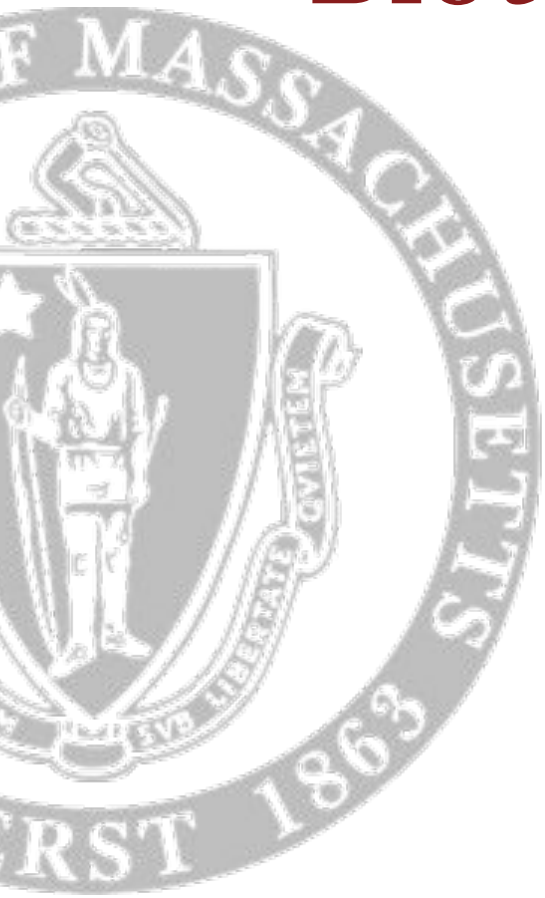
UMassAmherst

Inconsistencies in Sooty Blotch and Flyspeck Models



Daniel Cooley and Jon Clements
University of Massachusetts Amherst

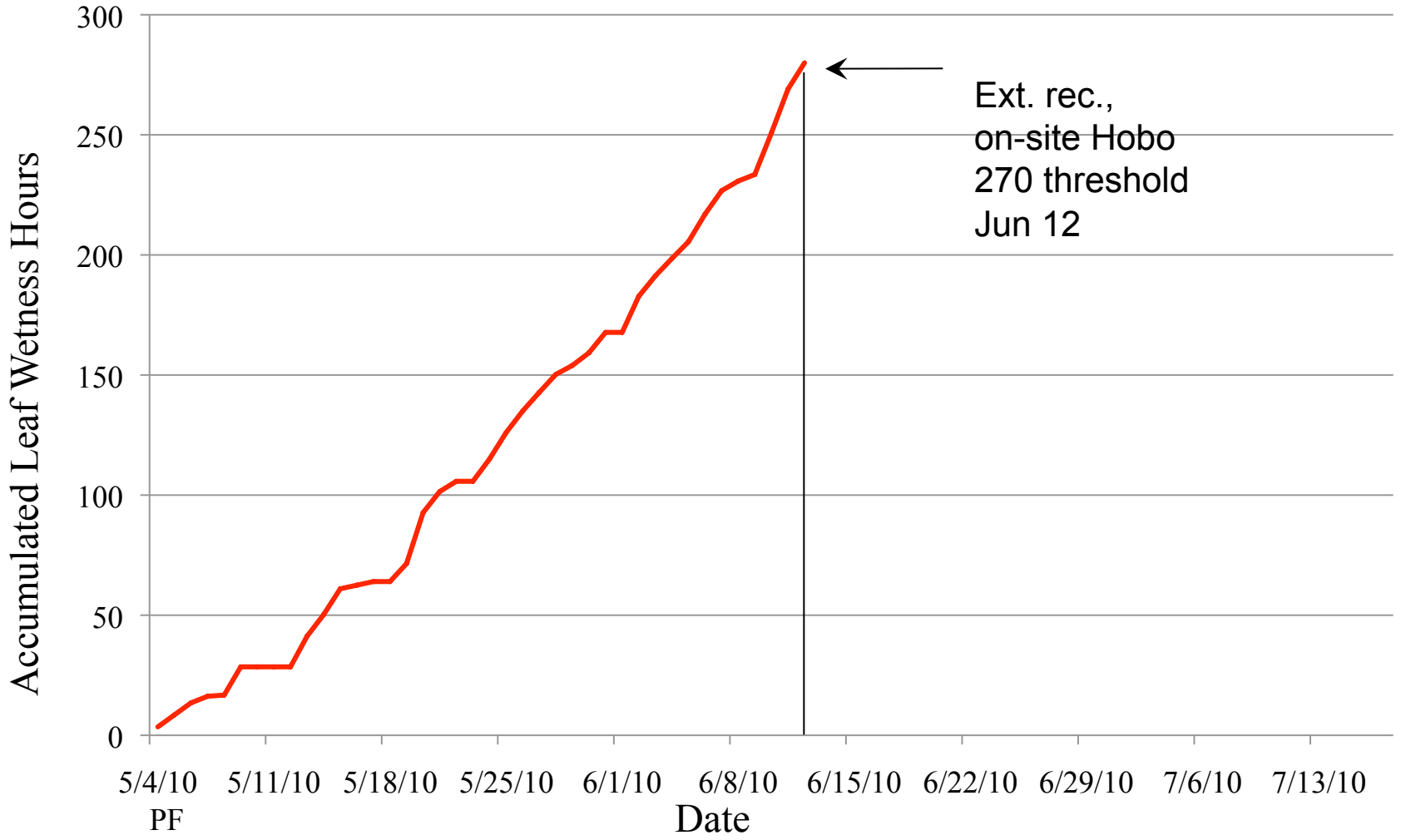
What does a user ask of a forecast model?

- When should I spray?
- Most models recommend a break in early cover sprays followed by the first SBFS spray.
- Length of the break is determined by moisture measurement, usually accumulated leaf wetness hours
- Some models then stop and growers use calendar-based covers
- Others estimate fungicide depletion

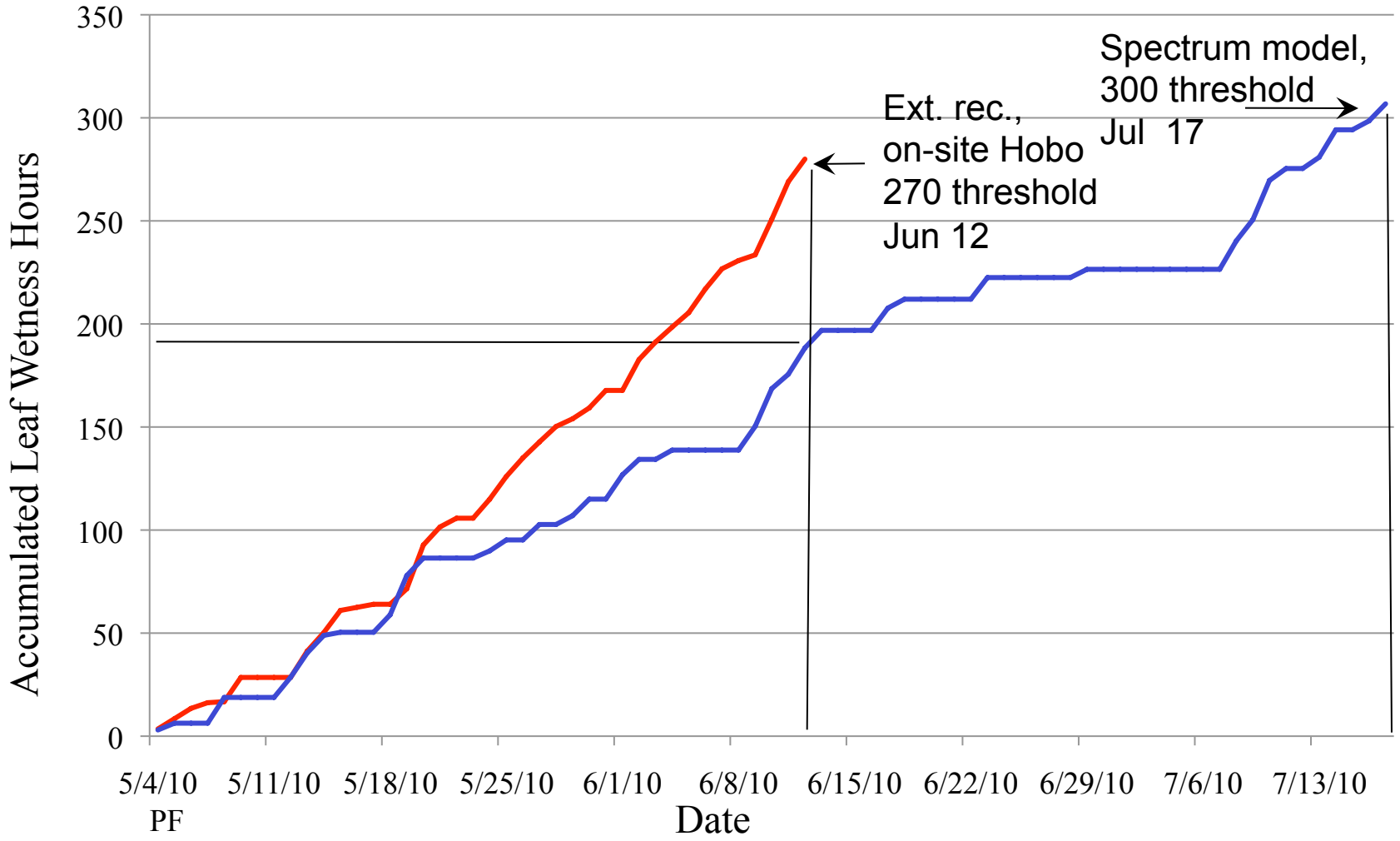
Where does a user go for a forecast model?

- In MA, several sources - five examples:
- On-site monitoring and published Extension recommendations
- Commercial model software and monitoring software bundle – Spectrum
- Commercial remote monitoring and model delivery – SkyBit
- Public web-based weather and model delivery - NEWA
- Private web-based weather and model delivery - Orchard Radar

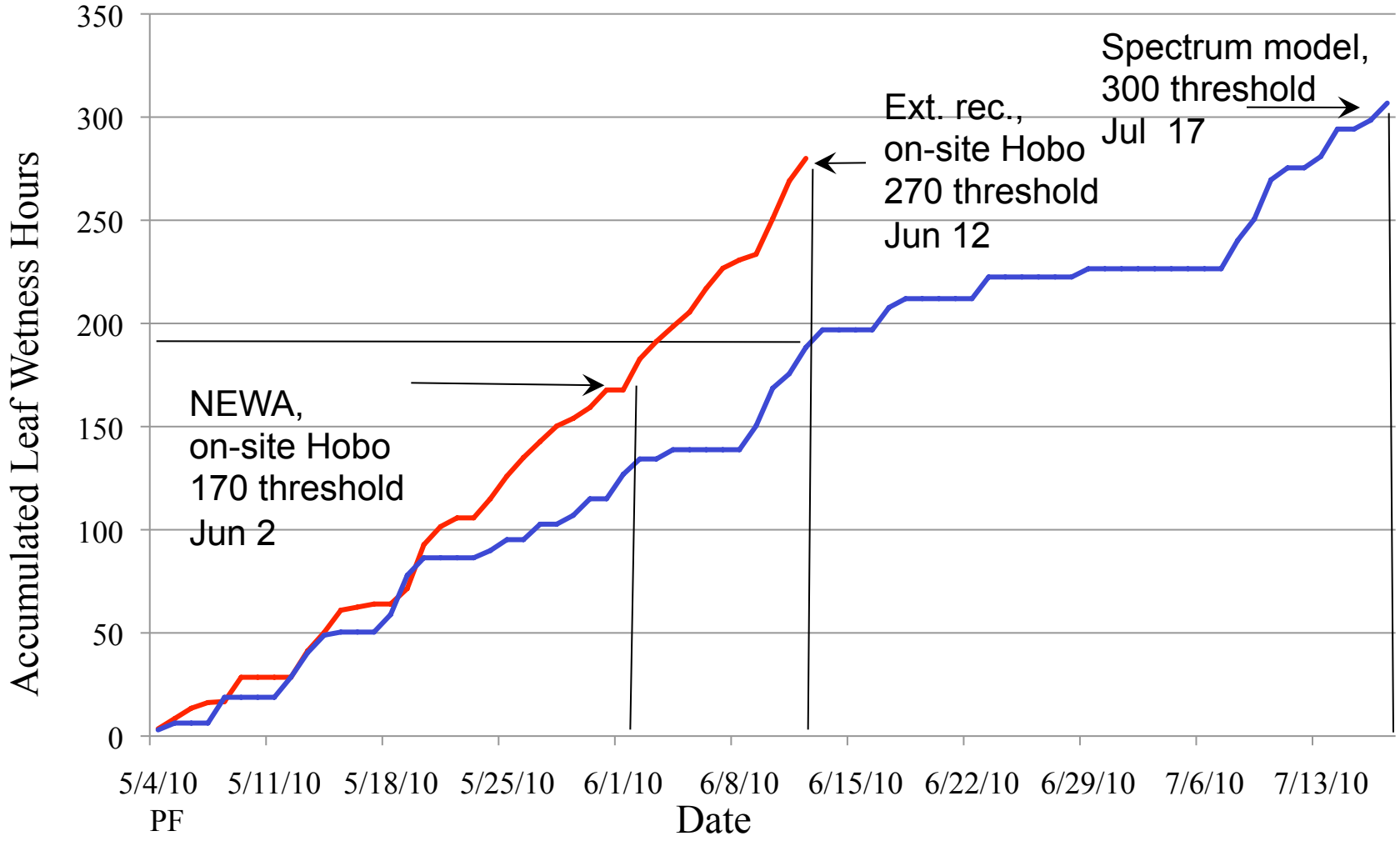
Extension recommendation and on-site monitoring



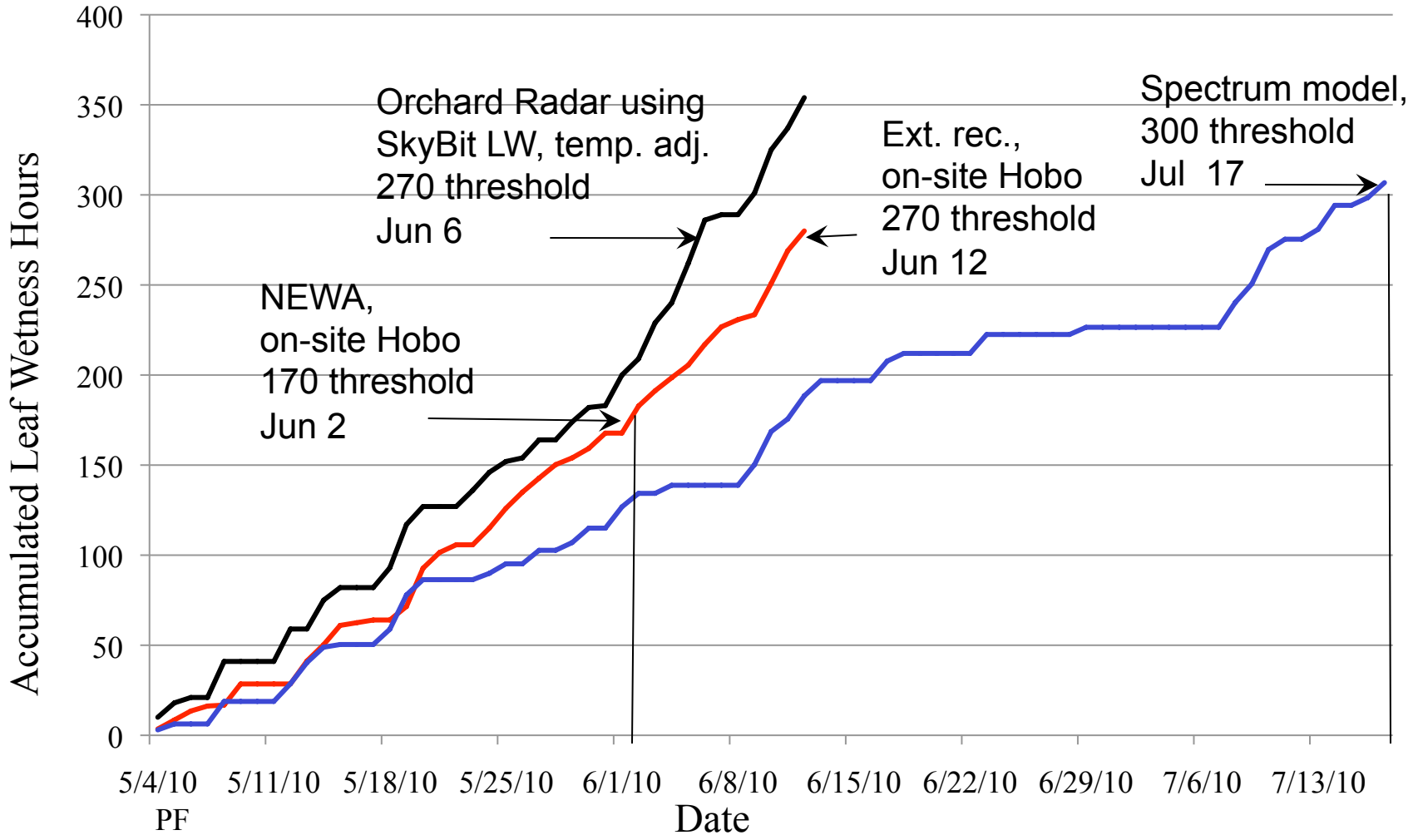
Compare with the Spectrum SpecWare model



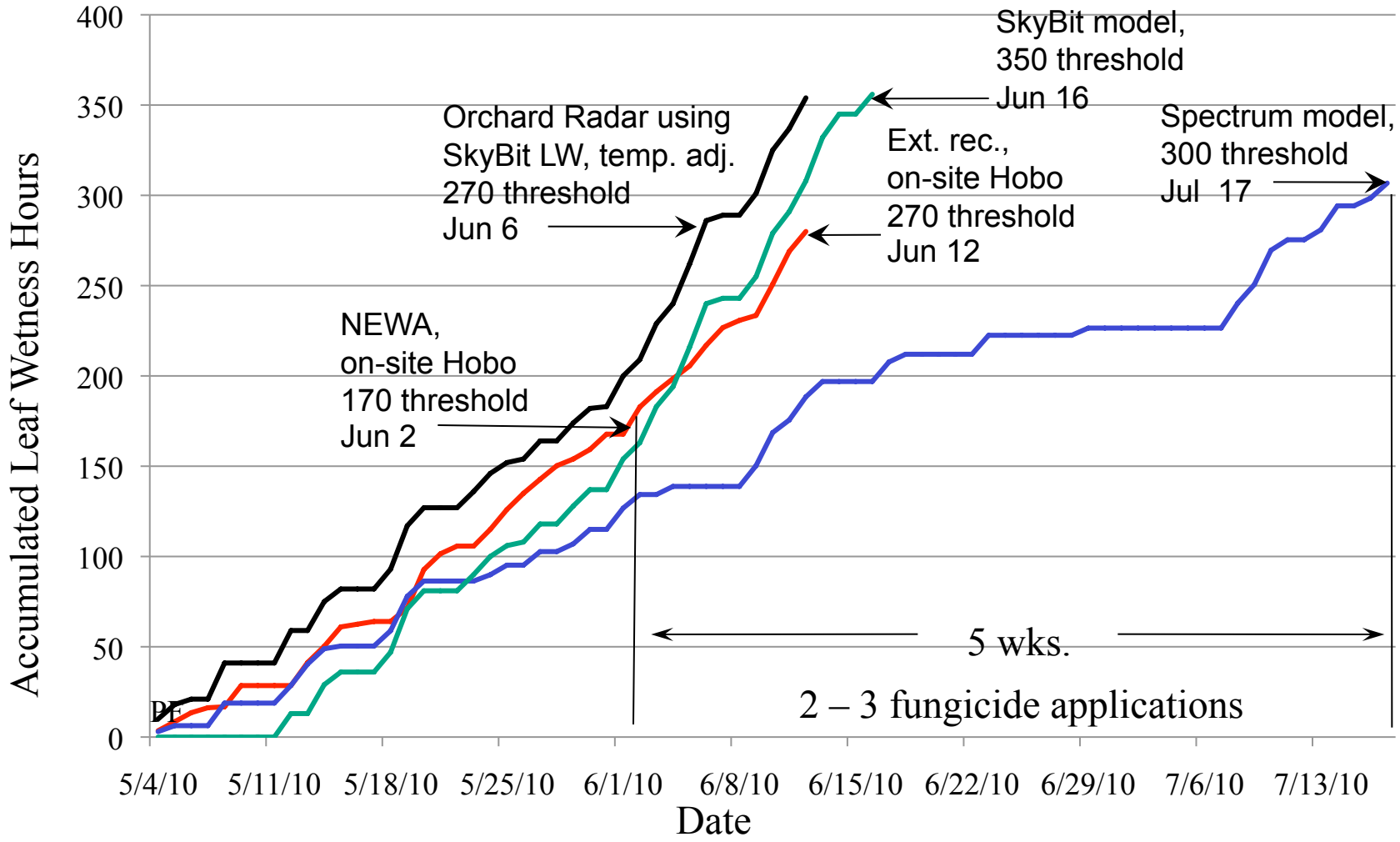
NEWA?


Accumulated Leaf Wetness Hours
350
300
250
200
150
100
50
0
5/4/10
PF
5/11/10
5/18/10
5/25/10
6/1/10
6/8/10
6/15/10
6/22/10
6/29/10
7/6/10
7/13/10
Date
NEWA,
on-site Hobo
170 threshold
Jun 2
Ext. rec.,
on-site Hobo
270 threshold
Jun 12
Spectrum model,
300 threshold
Jul 17

Orchard Radar?



First SBFS recs., 5 models

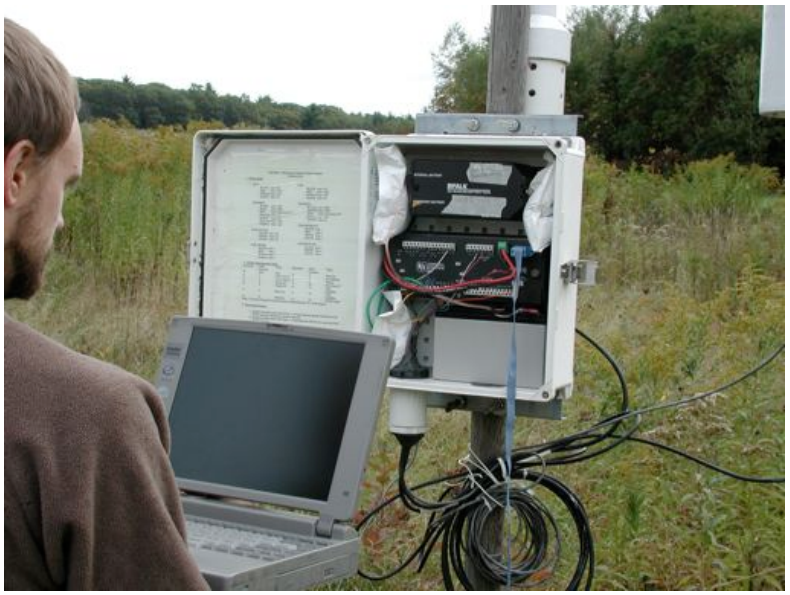


Potential sources of variability

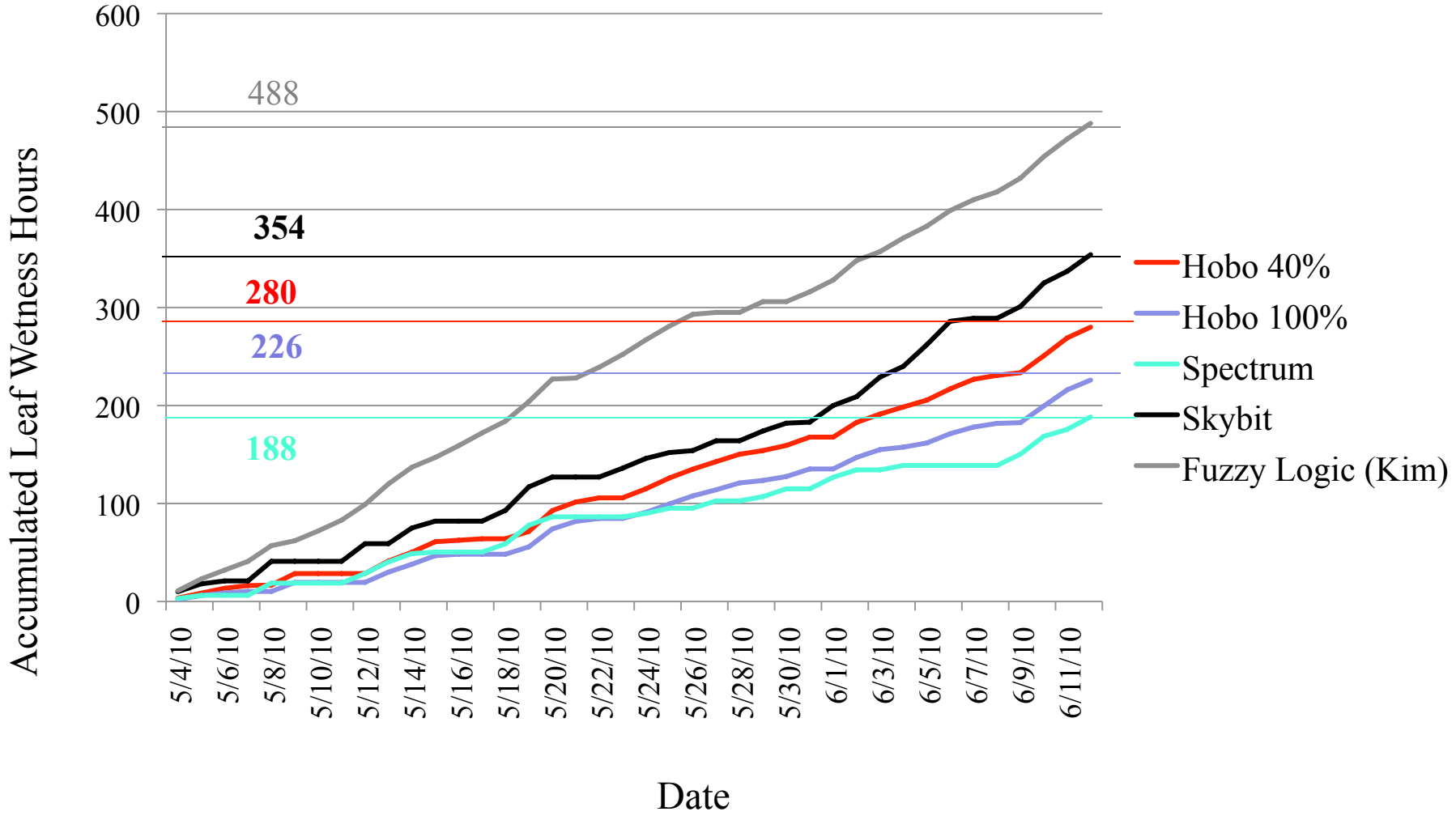
- Weather instrumentation and measurement
- Biofix
- Threshold calculation

Weather instrumentation and measurement

- String for LW – probably not for orchard, maybe for research
- Electronic grids – various types
- Setting threshold for “wet”
- Equipment placement relative to trees
- Off-site estimates via SkyBit, NOAA



Comparing five wetness data sources



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LW sensing

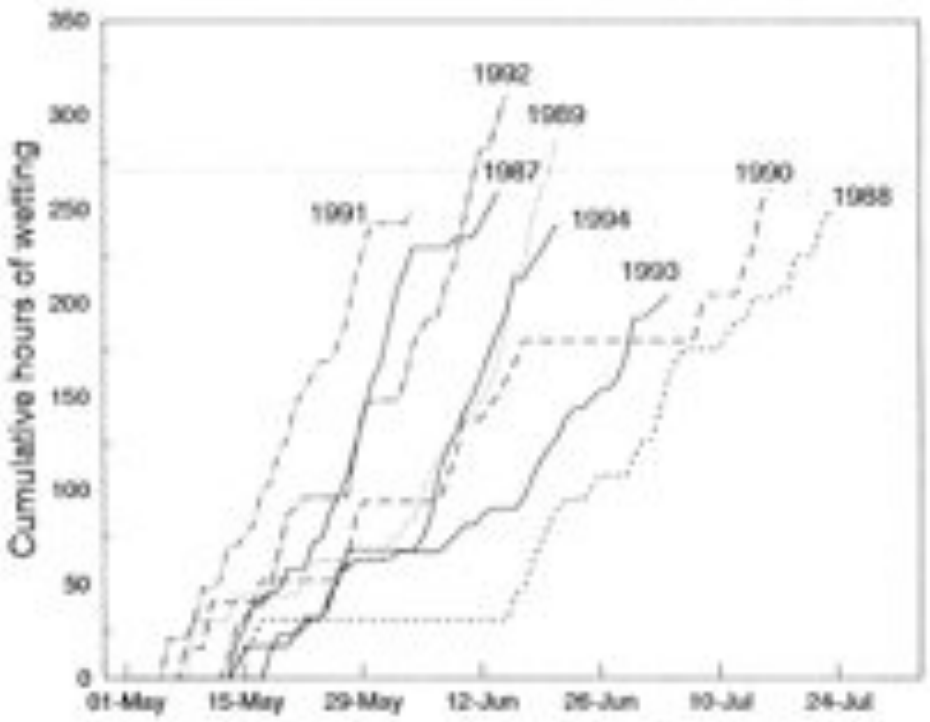
- Original DeWit monitor – "string" based
- Wet if ≥ 50% deflection
- Placed inside dripline of tree
- 1.5 meter above ground
- Electronic grids – Angle? Facing?
- Percent of full range – 40%?
- In the canopy? How high?

Original model

- Brown & Sutton 1995 – empirical model based on first signs
- Biofix – 10 days after petal fall
- 273 accumulated leaf wetness hrs. for periods ≥ 4 hrs.

Original model action threshold

- First appearance of signs: 209 to 310 ALWH
- Benzimidazole trt. at 200 to 225 ALWH
- "… the threshold that we hav established with the deWit sensor may have to be modified if other sensors are used."



Hartman revision

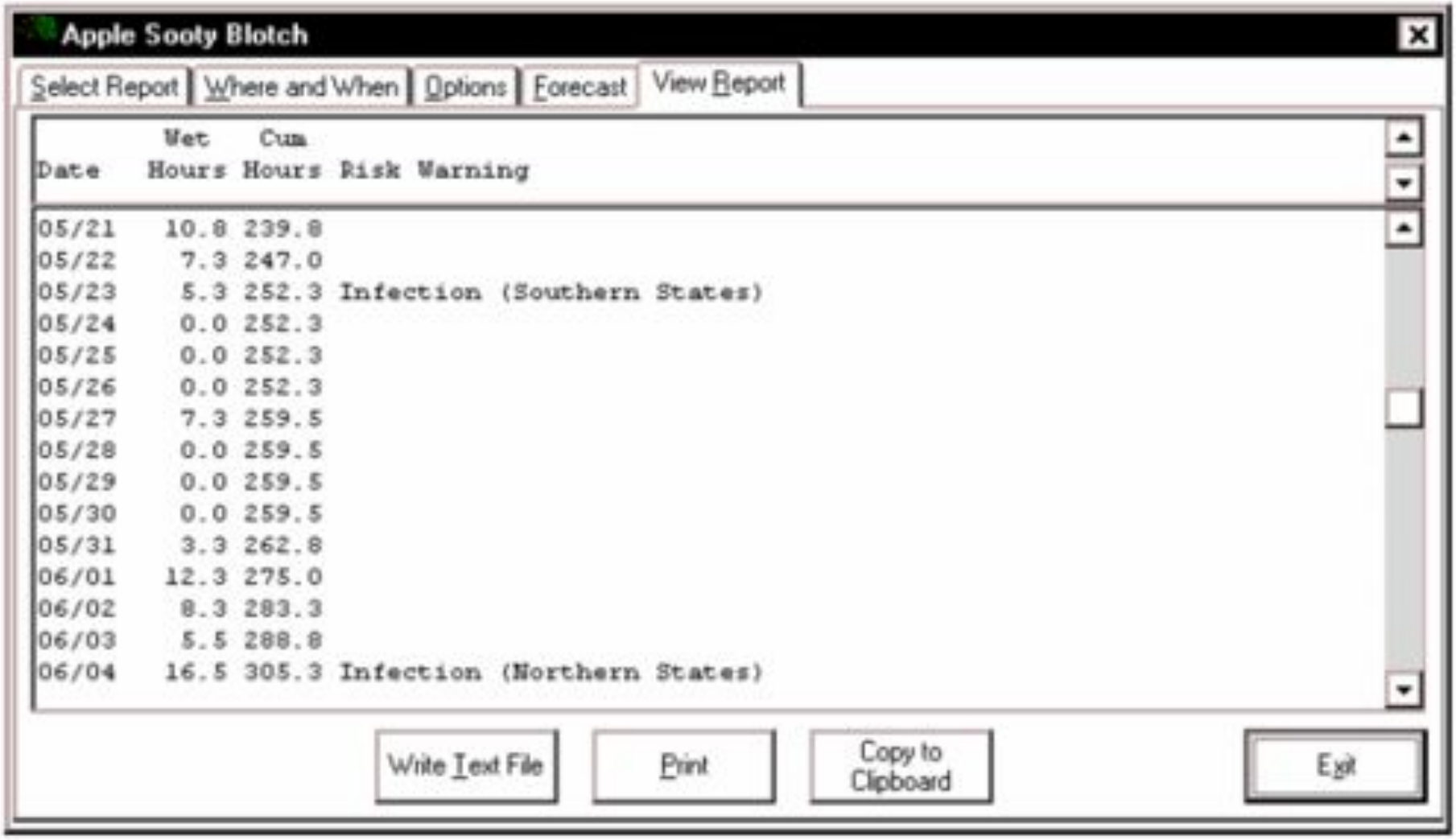
- Electronic sensor rather than deWit
- Used a 175 hr. treatment threshold
- Counted all wet hrs. – no 4 hr. minimum
- Biofix of the first post-petal fall fungicide treatment

Illinois / Iowa / Wisconsin

- Babadoost et al. 2004 used Hartman modification
- Compared electronic on-site with mesoscale interpolated (Skybit) data
- Skybit LW accumulated more rapidly than on-site
- SBFS incidence higher in model-directed plots in 12 of 28 site yrs.

Spectrum model

- "Both models [for sooty blotch and flyspeck] require **air temperature and leaf wetness data."**
- "Only leaf wetness periods of at least 3 hours are counted … . After the 259 hrs. [since?] have accumulated, the model starts. Any 3-hour leaf wetness period after the start signals a possible infection."
- Specify wetness threshold. Range 0 – 15
- Cite Sutton and Jones, but the ref. is not specific


Apple Sooty Blotch
Select Report
Where and When
Options
Forecast
View Report
Date Wet Hours Cum Hours Risk Warning
05/21 10.8 239.8
05/22 7.3 247.0
05/23 5.3 252.3 Infection (Southern States)
05/24 0.0 252.3
05/25 0.0 252.3
05/26 0.0 252.3
05/27 7.3 259.5
05/28 0.0 259.5
05/29 0.0 259.5
05/30 0.0 259.5
05/31 3.3 262.8
06/01 12.3 275.0
06/02 8.3 283.3
06/03 5.5 288.8
06/04 16.5 305.3 Infection (Northern States)
Write Text File
Print
Copy to Clipboard
Exit

Skybit

E-WEATHER SERVICE
For: MA-BELCHERTOWN-HORTRESCENTER

AGWEATHER IPM APPLE DISEASE PRODUCT
Date: SUN Jun 20, 2010

	WEATHER					APPLE SCAB 100329				FIRE BLIGHT 100422				SOOTY BLOTCH 100502	
	TMX	TMN	PREC	ARH	LW	ASM	AW	TW	PW	ADH	AW	TW	PW	ALW	PW
Date	F	F	in	%	hr	%	hr	F		65F	hr	F		hr	
BASED ON OBSERVATIONS															
0601	76	61	0.51	85	17	100	12	71	++	225	12	71	++	154	+
0602	81	59	0.00	69	9	100	21	68	++	225	21	68	++	163	+
0603	78	63	0.23	81	20	100	11	73	++	225	11	73	++	183	+
0604	82	63	0.24	72	11	100	21	78	++	225	21	78	++	194	+
0605	82	67	0.42	77	22	100	11	76	++	225	11	76	++	216	+
0606	75	57	0.54	81	24	100	35	70	++	225	35	70	++	248	+
0607	70	52	0.00	55	3	100	30	69	++	225	30	69	++	243	+
0608	68	49	0.00	57	0	100	0	-	-	225	0	-	-	243	+
0609	64	45	0.39	76	12	100	12	58	++	225	3	62	++	255	+
0610	63	54	0.54	90	24	100	36	58	++	225	36	58	+	279	+
0611	69	55	0.00	79	12	100	48	58	++	225	48	58	+	291	+
0612	64	58	1.01	90	17	100	14	63	++	225	14	63	++	308	+
0613	65	60	0.12	91	24	100	38	63	++	225	38	63	++	332	+
0614	74	60	0.00	81	13	100	51	63	++	225	51	63	++	345	+
0615	76	54	0.00	62	0	100	0	-	-	225	0	-	-	345	+
0616	70	51	0.15	72	11	100	11	67	++	225	11	67	++	356	++
0617	69	57	0.06	81	18	100	21	65	++	225	21	65	++	366	++
0618	84	54	0.00	63	5	100	5	58	+	225	5	58	+	371	++
0619	82	57	0.00	66	0	100	0	-	-	225	0	-	-	371	++
BASED ON FORECASTS															
0620	82	65	0.00	75	5	100	5	68	+	225	5	68	++	376	++
0621	83	62	0.00	62	0	100	0	-	-	225	0	-	-	376	++
0622	74	60	-----	69	0	100	0	-	-	225	0	-	-	376	++
0623	79	61	-----	84	24	100	24	71	++	225	24	71	++	400	++

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Skybit

E-WEATHER SERVICE — AGWEATHER IPM APPLE DISEASE PRODUCT
For: MA-BELCHERTOWN-HORTRESCENTER — Date: SUN Jun 20, 2010

	WEATHER					APPLE SCAB 100329				FIRE BLIGHT 100422				SOOTY BLOTCH 100502	
	TMX	TMN	PREC	ARH	LW	ASM	AW	TW	PW	ADH	AW	TW	PW	ALW	PW
Date	F	F	in	%	hr	%	hr	F		65F	hr	F		hr	
BASED ON OBSERVATIONS															
0601	76	61	0.51	85	17	100	12	71	++	225	12	71	++	154	+
0602	81	59	0.00	69	9	100	21	68	++	225	21	68	++	163	+
0603	78	63	0.23	81	20	100	11	73	++	225	11	73	++	183	+
0604	82	63	0.24	72	11	100	21	78	++	225	21	78	++	194	+
0605	82	67	0.42	77	22	100	11	76	++	225	11	76	++	216	+
0606	75	57	0.54	81	24	100	35	70	++	225	35	70	++	248	+
0607	70	52	0.00	55	3	100	30	69	++	225	30	69	++	243	+
0608	68	49	0.00	57	0	100	0	-	-	225	0	-	-	243	+
0609	64	45	0.39	76	12	100	12	58	++	225	3	62	++	255	+
0610	63	54	0.54	90	24	100	36	58	++	225	36	58	+	279	+
0611	69	55	0.00	79	12	100	48	58	++	225	48	58	+	291	+
0612	64	58	1.01	90	17	100	14	63	++	225	14	63	++	308	+
0613	65	60	0.12	91	24	100	30	63	++	225	30	63	++	332	+
0614	74	60	0.00	81	13	100	51	63	++	225	51	63	++	345	+
0615	76	54	0.00	62	0	100	0	-	-	225	0	-	-	345	+
0616	70	51	0.15	72	11	100	11	67	++	225	11	67	++	356	++
0617	69	57	0.06	81	18	100	21	65	++	225	21	65	++	366	++
0618	84	54	0.00	63	5	100	5	58	+	225	5	58	+	371	++
0619	82	57	0.00	66	0	100	0	-	-	225	0	-	-	371	++
BASED ON FORECASTS															
0620	82	65	0.00	75	5	100	5	68	+	225	5	68	++	376	++
0621	83	62	0.00	62	0	100	0	-	-	225	0	-	-	376	++
0622	74	60	-----	69	0	100	0	-	-	225	0	-	-	376	++
0623	79	61	-----	84	24	100	24	71	++	225	24	71	++	400	++

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Orchard Radar

Flyspeck prevention, Group A fungicides (strobilurins and Topsin M): August-September spray da

Background Information for this page
Return to radar list for Belchertown MA

Weather data for Belchertown MA. Forecast values begin August 3, 2010

Continuous protection from June 6 until 30 days before harvest is recommended. Risk of new flyspeck infections increases around July 11, and increases again around August 10.

Flyspeck infections that begin before August 19 are likely to become visible around September 20. Infections that begin before September 2 are likely to become visible around October 20. But warm wet weather in September can accelerate flyspeck development resulting in earlier dates of flyspeck appearance before harvest.

Postinfection control of flyspeck may occur with application a strobilurin or Topsin M fungicide within 50 wet hours after the 'Protection end date' of the previous fungicide application.

Weather data for Belchertown MA. Forecast values begin August 3, 2010

Inches Rain	Spray Date - assumes that fungicide was applied before any rain fell on spray date	Protection End Date for full-dose Pristine, Flint, Sovran, or Topsin M (deadline for postinfection strobilurin or Topsin M)	Date flyspeck infections that started after end of protection could appear (Left side = rough estimate of flyspeck show date for dense canopy trees if weather beyond forecast range is in top 20% of years for both temperature and wet hours. x = show date is within forecast range. Right side = rough estimate of flyspeck show date for small, open canopy, low-risk trees.)		
0	**Sun, August 1**	**Aug 22** (August 27)	(Sep 13)	**September 25**	(> Oct. 31)
0	**Mon, August 2**	**Aug 23** (August 28)	(Sep 14)	**September 27**	
0	**Tue, August 3**	**Aug 24** (August 29)	(Sep 15)	**September 29**	
0	**Wed, August 4**	**Aug 24** (August 29)	(Sep 15)	**September 29**	
0	**Thu, August 5**	**Aug 24** (August 29)	(Sep 15)	**September 29**	
0.10	**Fri, August 6**	**Aug 24** (August 29)	(Sep 15)	**September 29**	

Orchard Radar

- Uses 270 ALWH as a starting point for ‘high risk’
- Adjusts for temperature using Sutton’s *in vitro* range – no growth under 9º C or over 27º C
- Threshold of 212 ALWH is used for temperature adjusted LWH
- Skybit source for LW data

Basic problems with SBFS models

- Biofix arbitrary
- Petal fall has never been correlated with inoculum development – beginning, maturation or any key event
- Last fungicide spray has nothing to do with inoculum development
- Inoculum development may be moisture driven, temperature driven or both

Basic problems with SBFS models

- Unclear what accumulated leaf wetness hours are doing
- Driving inoculum development in borders?
- Driving growth on apple fruit?
- For which SBFS fungi?

What do we need to know about SBFS?

- When inoculum is mature and able to infect fruit
- The environmental conditions that lead to fruit infection, e.g. wetting, high humidity and/or temperature
- The amount of time it takes for infections to develop into signs on fruit – wetness, humidity and/or temperature driven

How do we do it?

- Bag and unbag fruit at regular intervals to determine when inoculum is arriving
- Incubate fruit under high humidity to determine infection
- Control and compare temperatures during high humidity incubations

Capturing conidia

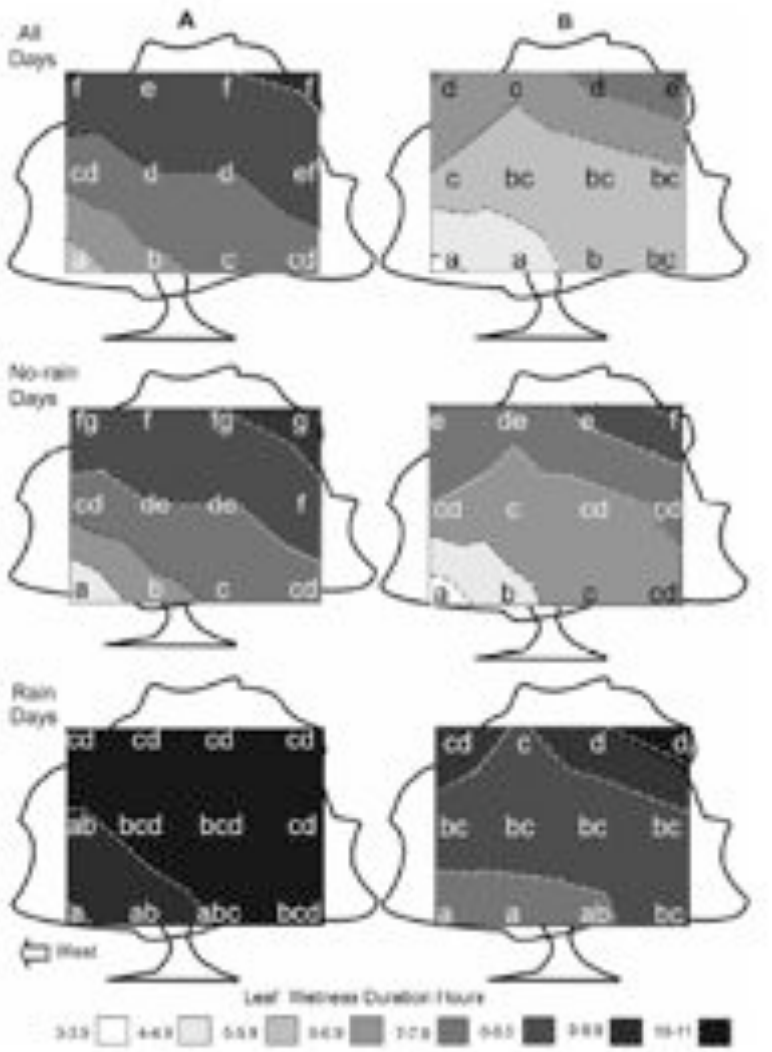
- Trap spores at orchard borders
- Use PCR to identify SBFS species
- Determines when inoculum is moving from reservoir hosts to fruit
- Correlate with temperature, humidity and wetness data

The problem of leaf wetness

- Method of data collection will probably shift from on-site to off site
- Develop or adapt models to off-site estimates!
- Relative humidity is easier to obtain and generally less variable than leaf wetness – use it if possible
- If on-site used standardize placement

LW vs. RH

- Duttweiler et al. 2008
- Accumulated hrs. of RH ≥ 97% better predictor in IA, but ALWH better in NC
- Regional differences in climate expected with empirical model



Thanks

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