

Best Management Practices for Agricultural Pesticide Runoff. Part II.



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Mitigation

PEST

Integrated Pest
Management

PESTICIDE

Label evaluation

Pesticide selection

Label directions

Equipment
Calibration

Application
Technology

BEST MANAGEMENT PRACTICES

Buffer Zone

★ Water quality treatment
pond

Recirculating system

★ Constructed Wetland
Vegetated Buffer Strip

Grassed waterway

Cover crops

Woodchip/charcoal filters

Bioreactors

★ PAM-Ca

★ Degradation Enzymes

This will be the focus of this presentation

More BMPs

Woodchip Bioreactors



**Winter pea, crimson clover, and cereal rye
cover crop mix**

From: NRCS, USDA

Filter/Buffer Strips



Woodchip Bioreactors

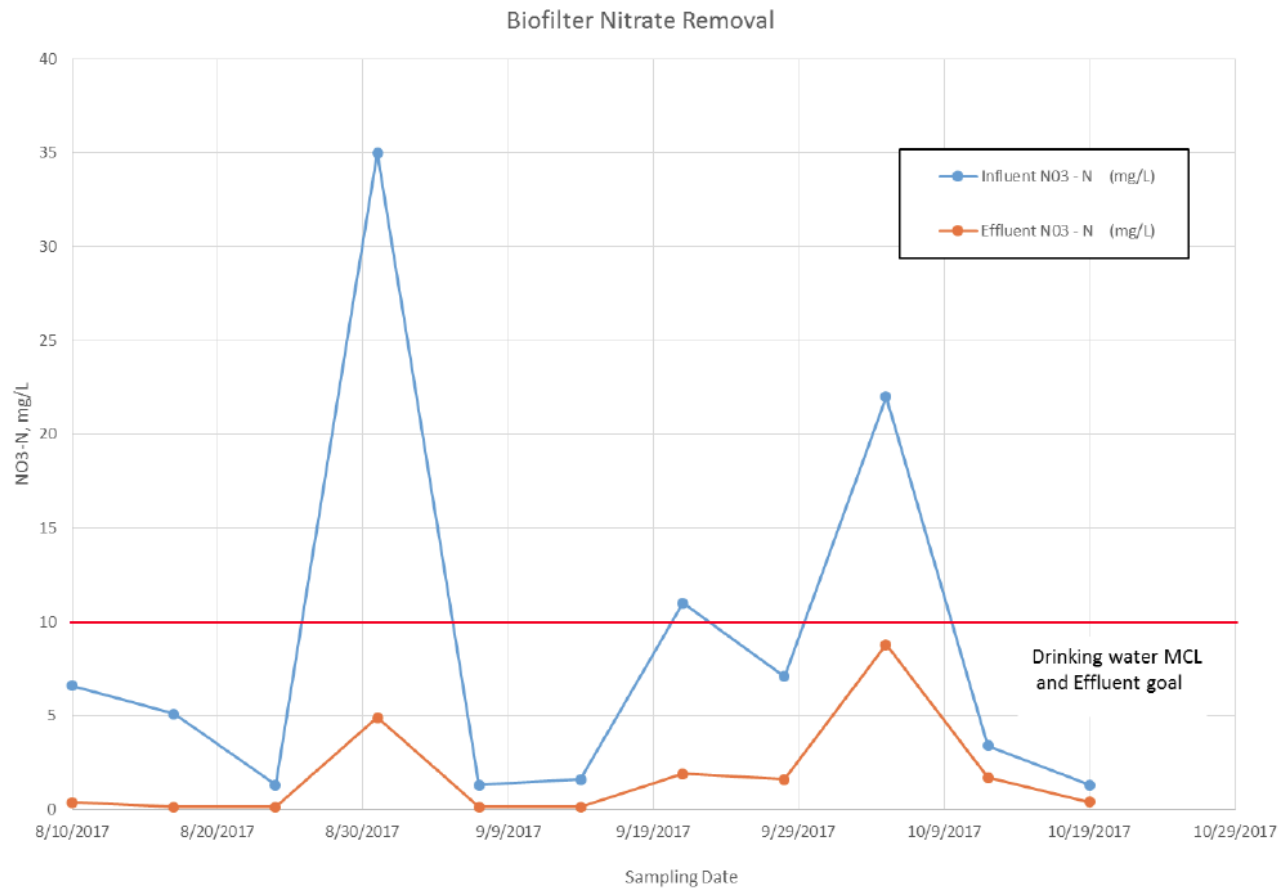
- Trenches filled with woodchips built to allow water to flow through for treatment purposes
- Woodchips = carbon source for anaerobic bacteria
- Removal dependent on length of time in the reactor (retention time), temperature, woodchip source, etc.



Jim May Park in Santa Maria

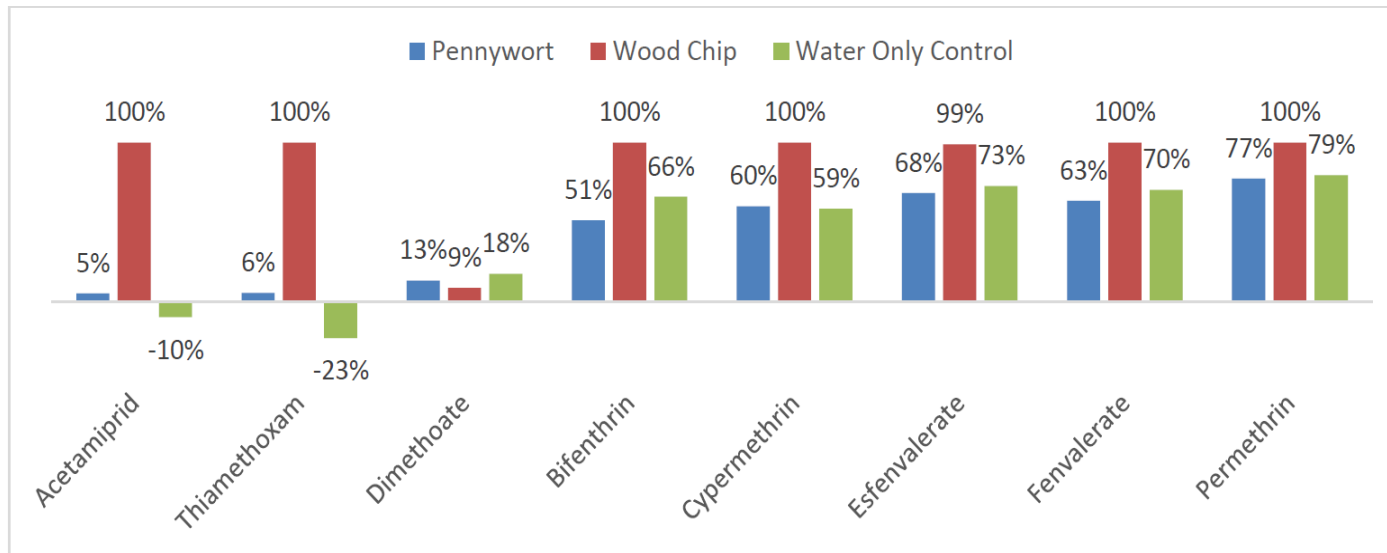
Nitrate Removal

- Woodchip bioreactors are designed for nitrate removal
- Shown to be effective in nitrate reduction



Pesticide Removal

- DPR and others are doing a lot of research on these systems, and they show promise:



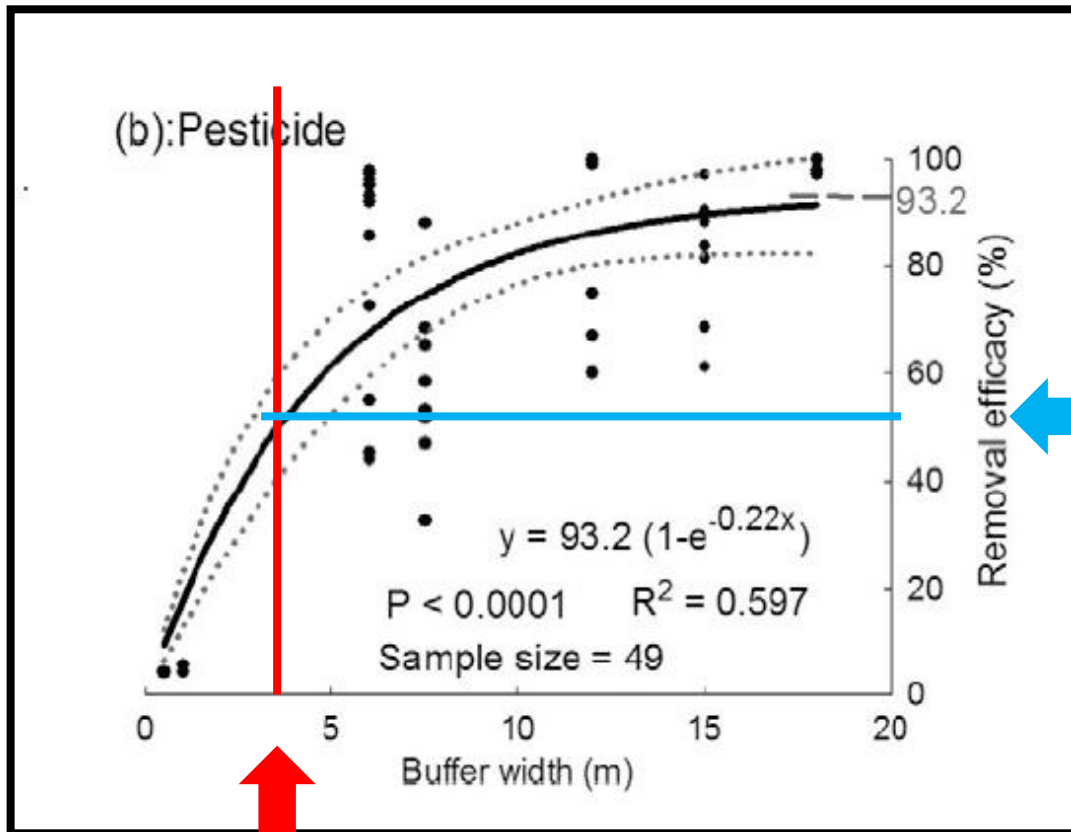
% of pesticide removed in woodchip
bioreactors

Buffer Strips

A small area or strip that slows down runoff, increases infiltration, traps sediments, and removes pollutants (pesticides, nutrients, pathogens).

Required by label for bifenthrin

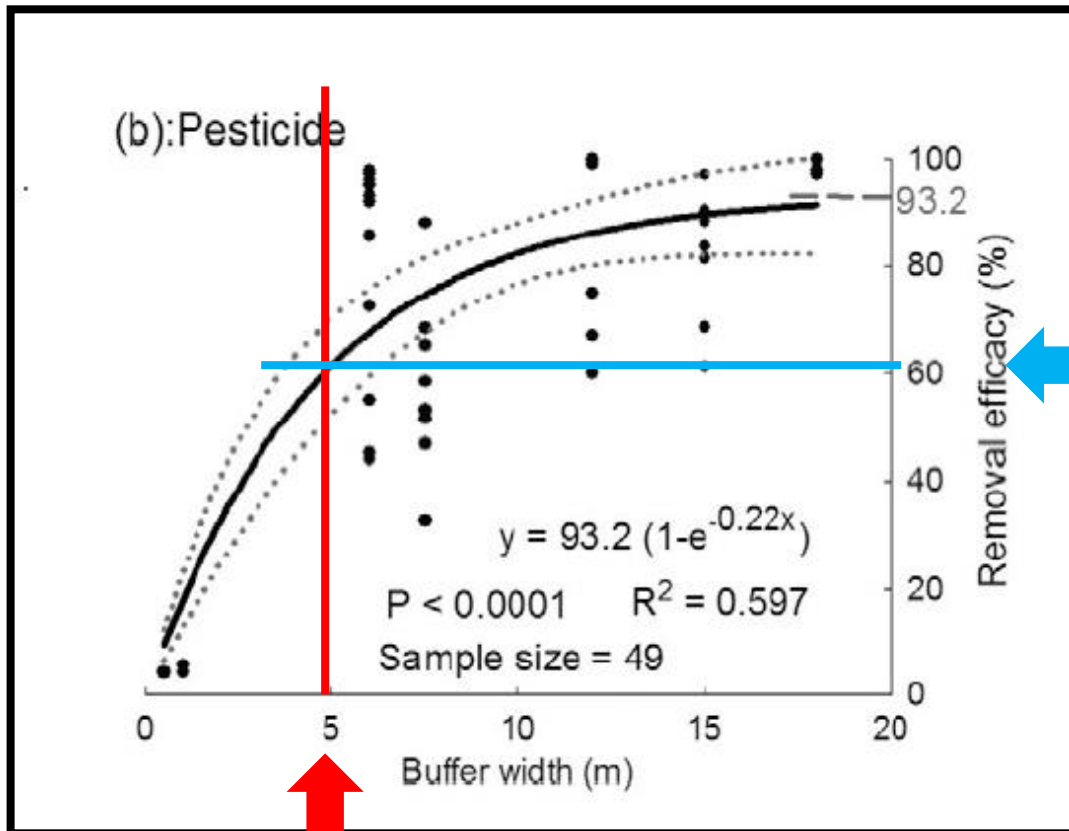
- Minimum of **10 feet** between field and aquatic habitat
- Remove up to:
 - 75% or more of sediment
 - 60% or more of pathogens
 - 50% or more of nutrients and pesticides



Predicted
removal
efficiency of
pesticides is
~50%

Zhang, et al., 2010

Minimum buffer required by
label!



Increase removal

Increase the length

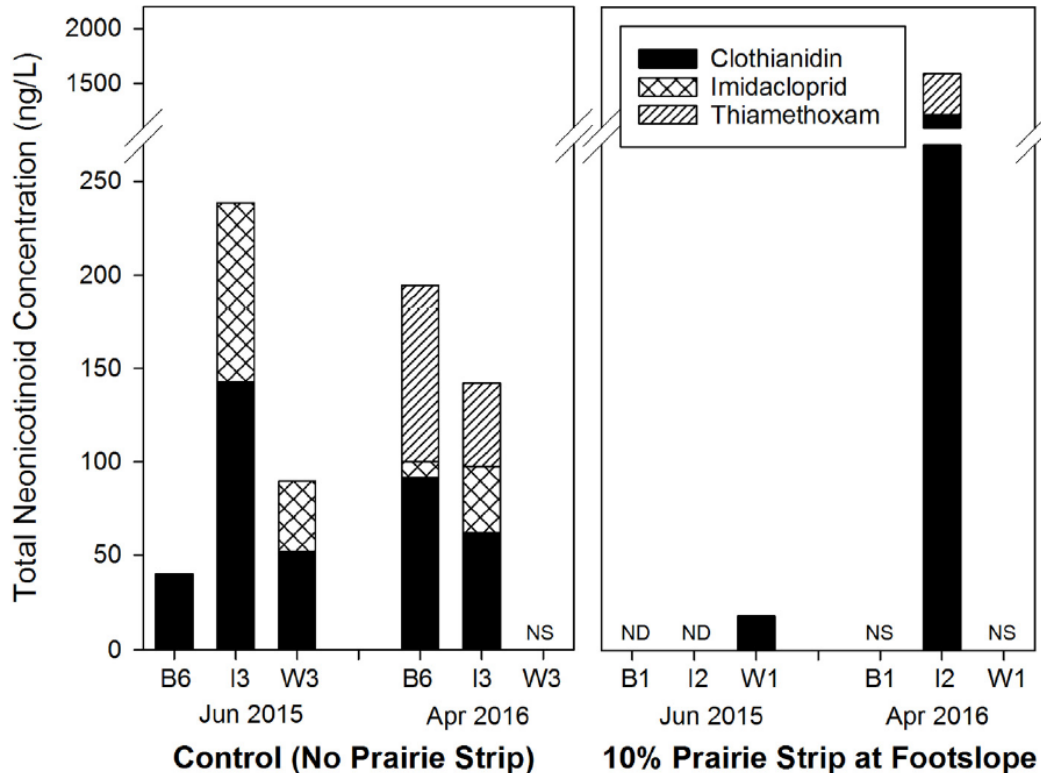
Zhang, et al., 2010

Width is not the only factor:
Slope and vegetation type play
a role; can **optimize** for your
situation

Buffer Strips

Buffer strips also reduce off-site movement of neonicotinoids.

Surface Water Runoff



100% row crop

90% row crop
10% strips

Slope

B1 - 7.5%

I2 - 6.1%

W1 - 10.3%

Different soil types

Cover Crops

- Vegetation that protects the soil during fallow periods.
- Prevention of eroding soils (with sorbed pesticides)
- Non-structural BMP, preventative, increased water infiltration
- Cover crop termination guidelines



Other benefits

- Preventing erosion is just one benefit
 - Improve soil health
 - Enhance water bioavailability
 - Smother weeds
 - Help control pests and diseases
 - Supply nutrients
 - Cover crops increase yield

Less erosion = Sediment bound pesticides

More water infiltration = Water-soluble pesticides

Maintenance

All BMPs require maintenance and management

- Cover crop plant and termination guidelines
- Mowing of vegetated ditches
- Adding woodchips to the bioreactor/controlling the residence time
- Clear blocked inlets and outlets for retention ponds/other BMPs
- And more...

Sediment-bound BMPs

Vegetated Treatment Pond



Vegetated Ditch



Untreated

PAM-Treated



Phillips, 2018

Wetland



Filter/Buffer Strips



wikipedia.org

Water-soluble BMPs

Carbon socks at the end of a Vegetated Ditch



Woodchip Bioreactors ★



★ **Cover Crops**



There are less treatment options available as a “catch-all” for water-soluble pesticides.

Structural BMPs

Stationary, permanent, footprint

GOAL: Prevents or reduces the discharge of pesticides into receiving waters

- Retention ponds
- Vegetated treatment systems
- Wetlands

- Woodchip bioreactors
- Buffer/prairie strips

Non-Structural BMPs

No footprint; minimizes disturbed area, non-permanent

GOAL: Prevents or reduces the discharge of pesticides into receiving waters

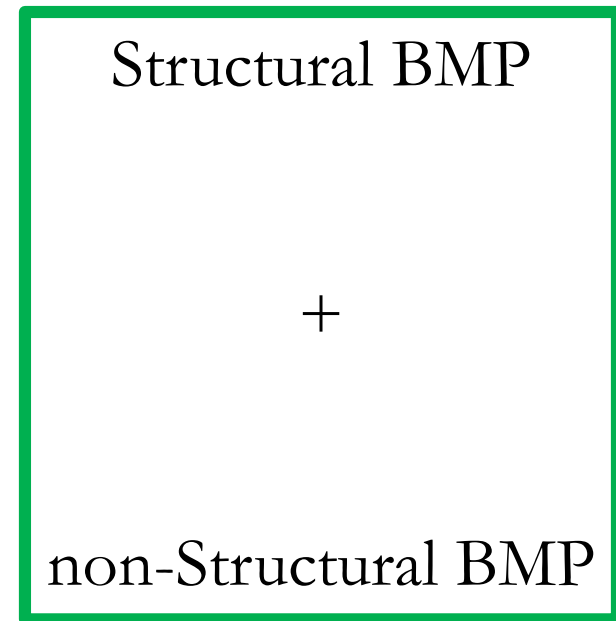
- PAM
- Landguard
- Apply tailwater to non-cropped areas

- Integrated Pest Management
- Pesticide Handling/Label Instructions

- Cover crops

Structural and non-structural BMPs **employed together** minimizes pesticide runoff.

Treatment train: Sequence of multiple treatments to meet the needs of an environment in order to maximize the results.



Open Discussion

- How many of you use any of the BMPs we discussed?
 - Structural BMPs?
 - Non-structural BMPs?
 - Both?
- What are barriers to implementing BMPs?
 - Food safety?
 - Cost?

Questions and Follow-Up

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