

Finding Cost-Effective Weed and Nutrient Management Practices in Organic Pear Orchards

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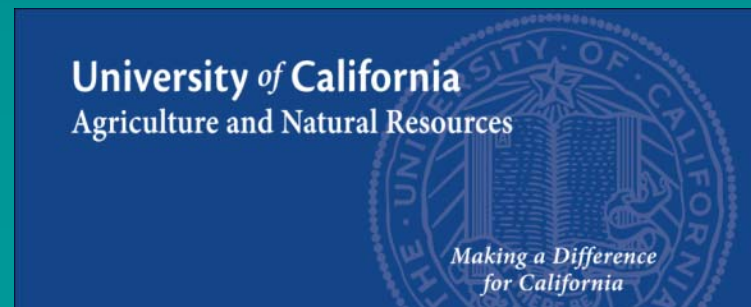
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Chris Frieders, Joe Green Ranch (Grower Cooperator)

Rachel Elkins (Presented at Pear Symposium)



Project Funding

2009

California Pear Advisory Board

2010-11

Organic Farming Research Foundation

Results of Past Surveys

Surveys of organic growers in WA & CA:
Weed control, soil fertility are two of the top
production challenges in organic tree fruit
production



Wonder Weeder –
Standard organic
weed control method
in PNW

Experimental Methods

Trial Started Oct. 16, 2008

- Uniform Bosc block, 18' x 10', planted 2001
- RCB design, 7 treatments, 5 reps
- Plot size: 6 trees/rep (sample middle 4 trees)
- All 7 treatments down each row

Rep



Treatments

1. In-row mowing, no N fertilizer
2. In-row mowing, manure (low rate)
3. In-row mowing, manure (high rate)
4. In-row mowing, feather meal**
5. Landscape fabric + manure (high rate)
6. Wood chips + manure (high rate)
7. Herbicide strip + manure (high rate)

**Grower Standard

Manure and N Rates

Low Rate Treatment¹

	Applic. Rate (Tons/Acre)	Total N (%)	Total N ² (lbs./A)
Oct. 2008	2.0	3.2	104
Oct. 2009	2.0	2.6	83
Apr. 2010	1.0	2.9	47
TOTAL			234

¹High rate = double the low rate

²Total N based on % N and % dry weight (avg. 80%)

Feather Meal and N Rates

	Applic. Rate (lbs./Acre)	Total N (%)	Total N ¹ (lbs./A)
Oct. 2008	1,000	11.0	103
Oct. 2009	1,000	7.7	74
Apr. 2010	400	12.0	46
TOTAL			223

¹Total N based on % N and % dry weight (avg. 94%)

In-Row Mower and Occasional Damage



Herbicide



Not great
control of
grasses

Weed Pharm Rates and Prices (Treated Acres)

- Typical grower rates (CEO, Pharm Solutions Inc.)
 - 1.5-2 gal./A/applic., 5-7 sprays/yr., 35 gal./A water
- Recommended rate (Tom Lanini, UCD)
 - Undiluted, 70 gal./A/application
- Price (275 gal. tote) \$2,100 delivered, \$7.60/gal.
- Price (truckload) \$5,600 delivered, \$6.75/gal.
- So the cost would be 70 gal. x \$6.75/gal. x 0.25 (treated acreage) = \$118 per orchard acre
- Weeds should be sprayed at the 4-6 leaf stage

Herbicides Used

Vinegar (Weed Pharm, now USDA NOP certified)

- » 20% vinegar + org. surfactant (NuFilm P),
1.0% v/v

GreenMatch (Marrone Bio Innovations, Davis)

- » d-limonene, 10% solution

- Spray volume 70 gal./treated acre
- 5 applications/year



Feb. 2009

Vinegar
Sprayed Oct., Nov. 2008,
Feb., June 2009, ...

May 2009





Wood Chips

Oct. 2009

5 ft. strip, 6 in. deep

224 yd.³/A (25 ft.³/tree)

Apr. 2010

5"-6" deep



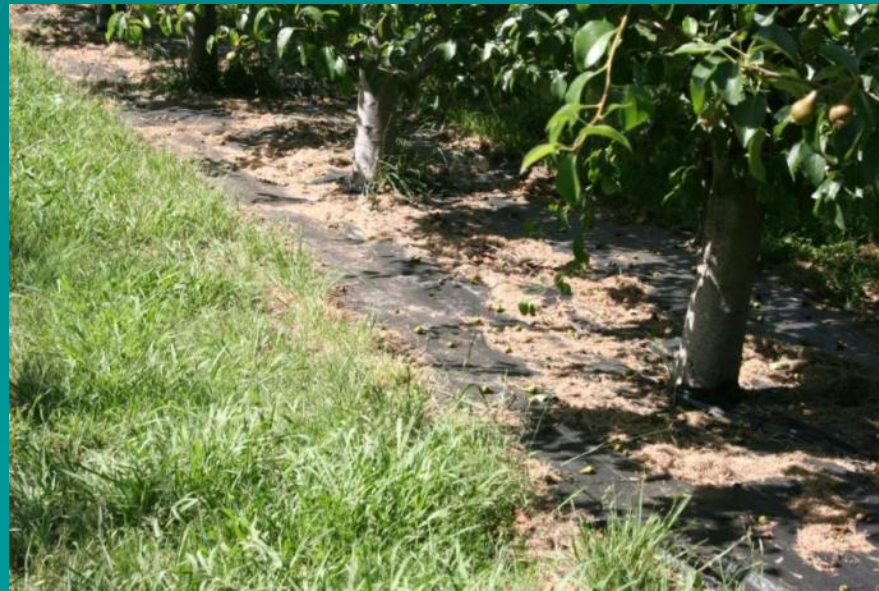
Wood Chips

Only occasional
weed growth



Landscape Fabric

- 3 ft. wide/side, overlapped 8 in. (~5 ft. wide)
- Pins placed every 2 ft.
- Lasts 8 years (?)
- Organic rules: Annual removal once a year





Landscape Fabric



Fabric
torn by
mower

Organic Fertilization



Chicken Manure

- Usually with wood shavings, rice hulls
- Smell, NH_3 volatilization are major issues

Feather Meal

- Pelleted; slow release through season
- Little smell, little NH_3 volatilization

Chicken Manure



2 T/A



4 T/A



Feather Meal (Pelleted)

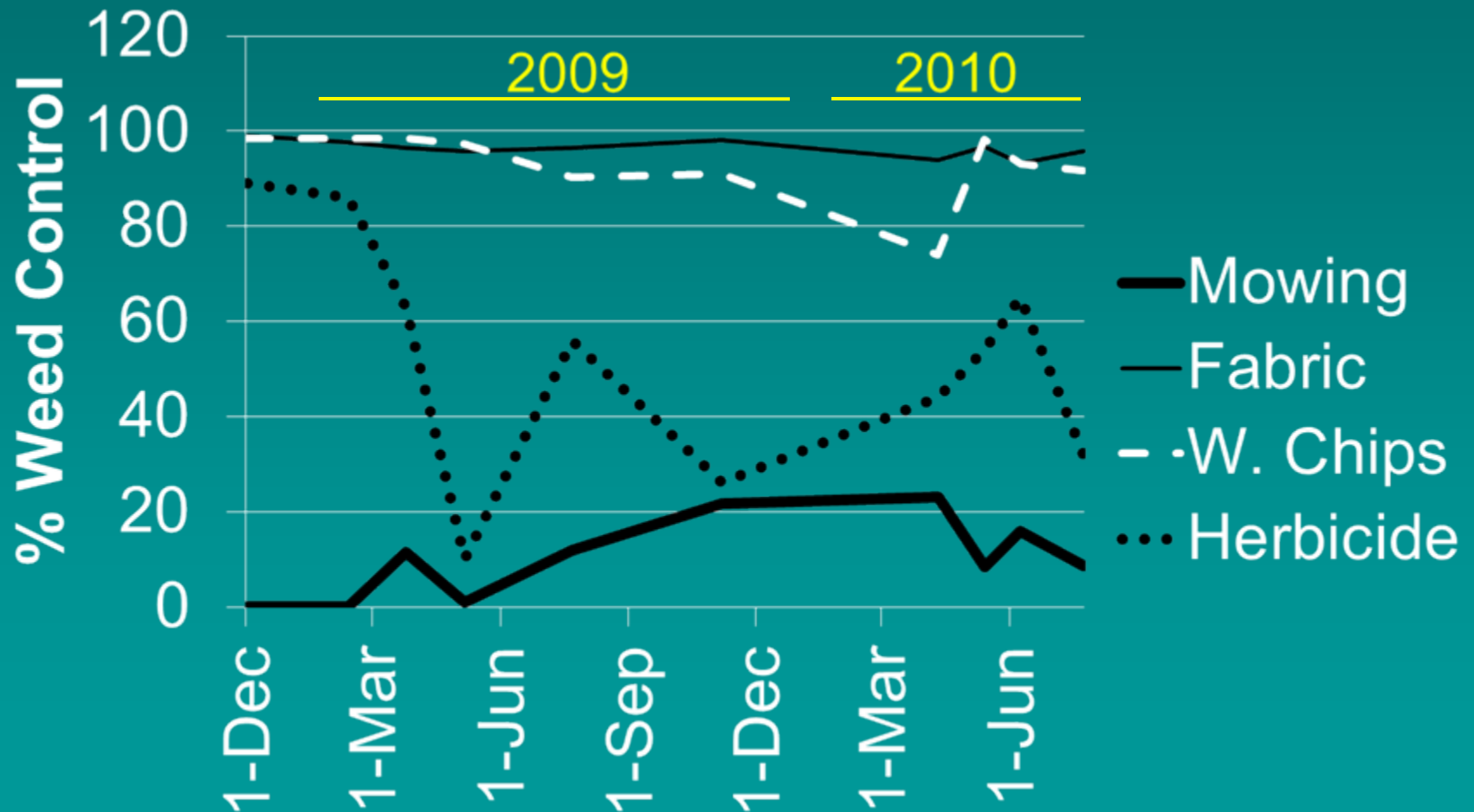


Results – 2009-10

No Significant Differences for These

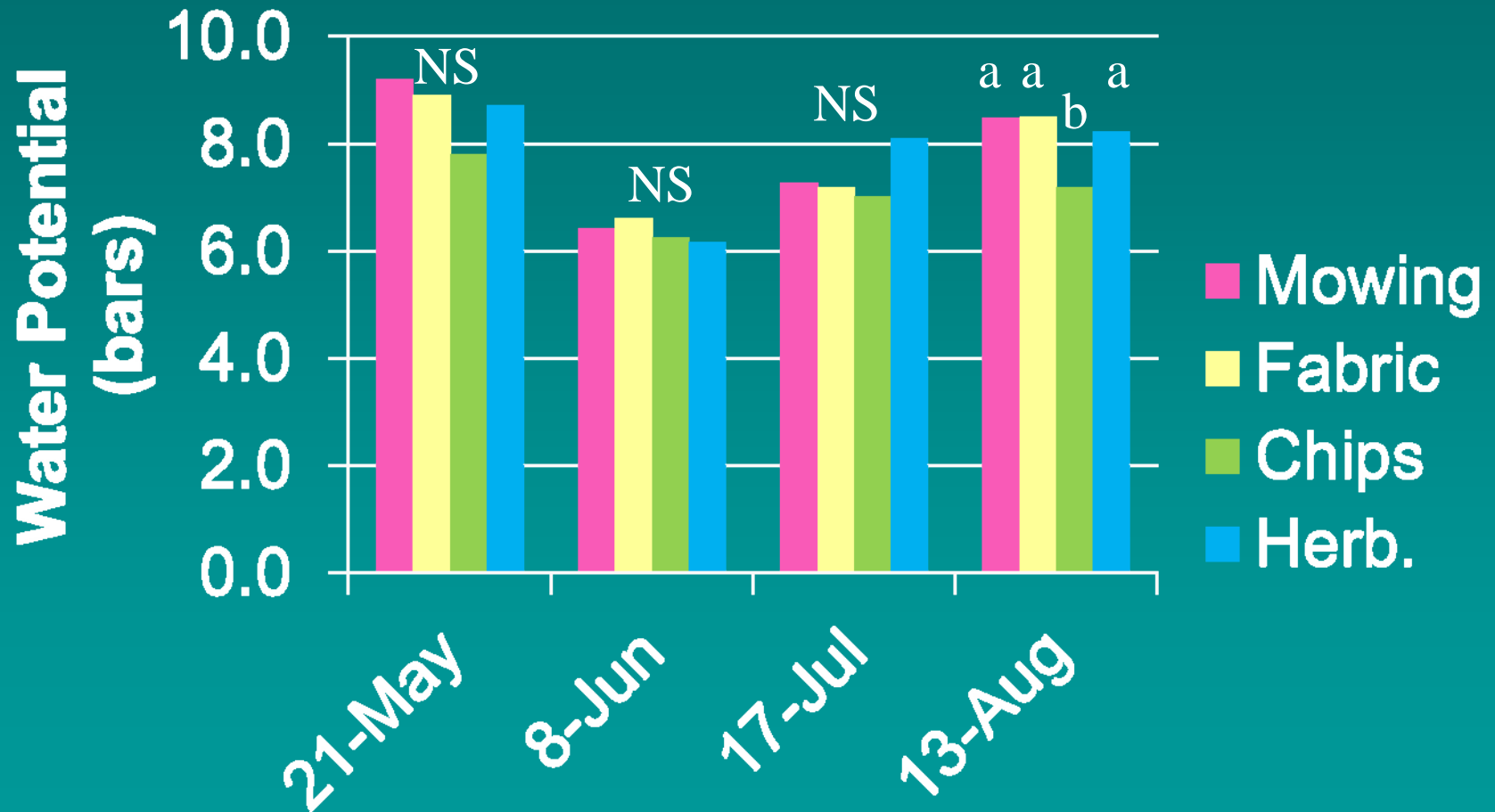
- Yield (30, 26 T/A)
- Fruit diameters (2.8, 2.7 in.)
- Trunk cross-sectional area
- Leaf P, K, Ca, Mg content
- Most soil nutrients

% Control of Weeds



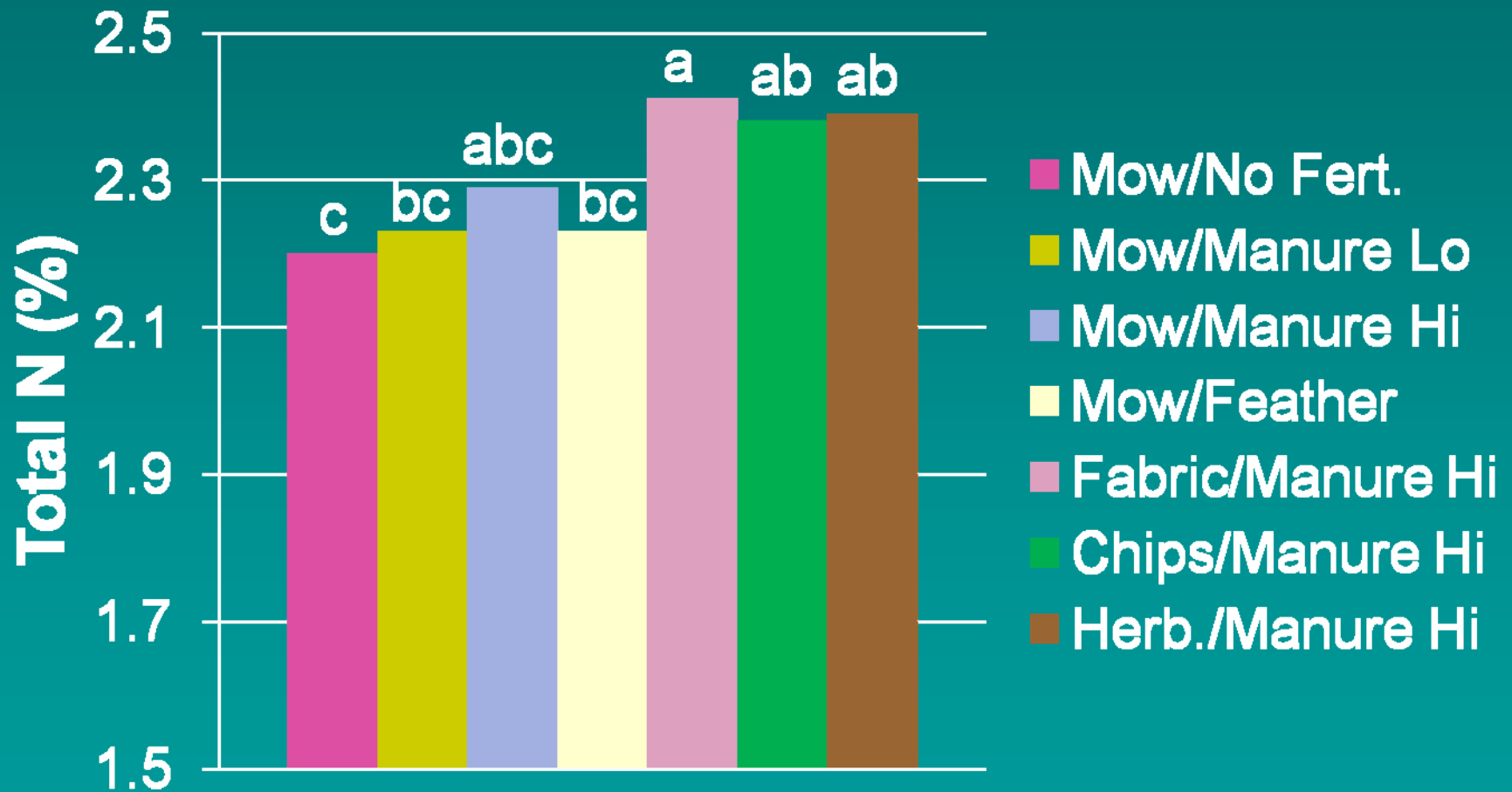
Stem Water Potential, 2009

(Tree Water Stress [neg.])



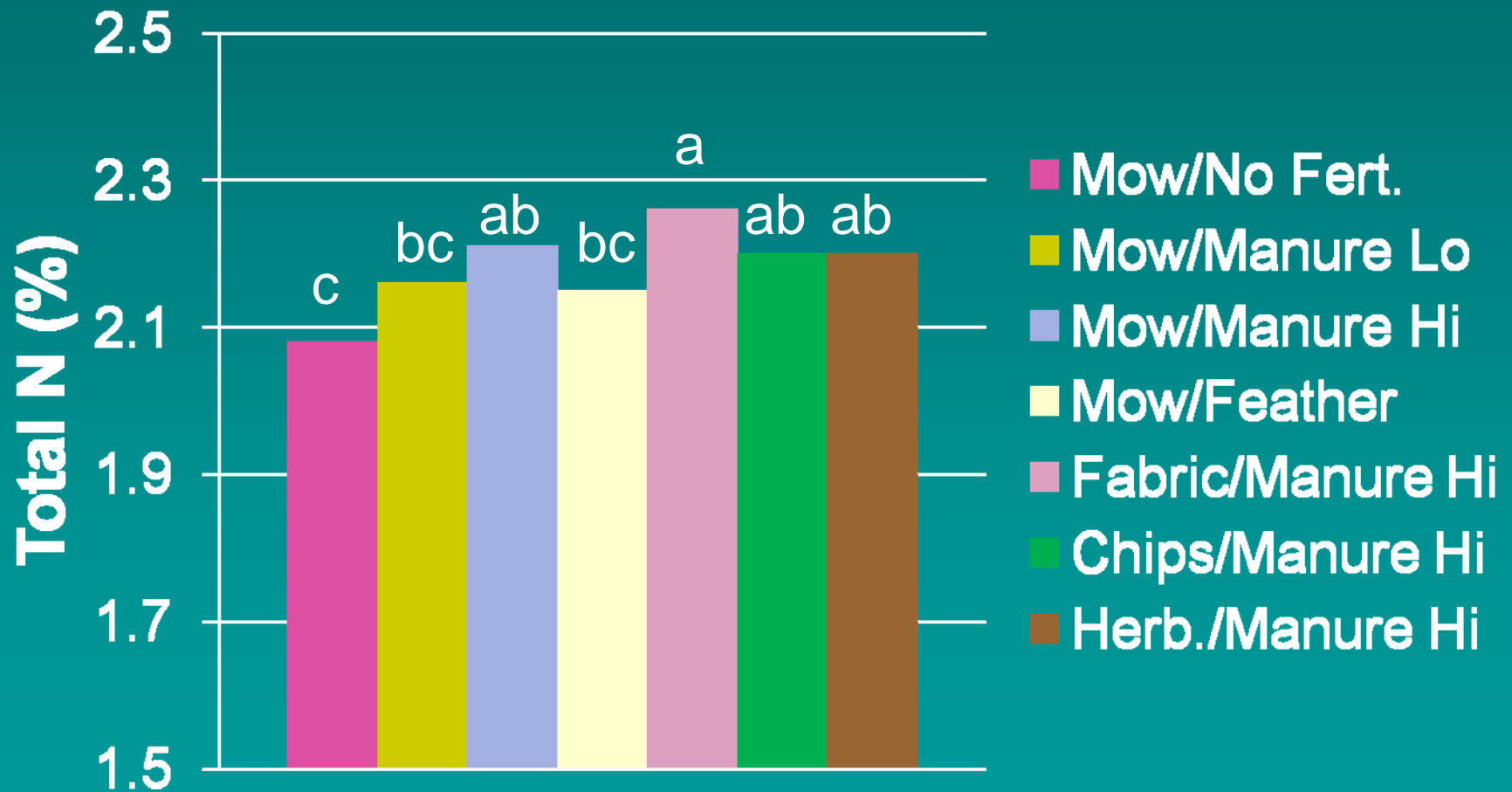
Leaf Nitrogen Content

2009



Leaf Nitrogen Content

2010



Vole Holes



Flooding – Fall 2010



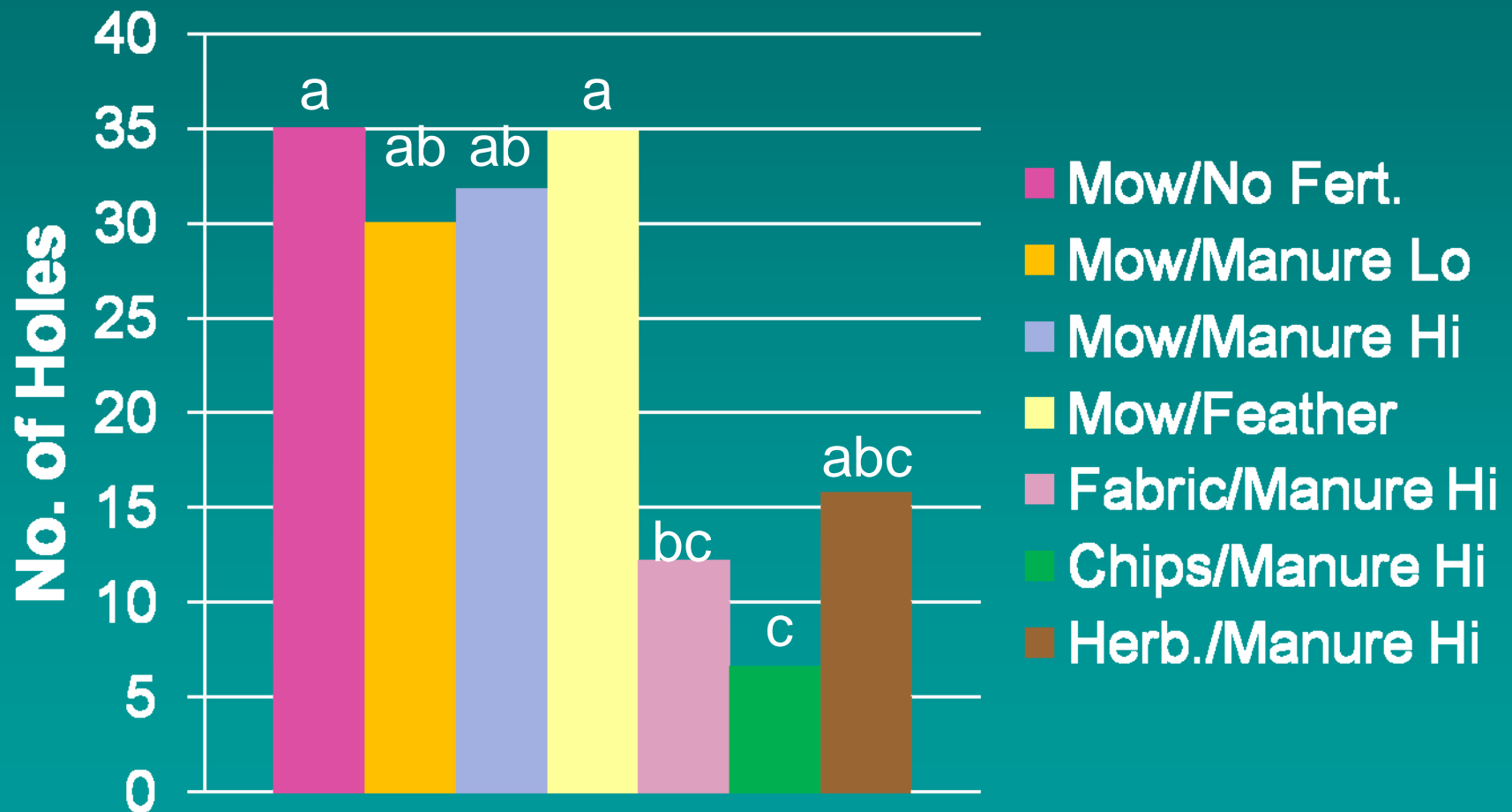
Voles

No Trunk Damage Seen



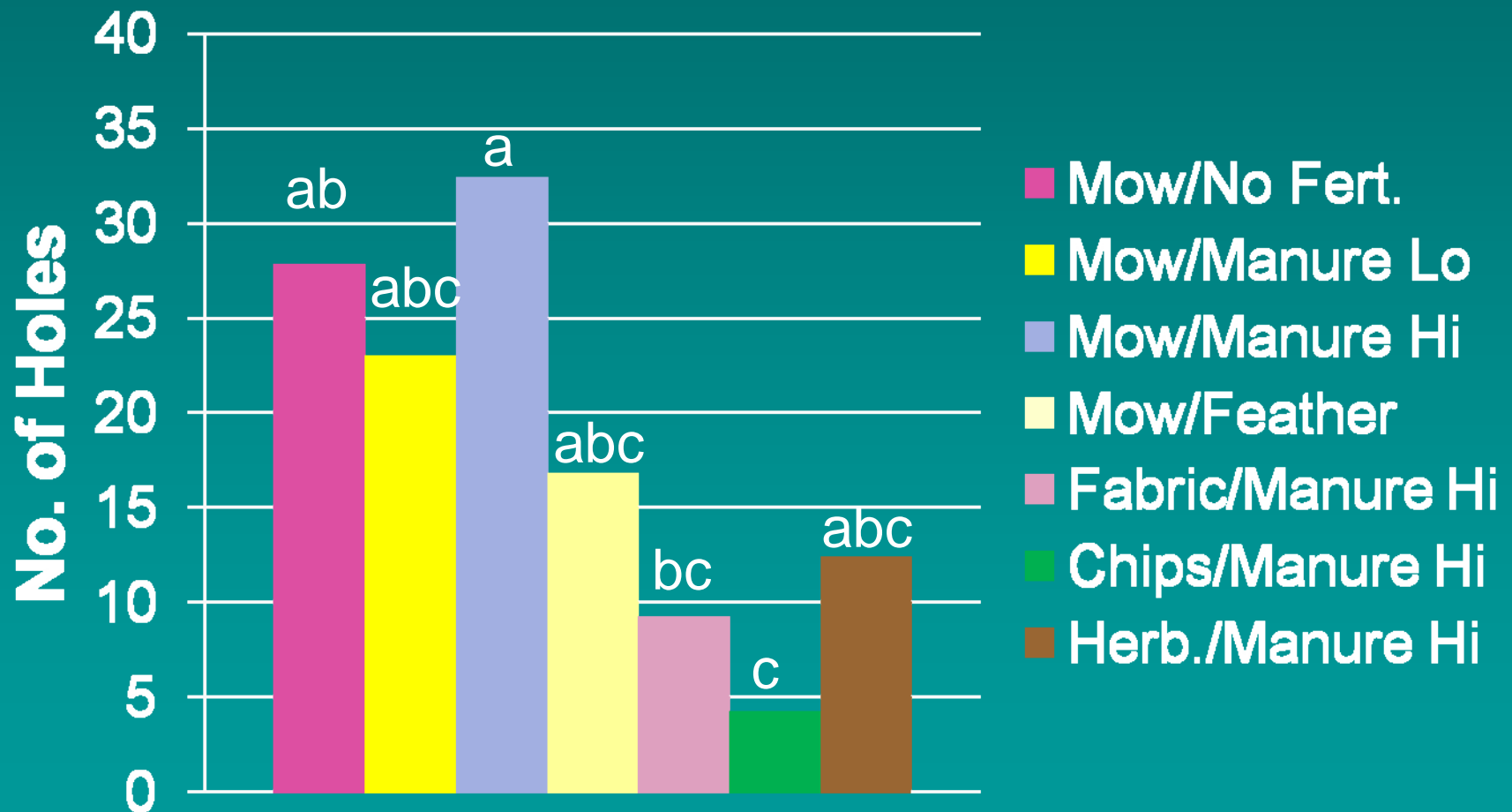
Vole Holes, Oct. 2009

No. per 6 Trees (1 Side Only)



Vole Holes, Oct. 2010

No. per 6 Trees (1 Side Only)



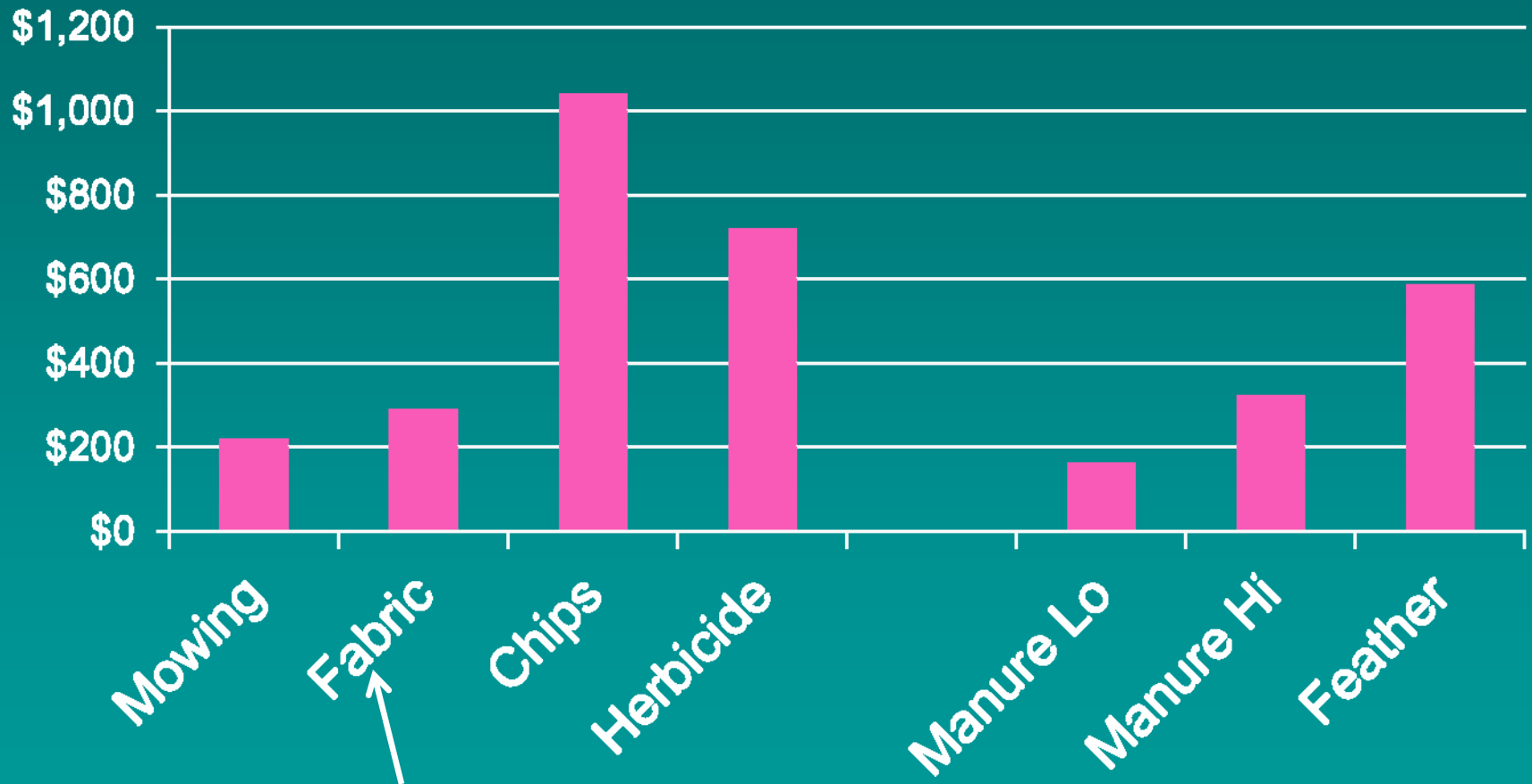
Economics

Assumptions Used

- In-row mowing 5 times per yr. (2 passes)
- GreenMatch herbicide applied 5 times
- Wood chips – Year 1: 6 in., Year 2: 3 in.
- Fabric longevity: 8 yrs.
- Chicken manure – 2 vs. 4 T/A
- Feather meal – 0.5 T/A

Economics

Total Costs/ Acre/Year



NOTE: Fabric cost does not include annual removal

Conclusions

- Wood chip cost prohibitive, weeds may invade, but voles are reduced
- Fabric mulch greatly reduces weeds and it may be cost-effective (if it lasts), but requires annual removal
- Current organic herbicides don't work well
- Manure is cheapest but availability is limited
- Organic production requires price premium
- Project to continue 1 more year