

Understanding the potential impact of pesticide no-spray buffers using geospatial information

Chemical Producers & Distributors Association
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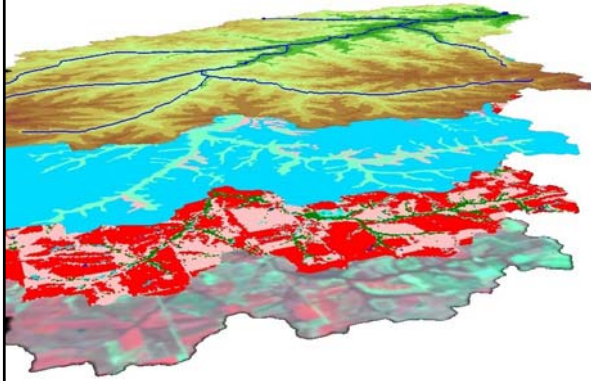


Outline

- Introduction on the use of spatial approaches in order to better understand the potential impact specific no-spray buffers may have
- Four case studies of differing spatial scales and different 'end points'
 - Regional scale, amount of crop affected
 - Local scale, including economic impacts
 - National scale, watershed level results
 - Water body scale modeling of environmental concentrations based on landscape information and varying no-spray distances



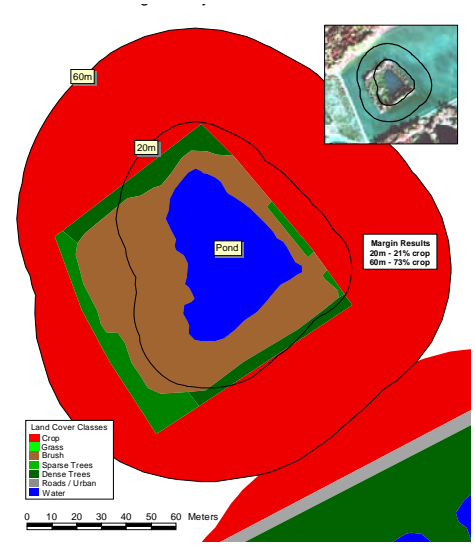
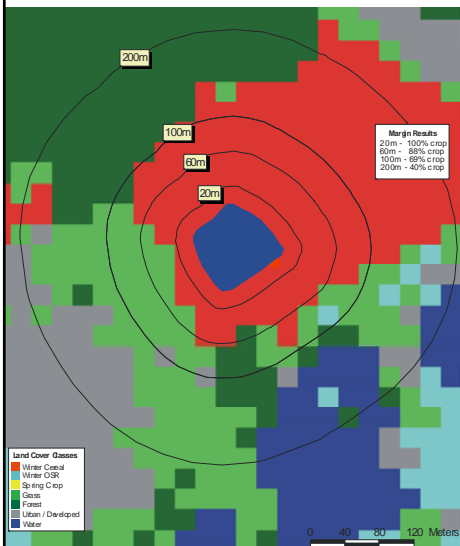
What is a GIS and Geospatial Information?



- GIS = Geographic Information System
- Works with all data having a location (i.e., 'geodata')
- Allows combination of multiple data 'layers', from simple to complex analyses of spatial relationships

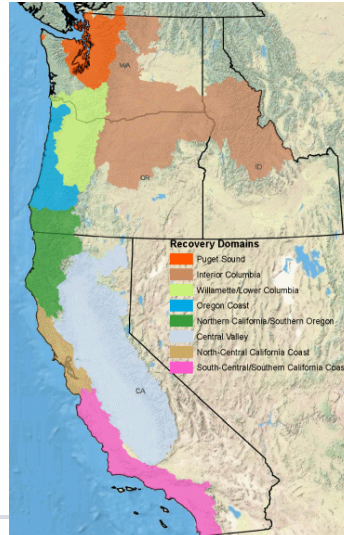


Buffering Within a GIS



Proximity of Agriculture to Salmonid Habitat in Pacific NW

- Mapping effort to estimate the proximity of agriculture to the critical habitats of five threatened and endangered distinct population segments (DPSs) of Pacific steelhead
- In response to the US EPA pesticide risk assessment and NMFS biological opinion related to salmonids



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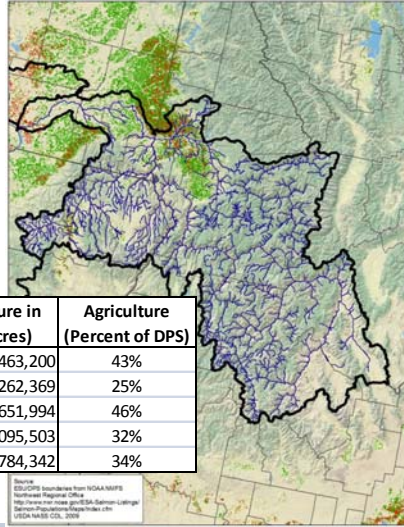
Proximity of Agriculture to Salmonid Habitat in Pacific NW

- For the five DPSs, agricultural cropping statistics were generated using a Geographic Information System (GIS) for multiple buffer distances from surface water identified as Critical Habitat by the National Marine Fisheries Service (NMFS).
- The distances used to generate the buffer zones were 100ft, 250ft, 500ft, 750ft, and 1,000ft.
- The agricultural lands examined included vegetables, grains, and a comprehensive "all agriculture" category.



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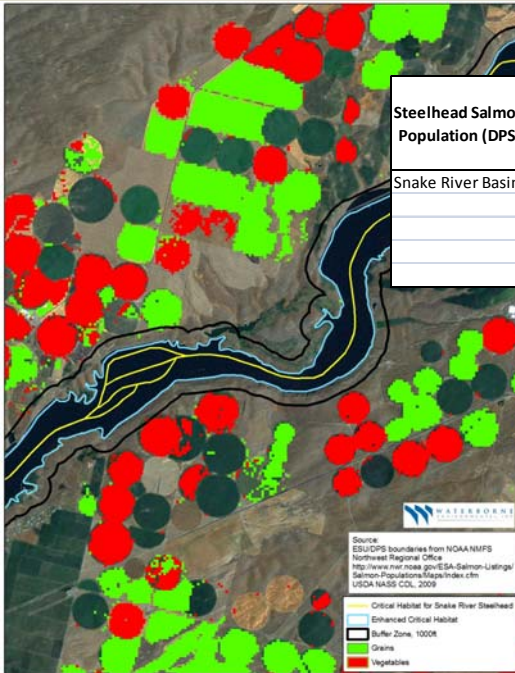
Distinct Population Segments / Evolutionarily Significant Units



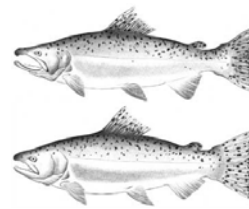
Steelhead Salmon Population (DPS)	DPS Area (Acres)	Agriculture in DPS (acres)	Agriculture (Percent of DPS)
Middle Columbia River	17,161,509	7,463,200	43%
Upper Columbia River	6,116,022	1,262,369	25%
Snake River Basin	18,794,414	4,651,994	46%
South-Central California Coast	4,532,941	2,095,503	32%
Southern California	2,459,557	784,342	34%

Source: ES/DPS boundaries from NOAA/NMFS Northwest Regional Office
<http://www.nwr.noaa.gov/ESA-Salmon-Listing/Salmon-Populations/Maps/index.cfm>
 USDA NASS CCL, 2009

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Steelhead Salmon Population (DPS)	Buffer Zone	Total Buffer Area (acres)	% of DPS Area	Total Agriculture in Buffer (acres)	% of DPS Agriculture
Snake River Basin	100ft	283,744	2%	28,798	<1%
	250ft	561,547	3%	74,716	2%
	500ft	1,015,394	5%	167,689	4%
	750ft	1,459,087	8%	263,455	6%
	1000ft	1,893,146	10%	359,544	8%



Source: ES/DPS boundaries from NOAA/NMFS Northwest Regional Office
<http://www.nwr.noaa.gov/ESA-Salmon-Listing/Salmon-Populations/Maps/index.cfm>
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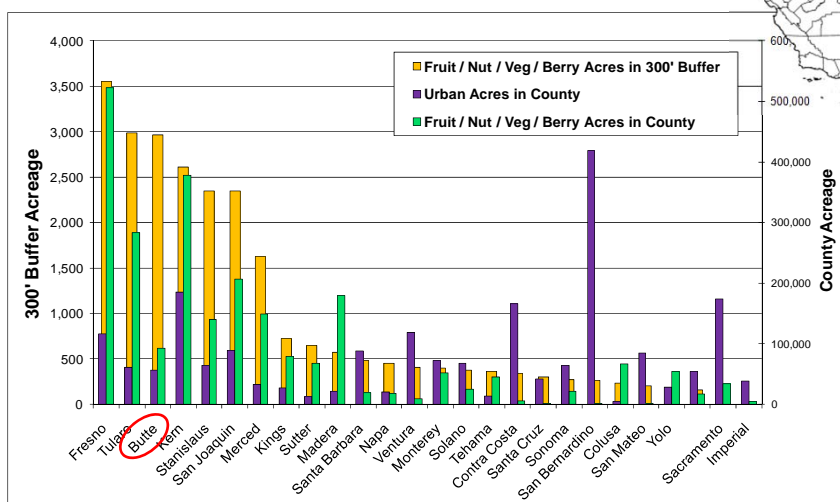
Legend:
 Critical Habitat for Snake River Steelhead
 Enhanced Critical Habitat
 Buffer Zone, 1000ft
 Grass
 Vegetables

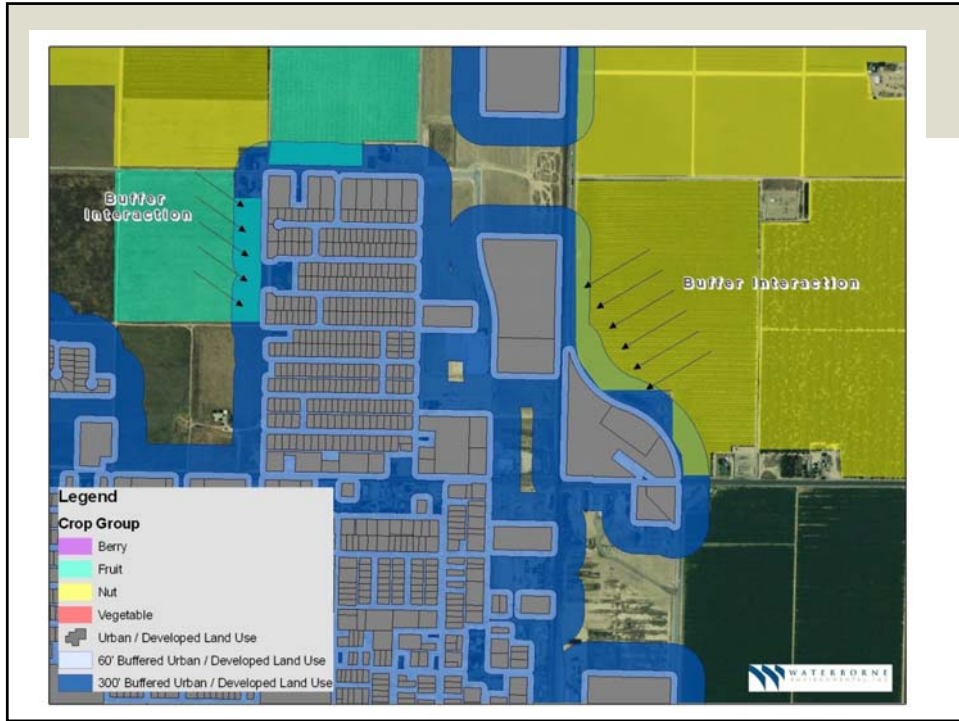
Data Used in Analysis

- Focused specifically on product labeled crops and included various fruit, nut and vegetable crops
 - Other crops not included in analysis
- Residential / developed land use is the aggregation of residential, commercial, recreational, institutional, etc.
- Spatial data was collected from the Generic Endangered Species Task Force (GESTF) Crop Use Sites Dataset, 2007 USDA NASS CDL and Tele Atlas StreetMap
- Including high resolution, county-level cropping and residential spatial data acquired from local governments

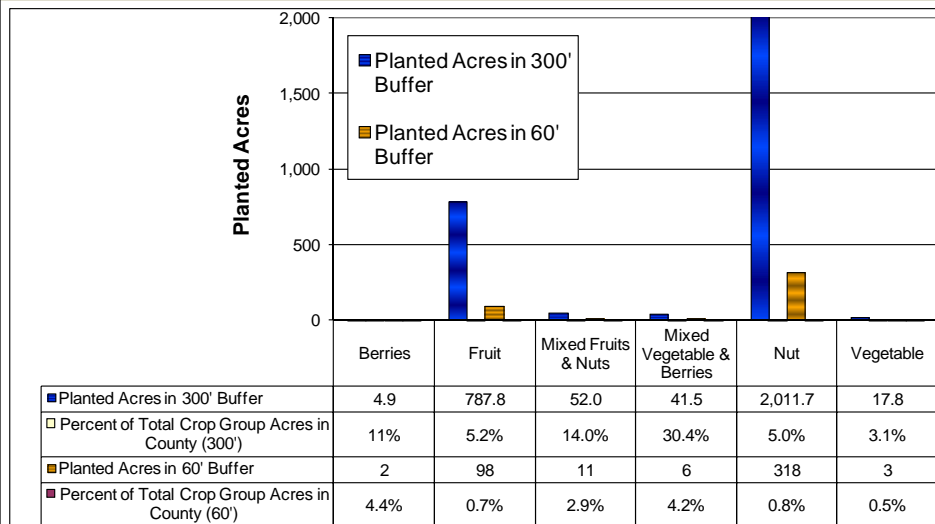


California Analysis





Amount of Crop in 60' and 300' Buffers



Butte County Agricultural Statistics

Harvested Acreage & Dollar Value by Commodity Group

Butte County - 2008		
Commodity	Harvested Acres	Dollar Value
Fruit & Nut Crops	86,672	\$232,981,000
Field Crops & Rangeland	375,030	\$266,206,000
Vegetable Crops	690	\$720,000
Seed Crops	5,702	\$14,853,000
Total	468,094	\$514,760,000

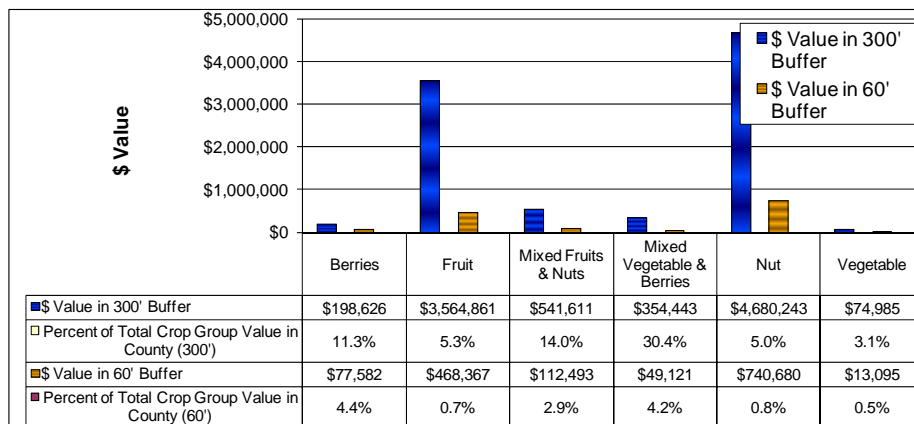
data source:

As reported in the 2008 Butte County Agricultural Crop Report

http://buttecounty.net/Agricultural%20Commissioner/~/_media/County%20Files/Agriculture/Public%20Internet/2008%20Crop%20Report.ashx



Calculation of Economic Impact



Comparison of Acreage and Value Against Reported Values

BUTTE - 2004 ¹						
	Calculated Acres	Reported Acres	% Difference	Calculated \$ Value	Reported \$ Value	% Difference
Berry	43	82	- 48%	\$1,831,922	-	
Fruit	15,013	14,375	+ 4%	\$55,419,373	-	
Mixed Fruit & Nut	371	-	-	\$3,865,907	-	
Mixed Vegetable & Berry	137	-	-	\$1,166,706	-	
Nut	40,410	41,554	+ 1%	\$94,012,388	\$96,673,718	- 3%
Vegetable	576			\$2,290,319	-	

¹ the comparison was performed using the 2004 Crop Report to match the year of the cropping spatial data
 - the value was not reported in county, state, or Ag Census report
 " reflects 2008 values

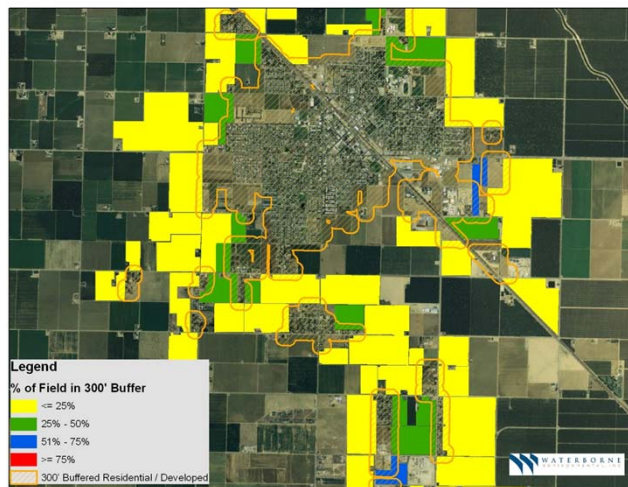
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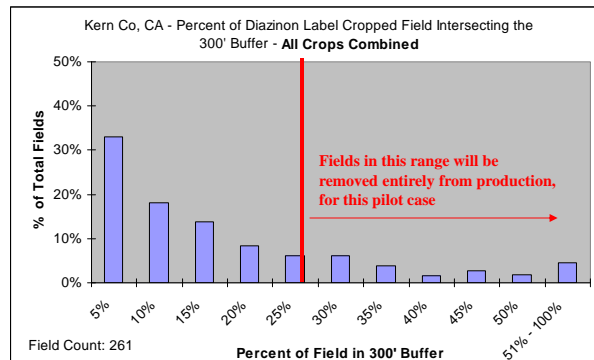
Revised Scenario – Kern County

- Removal of entire field if a large enough portion fell within the buffer

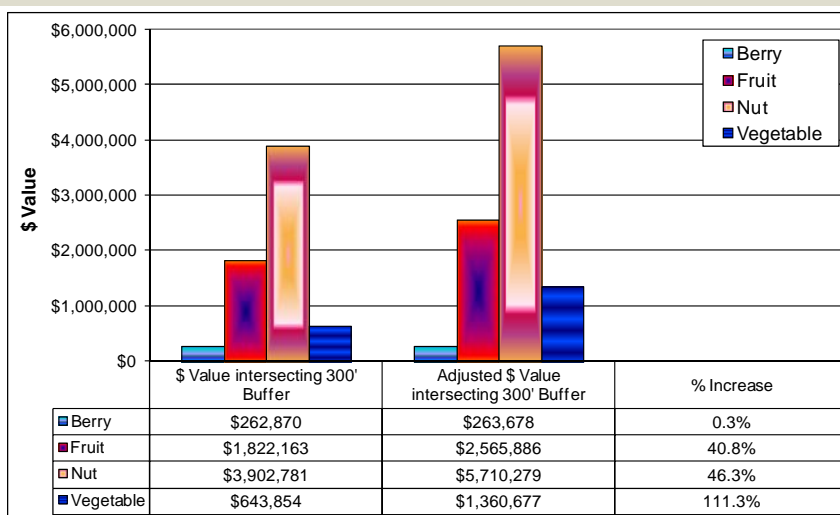


Percent of Field Within 300' Buffer

- Examination of distribution – 25% of field in buffer used as example threshold



Results for Field Removal – Kern County



National Agriculture Proximity to Surface Water

- The objective of the overall national aquatic exposure analysis was to describe the relative potential for pyrethroid entry into aquatic systems via spray drift and erosion (sponsored by the PWG)
- Summarized for 61,000 individual watersheds across the contiguous US using a GIS and publicly available datasets.
- Specifically for today's presentation ...
 - Characterize potential for entry via spray drift based on spatial proximity of crop to surface water within a watershed



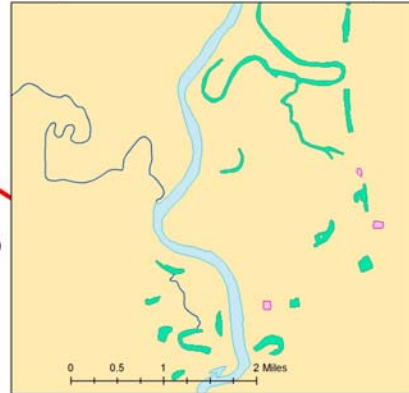
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Proximity Processing Steps

- Divide surface water into four classes
 - Stream, river, lakes, ponds
- Generate four spatial buffers around each water class (60, 120, 360 and 480 m)
- Intersect buffers with cropland (row crop, small grains, and fallow combined)
- Summarize crop area in buffers by watershed, water class and buffer distance

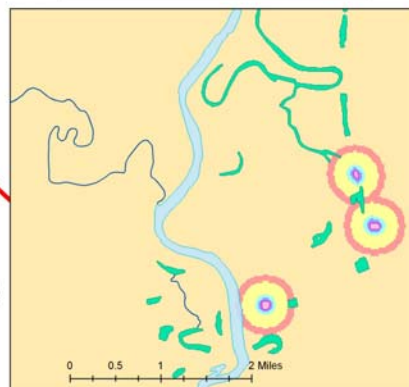
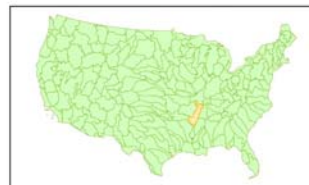
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Water Body Classes



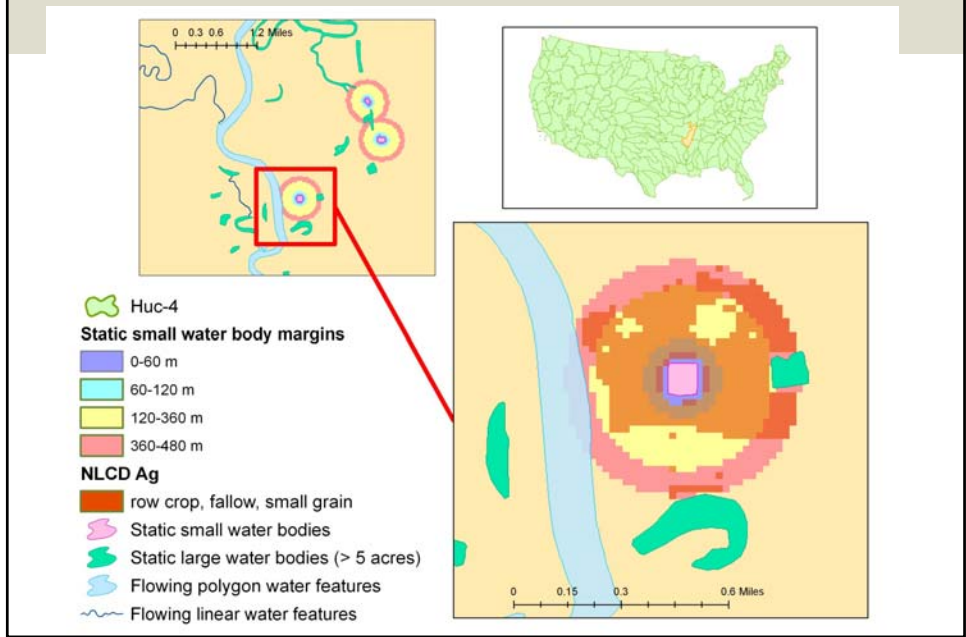
- Huc-4
- Static small water bodies (≤ 5 acres)
- Static large water bodies (> 5 acres)
- Flowing polygon water features
- Flowing linear water features

Generating Buffers



- Huc-4
- Static small water body margins**
 - 0-60 m
 - 60-120 m
 - 120-360 m
 - 360-480 m
- Static small water bodies (≤ 5 acres)
- Static large water bodies (> 5 acres)
- Flowing polygon water features
- Flowing linear water features

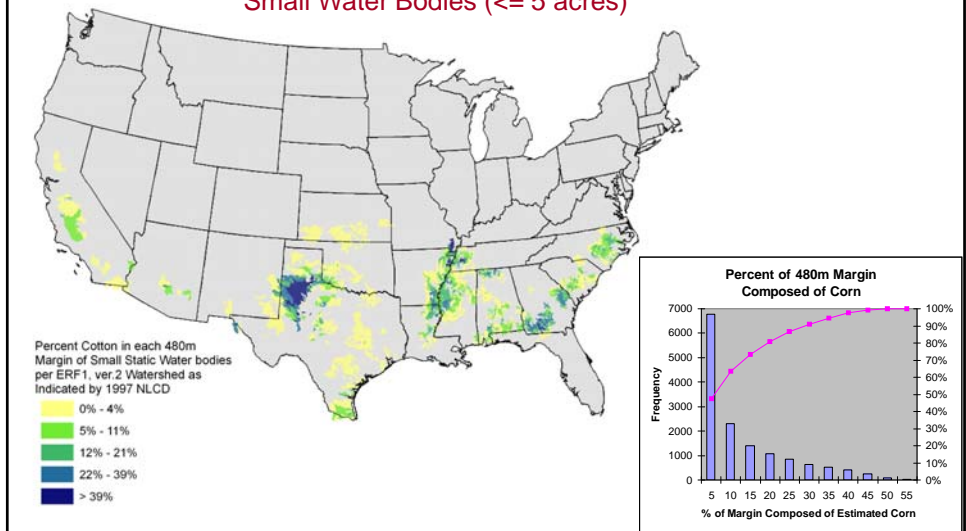
Cropland Within Buffers



Results

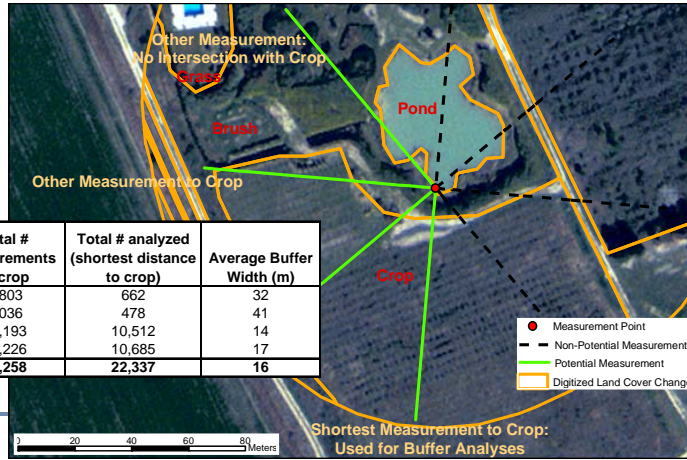
(Cotton = combination of cropland + Ag Census)

Estimated Cotton Density within 480m of Small Water Bodies (<= 5 acres)



Water Body-Level Crop Proximity and Natural Buffer Width

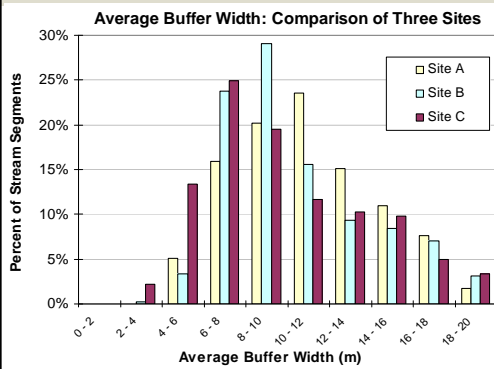
- Measure distance to crop for sample points along perimeter of the water body
- Characterize the width and land cover types within the buffer



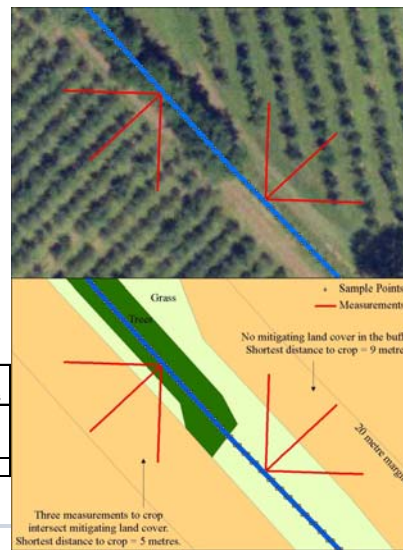
Class	Total # of measurements	Total # measurements to crop	Total # analyzed (shortest distance to crop)	Average Buffer Width (m)
Streams	3,004	1,803	662	32
Rivers	2,592	1,036	478	41
Canals	60,904	50,193	10,512	14
Ponds	49,648	38,226	10,685	17
All Water	116,148	91,258	22,337	16



Distribution of Buffer Widths and Buffer Composition

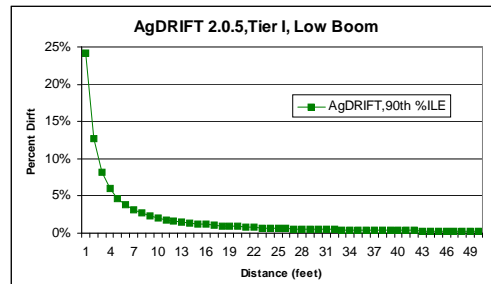
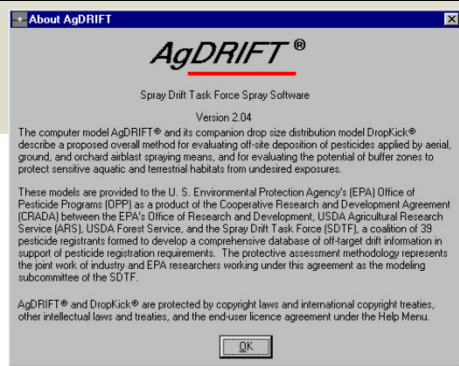


Site	Number of Stream Segments	Average Buffer Width: All Distances
Site A	119	10.1
Site B	354	8.8
Site C	1,008	7.9
All Water	1,481	8.3



AgDRIFT Model

- Calculates the fraction of spray that may deposit on off-site areas
- Developed by the Spray Drift Task Force (SDTF) in conjunction with EPA and USDA
- Tier 1 – conservative screening assessment
- Tier II and Tier III requiring more knowledge of spraying conditions, etc.
- Apply Tier 1 deposition curve to measurements from the landscape

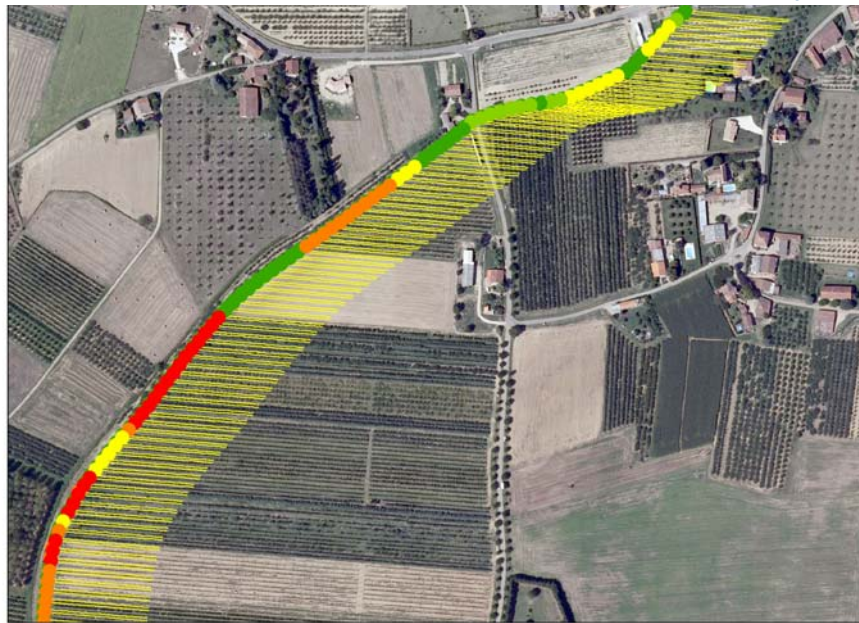


A User's Guide for AgDRIFT 2.0.05: A Tiered Approach for the Assessment of Spray Drift of Pesticides, C.D.I. Report No. 01-02, Jan 2001

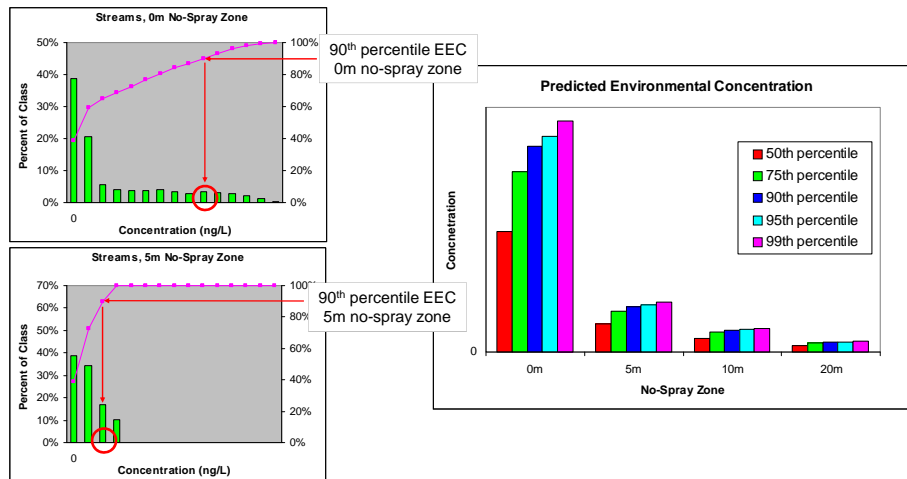
Estimating Landscape Level Concentrations



Exposure and Landscape Variability



Implementation of No-Spray Buffers and Effect on Estimated Concentrations



Summary

- Introduction of assessing potential impact of no-spray buffers, using examples:
 - Regional, endangered species
 - Local, including economic impacts
 - National, watershed level results
 - Modeling environmental concentrations based on landscape level information and no-spray distances
- Utilization of geospatial information within a Geographic Information System (GIS) to better understand potential impacts



Chemical Producers & Distributors Association 2011 Annual Adjuvants & Inerts Conference

THANK YOU

Acknowledgements:

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