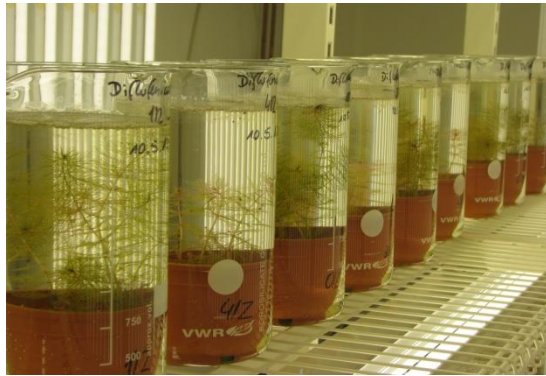


Recovery of Macrophytes –

How to address ? How to test ?



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- Guidance on tiered risk assessment for ppp for aquatic organisms in edge-of-field surface waters (EFSA 2013)
 - Ecological Threshold Option (ETO):
,negligible population-level effects only'

 - **Ecological Recovery Option (ERO):**
*,medium effects as long as the duration of the effect on the abundance and/or biomass of vulnerable populations of macrophytes is **not longer than weeks** or **small effects** when they last **for a few months.**'*

- To use the ERO option, a definition of recovery in case of macrophytes is needed!

- This definition has to consider the existing protection goals!

1. **Ecological entity:** individual – (meta)population – functional group – ecosystem
2. **Attribute:** behav. – surv./growth – abundance/biomass – process – biodiv.
3. **Effect magnitude:** negligible – small – medium – large
4. **Temporal scale:** days – weeks – months – seasons – > 1 year
5. **Spatial scale:** in crop – edge of field – nearby off-crop – watershed/landscape
6. **Degree of certainty:** low – medium – high

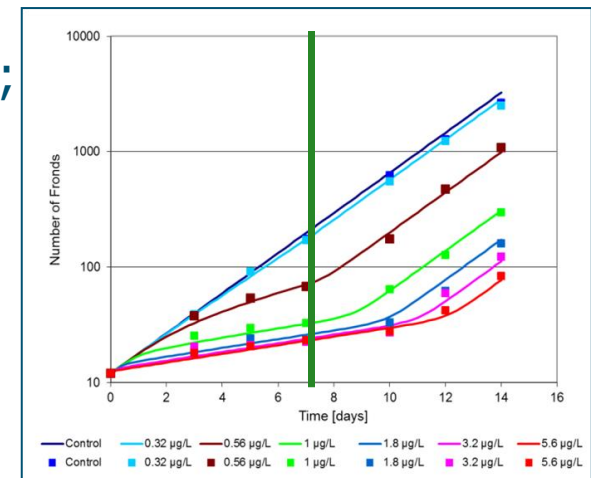
Protection goals

Attribute:
temporal scale:

Biomass (of functional group)
days to weeks

Laboratory studies?

- Static or variable exposure testing
(e.g. by transfer of exposed plants into vessels with control medium)
- Recovery cannot be demonstrated for **biomass** due to inherent properties of the used test designs:
 - Optimum (exponential) growth in controls;
Thus, effects observed within the test period cannot be compensated due to the optimum growth of controls
- Recovery can be demonstrated for **growth rate**



Is recovery of growth rate sufficient considering the protection goals?

Proposed solution for addressing recovery:

Combined use of recovery of growth rate based on test results and suitable ecological modeling approaches.

Higher tier studies? (e.g. mesocosms)

- Typical measurement endpoints are % area coverage, shoot length, biomass
- Environmental factors and competition can result in non-exponential growth;
- Potted plant studies somewhat artificial (reduced competition, artificial biodiversity);
- Free-living populations tend to develop into one or two species dominating the system;
- Mesocosms and multi species pond studies result in similar problems as lab systems;
- Proposed solution for addressing recovery:



Combined use of multi species studies plus suitable ecological modeling approaches

Recovery of macrophytes: other issues?

- Need to define “acceptable recovery”;
- Recovery period of 8 weeks (AGD) might not be applicable for macrophytes.
... **Protection goals**; growth of the organism, time to effect, time for recovery, nutrient situation in studies,
- Macrophytes in the real environment have a patchy distribution Populations might be stable but are variable with respect to location;
- To cover the protection goal “population” it might be more feasible and scientifically justified to change the temporal scale for recovery:
 - 1. Recovery within a growing season
 - 2. Recovery over the season might be feasible –e.g. in case of autumn applications

Recovery: other issues?

In case the Ecologically Recovery option is used within the ERA, a definition of Recovery in case of macrophytes is needed.

What is needed if a combination of test results and ecological models will be used to demonstrate recovery?

- If recovery of biomass is addressed by ecological models, it is necessary to define a threshold.
- A 10% threshold has been used exemplarily and would be in line with EC10 which is currently used as a surrogate for the NOEC in frequent cases. (compare AGD)
- Due to the high variability of macrophyte growth and distribution in the environment a threshold of 10 % difference to controls might be too low.

A photograph of a pond with lily pads, a frog, and a white flower. The text "Thank you for your attention" is overlaid in the center.

Thank you for your attention

Working group on recovery

Activities:

- Data mining:
 - Control data from lab studies;
 - Control data from mesocosm studies;
 - Growth dynamics in the field;
- Modeling workshop (MeMORISK + PLANT): see next presentation;