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Floridan Aquifer Collaborative Engagement for Sustainability

Stakeholder-Driven Modeling in Support of Groundwater Sustainability: the Floridan Aquifer Collaborative Engagement for Sustainability (FACETS) Project

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NASEM EHMI Workshop on Reducing the Health Impacts of the Nitrogen Problem
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USDA United States Department of Agriculture National Institute of Food and Agriculture

UNIVERSITY OF GEORGIA

Albany State University

UF Water Institute UNIVERSITY of FLORIDA

PROJECT VISION

Promote economic sustainability of agriculture and silviculture in N Florida and S Georgia while protecting water quantity, quality, and habitat in the Upper Floridan Aquifer and the springs and rivers it feeds.

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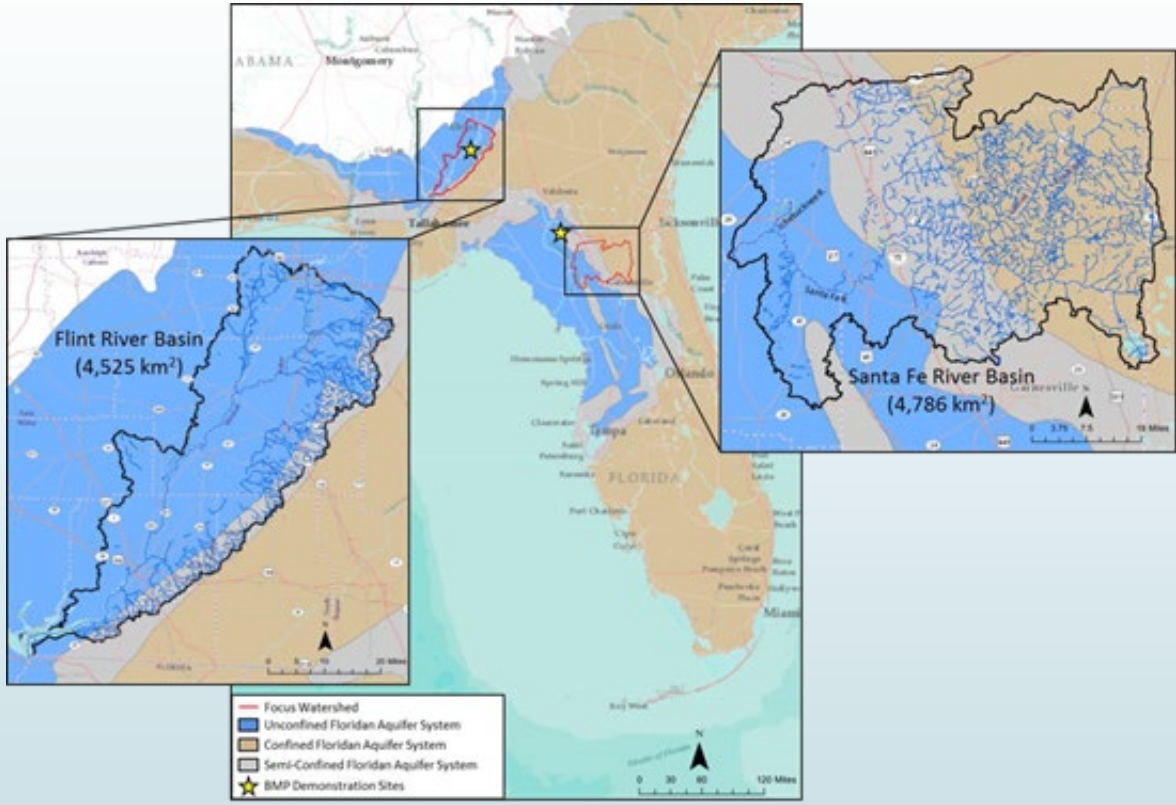
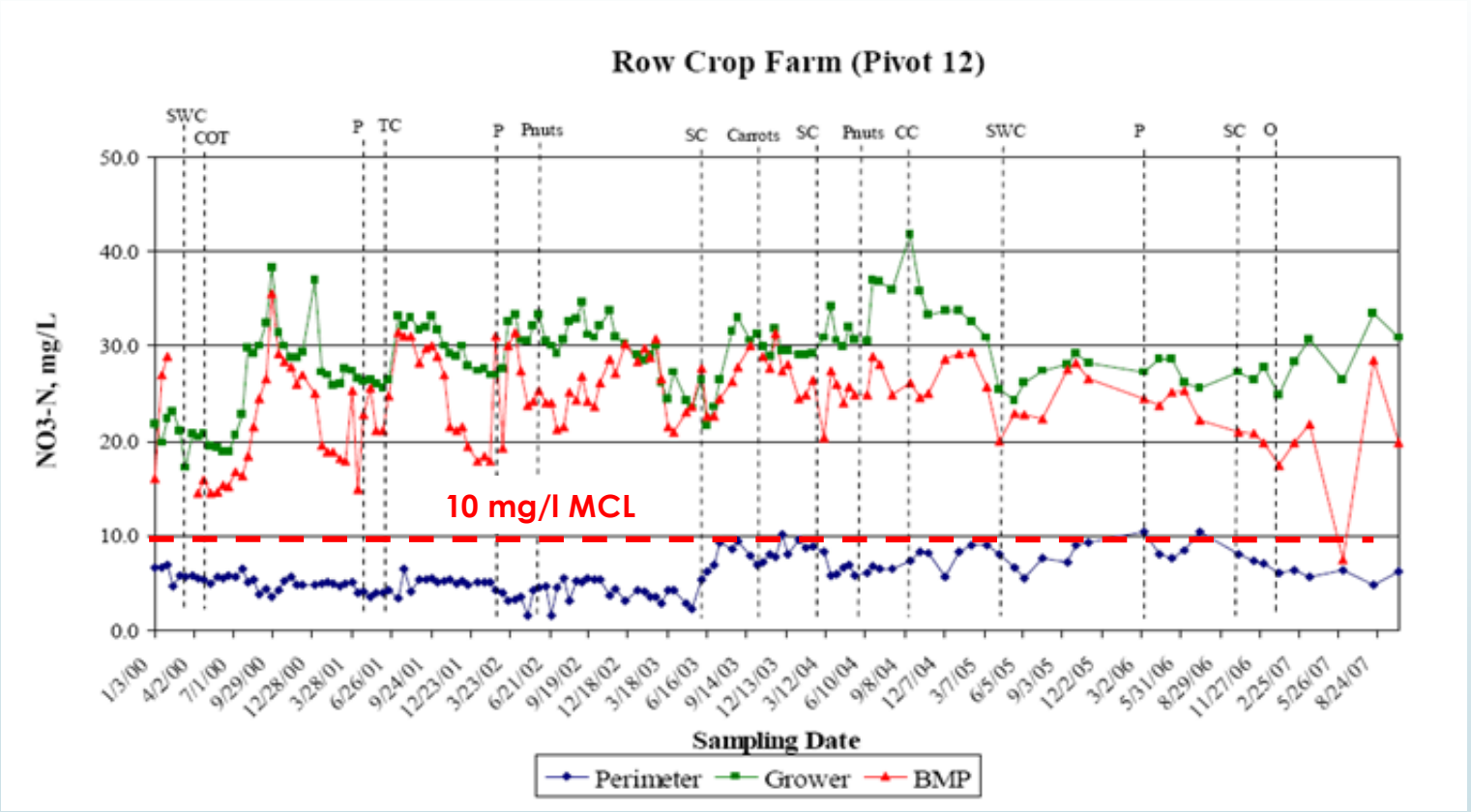
The Floridan Aquifer

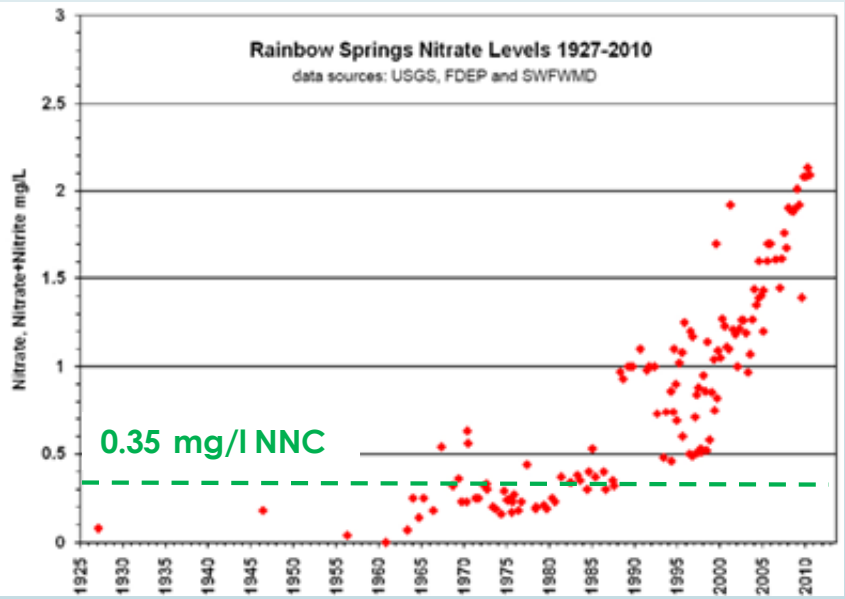
- **~10 million people** depends on Upper Floridan Aquifer (UFA) for water
- **~$9B in agriculture**-related economic activity; corn, cotton, peanuts, timber
- Among largest & most productive aquifers; **vital *regional* resource**.
- **Competition** between urban, ag, forestry, & environmental water uses.



- **Exacerbated by**: climate variability, agricultural migration, and stringent environmental standards to protect human and ecosystem health

Floridan Aquifer Nitrogen Issues





In addition to 10 mg/l MCL Florida mandates 0.35 mg/l **numeric nutrient criteria** for groundwater emerging from springs

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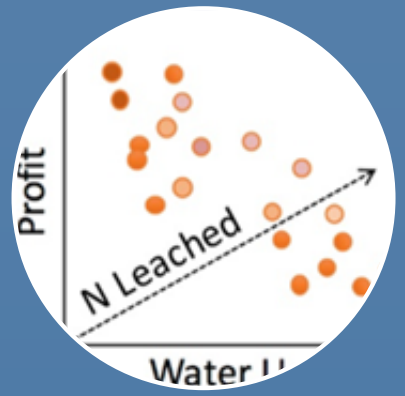
Brings together scientists and stakeholders to:

- develop new knowledge needed to explore tradeoffs and synergies between the regional agricultural economy and environmental quality;
- understand changes needed to achieve agricultural water security and environmental protection; and
- develop tools, incentives and educational programs for improved decision making

PROJECT ACTIVITIES AND OUTPUTS

BMP Research

- Water use, quality, yield impacts of alternative irrigation & nutrient practices
- Digital decision toolkit



Modeling Platform

- Land use/mgmt. impacts on water quantity/quality, crop/forest production and regional economy
- BMP supply and demand curves

Stakeholder Engagement

- Baseline & future scenarios
- Tradeoffs & synergies
- Social Learning
- Communication tools

Extension

- On-farm BMP demos
- In-Service Training programs
- Water Schools

collaborative research and Extension

BMP Research

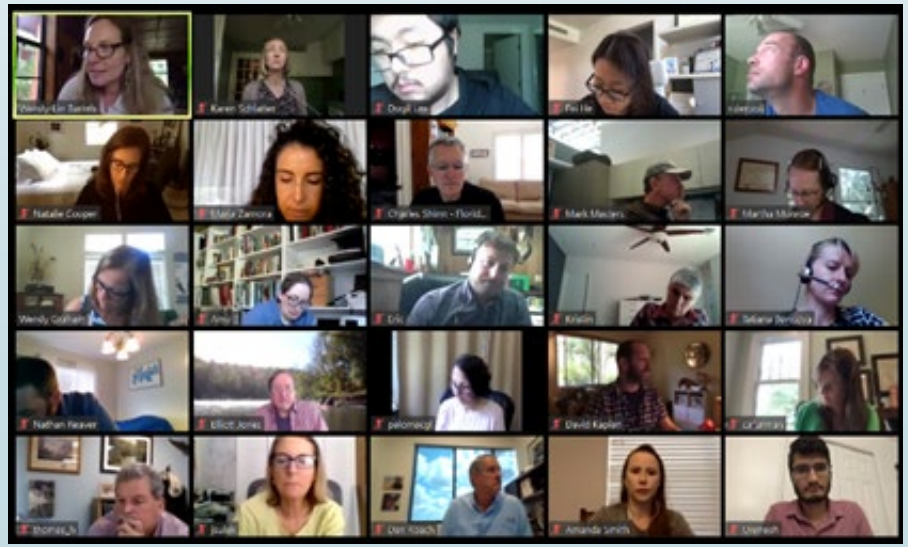
- Florida
  - Corn, Carrot, Peanut
  - Corn, Cover Crop, Peanut
- Georgia
  - Corn, Cotton, Peanut
- BMPs
  - Fertilizer rates/application methods, irrigation scheduling methods, winter cover crops, tillage methods







Participatory Modeling Process (PMP)



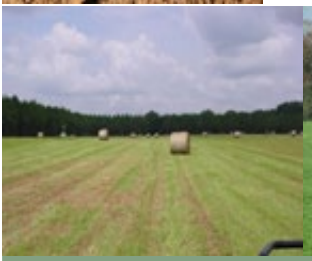
Modeling Approach:

Current FL Production Systems

CROPS
Corn-peanut
Corn-carrot-peanut

FORAGES
Hay (Bermuda)
Pasture (Bermuda)

FORESTS
Longleaf
Loblolly
Slash pine



Management System Summaries

	Crop	Forage	Forests
MS1	• Most Efficient irrigation • Lowest fertilization • Rye cover crop	• Lowest fertilization • Lowest number of cuttings (hay)	• No thinning • No fertilization • Longer rotation age • Lower initial planting density
MS2	• Efficient irrigation • Medium N rate • Oat cover crop	• Medium fertilization • Medium number of cuttings (hay)	• Thinning • Medium N rate • Medium rotation age
MS3	• Least efficient irrigation • Highest fertilization • No cover crops	• Highest fertilization • Most number of cuttings (hay)	• Thinning • Highest N rate • Shortest rotation age

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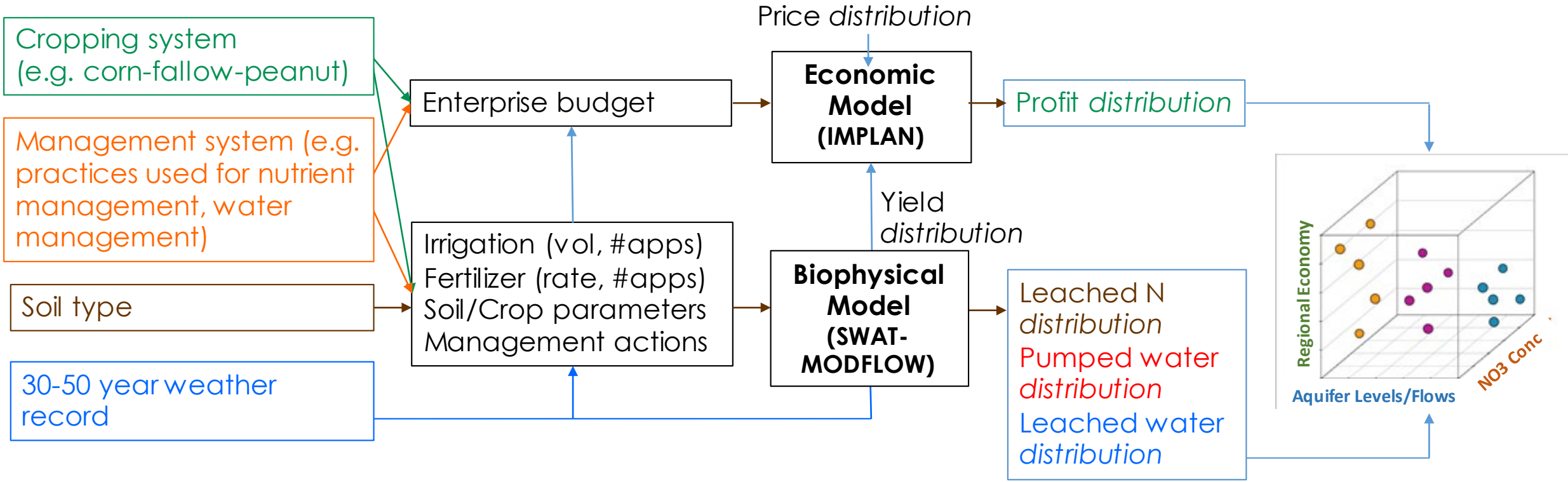
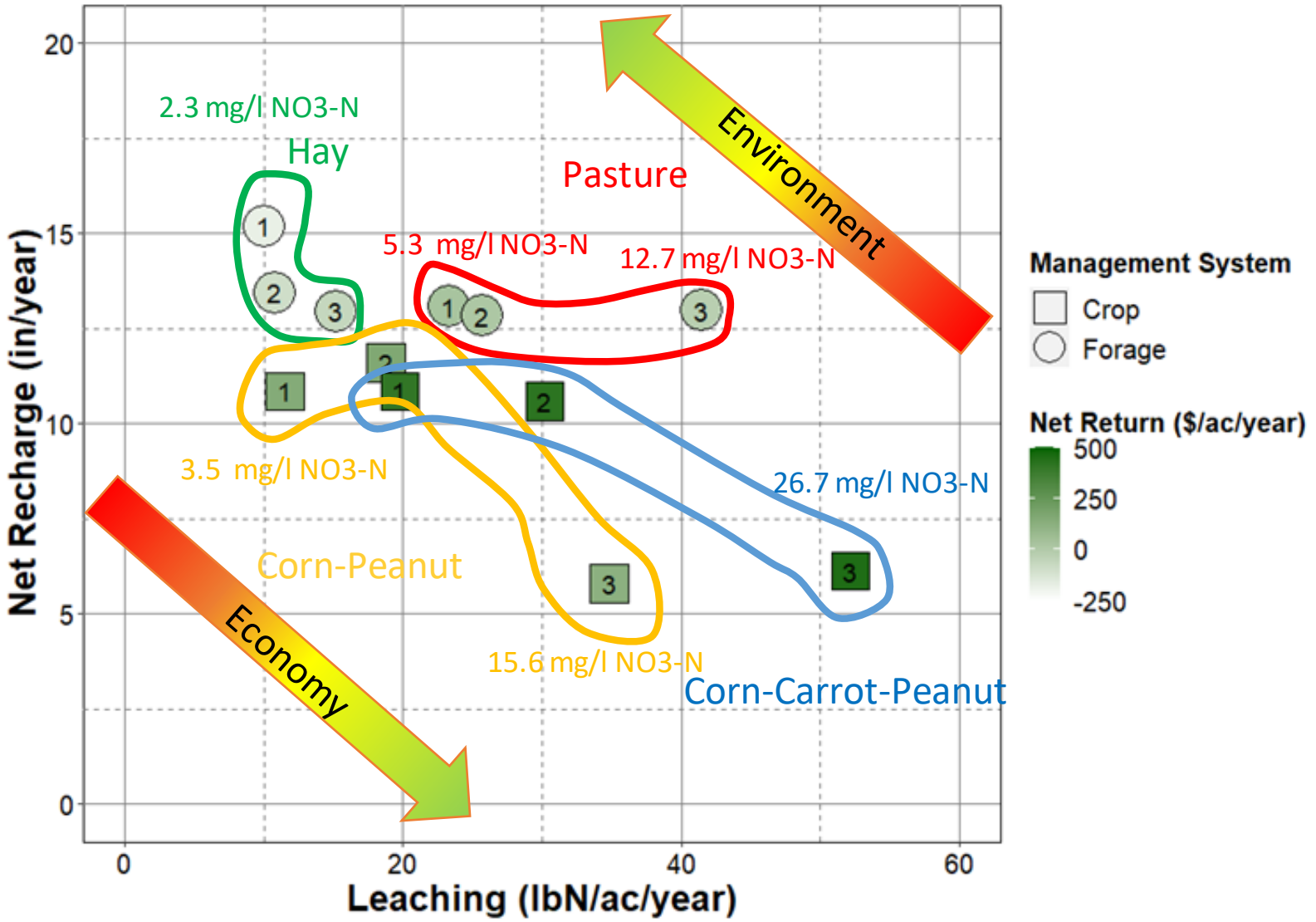
Biophysical & Economic Modeling PLATFORM



Farm/Forest Scale

Watershed Scale

Farm-Scale Biophysical & Economic Tradeoffs



MS1 (BMP) :Most efficient irrigation, lowest N rate, rye cover

MS2 (Improved): Efficient irrigation, medium N rate, oat cover crop

MS3 (Conventional): Least Efficient irrigation, Highest N rate, no cover crop

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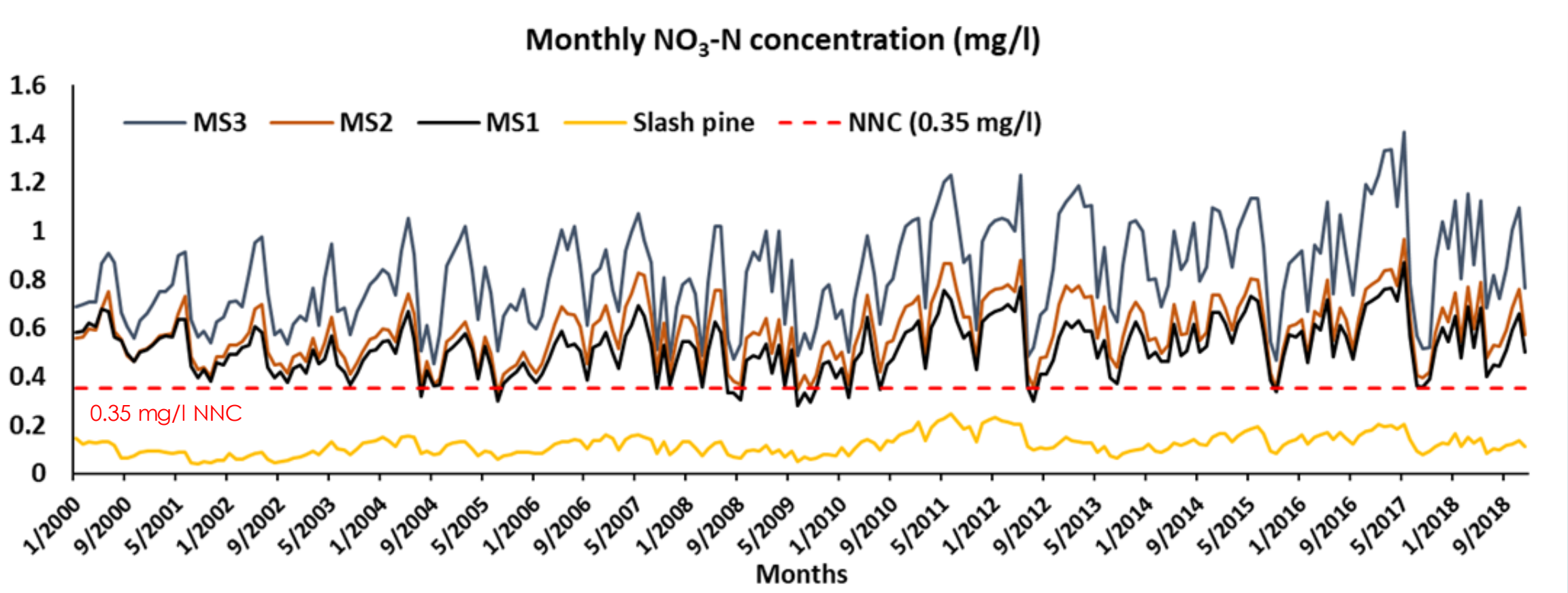
Simple Scenario Analysis: Stream NO3-N Concentration



- MS1 reduces annual average geometric mean stream concentration to 0.5 mg/l NO3-N , still above NNC of 0.35 mg/l
- Conversion to 100% slash pine reduces average geometric mean stream concentration to 0.1 mg/l

Results represent work in progress and are not yet peer reviewed

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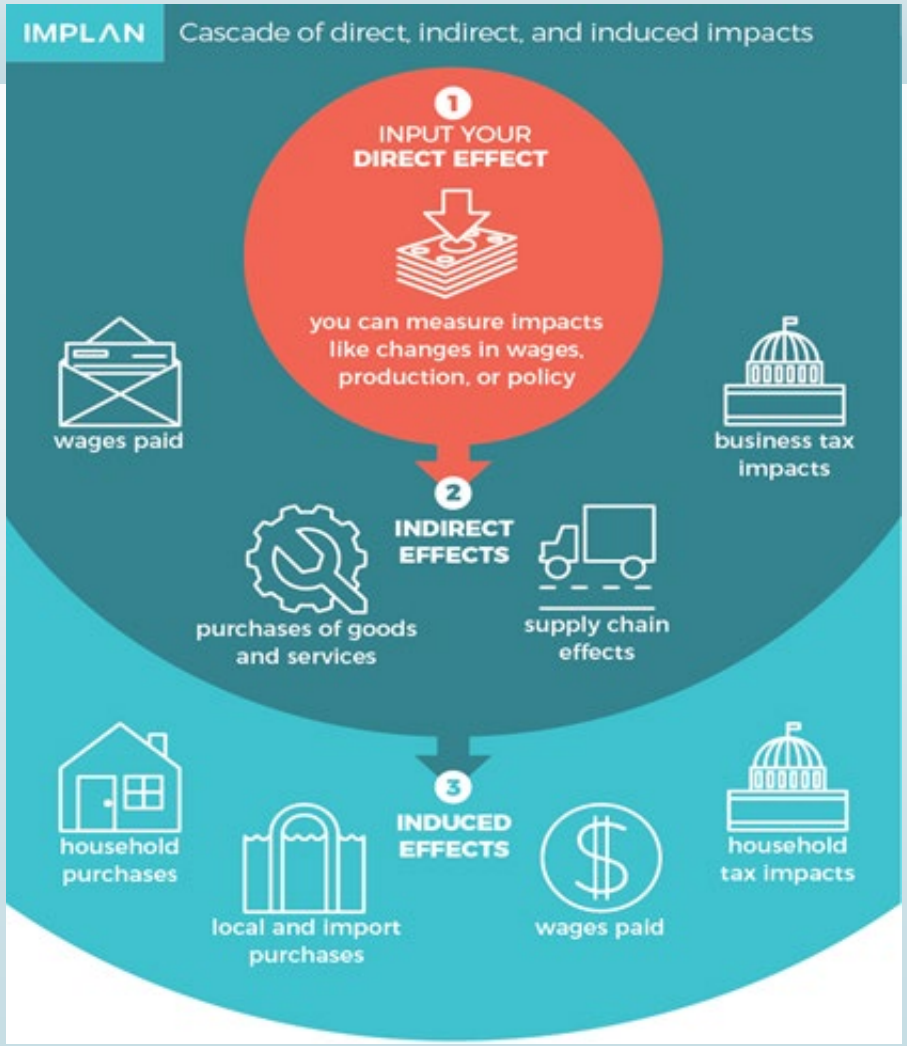
Regional Economic Modeling (IMPLAN): In Progress



Impact Analyses and Planning (IMPLAN) software and database

- quantify the interactions and linkages between economic sectors
- define economic sector based on the national classification system

Evaluate changes in economic to FACETS-defined scenarios

1) Develop IMPLAN model for the Santa Fe River and Flint Basins

2) Apply model to simplified scenarios using the yield results from the biophysical model

- All Land Uses use MS1
- All Land Uses use MS2
- All Land Uses use MS3
- Conversion to Forestry

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What does Success Look Like?

- Understanding and agreement on changes needed to achieve agricultural water security and environmental protection
- Transformative watershed-scale modifications including new incentives, widespread adoption of new BMPs and substantial changes in cropping systems
- Robust agricultural/silvicultural economy
- Trusted social networks created during the project sustain positive change beyond the project

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For more information http://Floridanwater.org