

An aerial photograph of Albuquerque, New Mexico, showing the city and the surrounding mountains. The University of New Mexico logo is overlaid in the center. The logo consists of the letters 'NM' in a large, stylized font, with 'STATE' and 'UNIVERSITY' stacked below it in a smaller, sans-serif font. The background of the logo is a semi-transparent purple square.

NM
STATE
UNIVERSITY

The Productivity of Water in Irrigated NM Pecan Production: Measurements & Policy Implications

**Rhonda Skaggs
Zohrab Samani, Salim Bawazir
Max Bleiweiss
Vien Tran, Aldo Piñon**

**New Mexico State University
Las Cruces, NM**

USDA-CSREES National Water Conference

6 February 2008, Reno, NV



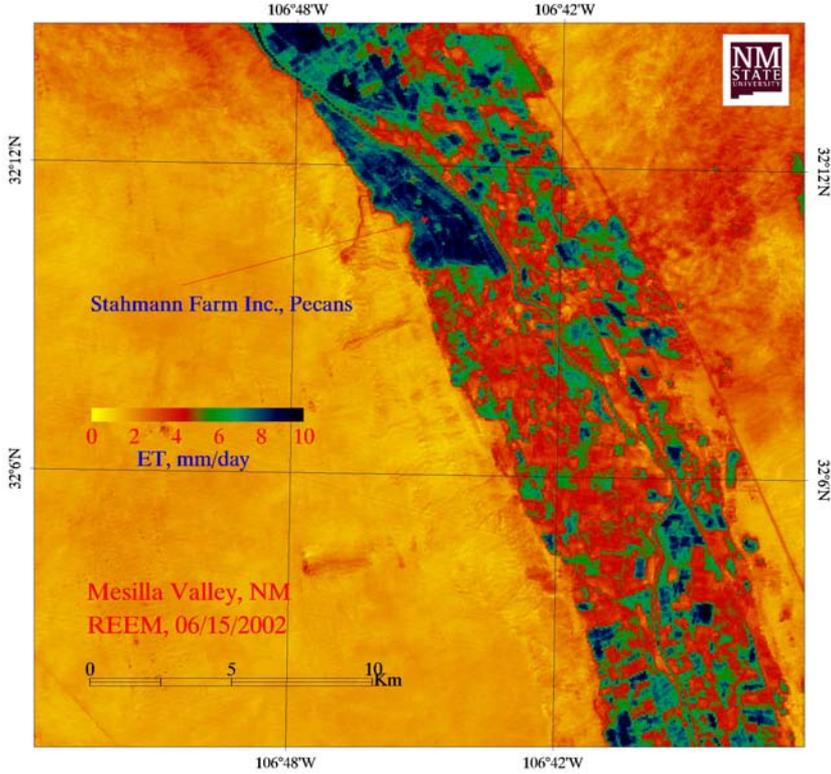
Background & Research Questions

- ↑ competition for water, transfers & adjudications require accurate information on crop water use.
- Often assumed that ag irrigation “wastes” water.
- How much water **do** crops consume?
- Remote sensing can provide broad-scale estimates of crop ET.

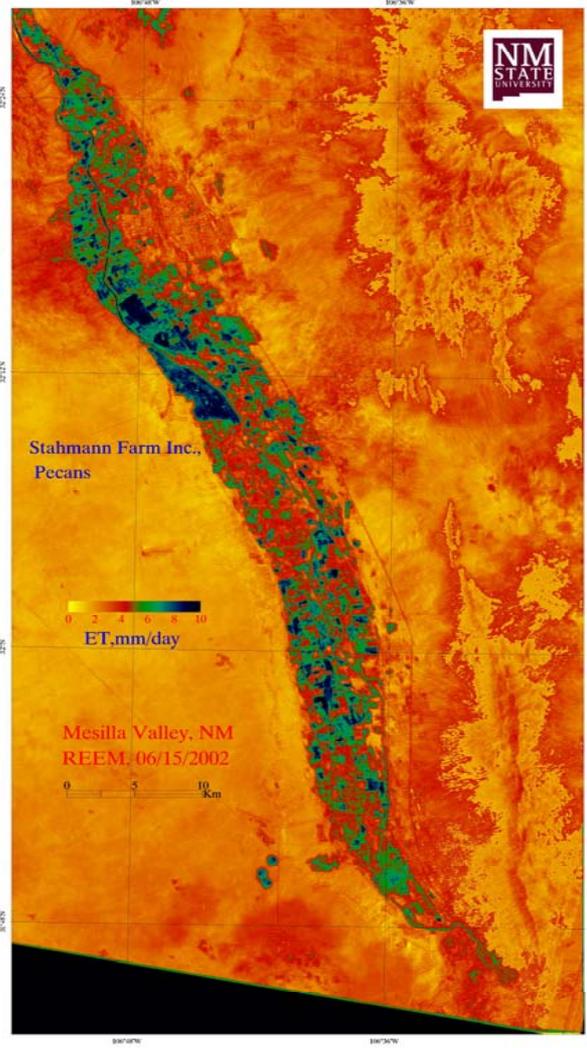
Regional ET Estimation Model (REEM)

- For crop & riparian vegetation
- Energy balance basis
- Uses satellite data to calculate daily ET
- Has been applied to the Mesilla Valley
 - Parcel level estimates of total annual ET
 - Emphasis on pecans
 - Degree of deficit irrigation?

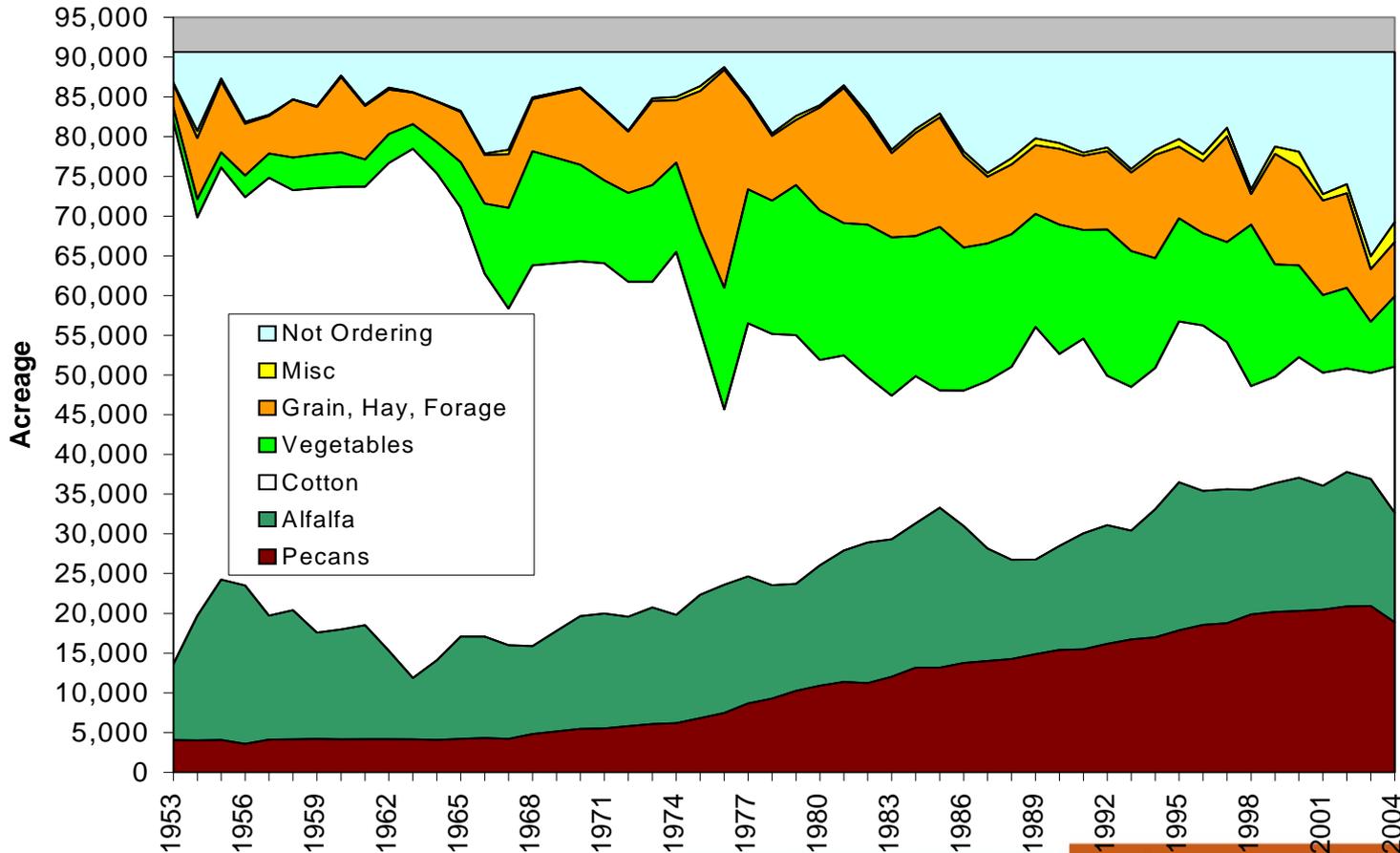
Evaluating Pecan Water Use through Remote Sensing



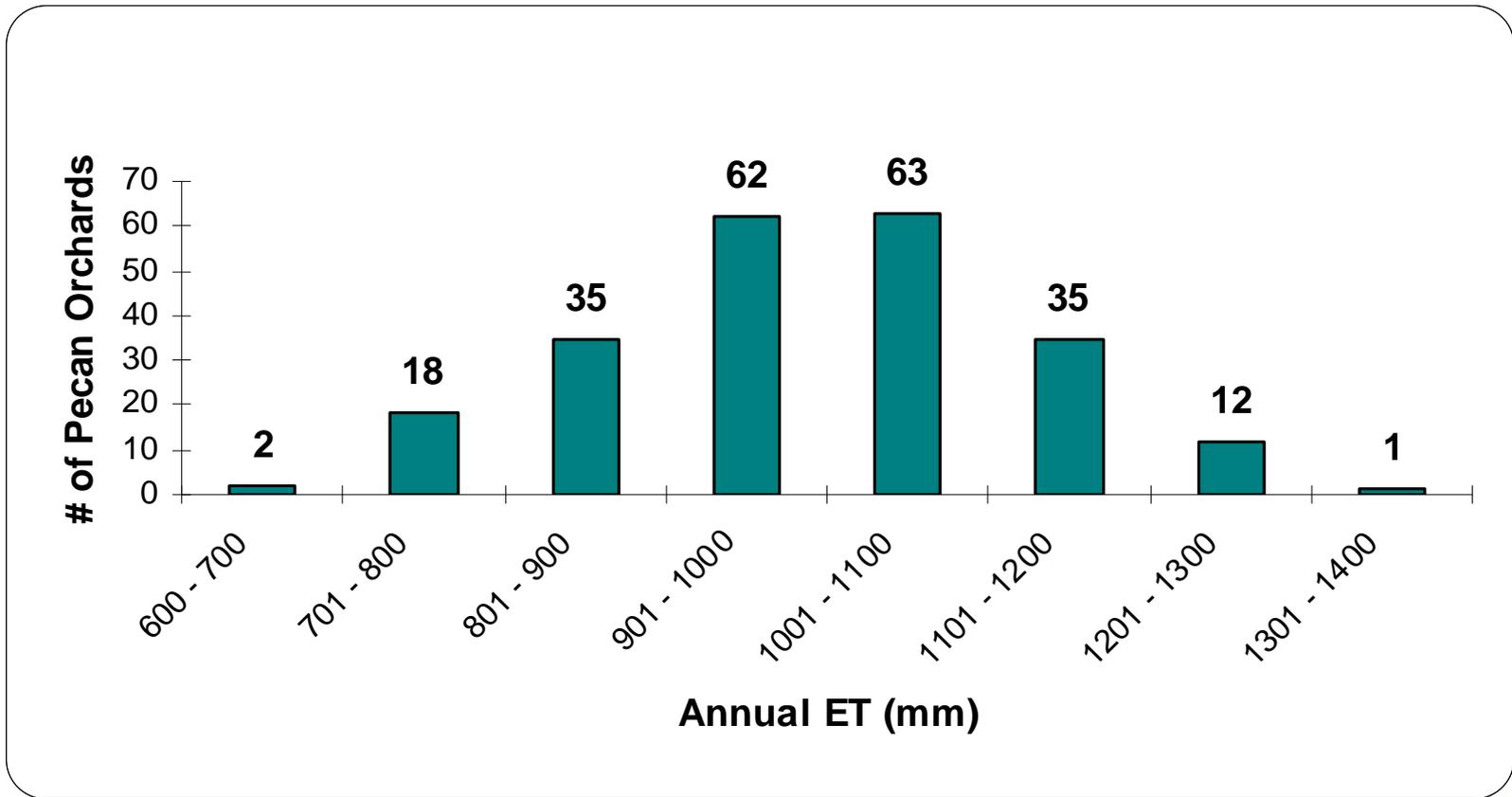
Samani,
Bawazir,
Bleiweiss,
Tran,
Piñon,
& Skaggs



Crop Acreage in the EBID 1953-2004



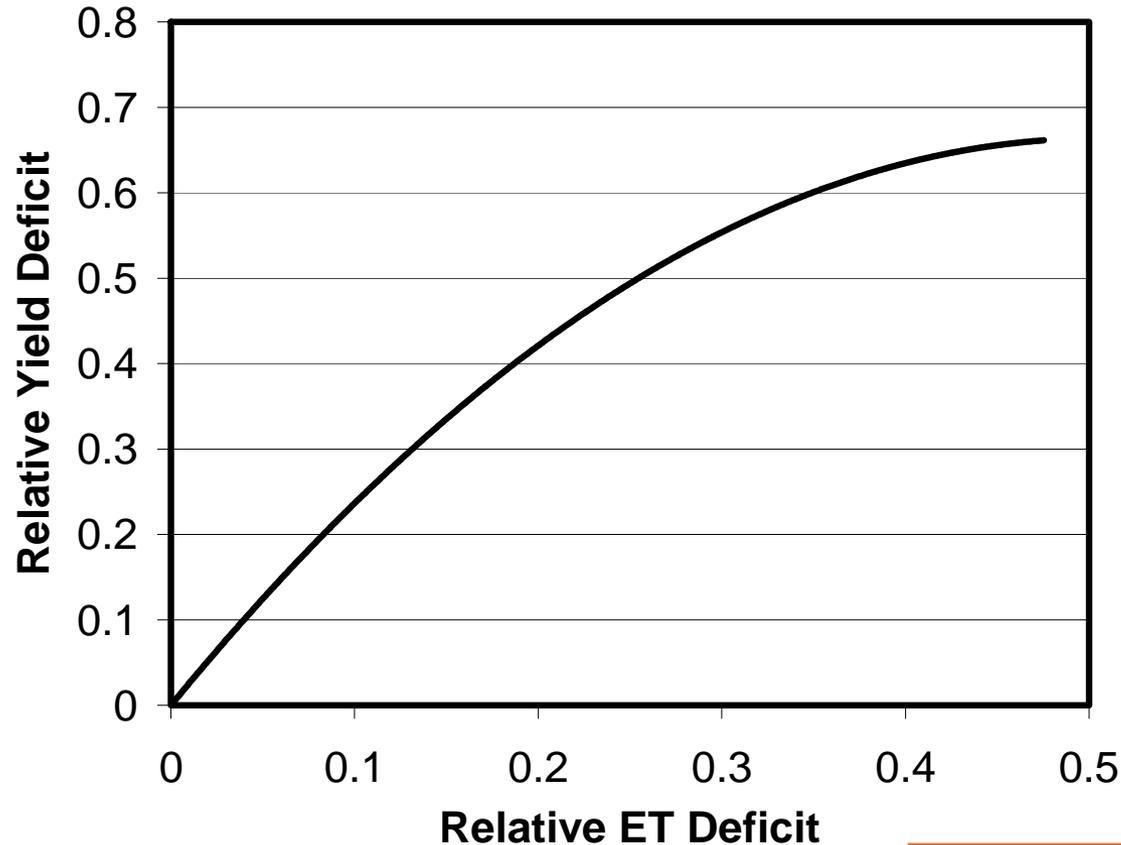
REEM Estimated Annual ET (mm), 2002, for 228 Mature Mesilla Valley Pecan Orchards (> 10 ac)



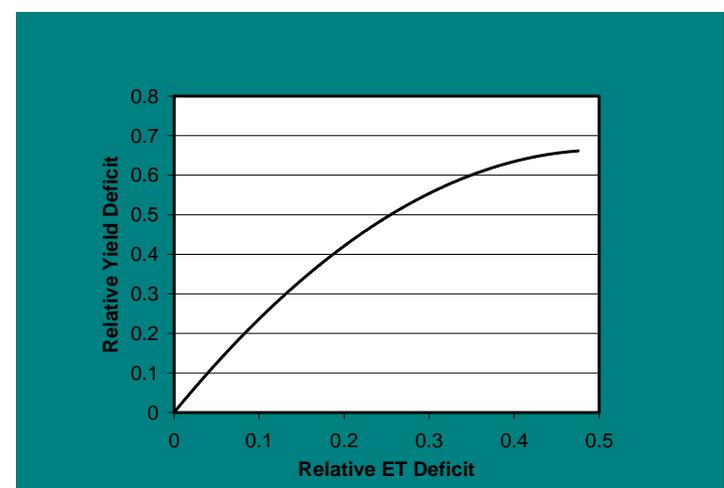
Relationship between Pecan Yield & ET?

- Physical & economic outcome of pecan ET?
 - A water production function
- Parcel-level ET data from REEM, $n = 228$
 - Reliable yield data difficult to obtain
- Reliable yields were obtained from a small number of pecan producers.
 - Data were normalized (relative to most well-watered orchard found)
 - Function was estimated

Relative normalized yield deficit = f (relative normalized ET deficit)



Interpretation of the water production function \longrightarrow



- Yield cost of an ET deficit is greater for well-watered orchards.
- Incremental yield losses for reduced ET in most well-watered orchards is \gt than incremental yield losses for orchards which are already in (severe) deficit.

Extension of WPF...

- Marginal relationship between yield deficit & ET deficit was derived.
- Yield = f (ET) relationship was derived.
- ET estimates (from REEM) were substituted into function to derive yields (n = 228).

Summary of Total ET Deficit...

1. 90% (n = 205) of orchards had ET deficits > 10%
2. Yields are reduced as a result of the ET deficit
3. 228 pecan orchards
4. 14,437 acres
5. Irrigating all 228 orchards at ET potential in 2002 would have increased depletion by 11,755 ac-ft.

Summary of Total Yield “Cost” of Deficit Irrigation...

1. Estimated yield cost of deficit irrigation relative to potential
2. 228 pecan orchards
3. 14,437 acres
4. 6,932 metric tons of in-shell pecans
5. Value of lost yield = \$19.1 million (2002 price)

Conclusions

- Vast majority of pecan orchards are not irrigated at or near potential ET.
- Majority of producers do not achieve potential or near-potential yields.
- **Few** producers are irrigating & producing at potential ET & yield.
- Improvements in irrigation infrastructure & technology will likely increase depletions (as a result of increased ET).

Why the ET-Yield deficits?

- Current operating & structural limitations of existing irrigation system.
- Many producers are not dependent upon pecan production for their livelihoods.
 - Not interested or able to change on-farm irrigation system or practices.
- Common property nature of irrigation system segments.

Related Policy Questions

- Should crop adjudications be based on potential or actual consumptive use?
- Should water policy for pecan growers be designed around a few high-achieving commercial producers' practices & investments?
- Given irrigation infrastructure limitations & pecan producers' constraints, what consumptive use is actually feasible?

Related Policy Questions

- Will generous adjudications to pecan growers constitute windfall gifts to landowners who have no intention or ability to use the water consumptively?
- **IF** adjudicated water is eventually used consumptively, what will be the impact on downstream deliveries?
- Should producers of other crops be adjudicated less simply because they didn't plant pecans in recent years?

Acknowledgements

- This research is part of the “Efficient Irrigation for Water Conservation in the Rio Grande Basin” project (a joint project of the Texas A&M University System Agriculture Program & New Mexico State University).
- The research was also supported by the New Mexico Agricultural Experiment Station, the New Mexico Office of the State Engineer (Governor’s Water Innovation Fund), the New Mexico Interstate Stream Commission, the United States Bureau of Reclamation, the National Science Foundation New Mexico EPSCoR Project & the New Mexico Water Resources Research Institute.

Contact Information

- rskaggs@nmsu.edu
- zsamani@nmsu.edu