Phenology Models from USPEST.ORG – Recent Developments

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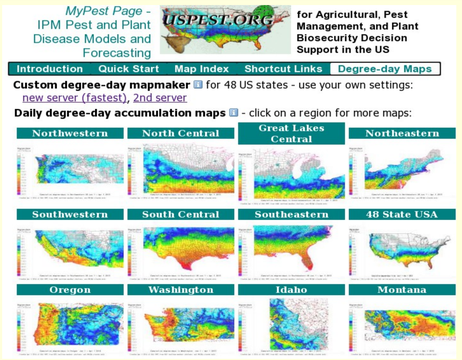


http://uspest.org/wea – DD Maps

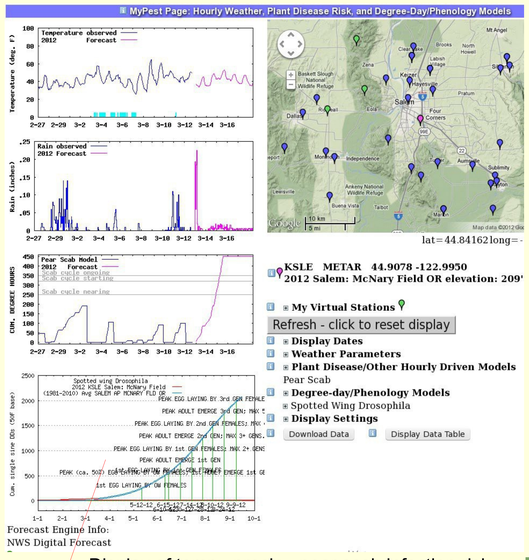
ABSTRACT

The website at http://uspest.org/wea has served degree-day (DD) models and maps, and plant disease risk models to Western states since around 2005. It has served the Pacific Northwest and Oregon in particular since 1997. In 2013 we display the current status and new features including a "MyPest Page" interface that integrates more than 100 models with google maps for selection of over 17,000 weather stations, a streamlined google map interface to degree-day models, a plant disease risk mapping tool using high-resolution spatialized weather inputs that use PRISM technology, a new "DD clock tool" that compares current DD accumulations with prior years and gives a status report showing relatively how far ahead or behind the current season is, and a vegetable planting and harvest scheduling webpage that serves the "CROPTIME" USDA SARE funded project group in the Pacific Northwest. Also new tools are focused on the spotted wing Drosophila: a degree-day model that can help determine initial spring/early summer egg-laying activity and number of generations over the season; a spatialized overwintering mortality model based on chilling units and urban refuge resources, and a new ipmPIPE website that integrates these tools. Growth in usage of the website over 15 years is also reported.

CREDITS

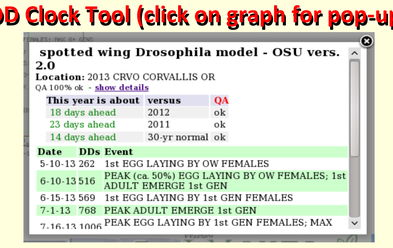
IPPC works closely with and gives thanks and appreciation to: funding agencies USDA RMA, USDA NIFA AFRI and WRIPM programs, USDA NPDN, CDFA SCRI, W. IPM Center at UC Davis; collaborators Fox Weather LLC, NOAA NWS, MESOWEST UTAH, the Western Weather Systems Workgroup, The OSU PRISM Group, and USDA ARS; and numerous sources of weather data including WSU AgWeatherNET, AGRIMET, ADCON, AUTOMATA, CIMIS, PestCast, and other networks. The system has evolved over 17 years using open source software tools such as GNU/LINUX, GRASS GIS, and the Perl programming language.

MyPest Page Integration of 100 models, forecasts

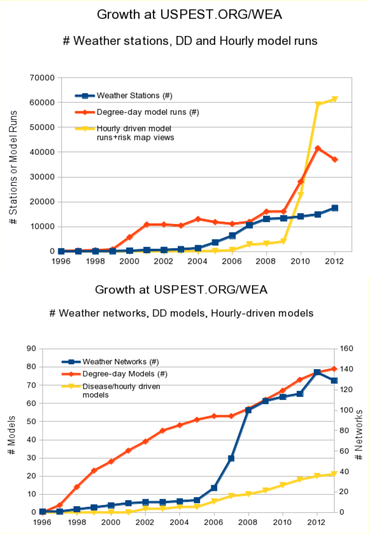


Display of temp., precip., pear scab infection risk, and spotted wing Drosophila models. Light blue shaded bars in temp. chart indicate times when V2 virtual data is used to fill-in missing data.

DD Clock Tool (click on graph for pop-up)

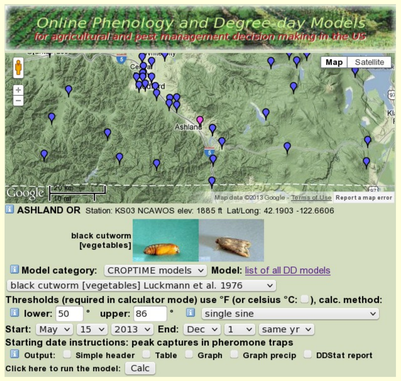


New "DD Clock" tool gives a status report, converting DD values to days, comparing current DDs to recent and 30-yr normal conditions. This report Is integrated into DD maps, calculations, and models.



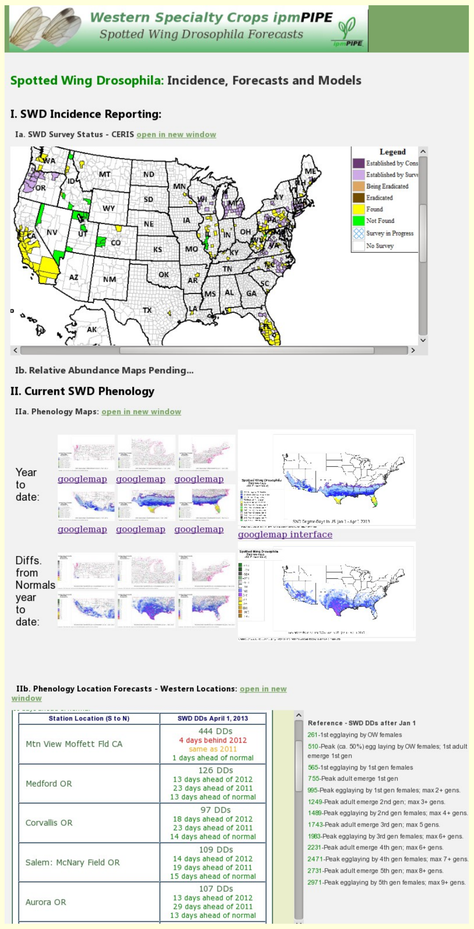
USPEST.ORG has had steady increases in number of models, weather stations and networks over the past 15+ years, while the number of phenolgy and disease risk model runs has increased significantly especially over the past 5 years with support for full US coverage.

New Interface and CROPTIME



A new Googlemap interface to DD models, plus USDA SARE funded CROPTIME project focused on improved scheduling of vegetable crops and integration with pest, weed, and fertilizer timing models.

IpmPIPE Page for SWD



New ipmPIPE website highlighting risk and forecast tools for spotted wing Drosophila with features such as incidence maps, relative abundance maps (in prep.), degree-day maps and reports, overwintering mortality maps, and webinars.

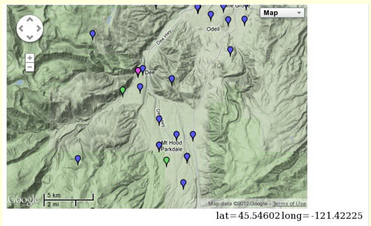
Phenology/Degree-day Models

#	Model/links to general info.	Abbrev	Image	Links to run model & model summary	Type	Model Documentation if avail.	Region of Known Usage	Validation Status	Lower Threshold
1.	Degree-Day Calculator	aaa		summary run: ddmodel.us MyPest Page	generic	calculator general introduction	USA	in regular use	41
2.	apple maggot 1st emerge [cherry & apple]	am1		summary run: ddmodel.us MyPest Page	insect	Jones etal 1989 JEE 82:788	Utah	testing	44
3.	apple maggot percent emergence [cherry & apple]	am2		summary run: ddmodel.us MyPest Page	insect	Jones et al. 1989	UT and OR	testing	44
4.	apple scab infection season [apple]	asc		summary run: ddmodel.us MyPest Page	disease	Gadoury et al. (1995)	Pacific Northwest	untested	32
5.	pear scab infection season [pear]	asp		summary run: ddmodel.us MyPest Page	disease	Hood River Exp. Sta./Bob Spotts	Pacific Northwest	experimental - untested	32
6.	bertha armyworm [vegetables]	baw		summary run: ddmodel.us MyPest Page	insect	Bailey 1976	Pacific Northwest	untested	45
7.	black cutworm Mich. State Univ. [vegetables]	bcw		summary run: ddmodel.us MyPest Page	insect	Luckmann et al. 1976 UC Davis	Pacific Northwest	partly validated	50
8.	brown marmorated stink bug [multiple hosts]	bms		summary run: ddmodel.us MyPest Page	insect	Nielsen et al 2008	data collected in PA	under development - new invasive species	54
9.	Barley	brl		summary run: ddmodel.us MyPest Page	crop	Miller MSU, Misc. refs	Montana	partly validated	32
10.	cabbage looper U. Minn. [vegetables]	cbl		summary run: ddmodel.us MyPest Page	insect	Toba et al. 1973	Pacific Northwest	untested	50
11.	corn earworm [sweet corn]	cew		summary run: ddmodel.us MyPest Page	insect	Hartstack et al. 1976	Pacific Northwest	partly validated	55
12.	western cherry fruit fly v2 [cherry E of Cascades]	cf2		summary run: ddmodel.us MyPest Page	insect	Jones et al. (1991), Song et al. 2004	in general use, revised June 2011		41
13.	western cherry fruit fly [cherry W of Cascades]	cff		summary run: ddmodel.us MyPest Page	insect	AliNiazee (1979)	Pacific Northwest-W. of Cascades	fully validated	41
14.	chick Pea (Desi) int. growth, req. stress to hasten matur.	chk		summary run: ddmodel.us MyPest Page	crop	Miller MSU, Misc. refs	Montana	partly validated	32
15.	codling moth revised 06 [apple & pear]	cl2		summary run: ddmodel.us MyPest Page	insect	2006 revision by A. L. Knight	used in WA	actively undergoing evaluation	50
16.	codling moth WSU model [apple & pear]	cl3		summary run: ddmodel.us MyPest Page	insect	Jones, Doerr & Brunner 2008	support for use in WA only	actively undergoing evaluation	50
17.	cereal leaf beetle [grasses and grains]	clb		summary run: ddmodel.us MyPest Page	insect	Fulton et al 1975 EE 4:357 OSU, OSU synth.	used in USA	requires local validation	48
18.	codling moth [apple & pear]	clm		summary run: ddmodel.us MyPest Page	insect	Brunner and Hoyt (1987)	Pacific Northwest	Fully tested and in use	50
19.	cabbage maggot - Delia radicum [L.]	cm1		summary run: ddmodel.us MyPest Page	insect	Dreves 2005 newsletter (pdf) info cards (pdf)	Pacific Northwest	partly validated	39.7
20.	canola (Arg) ind. growth-cont. to flwr until stressed	cnl		summary run: ddmodel.us MyPest Page	crop	Miller MSU, Misc. refs	Montana	partly validated	32
21.	canola (Pol) ind. growth habit, flwr until stressed	cnp		summary run: ddmodel.us MyPest Page	crop	Miller MSU, Misc. refs	Montana	partly validated	32
22.	canary	cnr		summary run: ddmodel.us MyPest Page	crop	Miller MSU, Misc. refs	Montana	partly validated	32
23.	downy brome	db		summary run: ddmodel.us MyPest Page	weed	Dan Ball et al, 2004 publication (pdf)	inland Pacific NW	validated - see publication	32
24.	Douglas-fir needle midge [fir]	dnm		summary run: ddmodel.us MyPest Page	insect	IPPC based on W. OR trapping data	now testing in W. Oregon	under development - unvalidated	39
25.	emerald ash borer [ash trees]	eab		summary run: ddmodel.us MyPest Page	insect	McCullough and Siegert (2006)		in current use in Great Lakes region US	50
26.	early blight (A. solani) [potato, tomato]	ebl		summary run: ddmodel.us MyPest Page	disease	Gent & Schwartz 2003 MSU Potato Lab	for use in most US states	newly added-undergoing evaluation	44.6
27.	european grapevine moth [grapes]	egm		summary run: ddmodel.us MyPest Page	insect	Univ. Calif. Coop. Ext. (2010-11)	Calibrated for CA Bay Area	Experimental, undergoing validation work	50
28.	european pine shoot moth [nursery crops]	eps		summary run: ddmodel.us MyPest Page	insect	Regan et al. (1990)	Pacific Northwest	partly validated	28
29.	Fenders blue butterfly [Fenders Lupine]	fbb		summary run: ddmodel.us MyPest Page	endangered species	model spreadsheet	Greg Fitzpatrick W. Oregon	new - use with caution	41
30.	cougarblight 2010[EF fire blight risk] [apple & pear]	fbl		summary run: ddmodel.us MyPest Page	disease	Tim Smith WSU	Pacific Northwest	Validated & In Use - Contact Ken Johnson at johnsonk@science.oregonstate.edu	50
31.	filbertworm [hazelnut]	fbw		summary run: ddmodel.us MyPest Page	insect	Alinajazee (1983)	Pacific Northwest	partly validated	50
32.	flax stage early in day before flwr ptls fall off	flx		summary run: ddmodel.us MyPest Page	crop	Miller MSU, Misc. refs	Montana	partly validated	32
33.	fruittree leafroller [tree fruits & ornamentals]	frl		summary run: ddmodel.us MyPest Page	insect	Judd et al. (1993)	developed in BC, Canada	unknown	41
34.	Galerucella calmariensis [weed biocontrol]	gca		summary run: ddmodel.us MyPest Page	insect	IPPC (in development) Cornell Univ.	VA & WA	under development	50
35.	gypsy moth egg hatch [mixed oak forest]	gm1		summary run: ddmodel.us MyPest Page	insect	Russo et al. (1993)	East Coast US	partly validated	37.4
36.	gypsy moth larvae & pupae [mixed oak forest]	gm2		summary run: ddmodel.us MyPest Page	insect	Carter et al (1992)	East Coast US	partly validated	45.8
37.	gypsy moth model from Jan 1 [oak-maple forest]	gm3		summary run: ddmodel.us MyPest Page	insect	Sheehan--simpl. vers	Midwest & PNW US	experimental	42
38.	hop downy mildew season initiation [hop]	hdm		summary run: ddmodel.us MyPest Page	disease	Gent et al.(2010) full pub. Hop IPM (pdf)	Pacific Northwest	supported in Oregon	42.8
39.	isomate-c+	ism		summary run: ddmodel.us MyPest Page	insect mating disruption dispenser	Pacific Biocontrol Corporation Data	Pacific Northwest	experimental	32
40.	Light Brown Apple Moth [omnivorous]	lba		summary run: ddmodel.us MyPest Page	insect	model spreadsheet	W. USA	new - use with caution	45
41.	lentil (int. growth chars) - cont. to flwr until stressed	lnt		summary run: ddmodel.us MyPest Page	crop	Miller MSU, Misc. refs	Montana	partly validated	32
42.	Lacanobia fruitworm [apple & pear]	lsu		summary run: ddmodel.us MyPest Page	insect	Doerr et al. (2002) article by Jay Brunner	Washington	partly validated in WA	44
43.	Lygus bug (alfalfa seed)	lyg		summary run: ddmodel.us MyPest Page	insect	Ben Simko 2000	E. Oregon, SW Idaho	partly validated	52
44.	mint flea beetle	mfb		summary run: ddmodel.us MyPest Page	insect	Berry et al.	Pacific Northwest	partly validated	41
45.	Metaseiulus occidentalis	moc		summary run: ddmodel.us MyPest Page	mite predator	Tanagoshi et al. 1975	Pacific Northwest	untested	52
46.	mint root borer	mrb		summary run: ddmodel.us MyPest Page	insect	Berry et al.	Pacific Northwest	partly validated	50
47.	mustard 3 (Brwn&Crntl) ind. grwth-cont.to flwr until stress	ms1		summary run: ddmodel.us MyPest Page	crop	Miller MSU, Misc. refs	Montana	partly validated	32
48.	mustard (Yellow) indet. grwth-cont.to flwr until stressed	msy		summary run: ddmodel.us MyPest Page	crop	Miller MSU, Misc. refs	Montana	partly validated	32
49.	Neoseiulus fallacis	nfa		summary run: ddmodel.us MyPest Page	mite predator	Dover et al. 1979	Pacific Northwest	untested	54
50.	oat	oat		summary run: ddmodel.us MyPest Page	crop	Miller MSU, Misc. refs	Montana	partly validated	32
51.	obliquebanded leafroller [tree ob.2 fruits]	obl		summary run: ddmodel.us MyPest Page	insect	Brunner et al. (1997)	Pacific Northwest	untested	43
52.	obliquebanded leafroller [hazelnut]	obl		summary run: ddmodel.us MyPest Page	insect	Gang, and Ali. (1985)	Pacific Northwest	partly validated	50
53.	oriental fruit moth [stone fruit]	ofm		summary run: ddmodel.us MyPest Page	insect	CA IPM	California	partly validated	45
54.	omnivorous leafrlr [multiple crops]	olt		summary run: ddmodel.us MyPest Page	insect	OSU vers. 1.0	developed for use in NW USA	new model would benefit from local validation	36
55.	orange tortrix (cold winter) [small fruit]	otc		summary run: ddmodel.us MyPest Page	insect	Knight (1988)	Pacific Northwest	partly validated	41
56.	orange tortrix (mild winter) [small fruit]	otm		summary run: ddmodel.us MyPest Page	insect	Knight (1988)	Pacific Northwest	partly validated	41
57.	pecan nut casebearer [pecan]	pcb		summary run: ddmodel.us MyPest Page	insect	Jackman and Harris (1988)	in current use in NM and TX, OK version slightly different	use with caution; requires local validation	38
58.	pea (yellow-determinate indeterminate growth chars.)	pea		summary run: ddmodel.us MyPest Page	crop	Miller MSU, Misc. refs	Montana	partly validated	32
59.	Pandemis leafroller [tree plr fruits]	plr		summary run: ddmodel.us MyPest Page	insect	Brunner (1991)	Pacific Northwest	partly validated	41
60.	pine shoot beetle [pine trees]	psb		summary run: ddmodel.us MyPest Page	insect	IPPC based on Saarenmaa (1989)	now testing for US	under development - unvalidated	54
61.	peach twig borer [stone fruits]	ptb		summary run: ddmodel.us MyPest Page	insect	2007 USU Extension Fact Sheet WSU IPM info	used in NW USA	requires local validation	50
62.	safflower (Saffire)	saf		summary run: ddmodel.us MyPest Page	crop	Miller MSU, Misc. refs	Montana	partly validated	32
63.	small broomrape (red clover)	sbr		summary run: ddmodel.us MyPest Page	weed	Jed Colquhoun, see Weed Handbook and model summary (publication in press)	Western Oregon	newly validated	32
64.	sweet corn [Jubilee]	scn		summary run: ddmodel.us MyPest Page	crop	Coop et al. (1993)	Pacific Northwest	partly validated	50
65.	San Jose scale [tree fruits]	sjs		summary run: ddmodel.us MyPest Page	insect	Rice et al. (1982)	Pacific Northwest	partly validated	51
66.	sunflower (dep. on matur. class) ear: matur, dwarf hybrids	snf		summary run: ddmodel.us MyPest Page	crop	Miller MSU, Misc. refs	Montana	partly validated	32
67.	sugarbeet root maggot	srm		summary run: ddmodel.us MyPest Page	insect	Bechinski et al. 1990	Pacific Northwest	partly validated	47.5
68.	strawberry root weevil [peppermint]	srw		summary run: ddmodel.us MyPest Page	insect	Cacka (1982)	Pacific Northwest	partly validated	48
69.	strawberry root weevil [strawberry]	srx		summary run: ddmodel.us MyPest Page	insect	Umble and Fisher (2000,2002)	Pacific Northwest	new and untested	40
70.	sunflower stem weevil	ssw		summary run: ddmodel.us MyPest Page	insect	Merrill et al. 2010	W. Great Plains	partly validated	41
71.	spotted wing Drosoph. overwinter mortal [fruit]	swi		summary run: ddmodel.us MyPest Page	insect	OSU in devel.	potential for use in US	under development - use with caution	53
72.	spotted wing Drosophila [fruit]	swd		summary run: ddmodel.us MyPest Page	insect	OSU vers. 2.0	potential for use in US	partly validated-has been compared to 2 years of field data in PNW	50
73.	variegated cutworm [peppermint]	vcw		summary run: ddmodel.us MyPest Page	insect	Coop & Berry (1987)	Pacific Northwest	partly validated	41
74.	western bean cutworm [corn & dry beans - midwest]	wbc		summary run: ddmodel.us MyPest Page	insect	Neb. IPM	developed in Neb.	unknown	50
75.	western flower thrips [vegetables]	wft		summary run: ddmodel.us MyPest Page	insect	IPPC based on sev. sources	data from numerous sources	under development	45
76.	wheat (Bauer model) [spring wheat]	whb		summary run: ddmodel.us MyPest Page	crop	Bauer et al. (1984) scale guide	Western States	in use	32
77.	walnut husk fly [walnut]	whf		summary run: ddmodel.us MyPest Page	insect	Kasana & AliNiazee (1997)	Pacific Northwest-W. of Cascades	developed but not calibrated or validated	41
78.	wheat R	whr		summary run: ddmodel.us MyPest Page	crop	Miller MSU, Misc. refs	Montana	partly validated	32
79.	winter wheat	wht		summary run: ddmodel.us MyPest Page	crop	Karow et al. 1993	Pacific Northwest	new prototype version - Contact Russ Karow at karow@css.oregonstate.edu	32

A database of 79 phenology models is currently in use at uspest.org.

A separate database of vegetable phenology models is expected to result from the CROP-TIME project.

"My Virtual Weather Stations"



Site ID	Name	Latitude	Longitude	Action
New Site	Upper Parkdale	45.55756	-121.59940	Create
v2my178	Castagnoli_new	45.69769	-121.498266	Delete
v2my142	N Dee Flat	45.56885	-121.66065	Delete
v2my102	Pine Grove 1	45.67041	-121.49926	Delete
v2my100	Parkdale 1	45.50610	-121.60357	Delete
v2my96	Marys Peak	44.50850	-123.55550	Delete
v2my55	Ronan N. 1	47.56397	-114.09529	Delete
v2my54	N. Dillon 1	45.31064	-112.65857	Delete
v2my38	Eola hills 1	44.95883	-123.13733	Delete

Refresh - click to reset display

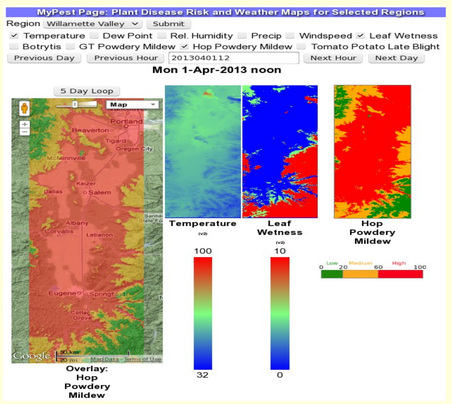
"My Virtual Weather Stations" integrated with "MyPest Page"

a) registered user clicks in map or hand-enters location lat-longs, adds a label, clicks "create" button

b) current and prior year data are generated automatically, kept up-to-date in real-time

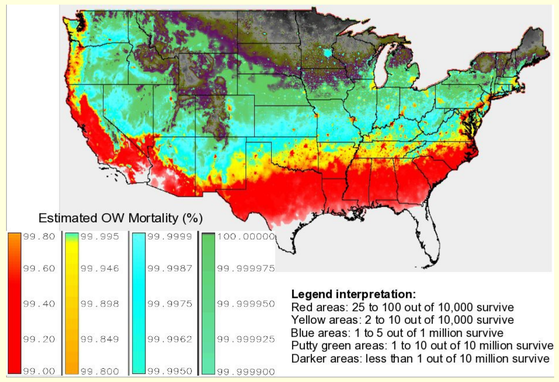
c) available for use with all models (denoted w/green pins) as are actual weather stations (blue pins)

New Disease Risk Model Gridded Forecasts



Example for Hop powdery mildew. Gridded hourly PRISM, IPPC V2, and forecasted weather data are produced in real-time and integrated for 4 disease risk models in 4 growing regions in W. states (Willamette Valley, OR, Napa/Sonoma CA, Central Valley, CA, and Columbia Basin, WA&OR). Option for 5-day succession of events a la "radar loops".

IPM PIPE ex. - Spotted Wing Drosophila OW Mortality



With IPM PIPE support (USDA RMA), we are developing a series of synoptic incidence and risk maps for the US, with focus on Western specialty crops. Here, relative overwintering mortality, an essential component of Spring risk of infestation and build-up, is estimated as a product of chilling degree-days and human-caused refuges as represented by NOAA satellite images of nighttime luminance. Created with GRASS GIS, PRISM climate data, and 30-yr normals.