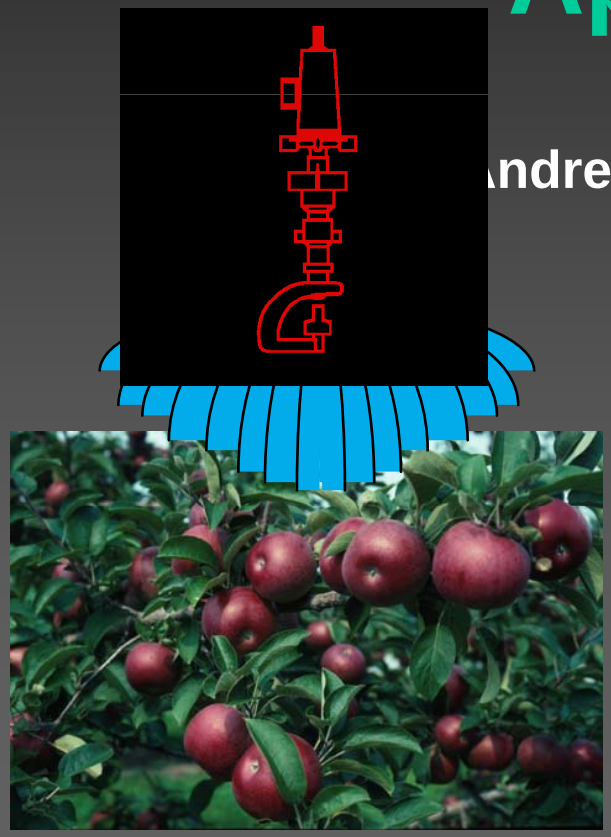
Current Progress in Developing a Fixed-Spray Application System for High-Density Apple Plantings



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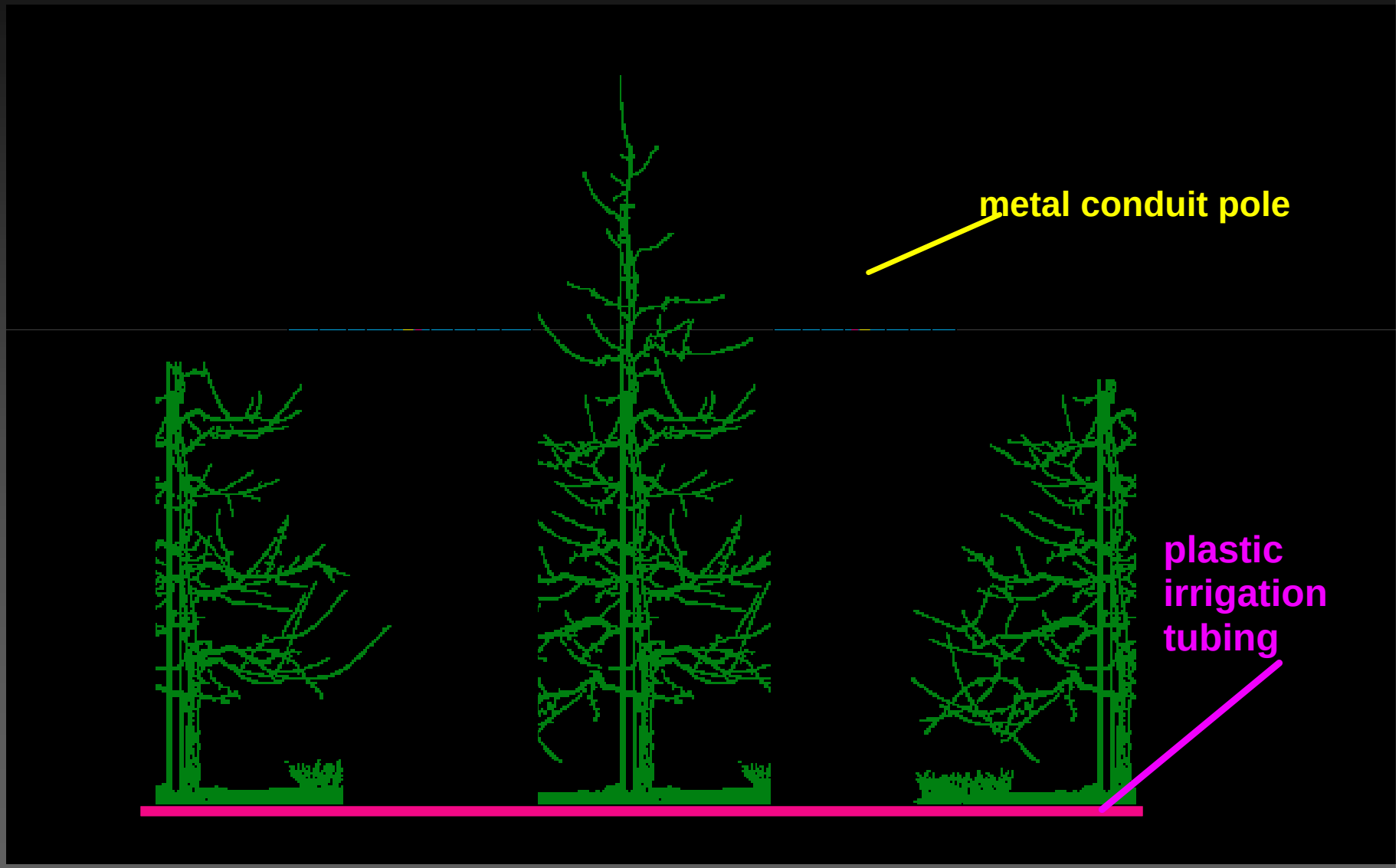
Conventional approach to pesticide application in apple orchards

1998-Microsprinkler arrangement for applying pesticides



Microsprinkler spray supply system

Single Nozzle Setup

Example of Row Coverage

Example of Row Coverage

Study Site for Fixed Spray Evaluation

Fowler Farms
Wolcott, NY

- Mature ‘Gala’ block, 0.9 A
- “Super Spindle” planting system
- Row spacing - 10 ft
- Tree spacing - 2 ft

System Design Limitations

Challenge

- Large number of branch points and changes in line size cause excessive pressure loss between pump and nozzles

Response

- Minimize branch points and tubing diameter reductions; attach nozzles directly to 3/4” line within the row

3/4” polyethylene tubing

System Design Limitations

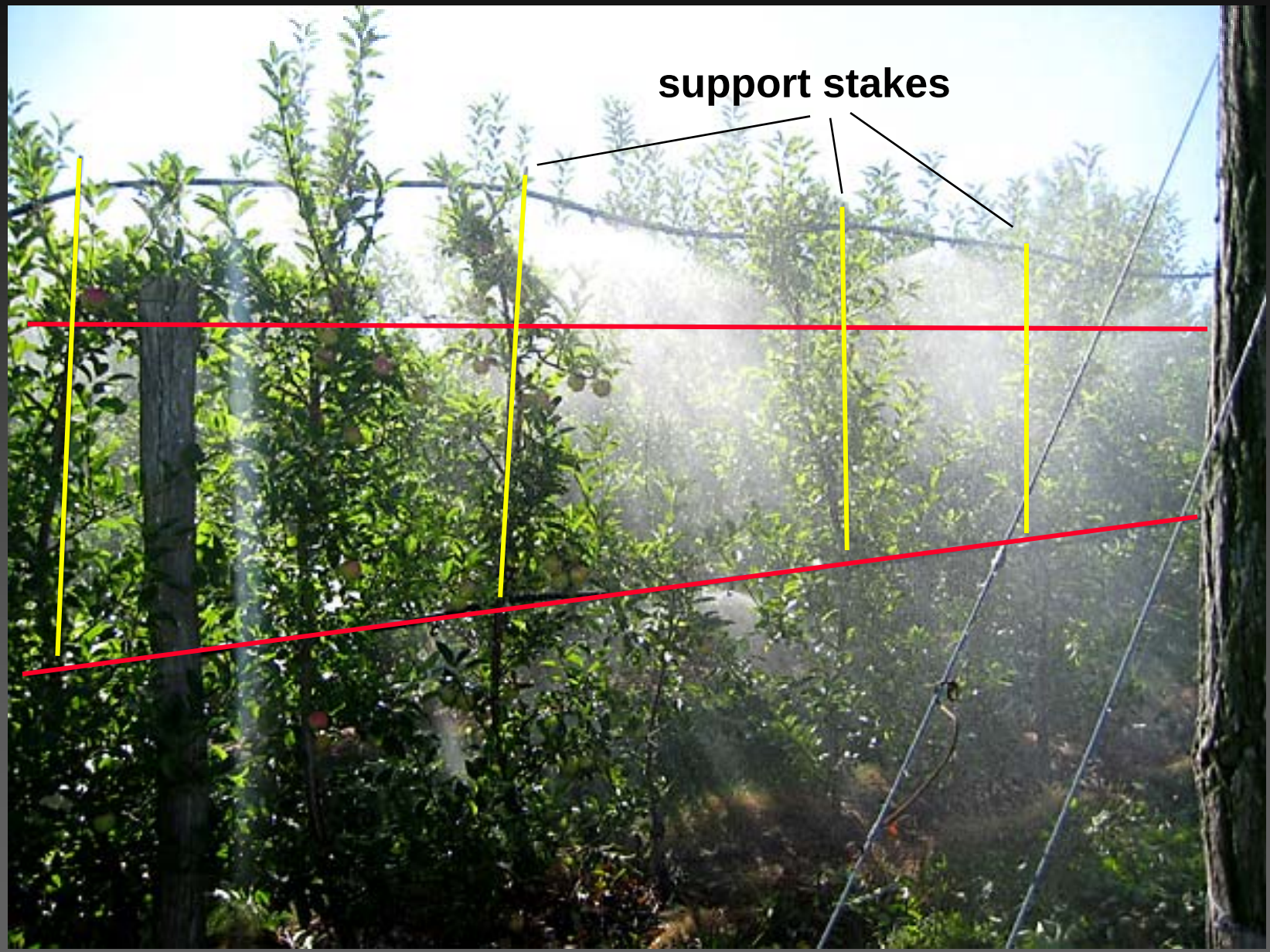
Challenge

- No air-assist
- Limited canopy penetration
- Difficult to get adequate coverage

Response

- Use in high-density plantings only
- Incorporate supply lines into tree support system
- Use dual (high and low) lateral lines, and spray from row center outwards

Lateral Line Support System



System Design Limitations

Challenge

- Supply line must cross rows; if placed on the ground, it will interfere with traffic

Response

- Mount supply line overhead, using rigid PVC pipe attached to the trellis support posts

Supply Manifold Support System

trellis support post

2” PVC Schedule 80 pipe

System Design Limitations

Challenge

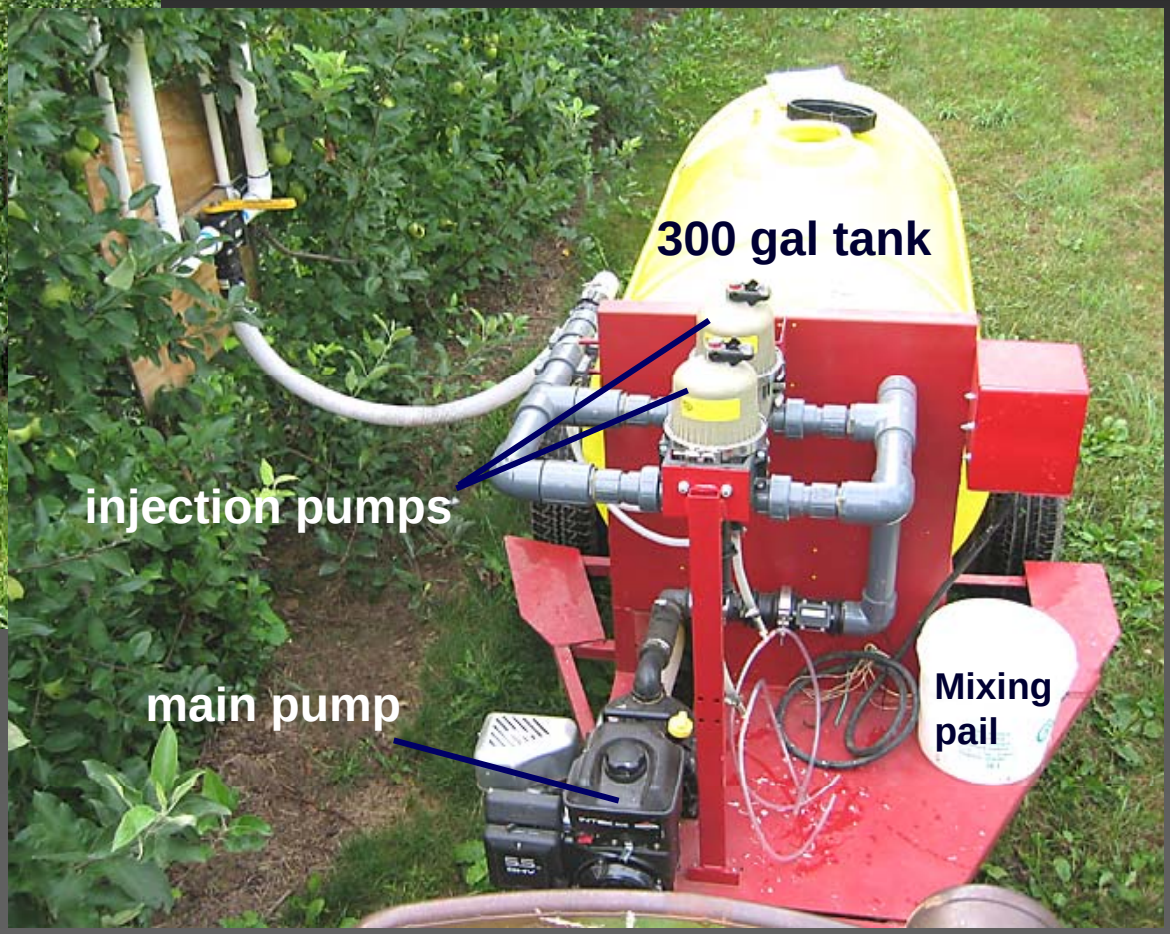
- Limited pumping capacity (= sprayed area) makes stationary pumping station impractical
- Could use airblast sprayer to pump the solution, but need a pump capacity of 100 gpm; most sprayer pumps provide ~35 gpm

Response

- Build a mobile unit with a suitable pump, plus a water tank and pesticide mixing agitator, and transport it to a central injection site

Pesticide Injection Site

Mobile Pumping Unit



- 5-hp pump: 90 gpm capacity @ 36 psi
- 2 Dosmatic proportional injection pumps: 0.2-2.5%

System Design Limitations

Challenge

- Tubing system has large capacity — greater than the amount needed to actually spray the trees

Response

- Initially attempted to inject pesticide concentrate into the water stream; too many complications
- 2006: Pump pesticide solution into tubing until desired amount has been deposited on trees. Flush with clean water 24 hr later.
- 2007: Pump desired amount into system, and push out of nozzles with compressed air

Trial Applications - 2006

- Sprays made to half of block (~0.5 acre, comprising 6 rows of fixed-spray system), using grower's regular schedule of pesticides: July 6, August 4, and August 17.
- Application process on each date required 2-3 minutes of system operation
- Foliar terminals inspected for obliquebanded leafroller infestations during late July
- Fruit inspected for insect and disease damage just before harvest

Points to be Addressed in Coming Work

- Coverage apparently good in initial coverage trials, but needs analysis of uniformity and optimization of nozzle placement
- Deposition characteristics of the emitters
- Uniformity of pesticide concentrations from nozzle to nozzle, particularly with regard to distance from the injection point
- Biological effectiveness in controlling diseases and insects

Fruit Damage at Harvest

Economics of a Fixed Spray System

Pumping	**Chassis**	**(donated)**
Unit	**300 gal tank, saddle & straps**	**$491**
	frame & plate for engine/pump; welding	**$572**
	flowmeter	**$450**
	5-hp gasoline pump	**$340**
	fittings	**$228**
	Total fixed costs	**$2283**
Structure		**Cost/acre**
	3/4” polyethylene tubing, double lines (@$0.10/ft)	**$648**
	Microsprinkler nozzles, 1 every 6 ft (@$0.65 ea)	**$702**
	PVC pipe, 2” Schedule 80 ($1.50/ft); 1” ($0.20/ft)	**$325**
	PVC elbows, tees, caps; clamps, etc.	**$250**
	cable ties for lateral lines: 2160 needed @ $0.07	**$151**
	2x4s, weatherized; hardware, U-bolts, etc.	**$100**
	Total per-A cost	**$2176**
	(Extra cost of support stakes/cable ties to raise line)	**$1188**

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