 (6): 1008–1021.
**Turetsky, M. R., Donahue, W. F., Benscoter, B. W., 2011.** Experimental drying intensifies burning and carbon losses in a northern peatland. Nature Communications, 514 (2): 1–5.
**Wieder, R. K., Scott, K. D., Kamminga, K., Vile M. A., Vitt, D. H., Bone, T., Xu, B., Benscoter, B. W., Bhatti, J. S., 2009.** Postfire carbon balance in boreal bogs of Alberta, Canada. Global Change Biology 15, 63–81.

## QUESTIONS

- How fast the vegetation recovers after fires in Saklaura Mire
- Interaction between fire and drainage

## STUDY AREA




## STUDY AREA

Ziemeļu Mires Nature Reserve

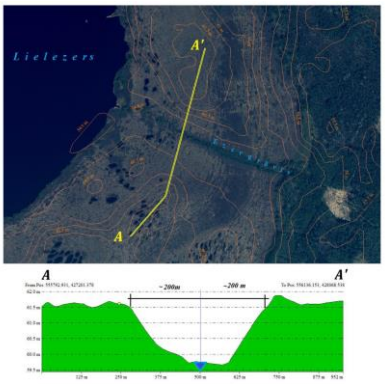
- Total area 7718 ha
- Protected since 1977
- Part of reserve included in Transboundary Ramsar Site
- 82% taken by EU habitats, 17 types
- 39 protected plant and 39 protected animal species
- 37 EU Directive species and 29 Bird Directive species

## DRAINAGE HISTORY

tā Triņiņas Anna, ar ko, bērni būdami, tos pāra gadus kopā dzīvojām un rotaļājmies, kā bērni būdami, tā ir tagad izprecēta par Kaiņpurlaur gruntnieci*.

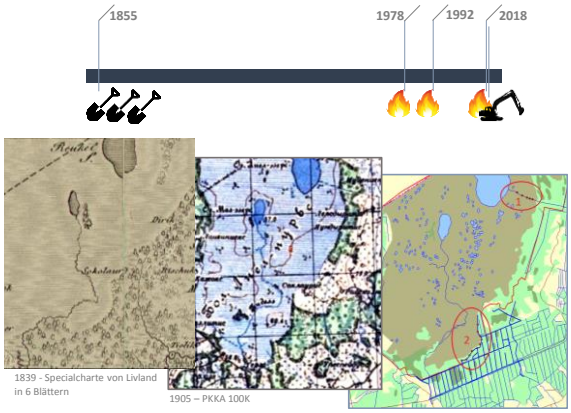
Tai gadā 1855-tā tad raka grāvjus tai lielā purā[16] muižas strādnieki igauņi, četrpadsmit viru. Tiem bija mūsu mājā rūme jādod tiem kunga strādniekim. Visu vasaru līdz rudeņam iedeva vien kambari* tiem igauņim priekš gulēšanas. Tad tika no muižas visa pārtika tiem strādniekim vesta, kā rudzu milti priekš maizes un tauki, gaļa, putraimi, un vien pusmuc brandvīna* par mēnesi, jo katram vīram tika dots stops* par nedēļu brandvīna.

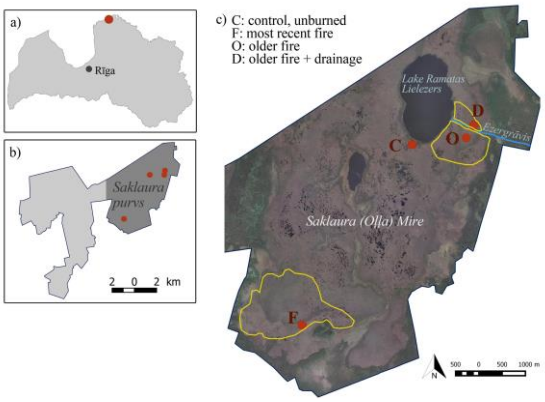
**Stašulāne I. (red.), 2008.** Ādama stāsts. Mazsalacieša dzīve, ieradumi un tikumi Ā. Purmaļa autobiogrāfijā 19. un 20. gs. mijā. SIA Apgāds „Zinātne", Rīga, 221 lpp.

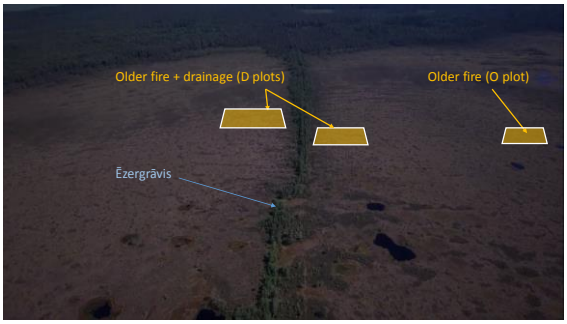




**Aleksāns O., 2005.** Hidroloģiskie un ģeoloģiskie pētījumi Ziemeļu purvu dabas liegumā. Latvijas Universitāte, 63 lpp.

PEAT DAMS ON EZERGRĀVIS



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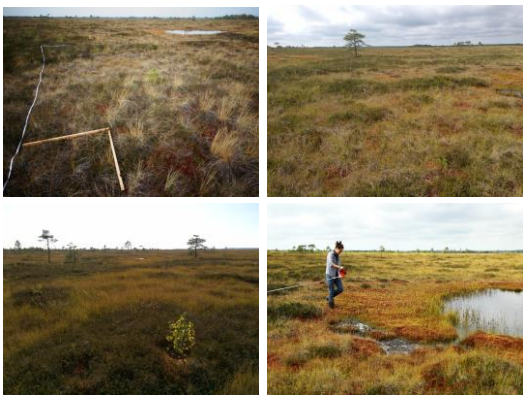
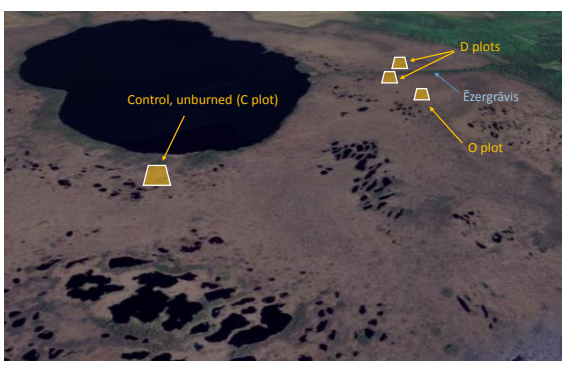
*OLDER FIRE + DRAINAGE* /plot #1/


*OLDER FIRE + DRAINAGE* /plot #2/

*OLDER FIRE*



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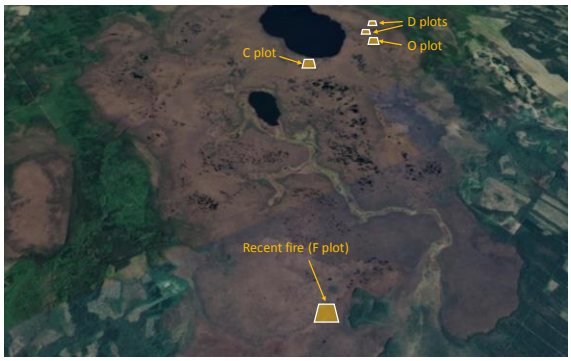
*CONTROL, UNBURNED, NOT DRAINED*

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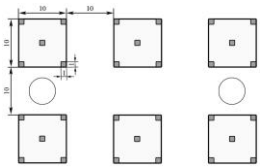
*RECENT FIRE*

## METHODS



% Cover of:
- Trees and bushes
- Dwarf shrubs
- Herbs
- Bryophytes
- Lichens

Tree age
Peat pH
Open peat area
Fire impact
Drainage impact

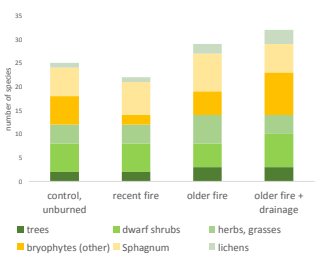
## RESULTS

150 plots from 4 relevé types
39 species: 3 trees, 8 dwarf shrubs, 6 herbs, 18 bryophytes (8 Sphagnum), 4 lichens

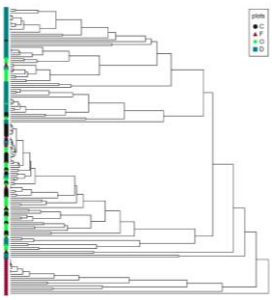
The most common species (N of plots):

*Calluna vulgaris* (134)
*Eriophorum vaginatum* (116)
*Oxycoccus palustris* (85)
*Rhynchospora alba* (81)

*Sphagnum magellanicum* (124)
*Sphagnum rubellum* (118)
*Sphagnum tenellum* (82)




*CLUSTER ANALYSIS*



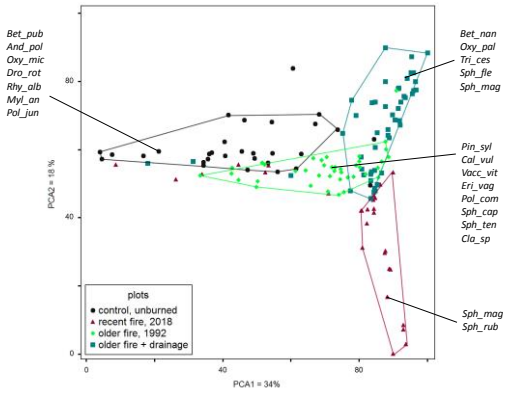

*SPECIES RICHNESS (S), SHANNON`S DIVERSITY INDEX (H') AND SIMPSON`S DIVERSITY INDEX (D)*

| | Control, unburned N=30 | Recent fire N=30 | Older fire N=40 | Older fire + drainage N=50 | Total |
|---|---|---|---|---|---|
| *Total* | | | | | |
| S (all species) | 25 | 22 | 29 | **32** | 39 |
| S (vascular plants) | 12 | 12 | 14 | **14** | 17 |
| S (bryophytes) | 12 | 9 | 13 | **15** | 18 |
| *Average* | | | | | |
| S (all species) | 9.6 | 6.7 | **11.0** | 8.5 | |
| H' | 1.46 | 0.96 | **1.67** | 1.38 | |
| D | 0.65 | 0.44 | **0.71** | 0.63 | |

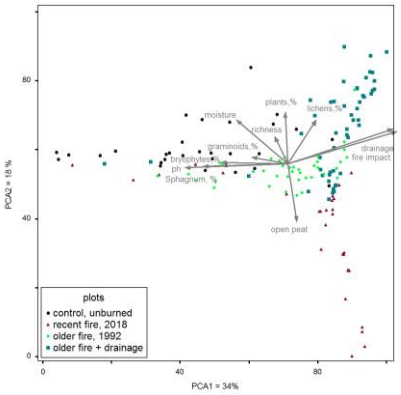
*JACCARD SIMILARITY COEFFICIENT*

| | |
|---|---|
| **J (F, O)** | **0.7** |
| J (O, D) | 0.649 |
| J (C, O) | 0.636 |
| J (C, D) | 0.629 |
| J (C, F) | 0.621 |
| **J (F, D)** | **0.588** |

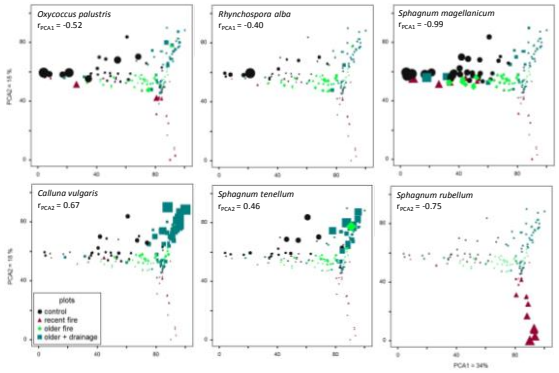
*PRINCIPAL COMPONENTS ANALYSIS (PCA) & INDICATOR SPECIES ANALYSIS*



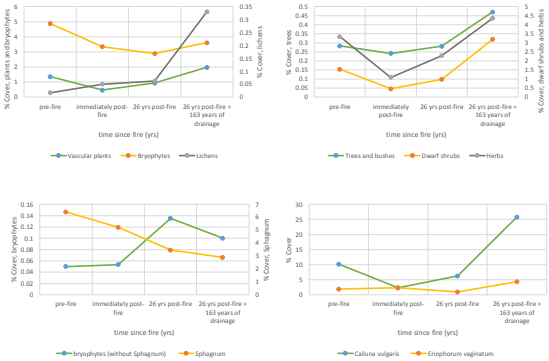

*PRINCIPAL COMPONENTS ANALYSIS (PCA)*




*PEARSON CORRELATION*




*VEGETATION COVER RESPONSE TO FIRE AND DRAINAGE DURING TIME*




## CONCLUSIONS

- Sample plots with drainage and fire impact had the highest total species richness and functional group % cover, except for *Sphagnum* species, which might result as a lower carbon accumulation, BUT hydrology restoration could prevent from that;
- The highest species diversity in plot level was found in relevé with old fire history followed by a control relevé;
- Recent fire relevé had the lowest richness numbers, it had similar species composition as in old fire plots but was very different from drainage impacted relevé;
- Drainage interaction with fire had more impact to vegetation composition than the fire alone;
- Vegetation had recovered during 26 year period since older fire;
- Additional survey in drained area without fire history would be needed, as well as more studies of the tree layer.

## Acknowledgment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Field data sampling: Krišjānis Libauers, Lauma Izolde Dziļuma, Jordina Gili