



Irrigation Water & Power Development in the East

Dr. Jim Hook

National Environmentally Sound Production
Agriculture Laboratory

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Why Irrigation in the East?



Why Irrigation in the East? Fundamentally

$$\text{Yield} = a * \text{Transpiration} - b$$

Why Irrigation in the East?

Fundamentally

- Slope & length vary, but fundamental link exists, despite our best bioengineering.
 - Have not been able to uncouple evaporative cooling from biochemical efficiency of sunlight conversion
 - Have not uncoupled stomatal opening (and concomitant water loss) from entry of CO_2 for fixing into carbs & yield
- Plants need to evaporate or “consume” water
- Rainfall doesn't sustain the optimal rate of transpiration

Why Irrigation in the East?

Farmer Perspective

1. Reduction of economic risk

- Risk of low prices
- Risk of crop failure
- Farmers & backers unwilling to accept the risk
- Much of expansion began with high crop prices (not seen since)

Why Irrigation in the East?

Farmer Perspective

2. Competition

- Once irrigation began non irrigators became more vulnerable to economic failure
- Couldn't count on low yields driving up prices (US & worldwide marketing negating local impacts)

Why Irrigation in the East?

Farmer Perspective

3. Multiple efficiencies

- Land area
- Fertilizer, agrichemical, fuel, labor, etc. all used more efficiently

Why Irrigation in the East

Community Perspective



Irrigation: Use of a Natural Resource to Produce Income for Individual and Region

Why Irrigation in East Community Perspective

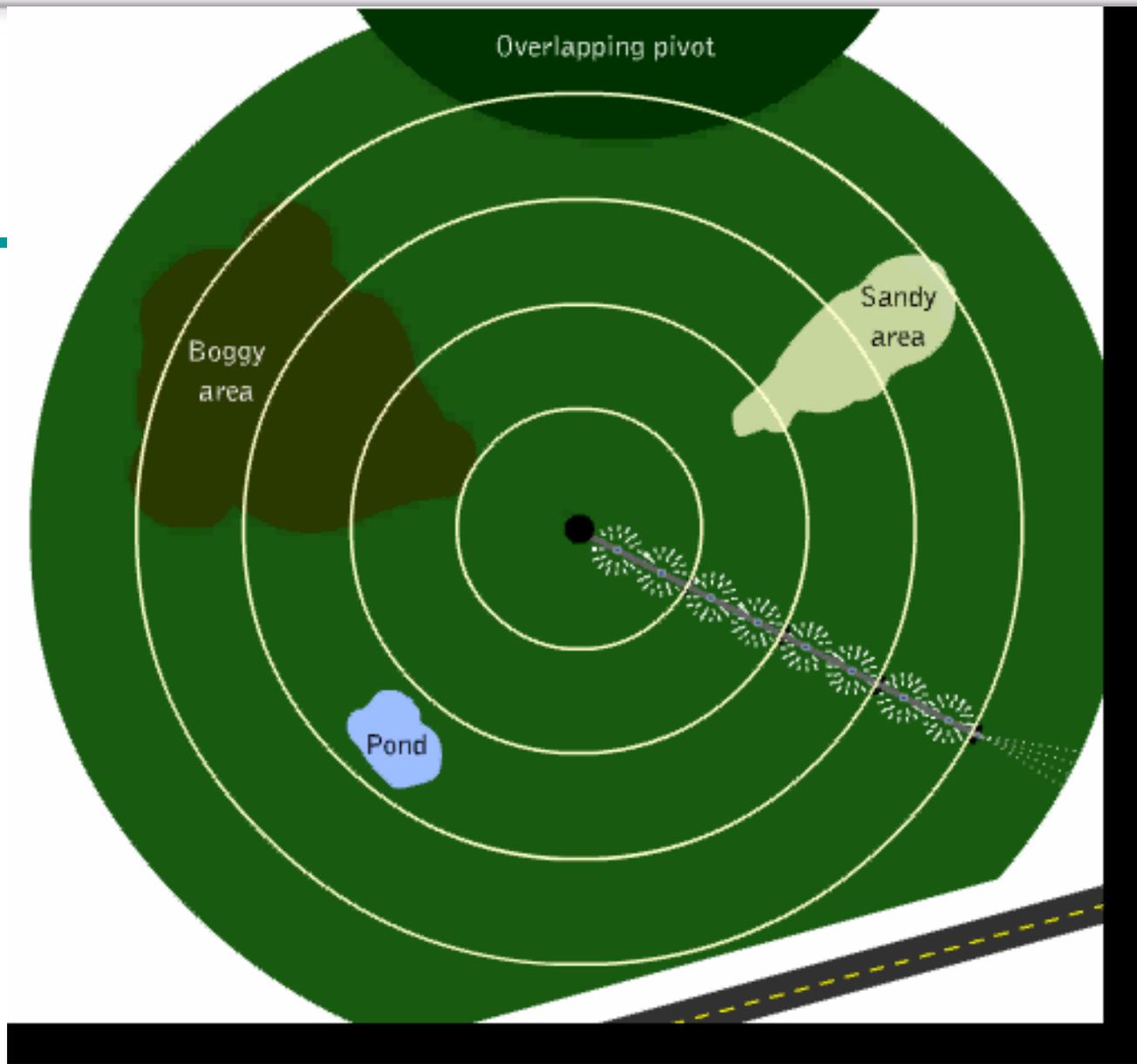
- Any action that reduces irrigation withdrawals, except conservation results in economic loss

Irrigation Infrastructure in the East

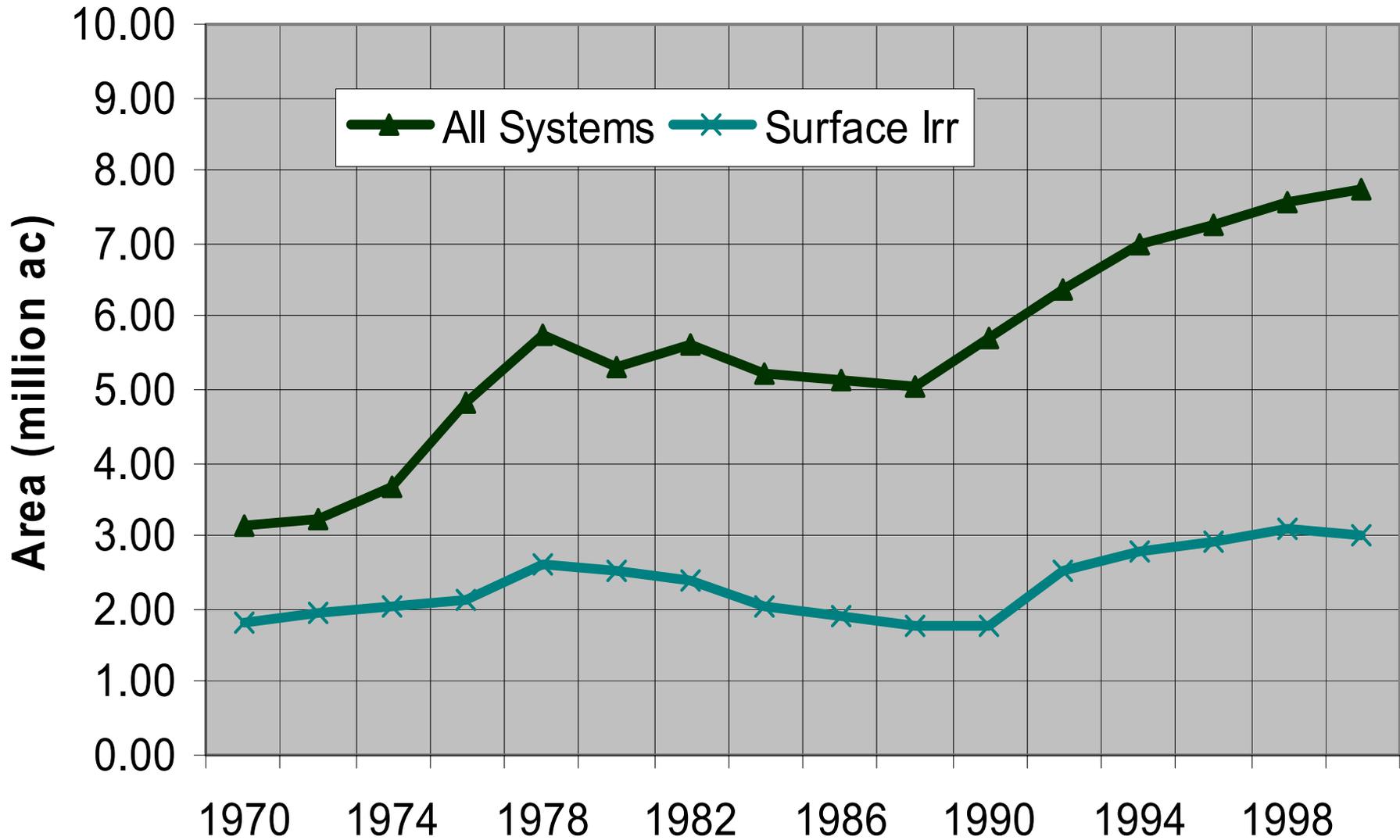
- Initially Gravity Systems
- Sprinkler - Center Pivot
- Drip



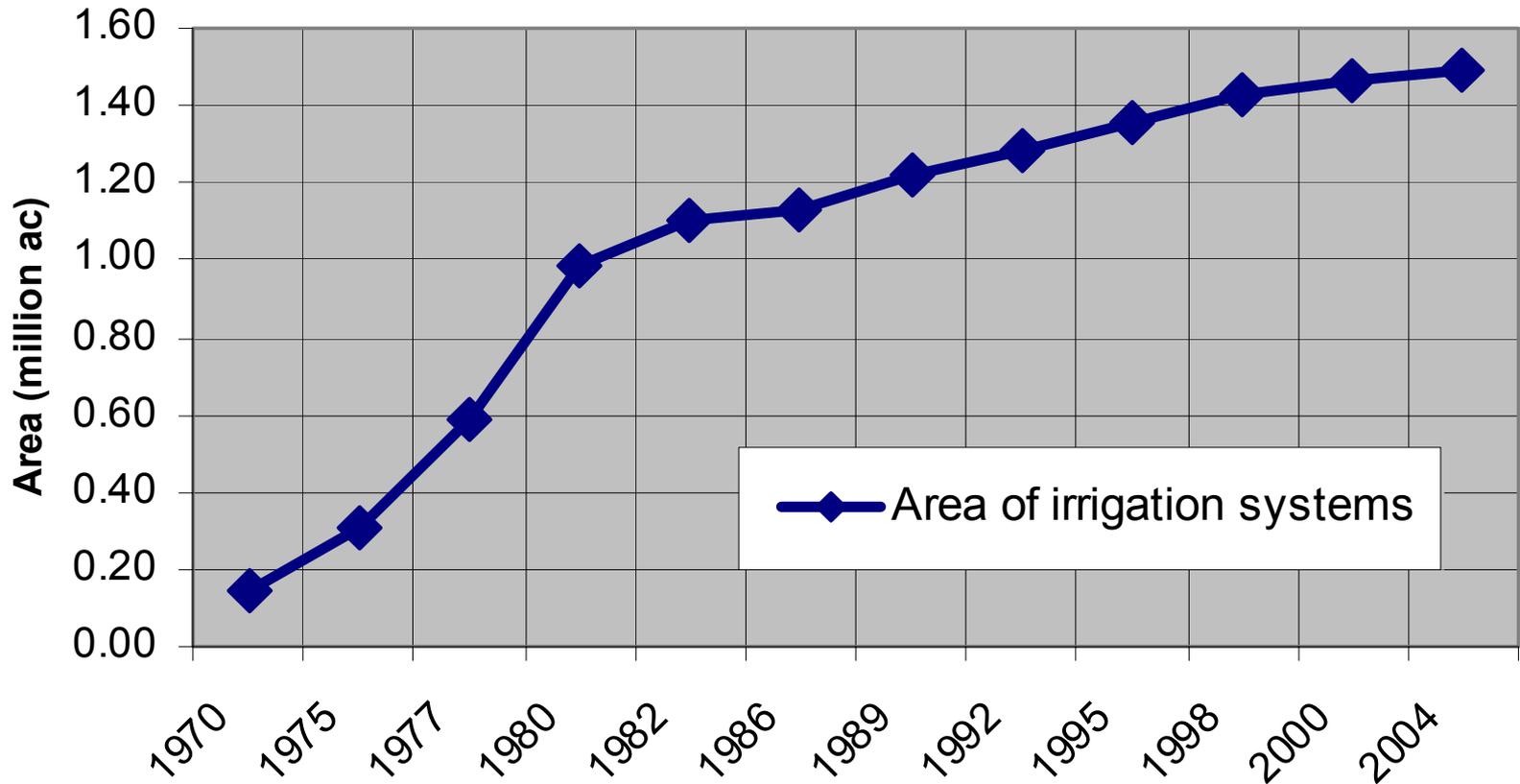


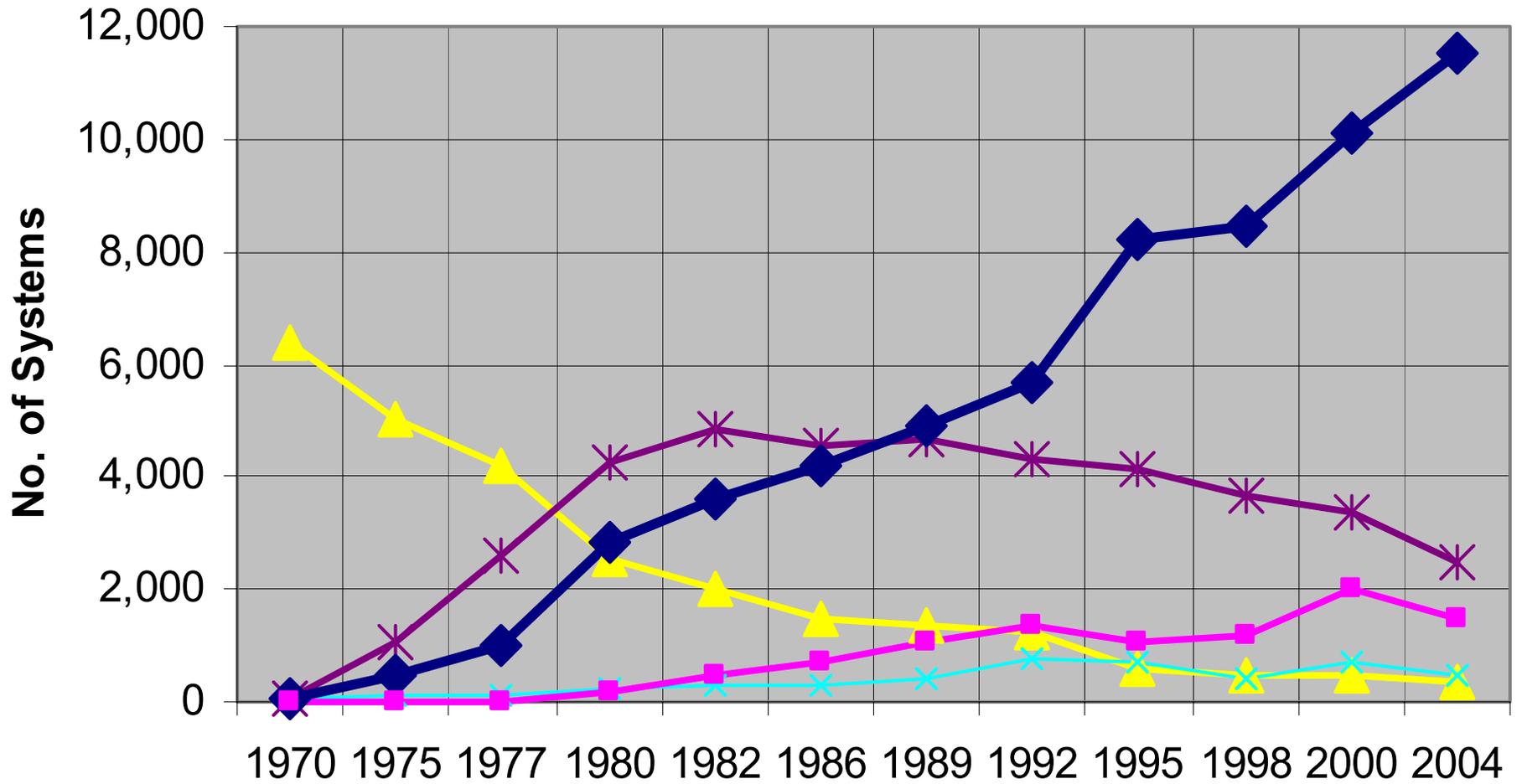


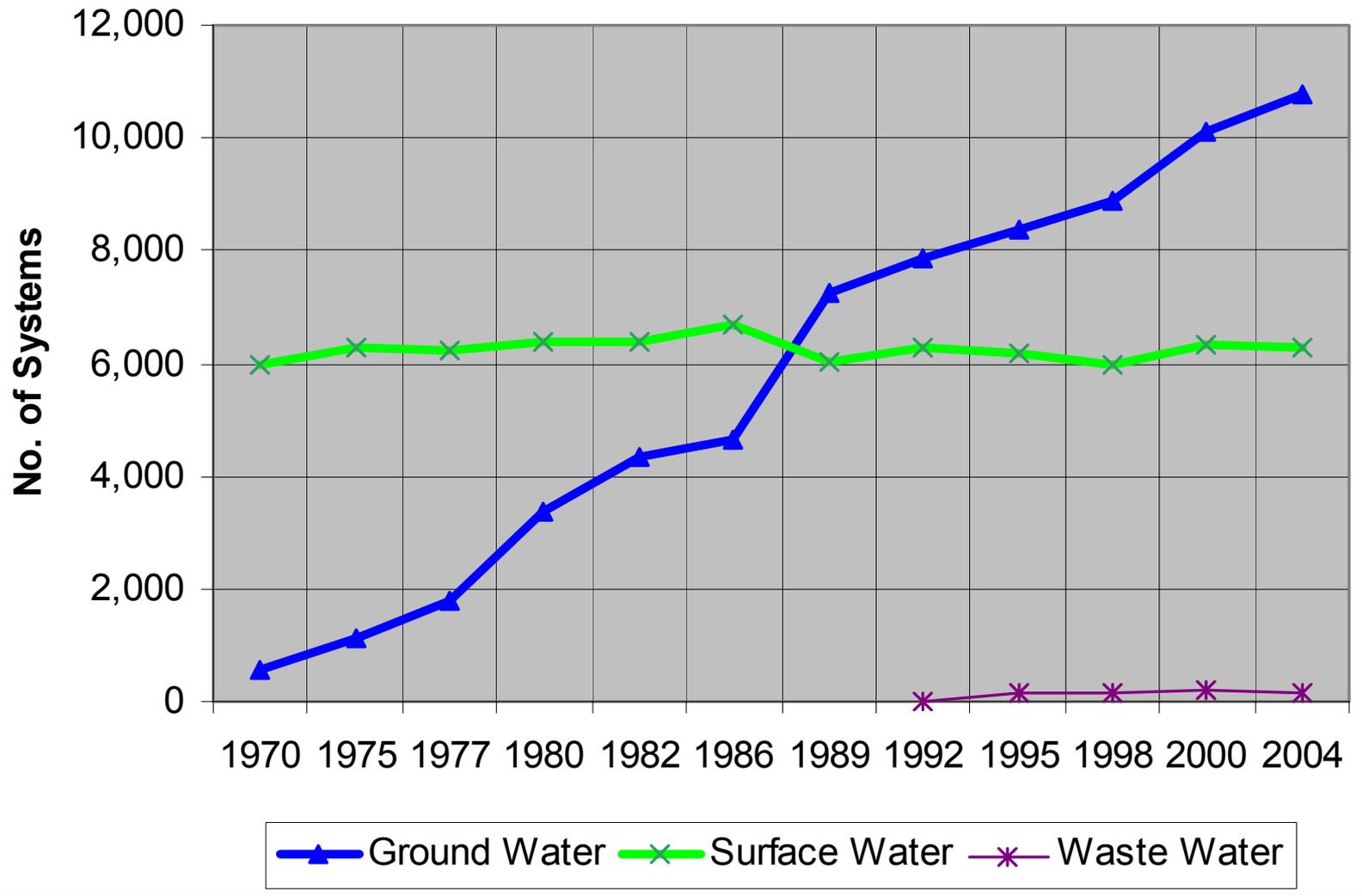




Area of Georgia Irrigation Systems







Energy for Irrigation

- Irrigator owned fossil fuel engine generators (w/ or w/o direct drive pumps)
- Utility supplied electricity.
- Majority systems require electricity, if only for powering motors and controls moving the system.



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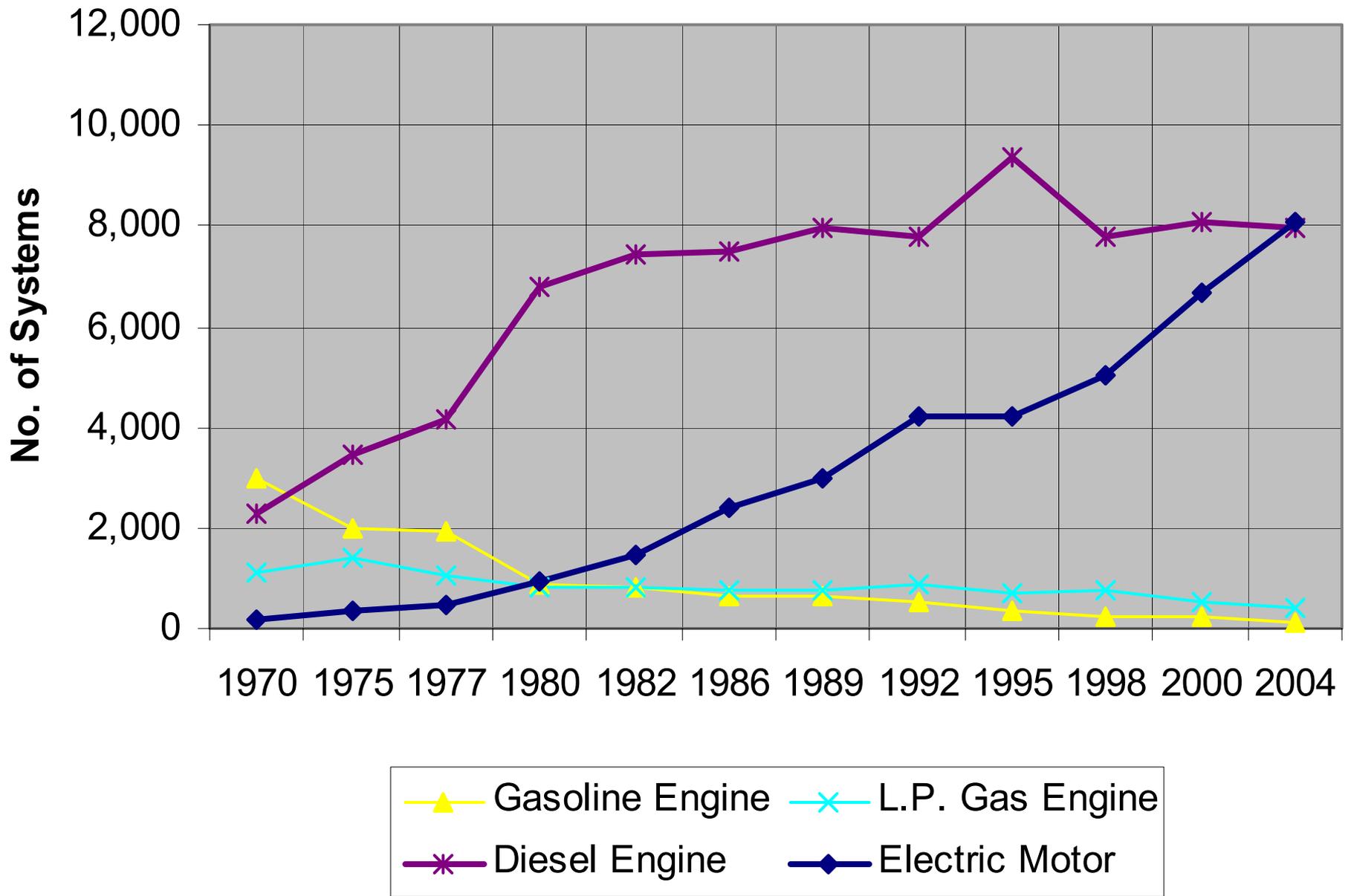
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PAIRBANKS



Energy for Irrigation

- Balance between self powered and utility powered
 - Electric rates vs diesel fuel costs
 - Availability of 3-phase power in remote field locations
 - Interruptible (power) irrigation on capacity "challenged" systems.
- Farmers prefer electricity



Energy vs Water Conservation

- Energy costs (i.e. irrigation operating) costs are primary constraint on irrigation amounts
- Farmers conserve water because it reduces pumping costs.
- Few other constraints in East on quantities of water withdrawn

Irrigation water conservation

- High Pressure big guns, travelers & fixed sprinkler to CP
- High pressure center pivots to low pressure pivots
- Use of Drip irrigation; primarily allow production of higher value crops
- Precision application pivots











Regulation of Irrigation in East

- **Individual business decisions**
 - Numerous attitudes regarding regulation and ownership of water
 - Efficient but not necessarily orderly
 - No view of collective impact

Regulation of Irrigation in East

- Developed without minimal government input and minimal constraints
- No large water supply dams in east commissioned for irrigation
- No canal or pipeline system for deliveries of water to farms.

Regulation of Irrigation in East

- Subsidies for pond development.
- Recent subsidies for irrigation conservation (slowing rate of conversion)
- By and large farmers in the East bear full cost for developing their water supplies, purchasing their irrigation systems, and applying water.

Regulation of Irrigation in East

- Pressure is on for regulation
 - Recent actions in Ga
 - Interstate conflicts
 - Perception -
 - Thermoelectric generator was largest withdrawal of water (withdrawal not consumption)
 - Conversion to cooling towers since 2000 already brought withdrawals to less than Agricultural, by 2010 more apparent.
 - Irrigated Agriculture is primary economic engine in rural counties where prevalent.

Fuel from farms

- Fuel from plants must be examined in total water and energy
- Forests and crops are diffuse solar collectors; concentrating that energy well enough to be useful requires energy
- May be renewable, but at what energy and water balance.
- Could we get in a position where we paid more for corn to convert it to ethanol than hungry nations could afford to purchase it as food to stave off starvation.

Future of Irrigation

- More intensive, less extensive.
- Higher value crops
- Precision application & timing
- Off stream storage & off-peak water withdrawals.
- Cautious controls on GW withdrawals

Future of Irrigation

- Removal of programs that discourage owner financed conservation improvements.
- Public support for incentives when conservation (or water an energy) is economically unfavorable, or when capital for conversion would speed adoption.
- Regulation at the fringes
- Insurance for drought losses tied to protection of base flow or water of competitors (enough water in many years)
Need plan for drought years