

Enviroweather website modernization, plans and how to help

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Enviro-weather Mission

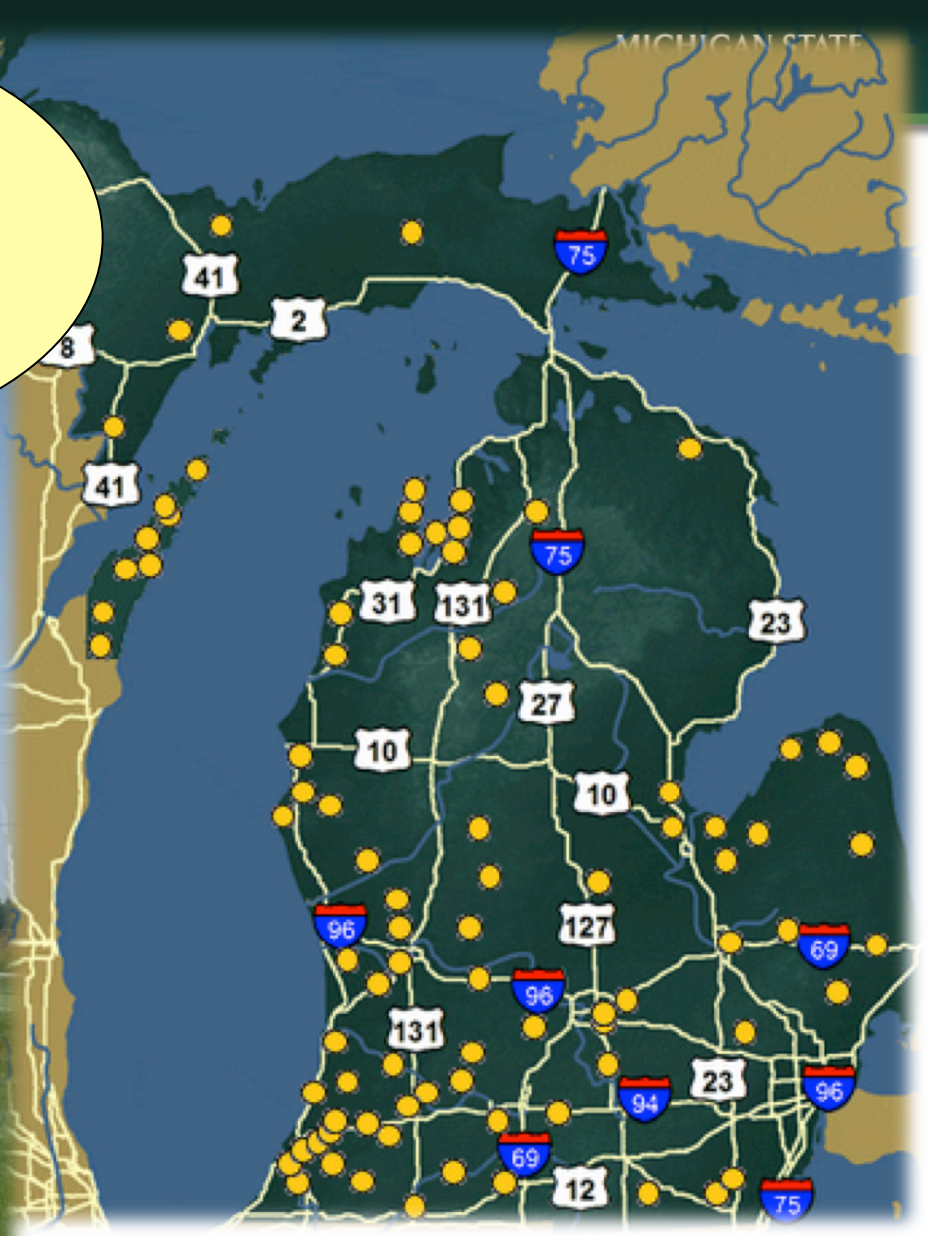
Enviro-weather is an interactive information system linking real-time weather data, forecasts, and biological and other process-based models for assistance in operational decision-making and risk management associated with Michigan's agriculture and natural resource industries.



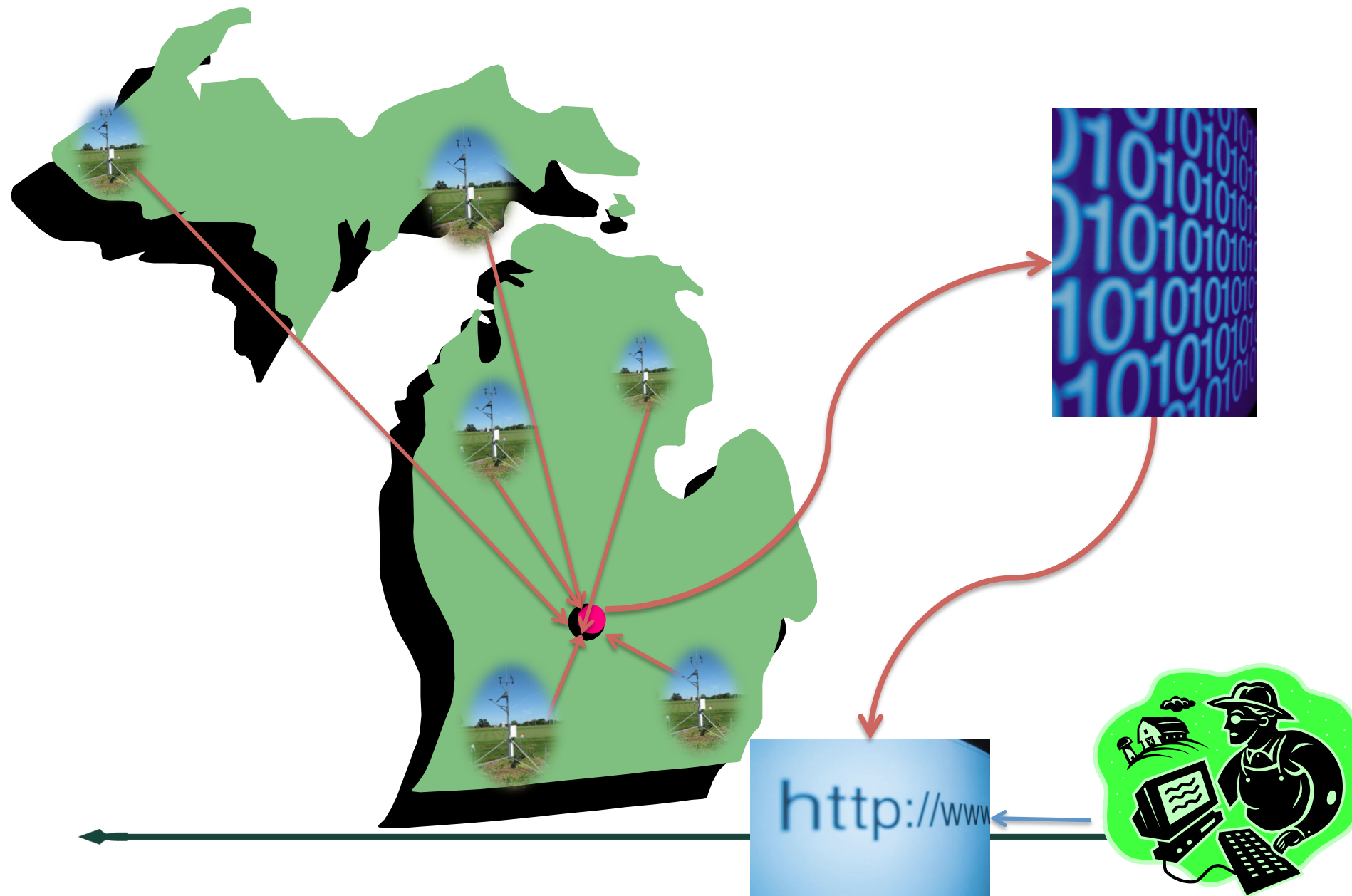




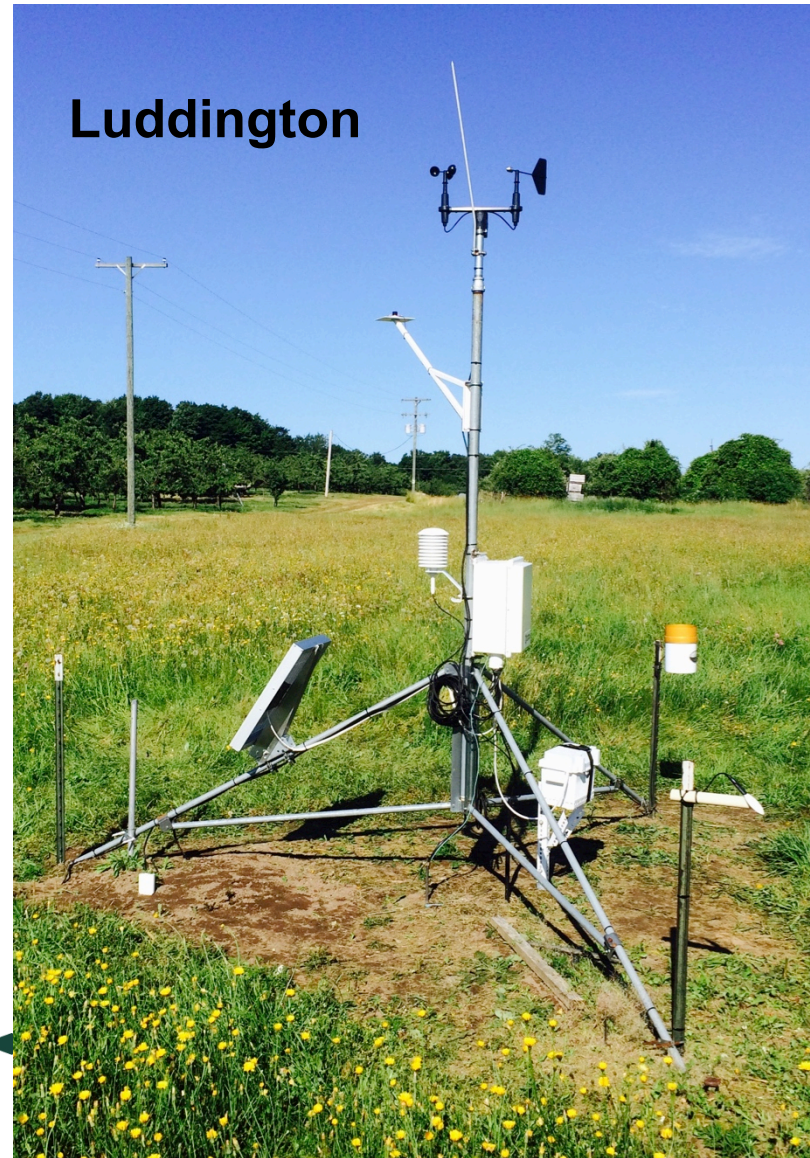
Enviro-weather
Station
Network



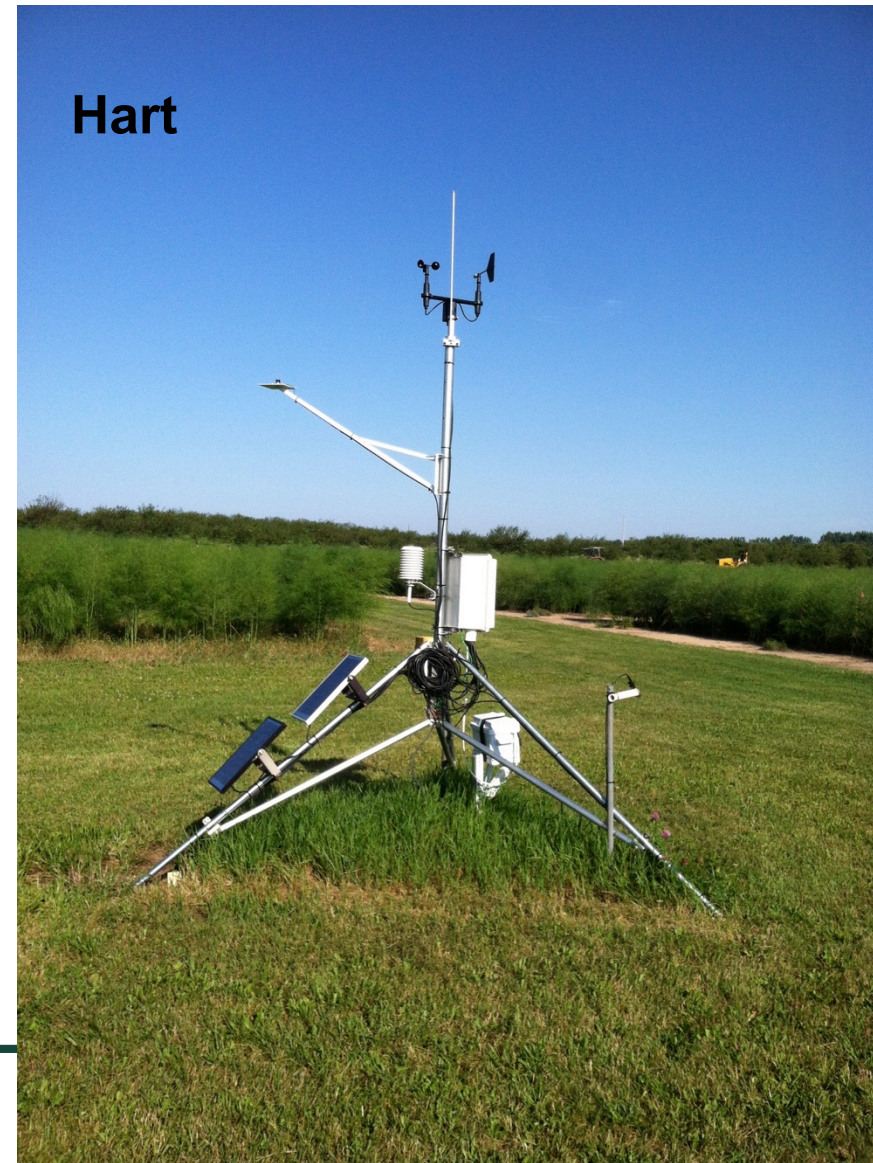
www.enviroweather.msu.edu



Luddington



Hart





Enviroweather: the website



Examples of Enviroweather “Tools”
(applications that use weather data
and are available on website)

www.enviroweather.msu.edu

“General” tools (not crop-specific)

Example:

Temperature, rainfall and degree-day
summary

Most used tool.



Region:

Station:

Model:

Select Start Date:

Select End Date:

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Project GREEN

West Olive Temperature and Rainfall Summary (Report issued 6/11/2015 22:49)

Rainfall sensors are unreliable for frozen precipitation; cumulative totals may be affected.

Add another column of degree day calculations

Starting date of growing degree day accumulation:

Base Temperature: °F

Method of calculation:

2015 ^		Temperature(F)			Degree Days Base 42F * (Baskerville-Emin method)		Degree Days Base 50F * (Baskerville-Emin method)		Rainfall (in.) *	
Day	Date	Min	Max	Ave	Today	Since 1/1	Today	Since 1/1	Today	Since 1/1
Thu	5/28	50.8	81.1	66	24	728.6	16	390.8	0	8.25
Fri	5/29	64	83.2	73.6	31.6	760.2	23.6	414.4	0.19	8.44
Sat	5/30	48.5	69.4	58.9	16.9	777.1	9.1	423.5	0.25	8.69

2015 ^		Temperature(F)			Degree Days Base 42F * (Baskerville-Emin method)		Degree Days Base 50F * (Baskerville-Emin method)		Rainfall (in.) *	
Day	Date	Min	Max	Ave	Today	Since 1/1	Today	Since 1/1	Today	Since 1/1
Thu	5/28	50.8	81.1	66	24	728.6	16	390.8	0	8.25
Fri	5/29	64	83.2	73.6	31.6	760.2	23.6	414.4	0.19	8.44
Sat	5/30	48.5	69.4	58.9	16.9	777.1	9.1	423.5	0.25	8.69
Sun	5/31	46.9	63.9	55.4	13.4	790.5	6	429.5	0.01	8.7
Mon	6/1	37.9	70.7	54.3	12.9	803.4	7.5	437	0	8.7
Tue	6/2	40.2	73.2	56.7	14.9	818.3	9	446	0	8.7
Wed	6/3	46.6	74.8	60.7	18.7	837	11.2	457.2	0	8.7
Thu	6/4	53	78.5	65.7	23.7	860.7	15.7	472.9	0	8.7
Fri	6/5	56.6	76.4	66.5	24.5	885.2	16.5	489.4	0	8.7
Sat	6/6	53.7	78.1	65.9	23.9	909.1	15.9	505.3	0	8.7
Sun	6/7	58.4	75.4	66.9	24.9	934	16.9	522.2	0	8.7
Mon	6/8	56.1	78.8	67.4	25.4	959.4	17.4	539.6	0	8.7
Tue	6/9	51	75.8	63.4	21.4	980.8	13.4	553	0	8.7
Wed	6/10	61.6	83.1	72.4	30.4	1011.2	22.4	575.4	0	8.7
Today's Data:										
2015		Temperature(F)			Degree Days Base 42F (Baskerville-Emin method)		Degree Days Base 50F (Baskerville-Emin method)		Rainfall	
Day	Date	Min	Max	Ave	Today	Since 1/1	Today	Since 1/1	Chance	
Thu	6/11	Actual (3:30-3:35AM): 57.8	Actual (5:55-6:00PM): 73.9	65.85	23.9	1035.1	15.9	591.3	61%	

Today's Data:									
2015		Temperature(F)			Degree Days Base 42F (Baskerville-Emin method)		Degree Days Base 50F (Baskerville-Emin method)		Rainfall
Day	Date	Min	Max	Ave	Today	Since 1/1	Today	Since 1/1	Chance
Fri	6/12	68	74	71	29	1064.1	21	612.3	100%
Sat	6/13	60	74	67	25	1089.1	17	629.3	41%
Sun	6/14	62	87	74.5	32.5	1121.6	24.5	653.8	74%
Mon	6/15	71	79	75	33	1154.6	25	678.8	80%
Tue	6/16	58	79	68.5	26.5	1181.1	18.5	697.3	34%
Wed	6/17	58	80	69	27	1208.1	19	716.3	23%



General Tool Example:
(not crop-specific)

Overnight temperatures:
hours below freezing



Region:

Station:

Model:

Select Date:

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Overnight Temperatures Report: Hourly average temperatures (Report issued 11/4/2016 16:24)

* Estimated values are highlighted in **BOLD**

	11/03/2016				11/04/2016								
Station	10-11 PM	11 PM	Midnight	Midnight	1-2 AM	2-3 AM	3-4 AM	4-5 AM	5-6 AM	6-7 AM	7-8 AM	8-9 AM	9-10 AM
Arlene	39.4	36.1	32.6	30.4	29.7	29.9	29.6	34.5					
Gaylord	35.3	31.9	31.8	32.2	36.2	36.8	35.5	37.8					
Kalkaska	38.9	34.9	33	30.2	30.1	31.9	31	32.5					
McBain	36.2	36	33.3	31.6	30.1	29.4	31.1	35.9					

* Estimated values are highlighted in **BOLD**

Late Afternoon Dew Point Report: For predicting (Report issued 11/4/2016 16:24)

	11/3/2016 (for predicting conditions on 11/4)			
Station	4 - 5 PM	5 - 6 PM	6 - 7 PM	7 - 8 PM
Arlene	45.1	43.1	40.8	40.9
Gaylord	44.3	42.8	41.8	41.6
Kalkaska	44	42.3	41	40.1
McBain	46.3	43.5	41	40



- Crop-Specific Tools
 - Crop growth and development models
 - Insect pest predictive models
 - Disease models

Examples: Fruit Disease Tools





Sparta Apple Scab Report (Report issued 3/27/2012 8:26)

McIntosh Green Tip for Sparta estimated as 4/13/2011 (110 DD Base 42 after 1/1).

Time period assessed for wetting events: 4/20 Midnight-1AM to 5/8/2011 11PM - Midnight

Select leaf wetness sensor for analysis:

Wet Period	Station	Start of wetting period	End of wetting period	Duration (Hrs.)	Avg temp (F)	Rainfall (in.)	Apple Scab (leaf)	Wet hrs @ avg temp for 1st infection	Progress toward infection
1	Sparta	4/20 Midnight-1AM	4/21 7-8AM	Wet: 18 Span: 32	34.6	0.15	None	48	33%
2	Sparta	4/22 2-3AM	4/23 1-2PM	Wet: 30 Span: 36	41.5	0.68	Light (Symptoms appear: 5/10)	26	119%
3	Sparta	4/26 2-3AM	4/29 7-8AM	Wet: 57 Span: 78	46.1	3.03	Heavy (Symptoms appear: 5/12)	16	328%
4	Sparta	5/6 1-2AM	5/6 7-8AM	Wet: 6 Span: 7	47.1	0.01	None	15	36%

Sparta Weekly Apple Scab Spore Maturity and Discharge Report (Report issued 3/27/2012 8:26)

Biofix (McIntosh Green Tip) for Sparta estimated as 4/13/2011 (110 DD Base 42 after 1/1).

Estimate was produced by calculating 110 DD Base 42 F from 1/1 and should be slightly conservative/early. Your orchard/variety may have a different biofix.

2011		Temperature(F)		Degree Days Base 32 F		Percent Ascospores Matured (M) and Discharged (D) Since Biofix Date																														
Day	Date	Max	Min	Ave	Today	Since 4/13	4/9			4/11			4/13			4/15			4/17			4/19			4/21			4/23			4/25			4/27		
							DD 32	M	D	DD 32	M	D	DD 32	M	D	DD 32	M	D	DD 32	M	D	DD 32	M	D	DD 32	M	D	DD 32	M	D	DD 32	M	D			
Wed	4/20	43	33.7	38.4	6.4	65.1	157	4%	0.4%	106	0%	0.1%	65	0%	0%	36	0%	0%	18	0%	0%	9	0%	0%	0	0%	0%	--	--	--	--	--	--	--	--	--
Wed	4/27	59.6	45.4	52.5	20.5	183.1	275	17%	4%	224	10%	2%	183	6%	0.8%	154	4%	0.4%	136	3%	0.2%	127	2%	0.2%	118	1%	0.1%	99	0%	0.1%	62	0%	0%	21	0%	0%
Wed	5/4	57.7	31.8	44.8	12.8	285.8	377	35%	12%	326	25%	7%	286	18%	4%	257	14%	3%	239	12%	2%	229	11%	2%	221	10%	2%	201	8%	1%	165	5%	0.5%	123	1%	0.2%

M = Percent of ascospores matured, based on Gadoury et al. D = Percent of the matured spores that have discharged, based on unpublished model by Dr. Alan Jones.



Multi- Disease Summaries

Wet Period	Station	Start of wetting period	End of wetting period	Duration (Hrs.)	Avg temp (F)	Rainfall (in.)	Apple Scab (leaf)	Cherry Leaf Spot	Grape Leaf Black Rot
1	Fennville	5/17 1-2AM	5/17 8-9AM	Wet: 8 Span: 8	49.3	0.01	None	None	No risk until pre-bloom period
2	Fennville	5/25 10-11PM	5/26 9-10AM	Wet: 12 Span: 12	65.1	0.8	Moderate (Symptoms appear: 6/2)	Moderate	No risk until pre-bloom period
3	Fennville	5/27 9-10PM	5/28 5-6AM	Wet: 9 Span: 9	68.8	0.02	Light (Symptoms appear: 6/4)	Low	Yes
4	Fennville	6/1 Noon-1PM	6/2 7-8AM	Wet: 11 Span: 20	61.6	0.06	Light (Symptoms appear: 6/11)	Low	Yes
5	Fennville	6/4 5-6PM	6/5 10-11AM	Wet: 18 Span: 18	62.9	0.55	Moderate (Symptoms appear: 6/14)	Moderate	Yes
6	Fennville	6/5 10-11PM	6/6 2-3PM	Wet: 12 Span: 17	59.5	0.13	Light (Symptoms appear: 6/15)	Low	Yes
7	Fennville	6/8 3-4AM	6/8 8-9AM	Wet: 6 Span: 6	48.9	0.01	None	None	None



General Weather tools

Degree-Day Tools	
Current degree-day maps	Map showing degree-day accumulations current and compared with normal
Degree-day comparisons last 5 years for this station (alfalfa and corn development)	Table comparing degree-day accumulations (alfalfa and corn) for last five years
Degree-day accumulations for region (alfalfa and corn development).	Table comparing degree-day accumulations (alfalfa and corn) for selected date range for stations in region.
Degree-day comparisons last 5 years for this station	Table comparing degree-day accumulations for selected date range for last five years.
Degree-day accumulations for region	Table comparing degree-day accumulations for selected date range for stations in region.
Polyhouse temperatures and degree-days	Table comparing temperatures and degree-day accumulations for air temperatures and inside polyhouse. West Olive station only.
Degree-day comparisons. Compare two sensors	Table listing daily degree-day accumulations for two different temperature sensors at same station
Water-use Tools	
Potential Evapotranspiration	Daily table showing rainfall, temperature and reference potential evapotranspiration
Weather Observations and Summaries	
Soil conditions	Daily tables listing air and soil temperature, rainfall and soil moisture.
Rainfall comparisons last 5 years for this station	Table comparing rainfall for selected date range for past five years.
Rainfall comparisons for region	Table comparing rainfall for selected date range for stations in region.
Overnight temperatures/ hours below freezing	Table listing average hourly temperatures for previous night, forecasted low for coming night, and late afternoon dew points for all stations in region
Temperature, rainfall and degree-day summary	Daily table listing temperature, rainfall and degree-days for several base temperatures.



Tree Fruit Tools

Apples	
Daily summary of weather and disease risk	Displays daily weather factors determining disease development and predictions of disease risk for station.
Regional disease report	Predict/display disease risk (3 diseases) at selected weather station and other stations in same region.
Station disease report: seasonal summary	Predict/display disease risk and predict symptoms (3 diseases) for each wetting period at station.
Apple Maturity Model	Predicts harvest date for three apple varieties
Apple Scab	Predicts infection from apple scab and apple scab discharge —when control is needed for apple scab.
Apple Scab	Predicts infection from apple scab and apple scab discharge —when control is needed for apple scab.
Codling Moth	Predicts when control is needed for Codling moth
Fireblight interactive predictor	Predicts risk of fireblight infection and progress toward symptoms
Fireblight of apple blossoms	Predicts fireblight infection and timing of appearance of symptoms
Fireblight of apple blossoms	Predicts fireblight infection and timing of appearance of symptoms
Fruit fly monitoring	Predicts the start of apple maggot flight and blueberry maggot flight
Obliquebanded Leafroller	Predicts egg hatch—when control is needed for Obliquebanded leafroller
Oriental fruit moth	Predicts when control is needed for Oriental fruit moth
Sooty blotch and flyspeck	Tracks wetting periods accumulates wet hours as a guide for disease control application
Cherries	
Daily summary of weather and disease risk	Displays daily weather factors determining disease development and predictions of disease risk for station.
Regional disease report	Predict/display disease risk (3 diseases) at selected weather station and other stations in same region.
Station disease report: seasonal summary	Predict/display disease risk and predict symptoms (3 diseases) for each wetting period at station.
Cherry leaf spot	Predicts cherry leaf spot risk and progress toward infection
Plum curculio	Predicts when control is needed for plum curculio

Pear	
Fruit fly monitoring	Predicts the start of apple maggot flight and blueberry maggot flight
Obliquebanded Leafroller	Predicts egg hatch—when control is needed for Obliquebanded leafroller
Sooty blotch and flyspeck	Tracks wetting periods accumulates wet hours as a guide for disease control application
Codling Moth	Predicts when control is needed for Codling moth
Peach	
Oriental fruit moth	Predicts when control is needed for Oriental fruit moth
Peach harvest estimates (all varieties)	Predicts harvest date for all peach varieties at station location
Regional peach harvest estimates	Predicts harvest date for early, mid and late season varieties for station and all others in region
Other Tree Fruit	
Daily summary of weather and disease risk	Displays daily weather factors determining disease development and predictions of disease risk for station.
Regional disease report	Predict/display disease risk (3 diseases) at selected weather station and other stations in same region.
Station disease report: seasonal summary	Predict/display disease risk and predict symptoms (3 diseases) for each wetting period at station.
Cherry leaf spot	Predicts cherry leaf spot risk and progress toward infection
Fruit fly monitoring	Predicts the start of apple maggot flight and blueberry maggot flight
Obliquebanded Leafroller	Predicts egg hatch—when control is needed for Obliquebanded leafroller
Oriental fruit moth	Predicts when control is needed for Oriental fruit moth



Website Navigation



Tools for: [Field crops](#) | [Fruit](#) | [Trees](#) | [Turfgrass](#) | [Vegetables](#) | [Landscape & Nursery](#) | [More weather](#)



Welcome to Enviro-weather!

For weather-based tools: Click on a station on the map.

For access to specific commodity tools: Select from list above.

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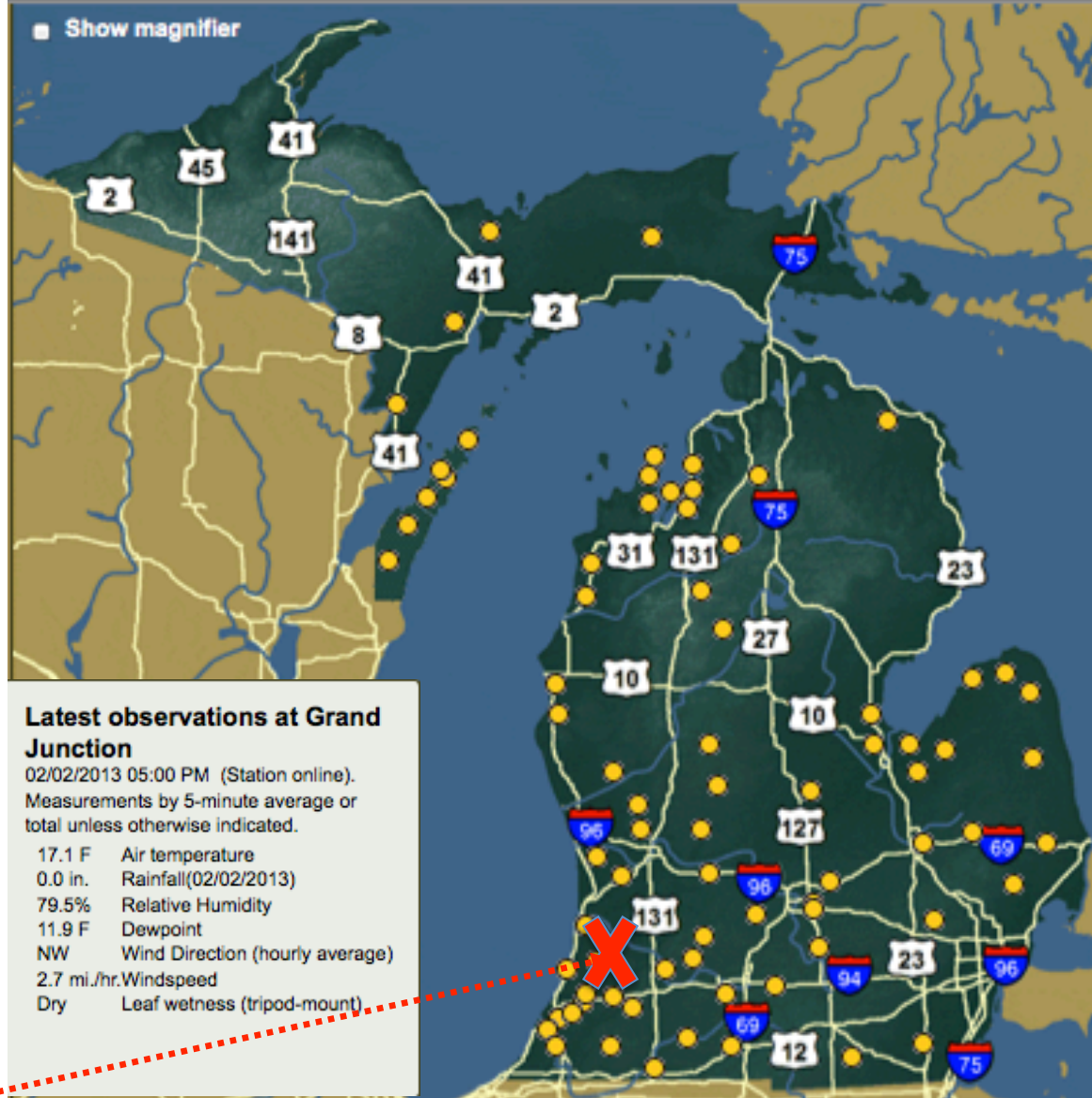
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Tools for: [Field crops](#) | [Fruit](#) | [Trees](#) | [Turfgrass](#) | [Vegetables](#) | [Landscape & Nursery](#) | [More weather](#)



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Degree-day tools

- ▶ [Current degree day](#) maps
- ▶ Degree Day accumulations [for Region](#) ←
- ▶ Degree Day accumulations [for Region](#) (alfalfa and corn development)
- ▶ [Average degree day](#) summary
- ▶ Temperature, rainfall and degree-day [summary](#)
- ▶ Degree day comparisons: [Compare 2 sensors](#)
- ▶ Degree day comparisons: [last 5 years](#) at this station
- ▶ Degree day comparisons: [last 5 years](#) at this station (alfalfa and corn development)

Water-use tools

- ▶ [Irrigation Scheduling](#)
- ▶ [Potential Evapotranspiration](#)
- ▶ [Irrigation Scheduling Checkbook](#) (Microsoft Excel file and weather data)



National Weather Service [radar](#) and [local forecast](#) for Grand Junction



[Weather Station at Grand Junction](#)

Grand Junction, Michigan

Latest observations at Grand Junction

02/02/2013 05:00 PM (Station online). Measurements by 5-minute average or total unless otherwise indicated.

17.1 F	Air temperature
0.0 in.	Rainfall(02/02/2013)
79.5%	Relative Humidity
11.9 F	Dewpoint
NW	Wind Direction (hourly average)
2.7 mi./hr.	Windspeed
Dry	Leaf wetness (tripod-mount)

Weather observations and summaries

- ▶ Overnight temperatures/ [hours below freezing](#)
- ▶ Rainfall comparisons [for Region](#)
- ▶ Temperature, rainfall and degree-day [summary](#)
- ▶ Rainfall comparisons [last 5 years](#) at this station
- ▶ [Soil conditions](#)
- ▶ [More weather](#) for this station

Degree-day tools

- ▶ [Current degree day](#) maps

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This station is hosted at MBG Marketing and is funded in part by:

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Tree fruit

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[Other tree fruit](#)

[Multi-Crop Disease Summaries](#)

Small fruit

[Blueberry](#)

Pest Management

- [Obliquebanded Leafroller](#)
- [Fruit Fly Monitoring](#)
- [Cranberry Fruitworm](#)
- [Tussock Moth](#)
- [Anthracnose fruit rot](#)

Resources

- [MSUE News for Fruit](#)
- [IPM Resources](#)
- [MSU Fruit Team](#)
- [Blueberries.msu.edu](#)

Grand Junction, Michigan

Latest observations at Grand Junction

02/02/2013 05:00 PM (Station online). Measurements by 5-minute average or total unless otherwise indicated.

17.1 F Air temperature
0.0 in. Rainfall(02/02/2013)
79.5% Relative Humidity
11.9 F Dewpoint
NW Wind Direction (hourly average)
2.7 mi./hr.Windspeed
Dry Leaf wetness (tripod-mount)

Weather observations and summaries

- [Overnight temperatures/ hours below freezing](#)
- [Rainfall comparisons for Region](#)
- [Temperature, rainfall and degree-day summary](#)
- [Rainfall comparisons last 5 years at this station](#)
- [Soil conditions](#)
- [More weather for this station](#)

Degree-day tools

- [Current degree day maps](#)
- [Degree Day accumulations for Region](#)
- [Degree Day accumulations for Region \(alfalfa and corn development\)](#)
- [Average degree day summary](#)
- [Temperature, rainfall and degree-day summary](#)



National Weather Service [radar](#) and [local forecast](#) for Grand Junction



[Weather Station at Grand Junction](#)

Thanks to our station sponsors:

This station is hosted at MBG Marketing and is

Enviroweather website over time

2008

2010

2014



2017 ?????

- It depends on you
- Feedback: eweather@msu.edu or 517 432-6520
- Online surveys:
 - General weather tools:
<https://www.surveymonkey.com/r/GeneralTools>
 - Tree fruit tools:
<https://www.surveymonkey.com/r/TreeFruit>



Estimated 2015 control dates for apple insects at East Lansing (MSUHort) (Report issued 1/26/2017 15:21)

Select biofix dates

Codling moth first sustained catch:

Oblique-banded leaf roller first sustained catch (estimate: 6/6):

Oriental fruit moth first adult emergence (estimate: 5/2):

Oriental fruit moth first adult emergence (2nd generation) (estimate: 6/16):

Combined Tools: Combined Apple Tool

Temperature and degree day data missing for: 4/29; 5/10 - 5/12

columns for each insect - only days of interest.

Daily table - columns for each insect

Date	DD42 since 1/1	Stage?	Codling Moth	Oblique Banded Leaf Roller	Oriental Fruit Moth	Apple Maggot
4/9	94.2	Dormant				
4/13	130.6	1st Green				
4/18	193.5	1/4" Green				
4/19	206	1/2" Green				
4/30	249.4	Tight Cluster				
5/2	279.9				Biofix (first adult emergence)	
5/3	299.8	Open Cluster				
5/6	357				First eggs laid	
5/7	384	Pink			Treatment window for ovicidal materials opens	
5/8	411.4	King Bloom				
5/9	436.2	Full Bloom				
5/13	443.2				Start of peak adult emergence	
5/15	472.7				Treatment window for contact materials opens	
5/16	497.3				Treatment window for contact materials closes	
5/17	528.1	Petal Fall				
5/18	556.8				End of peak adult emergence	
5/26	697.4				Peak egg laying	
5/29	777.3	First Cover				
6/6	919.6			Biofix (first sustained catch)		
6/12	1073.9	Second Cover				
6/16	1186.7				Biofix (first adult emergence (2nd generation))	
6/19	1263.2			Treatment window opens		
6/21	1318.1			Egg hatch begins		



Estimated 2015 control dates for apple insects at East Lansing (MSUHort) (Report issued 1/26/2017 15:23)

Select biofix dates

Codling moth first sustained catch:

Oblique-banded leaf roller first sustained catch (estimate: 6/8):

Oriental fruit moth first adult emergence (estimate: 5/2):

Oriental fruit moth first adult emergence (2nd generation) (estimate: 6/16):

Combined Tools: Combined Apple Tool

Temperature and degree day data missing for: 4/29; 5/10 - 5/12

Apple crop

Latest stage	Ninth Cover on 9/11
Next stage	All stages complete
Harvest estimates	Available 41 days after full bloom

Insect pest predictions - Take 2

Insect	Latest Stage	Next Stage	Selected Biofix	DD since biofix	DD Base
Apple maggot	Beginning of first flight 6/30	All stages complete	No biofix; start 3/1	2788.4	50
Codling moth	No development observed	Choose biofix	--	--	50
Oblique-banded leaf roller	Peak egg hatch 8/2	All stages complete	6/8	3345.7	42
Oriental fruit moth	First emergence of 3rd generation adults 7/27	All stages complete	6/16	2704.6	45

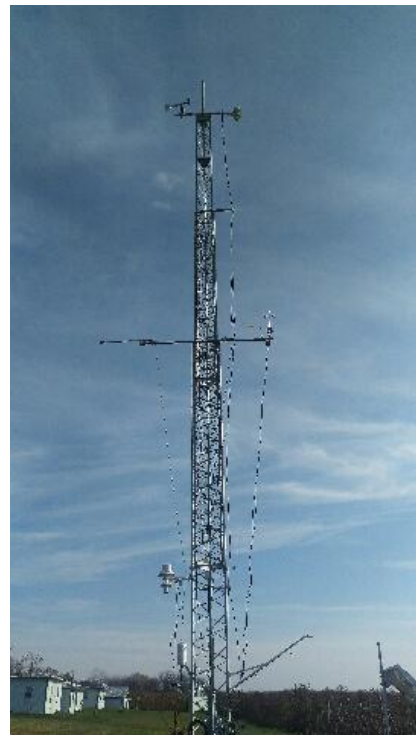


Other future goals:

- Mobile-ready website
- Easy navigation
- Accessible
- Customizable
- Able to select locations between stations
- Tower sites
- Other?



New 20m Inversion-Monitoring Towers



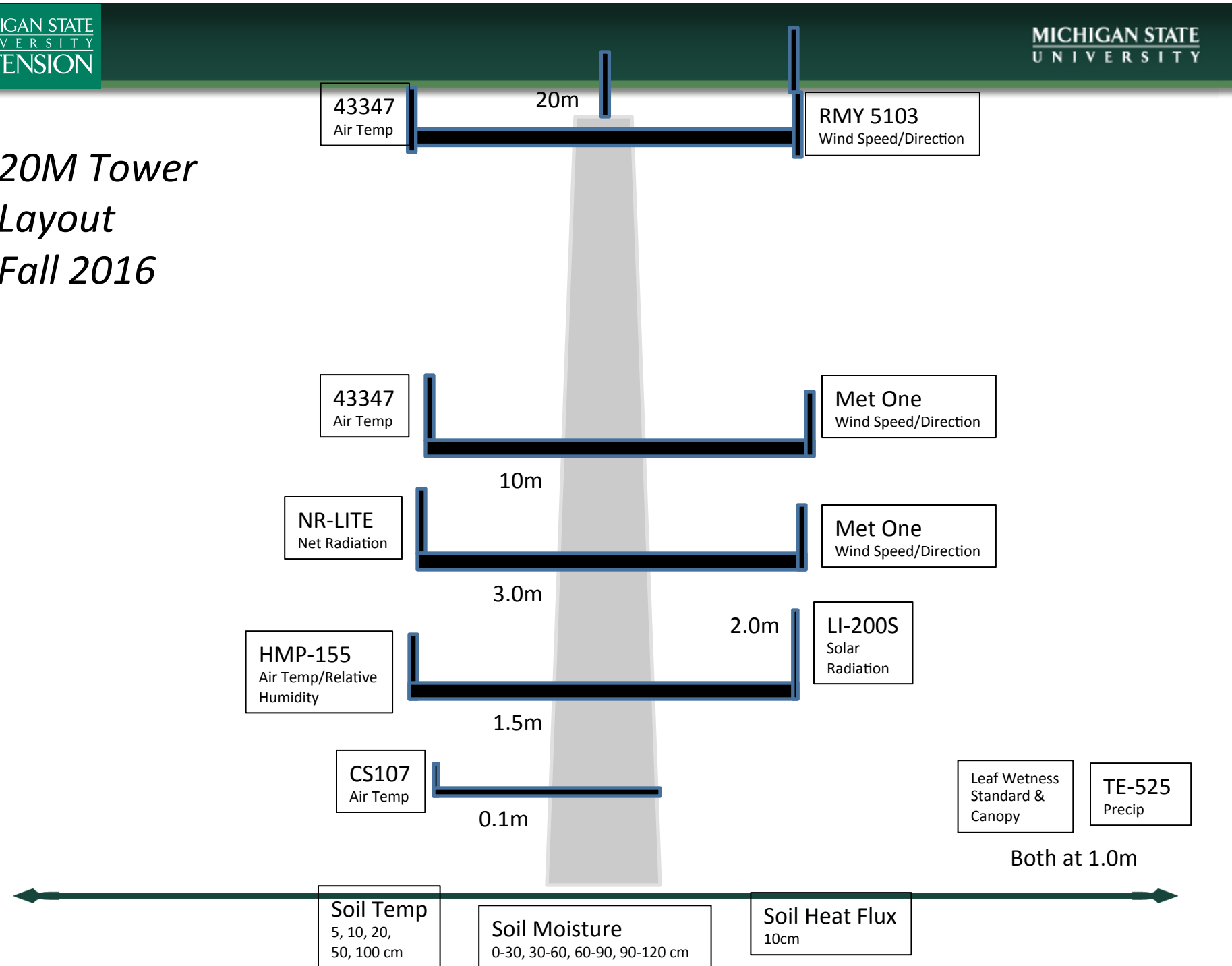
Sparta



Williamsburg



20M Tower
Layout
Fall 2016



Thank you!

- Michigan Tree Fruit Commission, Michigan Cherry Committee, Grand Traverse Fruit Council, Michigan Apple Committee, the Michigan State Horticultural Society, the MDARD Specialty Block Grant Program, MSU Extension, Michigan AgBioResearch, Project GREEN, many individual donors and other commodity groups.

