Simplistic predictions, confounding effects, and complex responses; climate tales from Archbold Biological Station

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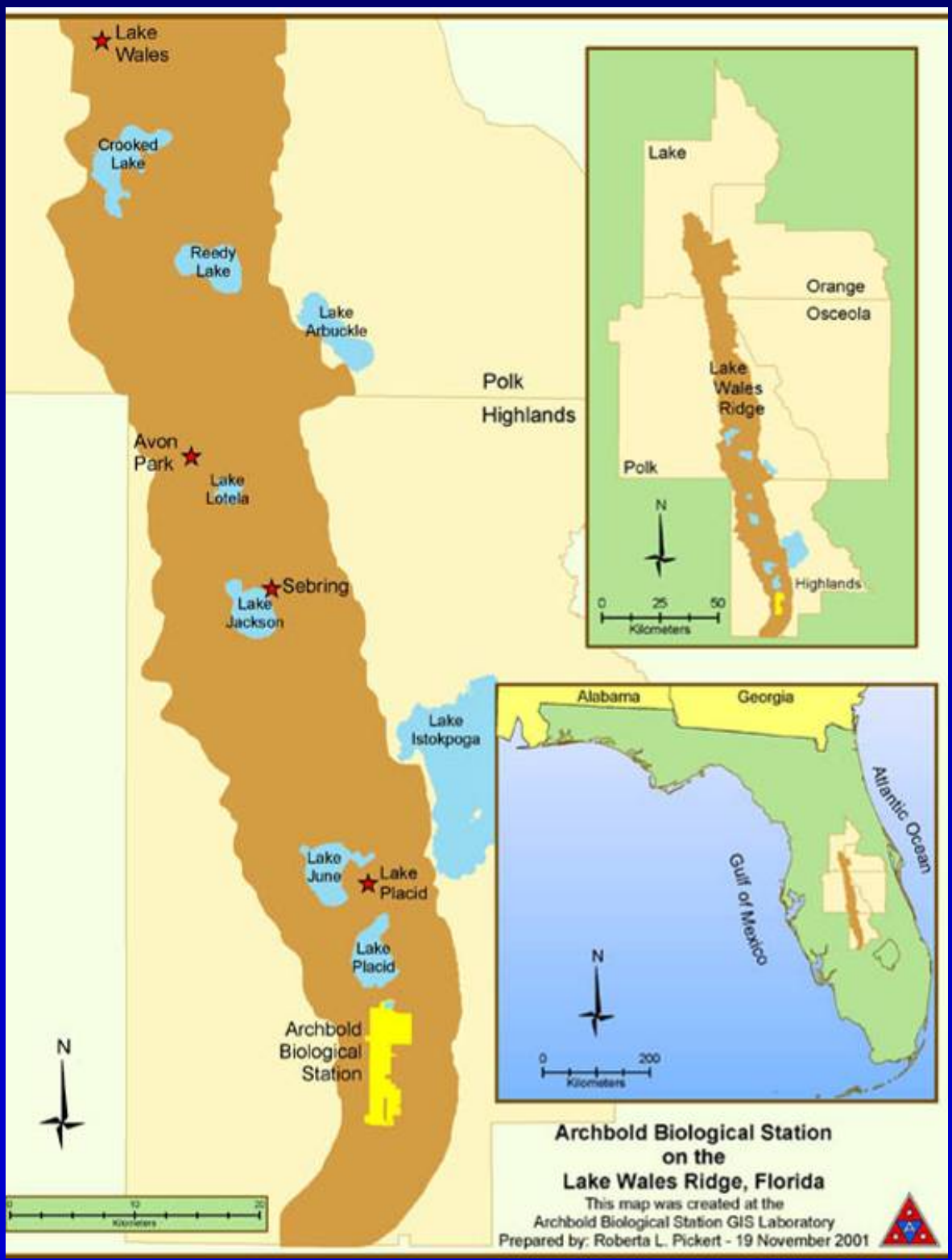
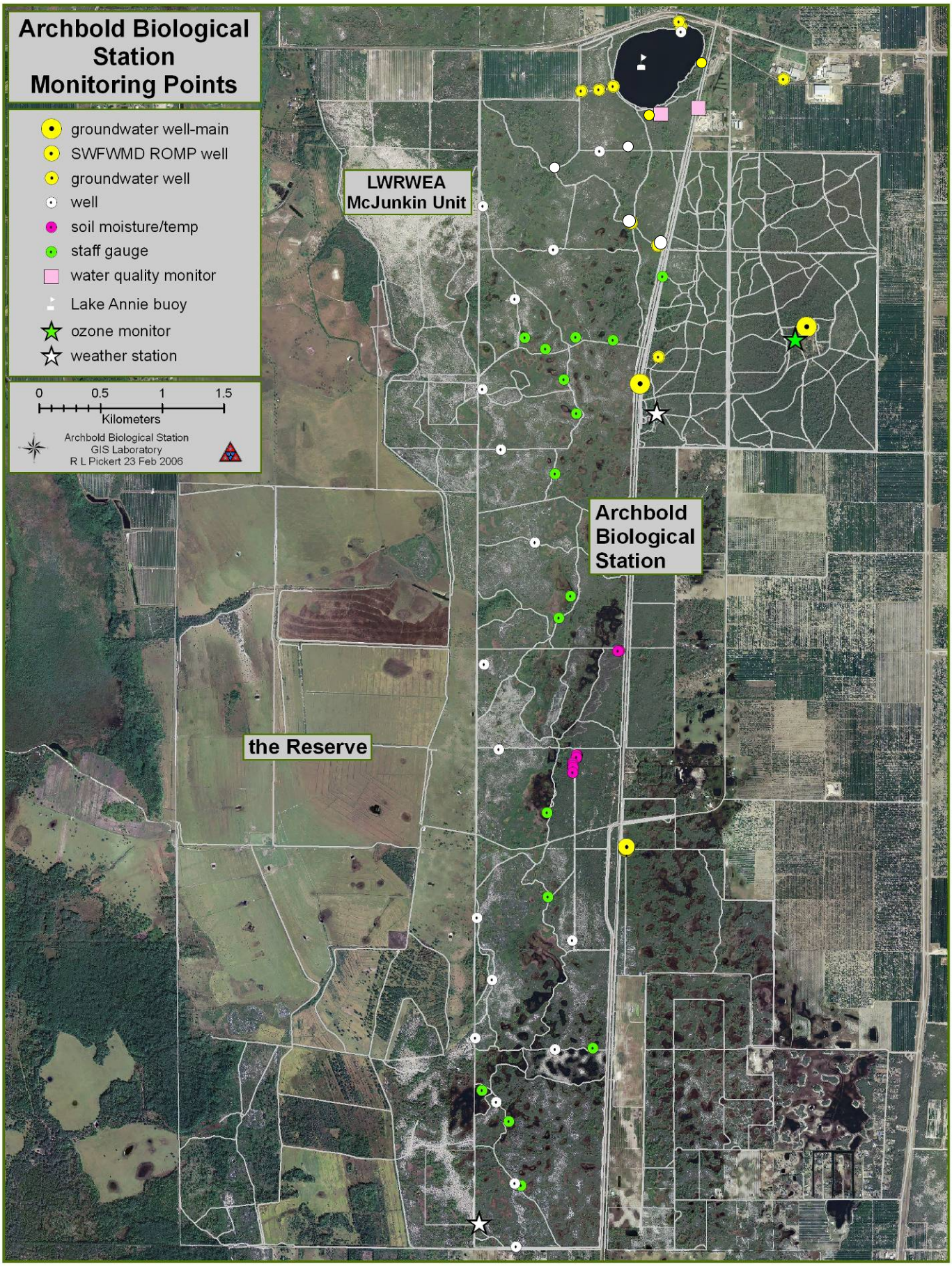
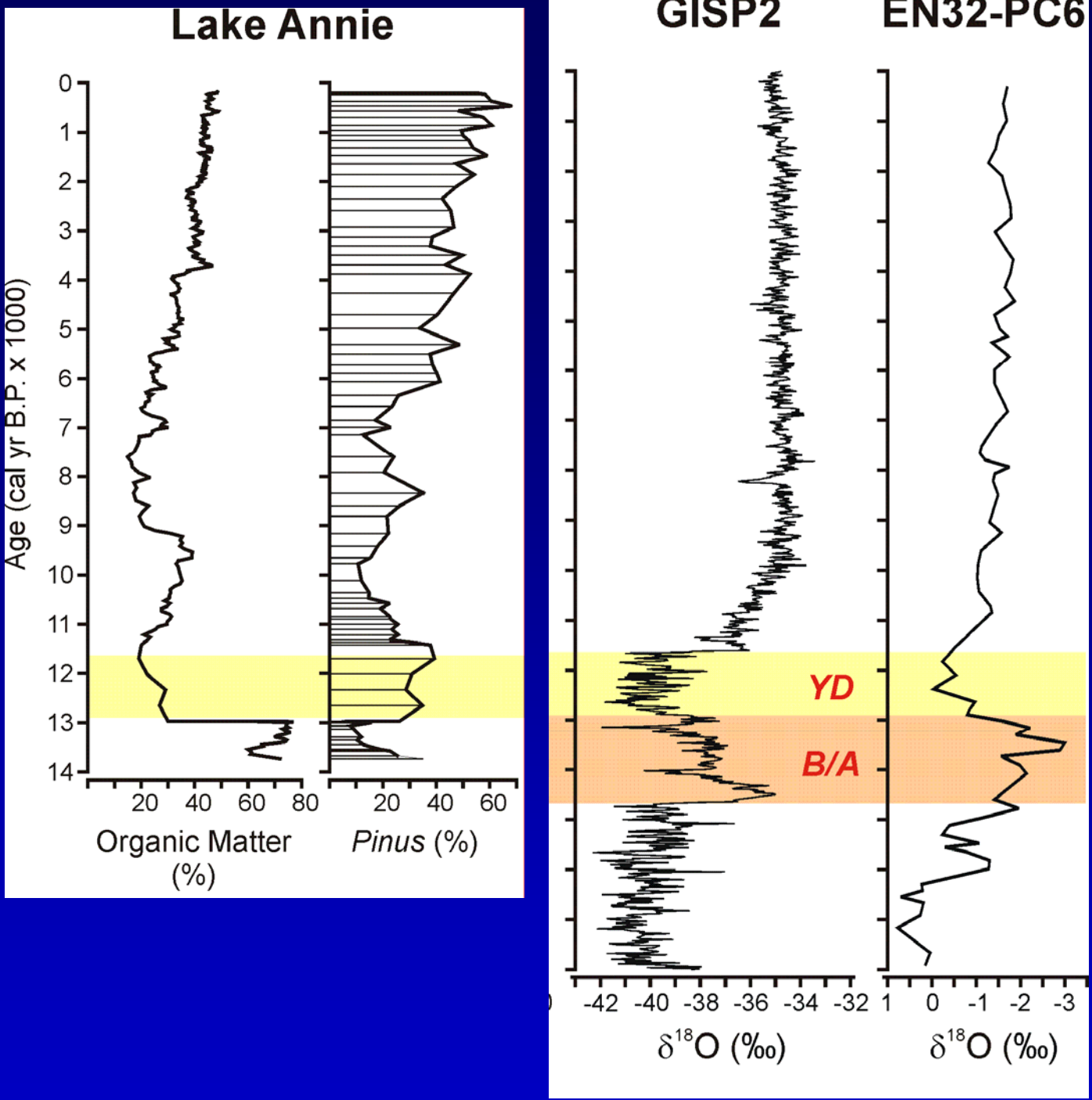
Archbold Biological Station

founded 1941

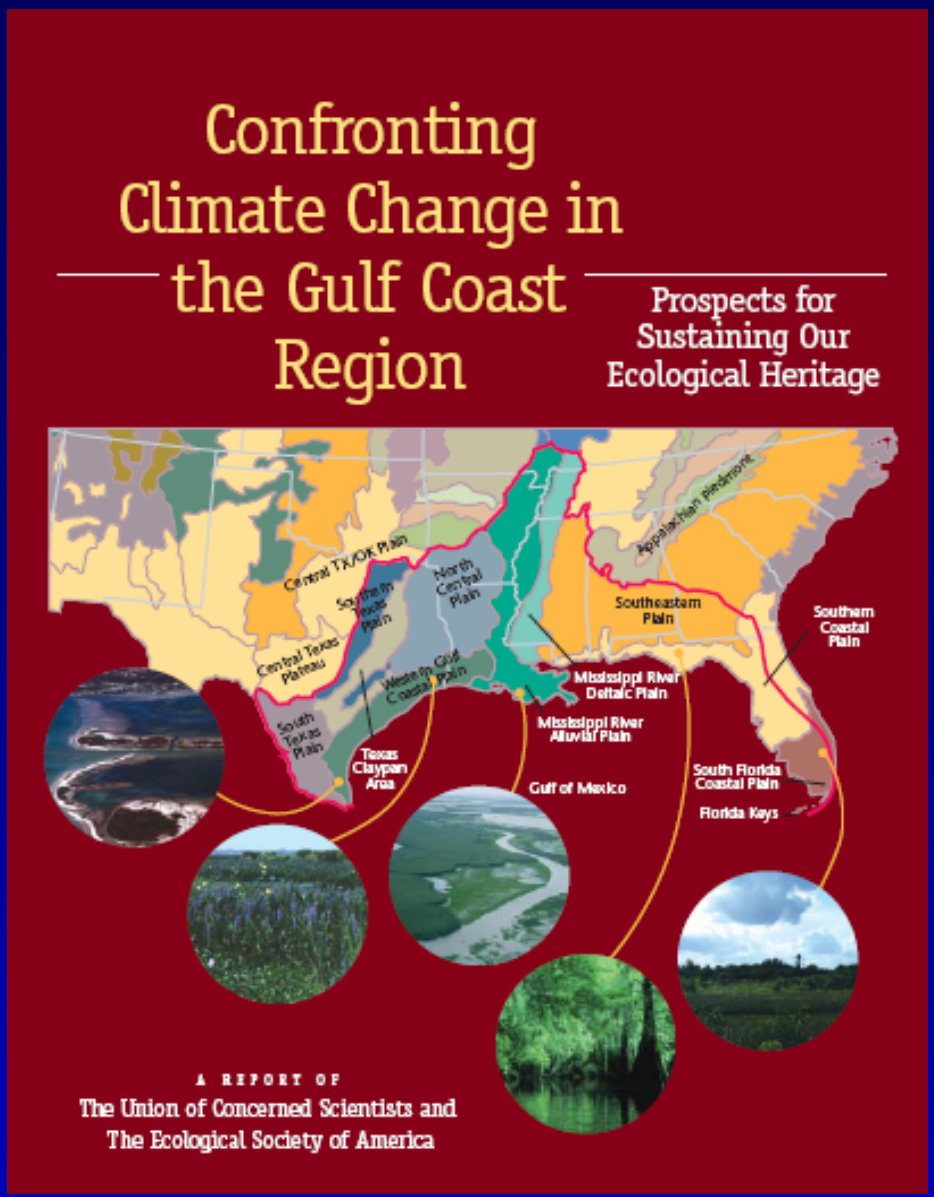
data collection from 1931




Archbold Biological Station Monitoring Points
groundwater well-main
SWFWMD ROMP well
groundwater well
well
soil moisture/temp
staff gauge
water quality monitor
Lake Annie buoy
ozone monitor
weather station
0
0.5
1
1.5
Kilometers
Archbold Biological Station
GIS Laboratory
R L Pickert 23 Feb 2006
LWRWEA
McJunkin Unit
Archbold
Biological
Station
the Reserve



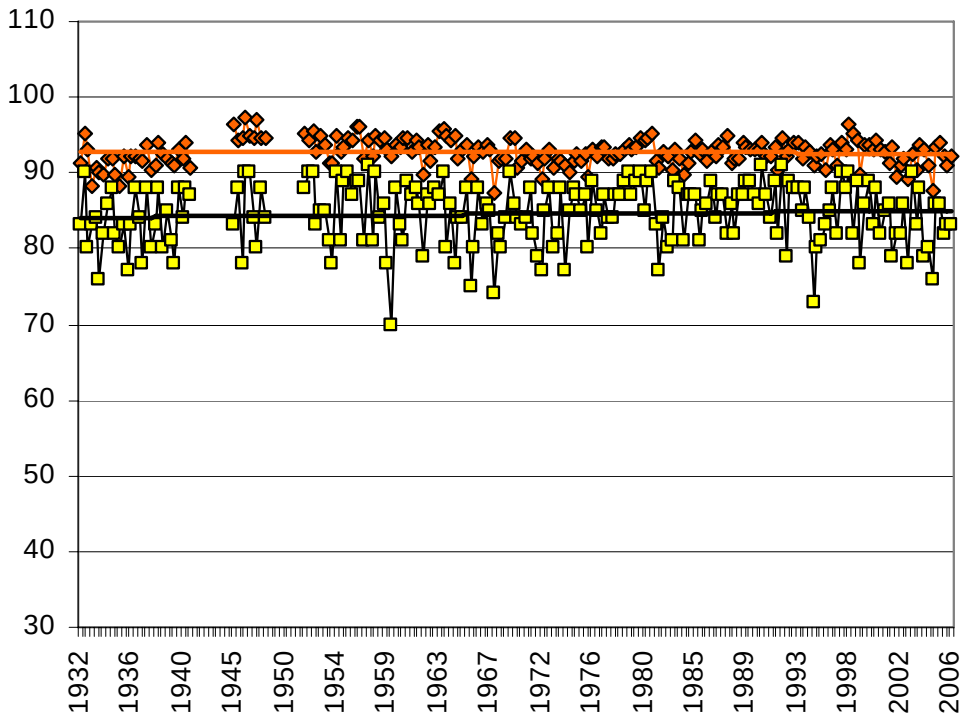
Eric C. Grimm
Illinois State Museum
Research and Collections Center



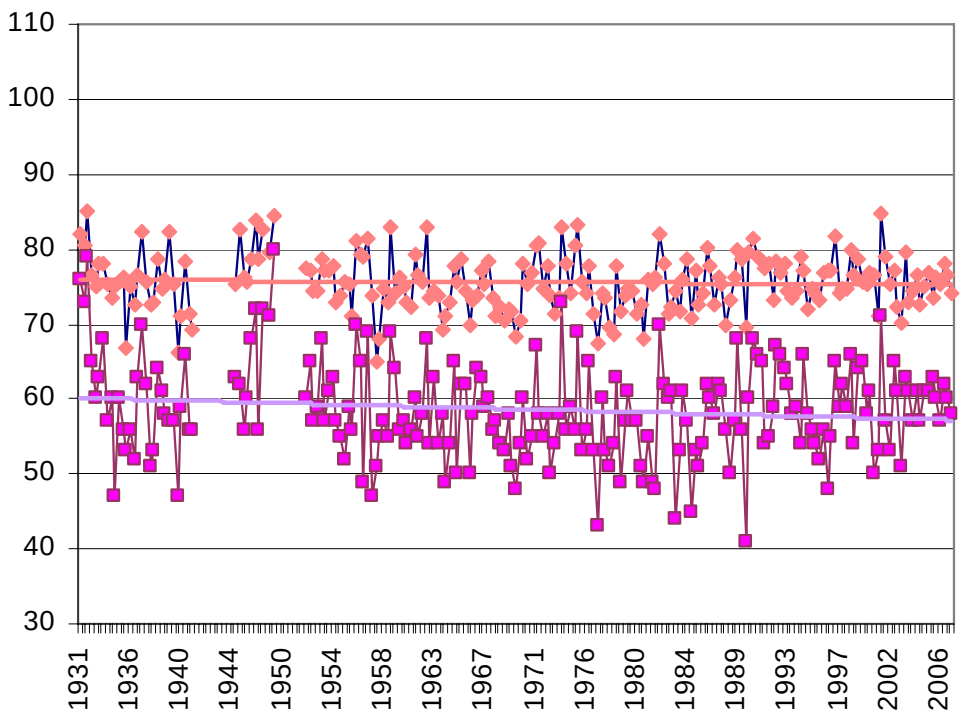
2001

- Higher summer temperatures, decrease in winter cold spells, shift north in frost line, earlier breeding for plants and animals
- Warming of lakes
- Increases in drought related fires

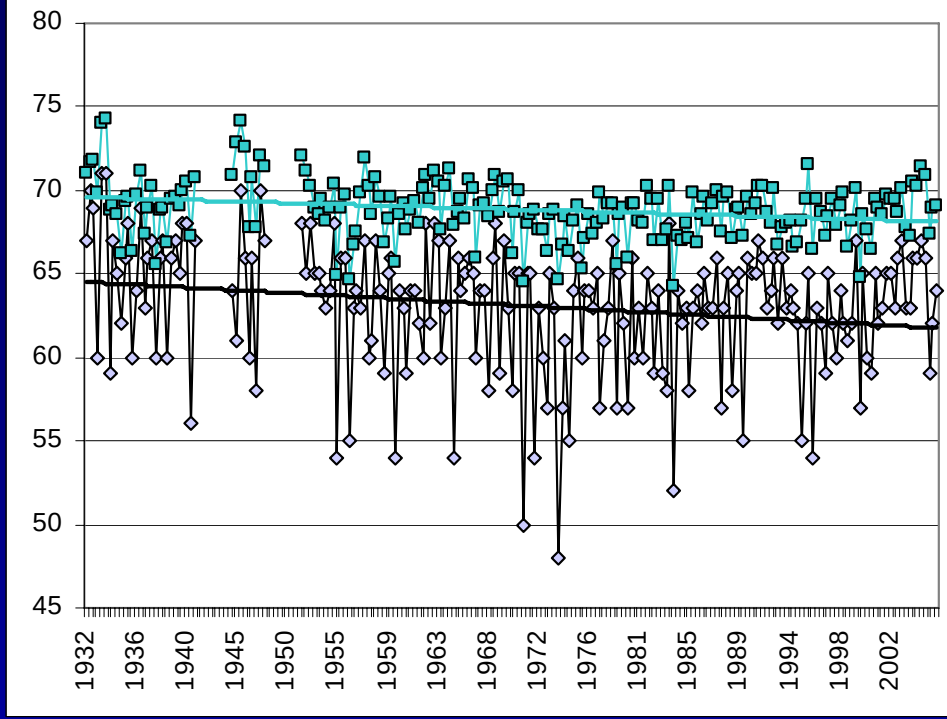
Maximum summer temperatures (J,J,A)



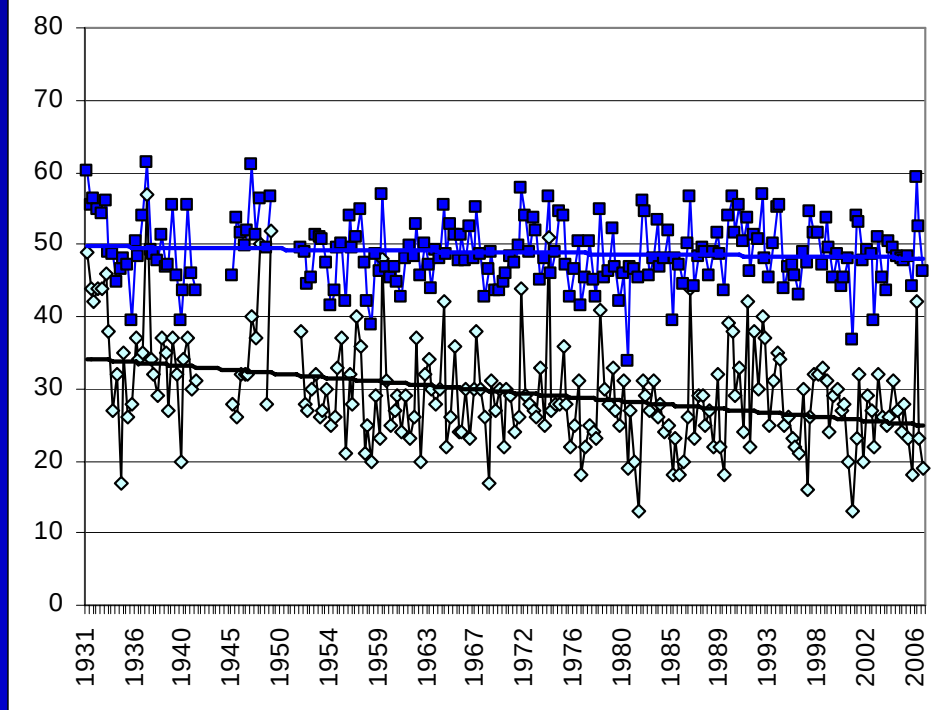
Maximum midwinter temperatures (D,J,F)



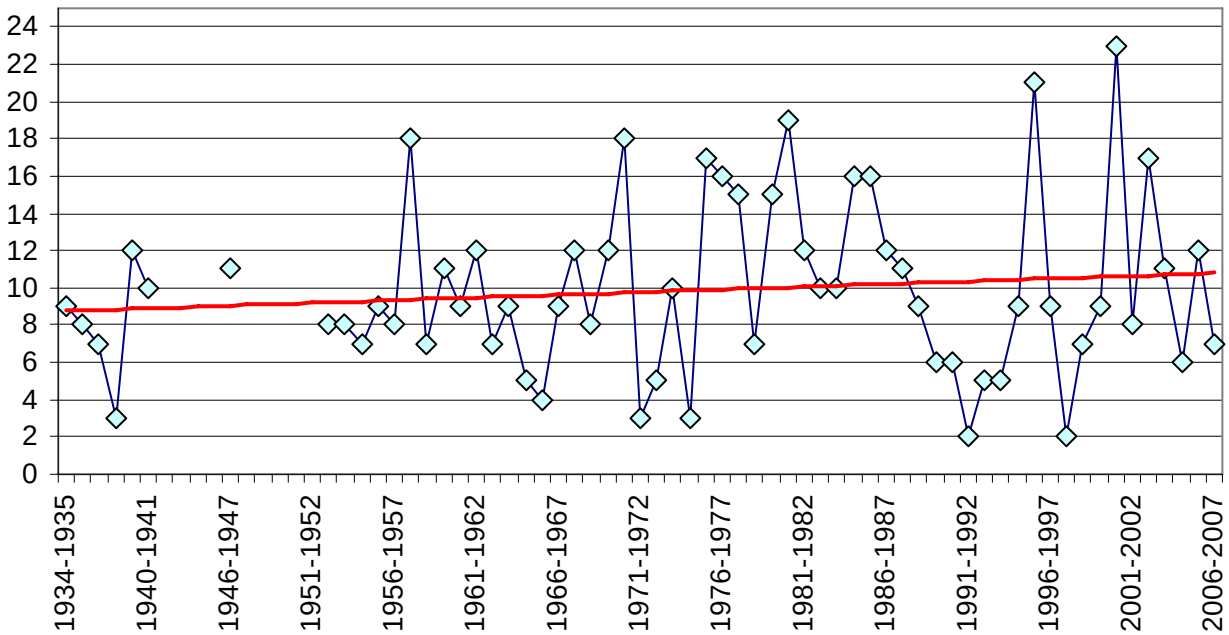
Summer minimum temperatures (J,J,A)

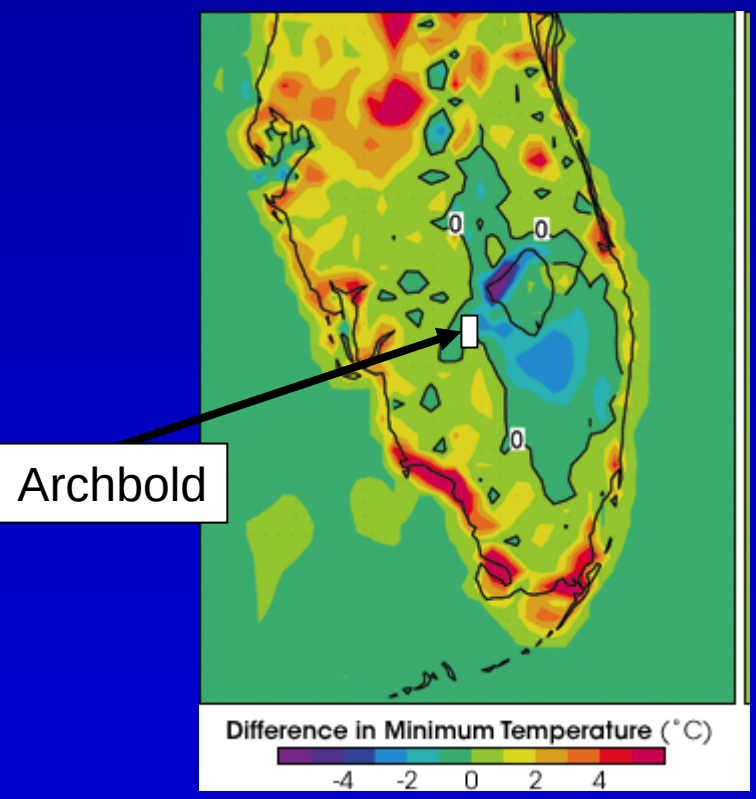


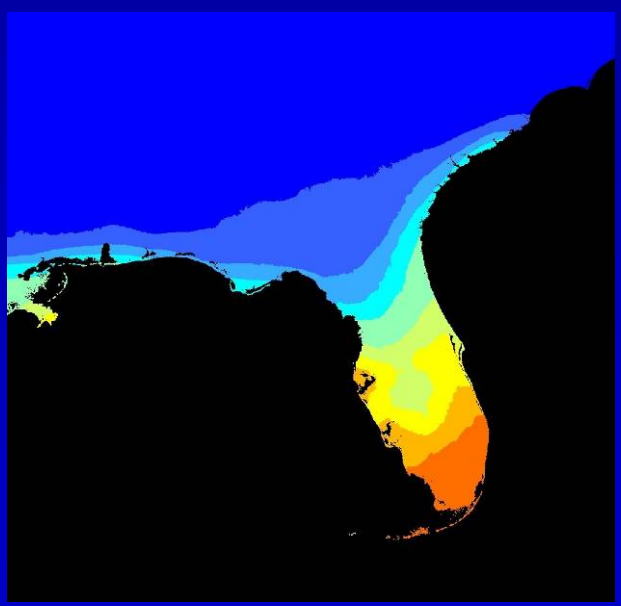
Midwinter minimum temperatures (D,J,F)



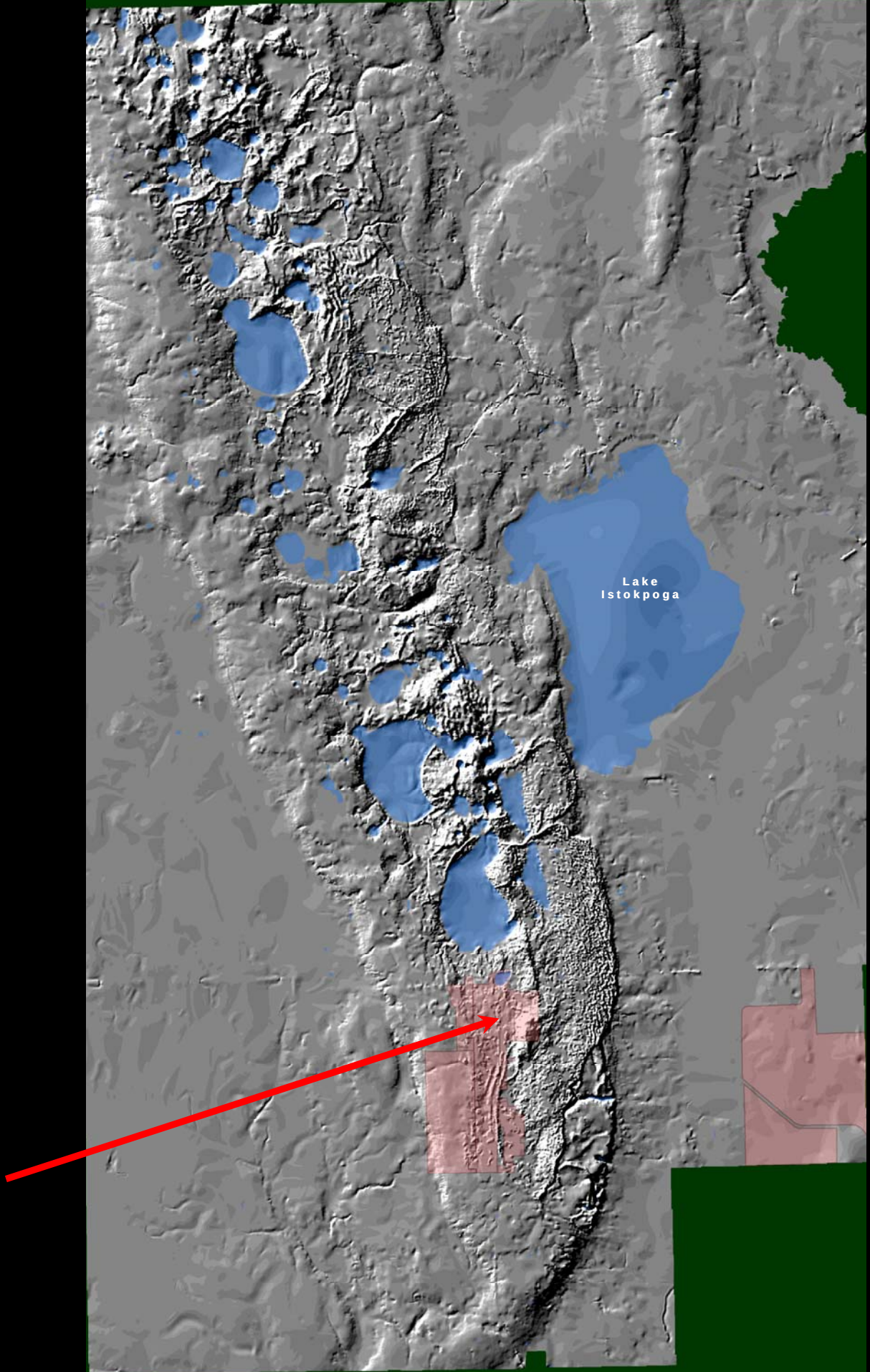
Number of freeze days at Archbold



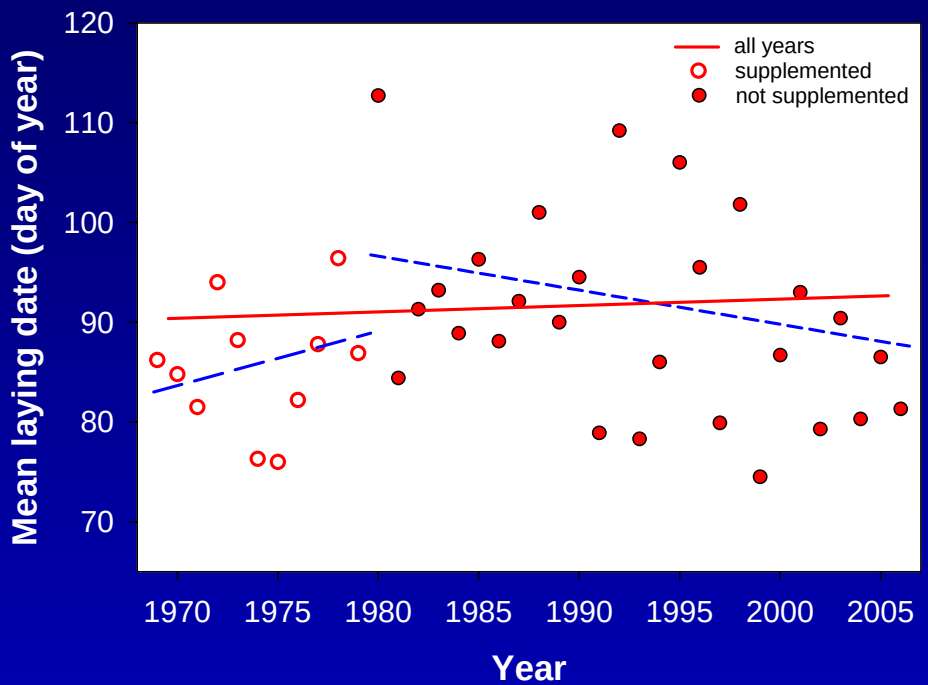




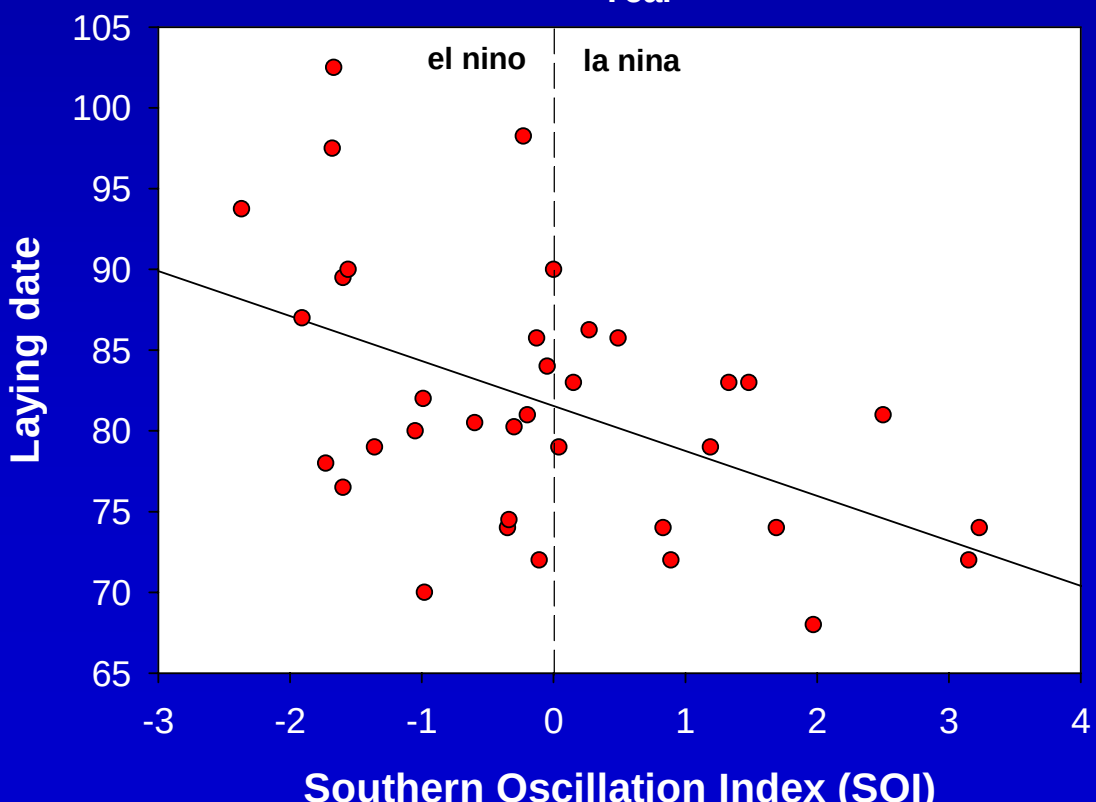
Temp change in relation to land use change- Marshall


Lake
Istokpoga

Long-term climate trends in timing of breeding in Florida Scrub-Jays? Unclear - except breed earlier during La Nina

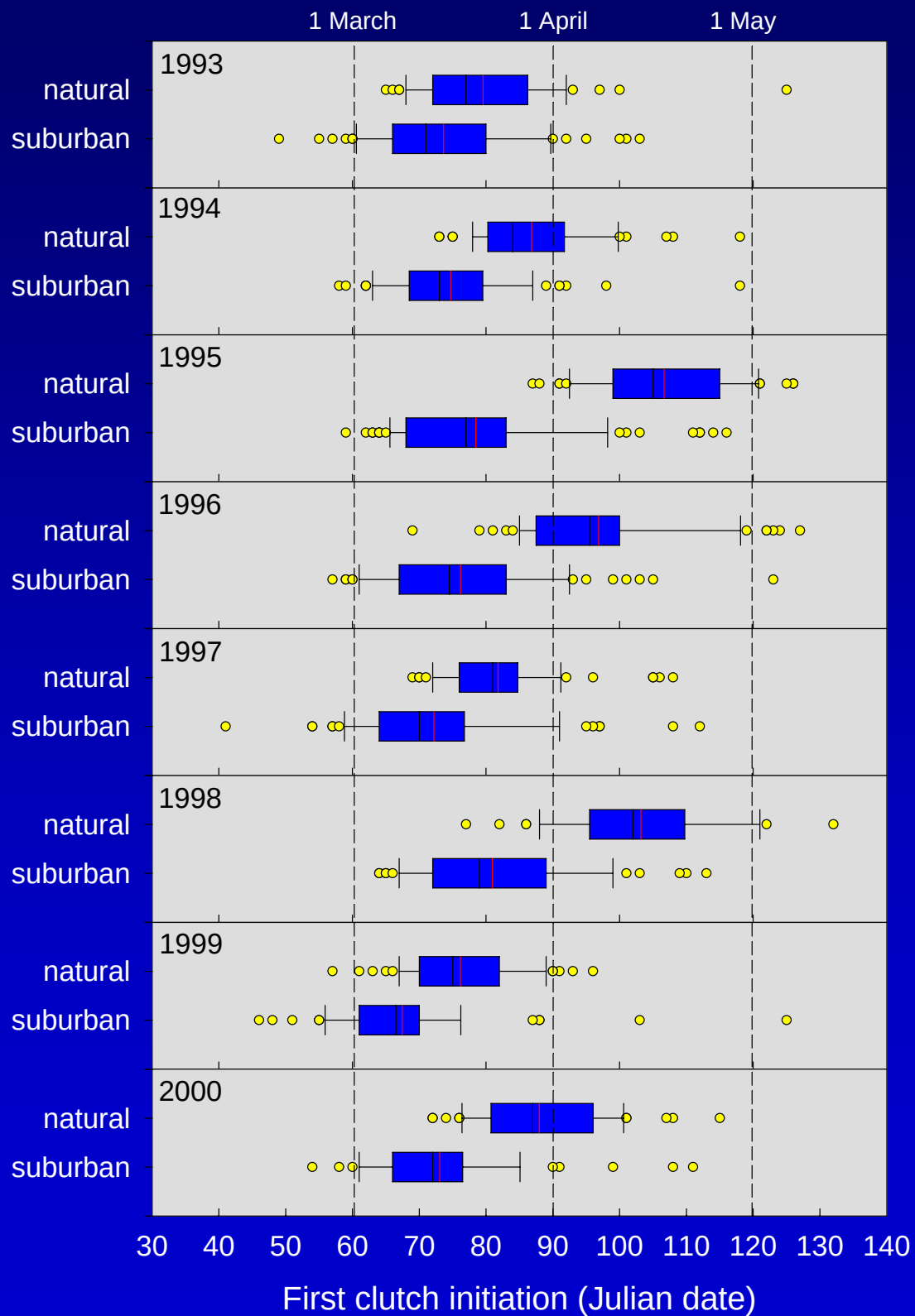


Reed Bowman

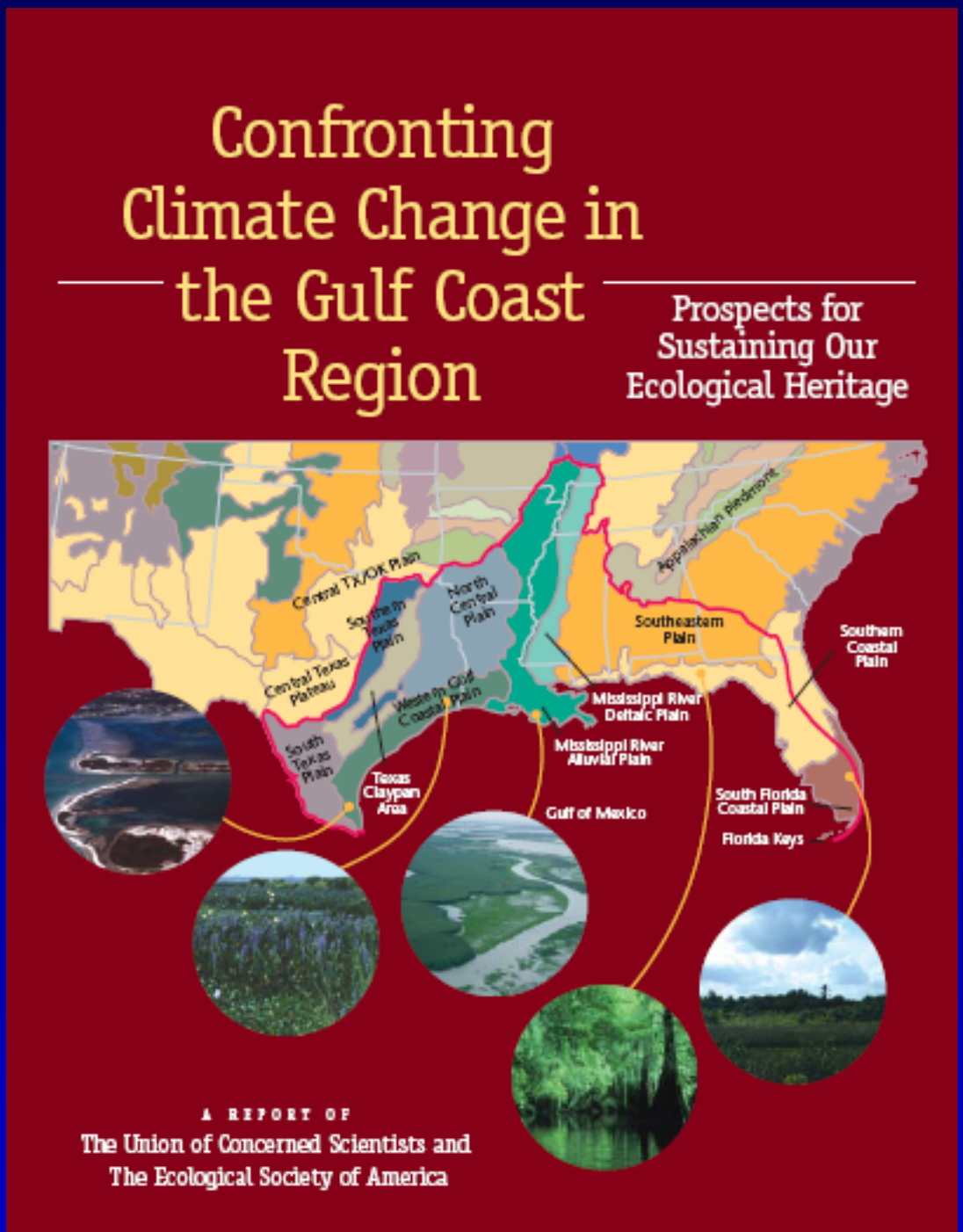


Reed Bowman

Marked land use effect on timing of breeding in "suburban" versus Archbold Scrub jays



Reed Bowman

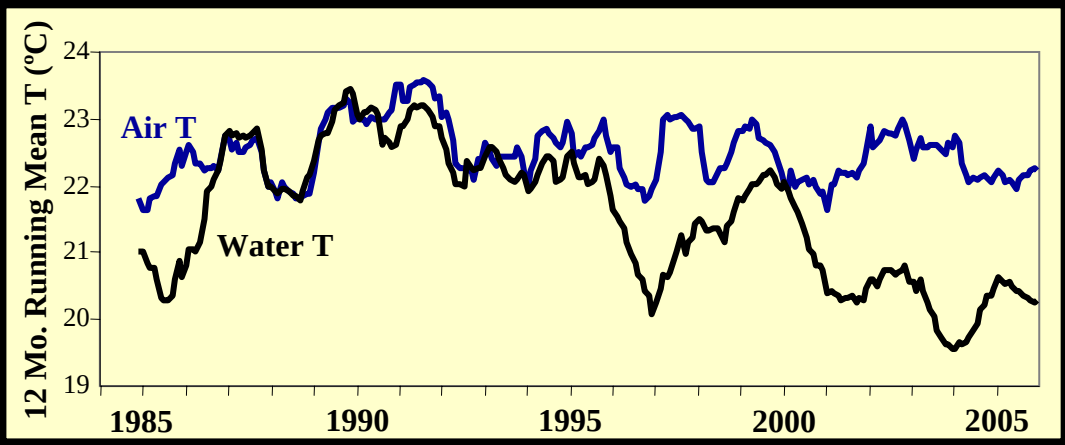


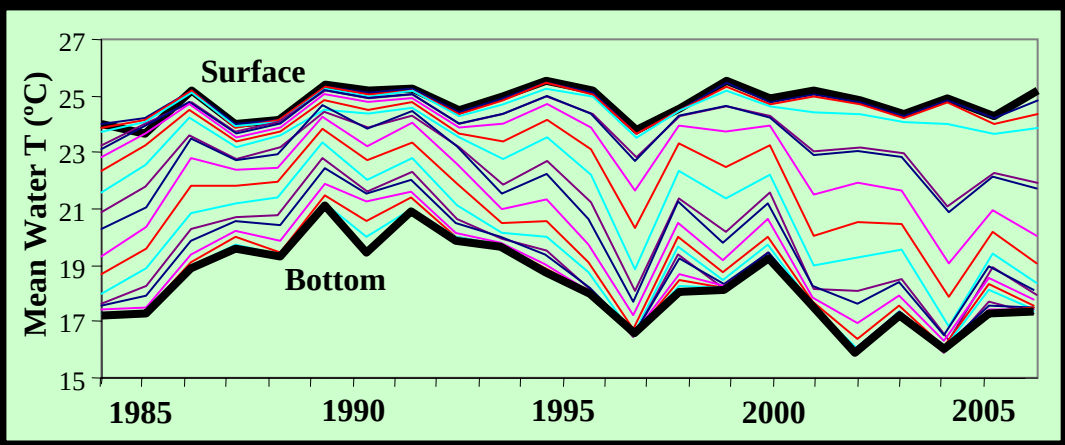
2001

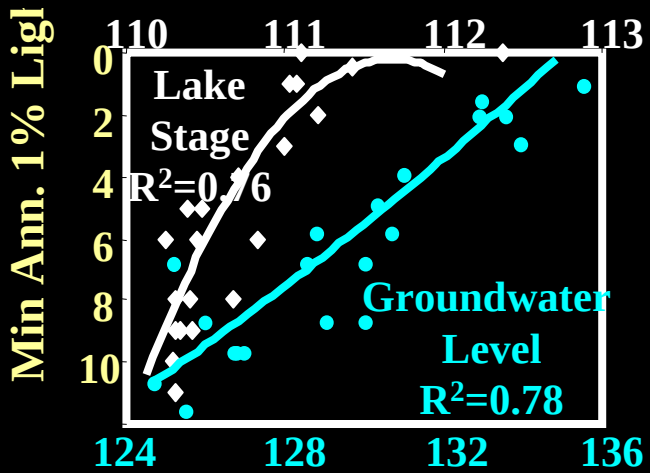
- Warming of lakes

test using Lake Annie
long-term datasets from Archbold 1983 – 2006

Lake Annie: decreasing temperature over time

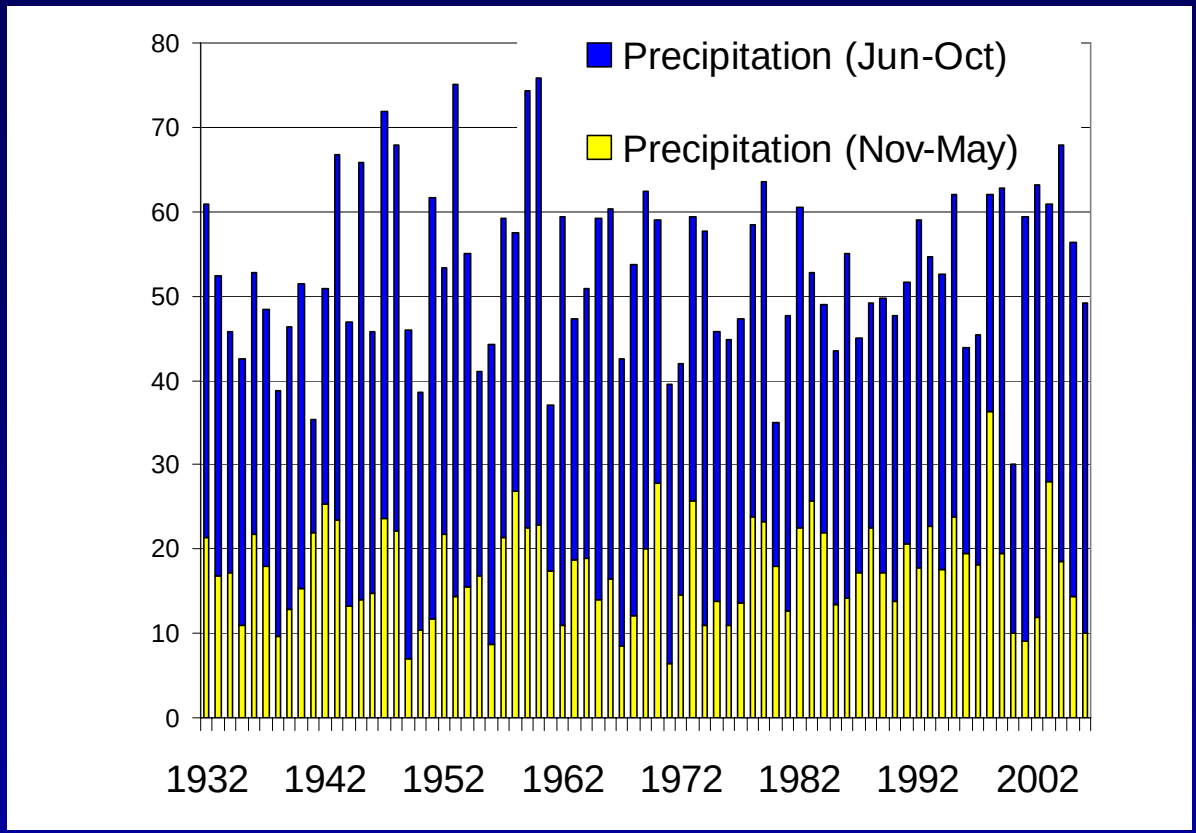


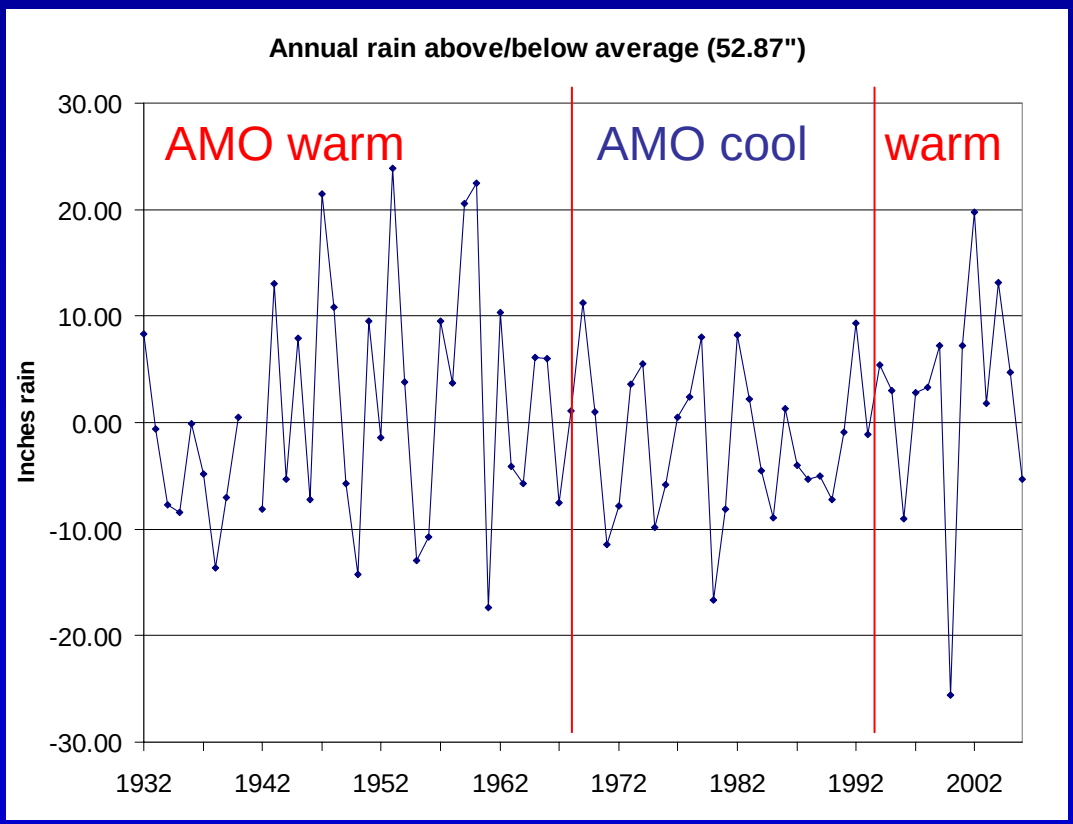


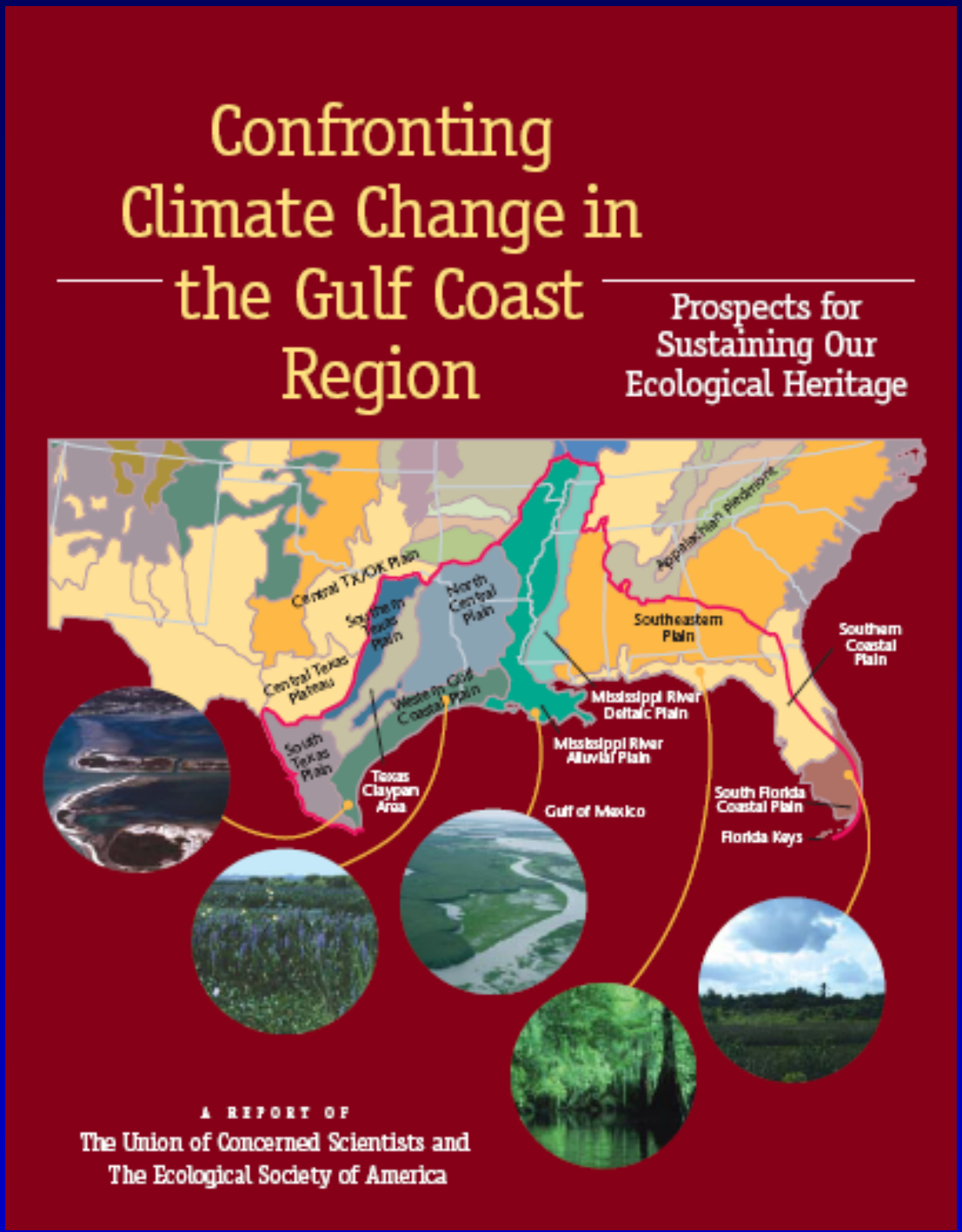


Increased stage and groundwater height are associated with decreased transparency

Gaiser et al in prep


Precipitation (Jun-Oct)
Precipitation (Nov-May)
80
70
60
50
40
30
20
10
0
1932
1942
1952
1962
1972
1982
1992
2002

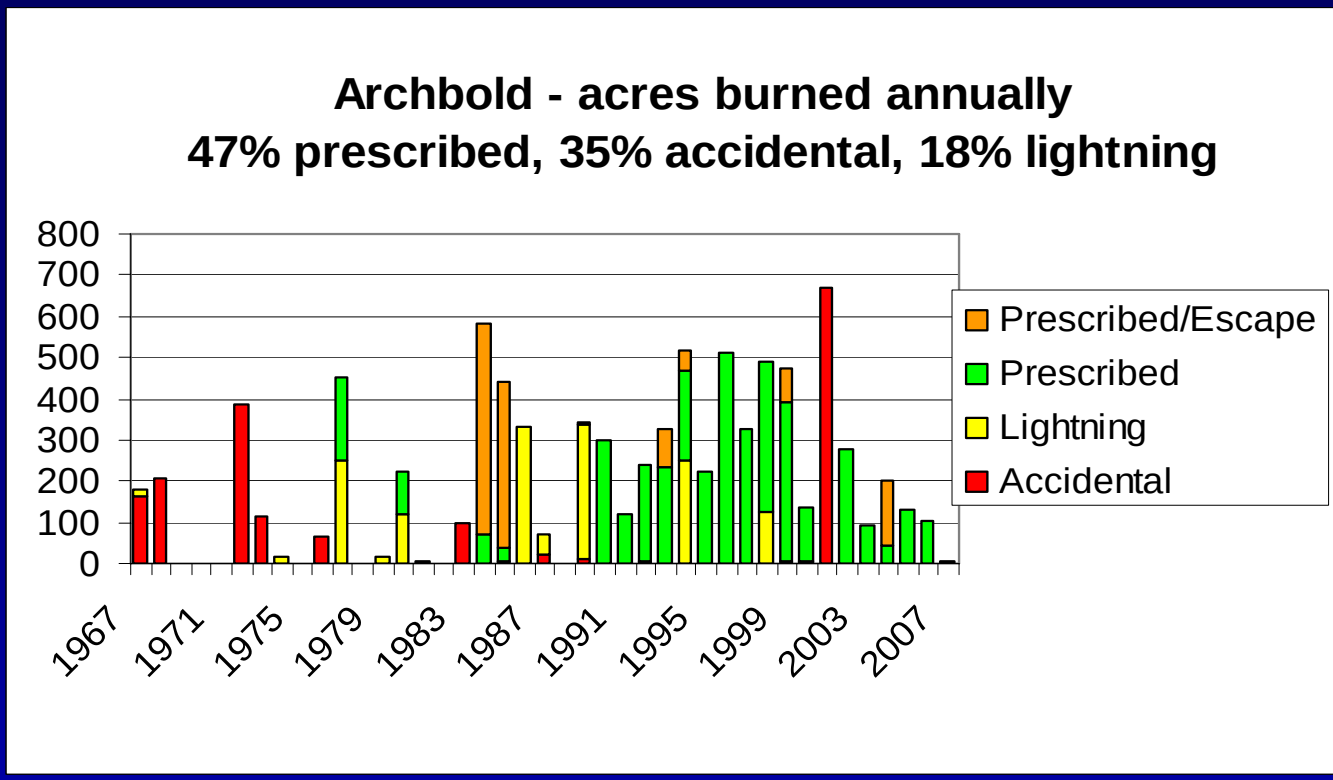

Annual rain above/below average (52.87")
Inches rain
AMO warm
AMO cool
warm
30.00
20.00
10.00
0.00
-10.00
-20.00
-30.00
1932
1942
1952
1962
1972
1982
1992
2002



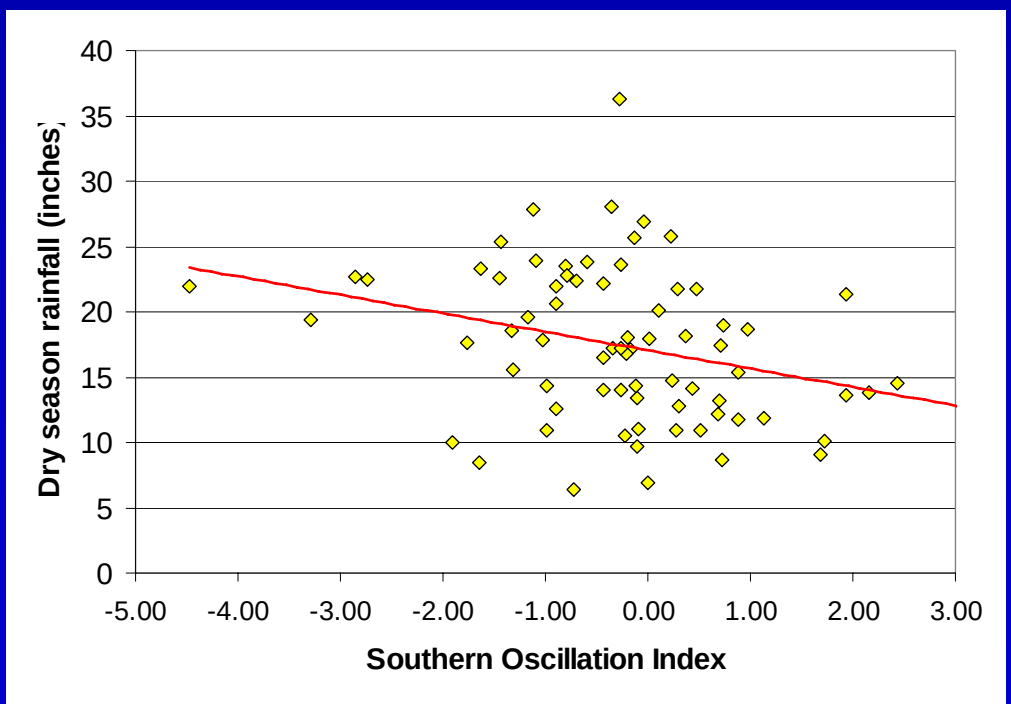
2001

- Increases in drought related fires

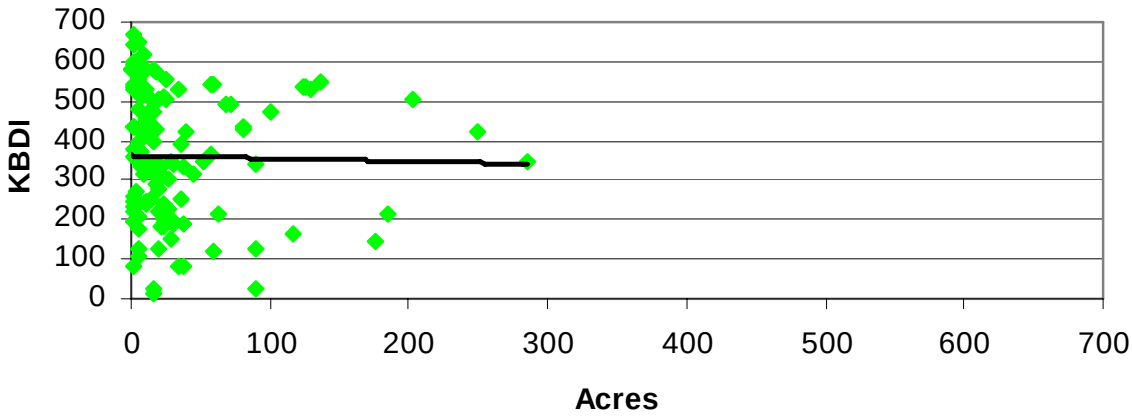
Increasing fires in relation to drought?



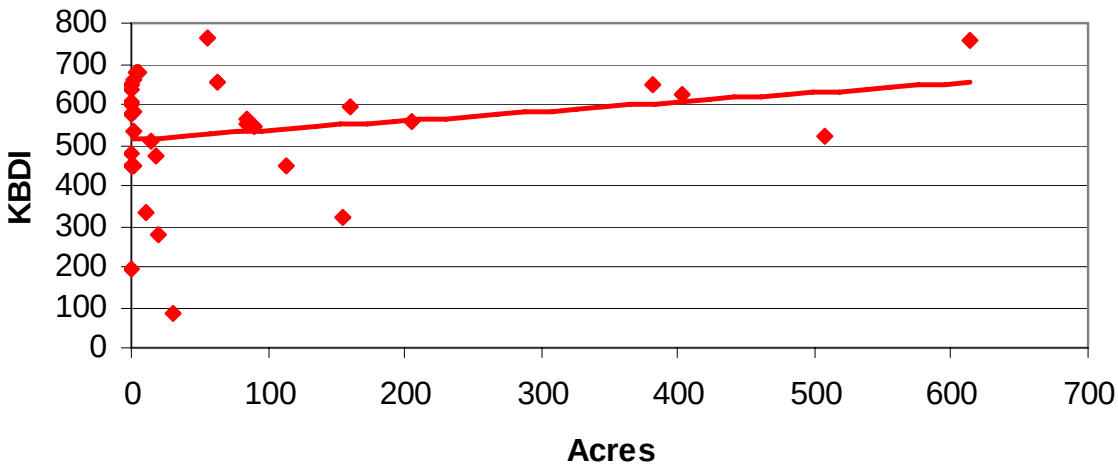
Dry season rainfall driven by ENSO



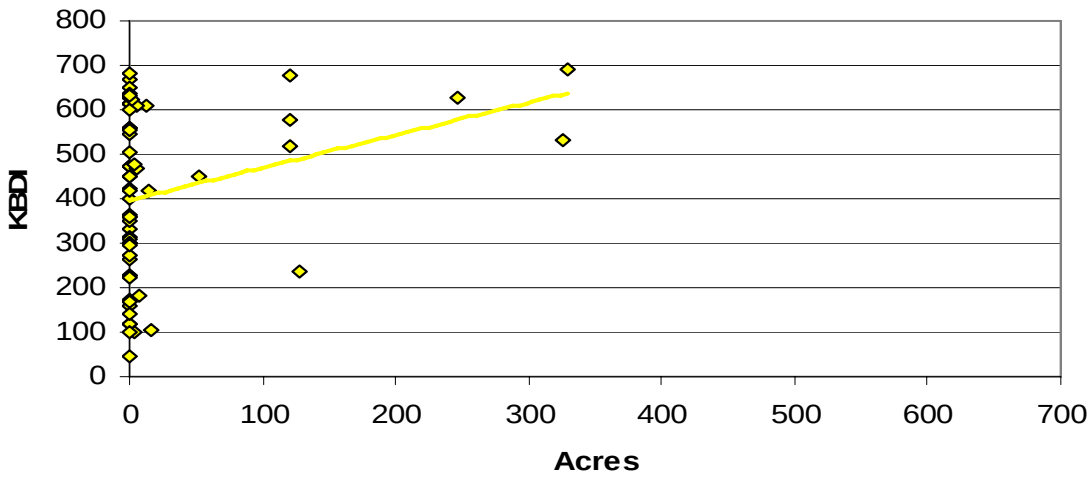
Prescribed fires acres in relation to drought



Accidental fire acres in relation to drought



Lightning fire acres in relation to drought

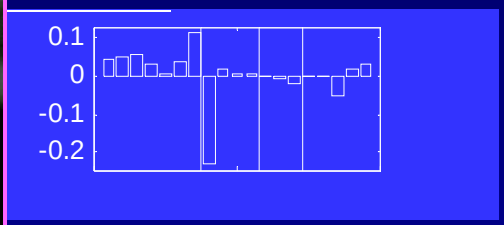


Climate change and plants

Eric Menges

- In Florida, predictions of more variable climate
- NCEAS group: explore different types of variation and effects on stochastic growth rate (Morris et al. 2007, Ecol. Letters)
- 3 of 5 species in analysis from Florida scrub (data from Menges et al., ABS plant lab)
- Expectation from past studies: variation reduces stochastic growth rate

Positive elasticities for between-phase variance, especially for survival (left group of bars), for *D. frutescens*



- Greater demographic variation between, rather than within time-since-fire phases
- Positive elasticities for between-phase demographic variance
- Implies adaptation to fire-driven disturbance regime
- Also implies that climate-change effects on plants will be mediated by effects on disturbance regime (e.g. will there be increased fire frequency given more variable climate?)

No good support for our simplistic predictions - plenty of confounding effects, and complex responses

- Land use change
  - Wetland losses, urbanization
- AMO and SOI drivers
  - Overwhelming drivers for intermediate (20 -30year) and short term drought and flooding cycles
- Socio-economic responses

  - burn permits, FSJ supplementary feeding

Recommend a return to Lake Annie for a detailed 2000+ year core to elucidate a decadal resolution climate record

Team of researchers very interested in such an undertaking.