Long-term development of riparian forest vegetation after bringing back more water dynamics to the floodplain

- success and limits of a restoration project along the Danube in Germany

Sponsored by:

BN Bundesamt für Naturschutz

Landkreis Neuburg Schrobenhausen

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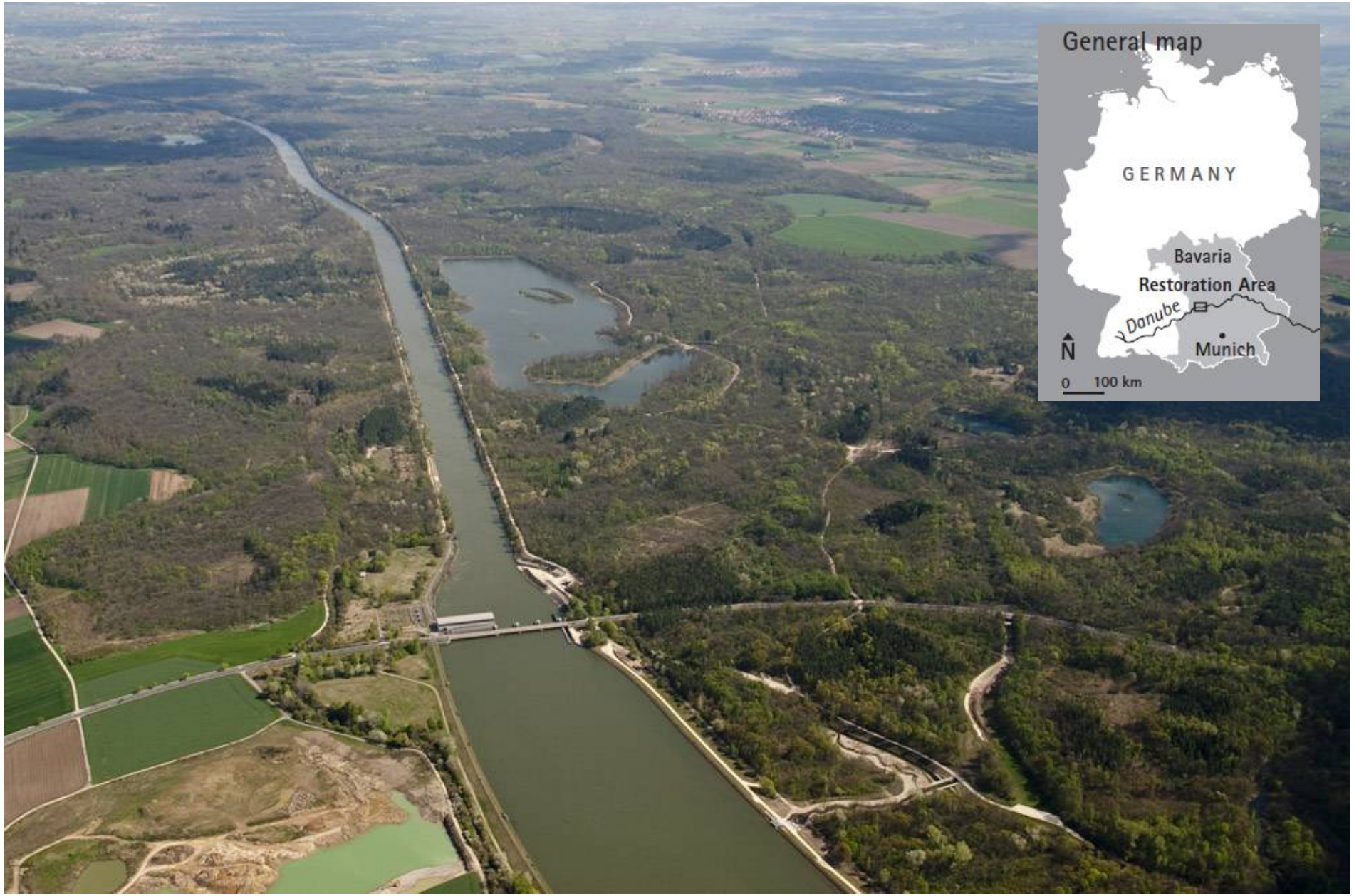
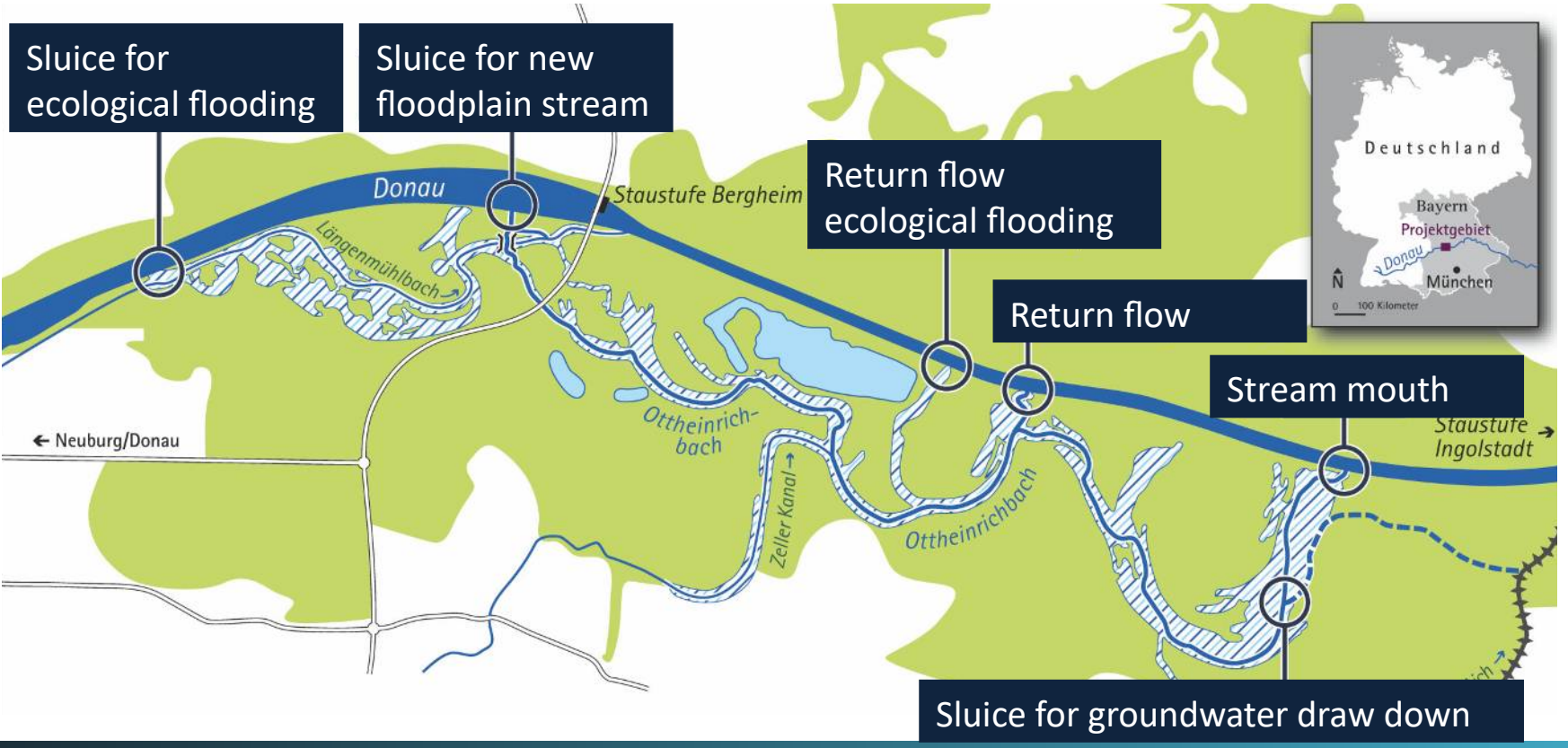
The project area

- River Danube
- Mean discharge: 300 m^3/s
- Impounded since 1970
- Large (floodplain) forest



The restoration project – bringing back more dynamics

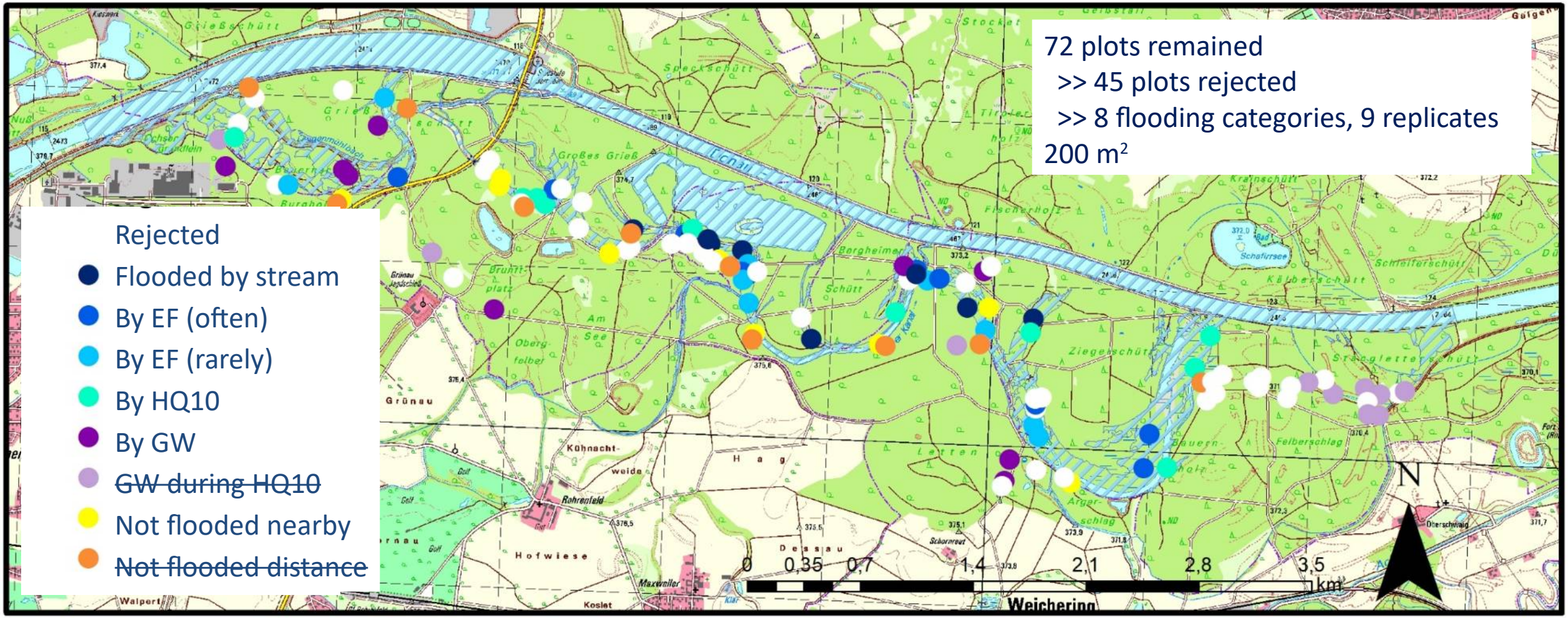


Implementation:
2006-2010
Water management authority Ingolstadt

Most important measures:
New flooplain stream: 1 – 5 m^3/s
Ecological floodings (EF): 25 m^3/s

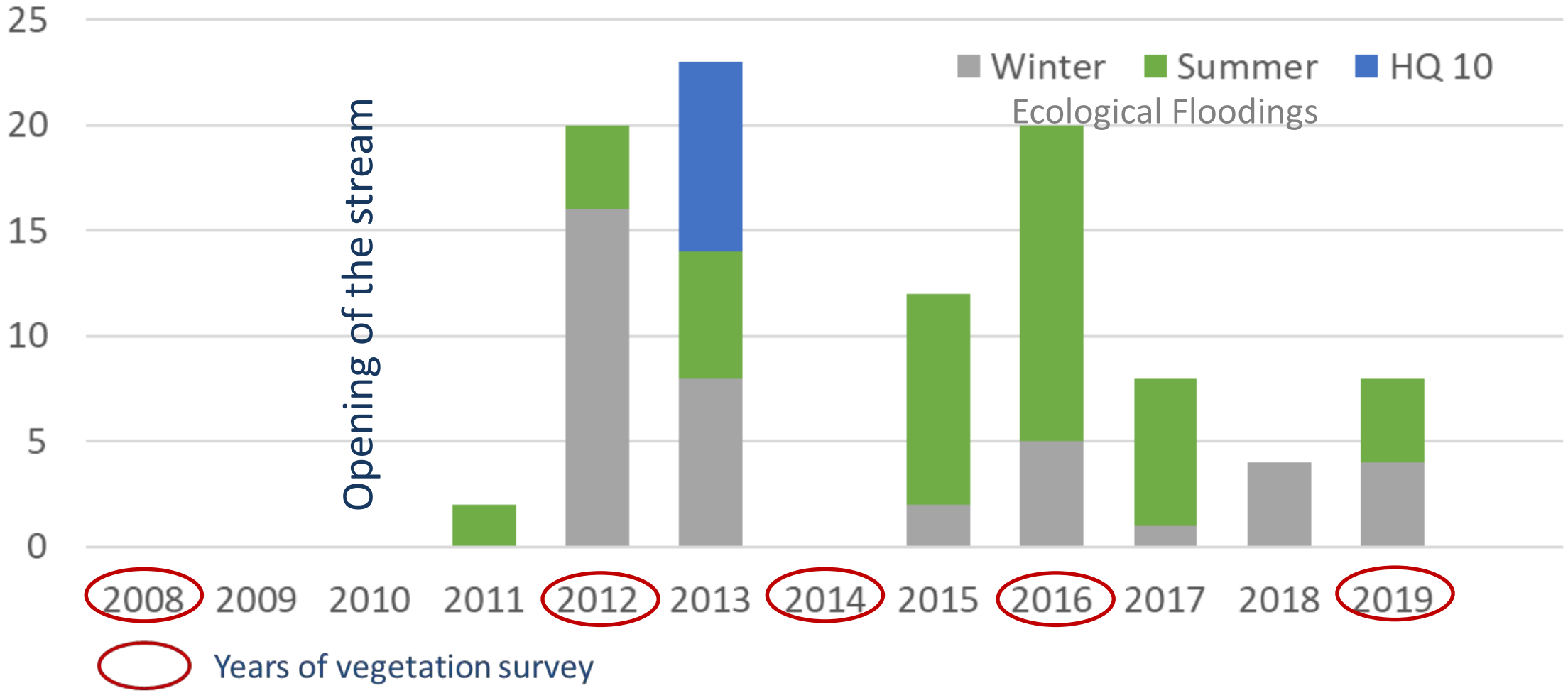
Projekt area:
1.200 ha Floodplain forest
Ca. 80 ha flooded during EF
Ca. 180 ha flooded during HQ_{10}

Plot design

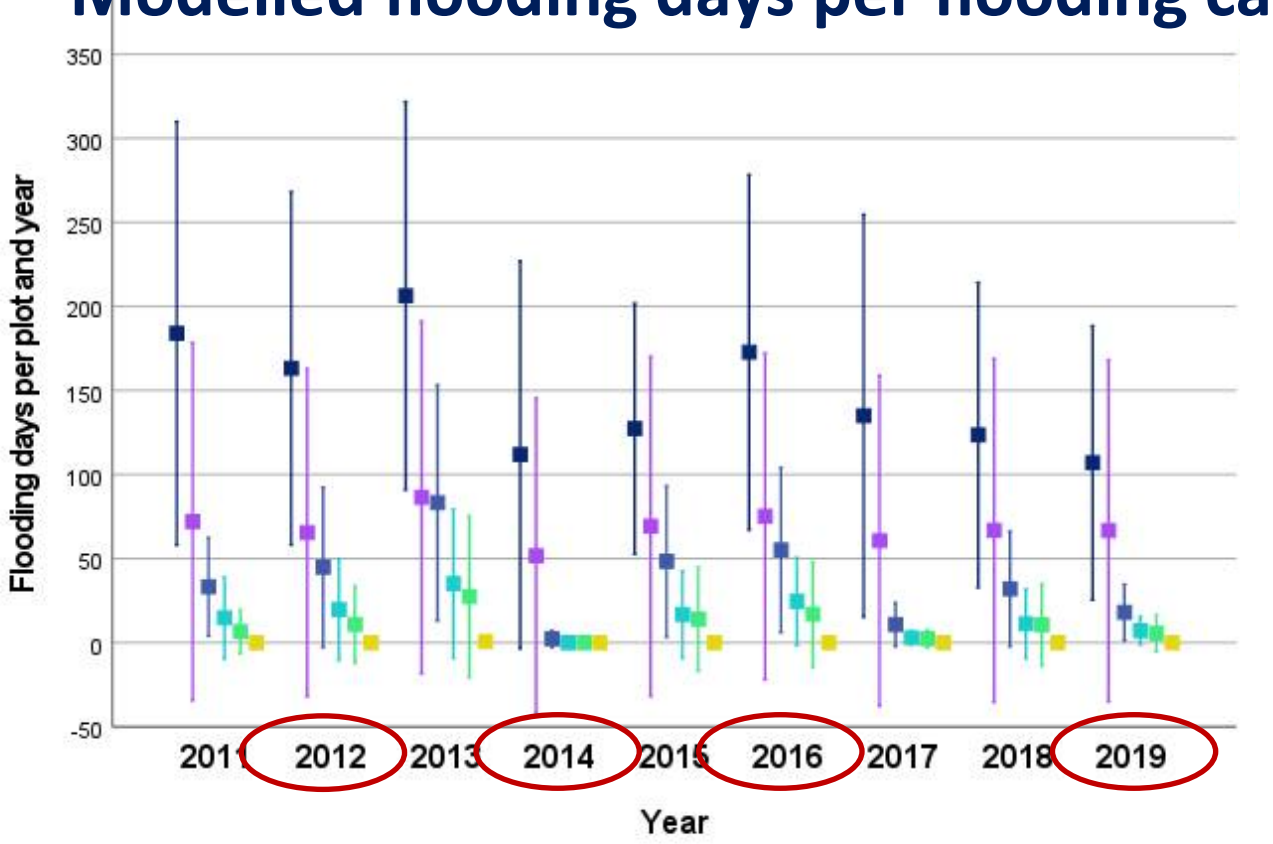


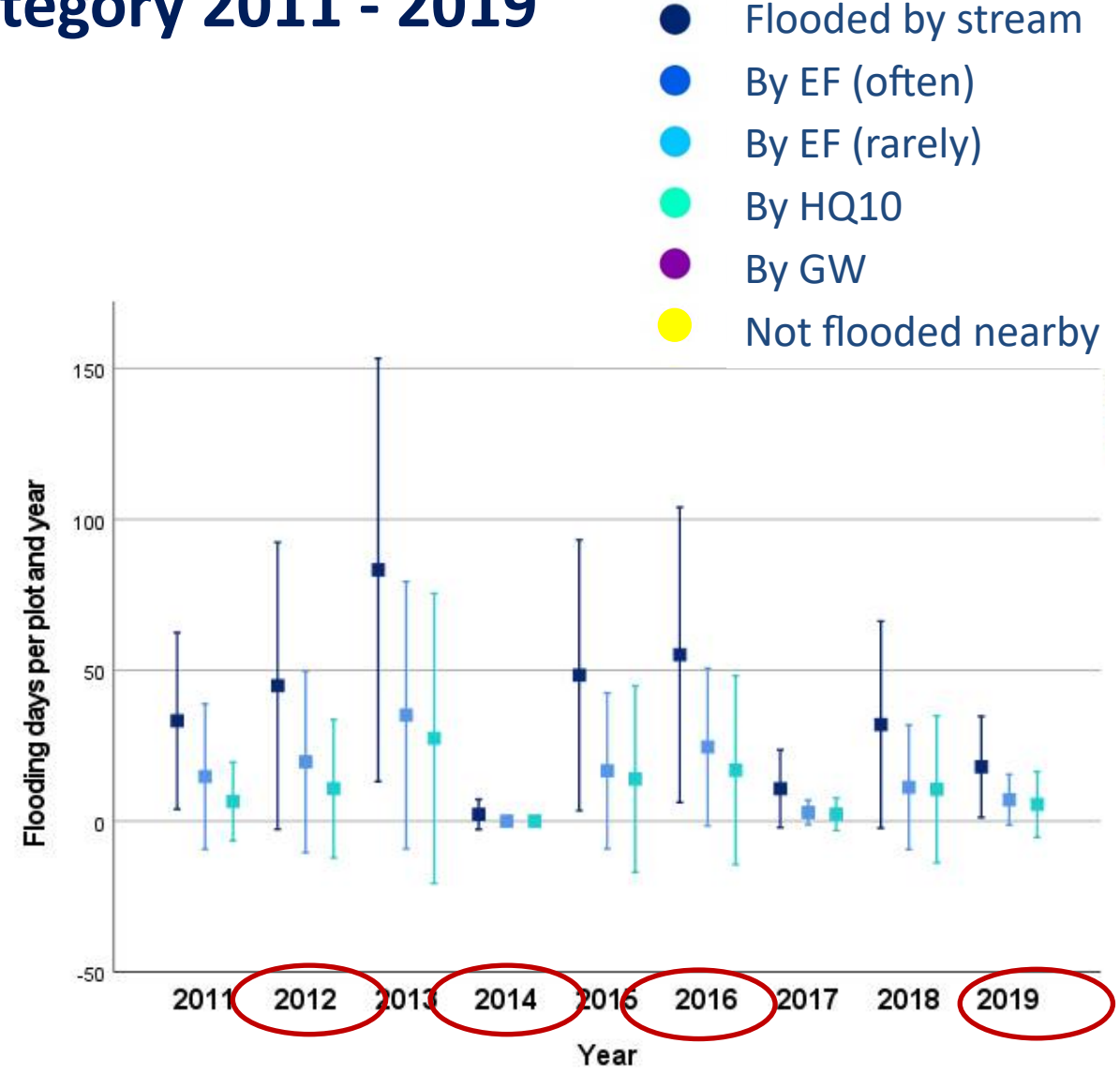
EF: ecological flooding, GW: groundwater, HQ10: 10yearly natural flood

Hydrologic events (“ecological” und “natural” floods) 2008 - 2019

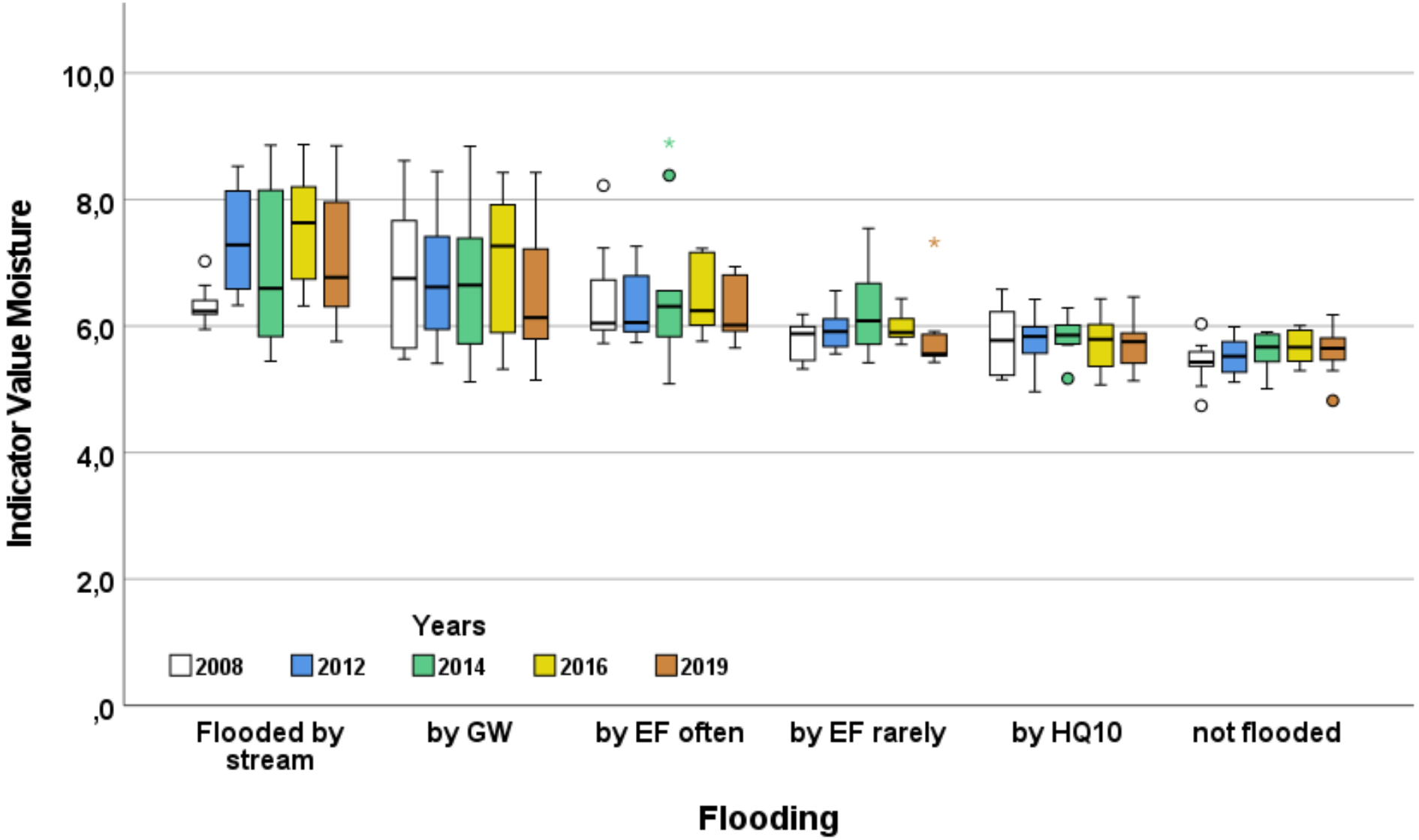


Modelled flooding days per flooding category 2011 - 2019



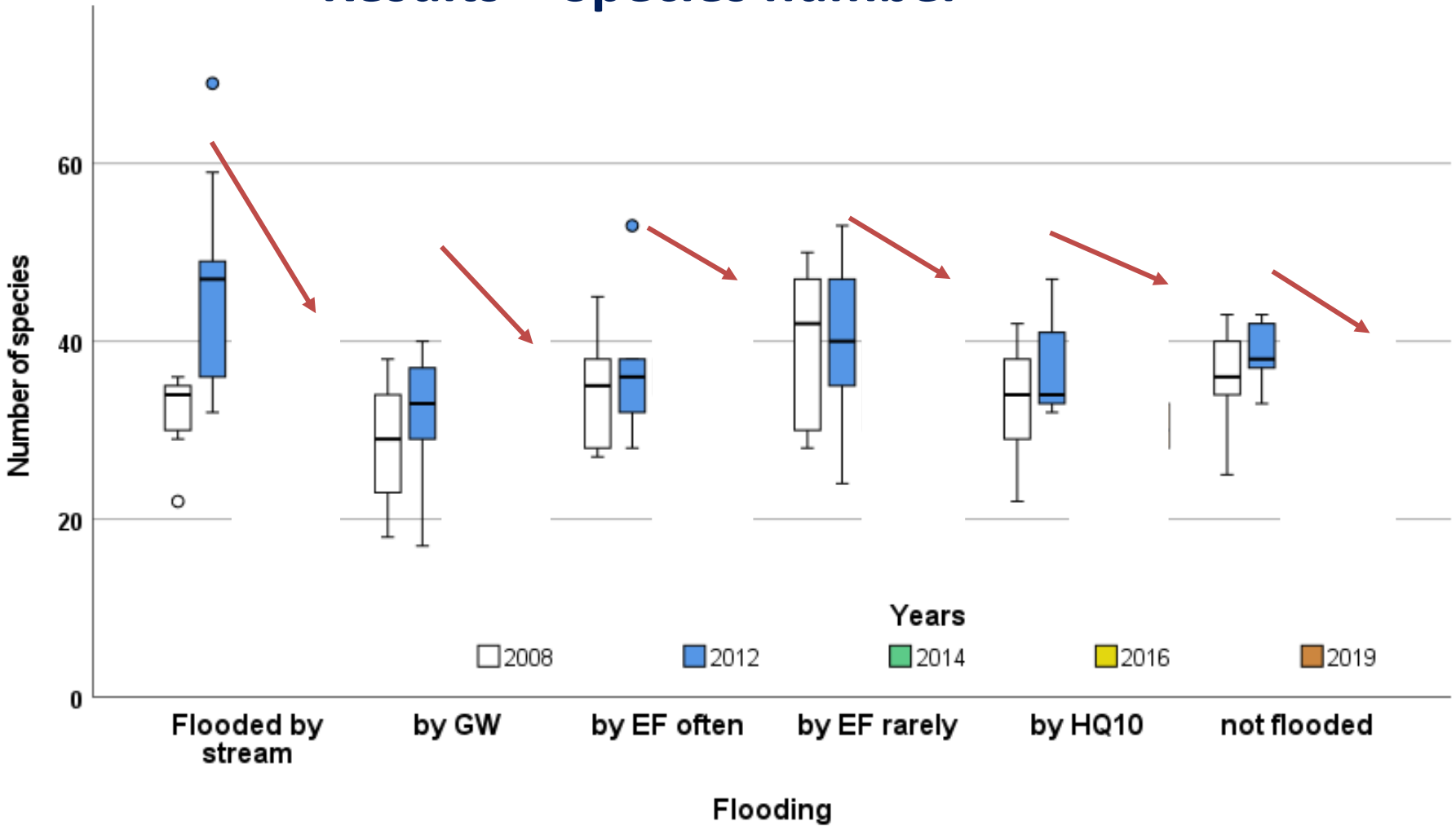


Results - Ellenberg Moisture Indicator Value



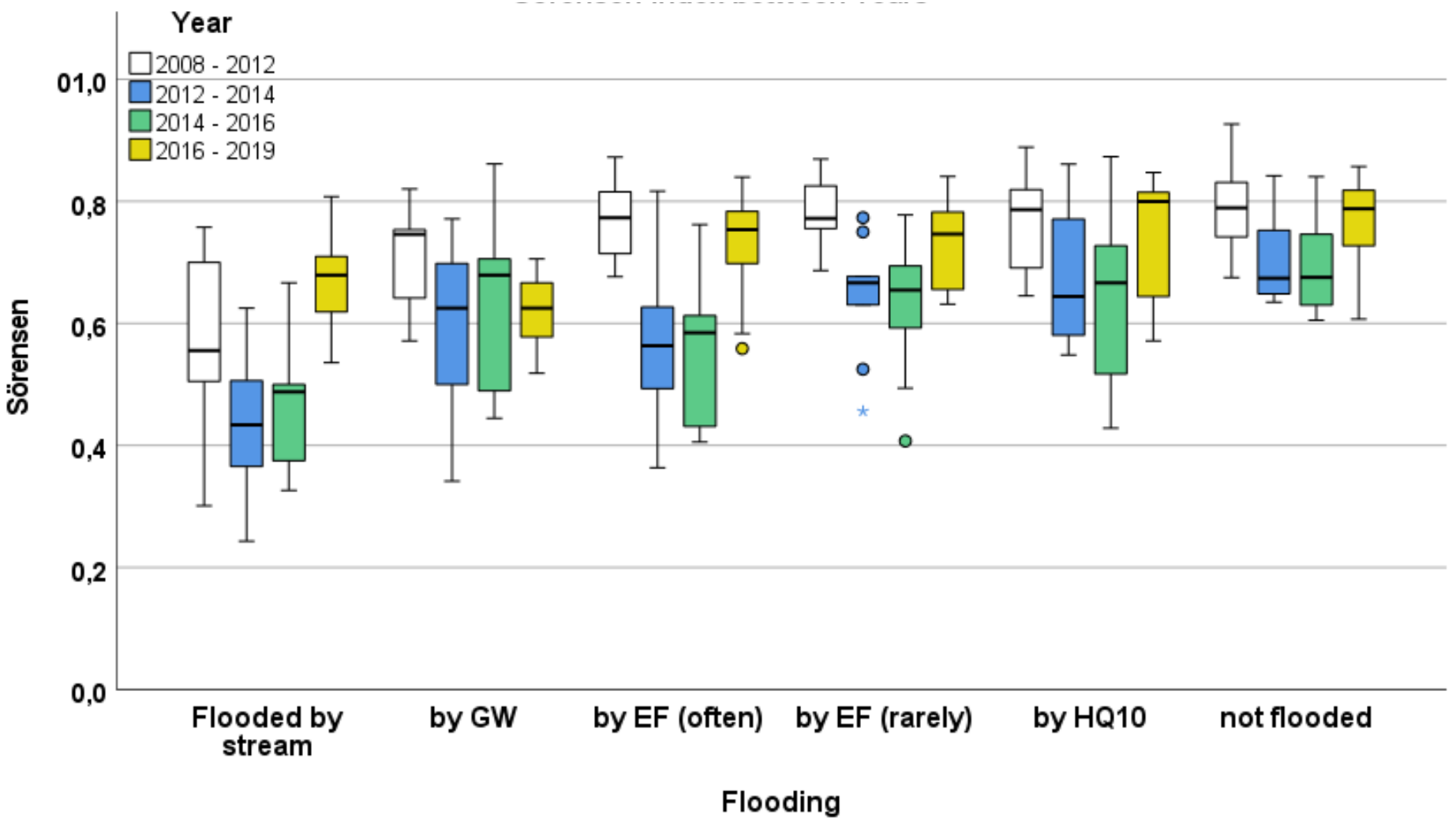
- Flooding categories show a clear gradient
- Timely changes only for permanently flooded plots

Results - Species number



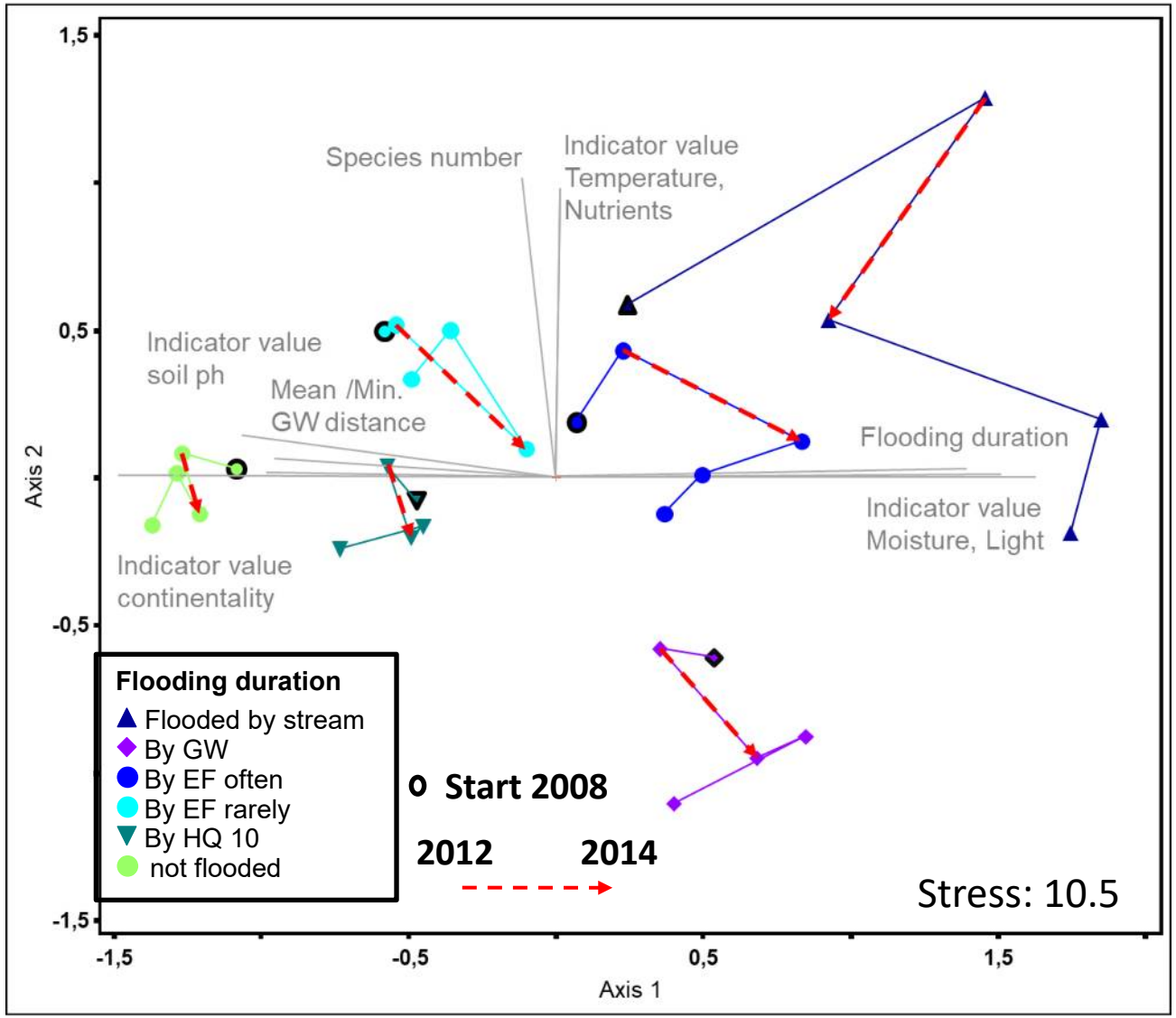
- 2008 – 2012: Species number increased significantly for plots flooded by the stream
- Strong decline after the HQ10 in 2013 on all plots
- Further decline in the dry year 2019
- Target species and typical floodplain species behave very similar

Results - Species turn over (Sörensen Index)



- The more water the more change
- HQ10 induced highest changes
- Many lost species (up to 30 per plot) due to HQ 10 in 2014
- Only slightly more new species in 2016

Results – Species composition



NMDS

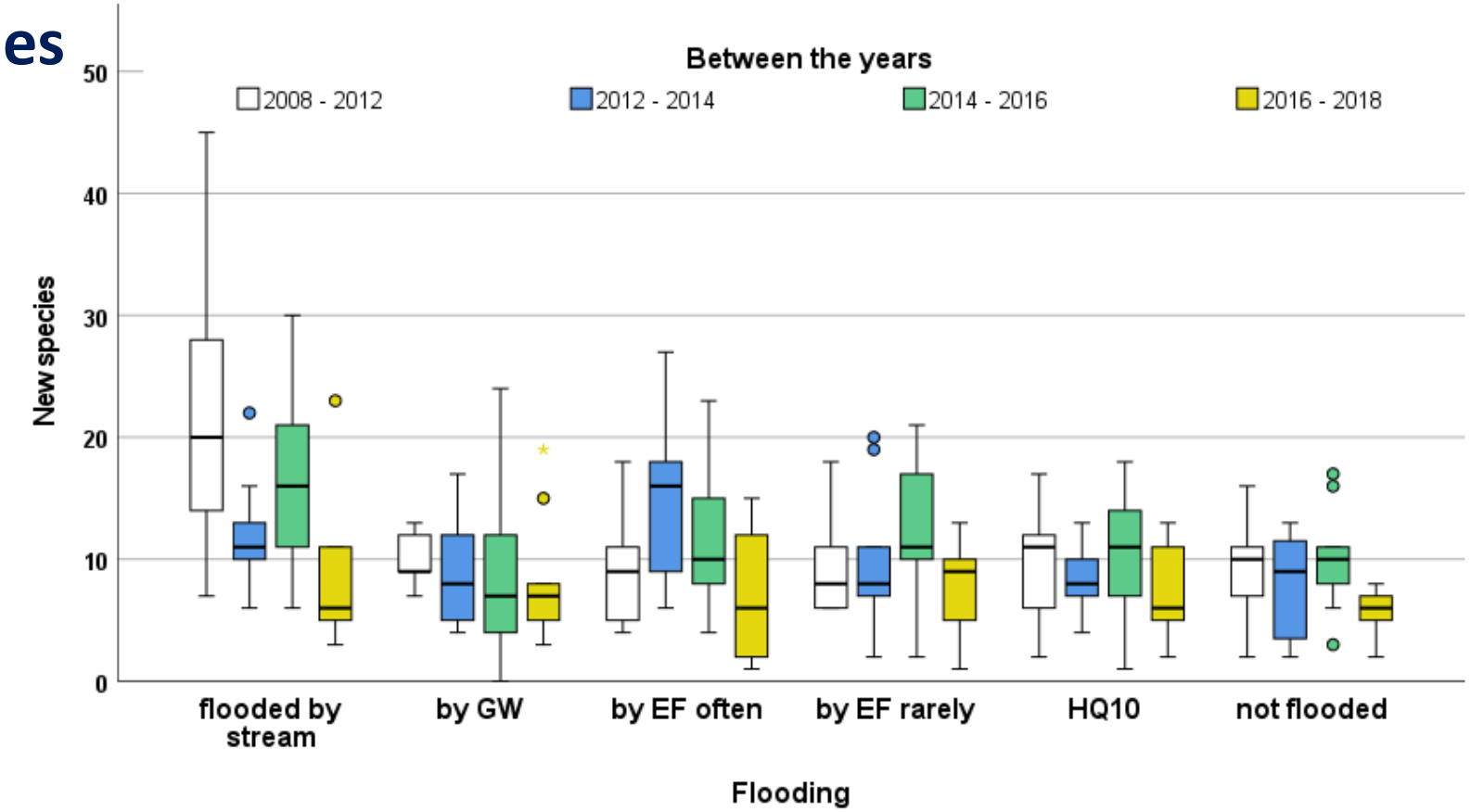
All plots of one flooding categories per year joined using frequency of species

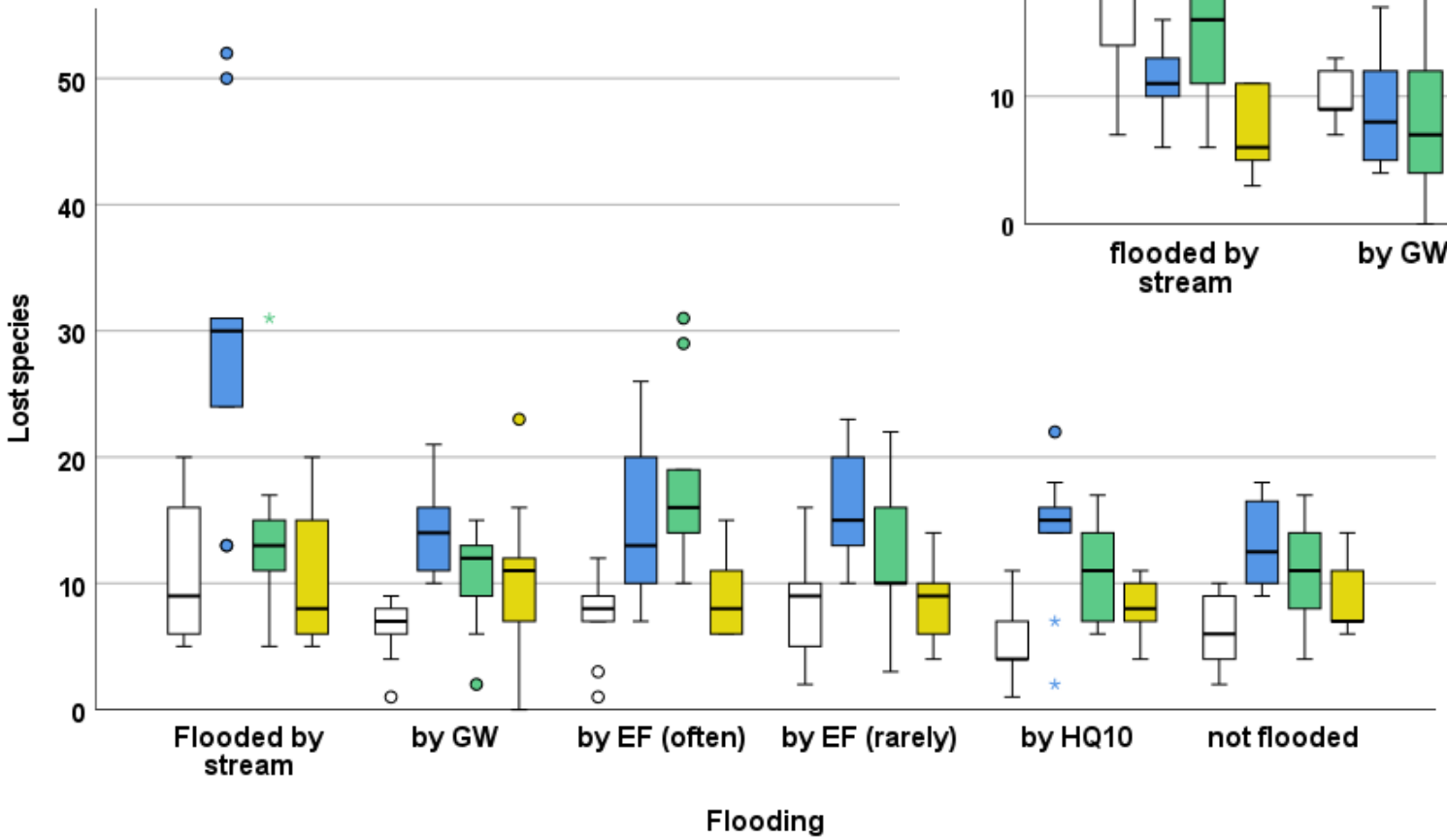
Dynamic Floodplain forest? – Summary and conclusions

- First increase: Floodplain forest adapted to flooding, even after 40 years of disconnection
- Mainly changes on plots flooded by the river
- Key factor for species diversity: relief (moisture gradient) and hydrodynamics
- High species turnover is typical for floodplains
- Significant changes by natural flooding could help restoration
- Declining species number due to dry summers? Further monitoring needed!!!

Thank you for your attention!!!

Results - new and lost species

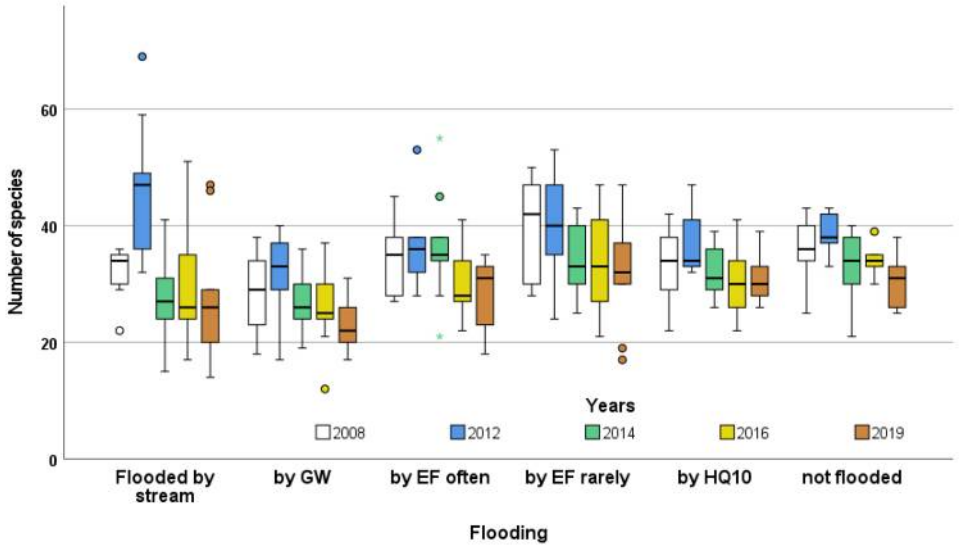


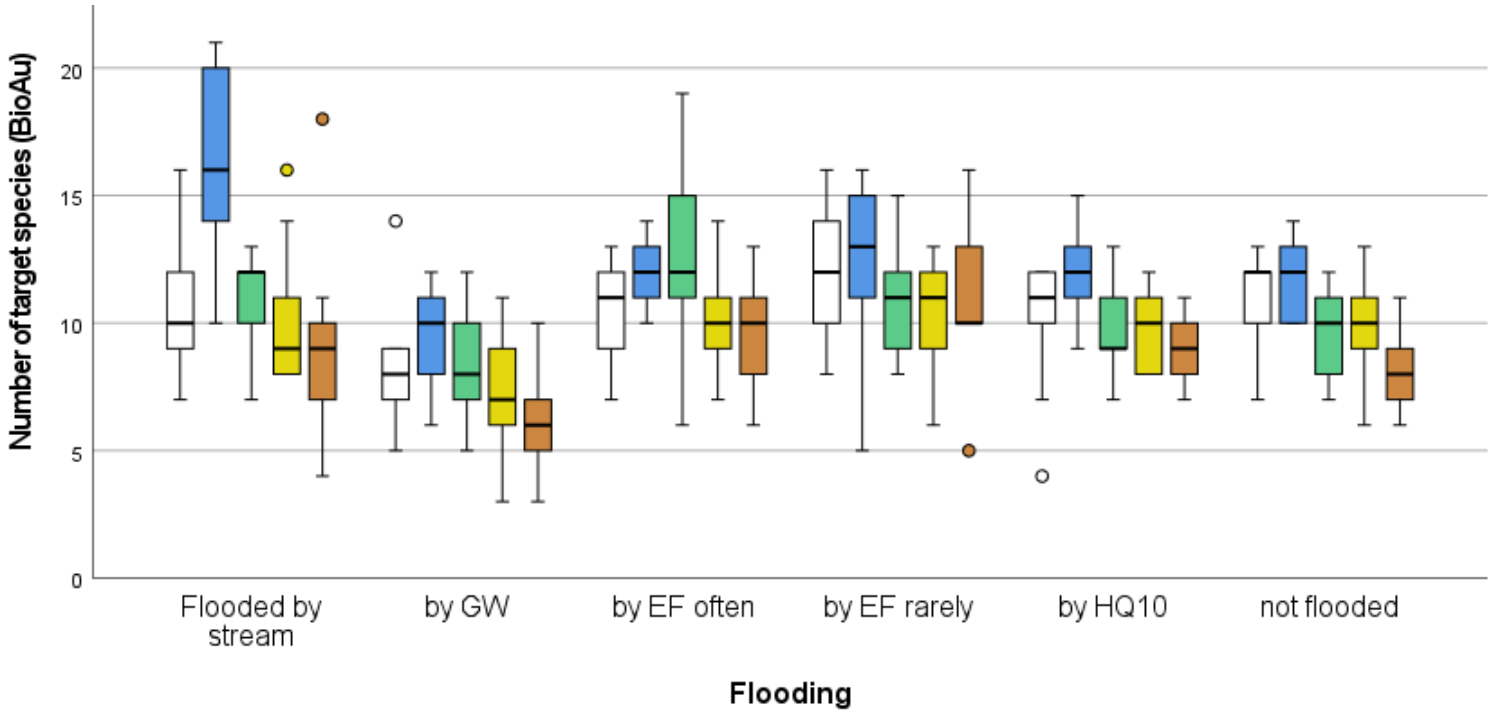


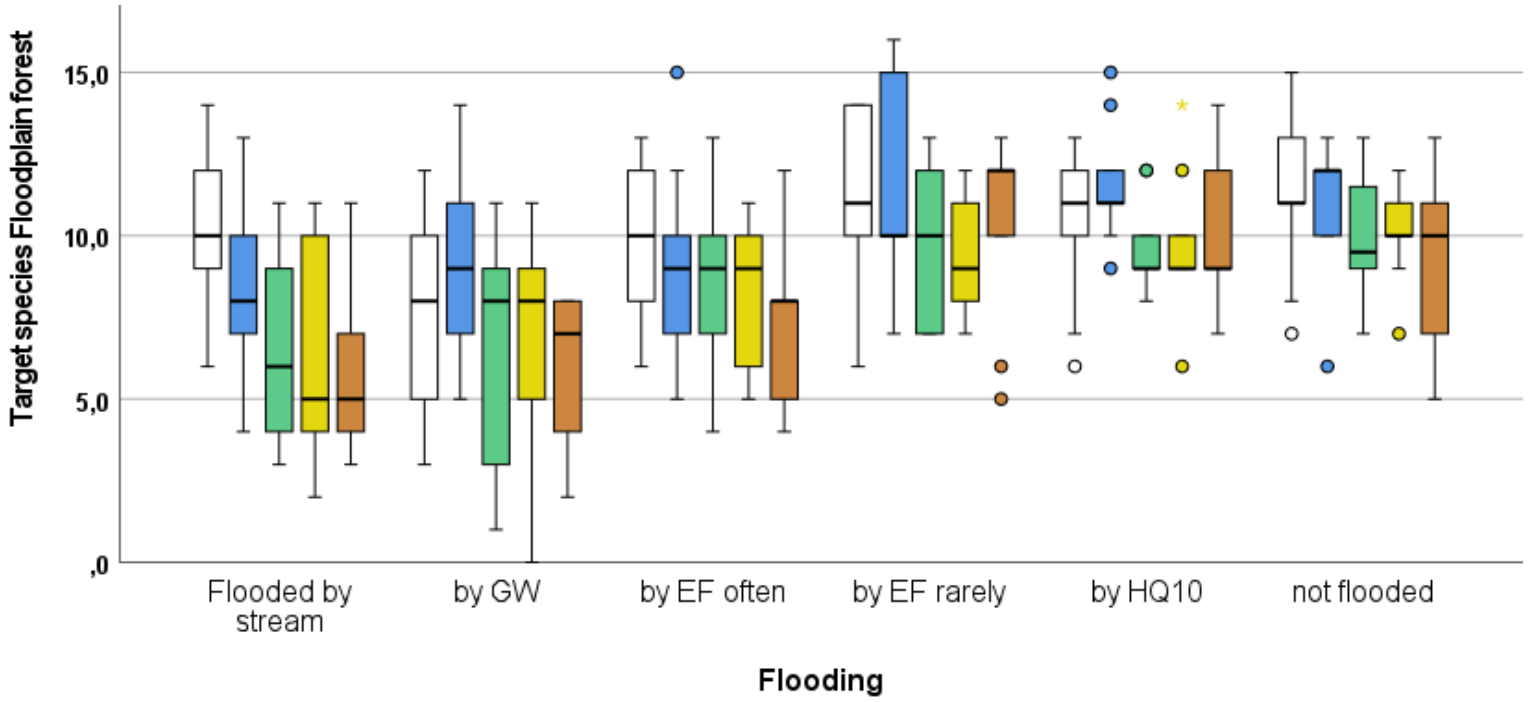
- Many lost species due to HQ 10 in 2014
- Only slightly more new species in 2016

Auen institut Neuburg/Donau

Results - Target species number







- Differences due to flooding categories
- 2008 – 2012: Species number increased
- HQ 10 induced species decrease on whi
  in the following years
- Für Zielarten sehr ähnlich, Feuchtezeige

Methode: ursprüngliches Plot-Design 2008