IPPC Model Synthesis Summary – Mar. 9, 2012 vers. 1.0 - Len Coop
developed for use at Oregon State University's Integrated Plant Protection Center website: http://uspest.org/wea

Omnivorous Leaftier Phenology (degree-day) Model ***Cnephasia longana Haworth***
data from 1930-42, 46-51 (listed below; reports avail. OSU IPPC Library),
and additional unpublished larval sample data from Willamette Valley Oregon, 1983-2011
In Oregon, this insect is an occasional pest of strawberry, raspberry, hazelnut, hops, wheat, flax,
and numerous other crops. See fact page from: Insects and Mites of Economic Importance in the Pacific Northwest
by Ralph E. Berry: http://insects.ippc.orst.edu/pdf/reb76.pdf

Omnivorous Leaftier Model Parameters:
Lower threshold: 36F (2.2C) (detn. by lowest C.V.)
Upper threshold: 100F (37.8C) (nominal)
Start Date: Jan. 1st (detn. based on ability of 1st instar larvae to leave OW hibernacula as early as Feb. 16-17 (noted during 1941 & 1947)
Calculation Method: single sine (nominal)

Events and Degree Days used in omnivorous leaftier model:

Event	DDs (F)	DDs (C)
Initial 1st instar larvae out of OW hibernacula (2-5%)	436	242
Peak 1st instar larvae out of OW hibernacula (50-60%)	617	343
Initial 3rd instars exit leaf mines begin leaf tying (2-5%)	775	431
Peak 3rd instars exit leaf mines begin leaf tying (50-60%)	1210	672
Last 3rd instars exit leaf mines begin leaf tying (90-100%)	1559	866
First larvae finish development to pupate	1698	943
First moths emerge	2045	1136
First eggs next generation oviposited	2265	1258
Last larvae finish feeding	2542	1412
First eggs hatch next generation will seek hibernation sites	2765	1536
Last eggs hatch and seek hibernation sites	3673	2041

Lowest C.V. Detn of Lower Threshold (results shown only for 36F, comparison of 36,38,39,41,43,45 F)

Omnivorous leaftier stage / event		Deg. Days (F) Mean	St. Dev.	C.V.	Years contrib. to analysis:
1st instar	First (2-5%)	436	142.9	32.8	1938,39,40,41,42,46,47
balloon	Peak (50-60%)	617	91.8	14.9	1938,39,40,41,42,46,47
	End (90-100%)	810	74.9	9.3	1938,39,40,41,42,46
3rd instar	First (2-5%)	775	166.2	21.4	1938,46,47,51
emerge	Peak (50-60%)	1210	53.7	4.4	1938,46,47,51,83-2011
	End (90-100%)	1559			1938,46,47,51
1st larvae		1125	198.3	17.6	1930,32,33,34,35,37,38
1st pupae		1698	97.9	5.8	1930,32,33,34,35,37,38
end larvae		2542	171.2	6.7	1930,32,33,34,35,37,38
1st moths		2045	92.7	4.5	1930,32,33,34,35,37,38
1st eggs oviposited		2265	99.1	4.4	1932,33,34,38
end pupae		2742	292.5	10.7	1930,32,33,34,35,37,38
end moths		3075	201.5	6.6	1930,32,33,34,35,37
last egg hatch		3673			1938
last larvae enter hibernation		3739			1938
1st eggs hatched		2765			1938 (temp-devel. Greenhouse data)

Notes: 1. Egg development period determined from temperature development data from Ferguson 1938.

2. 1st instar balloon data from "flypaper catch" studies 1938-42, 46-47

3. 3rd instar leafmining stage emergence data from studies 1938, 46-47, 51

4. First and last stage appearance (larvae, pupae, moths) summarized for early years in 1935 & 37

5. Peak larval emergence data 1983-2011 from private consultant sampling data, Willamette Valley, WAC, Inc.

6. While it is likely that egg and larvae development have a higher temperature threshold than 36F, this value was used to better reflect initial emergence from overwintering, and produced the lowest C.V. for all events evaluated. A more precise model might be produced using a higher threshold (betw. 38-40) and a biofix event such as 1st instar ballooning.

References on file at OSU IPPC Library (Part of OSU Valley Library, Corvallis, Oregon):

1. Omnivorous leaftier Reports 1930, 31, 34, 35, W. Donald Edwards et al.
2. Insect Pests of Flax and Their Control. Proj. Rep. For 1937. George R. Ferguson
3. Insect Pests of Flax and Their Control. Proj. Rep. For 1938. G. R. Ferguson
4. Omnivorous Leaf-Tier Cnephasia longana Haworth Control on Flax and Strawberries, by G. R. Ferguson – 1939
5. The Omnivorous Leaf-Tier, Cnephasia longana Haworth and its Control on Flax and Strawberries by R. G. Rosenstiel. 1940
6. The Omnivorous Leaf-Tier – 1941. R. G. Rosenstiel
7. The Omnivorous Leaf-Tier, Cnephasia longana Haworth & Its control on Flax and Strawberries by R. G. Rosenstiel. 1942
8. The Control of the Omnivorous Leaf-Tier, Cnephasia longana Haworth, by R. G. Rosenstiel – 1946
9. Control of the Omnivorous Leaf-Tier, Cnephasia longana Haworth by R. G. Rosenstiel -1947
10. Insect Pests of Small Fruit. Proj. Report for 1951. R. G. Rosenstiel