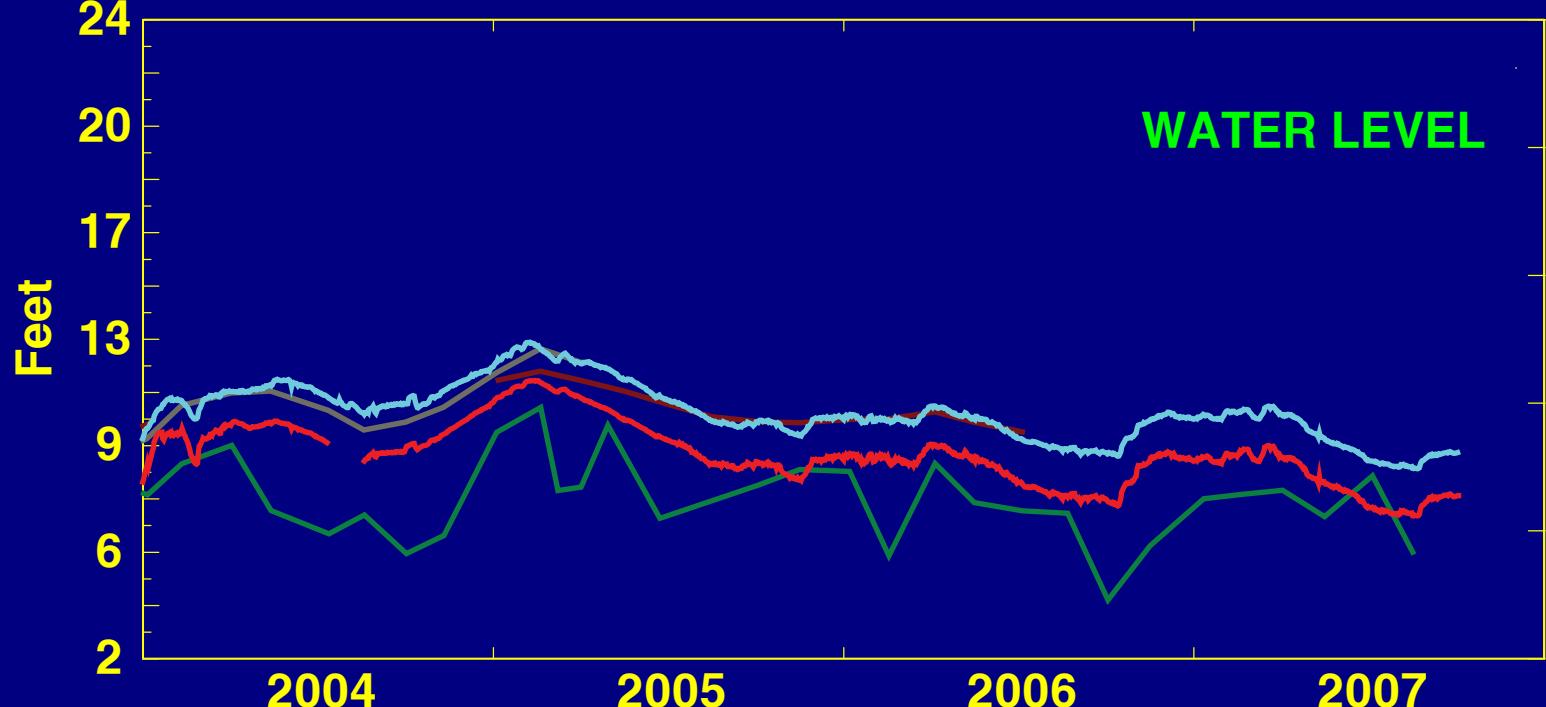
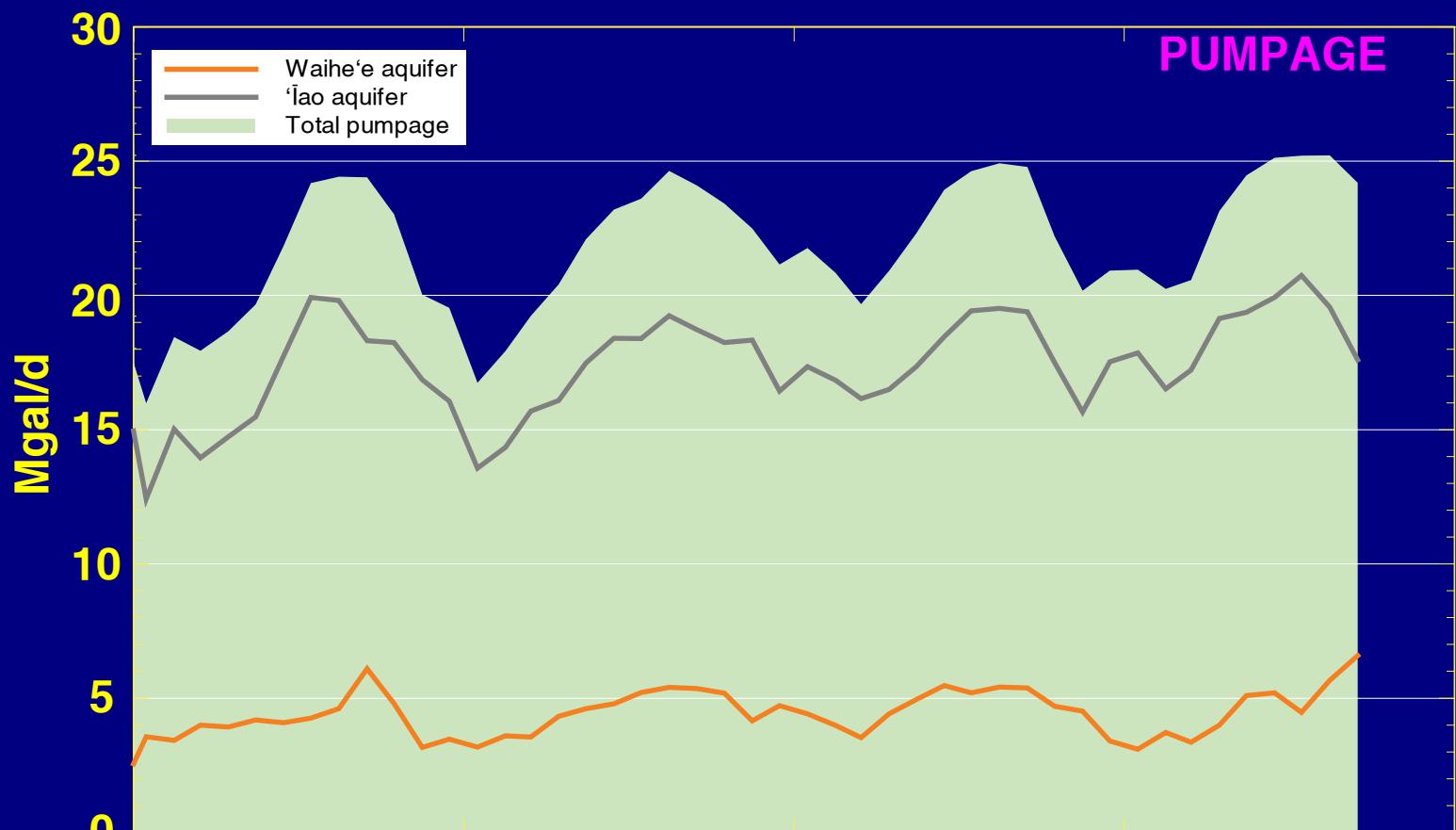
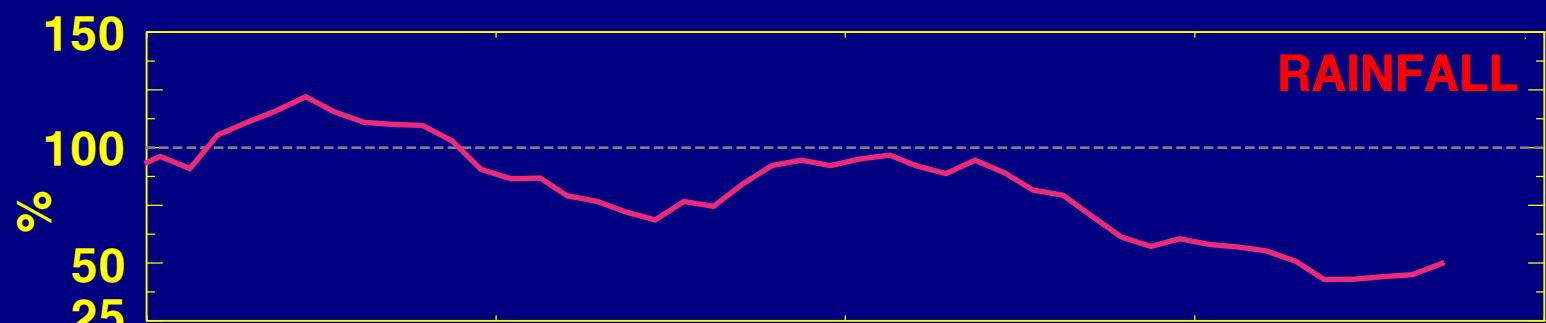


Central Maui Ground-Water Availability Study

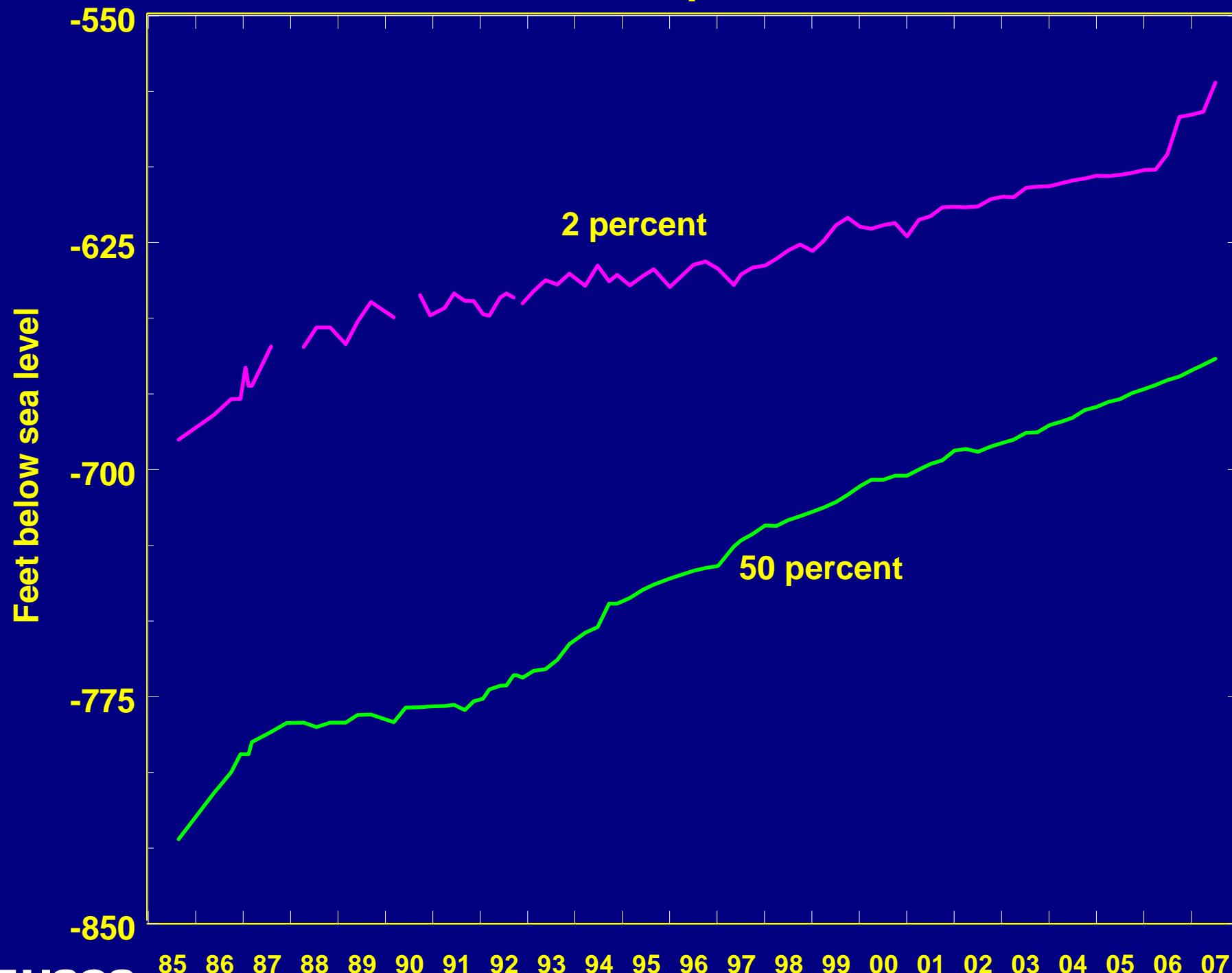
October 15, 2007

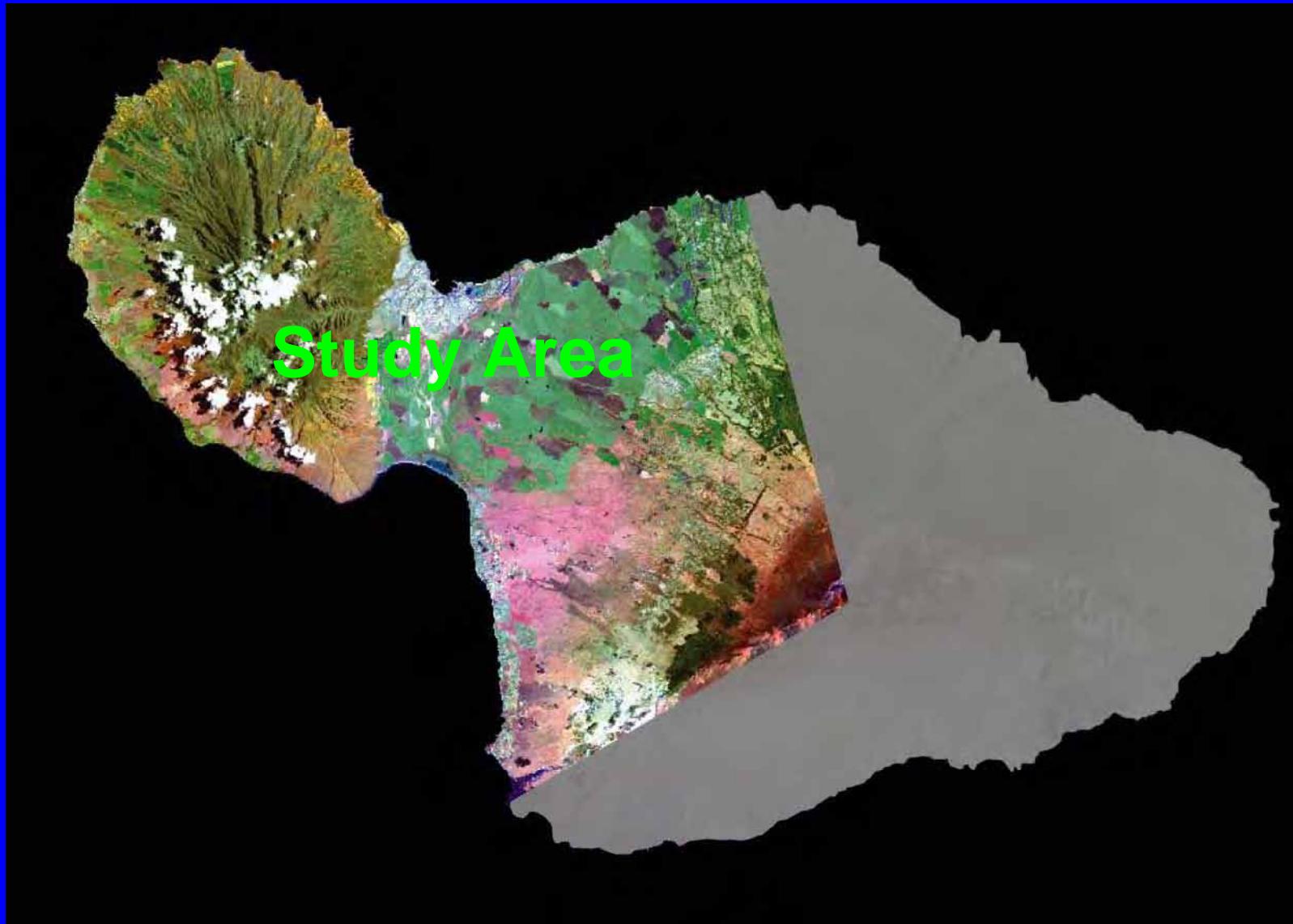
Current Status of ‘Iao and Waihe‘e Aquifer Areas





Waiehu Deep Monitor Well





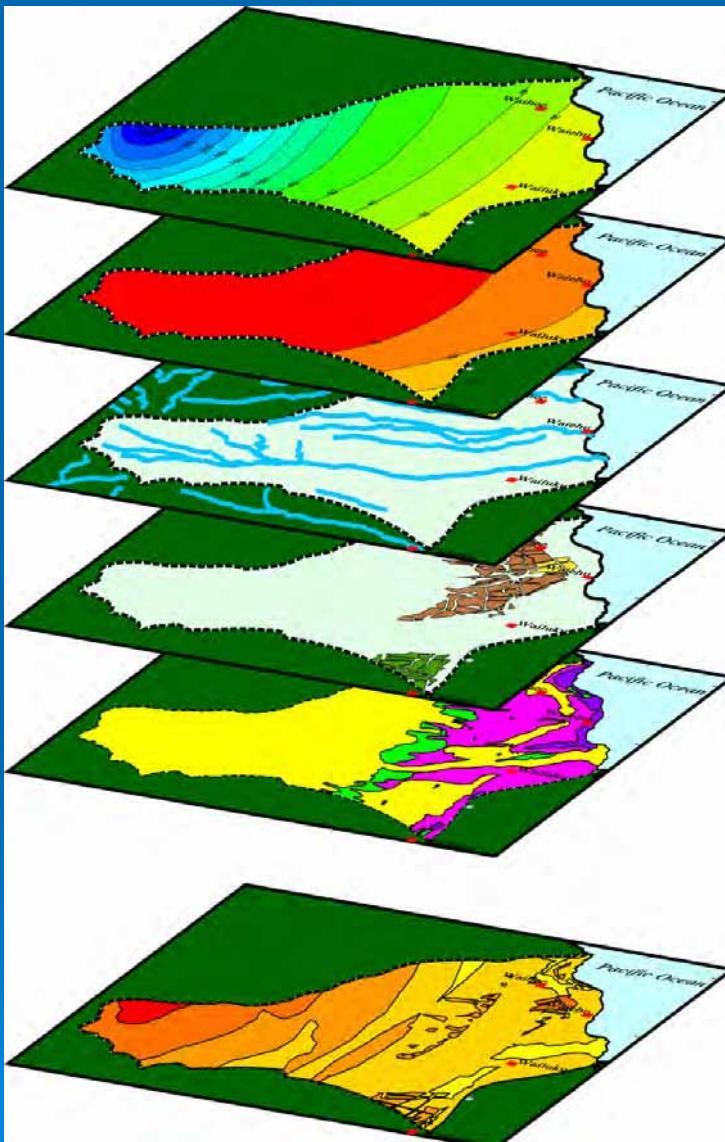
Study Objectives

- Improve understanding of regional flow
- Estimate ground-water recharge
- Estimate effects of selected pumping scenarios on the ground-water system

Study Approach

1. Analyze existing data
2. Collect climate, ground-water, and streamflow data
3. Compute recharge with a water budget
4. Develop numerical ground-water model

Recharge Computation



Rainfall + Fog drip

Pan evaporation

Runoff

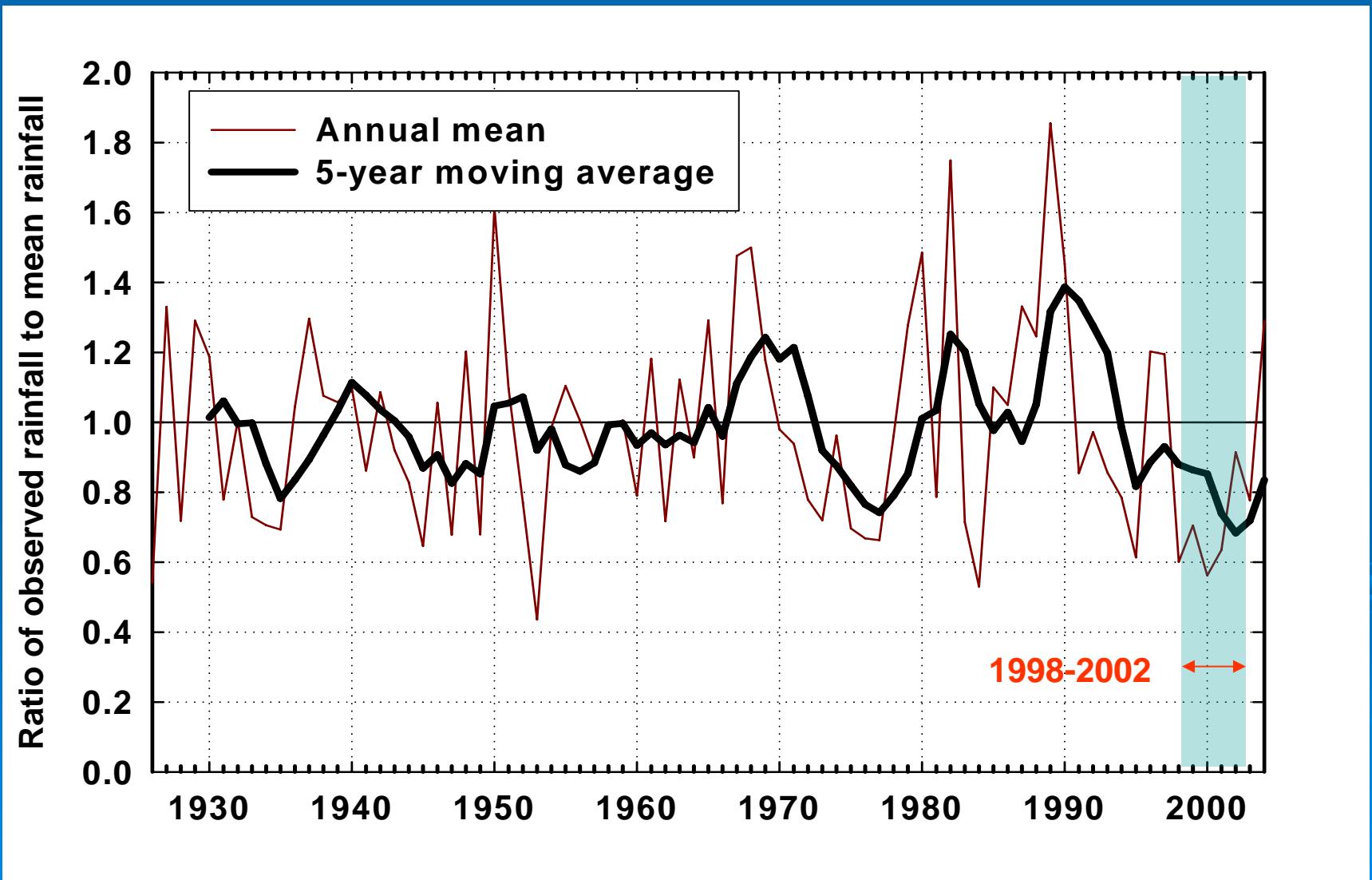
Irrigation

Soils + Land cover



Recharge

5-Year Moving Average of Study-Area Rainfall



Agricultural and Urban Land Use 1926-1979

Explanation

- █ Diversified agriculture
- █ Golf (former agriculture)
- █ Macadamia
- █ Pineapple
- █ Sugar
- █ Urban

Pineapple to
golf

Agricultural and Urban Land Use 1980-1984

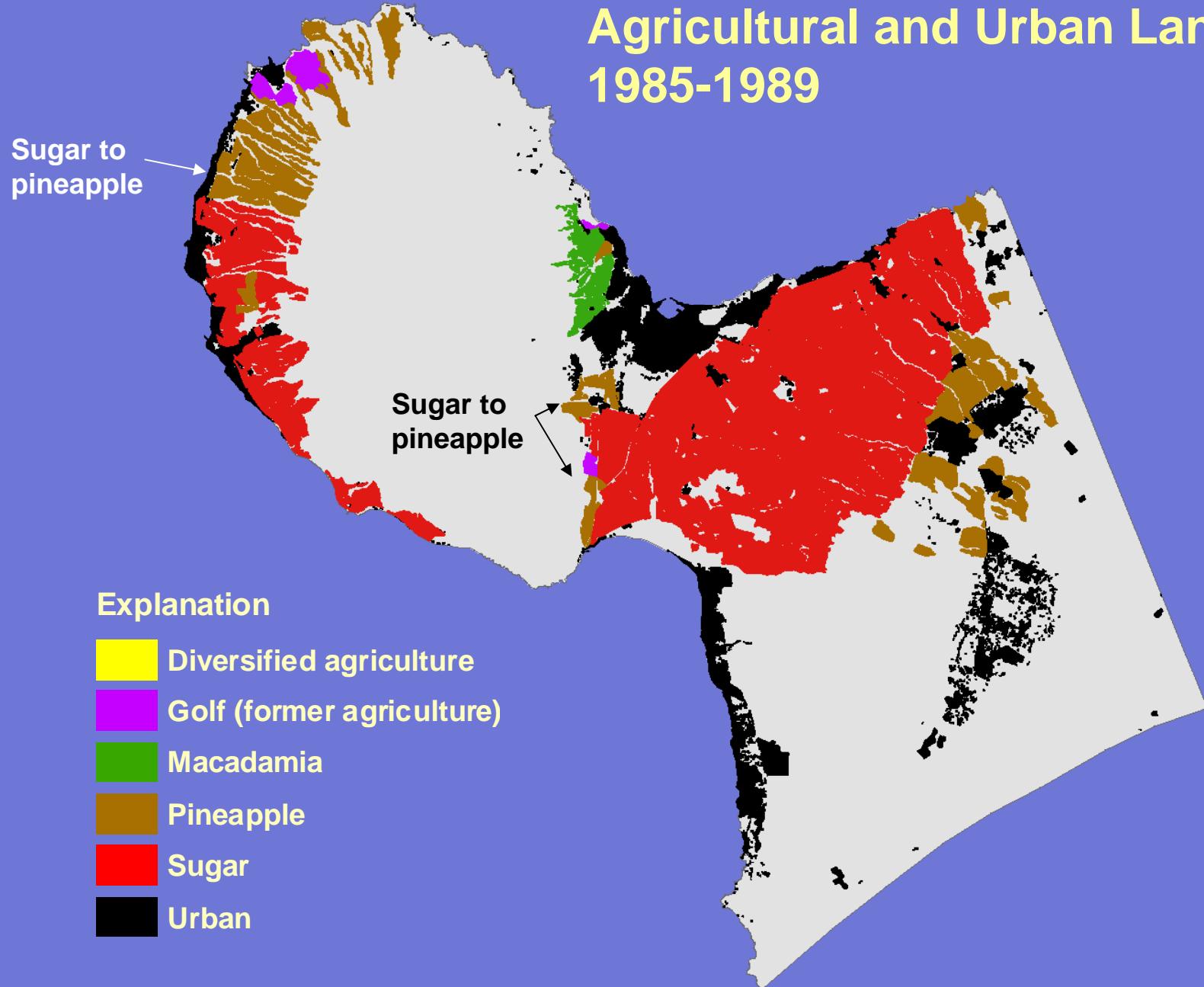
Sugar to macadamia

Pineapple to sugar

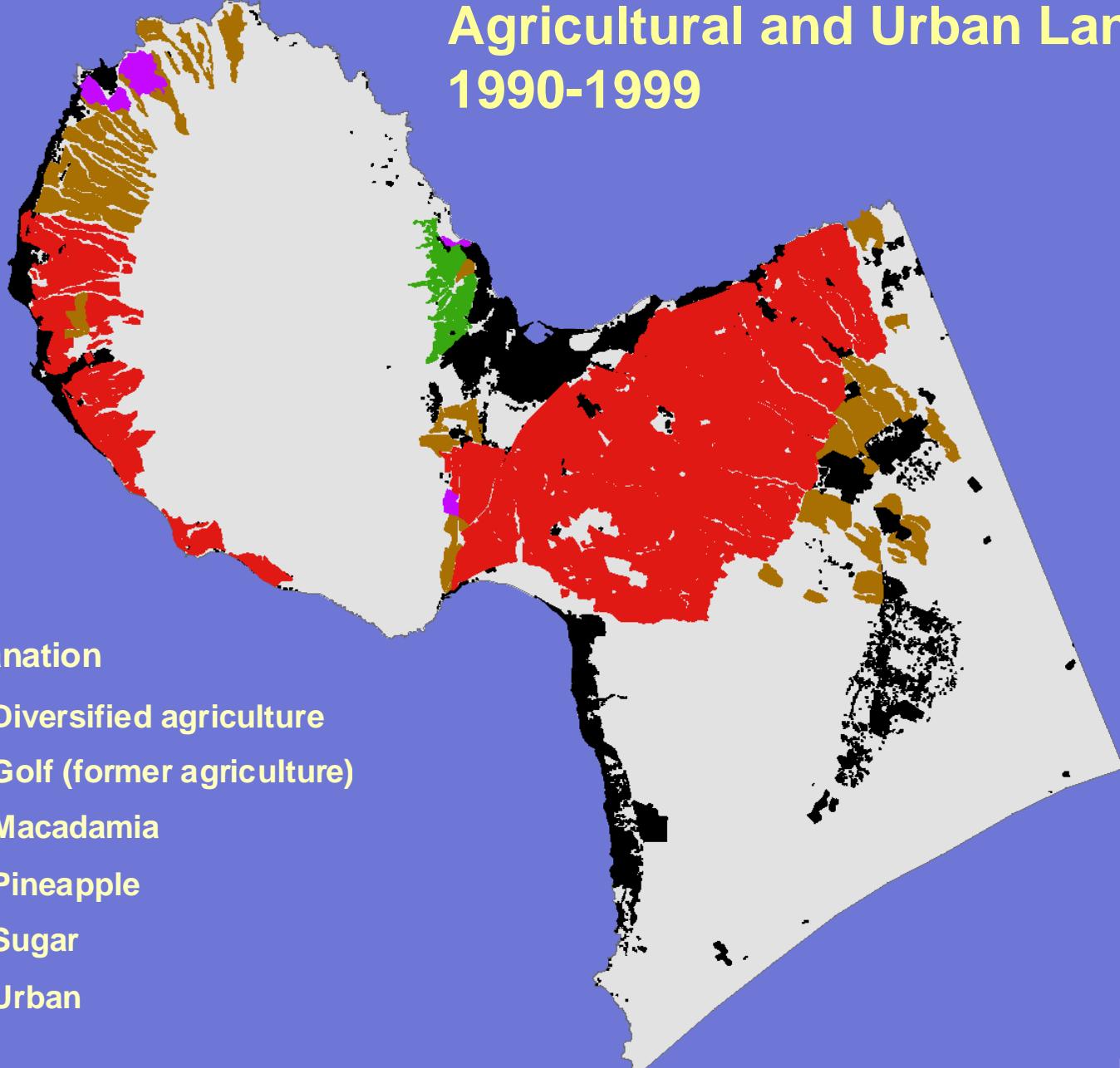
Explanation

- █ Diversified agriculture
- █ Golf (former agriculture)
- █ Macadamia
- █ Pineapple
- █ Sugar
- █ Urban

Agricultural and Urban Land Use 1985-1989



Agricultural and Urban Land Use 1990-1999



Pineapple to no ag.

Sugar to
no ag.

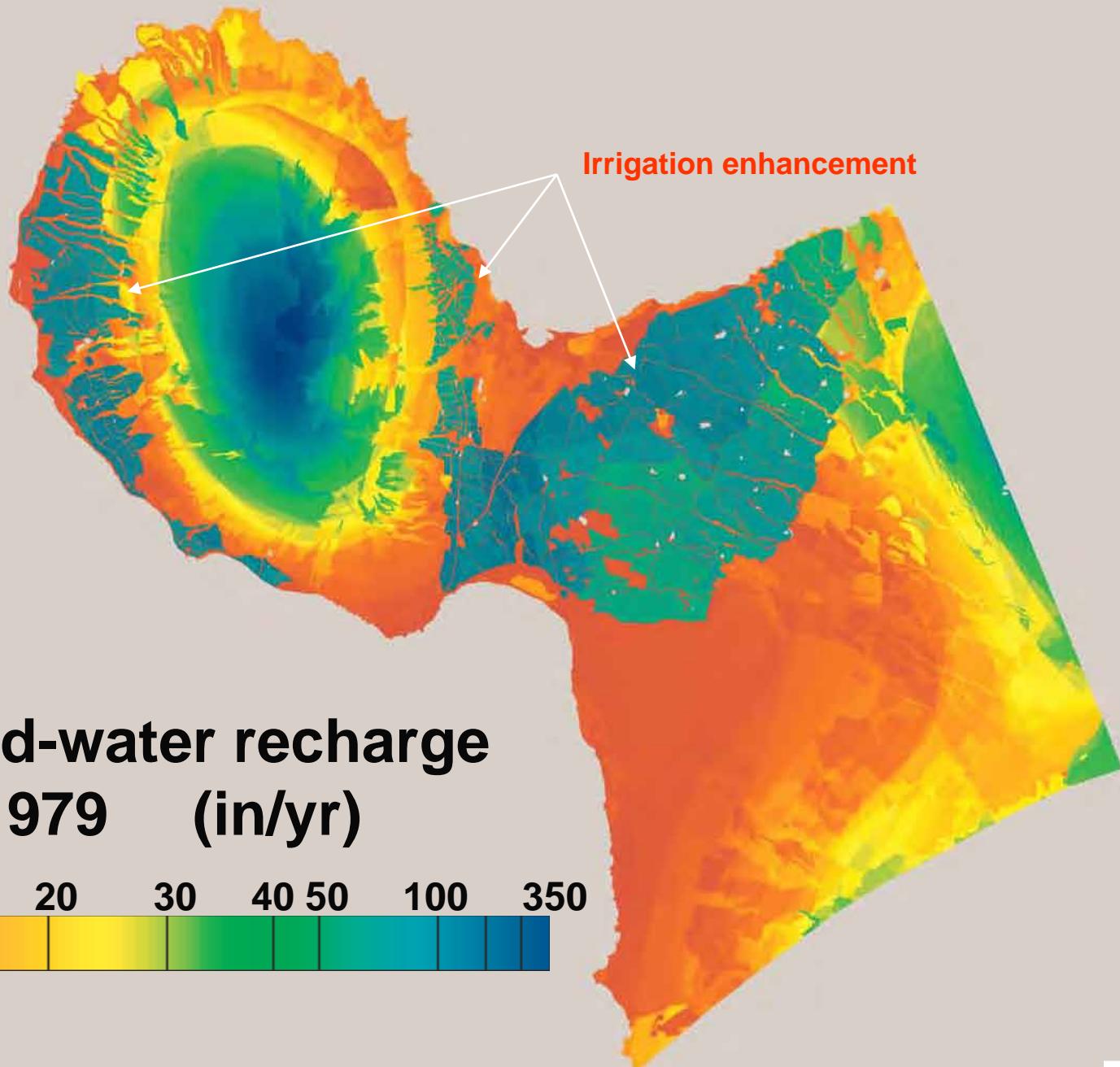
Pineapple to
diversified ag.

Agricultural and Urban Land Use 2000-2004

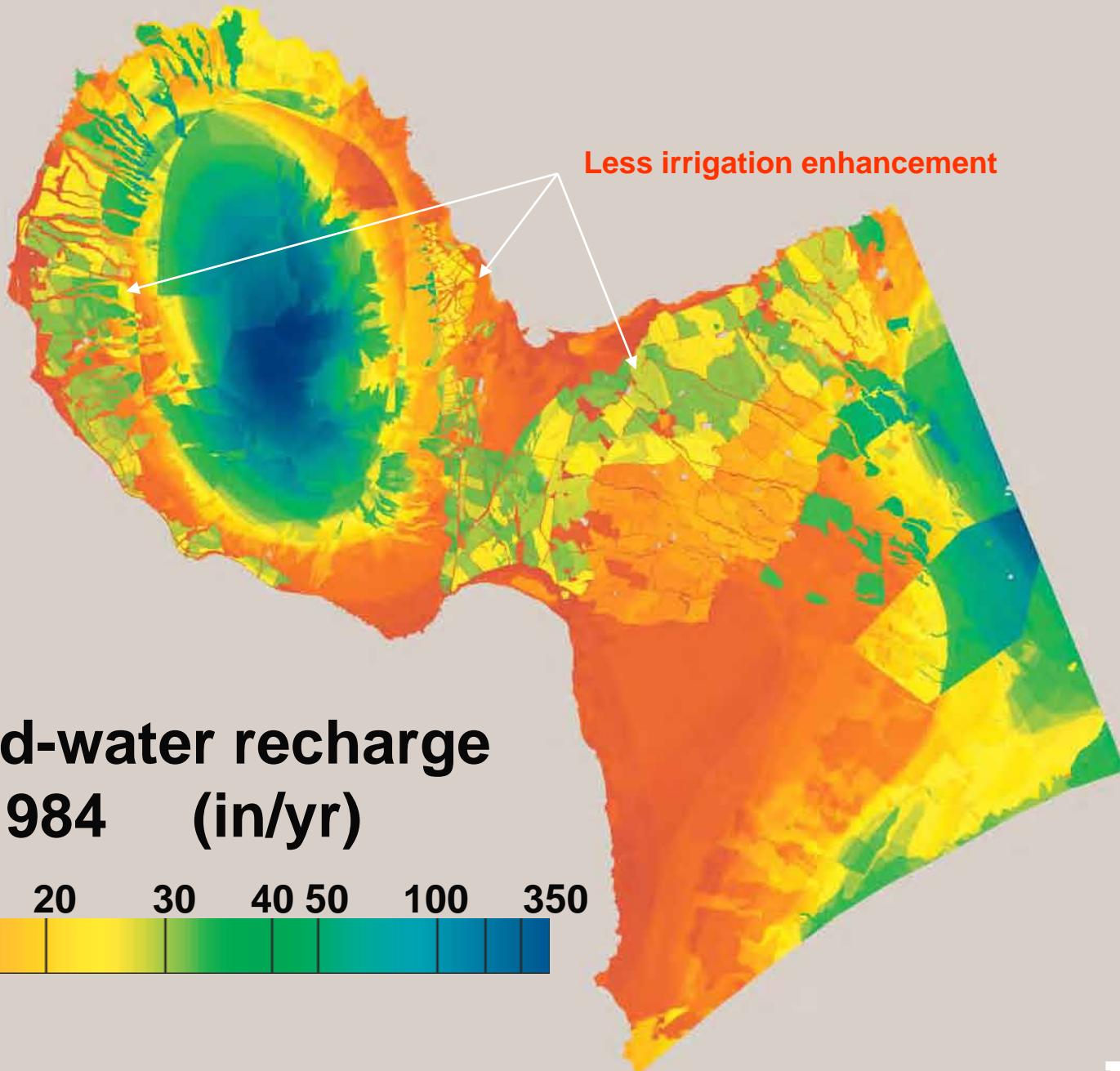
Macadamia to no ag.

Explanation

- Diversified agriculture
- Golf (former agriculture)
- Macadamia
- Pineapple
- Sugar
- Urban

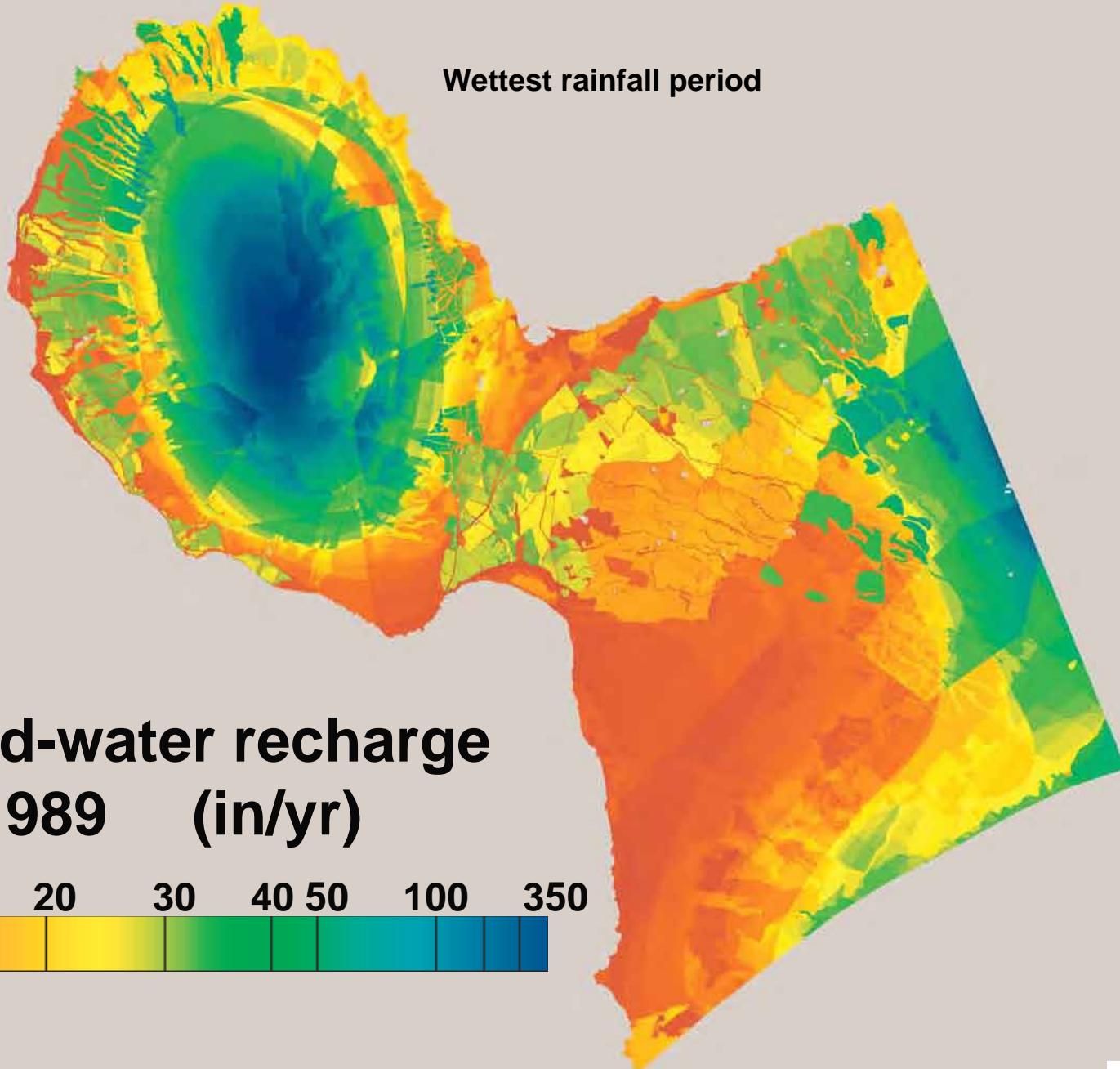


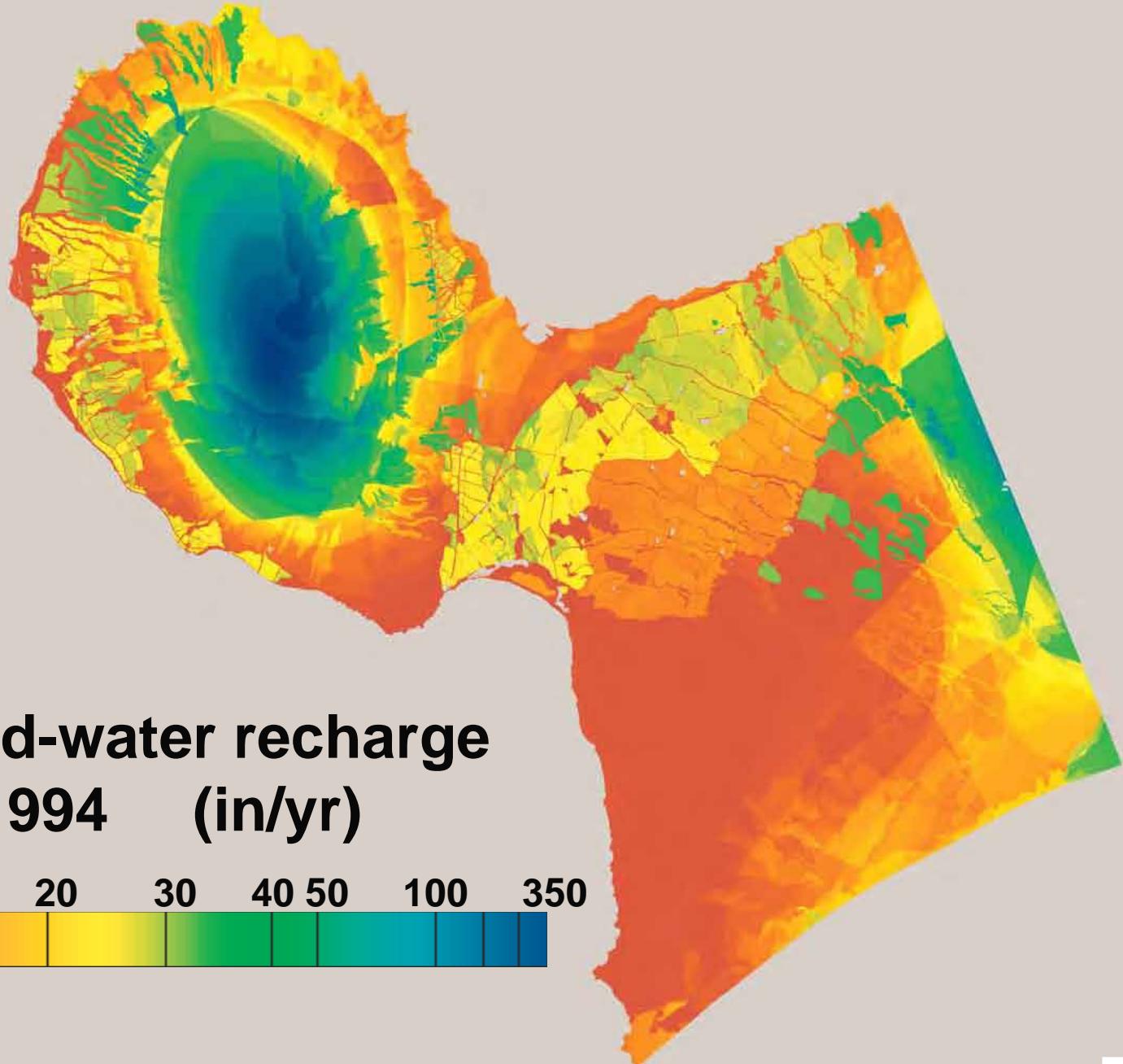
Ground-water recharge 1980-1984 (in/yr)



Wettest rainfall period

Ground-water recharge 1985-1989 (in/yr)

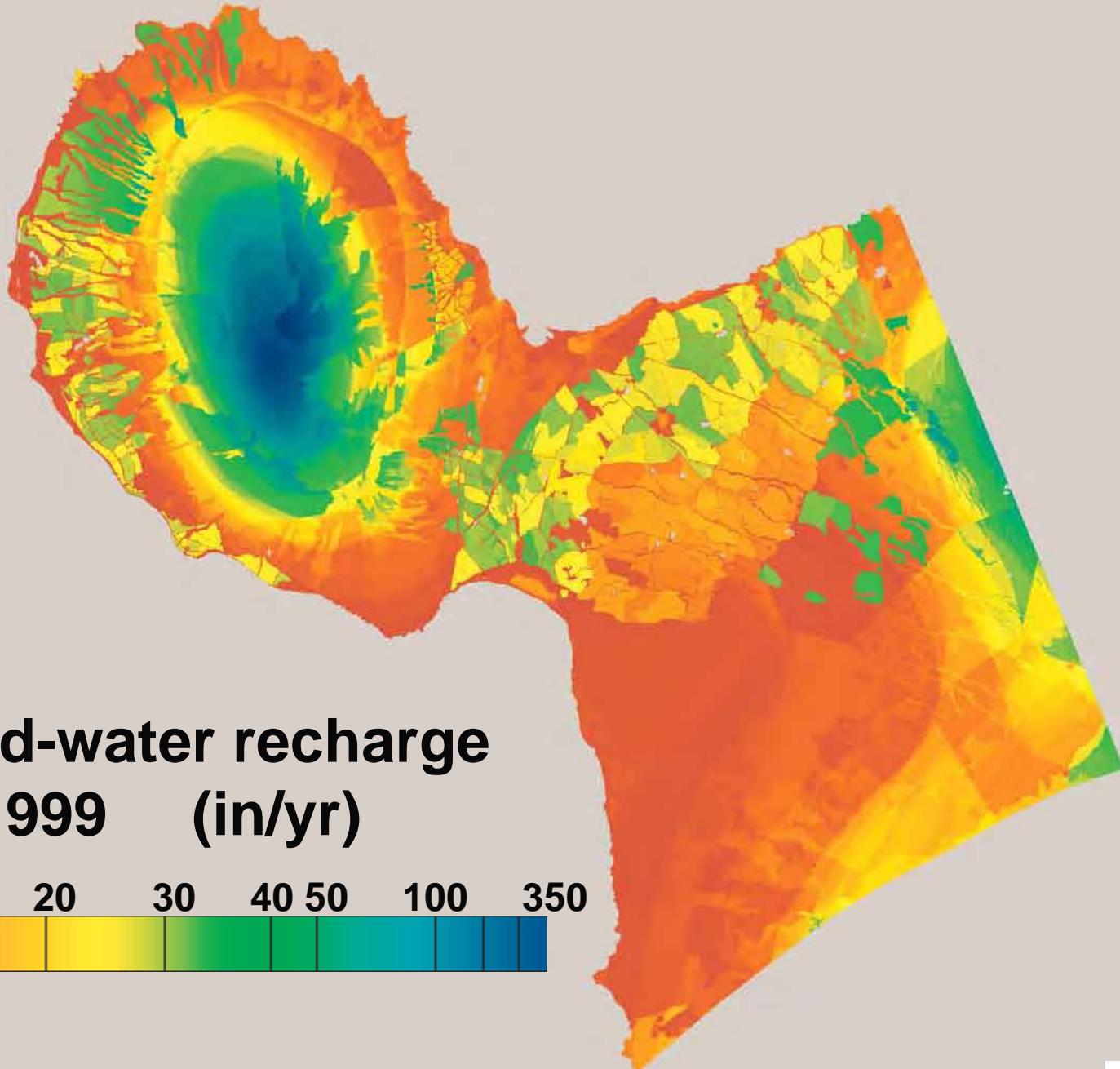


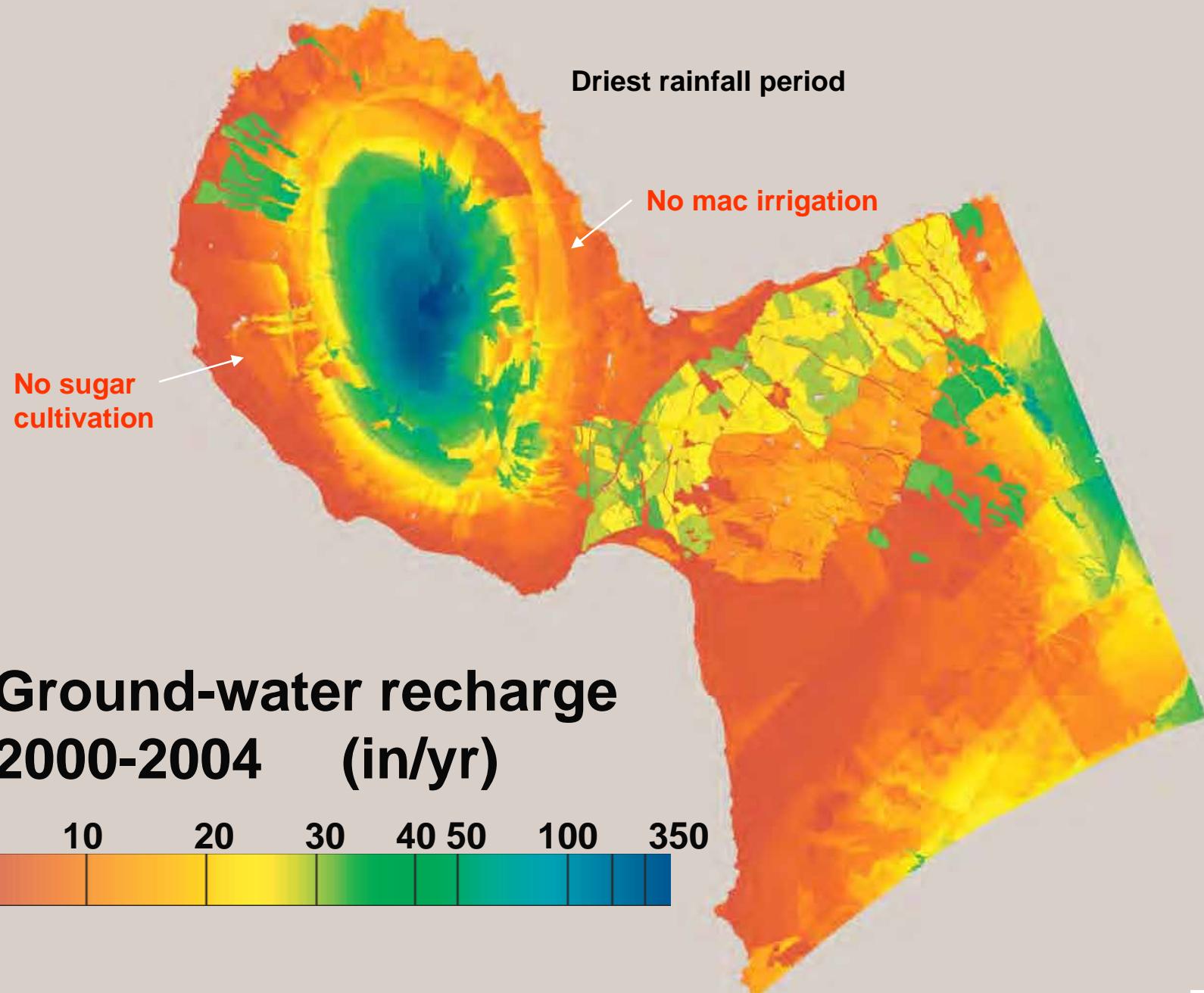


**Ground-water recharge
1990-1994 (in/yr)**

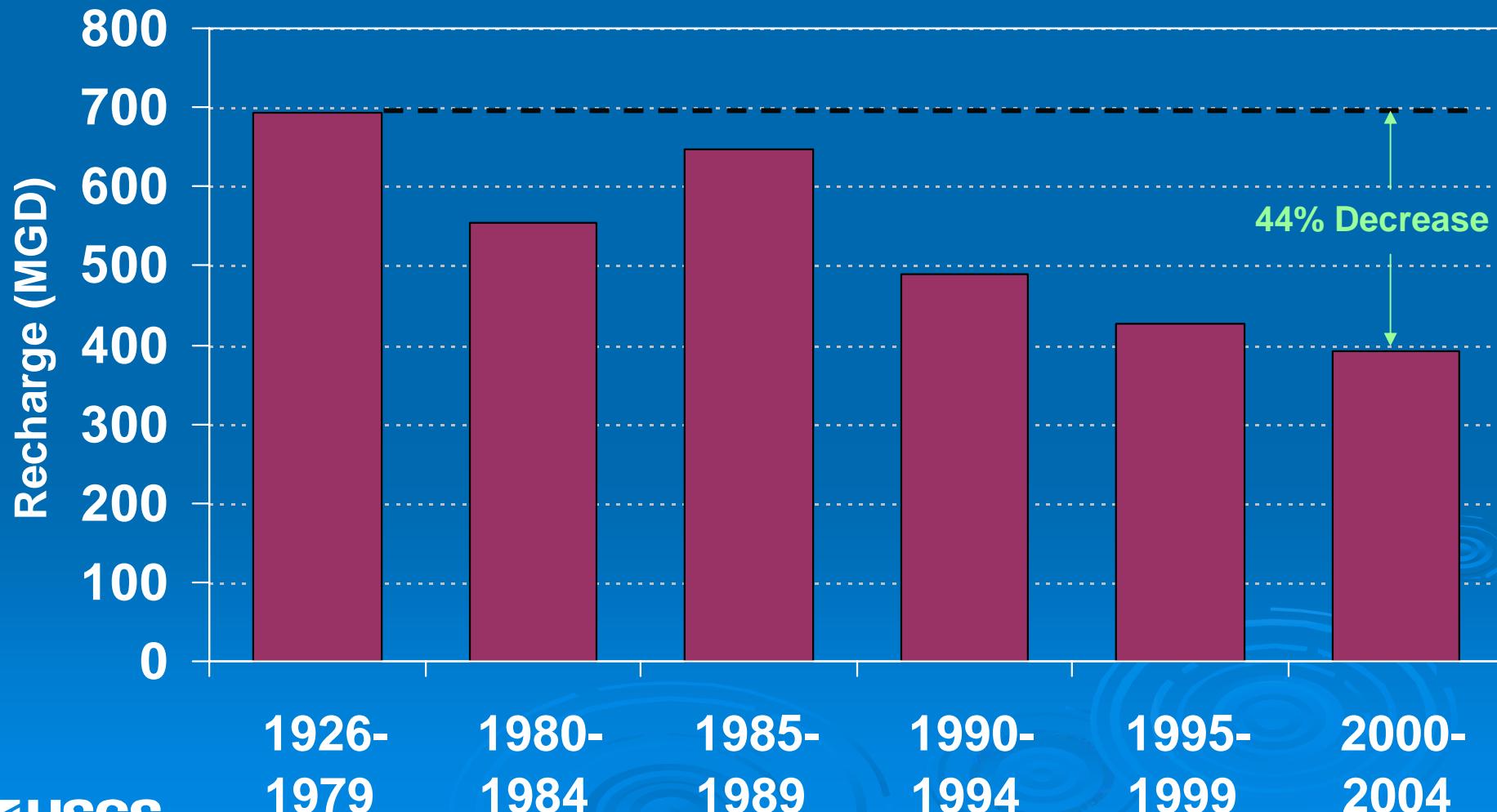


Ground-water recharge 1995-1999 (in/yr)

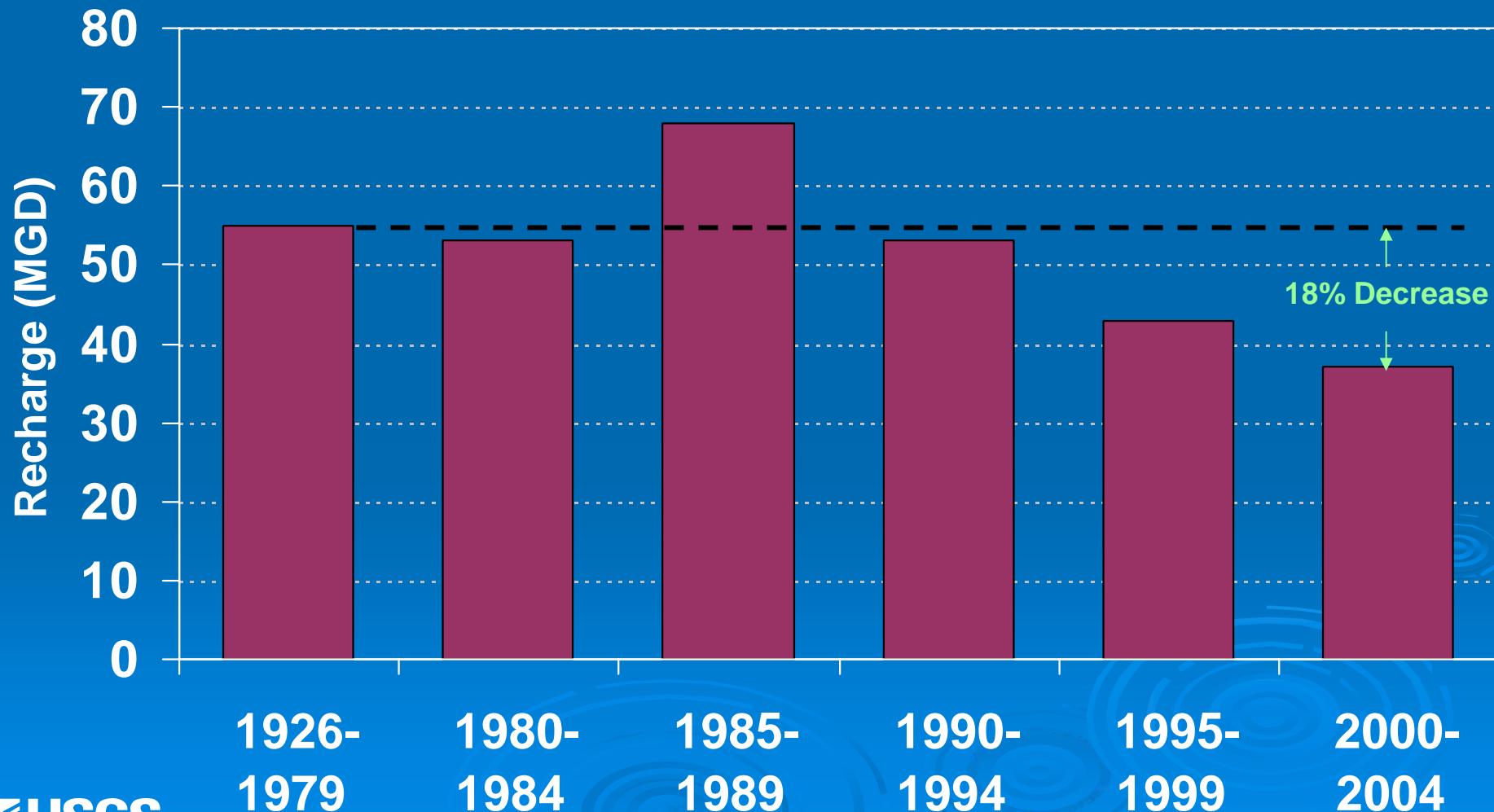




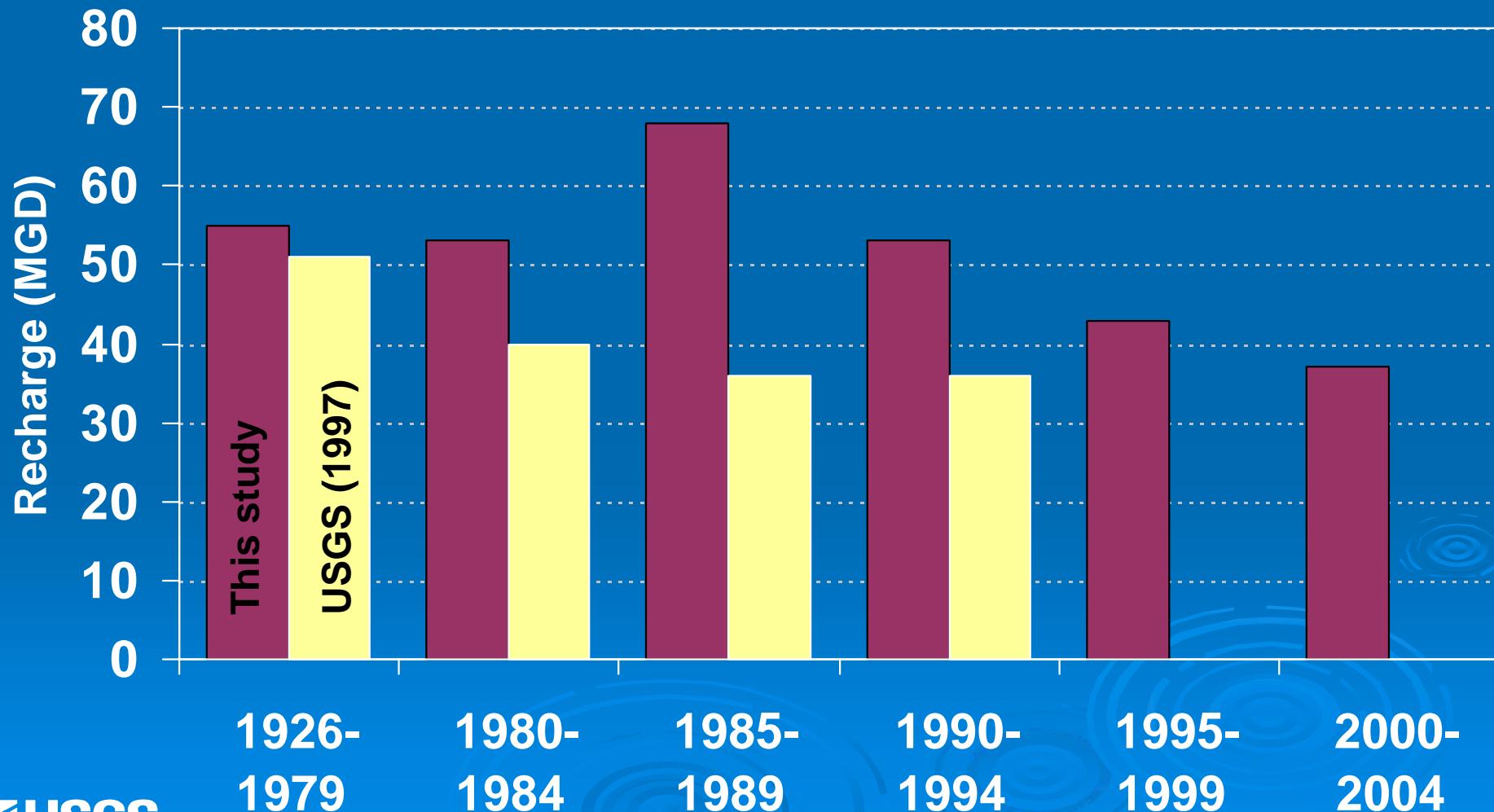
Historic Ground-Water Recharge in Central and West Maui



Historic Ground-Water Recharge in Iao Area



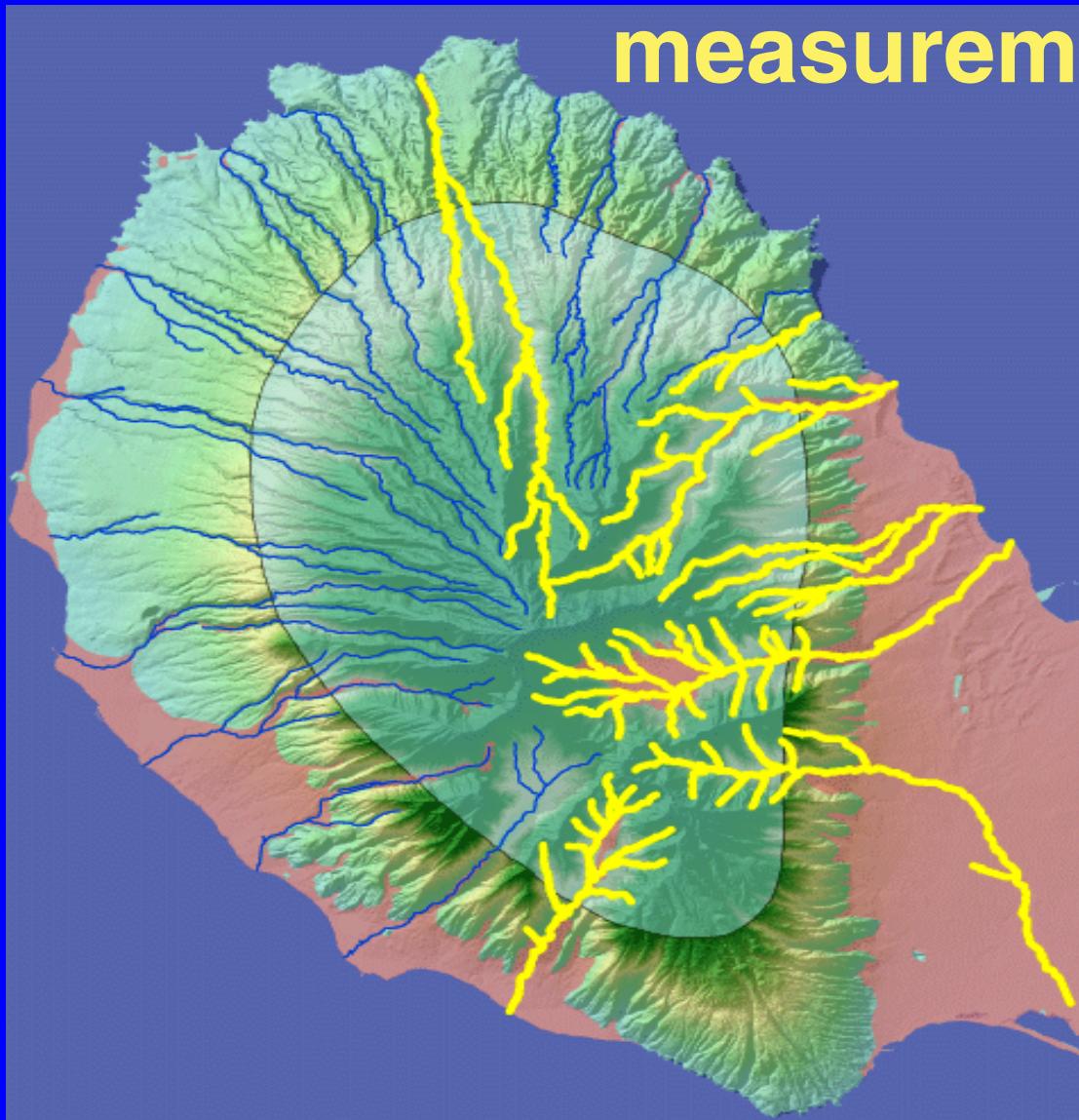
Comparison to Previous Study of Iao Area



Water-Budget Summary

- Decrease in estimated ground-water recharge from 1926-1979 to 2000-2004:
 - 44% for entire study area
 - 18% for Iao area
- Primary reasons for decreased recharge:
 - Reduction in agricultural irrigation
 - Recent below-normal rainfall

Stream-infiltration measurements



156°32'30"

156°32'

156°31'30"

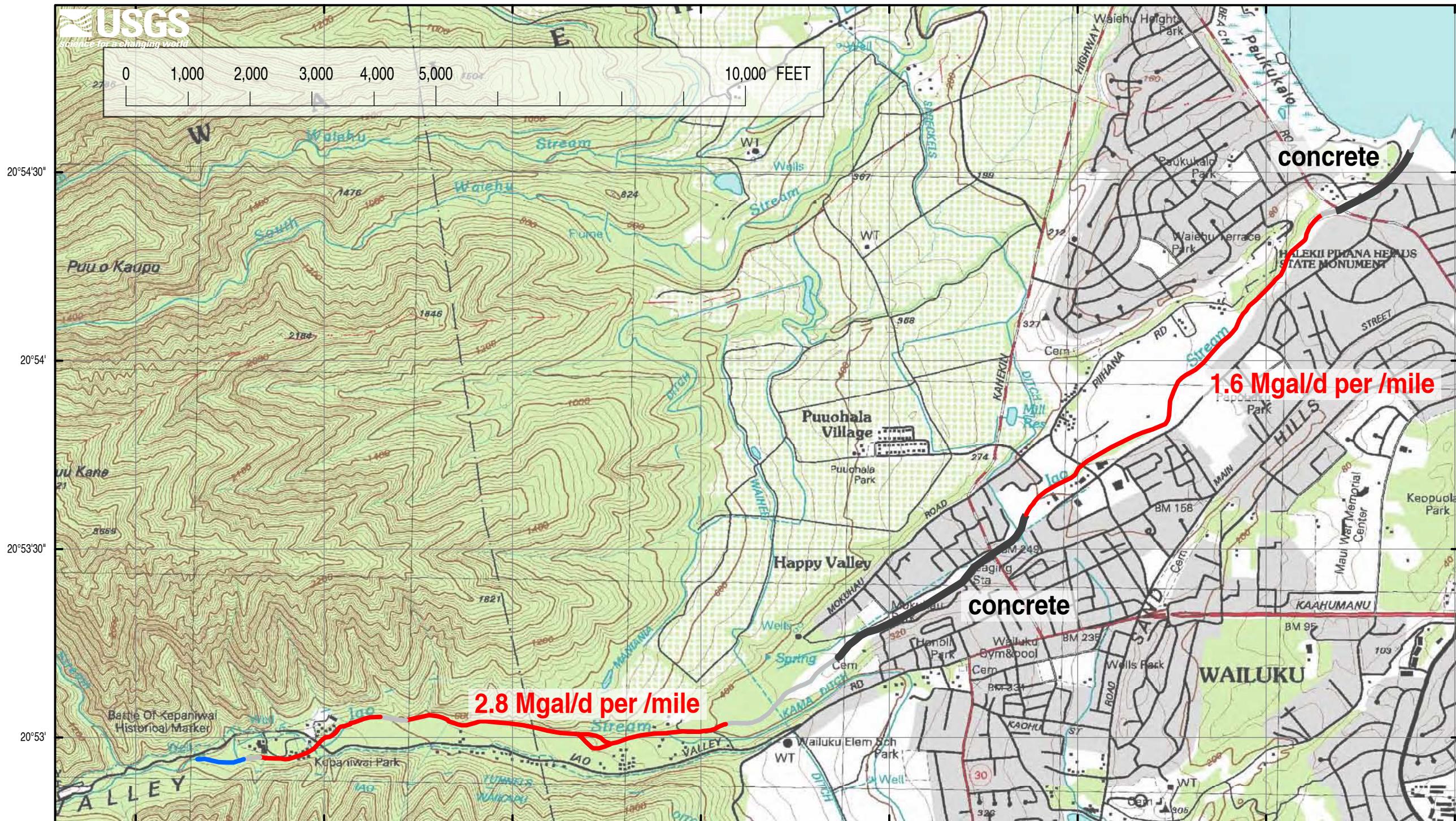
156°31'

156°30'30"

156°30'

156°29'30"

156°29'



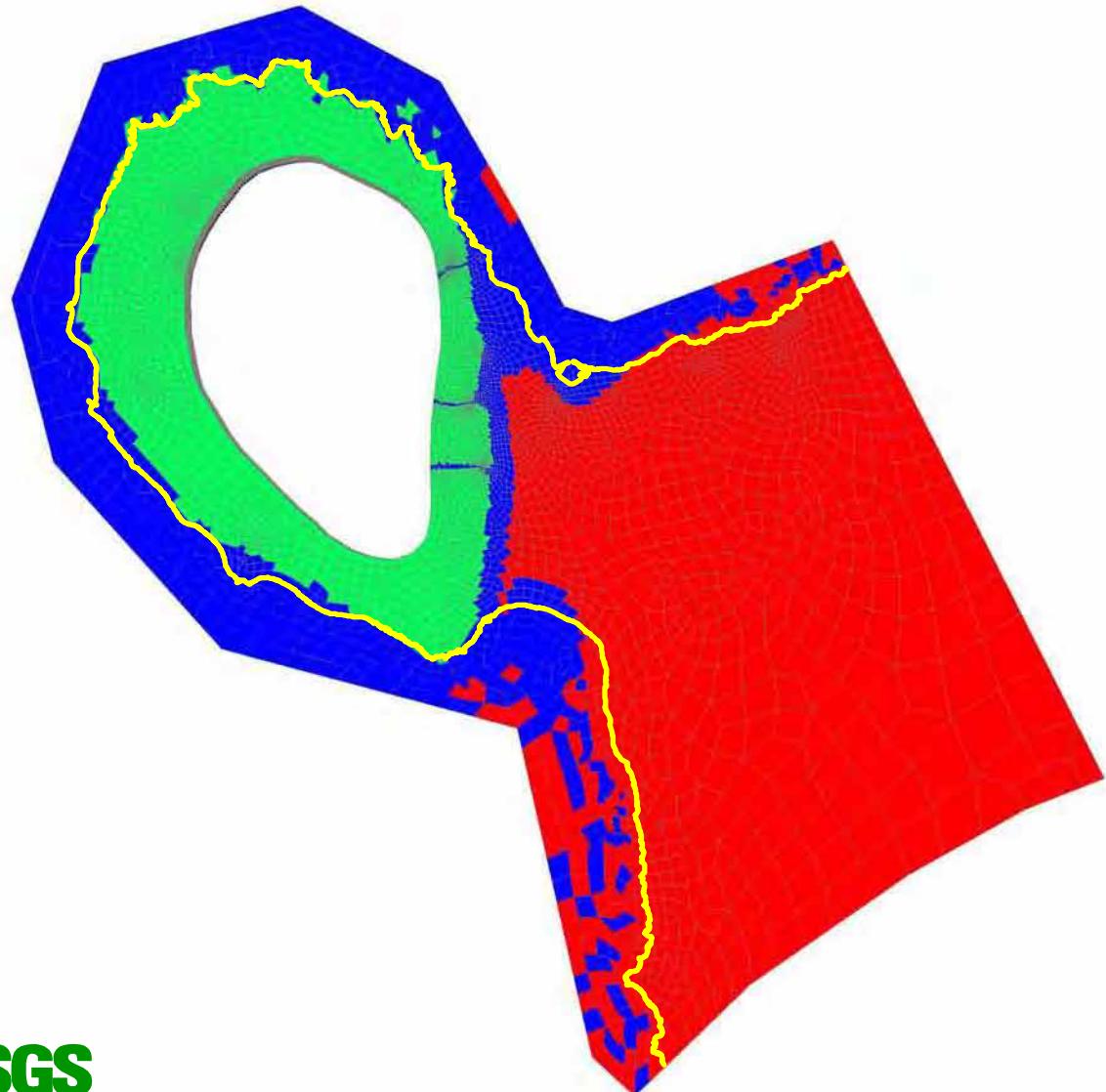
Provisional data-do not cite

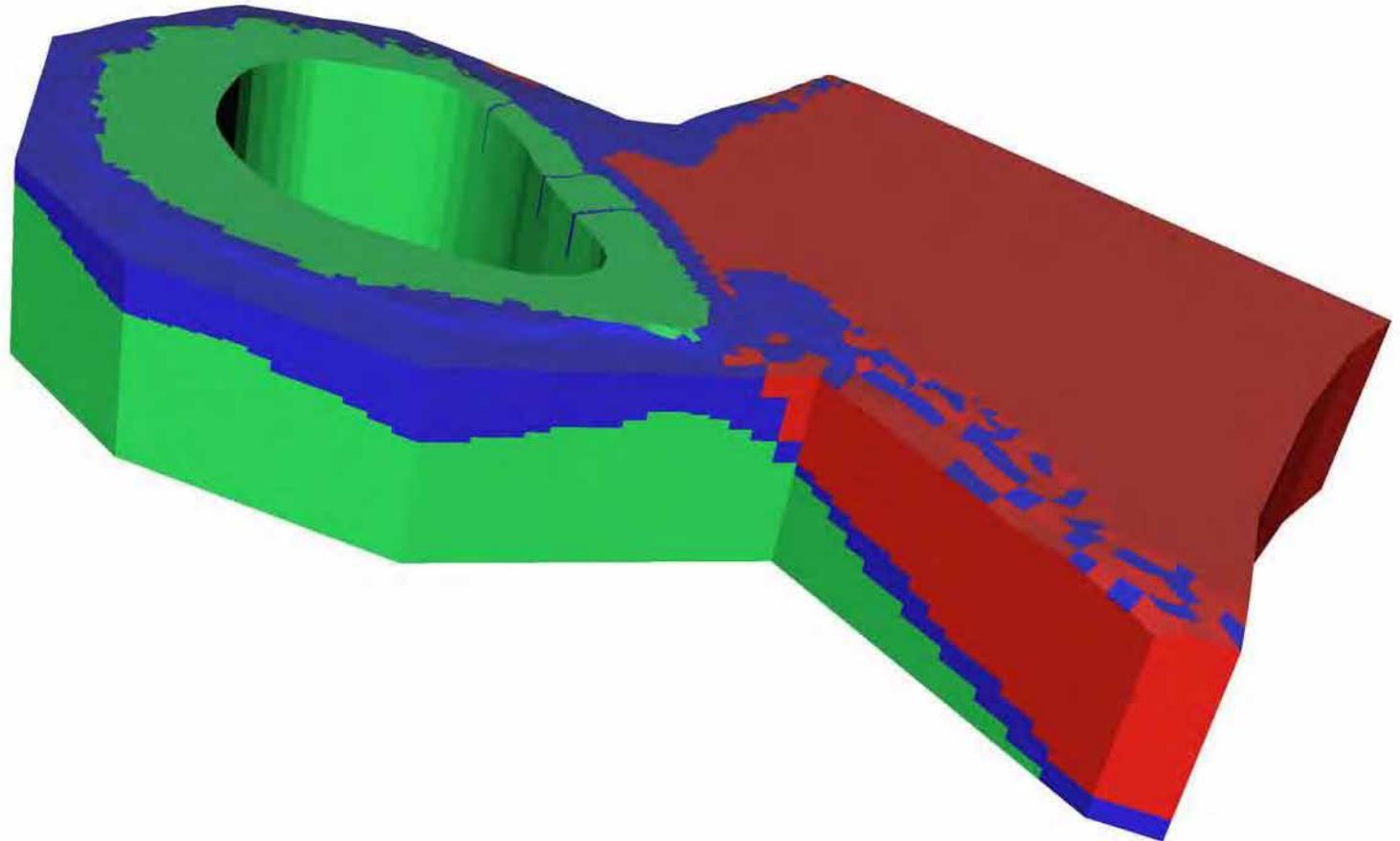
Study Approach

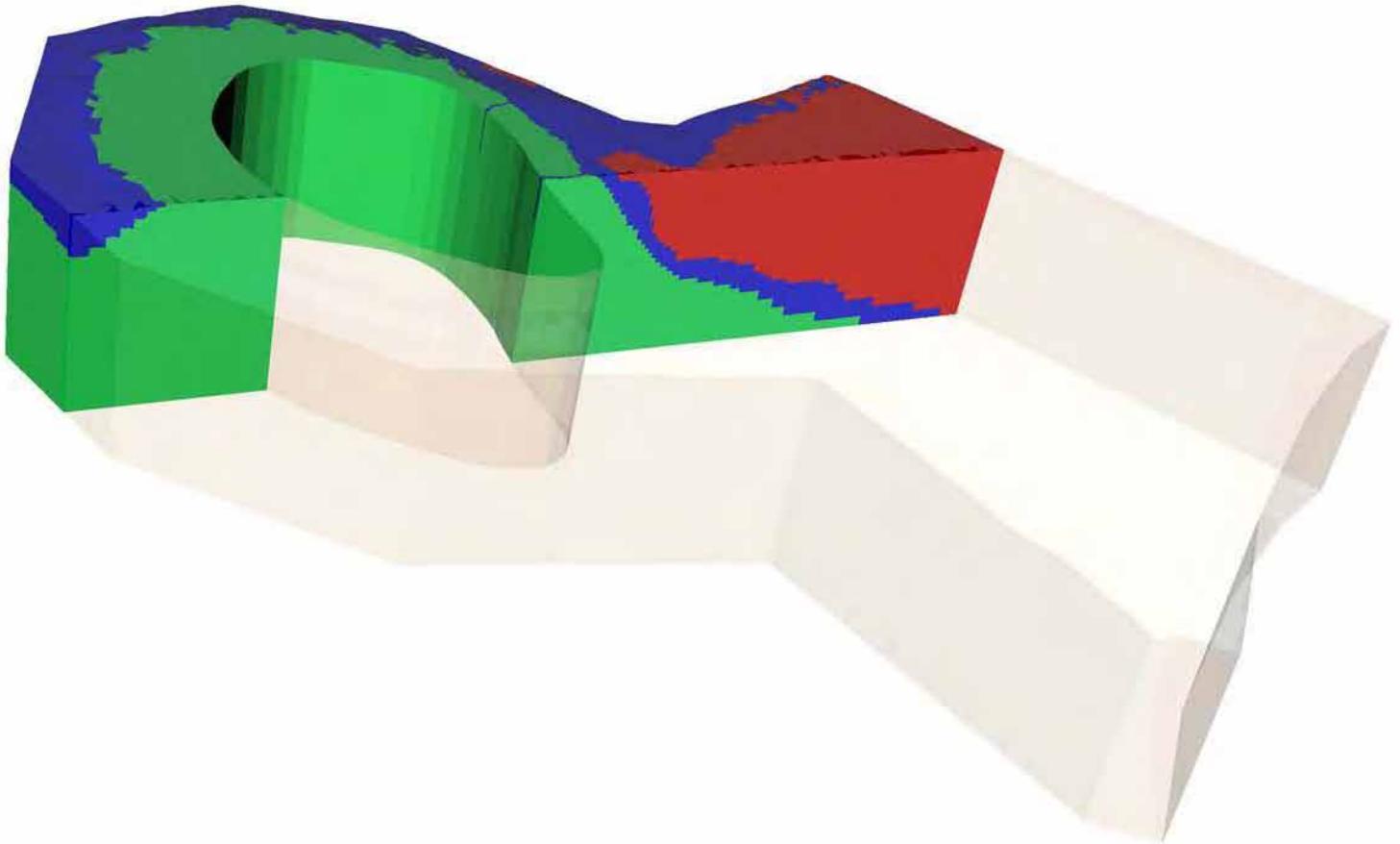
1. Analyze existing data
2. Collect climate, ground-water, and streamflow data
3. Compute recharge with a water budget
4. Develop numerical ground-water model

Modeling Approach

1. Estimate flow from high-level water area
2. Create steady-state model - pre-1926
3. Incorporate transient recharge and pumpage to match historic data
4. Predict future conditions due to drought or pumping changes







Plans for modeling

- History match to data from 1926-2006
- 30-yr future simulation with current land use and average rainfall
 - Investigate proposed/potential well locations
 - Add effects of stream recharge

1902

PUMPAGE, IN MGAL/D

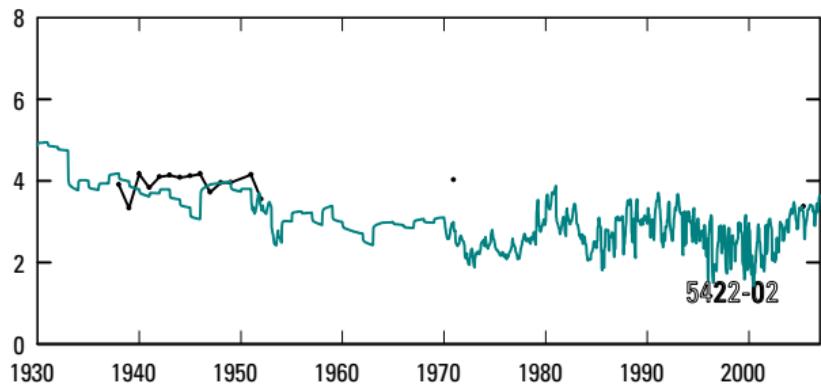
○ 0.5 - 0.6

○ 2.8 - 3.2

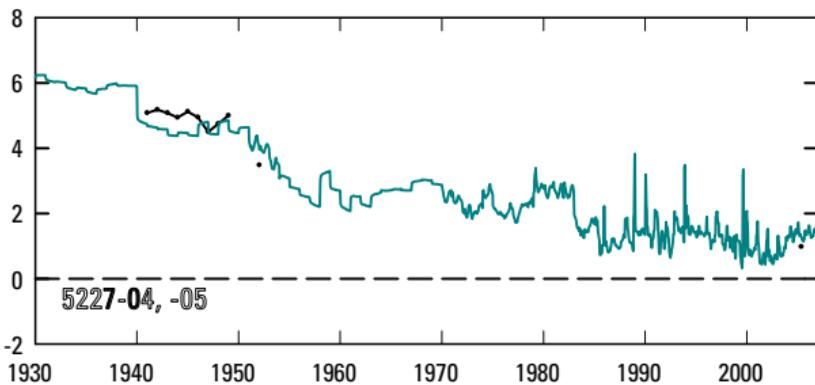
○ 17 - 32

[click image for animation](#)

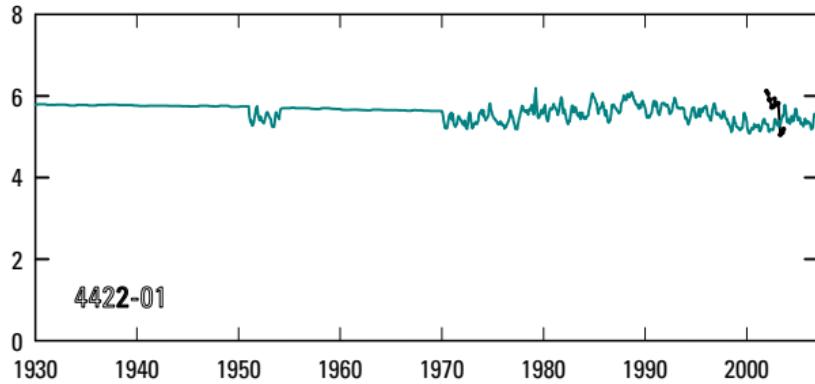
WATER LEVEL, IN FEET ABOVE SEA LEVEL



5422-02



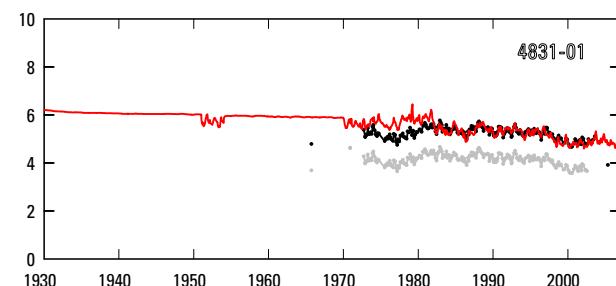
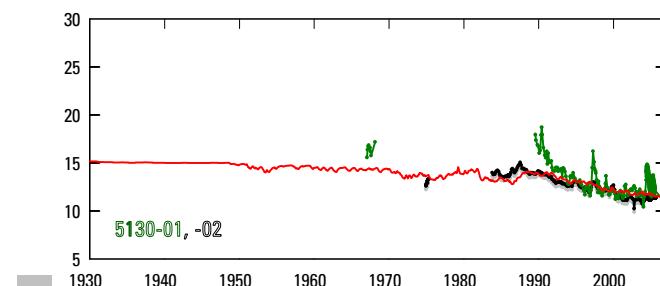
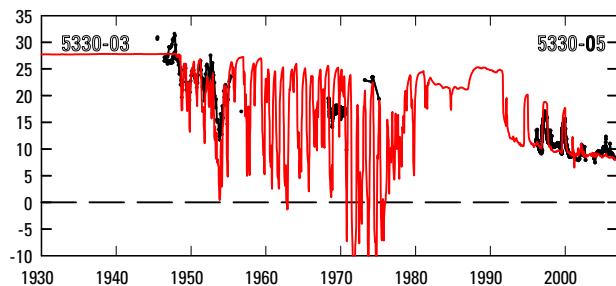
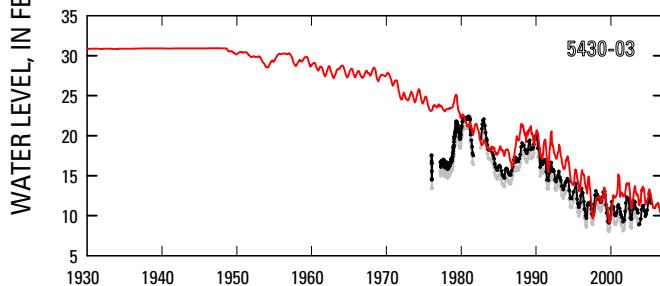
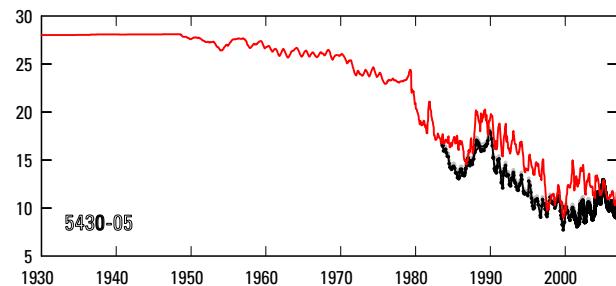
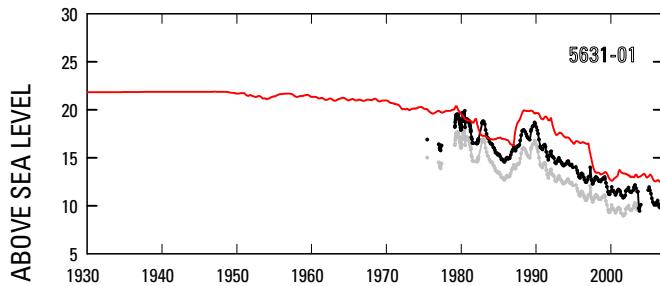
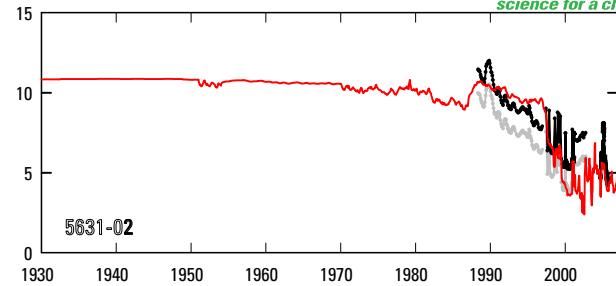
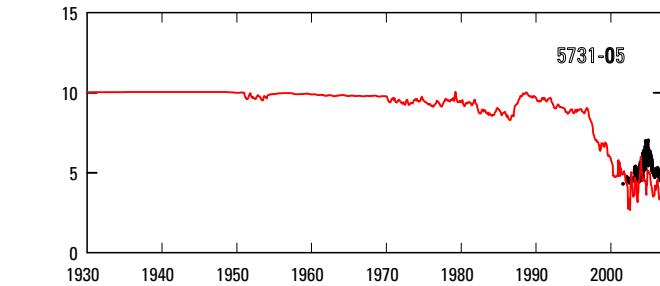
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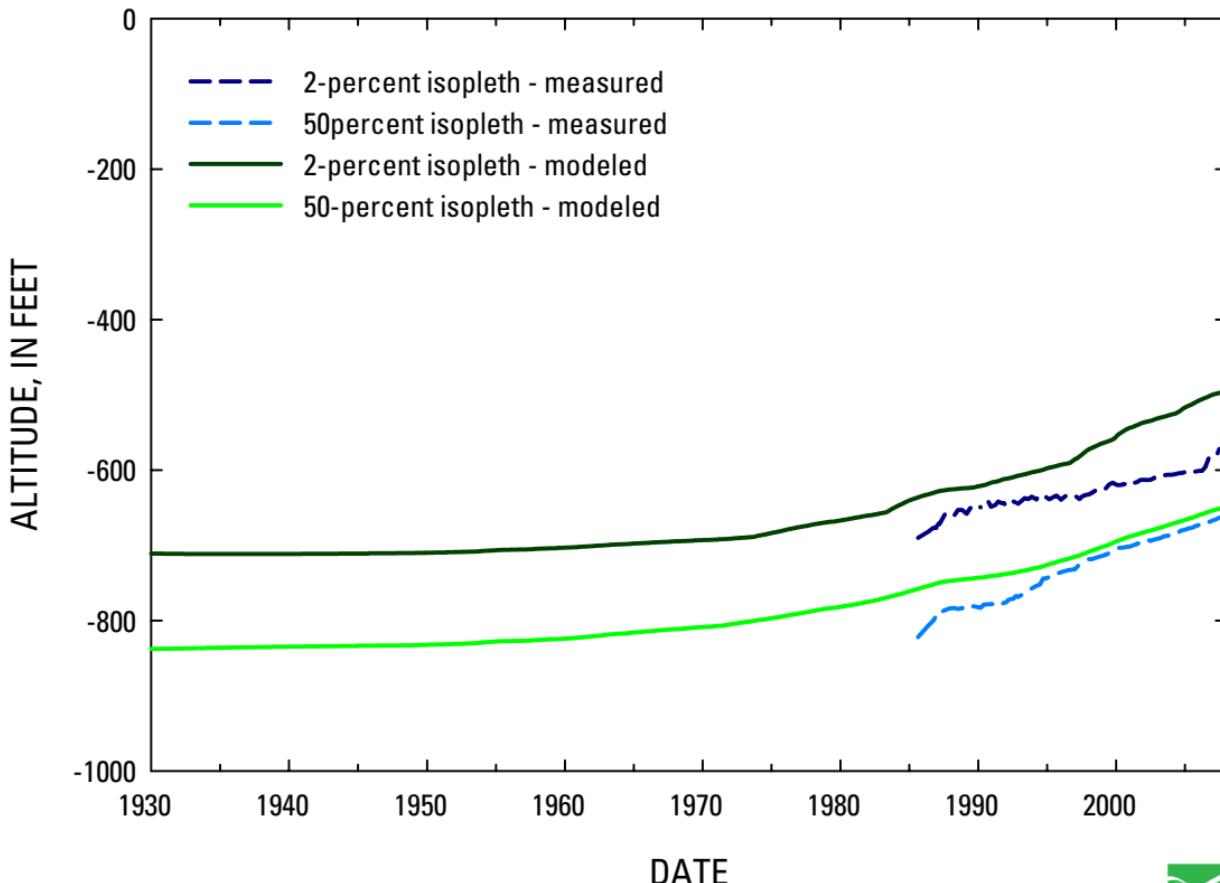
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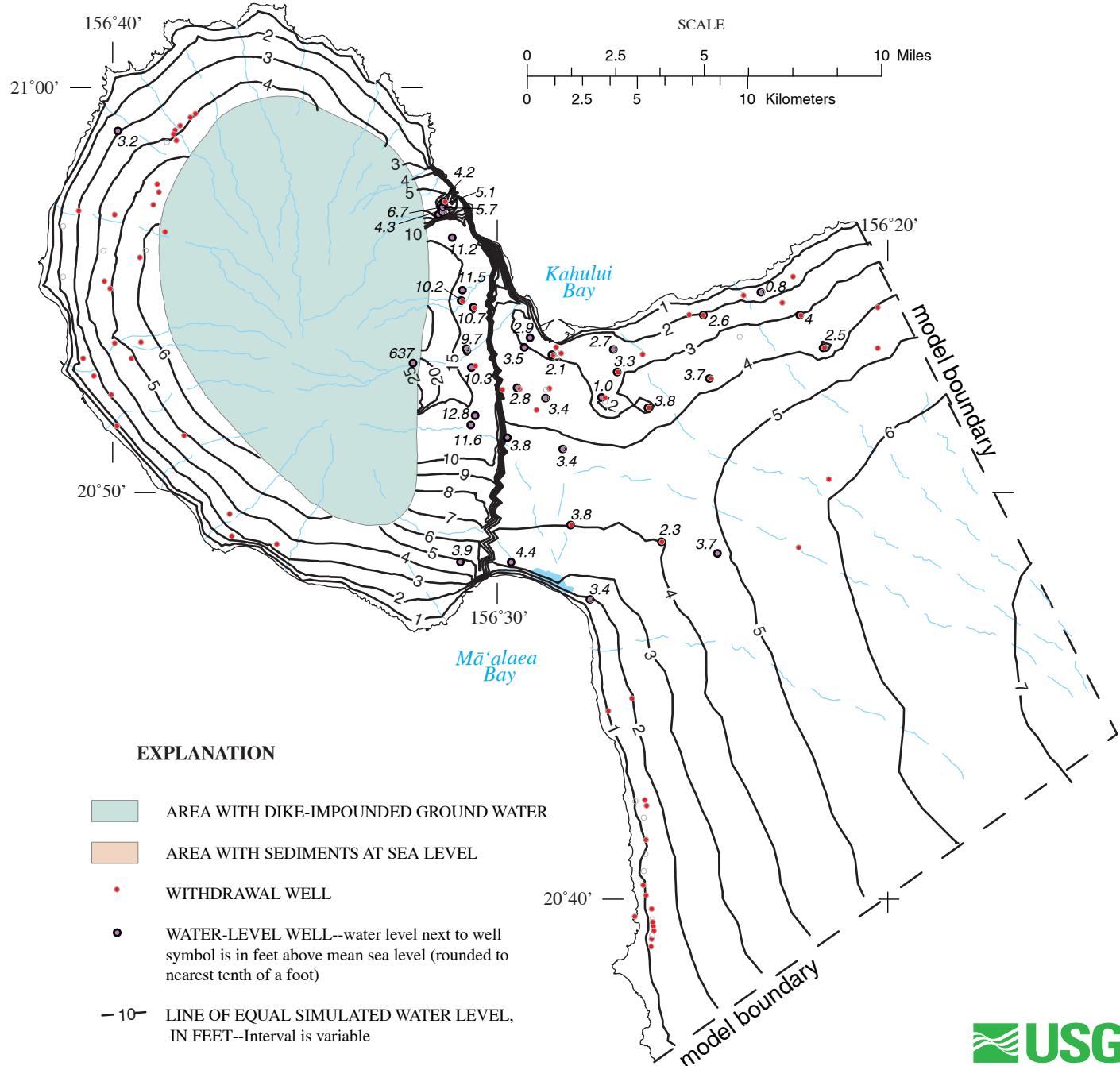
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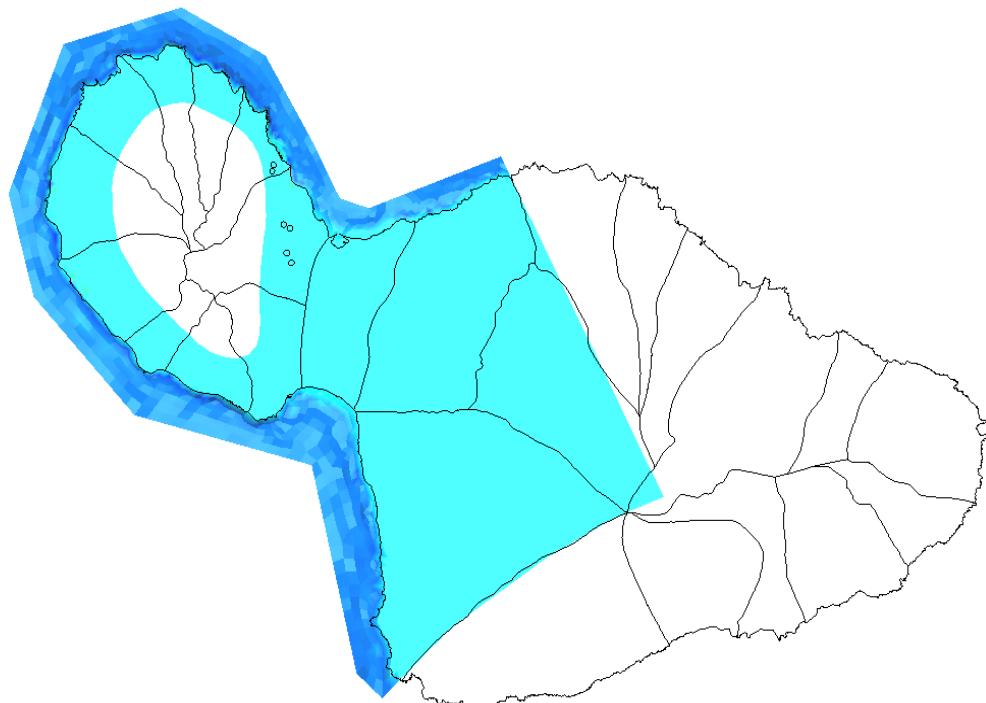


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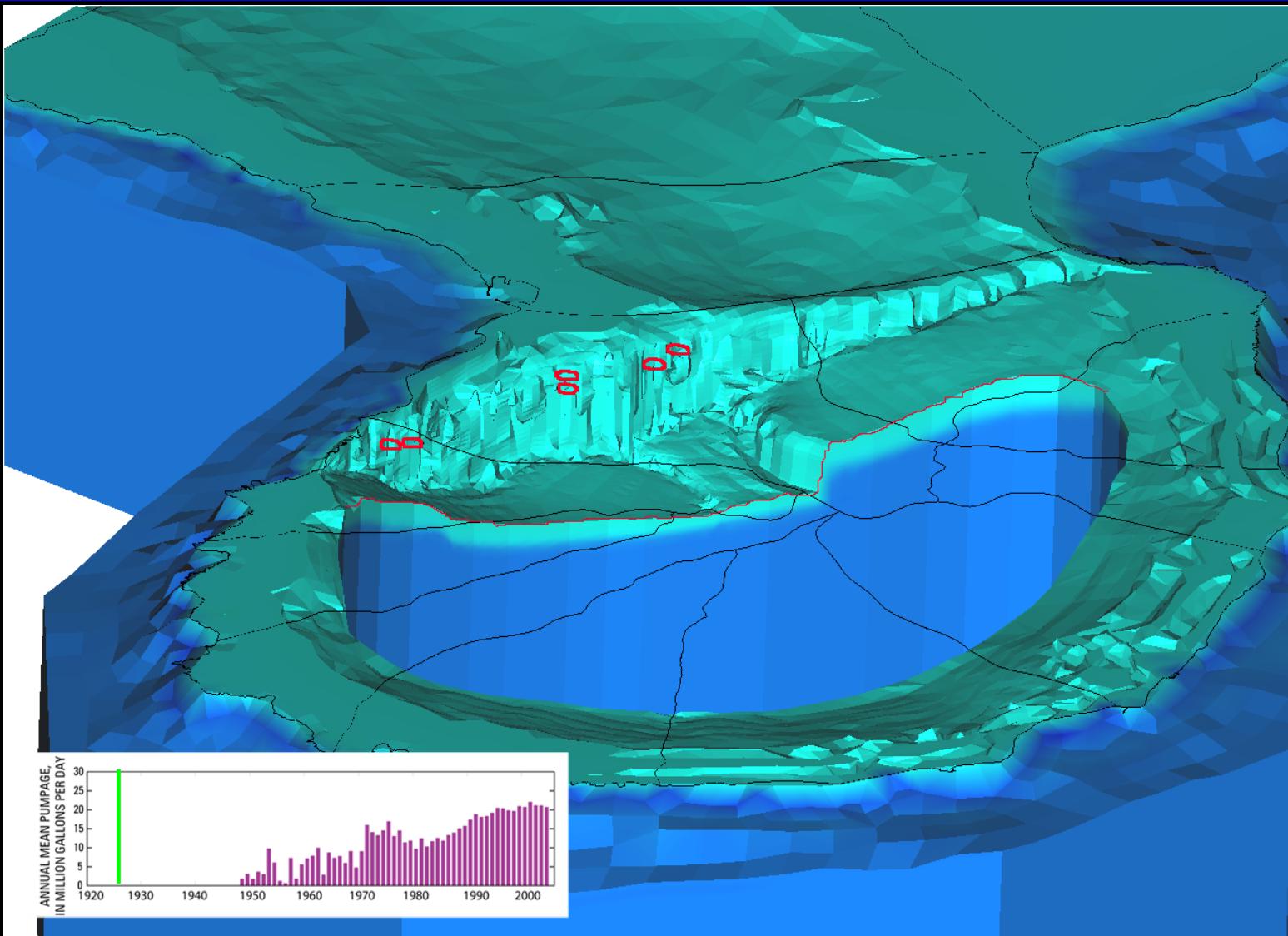


Provisional data-do not cite





[click image for animation](#)



click image for animation

Plans for the next 6 months

- Continue to meet with DWS to finalize scenarios
- Finish draft of modeling report and start review
- Begin field work in Lahaina District

ANY QUESTIONS?

