

FACETS Key Findings

Project Advisory Committee June 29, 2023

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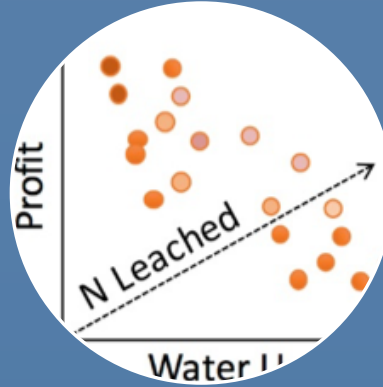
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PROJECT ACTIVITIES AND OUTPUTS



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
- Stakeholder valuation research (WTA/WTP)



Stakeholder Engagement

- Baseline & future scenarios
- Tradeoffs & synergies
- Reflexive Monitoring
- Communication research



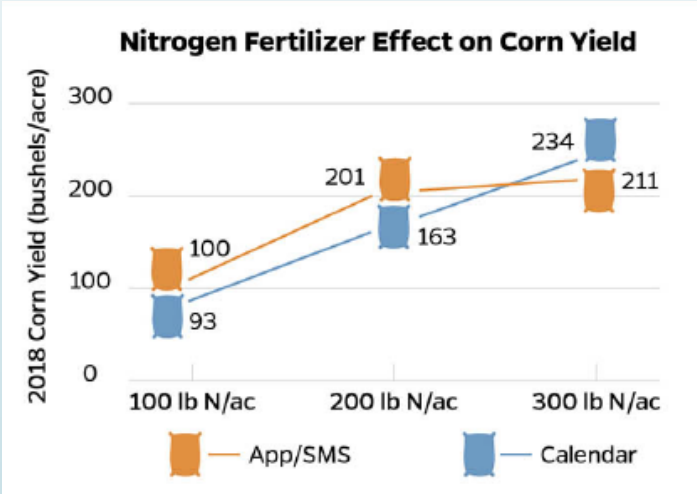
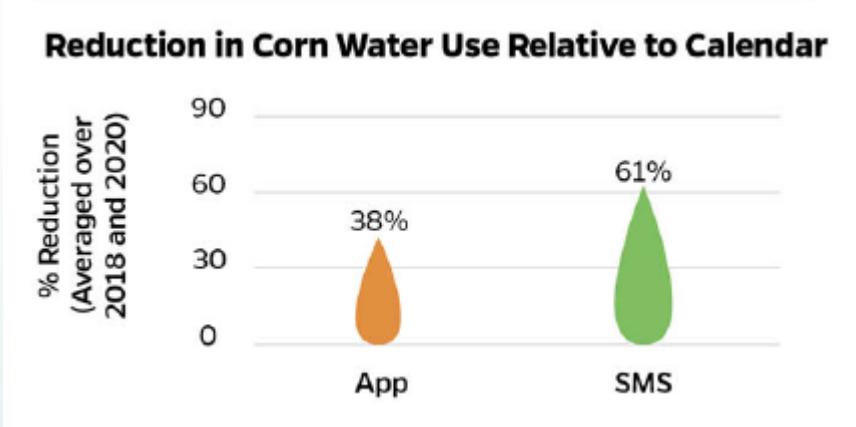
Extension

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

collaborative research and Extension

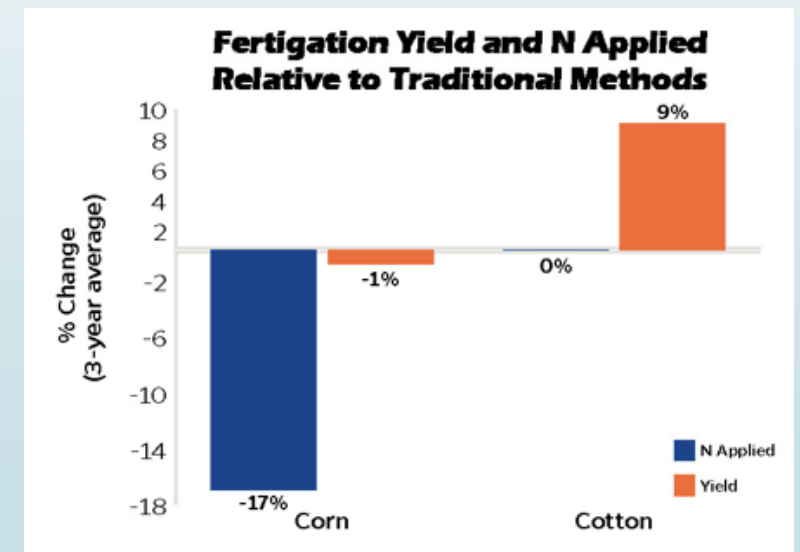
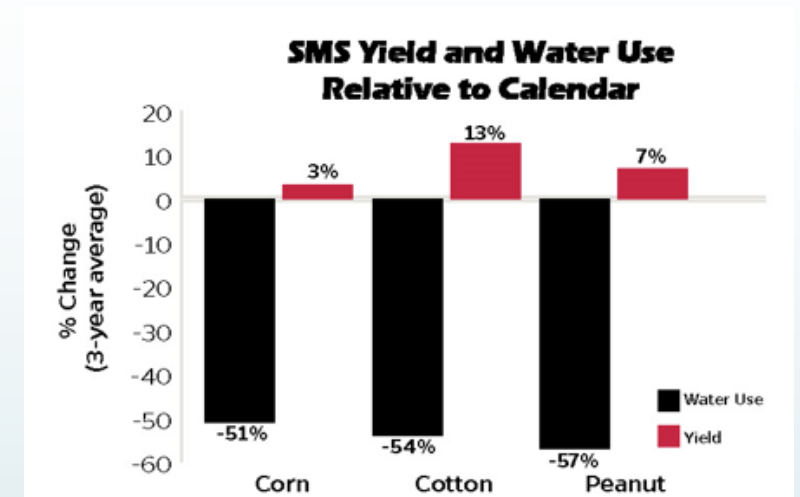
FL BMP Research

- Water Use: App and SMS reduce irrigation relative to calendar scheduling with similar yields for all crops
 - Corn: 38-61% irrigation reduction when using App and SMS irrigation
 - Carrot: 14% irrigation reduction when using App and SMS irrigation
 - Peanut: 40% irrigation reduction when using SMS
- Fertilizer: Increasing rate above 200 lb/ac does not significantly increase yield for corn or carrot when using App and SMS irrigation



GA BMP Research

- ▶ Water Use:
 - ▶ 51%-57% irrigation reduction when using SMS relative to calendar irrigation with slight increases in yield
- ▶ Fertigation:
 - ▶ Corn: Similar yields to traditional fertilization while using 17% less N
 - ▶ Cotton: 9% yield increase but no reduction on N rates when compared to traditional fertilization



Smartphone Apps for Irrigation Scheduling



CropFit

Corn included in new CropFit App
Available for iOS and Android since Feb 2023

www.smartirrigationapps.org

PARTICIPATORY MODELING PROCESS (PMP)

This network of 36
people worked together
to develop
core modeling
components
and interpret results

REGIONAL STAKEHOLDERS 25 PMP members

- Ag and Forestry Producers
- Farm Bureau (GA & FL)
- Forestry Commission (GA)
- Conservation Organizations (FL & GA)
- Suwannee River Water Management District (FL)
- State Environmental Protection Agencies (GA & FL)
State Agricultural Agency (FL)
- Local Governments

PROJECT TEAM 11 PMP members

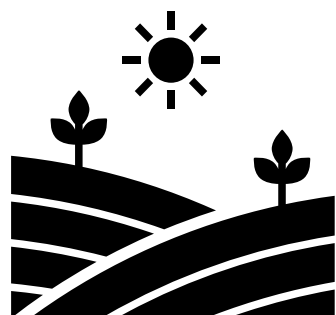
- UF/IFAS Extension (FL)
- UGA Cooperative Extension (GA)
- Communication Specialists
- Economic and Bio-Physical Modelers (GA & FL)
- Facilitators
- Reflexive Monitor
- Project Coordinators



FACETS PARTICIPATORY MODELING PROCESS (PMP)

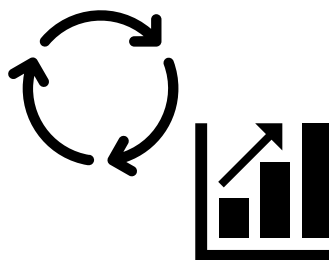
PARCEL SCALE

REGIONAL SCALE



Interpret BMP field trial results

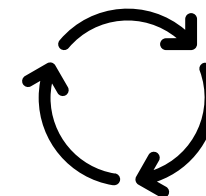
Develop management systems to represent current practices



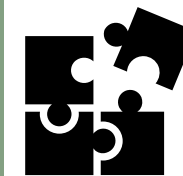
Interpret parcel-scale results



Generate & prioritize future scenarios



Interpret regional-scale results



Disseminate outcomes

2017

2018

2019

2020

2021

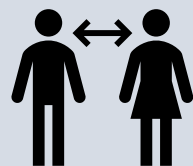
2022

Face-to-Face engagement ...

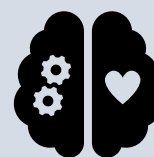
Global pandemic = virtual engagement

... Face-to-Face

Community Building



Incubation

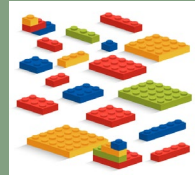


Interpretation & Dissemination

PMP OUTCOMES

26 Gatherings Over 6 Years

Participatory Modeling



Management system definitions
ag & forestry

Development of regional model
scenarios

Co-interpretation of model results

Shared understanding of model
limitations and sensitivities in
interpretation

Communication & Collaboration



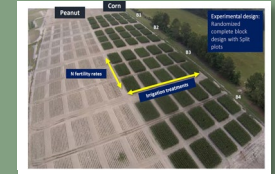
Dissemination of key findings across
water use, management, and research
sectors

Network of new and strengthened
relationships across sectors and
interests

Stakeholder interest in continued
partnership for improvement and
application of the models

Improvements in results visualizations

Research & Extension



Participation in communications &
social learning research

Co-interpretation of BMP field research
results

Recruitment for economic research
surveys

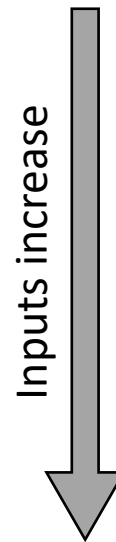
Shared Understanding of Floridan Aquifer

PMP Outcomes: Florida Priority Crops & Management Systems

Current Production Systems

CROPS	Corn-peanut Corn-carrot-peanut
FORAGES	Hay (Bermuda) Pasture (Bermuda)
FORESTS	Slash pine Loblolly pine Longleaf pine

Management System Summaries



MS1

- Crops
- Most efficient (SMS) irrigation
 - Lowest fertilization
 - Rye cover crop

- Forages
- Lowest fertilization
 - Lowest number of cuttings (hay)

- Forests
- No thinning
 - No fertilization
 - Longer rotation age
 - Lower initial planting density

MS2

- Crops
- Efficient (SMS) irrigation
 - Medium N rate
 - Oat cover crop

- Forages
- Medium fertilization
 - Medium number of cuttings (hay)

- Forests
- Thinning
 - Medium N rate
 - Medium rotation age

MS3

- Crops
- Least efficient (calendar) irrigation
 - Highest fertilization
 - No cover crops

- Forages
- Highest fertilization
 - Most number of cuttings (hay)

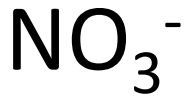
- Forests
- Thinning
 - Highest N rate
 - Shortest rotation age



Florida Parcel-Scale Tradeoffs



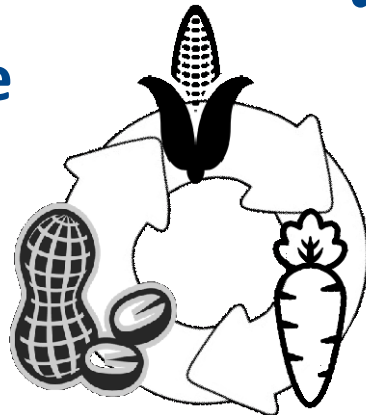
- **Net Recharge:** Hay > Pasture > Row Crops > Production Forest
- **Increased recharge** for moving crops & forages out of MS3



- **N Leaching:** Row Crops > Pasture > Hay > Production Forest
- **Decreased leaching** for moving crops & forages toward MS1



- **Low-density longleaf pine** has lowest leaching & highest recharge

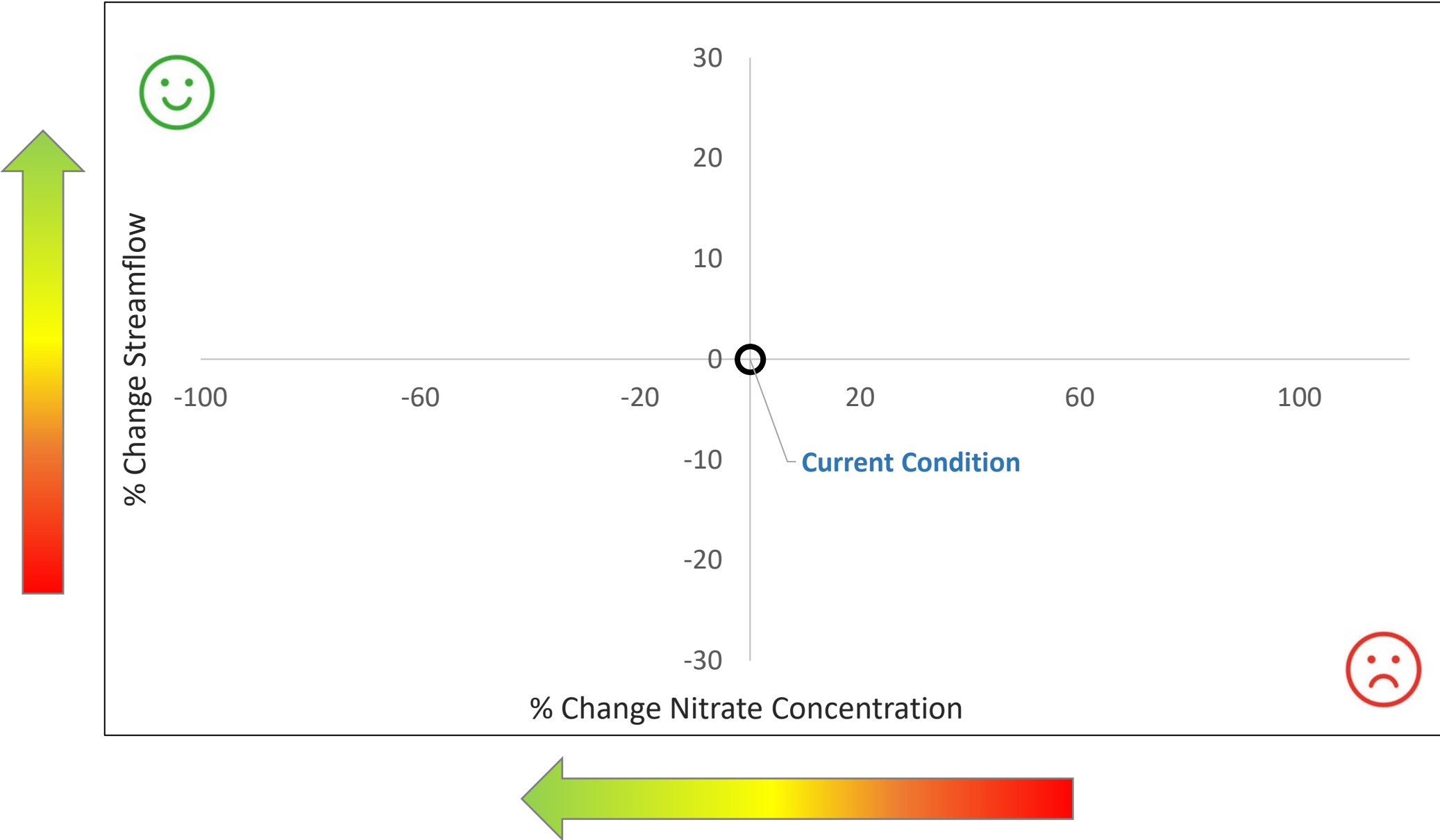


- **Adding carrot to corn-peanut** increases leaching by 50-80% but increases net returns by 75-93%

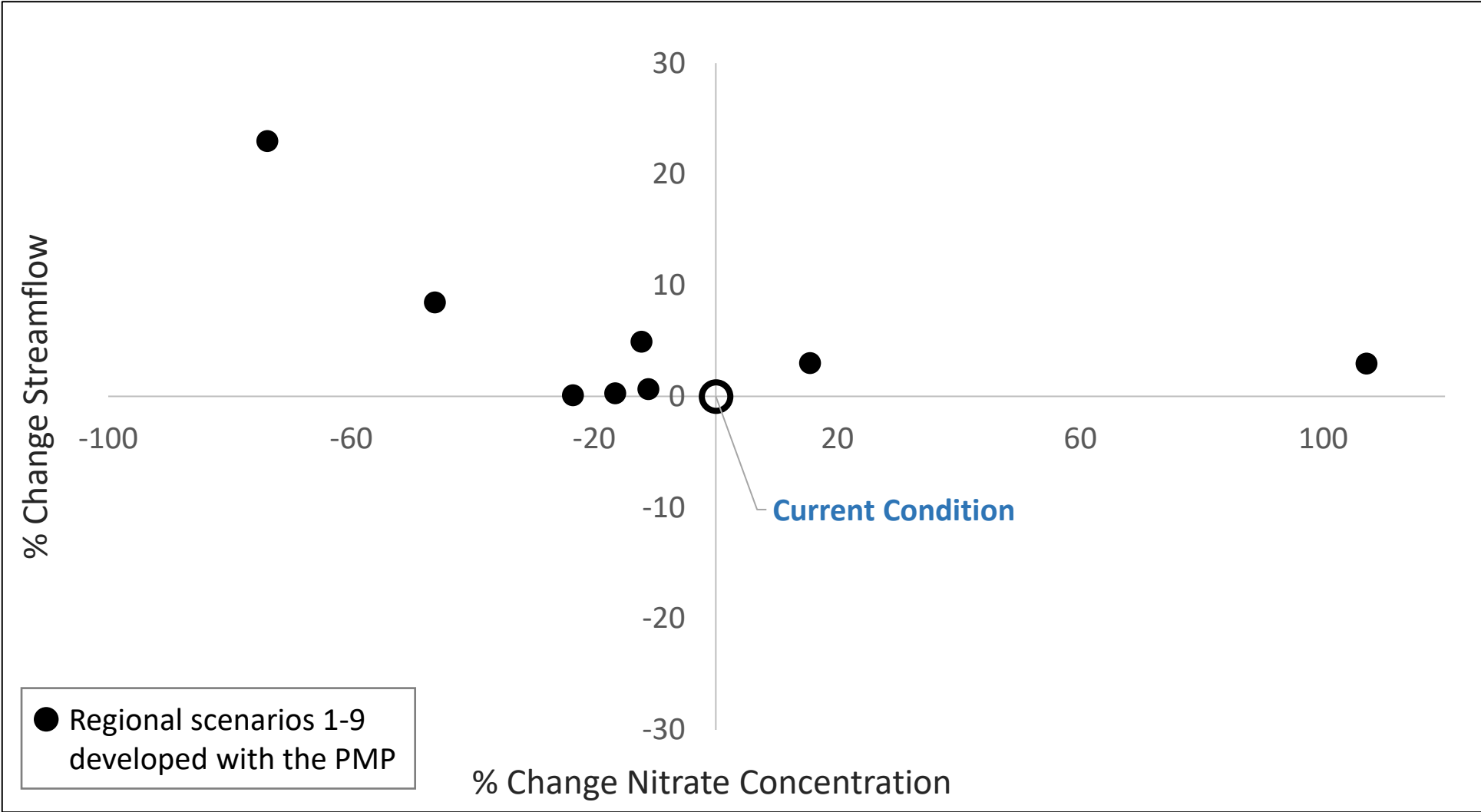


- **Changing from long- to short-rotation prod. forest (+thin)** increases recharge by 10-30% and increases net returns by ~90%

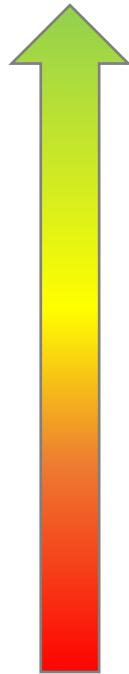
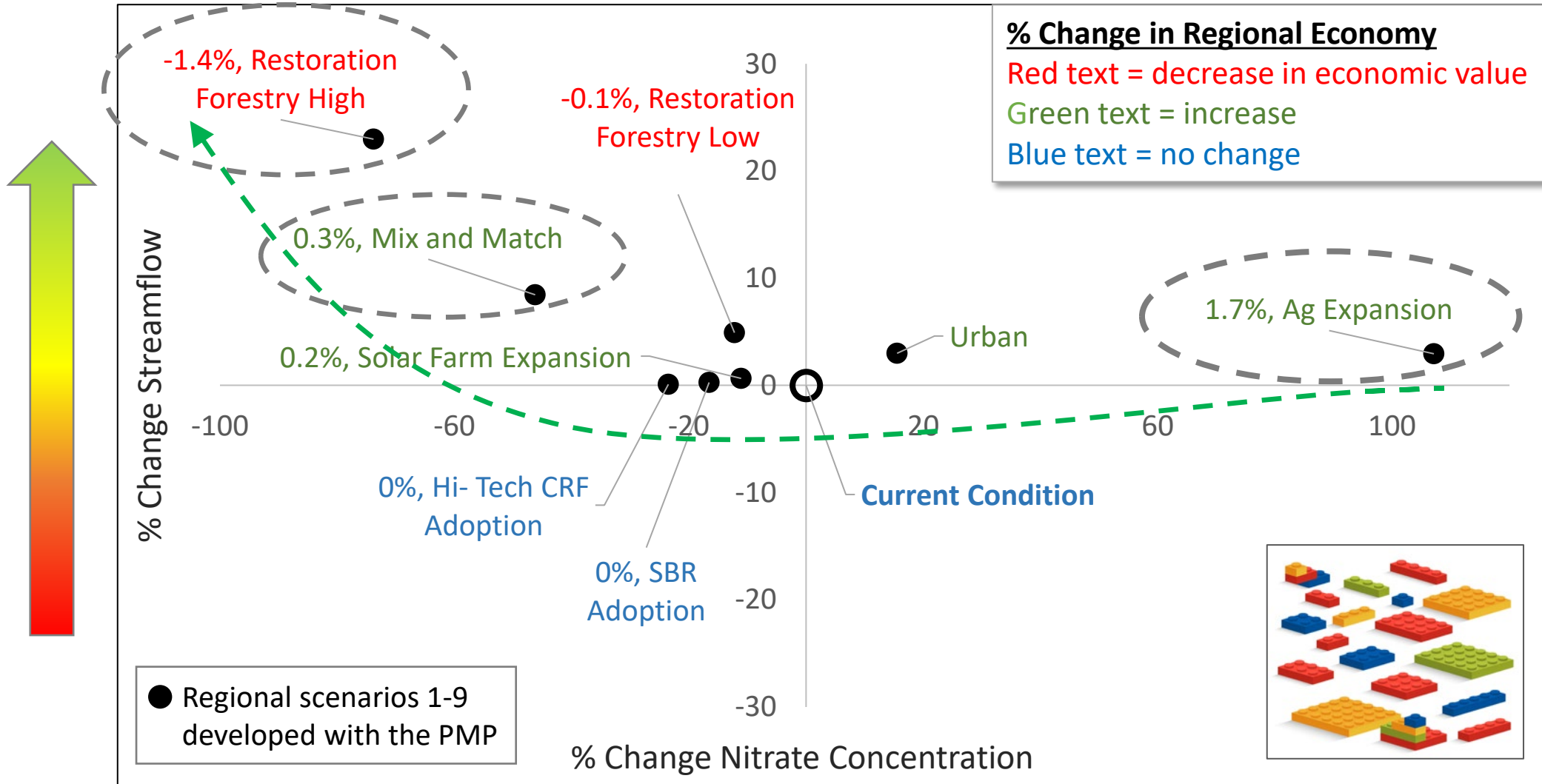
Florida Regional-Scale Tradeoffs



Florida Regional-Scale Tradeoffs



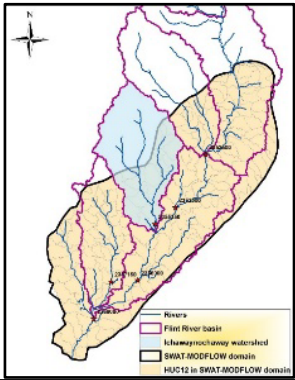
Florida Regional-Scale Tradeoffs



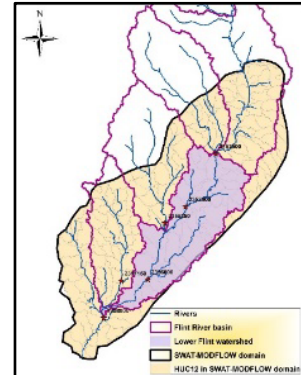
Key Findings: FL Regional Scenarios

- Conversion to **low-density longleaf** has best potential to increase flows and decrease nitrate concentrations
- **“Hi Tech CRF”** reduces row crop N load by 68%, total load by 20%
- **Mix-n-Match** provides environmental & economic benefits (win-win)
- All scenarios meet **minimum flows**; none meet **nutrient criteria**
- **“Realistic”** scenarios don’t move the needle on nitrogen much
- **Economic changes are uneven** across sector and region; rural counties more highly impacted by decreases in ag & forestry

Georgia Regional-Scale Tradeoffs

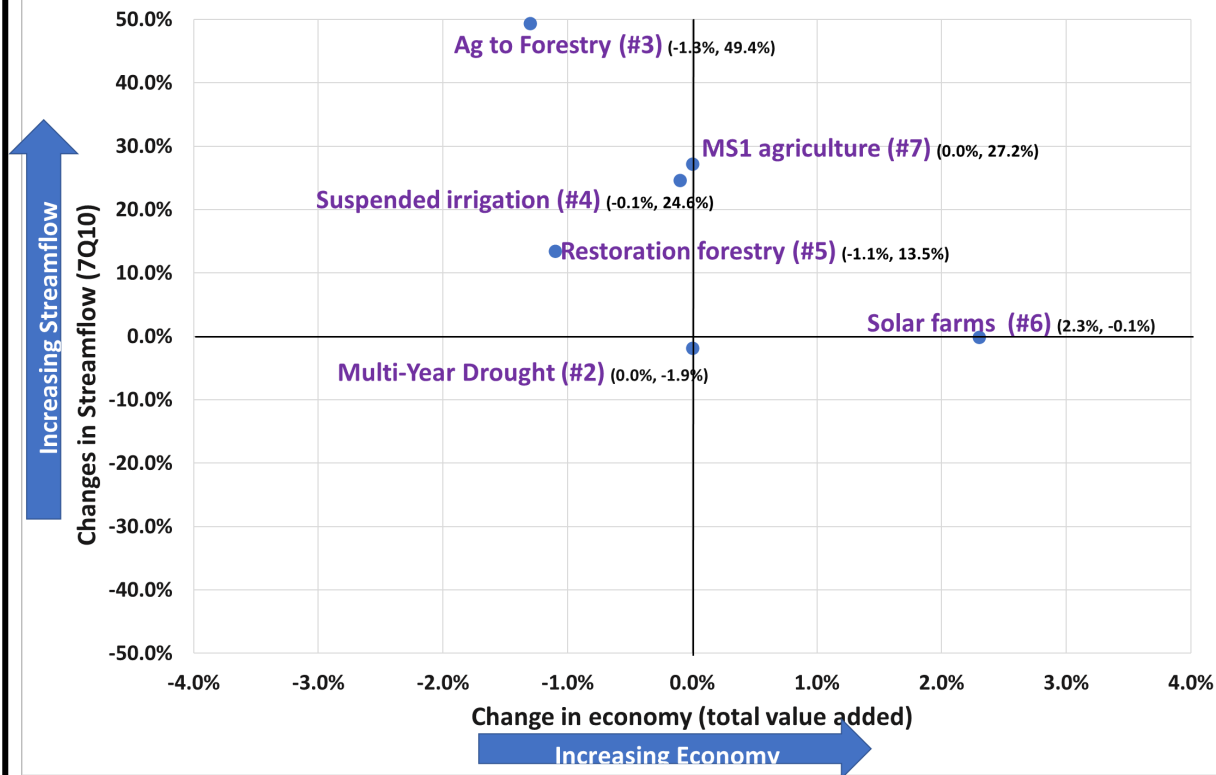


Ichawaynochaway

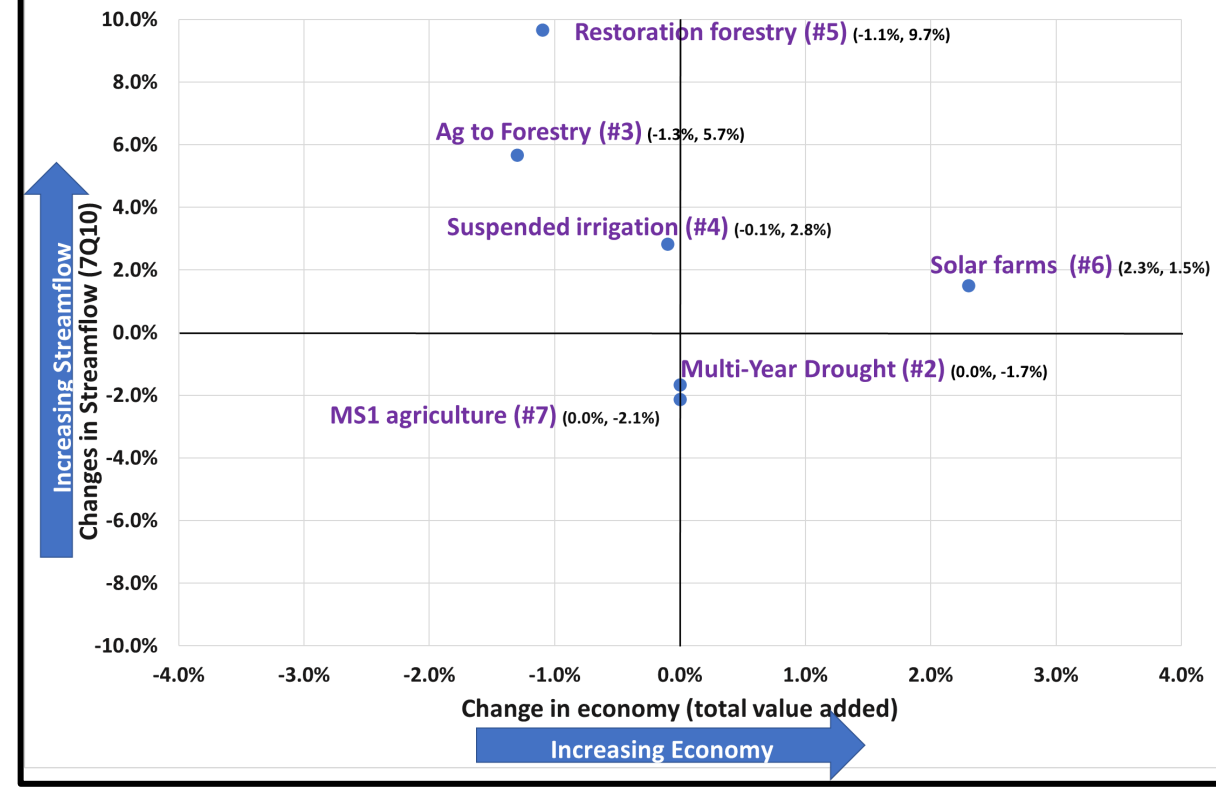


Lower Flint

Trade-off chart (Economy vs Streamflow)



Trade-off chart (Economy vs Streamflow)



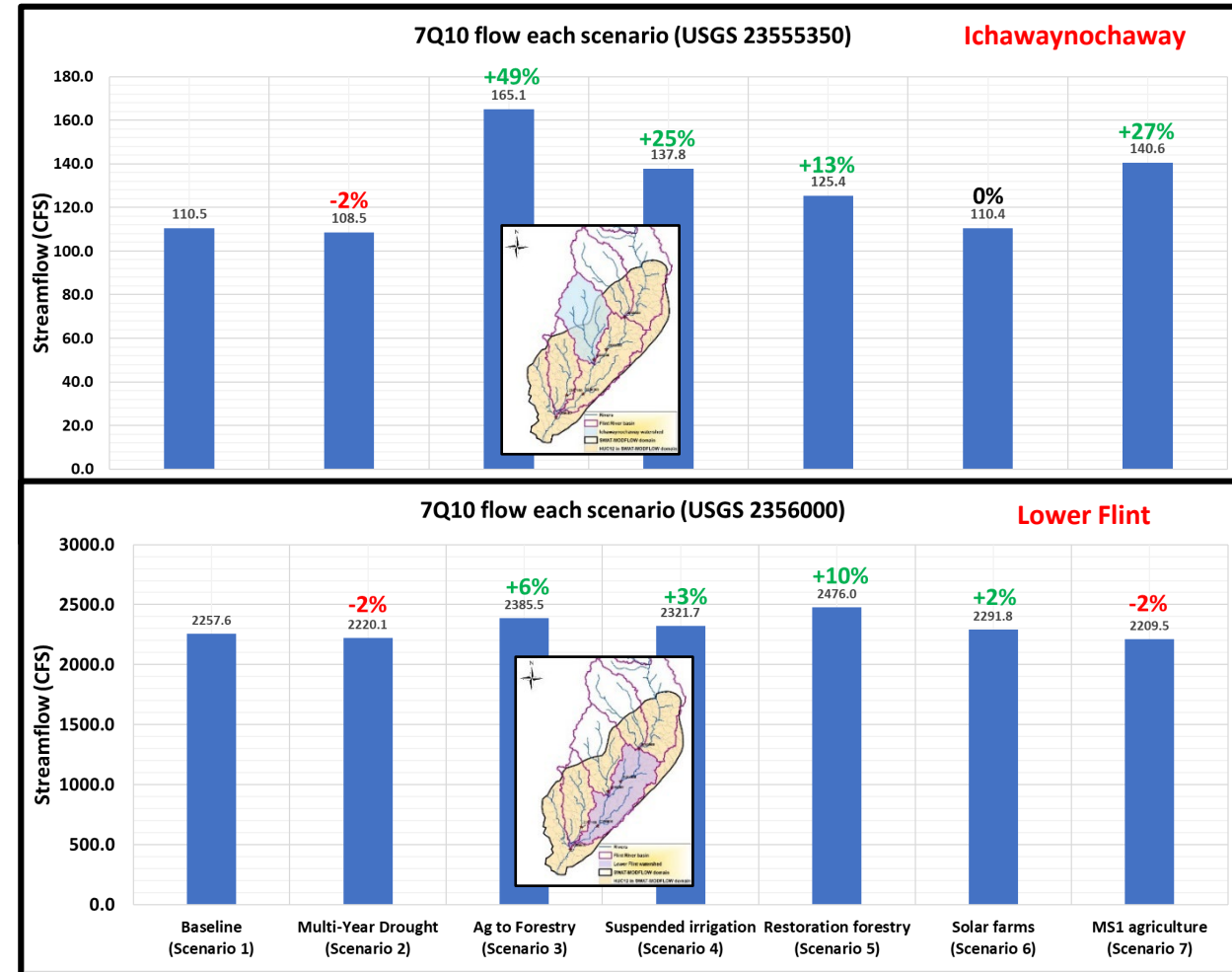
Regional-Scale Tradeoffs

- **Bigger improvement in low flows was attained at the tributary Ichawaynochaway watershed rather than the mainstem Flint River.**
 - 7Q10 improved by as much as 49% at the Ichawaynochaway watershed
 - Biggest increase at the mainstem Flint River was 10%
- **Conversion of Agriculture to forestry (Capacity and Restricted Use Areas) had the biggest negative impact in regional economy (reduction of 1.3%) but helped improve low flows (49% and 6% at Ichawaynochaway and mainstem Flint, respectively).**
- **Conversion of Agriculture to solar farms - only scenario that had a positive impact in economy (2.3% increase).**
 - Had little to no impact on 7Q10
- **An extended drought would have negligible impact in the economy (crop production was buffered by irrigation water use) but could decrease low flows.**

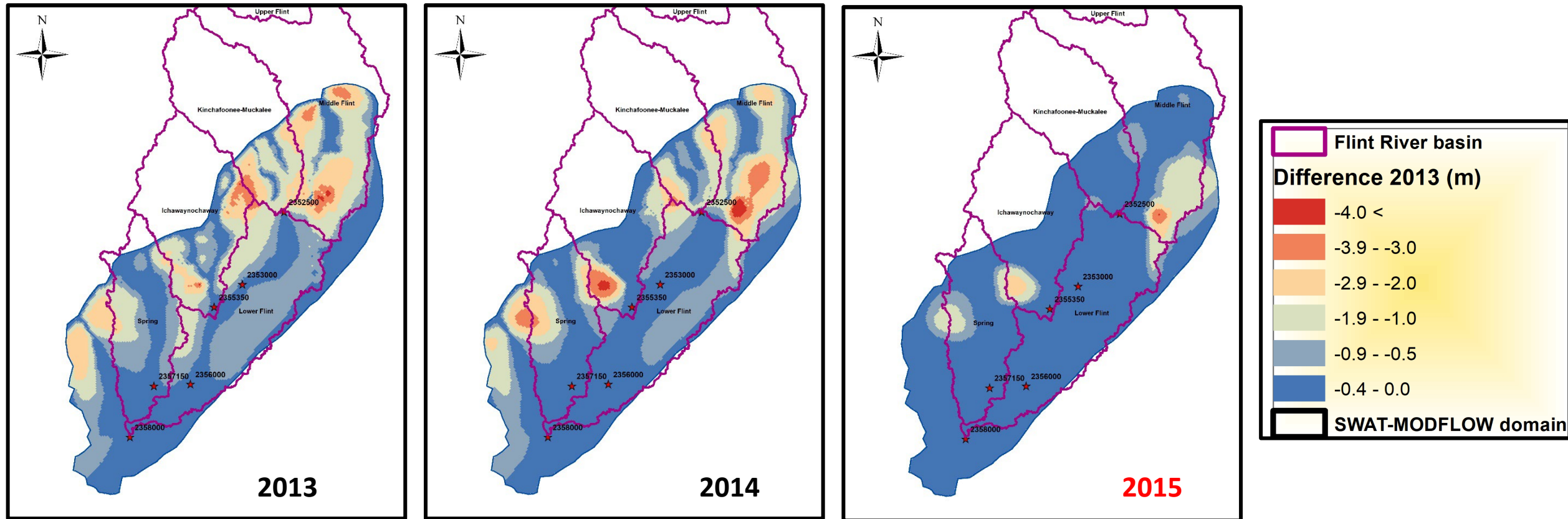
Farm/forest level (parcel level) model simulation for both row crops and forests were vital to improving model performance for evaluating at regional-scale as well as providing farm-level tradeoff analysis

Regional Scenarios (Streamflow at low flow conditions)

- **Changes to land use** (restoration forestry, production forestry) as well as **better row crop management** (MS1 agriculture/irrigation suspension) in the Capacity and Restricted Use areas can **have positive influences in streamflow**.
 - Especially in growing season and drought years
- **Conversion of agriculture land to forestry showed bigger improvement in low flow** (compared to changes to row crop management practices)
- **MS1 Agriculture can increase 7Q10 by 27% in Ichawaynochaway but had insignificant impact in lower Flint**
- **An extended drought (2011-2013) would reduce 7Q10 flow by 2%** compared to the baseline at both sub-watersheds.



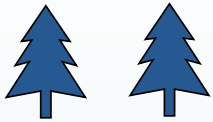
Regional Scenarios (Impacts of extended drought 2011, 2012 and 2013)



Difference in average annual groundwater level between the baseline scenario (scenario 1) and Multi-Year Drought (scenario 2) for 2013, 2014, and 2015.

- The hypothetical **Multi-Year Drought Scenario** helped identify the critical regions that would see an **additional reduction in groundwater levels**.
- **Streamflow at both Ichawaynochaway and lower Flint would not return to levels observed under baseline till 2015** due to an additional year of drought.

Stakeholder Valuation Research



	Tree farmers WTA	Forestry WTA	Agriculture WTA	WTP
Geographic scope	Georgia	Suwanee River Basin and Flint River Basin	Suwanee River Basin and Flint River Basin	Suwanee River Basin and Flint River Basin
Audience	Tree farmers	Forest landowners	Corn, cotton and peanut producers in N FL and S GA	FL and GA residents
Objective	WTA compensation for increased water flow	WTA for adopting a new set of BMP practices that helps improve groundwater quantity and quality	Producer preferences for hypothetical water policy incentive programs to adopt Ag BMPs	Understand public support and preferences for incentivizing producers to adopt BMPs



Key Findings: Stakeholder Valuation Research

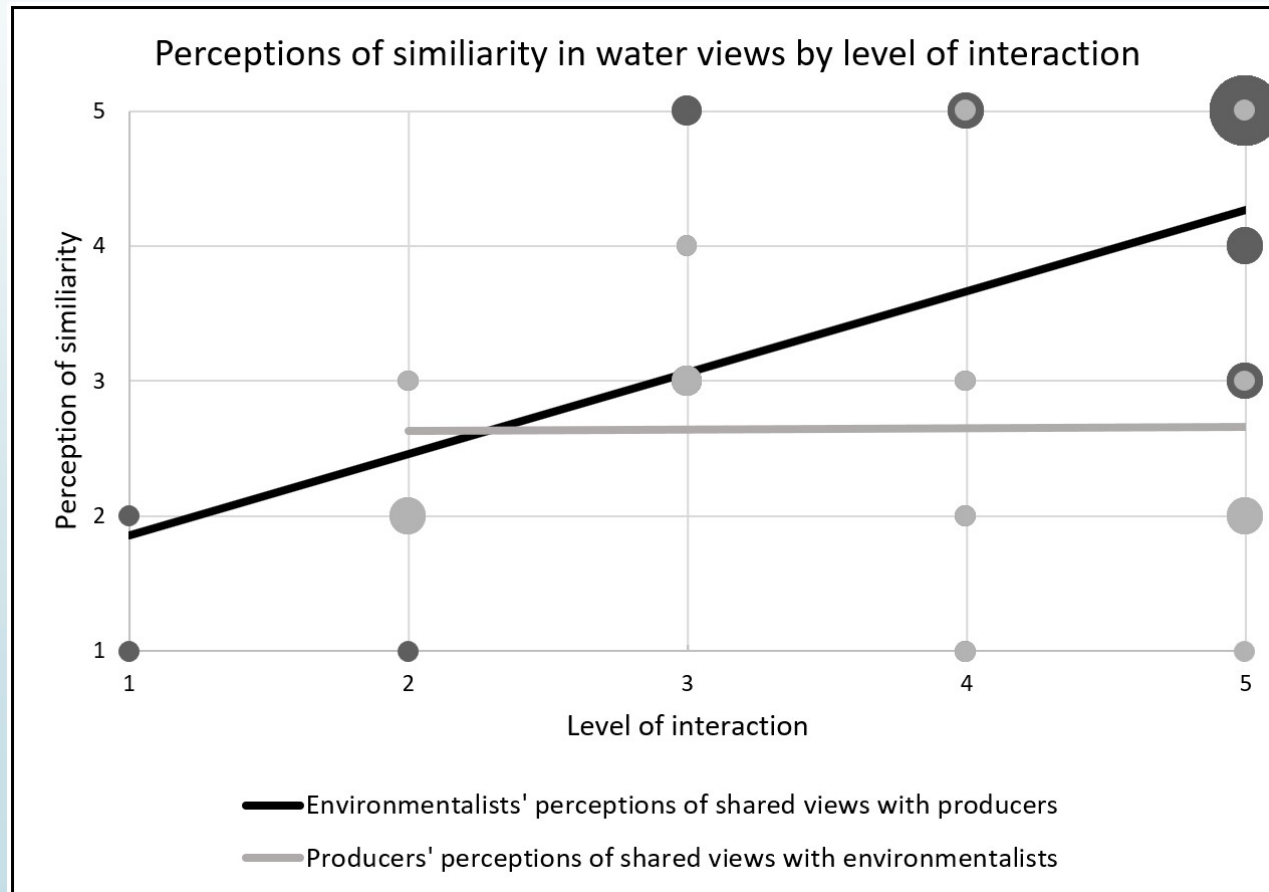
This research characterized landowner preferences for BMP programs and showed that there are **economically feasible** options for policy implementation.



- ▶ Buy-in exists for ecosystem services among Forest Landowners/Producers! Producers can be incentivized to change behaviors (production practices)/adopt BMPs.
 - ▶ Forest landowners: willing to reduce planting density, change rotation age, and thinning
 - ▶ Agricultural producers: change irrigation and nutrient management practices (adopt soil moisture sensors, controlled release fertilizer, and cover crop BMPs)
- ▶ Buy-in exists among residents who are supportive of paying farmers to improve water quality and availability (there is enough demand / public support at a high enough level)
- ▶ Results give policy-makers an idea of program feasibility, range of price, and potential financial output to incentivize producers

Communication Research

Producers and environmentalists have similar values and interests, but view agriculture differently



Similarities

- Connection to nature
- High perceived risk to ground and surface water
- Prioritization of water for crops and ecosystems

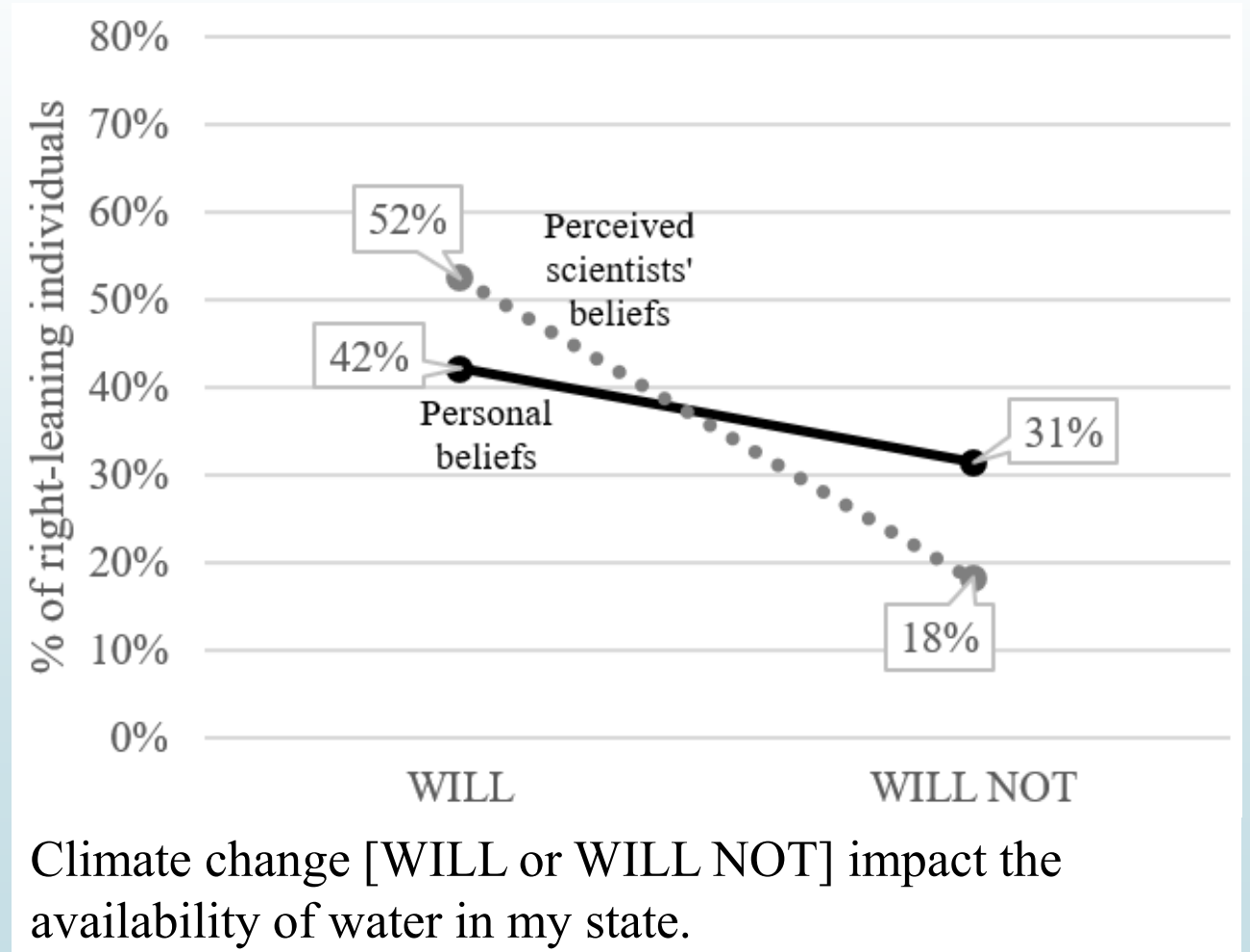
Differences

- The way they interact with water
- *Agriculture is part of the problem OR agriculture is part of the solution*

It's not just about science, it's about values!

The general public...

- Has limited water knowledge
- May not believe water scientists
- Follows their values to policy preferences



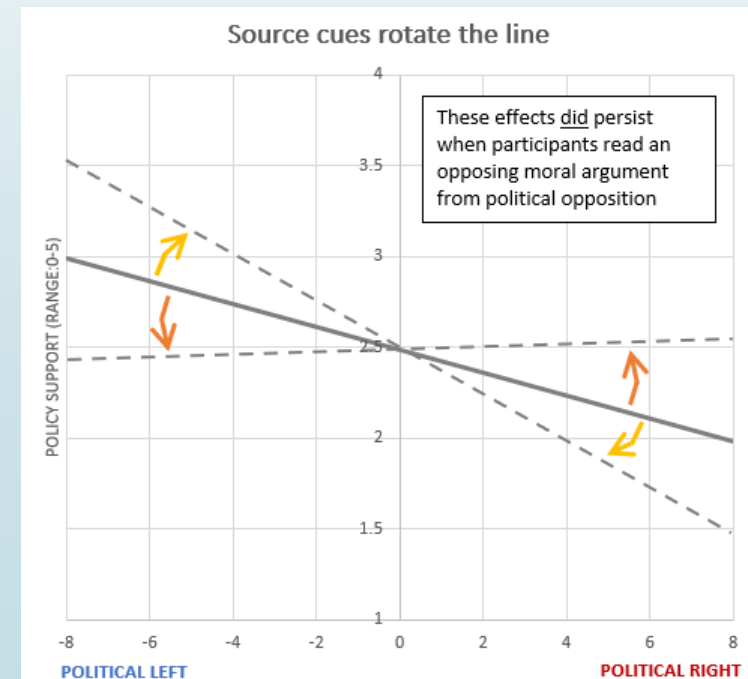
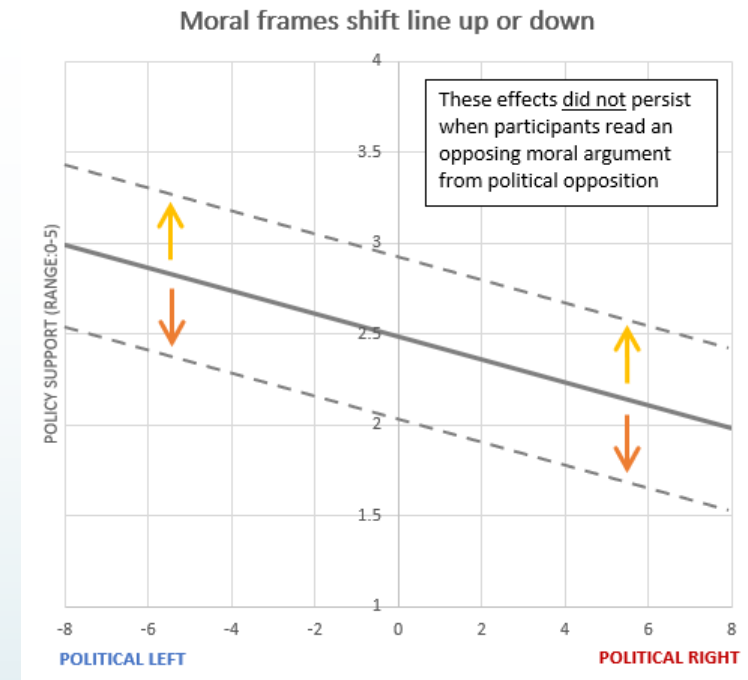
Strategic communication can increase support for sustainable water action

Reduce false conflict

1. End the blame game
2. Create opportunities to experience alternative perspectives
3. Use language that builds shared understandings

Support value-based discourse

1. Reveal shared values
2. Employ messages and messengers with value resonance



Extension

37 In Service Trainings

- Extension agents
- Crop consultants
- Water Conservation District Technicians
- Agriculture industry service providers
- Producers

- Precision agriculture & irrigation
- Use of advanced irrigation scheduling tools (SMS, App)
- Basics of BMPs for water quality & quantity



On Farm Demos

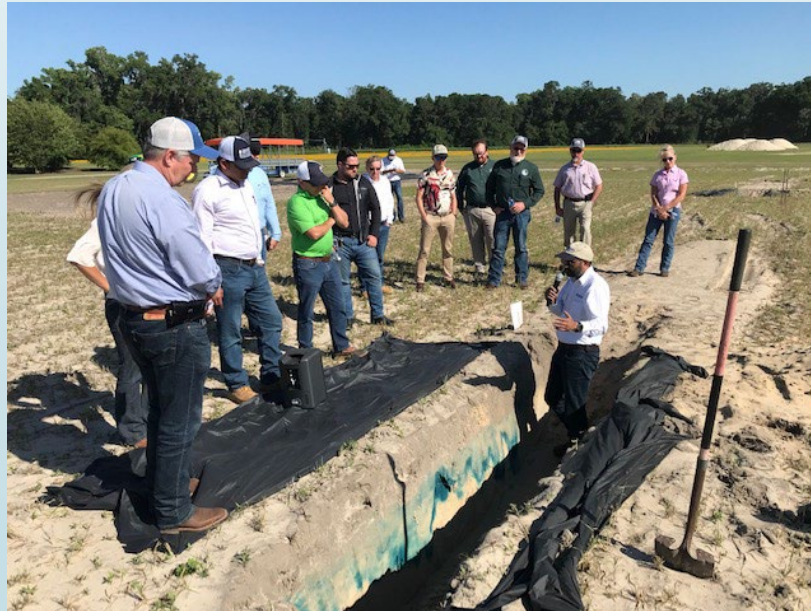
- Farmers
- Extension agents
- Government agencies
- Conservation Professionals

- FL: ~50 On-farm BMP Demos on performance of current and new BMPs across soils and landscape conditions
- GA: in collaboration with 20 Agents, installed SMS at the farm level.



Other informal trainings

- FL: 75 county and regional level farmer meetings, tours, and on-farm field days to discuss BMPs for irrigation and nutrient management (over 2000 farmers, allied ag industry reps, and government agency staff)
- GA: 50 county level farmer meetings to discuss BMPs for irrigation management and material related to the FACETS project (over 1000 farmers)



Water Schools

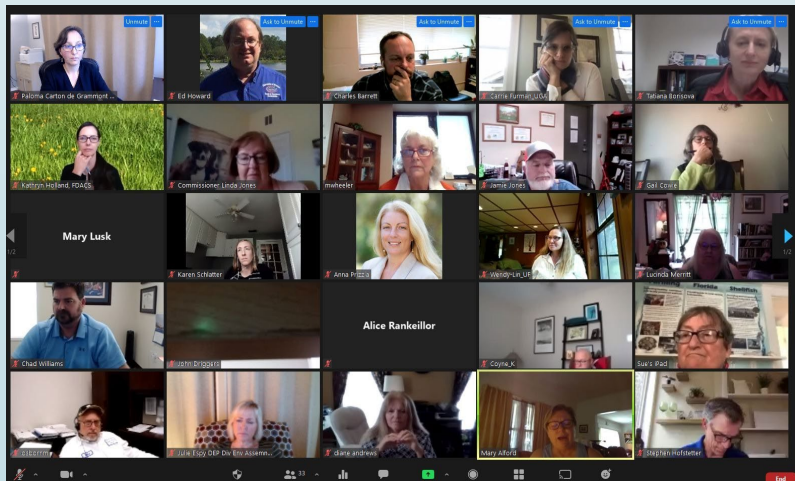
Empower communities to make more efficient, consensus-based decisions about water management

Water Workshops for North Florida

- 3 virtual sessions, 18 participants
- Discussed water policies and local priorities with regional and state agencies
- Allowed decision makers to network and exchange ideas
- Generated resources (available online)

Water for Southwest Georgia's Future

- In person, 20 participants
- Explored the distinctive features of the region's water resources
- Learned more about their use
- Heard about the FACETS research on their management
- Field trip to BMP Research at Stripling





Social Learning

Reflexive Monitoring



The Florian Aquifer Collaborative Engagement for Sustainability (FACETS) project is a Coordinated Agricultural Project funded by the USDA National Institute of Food and Agriculture



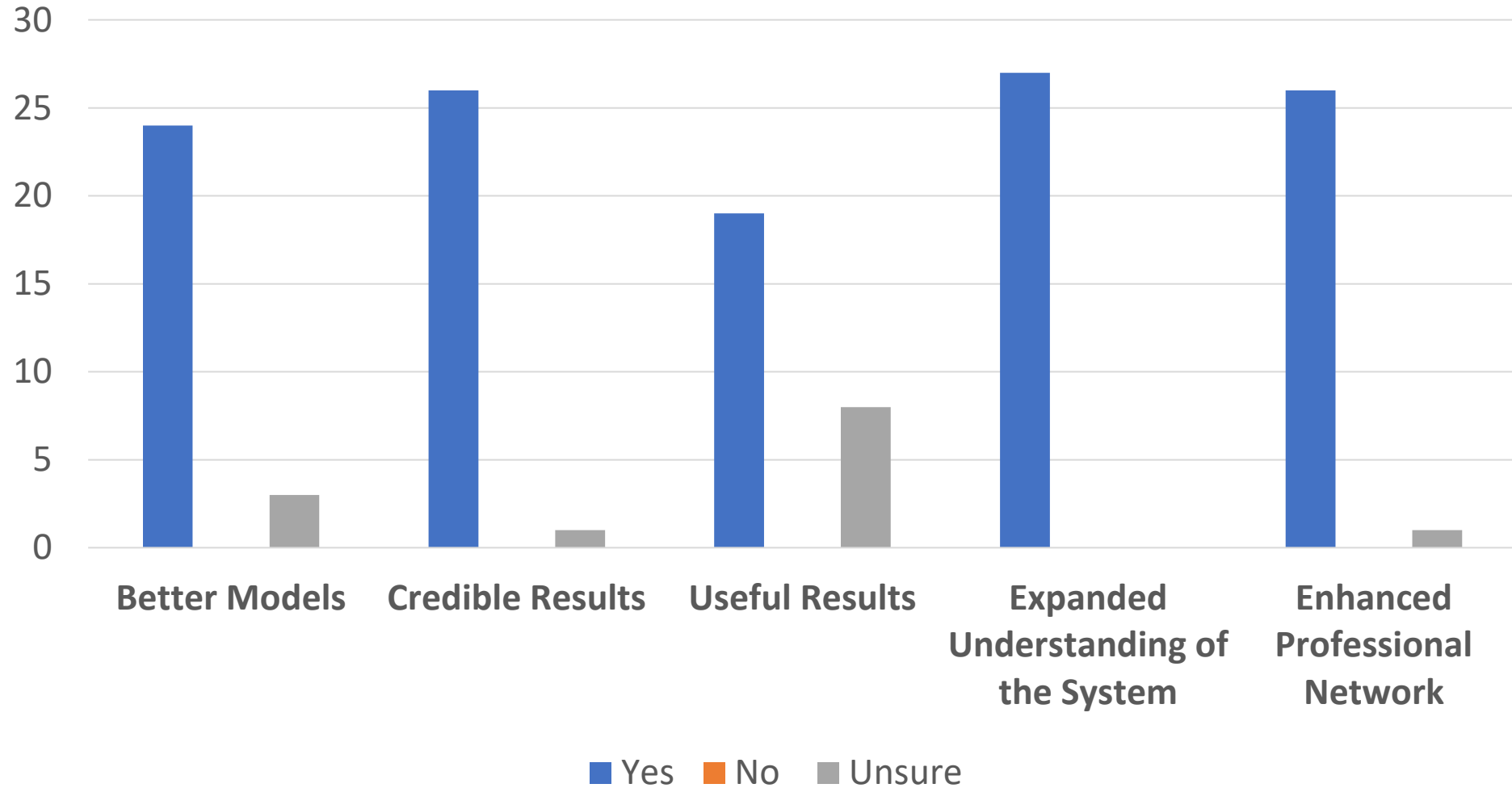
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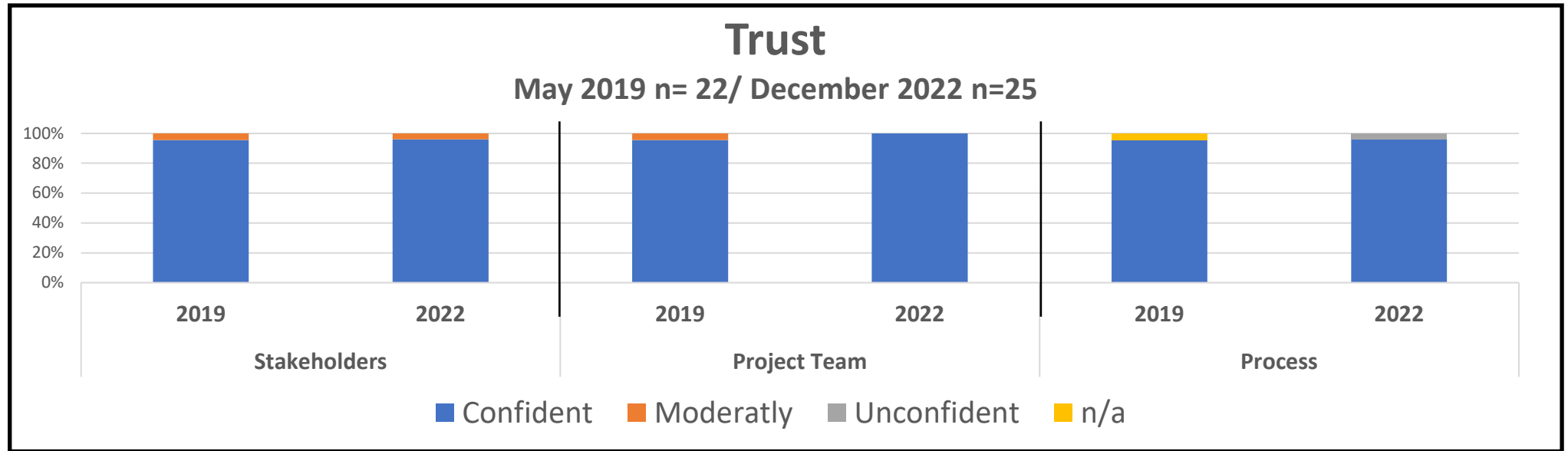
EXPECTATIONS

Did we achieve these anticipated OUTCOMES?

(N=27 PMP participants)



TRUST



Does this characterize your experience of trust in FACETS?

Yes = 13 (Trust stayed high)

No = 12 (Trust grew)

Unsure = 2

Can the trust established in FACETS transfer beyond the PMP?

Yes = 10.5

No = 2

Unsure = 14.5 (Depends on how and by whom the results are presented)

Would you do a participatory modeling project like this again?

Yes = 23

*I would say that because of the magnitude of the importance of the project, it was worth it. If the magnitude of the importance of the problem was not as great, it would not have been worth it
... You know, the potential impact is, is worth the investment*

*I would definitely do it again ... I think that the outcomes were worth it...
[As long as] someone else [besides me] is the PI*

No = 1

*Not because it isn't valuable [...] It's like going to Disney World, you know. **Once you've done it, it may be a while before you want to do it again***

Unsure = 3

Depends on who was running it.

Its worth the time when:

- There is good leadership and organization
- The project can make a real impact

What Does “Long-Term Success” Look Like?

- **Understanding and agreement** on the changes needed to achieve agricultural water security and environmental protection
- **Transformative watershed-scale modifications**, including widespread adoption of new management practices and land use changes
- **A robust agricultural/silvicultural economy**
- **Trusted social networks** that sustain positive change beyond the project

