Apple Information Manager

AIM

Presentation for the

ESA Eastern Branch Symposium

March 6, 2001

Harrisburg, PA

By

Lorraine P. Berkett

University of Vermont

Apple Information Manager

AIM

- Apples were identified as a priority crop in all 6 New England states under the IPM National Initiative, 1995-96.
- The AIM project specifically addressed grower-identified apple extension and research needs in New England.
- Project Duration: 1997 – 2000

AIM Project Participants

- ✓ CT: Lorraine Los and growers
- ✓ MA: Dan Cooley, Art Tuttle, and growers
- ✓ ME: Glen Koehler and growers
- ✓ NH: William MacHardy and growers
- ✓ RI: Heather Faubert and growers
- ✓ VT: Lorraine Berkett, Elena Garcia, Jon Clements, Gwen Neff, and growers

AIM Objectives

1. Enhance apple IPM implementation in New England by developing the Apple Information Manager (AIM) -- a New England Apple IPM website. [Extension]
2. Compare the relative performance of major apple pest models using remotely generated virtual weather data versus data collected on site. [Research]
3. Increase awareness and knowledge among New England commercial apple growers of IPM web resources. [Extension]

Accomplishments

Extension Objectives

- ✓ AIM Development - http://orchard.uvm.edu/aim/
- ✓ Increase Grower Awareness and Knowledge of IPM Web resources

AIM Website

1. **Homepage:** Serves as a ‘portal’ or ‘gateway’ linking the various pages on the site

Netscape - [Apple Information Manager]

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Netsite: http://orchard.uvm.edu/AIM/

What's New? What's Cool? Destinations Net Search People Software

AIM

Apple Information Manager

New/News:

01/25/99: Agenda of VTFGA Annual Meeting

01/21/99: Agenda of Conn. Pomological Society Mid-Winter Meeting

01/13/99: Pictures of AIM Information Booth at the 1999 New England Fruit

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Netscape - [Apple Information Manager]

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Netsite: http://orchard.uvm.edu/AIM/

What's New? What's Cool? Destinations Net Search People Software

Weather

- Useful links to current and forecast weather conditions plus 'Skybit' weather data for CT, MA, ME, NH, RI and VT

Newsletters

- Archived and current Extension/research newsletters from CT, MA, ME, NH, RI and VT

Questions?, and Answers!

- Regional and world-wide E-mail discussion group lists; interactive forum for posting questions and responses in topic areas; e-mail to

Decision Support

- Weather-based estimates of dates for some key events that affect orchard management

Library

- An archive of New England Extension and research orchard publications

Contacts: Growers and Extension

Start Eudora Lig... Microsoft ... Microsoft P... Netscap... Exploring - ... 4:04 PM

Apple Information Manager - Netscape

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Bookmarks Netsite: http://orchard.uvm.edu/aim/default.html What's Related

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The Apple Information Manager (AIM) is a collaborative Extension and research effort of the Universities of Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont to deliver timely, relevant, and useful region-wide apple production information to New England commercial apple growers via the World Wide Web.

If AIM is to succeed, however, we need your visionary help! What have you found useful about AIM? What not? And what would you like to see that we don't have? Please **Let Us Know!**

The New England AIM Team:

Lorraine Los llos@canr1.cag.uconn.edu **Connecticut Apple IPM**	Glen Koehler gkoehler@umext.maine.edu **Maine Apple IPM Program**	Dan Cooley dcooley@microbio.umass.edu **Massachusetts Apple IPM Program**
Heather Faubert hhf@uriacc.uri.edu **Rhode Island Apple IPM Program**	Lorraine Berkett lberkett@zoo.uvm.edu **Vermont Apple IPM Program**	William Machardy machardy@christa.unh.edu **New Hampshire Apple IPM Program**

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AIM Website

2. Weather: Linked to weather-related sites for each state including both general (i.e., public domain sites such as weather.com) and specific, site-related sites (i.e., ‘virtual data’ from Skybit®, i.e.,Zedex).

Netscape - [AIM -- Vermont Weather]

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Netsite: http://orchard.uvm.edu/AIM/weather/vt.html

What's New? What's Cool? Destinations Net Search People Software

Vermont -- Weather

AIM -- 'Skybit' Weather Products

VT-New Haven: 48 hour details & 7 day forecast
VT-New Haven last 7 days

VT-Shoreham: 48 hour details & 7 day forecast
VT-Shoreham last 7 days

VT-South Burlington: 48 hour details & 7 day forecast
VT-South Burlington last 7 days

AIM -- Vermont Weather Forecasts

AIM -- Vermont Current/Recent Conditions

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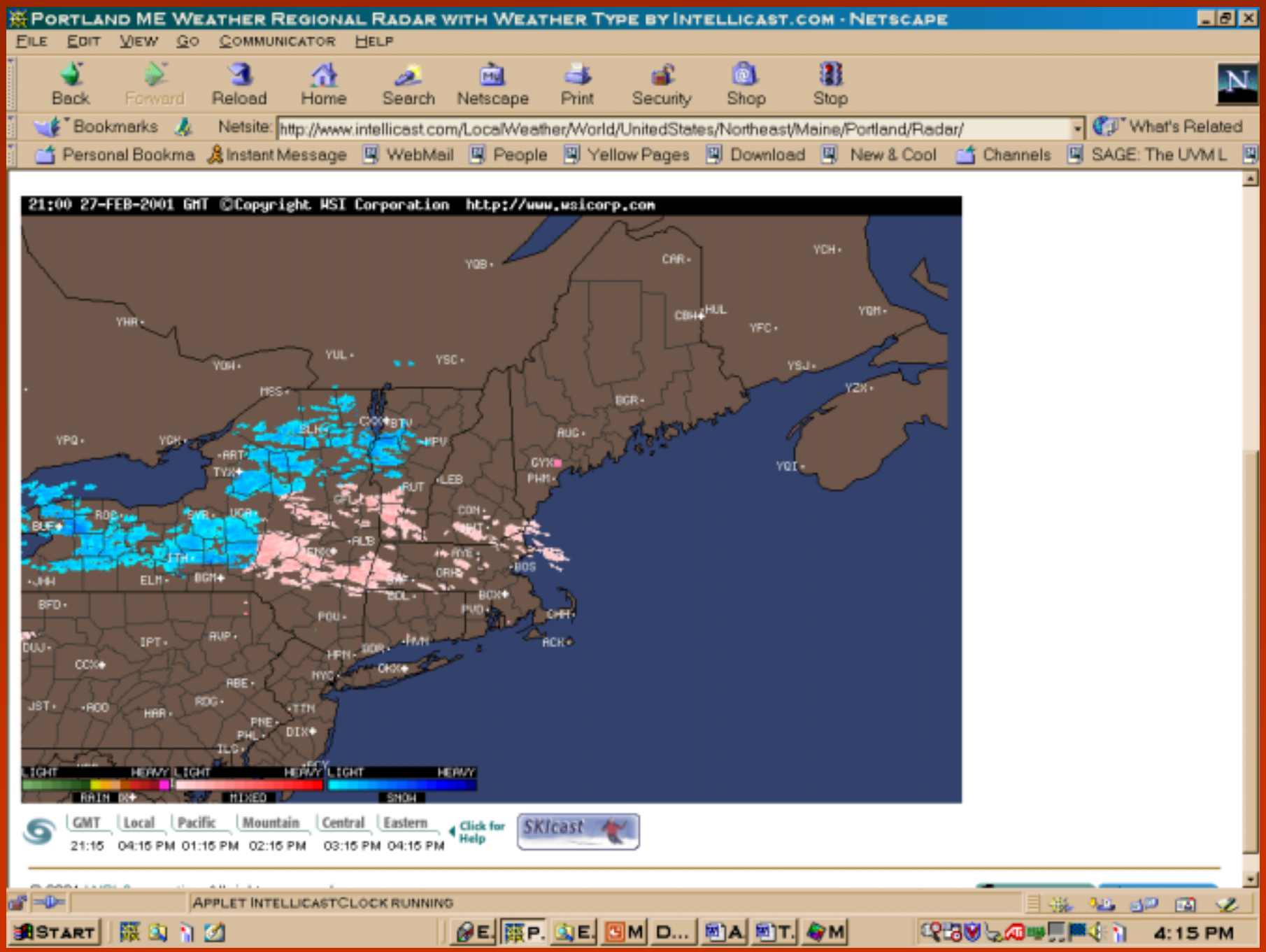
Portland ME Weather Regional Radar with Weather Type by Intellicast.com - Netscape
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21:00 27-FEB-2001 GMT ©Copyright WSI Corporation http://www.wsicorp.com
LIGHT HEAVY LIGHT HEAVY LIGHT HEAVY
RAIN MIXED SNOW
GMT Local Pacific Mountain Central Eastern
21:15 04:15 PM 01:15 PM 02:15 PM 03:15 PM 04:15 PM
Click for Help
SKIcast
Applet IntellicastClock running
Start
4:15 PM

AIM TEMPORARY SKYBIT LINKS - NETSCAPE

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Bookmarks Location: file:///D|/My Documents/applewebsite/aim/weather/skybit.html What's Related

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Welcome to the AIM directory for SkyBit weather reports

Disclaimer: Normally SkyBit Inc. sends their reports directly to the paying customer only. The SkyBit reports referenced below are being made available at this web site through an experimental two year agreement with the company. As part of that agreement, the following statements are required. Please read and act in accordance with these statements. They are as much for your protection as the company's.

--- The data for each site are site-specific and are limited in their representation of regional weather conditions.

--- SkyBit Inc. assumes no responsibility for results from AIM pest models that use SkyBit data as input.

--- Persons accessing SkyBit data from the AIM web site cannot redistribute the data in any form without permission from SkyBit.

Connecticut

CT-Broad Brook: 48 hour details & 7 day forecast

CT-Broad Brook hourly values yesterday and today
CT-Broad Brook last 7 days

CT-Guilford: 48 hour details & 7 day forecast

CT-Guilford hourly values yesterday and today
CT-Guilford last 7 days

CT-Middlefield: 48 hour details & 7 day forecast

CT-Middlefield hourly values yesterday and today
CT-Middlefield last 7 days

Massachusetts

MA-Belchertown: 48 hour details & 7 day forecast

MA-Belchertown hourly values yesterday and today
MA-Belchertown last 7 days

MA-Sterling: 48 hour details & 7 day forecast

MA-Sterling hourly values yesterday and today
MA-Sterling last 7 days

New Hampshire

NH-Durham: 48 hour details & 7 day forecast

DOCUMENT: DONE

START AIMMARCH20... EXPLORING-... MICROSOFT IM... AIM TEMPORA... 1:04 PM

Netscape - [http://pmo.umext.maine....-VT-Shoreham-Demong.txt]

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Location: http://pmo.umext.maine.edu/ftproot/forectxt/forecast-VT-Shoreham-Demong.txt

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Copyright(c) 1998 SkyBit, Inc. Phone: (800) 454-2266

AgWeather Forecast for: VT-SHOREHAM-DEMONG
Forecast beginning : FRI Oct 2, 1998

<---------- 0-48 HOUR FORECAST---------->

	Oct 2						Oct 3							
HOUR (EDT)	8a	11a	2p	5p	8p	11p	2a	5a	8a	11a	2p	5p	8p	11p
TEMP (F)	40	49	53	53	48	47	45	43	43	50	55	55	47	43
2"- SOIL TEMP (F)	44	47	51	53	52	49	45	42	44	48	52	54	53	49
REL HUM (%)	73	59	52	53	69	75	76	78	79	60	47	47	68	77
6HR PRECIP(in)	.00/		.00/		.00/		.00/		.00/		.00/		.00/	
6HR PRECIP PROB(%)	11/		24/		27/		12/		12/		9/		8/	
3HR WETNESS (hrs)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WIND DIR (pt)	W	WSW	W	W	W	W	WNW	WNW	WNW	W	W	W	NW	NW
WIND SPEED (mph)	11	16	15	13	10	9	9	7	7	10	9	9	5	5
CLOUD COVER	CLR	SCT	SCT	SCT	CLR	CLR	CLR	SCT	CLR	SCT	SCT	SCT	SCT	SCT
3HR RADIATION (ly)	5	93	164	121	17	0	0	0	5	91	162	119	16	0
DRYING (key)	4	6	7	7	5	4	4	3	3	6	7	7	4	3
SPRAYING (key)	3	0	1	3	4	5	5	6	6	4	5	5	8	7

Document: Done

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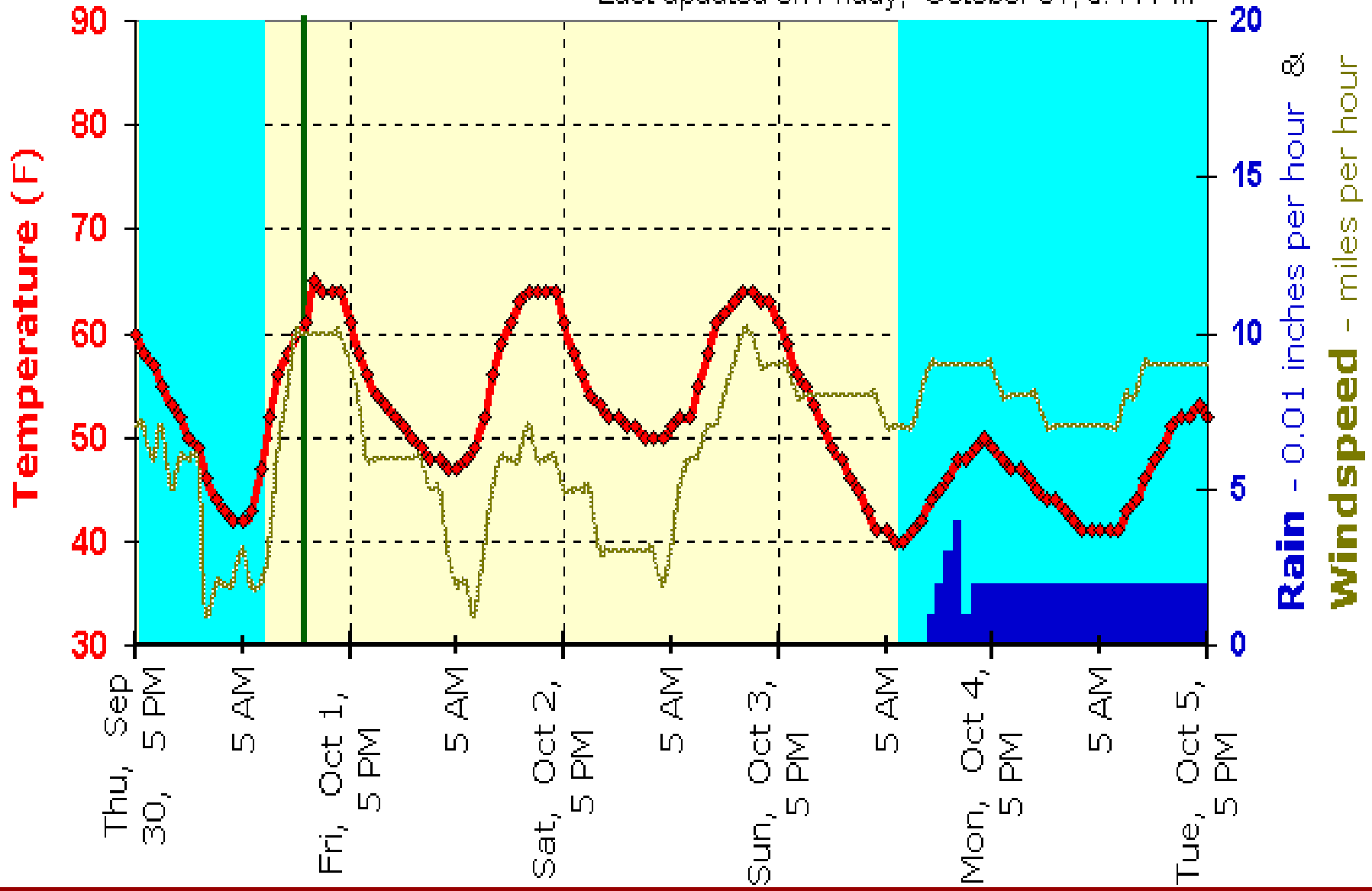
Temperature, Rain, Leafwetness & Windspeed for past 24 and next 96 hours

Key to symbols is below chart

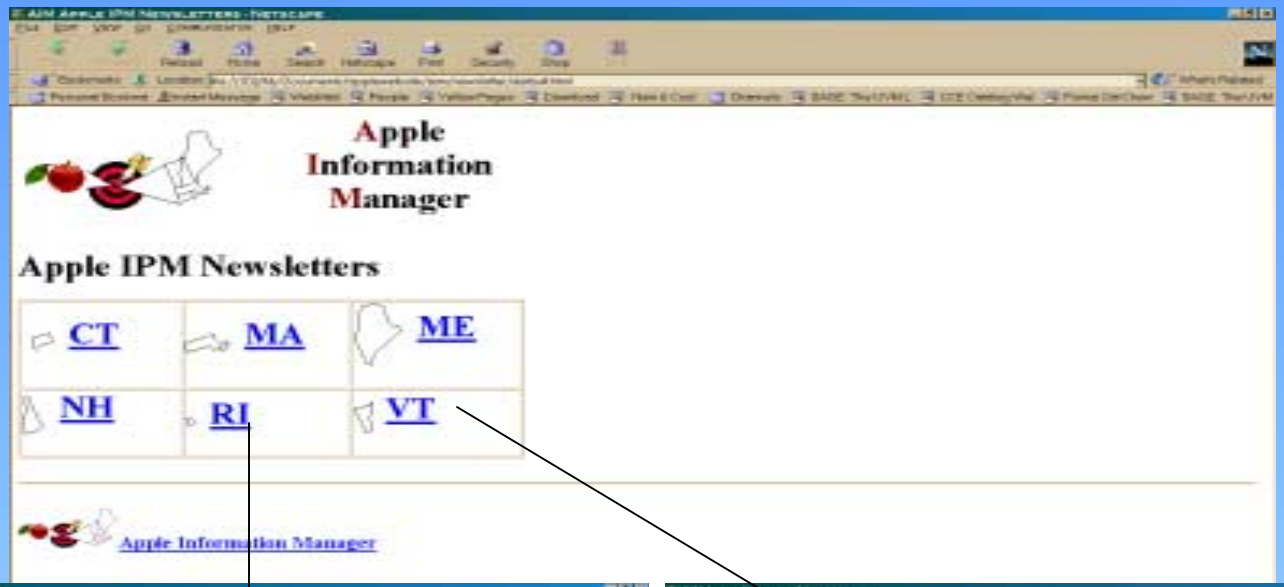
Data for Morrill ME

Last updated on Friday, October 01, 5:44 PM



AIM Website

3. **Newsletters**: Linked to newsletters from each state's IPM programs.


Apple
Information
Manager
Apple IPM Newsletters
CT
MA
ME
NH
RI
VT
Apple Information Manager

University of Rhode Island
College of the Environmental and Life Sciences
Rhode Island Apple IPM
E-Mail: Mf@uri.edu
Recorded pest message @ (401) 949-0670
URI Links
College of the Environment and Life Sciences
Plant Sciences Department
Rhode Island Agricultural Experiment Station
Rhode Island Apple IPM
Information primarily for Rhode Island commercial apple growers. Access to RI Apple IPM Newsletters, current pest reports and RI Fruit Grower Meetings
Field Season 2000
Current pest reports -insect trap counts, apple scab infection
IPM LINKS
AIM - Apple Information Manager
VT Apple IPM
Maine Apple IPM
Scaffolds - NY Newsletter
UMASS Fruit Program

UVM Apple Orchard
The UVM Apple Program:
UVM Apple Orchard Blocks
Horticulture
IPM
Newsletters

AIM Website

4. **Decision support**: Over the 1998 and 1999 growing seasons, Orchard Radar, developed by Glen Koehler of the University of Maine, provided daily updates of site-specific apple IPM decision support models covering orchards in each New England state

ORCHARD RADAR SITE DIRECTORY - NETSCAPE

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Maine Apple IPM Program

Introduction to Orchard Radar

for update times see optimizing your Orchard Radar display

ORCHARD RADAR Sites

Maine

Monmouth - Highmoor Farm
Lincolnville Center
Manchester
Morrill
Sanford
Waterford

Connecticut

Broad Brook
Guilford
Middlefield

Massachusetts

Belchertown
Shelburne
Sterling

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New Hampshire

Walpole

Rhode Island

Greenville

Vermont

Bennington

New Haven

Shoreham

S. Burlington

Acknowledgements

Please send your suggestions or comments to:

Glen W. Koehler gkoehler@umext.maine.edu
Associate Scientist IPM/NAPIAP, Pest Management Office
491 College Avenue
Orono, ME 04473-1295
Tel: 207-581-3882
within Maine: 800-287-0279

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Introduction to Orchard Radar products - Netscape

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Pest Management Office
THE UNIVERSITY OF MAINE
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Maine Apple IPM Program

Introduction to Orchard Radar

1) Use your common sense in applying this information.
These are educated guesses, no more, no less.
These products are **supplementary** tools for IPM decision making, no more, no less.
The best tool is the experience and knowledge between your ears, no doubt about it.

2) The University of Maine and no other persons or institutions make any claim about the validity of these estimates. These are experimental tools in development.

3) Estimates for Highmoor Farm have no validity beyond Maine. Be cautious in extrapolating from the Highmoor Farm site to other Maine locations. Rain especially can be very localized, causing a nearby site to have estimates that do not accurately reflect conditions at your location.

4) Do yourself a favor and read the technical notes on optimizing your Orchard Radar display.

5) As they are posted (most not there yet) - Do yourself another favor and read the background information for the different Orchard Radar products. At present there are two background pages:
a) Description of Fungicide Groups A and B referred to by Flyspeck radar tables,
b) Examples of mite thresholds referred to Mite resampling date radar tables

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Orchard Radar

- ✓ List of information/models available to each AIM orchard in each New England state.

ORCHARD RADAR - VT SOUTHBURLINGTON - NETSCAPE

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Orchard Radar list for SOUTHBURLINGTON VT

Please read the introduction before accessing any of these products. In particular, note that:
1) These are educated guesses, no more, no less. These products are ***supplementary*** tools for IPM decision making, no more, no less.

2) Neither SkyBit Inc., the University of Maine, nor Glen W. Koehler make any claim about the validity of these estimates.

Apple IPM Calendar - Selection of key dates from other radar products

Insect and Mite Pests

INSECTS
Insect Dates (CM, LAW, MPB, RBLR, SJS, STLM, TPB, WAL)

Plum Curculio - insecticide residue depletion Table
PC - residue depletion Chart
PC - warm & humid hours Chart

Apple maggot reset sticky trap - July spray dates
Apple maggot reset sticky trap - August spray dates

MITES
European Red Mite key dates
ERM resample dates - June
ERM resample dates - July
ERM resample dates - August

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ORCHARD RADAR - VT SOUTHBURLINGTON - NETSCAPE

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Diseases (Fungus and Bacterium Pests)

APPLE SCAB

Apple scab - Key dates

Apple scab - Ascospore maturity Table

Apple scab - Ascospore maturity Chart

FIRE BLIGHT

Fire blight - Washington model

FLYSPECK

Flyspeck - Group A fungicides - 1stCoverJune

Flyspeck - Group A fungicides - July

Flyspeck - Group A fungicides - August

Flyspeck - Group B fungicides - 1stCoverJune

Flyspeck - Group B fungicides - July

Flyspeck - Group B fungicides - August

Flyspeck - ZiramLowDose - 1stCoverJune

Flyspeck - ZiramLowDose - July

Flyspeck - ZiramLowDose - August

Flyspeck - CaptanLowDose - 1stCoverJune

Flyspeck - CaptanLowDose - July

Flyspeck - CaptanLowDose - August

General

Bud Stage Predictor

Weather Data - April Weather Data - May

Weather Data - June Weather Data - July

Weather Data - August Weather Data - September

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Data for SouthBurlington VT_____Latest update: October 06 07:18 AM

Estimates based on SkyBit observation data for dates through October 05

Forecast used from October 06 to October 12_____30 year average values used for later dates

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Codling Moth (CM)

1st generation 3% CM egg hatch: June 14, Sunday

(= first spray date where two sprays needed to control 1st generation codling moth, 2nd spray is 2-3 weeks later)

1st generation 20% CM egg hatch: June 21, Sunday

(= single spray date where one spray needed to control 1st generation codling moth)

2nd generation 3% CM egg hatch: August 11, Tuesday

(= first spray date where two sprays needed to control 2nd generation codling moth, 2nd spray is 2-3 weeks later)

2nd generation 20% CM egg hatch: August 26, Wednesday

(= single spray date where one spray needed to control 2nd generation codling moth)

Lesser Appleworm (LAW)

1st LAW flight, first pheromone trap catch: May 09, Saturday

1st LAW flight, peak trap catch: May 19, Tuesday

2nd LAW flight, first pheromone trap catch: July 11, Saturday

DOCUMENT: DONE

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Mullein Plant Bug (MPB)

A good time to begin limb tapping in threatened blocks is when 1st generation eggs have 50% hatched

50% egg hatch by NY model: May 12, Tuesday

50% egg hatch by WA and British Columbia models: May 14, Thursday

Most accurate time for limb tapping counts, and just before MPB damage begins, is when 90% of eggs have hatched.

90% egg hatch by NY model: May 19, Tuesday

90% egg hatch by WA and British Columbia models: May 17, Sunday

---

Redbanded Leafroller (RBLR)

1st RBLR flight, peak pheromone trap catch: May 04, Monday

2nd RBLR flight, first trap catch: July 06, Monday

2nd RBLR flight, peak trap catch: July 19, Sunday

San Jose Scale (SJS)

First adult SJS caught on trap: May 15, Friday

Peak trap catch of of SJS adults: May 26, Tuesday

1st generation SJS crawlers appear: June 21, Sunday

Spotted Tentiform Leafminer (STLM)

First STLM catch on pheromone trap: April 19, Sunday

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First adult SJS caught on trap: May 19, Friday

Peak trap catch of of SJS adults: May 26, Tuesday

1st generation SJS crawlers appear: June 21, Sunday

Spotted Tentiform Leafminer (STLM)

First STLM catch on pheromone trap: April 19, Sunday

1st STLM flight, peak trap catch: May 10, Sunday

1st generation sapfeeding mines start showing: May 15, Friday

---

Start of 2nd STLM flight: June 19, Friday

2nd STLM flight, peak trap catch: July 14, Tuesday

First sample date for 2nd generation STLM sapfeeding mines: July 18, Saturday

Second sample date for 2nd generation STLM sapfeeding mines, if needed: July 23, Thursday

Third sample date for 2nd generation STLM sapfeeding mines, if needed: August 06, Thursday

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Tarnished Plant Bug (TPB)

Rough guess of when TPB damage leaves wounded fruit instead of aborted bud: April 28, Tuesday

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White Apple Leafhopper (WAL)

1st generation WAL found on apple foliage: May 12, Tuesday

2nd generation WAL found on apple foliage: August 16, Sunday

* Note that Rose leafhopper is easily confused with WAL but has different generation dates.

DOCUMENT: DONE

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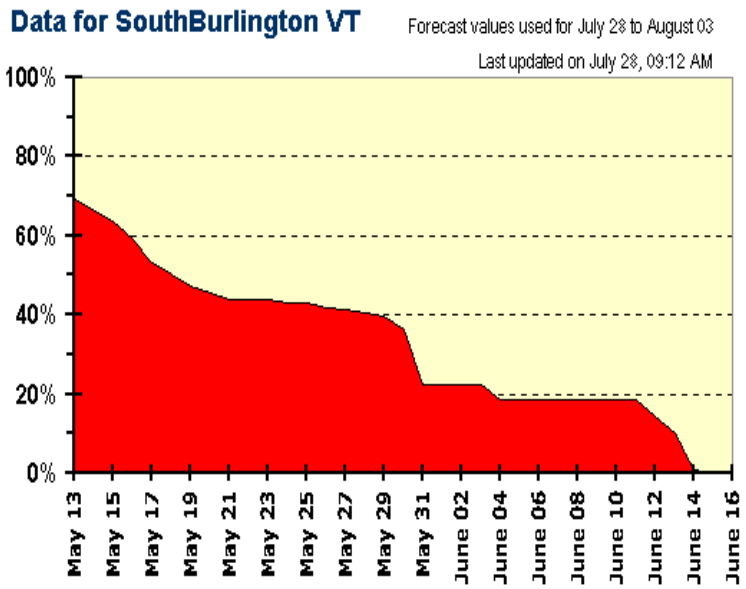
Orchard Radar

- ✓ More specific example of plum curculio information available to AIM growers

Portion of plum curculio immigration period left unprotected by expected residue depletion of full-dose Imidan or Guthion applied on different spray dates



Date of last full dose insecticide spray

Dotted green line marks today's date.

Height of the red area estimates the portion of PC immigration period remaining after residue from the last full-dose insecticide spray was too depleted to insure control of newly immigrating PC.

If last spray date was late enough to protect through the end of the PC immigration period, then the value is zero.

Estimates assume that last spray consisted of full-dose full-block application of Imidan or Guthion (azinphos-methyl).

Estimated end of PC immigration is June 19

Plum curculio protection period

Return to radar list for Monmouth ME

Weather data for Monmouth ME. Last updated on Monday, July 17, 1:55 PM
95% Petal Fall estimated or reported as: May 29, Monday

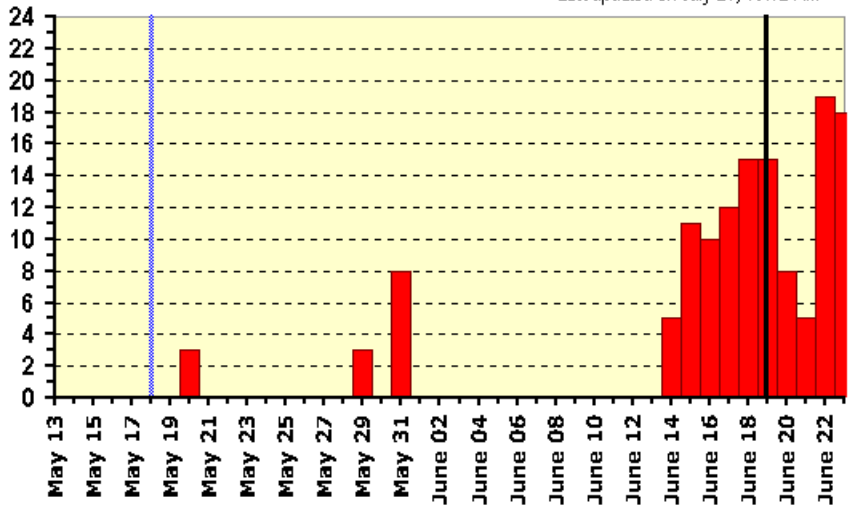
Full-dose Imidan or Guthion Spray Date	PC Degree Days Accumulated since Petal Fall	Inches Rain	Estimated Depletion Date	Portion of immigration period left unprotected by depletion date
Mon, May 29		0	June 10	74%
Tue, May 30		0	June 11	74%
Wed, May 31		0	June 12	73%
Thu, Jun 01	17	0	June 13	72%
Fri, Jun 02	30	0	June 14	71%
Sat, Jun 03	41	0	June 15	69%
Sun, Jun 04	45	0.09	June 16	63%

Number of warm-humid hours per day during plum curculio immigration period

Data for SouthBurlington VT

Forecast values used for July 28 to August 03

Last updated on July 28, 09:12 AM



Vertical lines mark key dates as follows:

green dotted line = today's date.
purple solid line = McIntosh 95-100% Petal Fall date.
blue solid line = McIntosh fruit set date (see note below).
black solid line = end of degree day period for PC immigration.

Fruit diameter increase at fruit set may be associated with increase in PC egglaying.

Warm is Temperature 65 degrees F or higher, Humid is Rel. humidity > 70%. Both most be true for an hour to be counted as warm-humid.

Increased plum curculio activity is associated with warm-humid weather, though the specific relationship to egglaying is not defined. Many warm-humid hours occurring during a day when fruit does not have insecticide protection is incentive to not delay in establishing or renewing protection. The PC table radar shows estimated depletion date for last full dose spray.

WARNING: PC damage can occur on a day with zero warm-humid hours!

Orchard Radar

- ✓ Specific example of Apple Scab information available to AIM growers

Forecast values used for July 28 to August 03 Last updated on July 28, 09:12 AM

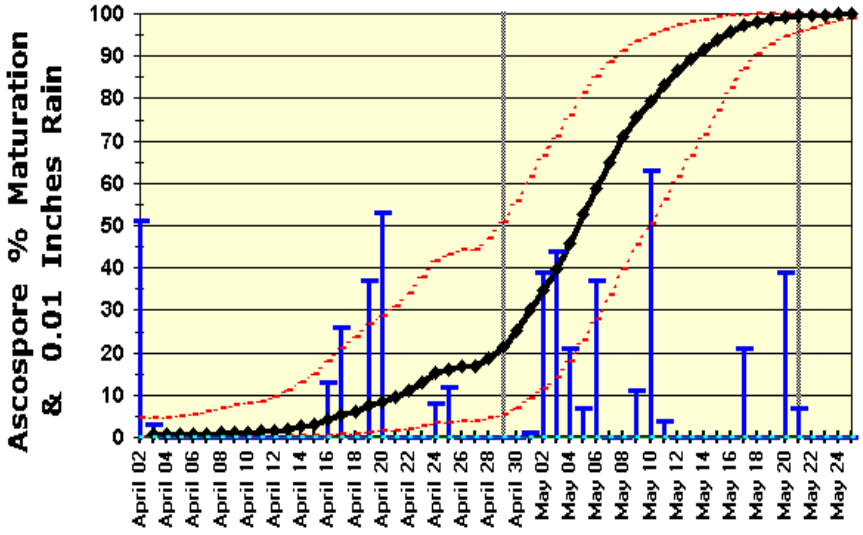
Estimated start of Accelerated phase is: **April 29**

Estimated end of Accerated phase (= 95% ascospore maturity) is: **May 21**

(these two dates marked by vertical grey bars)

Significant primary ascospore releases in commercially managed orchards expected to end with first soaking daytime rain AFTER completion of the accelerated phase.

Data for SouthBurlington VT



For each date, cumulative maturity has a 90% chance of being between values marked by upper & lower dotted red lines.

Best guess is shown by solid black line.

Blue bars show rain in 100ths of inch.

Today's date marked by vertical dotted green line.

NETSCAPE

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Data for SouthBurlington VT Latest update: July 28 09:12 AM

Estimates based on SkyBit observation data for dates through July 27

Forecast used from July 28 to August 03 30 year average values used for later dates

Date	Observed and Forecast Inches Rain	Cumulative Scab Degree Days	1 in 20 chance that cumulative ascospore maturity is less than:	Best Estimate of Cumulative Ascospore Maturity	1 in 20 chance that cumulative ascospore maturity is greater than:
April 02	.51	0		0%	4%
April 03	.03	5		1%	5%
April 04	0	5		1%	5%
April 05	0	8		1%	5%
April 06	0	17		1%	5%
April 07	0	27		1%	6%
April 08	0	37		1%	7%
April 09	0	47		1%	8%
April 10	0	52		1%	8%
April 11	0	58		1%	8%
April 12	0	71		2%	10%
April 13	0	85		2%	11%
April 14	0	101		3%	13%
April 15	0	119		3%	15%
April 16	.13	139	1%	4%	18%
April 17	.26	161	1%	5%	21%
April 18	0	176	1%	6%	24%

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Bookmarks Location: file:///D|/My Documents/IPMNEWS/IPMClassimages/MEVT-SOUTHBURLINGTON-ScabSporeTable.htm What's Related

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May 03	.44	406	14%	40%	71%
May 04	.21	433	18%	46%	76%
May 05	.07	465	23%	53%	81%
May 06	.37	493	28%	59%	85%
May 07	0	522	33%	65%	89%
May 08	0	551	40%	71%	91%
May 09	.11	578	45%	76%	93%
May 10	.63	601	50%	80%	95%
May 11	.04	626	56%	83%	96%
May 12	0	651	62%	87%	97%
May 13	0	674	66%	89%	98%
May 14	0	700	71%	92%	99%
May 15	0	732	77%	94%	99%
May 16	0	767	82%	96%	99%
May 17	.21	801	87%	97%	100%
May 18	0	832	90%	98%	100%
May 19	0	860	93%	99%	100%
May 20	.39	889	95%	99%	100%
May 21	.07	910	96%	99%	100%
May 22	0	929	97%	100%	100%
May 23	0	954	98%	100%	100%
May 24	0	984	98%	100%	100%

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Data for SouthBurlington VT **Latest update: July 28 09:12 AM**

Estimates based on SkyBit observation data for dates through July 27

Forecast used from July 28 to August 03 30 year average values used for later dates

Key Events for Apple Scab	Estimated Date
Accelerated ascospore maturation phase (300 scab degree days) starts on —>	April 29
Earliest date for primary scab lesions to appear (from first rain after green tip in high inoculum orchard) is on —>	April 28
Lesions from first ascospore release after accerated maturation phase began would show on (= Latest date to begin regular scab scouting in low inoculum blocks) —>	May 14
At least 95% of ascospores matured by accumulation of 900 scab degree days on —>	May 21
All primary scab lesions have had time to appear by (keep scouting for new primary scab lesions until this date is passed) —>	June 16

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Orchard Radar

- ✓ Provided complete, integrated calendar of events for growing season

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Data for SouthBurlington VT **Latest update: October 06 07:18 AM**

Estimates based on SkyBit observation data for dates through October 05

Forecast used from October 06 to October 12 30 year average values used for later dates

Events are shown in approximate, but not exact, chronological order.

Date	Event
April 02	McIntosh trees at 50% Green Tip (observed)
April 16	McIntosh trees at Half-Inch Green
April 19	beginning of 1st generation Spotted tentiform leafminer flight
April 28	McIntosh Tight Cluster
April 29	beginning of accelerated scab ascospore maturation
May 01	1st generation European red mite egg hatch begins
April 28	for HIGH scab inoculum orchards: lesions from first significant ascospore release would show
May 04	McIntosh full extended Pink
May 07	McIntosh King Bloom
May 04	Gypsy Moth eggs hatch into larvae (rough guess)
May 09	non-spur McIntosh Full Bloom
May 10	peak of 1st generation Spotted tentiform leafminer flight
May 14	for LOW scab inoculum orchards: lesions from first significant ascospore release would show
May 07	earliest high risk Fireblight infection period. Note: Lower risk conditions may have occurred prior to this date.
May 12	1st generation White apple leafhopper nymphs present

DOCUMENT: DONE

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May 12	1st generation White apple leafhopper nymphs present
May 11	McIntosh 95% Petal Fall (estimated or observed)
May 15	1st generation Spotted tentiform leafminer sap-feeding mines appear
May 15	McIntosh at about 100% Petal Fall
May 21	cumulative scab ascospore maturity reaches 95%
May 18	McIntosh Fruit Set
May 17	optimum sample date for mullein plant bug
May 23	if present, blossom blight from earliest high risk Fireblight infection period would appear
June 11	earliest safe date for last Plum Curculio spray
June 03	2nd generation European red mite nymphs appear
June 16	earliest date on which it is safe to assume that all primary scab lesions have had time to appear
June 18	earliest 2nd generation European red mite adults begin laying eggs
June 19	end of Plum Curculio immigration period
June 11	if present, shoot blight from earliest high risk Fireblight infection period would appear
June 19	Beginning of 2nd generation Spotted tentiform leafminer flight
June 21	1st generation Codling Moth - best date for single spray (estimated 20% egg hatch)
June 23	Japanese beetles begin showing up (rough guess)
June 27	early 3rd generation European red mite nymphs appear
June 30	Apple maggot flight actiivity increases (rough guess)
July 07	early 3rd generation European red mite adults begin laying eggs
July 14	peak of 2nd generation Spotted tentiform leafminer flight
July 18	begin sampling 2nd generation Spotted tentiform leafminer sap-feeding mines

DOCUMENT: DONE

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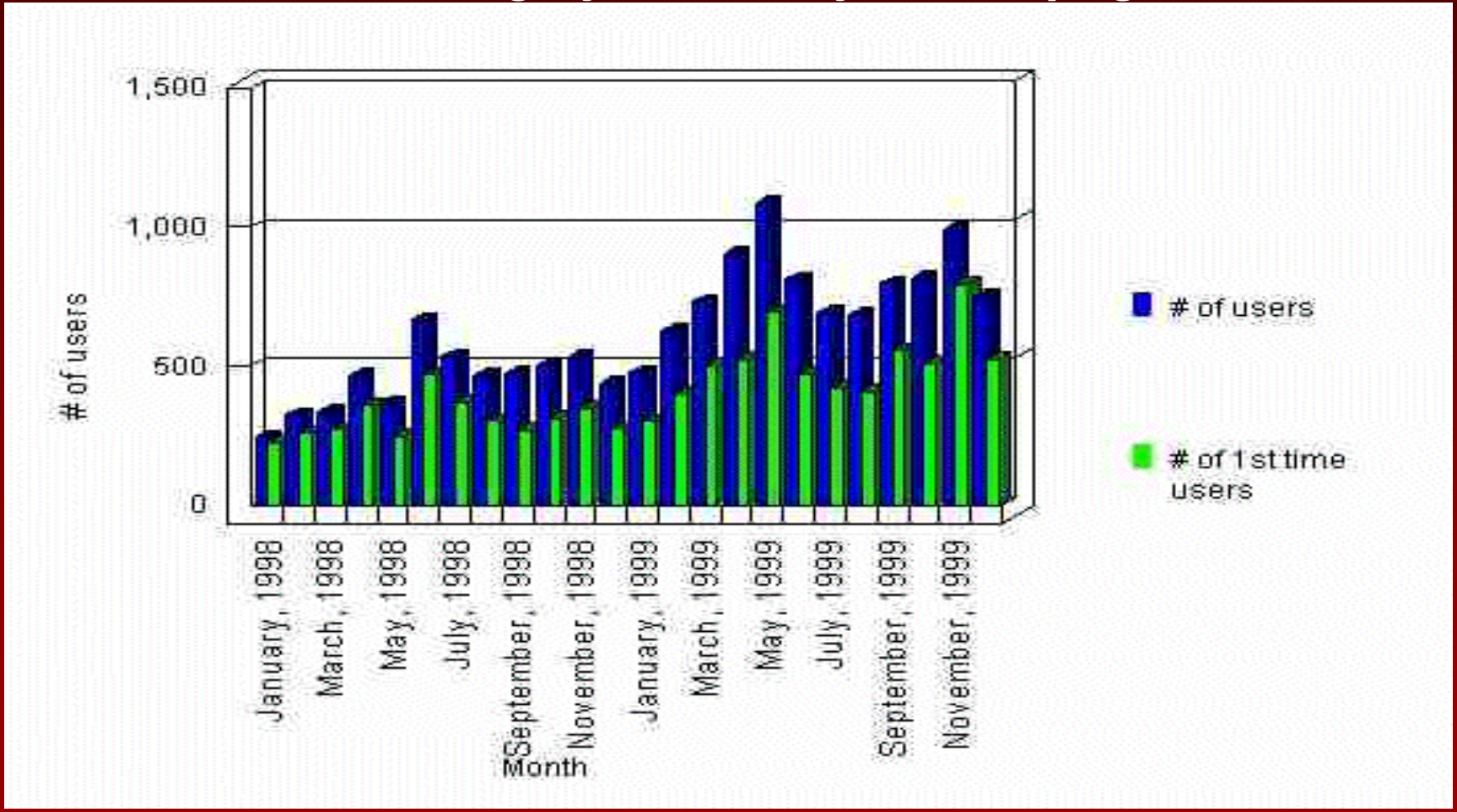
Orchard Radar

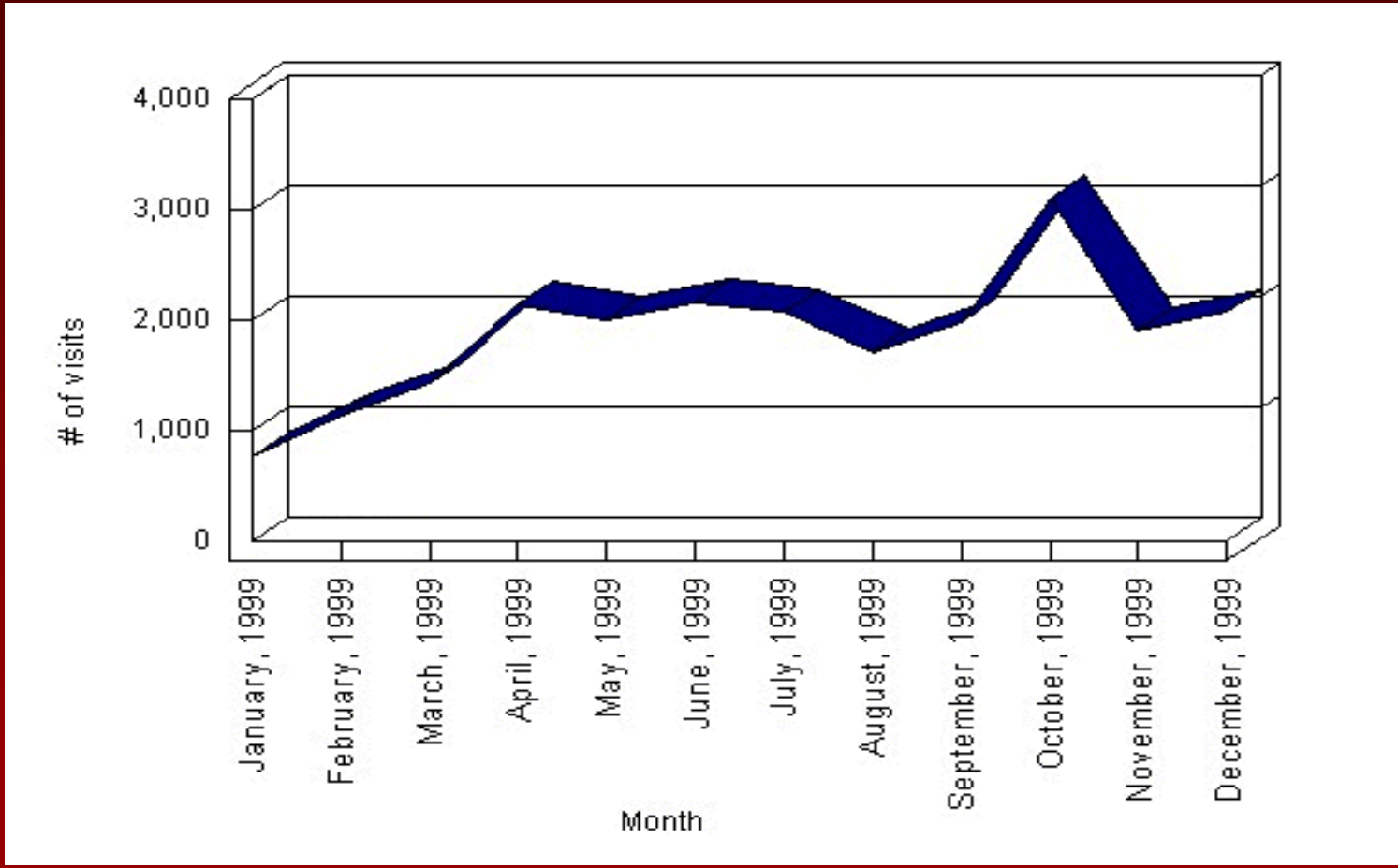
- ✓ Data on use/visits to Orchard Radar

New & Returning Users per month
1998-1999 Maine Apple IPM Program web site traffic, but largely driven by Radar pages.



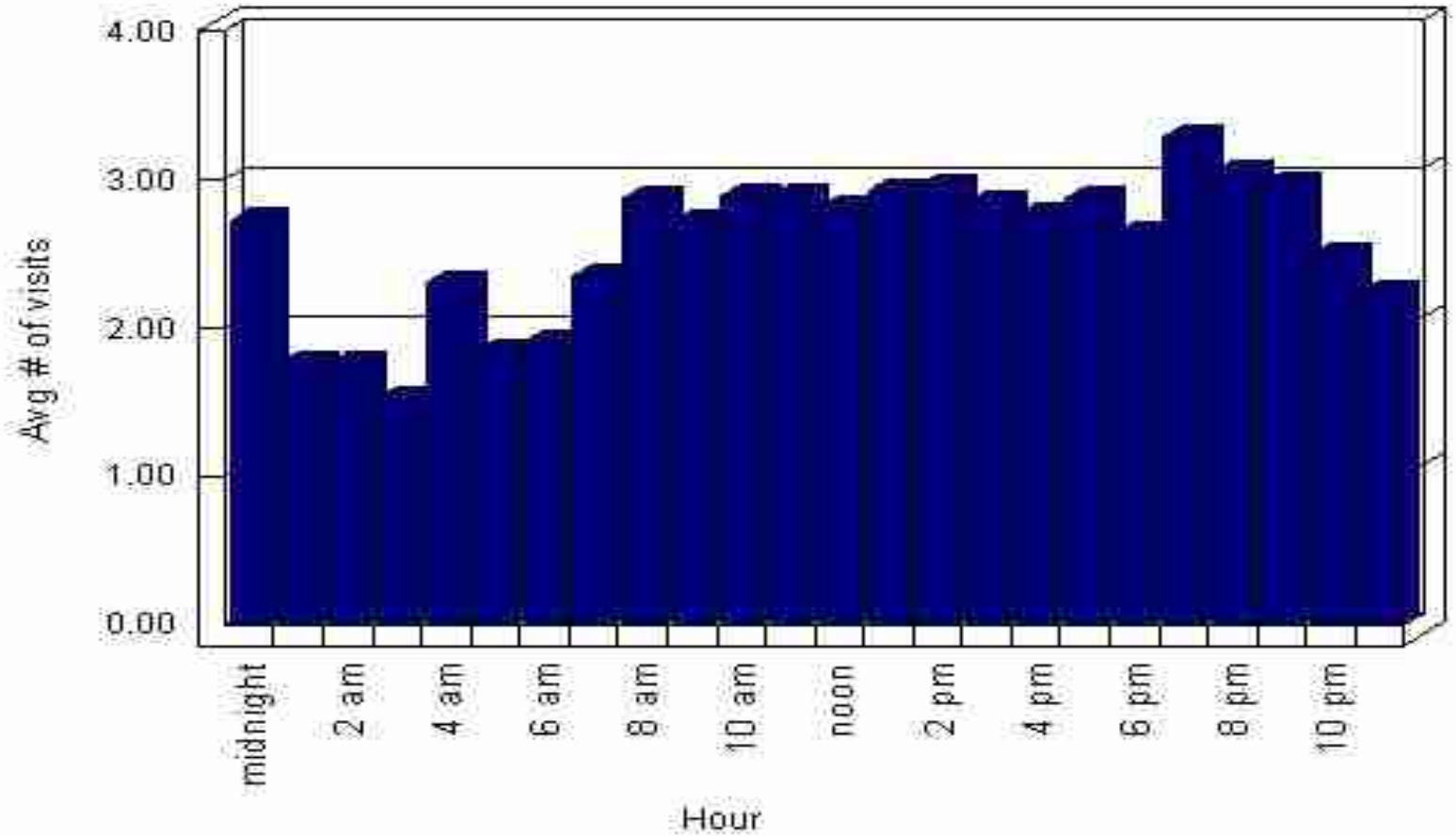
Glen Koehler, Univ. of Maine

Visits per month
1999 Maine Apple IPM Program web site traffic, but largely driven by Radar pages.



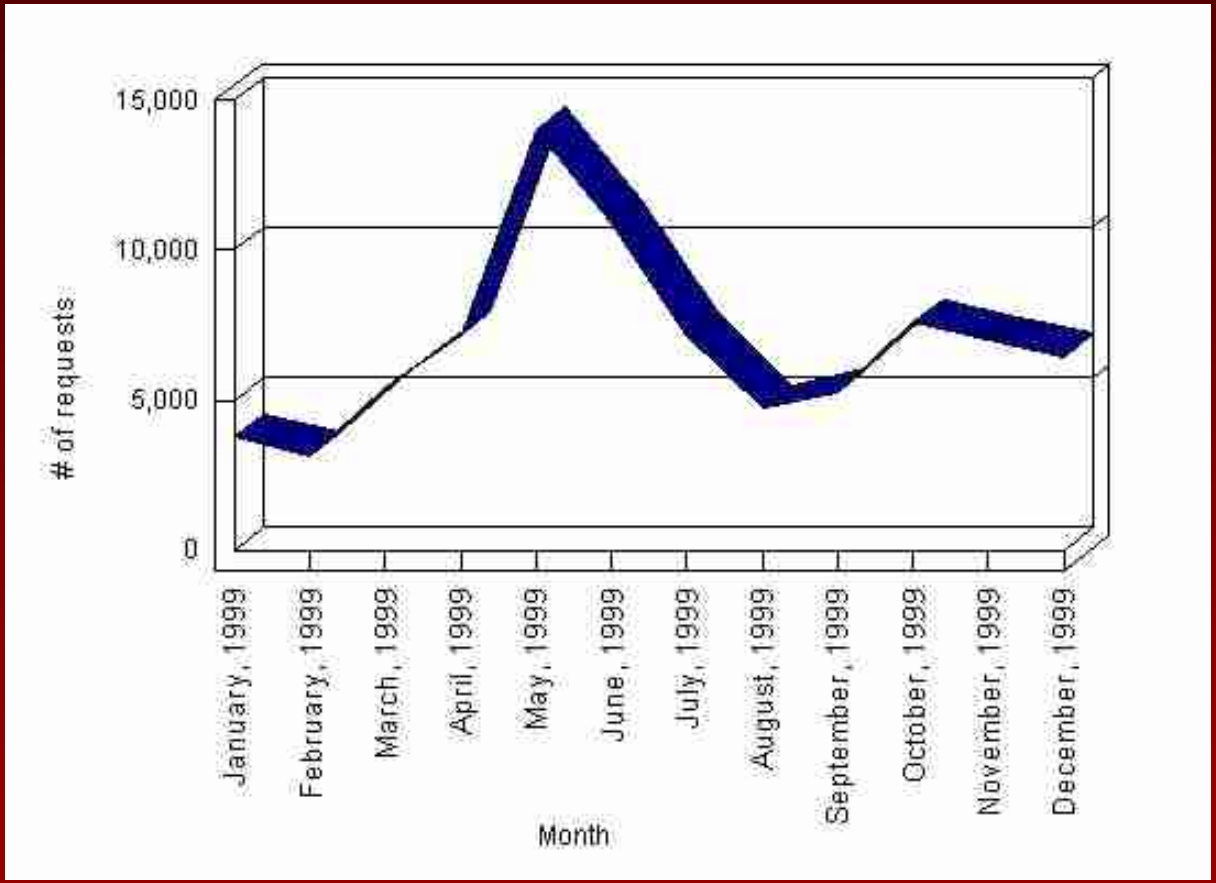
Glen Koehler, Univ. of Maine

Average Visits per hour.
1999 Maine Apple IPM Program web site traffic, but primarily due to Radar pages .



Glen Koehler, Univ. of Maine

Page requests per month
1999 Maine Apple IPM Program web site traffic, but largely driven by Radar pages.



Glen Koehler, Univ. of Maine

AIM Development
Participatory Process

- ✓ "AIM" growers in each state – provided input and evaluation
- ✓ New England Fruit Meetings and Trade Show 1997, 1998, 1999 – demonstrations, surveys, one-to-one discussions (largest gathering of growers and apple industry representatives in New England)
- ✓ Over 20 workshops and demonstrations across New England
- ✓ On-line feed back form which allowed instantaneous evaluation and comment on the website

AIM IPM Evaluation - Netscape

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Bookmarks Location: file:///D|/My Documents/applewebsite/aim/AIMIPMevaluation.html What's Related

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AIM Apple Information Manager

Evaluation Form - Impact on IPM

Thank you for taking 2-3 minutes to fill out this evaluation form.

Your effort and input are sincerely appreciated !

---

1. Is this your first visit to the AIM website ?

   - Yes
   - No

2. Do you practice IPM in your orchard:

   - Yes
   - No

3. Have you found the IPM information associated with this website:

   - Highly Useful
   - Useful
   - Rarely Useful

Document: Done

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AIM IPM Evaluation - Netscape

4. Have you used the IPM information linked through the website in decision-making?

- Yes
- No

5. Has the information obtained through this website allowed you to:

Yes	No	Unsure	Learn more about *how to use* IPM techniques
Yes	No	Unsure	*Increase your use* of IPM techniques
Yes	No	Unsure	*Learn new* IPM techniques
Yes	No	Unsure	Increase your knowledge or understanding of Apple IPM
Yes	No	Unsure	Reduce or minimize pesticide use
Yes	No	Unsure	Determine if pesticides are needed in your orchard
Yes	No	Unsure	Effectively time pesticides if they were needed.

6. Please type any comments or suggestions in the area below:

Thank you for your evaluation and input !

AIM On-Line Evaluation, 1999

		Total		New Englanders
First Visit?	Yes	56.5%		25.0%
	No	43.5%		75.0%
Practice IPM?	Yes	80.0%		90.0%
	No	20.0%		10.0%
How useful?	1 =never useful 4 =very useful	3.52		3.55
Have you used the IPM information in decision-making?	Yes	75.6%		85.0%
	No	24.4%		15.0%

AIM On-Line Evaluation, 1999

Has the information obtained through this website allowed you to:

Learn more about how to use IPM techniques	Yes	81.8%		88.9%
	No	9.1%		5.6%
	Unsure	9.1%		5.6%
Increase your use of IPM techniques	Yes	64.3%		77.8%
	No	11.9%		5.6%
	Unsure	23.8%		16.7%
Learn new IPM techniques	Yes	71.4%		77.8%
	No	9.5%		0.0%
	Unsure	19.0%		22.2%
Increase your knowledge or understanding of Apple IPM	Yes	86.0%		94.7%
	No	9.3%		5.3%
	Unsure	4.7%		0.0%

AIM On-Line Evaluation, 1999

Has the information obtained through this website allowed you to:

Reduce or minimize pesticide use	Yes	69.8%		84.2%
	No	9.3%		5.3%
	Unsure	20.9%		10.5%
Determine if pesticides are needed in your orchard	Yes	66.7%		94.4%
	No	4.8%		0.0%
	Unsure	28.6%		5.6%
Effectively time pesticides if they are needed	Yes	71.4%		94.4%
	No	4.8%		0.0%
	Unsure	23.8%		5.6%

AIM Comments from Growers

- *"… The AIM website has been a great help in choosing and timing of insecticides and fungicides. Without the use of those I have been unsuccessful in getting good apples and pears. The site has been very helpful in pointing me to other information." (Maine, 1999)*

- *"I used orchard radar briefly last year, but have really been into it this year. The hourly weather chart is really helpful for weekly spraying decisions. Wind, temp, wetting is very helpful…Being able to print out charts and tables for scab management really increases the science in this." (Vermont, 1999)*

- *"Weekly and twice weekly updated information is useful"* (Rhode Island, 1999)

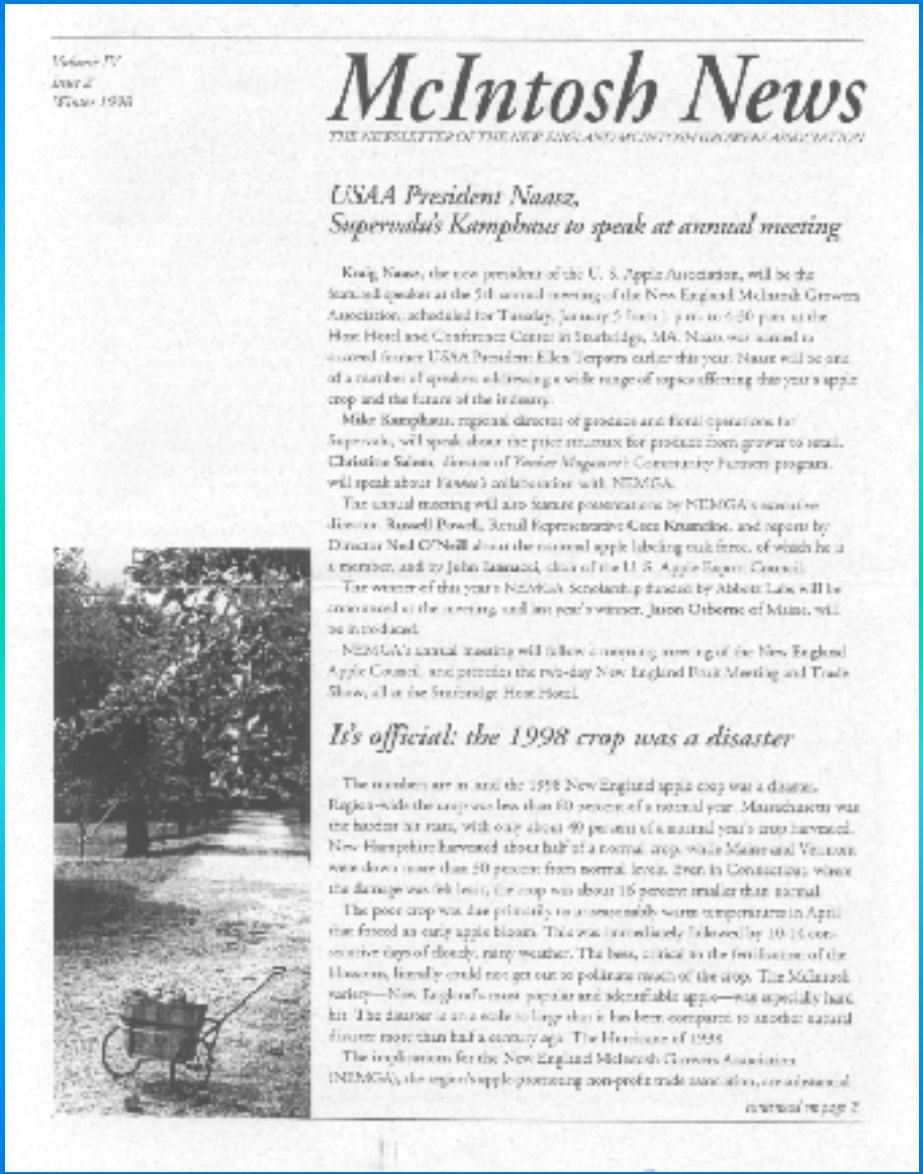
- *"… I think sites like this are going to become more important as the world learns that this kind of info is available. Thanks in advance for your help…" (Connecticut, 1999)*

- *"Keep feeding me this useful information!" (Massachusetts, 2000)*

AIM Comments from Growers

- *"Good site, will visit again" (Bhutan, 1999)*
- *"I wish we had an equivalent site in England. An excellent and thoughtful site as well. Long may it continue and I hope that you are happy that an English grower is busy practicing your IPM; though we do operate it over here. However we lack such precise details that you offer. Thanks." (United Kingdom, 1999)*
- *"I don't know IPM very well, But it looks like very informative for people who want to fine some valuable information in their interest subjects." (Turkey, 1999)*
- *"Great way to inform us the growers, especially of other countries." (Mexico, 2000)*
- *"I hope you aren't considering discontinuing this site on the web. It has been very helpful for me in controlling the many problems that occur in my orchard throughout the year. I am convinced that the information I get from this site and others like it has helped me to grow high quality fruit and survive in these difficult economic times for fruit growers." (Michigan 2000)*

AIM was cited in this publication as a source of internet information for New England Apple growers



Volume IV
Issue 2
Winter 1998

McIntosh News

THE NEWSLETTER OF THE NEW ENGLAND McINTOSH GROWERS ASSOCIATION

USAA President Naasz, Supervalu's Kamphaus to speak at annual meeting

Craig Naasz, the new president of the U. S. Apple Association, will be the featured speaker at the 5th annual meeting of the New England McIntosh Growers Association, scheduled for Tuesday, January 5 from 1 p.m. to 6:30 p.m. at the Host Hotel and Conference Center in Sturbridge, MA. Naasz was named to succeed former USAA President Ellen Terpstra earlier this year. Naasz will be one of a number of speakers addressing a wide range of topics affecting this year's apple crop and the future of the industry.

Mike Kamphaus, regional director of produce and floral operations for Supervalu, will speak about the price structure for produce from grower to retail. Christine Salem, director of *Yankee Magazine's* Community Partners program, will speak about Fawn's collaboration with NEMGA.

The annual meeting will also feature presentations by NEMGA's executive director, Russell Powell, Retail Representative Cece Kruandine, and reports by Director Ned O'Neill about the national apple labeling task force, of which he is a member, and by John Iannacci, chair of the U. S. Apple Export Council.

The winner of this year's NEMGA Scholarship funded by Abbott Labs will be announced at the meeting, and last year's winner, Jason Osborne of Maine, will be introduced.

NEMGA's annual meeting will follow a morning meeting of the New England Apple Council, and precedes the two-day New England Fruit Meeting and Trade Show, all at the Sturbridge Host Hotel.

It's official: the 1998 crop was a disaster

The numbers are in, and the 1998 New England apple crop was a disaster. Region-wide the crop was less than 80 percent of a normal year. Massachusetts was the hardest hit state, with only about 40 percent of a normal year's crop harvested. New Hampshire harvested about half of a normal crop, while Maine and Vermont were down more than 50 percent from normal levels. Even in Connecticut, where the damage was felt least, the crop was about 16 percent smaller than normal.

The poor crop was due primarily to unseasonably warm temperatures in April that forced an early apple bloom. This was immediately followed by 10-14 consecutive days of cloudy, rainy weather. The bees, critical to the fertilization of the blossoms, literally could not get out to pollinate much of the crop. The McIntosh variety—New England's most popular and identifiable apple—was especially hard hit. The disaster is on a scale so large that it has been compared to another natural disaster more than half a century ago. The Hurricane of 1938.

The implications for the New England McIntosh Growers Association (NEMGA), the region's apple-promoting non-profit trade association, are substantial

continued on page 2

Accomplishments
Extension Objectives

- AIM was developed based on grower input and evolved according to grower feedback.
- Over the 1999 and 2000 growing seasons, over 95% of New England evaluators rated the IPM information associated with the AIM website as useful and, on average, 80% used the information in decision-making.
- 85% of New England growers reported that the AIM website increased their knowledge or understanding of Apple IPM.
- The information obtained through AIM also allowed New England apple growers to determine if pesticides were needed in their orchard and effectively time pesticides if they were needed, resulting in reduced or minimized pesticide use.

AIM Research Objective:

- ✓ Glen Koehler, University of Maine
- ✓ Dan Cooley, University of Massachusetts
- ✓ William MacHardy, University of New Hampshire

AIM Research Objective:

- ✓ Compare relative performance of major pest models using remotely generated virtual weather data versus weather data collected on site.

Question:

- *Would using remotely generated virtual weather data in decision support models for apple scab, flyspeck, plum curculio, and European red mite result in the same model output and/or management decisions as would occur if the models were run with data from on-site monitoring equipment ?*

  [It would be desirable if the Zedex and on-site estimates were within the range of *operational insignificance.* That would suggest that operationally similar model estimates are achieved when using Zedex data or data acquired from an on-farm weather station.]

Models dealt with these apple problems

Models

- ✓ Apple Scab – infection periods, lesion appearance
- ✓ Flyspeck – re-spray intervals, final spray date
- ✓ European Red Mite – egg hatch date, generation time for re-sampling frequency
- ✓ Plum Curculio – management period, final spray date

Sources of Model Logic

- MacHardy, 1995; Gadoury and MacHardy, 1982; MacHardy and Gadoury, 1989; Mills, 1944.
- Rosenberger, 1996.
- Reissig and Nyrop, 1994.
- Agnello et al., 1993, 1996; Herbert, 1981.

Source of Weather Data

- ✓ Skybit, Inc. (= Zedex, Inc.)
- ✓ On-site ground units (14 orchards across 5 states)

General Comments

- Zedex data are generated by interpolation of data from surrounding National Weather Service sites.
- The on-site data came from ground units by different manufacturers and subject to different levels of maintenance. There was no replication of ground units at specific sites.

Important Issues:

- It was difficult to collect complete on-site weather data sets.
- Out of 24 site-years, only eight sets were complete enough to make comparisons across most of the models.
- On-site data sets required tedious quality control to remove flagrant errors.
- Operating orchard models with Zedex, Inc. data was much less problematic.

Quick Overview of Results

- For the six models that track an accumulation of degree-days or rainfall over a period of 1–21 days, differences of two days or less were arbitrarily classified as being with the range of operational insignificance.
- For this group of models, differences in the paired model outputs were within the two-day 'range of operational insignificance' in 68% of the cases.
- The average of the ‘average absolute deviations’ (for each model pair) was 2.6 days.
- Only with the estimates of ERM generational time for re-sampling frequency was the onsite and Zedex-based model estimates within two days of each other in a high percentage of cases (99%).

Quick Overview of Results

- ✓ A seven-day 'range of operational insignificance' was selected for apple scab models that estimate infection period and symptom appearance dates over a two-month period.
- ✓ For this group of models, differences in the paired model outputs were within the seven-day 'range of operational insignificance' in 73% of the cases.
- ✓ The average of the ‘average absolute deviations’ (for each model pair) was 5.2 days.

Details on specific disease and summary of AIM research results

Flyspeck on apple

Dan Cooley, UMass

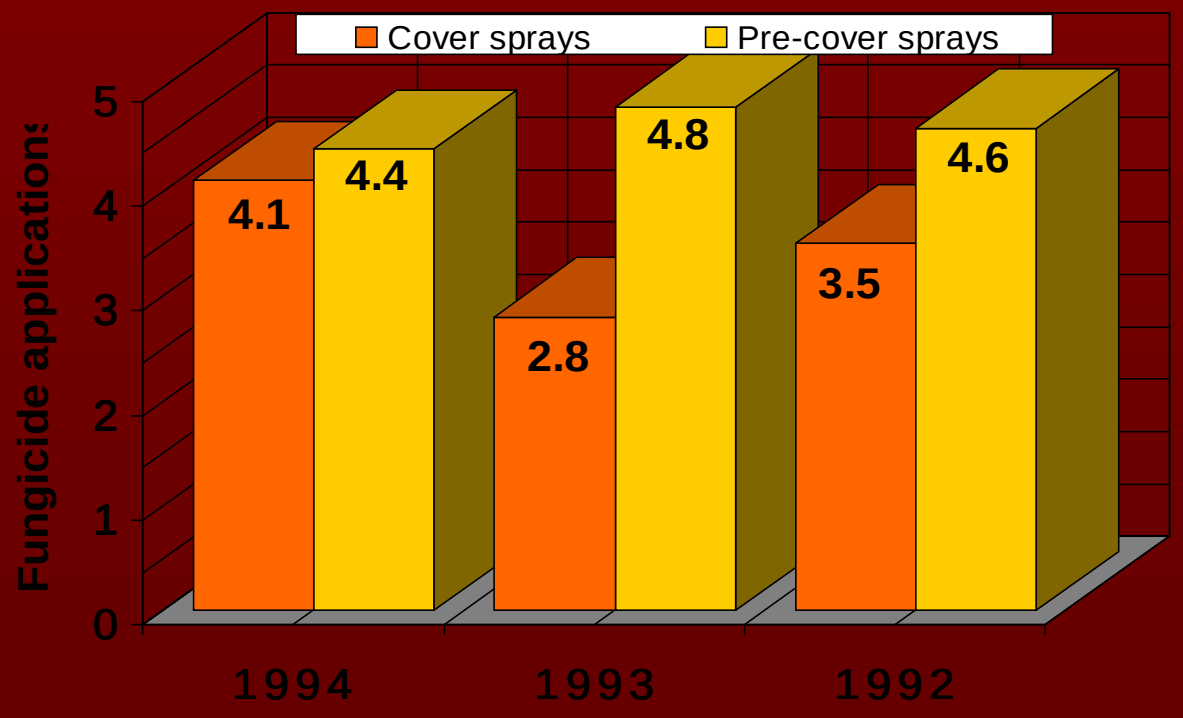
New England apple fungicides target scab and blemish diseases

Apple scab	Flyspeck and sooty blotch
Venturia inaequalis	*Schizothyrium pomi; Peltaster, Leptodontidium, Geastrumia*

April May June July August Sept

Dan Cooley, UMass

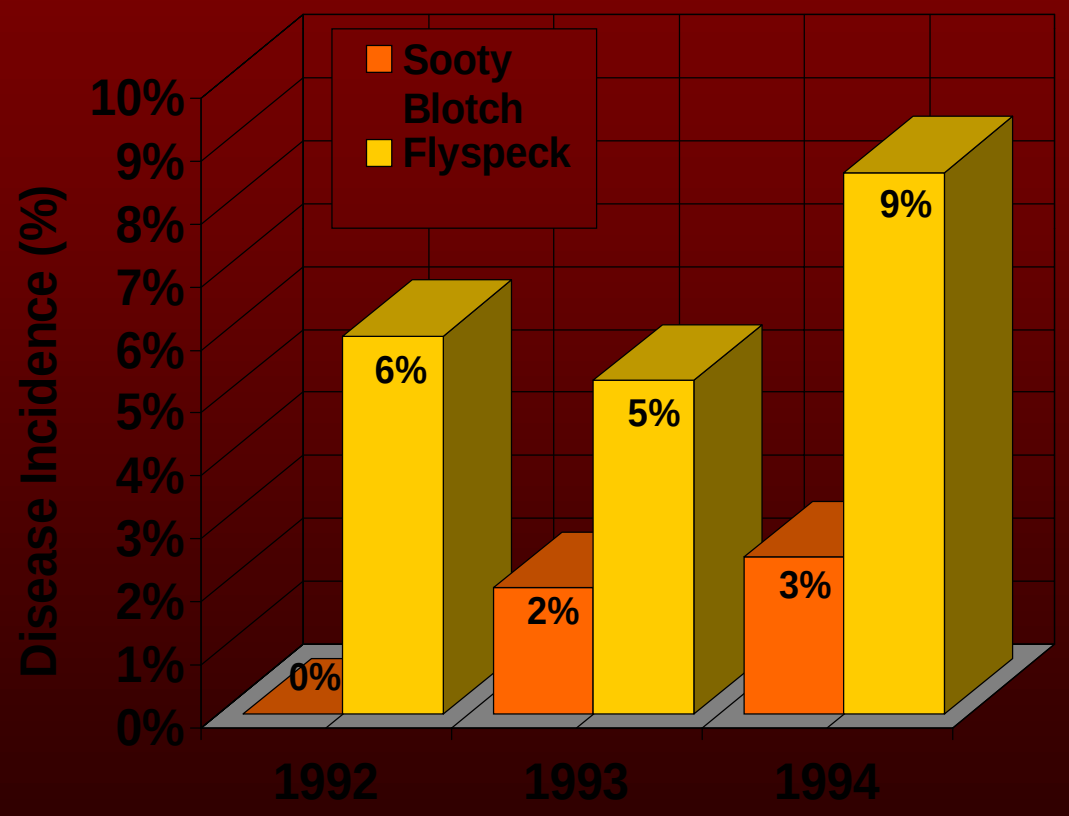
Fungicide use by season: number of sprays



Fungicide applications used under standard IPM over 3 years in 6 apple orchards in Massachusetts

Dan Cooley, UMass

Flyspeck usually is more difficult to manage than sooty blotch

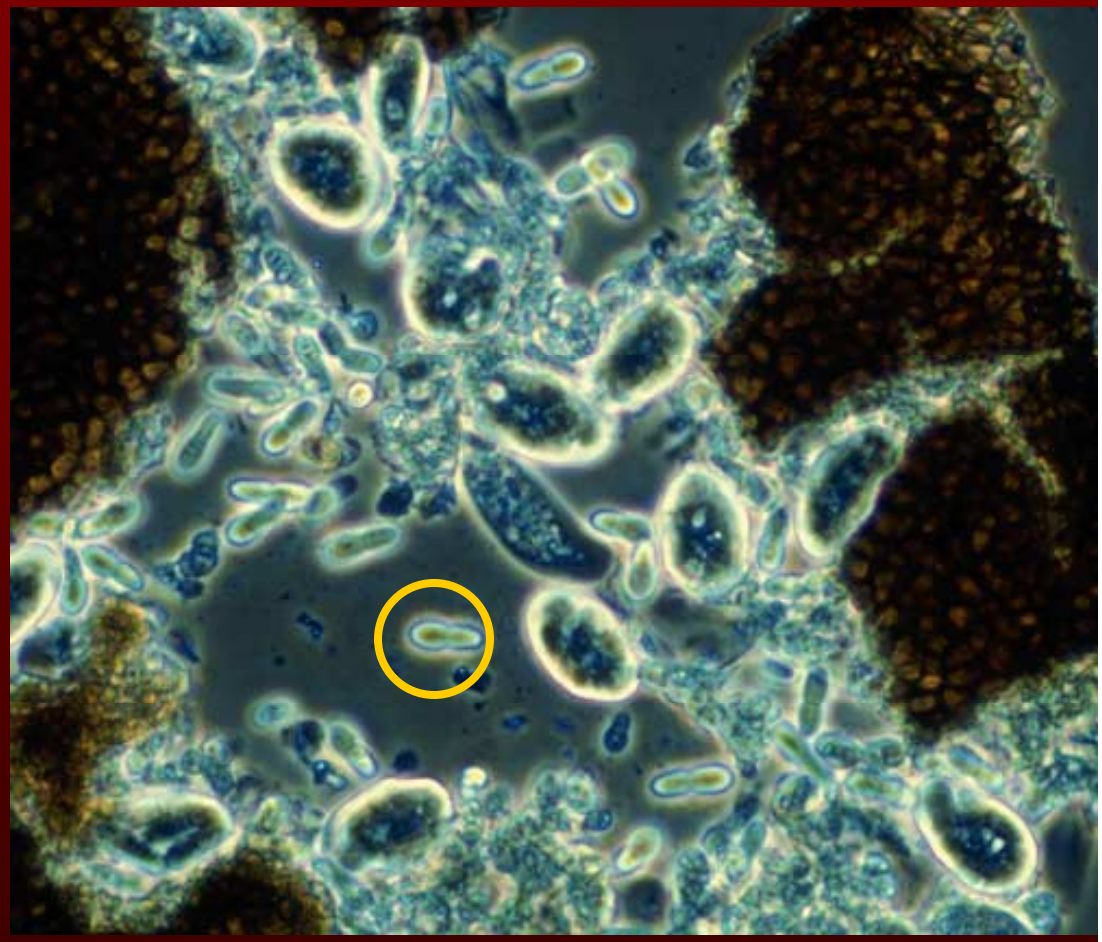


Means of flyspeck and sooty blotch incidence from 8 commercial apple blocks receiving summer fungicide sprays.

Dan Cooley, UMass

The pathogen, *Schizothyrium pomi*

Ascomycete
Holomorph:
Schizothyrium pomi
(Montagne & Fries)
v. Arx
[Dothideales:
Schizothyriaceae]



Crushed ascocarp of S. pomi showing mature ascospores

Dan Cooley, UMass

The pathogen, *Schizothyrium pomi*

Anamorph:
Zygophiala jamaicensis
E. Mason

Stained* Z. jamaicensis *conidia from Rotorod trap

Dan Cooley, UMass

Alternative hosts

Flyspeck occurs on over 100 plant species in many genera. Many of these plants, such as grape, maple, or blackberry, are commonly found in plants at the borders of commercial apple orchards in New England.

Dan Cooley, UMass

Flyspeck life cycle

Ascospores colonize cuticle tissue and grow.

Late May through June (early fruit formation)

Conidia form on hyphae, invisible to eye, spread during rain, and cause new infections.

Mid June through harvest

Ascospores mature and are discharged in rain.

Late May through June (early fruit formation)

During periods of high humidity, over several days, fungal stromata ("specks") develop.

Late July through harvest

Overwinters as stroma on wild hosts

Post-harvest through April

Dan Cooley, UMass

Flyspeck management

- ✓ Present management is largely based on the calendar and convenience.
- ✓ IPM alternative for New England is under development, based on work by
  - ✓ Rosenberger - model based on fungicide efficacy and retention, related to rainfall
  - ✓ Sutton - predicts first appearance of symptoms based on wetting periods
  - ✓ Lerner & Cooley - epidemiology indicates that ascospores are unimportant source of inoculum in commercial orchards.

New England flyspeck IPM

- ✓ Assumption 1: Inoculum that overwinters in the orchard is insignificant. Studies indicate that the inoculum moves into orchards from the wild hosts along orchard borders. (Cooley)
- ✓ Assumption 2: Ascospores release during a discrete period, from about pink to 10 days after petal fall, and infections on fruit at this time are prevented by scab fungicides. (Lerner & Cooley)

New England flyspeck IPM

- ✓ Assumption 3: It takes about 270 hours of wetting for flyspeck to produce a new generation of conidia and new ascocarps, the “specks”. (Sutton and others).
- ✓ Assumption 4: Fungicide efficacy against flyspeck decays as a function of time and rain wash off. Depending on the fungicide, this may take 2 to 3 in of rain, or a 14 to 28 day period. (Rosenberger)

New England flyspeck IPM *Very* general rules

- ✓ Apply first fungicide strictly targeting flyspeck just before (captan and ziram) or within 100 hrs after (benomyl and thiophanate methyl) the 270 hrs of wetting from 10 days after p.f.
- ✓ Apply subsequent fungicides according to weathering, determined by either time interval or rainfall.
- ✓ Apply last fungicide according to predicted harvest date, rainfall and time from last application.

Dan Cooley, UMass

Weather data needed for model

- ✓ Wetting periods - to calculate 270 hrs from fix at 10 days after petal fall.
- ✓ Rainfall - to determine amount of fungicide wash-off.
- ✓ Temperature -
  - ✓ may be useful in refining 270 hr period;
  - ✓ in predicting the end of ascospore development;
  - ✓ in predicting harvest and timing of last spray

Dan Cooley, UMass

Skybit / on-site comparison: early analysis

- ✓ Flyspeck re-spray interval, calculated assuming use of captan 50W 1 lb/100 gal, re-applied when either the 14 day interval or the 2 in rainfall threshold was reached.
- ✓ Flyspeck initial spray date, calculated from 10 days after petal fall using leaf wetness hours.

Dan Cooley, UMass

Skybit / on-site comparison: re-spray intervals

- ✓ 78 cases
- ✓ Average difference was 2.7 days
- ✓ In 67% of cases, dates were within 2 days

Dan Cooley, UMass

Skybit / on-site comparison: flyspeck initial spray

- ✓ 30 cases
- ✓ Average difference was 12 days
- ✓ In 15% of cases, dates were within 2 days

Dan Cooley, UMass

Some Additional General AIM Research Considerations

- If the on-site and Zedex-based estimates differ, it may be because the Zedex data were more accurate, or it could be the reverse, or they could both be off with the unknown true value lying between.

- Another source of deviation could be from scale. Zedex data represent the meteorological values for a 10 square kilometer area, while the on-site weather station is a single point estimate. Skepticism about interpolated area values should be equally applied to extrapolation from single point estimates to represent conditions over 200 acres of orchard.

AIM ResearchSummary

- ✓ Operating models with on-site data was problematic.
- ✓ In a high percentage of the cases, the on-site and Zedex-based model estimates were outside the set level of “operational insignificance.”
- ✓ Research was not designed to test consequences of management decisions based on model estimates from different weather sources.

Apple Information Manager

AIM

Final words ....

- ✓ AIM was a multi-disciplinary, multi-state, extension/research project
- ✓ Growers were very involved in development and implementation
- ✓ AIM will continue as a gateway to New England Apple IPM information

http://orchard.uvm.edu/aim/