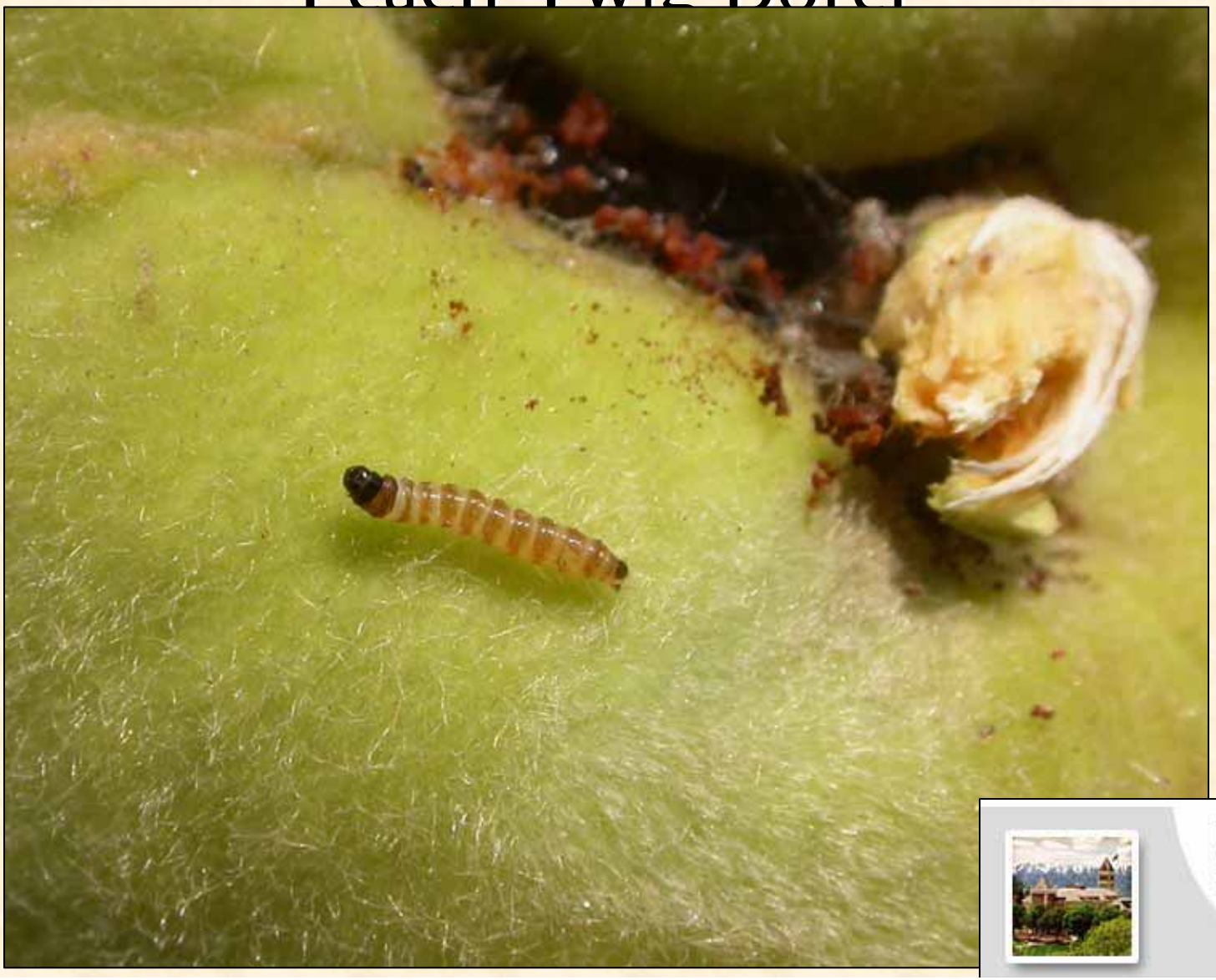
Anarsia lineatella
Peach Twig Borer



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Twig Borer Life Cycle

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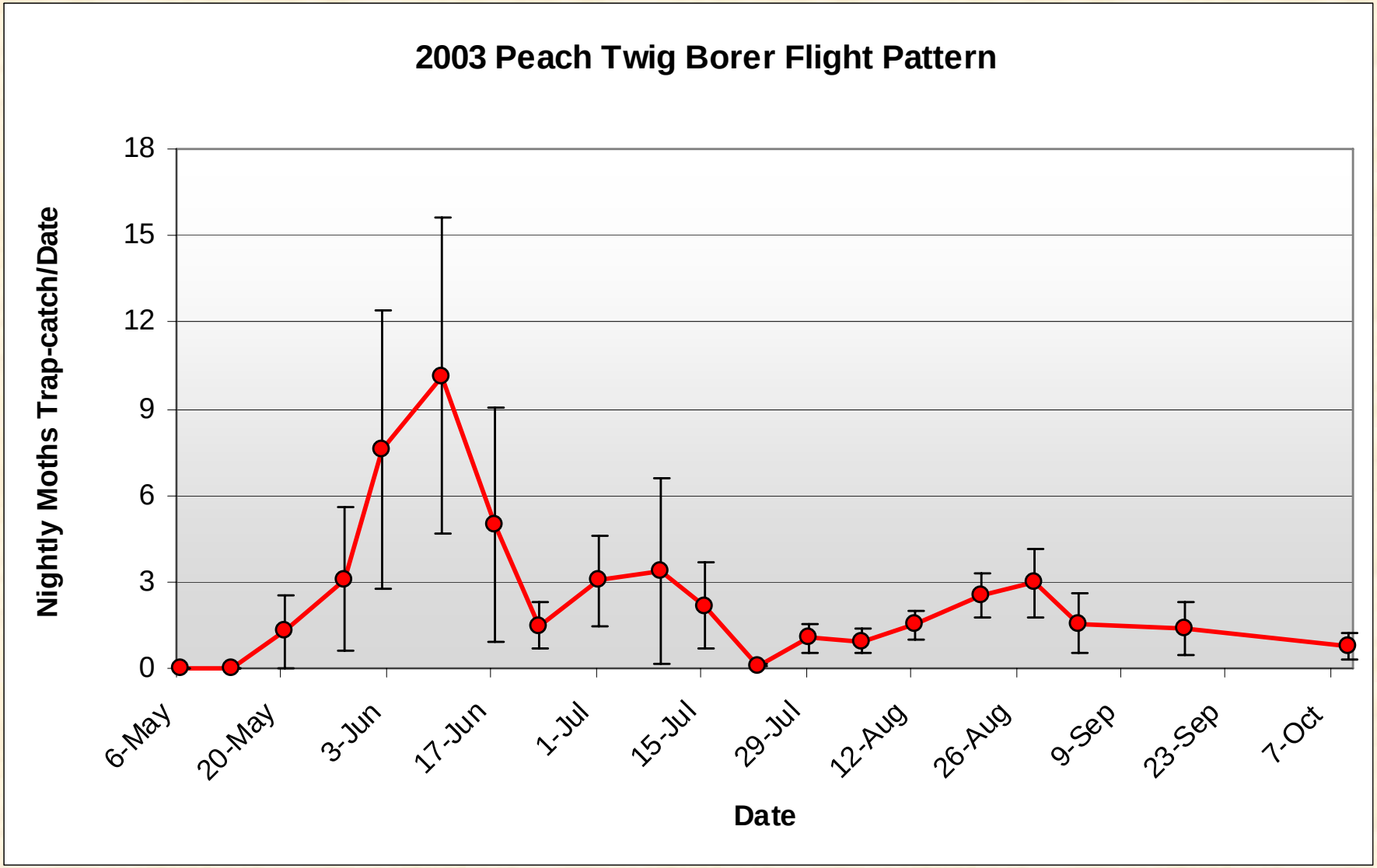
Typical Fruit Damage



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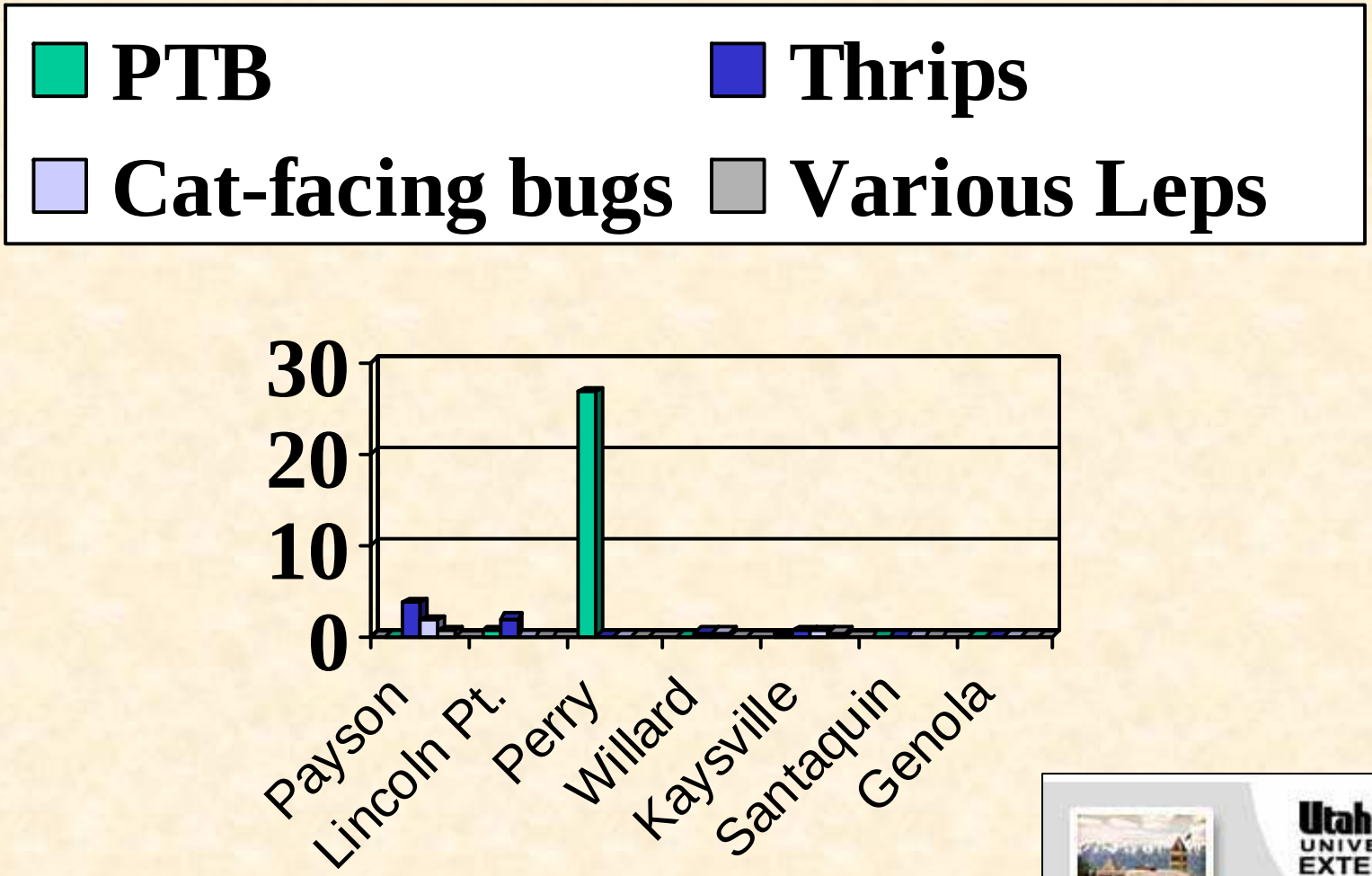
Trapping Results: 2003

- Total PTB: **4,863**
- Average per trap: **413**
  - Duration: April-October
- Ave. *per block*: **608**
  - Boxelder County: 1,976
  - Utah County: 131

Site	**Total PTB**	**Per-Trap**
Perry	3388	1694
Willard	564	282
Kaysville	256	128
Payson	19	9.5
Santaquin	60	30
N. Santaquin	91	91
Genola	83	41.5
Lincoln Pt.	402	201
Overall:	**4863**	
Average:	**608**	**413**

Peach Harvest Damage (%)



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2003 Shoot Strike Counts

Orchard Site	Mean Strikes/tree	Harvest Damage (%)
Payson Peaches	0.00	0.00
Lincoln Pt. Nectarines	0.06	0.50
Perry Peaches	2.30	26.80
Willard Peaches	0.01	0.00
Kaysville Peaches	0.04	0.12
Santaquin Peaches	0.00	0.00
Genola Peaches	0.00	0.00

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Key Elements for Management

- Overwinters as a larva in hibernacula
- 3-4 generations / year
- First generation targets succulent shoots.
- 2nd and 3rd generations target fruit.

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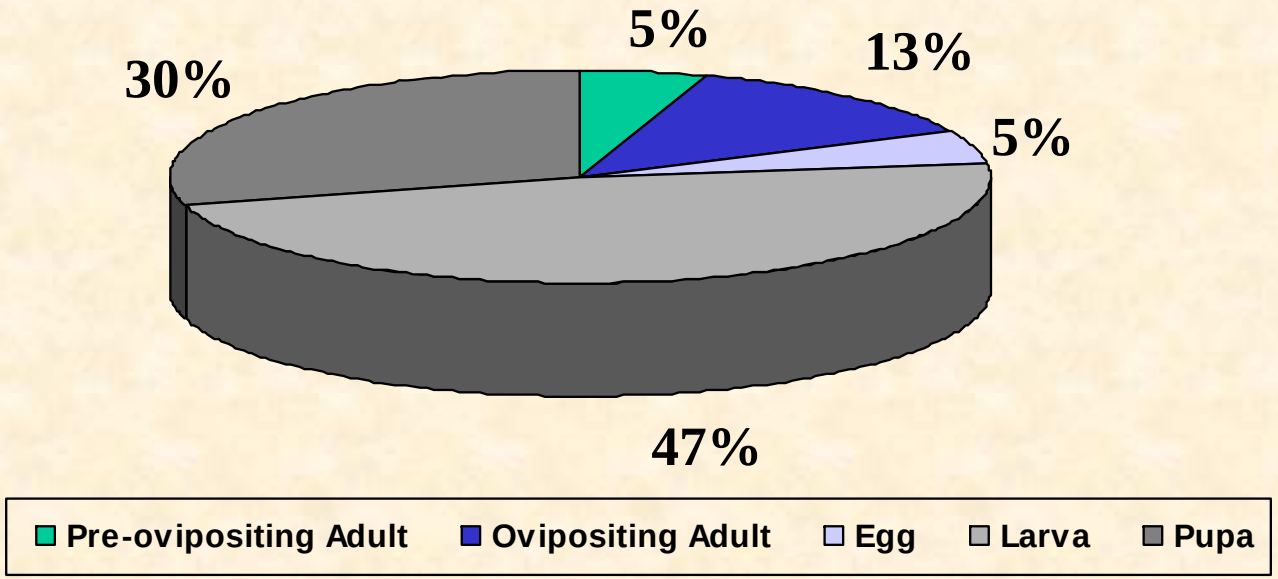
Degree-Days (DDs) for Each Stage

- Total required for a generation: **1,092.6** DDs
  - Pre-ovipositing Adult: **50.4**
  - Ovipositing Adult: **124.2**
  - Egg: **165.6**
  - Larva: **464.4**
  - Pupa: **288.0**



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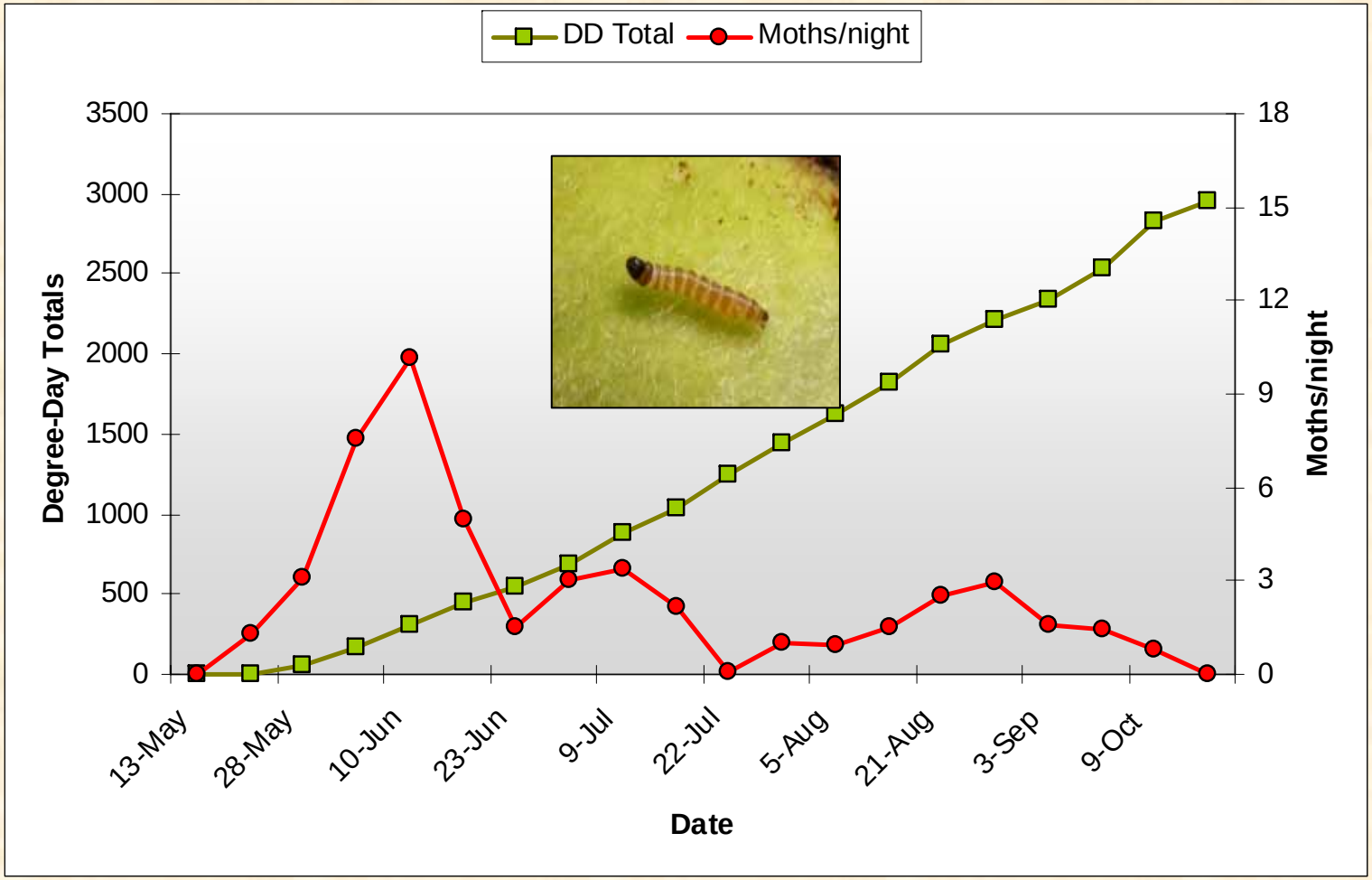
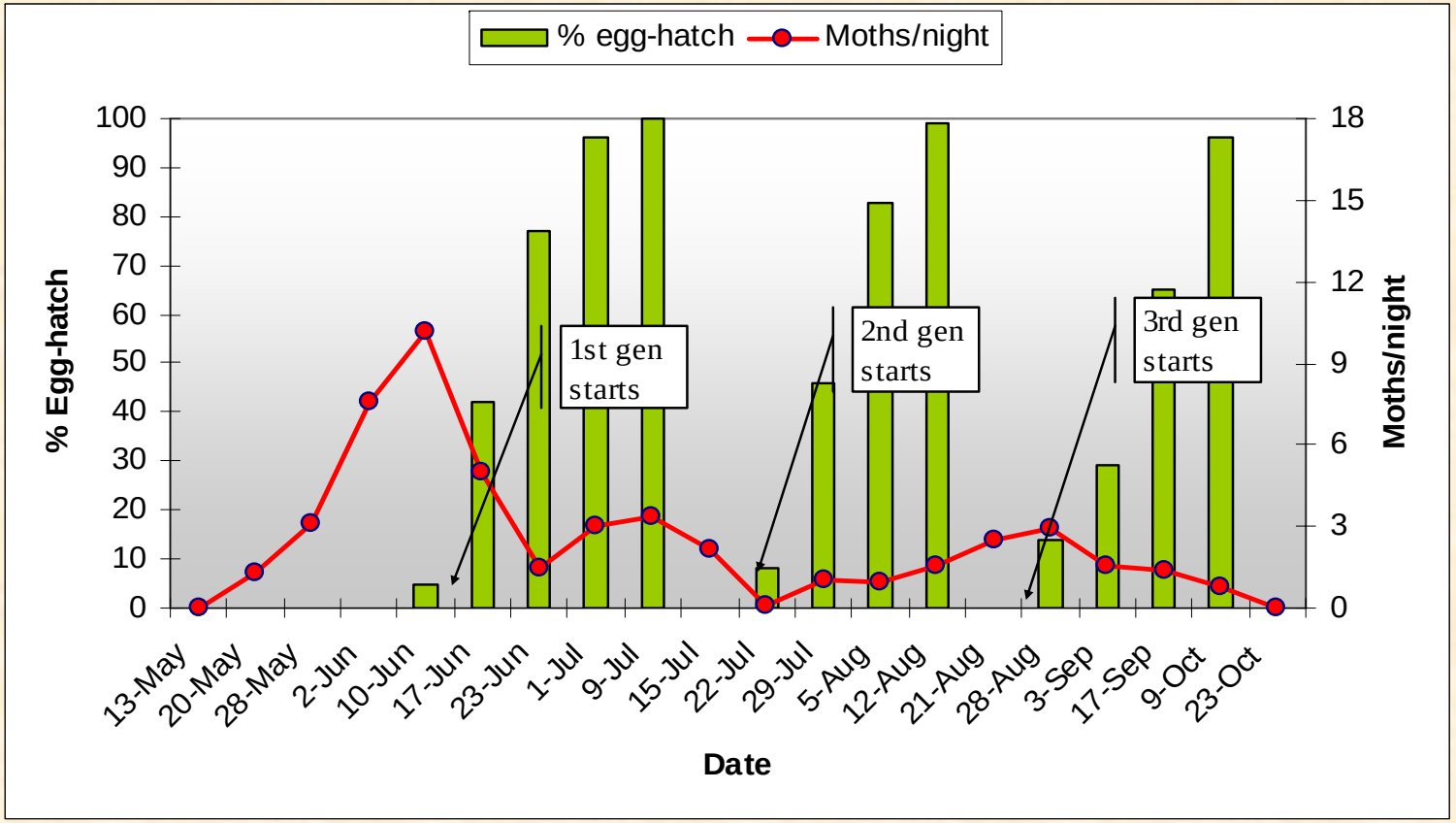
Translate DDs into Biology

- PTB larvae require **3-5** shoots to complete their development.
- *Residence time* per shoot:
  - 464 DDs / # shoots
  - between 155 and 93 DDs per shoot.
- Assuming warm temperatures (~22 DDs per day), the residence time is:
  - 4-7 days per shoot
  - larva will likely be "re-surfacing" every 4-7 days.

2003 PTB Flight and DD Accumulations



Egg-hatch Relative to Date (based on DD model projections)



Strategies for 2004

- Accurate trapping is key to precision in management.
- Average DDs for first moth emergence in 2003:
  - **367 ± 53 DDs**
  - get traps out ~ 250 DDs to ensure reliable biofix.
- 340-640 is likely peak egg-hatch window for 1st generation.
- First generation sprays may need to be initiated at 300-400 DD.

On the Horizon in 2004

- As more and more orchards are abandoned or neglected, beware of:
  - Greater Peachtree Borer
  - Giant CA Prionus Beetle
  - Shothole Borers

- For more information on tree borers, see recent talks by Dr. Alston at: www.extension.usu.edu/SlideShowIndex.htm

Tree Borer Management

(courtesy Diane Alston, March 3rd, 2004)

- Timing is critical (northern Utah)
  - Ash/Lilac borer – May 1- late June
  - Bronze birch borer – late May – June
  - Aspen borer – May-July
  - Peachtree (Crown) borer – late June – August
  - Poplar-and-Willow borer – July – Sept.
  - Locust borer – August – Sept.
  - Shothole borer – June and late Sept.
- Insecticides: carbaryl, endosulfan, pyrethroids (permethrin, bifenthrin)

Considerations for Codling Moth Management

Shawn A. Steffan

Dept. Of Biology

Utah State University

February 20th, 2004

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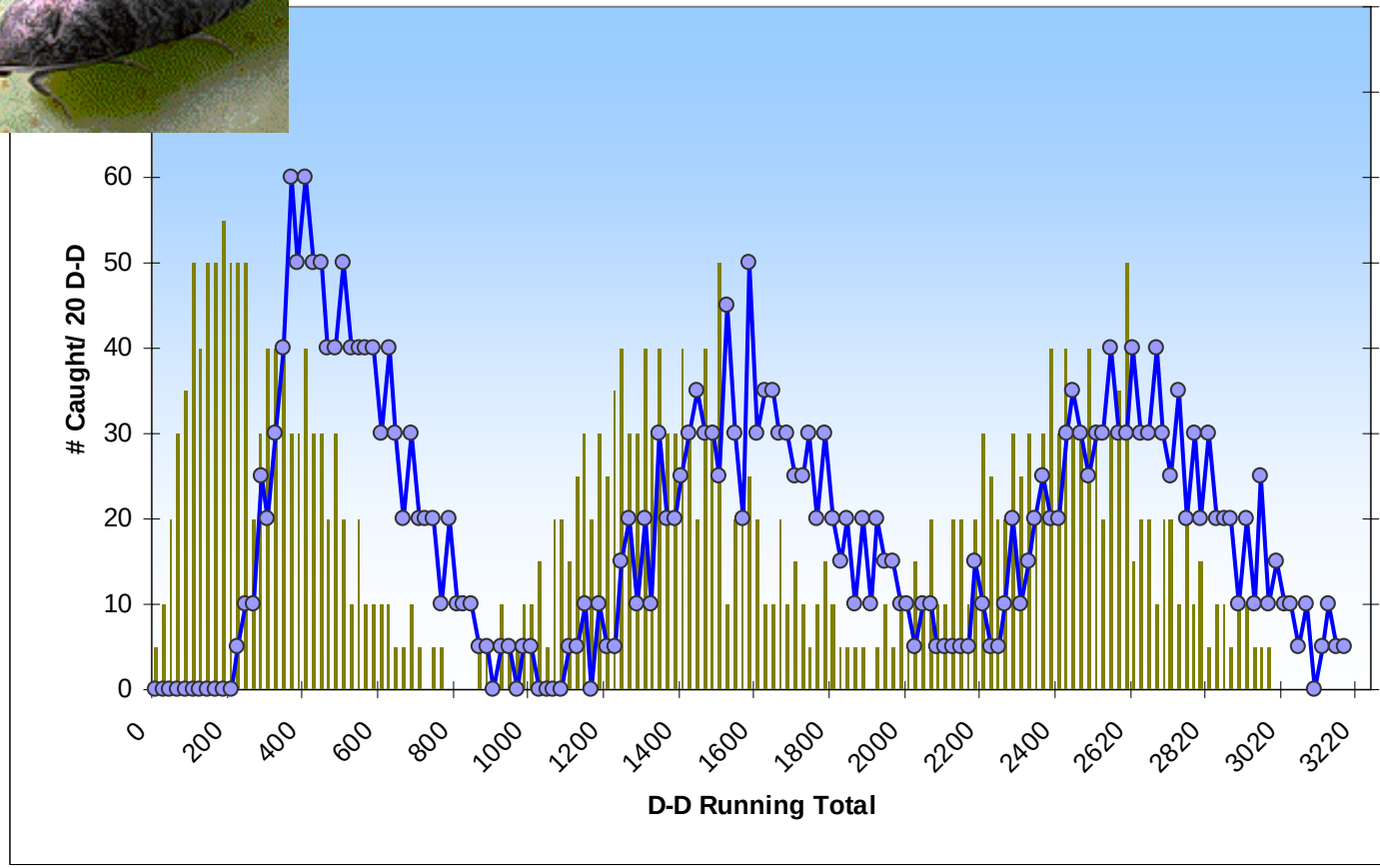
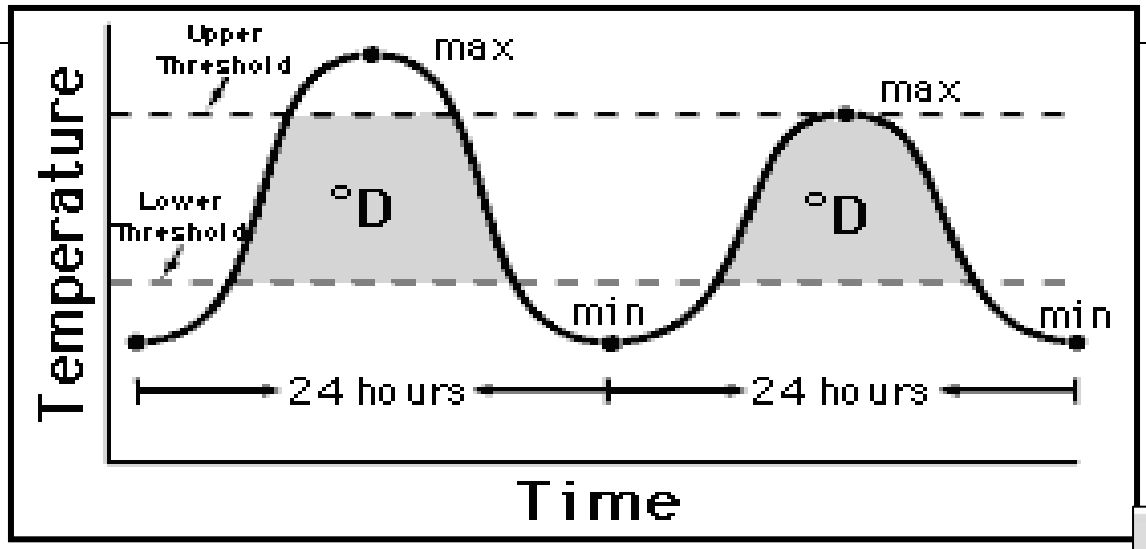
General Pattern of Codling Moth Flight and Egg-hatch, Relative to Degree-Days



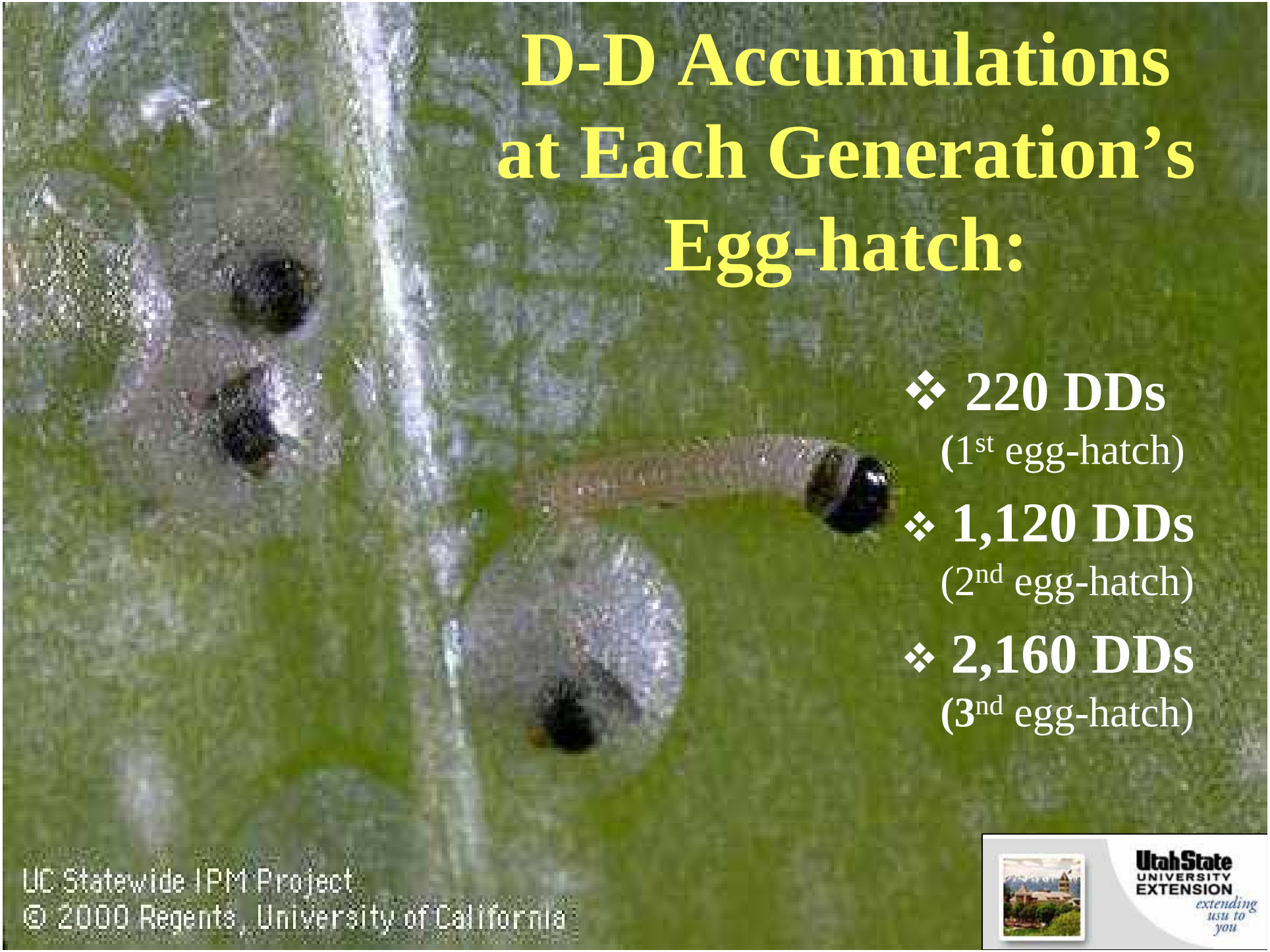
Codling Moth Degree-Days

- Degree-days give us an indirect measurement of an arthropod's development.
- *How* are DDs calculated?
  - Time spent within a specific temperature range.
  - For codling moth, the *upper threshold is:* **88**; the *lower is:* **50**).



Important Stages in a Codling Moth's Life

- Pre-ovip. Flight: **58** DDs
- Eggs: **158** DDs
- Larval Feeding: **471** DDs
- Pupae: **431** DDs
- Total for Generation: **1,118** DDs



D-D Accumulations at Each Generation's Egg-hatch:

- **220 DDs** (1st egg-hatch)
- **1,120 DDs** (2nd egg-hatch)
- **2,160 DDs** (3nd egg-hatch)

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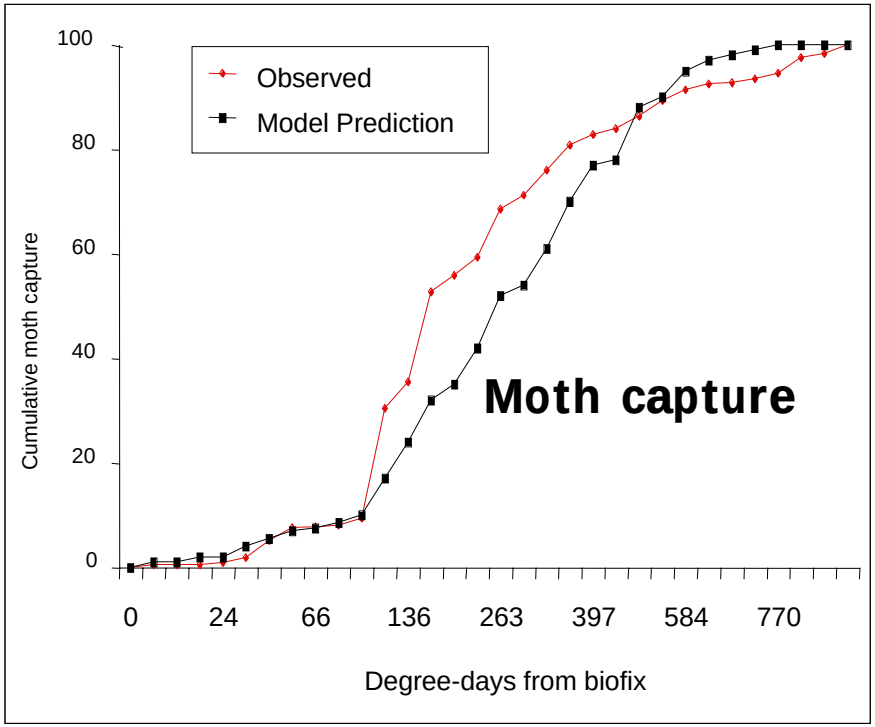
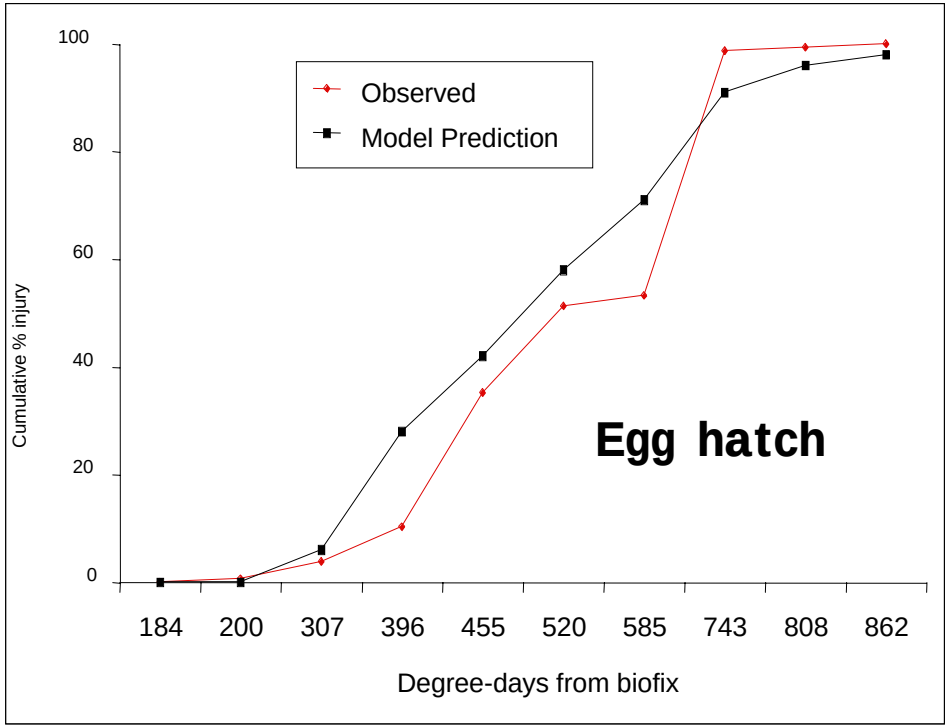
For the past 3 years the model has accurately predicted codling moth development (flight, oviposition, and egg hatch) in Wenatchee in unsprayed orchards.

2002 actual activity and model predictions - 1st generation





Courtesy Dr. Jay Brunner, WSU, Wenatchee

Case Studies from ’03 Season

- ✓ **Case 1:** *No mating disruption;* ***high CM pop****;* poorly timed apps; over-reliance on a single material; insecticide resistance documented.
- ✓ **Case 2:** *No mating disruption;* ***moderate CM pop****;* well-timed apps; use of IGR and conventional materials.
- ✓ **Case 3:** *Mating disruption;* ***moderate CM pop****;* many applications; use of various materials.
- ✓ **Case 4:** *Mating disruption (applied 1 week late);* ***high CM pop****;* well-timed applications; various materials.

Case Studies from ’03 Season

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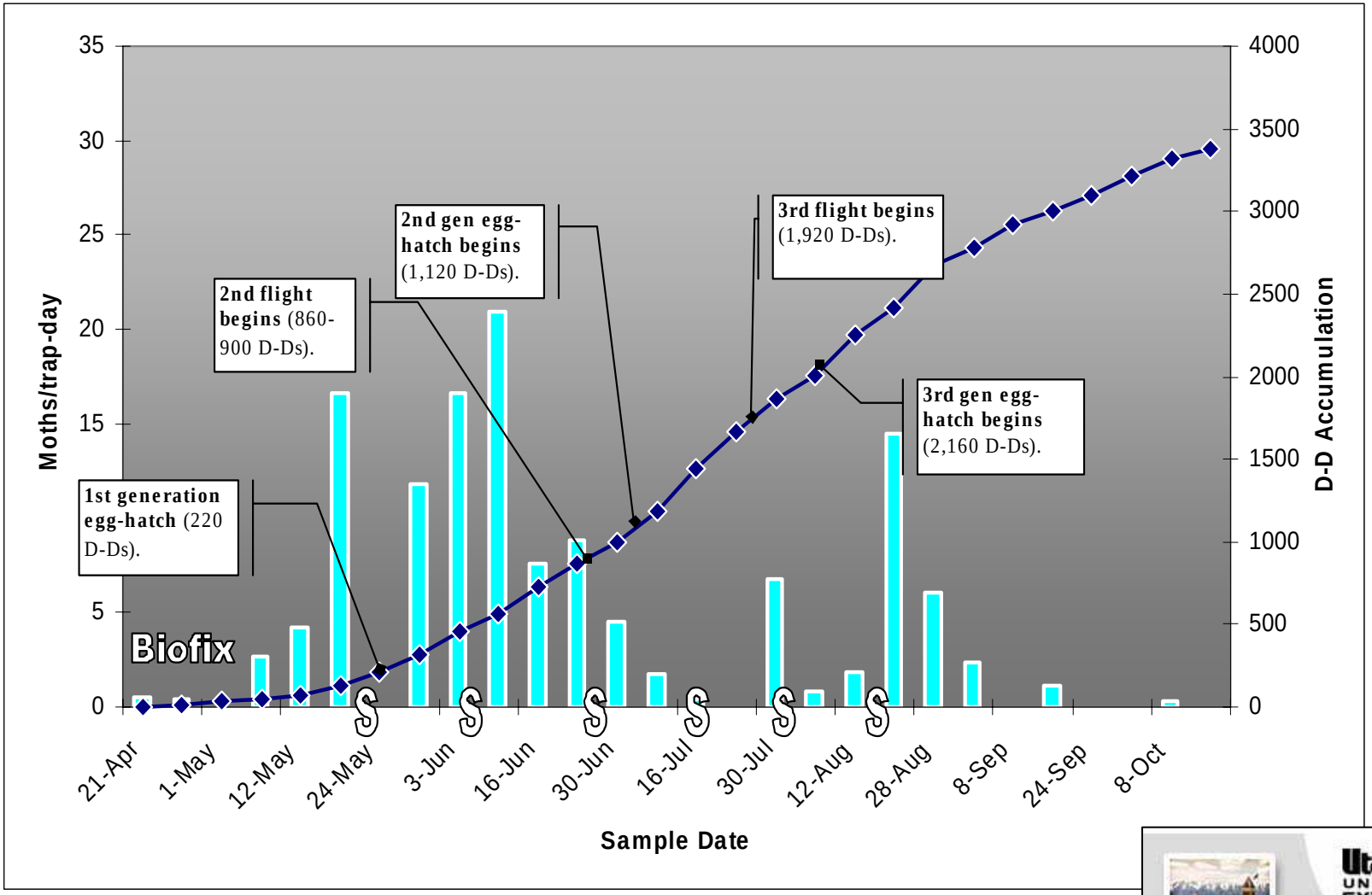
Case 1: Codling Moth Flight and Degree-Day Accumulation for Apples in *Perry (Boxelder Co.)*



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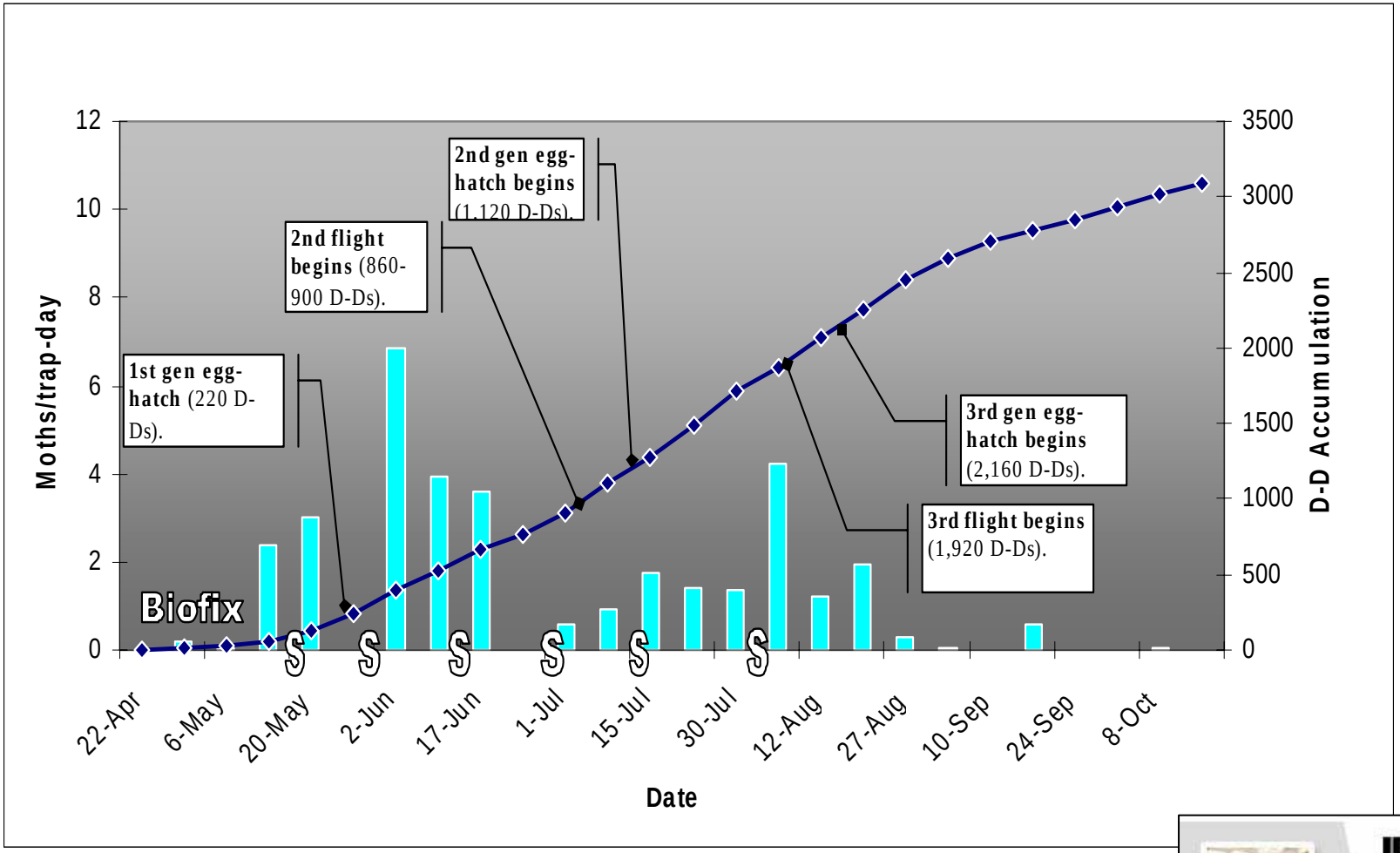
Case 2: Codling Moth Flight and Degree-Day Accumulation for Apples in *Kaysville (Davis Co.)*



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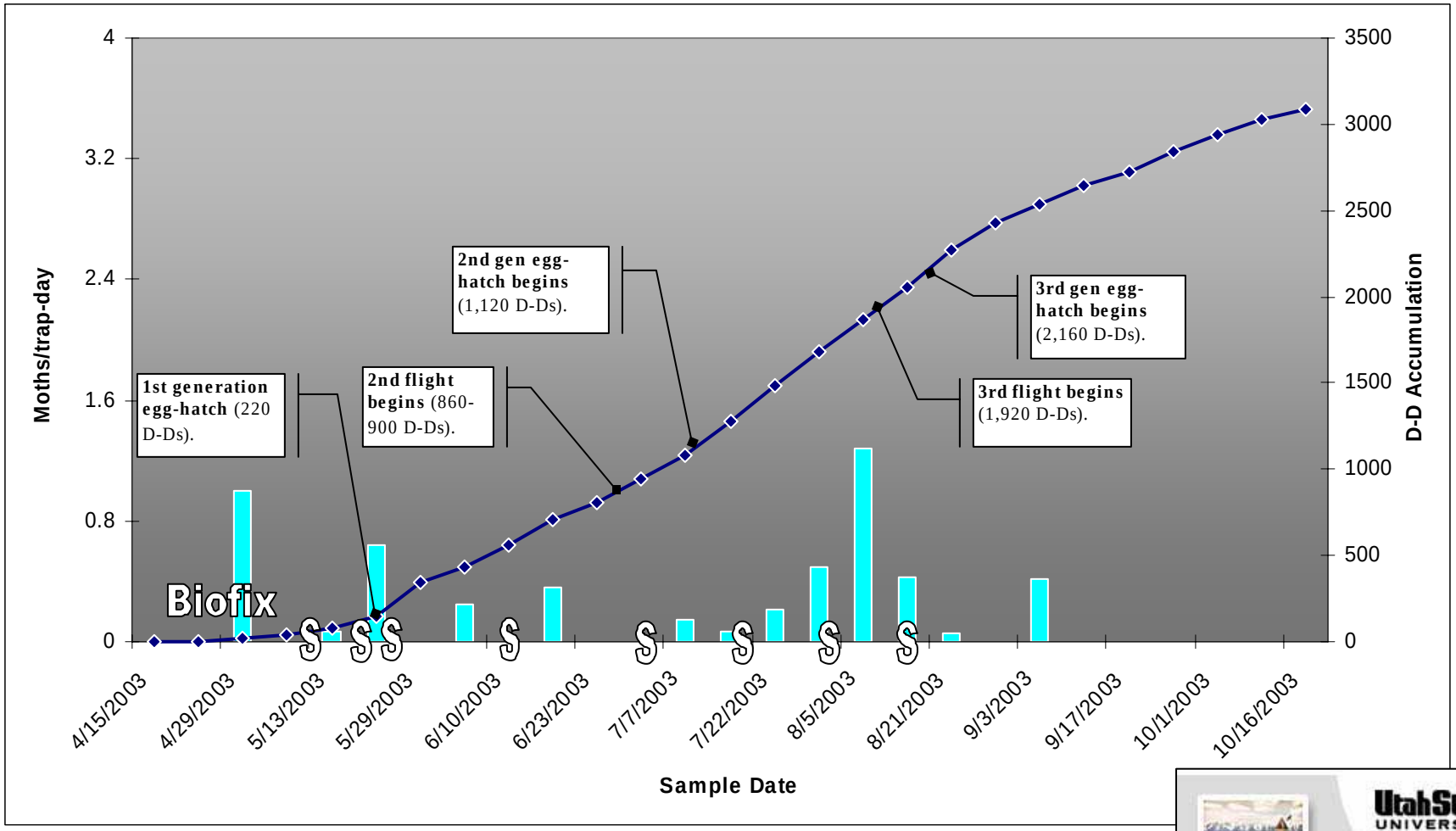
Case 3: Codling Moth Flight and Degree-Day Accumulation for Apples in *Genola (Utah Co.)*



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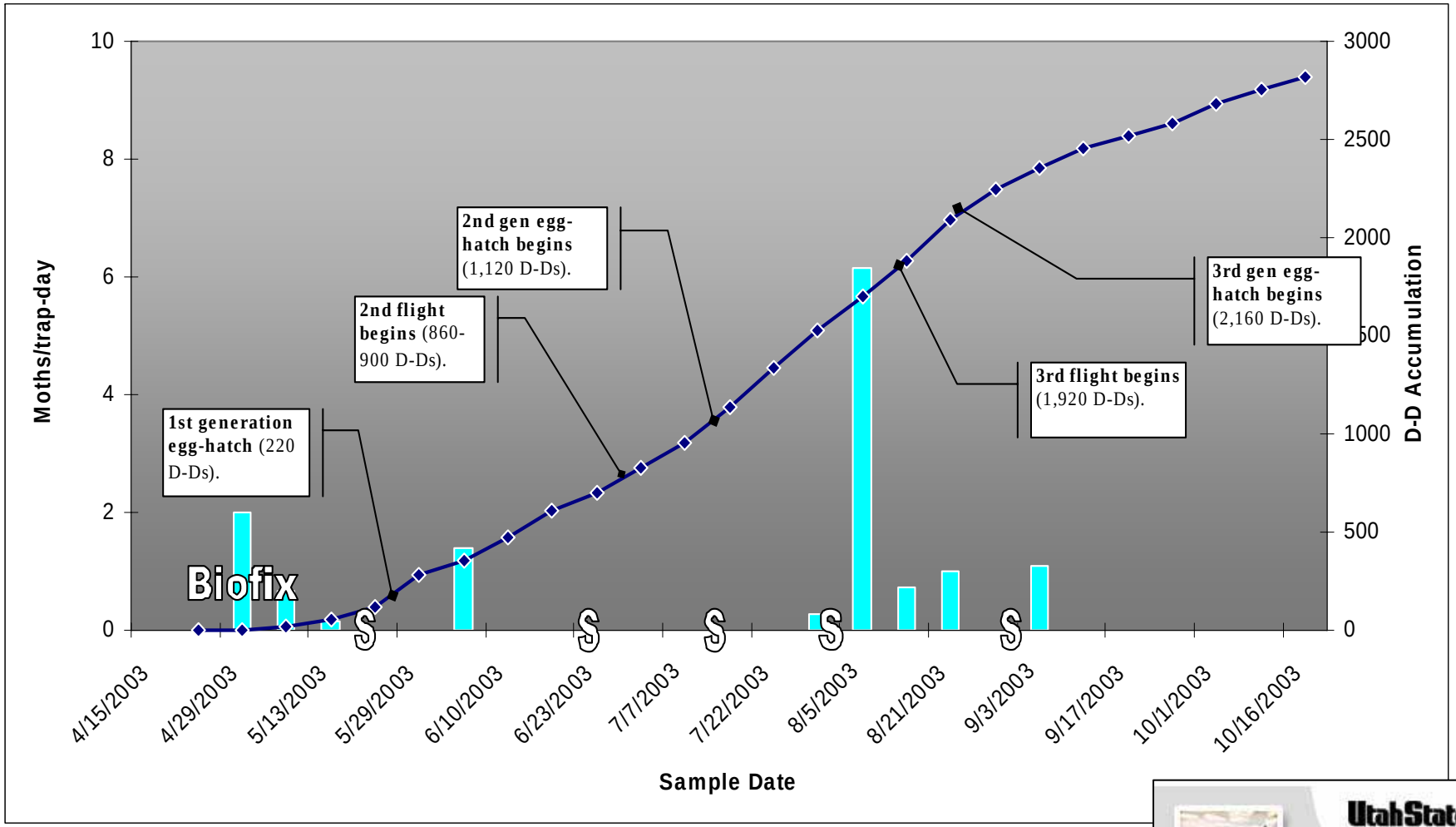
Case 4: Codling Moth Flight and Degree-Day Accumulation for Apples in *Lincoln Point (Utah Co.)*



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CM Damage Estimates

- ✓ **Case 1 (Perry):** Not harvested due to CM damage (83% worm entry).
- ✓ **Case 2 (Kaysville):** Moderate CM damage (1.3% worm entry).
- ✓ **Case 3 (Genola):** Very low CM damage.
- ✓ **Case 4 (Lincoln Pt.):** High CM damage (approx. 20% worm entry).

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Improve the Odds

- **Time the cover sprays based on known biological events** (run traps).
- **Achieve better coverage** by using higher gallonages and verifying uniformity within the canopy**.**
- **Sanitation** (remove infested apples from orchard).
- **Rotate insecticide classes** (implications for spray timing).
- **Use Pheromone mating disruption** to *reduce the egg load.*

Mating Disruption Works

- Here's how:
  - It **delays the mating** of females.
  - Late mating means fewer eggs deposited.
  - The dispensers work **24-7** for months.
- Some of the nuts-n-bolts:
  - **Dispensers** (ties, tubes, ropes, membranes, puffers, etc.)
  - Applied relative to CM phenology, biofix.
  - Function is independent of sprays, tree growth.

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A Key Point in CM Development

- **1st Generation Egg-Hatch.**
  - **The success/failure of 1st gen. larvae set the stage for the remainder of the season.**

Broad-Strokes Strategy for CM Management

- Set traps in early spring (around bud break).
- At first biofix, hang mating disruption dispensers asap.
- Keep track of accumulated DDs using IPM Advisory or your own weather monitoring system.
- Make treatments based on DD accumulations (time sprays for egg-hatch periods).
- Continue to monitor traps and fruit.

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Good Resources

- **www.extension.usu.edu/ipm**
- **www.extension.usu.edu/insectpath**
- **www.ipm.ucdavis.edu/default.html**

- Common Sense Pest Control (Olkowski et al)
- USU Home Orchard Pest Management Guide
- Pests of the Garden and Small Farm

- *Materials*: www.ipmtech.com , www.bioquip.com

- Box Elder County Home Orchard Hotline
  435-734-9958 ext-298

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