

# Iron: A Limiting Nutrient for Benthic Macroalgae in Florida Springs?

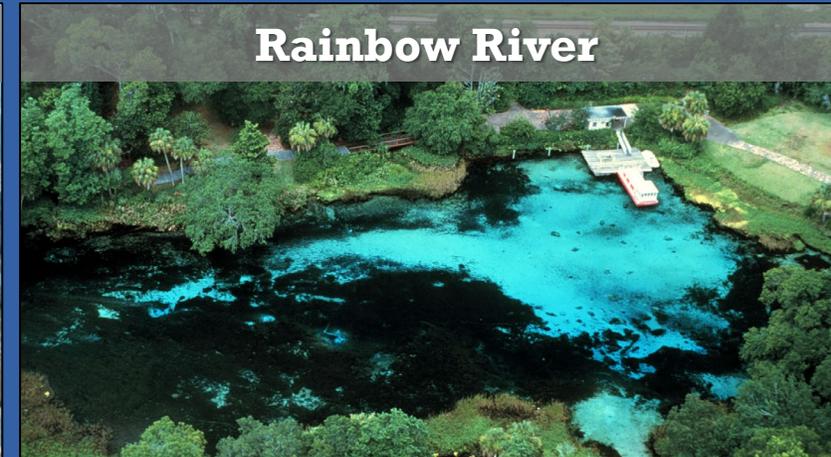
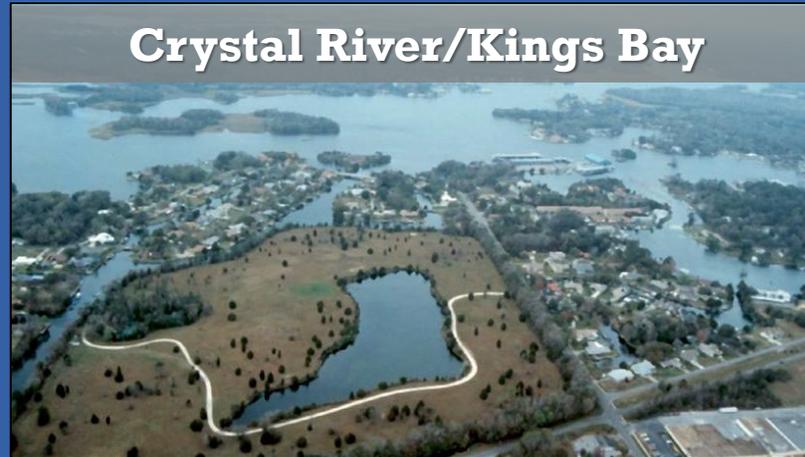
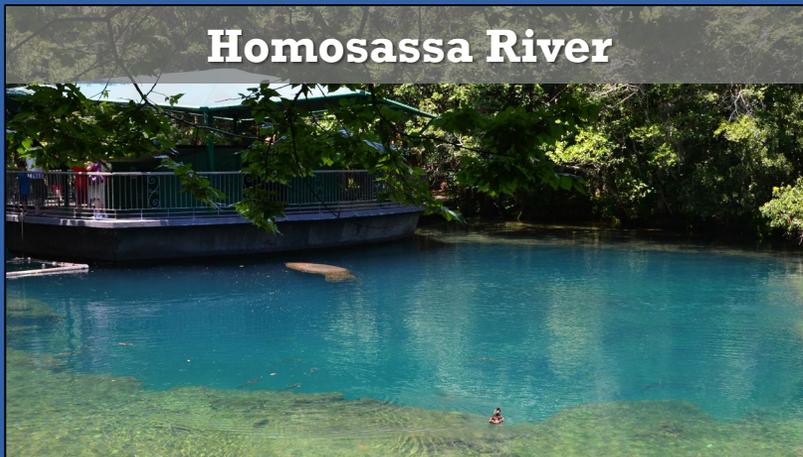
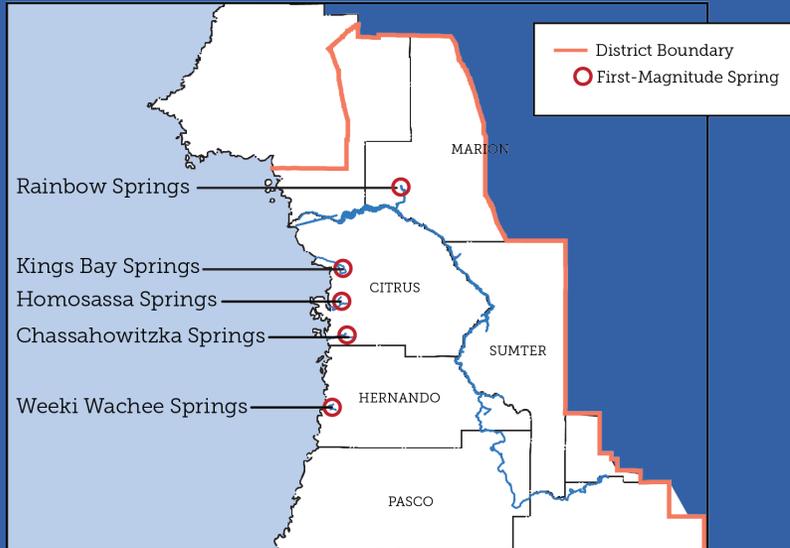


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Surface Water Improvement & Management (SWIM) Program

# District Springs



# Submerged Aquatic Vegetation in Springs



# Types of Submerged Aquatic Vegetation

**Desirable/native**  
(Ex: *Sagittaria kurziana*)



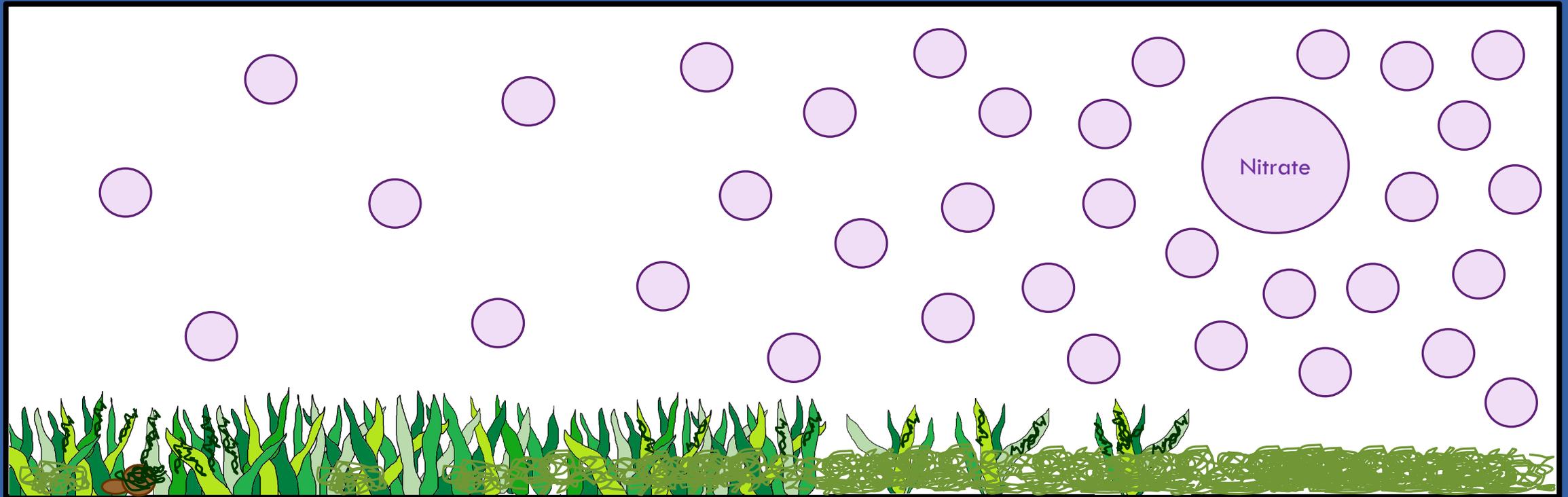
**Undesirable/invasive**  
(Ex: *Hydrilla verticillata*)



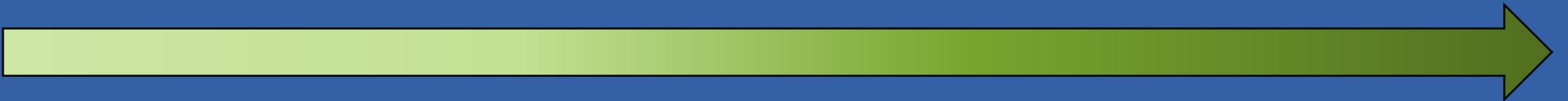
**Macroalgae**  
(Ex: *Lyngbya*)



# Excess nitrate thought to cause overgrowth of algae



# Algal abundance increases with downstream distance in Rainbow River



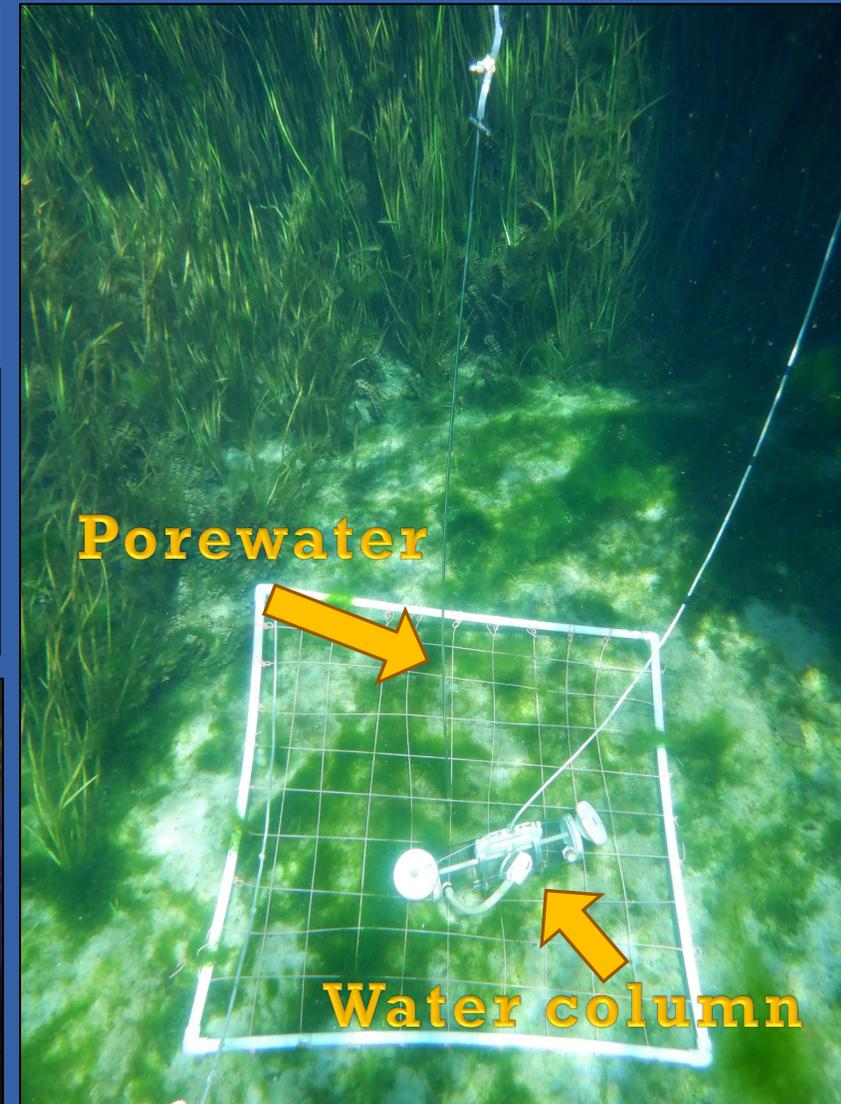
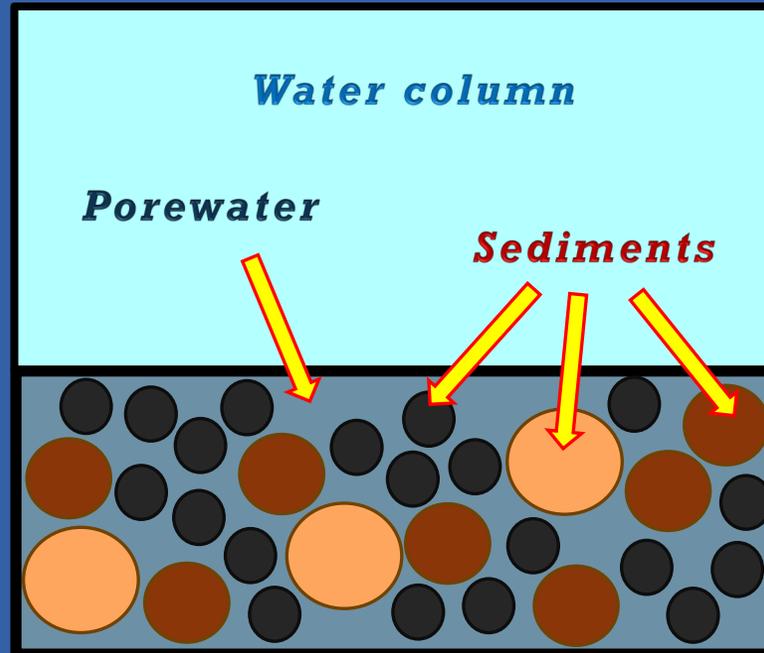
# Hensley et al. 2017: Rainbow River Analysis

- Gross primary production (GPP) in Rainbow River
  - GPP not limited by nitrate
  - Filamentous algae coverage not correlated to water velocity
  - **GPP and epiphytic algae biomass stimulated by iron (Fe) additions**

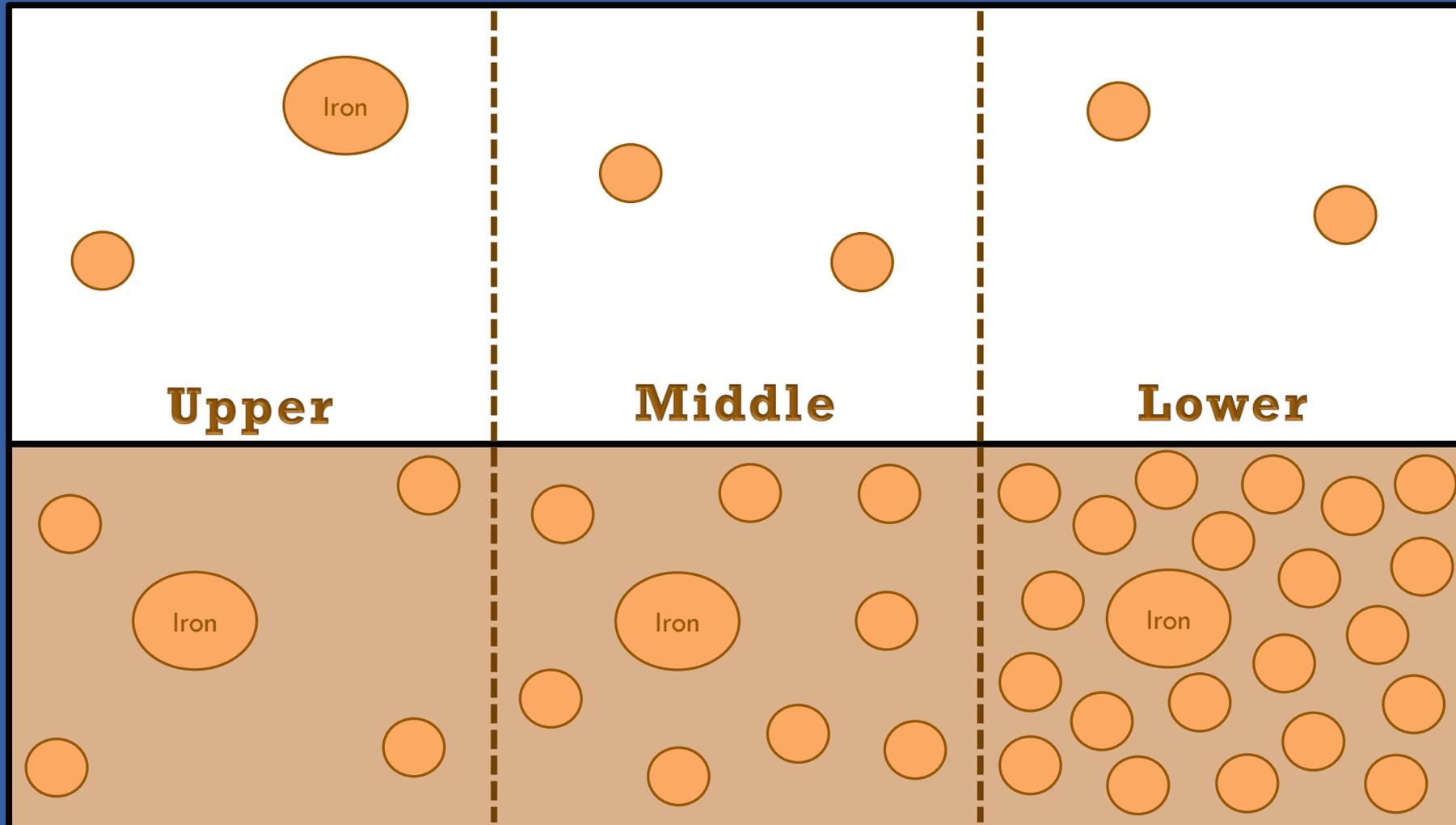


# Iron & Filamentous Algae in Rainbow River

- Methodology
  - 60+ samples
  - Control
  - Tested seasonality
- Benthic algae coverage & thickness
- Porewater & water column water chemistry

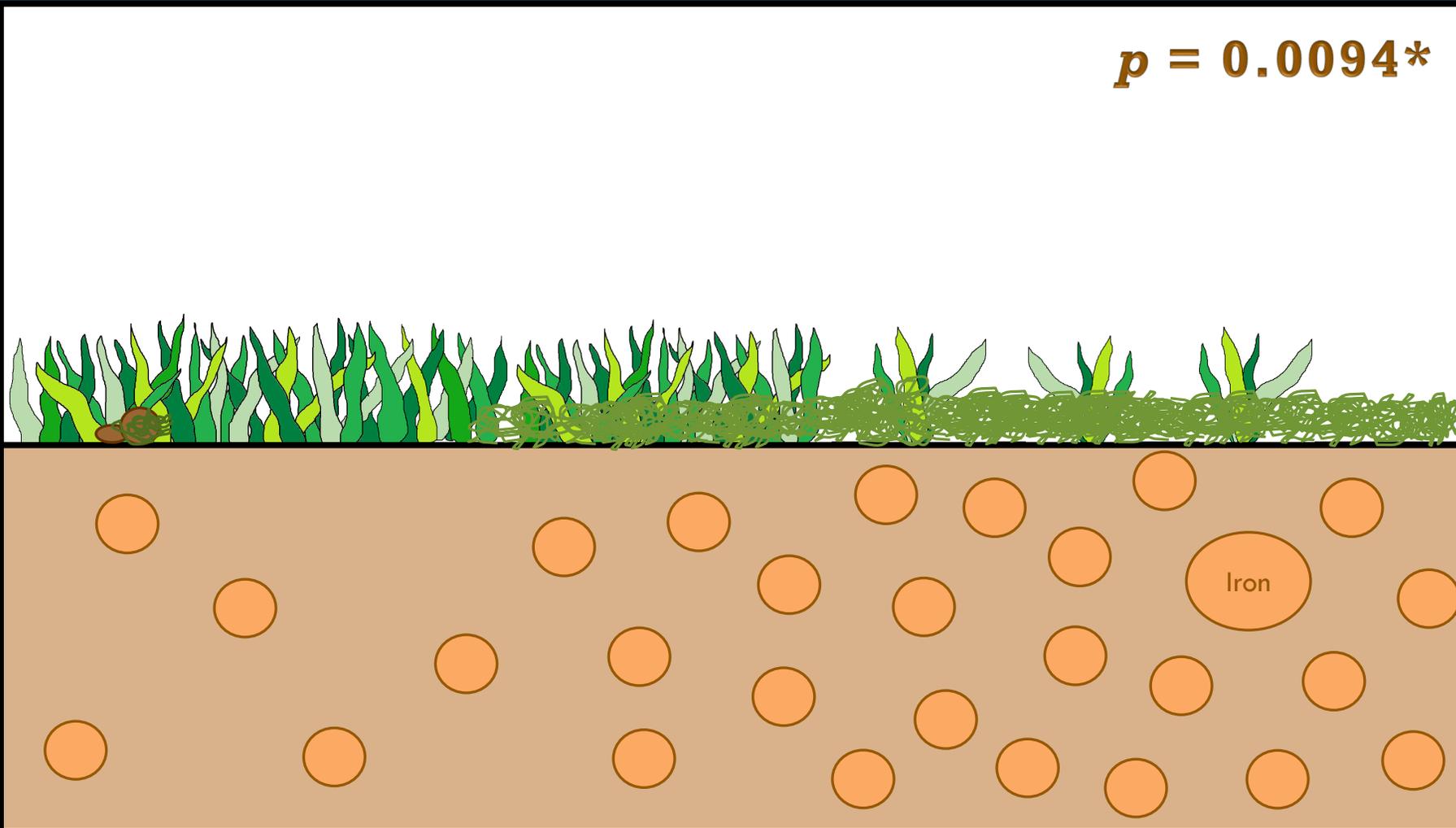


# Iron concentrations vary in Rainbow River



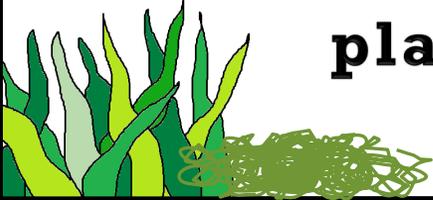
# Porewater iron correlated to algal coverage

$p = 0.0094^*$



# Why iron?

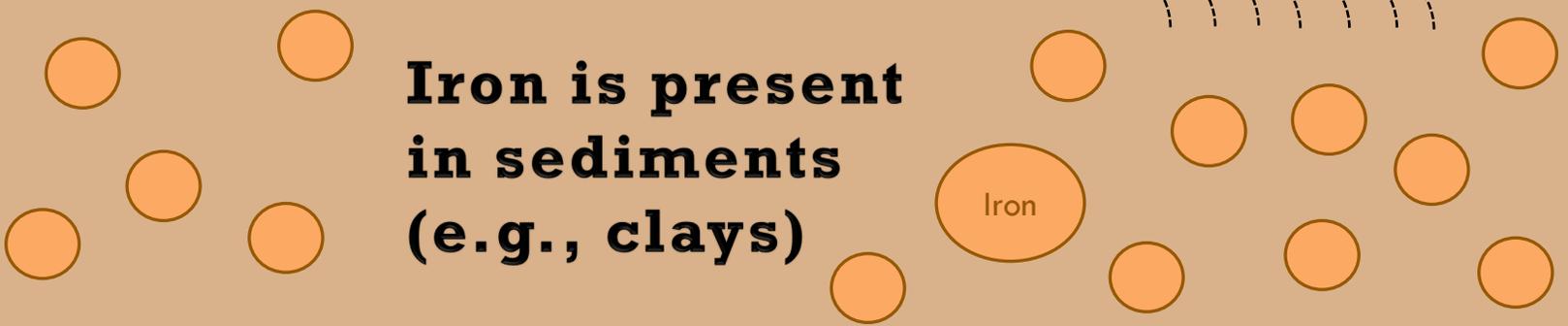
**Algae need  
more iron than  
plants**



**More iron gives algae a  
competitive advantage**



**Iron is present  
in sediments  
(e.g., clays)**



# Redefining iron's role in springs

- Nitrate reduction still important
  - May exacerbate iron limitation/deficiency
  - Potential downstream impacts
  - Can cause negative impacts to macrophytes
- *Is iron stimulatory? Is nitrate inhibitory?*
- Next steps

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