

Shallow Ground Water Use by Alfalfa

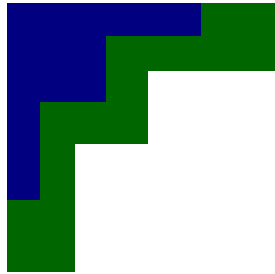
J.E. Ayars, P.J. Shouse, S.M. Lesch





Introduction

- Background
- Overview of the project
- Results
- Conclusions



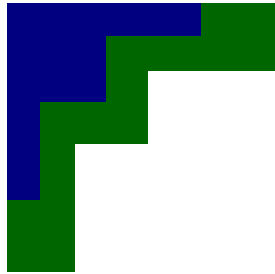
Conclusions

- Significant quantities can be extracted > 50% crop water requirement
- Water use increased with time when ground water $EC \leq 2$ dS/m
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- Salinity accumulation in upper 90 cm of soil profile demonstrated need for leaching
- In-situ use occurred up to EC of 6 dS/m



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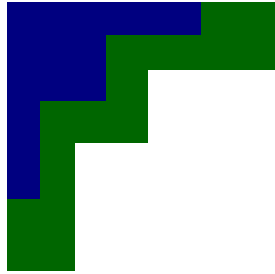
Background

- Competition for water between municipal, industrial, environmental, and agricultural users
 - Irrigated agricultural uses 70 – 80 %
- California Dairy Industry – leads nation
 - 27.1% Ag economy related to dairy and cattle



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Background Cont'd

- How to survive
 - Improve water productivity
 - Improve irrigation efficiency
 - Find alternate sources of water

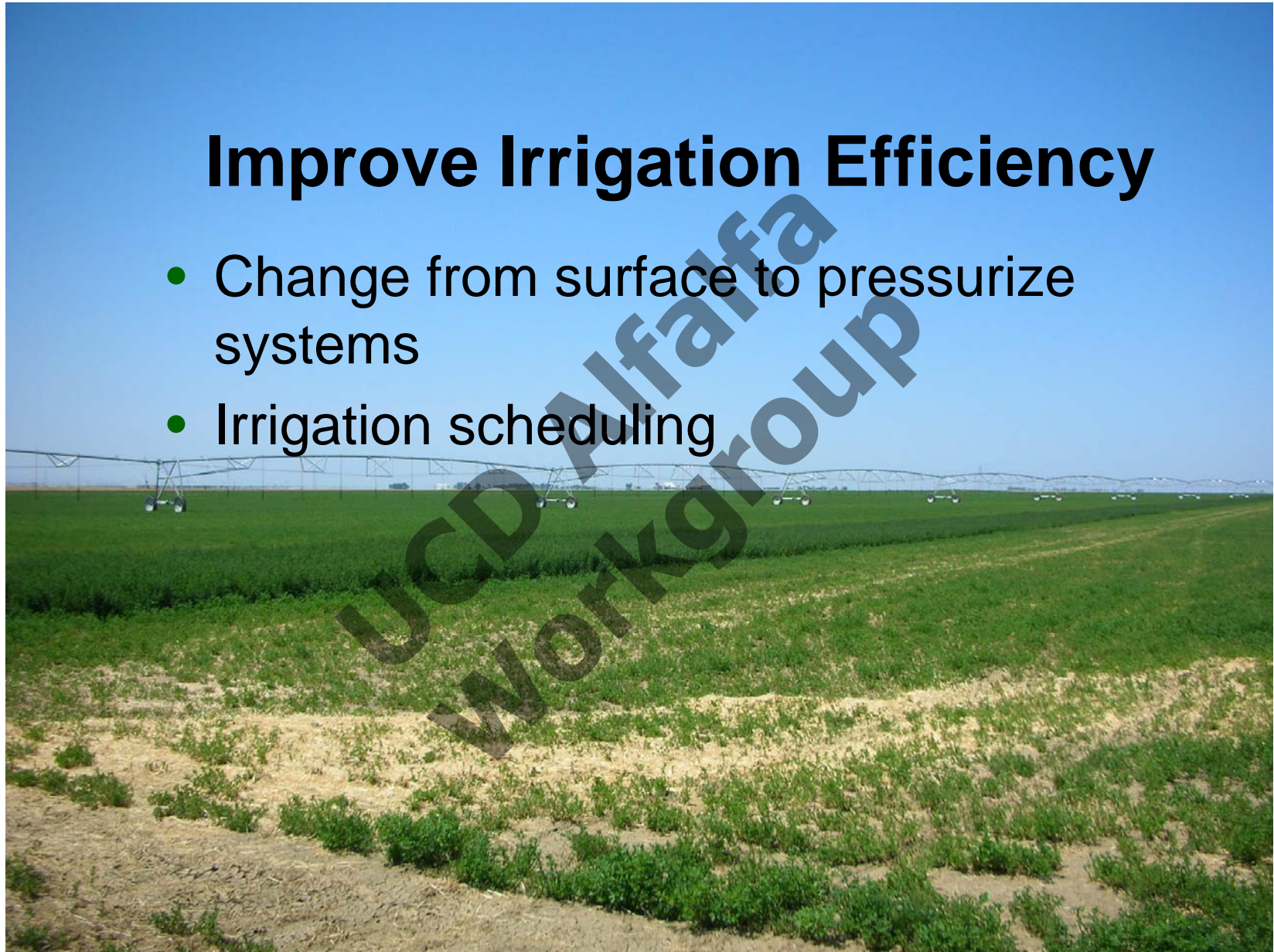


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Improve Irrigation Efficiency

- Change from surface to pressurize systems
- Irrigation scheduling



Alternate Water Supplies

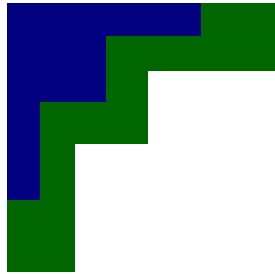
- Saline drainage water
- Treated municipal water
- Dairy lagoon effluent
- Shallow ground water

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Management Challenges

- Salinity
- Nutrients
- Toxic elements
- Availability





Objective

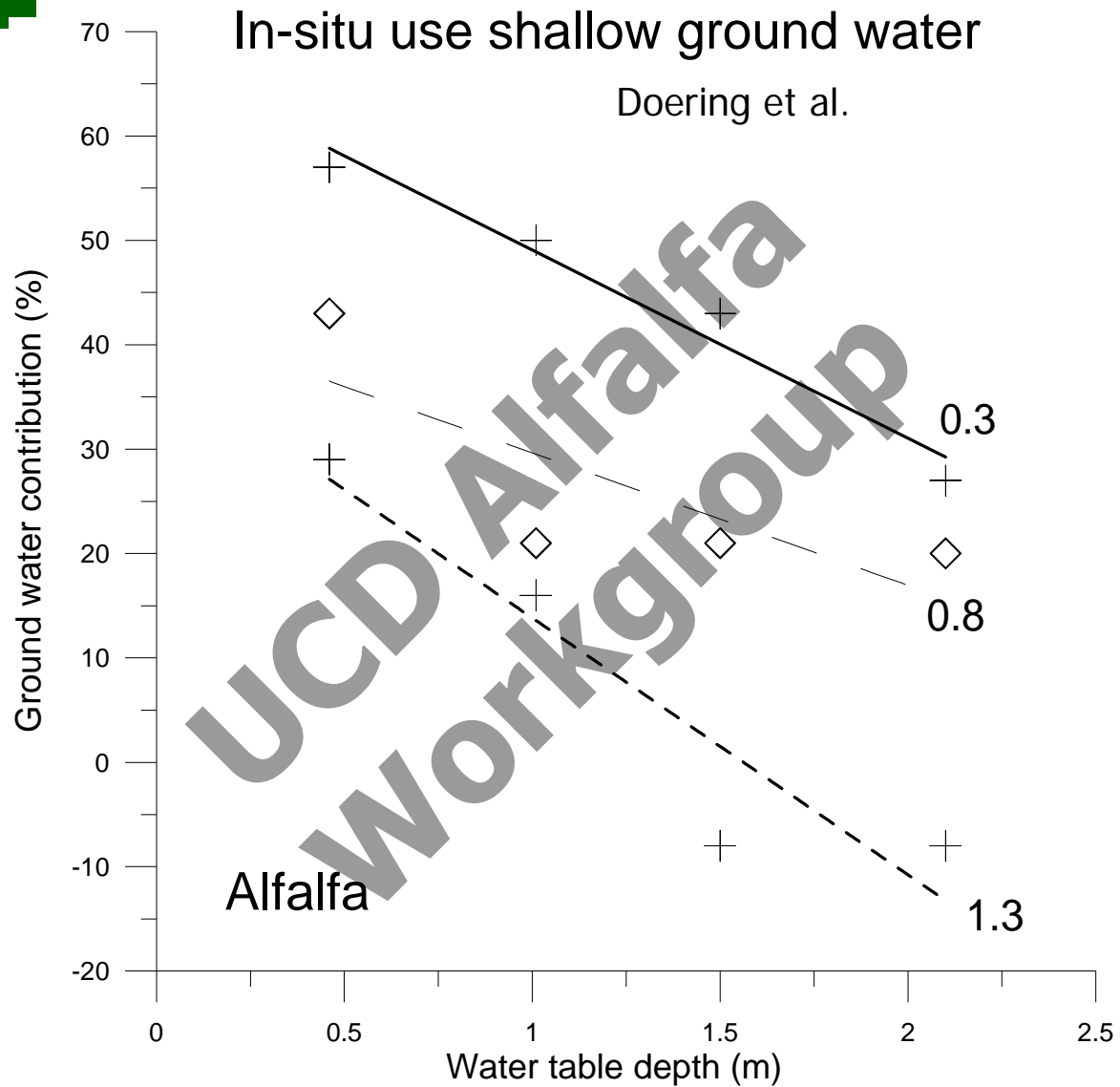
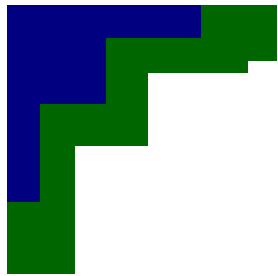
- Determine effect of ground water quality (EC) and depth on the in-situ use of ground water by alfalfa.



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Workgroup

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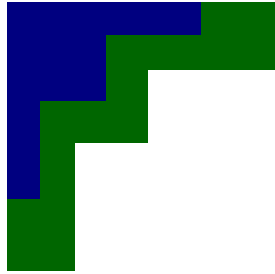


Alfalfa



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Materials and Methods

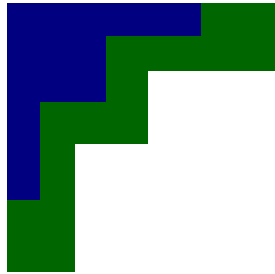
- Column lysimeters - PVC
 - 45 cm diameter
 - 1.8 m height
 - 2.6 m height
- Water table depth – Marriotte Bottles
 - 1.2 m
 - 2.0 m
- Instrumentation – Pillows
 - Water manometers – read twice a week





Marriotte Bottle

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M and M cont'd

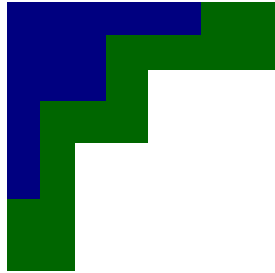
- Six ground water salinity (EC) treatments at 1.2 m
 - T1 – no groundwater - control
 - T2 – 0.3 dS/m
 - T3 – 2.0 dS/m – Maas – Hoffman Threshold
 - T4 – 4.0 dS/m
 - T5 – 6.0 dS/m
 - T6 – 8.0 dS/m
- Depth and salinity (EC)
 - T3T – 2.0 dS/m – 2m
 - T4T - 4.0 dS/m – 2m
- 4 replications



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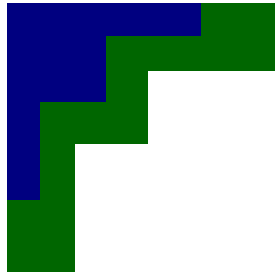
M and M cont'd

- Irrigation based on water loss in T1, no water table
 - 0.3 dS/m
 - 1 to 2 times per week
- Harvest
 - 4 to 6 week intervals
 - Weighed, dried, analyzed for quality
- Statistics - Yield
 - Mixed Procedure (SAS)



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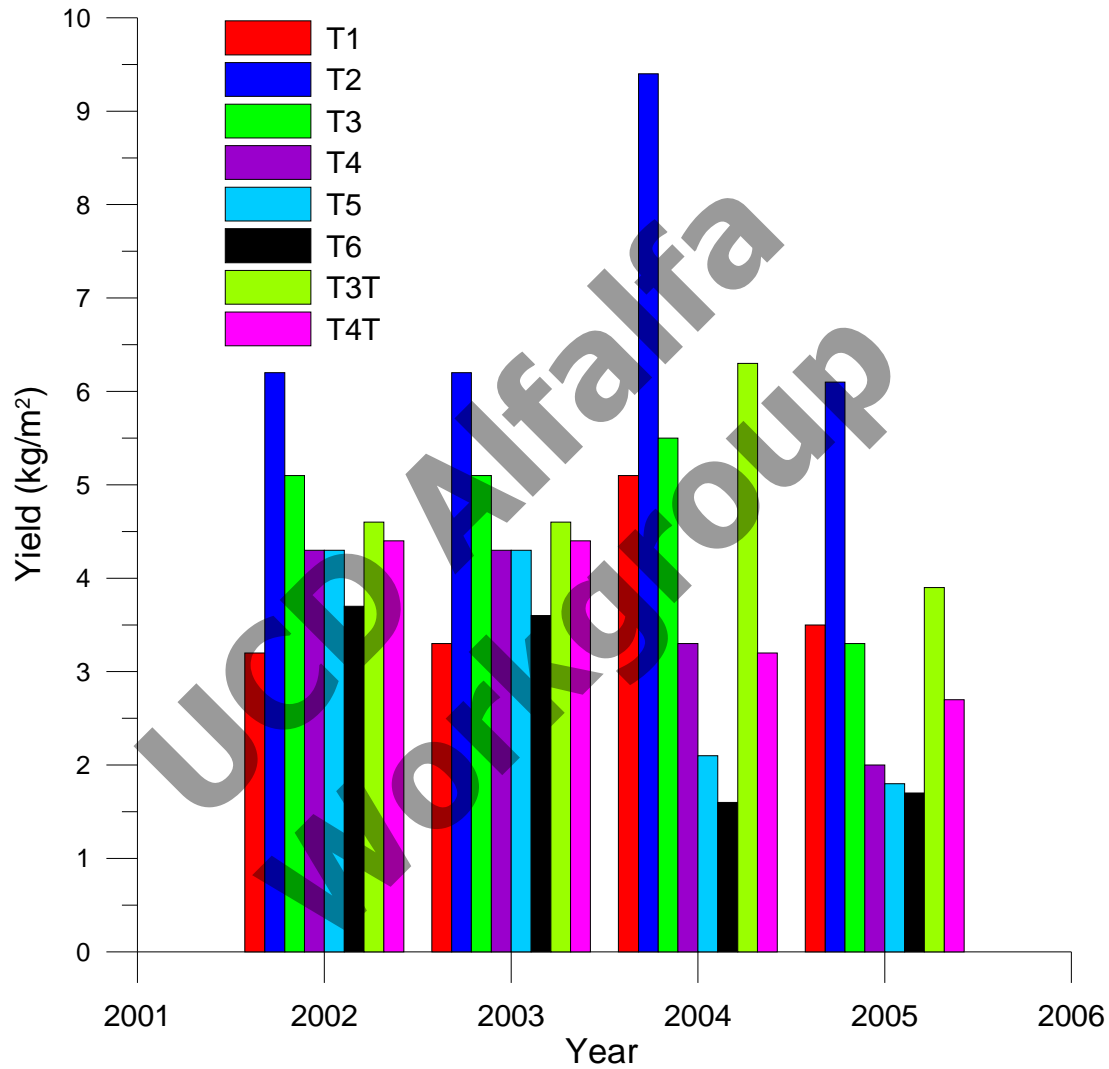
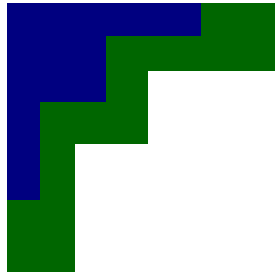
Yield

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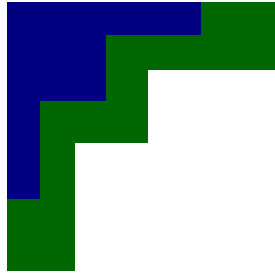
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Questions

- Was there a reduction in yield with time that was related to the ground water quality?
- If so, was it a significant relationship?



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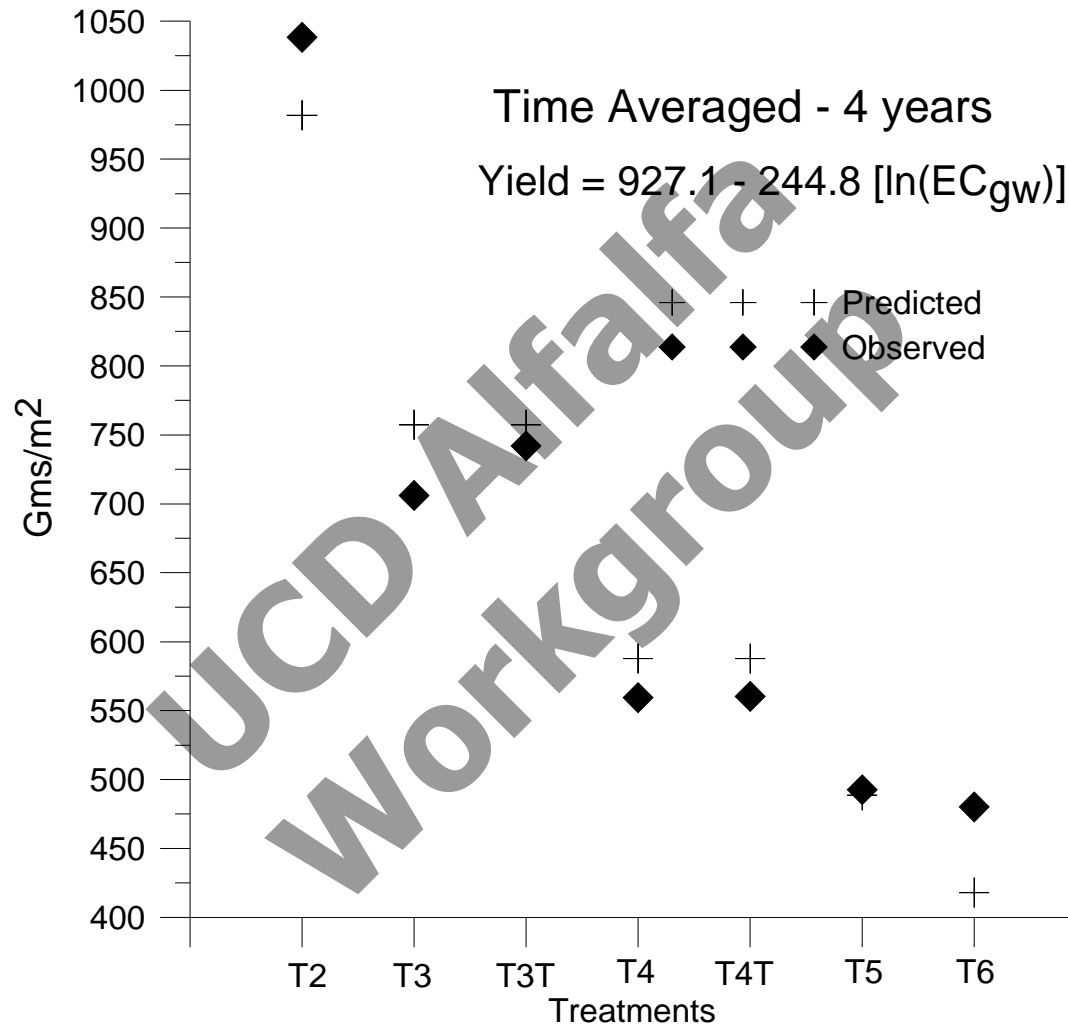
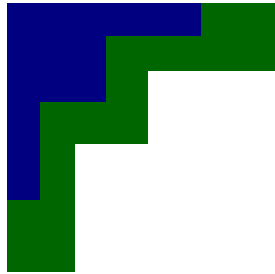
Linear Regression Model Slope Coefficients, Stn'd Errors, t-tests, P values

Treatment	T1	T2	T3	T3T	T4	T4T	T5	T6
Estimate	-16.35	-41.15	-136.49	-76.65	-148.80	-133.24	-173.28	-96.72
Std.error	28.58	68.97	26.71	45.06	18.74	18.11	15.79	40.30
t-test	-0.57	-0.60	-5.11	-1.70	-7.94	-7.36	-10.98	-2.40
p-value	0.5744	0.5603	0.0002	0.1110	0.0001	0.0001	0.0001	0.0309



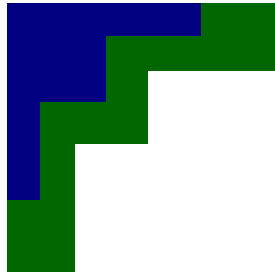
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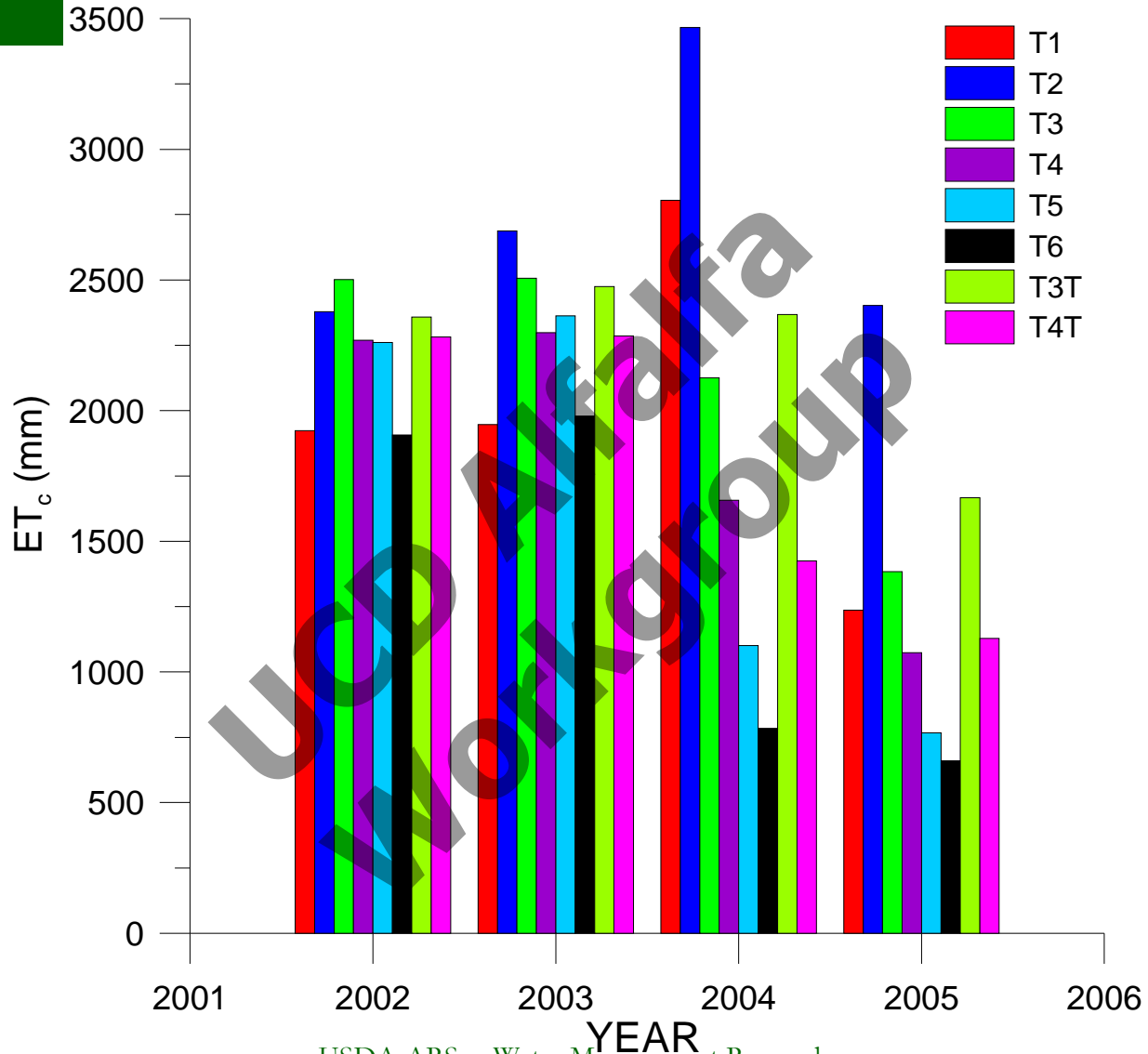
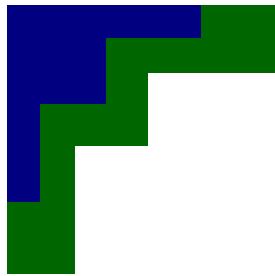
Crop Water Use

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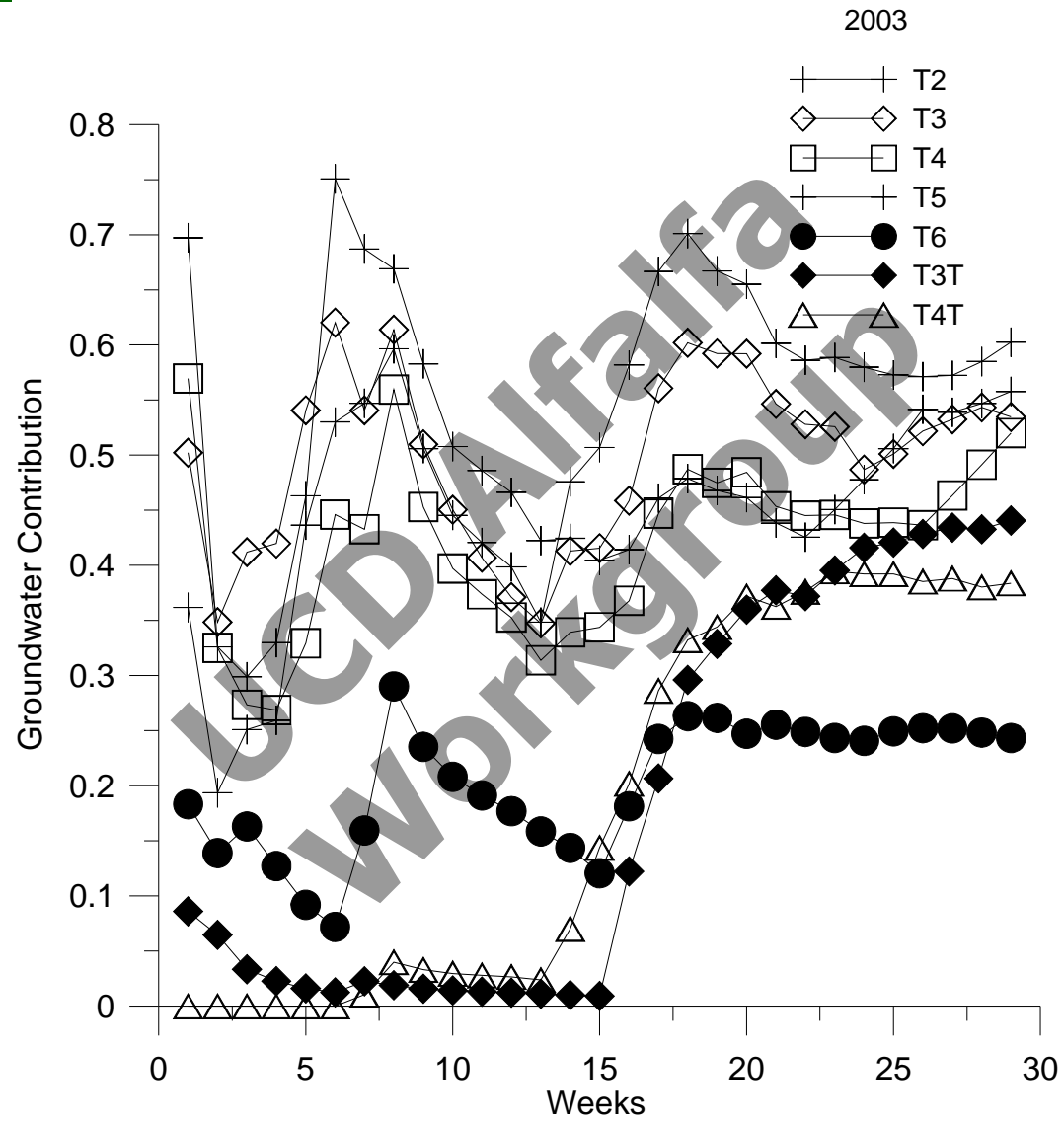
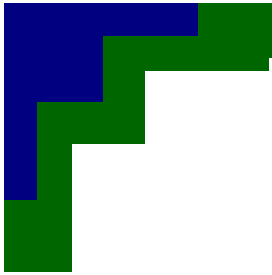
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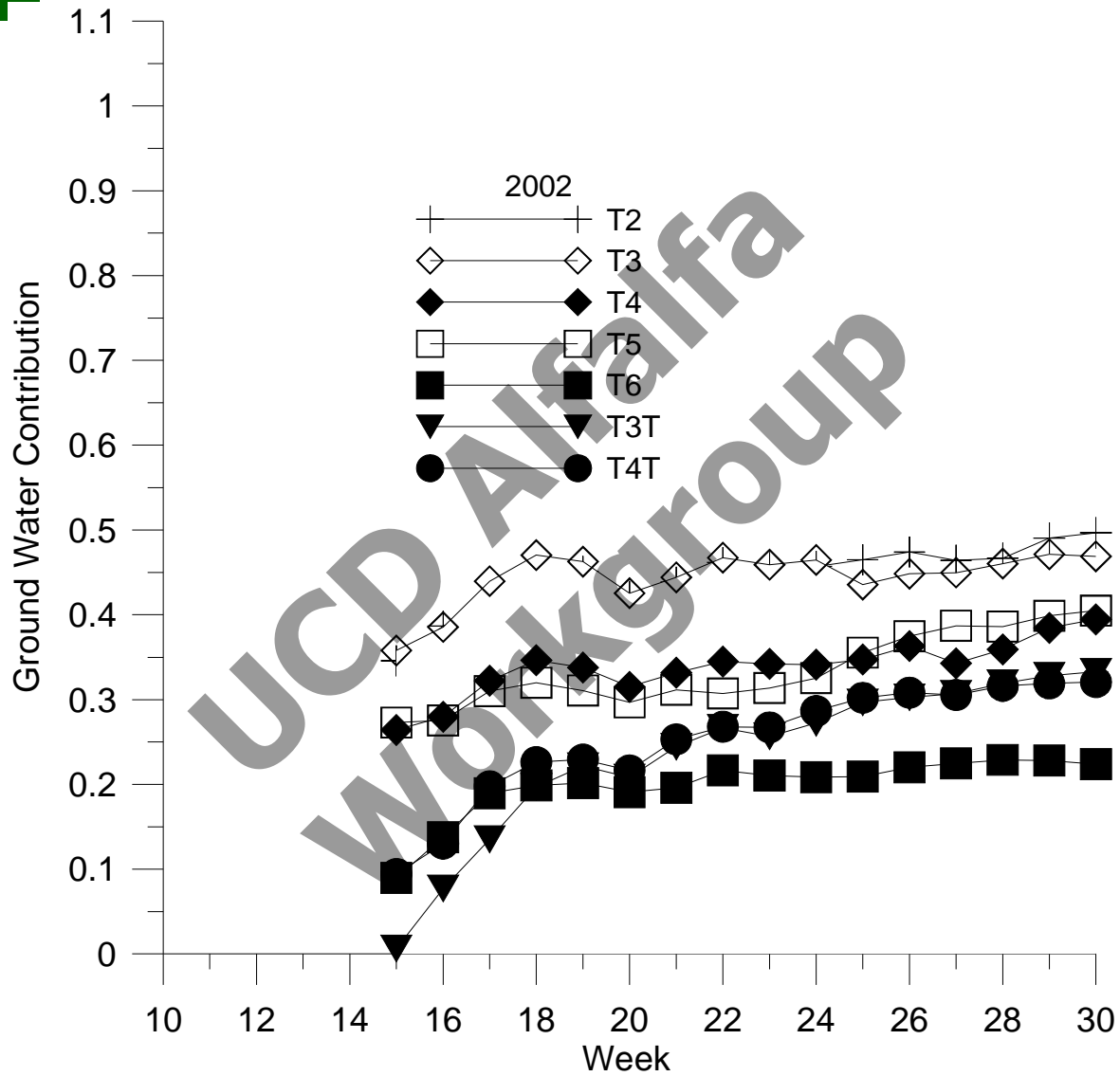
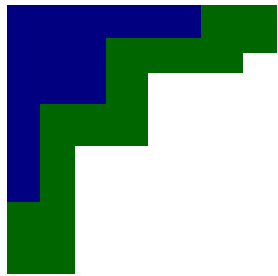




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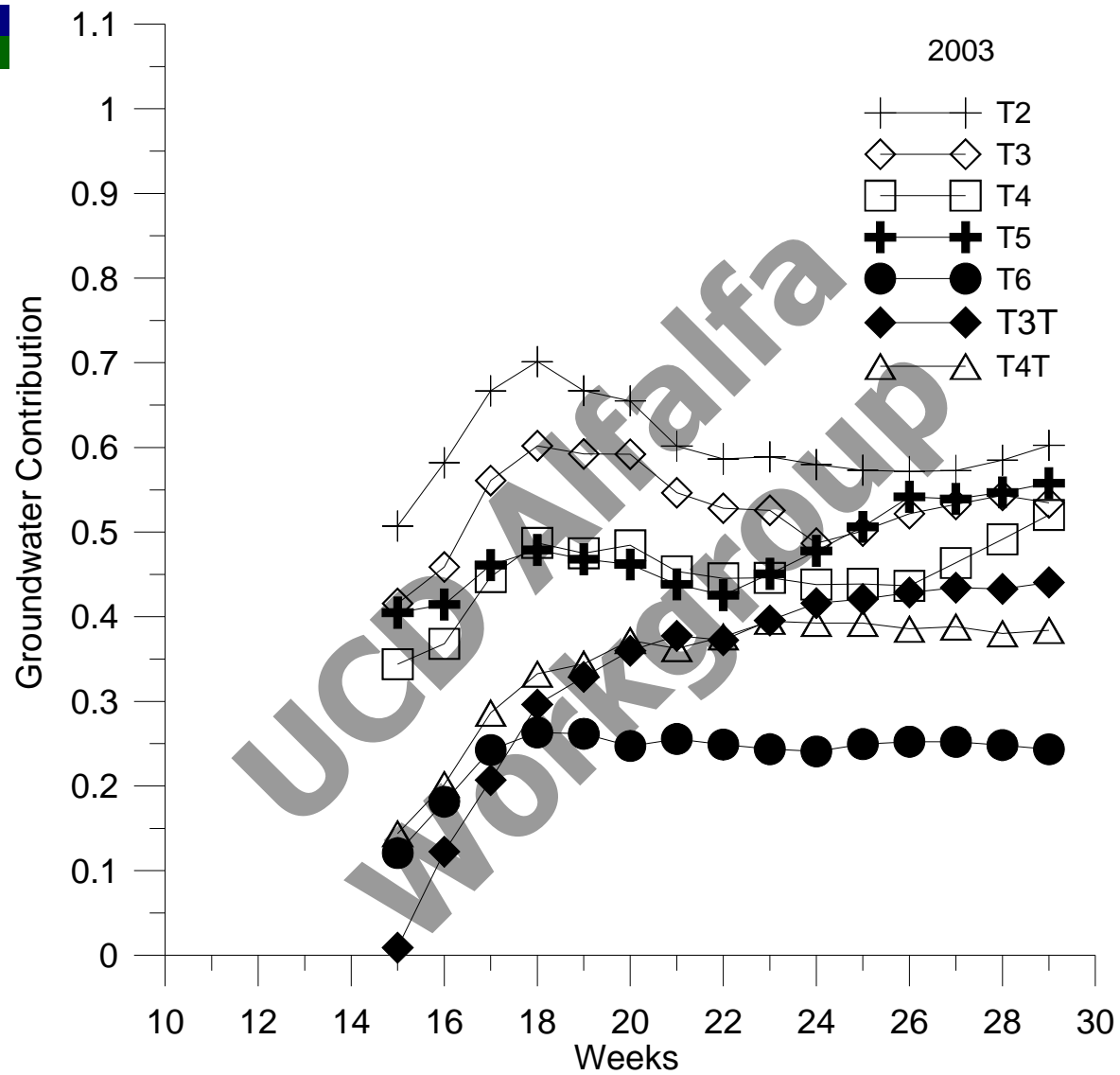
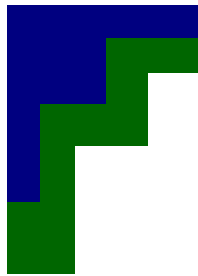






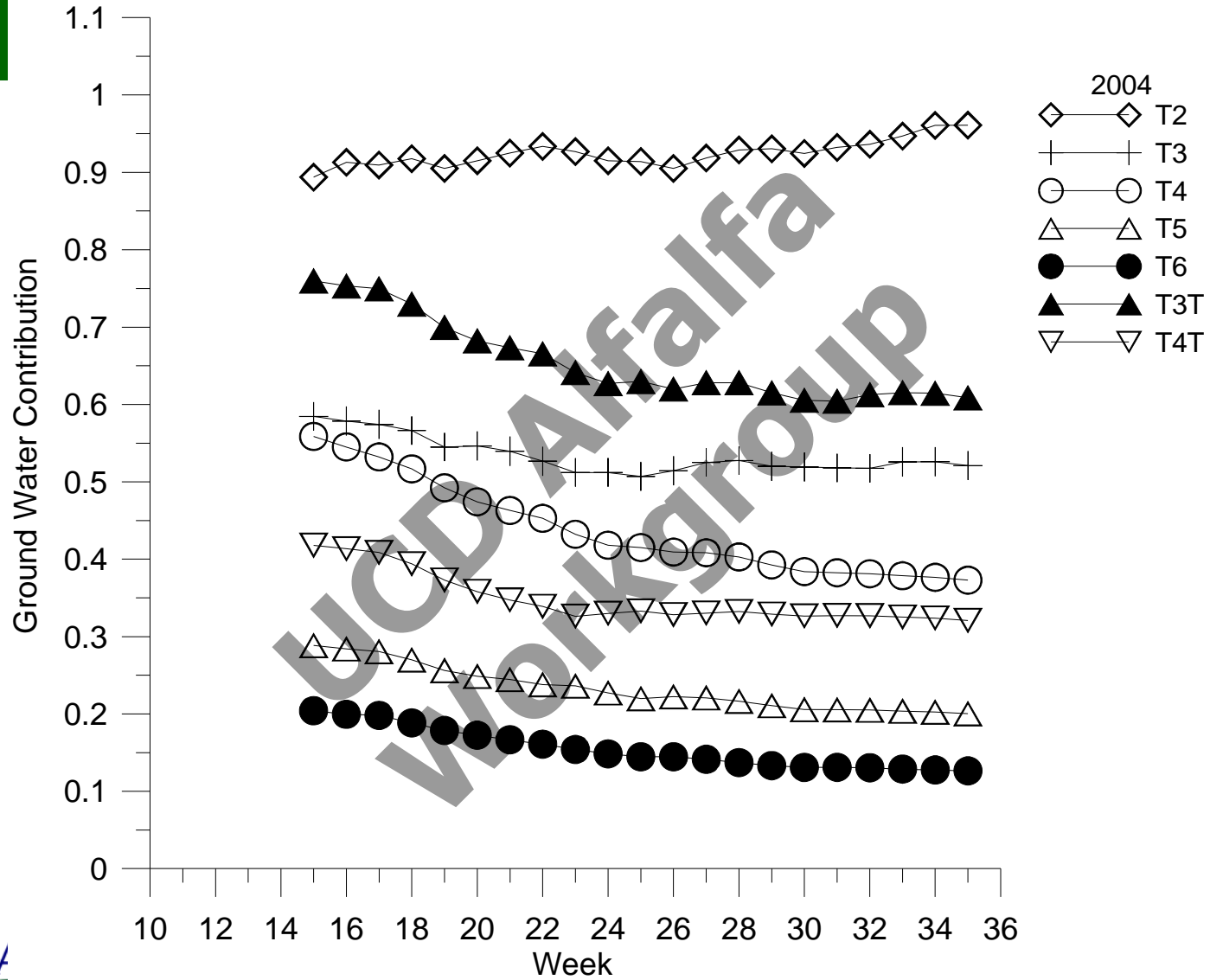
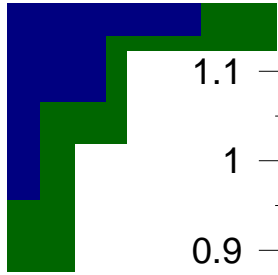
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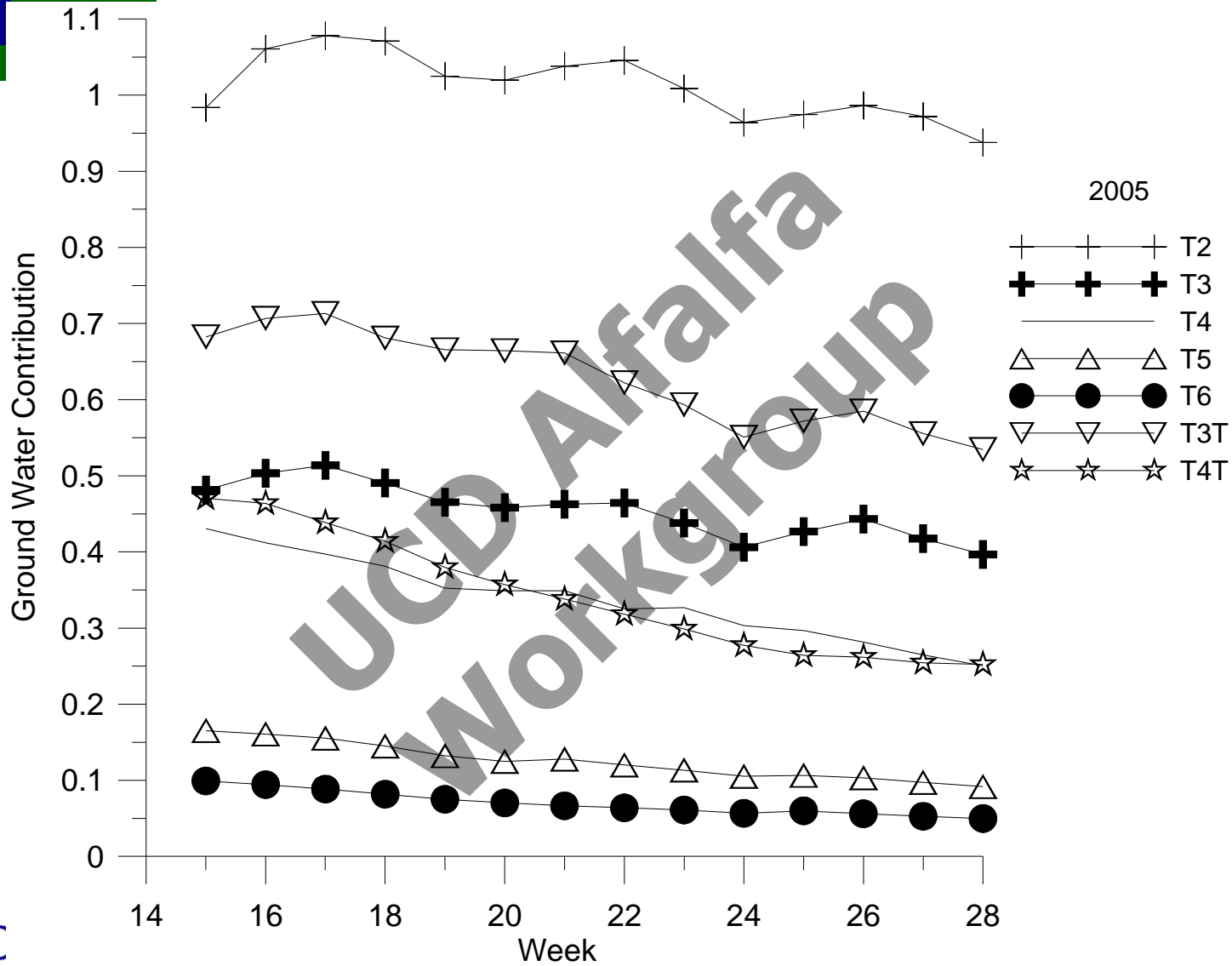
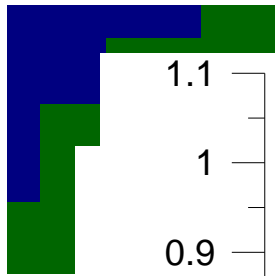
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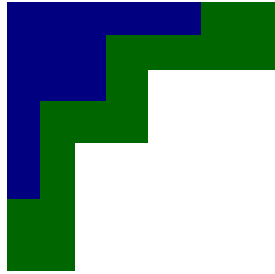
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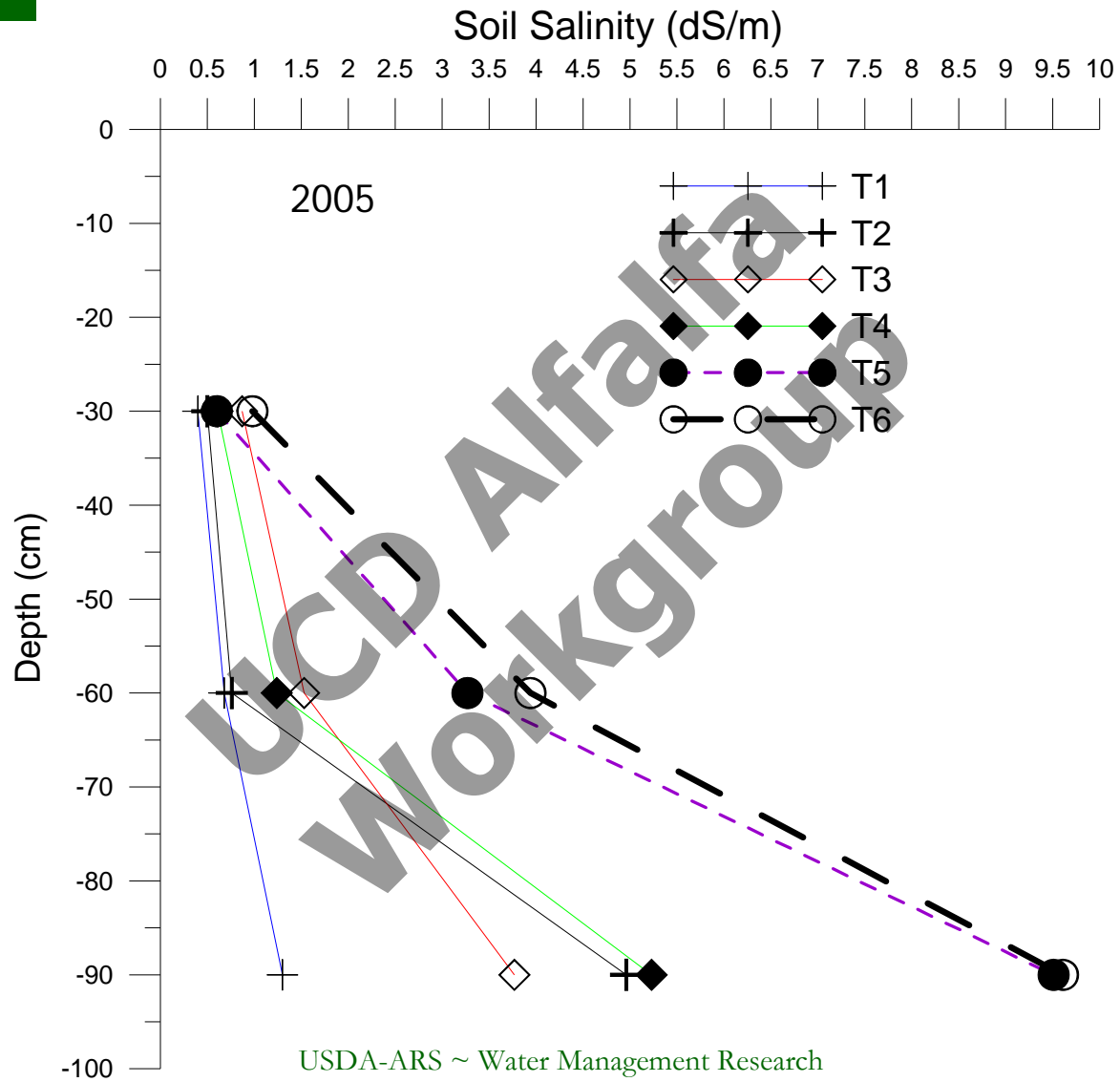
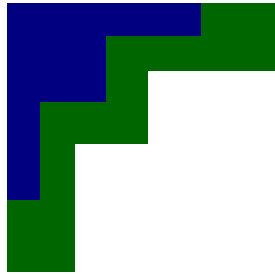
Soil Salinity

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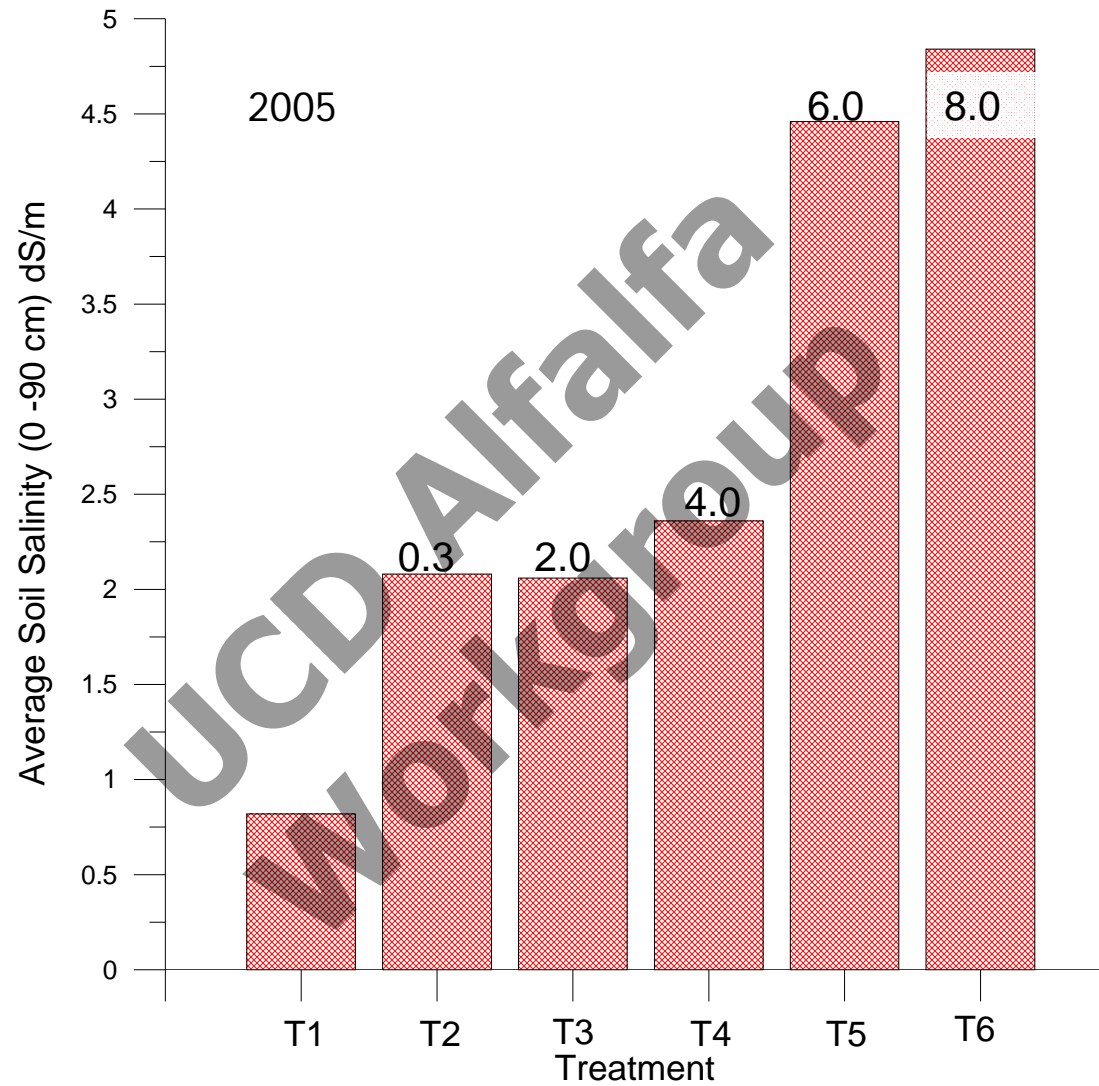
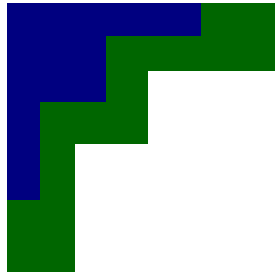
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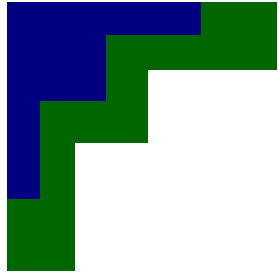
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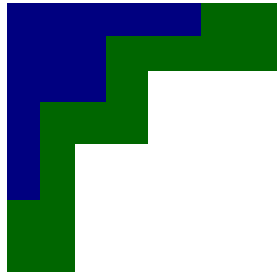
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