Update on Development of the Smith River Plain Water Quality Management Plan

Item 7

North Coast Regional Water Quality Control Board

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December 19, 2019

Water Boards

Acknowledgments

- Lily Bulb Growers
  - ✓ Hastings Bulb Growers
  - ✓ United Lily Growers
  - ✓ Dahlstrom and Watt Bulbs
  - ✓ Palmer Westbrook Inc.
- Key Organizational Partners
  - ✓ NOAA Fisheries
  - ✓ Tolowa Dee-ni' Nation
  - ✓ Cal Fish and Wildlife
  - ✓ Smith River Alliance
- Other Stewardship Partners
  - ✓ NRCS Eureka
  - ✓ Del Norte RCD
  - ✓ Del Norte Ag Commissioner
  - ✓ Dept. of Pesticide Reg
- RB1 Project Team
  - ✓ Ben Zabinsky
  - ✓ Maurice Washington
  - ✓ Lynette Shipsey
  - ✓ Izaac Russo
  - ✓ Carrieann Lopez
  - ✓ Alex Liebert
  - ✓ Lance Le
  - ✓ Rich Fadness
  - ✓ Clayton Creager
  - ✓ Kelsey Cody

Water Boards

Presentation Topics

- Background on Regional Board activities
  - ✓ Smith River Plain monitoring results
  - ✓ Board direction to develop Smith River Plain Water Quality Management Plan (SRPWQMP)
- Overview of the sections of SRPWQMP
  1) Cultural and Biological Resources
  2) Lily Bulb Operations
  3) Risks to Water Quality

  --- Break for Board Questions ---

  4) Water Quality Management Practices
  5) Implementation Tracking and Reporting

  --- Break for Board Questions ---

  6) Adaptive Management Monitoring Program
  7) Adaptive Management
- Next Steps

Smith River Plain Project Timeline

2013 – 2017 Smith River Plain Water Quality Monitoring

J F M A M J J A S O N D

2018

- Smith River Water Quality Monitoring Report
- Board direction to develop Smith River Plain WQ Management Plan
- Staff visit lily bulb operations and meet with external team

2019

- Staff visit lily bulb operations and meet with external team
- Begin 2019 – 2020 water quality monitoring

2020

- Administrative Review of Draft SRPWQMP
- Release of Public Review Draft – March 2020
- EO Approval of Plan and begin permit development – May 2020

Smith River Plain Water Quality Monitoring

- Regional Water Board sampling of Smith River coastal tributaries in 2013-2015 with follow up in 2017
- Concentrations of five pesticides and copper exceeded USEPA 2017 Aquatic Life Benchmarks
- Delilah Creek samples exhibited toxicity due to copper
- Results documented in January 2018 *Smith River Plain Surface Water and Sediment Monitoring Report*
  - ✓ Concludes that pesticides are being delivered to surface waters from lily bulb fields during rain events
  - ✓ Available at: https://www.waterboards.ca.gov/northcoast/water_issues/programs/agricultural_lands/lily/

Water Boards

Board Direction (April 2018)

- Regional Water Board directed staff to collaborate with growers and other stakeholders to develop SRPWQMP
  - ✓ Tolowa Dee-ni' Nation
  - ✓ California Department of Fish and Wildlife
  - ✓ NOAA Fisheries
  - ✓ Smith River Alliance
  - ✓ Lily Bulb Growers
  - ✓ Others
- Executive Officer issued Water Code Section13267 request for information to growers
  - ✓ October 2018 request with follow up request in June 2019
  - ✓ Growers have provided timely responses to both requests

Water Boards

Geographic Setting

- Located north of Crescent City
- 700 square mile watershed
- Largest undammed river in CA
- Includes tidal sloughs, both salt and freshwater wetlands, and coastal tributaries
- Ancestral home of Tolowa Dee-ni'
- Location of lily bulb operations (north shore), and dairies

SRPWQMP Sections

1) **Cultural and Biological Resources**
2) Lily bulb Operations
3) Risks to Water Quality
4) Water Quality Management Practices
5) Implementation Tracking and Reporting
6) Adaptive Management Monitoring Program
7) Adaptive Management

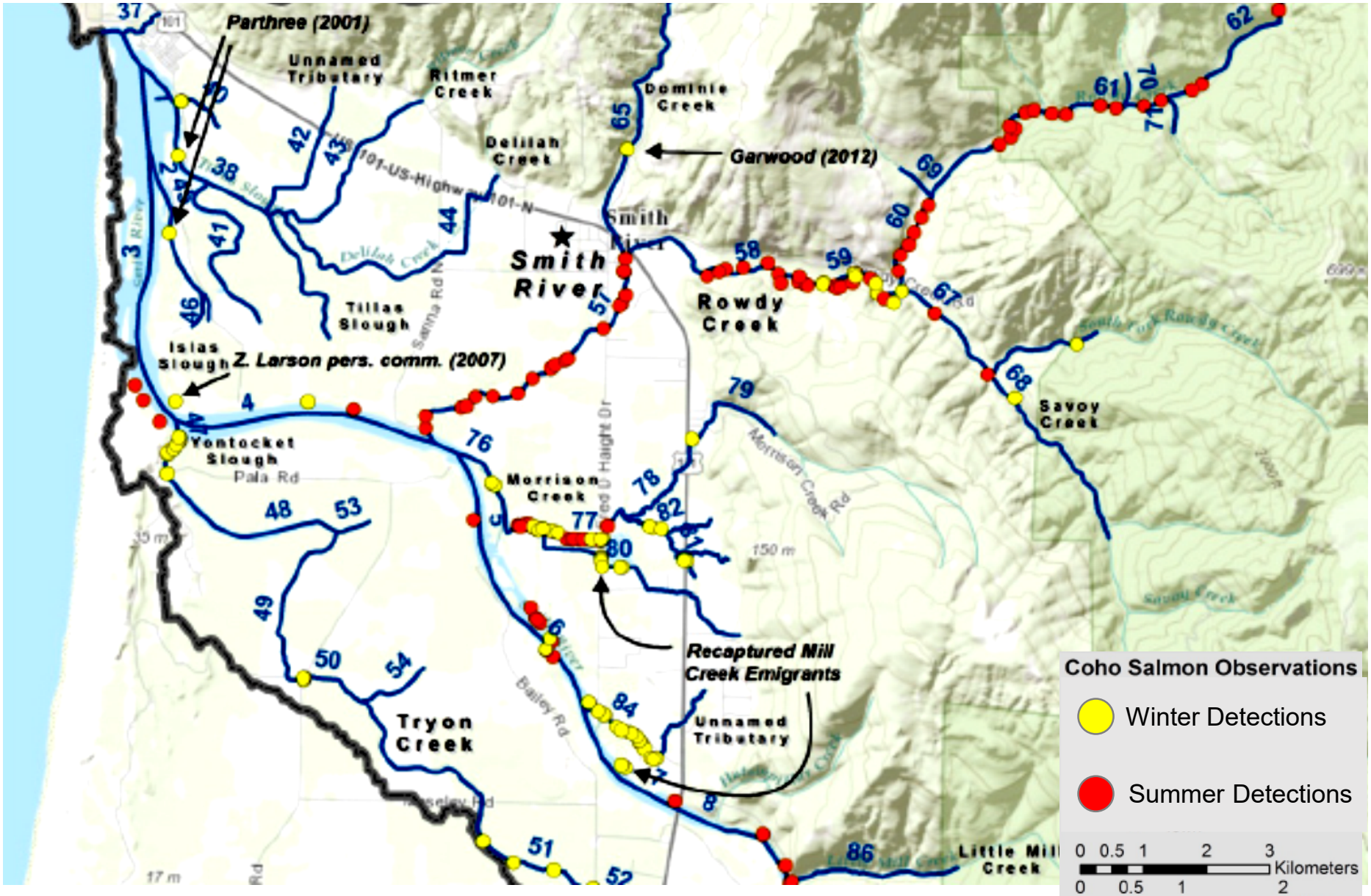
Water Boards

Cultural and Biological Resources

- Tolowa Dee-ni' Nation is the original steward
  - ✓ Crucial environmental trust resource
  - ✓ Supports cultural ceremonial and subsistence beneficial uses
- Smith River Plain is part of Smith River fishery and critical in supporting endangered species
  - ✓ Coho salmon – federally and state threatened species
  - ✓ Tidewater goby – federally endangered
  - ✓ Aquatic species are sensitive to toxicity

Water Boards

Use of Smith River Plain by Coho Salmon



SRPWQMP Sections

1) Cultural and Biological Resources
2) **Lily bulb Operations**
3) Risks to Water Quality
4) Water Quality Management Practices
5) Implementation Tracking and Reporting
6) Adaptive Management Monitoring Program
7) Adaptive Management

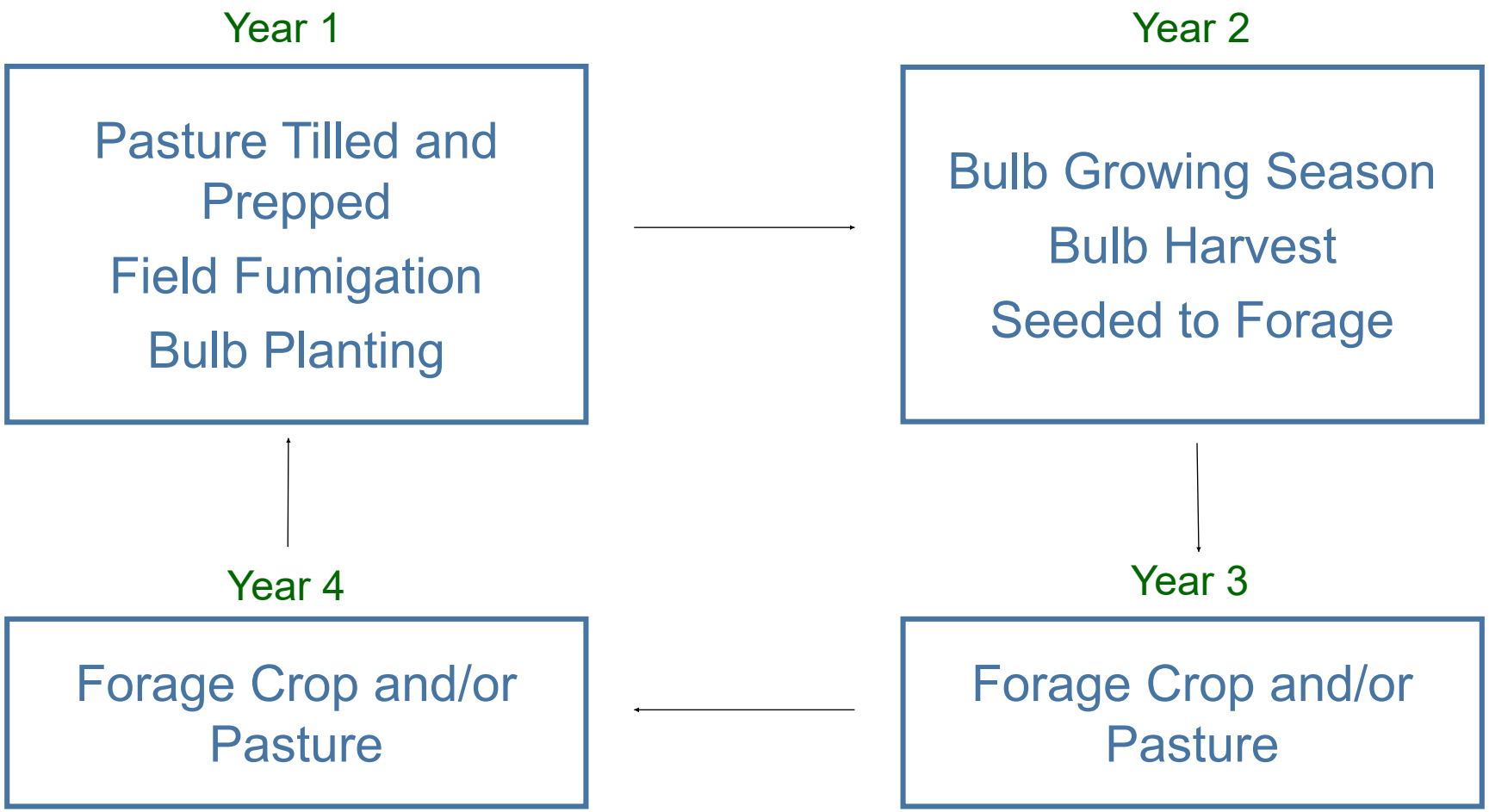
Water Boards

Lily Bulb Operations

- 11 million bulbs produced annually
- Important part of the local economy
- Lily bulbs farmed on 1500 - 1600 acres in the Smith River Plain
- Lily bulbs farmed on a 3 to 5-year field rotation with forage crops
- Only about 350 - 400 acres are in bulb production per growing season
- Growers use pesticides to control disease, weeds, and insects

Water Boards

4-Year Field Rotation



Water Boards

Recently Fumigated Field (Year 1)

Water Boards

Lily Bulb Field in Wet Season (Year 2)

Water Boards

Lilies in Bloom in Dry Season (Year 2)

Water Boards

Forage Crop/Pasture (Years 3 and 4)

Water Boards

SRPWQMP Sections

1) Cultural and Biological Resources
2) Lily bulb Operations
3) **Risks to Water Quality**
4) Water Quality Management Practices
5) Implementation Tracking and Reporting
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7) Adaptive Management

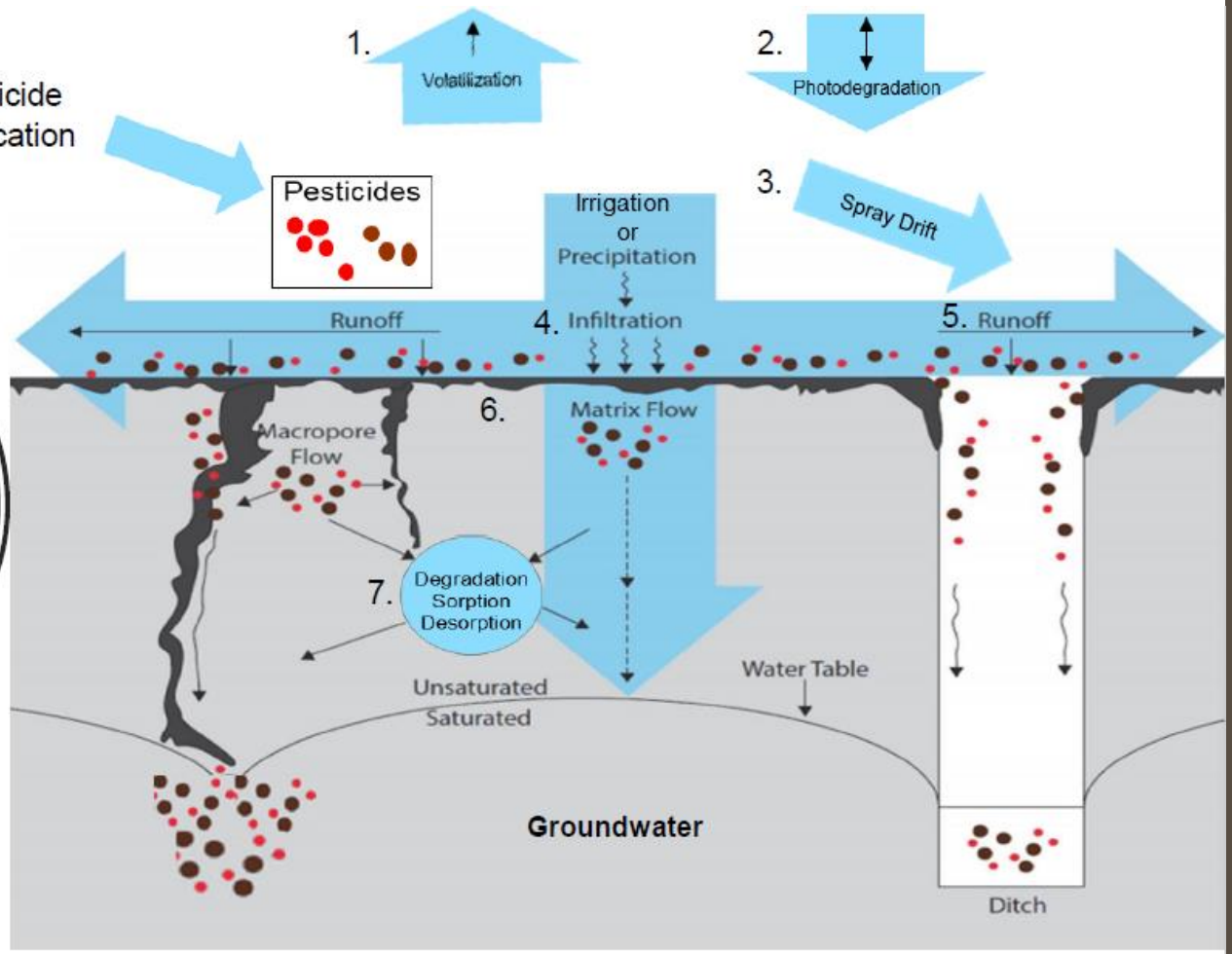
Water Boards

Risks to Water Quality

- Delivery through surface runoff during storm events
  - ✓ Soluble pesticides dissolved in surface water runoff
  - ✓ Less soluble pesticides attached to soil eroded from fields
  - ✓ Erosion of ditches and stream channels
- Groundwater
  - ✓ Soluble pesticides leaching
  - ✓ Infiltration and delivery to nearby streams
  - ✓ Nitrates from fertilizer and manure
- Spray drift during application

Water Boards

Transport Mechanisms of Pesticides



Adapted from Radcliffe et al., 2015 "Water & P partitioning in artificially drained system" and Washington et al., 2017 "Monitoring of Antibiotics and Atrazine in Tile Drained landscapes"

Lily Bulb Field

Water Boards

Surface Runoff

Water Boards

Pesticide Selection & Risk Characterization

- 2013 – 2015 Surface Water Ambient Monitoring Program (SWAMP)
- California Department of Pesticide Regulation's (CDPR) Prioritization Score Method
- Physiochemical Properties

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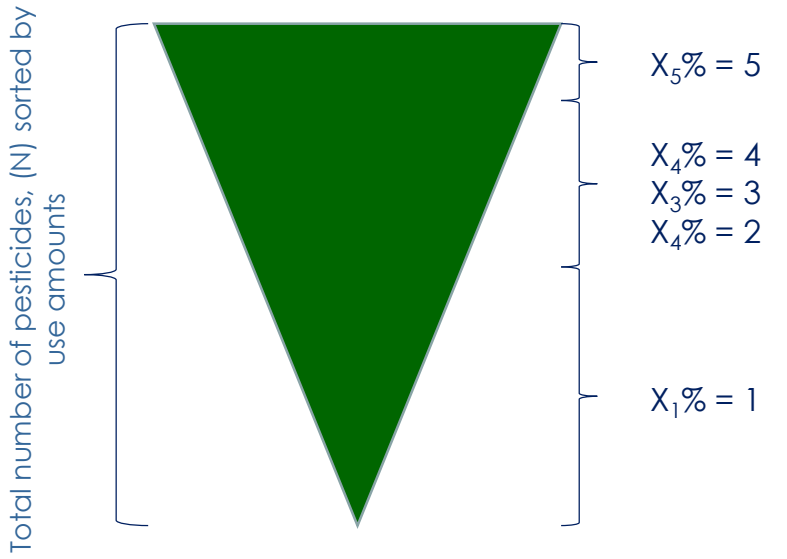
Pesticide Risk Characterization

5-year Pesticide Use on Bulb Fields

Pesticide	2014	2015	2016	2017	2018
Aldicarb					
Captan		X	X	X	X
Carbaryl					
Carbofuran					
Diuron	X	X	X	X	X
Ethoprop	X	X	X	X	X
Fenpropathrin					
Imidacloprid	X	X	X	X	X
Hexachlorobenzene					
HCH Beta					
Methiocarb	X		X		
Mirex					
Permethrin	X	X	X	X	X
Pyraclostrobin					
Simazine					
Tebuconazole	X	X	X	X	X
Thiamethoxam	X	X		X	

Probability based use ranking



Pesticides are sorted by their use amount in descending order

CDPR Pesticide Use Report Data

Water Boards

Pesticide Risk Characterization

Ranking Scheme for pesticide Toxicity

Toxicity Score	Lowest Benchmark (BM) ppb	USEPA Description
8	BM ≤ 0.001	Very high toxic
7	0.001 < BM≤ 0.01	
6	0.01 < BM≤ 0.1	
5	0.1 < BM≤ 1	
4	1 < BM≤ 10	
3	10 < BM≤ 100	
2	100 < BM≤ 1000	Highly toxic
1	BM > 1000	Moderately toxic to practically non-toxic
0	No Data	

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Prioritization Score

Pesticide	Final Score Fish	Pesticide	Final Score Invertebrate
Permethrin	18	Ethoprop	25
Ethoprop	15	Peremethrin	21
Diuron	12	Diuron	12
Captan	9	Imidacloprid	8
Tebuconazole	6	Captan	6
Methiocarb	3	Methiocarb	5
Imidacloprid	2	Tebuconazole	4
Thiamethoxam	1	Thiamethoxam	3
Prioritization Score (Final Score) = (Use Score) * (Toxicity Score)			

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Selection of Pesticides

- Permethrin
  - ✓High organic carbon- water partition coefficient (K_{OC}), strong affinity to sorb to soils with high organic matter (OM)
  - ✓Moderately persistent in soil
  - ✓Low leachability
  - ✓Potential to transport via sediment attachment
  - ✓Detected in a sediment sample from (2013 – 2015) SWAMP report.
  - ✓Surface water conc. Exceeded both acute and chronic thresholds for invertebrate species.

Selection Of Pesticides

- Ethoprop
  - ✓Low (K_{OC}), low tendency to sorb to soil and sediment, not persistent in soil
  - ✓Likely to transport via surface runoff
  - ✓Mobile to very mobile in soil, with a potential to leach in the subsurface
  - ✓Half-life: 75 – 90 days (water-sediment), approximately 133 days in water

Water Boards

Selection of Pesticides

- Diuron
  - ✓Low (Koc), low propensity to sorb to soil or sediment.
  - ✓Persistent in soil, half-life: 146 – 229 days.
  - ✓Mobile and persistent in the soil.
  - ✓Prone to transport via surface runoff and leach.
  - ✓Detected in surface water samples from (2013 – 2015) SWAMP report. Concentrations were higher than the acute toxicity for fish.

Water Boards

Selection Of Pesticides

- Imidacloprid
  - ✓Low (K_{OC}) and a high-water solubility suggest a high leaching potential
  - ✓Likely to transport via surface runoff and spray drift application
  - ✓Detected in surface water samples from (2013 – 2015) SWAMP report. Concentrations were higher than the chronic toxicity threshold for invertebrates.
- Tebuconazole
  - ✓Very persistent in soil, half-life: 47 – 796 days
  - ✓Slightly mobile to immobile in soil
  - ✓Likely to transport via sediment attachment
  - ✓Not likely to leach

Water Boards

Seasonality of Pesticide Use

Pesticide Type	*Name*	*Date*	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
Herbicide	Diuron	2014	■		■		■	■	■					
		2015	■	■	■	■	■	■	■					■
		2016	■	■	■	■		■						■
		2017		■	■	■	■	■	■	■	■			■
		2018		■	■	■	■	■	■	■				■
Insecticide	Ethoprop	2014	■									■	■	■
		2015	■									■	■	■
		2016	■									■	■	■
		2017	■	■								■	■	■
		2018	■									■	■	■
	Imidacloprid	2014						■	■	■	■	■	■	
		2015					■	■	■	■	■	■	■	
		2016				■	■	■	■	■	■	■	■	
		2017					■	■	■	■	■	■	■	
		2018						■		■	■	■	■	
	Permethrin	2014						■	■	■	■	■		
		2015							■	■	■	■		
		2016						■	■	■	■	■		
		2017							■	■	■	■		
		2018							■	■	■			
Fungicide	Tebuconazole	2014					■							
		2015			■		■			■				
		2016					■	■	■	■				
		2017					■	■						
		2018					■	■			■			

Wet Season Application **Dry Season Application**

SRPWQMP Sections

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Water Boards

Water Quality Management Practices

- Practices address water quality risks and account for behavior of pesticides
- Growers will select from practices in the Plan based on field conditions
- Growers have been implementing new and revised practices
- Staff have visited operations to document practices
- Most recent visit in August 2019

Water Boards

Inter-Row Barley Planting with Buffer Strip

November 2018 Site Visit

Water Boards

Plant Residue Left on Field

Water Boards

Example of Isolated Field

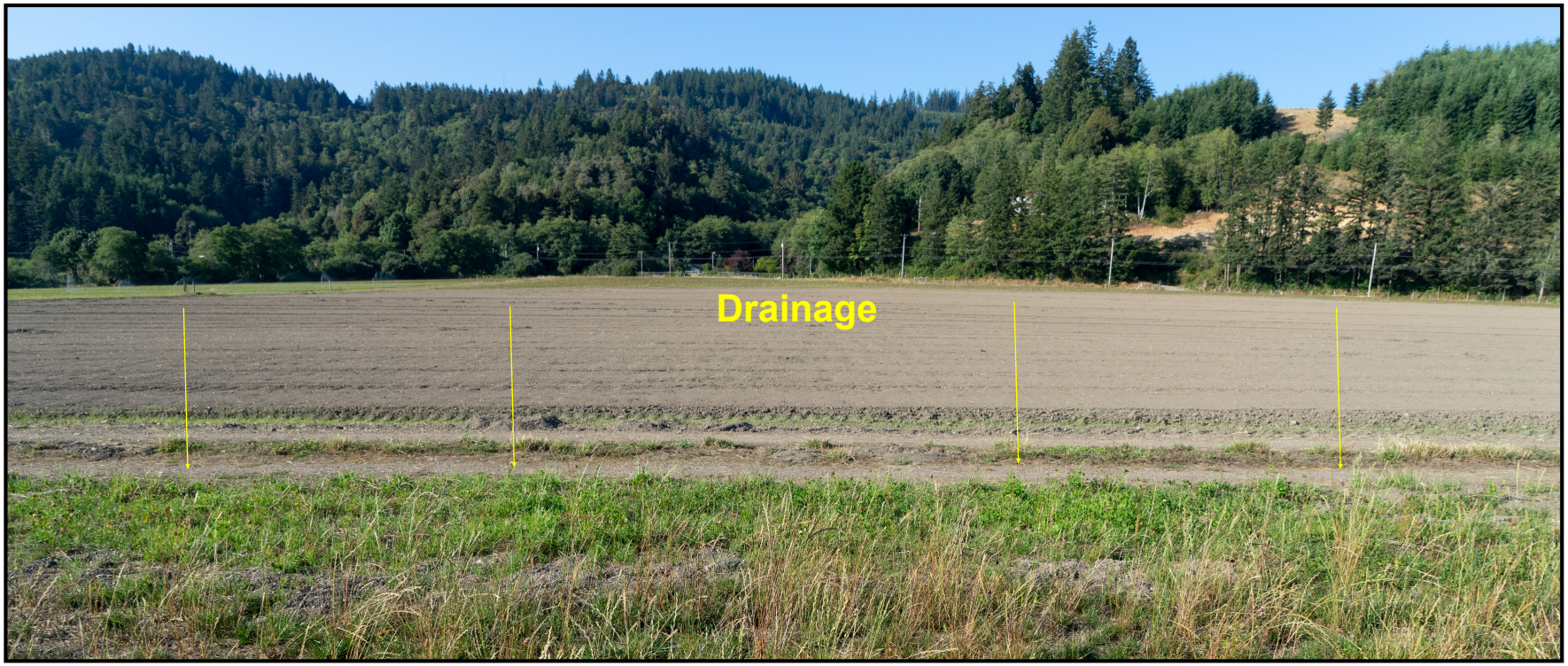
Surrounding pastures may limit the need for additional buffers

Water Boards

Directional Tilling and Buffer Strip

Water Boards

Using Pasture as a Buffer

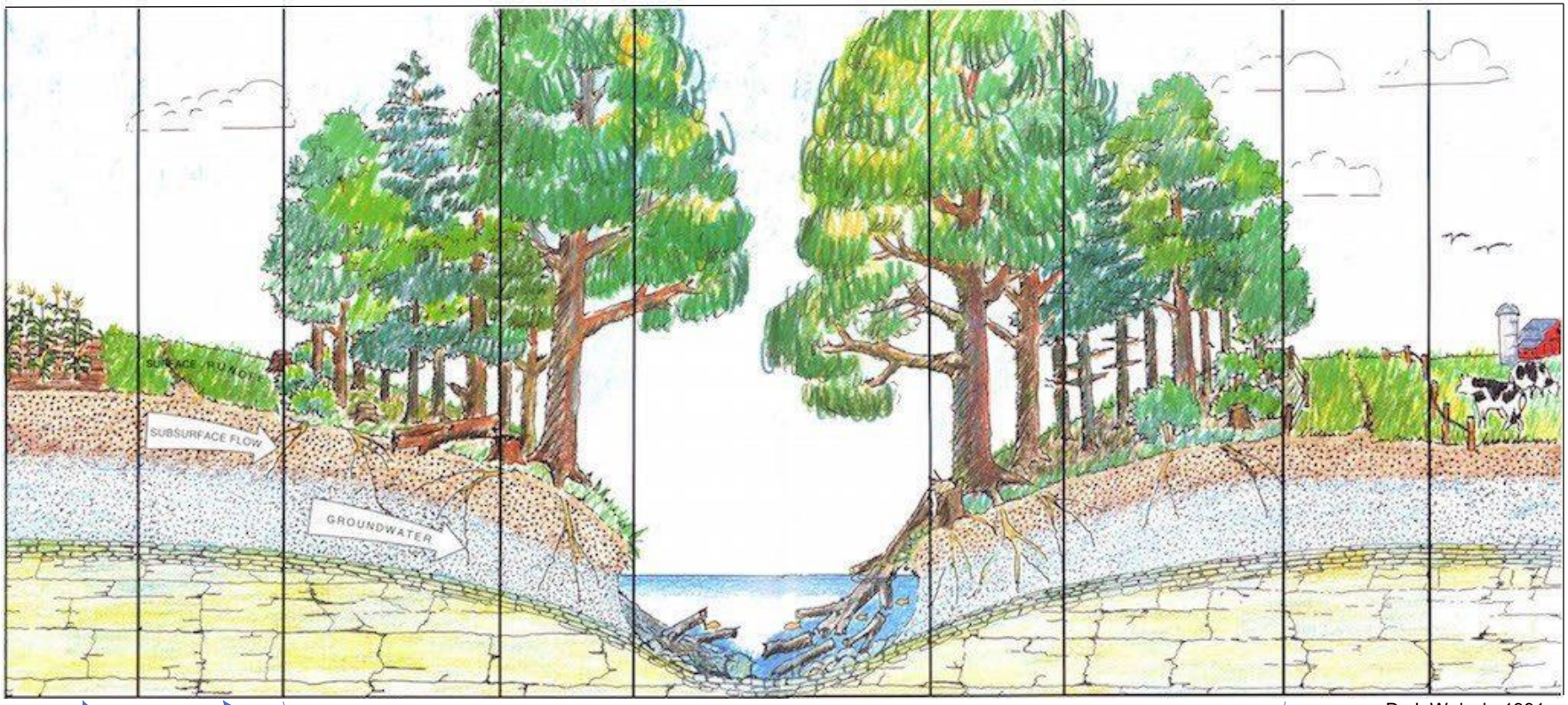


Water Boards

Using Pasture as a Buffer

Water Boards

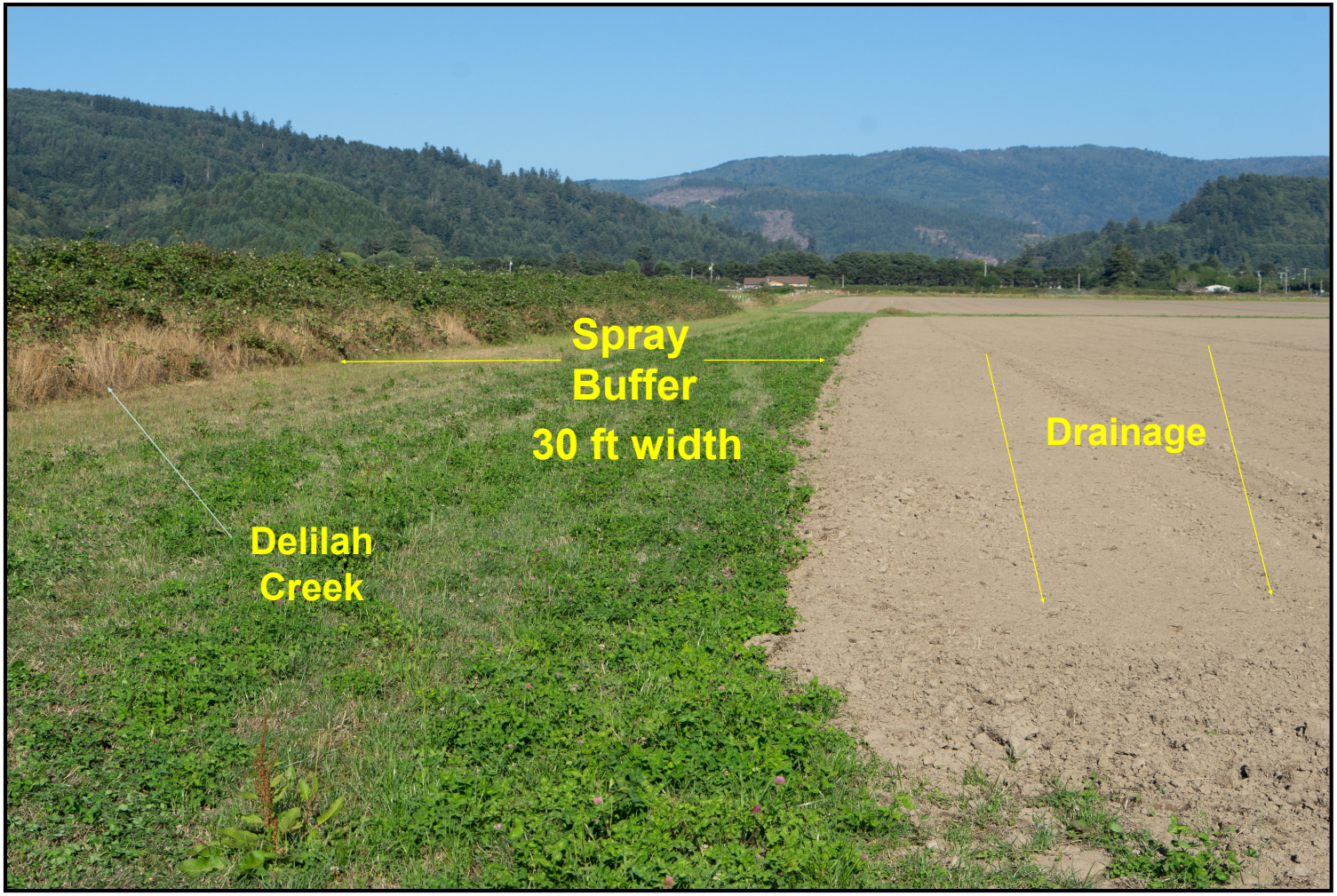
Riparian Area with Filter Strips



Delilah Creek Buffer

Water Boards

Delilah Creek Spray Drift Buffer



Water Boards

Filter Strip Upstream of Ditch

Water Boards

Larger Filter Strip on Steeper Field

Water Boards

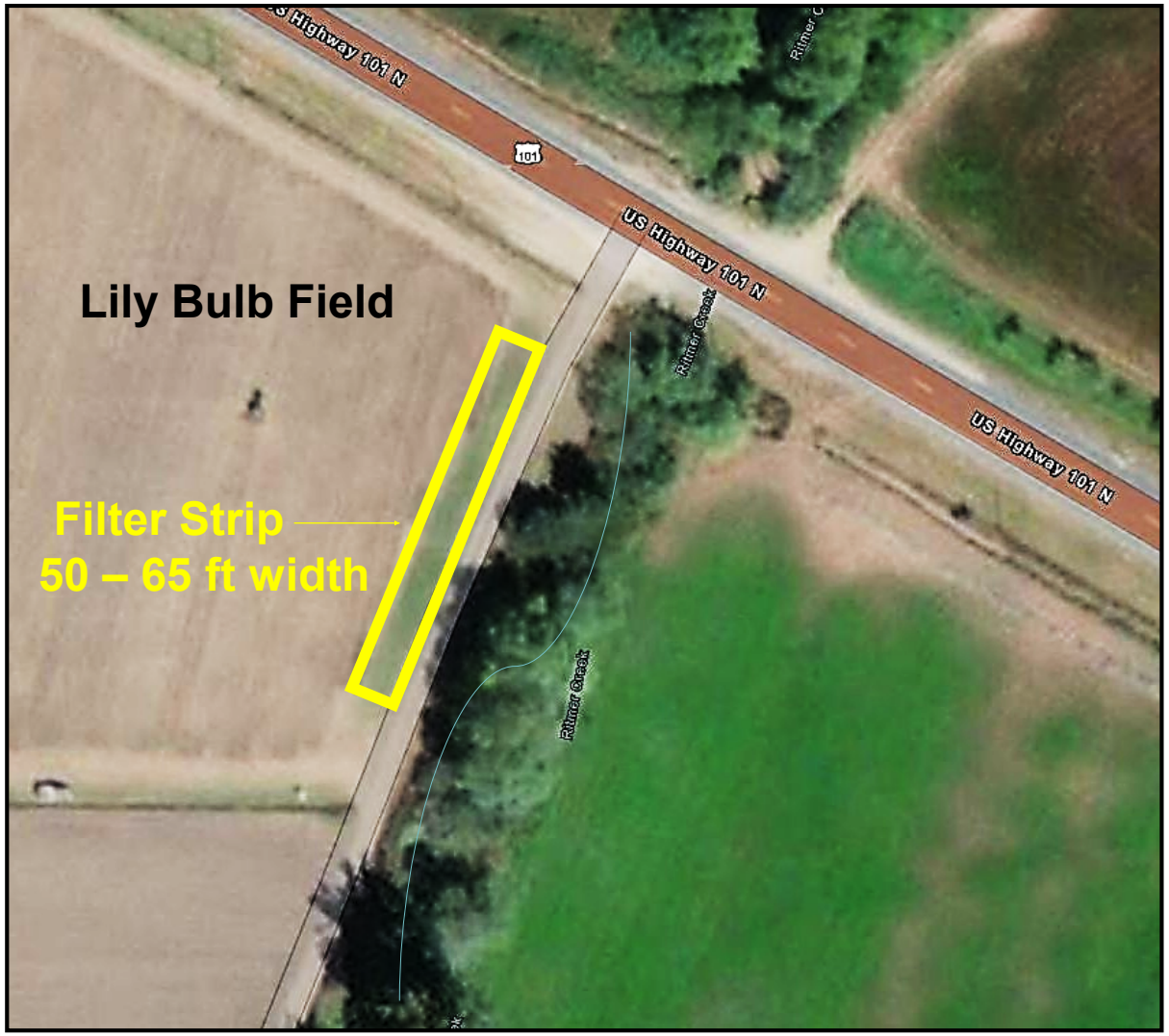
Spray Buffer on Ritmer Creek

Water Boards

Field 19 – Ritmer Creek - June 2010

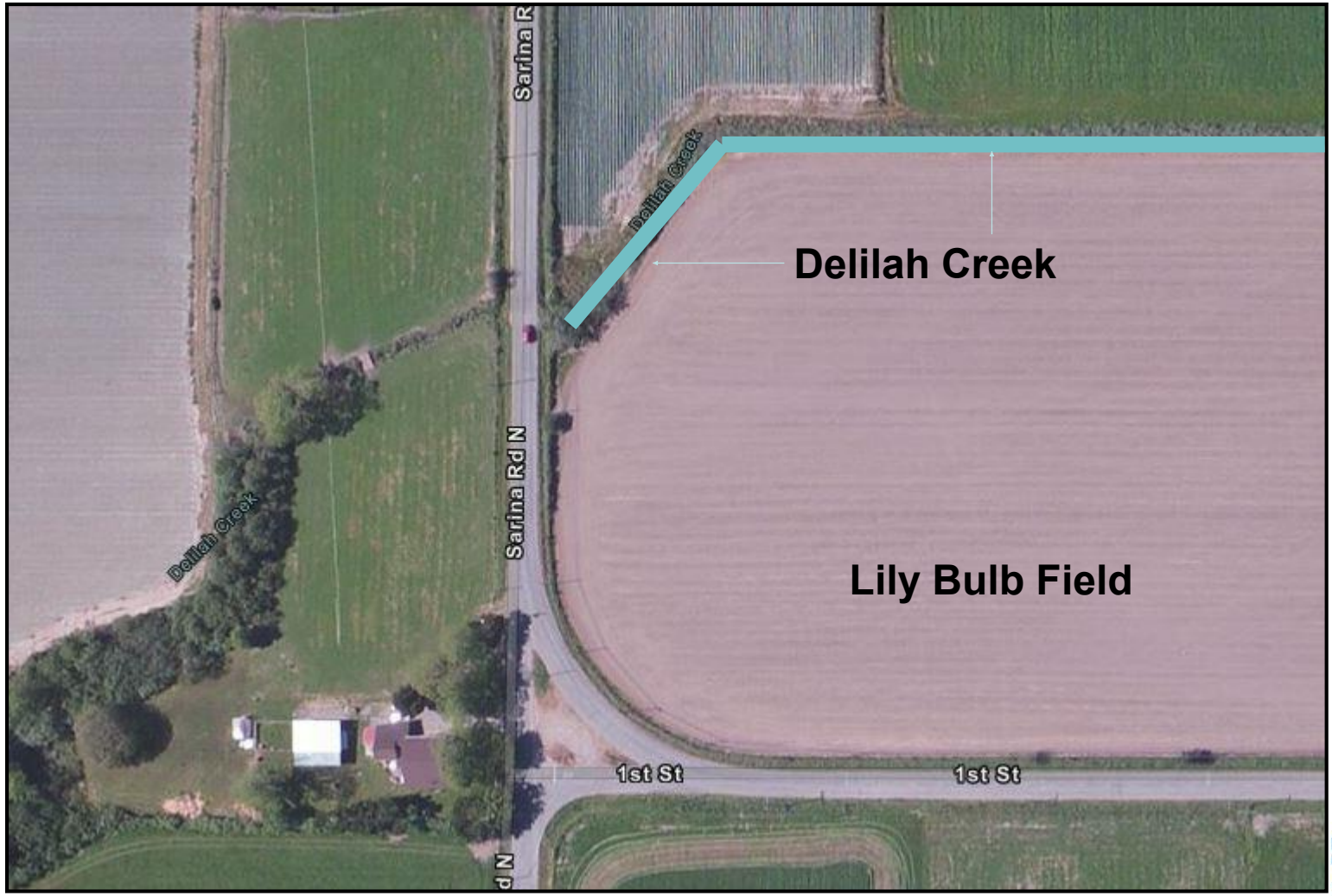
Water Boards

Field 19 – Ritmer Creek Buffer - September 2018



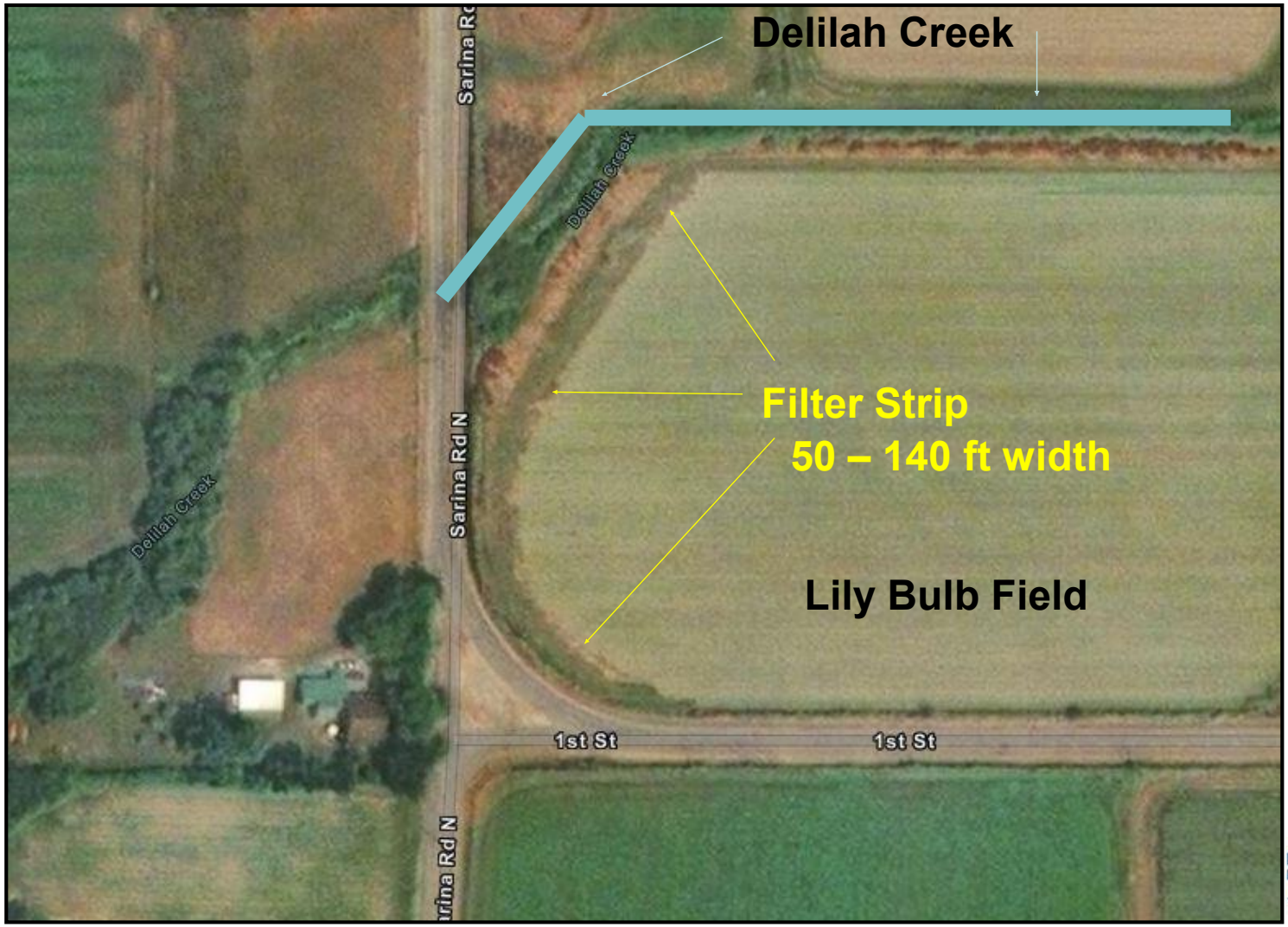
Water Boards

Field 70 - Delilah Creek - June 2010



Water Boards

Field 70 - Delilah Creek Buffer - August 2017



Water Boards

Delilah Creek Buffer August 2019

Water Boards

SRPWQMP Sections

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Water Boards

Implementation Tracking and Reporting

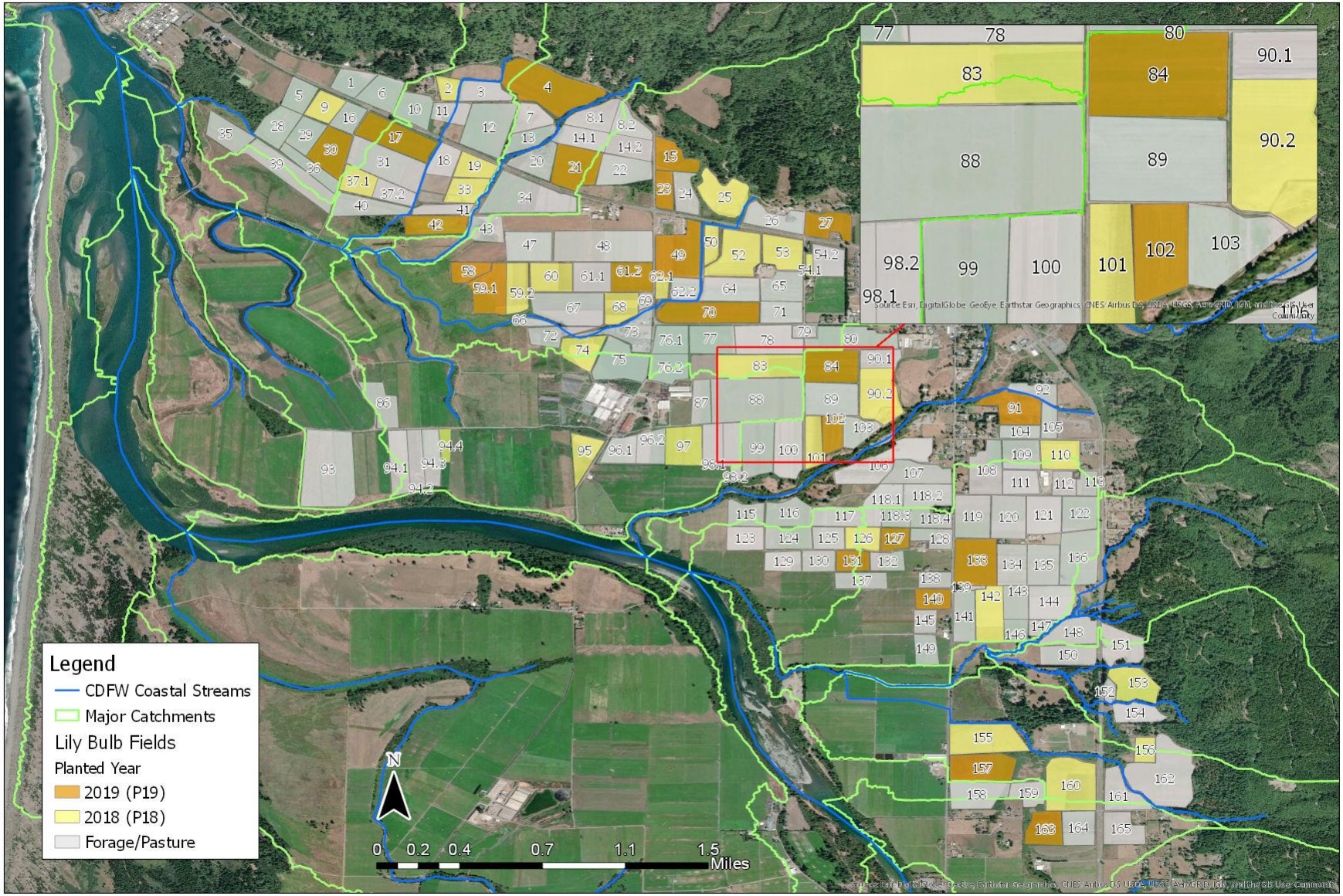
- Track practices and field rotation annually
- Growers implement a diverse set of practices with coverage over a broad area of the Smith River Plain
- Compare implementation patterns on the ground to sample results instream
- Adjust practices based on feedback
- Increase effectiveness of practices over time

Water Boards

Smith River Plain Water Quality Management Plan

Management Practice Reporting

Field Identification



Field Practices Reporting

Year:		**Date:**	
Field ID:		Acreage:	
Rotation Years:	Choose an item.	Rotation Phase:	Choose an item.

Check	Water Quality Management Practice Implementation (Lily Bulbs)	Notes
☐	Filter Strip	
☐	Field Size Reduction	
☐	Contour Farming	
☐	Precision Land Forming	
☐	Row Arrangement	
☐	Cover Crop	
☐	Enhance Soil Infiltration	
☐	Critical Area Planting	
☐	Soil Amendments	
☐	In Furrow Dams	
☐	Field Border (includes field berms)	
☐	Plant Residue Tillage Management	
☐	Vegetative Barrier	
☐	Grassed Waterway	
☐	Stormwater Diversion	
☐	Field Isolation	
☐	Grade Stabilization Structure	
☐	Maintain Stream Setbacks	
☐	Riparian Area Support	
☐	Stream Livestock Crossing Control	
☐	Livestock Water Facility Access Management	
☐	Livestock Barriers	
☐	Prescribed Grazing in Sensitive Areas	
☐	Follow Dairy Nutrient Guidelines	
☐	Nutrient Budget	
☐	Soil Testing	
☐	Irrigation Water Testing	
☐	Use of Beneficial Cover Crops	

Water Boards

Management Practice Implementation Tracking

Field Identification Number	Total Acreage	Percent Acreage	Total Fields	Percent of Fields
Acreage	324		25	
Filter Strip	324	100%	25	100%
Field Size Reduction	288	89%	21	84%
Contour Farming	91	28%	8	32%
Precision Land Forming	324	100%	25	100%
Row Arrangement	293	91%	23	92%
Cover Crop	50	15%	5	20%
Plant Residue Tillage Management	242	75%	20	80%
Soil Amendments	261	81%	19	76%
In Furrow Dams	50	15%	5	20%
Field Border (includes field berms)	267	82%	19	76%
Plant Residue Tillage Management	242	75%	20	80%
Vegetative Barrier	195	60%	15	60%
Grassed Waterway	313	97%	24	96%
Stormwater Diversion	124	38%	10	40%
Field Isolation	96	30%	7	28%
Grade Stabilization Structure	0	0%	0	0%
Maintain Stream Setbacks	130	40%	9	36%
Riparian Area Support	91	28%	7	28%
Stream Livestock Crossing Control	91	28%	7	28%
Livestock Water Access Management	91	28%	7	28%
Livestock Barriers	91	28%	7	28%
Prescribed Grazing in Sensitive Areas	50	15%	5	20%
Follow Dairy Nutrient Guidelines	129	40%	11	44%
Nutrient Budget	0	0%	0	0%
Soil Testing	129	40%	11	44%
Irrigation Water Testing	0	0%	0	0%
Use of Beneficial Cover Crops	129	40%	11	44%

SRPWQMP Sections

1) Cultural and Biological Resources
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7) Adaptive Management

Water Boards

Adaptive Management Monitoring Program

- Monitoring sampling and analysis for 2019-2021 being done by Regional Water Board
- Monitoring objectives:
  - ✓ Standardize locations, methods, and protocols
  - ✓ Assess background concentrations of copper
  - ✓ Support assessment of BMP program
  - ✓ Provide data to run model that assesses toxicity of copper
- Staff is consulting with growers on access protocol
- Analytical costs estimated up to max $60,000/year
- Extent and timeframe of monitoring being developed

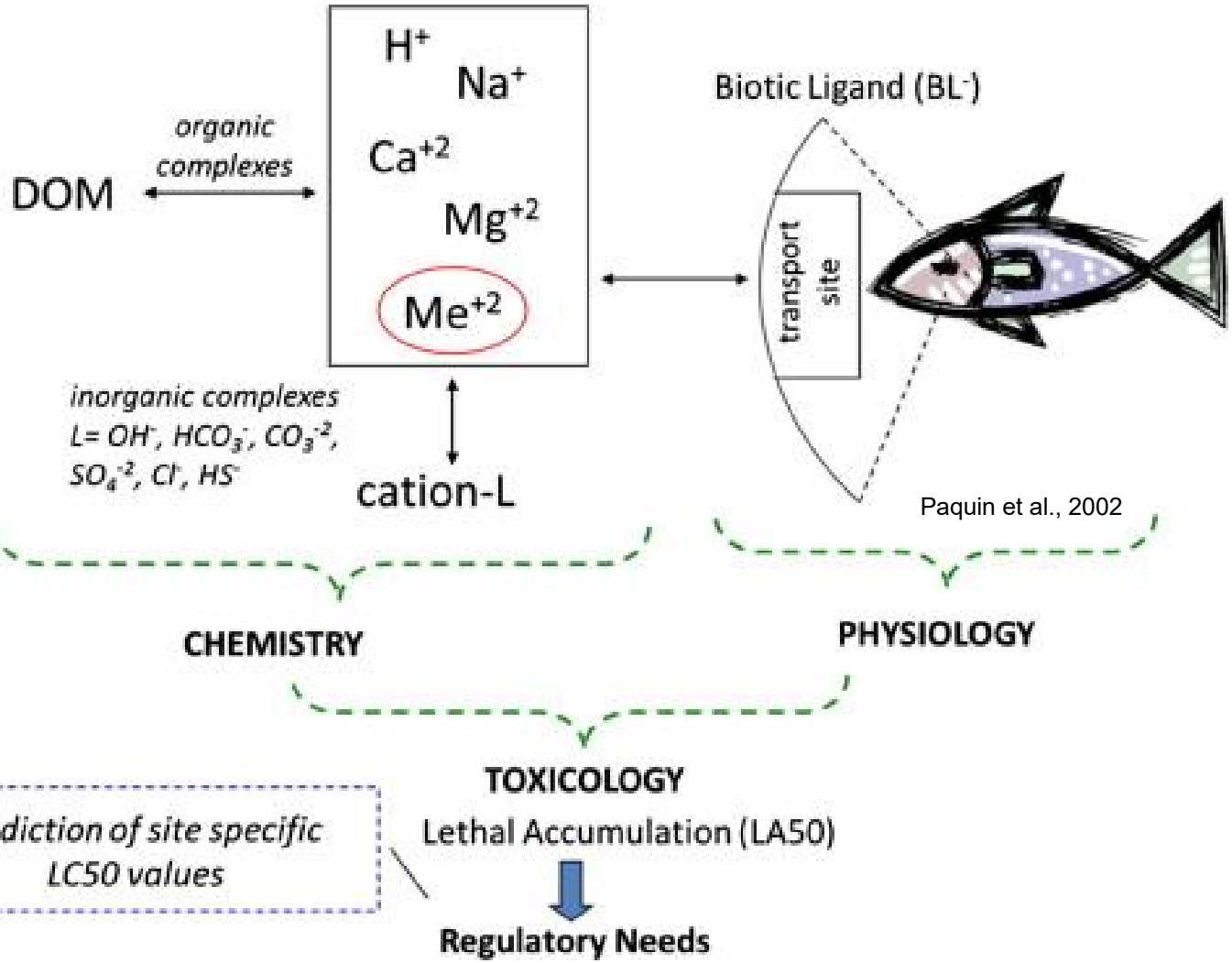
Water Boards

Toxicity Assessment Endpoints

- Basin Plan Chapter 3 Water Quality Objectives Section 3.3.16 Toxicity
  - ✓ Waters shall not contain toxic substances in concentrations that are toxic to, or that produce detrimental physiological responses in human, plant, animal, or aquatic life.
- Basin Plan provides general guidance on how to determine toxicity
- Use of USEPA 2017 Aquatic Life Benchmarks for pesticides
- Copper toxicity requires more complex assessment

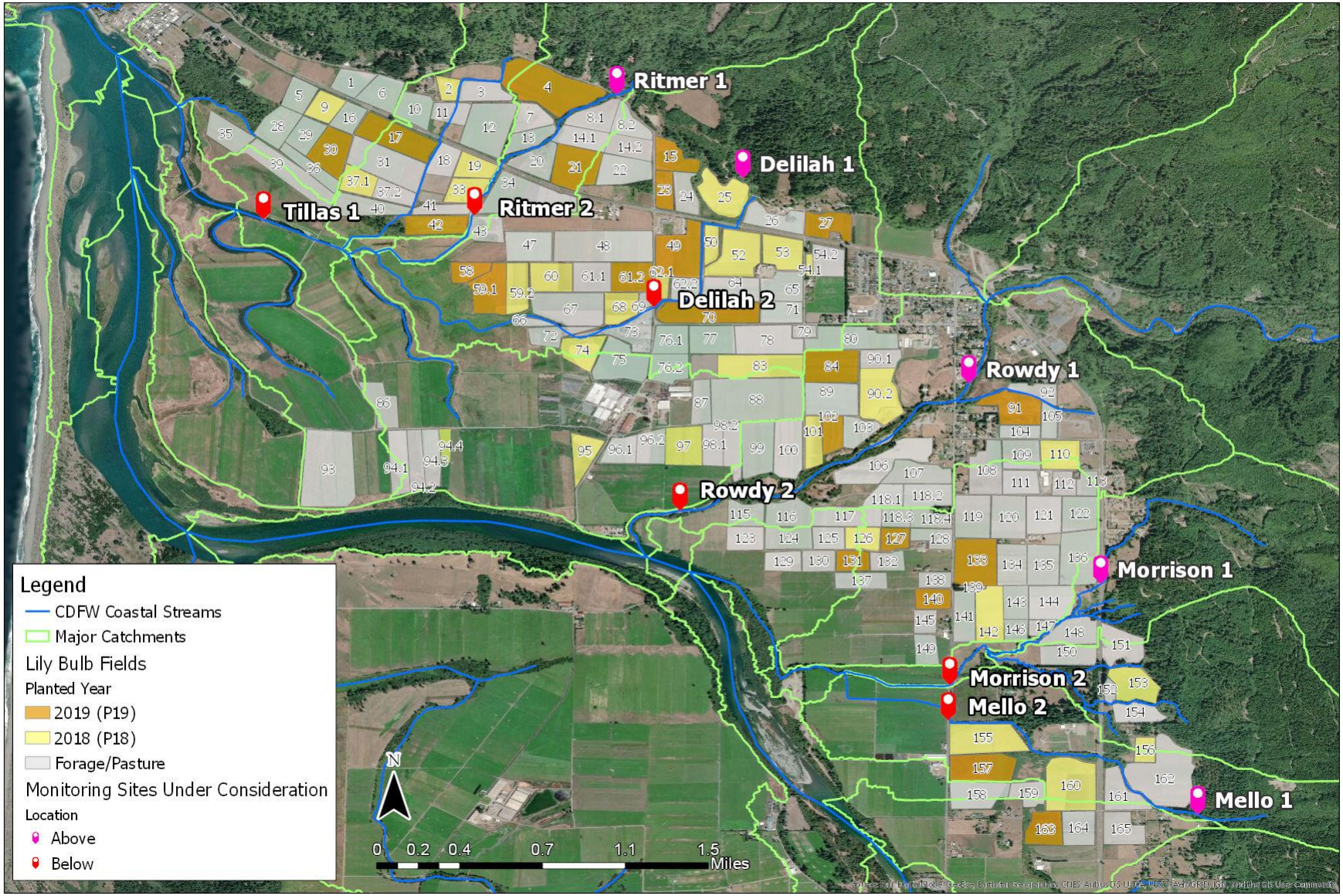
Water Boards

Biotic Ligand Conceptual Model



Water Boards

Smith River Plain WQ Monitoring Sites



Stations / Parameters / Frequency matrix

UP and DOWN STREAM SITE	RITMER CREEK	FIELD MEASUREMENT	BLM PARAMETERS	COPPER	PESTICIDES
	DELILAH CREEK				
	MELLO CREEK				
	ROWDY CREEK				
	MORRISON CREEK				
DOWNSTREAM ONLY	TILLAS SLOUGH				
BACKGROUND	SMITH RIVER *				

* Smith River not sampled for pesticides

- 12 sites total.
- Each site will be sampled 3 times during wet weather, runoff events.
- Pesticides will be sampled only 2 out of 3 events.

Water Boards

SRPWQMP Sections

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Water Boards

Adaptive Management

- Growers continue to implement new and revised practices
- Implementation reporting will continue to document field rotations and BMP implementation
- Regional Water Board staff will conduct sampling over 2019-2020 and 2020-2021 growing seasons
- Assess effectiveness of water quality management practices
- Growers will adapt practices based on sampling results for the next field rotation

Water Boards

Next Steps

- Draft SRPWQMP available for stakeholder input and written comment in spring of 2020
- After comment period, the Plan will be finalized and approved by EO
- After approval, the development team will continue to adaptively manage the program
- Regular updates to the Board with opportunities for public comment
- Lessons learned from SRPWMQP will be incorporated into a permit for discharges from lily bulb operations
- Separate public comment period for draft permit

Water Boards

Questions and Comments

Water Boards