

The Groundwater-Ecosystem Connection

Multi-scale assessment methods for
inventory, assessment, and analysis



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Groundwater-dependent ecosystems (**GDEs**)

Ecosystems and species that rely on access to groundwater to maintain ecological structure and function, for at least some part of the year

wetlands

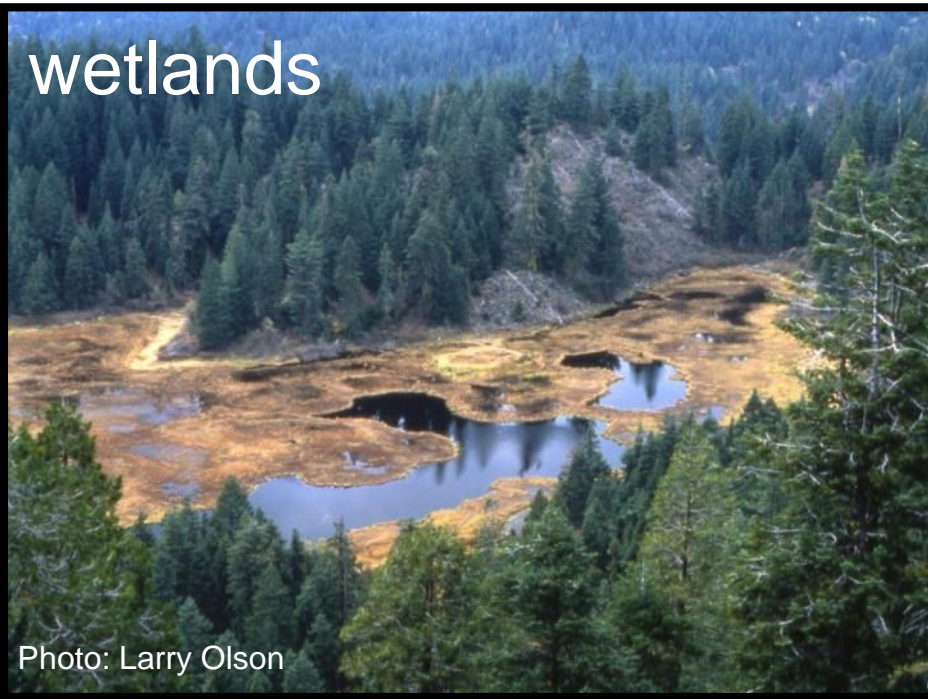


Photo: Larry Olson

rivers



Photo: Allison Aldous

springs



Photo: Daryl Gusey

lakes



Photo: Leslie Bach

Yellow rail



Photo: Ken Popper

Darlingtonia



Photo: A Hesterman

Lost River Sucker



Photo: Tupper Blake

OR spotted frog



Photo: USFWS

GDEs on the Endangered Species List

	Total # listed species	Listed species that depend on groundwater	
		#	%
Invertebrates	325	84	26%
Vertebrates	490	113	23%
Vascular plants	936	94	10%
Fungi	2	0	0%
TOTAL	1753	291	17%

water quality threats to GDEs

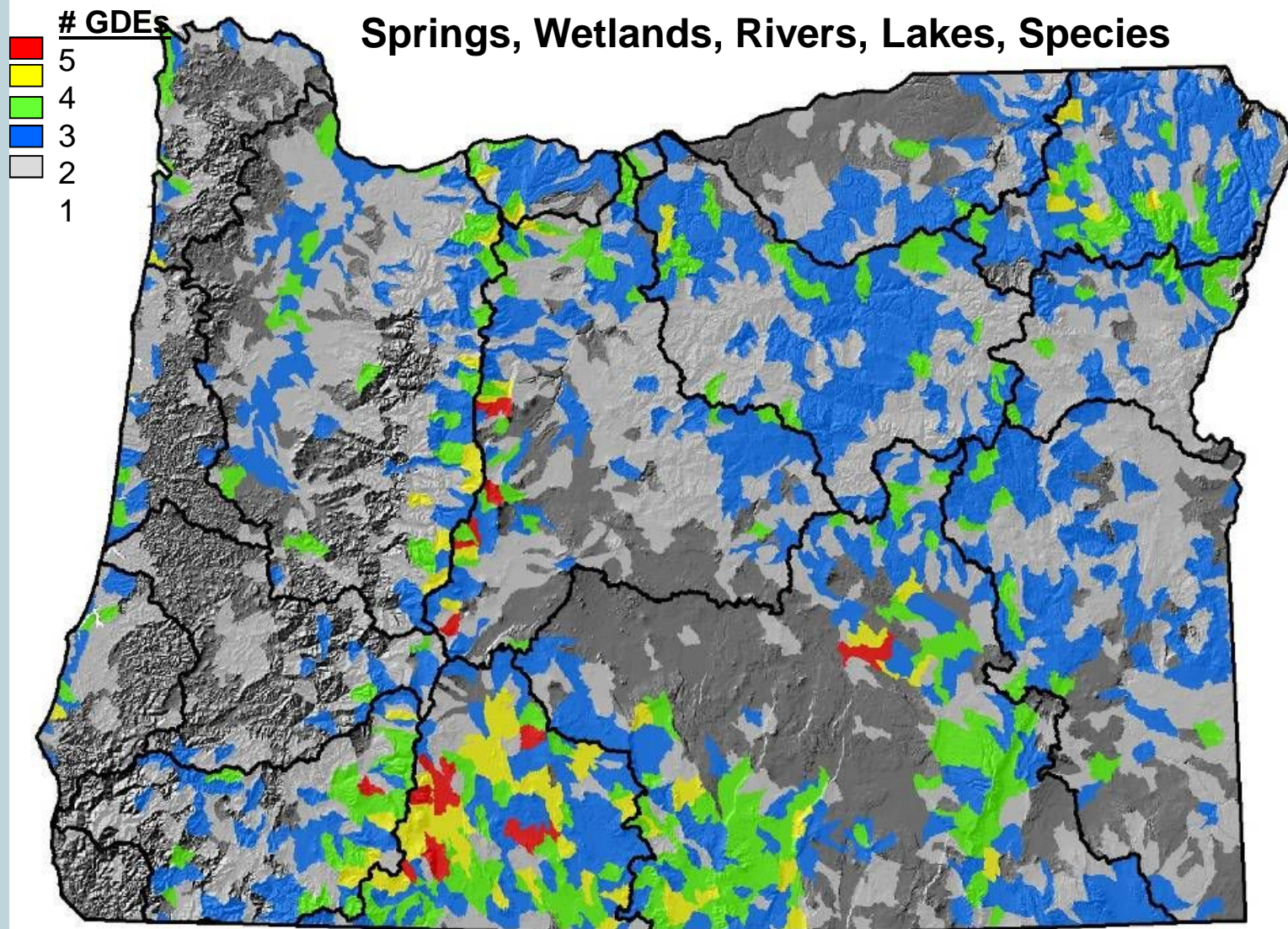
- Nutrients (N, P)
 - septic
 - fertilizer applications
 - CAFOs
- Pesticides
 - agricultural
 - urban/domestic
- Other toxic contaminants
 - UICs, gas stations, mines, airports, etc

3-tiered approach to protection

1. Methods to identify GDEs and threats
(WHERE)
2. Approaches for characterizing GDEs and
evaluating their ecological requirements
(WHAT)
3. Novel strategies for protecting groundwater
for ecosystems (HOW)



HUC6s with high densities of GDEs (GDE clusters)

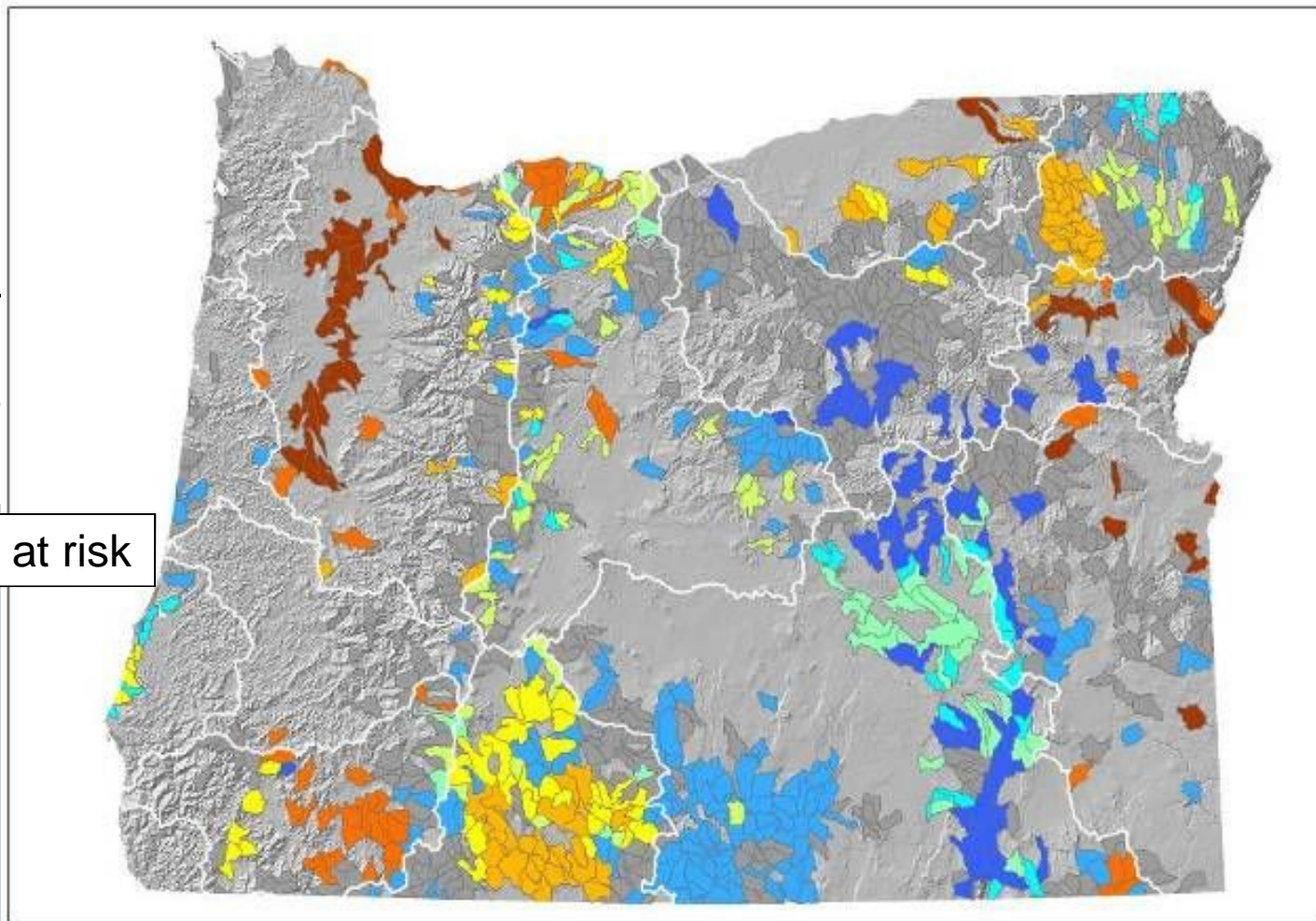


Pesticide risk

Pesticide analysis:

- mapped ag use
- toxic to aquatic life
- mobile in groundwater (high volatility, high solubility, long half-life)
- applied on soils with high leaching potential
- 10 pesticides meet criteria

53% of GDE clusters at risk



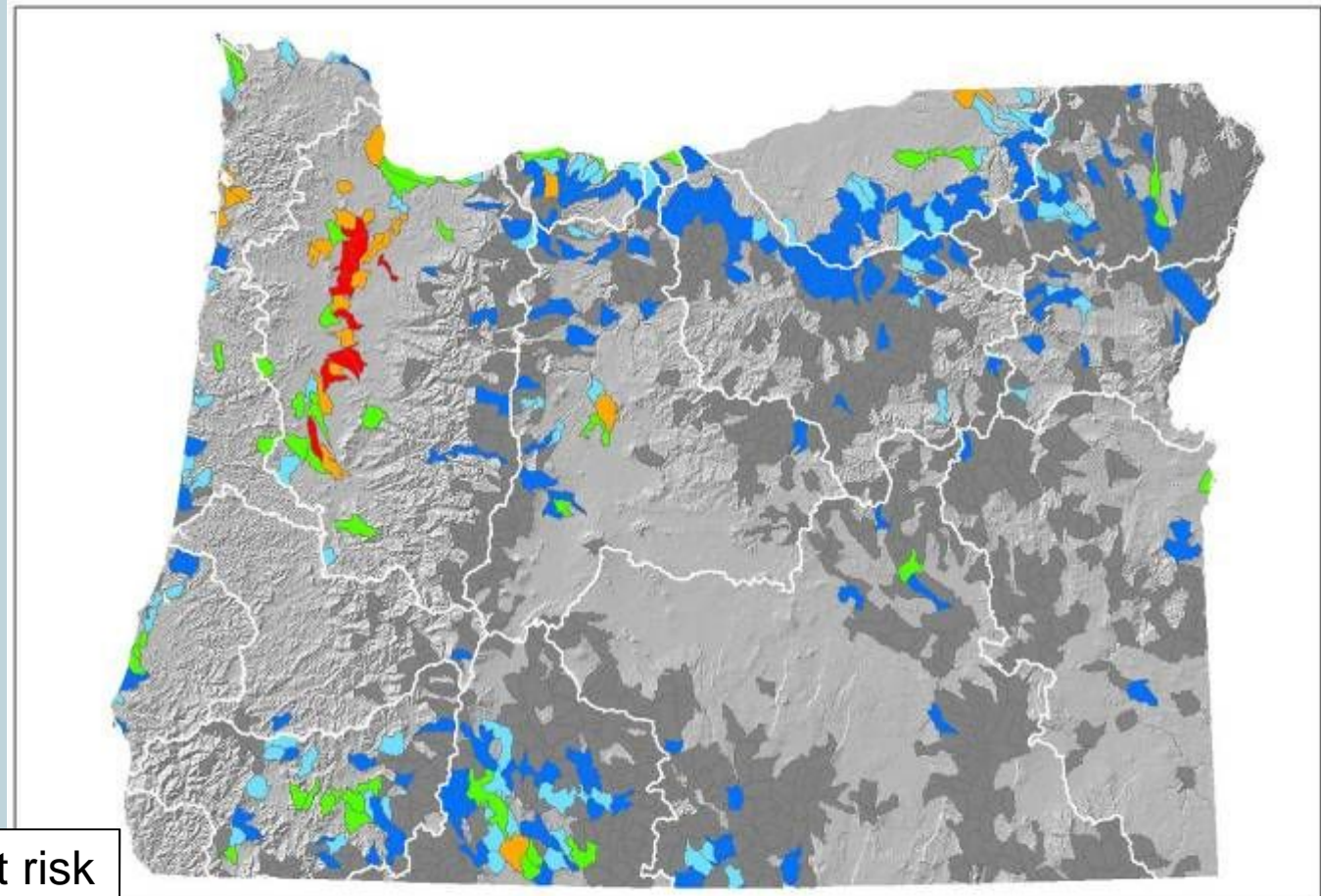
of Pesticides



Analysis Regions



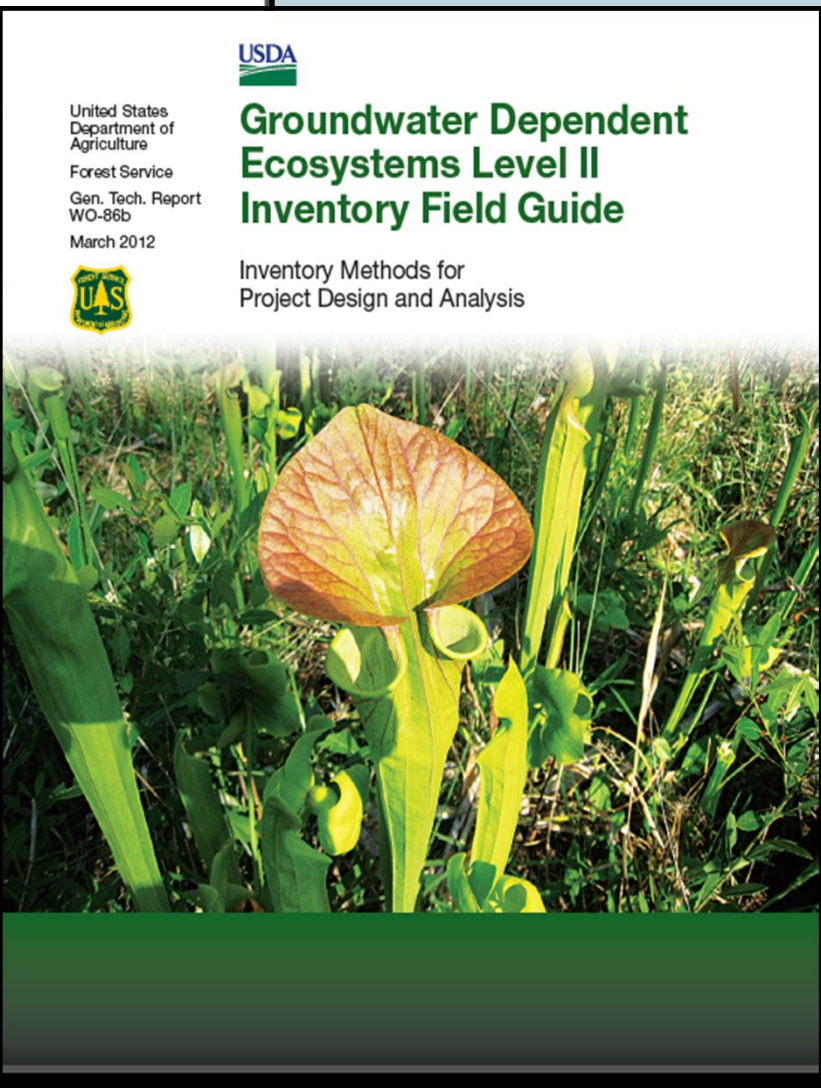
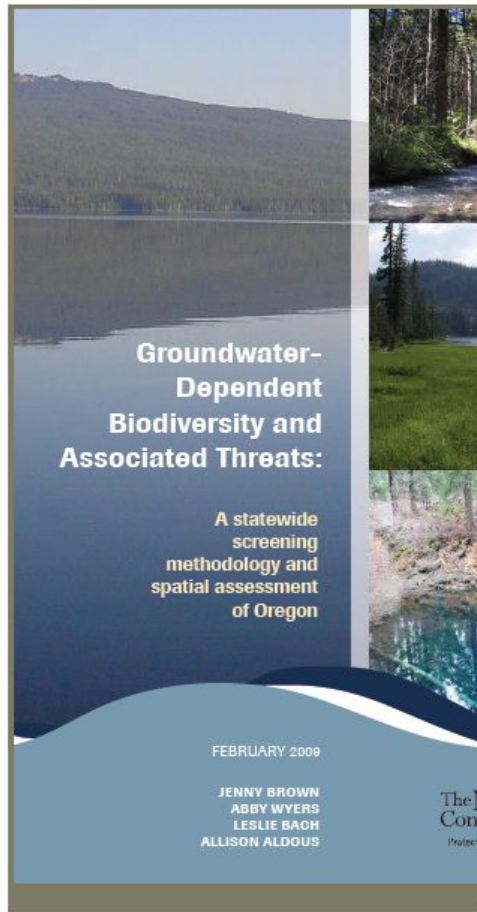
Nitrate



29% of GDE clusters at risk



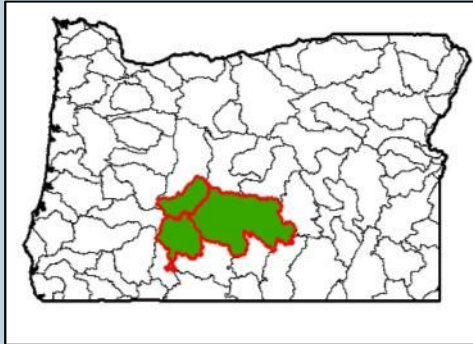
GDE characterization



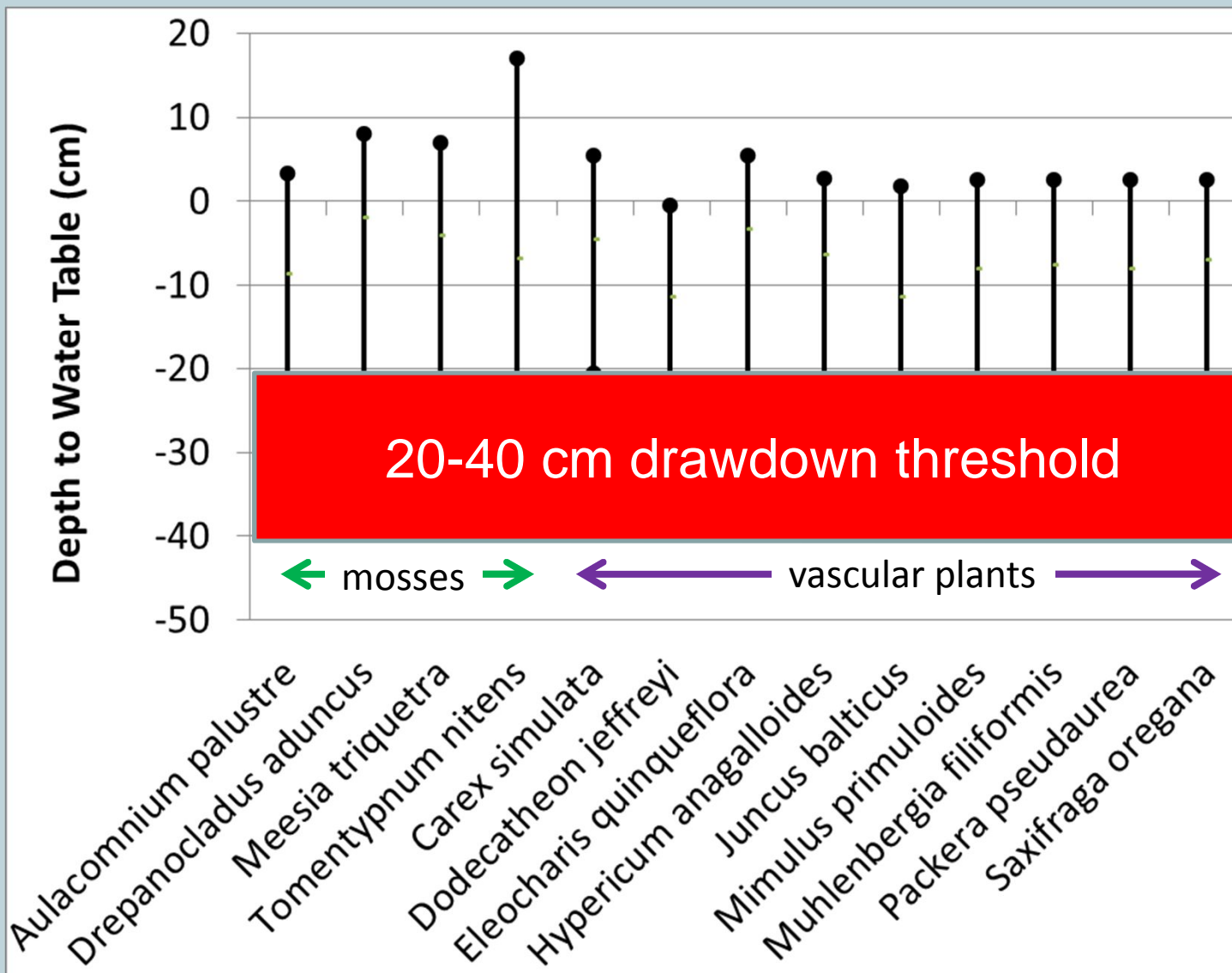
Environmental Flows and Levels

1. Determine groundwater-ecology relationship
2. Quantify groundwater requirements of GDEs
3. Set limits to groundwater extraction / contamination

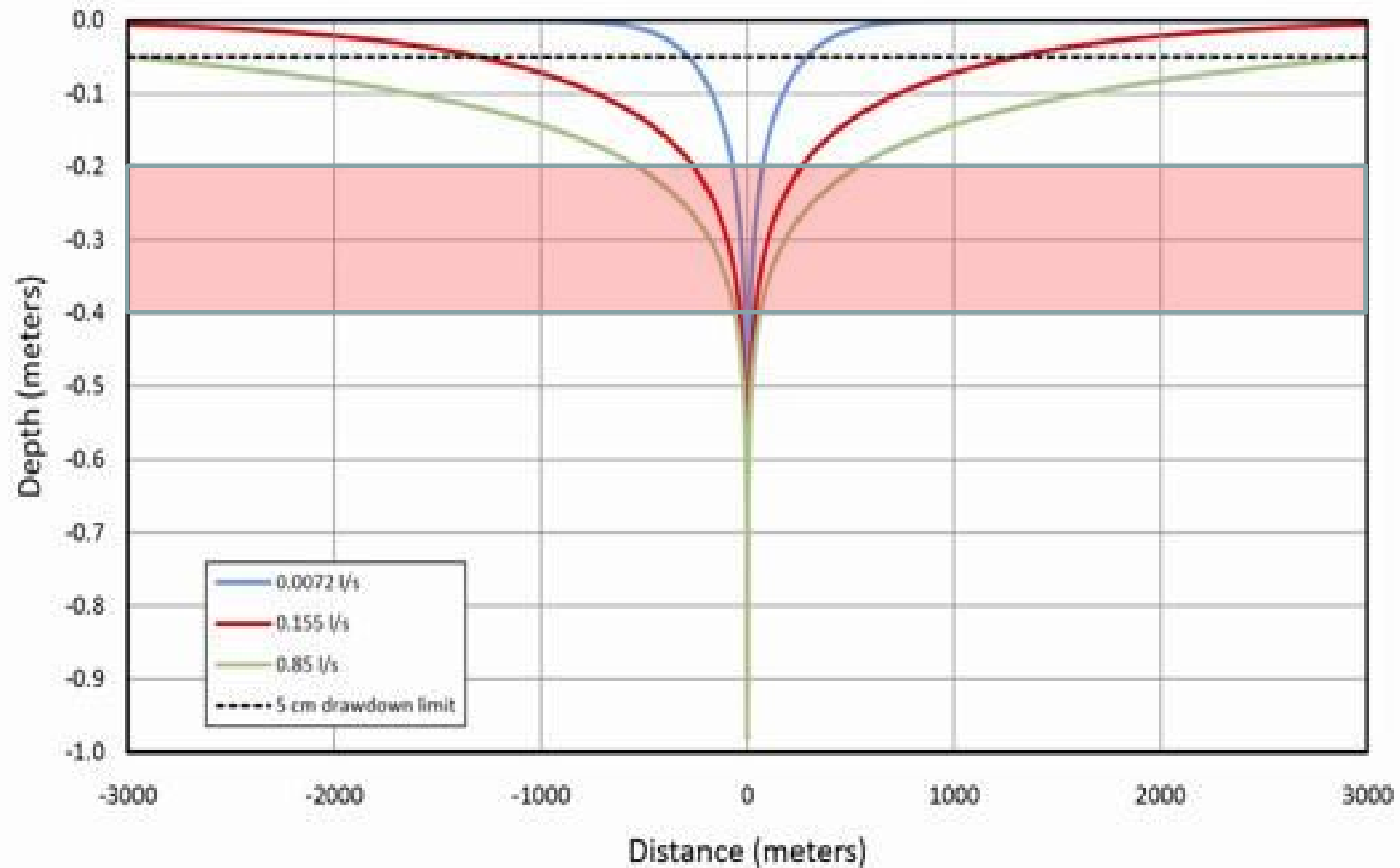
Fens in the Fremont-Winema



water table ranges for indicator species



cone of depression - analytical solution



future projects

- Identifying GDEs at the basin scale
- Environmental flows and levels
- Quantitative groundwater-ecology relationships

<http://conserveonline.org/workspaces/GDE>