

**WATERIGHT**

**ONLINE IRRIGATION  
SCHEDULING**

Developed by:  
Center for Irrigation Technology  
Fresno State

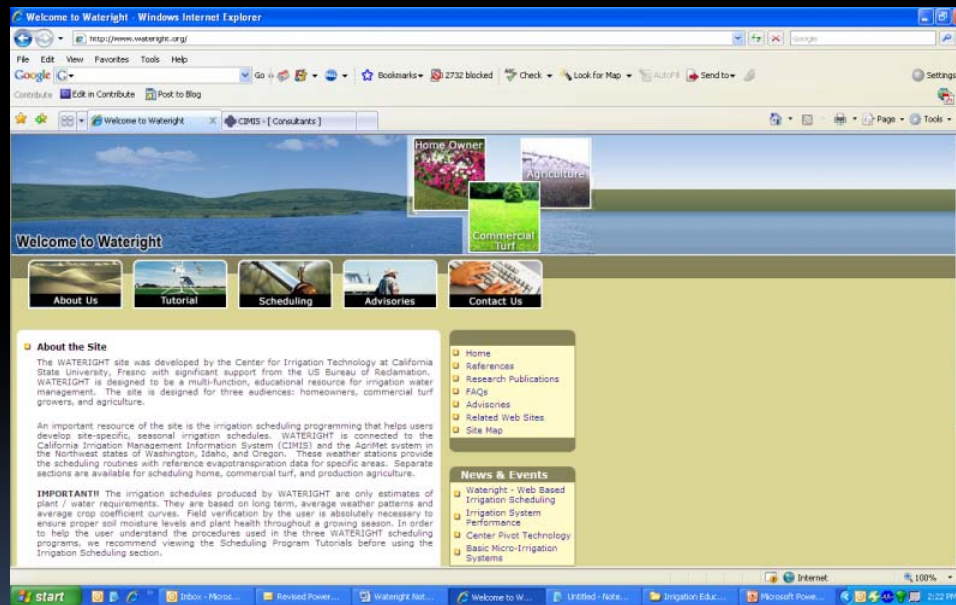
# About WATERIGHT

- The WATERIGHT - developed by the CII with support from the US Bureau of Reclamation and the CA-DWR (1997).
- WATERIGHT is designed to be a multi-function, educational resource for irrigation water management.
- References over 60 crops grown in California

[www.wateright.org](http://www.wateright.org)

# What is WATERIGHT?

- Irrigation Scheduling Tool
- Educational Tool



# WATERIGHT

- **IMPORTANT NOTE!!**

- Data used to produce the schedule is less than 24 hours old (near real time)
- The irrigation schedules produced by WATERIGHT are only **estimates** of plant / water requirements. Some of the calculations are based on long-term, average weather patterns and average crop coefficient curves.
- Field verification by the user is absolutely necessary to ensure proper soil moisture levels and plant health throughout a growing season.

# WATERIGHT

- 3 options

**Agriculture**

**Commercial Turf**

**Home Owner**



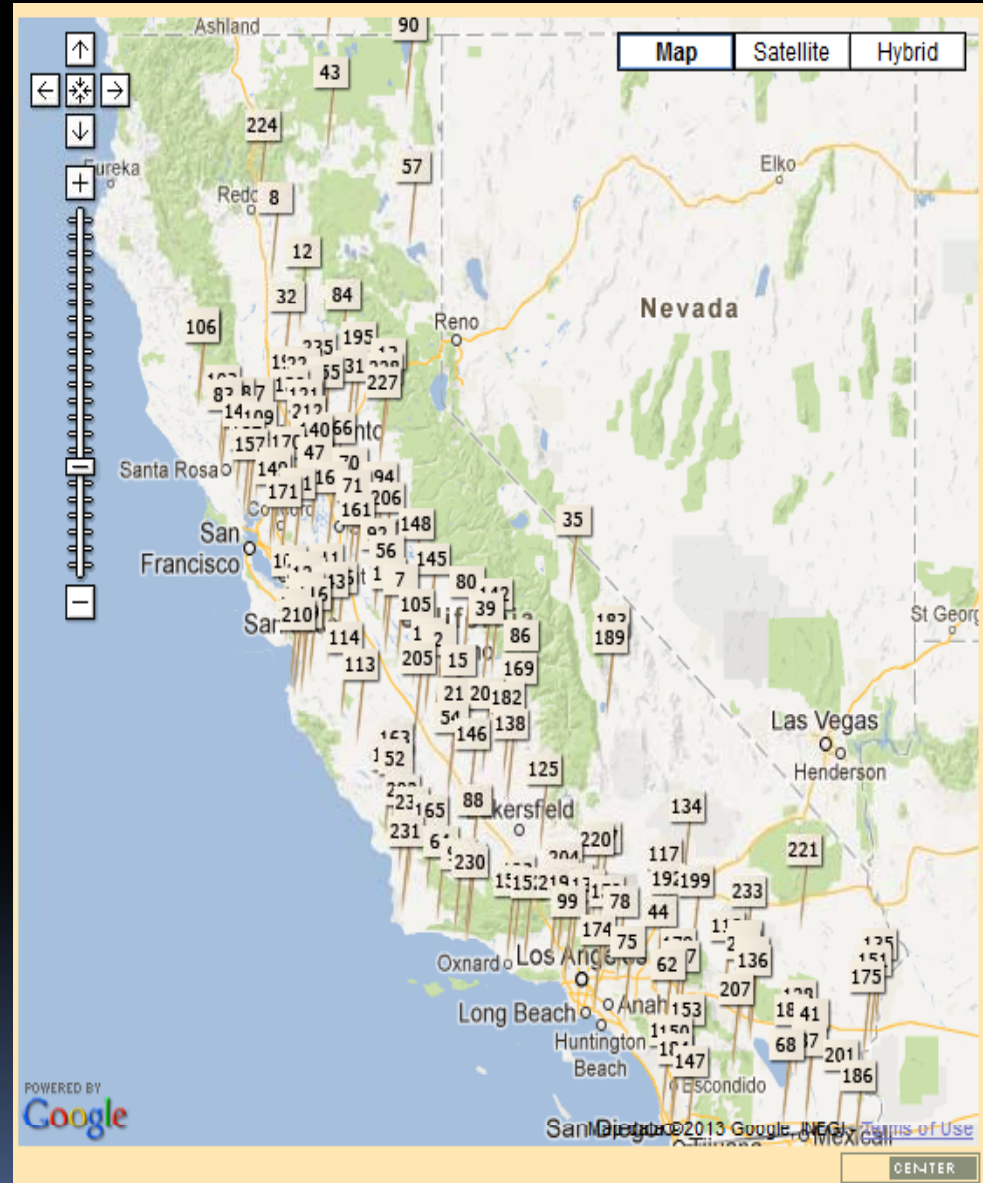
# WATERIGHT

- **Agricultural Users:**
  - Farmers and users whom want to do irrigation scheduling but know nothing about the subject.
  - Farmers whom know about scheduling and want to use WATERIGHT as a tool for more efficient watering schedules.

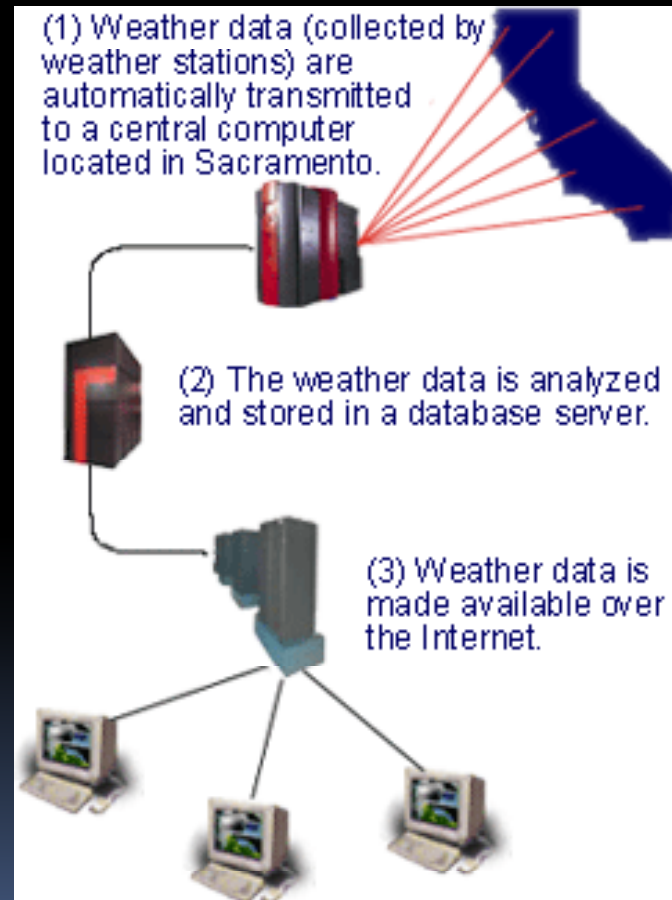


# CIMIS

- 230 Stations Across California



# CIMIS - Stations



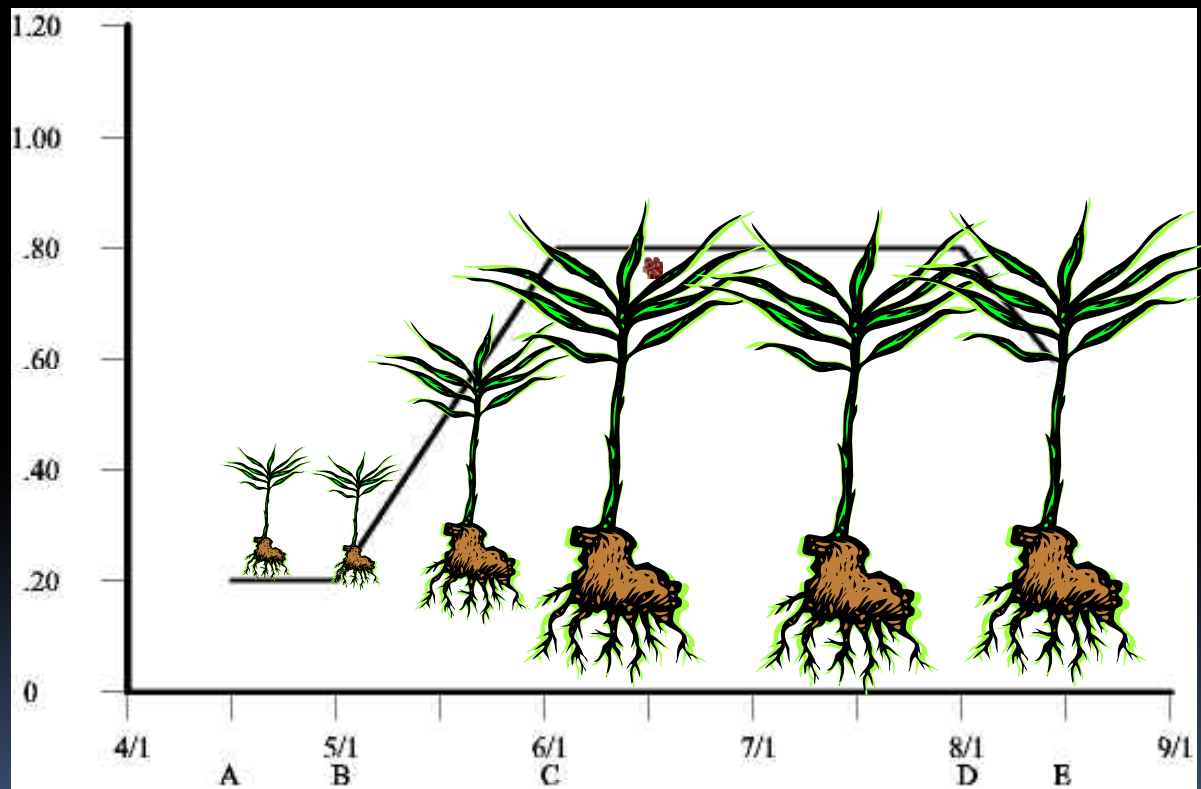


# Water use estimates

- *Example:*
  - *If,  $ET_o = 0.25$  inches/day*
  - *and,  $K_c = 0.55$  (for an orange tree in July)*
  - *then,  $ET_c = ET_o \times K_c = 0.25$  inches/day  $\times 0.55 = 0.1375$  or  $0.14$  inches/day*
  
  - *Red is from CIMIS*
  - *Yellow is from Waterright*

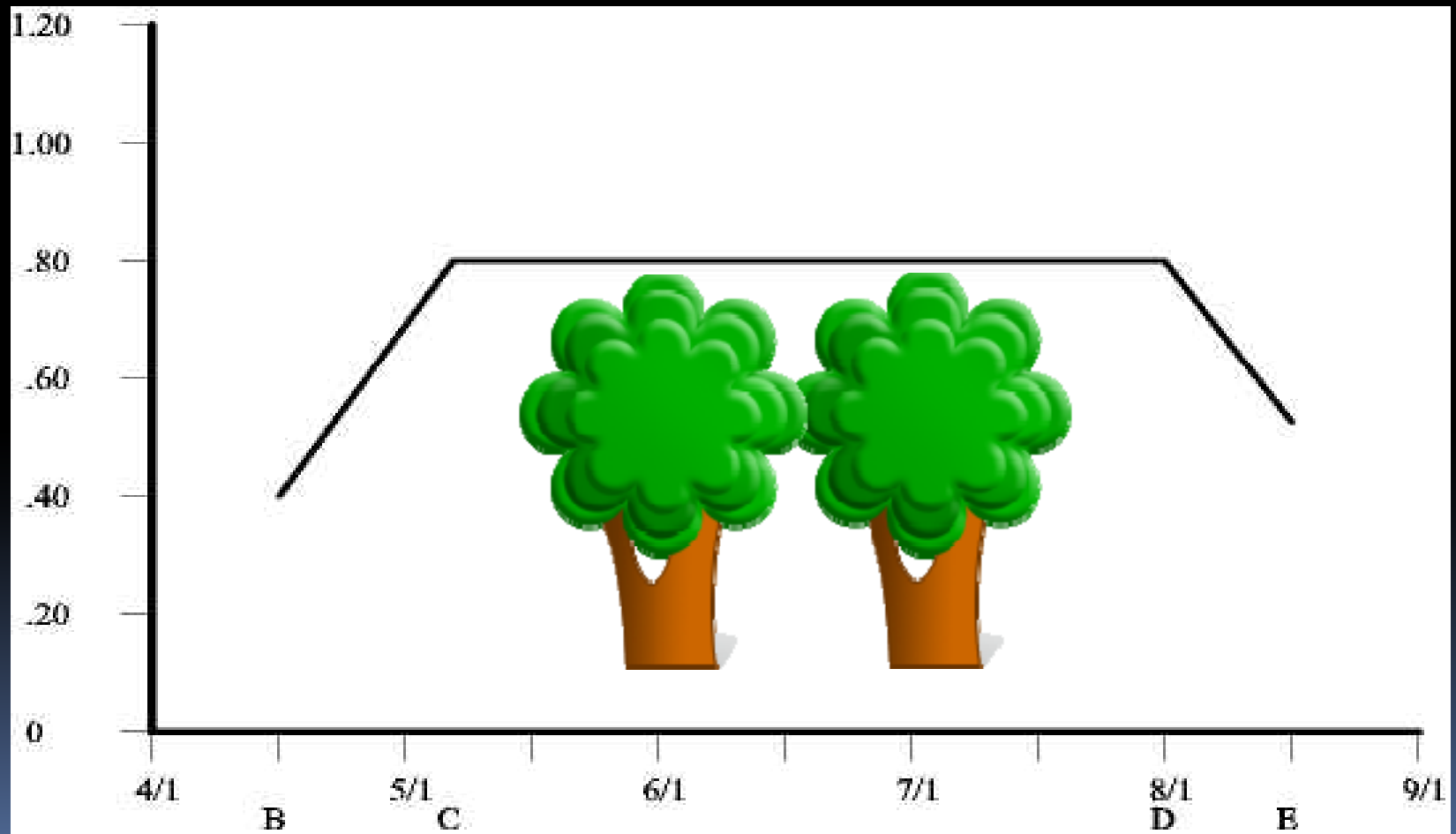
# Typical water use demand

Typical Curve- Annual Crop



# Typical water use demand

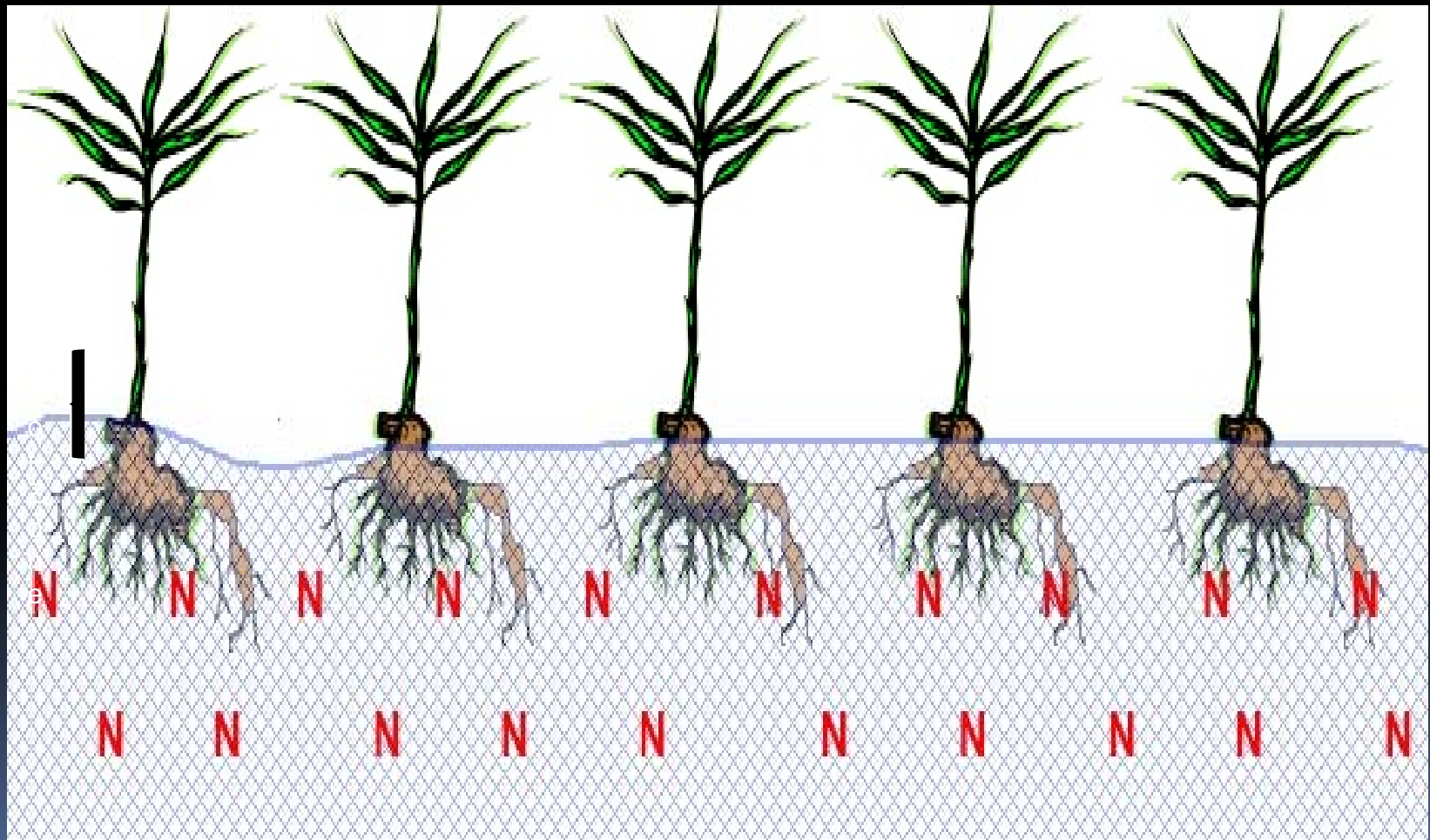
Typical Curve – Permanent Crop



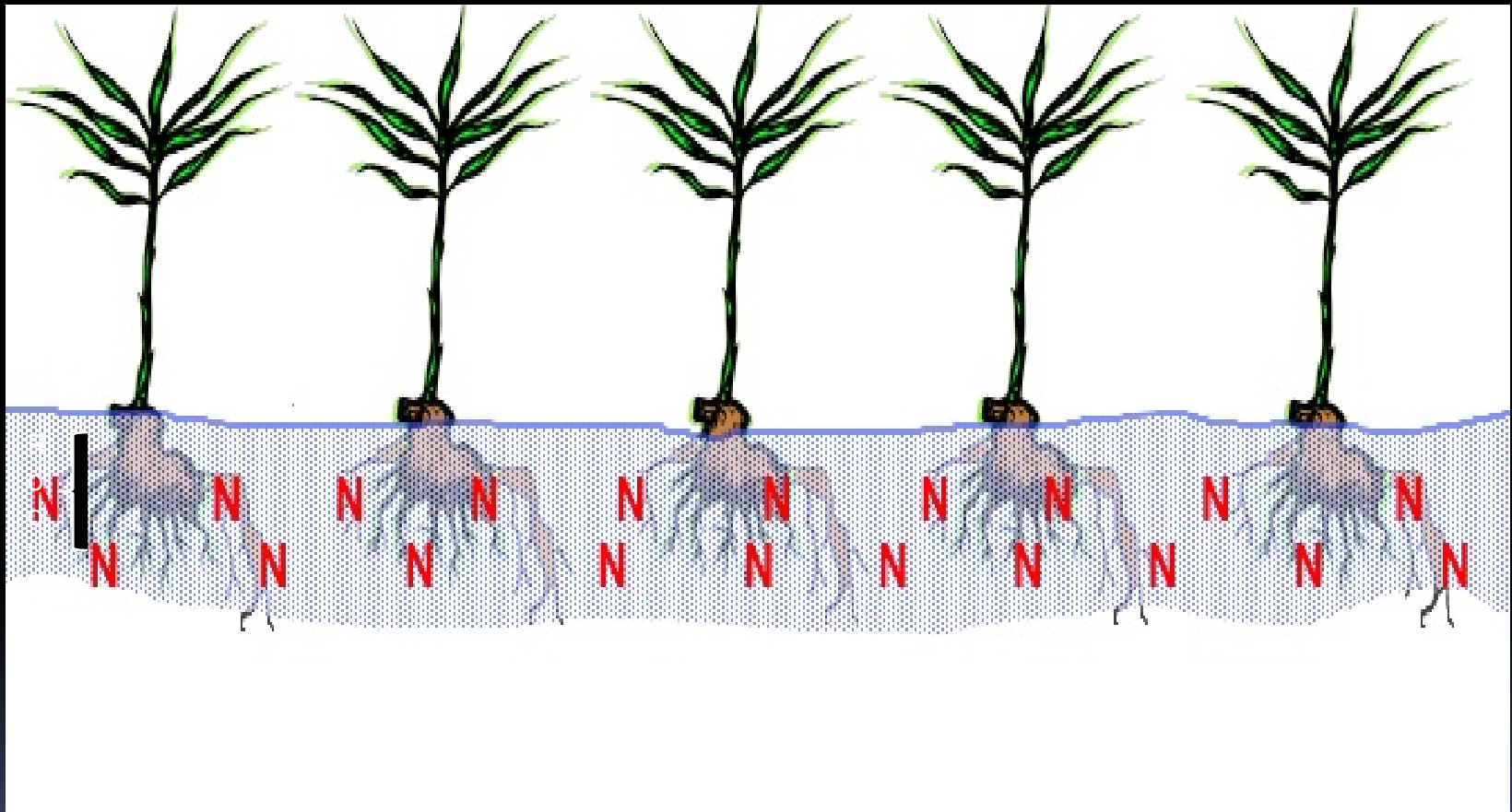
# Irrigation Efficiency

- **What is irrigation efficiency ?**
  - Irrigation efficiency (IE) is a measure of how much applied water is used beneficially. A general equation for irrigation efficiency would be:  
  
$$IE = \frac{\text{Beneficial Use of Applied Water}}{\text{Total Applied Water}}$$

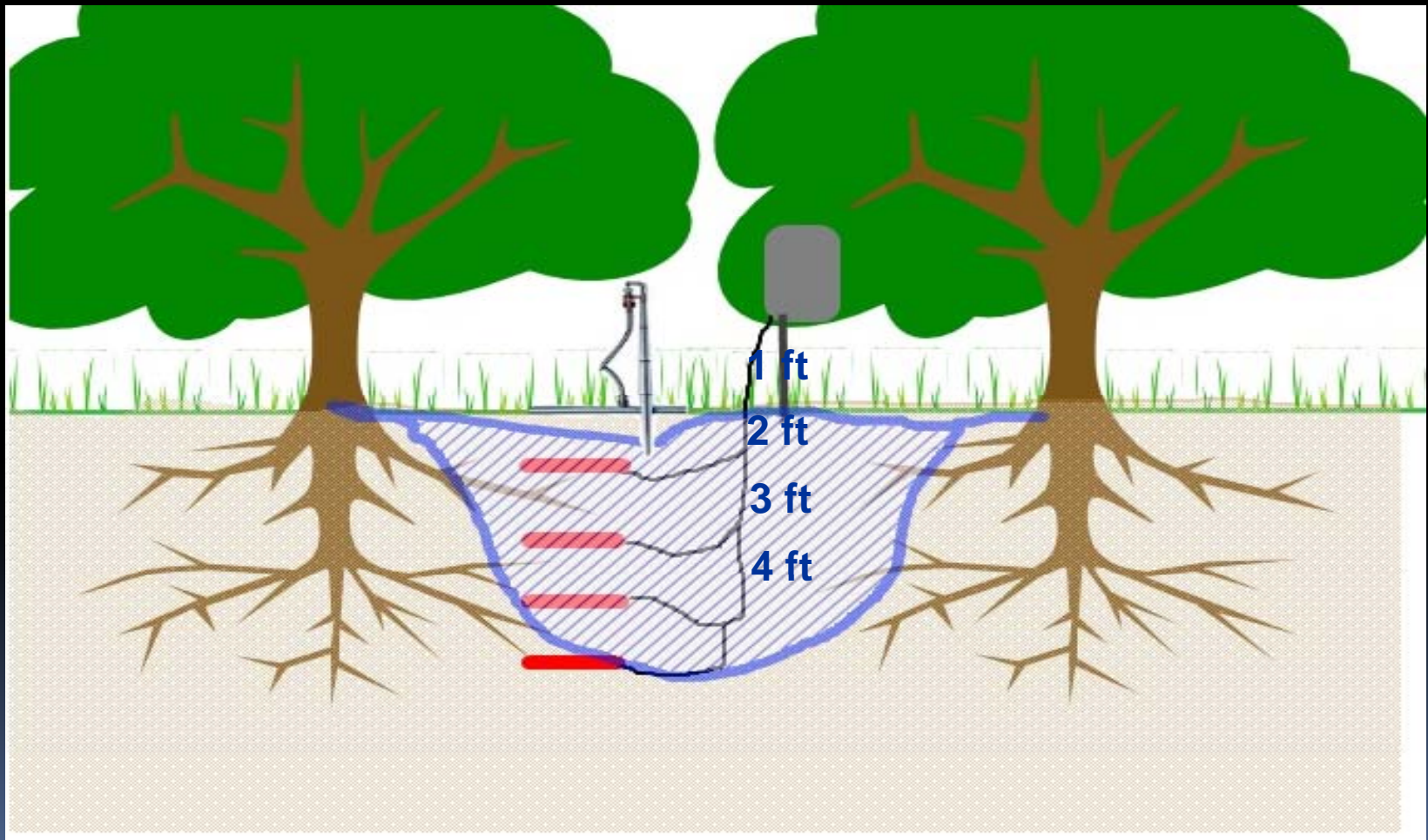
# Too much water & nitrates



# Proper irrigation scheduling



# Soil Moisture Sensor Placement



# Before Using WATERIGHT

- Know Your Soil Type
- Know Your Irrigation System
- Know Your Crop
- Know Your Water



# Agriculture

- A new screen will appear that looks like this.

**▣ Agricultural Irrigation Scheduling**

**Field Data Summary**

<b>Field Name:</b>	<input type="text"/>
<b>Choose Station</b>	CIMIS Station - 80 City - Fresno County - Fresno
Scheduling Basis and Criteria (choose one):	
<input checked="" type="radio"/> Management Allowed Depletion	<input type="text" value="50"/> %
<input type="radio"/> Set Time/Irrigation Set	<input type="text"/> hrs
<input type="radio"/> Set Days in Rotation	<input type="text"/> days
<b>Choose Crop</b>	None selected
<b>Choose Soil &gt;&gt;&gt;</b>	Avail H2O (in/ft) - Soil .45 - Coarse Sand/Gravel ▾
<b>Choose System &gt;&gt;</b> then	Drip Tape ▾
<b>System Parameters</b>	Irrigation Efficiency - % Gross Application Rate - 0.000 in/hr

**Schedule this Field**

**Back to Field List**

**Save this Field**

**Instructions (detailed):**

1. Enter a Field Name.
2. Click the 'Choose Station' button to select a weather station. (You MUST do this first if using the AgriMet system!)
3. Choose a Scheduling Basis and enter the Criteria.
4. Click the 'Choose Crop' button to choose a Crop

5. Select the soil type from the drop-down list.
6. Select the irrigation system from the drop-down list and then click the 'System parameters' button.
7. Then click one of the action buttons above.


**Detailed Instructions:**

# Agriculture

- Select "Choose Station".

**Agricultural Irrigation Scheduling**

Field Data Summary



Field Name:	<input type="text" value="North Field"/>
<b>Choose Station</b>	CIMIS Station - 80 City - Fresno County - Fresno
Scheduling Basis and Criteria (choose one):	
<input checked="" type="radio"/> Management Allowed Depletion	<input type="text" value="50"/> %
<input type="radio"/> Set Time/Irrigation Set	<input type="text"/> hrs
<input type="radio"/> Set Days in Rotation	<input type="text"/> days
<b>Choose Crop</b>	None selected

**Schedule this Field**

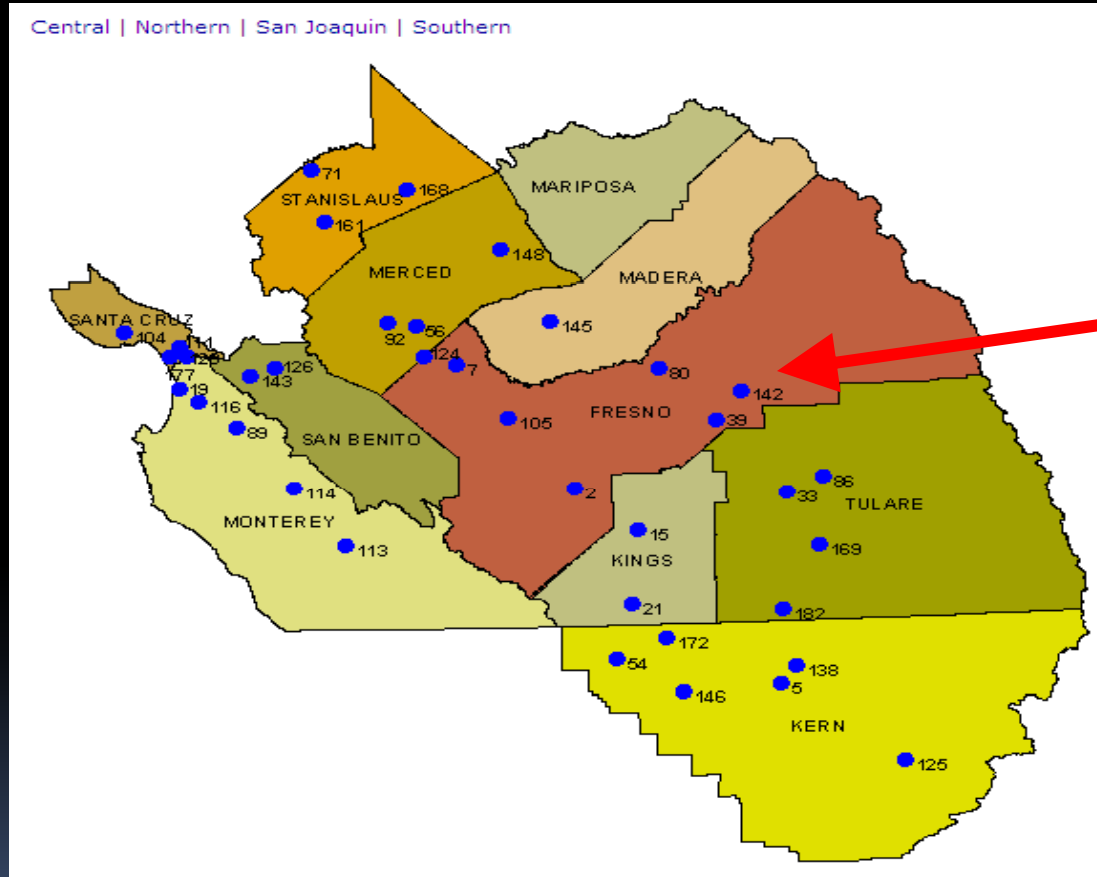
**Back to Field List**

**Save this Field**

**Instructions (detailed):**

1. Enter a Field Name.
2. Click the 'Choose Station' button to select a weather station. (You MUST do this

# Select your CIMIS station



- Selected Station 80 (located on the Fresno State campus farm)

# Agriculture

- Back to the initial entry screen. Click
- “Set Time/Irrigation Set”.
- Enter 18 for hours.

## ■ Agricultural Irrigation Scheduling

### Field Data Summary

Field Name:	North Field
<b>Choose Station</b>	CIMIS Station - 0 City - Fresno County - Fresno
Scheduling Basis and Criteria (choose one):	
<input type="radio"/> Management Allowed Depletion	<input type="text"/> %
<input checked="" type="radio"/> Set Time/Irrigation Set	<input type="text" value="18"/> hrs
<input type="radio"/> Set Days in Rotation	<input type="text"/> days
<b>Choose Crop</b>	Crop - Cotton Start - 5/15 End - 10/15 Stop Irrigating - 10/15 Rootzone - 3 feet ETc Adjust - 100%
<b>Choose Soil &gt;&gt;&gt;</b>	Avail H2O (in/ft) - Soil .45 - Coarse Sand/Gravel
<b>Choose System &gt;&gt;&gt;</b> then	Drip Tape
<b>System Parameters</b>	Irrigation Efficiency - 85% Gross Application Rate - 0.002 in/hr

**Schedule this Field**

**Back to Field List**

**Save this Field**

#### Instructions (detailed):

1. Enter a Field Name.
2. Click the 'Choose Station' button to select a weather station. (You MUST do this first if using the AgriMet system!)
3. Choose a Scheduling Basis and enter the Criteria.
4. Click the 'Choose Crop' button to choose a Crop

# Agriculture

- Click on “Choose Crop”.

<b>Choose Station</b>	City - Fresno County - Fresno
Scheduling Basis and Criteria (choose one):	
<input type="radio"/> Management Allowed Depletion	<input type="text" value="50"/> %
<input checked="" type="radio"/> Set Time/Irrigation Set	<input type="text" value="18"/> hrs
<input type="radio"/> Set Days in Rotation	<input type="text"/> days
<b>Choose Crop</b>	None selected
<b>Choose Soil &gt;&gt;&gt;</b>	Avail H2O (in/ft) - Soil .45 - Coarse Sand/Gravel <input type="button" value="v"/>
<b>Choose System &gt;&gt;&gt;</b>	Drip Tape <input type="button" value="v"/>
<b>System Parameters</b>	Irrigation Efficiency - % Gross Application Rate - 0.000 in/hr

# Agriculture

- It will take you to a new screen
- On Crop Name drop down menu select "Almond"
- Default Settings will appear

## ▣ Agricultural Irrigation Scheduling

### Crop Selection/Data Entry

Crop Name	Almonds				
Start Month	3	End Month	10	Stop Irr. Month	10
Start Day	1	End Day	15	Stop Irr. Day	15
Maximum Rooting Depth (feet)	5				
ETc Adjustment (%) (This factor can be used to increase or decrease crop ETc to account for individual management factors.)	100				

Next

#### Instructions:

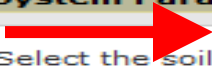
1. Use the pull-down list to choose a crop.
2. Defaults will appear in the other entry boxes. Check these and change as necessary.
3. You may want to come back and change the ETc Adjustment if the resulting irrigation schedule does not appear reasonable for your conditions.

# Agriculture

- You should now be back on the home entry page.
- Go down to “Choose Soil >>>” click on the drop down and select a soil type.

**Agricultural Irrigation Scheduling**  
**Field Data Summary**

<b>Field Name:</b>	<input type="text"/>
<b>Choose Station</b>	CIMIS Station - 80 City - Fresno County - Fresno
Scheduling Basis and Criteria (choose one):	
<input type="radio"/> Management Allowed Depletion	<input type="text" value="50"/> %
<input checked="" type="radio"/> Set Time/Irrigation Set	<input type="text" value="18"/> hrs
<input type="radio"/> Set Days in Rotation	<input type="text"/> days
<b>Choose Crop</b>	Crop - Almonds Start - 3/1 End - 10/15 Stop Irrigating - 10/15 Rootzone - 5 feet ETc Adjust - 100%
<b>Choose Soil &gt;&gt;&gt;</b>	Avail H2O (in/ft) - Soil
<b>Choose System &gt;&gt;&gt;</b> then	<b>System Parameters</b>



5. Select the soil type from the dropdown menu.

6. Select the irrigation system then click the 'System parameters' button.

7. Then click one of the action buttons above.

**Detailed Instructions:**  
Step 1: Enter a Field Name.

**Schedule this Field**

**Back to Field List**

**Save this Field**

**Instructions (detailed):**  
1. Enter a Field Name.  
2. Click the 'Choose Station' button to select a weather station. (You MUST do this first if using the AgriMet system!)  
3. Choose a Scheduling Basis and enter the Criteria.  
4. Click the 'Choose Crop' button to choose a Crop

# Agriculture

- Next by “Choose System>>” click on the drop down menu and select an irrigation system type.

**Agricultural Irrigation Scheduling**

**Field Data Summary**

<b>Field Name:</b>	<input type="text"/>
<b>Choose Station</b>	CIMIS Station - 80 City - Fresno County - Fresno
Scheduling Basis and Criteria (choose one):	
<input type="radio"/> Management Allowed Depletion	<input type="text" value="50"/> %
<input checked="" type="radio"/> Set Time/Irrigation Set	<input type="text" value="18"/> hrs
<input type="radio"/> Set Days in Rotation	<input type="text"/> days
<b>Choose Crop</b>	Crop - Almonds Start - 3/1 End - 10/15 Stop Irrigating - 10/15 Rootzone - 5 feet ETc Adjust - 100%
<b>Choose Soil &gt;&gt;&gt;</b>	Avail H2O (in/ft) - Soil .45 - Coarse Sand/Gravel
<b>Choose System &gt;&gt;&gt;</b> then	Drip Tape Drip Tape Drip Emitter Micro Sprinkler/Spray/Jet Surface Irrigation Sprinkler Pivot/Linear
<b>System Parameters</b>	

5. Select the soil type from

6. Select the irrigation system from the drop-down list and then click the 'System parameters' button.

7. Then click one of the action buttons above.

**Detailed Instructions:**  
Step 1: Enter a Field Name.

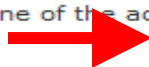
**Schedule this Field**

**Back to Field List**

**Save this Field**

**Instructions (detailed):**

1. Enter a Field Name.
2. Click the 'Choose Station' button to select a weather station. (You MUST do this first if using the AgriMet system!)
3. Choose a Scheduling Basis and enter the Criteria.
4. Click the 'Choose Crop' button to choose a Crop





# Agriculture

- It will take you to the following screen below.
- Enter a percentage for “System Emission Uniformity”, “Flow Rate”, Tree Spacing, diameter of spray”.

## ■ Agricultural Irrigation Scheduling

### Irrigation System Data Entry

#### Micro Sprinkler/Spray/Jet Irrigation

System Emission Uniformity:	<input type="text" value="85"/> %
Flow Rate per Microsprinkler in gph:	<input type="text" value="3"/>
Number of Microsprinkler per Plant:	<input type="text" value="1"/>
Tree or Vine Spacing in Feet:	<input type="text" value="18"/> by <input type="text" value="22"/>
Maximum Diameter in Feet:	<input type="text" value="15"/>
Microsprinkler spray pattern:	<input type="text" value="full circle"/>

Cancel

Schedule this Field

Back to Field Entry

# Agriculture

- Once all the required information has been entered and selected click “Schedule This Field”.
- **The Info You have entered will be saved onto Cookies**

## ▣ Agricultural Irrigation Scheduling

### Field Data Summary

Field Name:	North Field
<b>Choose Station</b>	CIMIS Station - 80 City - Fresno County - Fresno
Scheduling Basis and Criteria (choose one):	
<input type="radio"/> Management Allowed Depletion	<input type="text" value="50"/> %
<input checked="" type="radio"/> Set Time/Irrigation Set	<input type="text" value="18"/> hrs
<input type="radio"/> Set Days in Rotation	<input type="text"/> days
<b>Choose Crop</b>	Crop - Almonds Start - 3/1 End - 10/15 Stop Irrigating - 10/15 Rootzone - 5 feet ETc Adjust - 100%
<b>Choose Soil &gt;&gt;&gt;</b>	Avail H2O (in/ft) - Soil <input type="text" value=".45 - Coarse Sand/Gravel"/> ▼
<b>Choose System &gt;&gt;&gt;</b> then	<input type="text" value="Micro Sprinkler/Spray/Jet"/> ▼ Irrigation Efficiency - 85% Gross Application Rate - 0.012 in/hr
<b>System Parameters</b>	

**Schedule this Field**

**Back to Field List**

**Save this Field**

#### Instructions (detailed):

1. Enter a Field Name.
2. Click the 'Choose Station' button to select a weather station. (You MUST do this first if using the AgriMet system!)
3. Choose a Scheduling Basis and enter the Criteria.
4. Click the 'Choose Crop' button to choose a Crop



# Agriculture

## Agricultural Irrigation Scheduling

### - Agricultural Irrigation Scheduling

#### Seasonal Irrigation Schedule

#### IMPORTANT!

- Please refer to the notes at the bottom of this page for information on how the schedule was calculated.
- Users ABSOLUTELY need to verify the plant health and soil moisture in their fields.
- This is an AVERAGE SEASONAL schedule and should be used as INITIAL GUIDANCE ONLY.

The Irrigation Schedule starts just below the Field Data Summary.

#### Field Data Summary



CIMIS Stn:	Fresno State #80 City of Fresno in Fresno County
Field Number	1
Description	North Field
Crop	Almonds
Crop Season	3/1 - 10/15
Stop Irrigating	10/15
Soil	Coarse Sand/Gravel
Maximum RootZone (ft)	5
Irrigation System	Microsprinkler
Irrigation Efficiency	85%
Gross Application Rate (in/hr)	0.012
Scheduling Basis	Hours/Irrigation Set
Desired Hours per Set (hrs)	18
Gross Applied per Set (in)	0.218765192027224

#### Seasonal Irrigation Schedule

For Week Ending	Average Year		This Year		Averages for Week				Change This Yr vs Avg Yr	Total ETc to Date
	ETo	Rain	ETo	Rain	Kc	ETc	Root Zone	RunTime		
	In/Day	In/Wk	In/Day	In/Wk	In/Dy	Ft	HH:mm	%	In	
3/8/2013	0.09	0.21	0.13	0.00	0.57	0.05	5.00	34:19	44	0.35
3/15/2013	0.10	0.01	N/A	N/A	0.60	0.06	5.00	39:55	N/A	0.77

# Agriculture

## Field Data Summary



CIMIS Stn:	Fresno State #80 City of Fresno in Fresno County
Field Number	1
Description	North Field
Crop	Almonds
Crop Season	3/1 - 10/15
Stop Irrigating	10/15
Soil	Coarse Sand/Gravel
Maximum RootZone (ft)	5
Irrigation System	Microsprinkler
Irrigation Efficiency	85%
Gross Application Rate (in/hr)	0.012
Scheduling Basis	Hours/Irrigation Set
Desired Hours per Set (hrs)	18
Gross Applied per Set (in)	0.218765192027224

# Agriculture

Seasonal Irrigation Schedule

For Week Ending	Average Year		This Year		Averages for Week				Change	Total ETc to Date
	ETo	Rain	ETo	Rain	Kc	ETc	Root Zone	RunTime	This Yr vs Avg Yr	
	In/Day	In/Wk	In/Day	In/Wk	In/Dy	Ft	HH:mm	%	In	
3/8/2013	0.09	0.21	0.13	0.00	0.57	0.05	5.00	34:19	44	0.35
3/15/2013	0.10	0.01	N/A	N/A	0.60	0.06	5.00	39:55	N/A	0.77
3/22/2013	0.11	1.71	N/A	N/A	0.63	0.07	5.00	46:46	N/A	1.25
3/29/2013	0.12	0.46	N/A	N/A	0.66	0.08	5.00	54:28	N/A	1.81
4/5/2013	0.14	0.35	N/A	N/A	0.69	0.09	5.00	64:19	N/A	2.48
4/12/2013	0.15	0.47	N/A	N/A	0.72	0.11	5.00	74:10	N/A	3.24
4/19/2013	0.17	1.13	N/A	N/A	0.74	0.12	5.00	84:37	N/A	4.12
4/26/2013	0.18	0.06	N/A	N/A	0.77	0.14	5.00	95:15	N/A	5.10
5/3/2013	0.20	0.04	N/A	N/A	0.80	0.16	5.00	106:19	N/A	6.20
5/10/2013	0.21	0.03	N/A	N/A	0.83	0.17	5.00	118:08	N/A	7.42
5/17/2013	0.22	0.13	N/A	N/A	0.86	0.19	5.00	131:04	N/A	8.77
5/24/2013	0.24	0.00	N/A	N/A	0.89	0.21	5.00	144:00	N/A	10.26
5/31/2013	0.25	0.02	N/A	N/A	0.92	0.23	5.00	157:02	N/A	11.88
6/7/2013	0.26	0.55	N/A	N/A	0.95	0.25	5.00	170:33	N/A	13.65
6/14/2013	0.28	0.00	N/A	N/A	0.98	0.27	5.00	183:46	N/A	15.54
6/21/2013	0.29	0.00	N/A	N/A	1.01	0.29	5.00	195:26	N/A	17.56
6/28/2013	0.29	0.00	N/A	N/A	1.03	0.30	5.00	202:09	N/A	19.65
7/5/2013	0.29	0.00	N/A	N/A	1.03	0.30	5.00	203:04	N/A	21.75
7/12/2013	0.29	0.00	N/A	N/A	1.03	0.30	5.00	202:31	N/A	23.84
7/19/2013	0.29	0.00	N/A	N/A	1.03	0.30	5.00	201:06	N/A	25.92
7/26/2013	0.28	0.00	N/A	N/A	1.03	0.29	5.00	198:49	N/A	27.97
8/2/2013	0.28	0.00	N/A	N/A	1.03	0.29	5.00	195:53	N/A	30.00
8/9/2013	0.27	0.00	N/A	N/A	1.03	0.28	5.00	192:09	N/A	31.98

# Benefits of Irrigation Management

- Why is irrigation scheduling important?
  - Improved water and energy use
  - Water Use Efficiency (WUE) – More Crop Per Drop
  - Irrigation management is a crucial key to utilize fertilizer effectively on farmlands.
  - Protect ground water quality
  - Sustainable water supply

# Summary of WATERIGHT

- Education Tool
- Helps with water budgeting
- Know “How Much” and “When”
- Promotes Flow Meters and Moisture Sensors as a valuable tool
- Best Management Practice
  - Avoid deep percolation and over irrigation
  - Manage water in the Root Zone

Questions

[www.waterright.org](http://www.waterright.org)