Voluntary Irrigation Monitoring ➔ River Basin Planning

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Rationale for Flint Basin Planning

ACT/ACF Compact Negotiations pointed to agricultural withdrawals as the largest unknown among Flint River water users in the ACF.

How could Florida agree to a formula when the extent of Ag withdrawals estimated by Georgia EPD was so great and so uncertain.

The Problem

- Georgia lacked adequate data on extent and magnitude agricultural irrigation
  - Not a problem in 1988 when ag permitting started.
  - ACF lawsuits ➔ Comp Study➔ Compact ➔ Allocation negotiation.

Georgia lacked adequate data

- Irrigated area estimates varied widely
  - **USDA-ERS: 700,000 ac**
  - **CES surveys: 1,500,000 ac**
  - **EPD permits: 2,100,000 ac**
- Water use all over the map
  - **EPD permits: 40 in/y**
  - **CES survey: 7 to 10 in/y**
  - **Ga advisors: 12 to 21 in/y**

Resolve to get the facts

- River Basin Water Conservation & Development Plan
  - Monthly irrigation amounts
  - Accurate measure irrigation area
  - Appraisal of GW contribution to river flow

  - Meantime Freeze on permits (now 7 years)

Early missteps

- Some early efforts left out farmer
  - Bring in experts
  - Computer crop models
    - What they should be doing not what they were doing
  - Use drive-by surveillance
  - High elevation aerial imagery to measure irrigated land
    - Last would have been reasonable estimate but in Georgia pivot fields aren't round, many systems are mobile, and non-irrigated areas aren't brown
- How do you enable farmers to become involved, not force?

Involving the water users

- How do you enable farmer involvement?
  - Ask them about data sharing
  - Explain reasons, previous attempts
  - Find out what willing/not willing to do
    - Won't share yields
    - No reporting of individual water use
    - No reporting of names of participants
    - Two way hold-harmless agreements for site visits
    - Individual farmer decide on notification before visits
  - Keep them informed
  - Involve them in interpretation and application of the data

Ag Water Pumping – measuring application

- Random selection of 2% statewide (7% in Flint Basin) using permit numbers
  - Stratified sampling (source, county, watershed)
  - System types & major crops
- Voluntary participation
- Site characterization and flow test involving farmer
- Monthly visits to read meters, note field division, crops present, and water distribution

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Ag Water Pumping

- 5-6 y of monthly visits; system, crop, & field observations, and water flow measurement
- 800 separate irrigation systems/fields
- ¾ million miles, millions of data records

- Yield = monthly water application depths

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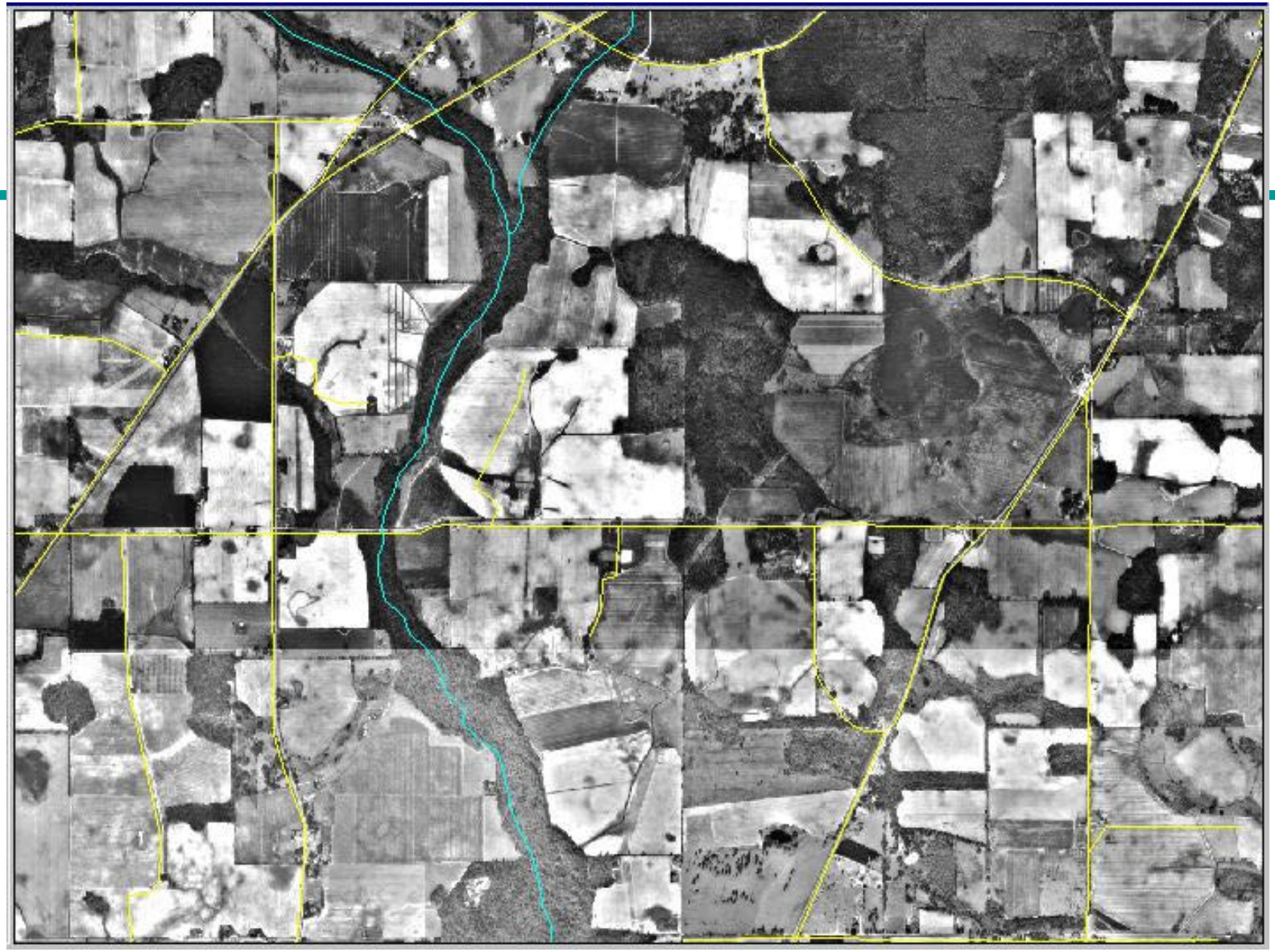
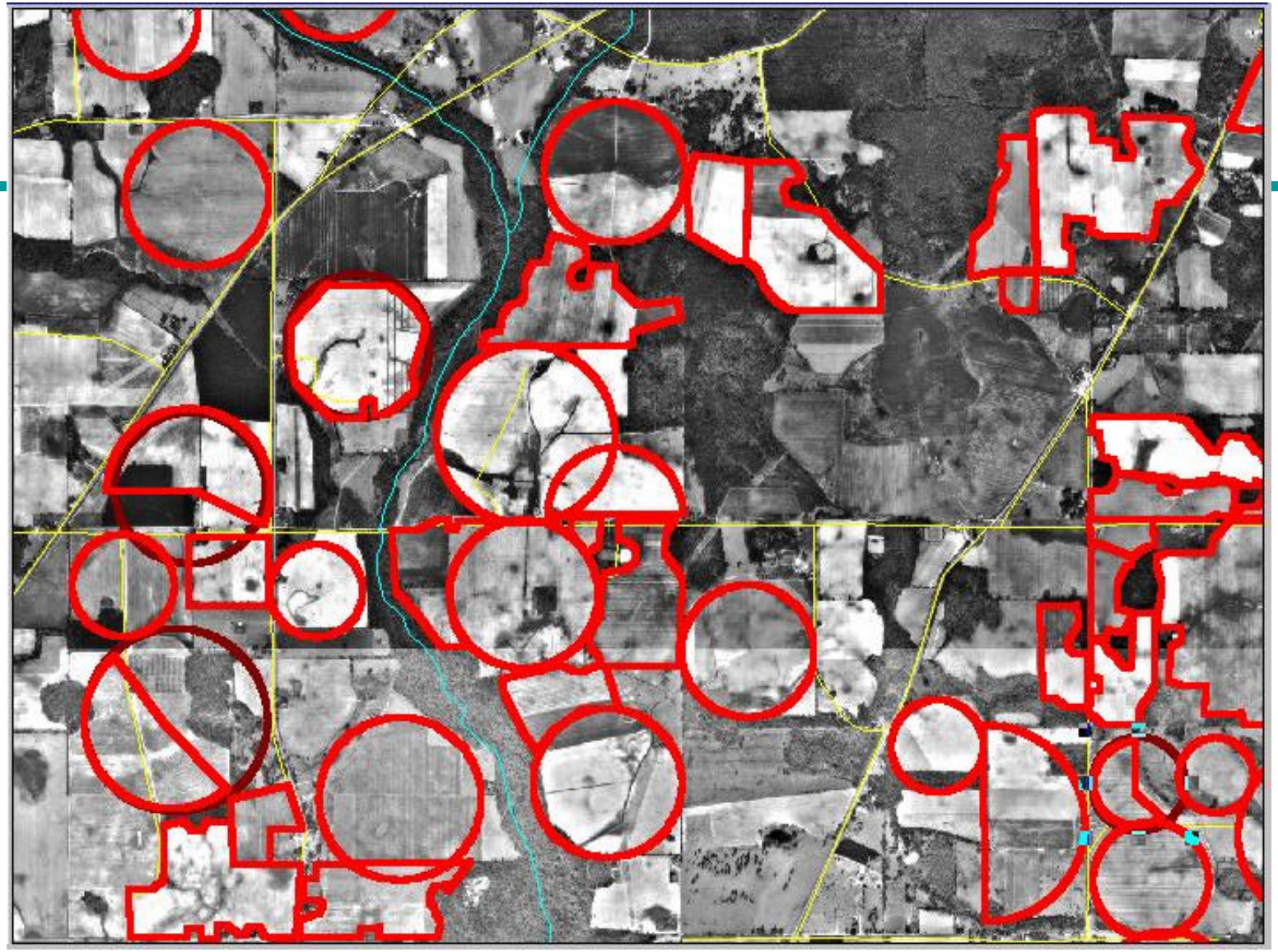
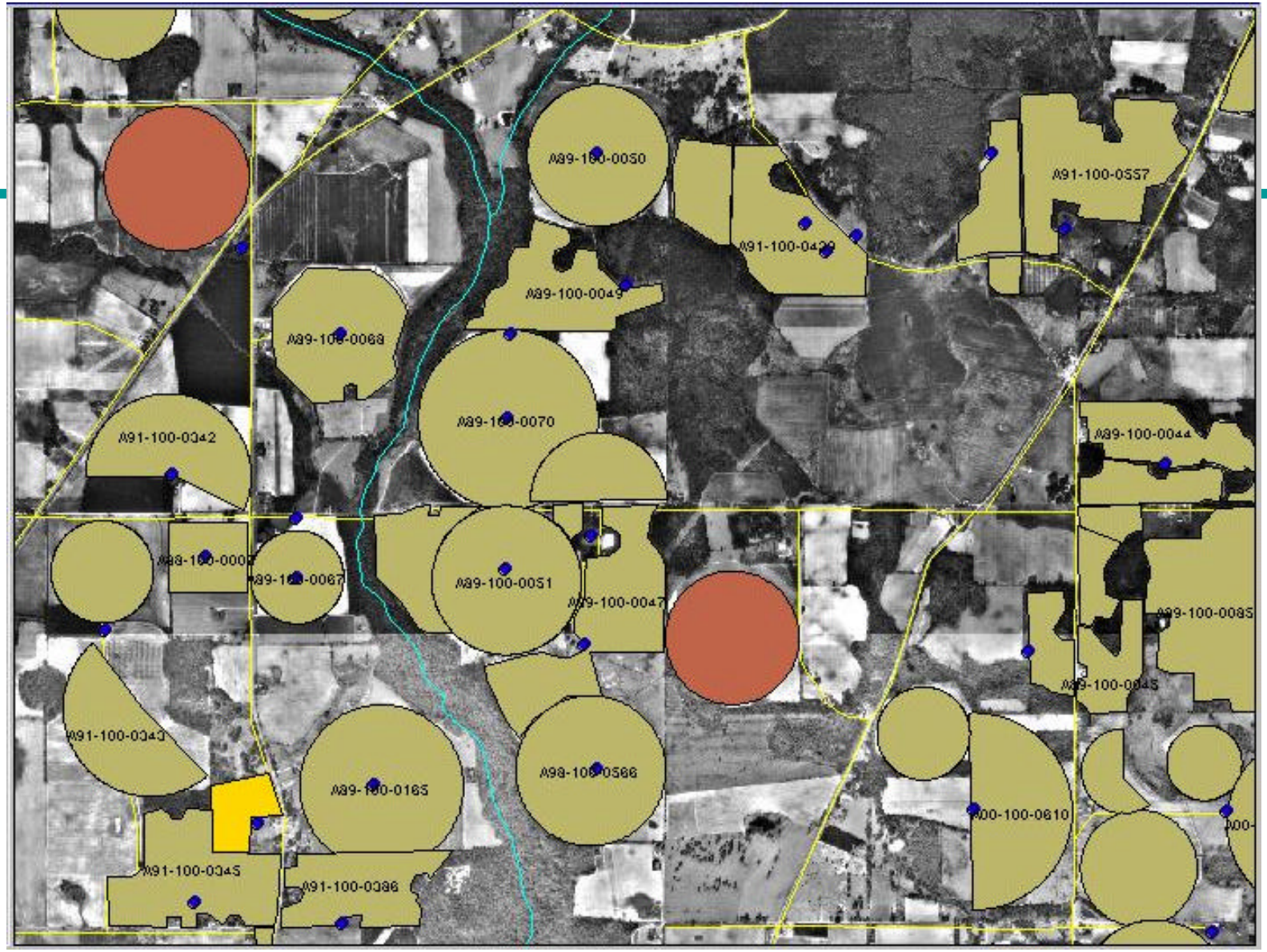
Permit Mapping

- Most people intensive effort.
- Began with four meetings with farm Bureau and other farm groups to explain need, learn their concerns, discern willingness.
  - Convenience to individual
  - Could not be confidential by nature, but EPD must agree not to penalize
  - Wanted something tangible in return – better evidence of permit ownership



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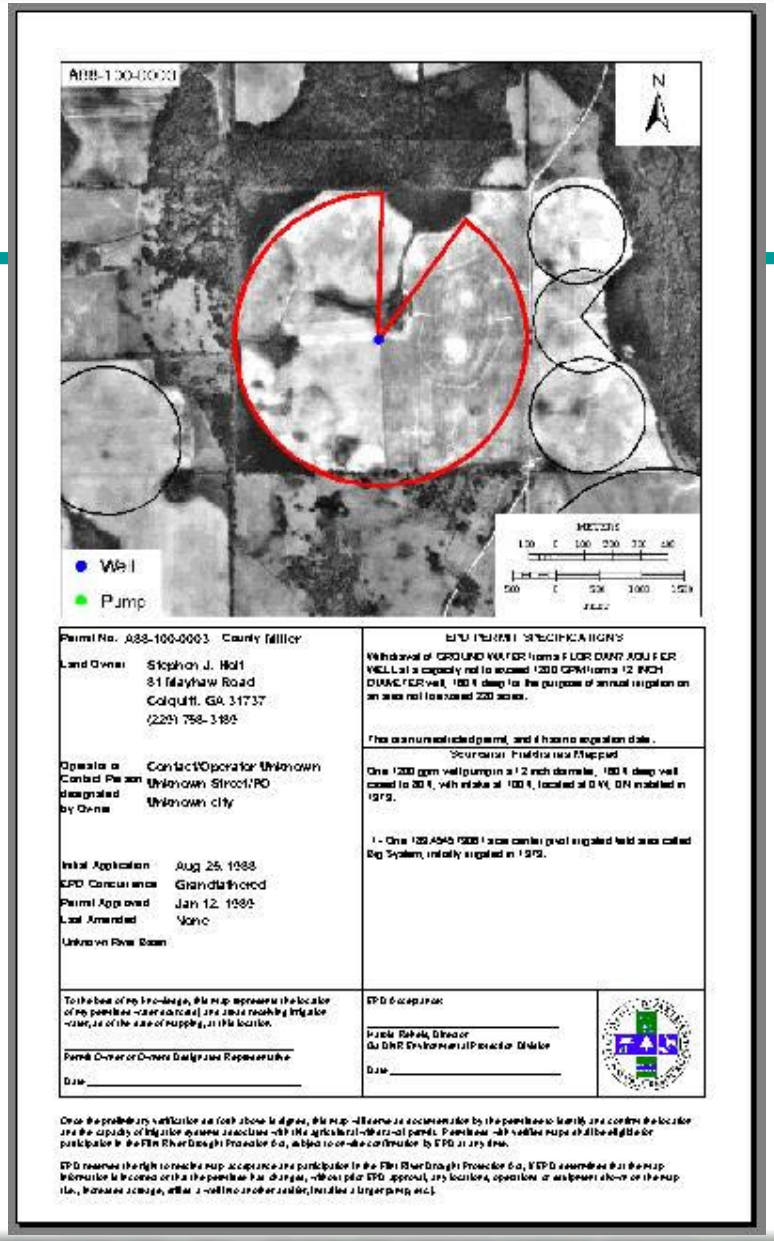


Permit Maps

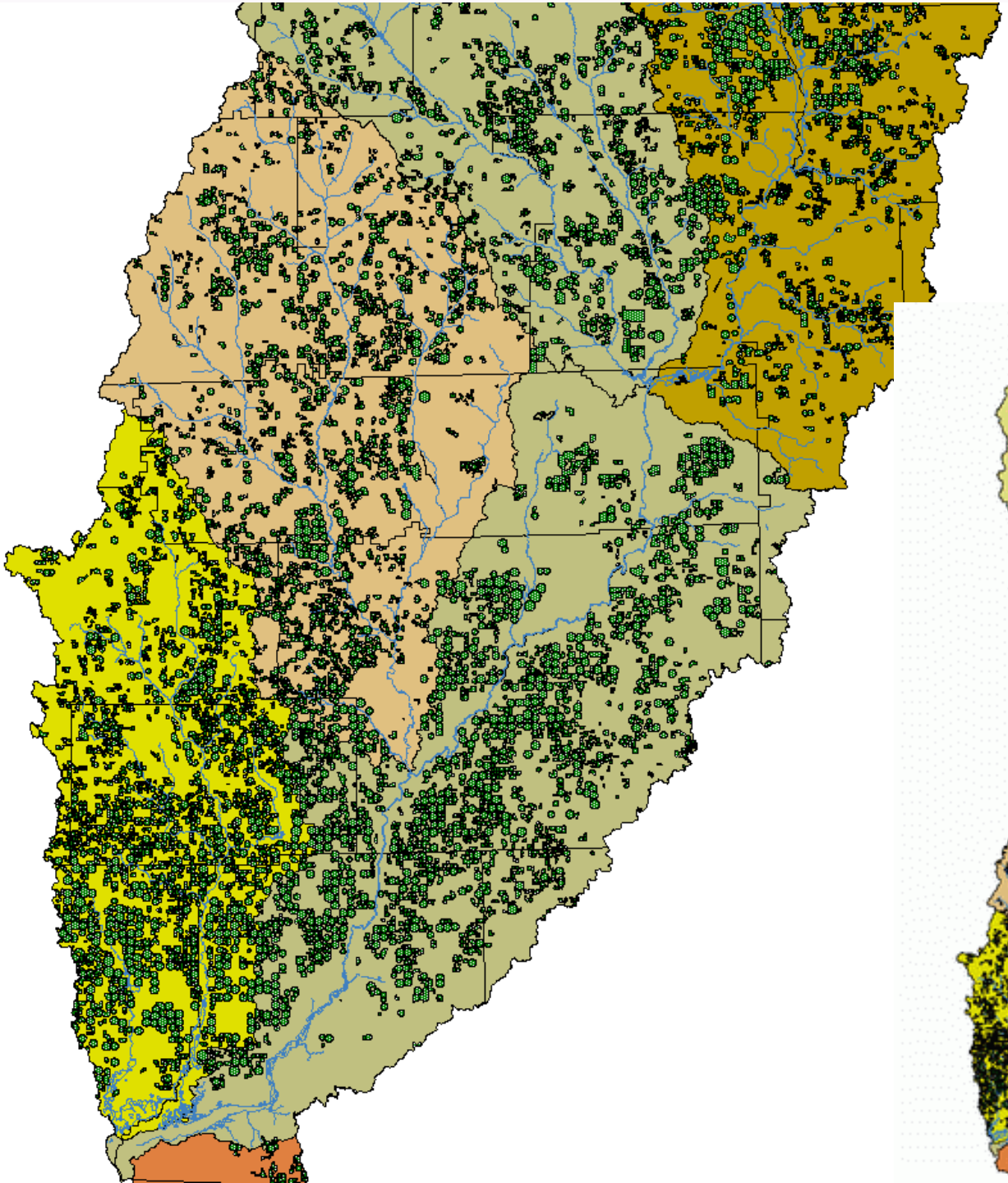
- **Official permit limits**
- **Ownership information**
- **Measured field areas**
- **Source location data**
- **Drawing on Photo & Map**

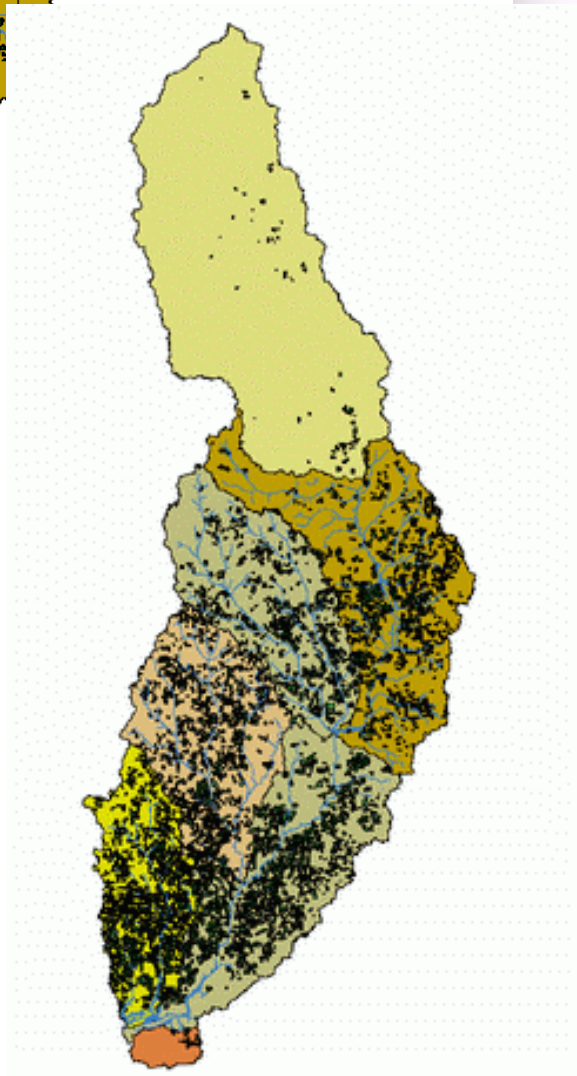
Signed by farmer

Signed by EPD

Irrigation Permit Mapping

- Cooperative Effort
  - Farmers and Landowners of Southwest Georgia
  - J.W. Jones Ecological Research Center
  - University of Georgia NESPAL
  - DNR Environmental Protection Division

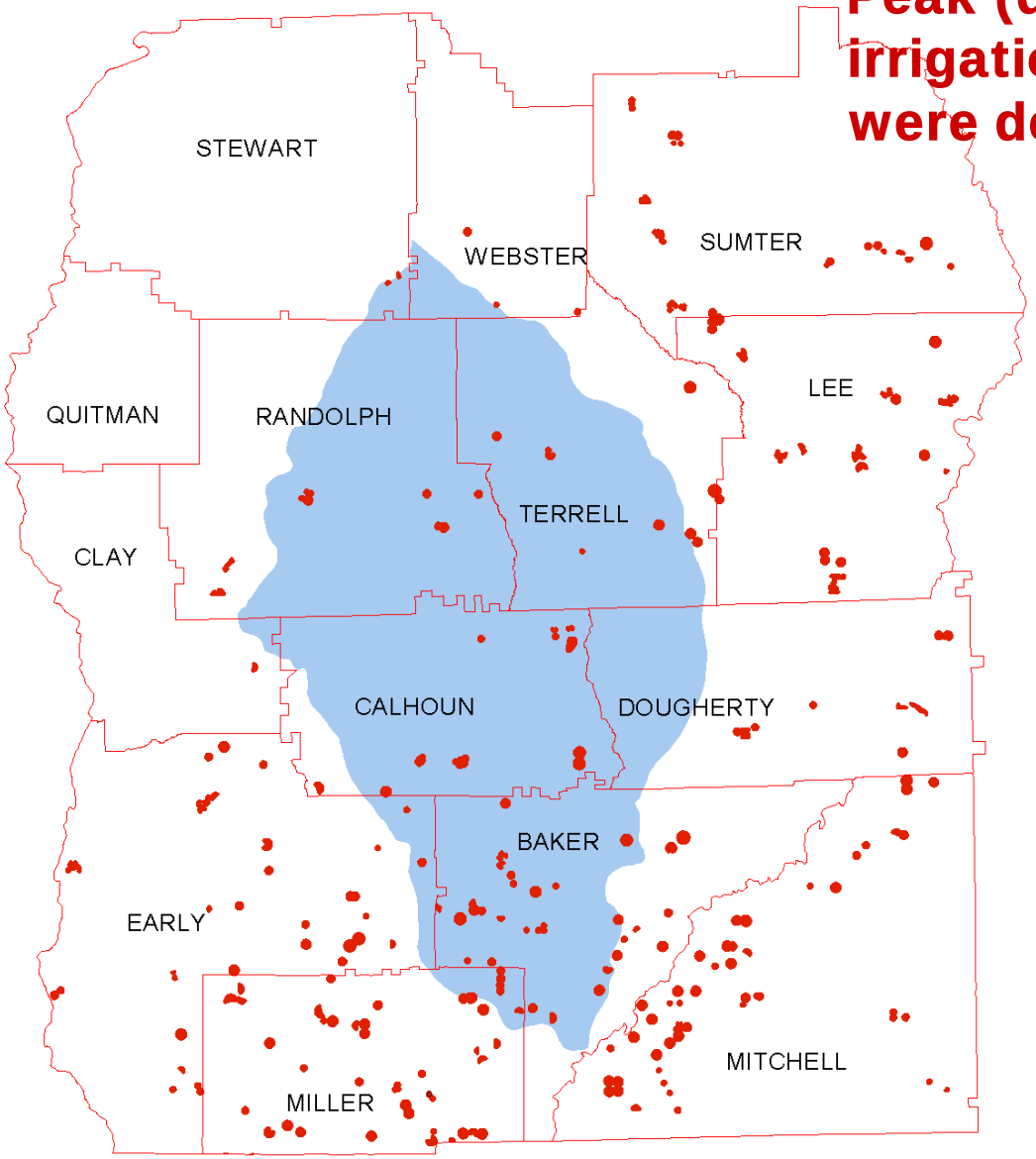




Feeding the models

- Aggregated monthly irrigation depths by source and location
- Aggregate area irrigated by water source and location
- Combine to provide monthly withdrawals for any source
- Driest years on records as well as wet and average.
- Daily hours of GW withdrawal

Ichawaynotchaway Basin
AWP I & II Sites



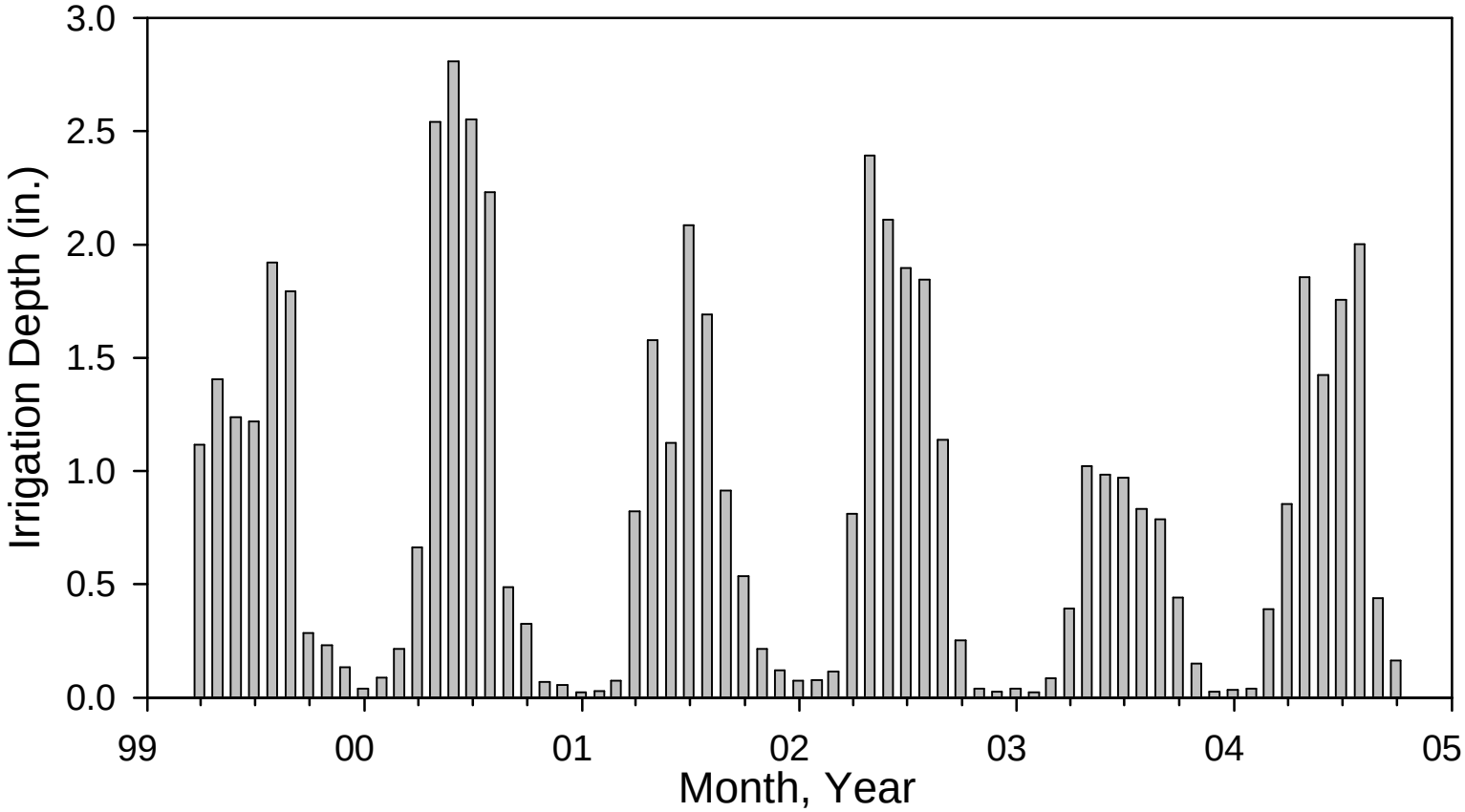
Peak (drought) and average irrigation water use habits were determined by sub-basins

Assume sampled sites are representative (crops, irrigation habits) of what is happening throughout the sub-basin, within water sources.

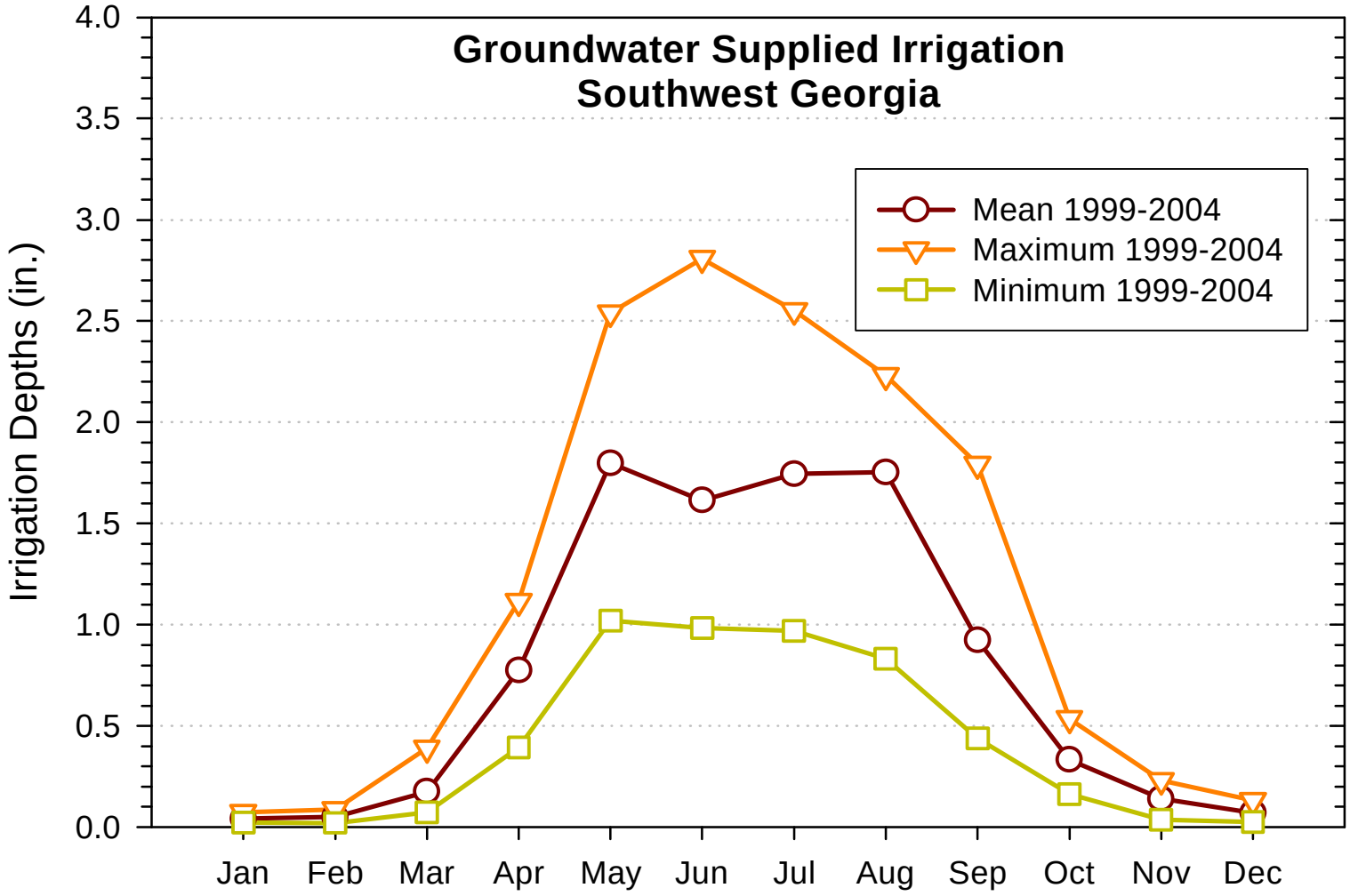
Those at distance from basin will be less representative. Use distance weighting

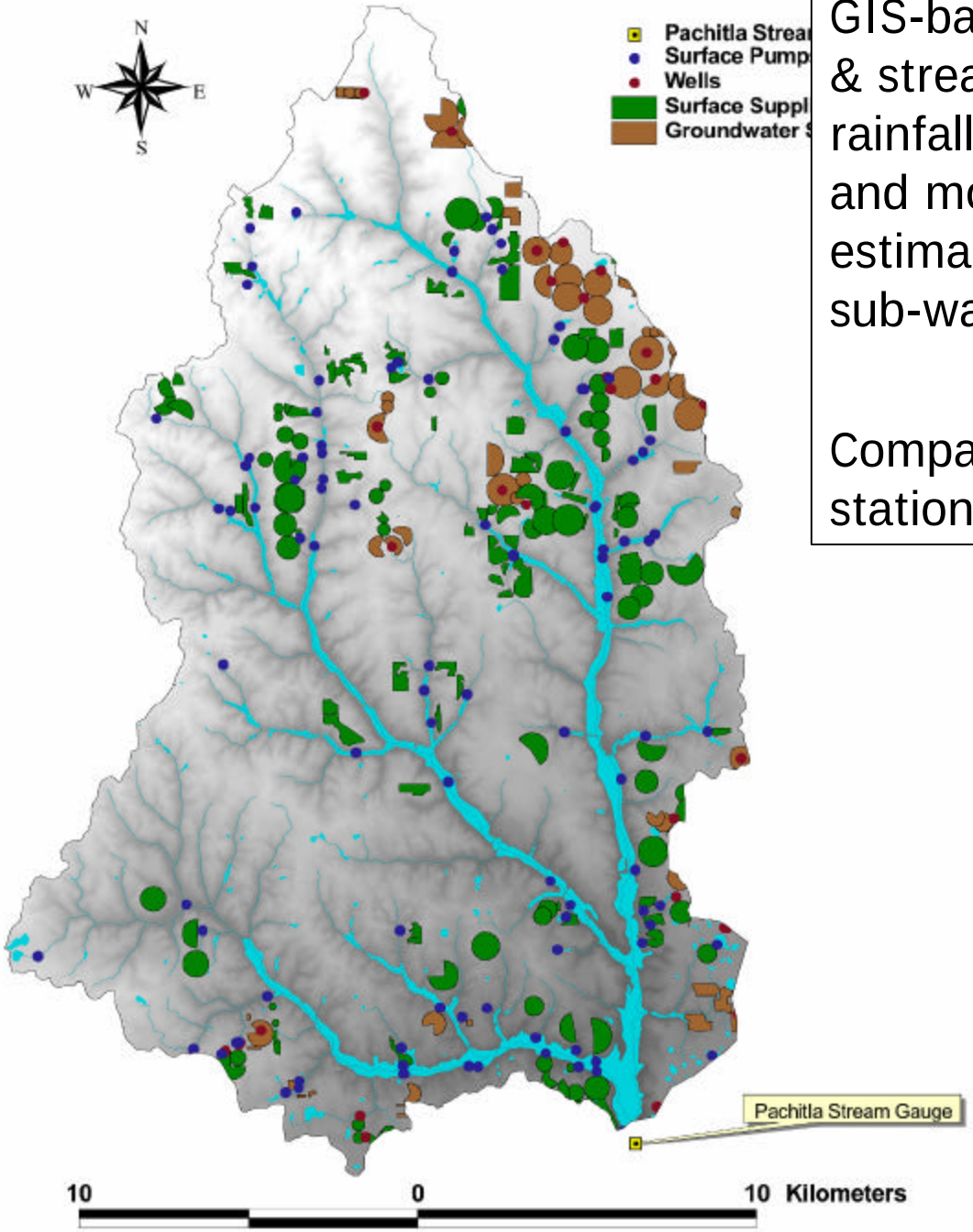
Mean Monthly Irrigation Depths:

Southwest Ga, Groundwater Supplied Systems



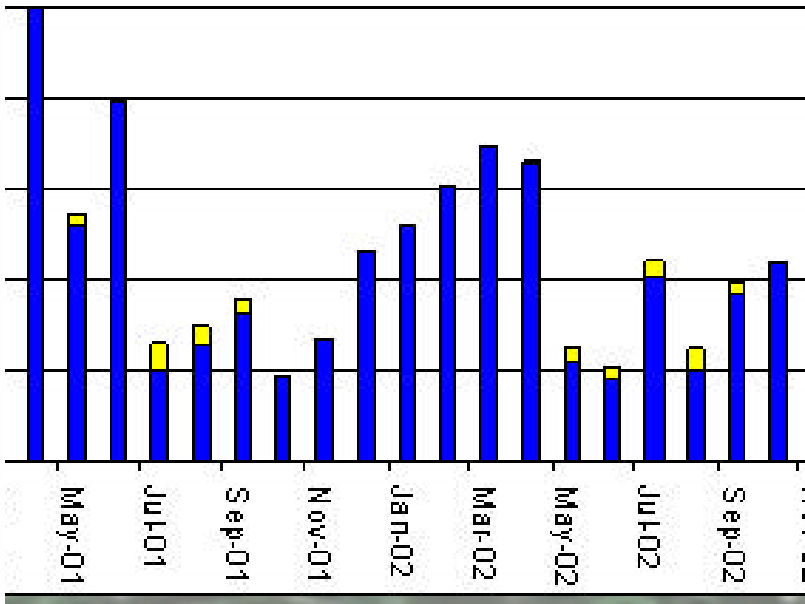
Mean Monthly Irrigation Depth: Extremes





GIS-based surface water models (HSPF) & stream routing model (STELLA) used rainfall records, these irrigation values, and modeled groundwater inputs to estimate streamflow from each HUC12 sub-watershed.

Compared with hydrographs at gauging stations to assess accuracy.



Harsh realities

- With irrigation at present levels
- Found stream segments with problems from either or both SW & GW withdrawals.
- In some streams of basin
  - recession curve steeper (low flow earlier)
  - duration of low flows longer
  - severity of low flows worse

- What do you do about pending and future requests for additional irrigation withdrawals?

Harsh realities

- In years with severe droughts, flows in some stretches were low enough to cause potential harm to threatened and endangered species.

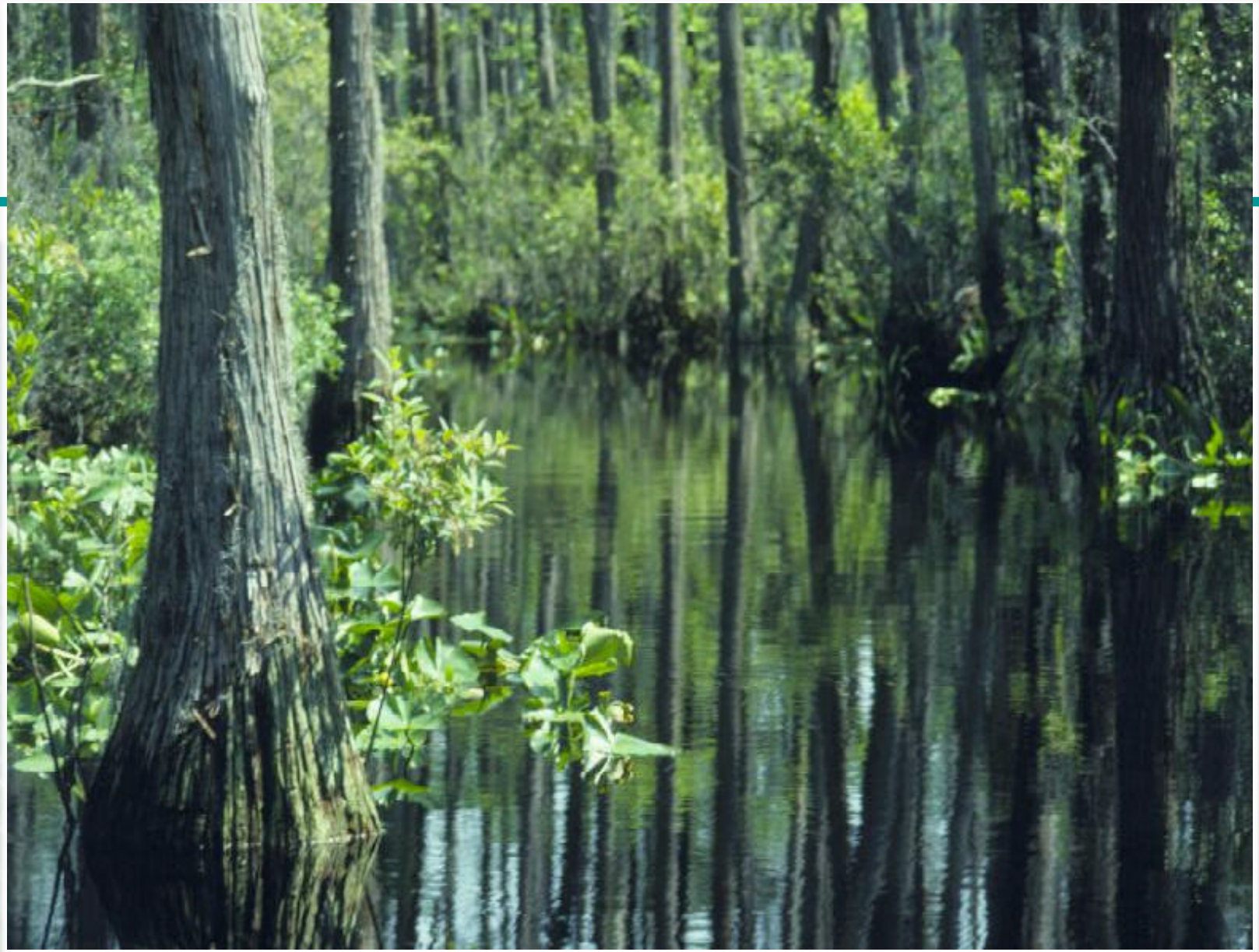
- What do you do with existing & future irrigation withdrawals in drought years?

Stakeholder policy formation

- All this unfolding before sometimes bewildered and recalcitrant
  - Not easy to accept that you son is on drugs or that wife has cancer.
  - No easier to hear that your collective irrigation growth is not sustainable or that, at times, it could be causing harm to others.
- Not clear what course of remediation you have available.

Stakeholder policy formation

- Generally accepted pieces of the study, especially those they had an active part in collecting.
  - Harder to accept the models, or even the evidence in stream gauges and well depth sensors located miles from them.

Solutions

- Flint River Basin Water Conservation & Development Plan
  - Stakeholder did adopt a series of recommendations for permitting reform and recommendations for reporting and conservation.
  - Recommended immediate changes in drought management, the FRDPA.
  - Also made a number of recommendations for regulatory reform, actions that will be taken up in future legislative sessions.
- EPD Implementation of Plan
- Or can they?