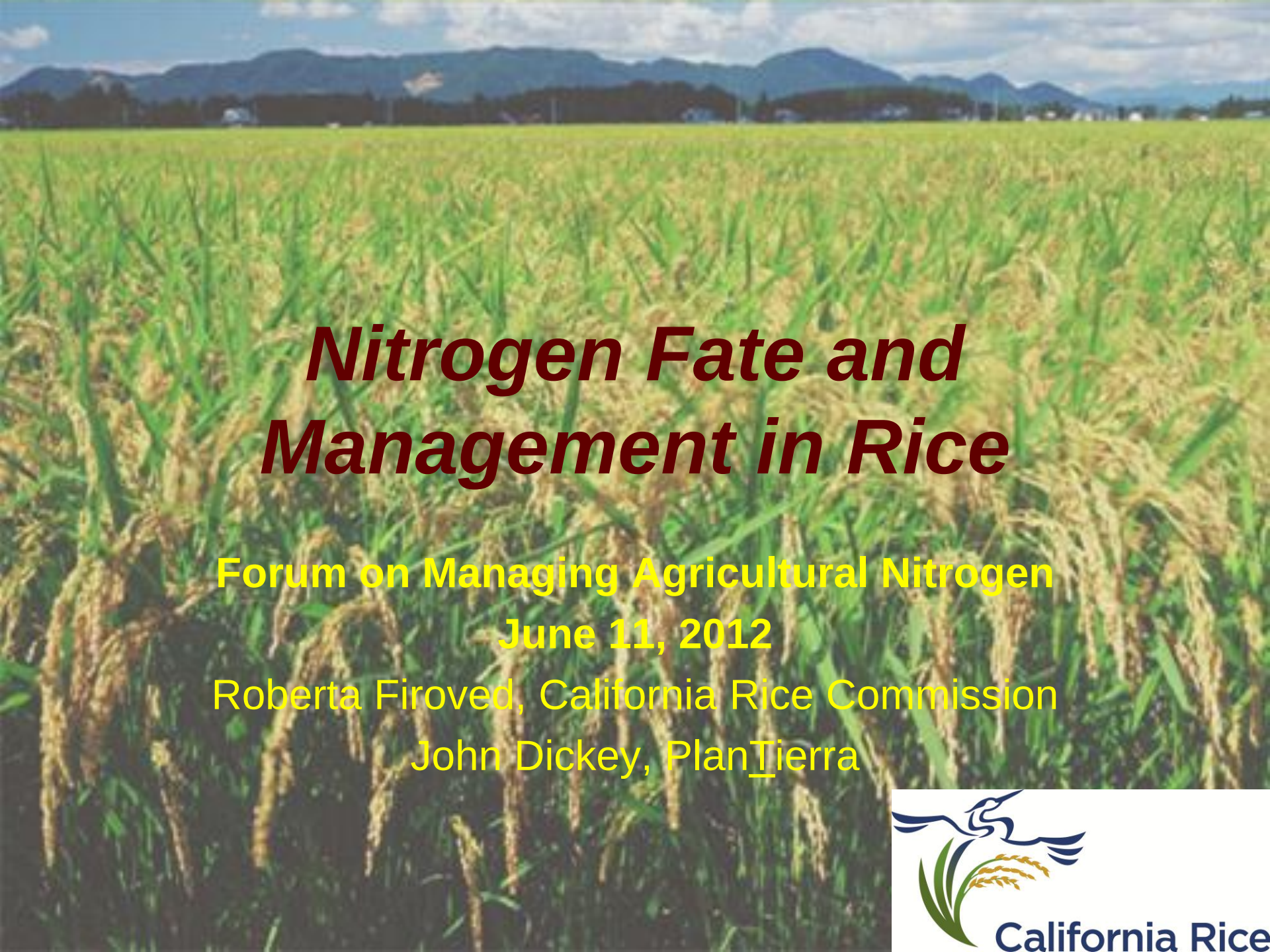


Nitrogen Fate and Management in Rice

Forum on Managing Agricultural Nitrogen

June 11, 2012

Roberta Firoved, California Rice Commission

John Dickey, PlanTierra

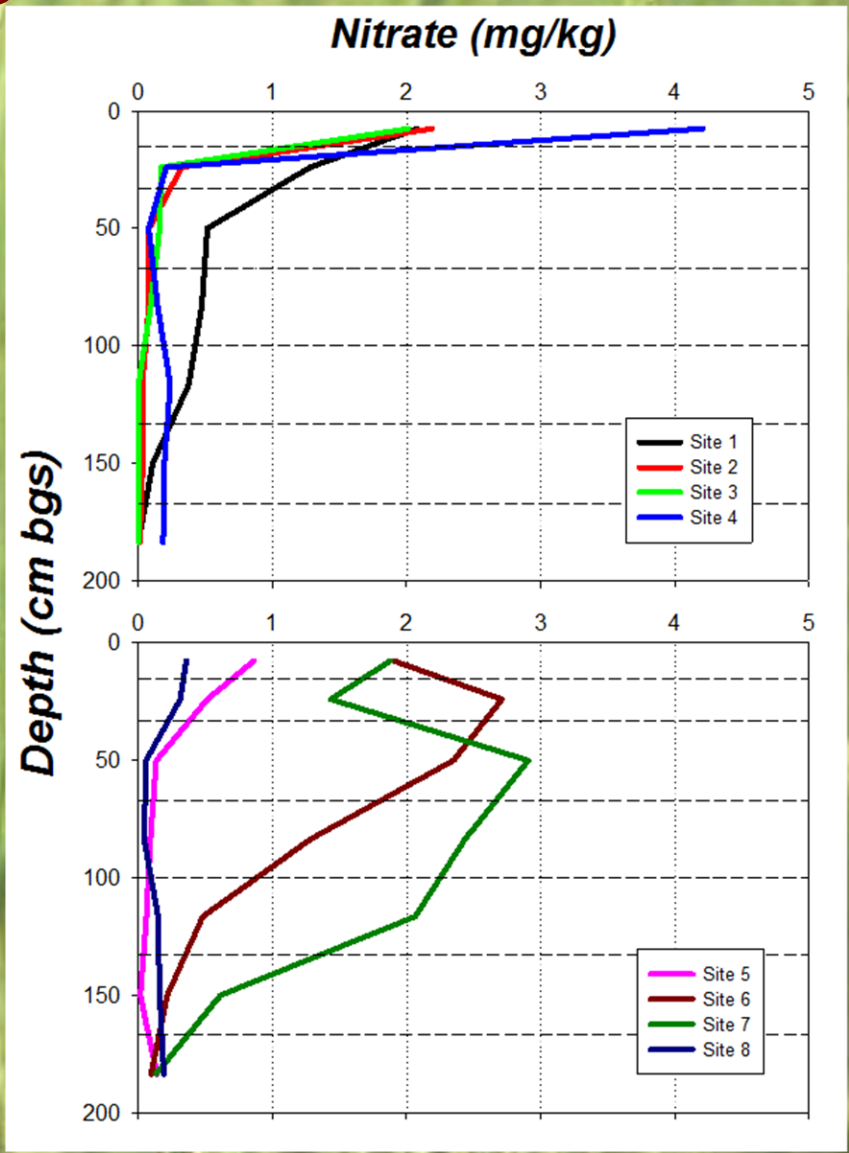
California Rice

What we know about nitrogen fate in rice soils

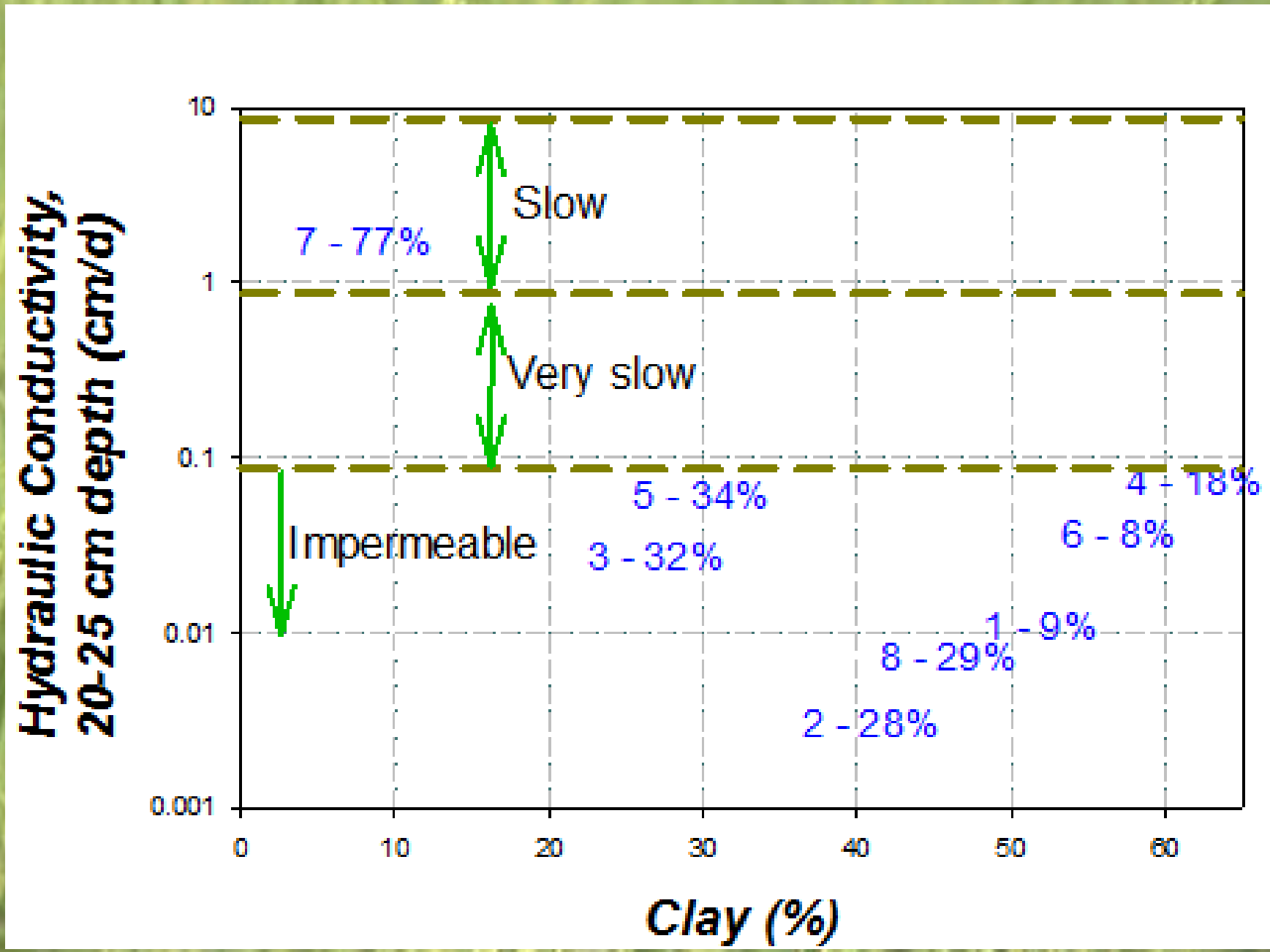
- Little nitrate in root zone
- Very slow downward water movement
- Low concentrations in underlying shallow groundwater

Nitrate concentrations in rice soils

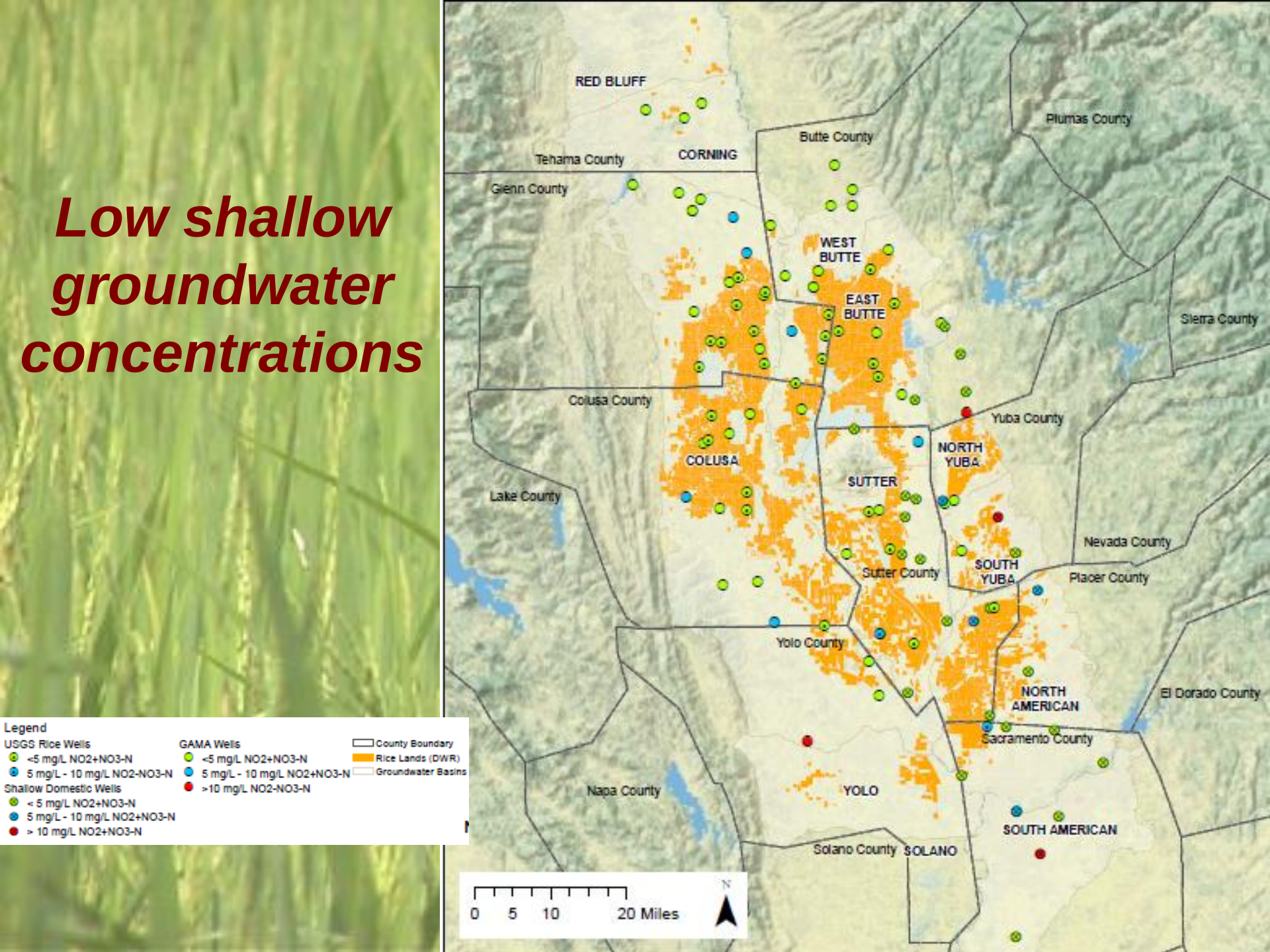
- Pore water concentrations are ~1.2x soil
- <MCL throughout
- ~0 at the base of the profile



Very slow vertical hydraulic conductivity



Low shallow groundwater concentrations



What we have done

- FREP grants (e.g., leaf color charts)
- UC ANR Publication
- Contributions to broader literature
- Groundwater Assessment Report

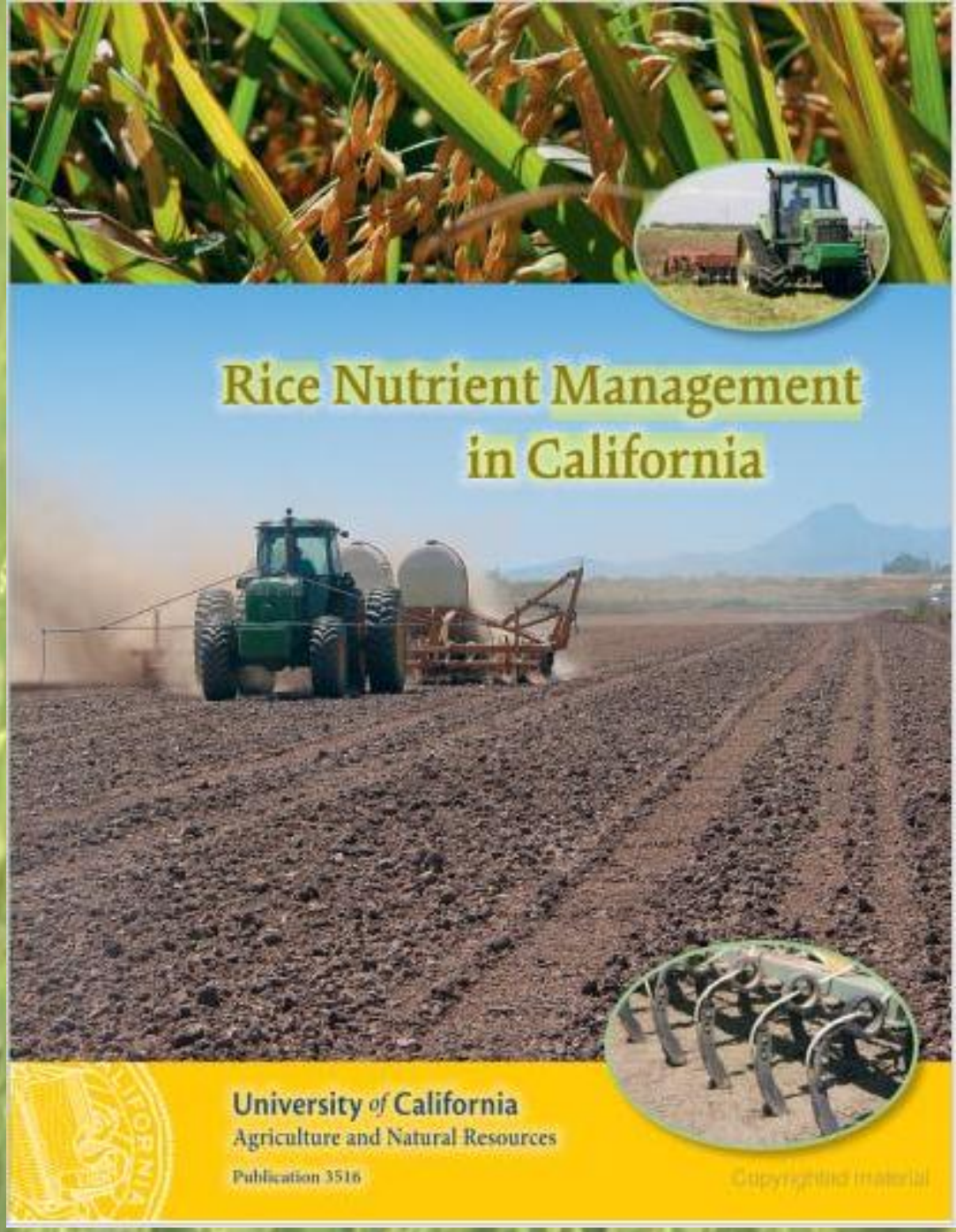
FREP Publications

- **Fertility Management in Rice**
  Project Leaders: Chris van Kessel and B. Linquist
- **Development of a Leaf Color Chart for California Rice Varieties**
  Project Leader: Randall G. Mutters
- **Long-term Rice Straw Incorporation: Does It Impact Maximum Yield?**
  Project Leader: Chris van Kessel
- **Potassium Responses in California Rice Fields as Affected By Straw Management Practices**
  Project Leaders: Chris van Kessel, William Horwath, John K. Williams, Eric Byous, Grace Jones

Leaf Nitrogen (%)

	Mid-Tiller Stage			Panicle Initiation Stage		
Variety	Adequate	Excessive	Exc - Adq	Adequate	Excessive	Exc - Adq
M206	4.1	5.0	0.9	3.7	4.8	1.2
M205	3.8	4.5	0.7	3.7	4.4	0.7
M104	3.8	5.0	1.2	3.5	4.7	1.2
M202	3.6	4.6	0.9	3.0	4.7	1.6
S102	3.4	4.2	0.8	3.0	4.2	1.1
M402	3.5	4.0	0.5	3.1	3.7	0.6
Mean	3.7	4.5	0.8	3.3	4.4	1.1
Chart	4.0	4.6	0.6	3.2	3.6	0.4

U.C. Cooperative Extension



Broader literature

RESEARCH ARTICLE

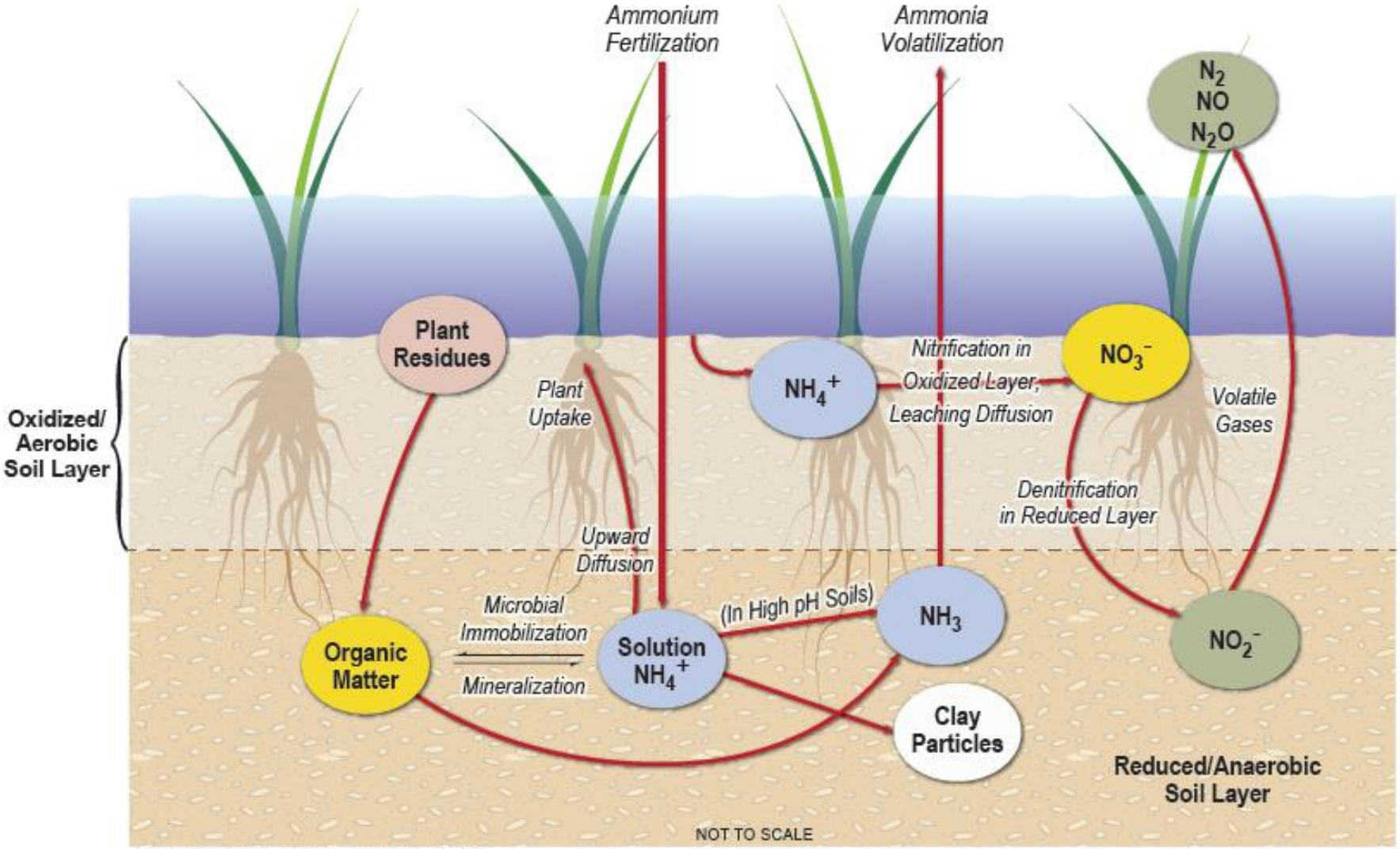
Rice field drainage affects nitrogen dynamics and management

by Bruce A. Linquist, Kaden Koffler, Jim E. Hill *and* Chris van Kessel

Many California rice growers are now using foliar-active herbicides that require fields to be drained before application. Current regulations limit aerial herbicides and they must be applied by ground, requiring a soil surface dry enough to support application equipment. Our research showed that draining rice fields for a prolonged period early in the sea-

Transferring data from www.plantsciences.ucdavis.ed

GAR's conceptual model of N fate & transport in and below rice fields



Source: Modified from Figure 4.2, UC-ANR 2010.

FIGURE 2-12
Nitrogen Transformations in Flooded Soils
CRC Groundwater Assessment Report

What we plan to do

- Commodity-specific WDR and MRP
  - Continue focused surface-water monitoring
  - Rice monitoring wells (USGS network plus some)
  - Sound nutrient management
  - Field-level BMP development and effectiveness verification
- Commodity-specific nutrient management plans, as required

QUESTIONS & COMMENTS?