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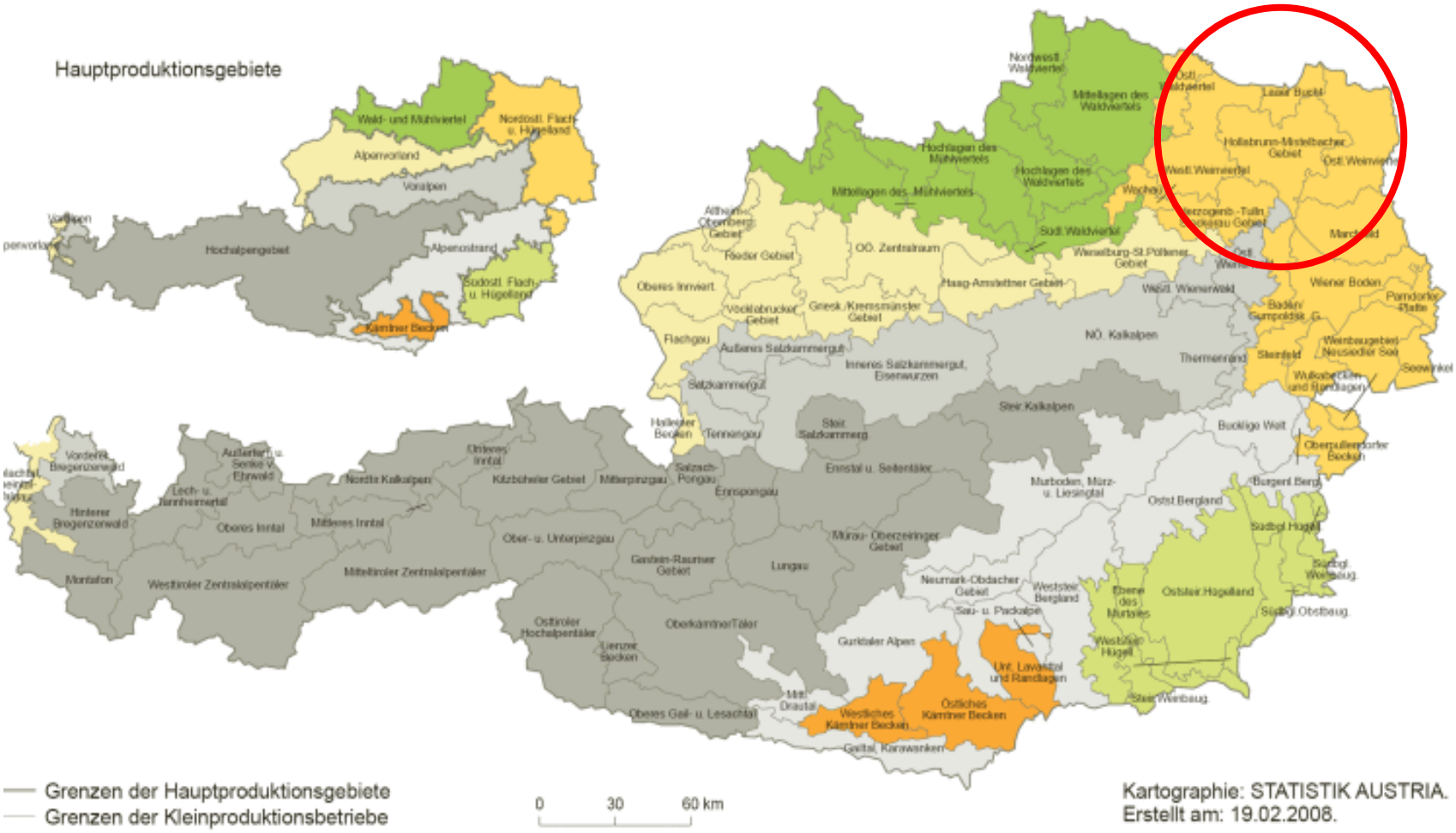
IN-STREAM PHOSPHOROUS RETENTION AND SEDIMENTARY PHOSPHOROUS RELEASE IN AGRICULTURAL HEADWATER STREAMS

Gabriele Weigelhofer

The project area



Large-scale stream regulation

Pressures

- Intensive agricultural land use
- Large-scale drainage
- Large-scale channelization
- Low precipitation
- High soil erosion

Back to the good ecological state?

?

Morphological restoration as solution?

Research questions

- Is it possible to restore the good ecological state of these streams? Which measures are most efficient?

- What happens if we restore channel morphology? Which type of channel should we restore?

- How do these streams function?

In-stream nutrient retention capacity

15 Study streams

Forested meanders

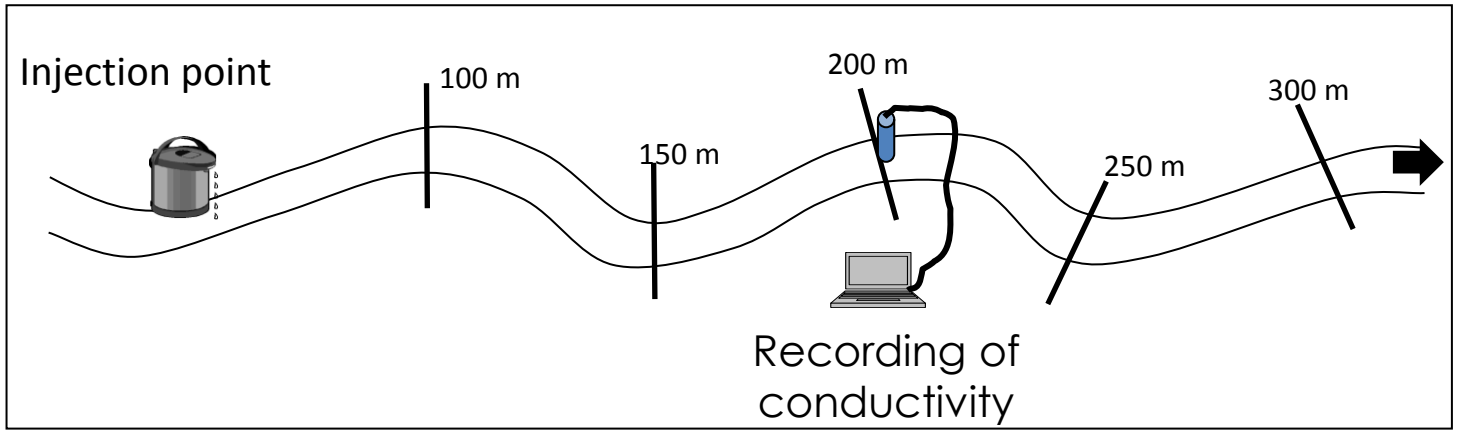
Discharge 0.5 – 15 L s^{-1}

Open meanders

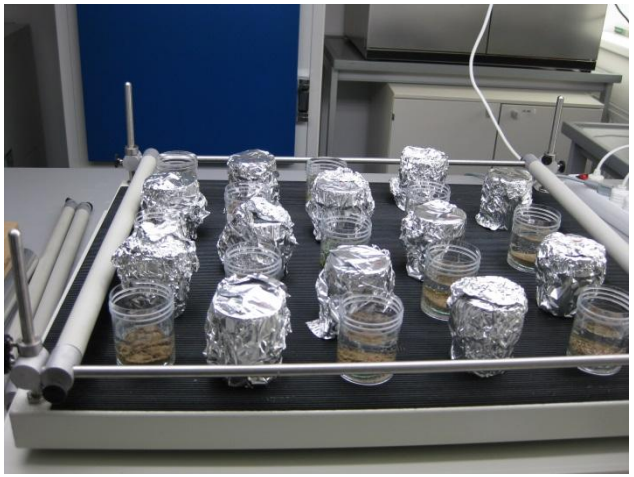
Channels

Methods

- Short-term nutrient additions



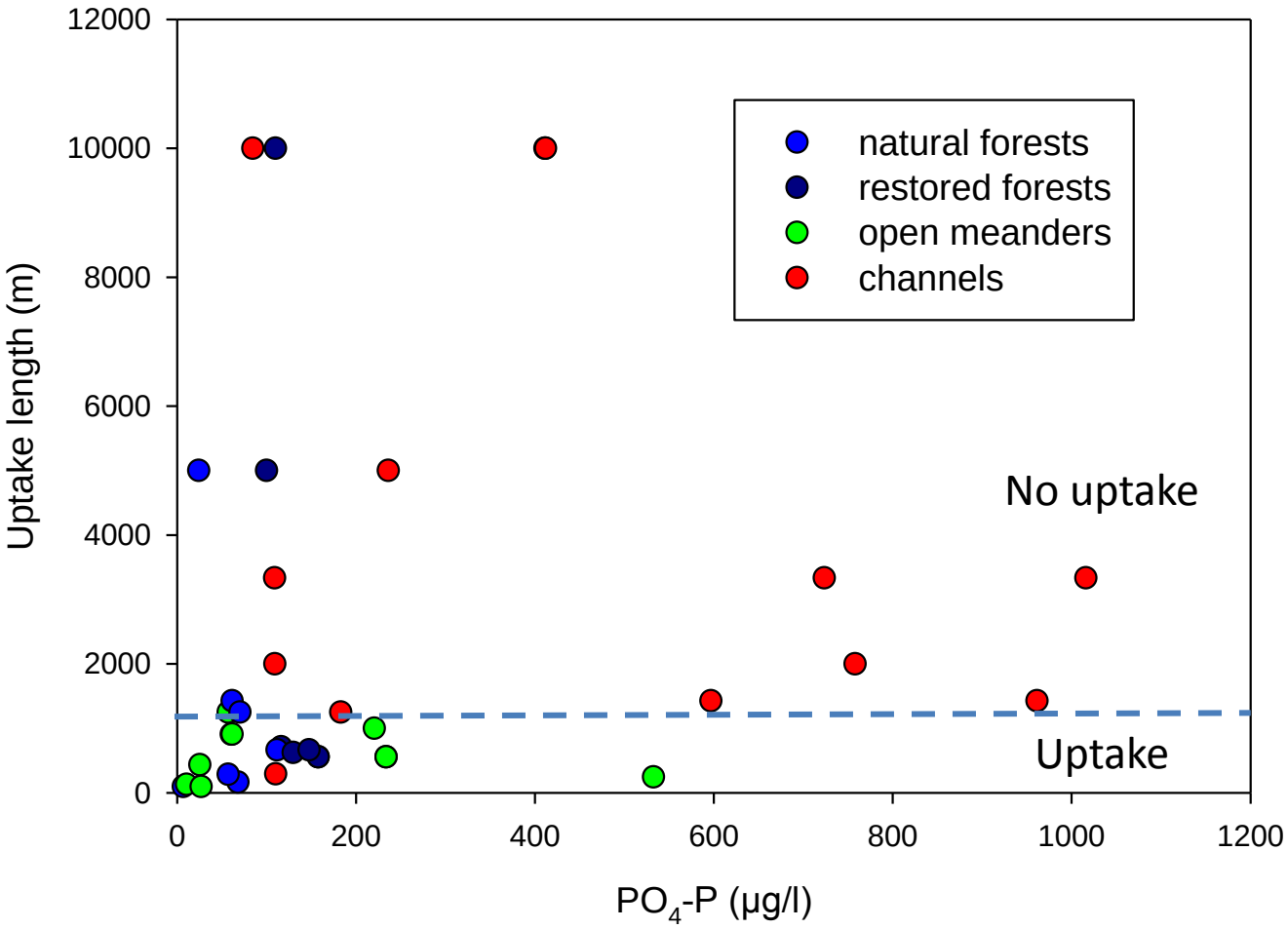
- Water and sediment analyses
- Laboratory uptake and release experiments



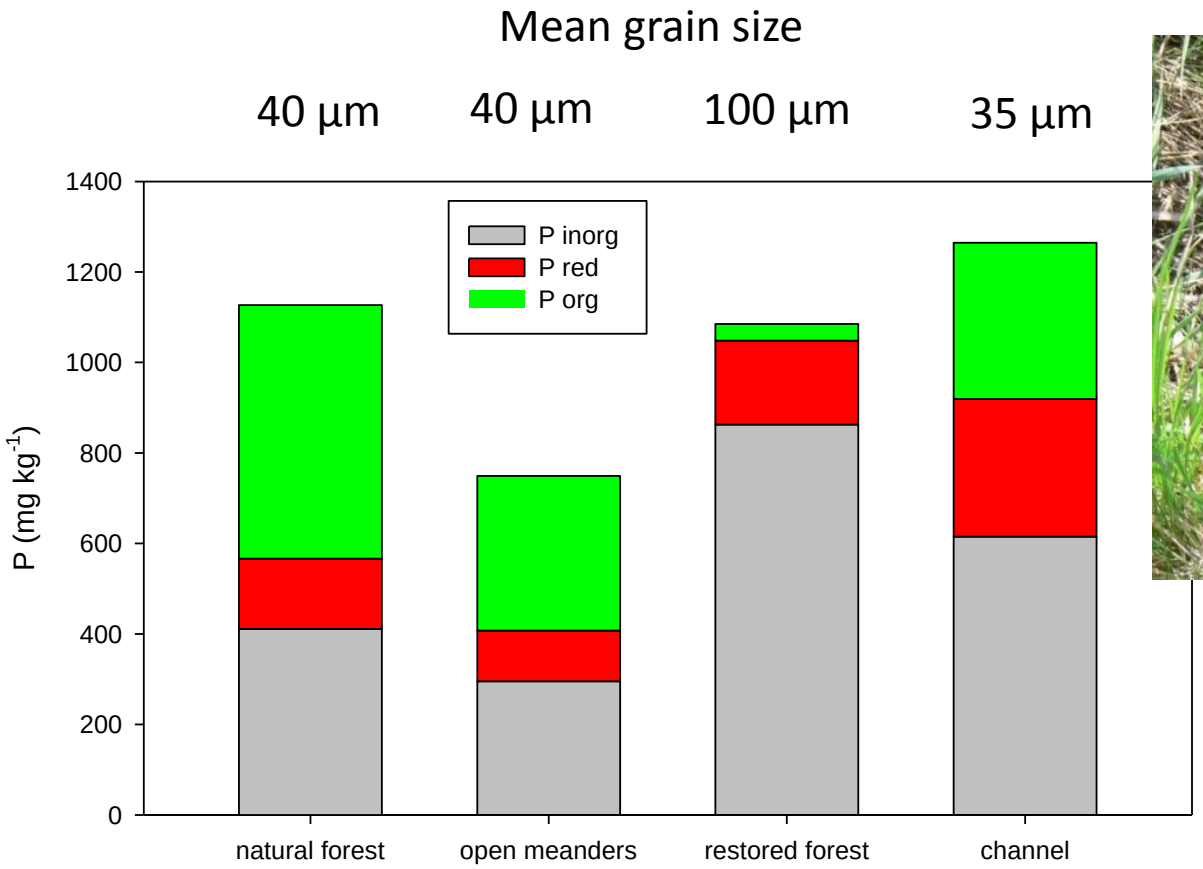
In-stream phosphorous uptake

Uptake length = Average travel distance

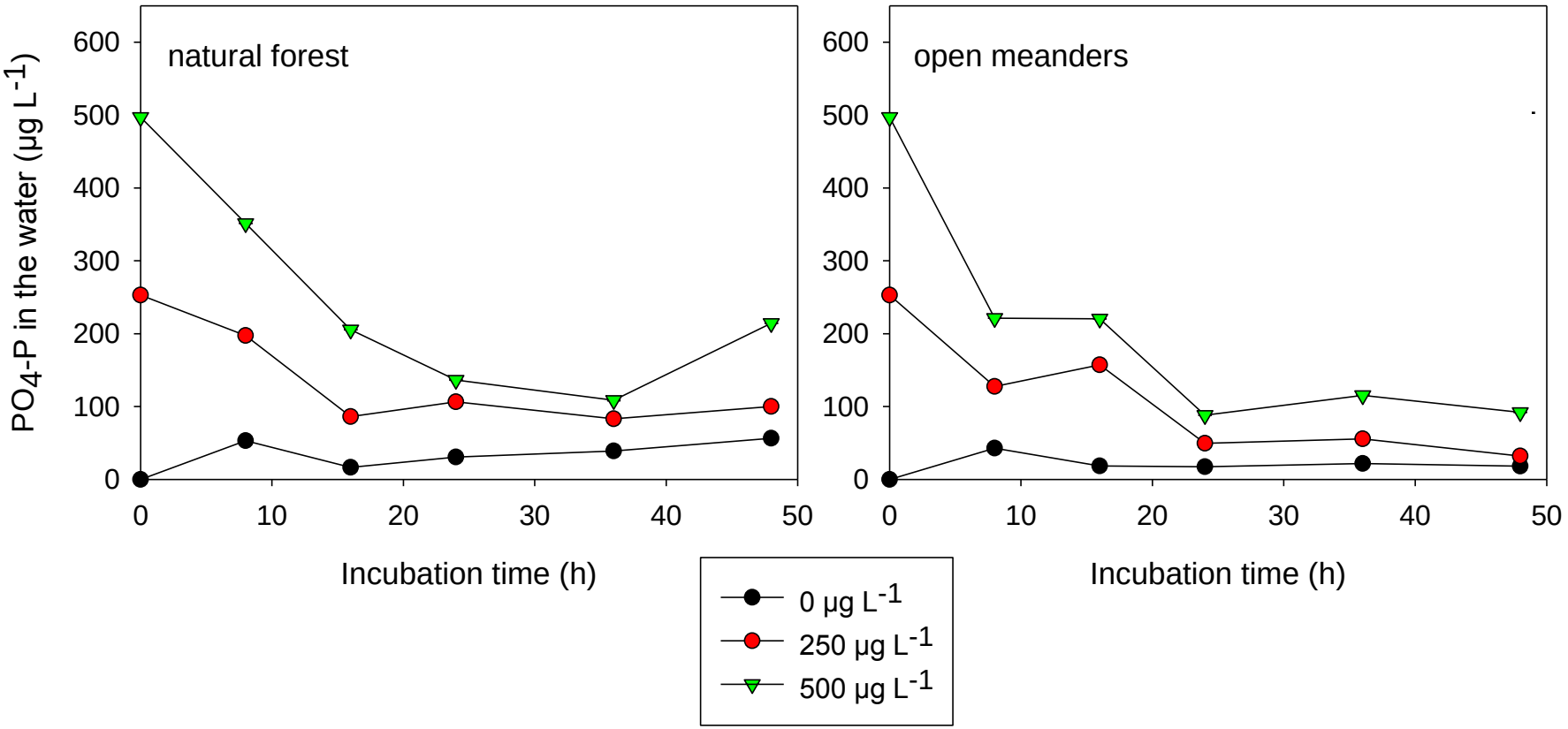
Oligotrophic headwater streams:
UL << 1000 m



Sediment quality



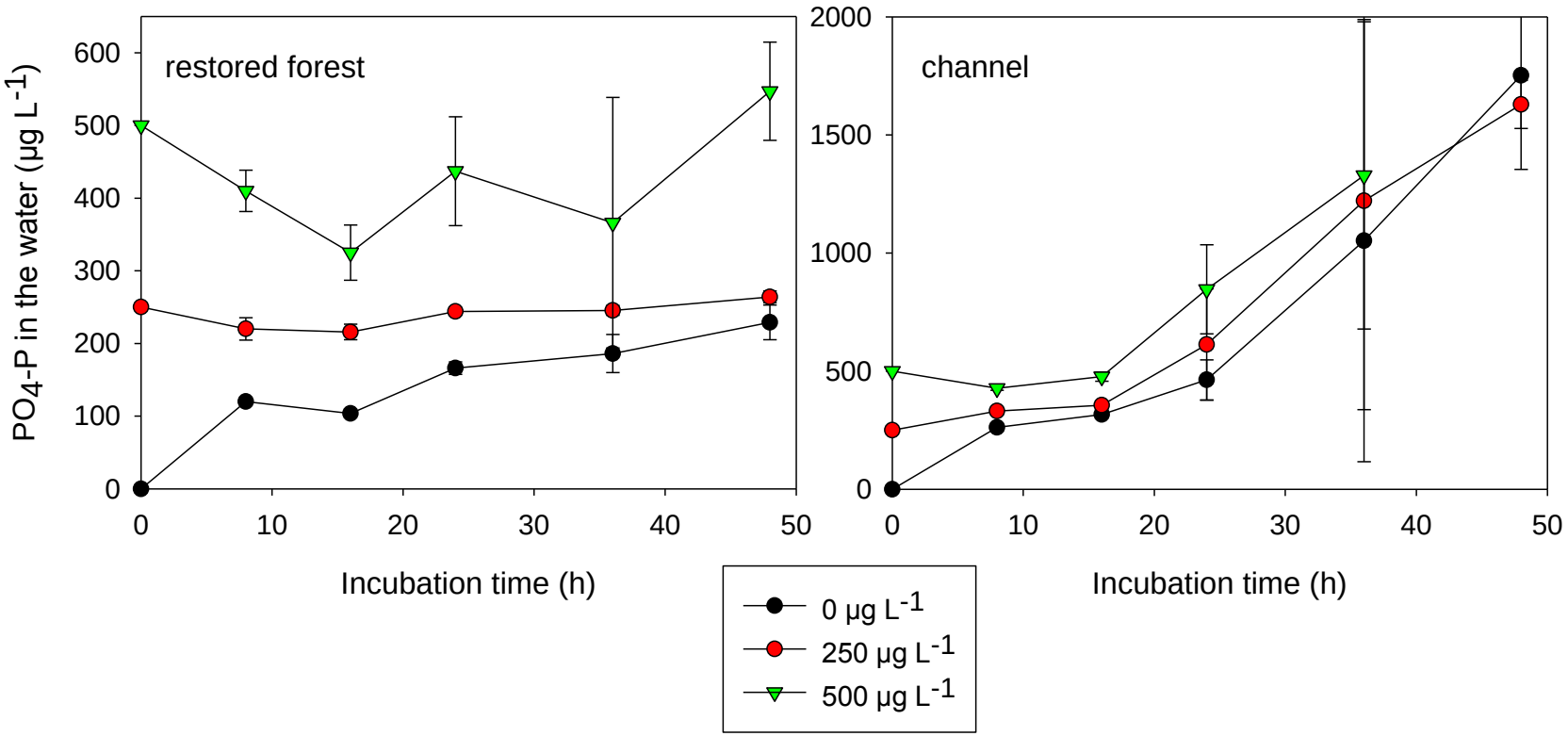
Sedimentary uptake / release



Release rate 0.4 mg m^{-2} h^{-1}
Uptake rate 0.6 mg m^{-2} h^{-1}

Release rate 0.4 mg m^{-2} h^{-1}
Uptake rate 0.7 mg m^{-2} h^{-1}

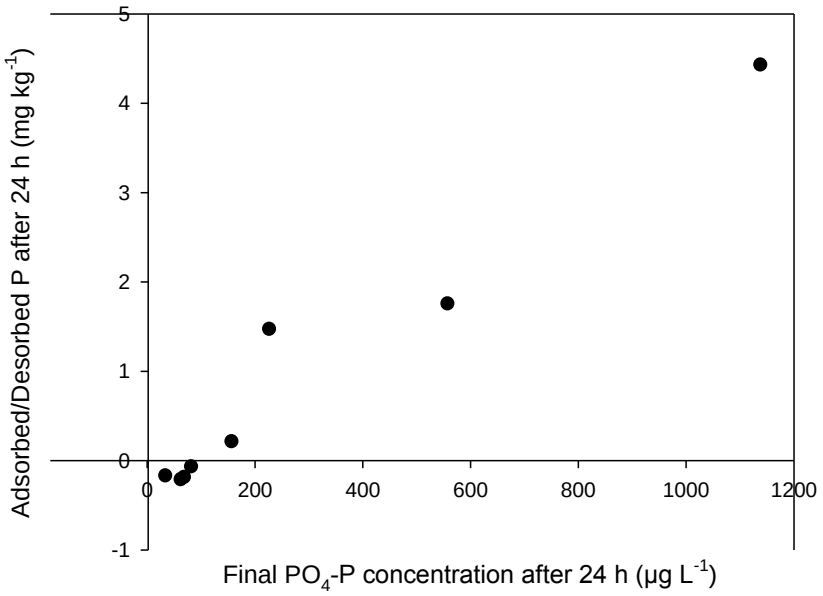
Sedimentary uptake / release

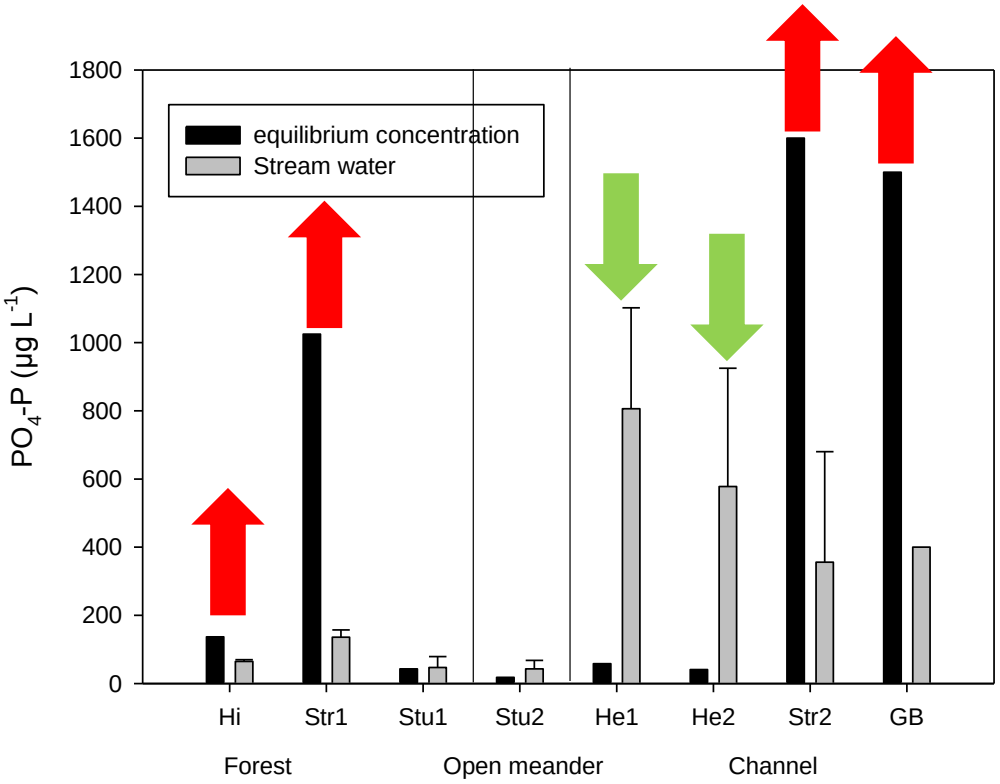


Release rate 1 mg m^{-2} h^{-1}
No Uptake

Release rate 1 mg m^{-2} h^{-1}
No Uptake

P equilibrium concentration





Sediment acts as source

Sediment acts as source

Conclusions for the P management

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- Sediments may act as P source in the case of re-mobilization
- Sediments supply benthic community continuously with P via diffusion
- Reduce diffuse P inputs by applying best-practice in agriculture
- Protect headwaters from soil input via extensive riparian buffer strips
- Consider sediment quality in risk assessment
- Consider sedimentation and P release from sediments in restoration concepts

Thank you!

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