Coupling in situ chemical oxidation with bioremediation

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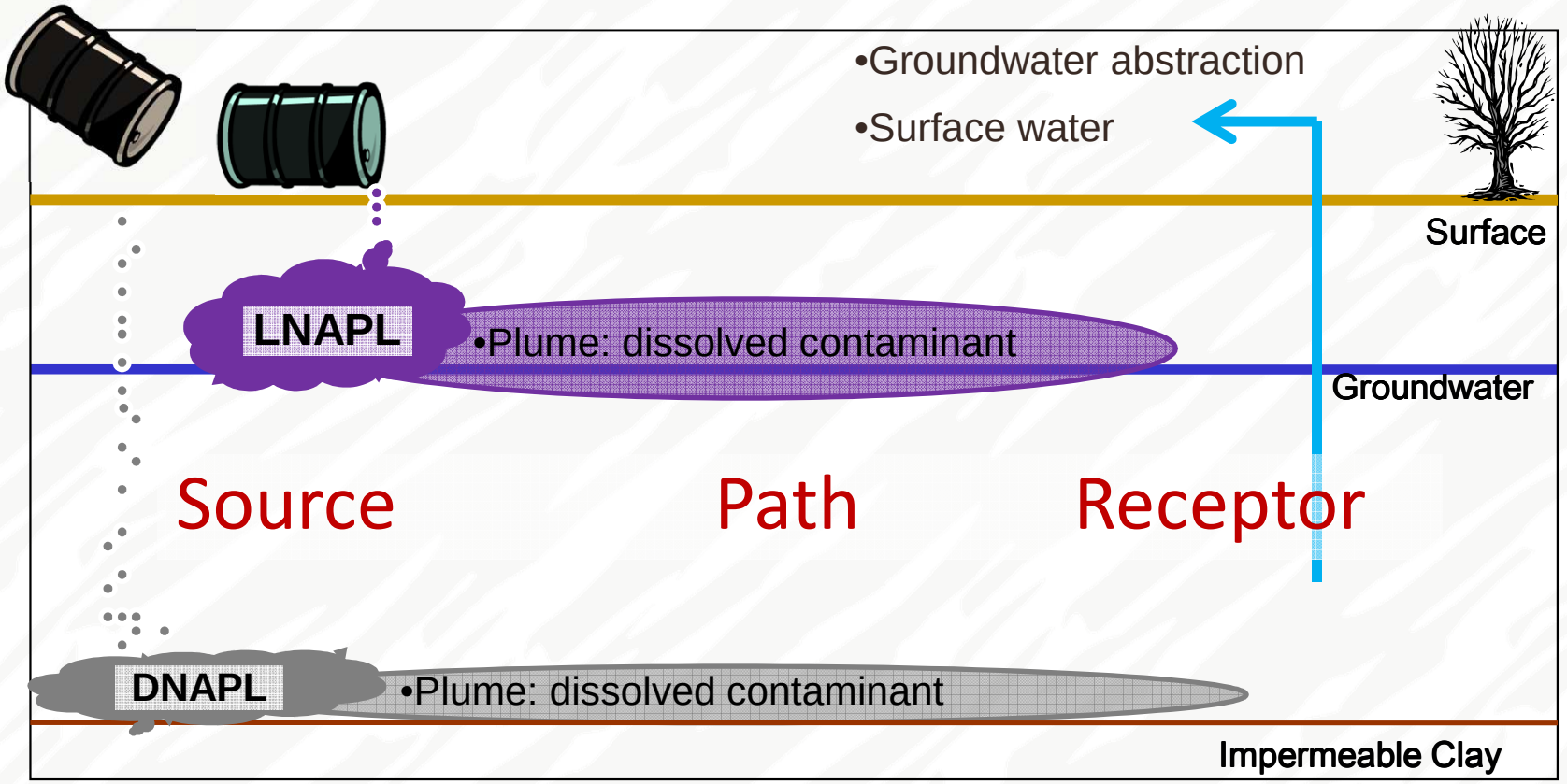
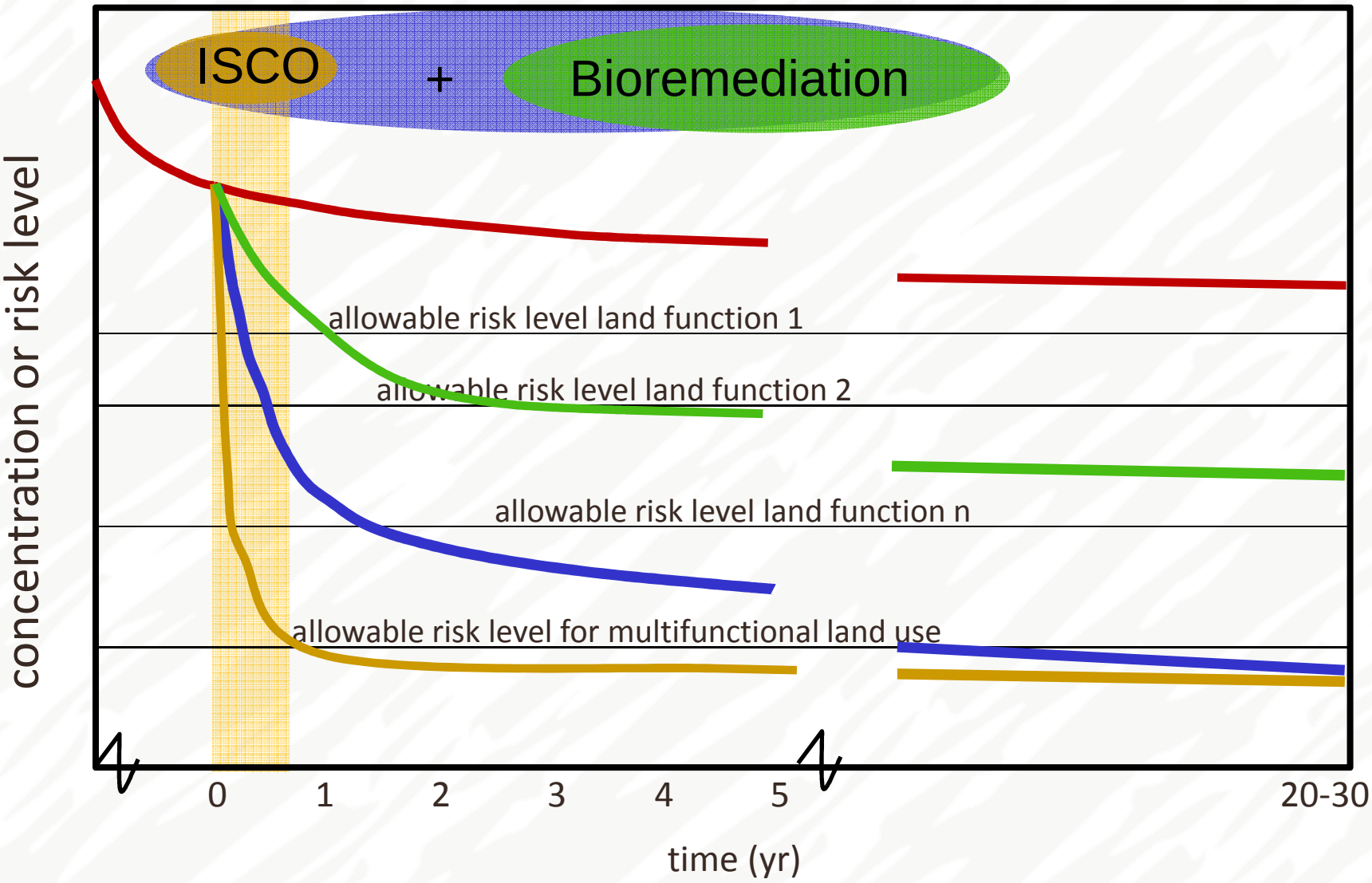
Source-Path-Receptor



Remediation Technology	Dimensions		
	Cost	Time	Sustainability Aspects
Conventional:			
Excavation (Source)	--	++	--
Pump-and-treat (Plume)	--	--	--
In Situ:			
In Situ Chemical Treatments (Source and Plume)	--	++	--
Bioremediation (Plume)	++	--	++
Aim for Upsoil:			
ISCO + Bioremediation	++	++	++

Coupling ISCO and Bioremediation



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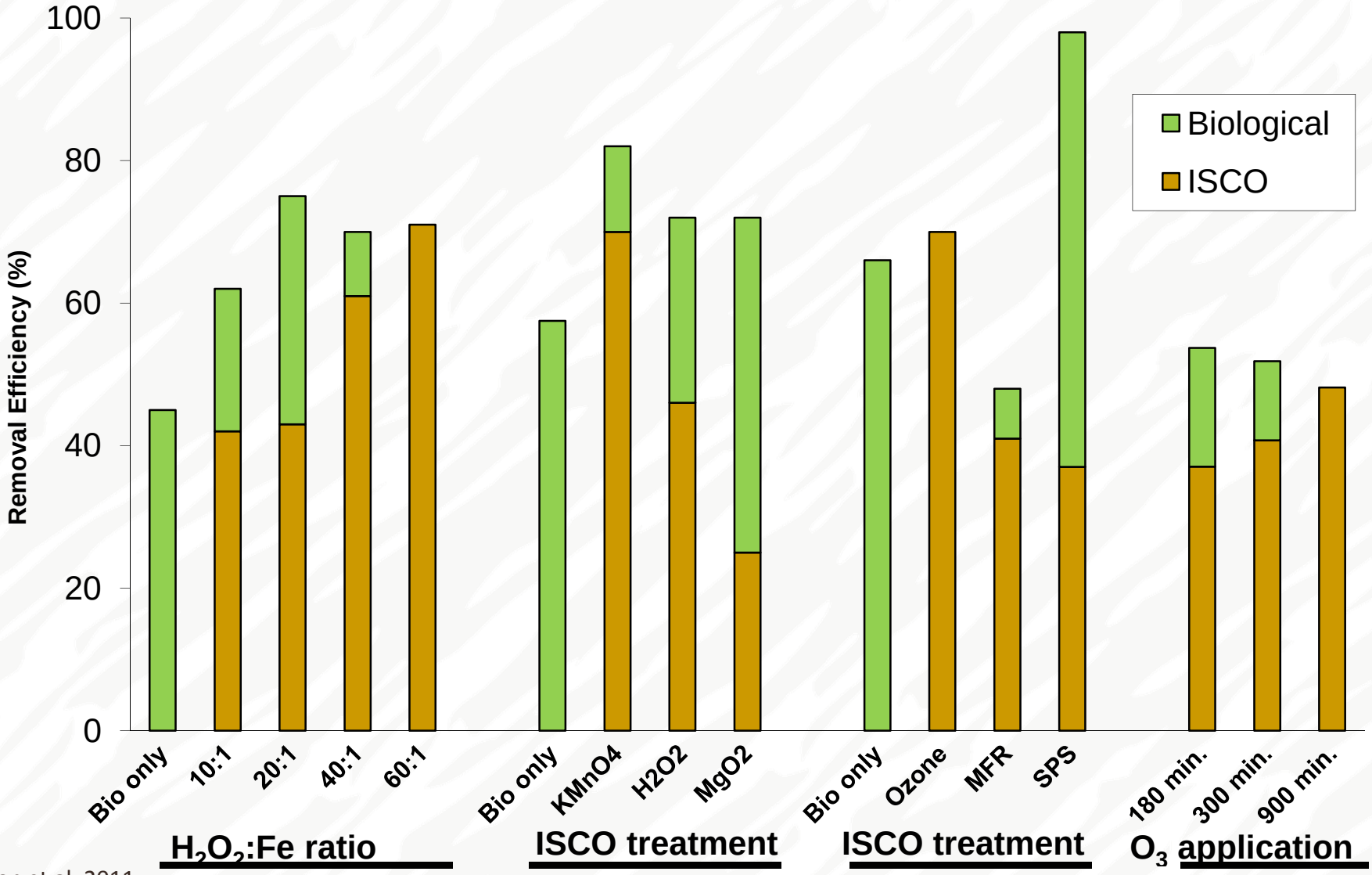


Sutton et al, 2011.

ISCO from a biological perspective

- -- Cons:
  - Harsh oxidizing conditions
  - Chemical oxidant catalysis or reaction yields alkaline or acidic pH
  - Can cause unfavorable redox conditions for biological conversion
  - Non-specific reaction degrades soil organic matter

- ++ Pros:
  - Reduces contaminant concentrations to less toxic levels
  - Improves biodegradability of parent compound(s)
  - Can improve redox conditions for biological conversion
  - Improves bioavailability of residual contaminant

Bioavailability

Ecotoxicology

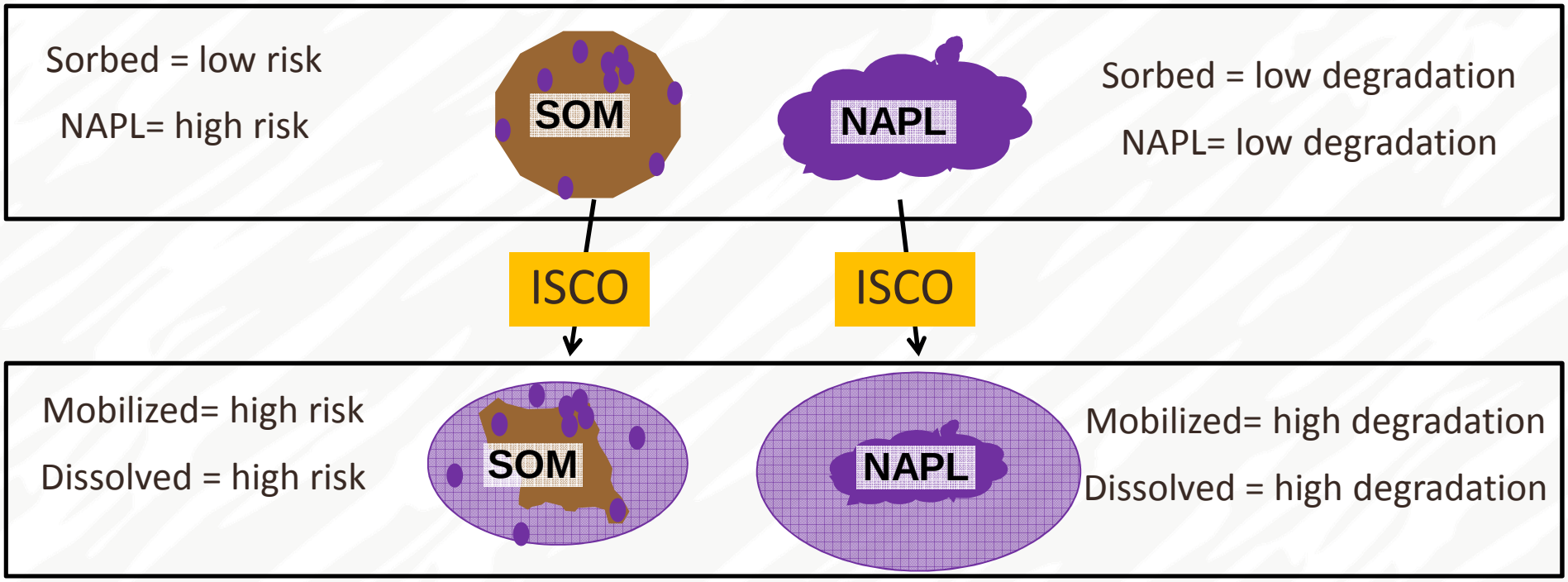
Extent to which humans or ecological receptors are exposed to a contaminant

= Risk Assessment

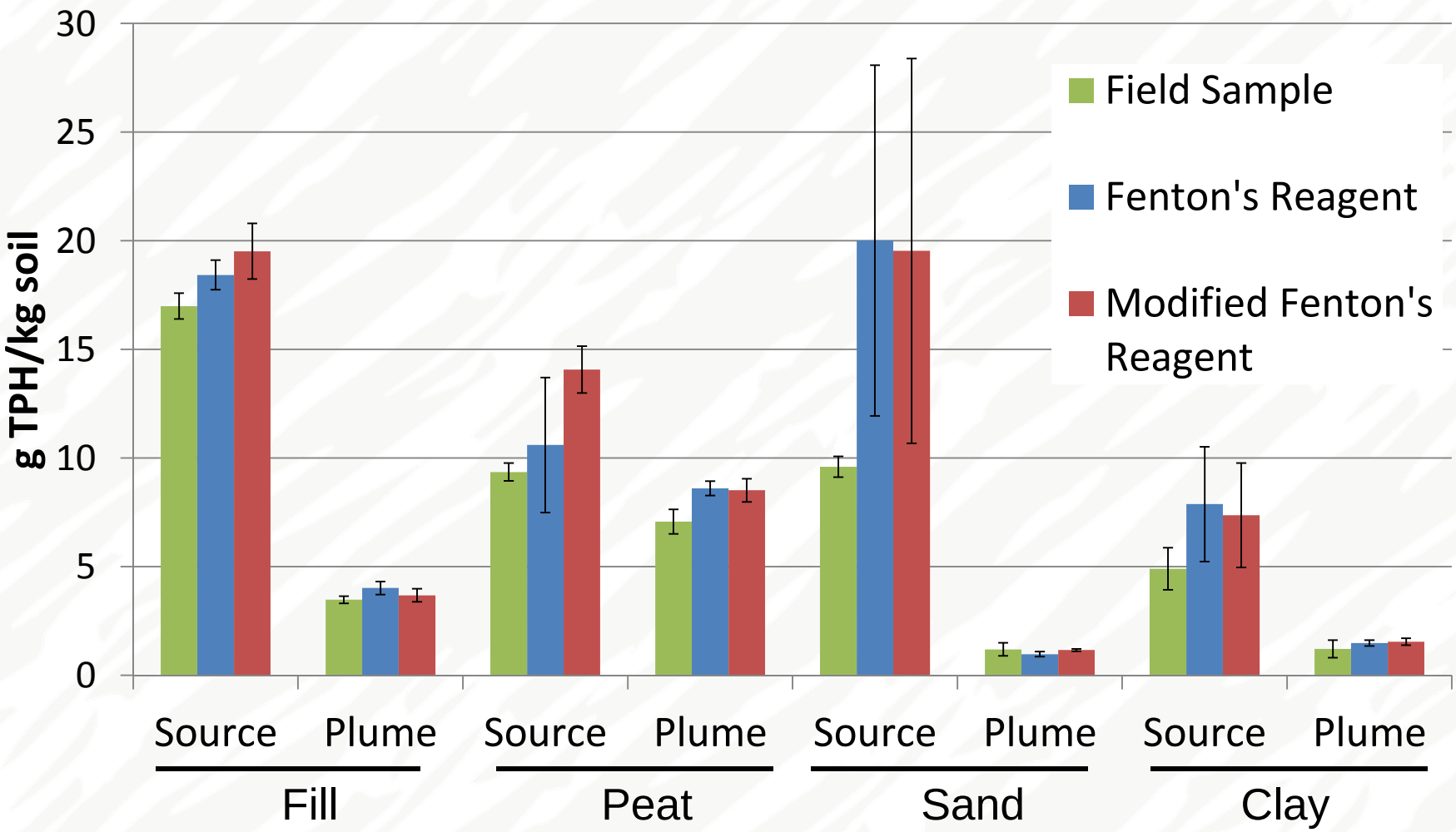
Bioremediation

Extent to which contaminant is in phase available to biological degradation

=Degradation Assessment



An example from the lab…



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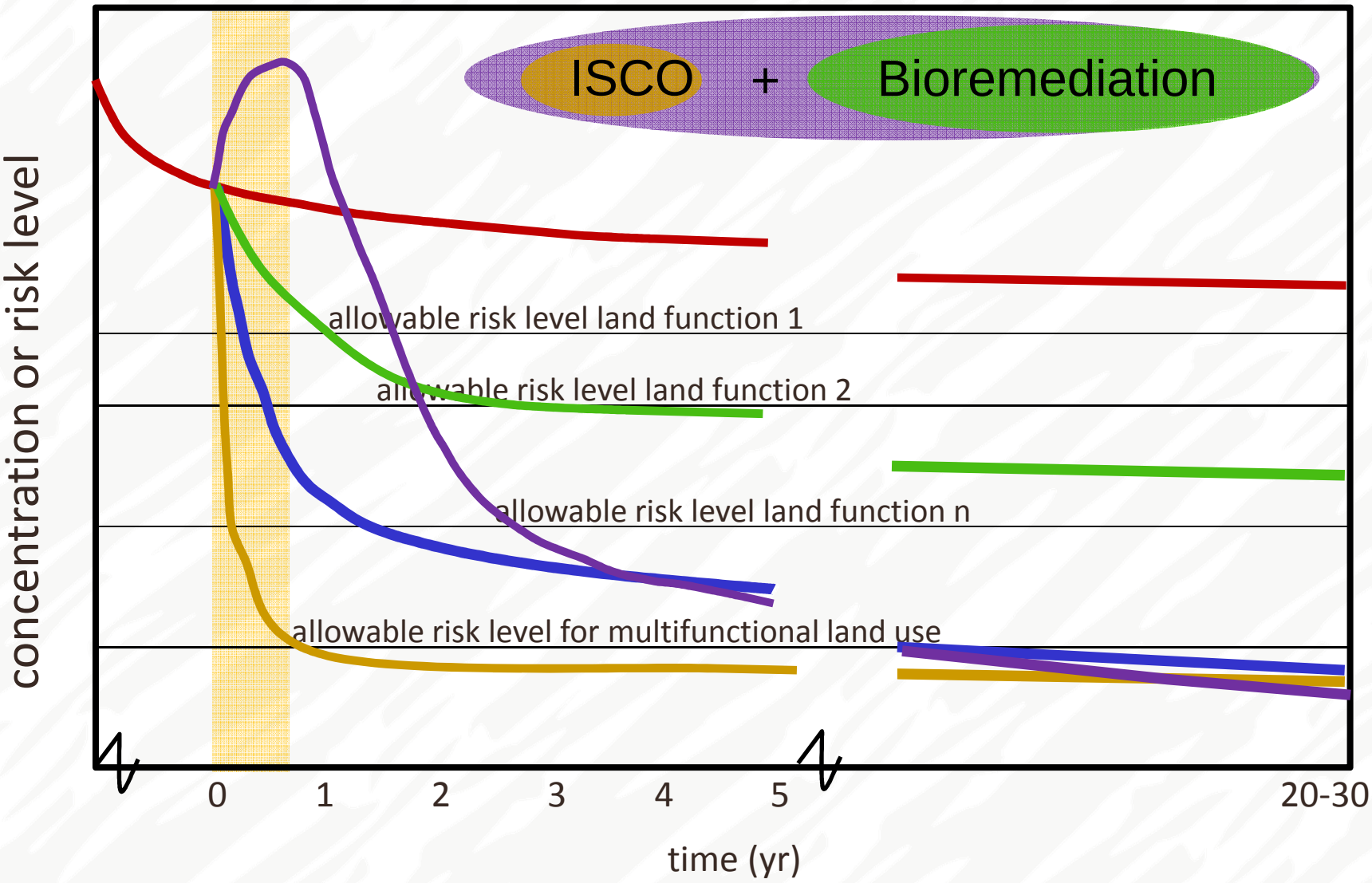

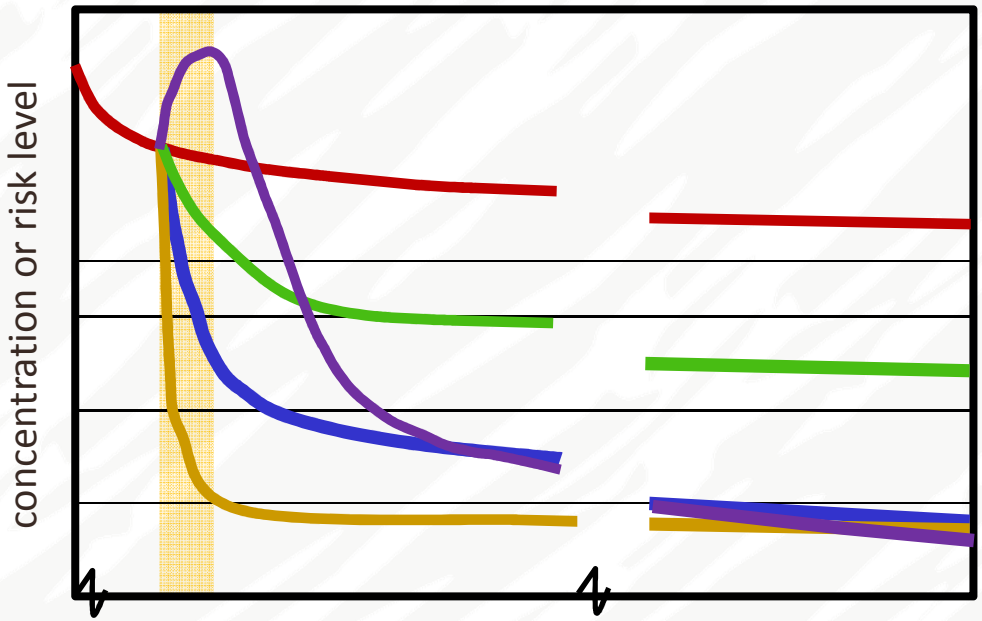

Bioavailability

Ecotoxicology	Bioremediation
= increased risk	= increased degradation

Aims:	Cost	Time	Sustainability Aspects
ISCO + Bioremediation	??	??	??

Questions and Discussion points

- Is increased risk due to mobility noticed in field ISCO application?
- Is this amplified contaminant mobility incorporated into remediation plans? In terms of risk or in terms of bioremediation
- To what extent is bioremediation following ISCO included into site remediation plans?
- Is bioavailability an important consideration when designing chemical or biological field treatments?

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More Info:

"Efforts to improve coupled in situ chemical oxidation with bioremediation: a review of optimization strategies" *Journal of Soils and Sediments* (2011) 11:129-140.