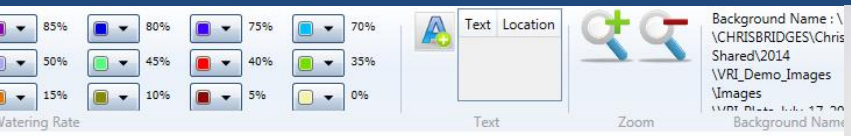
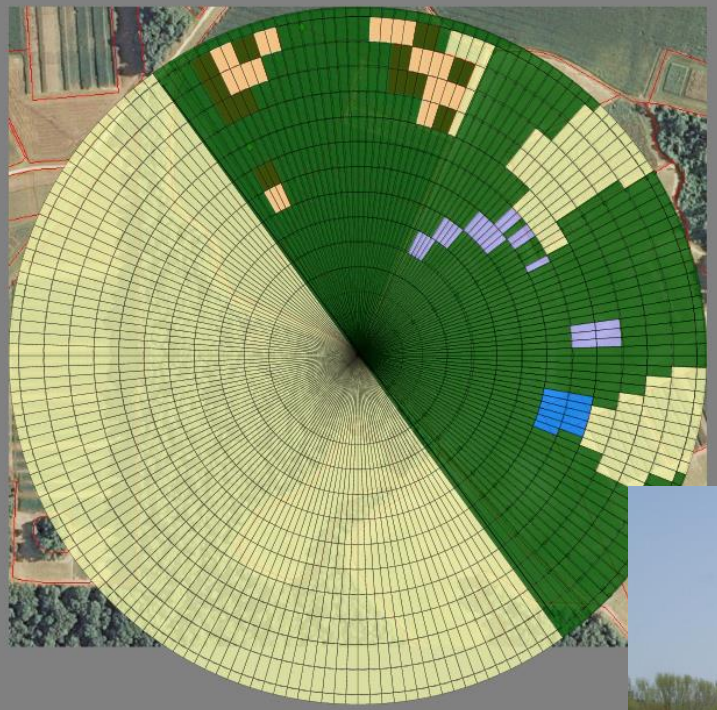
Variable Rate Center Pivot Irrigation





Blake Brown, Director
The University of Tennessee
Research and Education Center at Milan

UT AgResearch

Irrigation History at UT REC-Milan

- Irrigation installed in 2001
  - 2 center pivots
  - 1 linear move
- Irrigation increasing rapidly in west TN
  - Local Valley dealer was #1 dealer in U.S.
- Still learning how to manage
  - HEL
  - >70% No-Till
  - Application Rates – maximize without runoff
  - Pivot Tracks, etc.

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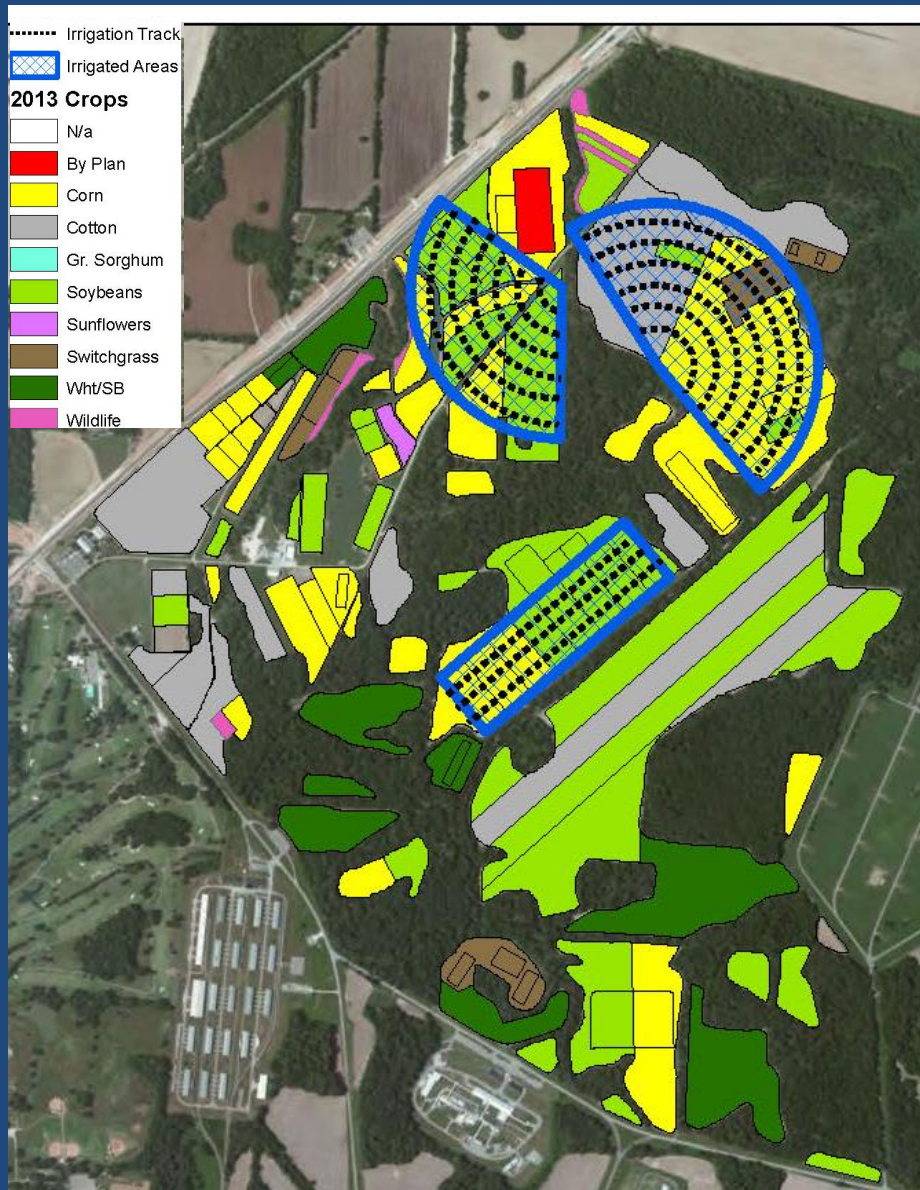
Irrigation Utilization

- 3 fields under pivots rotate corn, cotton, soybeans
  - Originally production fields - moving to small plot research
- Linear designated for corn/SB variety development and testing
- Various research projects have utilized irrigated acreage



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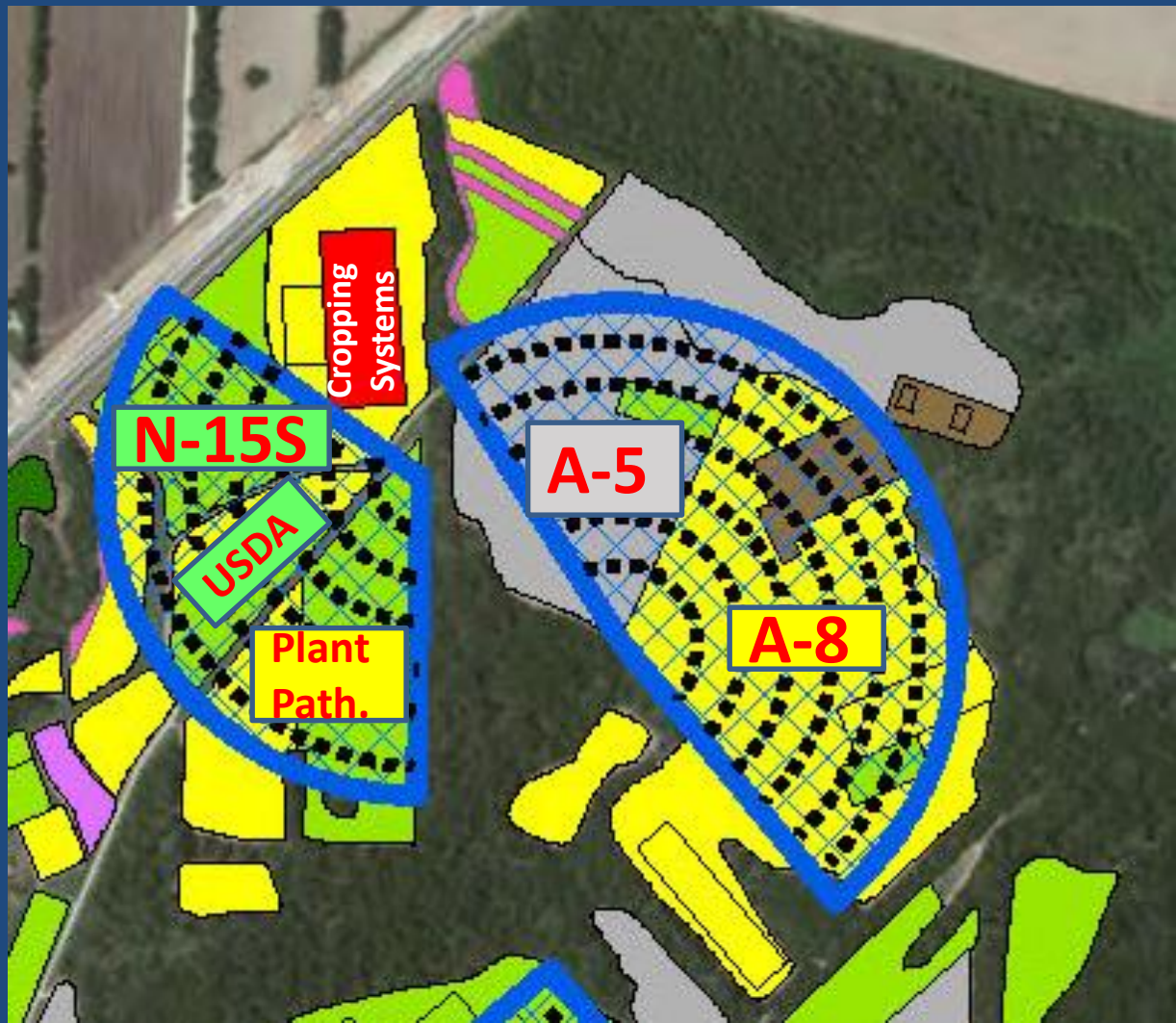
Irrigation Utilization

- N-15S, A-5 and A-8 are in corn, cotton, soybean rotation
- N-14 – USDA soybean research
- A-2 & 4 – Plant Path. corn and soybean
- N-15N Cropping Systems – No Irrigation on approx. 20 Acres!



UT AgResearch

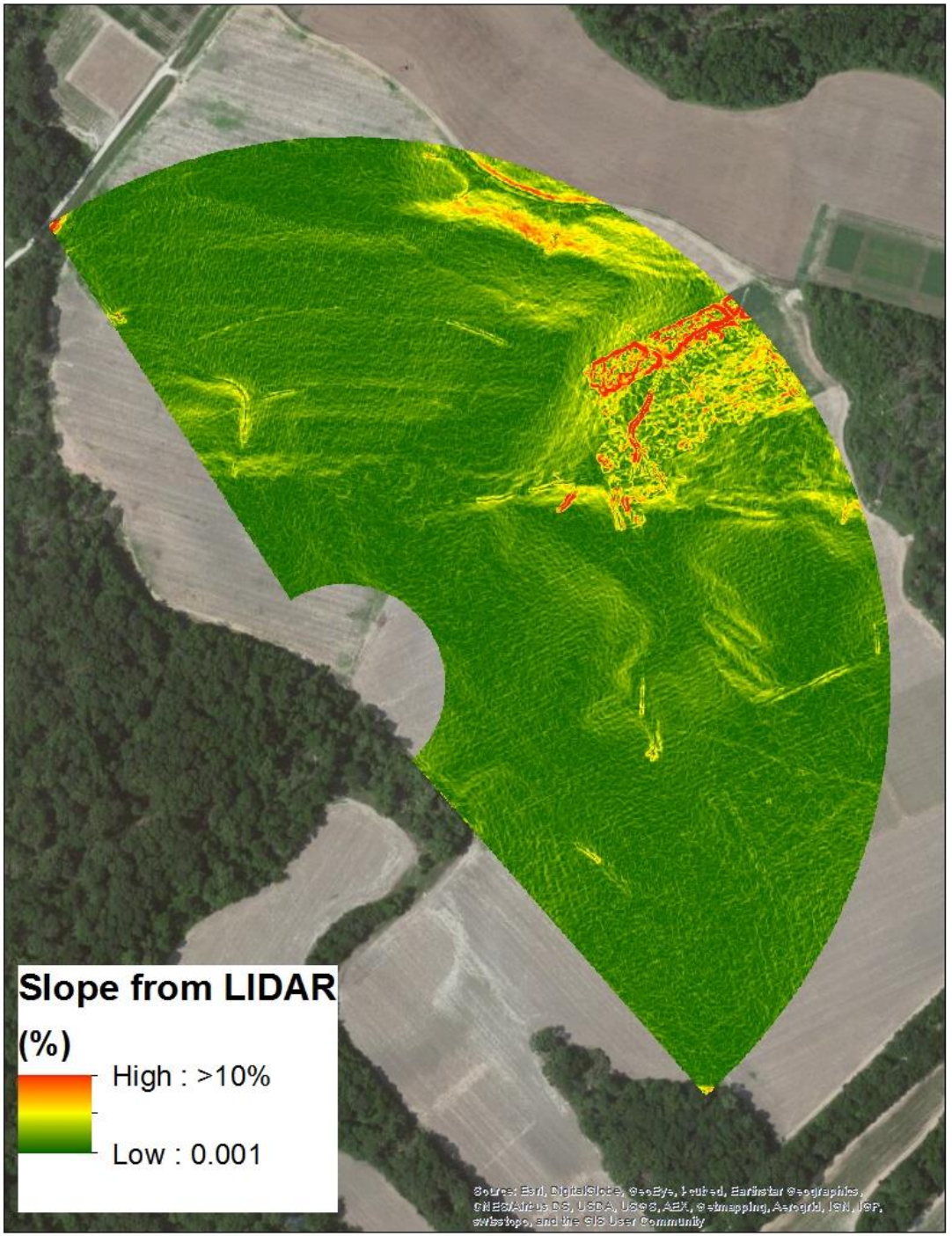
Justification for Considering VRI

- Management Issues
  - Irrigated acreage is limited (20% of tillable land)
  - Demand for irrigated plot land is increasing
  - Inability/difficulty in managing water needs for different crops under a single pivot
- VRI Research
  - Multiple irrigation schemes under single pivot
  - Varying soil types/crops/water usage

- Pivot installed in 2001
- Seven spans totaling 1,250’
- 63 acres irrigated including end gun
- VRI retrofit installed Spring 2014

AgResearch

- Well-Drained to Mod. Well-Drained Lexington-Loring
- Smaller Poorly-Drained inclusions of Henry
- Moderate topographic variation across irrigated area



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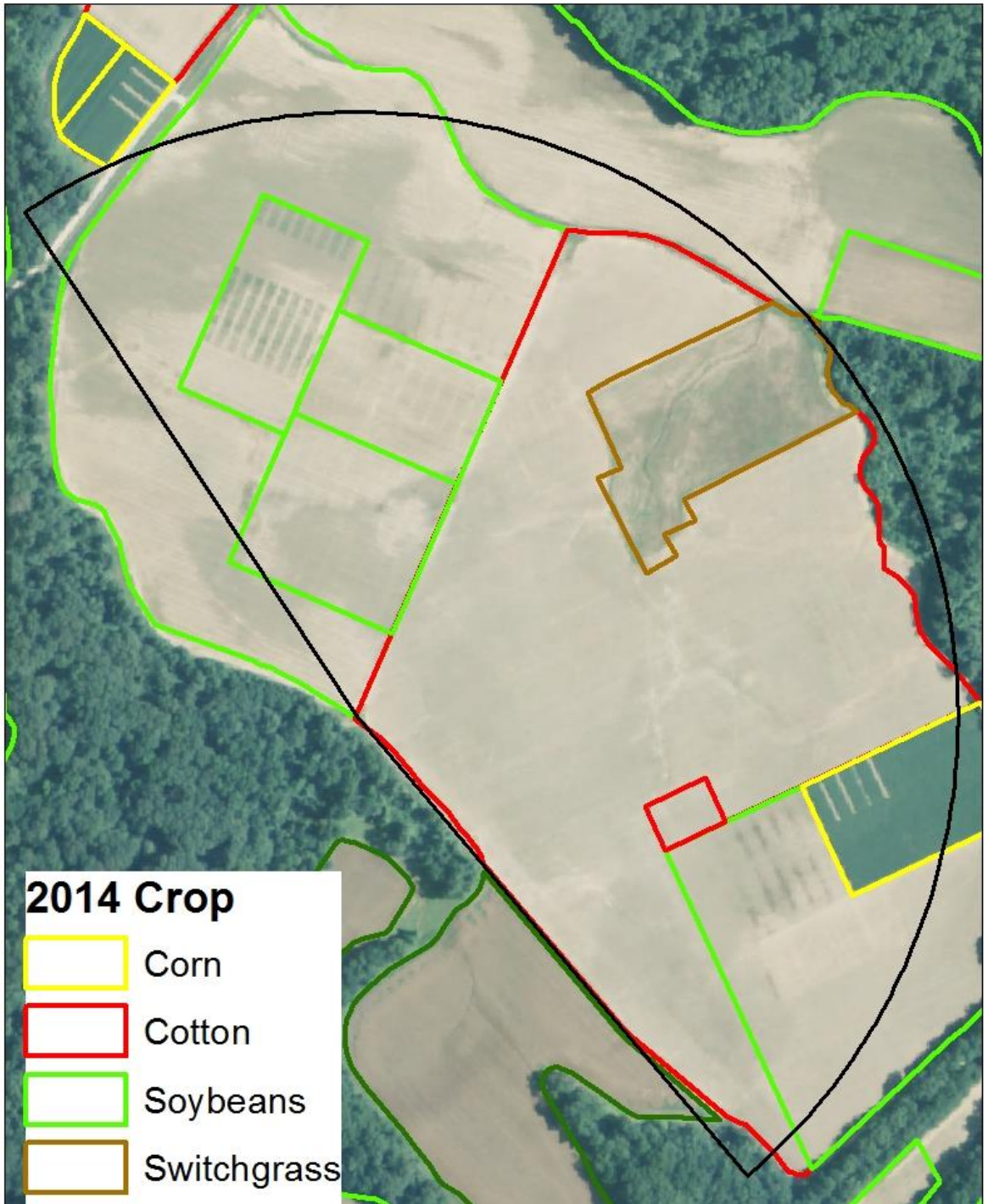
- Soybeans, cotton and corn under same pivot
- Small plot research trials & rotational/ production crops



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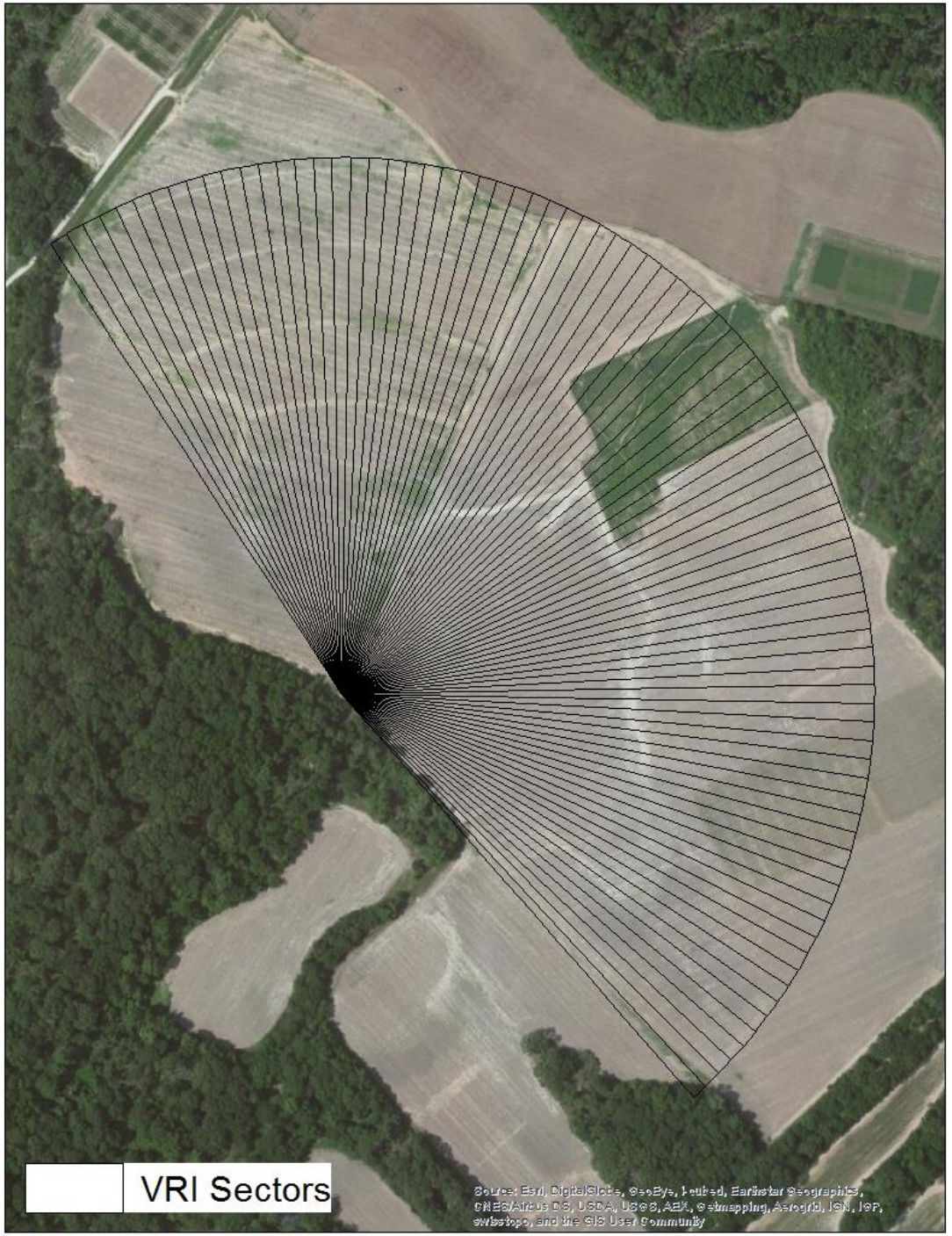
VRI Zone Size

- Each sector = 2 degrees
- Sector width at far end is approximately 43’



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VRI Zone Size

- Two zones per span, starting at second half of second span
- App. 10 nozzles per zone
- Only 3 nozzles in outer zone (Zone 12)

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VRI Zone Size

- 1,040 zones that can be watered at different rates
- Larger zones app 40’ x 95’
- Zones mapped by RTK-GPS

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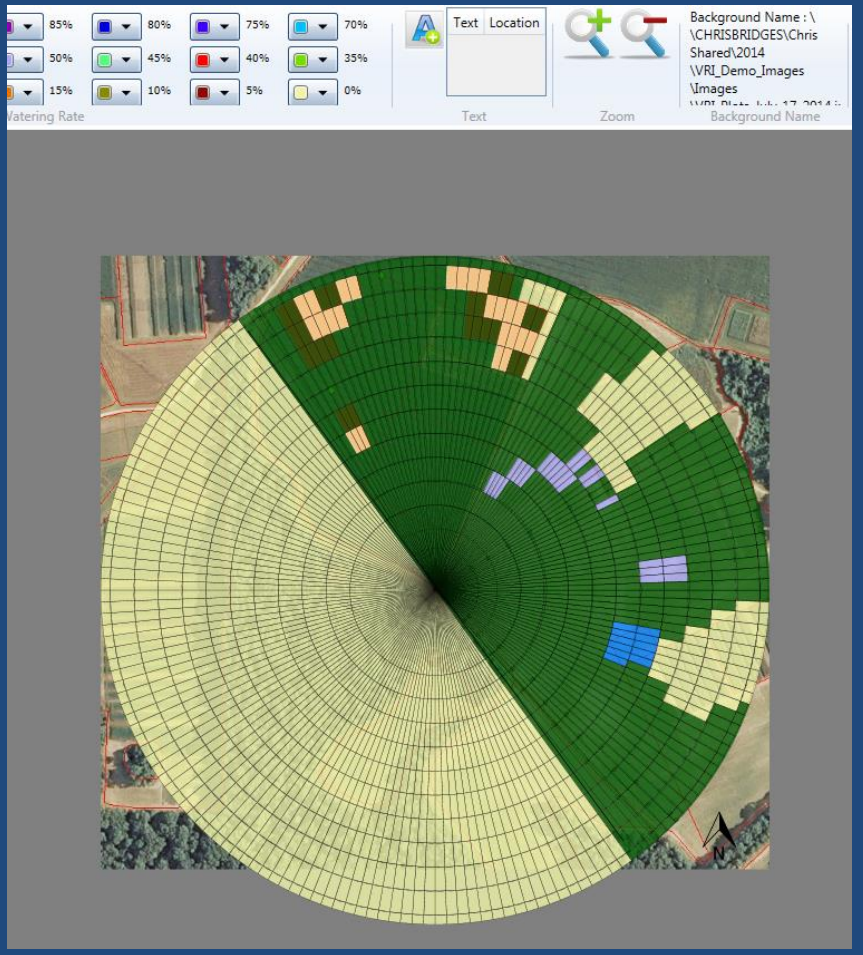
Valley VRI 6.29

- Allows irrigation rate to be changed in increments of 5%
- Zones can get from 0% to 100% of total rate
- Set as ‘percent of cycle time on / off’
- Cycle time usually 20 seconds
- Remote upload to pivot



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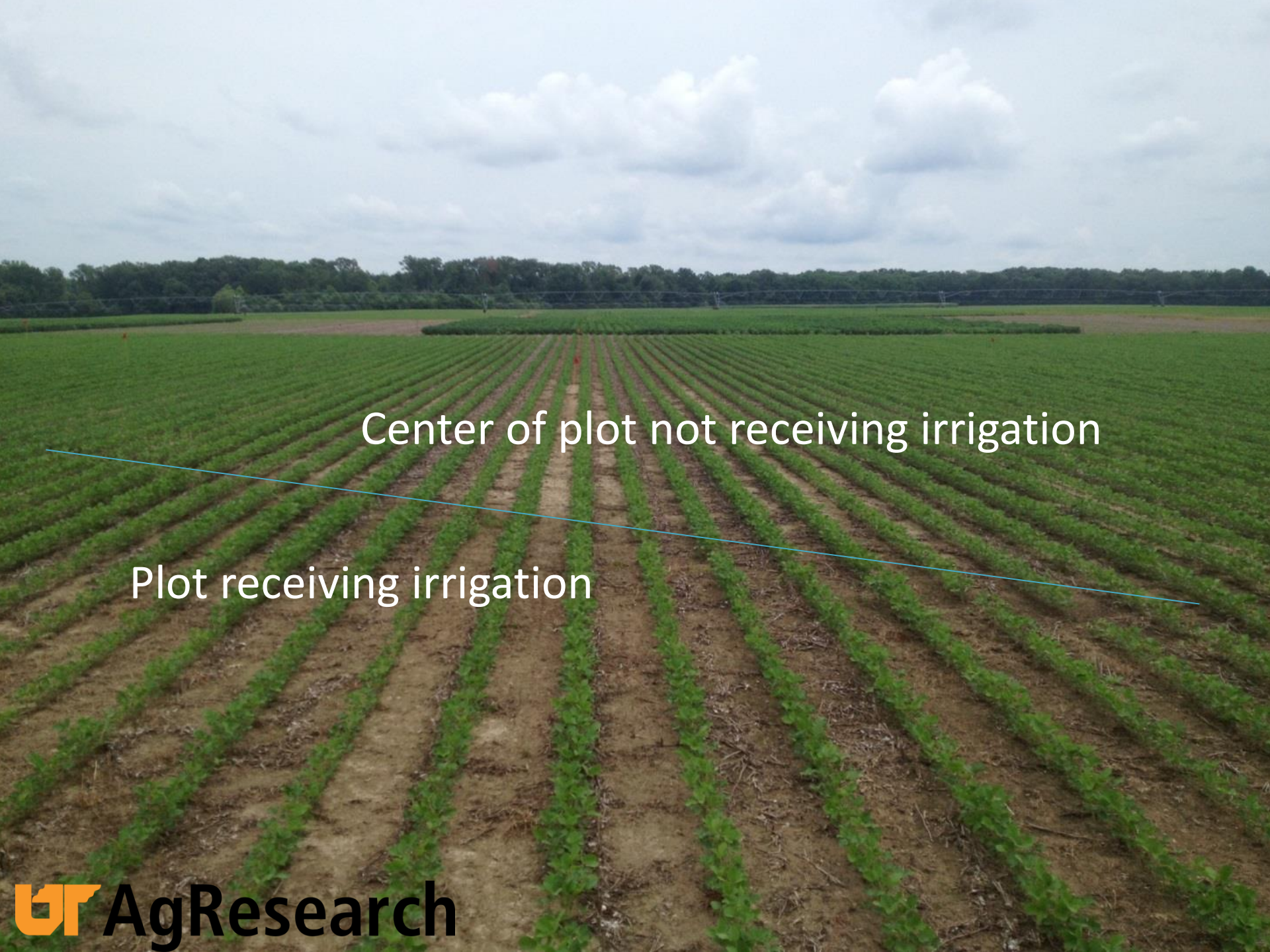
Center of plot not receiving irrigation
Plot receiving irrigation

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- Irrigation timing study placed following small plot layout

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Irrigation Schedule for 1st Rep

Zone	Treatment	Stage to Start Irrigation	Stage to End Irrigation
101	6	R3	R7
102	1	V3	R6
103	2	V3	R7
104	5	R3	R6
105	3	R1	R6
106	4	R1	R7

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- No significant difference in irrigation treatment
- Varietal difference was significant
- Soybean irrigation timing study to continue in 2015

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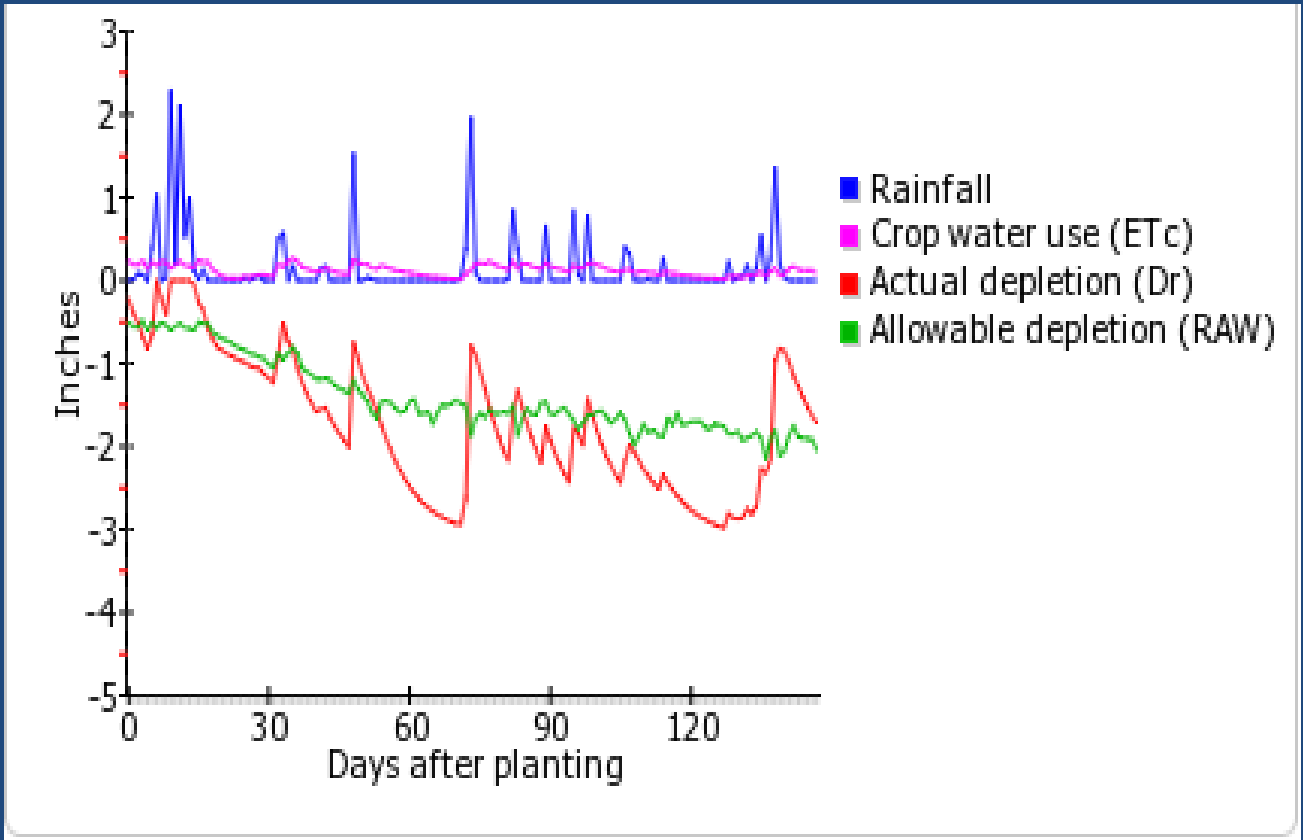
Rainfall

- Weather
  - 32.4” rainfall during growing season
  - In 2014, Milan REC received 12.2” more than 30-yr average



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What did it cost?

- $38,000 for retro-fit to existing system
- Included Variable Frequency Drive for well
  - ~$10,000

AgResearch

Results from 2014…
What did we learn?

- 2014 was relatively wet year
  - Difficult to conduct irrigation research!
- System was fairly simple to operate
- Valley software not geo-referenced – will need other GIS software (i.e. ArcGIS) to develop accurate prescriptions

Future Questions???

- How large must zones be?
- How much buffer is needed between zones?
- Are there effects from adjacent zones other than soil moisture – micro-climate, cooling, etc.?

- Thank You!