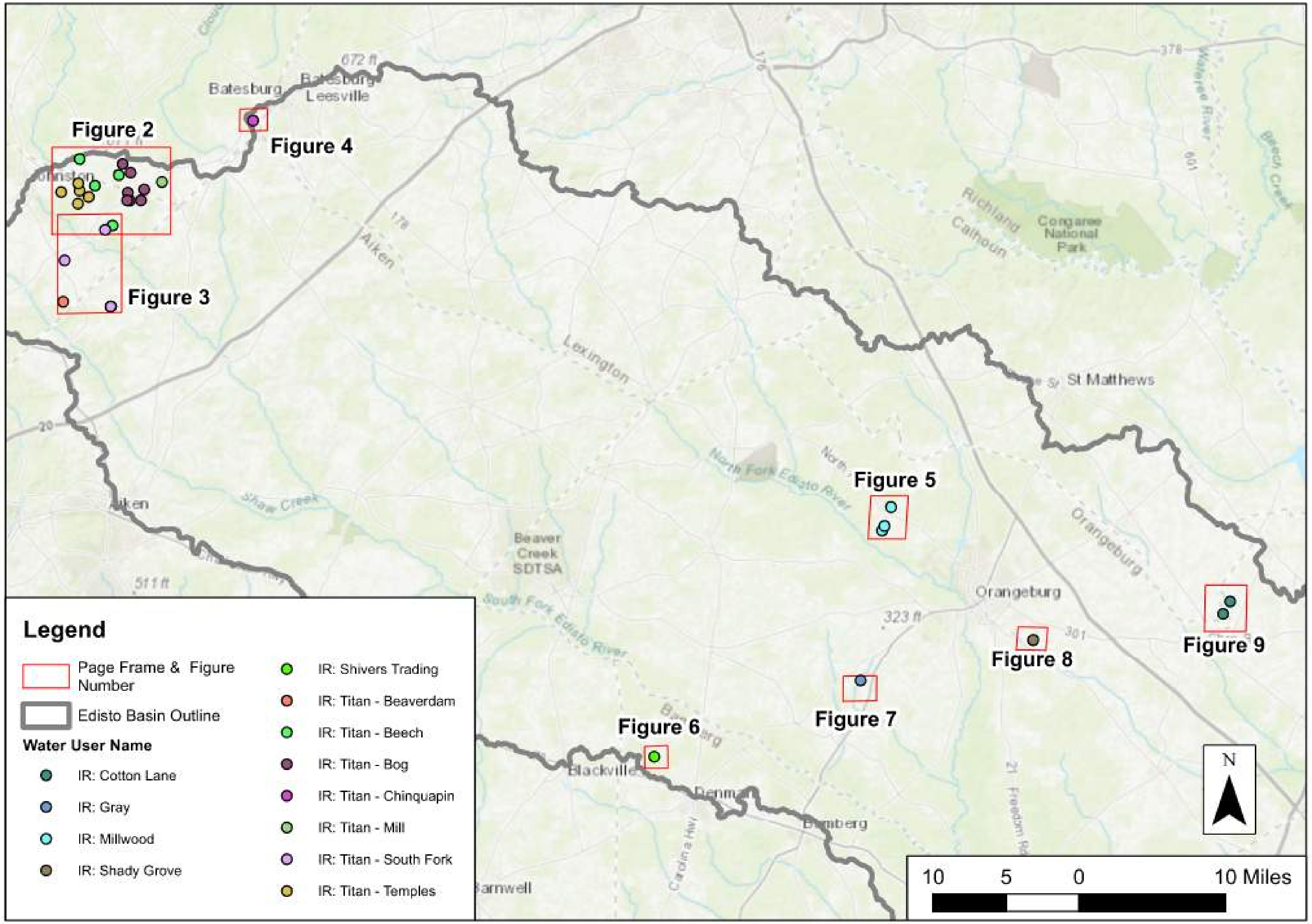
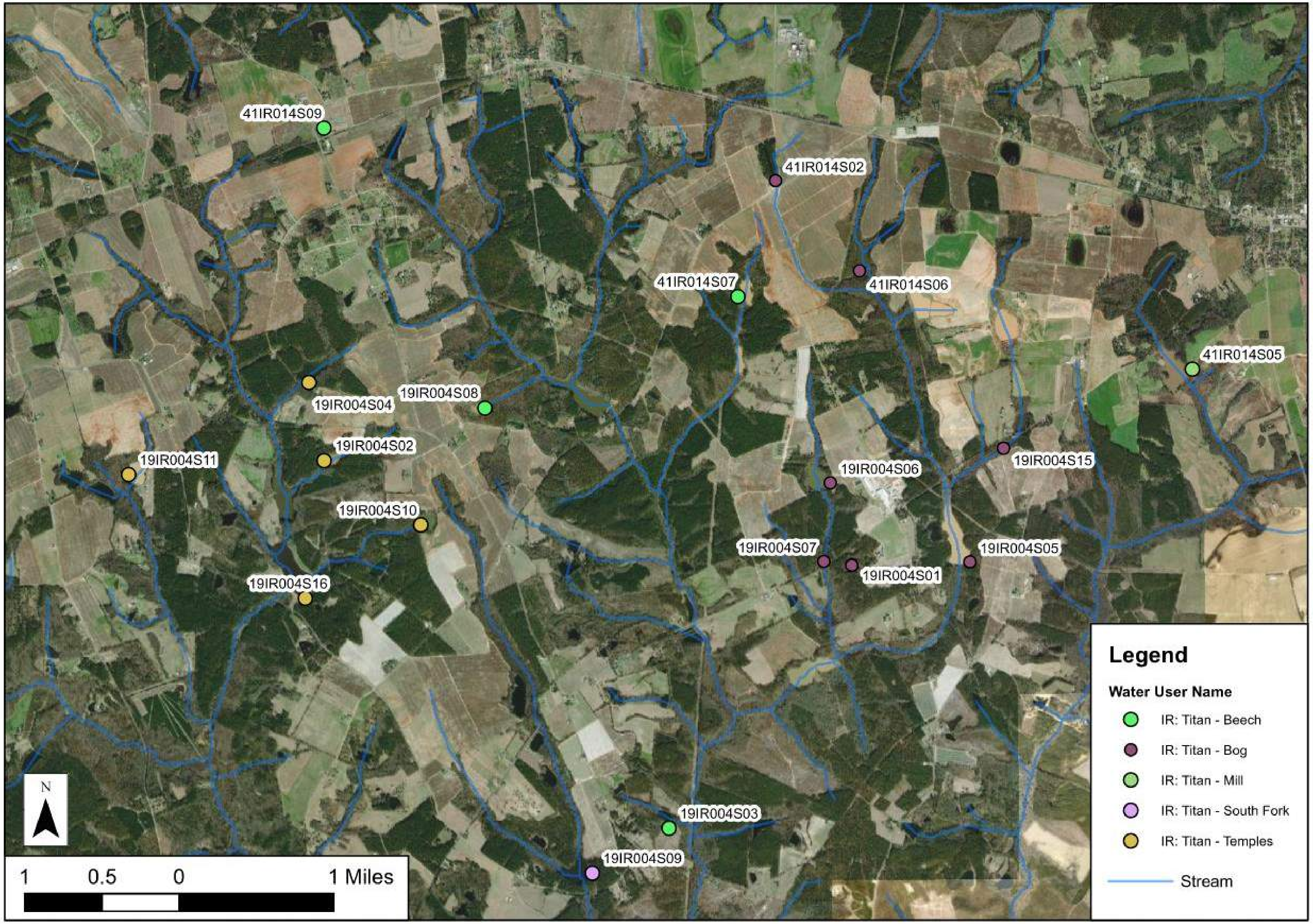
Agenda Item #7

Evaluation of Modeled Agricultural Surface Water User Shortages and Storage as a Water Management Strategy

John Boyer, CDM Smith

Ag Water Users with Modeled Shortages





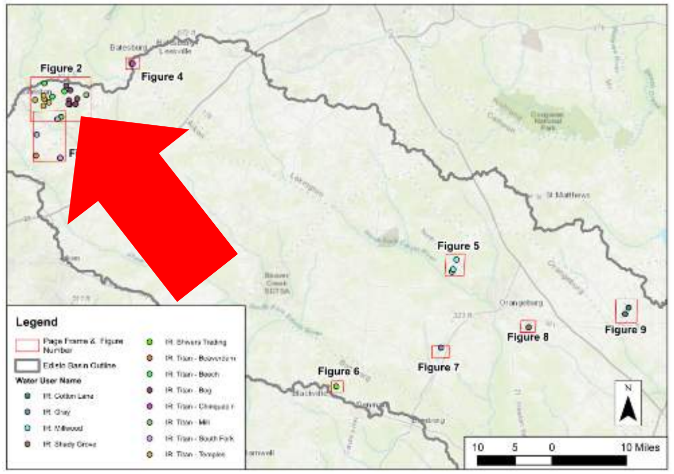


Figure 2

Agricultural Users with Modeled Shortages, Titan (1/3)

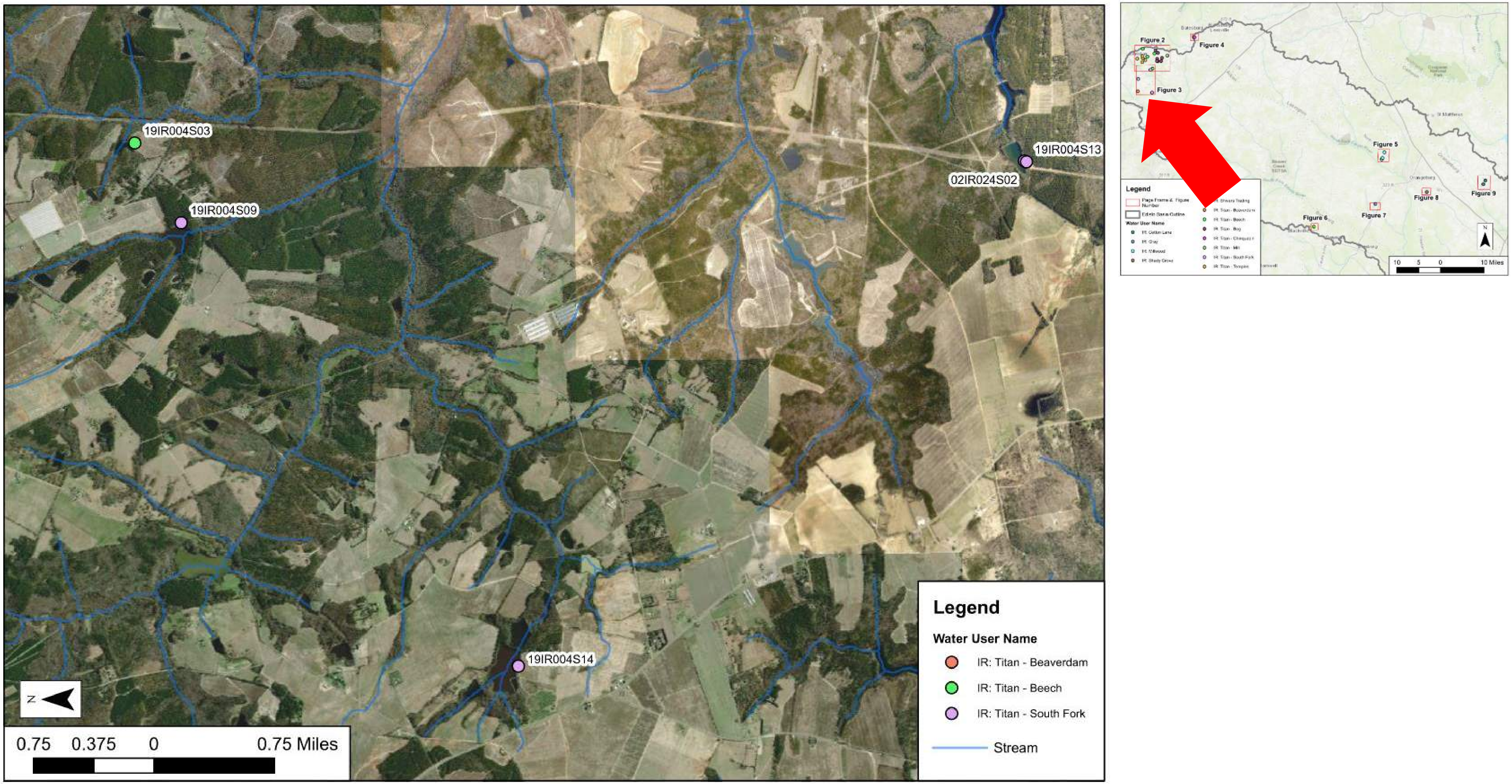
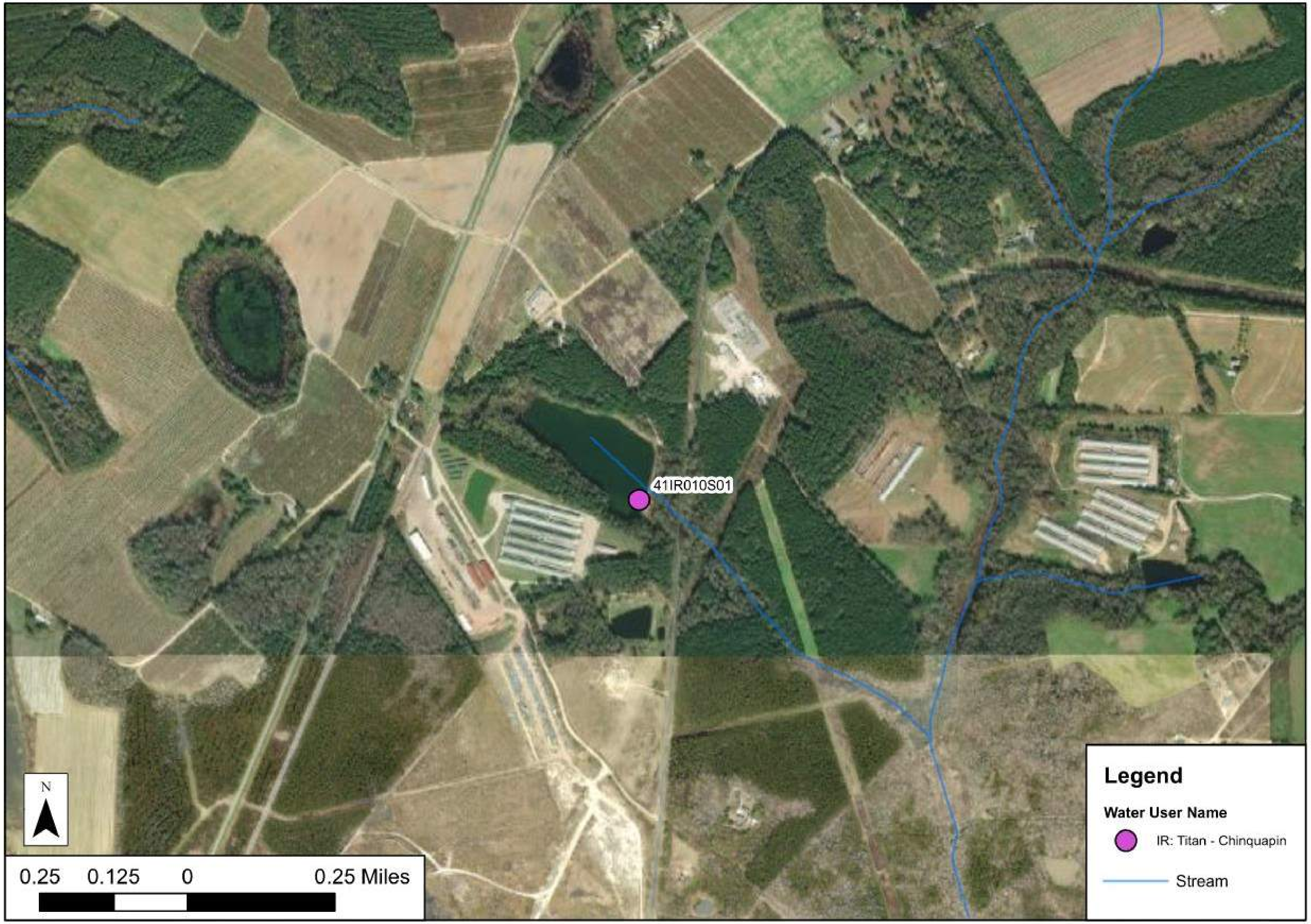


Figure 3
Agricultural Users with Modeled Shortages, Titan (2/3)



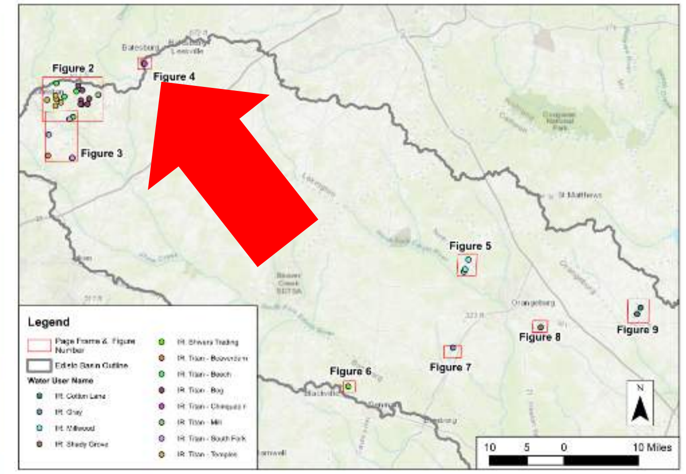
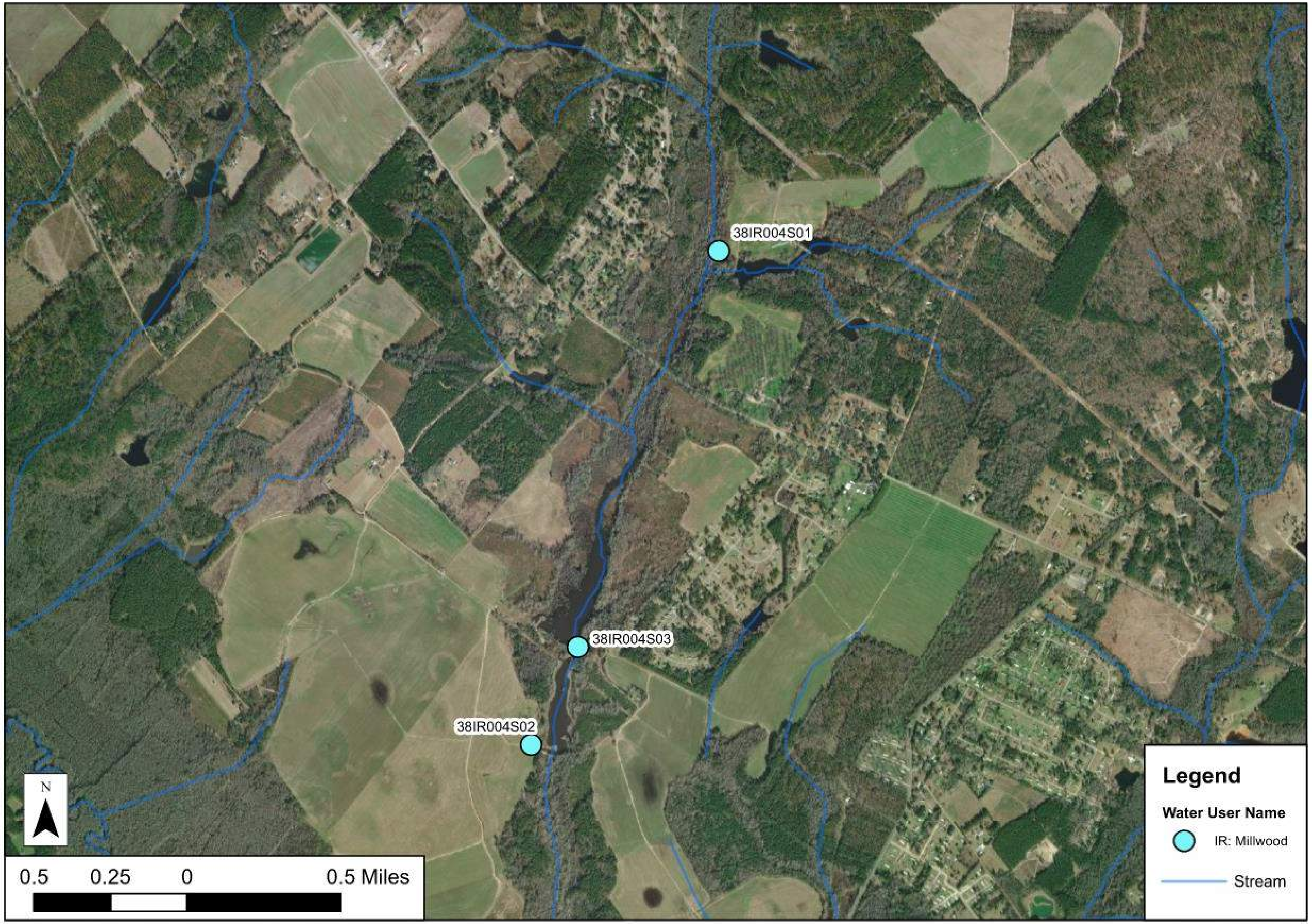


Figure 4
Agricultural Users with Modeled Shortages, Titan (3/3)



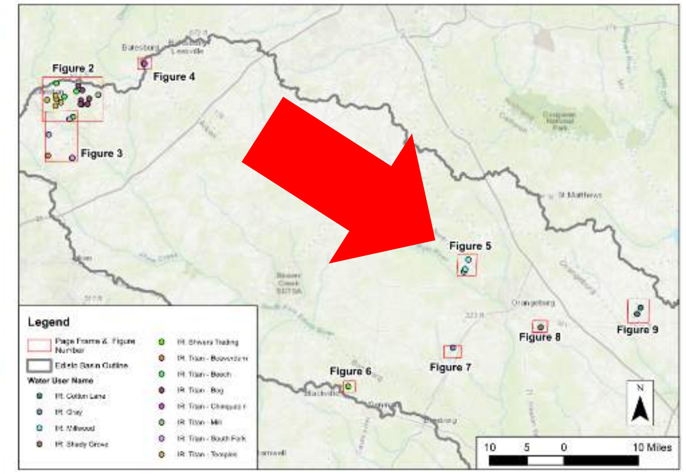


Figure 5
Agricultural Users with Modeled Shortages, Millwood

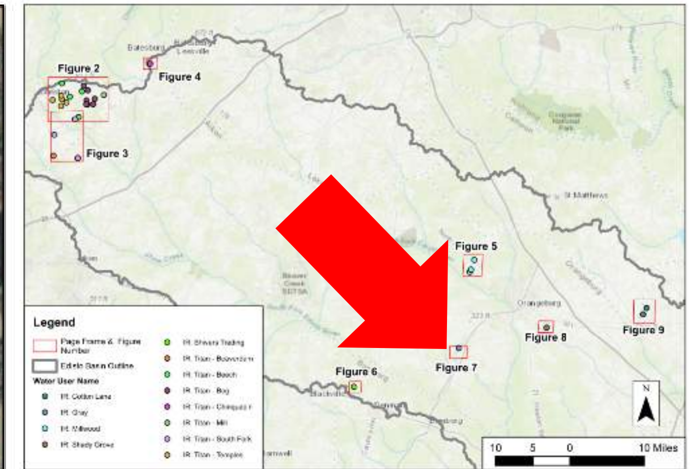
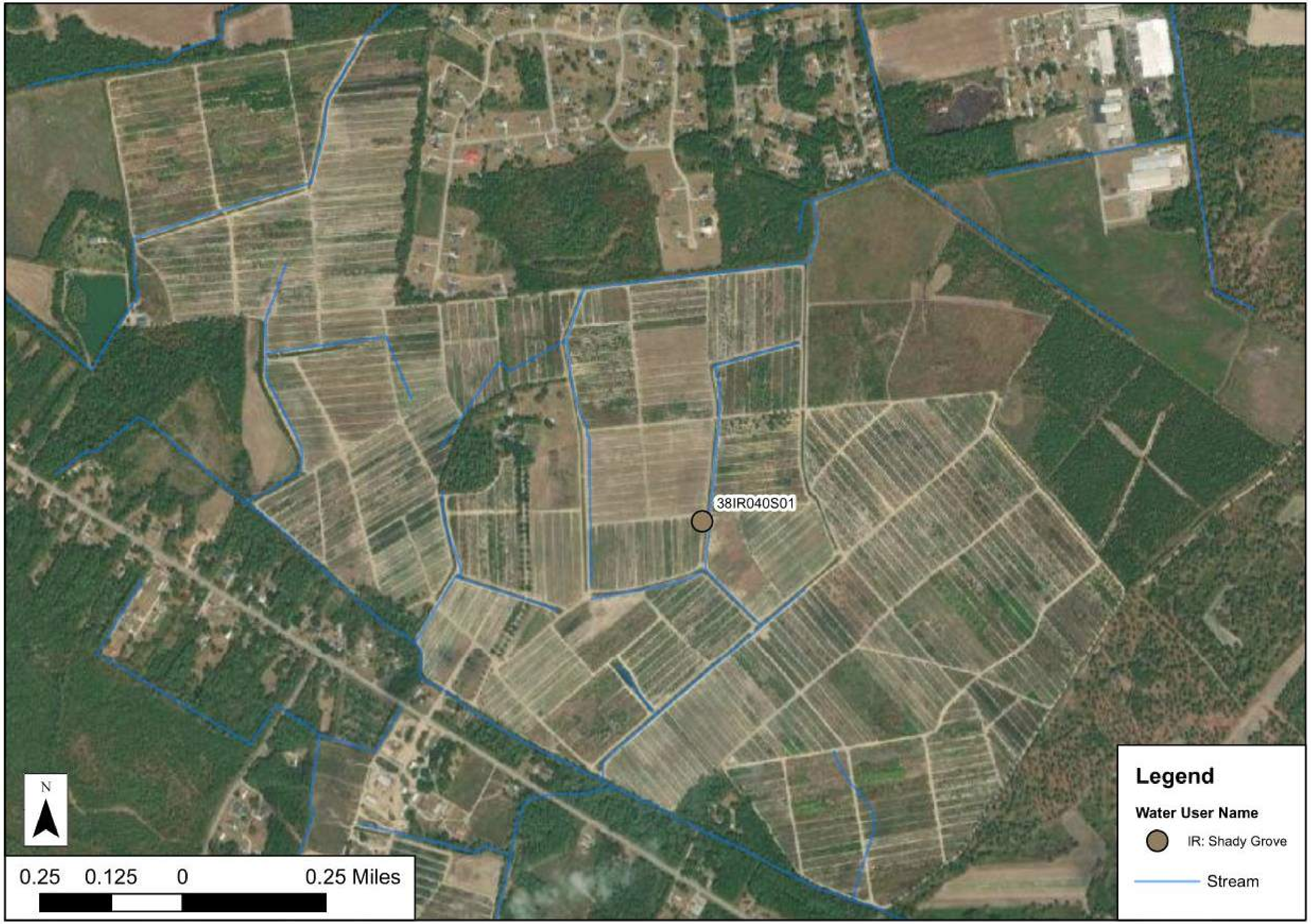


Figure 7
Agricultural Users with Modeled Shortages, Gray



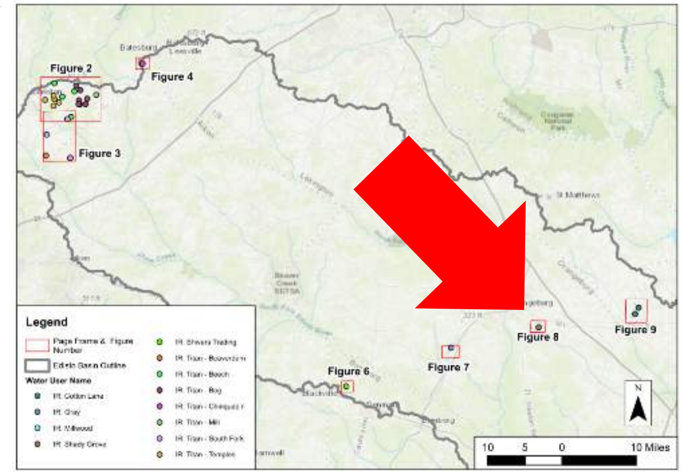


Figure 8
Agricultural Users with Modeled Shortages, Shady Grove

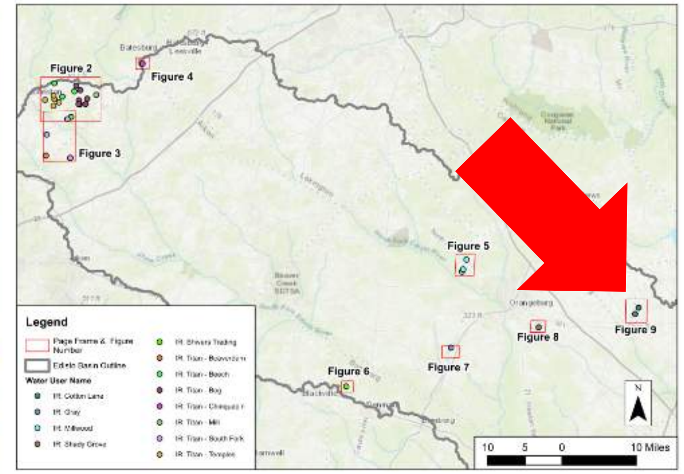


Figure 9
Agricultural Users with Modeled Shortages, Cotton Lane

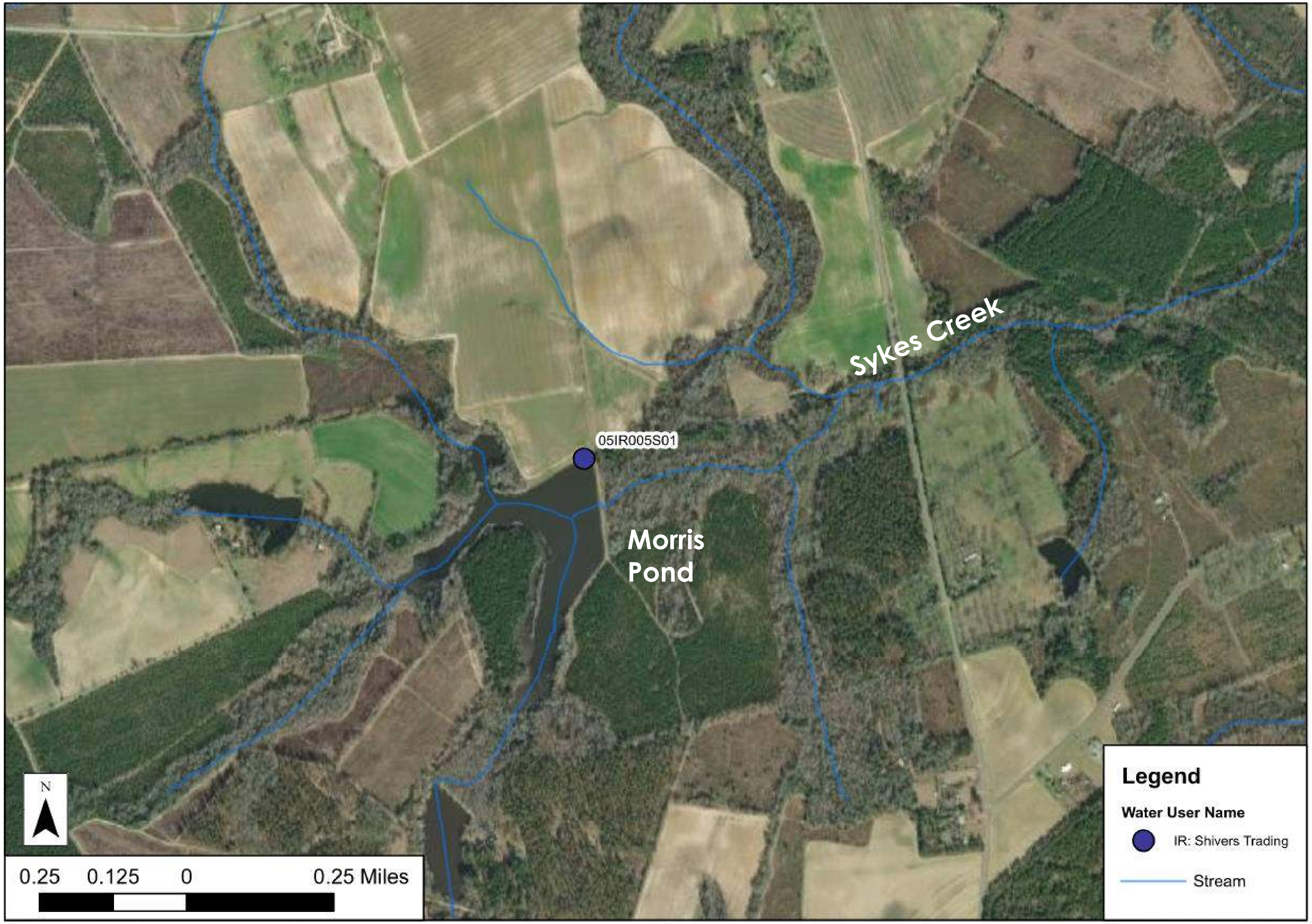
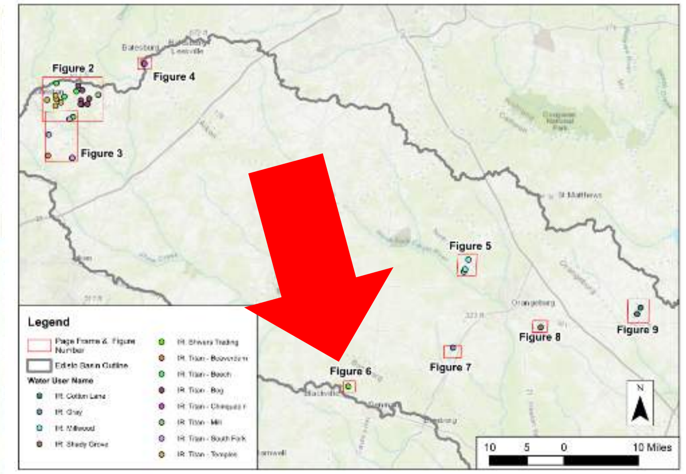


Figure 6
Agricultural Users with Modeled Shortages, Shivers Trading



Morris Pond

- 23 Acres
- Provides an estimated 53 million gallons storage at normal pool

Morris Pond on Sykes Creek

Drop Inlet with a low-level valve

Outlet to Sykes Creek

Photos taken August 24, 2017

Morris Pond on Sykes Creek

Three SWAM model simulations performed to understand how storage plays a role in reducing or eliminating modeled shortages

SWAM Model Simulation	Annual Demand (MGD)	Modeled Storage (MG)	Average Shortage[1] (MGD)	Maximum Shortage (MGD)	Frequency of Shortage
1. No Morris Pond	0.23	0	0.133	0.40	19%
2. With Morris Pond based on initial estimate of existing storage	0.23	30	0.128	0.40	2%
3. With Morris Pond at maximum yield capacity	0.23	70	0	0	0%

Actual storage at normal pool was estimated at **53 MG** for previous inundation mapping by DHEC

Observations

- Existing impoundments on the second, third and fourth order streams provide storage to reduce, and in potentially eliminate the modeled shortages of **existing Ag water users**.
- Small impoundments may be an effective means to eliminate or reduce shortages for **new surface water withdrawals** that are located on the small, second, third and fourth order streams which experience low flows during extended dry periods.
- The cumulative impact of the many but relatively small impoundments on downstream, mainstem flows is unknown.
  - Evaporative losses from impoundments will reduce flows.
  - During the transition from normal to low flow periods, there may be lower mainstem flows because of these impoundments.

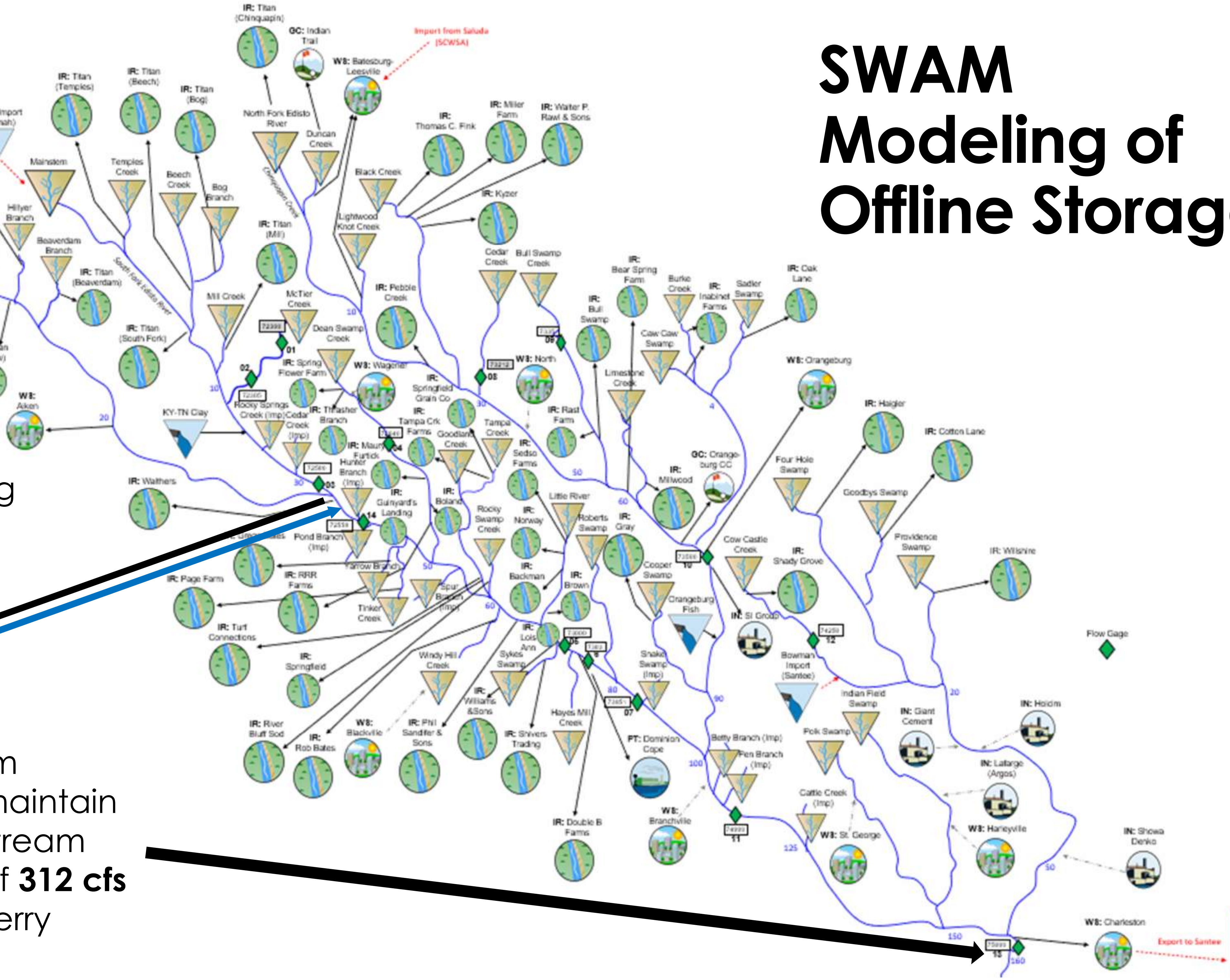
SWAM Modeling of Offline Storage

- Simulated conceptual offline storage, with diversion from the South Fork Edisto River (Mainstem), below Shaw Creek
- Diversions occur during above average flow conditions (flow > mean)
- Storage releases to augment low flows at Givhans; minimum instream flow target of **312 cfs**
- Simulated a range of hypothetical storage capacities, using the 2070 High Demand Scenario:
    - From **340 million gallons** (approximate volume of Mason Branch Reservoir [aka Aiken Reservoir] which covers 85 acres)
    - To **50 billion gallons** (~1/10 the size of Lake Marion)

SWAM Modeling of Offline Storage

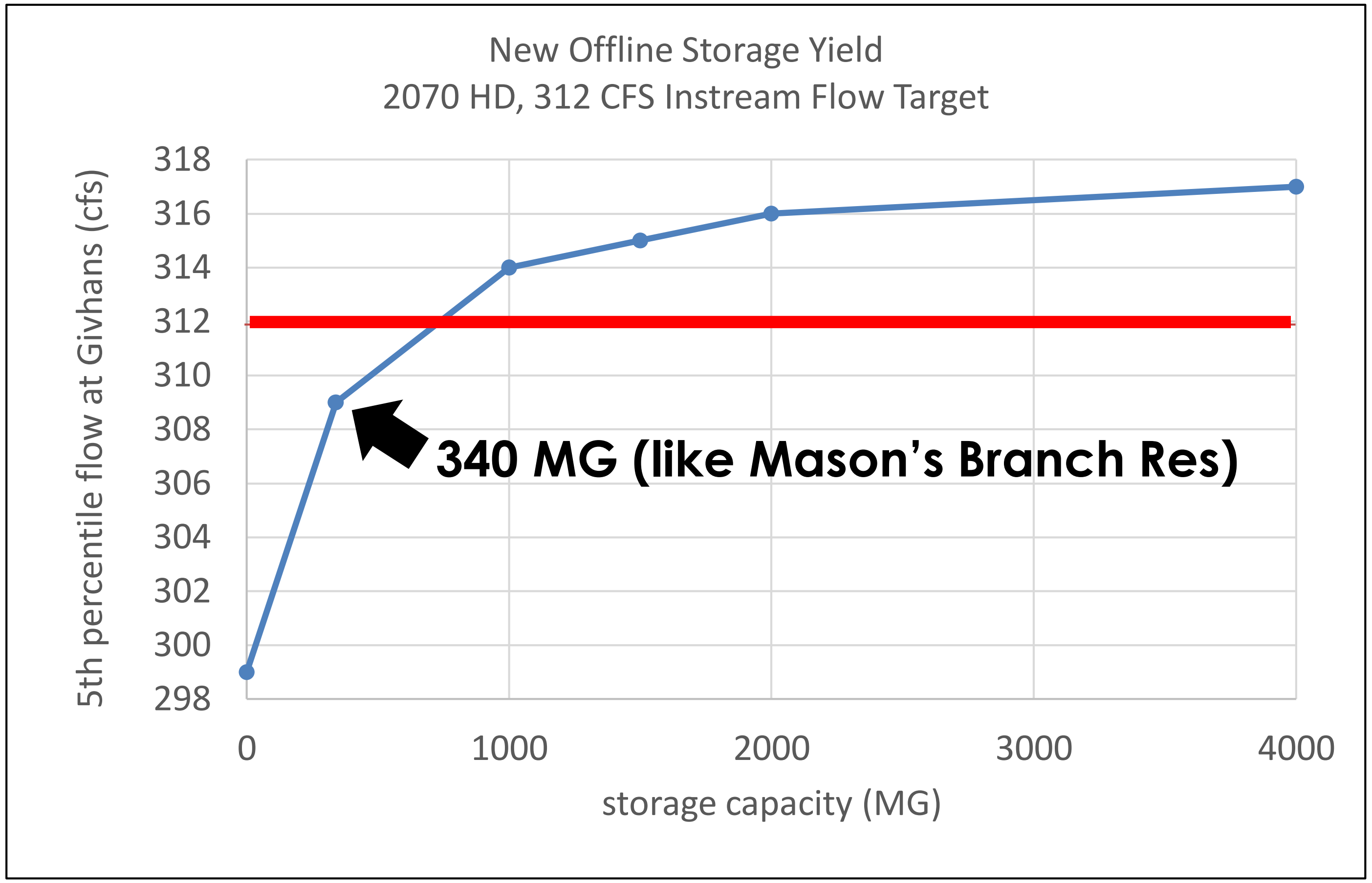
Diversions occur during above average flow conditions (> mean)

Releases from reservoir to maintain minimum instream flow target of **312 cfs** at Givhans Ferry

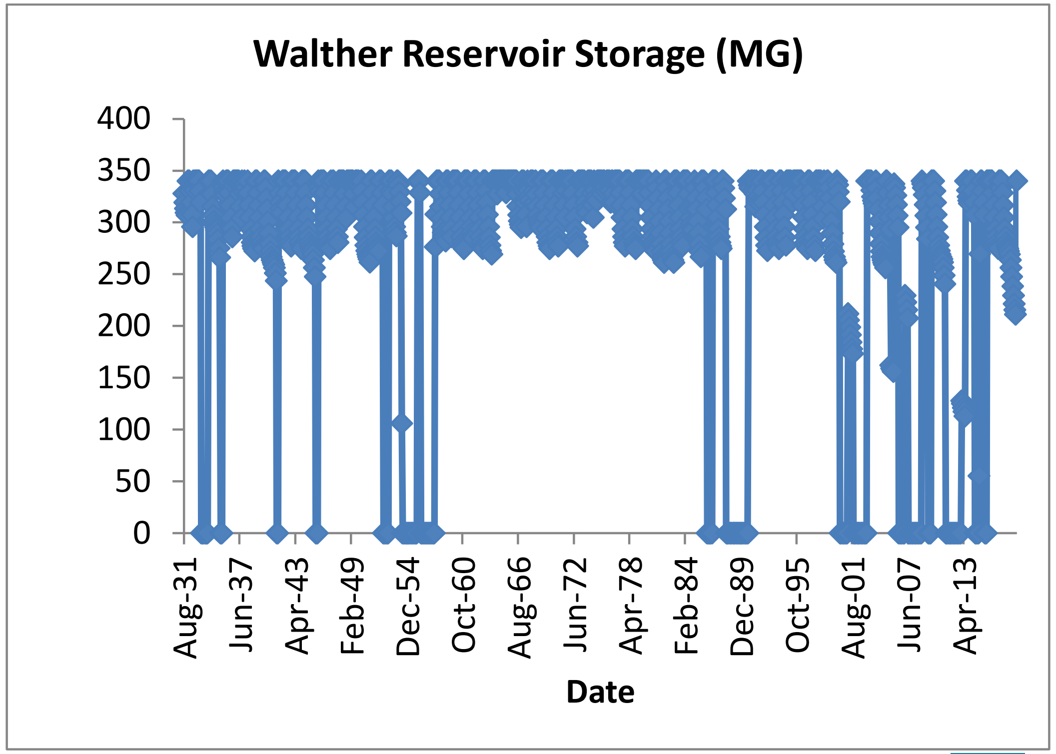


SWAM Modeling of Offline Storage: Results

< 1,000 MG capacity needed to increase 5th percentile flow at Givhans to **312 CFS**



Storage Plot for Simulated 340 MG Reservoir



SWAM Modeling of Offline Storage: Results

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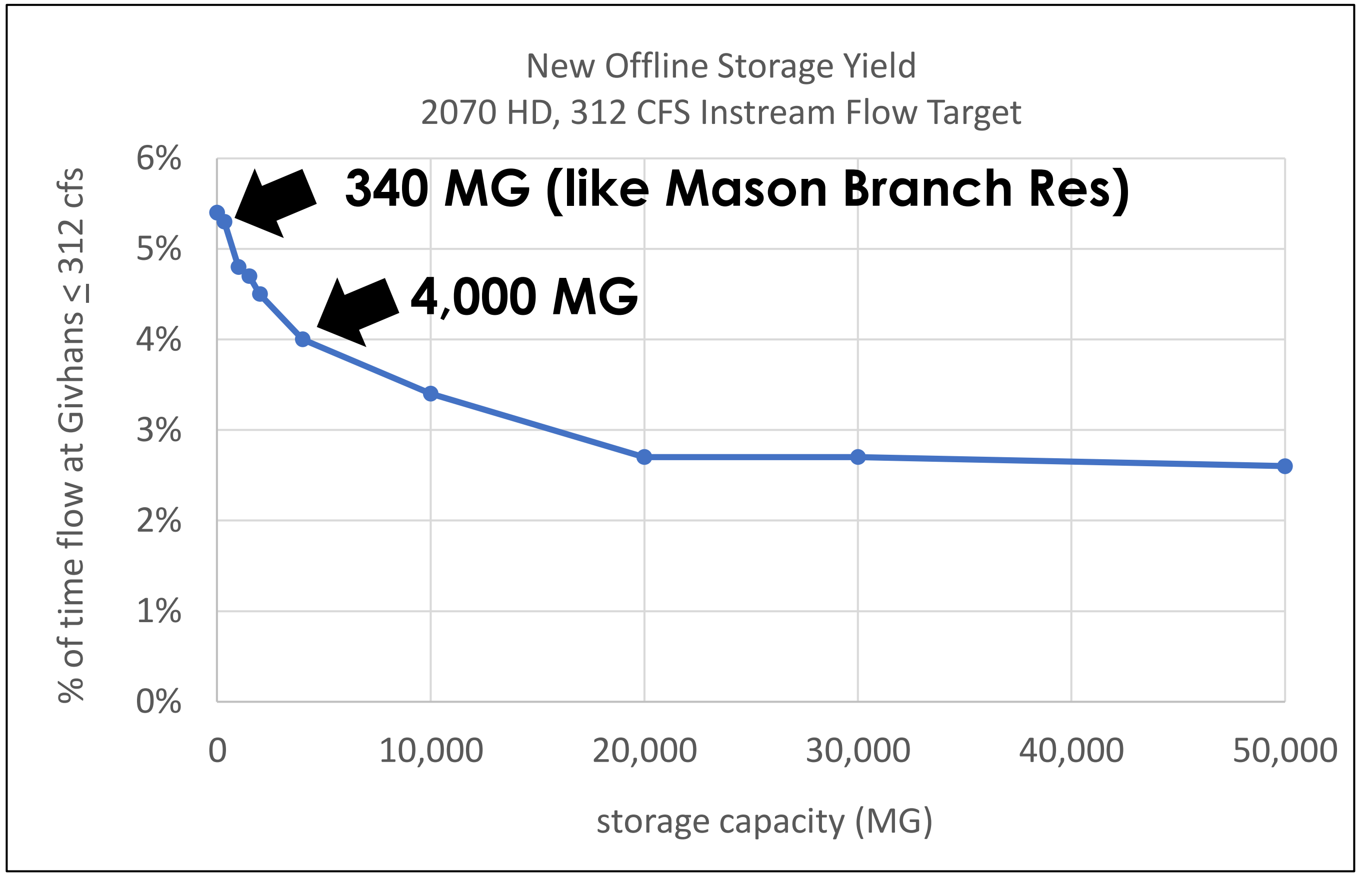
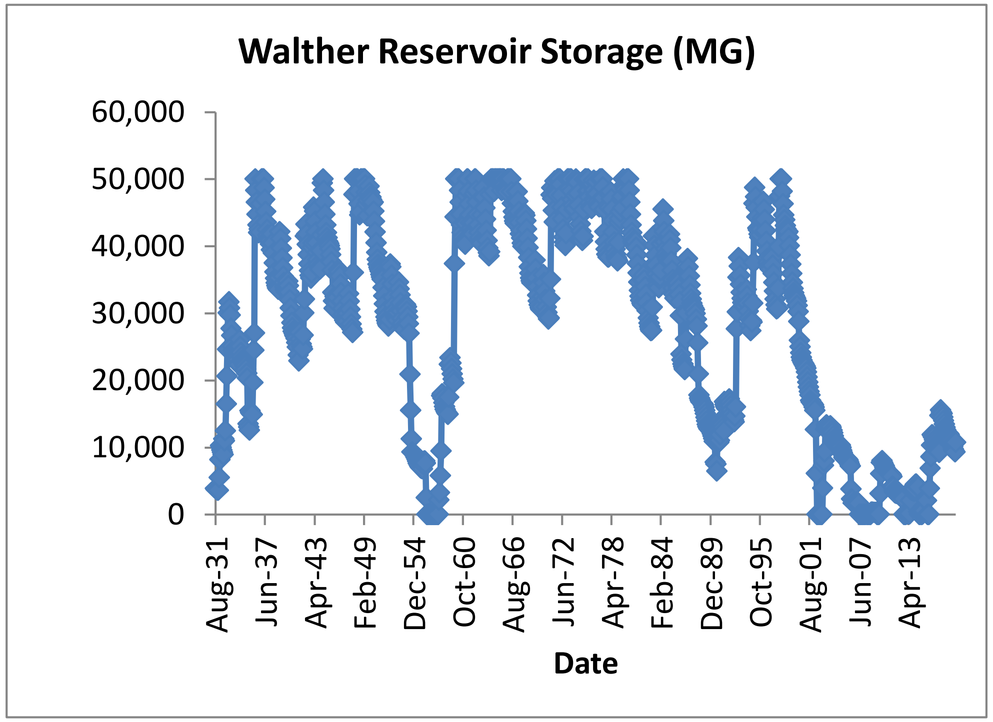


Storage Plot for Simulated 50,000 MG Reservoir



Observations

- Releases from an offline impoundment that is roughly the same size as Mason Branch reservoir (340 MG) could increase 5th percentile flows at Givhans by 10 cfs (from 299 to 309 cfs)
- Even with releases from a 50 BG reservoir, flows at Givhans Ferry would still drop below 312 cfs approximately 2.6% of the time