

Update on Data Analysis and Model Development

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Kinney County GCD Board Meeting

September 15, 2022

Topics

- Monitoring well data
 - Cross plot end-of-month monitoring well data with end-of-month Las Moras spring flow
 - Possible update to management zone concept based on cross plots
- Landsat analysis of irrigation acreage
 - Estimates of irrigation pumping based on irrigation acreage
 - Comparison with other estimates of pumping
- Next Steps

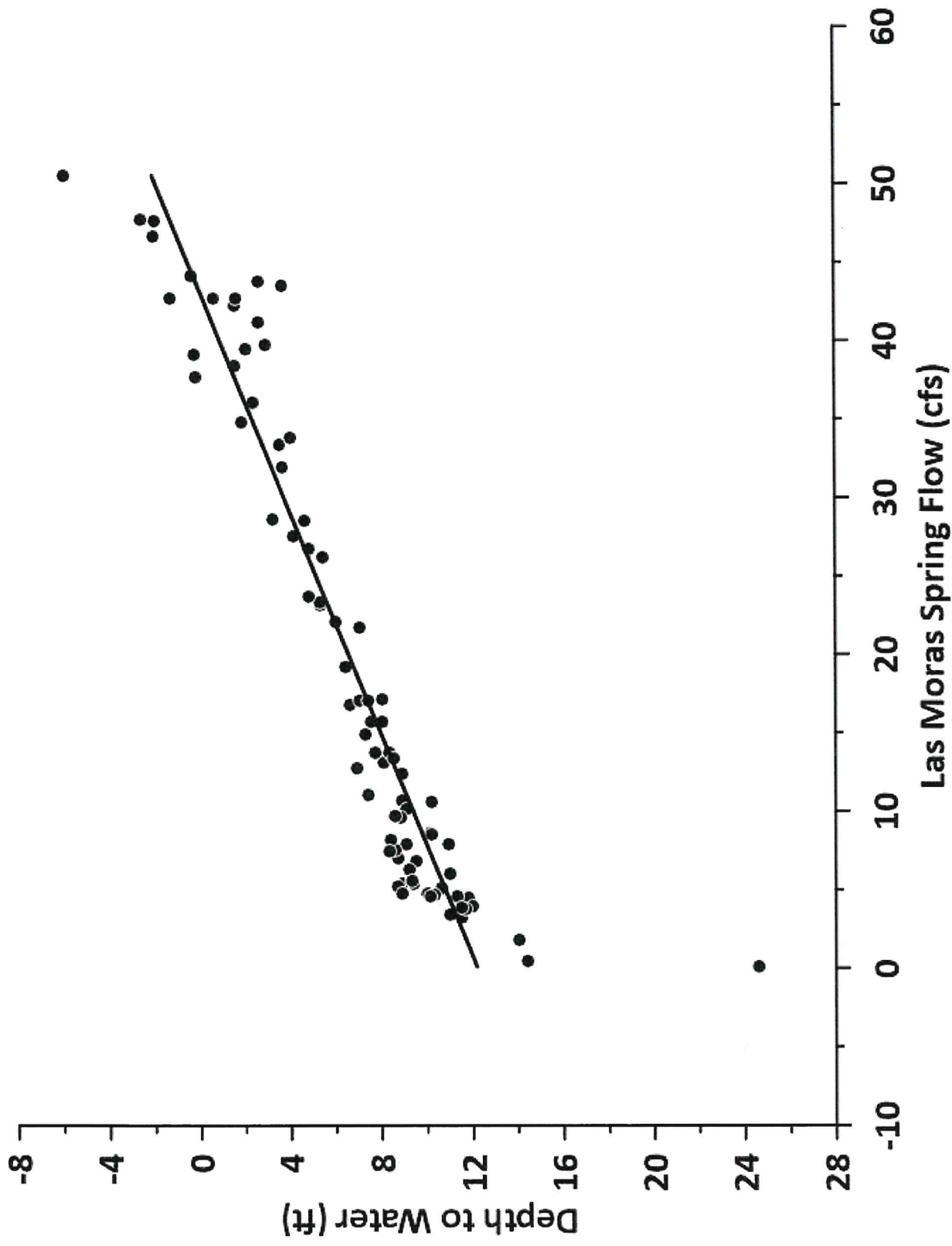
Monitoring Well Data

- Processed all downloaded data
 - Determine “end-of-month” data for 39 wells (excluded wells with short records)
- Cross plot with end-of-month Las Moras spring flow data to map areas of influence (“springshed”)
 - Zone 1 = strong correlation
 - Zone 2 = moderate correlation
 - Zone 3 = weak or no correlation

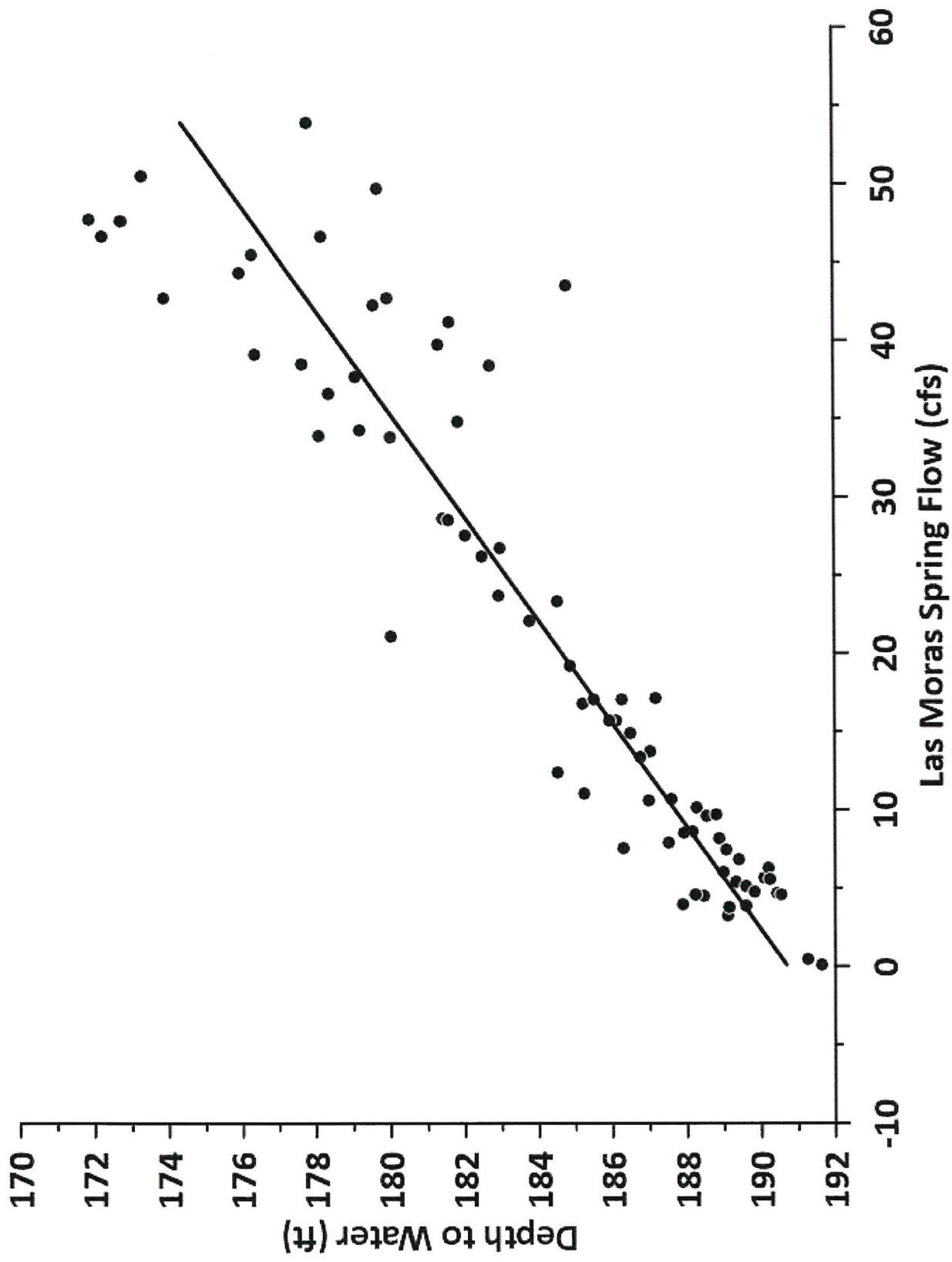
Las Moras Spring vs. City Well 1

Zone 1 Example

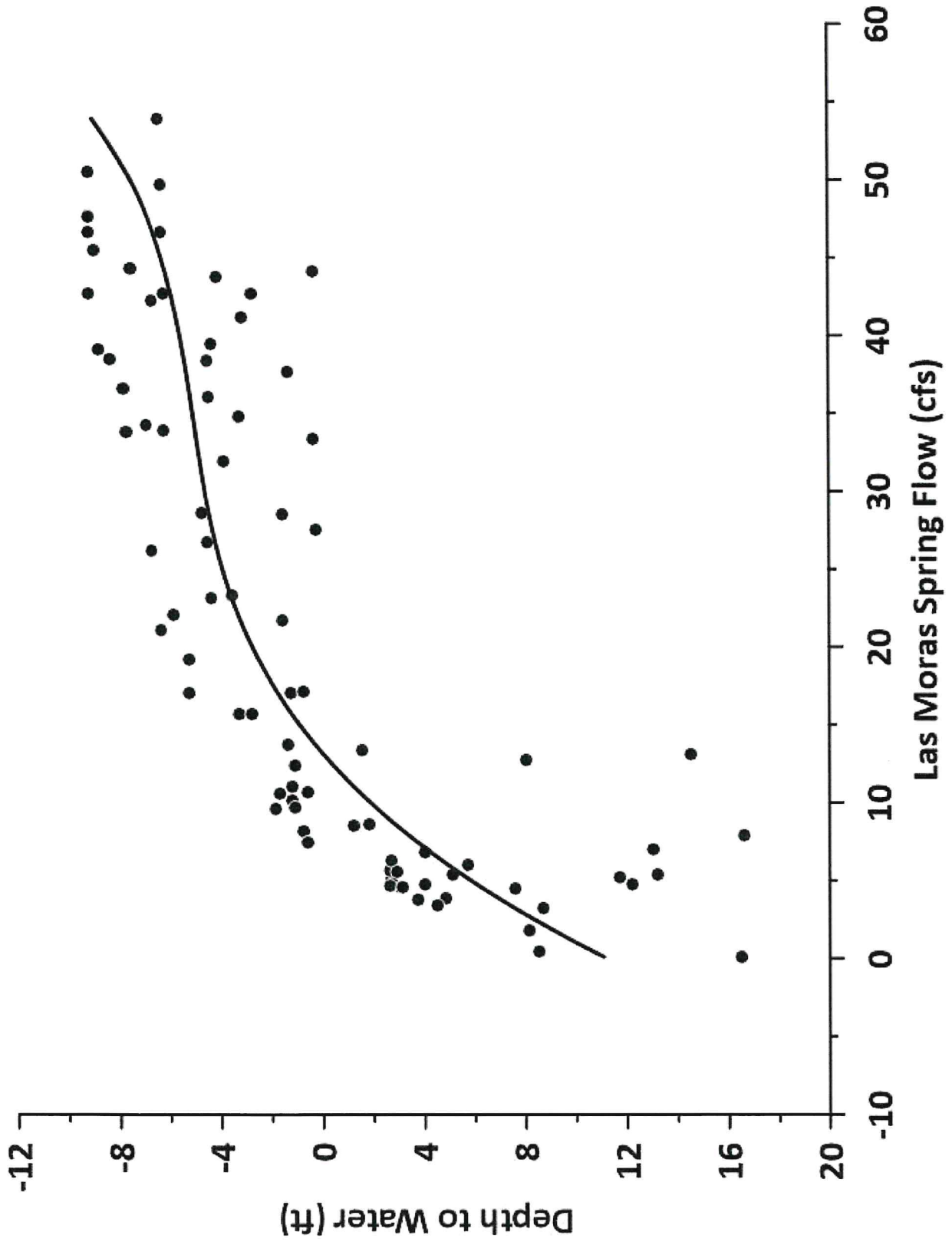
End of Month - October 2014 to June 2022



Las Moras Spring vs. Tularosa Well
End of Month - March 2016 to June 2022
Zone 1 Example



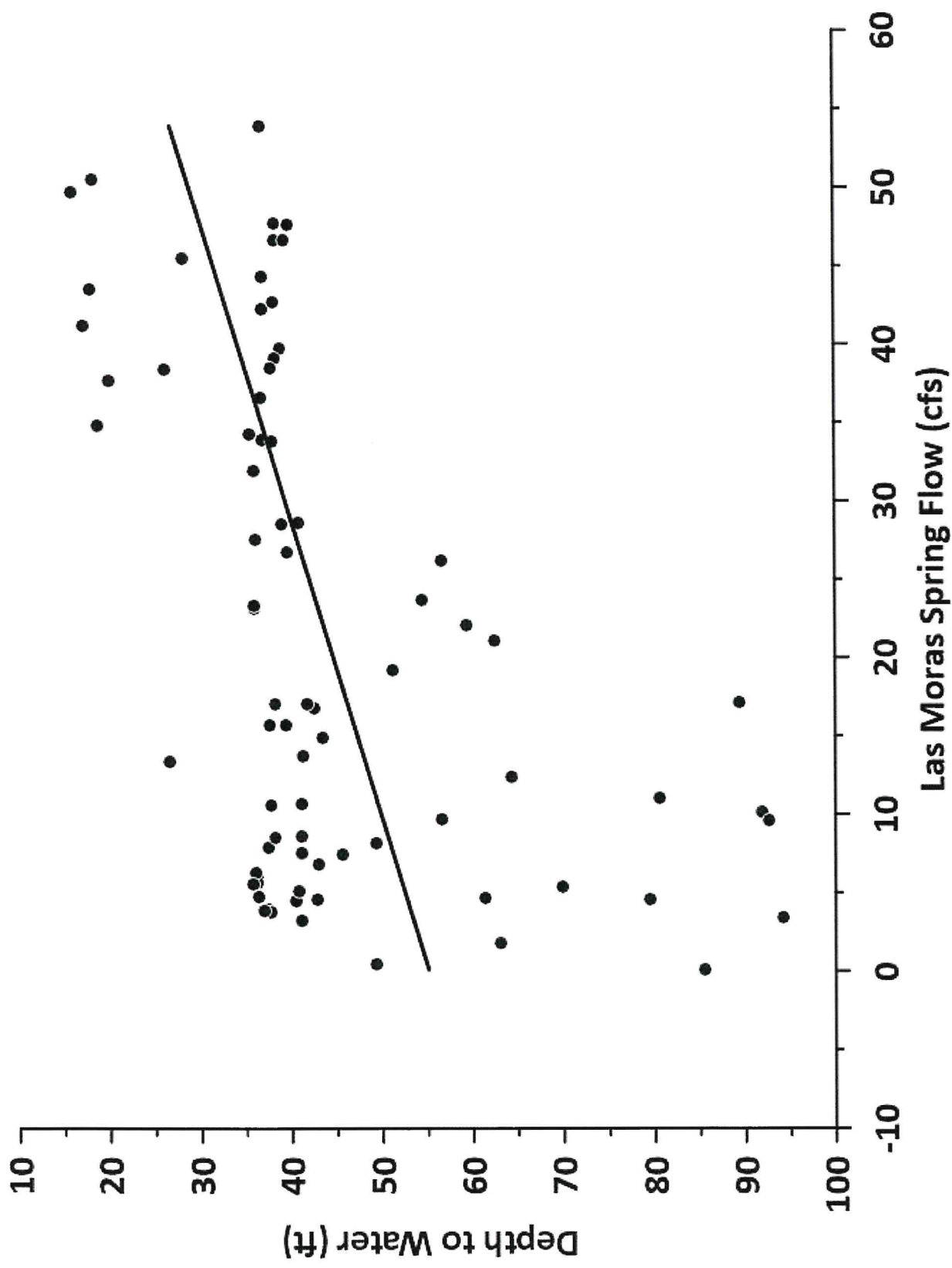
Las Moras Spring vs. Dooley Well
End of Month - October 2014 to June 2022
Zone 1 Example



Las Moras Spring vs. Boiling Springs Front Gate Well

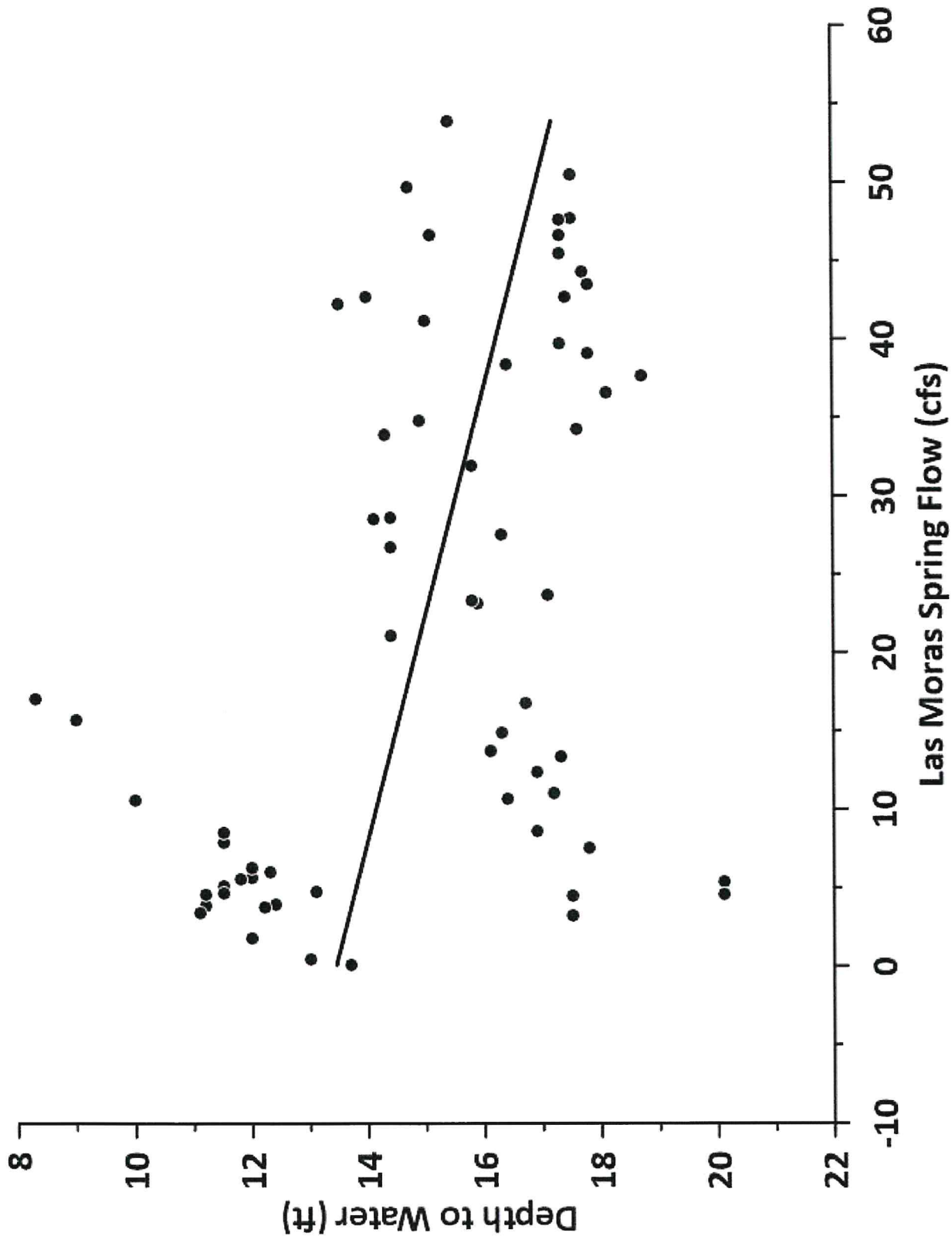
End of Month - January 2016 to June 2022

Zone 2 Example



**Las Moras Spring vs. R. Frerich House Well
End of Month - January 2016 to June 2022**

Zone 3 Example

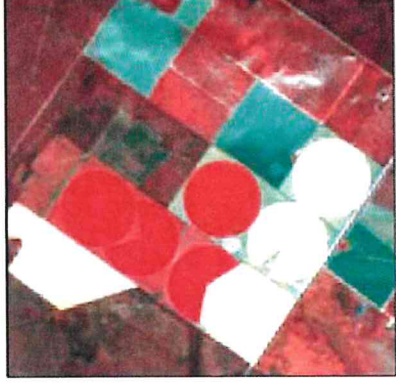


Landsat Analysis of Irrigation Acreage

- Identified historic irrigation areas
- Identified actual irrigation (odd years) 1995 to 2021
 - Summer and Winter
 - Also included summer 2022
 - Summer 2005 possible overestimate (recent rains)
 - Summer 2007 not available (cloud cover)
 - Summer 2013 possible overestimate (recent rains)
 - Winter 2015 possible underestimate (imagery issues)
 - 2017 (winter and summer) not available
- Subtotals based on springshed zones

Landsat Background

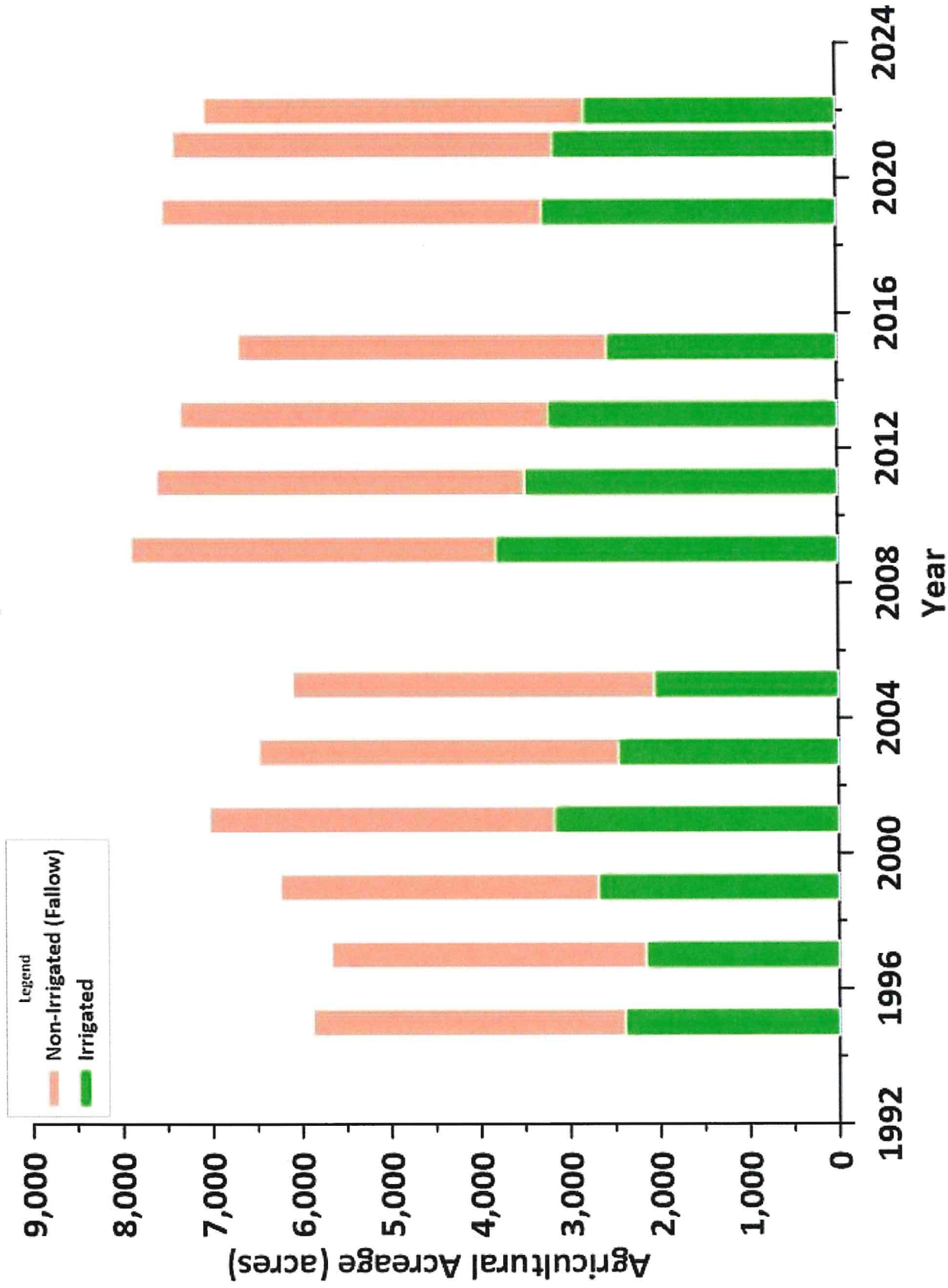
- Near infrared band useful for vegetation analysis
 - “False” color (red) shows healthy vegetation (well watered)
- Limitations:
 - Cloud cover, airborne particulates (e.g. dust, smoke), recent rainfall events
 - No differentiation in crop type, irrigation frequency etc.
 - Resolution of 30 meters
 - No small tract (< 5 acres) irrigation



Example Graphs

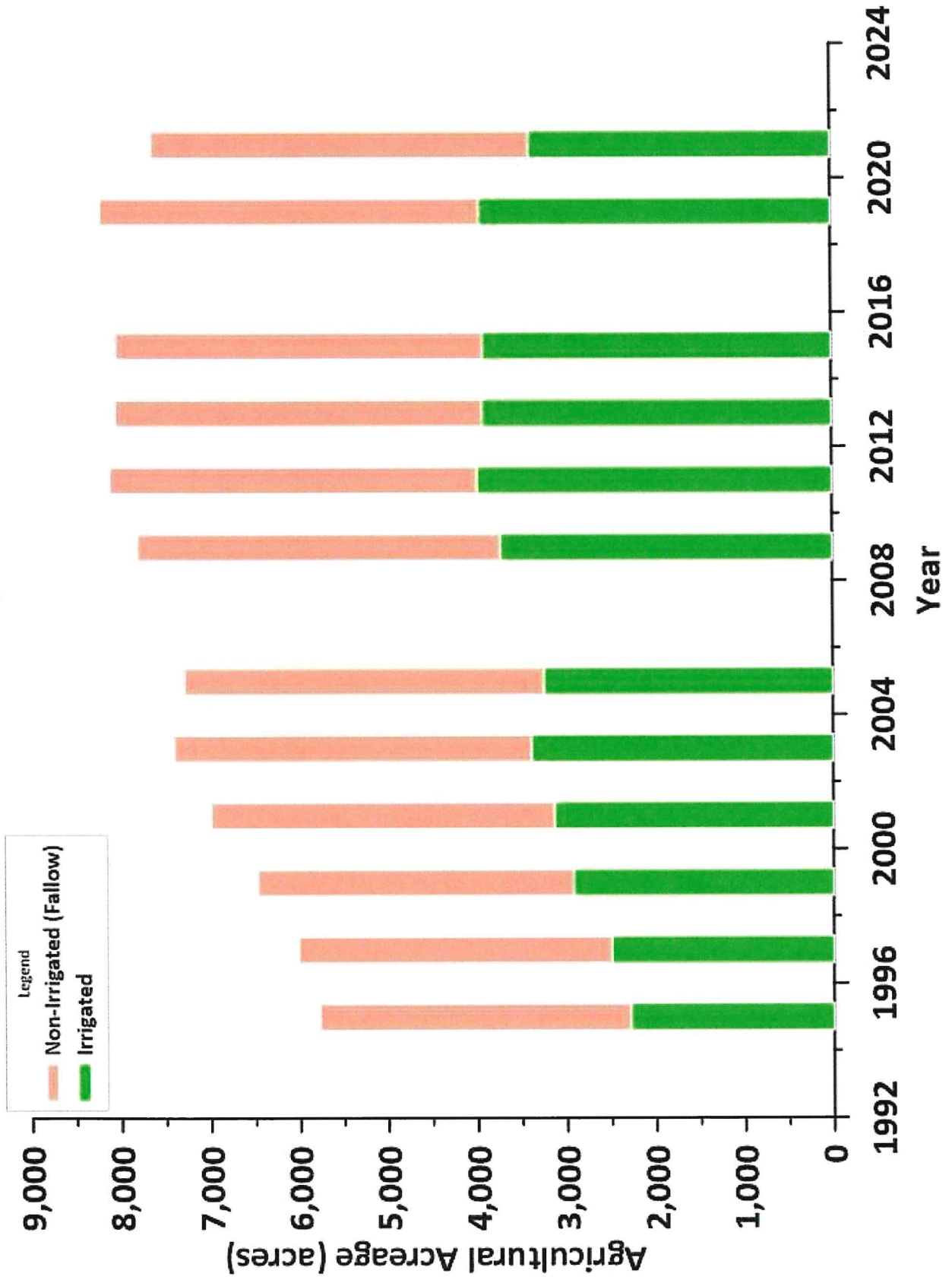
- Kinney County Irrigated and Fallow ag acreage
- Kinney County Irrigated acreage by zone
- Zone 1 Irrigated and Fallow ag acreage
- Kinney County estimated water use by zone
 - Comparison with reported permitted water use
- Zone 1 and Zone 2 estimated water use
 - Comparison with pumping estimates from empirical spring flow model

Kinney County Agricultural Acreage - Total Based on Landsat Analysis - Summer Data

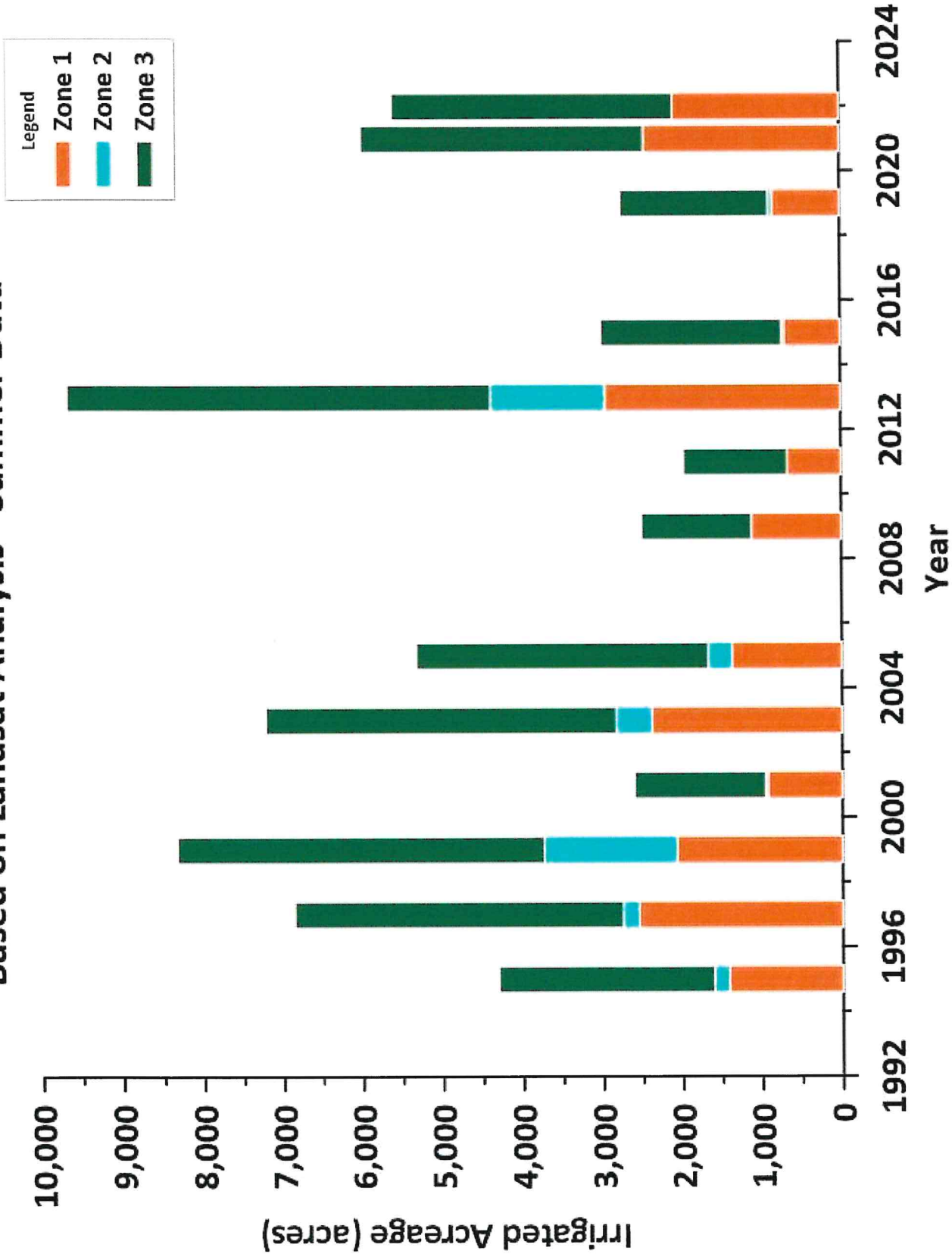


Kinney County Agricultural Acreage - Total

Based on Landsat Analysis - Winter Data

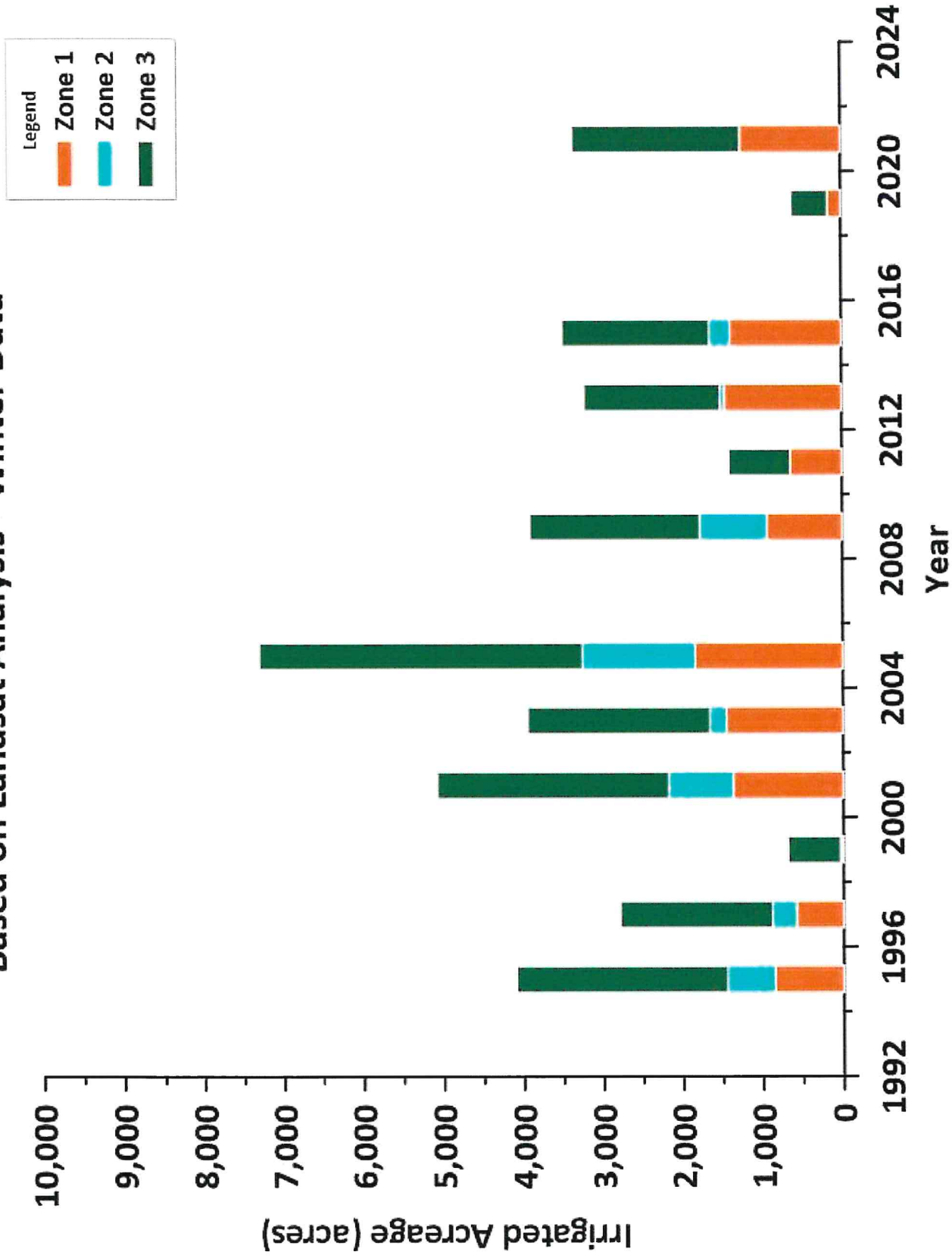


Kinney County Irrigated Acreage Based on Landsat Analysis - Summer Data



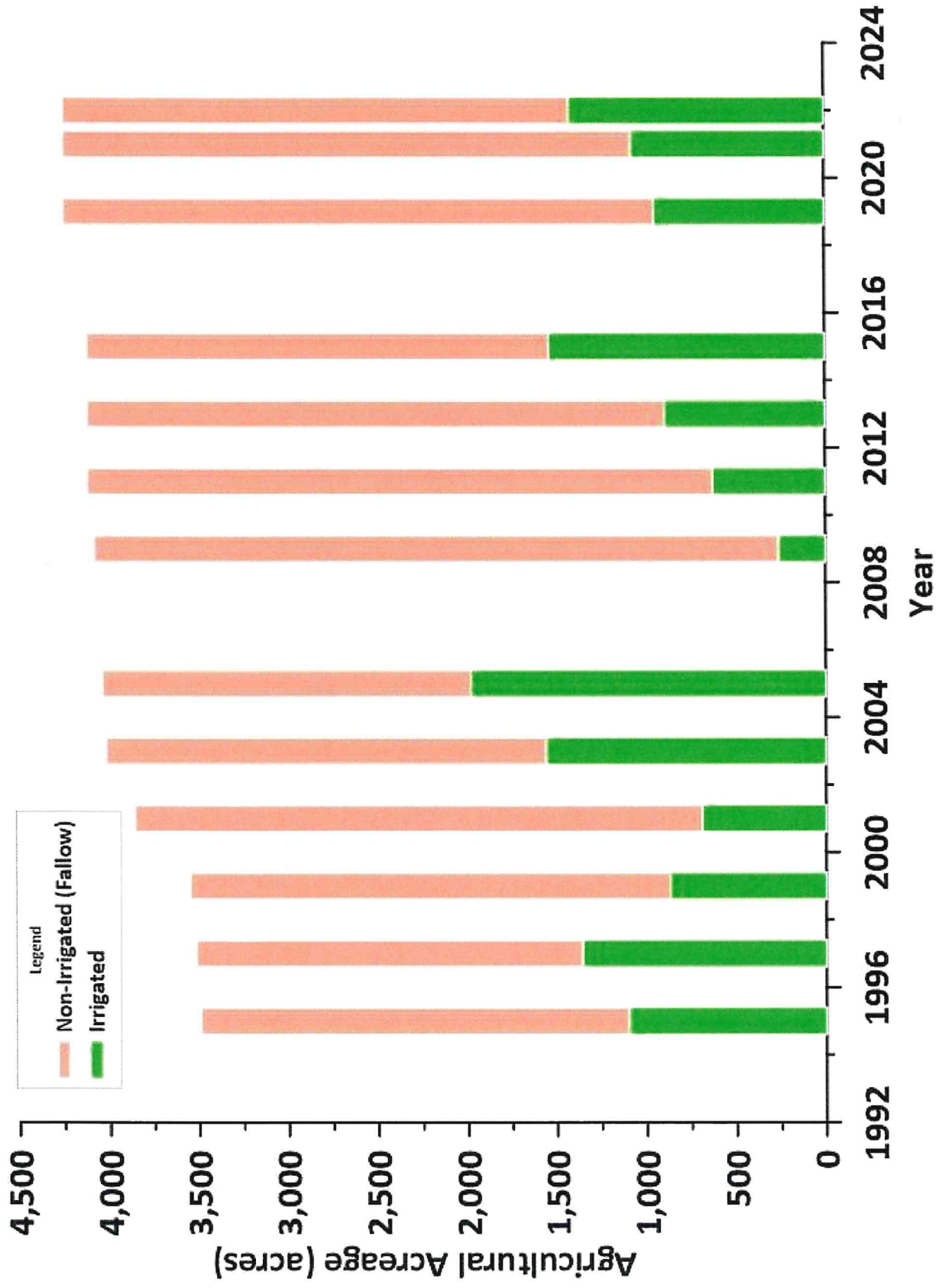
Kinney County Irrigated Acreage

Based on Landsat Analysis - Winter Data



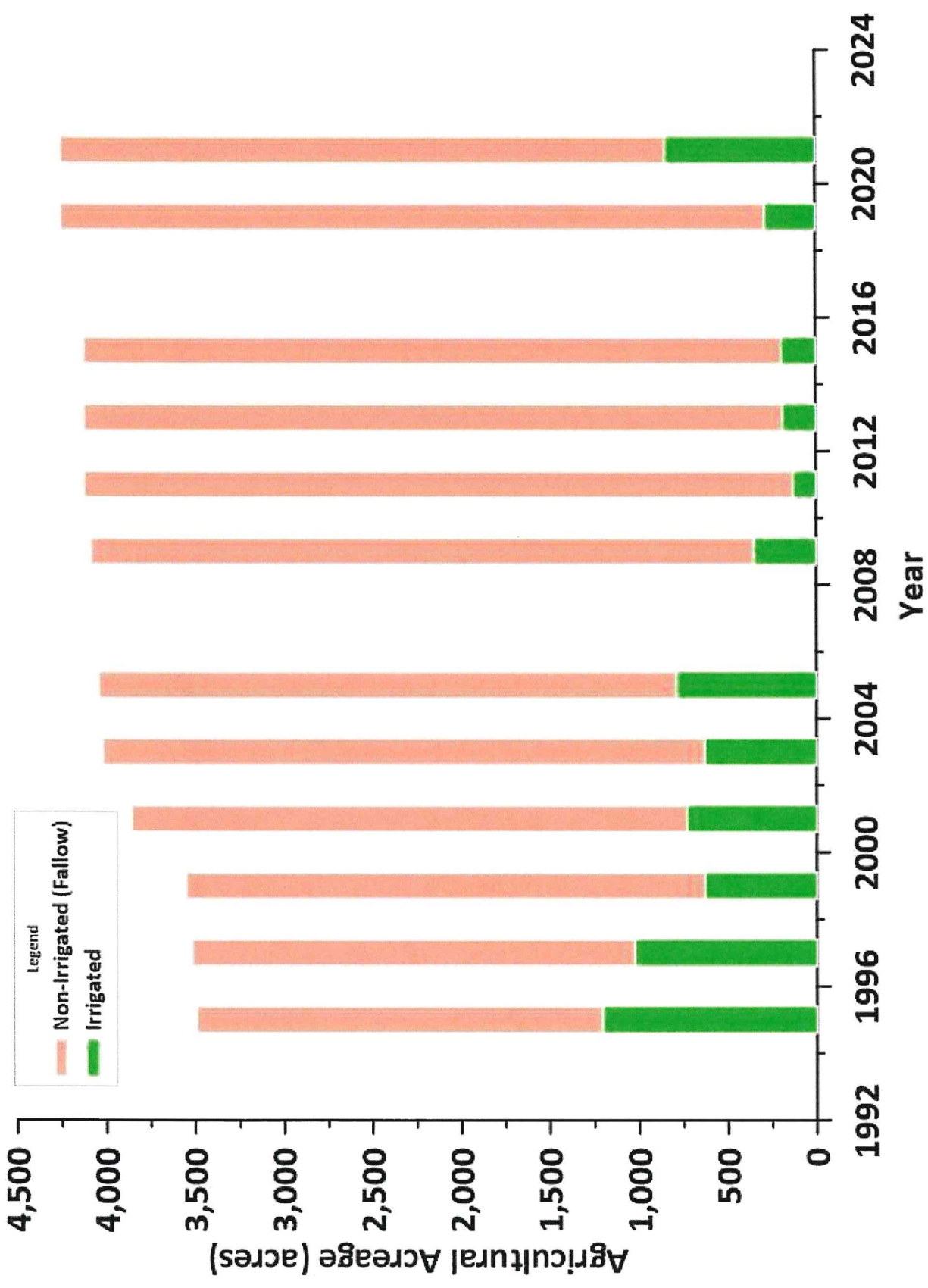
Kinney County Agricultural Acreage - Zone 1

Based on Landsat Analysis - Summer Data

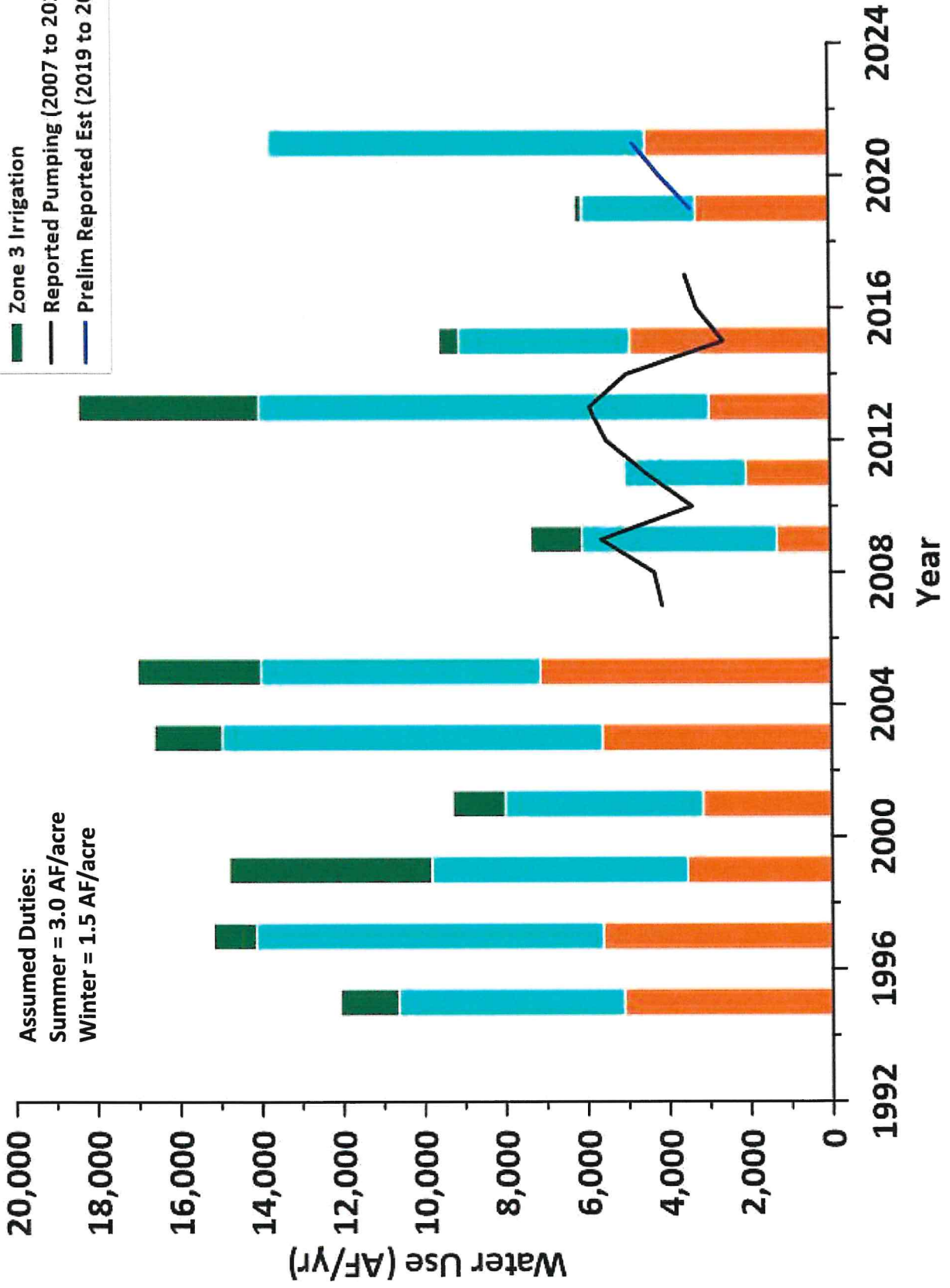


Kinney County Agricultural Acreage - Zone 1

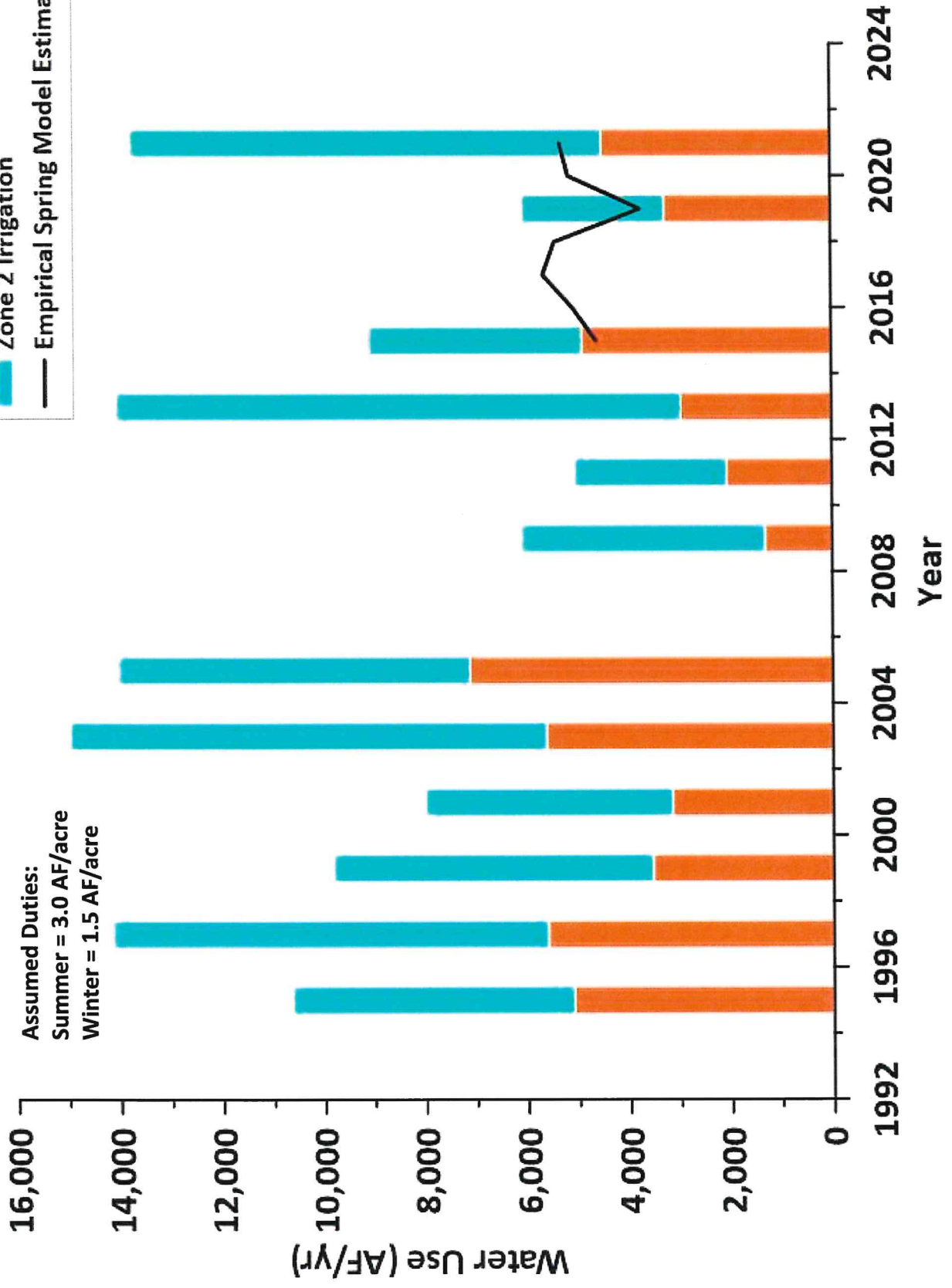
Based on Landsat Analysis - Winter Data



Estimated Water Use All Zones



Estimated Water Use Zones 1 and 2



Key Observations

- Most agricultural land is fallowed in any given year
 - Irrigated land in a specific year is a relatively small percentage
- Winter irrigation is significant
 - Empirical model suggested winter pumping
- Water use estimates are consistent with empirical spring model for areas where groundwater pumping affects spring flow (Zone 1 and some of Zone 2)
- No evidence of an “explosion” in “commercial irrigation” in recent years (since 1985)
- Estimated water use of all agricultural land are generally consistent with Existing and Historic Use permitted water use totals (not “inaccurate”, not “outright lies”)
 - Historic period = 1960 to 1991 (~52,000 AF/yr)
 - Existing period = 1992 to 2003 (~36,000 AF/yr)

Planned Documentation

- ARS LLC has prepared a technical memorandum of work completed to date
- This report and subsequent report will be appendices in my planned report that covers:
 - Spring data and empirical model (presented on July 12, 2022)
 - Analysis of monitoring data and documentation of spring flow cross plots to define zones (presented today)
 - Estimates of irrigation pumping from Landsat work (initial work presented today, to be supplemented with second phase)
 - This report will be an appendix to updated management plan

Next Steps

- “Fill in” even years for Landsat Analysis
 - Complete by September 30, 2022
- Extend irrigation analyses prior to 1995
 - Work beginning on October 1, 2022
 - More time consuming and expensive
- Numerical groundwater model will provide more refinement to zone designation
 - This work represents a conceptual starting point for numerical model development and calibration