Leibniz Centre for Agricultural Landscape Research (ZALF)

Persistently high CH_4 emissions 10 years after rewetting: The necessity for long-term observations when measuring GHG emissions of transitional systems

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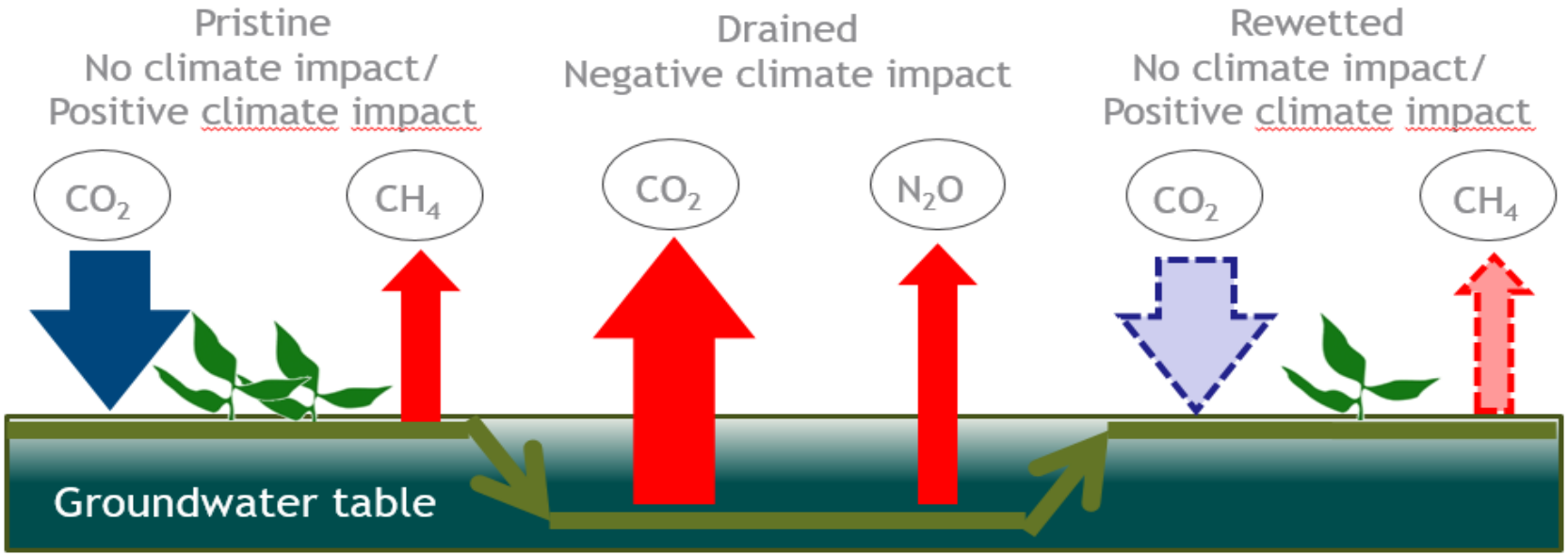
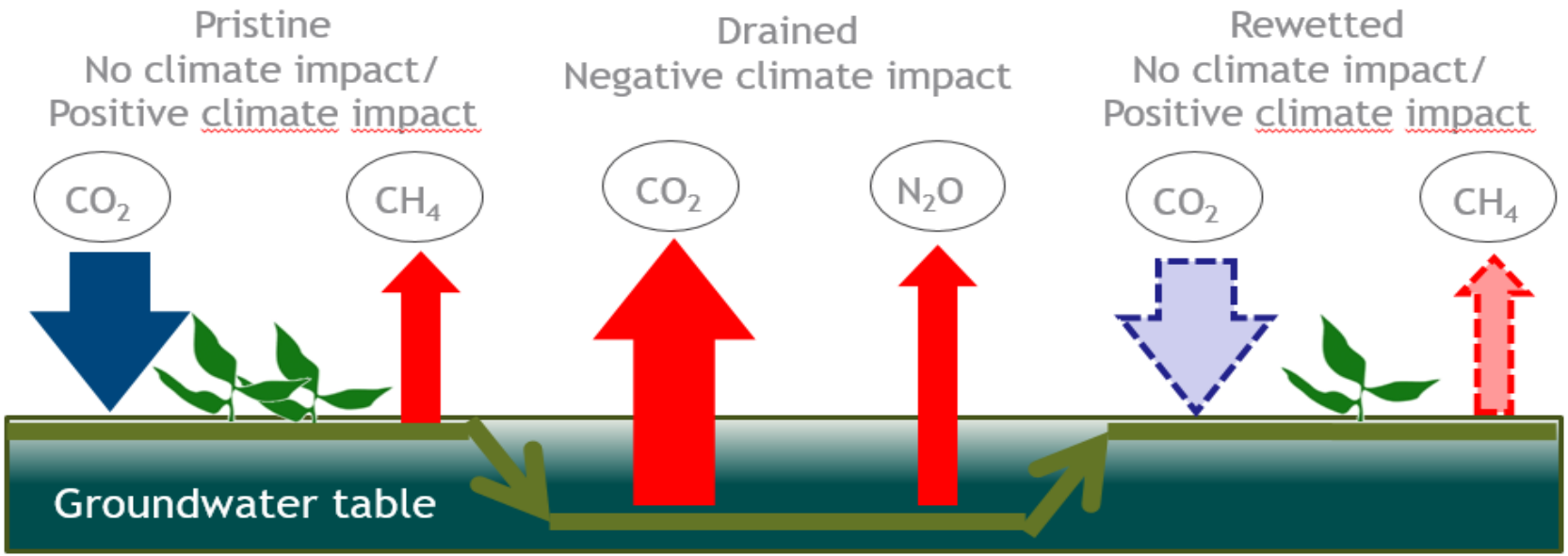
Background

- Peatlands play an important role in the global climate system
- Drainage for agricultural use (e.g., grassland) transforms peatlands from a C sink into C source.
- Rewetting might restore the C sink function of formerly drained peatlands



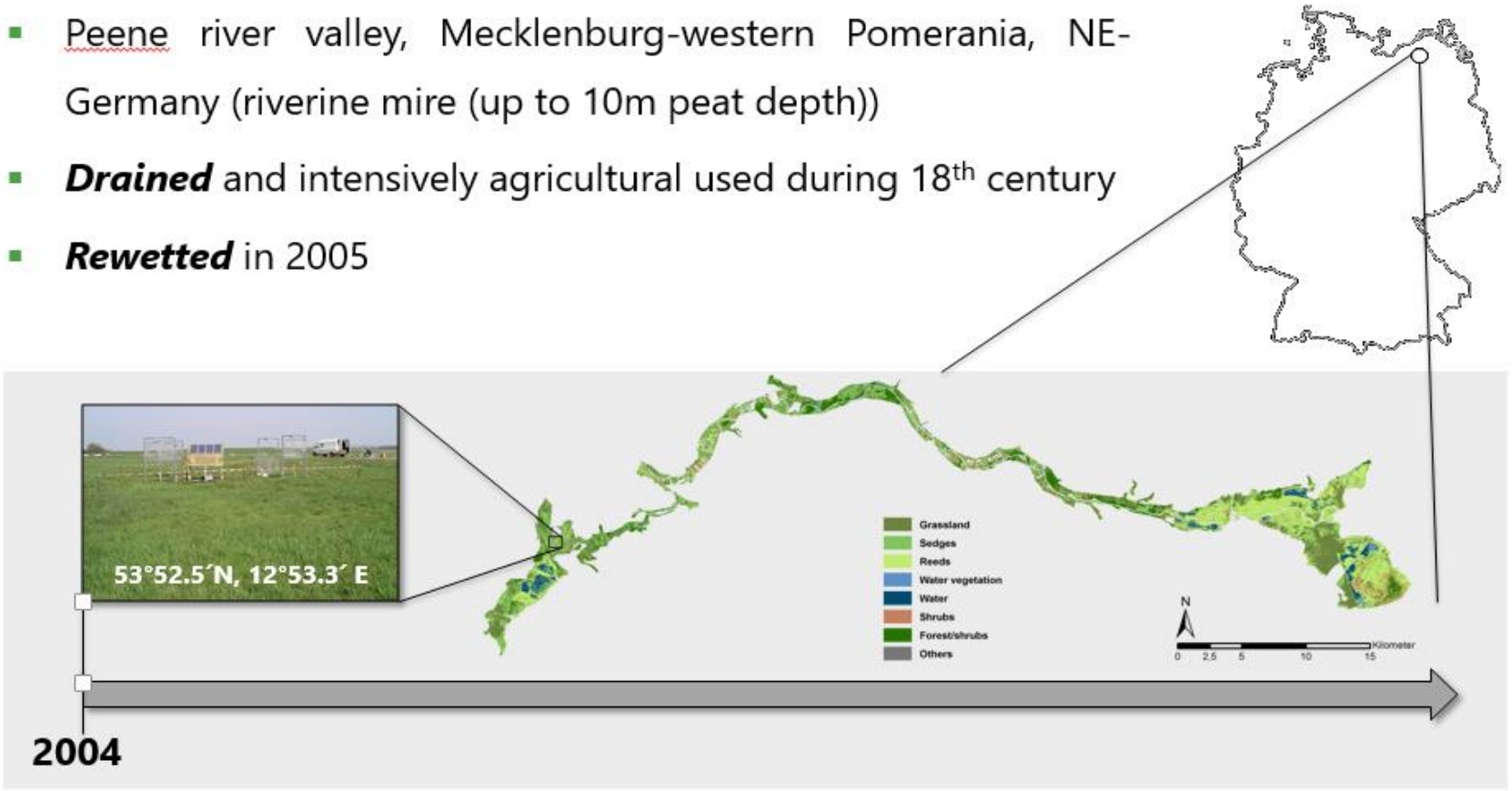
Research Question

How long does it take to restore the C sink function?



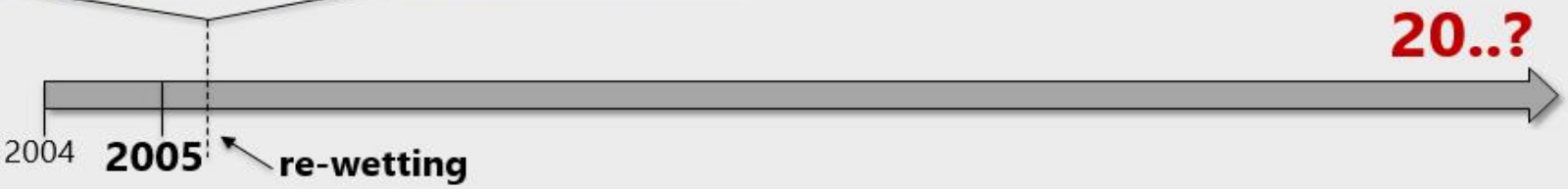
Study Site

- Peene river valley, Mecklenburg-western Pomerania, NE-Germany (riverine mire (up to 10m peat depth))
- ***Drained*** and intensively agricultural used during 18th century
- ***Rewetted*** in 2005

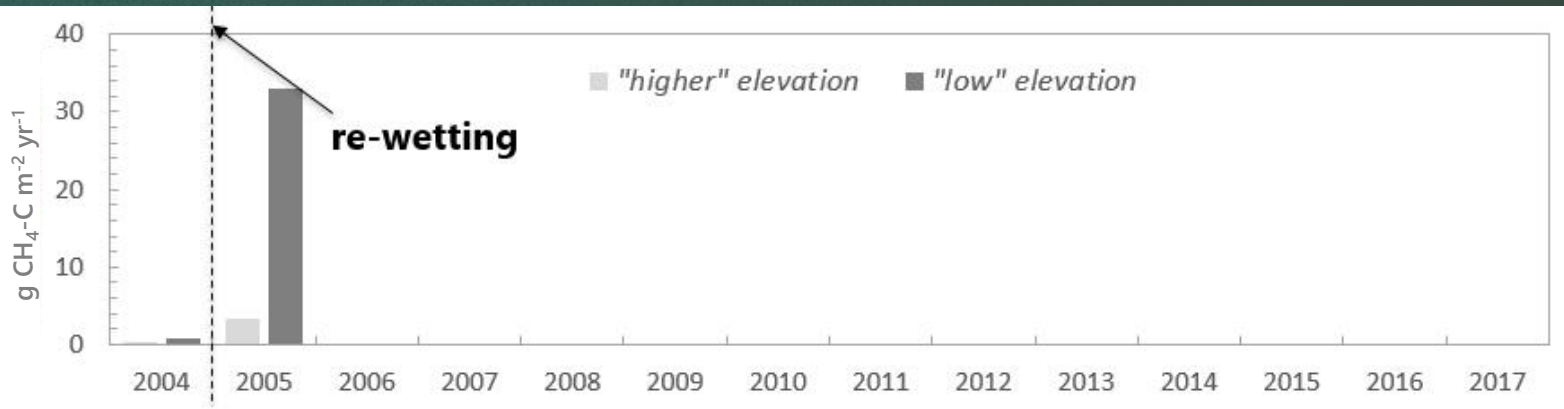


Study Design

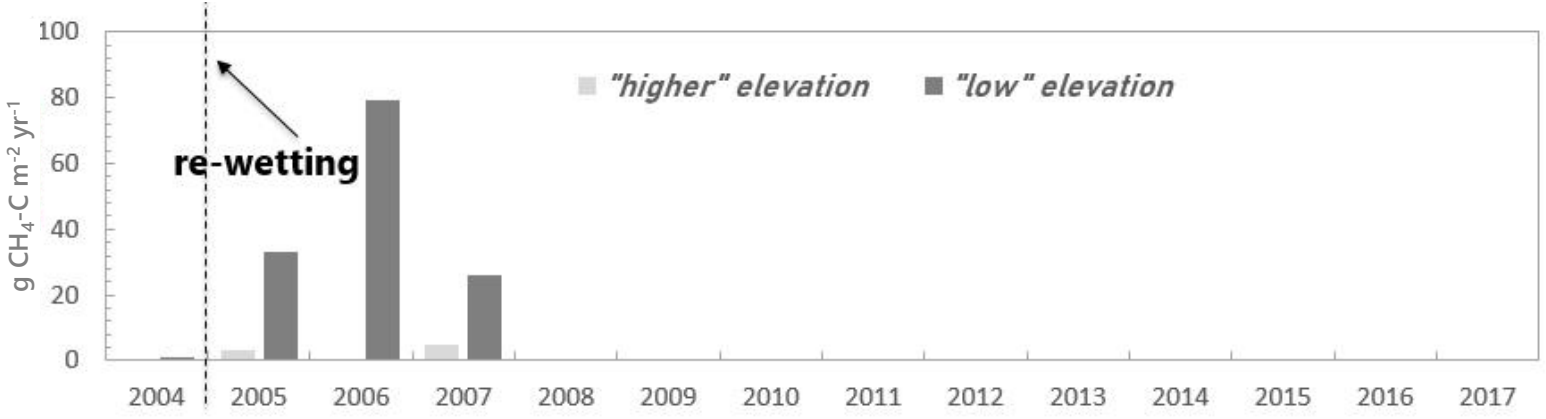
- Two measurement sites which differ in elevation
- Semi-humid grassland ***(=> "higher elevation")***
- Inundated grassland ***(=>"low" elevation)***
- 13 years of NFT-NSS closed chamber measurements of CH_4 (n=5) following rewetting (+ 1 year prior rewetting)



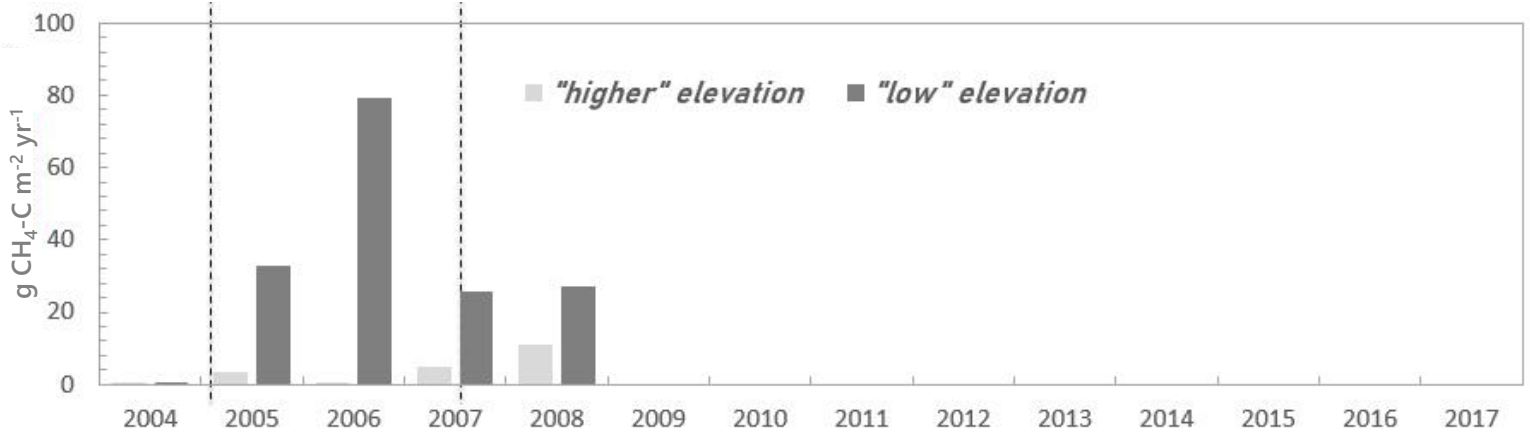
Results: high CH_4 emissions 1 year after rewetting!



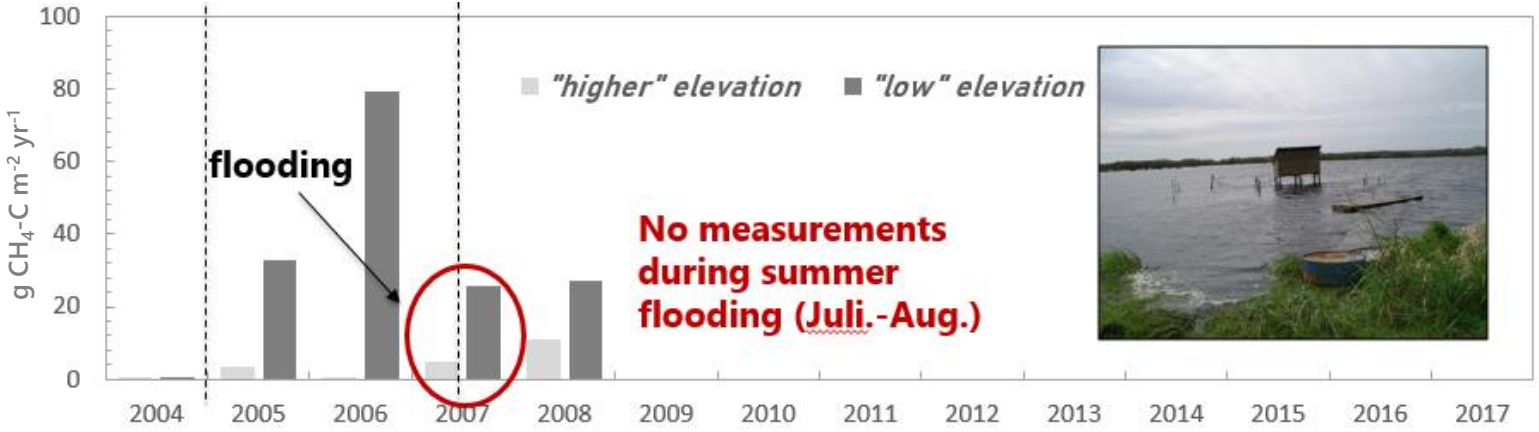
Results: decreasing CH_4 emissions after 2 years!



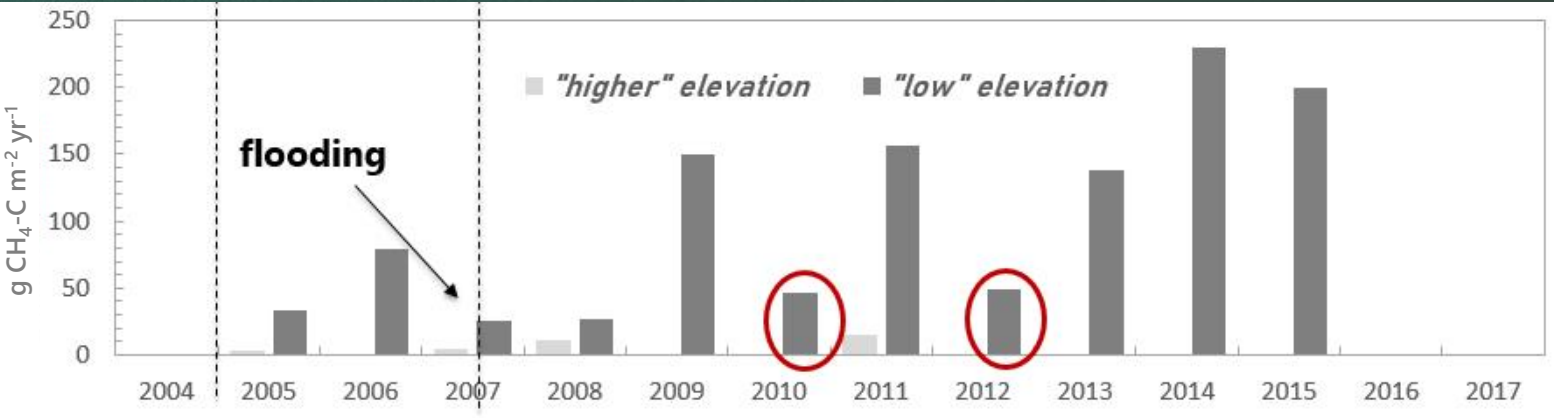
Results: high CH_4 emissions after rewetting!

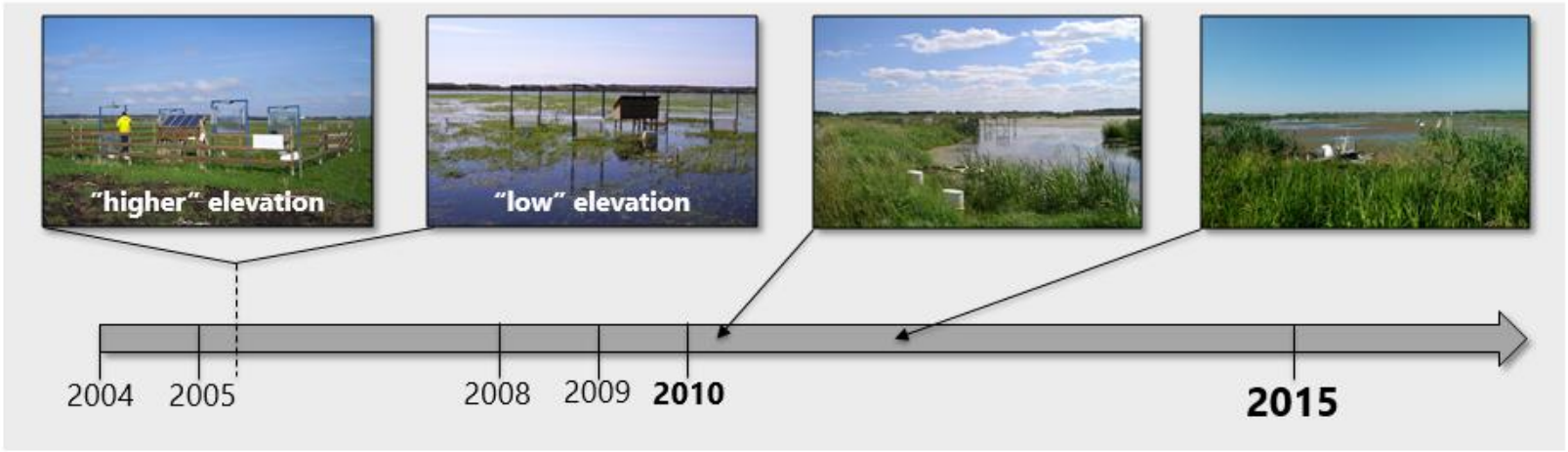


Results: high CH_4 emissions after rewetting!



Results: remaining high CH_4 emissions!





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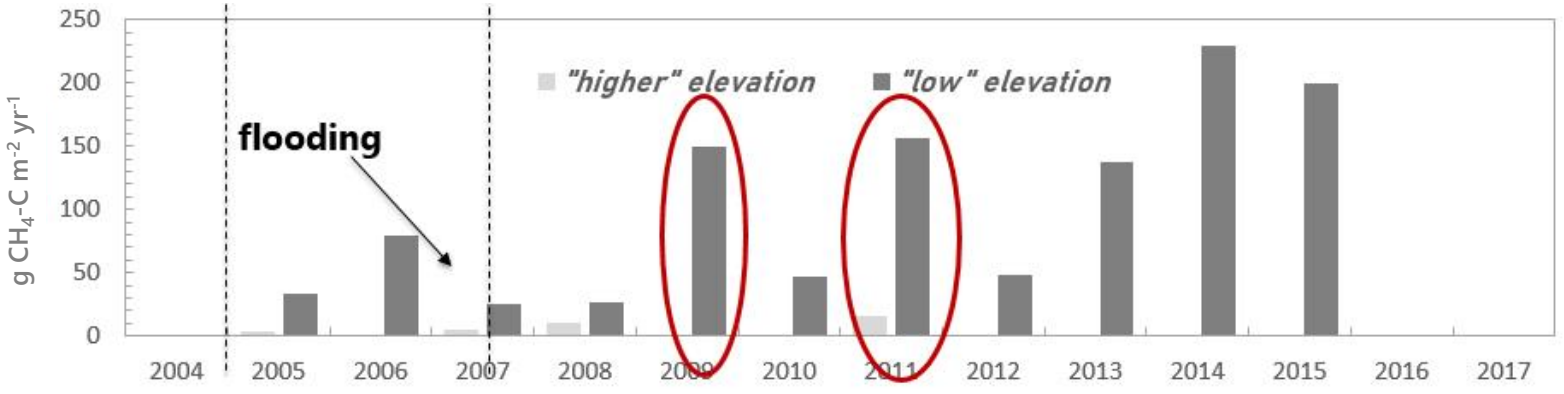
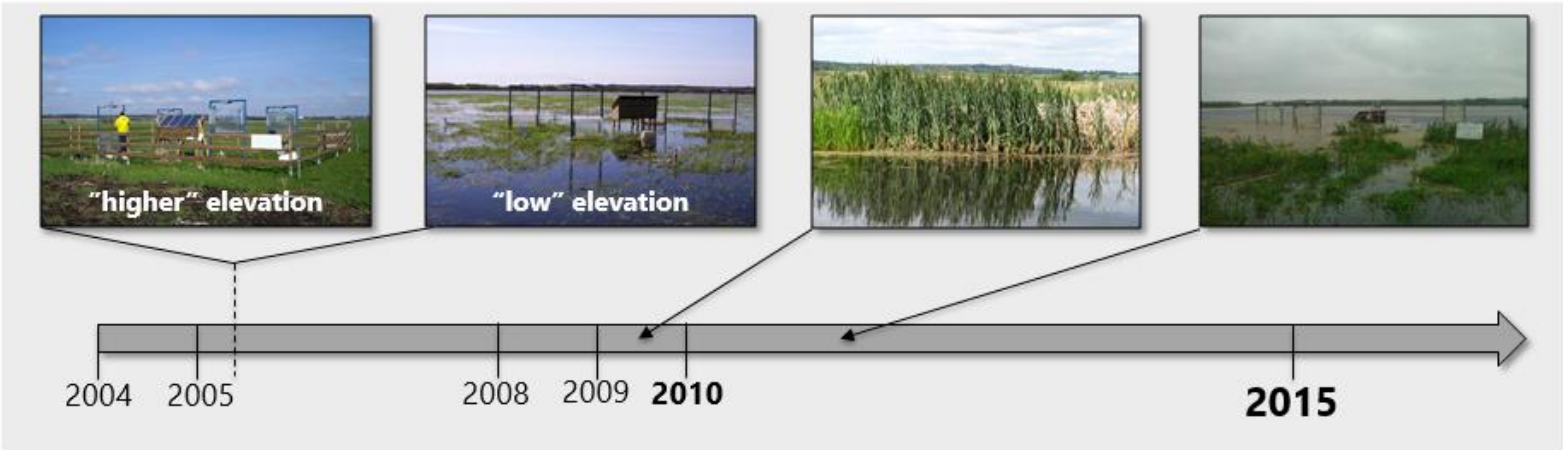
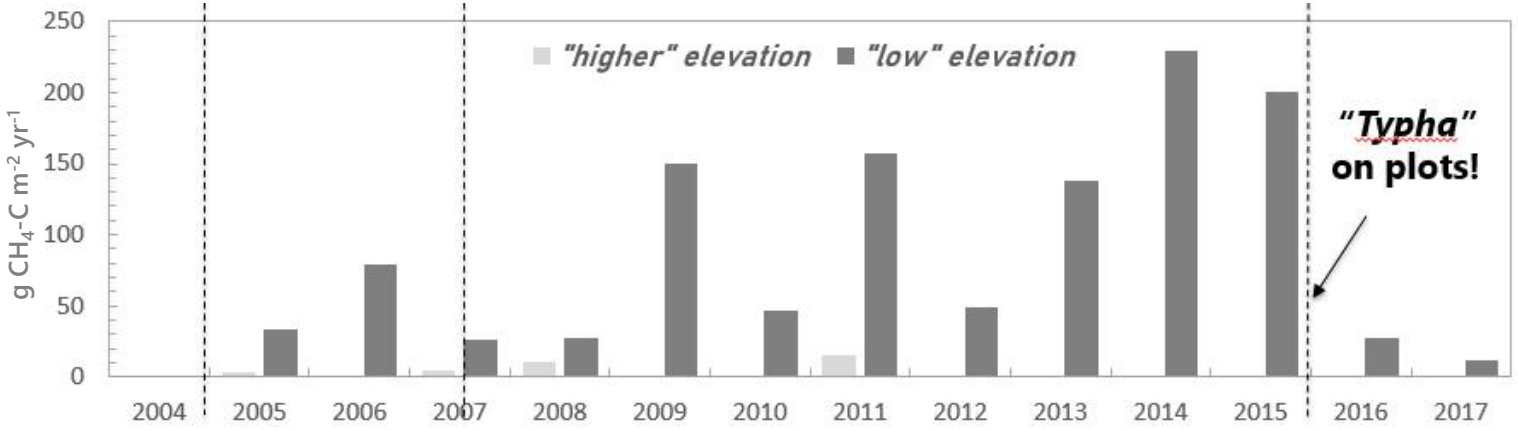
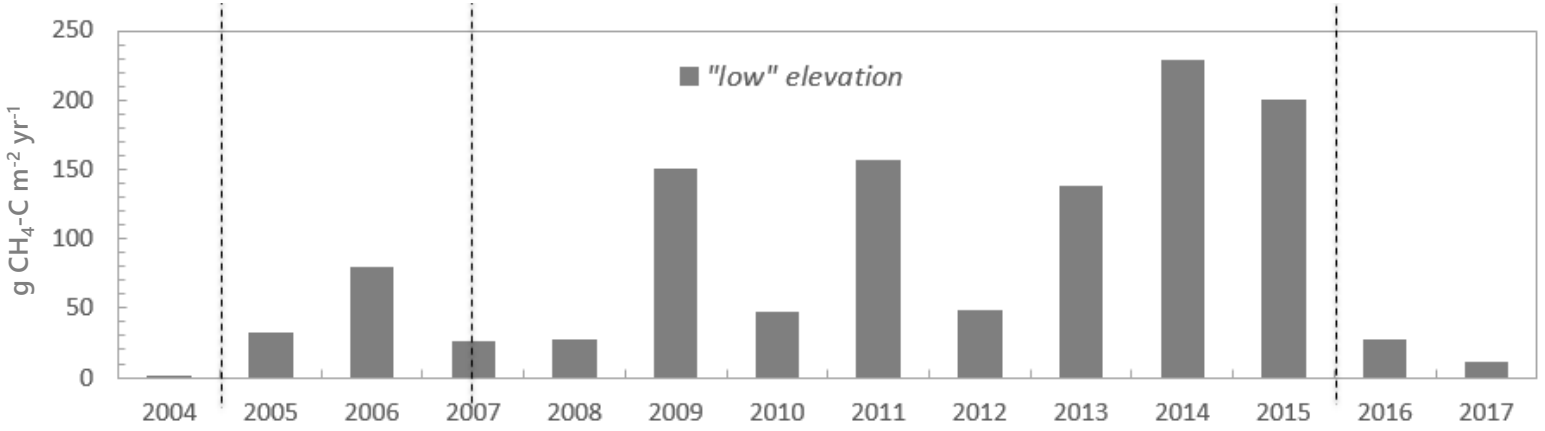


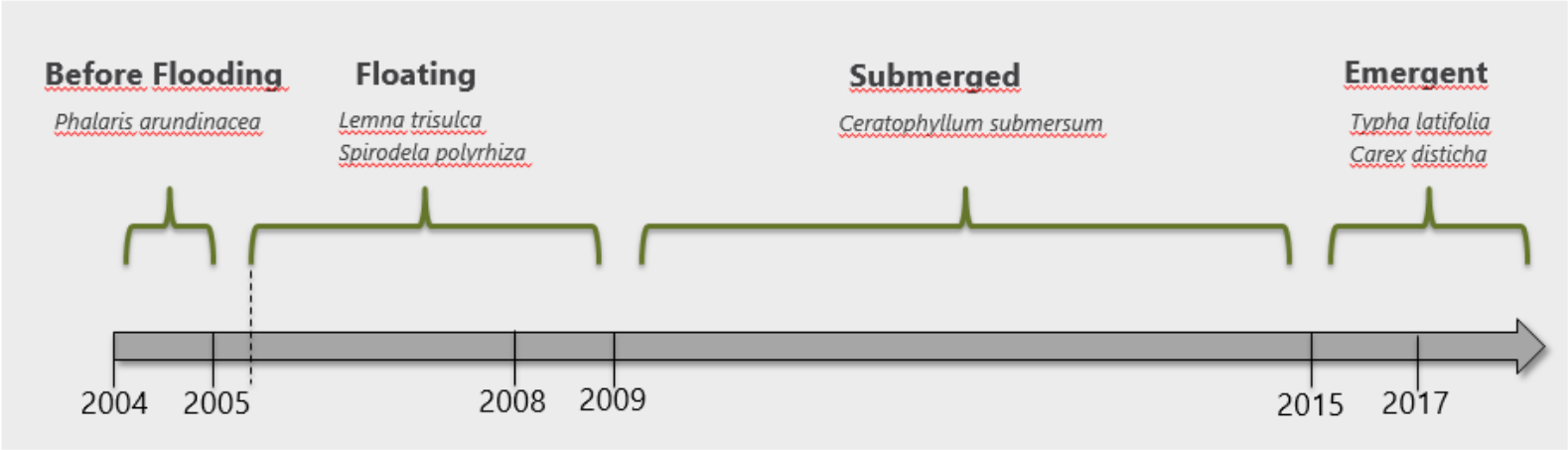


Results: decreasing CH_4 emissions!



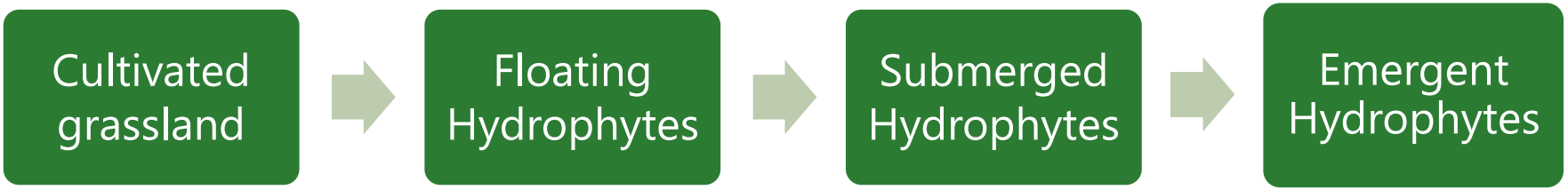
Results: decreasing CH_4 emissions!





Conclusions

There is temporal vegetation shifts from:



- Initial stage after rewetting generates high CH4 emission (creating open shallow lake)
- In the second stage, the shallow lake was colonised by floating and submerged hydrophytes which increases more stable CH4 emission
- In the third stage, the emergent hydrophytes in marginal areas colonised the area and therefore substantial decrease in CH4 emission in 2016/2017
- Hence, there is need for long term studies to cover long term transition

Thank you for your attention! Questions?

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