



CLEMSON UNIVERSITY
Department of Agricultural & Biological Engineering
Edisto Research & Education Center, Blackville, SC

Irrigation Water Management in South Carolina - Trends and Needs

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South Carolina Water Resources Conference
October 14 - 15, 2008
Charleston, SC



CLEMSON UNIVERSITY

Department of Agricultural & Biological Engineering
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Locations

-  Clemson University
-  County Extension Offices
-  Research and Education Centers
Coastal, Edisto, Pee Dee,
Restoration Ecology, Sandhill
-  Simpson Experiment Station
-  Belle W. Baruch Institute of Coastal Ecology
and Forest Science
-  Clemson University Experimental Forest
- YLI 1 Youth Learning Institute
- YLI 2 Cooper Leadership Development Center
- YLI 3 Long Leadership Development Center
- YLI 4 Matthews 4-H Environmental Learning Center
-  Outdoor Laboratory
-  Livestock and Poultry Health Programs
-  Regulatory Services
-  Agricultural Education (FFA) Offices



Outline

- Building a State-wide Irrigation & Water Management Program
- Irrigation in South Carolina - Trends and needs
- Irrigation Research and Extension - Highlights



Stated Purpose of this Water Conference

Provide an integrated forum for discussion of water policies, research and water management among all water players and for the purpose of building productive collaboration among key stakeholders .

The Forgotten Water

Irrigated agriculture and landscape is a major consumer of water and has a large impact on the State's economy and rural livelihoods.

"Agriculture, Crop, Turf, Evapotranspiration, Crop water or consumptive use, Irrigation systems and scheduling, Demand management or water conservation in irrigated agriculture, Supply management and water harvesting and storage , etc..."



Research and Extension Program - New Faculty

Develop and lead a strong interdisciplinary, externally-funded and nationally-recognized research and extension program in irrigation water and systems management. (75% research and 25% extension)

Questions???

- What is the state of irrigation in South Carolina?
- What are the irrigation needs?
- Who is who in irrigation research?
- Where is the integration/collaboration?
- What are the water managerial skills of SC irrigators?
- What is the level of extension expertise in irrigation?
- Where are the irrigation consultants?
- When is the next irrigation forum or workshop?
- Where is the reference ET?
- Where are the crop coefficients?





Rapid Appraisal:

The tradition/culture is rainfed agriculture

Low understanding of the science & engineering of irrigation - rules of thumb

Irrigated agriculture has a low priority among water players

Irrigation literature & data is scarce and incomplete

Limited collaboration between the University and other water players
(Fed, State)

No irrigation information system or website (no farmer-friendly site)

No state-wide agro-meteorology networks (ET_o, K_c, ET, GDD, scheduling tools)

Lack of irrigation Fact sheets

No irrigation Workshops or Training



Issues:

Increasing irrigation - More pivots and drips and wells are going in.

Water availability - Drought, conflicts, quality degradation.

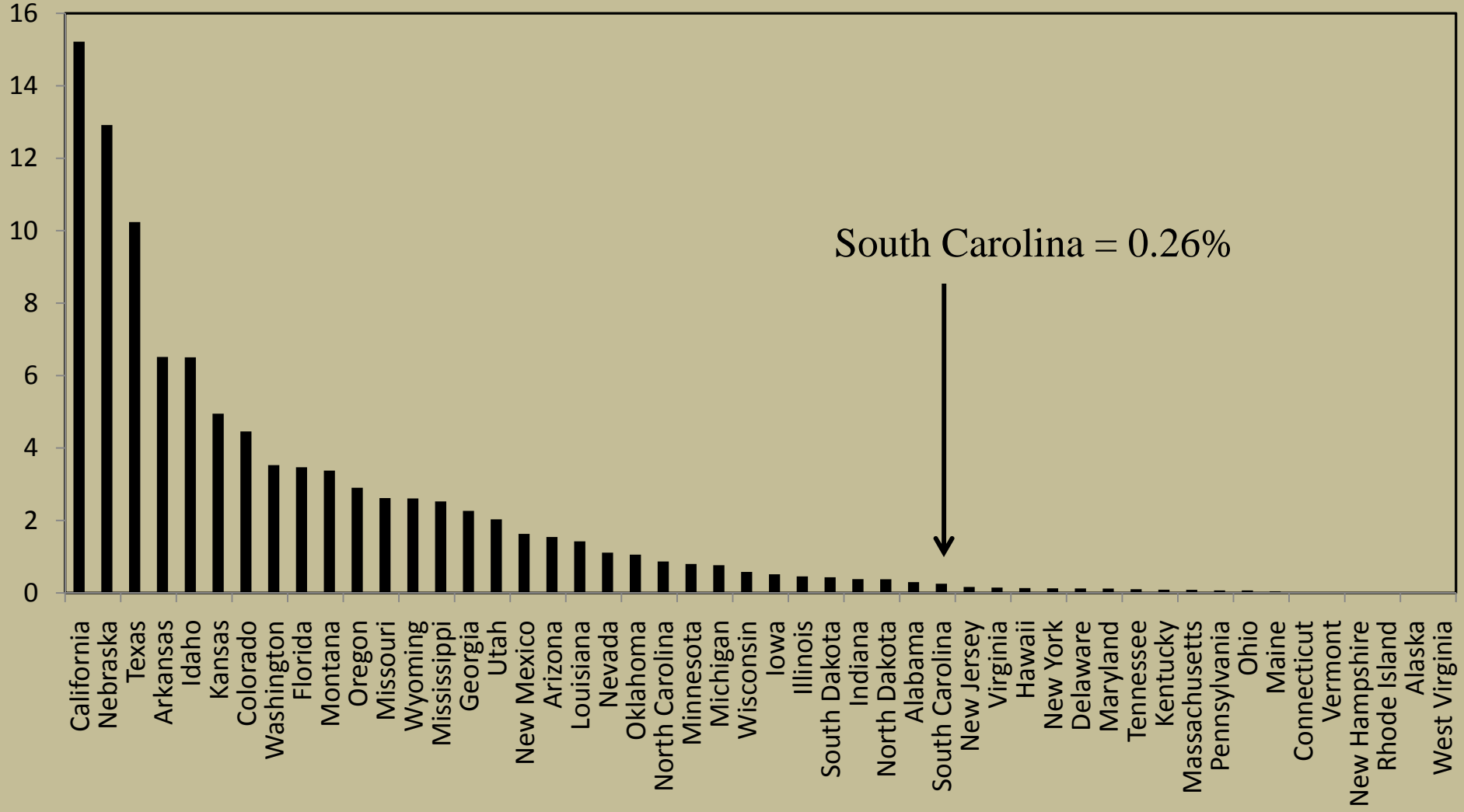
Water withdrawal, use, and permitting - Not many know about!

Needs:

In South Carolina, irrigators need up-to-date information and know-how as well as simple and practical methods and technologies to efficiently utilize the advantages of irrigation to remain competitive.

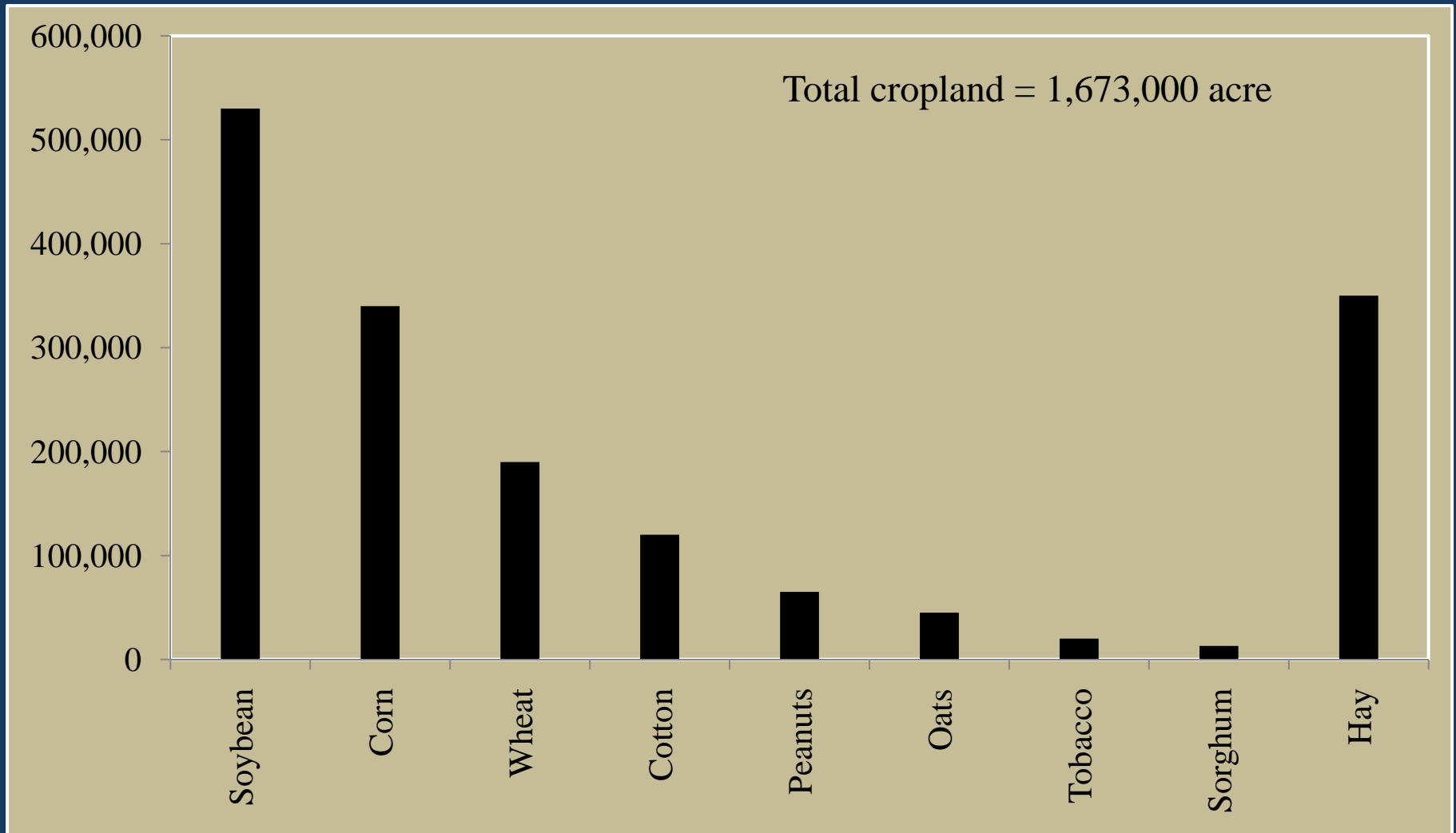


Irrigated Acreage - A National View



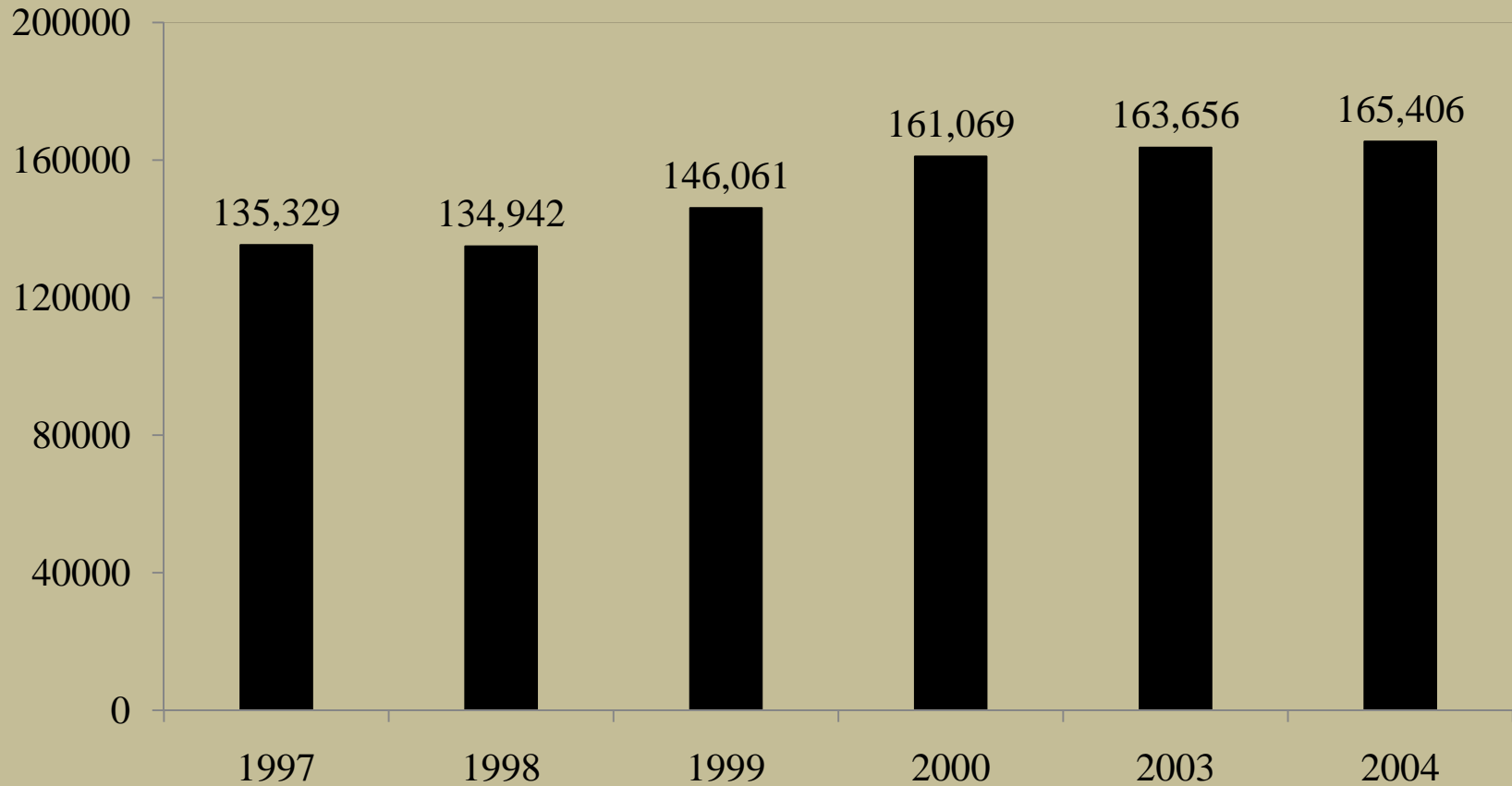


2008 Cropland Acreage in South Carolina





Trend in Irrigated Acreage in South Carolina

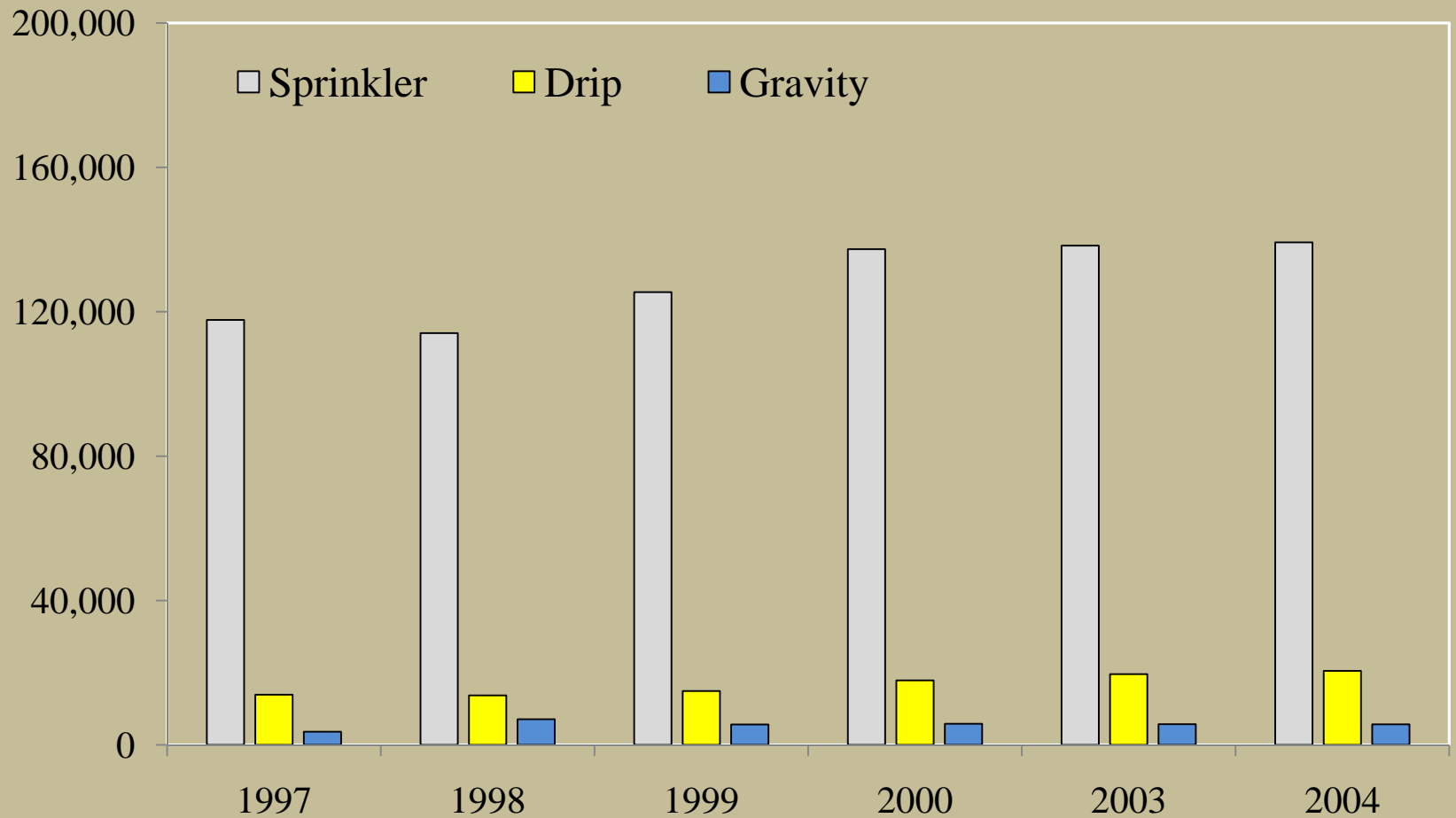


USDA-NASS = 95,000 ac

Clemson Extension = 161,000 ac

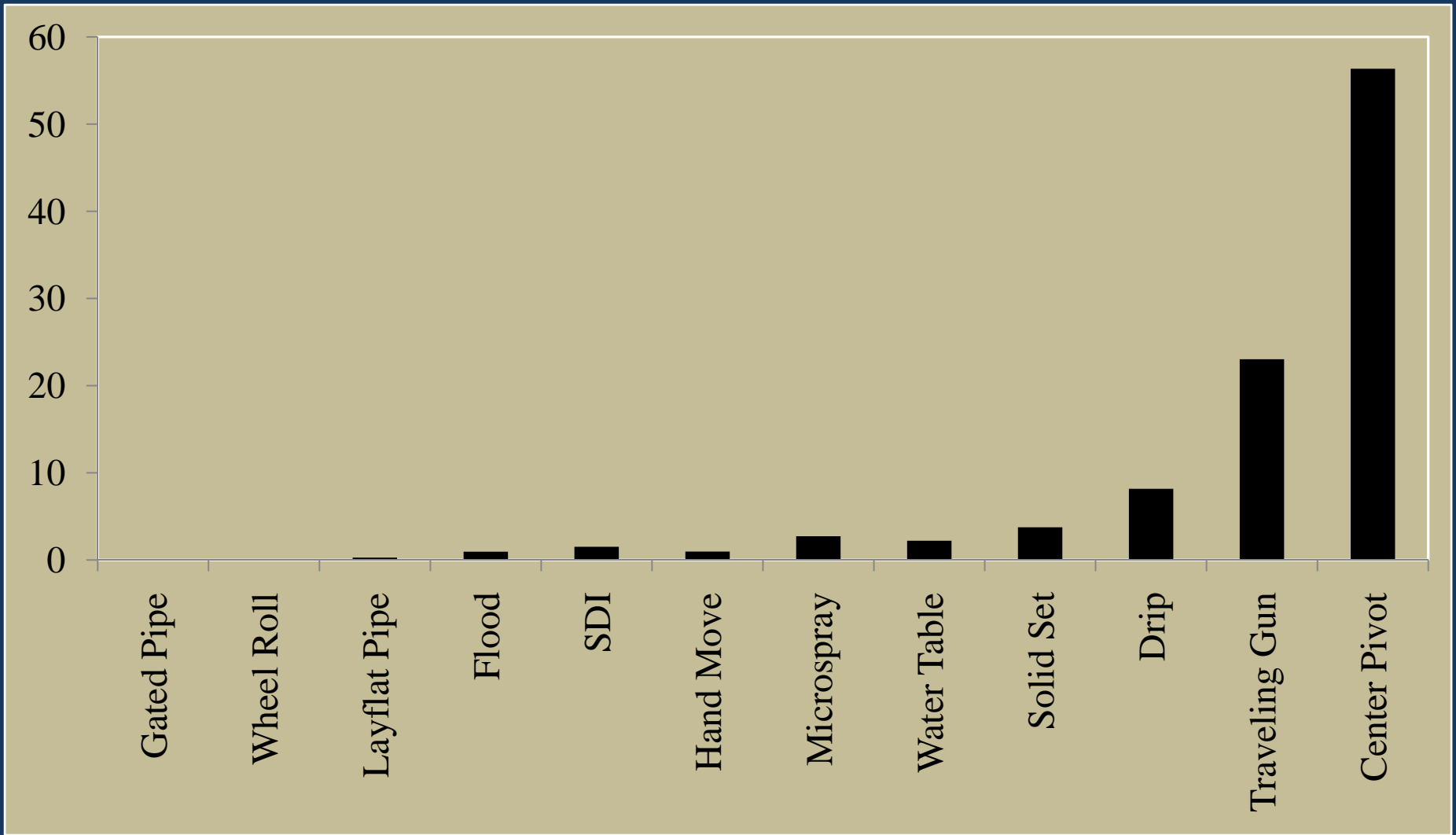


Irrigated Acreage by Irrigation System



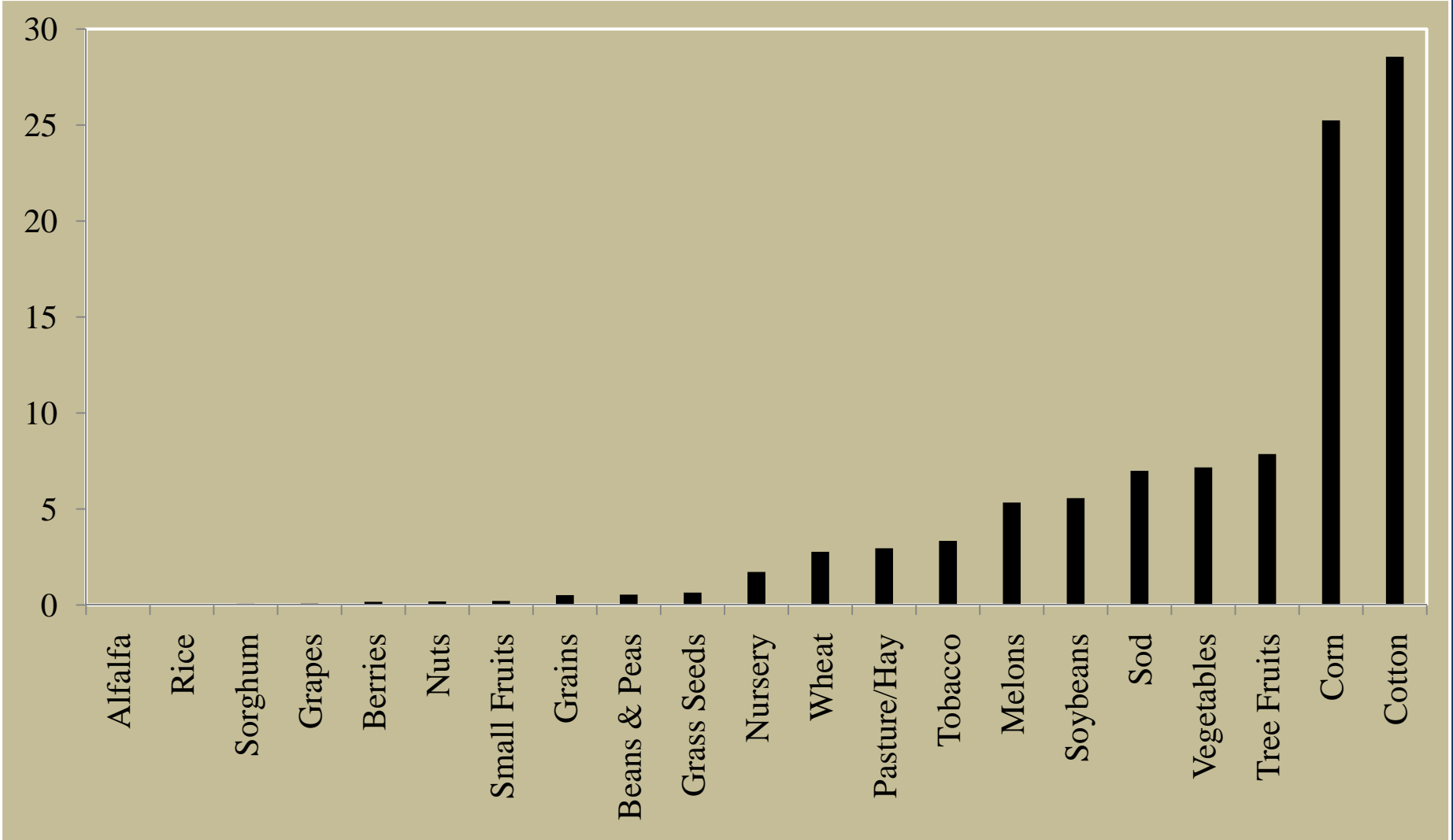


Irrigated Acreage by Irrigation Type (%)



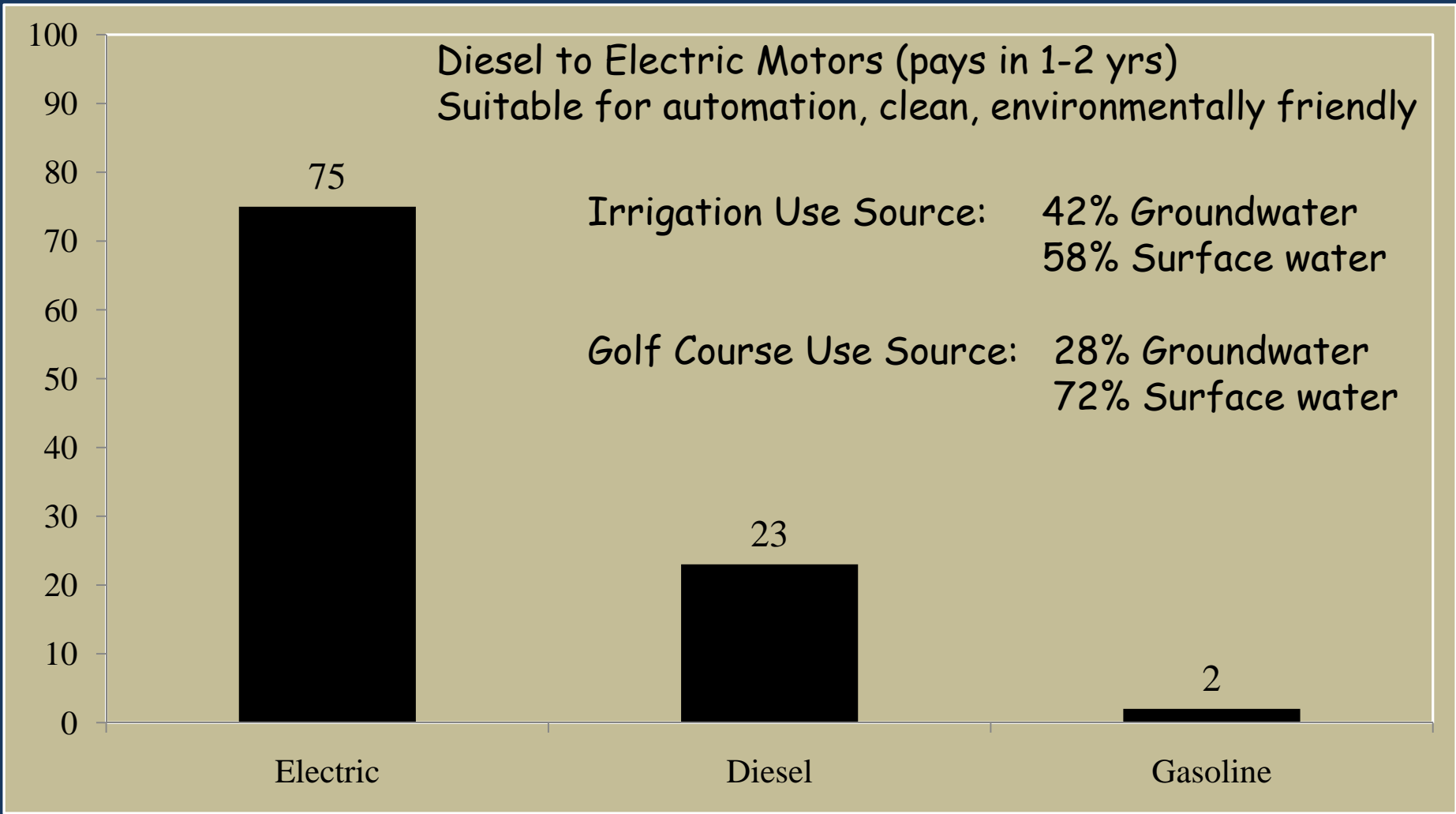


Irrigated Acreage by Crop (%) in South Carolina





SC Pumping Power Source (%)





Yearly Water Use in the State (million gals, DHEC)

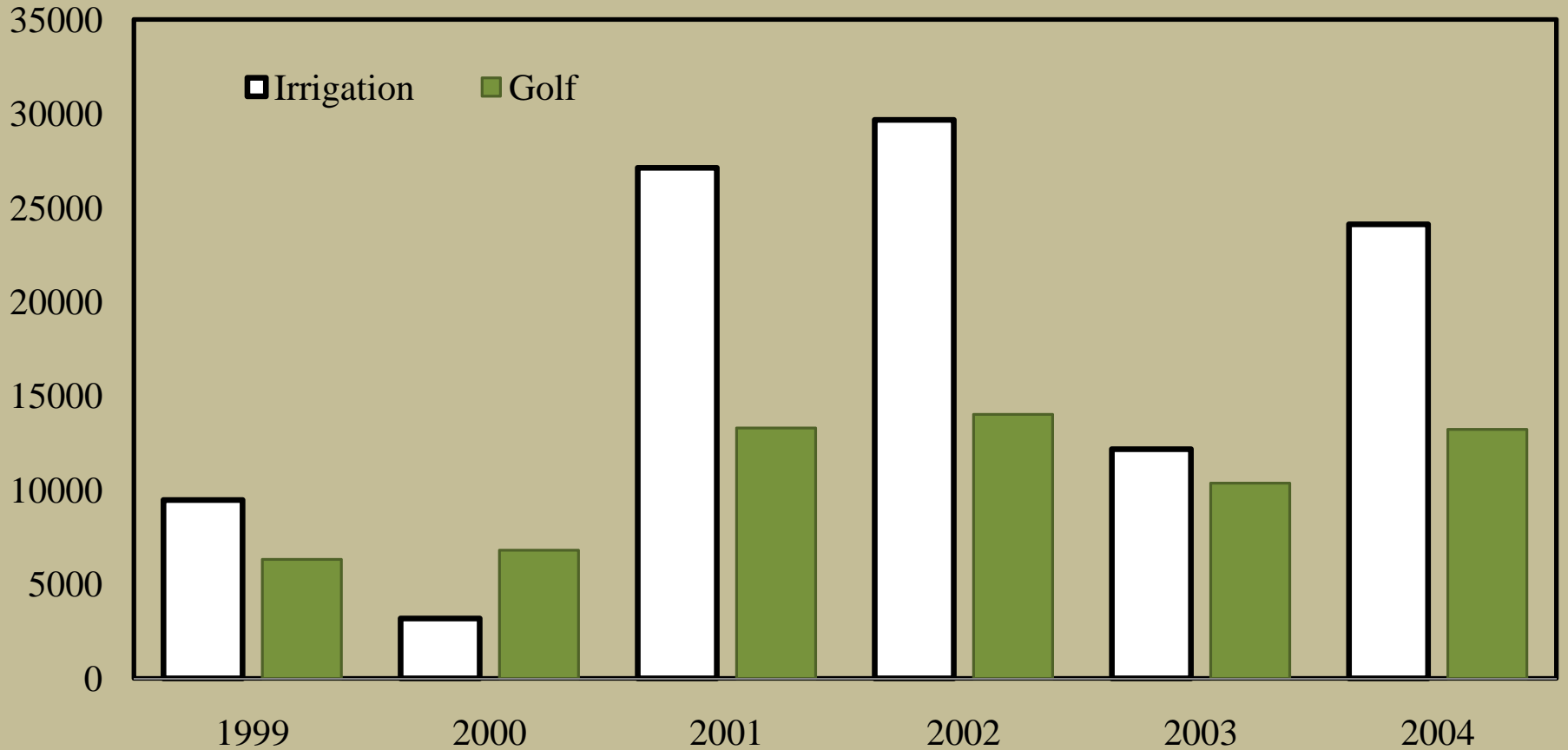
	1999	2000	2001	2002	2003	2004
Hydroelectric	12,160,642.62	10,281,681.91	9,796,267.91	11,415,081.44	18,958,207.77	15,203,000.52
Thermoelectric	2,326,627.77	2,240,508.37	1,624,984.88	2,467,042.32	3,558,474.88	3,232,104.07
Water Supply	221,911.79	148,265.21	193,525.29	212,402.79	197,088.27	209,464.30
Industrial	172,314.14	157,463.33	180,579.90	167,051.34	168,334.76	157,309.02
Irrigation	9,470.97	3,182.73	27,121.14	29,668.39	12,172.86	24,119.87
Golf Course	6,323.77	6,806.35	13,302.54	14,022.92	10,373.47	13,230.46
Mining	2,546.92	3,056.08	2,691.75	3,159.88	4,935.07	3,241.62
Aquaculture	35.97	13.67	865.17	2,283.95	1,451.98	1,355.63
Other	367.06	223.61	204.84	106.22	59.033	85.505
Total	14,900,241.01	12,841,201.26	11,839,543.42	14,310,819.25	22,911,098.09	18,843,911.01

How much of each use is consumptive?

Irrigation of cropland and golf courses are mostly consumptive (ET).
 Hydro and Thermoelectric and Industry uses are mostly returned.

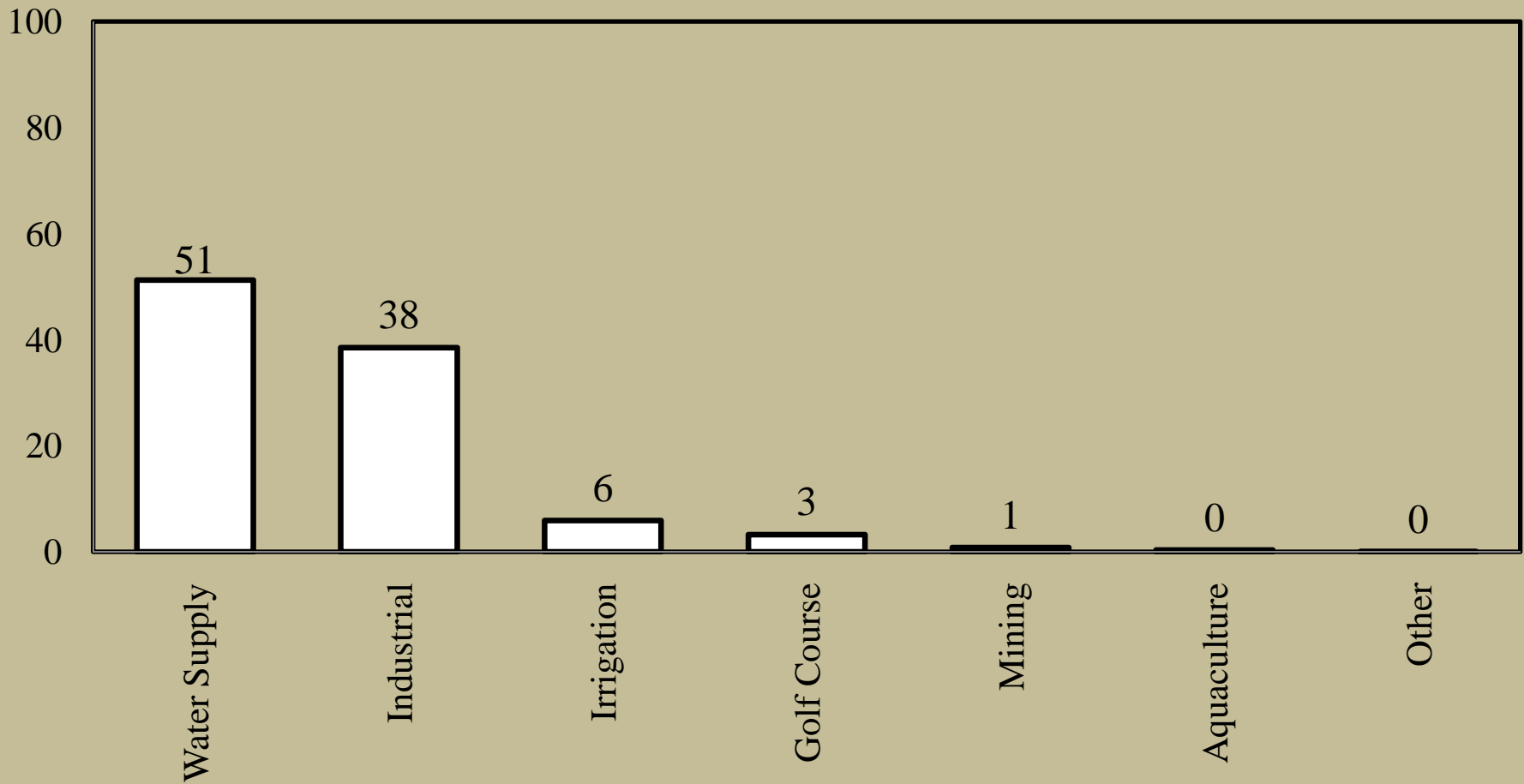


Yearly Variations in Water Use (million gallons)



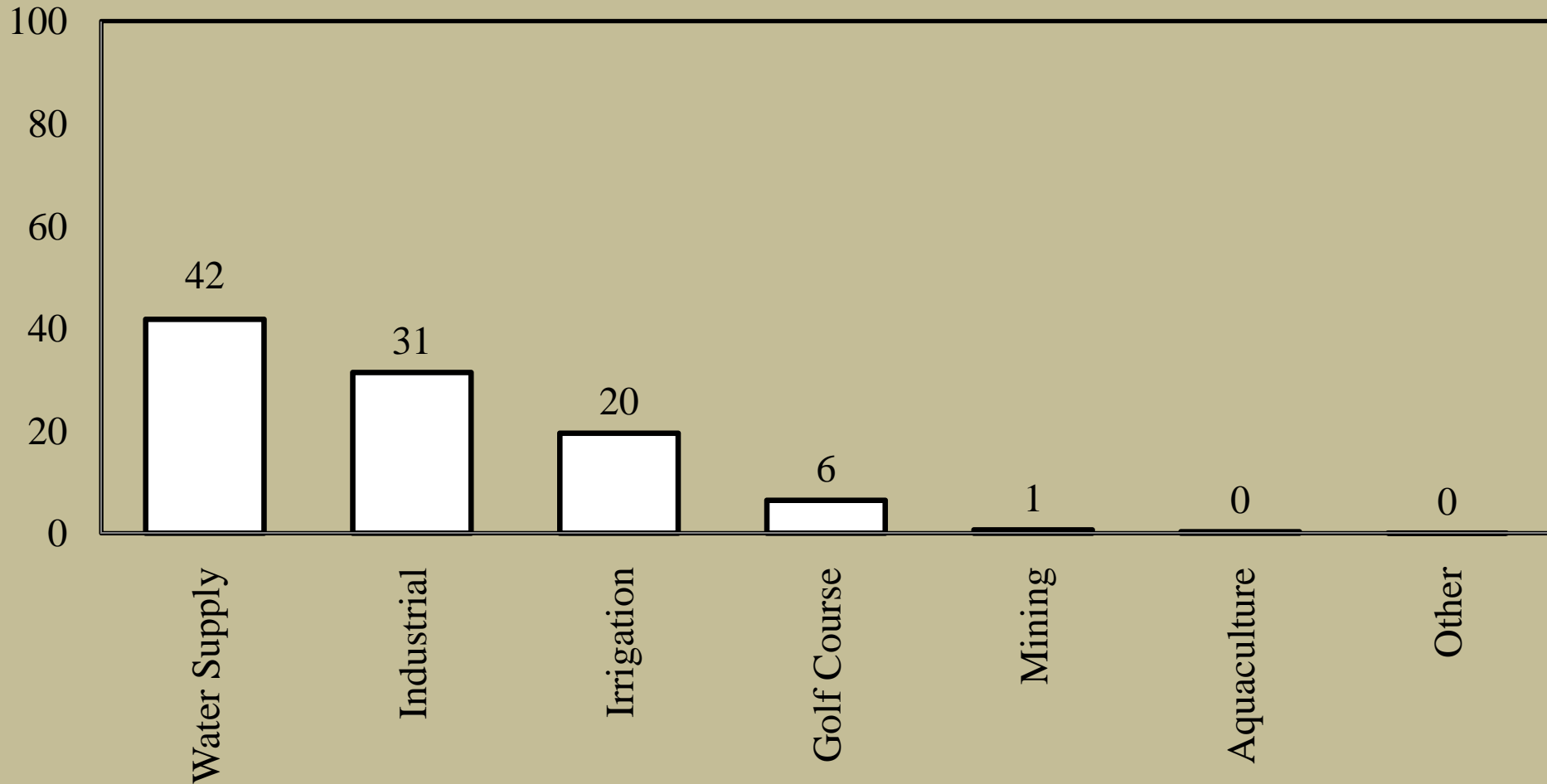


2004 Yearly Water Use (%)



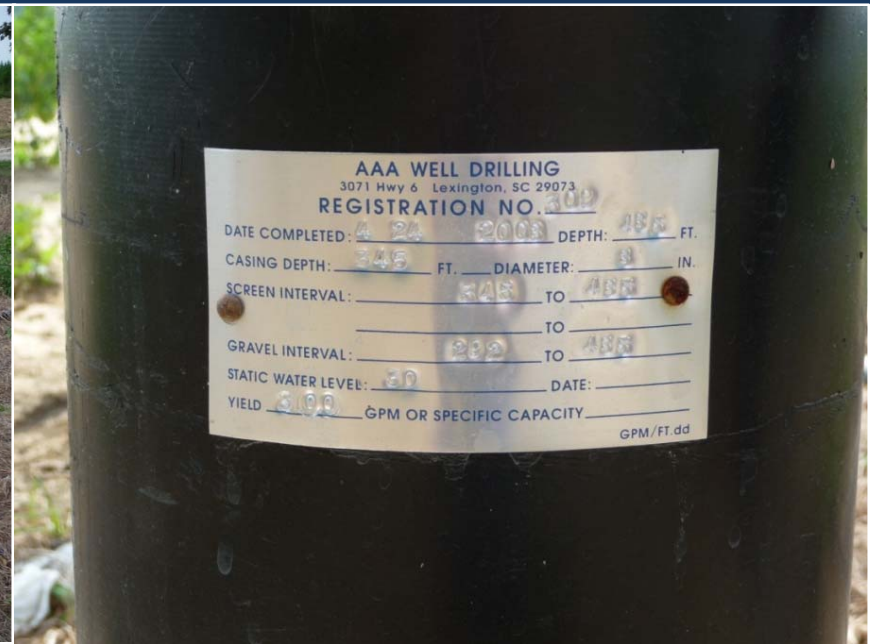


2004 Daily Water Use (%)





Where do these numbers come from?



SC Water Use Reporting Act of 1982 - Withdrawals of 100,000 gals/day or more.

Center pivot pumping at 500 gal/min, will pump 30,000 in an hour, and 720,000 in a day.

For 10 irrigations, that's 10 million gallon per year.



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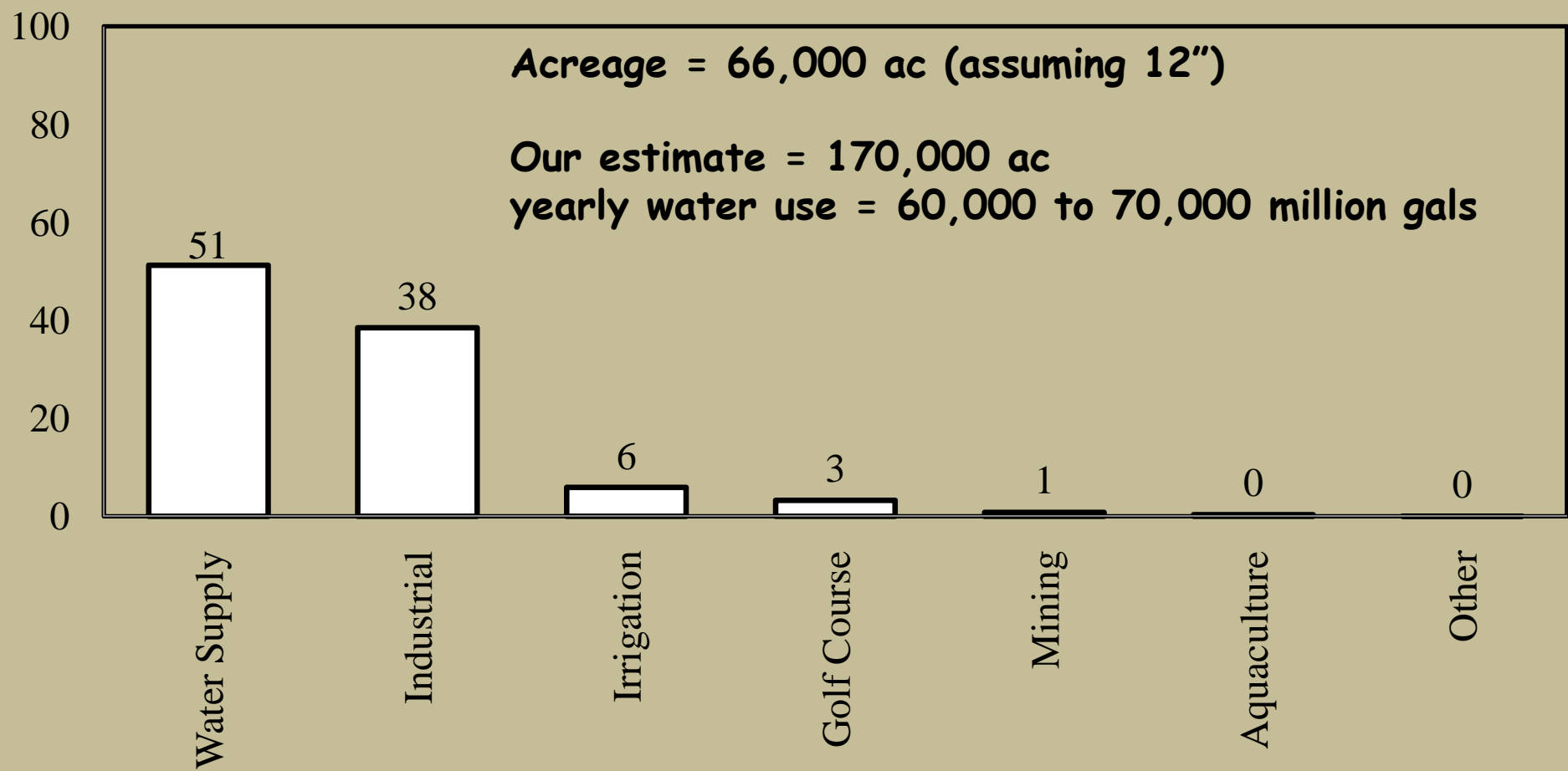


WELL TAG

REGISTRATION NO.	_____		
INSTALLER	_____		
DATE COMPLETED	_____	DEPTH	_____ FT.
CASING DEPTH	_____	DIAMETER	_____ IN.
STATIC WATER LEVEL	_____	DATE	_____
YIELD	_____	GPM OR SPECIFIC CAPACITY	_____



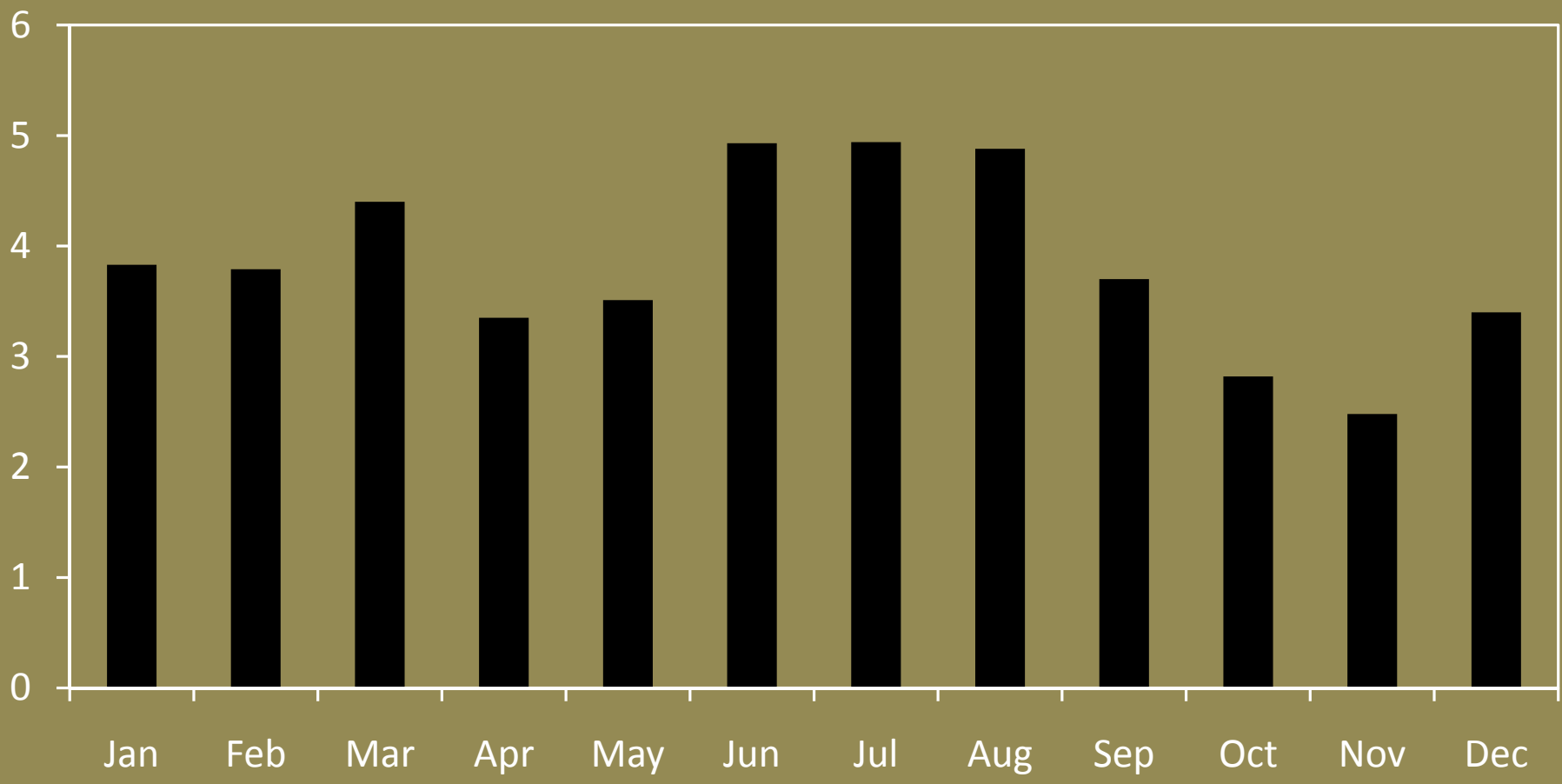
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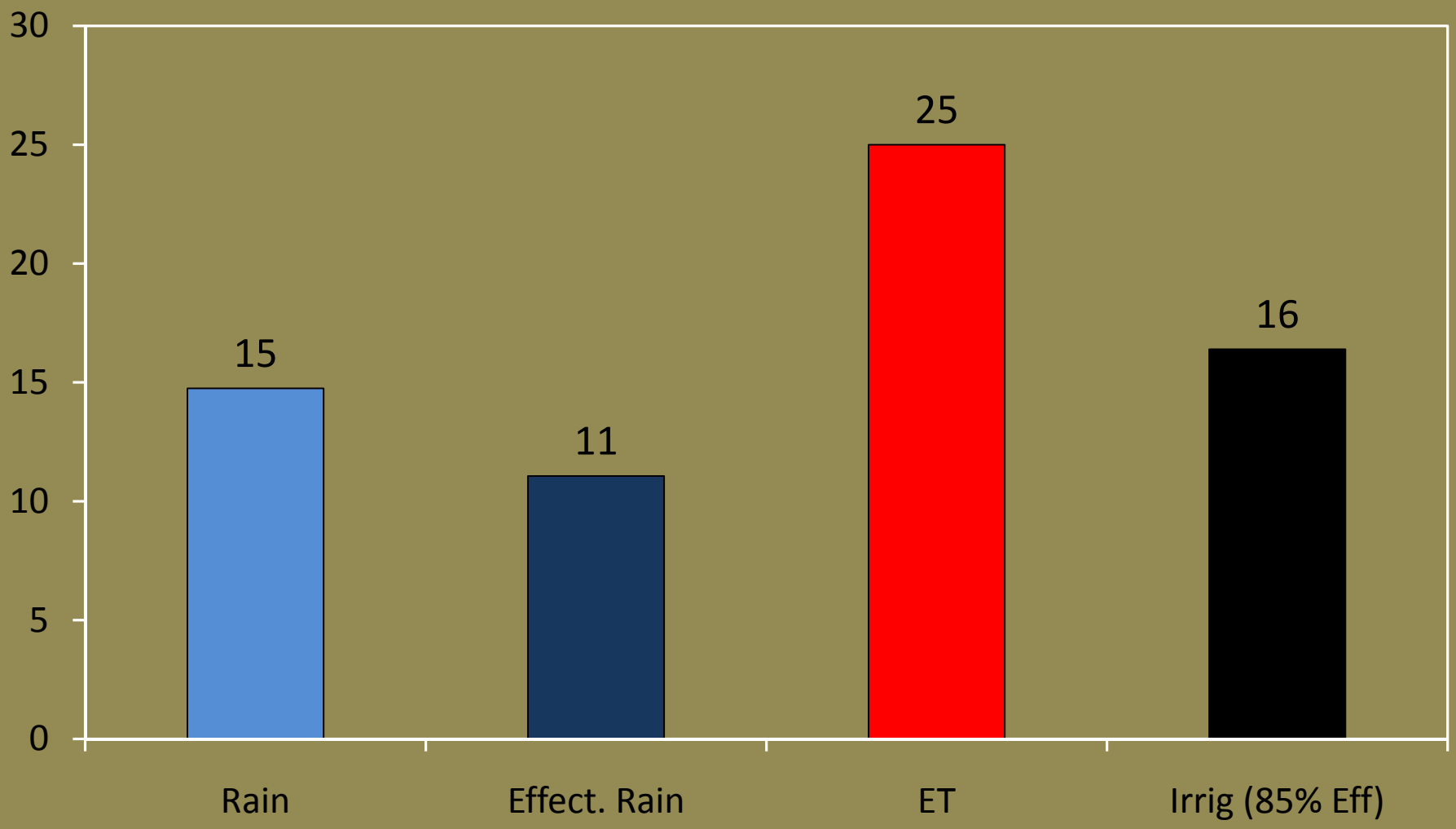
Do we even need to irrigate?

Rainfall at Edisto REC (1930-2002) - 46 inches





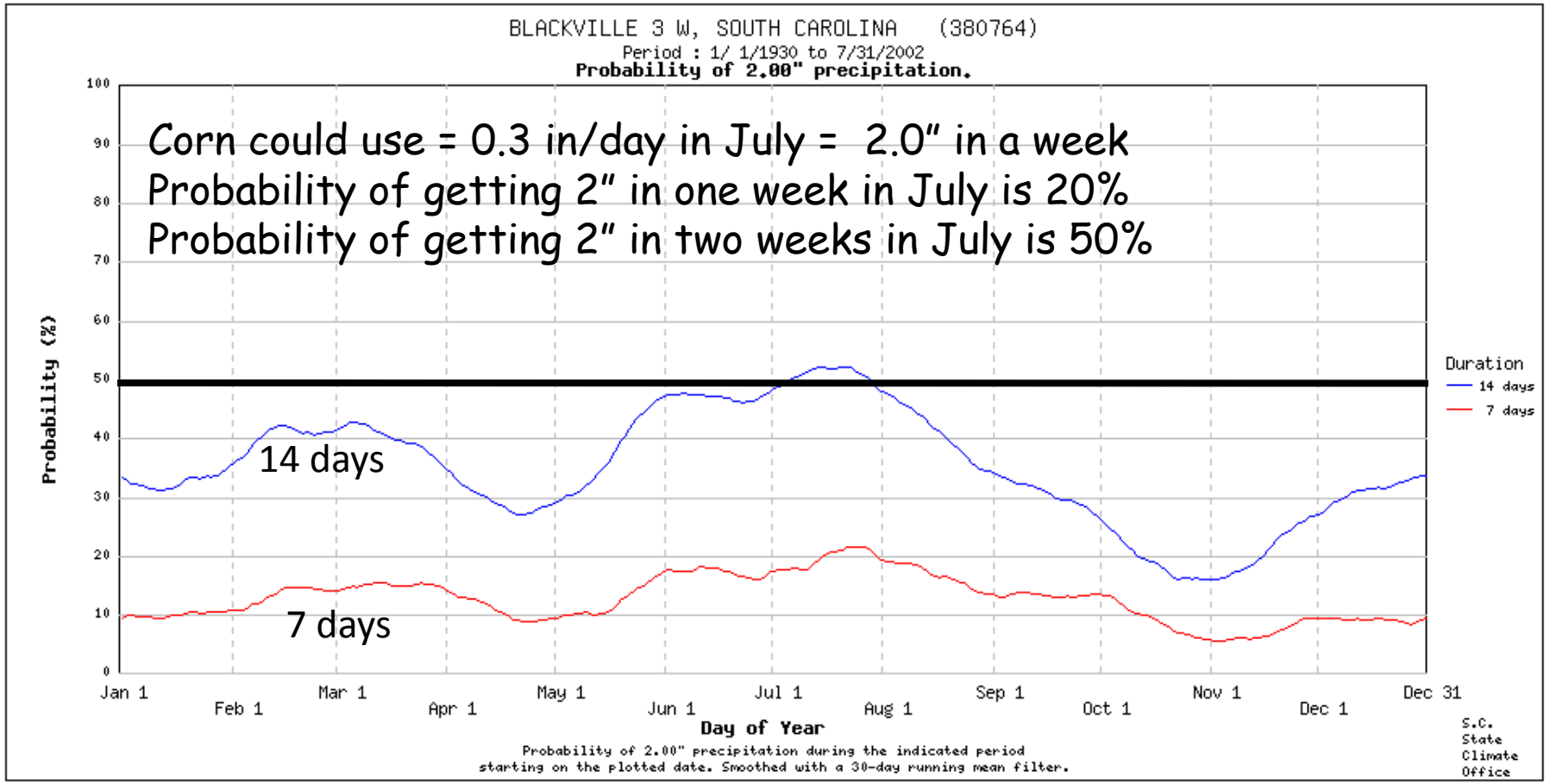
Need for Irrigation at Edisto REC





Probability to get 2" in 7 and 14 days

Precipitation Probability by Duration





Irrigation and Water Management Research & Extension

State-wide Initiatives in Irrigation Research and Outreach

- State-wide survey (baseline data)
- SC Irrigation Society (& Customer Focus Group)
 - A forum to discuss problems, constraints, and solutions
- Update Extension/Irrigation Information Resources
 - Pubs, on-line irrigation scheduling guides (Kc major crops)
- Workshops and Training (IA Certification)
- Mobile Irrigation Lab (NRCS, and other RECS)
- Irrigation & soil-plant water relations lab (production functions)
- Cropping systems modeling (Yield response to water)
- SCAgMet - South Carolina Agricultural Meteorology Network



What do my checking account and the farmers' soil water storage have in common? Nothing...

Irrigated farmers need their own online irrigation checkbook

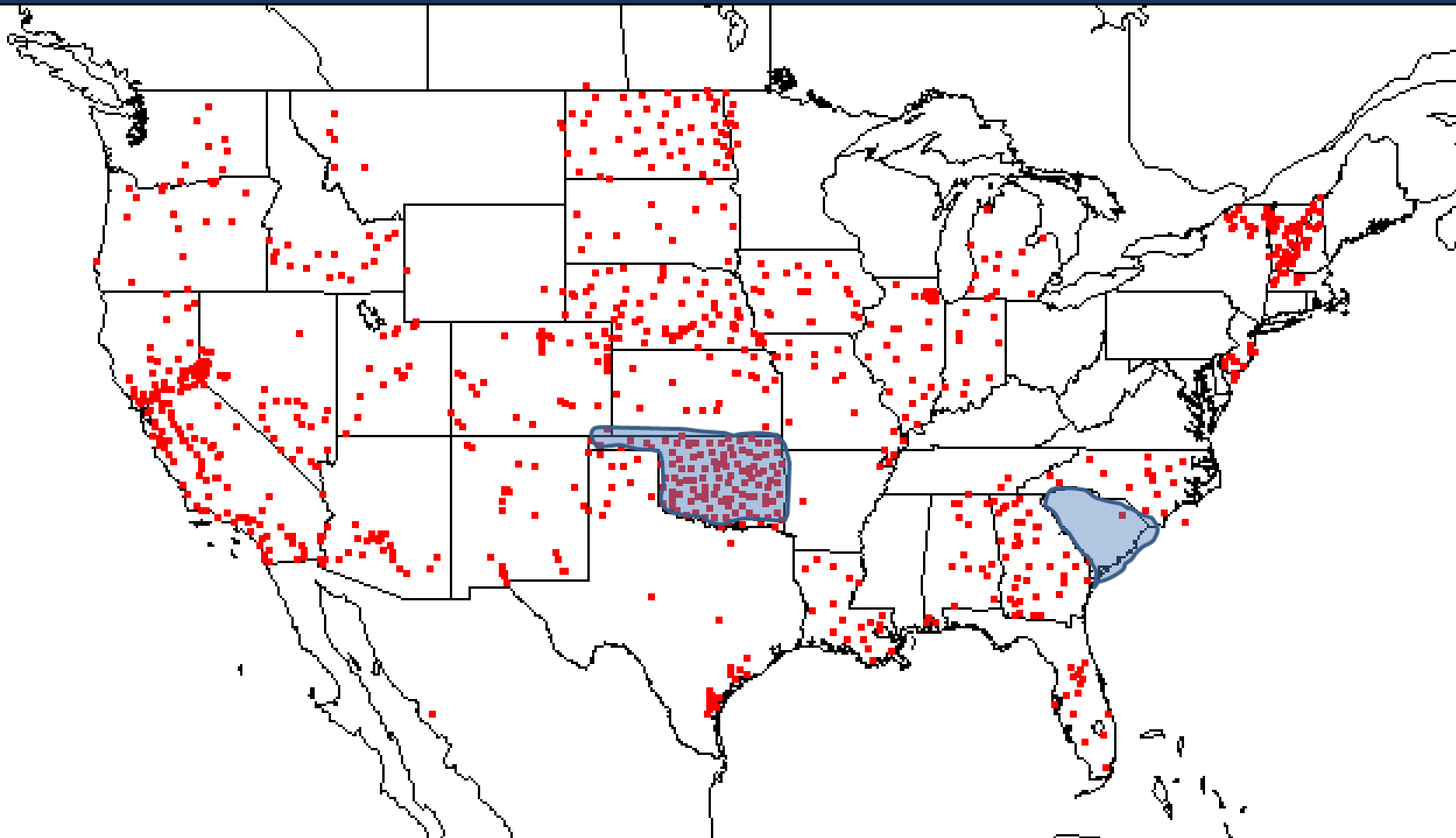
- When to irrigate? How much to apply? and for what purpose?
- What was the reference ET in my area yesterday? Not in GA, FL, or NC
- How much water corn or cotton or turf used yesterday?
- How many GDD has the crop accumulated so far?
- What is the forecast for next few days?
- How much water do I have in the bank, the rootzone?

A Network of Agricultural Meteorology Stations in South Carolina can help develop an Irrigation and Water Management Information Website



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US Networks of Agricultural Meteorological Stations





Weather Data Networks

- ASOS
- AWOS
- ECONet
- COOP
- RAWS
- USCRN
- Buoy

Current Conditions

- Temperature (F)
- Heat index (F)
- Soil Temperature (F)
- Dewpoint (F)
- Windbarbs

Radar Imagery

- Regional Mosaic

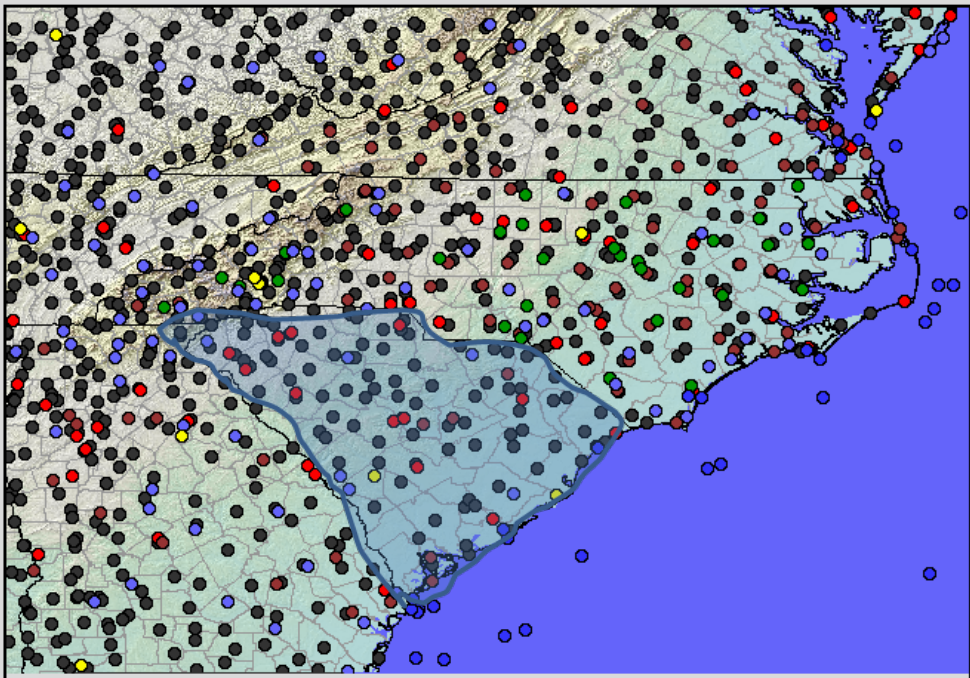
Geographic

- County lines
- Cities
- Rivers and Streams

Map navigation controls: redraw map, Information, recenter, zoom in, zoom out, full extent

Legend:

- USCRN
- RAWS
- ECONet
- Buoys
- AWOS
- ASOS
- COOP
- ∧ County Lines



State Climate Office of North Carolina NC CRONOS Database *N *W
 Map is currently showing current conditions. [Click to show past](#) and then redraw map.



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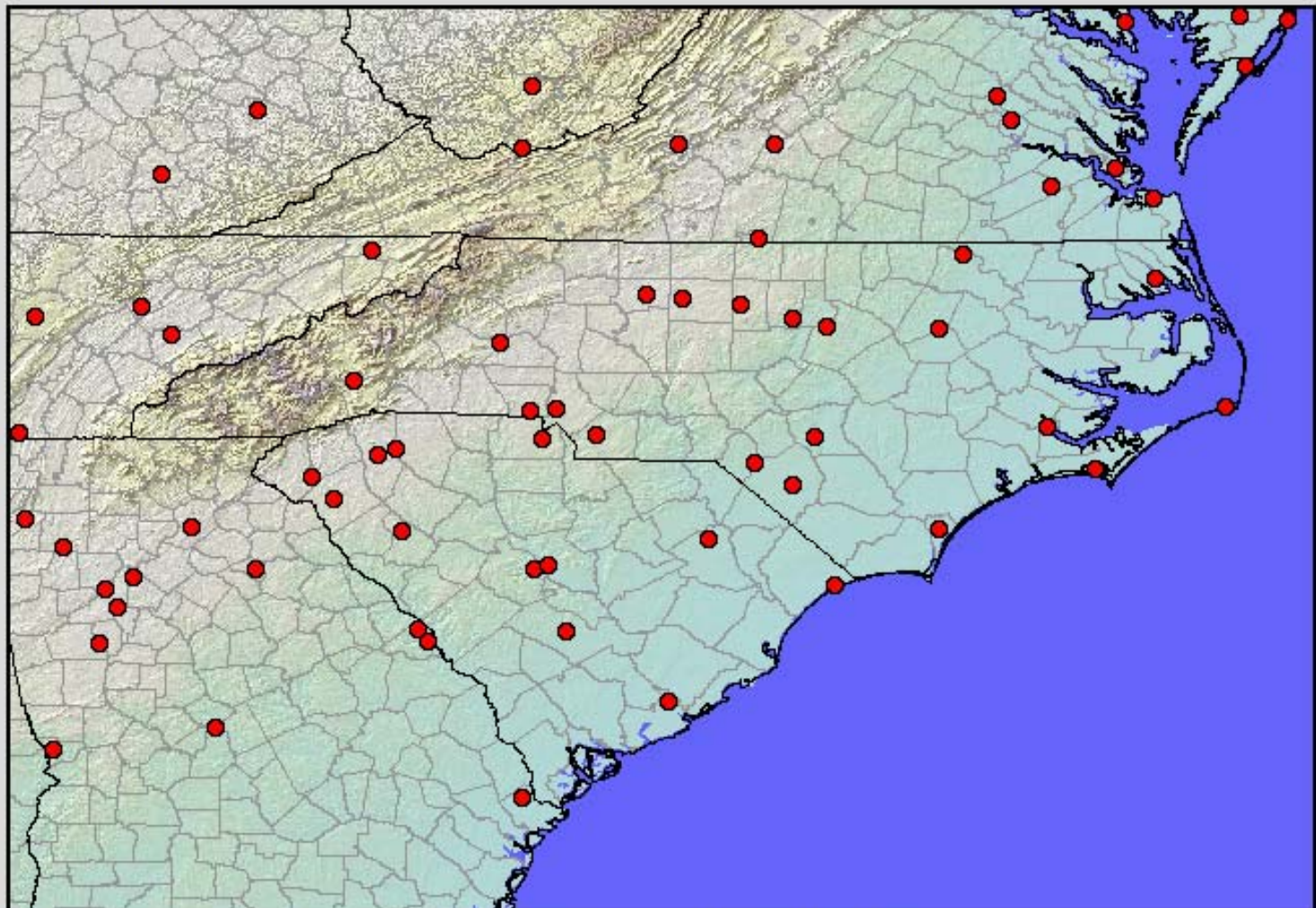
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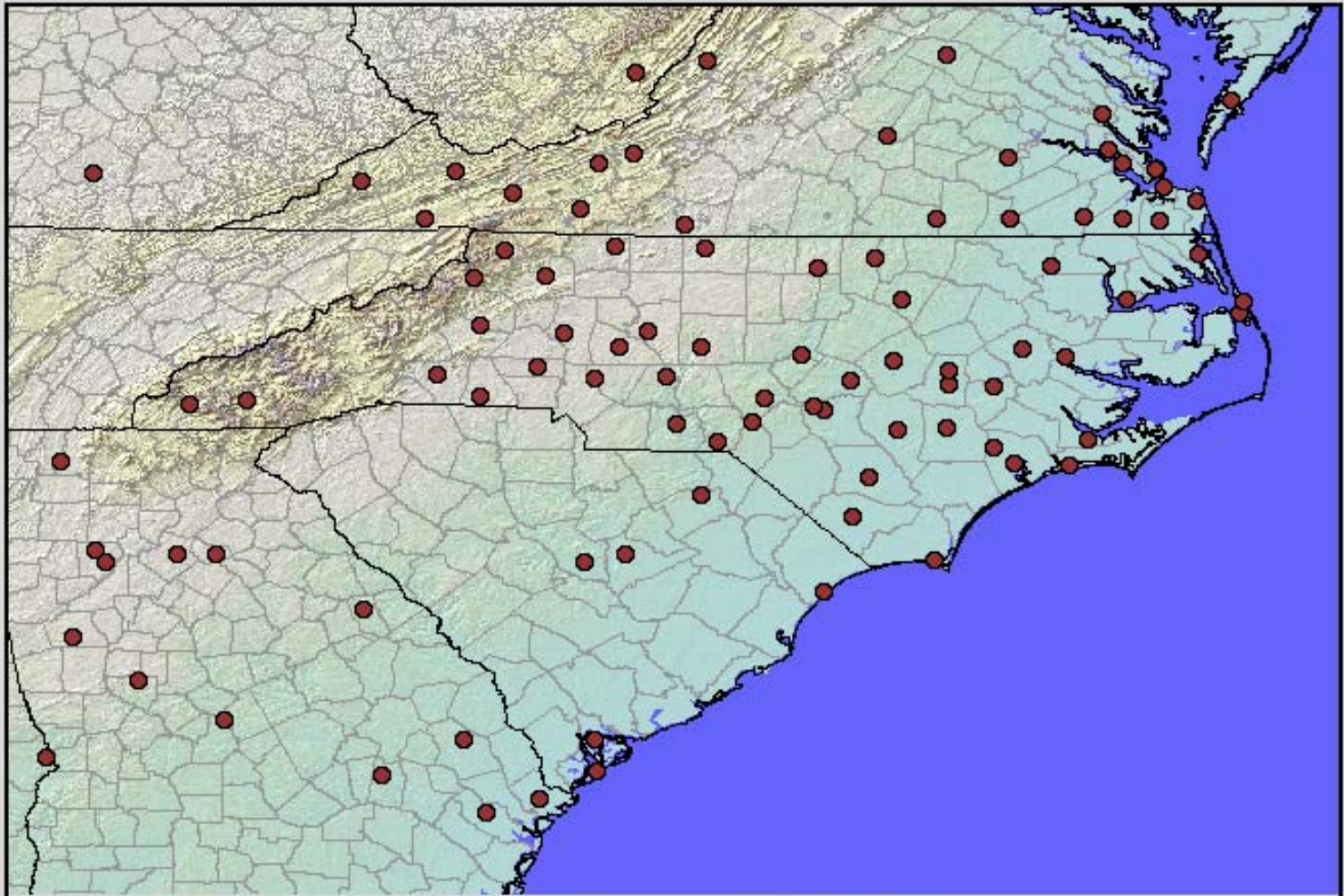
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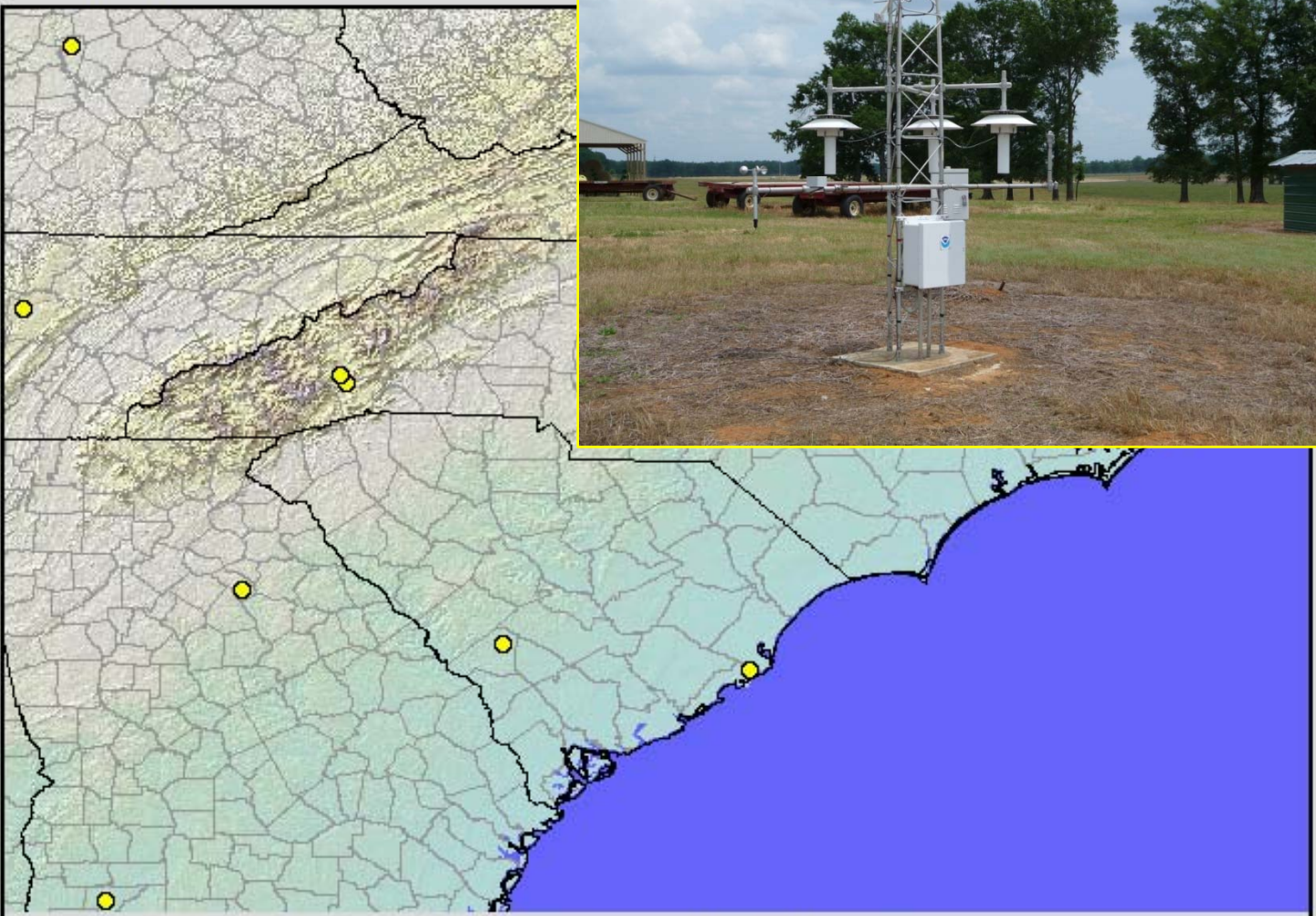
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 redraw map  Information  recent



South Carolina Agricultural Meteorology Network (SCAgMet)

96 per State (2 per County)
ET, temperature, wind, ... maps

Concluding Remarks

SCAgMet is a need, yet a huge task.

Clemson, Experiment Station,
Cooperative Extension, DNR, State
Climate Office, DHEC, the State &
Fed Depts of Ag, Irrigation
dealers, and ...are needed to get it
accomplished.

\$8-10K per station
\$500-700 per yr for maintenance
Sponsors are welcome!





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