WALNUT BLIGHT CONTROL INVESTIGATIONS 2003

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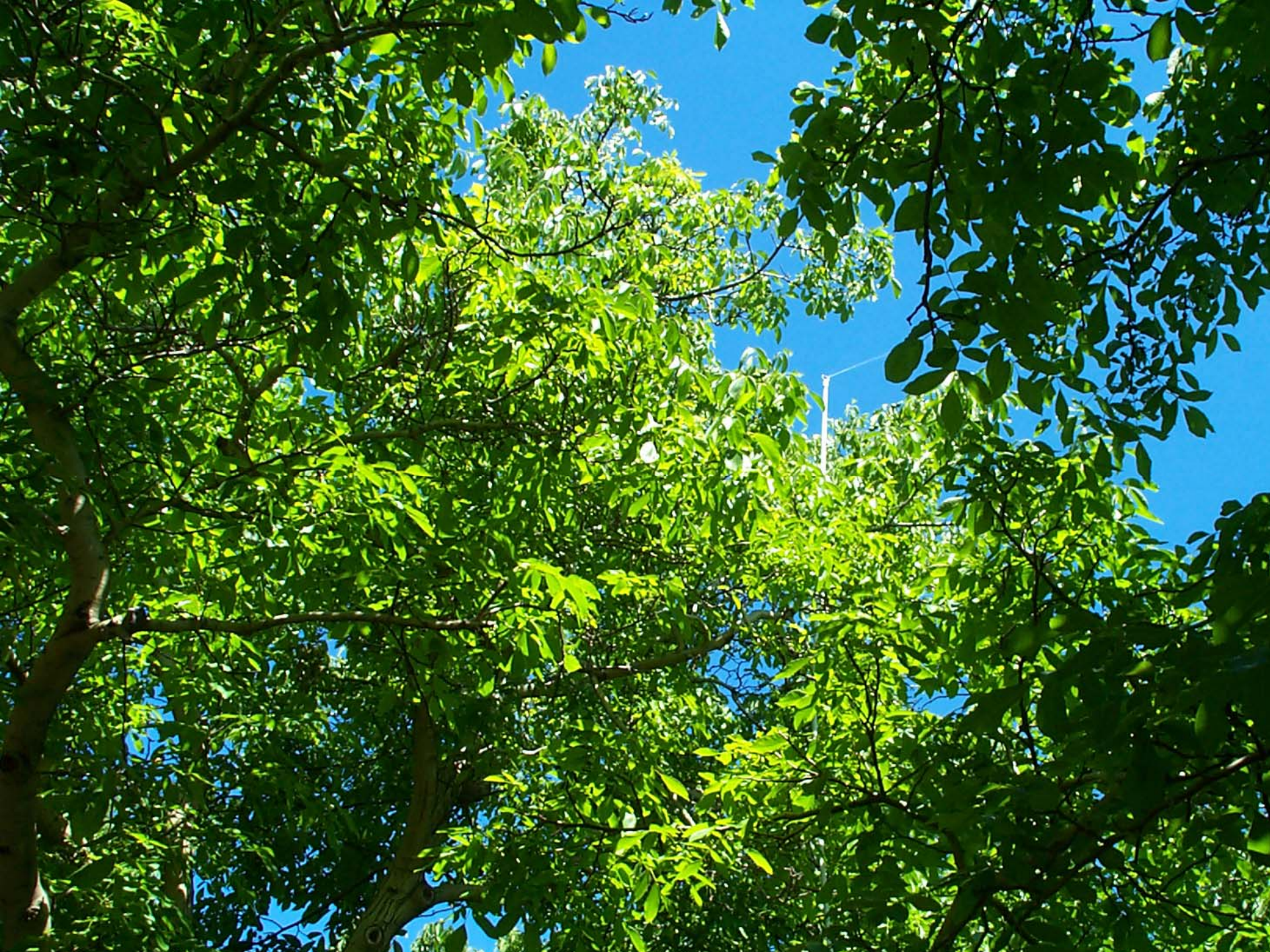
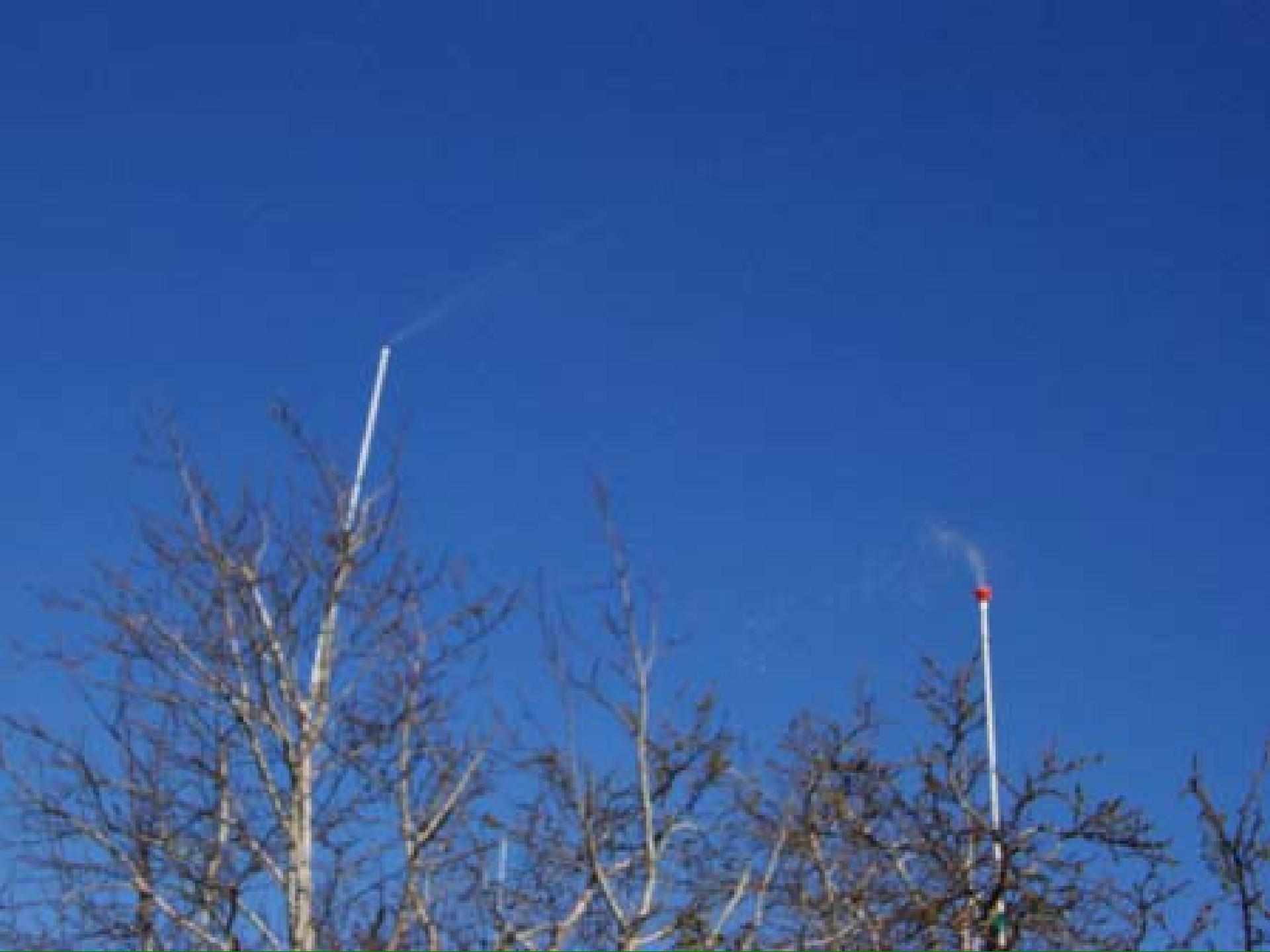
Objectives

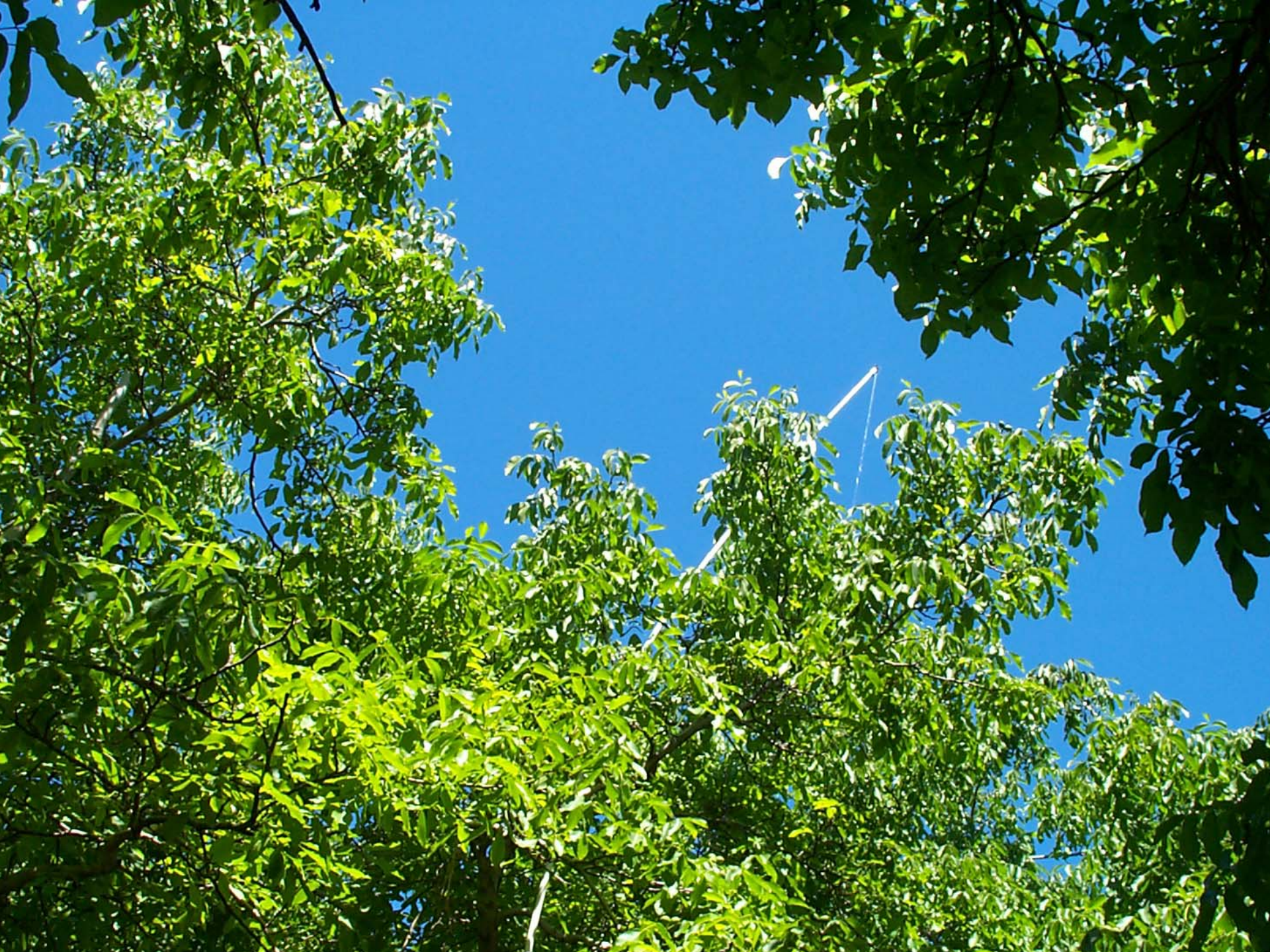
- Build a “blight generator” by installing overhead sprinklers in blight test plots.
- Continue to evaluate “new” products for walnut blight control. Working with Jim Adaskaveg, include DBNPA and other materials as appropriate.
- Generate data to support the Manex® registration.
- Work toward a Best Management Practices (BMP) methodology for walnut blight control.
- Evaluate the efficacy of sprays based upon the temperature threshold predictive model developed by Adaskaveg, et. al.
- Continue to research rates by handgun and speed sprayer application using the bud break “erradicant” spray technique.

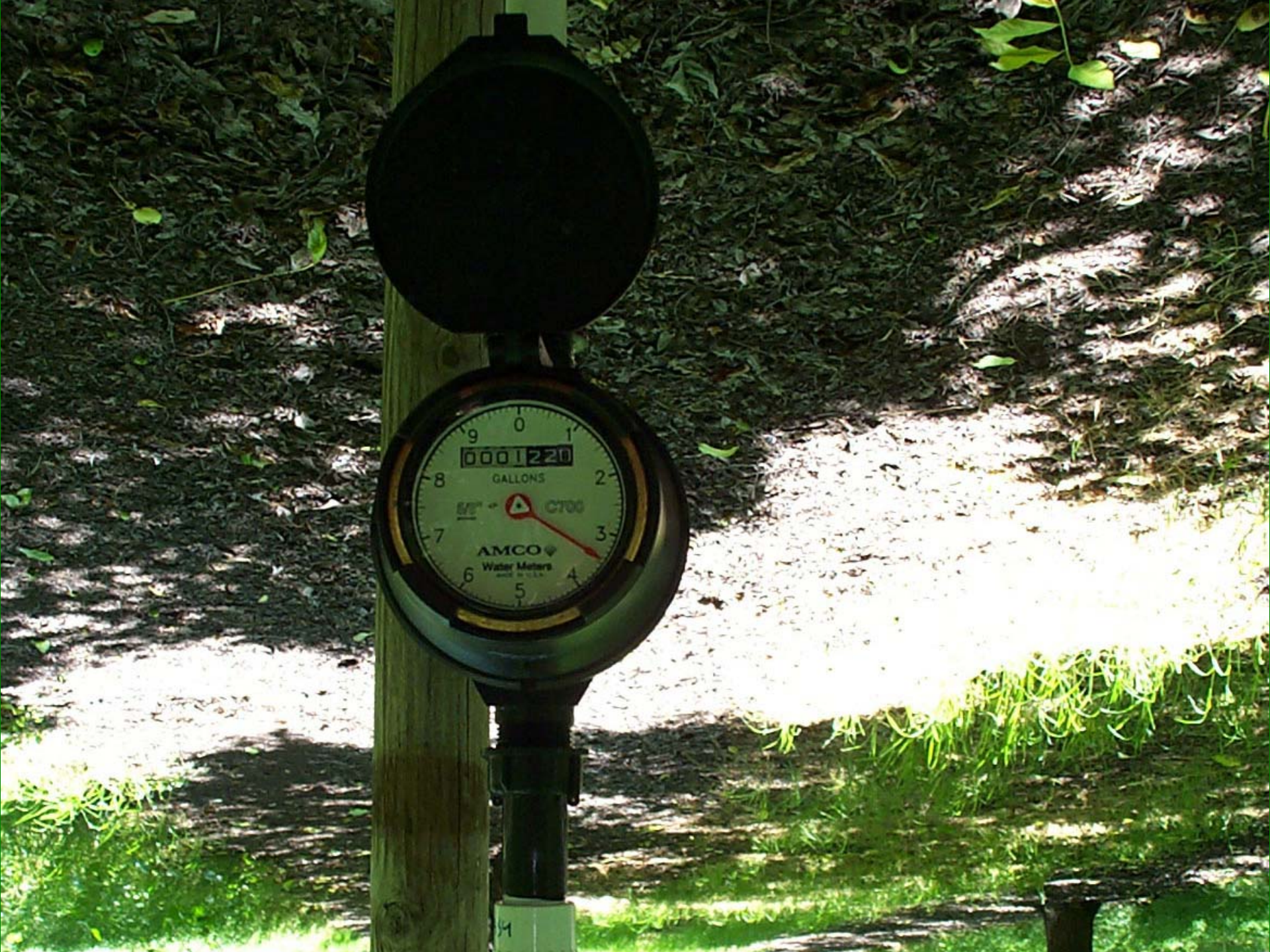
Objective 1: Build a Blight Generator by Installing Overhead Sprinklers in Test Walnut Orchards

- Tehama Artificial Rain 5/17 and 5/27
- Butte Artificial Rain 4/8, 5/15 and 5/26





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Objectives 2 and 3: Evaluate New Products for Walnut Blight Control. Support Manex Registration (5 comparisons)

- Serenade for walnut blight control – Tehama
- New materials for walnut blight control – Tehama
- Commercial copper formulations – Tehama
- New formulations – Tehama
- Nordox 75 WG evaluation – Butte

Serenade for Walnut Blight Control

Treatment	Canopy[1] % Blight	Ground[2] # blighted nuts	Leaf[3] Phyto
1. Kocide 2000 Pro Tech + Manex	6.72 a[4]	12.60 a	1
2. Kocide 2000 Pro Tech	23.00 b	18.20 a	1
3. Serenade	22.71 b	19.20 a	1
4. Serenade + Kocide 2000	31.28 b	30.60 a	1
5. Control (artificial rain)	34.90 b	20.60 a	1
6. Control (natural conditions)	34.58 b	50.80 b	1

[1]Visual inspection of blighted walnuts within the tree canopy 6-12 feet above ground.

[2]Average number of blighted walnuts per tree on the ground, counted 6/12/03.

[3]Leaf phytotoxicity visually rated using a scale of 1-5 where a rating of 1 represents no observable phytotoxicity.

[4]Duncan's multiple range test for treatment means at the 5% level.

Figure 11. Percent blighted walnuts, blighted walnuts for dropped nut counts and leaf phyto for Serenade comparisons.

New Materials for Walnut Blight Control

Treatment	Canopy[1] % Blight	Ground[2] # blighted nuts	Leaf[3] Phyto
1. Kocide 2000 Pro Tech + Manex	6.72 b	12.60 a[4]	1
2. Kocide 2000 Pro Tech	23.00 ab	18.20 a	1
3. DBNPA + Bond (1x)	29.75 a	15.00 a	1
4. DBNPA + Bond (2x)	27.06 a	26.60 a	1
5. Zerotol (1x)	19.87 ab	12.80 a	1
6. Zerotol (2x)	35.11 a	30.20 a	1
7. Control (artificial rain)	34.90 a	20.60 a	1
8. Control (natural conditions)	34.58 a	50.80 b	1

[1]Visual inspection of blighted walnuts within the tree canopy 6-12 feet above ground.

[2]Average number of blighted walnuts per tree on the ground, counted 6/12/03.

[3]Leaf phytotoxicity visually rated using a scale of 1-5 where a rating of 1 represents no observable phytotoxicity.

[4]Duncan's multiple range test for treatment means at the 5% level.

Figure 12. Blight Damage ratings for DBNPA and Zerotol comparisons.

Commercial Copper Formulations For Walnut Blight Control

Treatment	Canopy[1] % Blight	Ground[2] # blighted nuts	Leaf[3] Phyto
1. Kocide 2000 Pro Tech	23.00 ab[4]	18.20 b[4]	1
2. Kocide 2000 Pro Tech + Manex	6.72 c	12.60 b	1
3. Champ Dry Prill	19.63 bc	14.60 b	1
4. Champ Dry Prill + Manex	9.36 c	10.60 b	1
5. Control (artificial rain)	34.90 a	20.60 b	1
6. Control (natural conditions)	34.58 a	50.80 a	1

[1]Visual inspection of blighted walnuts within the tree canopy 6-12 feet above ground.

[2]Average number of blighted walnuts per tree on the ground, counted 6/12/03.

[3]Leaf phytotoxicity visually rated using a scale of 1-5 where a rating of 1 represents no observable phytotoxicity.

[4]Duncan's multiple range test for treatment means at the 5% level.

Figure 13. Blight Damage ratings for Champ Dry Prill comparisons.

New Copper Formulations for Walnut Blight Control

Treatment	Canopy[1] % Blight	Ground[2] # blighted nuts	Leaf[3] Phyto
1. Kocide 2000 Pro Tech	23.00 ab[4]	18.20 b[4]	1
2. Kocide 2000 Pro Tech + Manex	6.72 c	12.60 b	1
3. GX 569 + Manex (low rate)	4.36 b	17.40 b	1
4. GX 569 + Manex (high rate)	10.65 b	13.20 b	1
5. Control (artificial rain)	34.90 a	20.60 b	1
6. Control (natural conditions)	34.58 a	50.80 a	1

[1]Visual inspection of blighted walnuts within the tree canopy 6-12 feet above ground.

[2]Average number of blighted walnuts per tree on the ground, counted 6/12/03.

[3]Leaf phytotoxicity visually rated using a scale of 1-5 where a rating of 1 represents no observable phytotoxicity.

[4]Duncan's multiple range test for treatment means at the 5% level.

Figure 14. Blight Damage ratings for GX 569 comparisons.

Nordox 75 WG Evaluation

Treatments	Rate/Acre	% Walnut Blight[1]
1. Kocide 2000 + Manex	6 lbs. + 58 oz.	1.75 b
2. Nordox 75 WG + Manex	5 lbs. + 58 oz.	1.68 b
3. Nordox 75 WG + Manex	4 lbs. + 58 oz.	.89 b
4. Untreated Check	—	5.15 a

[1]Means not followed by a common letter are significantly different from one another at the 5% level of significance.

Figure 15. Percent walnut blight for the Nordox comparisons.

Objective 4: Best Management Practices for Walnut Blight Control (2 experiments).

- Best Management Program – Butte
- Best Treatment Timing – Butte

Best Management Program Alternating Materials

Trtmt #	Treatments	# In-season Sprays	% Blight**	Phyto Rating*	Mixing Prob
1	One wk aft term bud brk: Kocide+Manex + Breakthru	1	0.95 c	1 b	None
	Inseason: Kocide+Manex	6			
2	One wk aft term bud brk: Champ+Manex+Breakthru	1	1.39 c	1 b	None
	Inseason: Champ+Manex	6			
3	One wk aft term bud brk: Kocide+Manex + Breakthru	1	2.02 c	1 b	Sig
	Inseason: Alternate Kocide + Manex	3			
	Zinc sulfate + hydrated lime	3			
4	One wk aft term bud brk: Zinc sulfate + hydrated lime + Breakthru	1	1.65 c	1c	Sig
	Inseason: Alternate Kocide	3			
	Zinc sulfate + hydrated lime	3			
5	One wk aft term bud brk: Kocide + Breakthru	1	18.08 c	1 b	None
	Inseason: Kocide	6			
6	One wk aft term bud brk: Kocide+Manex	1	0.67 c	1b	None
	Inseason: Serenade + Kocide + Manex (1st week)	1			
	Kocide+Manex (2nd and 3rd weeks)	2			
	Serenade + Kocide + Manex (4 th week)	1			
	Kocide + Manex (5th and 6th weeks)	2			
7	One wk aft term bud brk: None	0	2.94 c	3.4 a	None
	Inseason: Kocide+Zinc sulfate+oil	6			
8	One wk aft term bud brk: None	0	1.1 c	1 b	None
	Inseason: Kocide + Manex	6			
9	Untreated Control	0	57.4 a	1b	None

* Phyto Rating: 1 = None, 2 = Slight, 3 = Moderate, 4 = Heavy, 5 = Extreme

**Treatment means that are not followed by a common letter are significantly different from each other at the 5% level according to Duncan's Multiple Range Test for Mean Separation.

Figure 16. Blight damage evaluations for the Alternating Spray Materials BMP.

Best Treatment Timing

One week after terminal bud break[a]	In-Season Sprays[b]						% Blight[c]
3/31/03	4/8/03	4/15/03	4/21/03	5/1/03	5/15/03	5/26/03	
x	x	x	x	x	x	x	0.95 c
x	x	x	x	x	x		1.24 c
x	x	x	x	x			0.97 c
x	x	x	x				1.14 c
x	x	x					4.7 c
x	x						4.39 c
x							25.46 b
x[b]							24.44 b
	x	x	x	x	x	x	1.1 c
Nontreated							57.4 a

a – Kocide + Manex + Breakthru
b – Kocide + Manex
c - Treatment means that are not followed by a common letter are significantly different from each other at the 5% level according to Duncan's Multiple Range Test for Mean Separation.

Figure 19. Blight damage compared to spray application timing.

Objective 5: Evaluate the efficacy of sprays based on the temperature threshold predictive model (Xanthocast).

- Walnut Blight Predictive Model – Tehama
- Walnut Blight Predictive Model – Butte

Xanthocast Performance In Tehama County

	Research	Grower[1]	Xanthocast	Erradicant	Control In	Control Out
	—	3/25	—	3/25	—	—
	—	3/27	—	—	—	—
	3/31	—	—	—	—	—
	—	4/8	—	—	—	—
	4/10	—	—	—	—	—
	—	4/15	—	—	—	—
	4/22	—	—	—	—	—
	—	4/26	—	—	—	—
	5/1	5/1	5/1	—	—	—
	5/7	5/7	5/7	—	—	—
	—	5/9	—	—	—	—
	5/16	—	—	—	—	—
	—	5/21	—	—	—	—
	5/26	—	—	—	—	—
% blight	6.72 c[2]	10.72 c	17.26 bc	23.76 ab	34.90 a	34.58 a
Nut drop	12.62 a	23.60 a	12.60 a	14.40 a	20.60 a	50.80 b

[1]Grower applications were half sprays
[2]Duncan's multiple range test for treatment means at the 5% level.

Figure 21. Blight damage for four possible blight control strategies.

Walnut Blight Predictive Model – Butte

"Model" Spray Dates	Rainfall (Inches)
3/31/2003	0.36
4/21/2003	1.84
5/6/2003	2.48
Total Rainfall	**4.68**

Treatment	% Blight	5% Level
Model	4.09	b
Grower	0.35	b
Untreated	16.8	a

Figure 23. Blight control performance for the Xanthocast spray predictions versus the grower schedule in Butte County.

Objective 6: Evaluation of the Bud Break "Erradicant" Spray Technique

Treatments	% Blight
1. Untreated control	31.15 a[1]
2. Kocide + Manex + 0.2% Breakthru 200 gpa	9.68 bc
3. Kocide + Manex + 0.5% Breakthru 100 gpa	14.73 b
4. Kocide + Manex + 0.5% Breakthru 200 gpa	3.87 c
5. Kocide + Manex _ 0.2% Breakthru 100 gpa	14.13 b
6. Grower standard	0.35 c

[1]Means not followed by a common letter are significantly different from one another at the 5% level of significance.

Figure 24. Blight damage evaluations for the single "erradicant" spray strategy

Project Summary

- Rainfall simulators in the 2003 and 2004 blight plots
- Copper/Manex is the material of choice (23% blight vs. 6.72% C+M)
- Reduction in the amount of copper applied (8lbs KOC 101 > 6 lbs. KOC 2000 > 3.5 lbs. GX 569)
- We have found no superior copper product
- Alternating material “BMP” to reduce/eliminate copper runoff
- Reducing the number of applications to reduce/eliminate copper runoff
- Evaluating varieties with potential walnut blight resistance