Management of Pesticide in the Runoff in the San Joaquin - Sacramento Delta and San Joaquin County Watersheds

- DPR / PMA Grant
- Sept 2008 – May 2011

Terry Prichard
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UC Davis, LAWR--Hydrology

Participants

- DPR
- SJ County Resource Conservation District
- San Joaquin County and Delta Water Quality Coalition
- UC Cooperative Extension
- Lodi Woodbridge Winegrape Commission

Project Scope of Work

- Implement a program to address non-point runoff from Ag sources
- Focus on chlorpyrifos, diazinon, and pyrethroids.

SJ County and Delta Water Quality Coalition

- Grower Members ~ 1700
- Member Acres ~ 600,000 acres
- Total Acres ~ XXXXXXX

Pesticide Exceedances in the SJCDWQC Area
Irrigation and storm water samples 2007

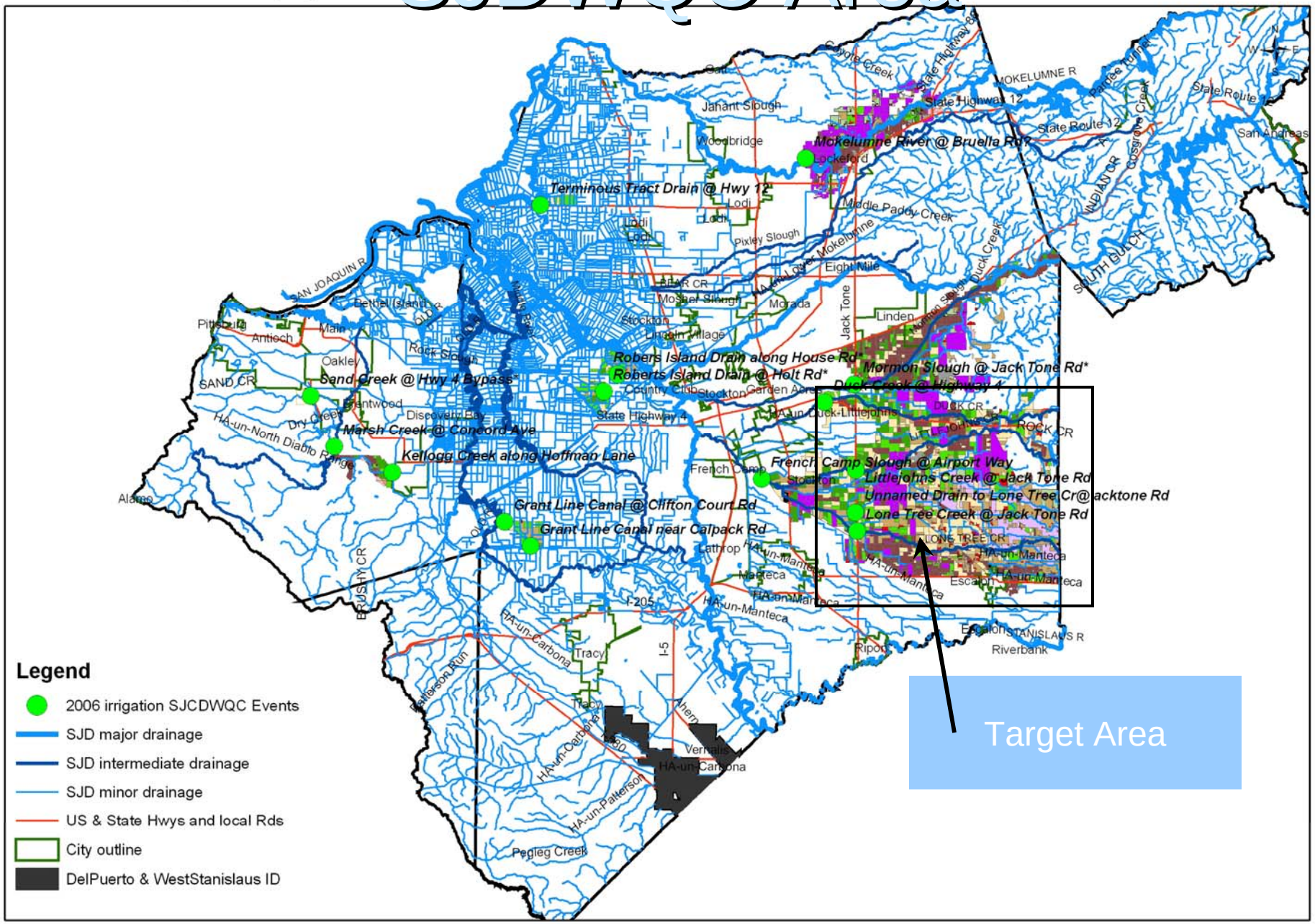
Pesticide Exceedances 2007 *

	Carbofuron	Chlorpyrifos	Cypermethrin	Diazinon	Dieldrin	Disulfoton	Diuron	Malathion	Methidathion	Simazine	Thiobencarb	Copper
Limits	0 µg/L	0.015 µg/L	0.002 µg/L	0.1 µg/L	0.00014 µg/L	0.05 µg/L	2 µg/L	0 µg/L	0.7 µg/L	4.0 µg/L	0 µg/L	variable trigger
April - Septe 6 Irrigation Samples	1	9	1		1	1					2	18
Feburary 2 Storm Samples		7		5			2	1	2	2		
Pesticide as % of Total Samples	1.0	15.2	1.0	4.8	1.0	1.0	1.9	1.0	1.9	1.9	1.9	17.1
Pesticide % of Exceedances	2	36	2	11	2	2	5	2	5	5	5	41

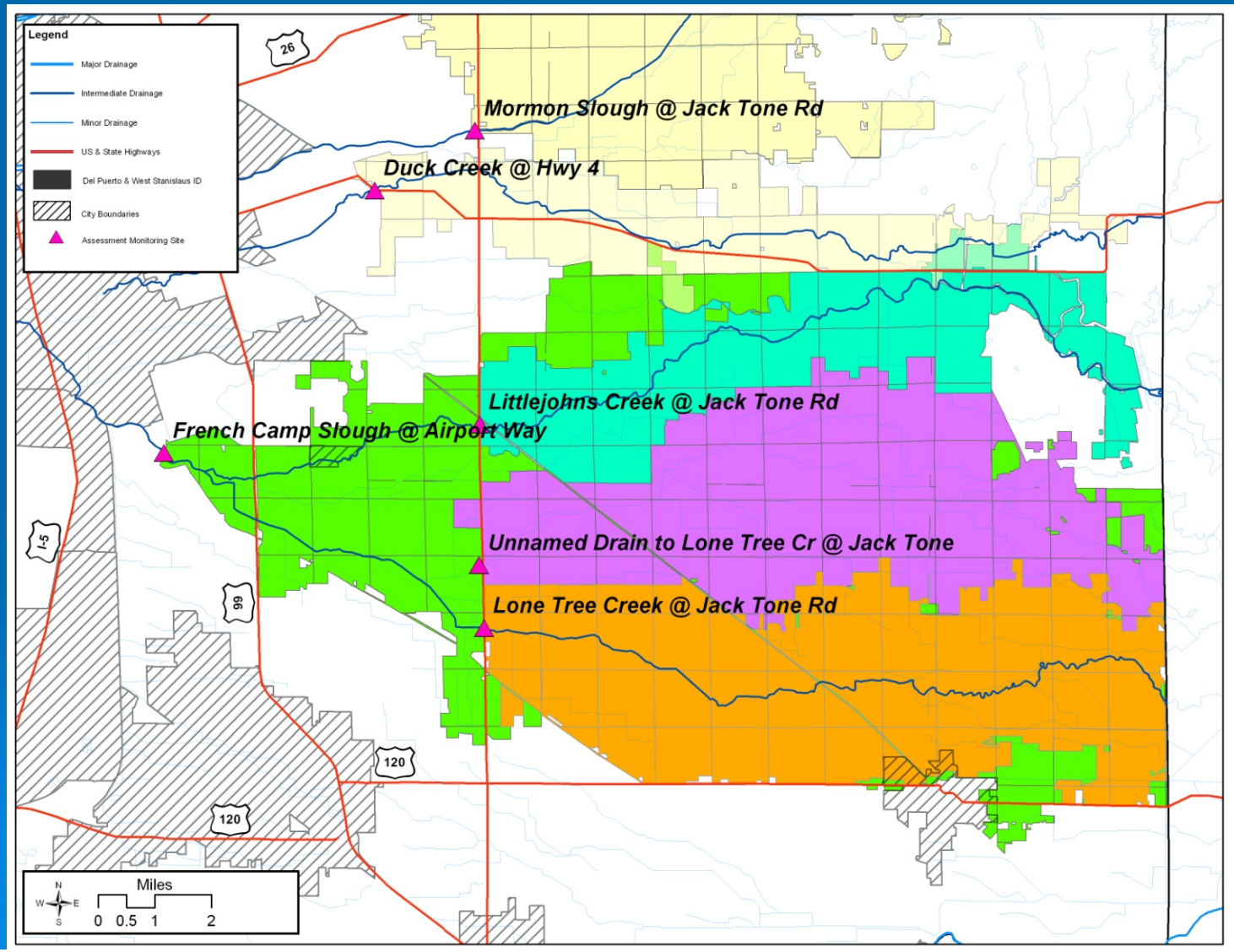
Tasks

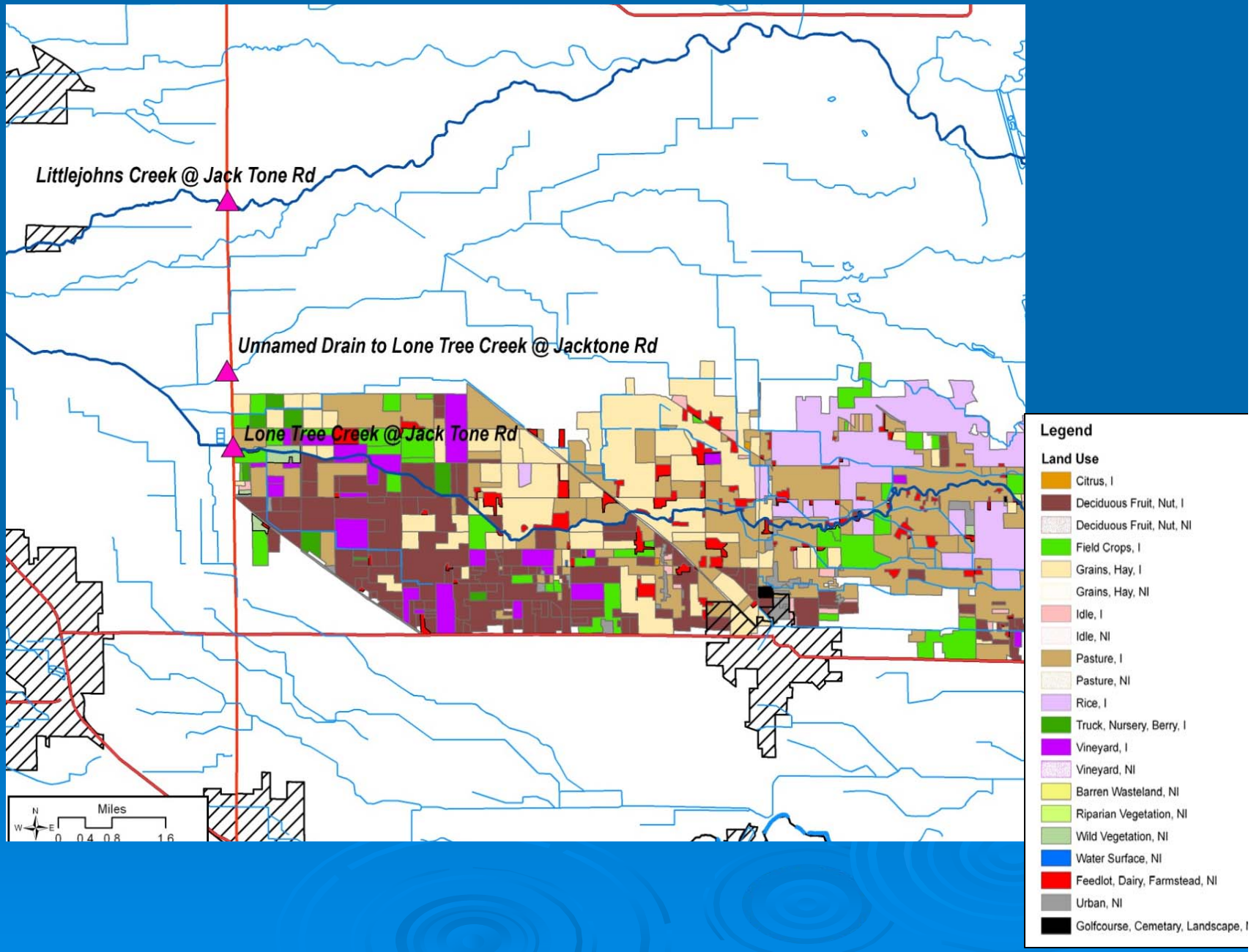
- Select target area
- Determine baseline water quality data
- Continue water quality monitoring
- Determine current management practices
- Reinforce current/new management practices
- Develop “risk evaluation and management practice workbook”
- Test / implement “Workbook”
- Publish workbook
- Evaluate project

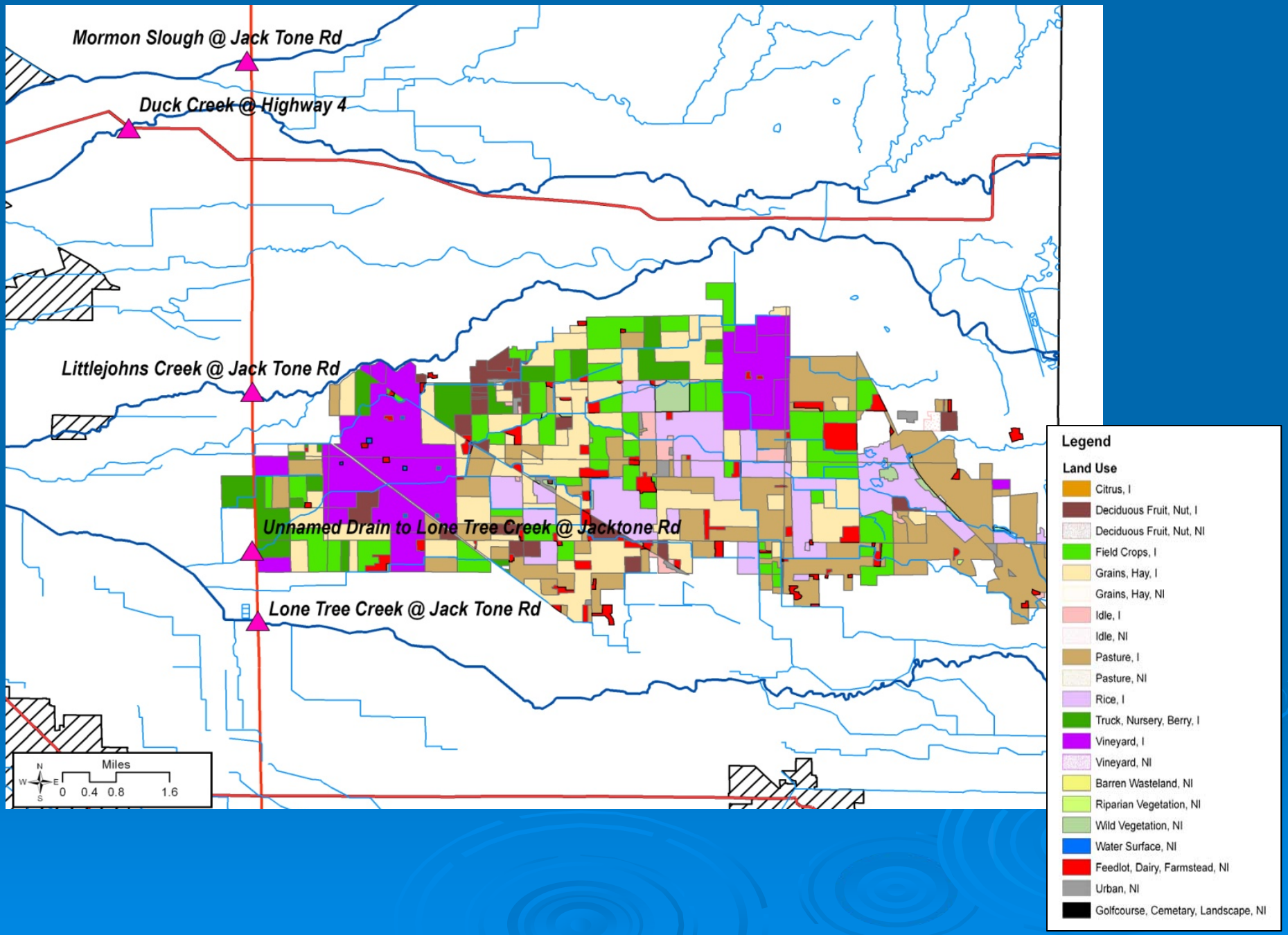
SJDWQC Area


SJCDWQC - 2006 Irrigation Sampling Sites
Terminous Tract Drain @ Hwy 12*
Mokelumne River @ Bruella Rd*
Robers Island Drain along House Rd*
Roberts Island Drain @ Holt Rd*
Sand Creek @ Hwy 4 Bypass*
Marsh Creek @ Concord Ave
Kellogg Creek along Hoffman Lane
Grant Line Canal @ Clifton Court Rd
Grant Line Canal near Calpack Rd
Mormon Slough @ Jack Tone Rd*
Duck Creek @ Highway 4
French Camp Slough @ Airport Way
Littlejohns Creek @ Jack Tone Rd
Unnamed Drain to Lone Tree Cr@acktone Rd
Lone Tree Creek @ Jack Tone Rd
Target Area
Legend
2006 irrigation SJCDWQC Events
SJD major drainage
SJD intermediate drainage
SJD minor drainage
US & State Hwys and local Rds
City outline
DelPuerto & WestStanislaus ID

South East Stockton Sub-Watersheds




Littlejohns Creek @ Jack Tone Rd
Unnamed Drain to Lone Tree Creek @ Jacktone Rd
Lone Tree Creek @ Jack Tone Rd
Miles
0 0.4 0.8 1.6
Legend
Land Use
Citrus, I
Deciduous Fruit, Nut, I
Deciduous Fruit, Nut, NI
Field Crops, I
Grains, Hay, I
Grains, Hay, NI
Idle, I
Idle, NI
Pasture, I
Pasture, NI
Rice, I
Truck, Nursery, Berry, I
Vineyard, I
Vineyard, NI
Barren Wasteland, NI
Riparian Vegetation, NI
Wild Vegetation, NI
Water Surface, NI
Feedlot, Dairy, Farmstead, NI
Urban, NI
Golfcourse, Cemetary, Landscape, I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Wild Vegetation, NI
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Urban, NI
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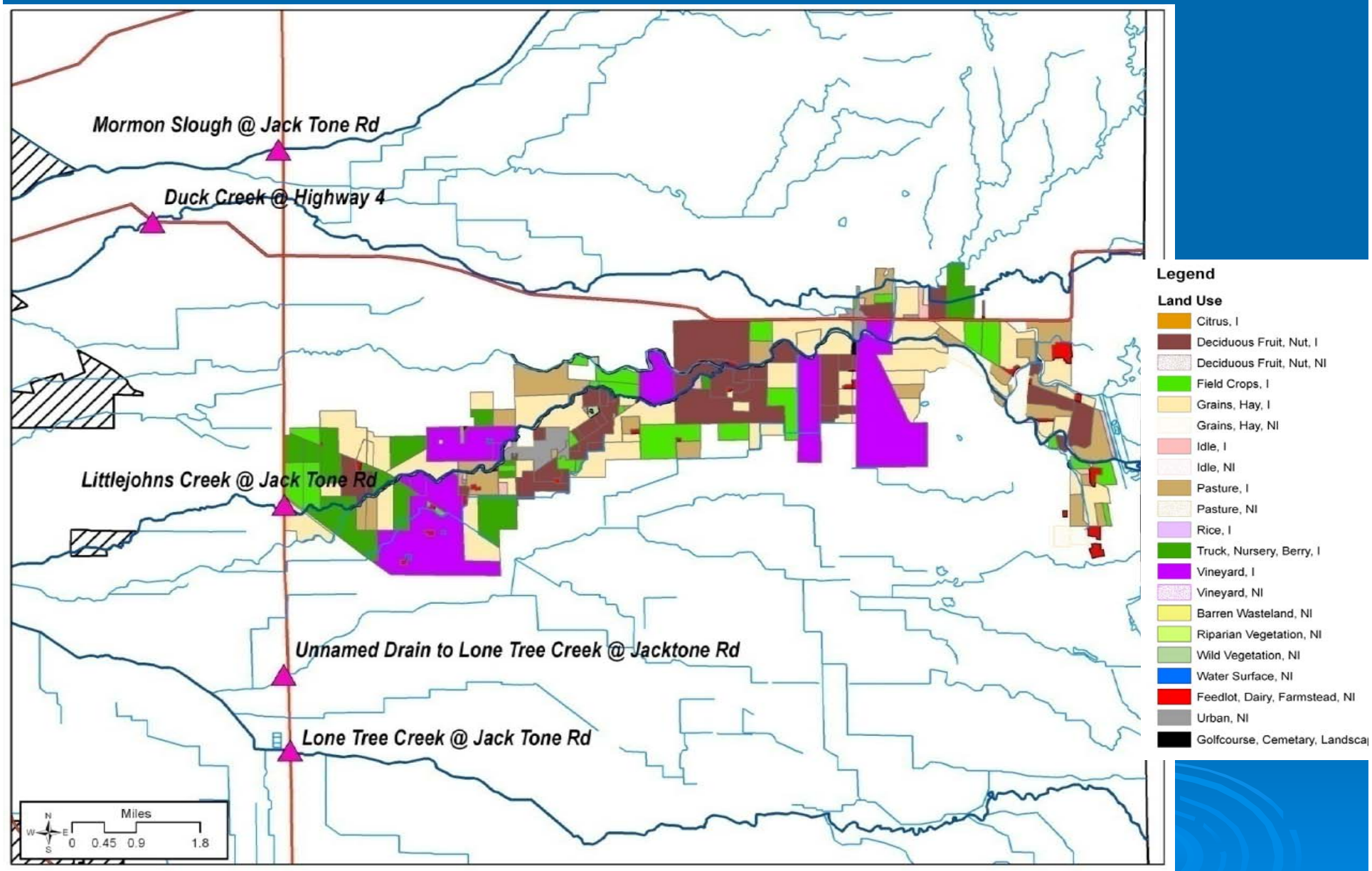
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Riparian Vegetation, NI
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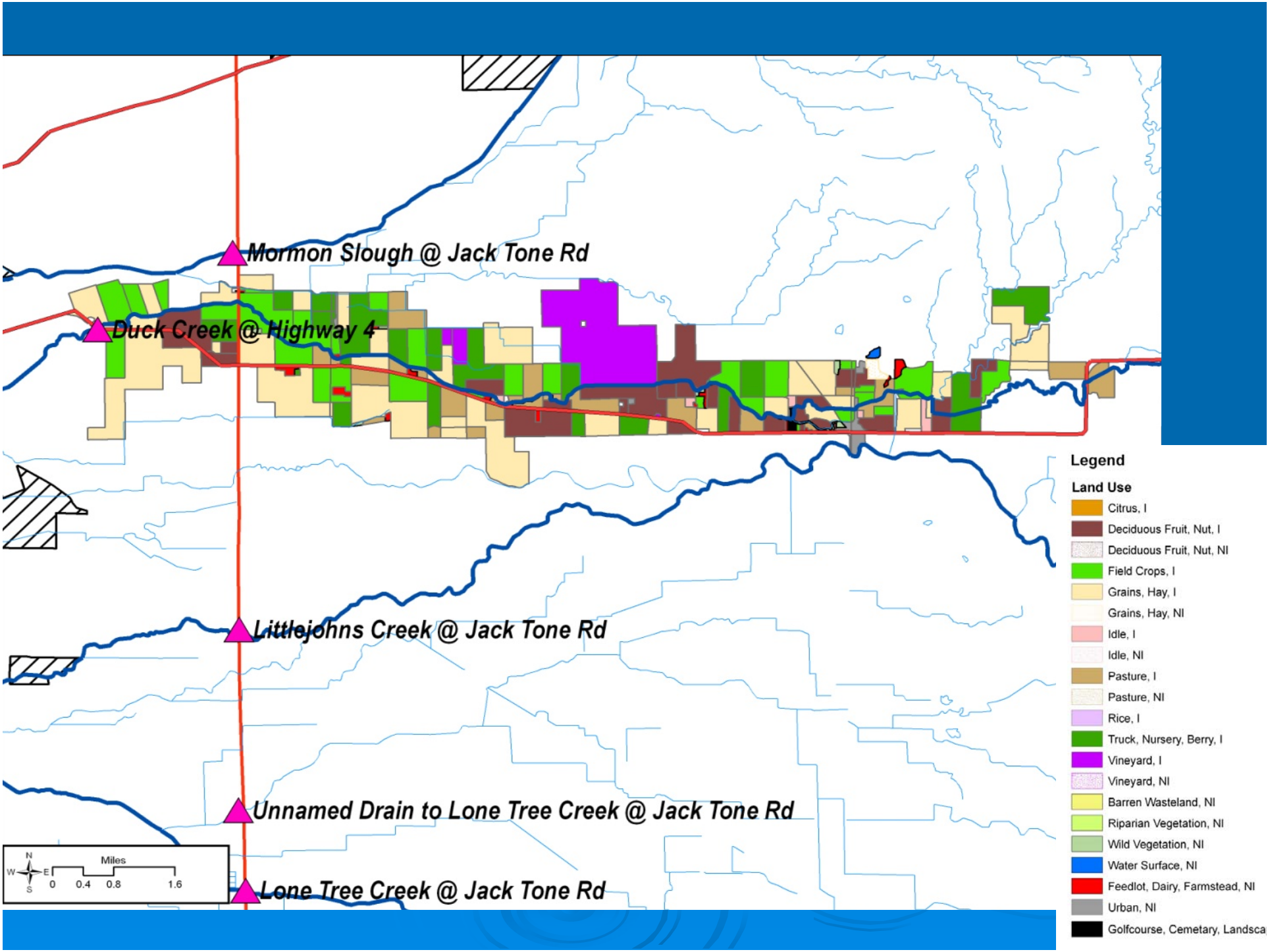
Water Surface, NI
Feedlot, Dairy, Farmstead, NI
Urban, NI
Golfcourse, Cemetary, Landsca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Target Area

- Size and crops

	Alfalfa	Tomato	Walnut	Winegrape		Irrigated
Duck Creek	1,719	5,234	5,291	1,232		10,777
Little Johns Creek	1,109	4,538	3,757	3,204		12,356
Lone Tree Creek	2,032	0	750	542		22,359
Temple Creek	2,215	4,029	2,307	2,275		23,051
Target Area Total	7,075	13,800	12,106	7,252		
Grand Total				40,233		68,543

Target Area Baseline

Number of Chlorpyrifos Exceedances by year in Each Sub-Watershed

Year	Lone Tree	Temple	Duck	Little Johns	Total
2007	2	5	2	2	11
2008	1	3	3	4	11

Number of Diazinon Exceedances by Year in Each Sub-Watershed

Year	Lone Tree	Temple	Duck	Little Johns	Total
2007	1		1	1	3
2008	1				1

Number of Sediment Toxicity (Hyalella azteca) by Year in Each Sub-Watershed

Year	Lone Tree	Temple	Duck	Little Johns	Total
2007	1	1			2
2008		3			3

Continue Water Quality Monitoring

- Same constituents and timing as baseline year

Tasks

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Determine Current Management Practices

- Conduct Management practice grower meetings
- Conduct MP Survey at meeting
- Follow up with growers not attending meeting for survey

Individual Management Practice Survey

SJCDWQC Member ID# 2500
Name (filled out by): _____
Date (date filled out): _____
Associated Meeting: Alfalfa Grower Meeting – Littlejohns Creek

Packet Contents

Member Subwatershed Parcel Information
Map – Littlejohns Creek @ Jack Tone Rd Member Parcels in Relation to Monitoring Locations
Map – Littlejohns Creek @ Jack Tone Rd Member 2500 Parcels
Coalition Exceedances – Littlejohns Creek @ Jack Tone Rd
Pesticide Use Report Information (Chemistry) – Littlejohns Creek @ Jack Tone Rd
Pesticide Use Report Information (Toxicity) – Littlejohns Creek @ Jack Tone Rd
Management Practice Information (2009)
- Pesticide Management
- Off-Target Mixing and Application
- Pesticide Selection Issues
- Irrigation Runoff Issues
- Rainfall Runoff Issues

2010 Management Practice Implementation

Answer for the 2009 season	Field 1
26. Which of the following management practices do you plan to implement in 2010?	
Reduce use of the pesticide types found in exceedance	☐
Installation of sprinkler or micro irrigation when an option	☐
Installation of retention pond / holding basin / return systems	☐
Use of center grass rows, grass waterways or grass filter strips	☐
Reduce runoff water volumes using irrigation management	☐
Treat runoff waters with PAM or other materials	☐

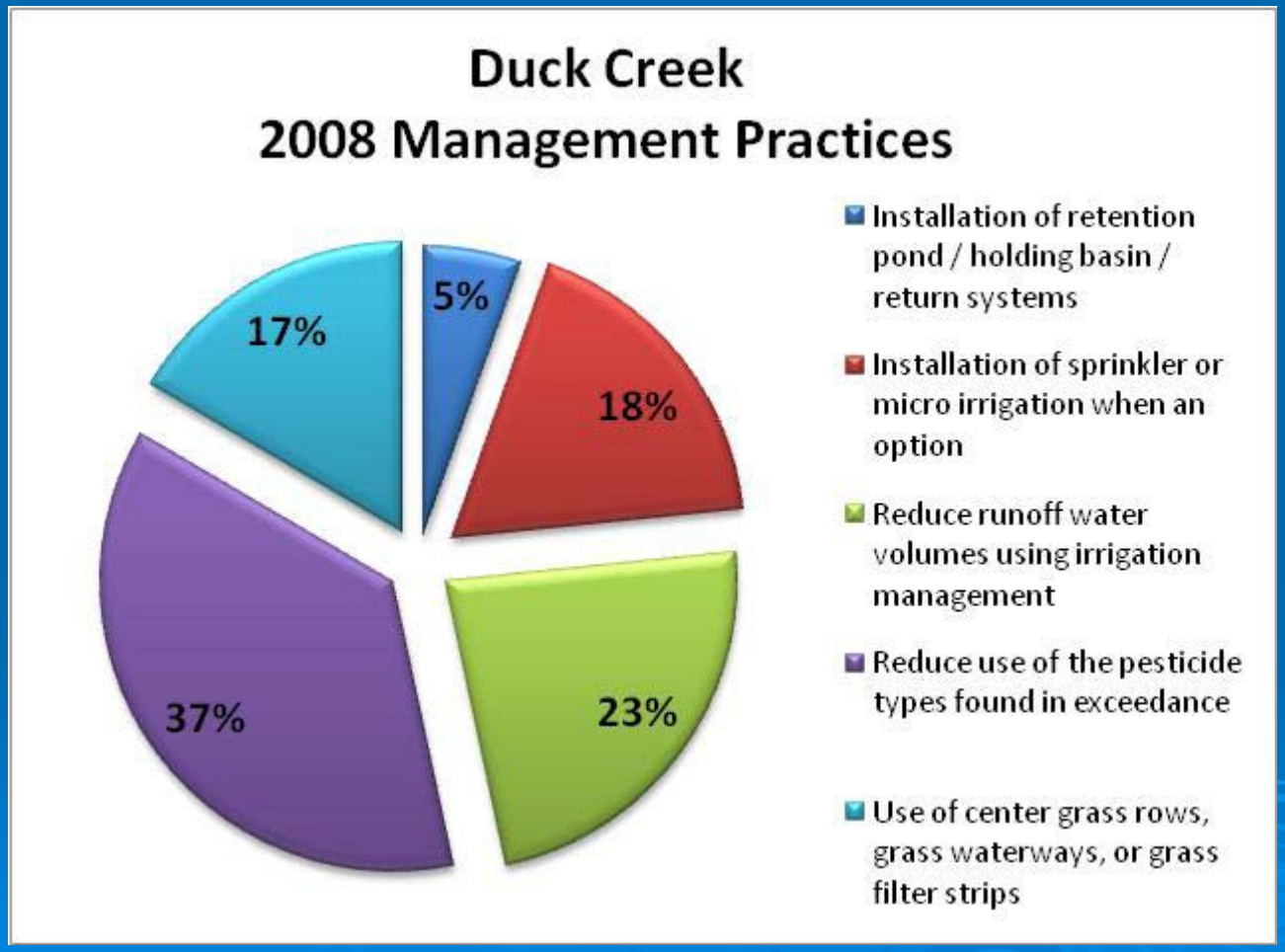
27. Do you think the associated meeting had value in helping you understanding the issues? **Yes** **No**

28. Which source do you rely on in determining which management practices to implement?

☐ Pest Control Advisor PCA, CCA ☐ Agricultural Commissioner

☐ Industry magazines ☐ UC Extension

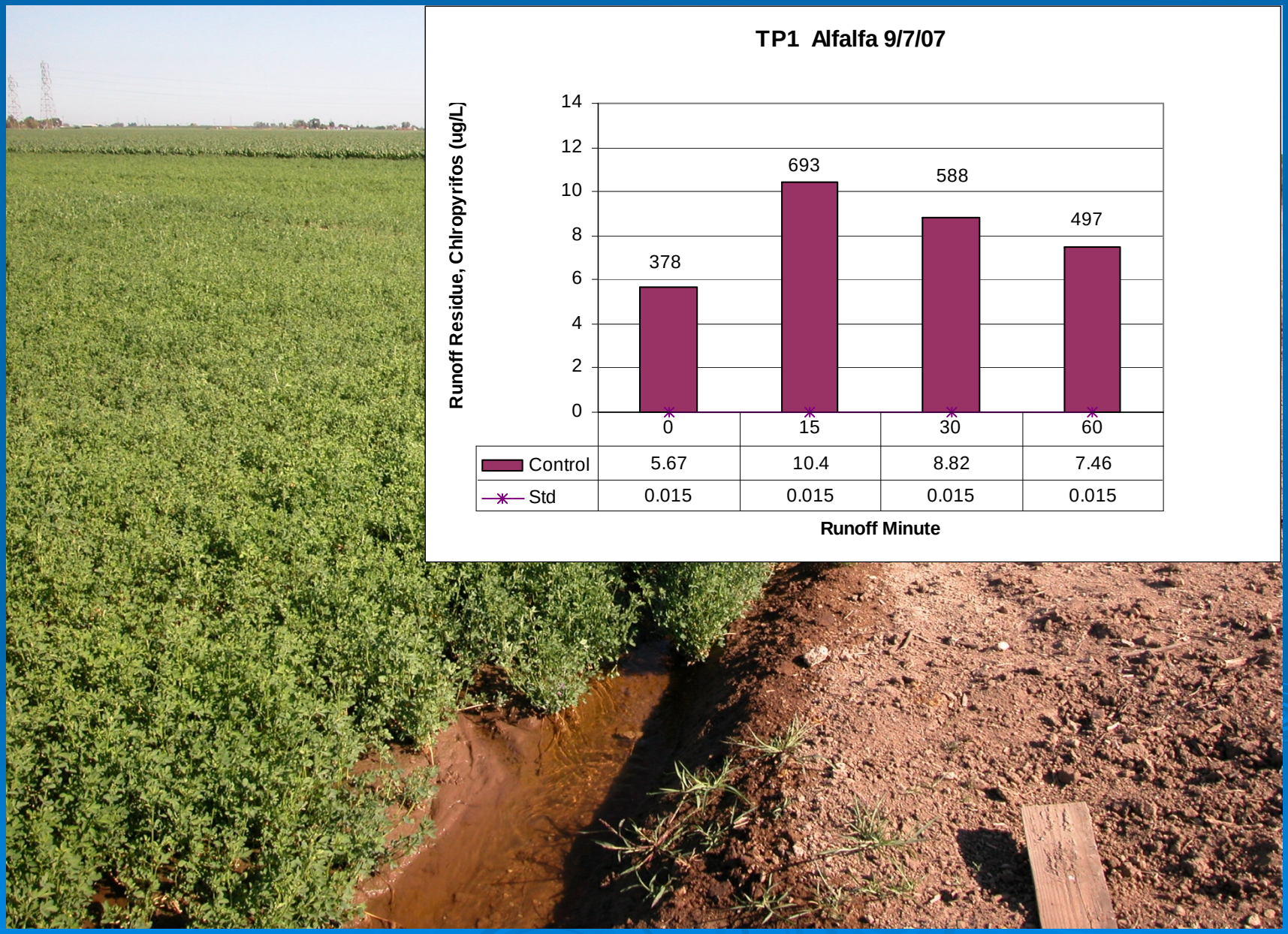
Current Management Practices



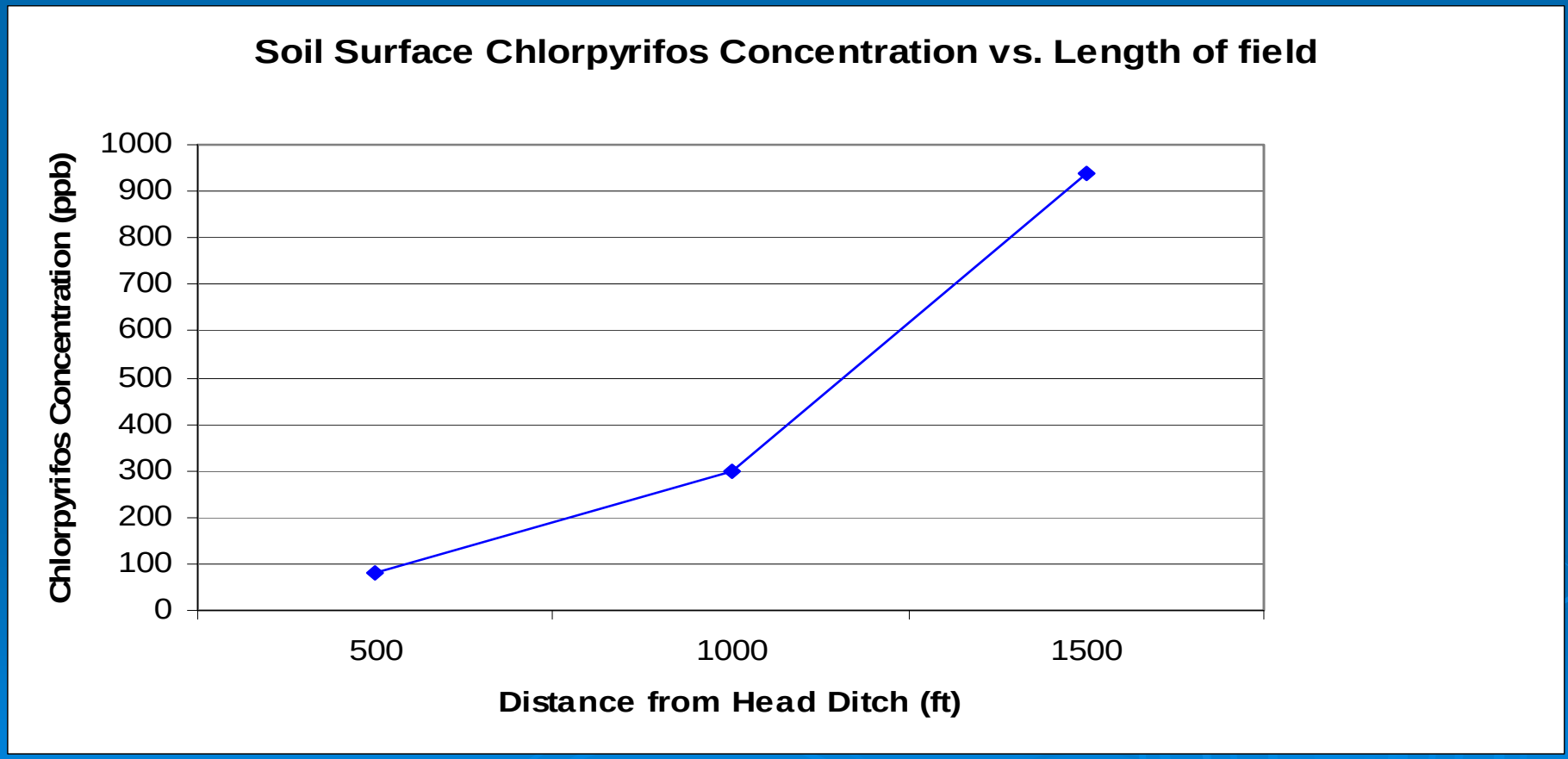
Reinforce Management Practices

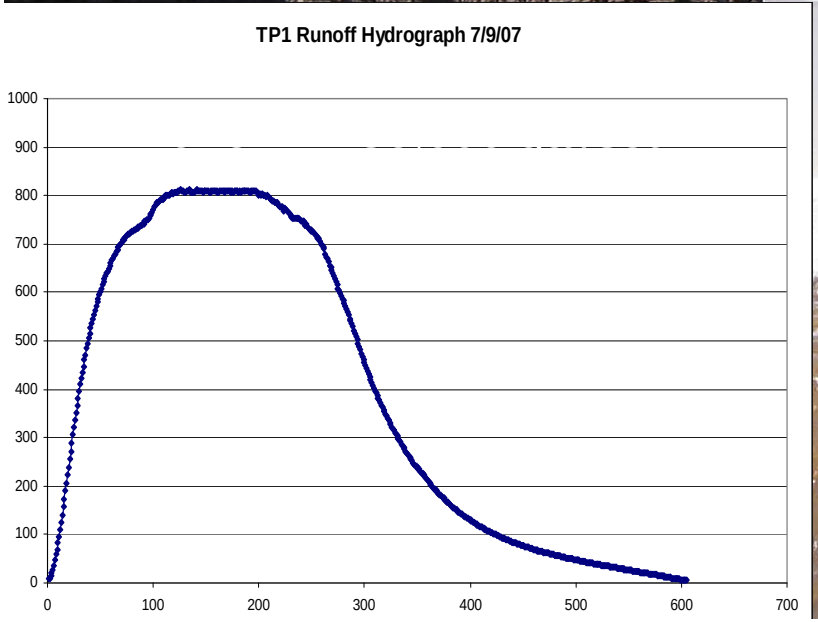
- Grower Meetings – 2008 to Current
  - General – 3869
  - Target Area Specific -- 532

Chlorpyrifos 1pt/acre


TP1 Alfalfa 9/7/07
Runoff Residue, Chlropyrifos (ug/L)
14
12
10
8
6
4
2
0
378
693
588
497
0
15
30
60
Control
5.67
10.4
8.82
7.46
Std
0.015
0.015
0.015
0.015
Runoff Minute

Alfalfa, Chlorpyrifos




TP1 Runoff Hydrograph 7/9/07
1000
900
800
700
600
500
400
300
200
100
0
0
100
200
300
400
500
600
700

Management Practices to Reduce Offsite Movement

- Delay irrigation after application
- Hold runoff water
- Capture and recycle runoff
- Use lower risk materials
- Buffer zones
- Treat runoff

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Draft

Controlling Offsite Movement of Agricultural Chemical Residues -- Alfalfa

Terry Prichard
UC Water Management Specialist
Mick Canevari
UC Field Crops Farm Advisor
Larry Schwankl
UC Irrigation Specialist

Prepared as a Component of:
California Department of Pesticide Regulation-- Pesticide Management Alliance Grant
in Cooperation with the San Joaquin County and Delta Water Quality Coalition. 2010

Workbooks

- Winegrape
- Walnut
- Tomato
- Alfalfa

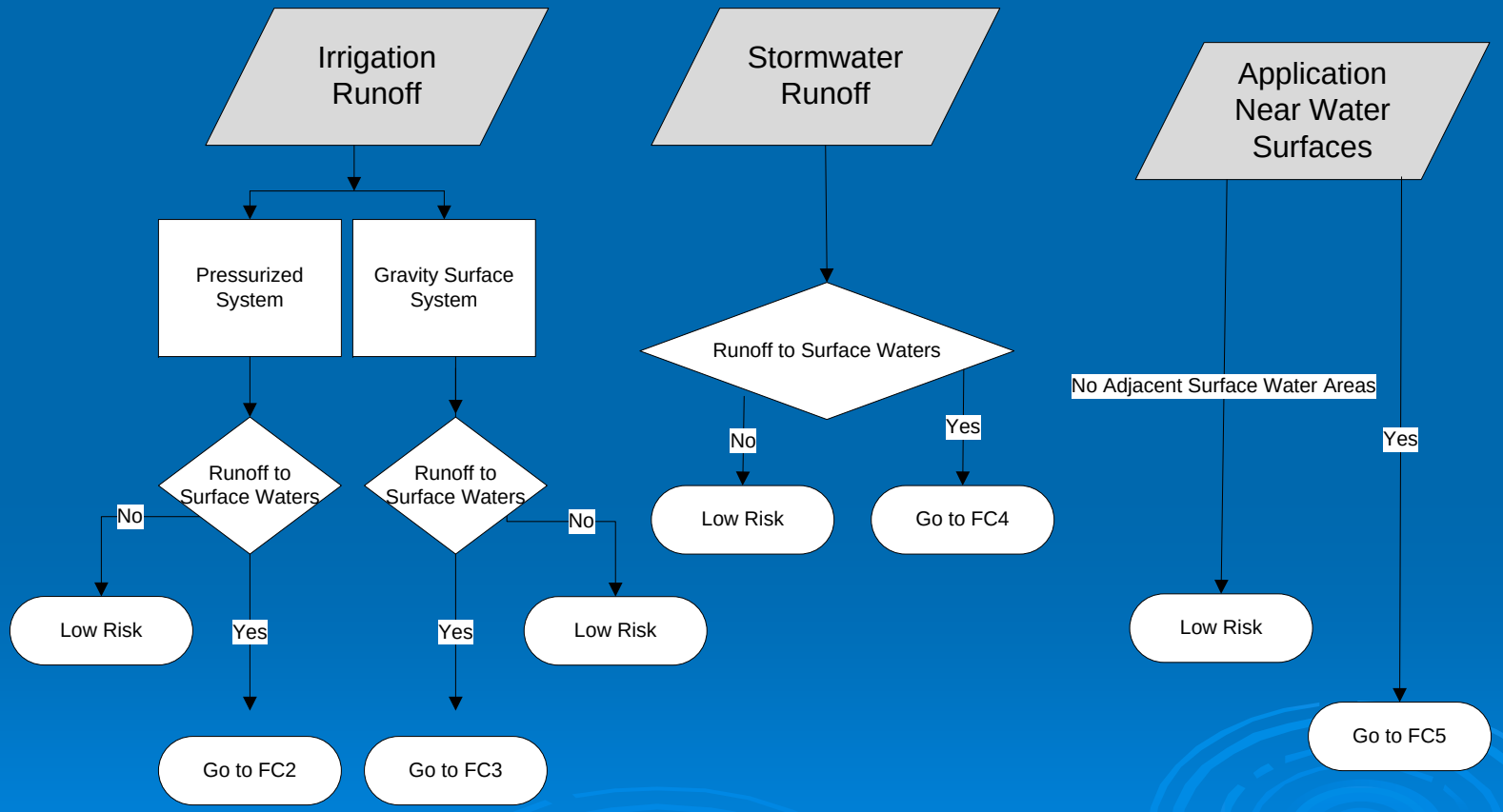
Workbook

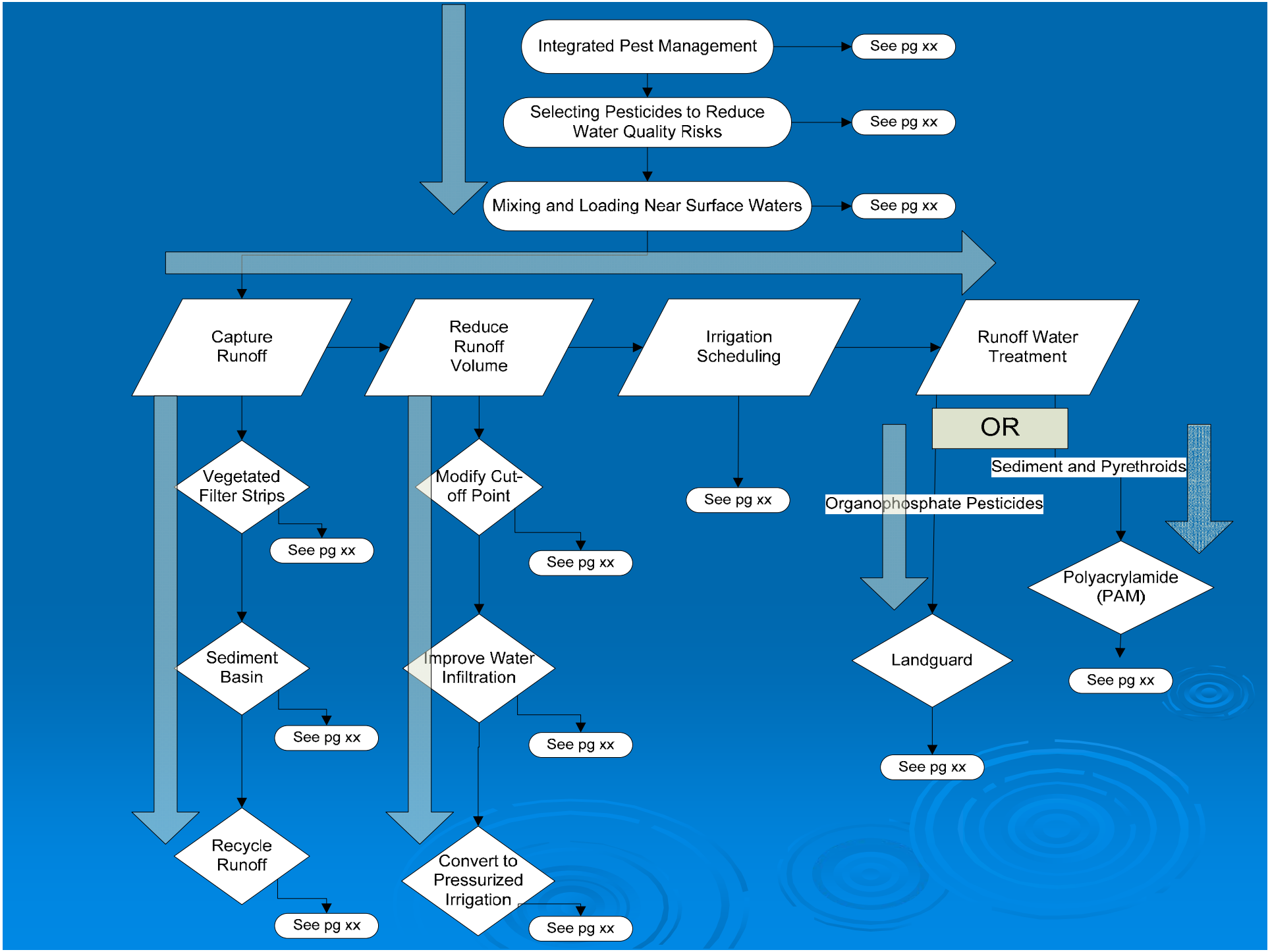
- Team prepared:
  - Brenna Aegerter
  - Joe Grant
  - Mick Canevari
  - Paul Verdegaal
  - Larry Schwankl
  - Terry Prichard

Workbook

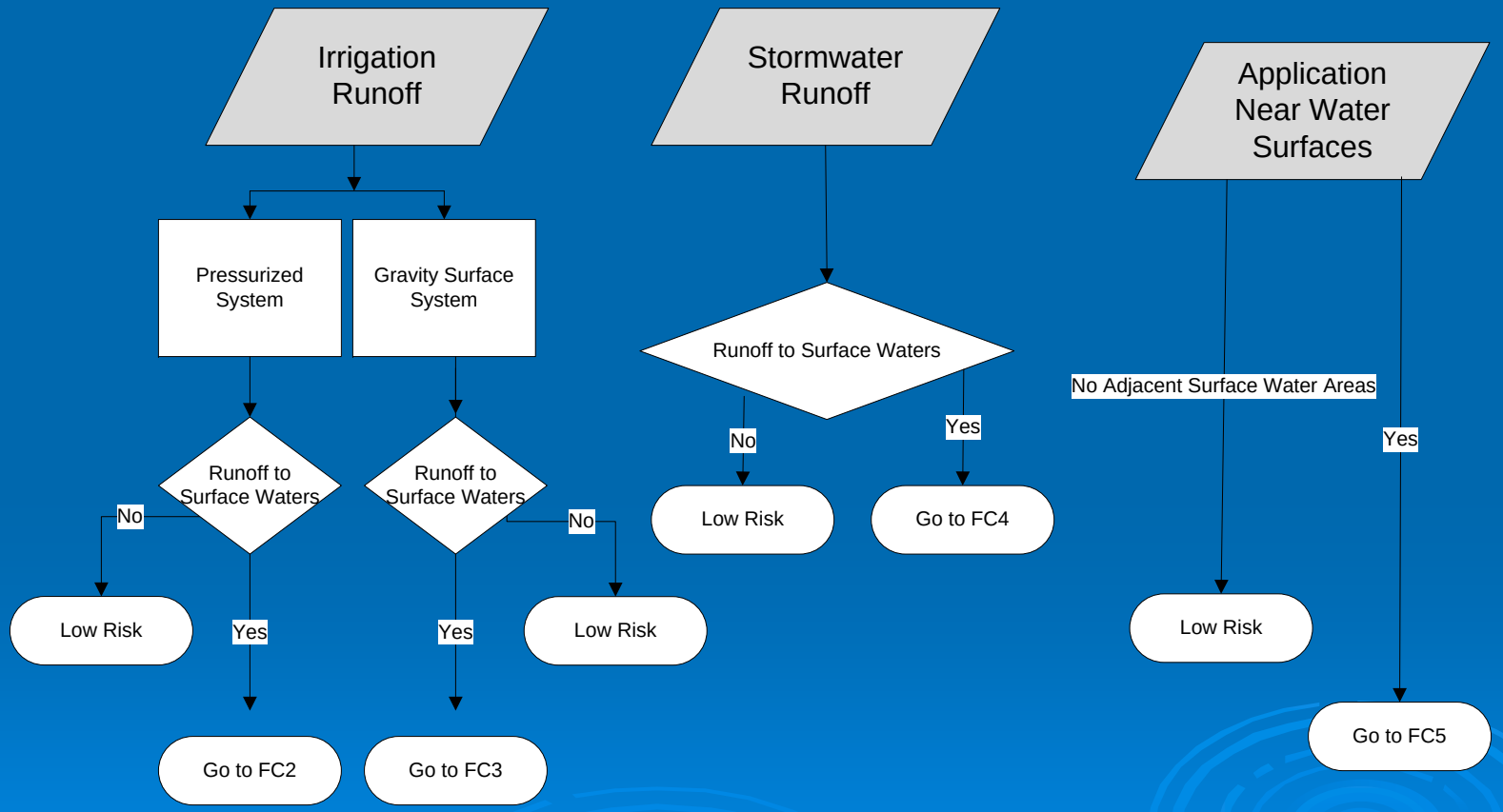
- Grower reviewed:
  - 2 growers reviewed and commented
- Conduct grower workshops
  - All growers of the specific crop in target area invited
- Peer review
  - Each workbook reviewed by UC IPM Advisor and commodity Farm Advisor
- Publish Workbook
  - ANR 8000 series

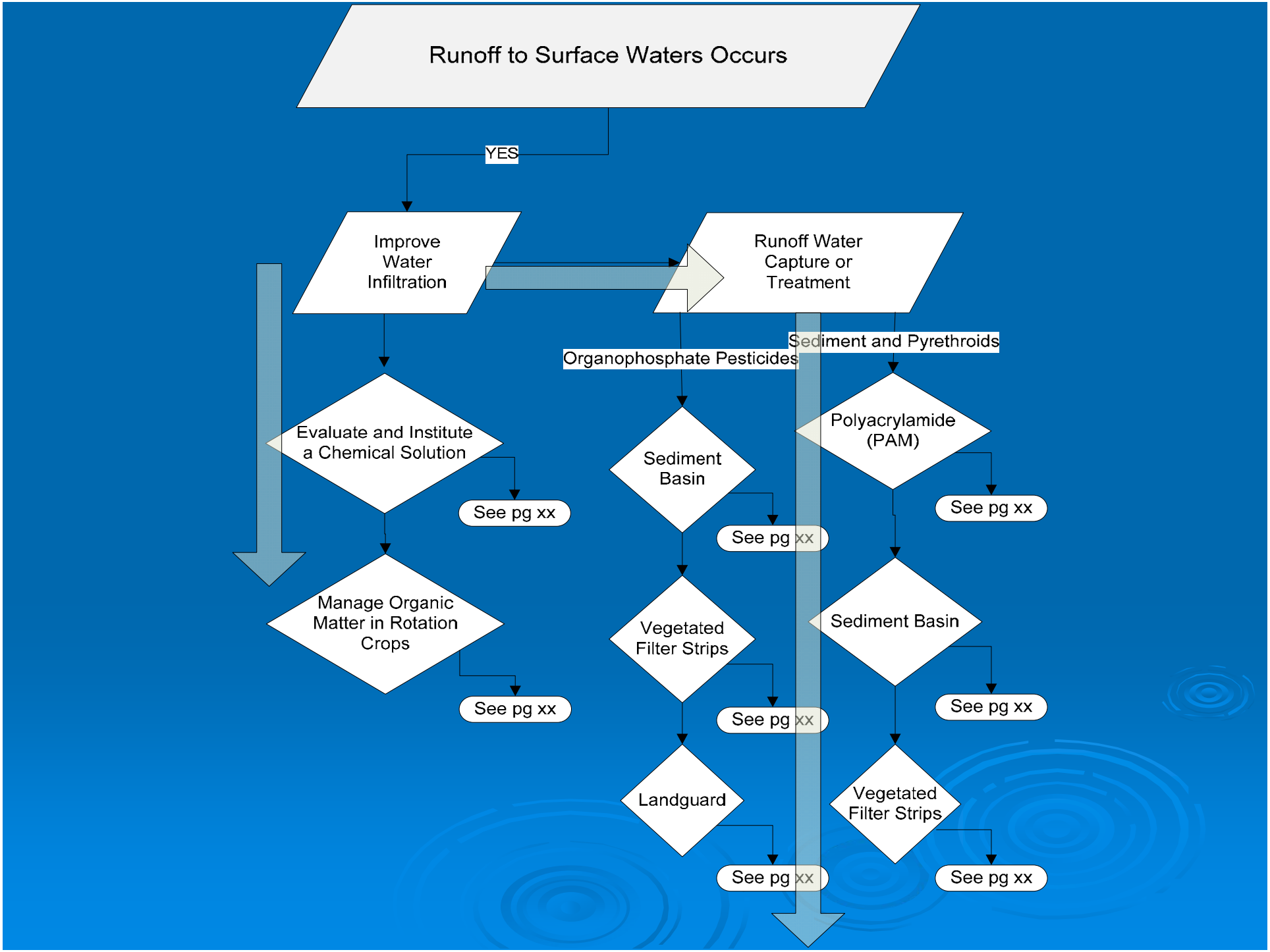
Pathways to Surface Waters




Integrated Pest Management
See pg xx
Selecting Pesticides to Reduce Water Quality Risks
See pg xx
Mixing and Loading Near Surface Waters
See pg xx
Capture Runoff
Reduce Runoff Volume
Irrigation Scheduling
Runoff Water Treatment
Vegetated Filter Strips
See pg xx
Modify Cut-off Point
See pg xx
See pg xx
OR
Sediment and Pyrethroids
Organophosphate Pesticides
Polyacrylamide (PAM)
See pg xx
Sediment Basin
See pg xx
Improve Water Infiltration
See pg xx
Landguard
See pg xx
Recycle Runoff
See pg xx
Convert to Pressurized Irrigation
See pg xx

Pathways to Surface Waters




Runoff to Surface Waters Occurs
YES
Improve Water Infiltration
Runoff Water Capture or Treatment
Organophosphate Pesticides
Sediment and Pyrethroids
Evaluate and Institute a Chemical Solution
See pg xx
Manage Organic Matter in Rotation Crops
See pg xx
Sediment Basin
See pg xx
Vegetated Filter Strips
See pg xx
Landguard
See pg xx
Polyacrylamide (PAM)
See pg xx
Sediment Basin
See pg xx
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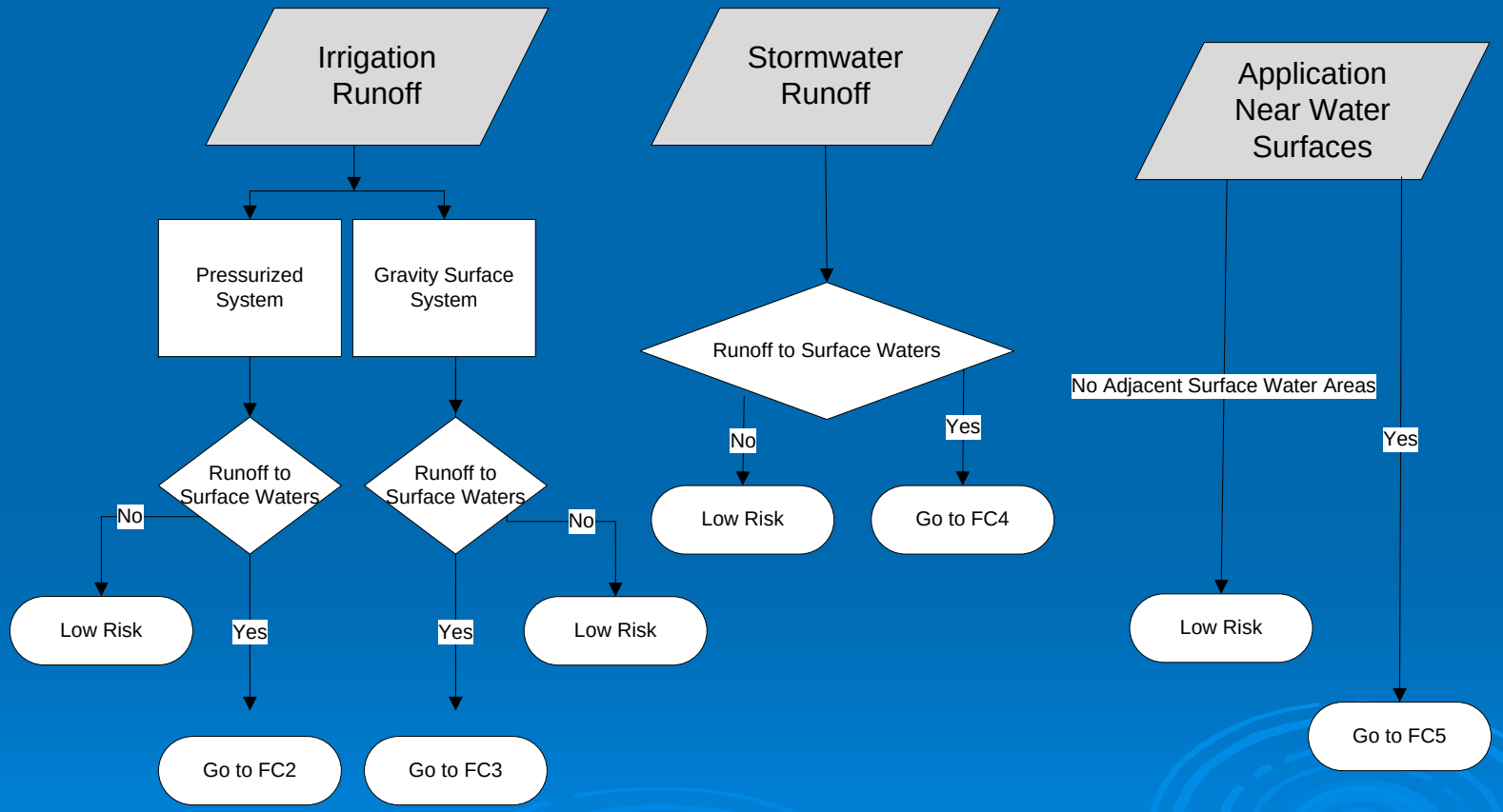
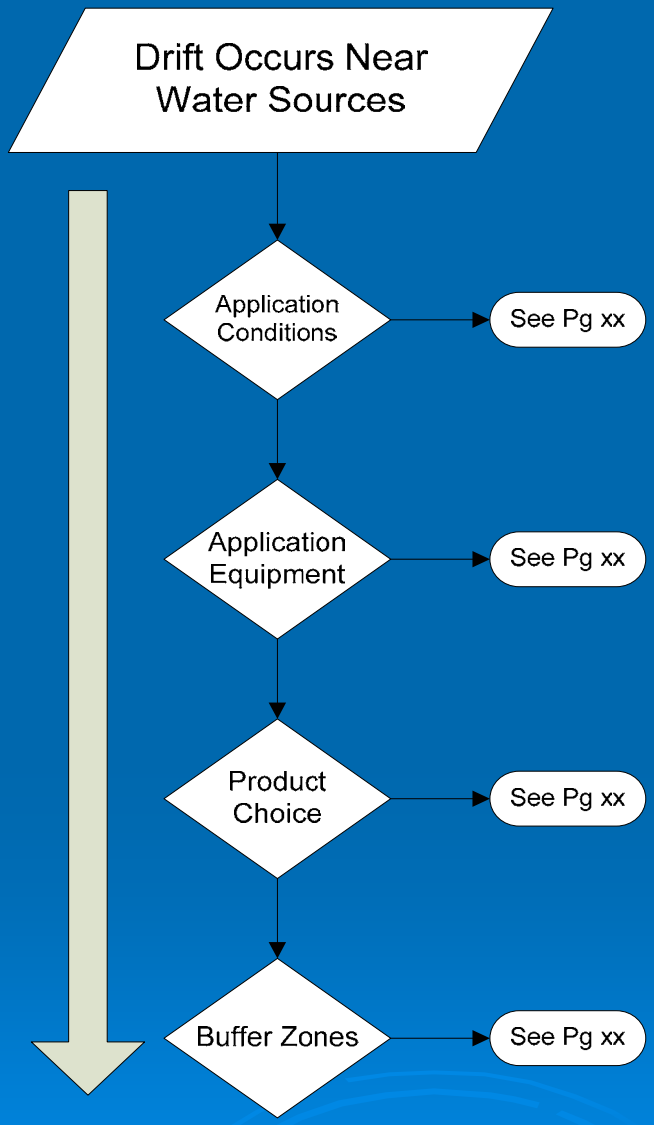
See pg xx

Pathways to Surface Waters




Drift Occurs Near Water Sources
Application Conditions
See Pg xx
Application Equipment
See Pg xx
Product Choice
See Pg xx
Buffer Zones
See Pg xx

Specific Management Practices

- *Implementing Practices*
  - *Basic information*
  - *References to further reading*
  - *Management Publications*

- *Effectiveness in Removing Pesticide Residues*

  References
  - Research
  - Management Publications

MANAGEMENT PRACTICE TO REDUCE SURFACE WATER PESTICIDE CONTAMINATION

- Integrated Pest Management
- Selecting Pesticides to Reduce Water Quality Risks
- Handling Pesticides to Reduce Water Quality Risks
- Pesticide Application Practices to Reduce Offsite Pesticide Movement
- Soil and Water Management to Reduce Runoff
- Reducing Runoff by Improving Water Penetration
- Intercepting Surface Waters and Pesticides
- Treatment of Runoff Waters

A RISK ANALYSIS CASE STUDY -- Appendix

- Alfalfa weevil

Case Study

- **Crop:** Alfalfa, 40 acres
- ***Topography*:** 0.15 percent slope
- ***Soil:*** Hollenbeck silty clay loam soil, soil tends to crust limiting the water infiltration rate.
- ***Irrigation system*:** Border check irrigation, 53 foot wide checks
- ***Irrigation Runoff:*** Runoff is about 17% of the applied water
- ***Drainage:*** Runoff moves to a drain at edge of field; then, on to a larger creek
- ***Irrigation water*:** pH 7.5, EC 0.2 dS/m
- ***Pesticide mixing and loading:*** A pesticide mixing & loading area is located about 40 feet from the drainage ditch.
- ***Pest*:** Egyptian alfalfa weevil, 20 per sweep

Measures of Change

- Compare the number and magnitude of exceedances to base year
- Compare management practice changes– follow-up survey
- Compare use of target materials as a trend 2008 - 2010