



# Dispersal capacity of late instar gypsy moth larvae (*Lymantria dispar*) and implications for wood products movement

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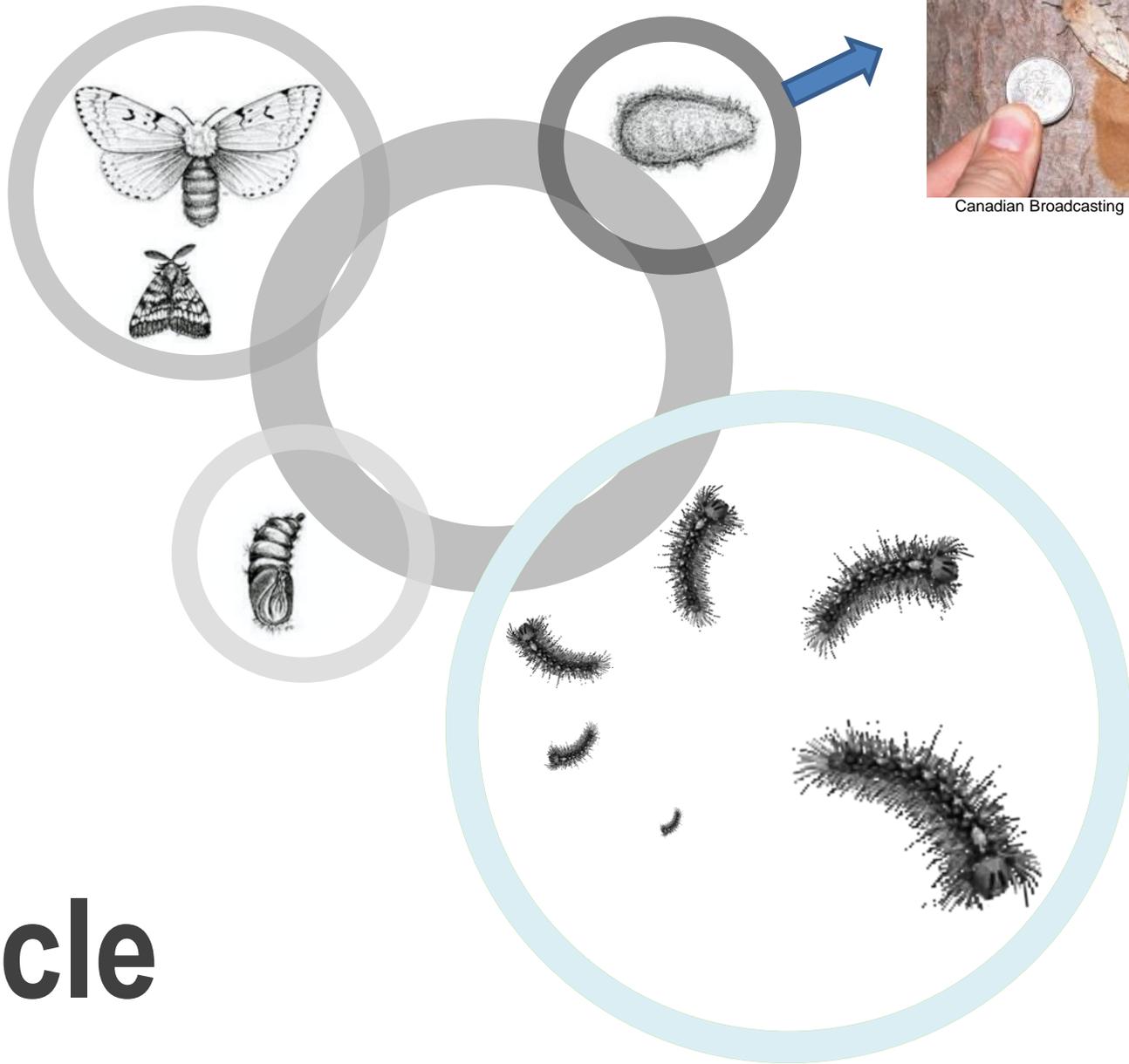
<sup>2</sup>USDA-APHIS-PPQ, Center for Plant Health, Science, and Technology, Buzzards Bay, MA

Forest Health Workshop | February 2, 2016



# Gypsy moth

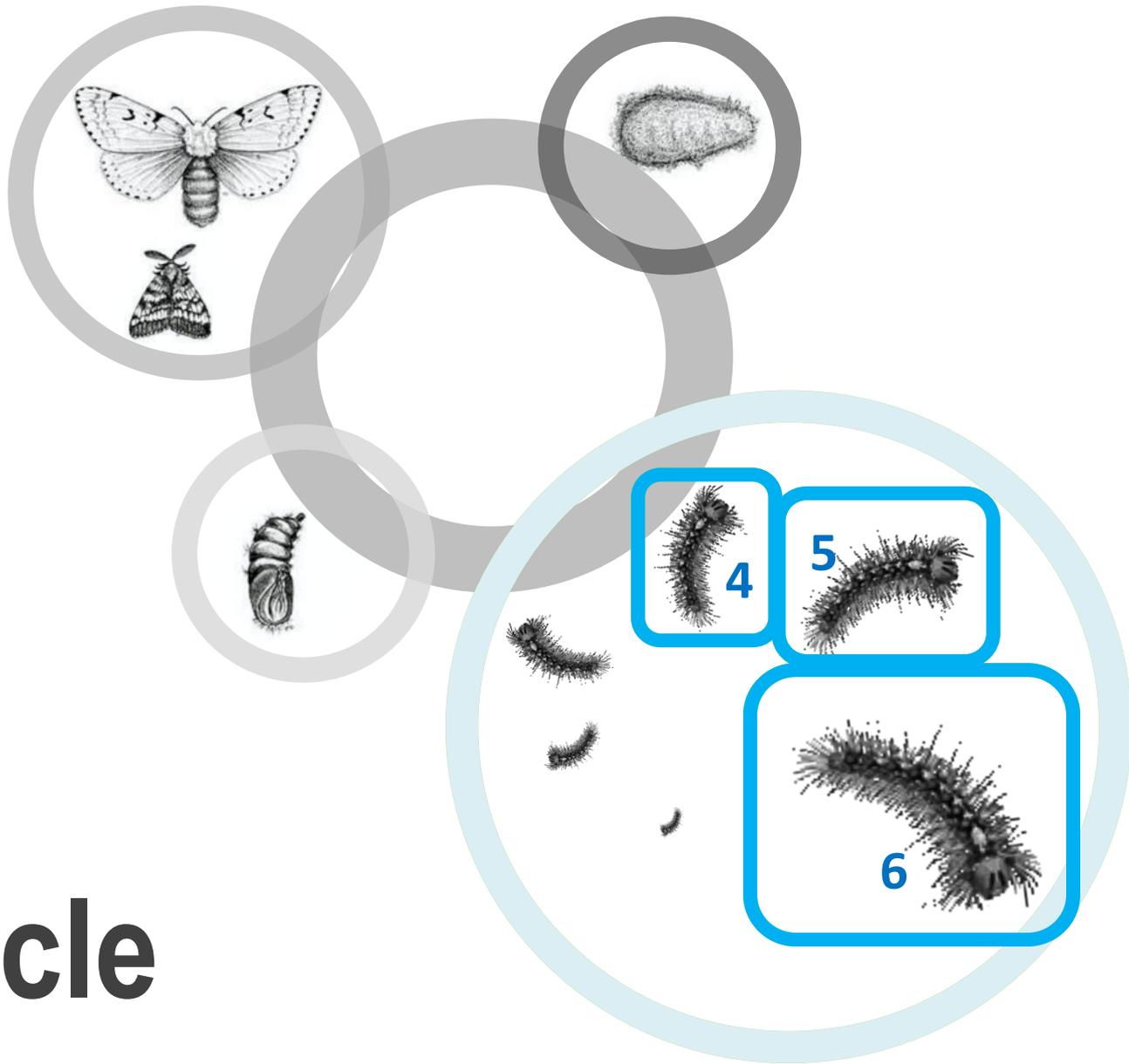
*Lymantria dispar*



Canadian Broadcasting Corporation

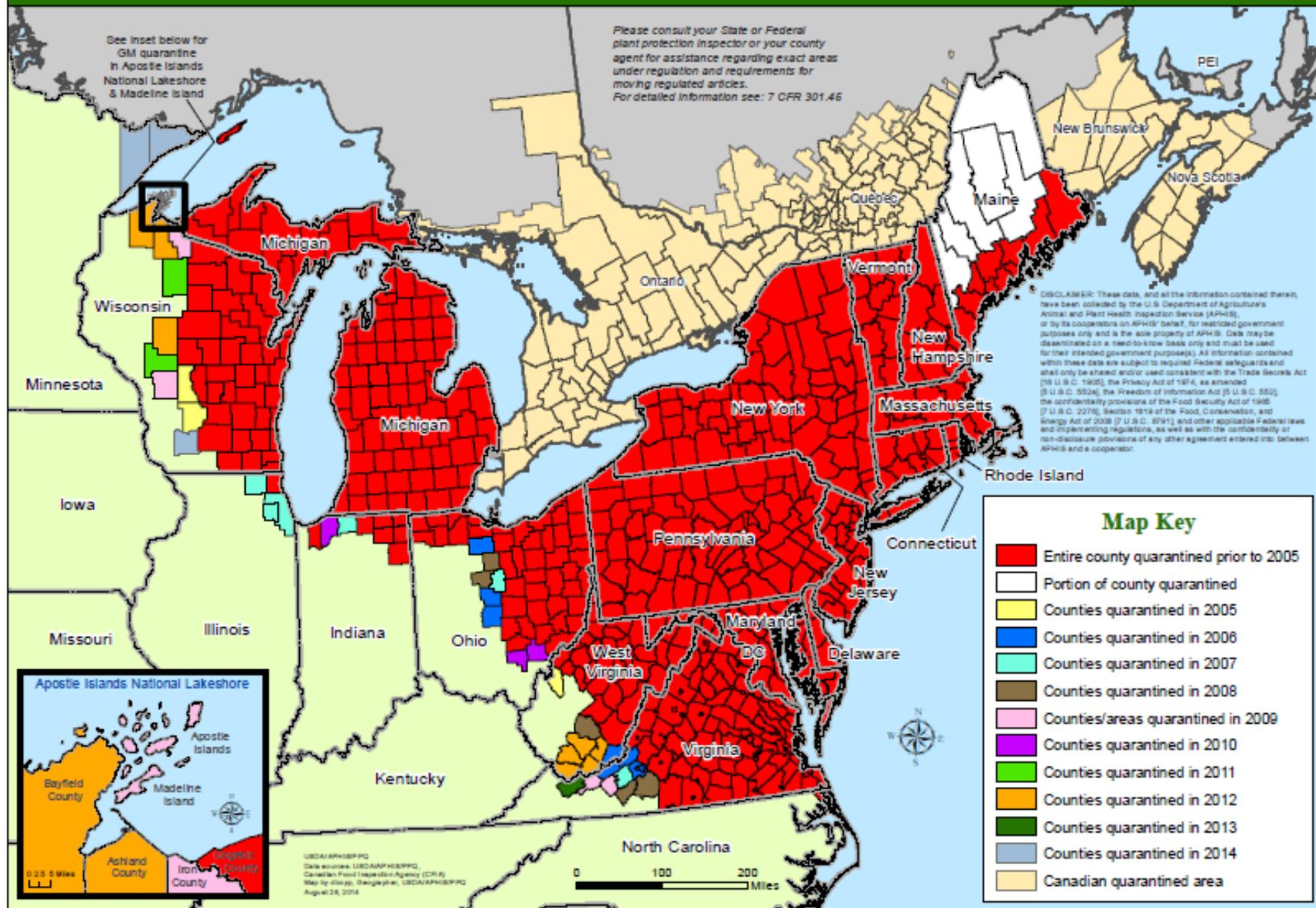
# Life Cycle

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# European Gypsy Moth (*Lymantria dispar*) North America quarantine





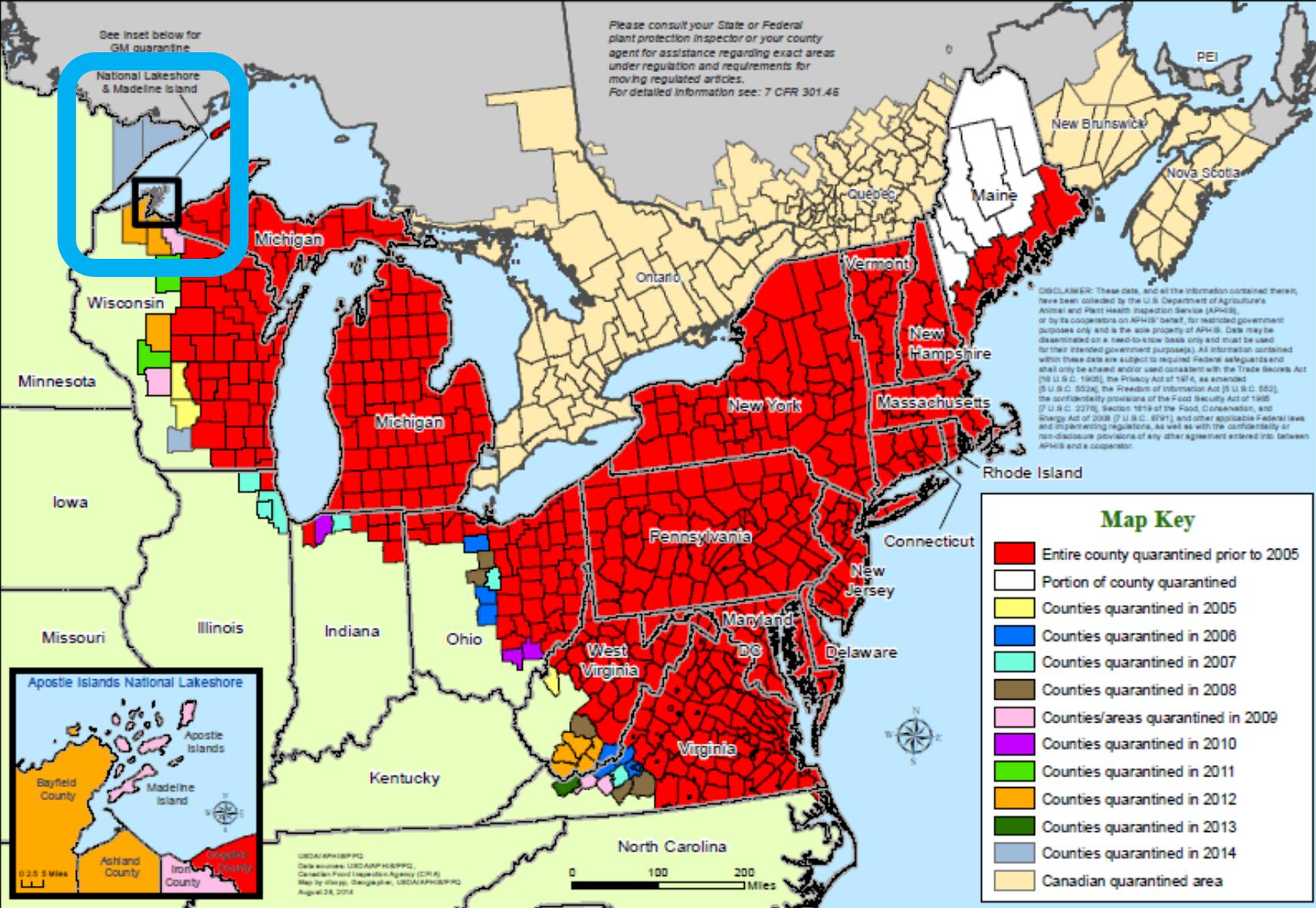
# European Gypsy Moth (*Lymantria dispar*) North America quarantine

Please consult your State or Federal plant protection inspector or your county agent for assistance regarding exact areas under regulation and requirements for moving regulated articles. For detailed information see: 7 CFR 301.46

See inset below for GM quarantine

National Lakeshore & Madeline Island

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### Map Key

- Entire county quarantined prior to 2005
- Portion of county quarantined
- Counties quarantined in 2005
- Counties quarantined in 2006
- Counties quarantined in 2007
- Counties quarantined in 2008
- Counties/areas quarantined in 2009
- Counties quarantined in 2010
- Counties quarantined in 2011
- Counties quarantined in 2012
- Counties quarantined in 2013
- Counties quarantined in 2014
- Canadian quarantined area



USDA APHIS/PPQ  
Data sources: USDA/APHIS/PPQ  
Canadian Plant Inspection Agency (CPA)  
Map by (c)2015, Geographic, USDA/APHIS/PPQ  
August 28, 2014





# Mitigation of spread via wood products



The gypsy moth quarantine restricts the movement of wood products.



Maintenance of a 100-foot host vegetation-free buffer zone surrounding log decks is required to prevent new gypsy moth infestations.

**100 ft. buffer**





# Mitigation of spread via wood products

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Buffer zone width concerns:  
 It is not based on any known  
scientific study.

**100 ft. buffer** →



# Mitigation of spread via wood products

Buffer-zone width concerns:



It is not based on any known scientific study.



Late instar gypsy moth larvae may be **capable of movement up to 410 ft.** (Doane & Leonard 1975).

**100 ft. buffer** →



# Mitigation of spread via wood products

## Buffer-zone width concerns:



It is not based on any known scientific study.



Late instar gypsy moth larvae may be **capable of movement up to 410 ft.** (Doane & Leonard 1975).



The buffer zone may not be effective.

**100 ft. buffer** →



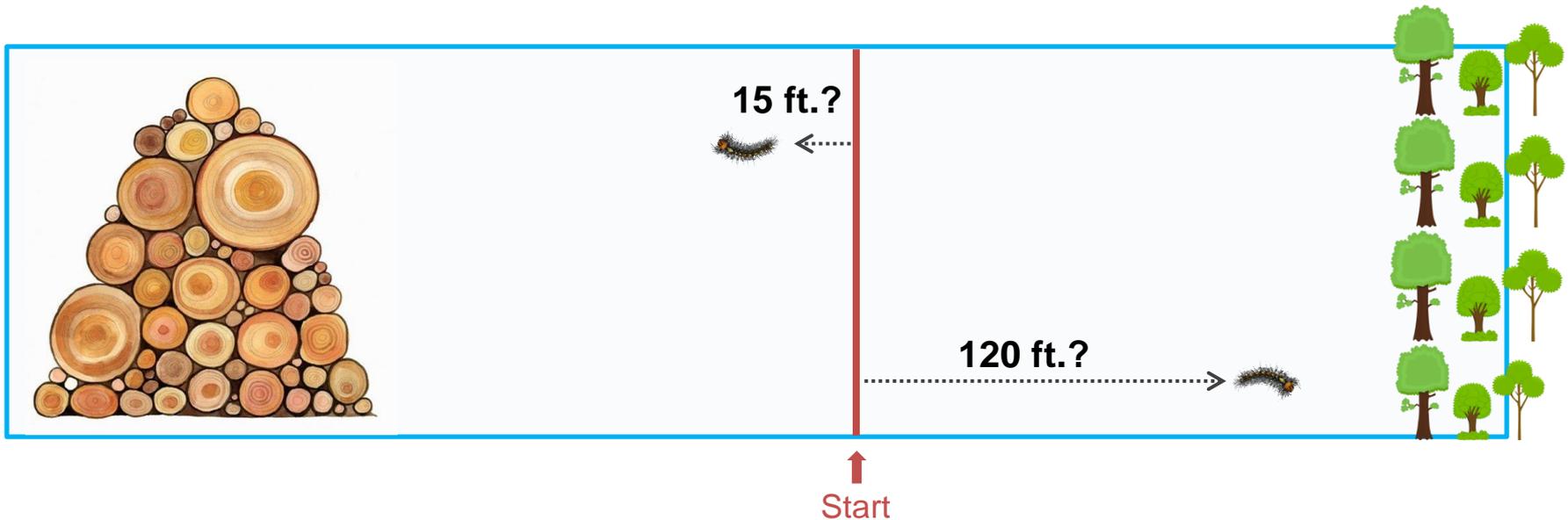
# Research questions



What is the long-distance dispersal capacity of late instar gypsy moth larvae?



Will late instar gypsy moth larvae orient to log decks and/or surrounding forest?



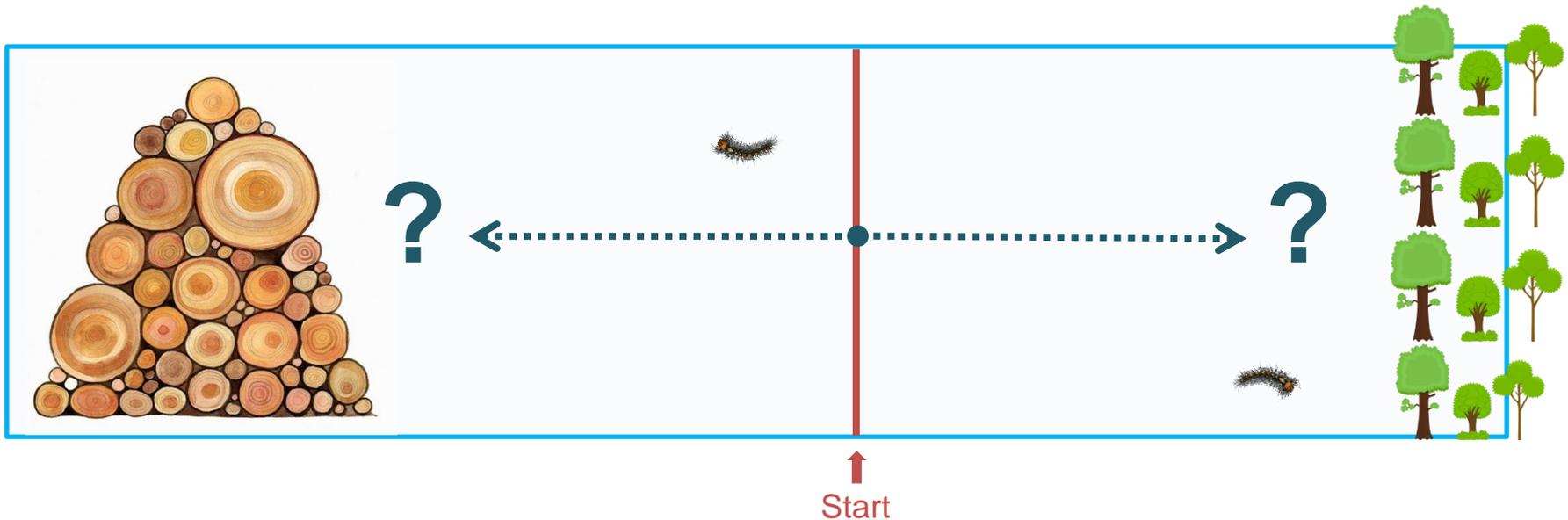
# Research questions



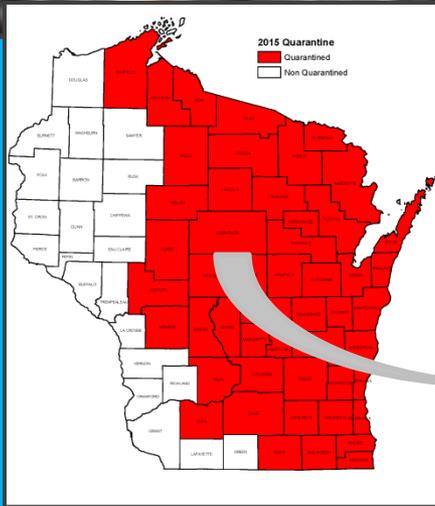
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# Pilot study of late instar dispersal



Mosinee, Wisconsin  
(Marathon County)

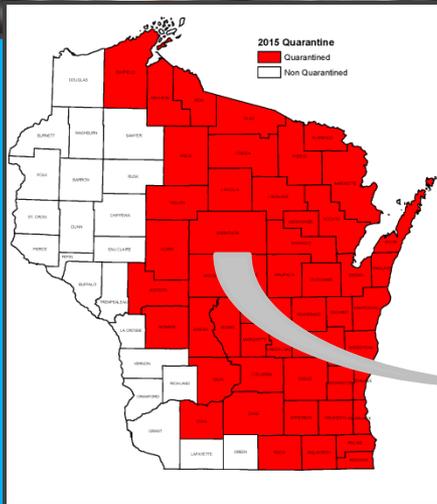


Expera Specialty  
Solutions Paper Mill

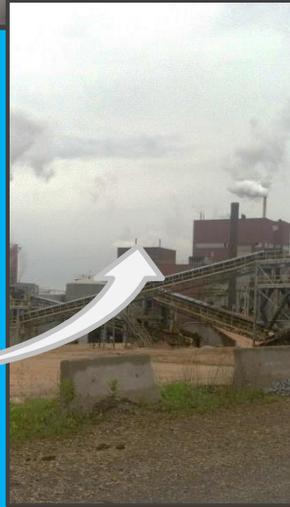


Lumber yard

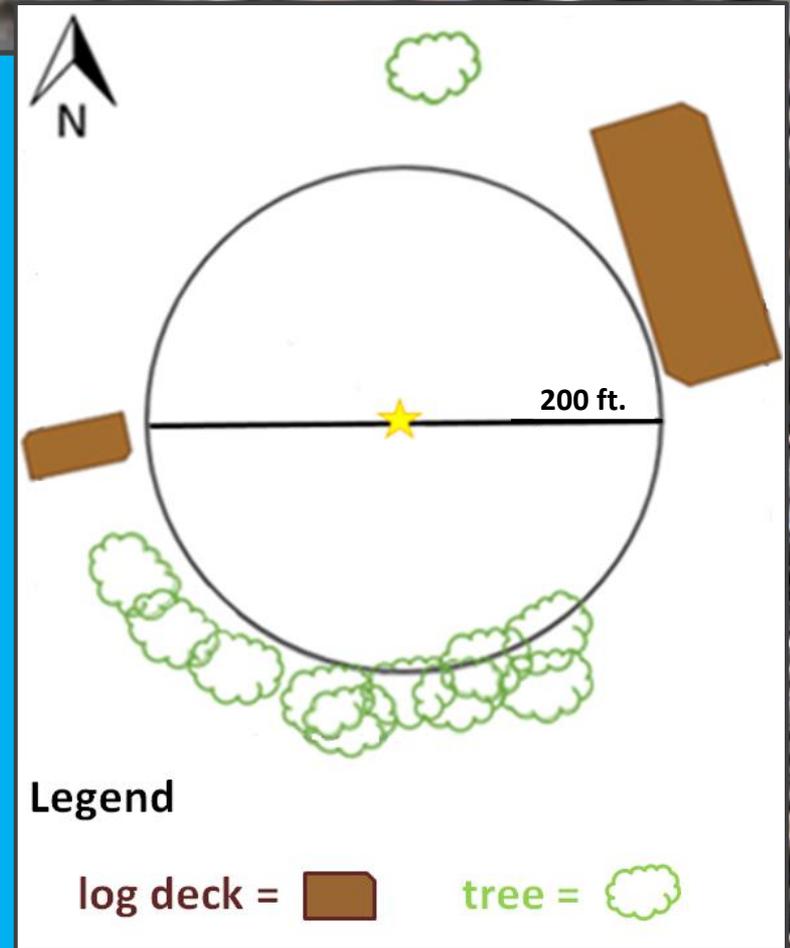
# Pilot study of late instar dispersal



Mosinee, Wisconsin  
(Marathon County)



Expera Spec  
Solutions Paper





40 gypsy moths released

Data collection after release: 3 h, 6 h, 9 h, 12 h





# 40 gypsy moths released





# 40 gypsy moths released





# 40 gypsy moths released





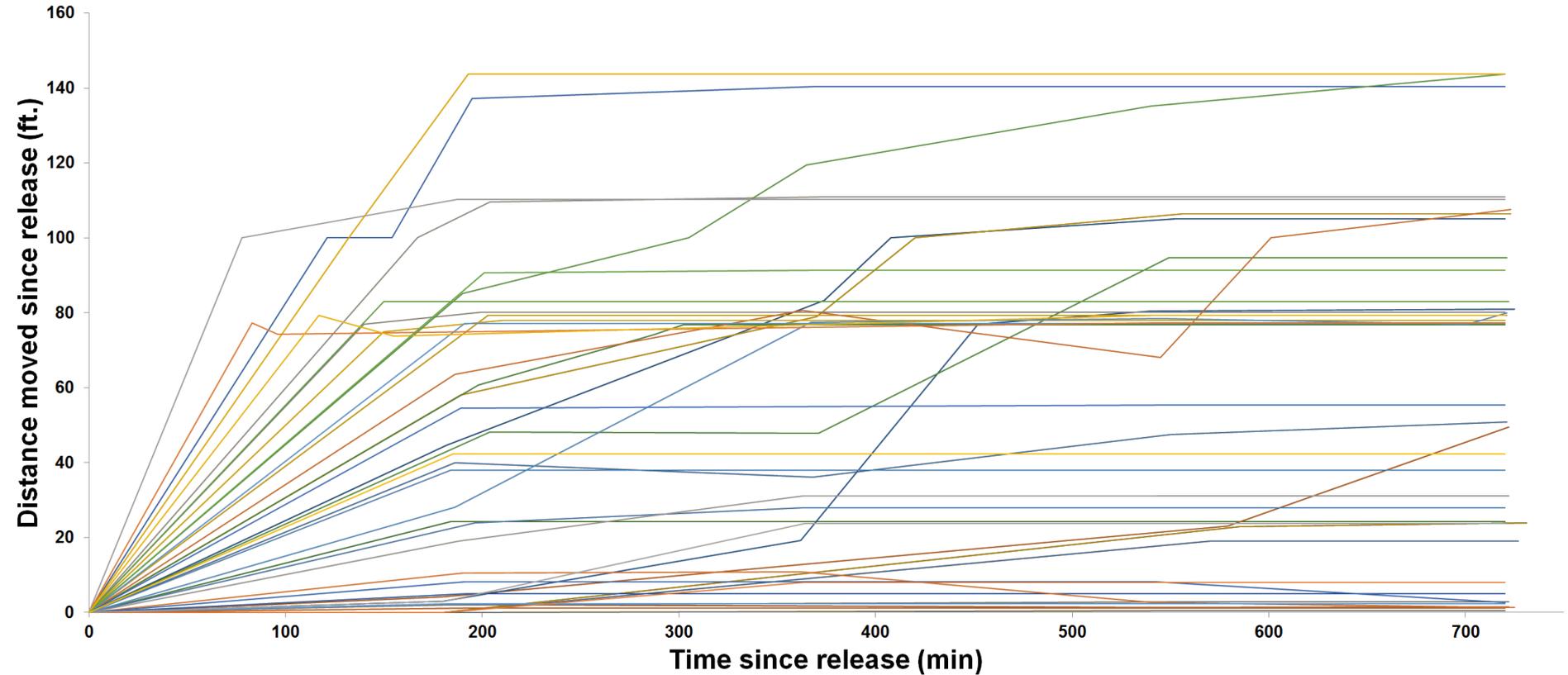
# 40 gypsy moths released

**Instars:** 16 fourth  
18 fifth  
6 sixth

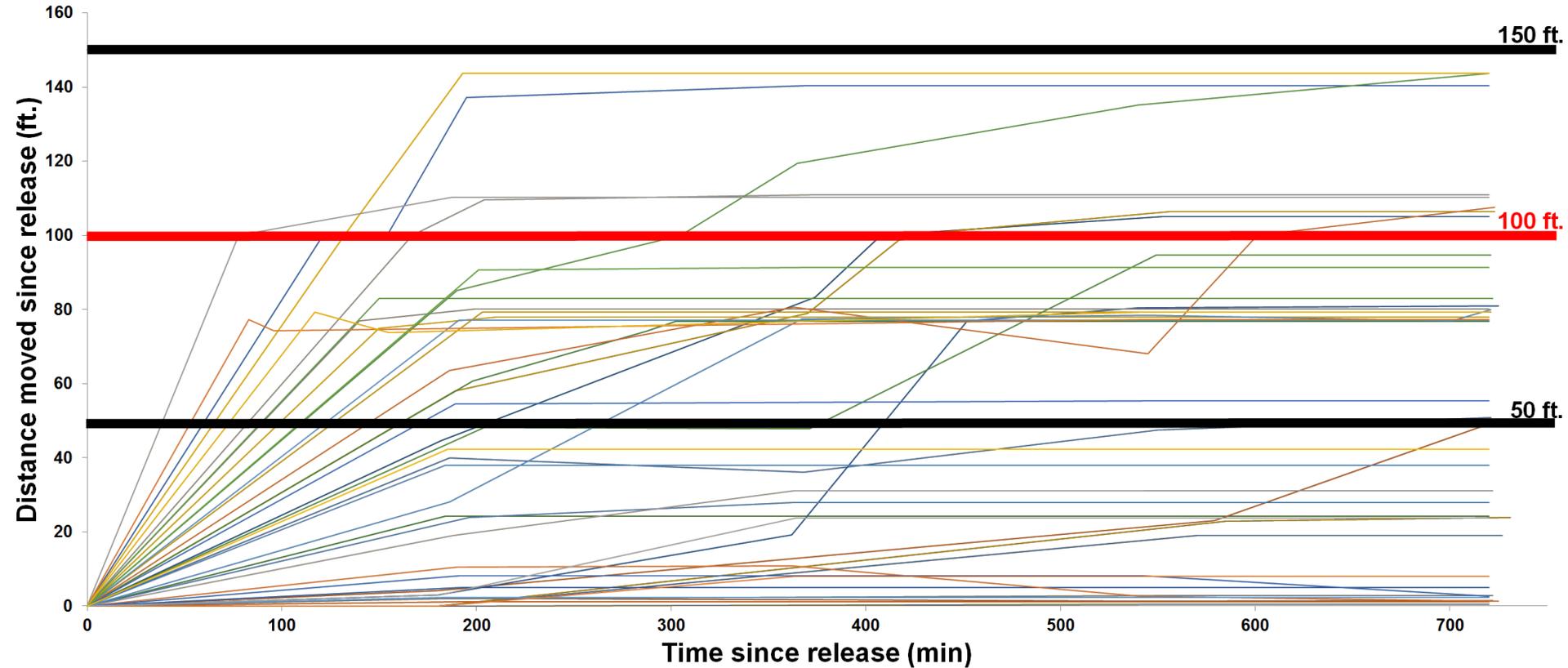
**Feeding regime:** 19 starved  
21 eating



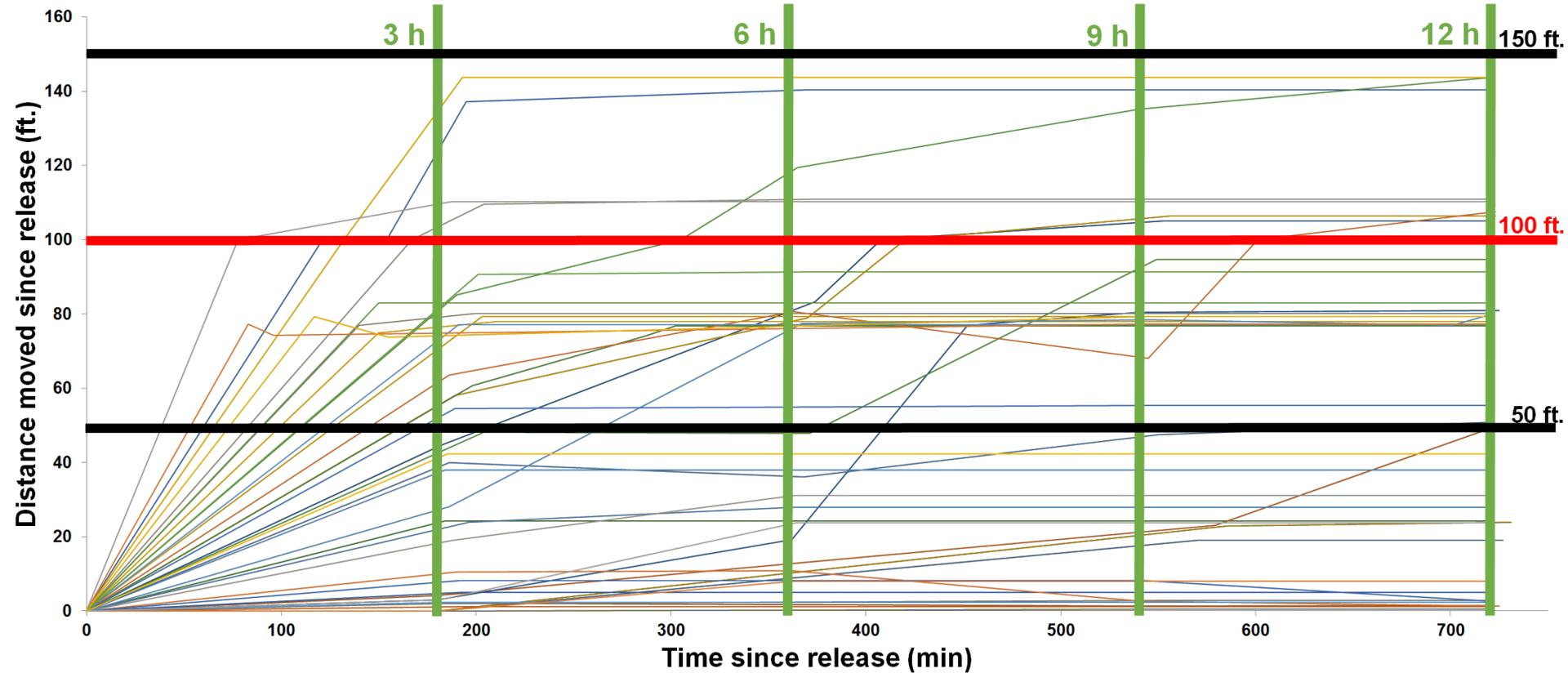
# Movement of all larvae over 12 hours



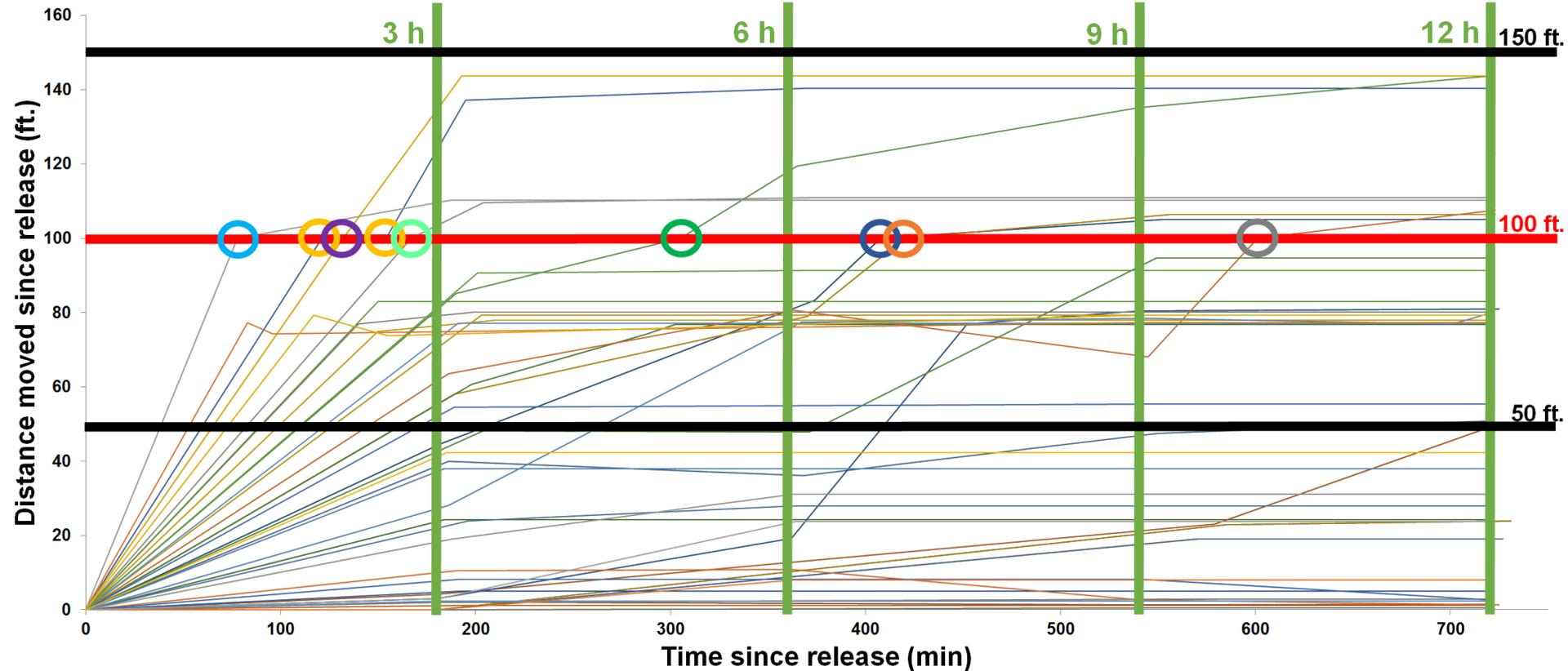
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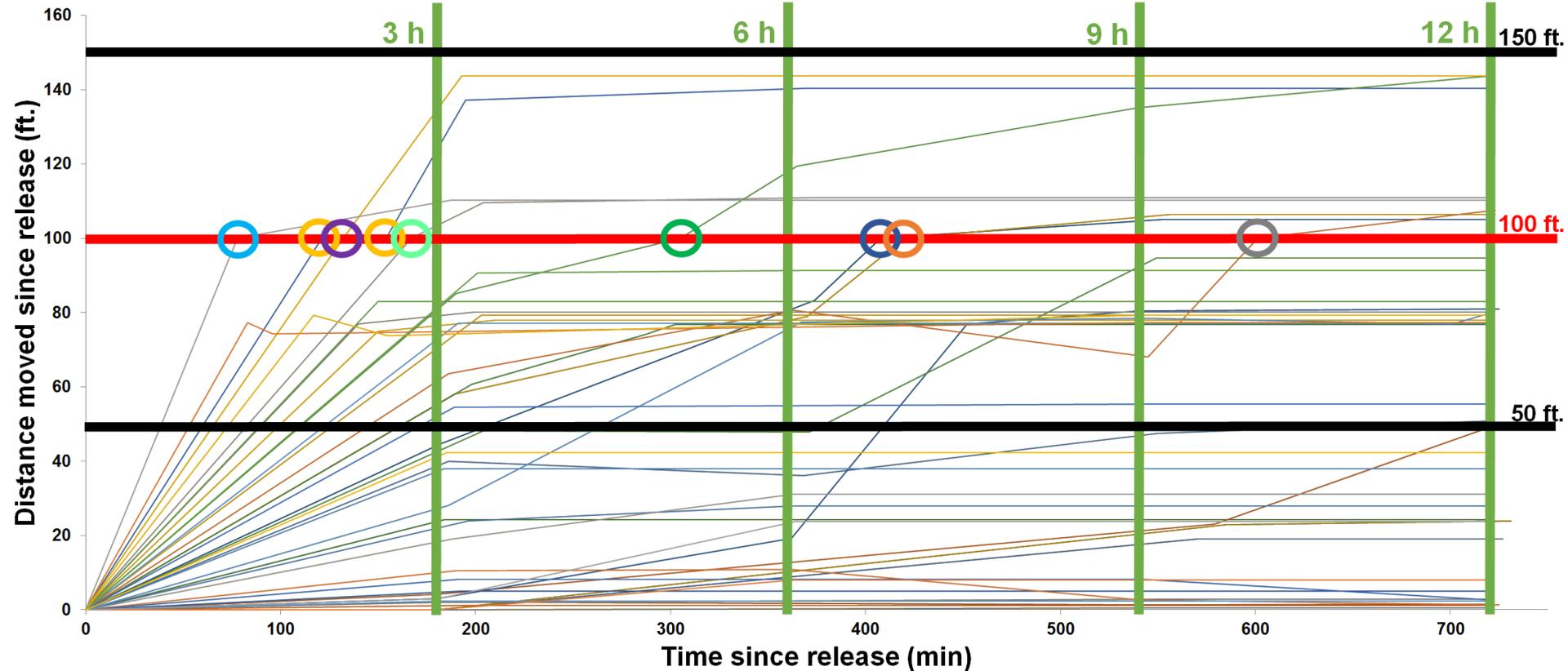
# Movement of all larvae over 12 hours



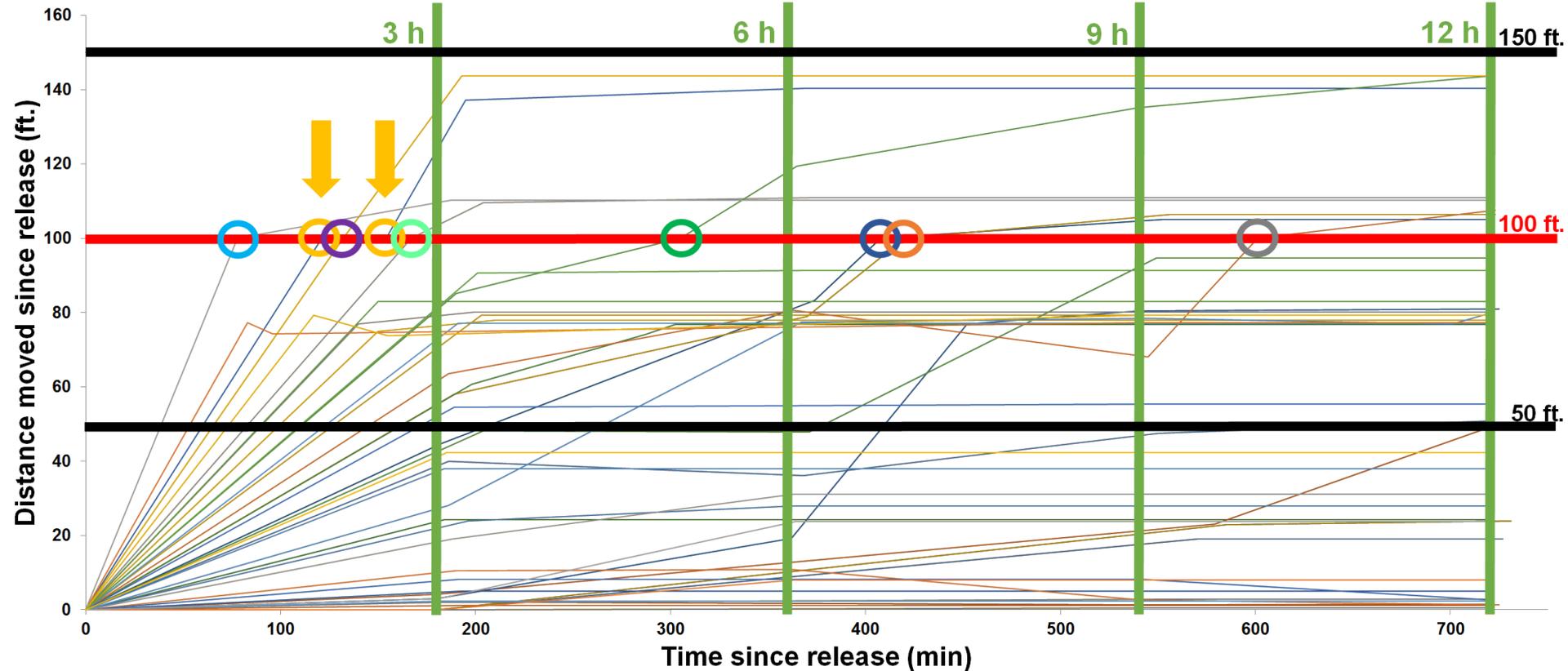
# Late instar dispersal capacity is **>100 ft.**



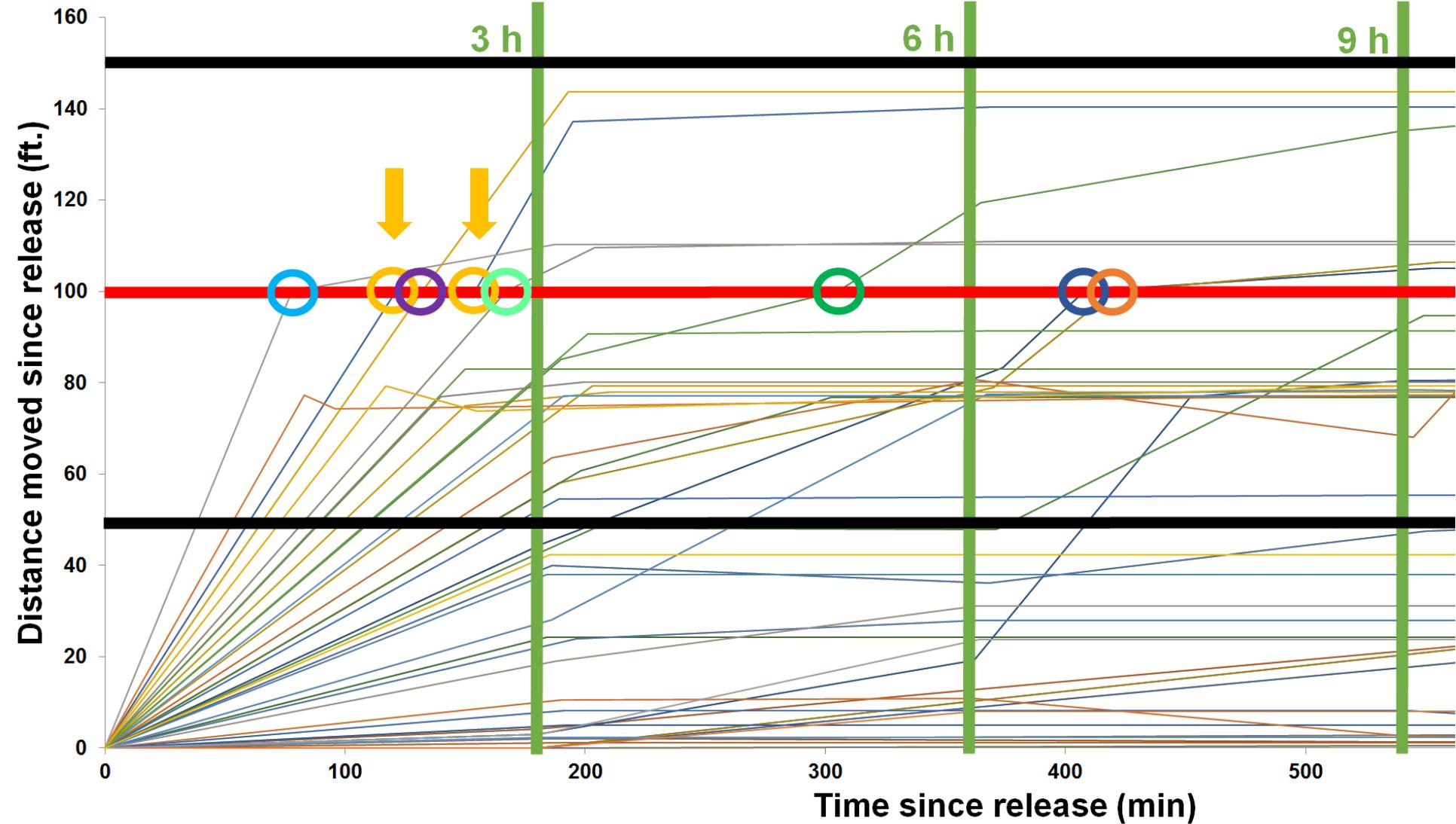
# Eight larvae of 40 (20%) dispersed 100 ft.



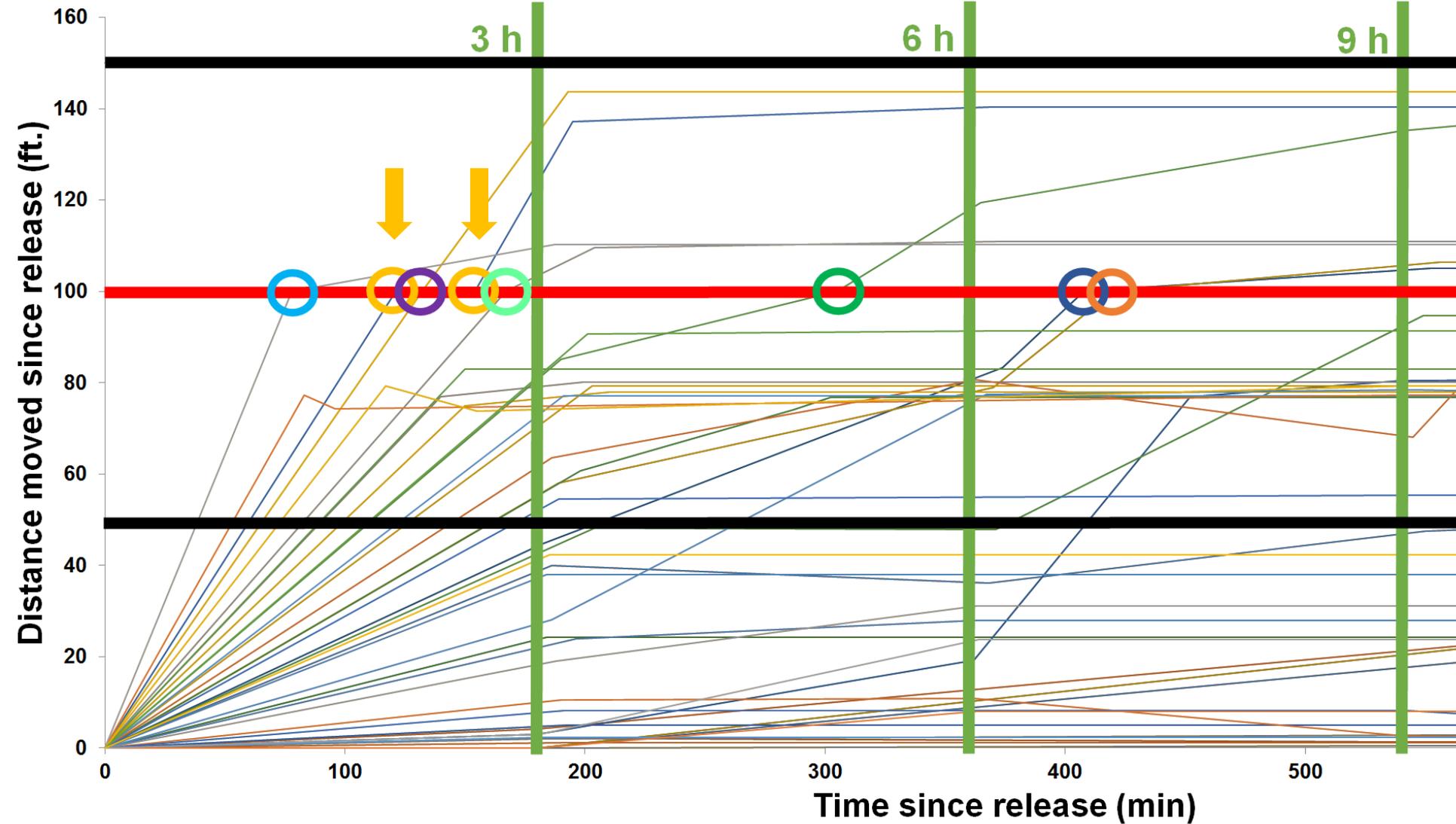
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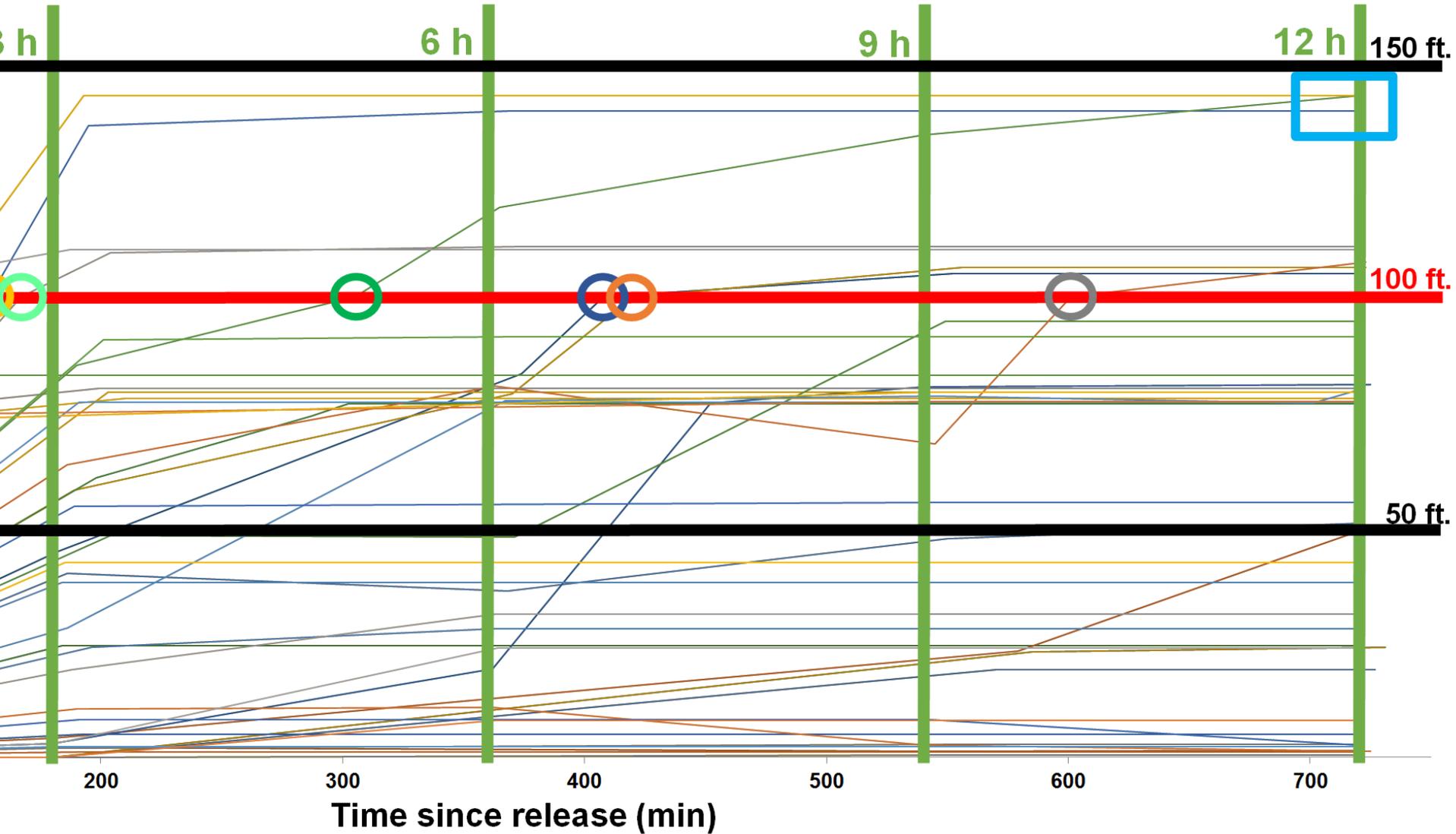
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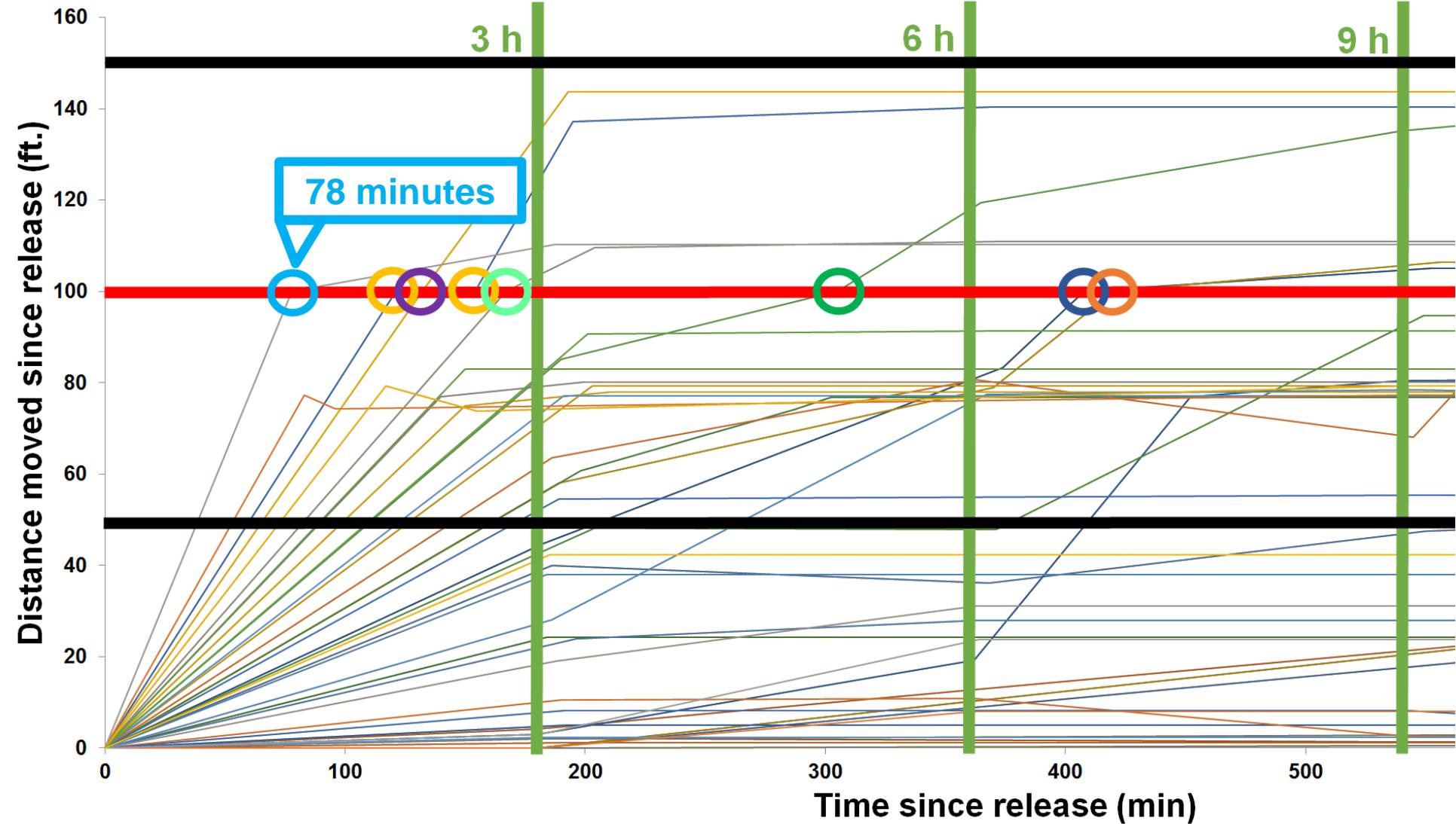
# Eight larvae of 40 (20%) dispersed 100 ft.



# Maximum distance moved was 143.7 ft.

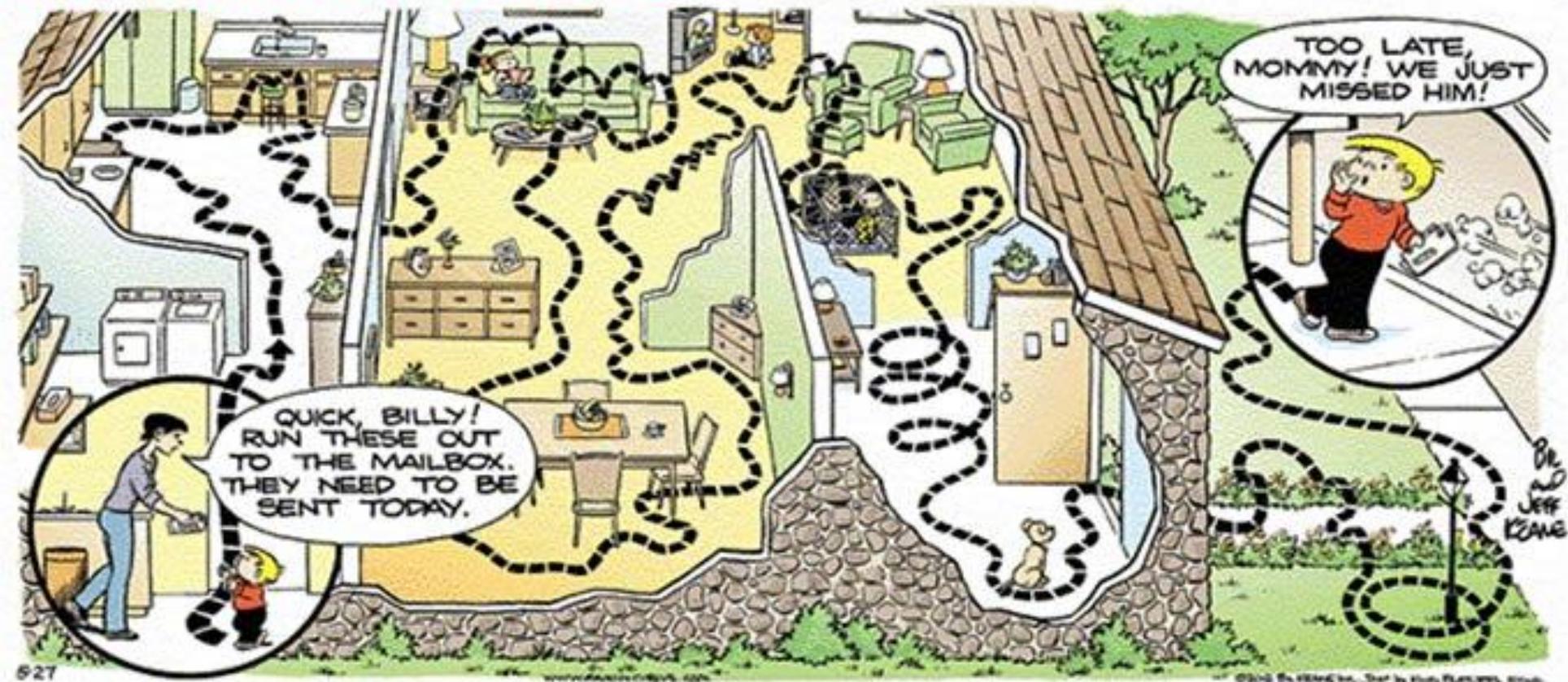


# 78 min to reach buffer distance (100 ft.)



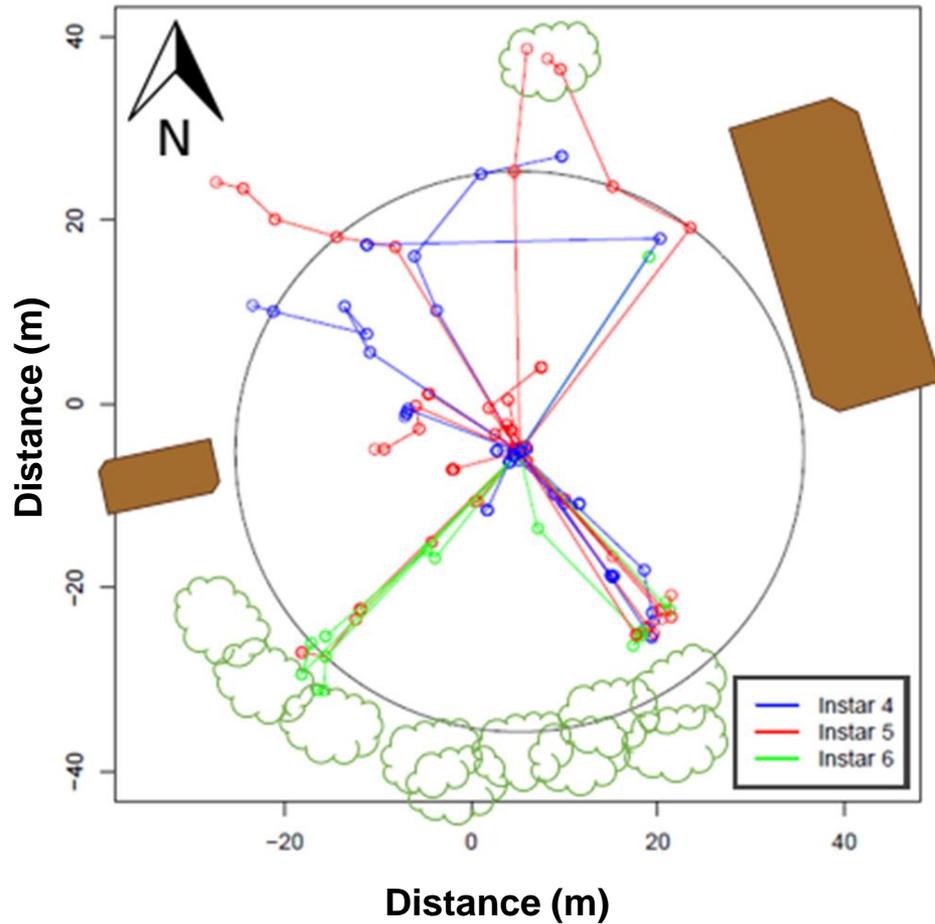
# THE FAMILY CIRCUS™

By **BIL KEANE**

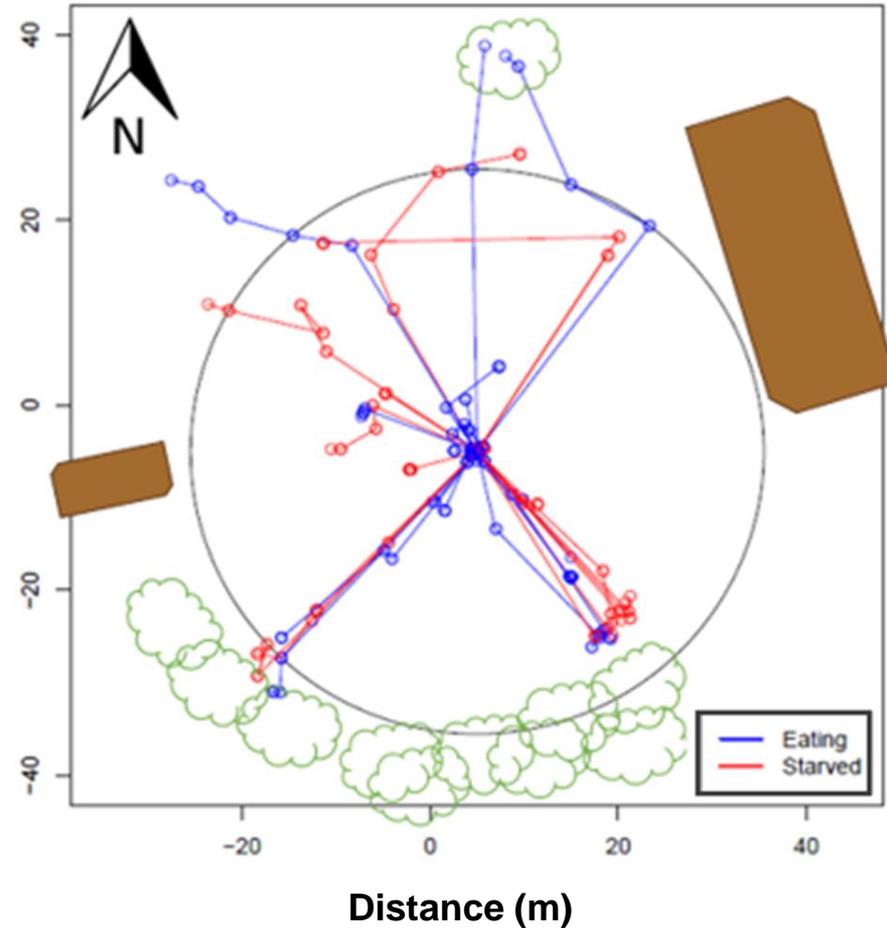


# Orientation of larval dispersal

## By instar

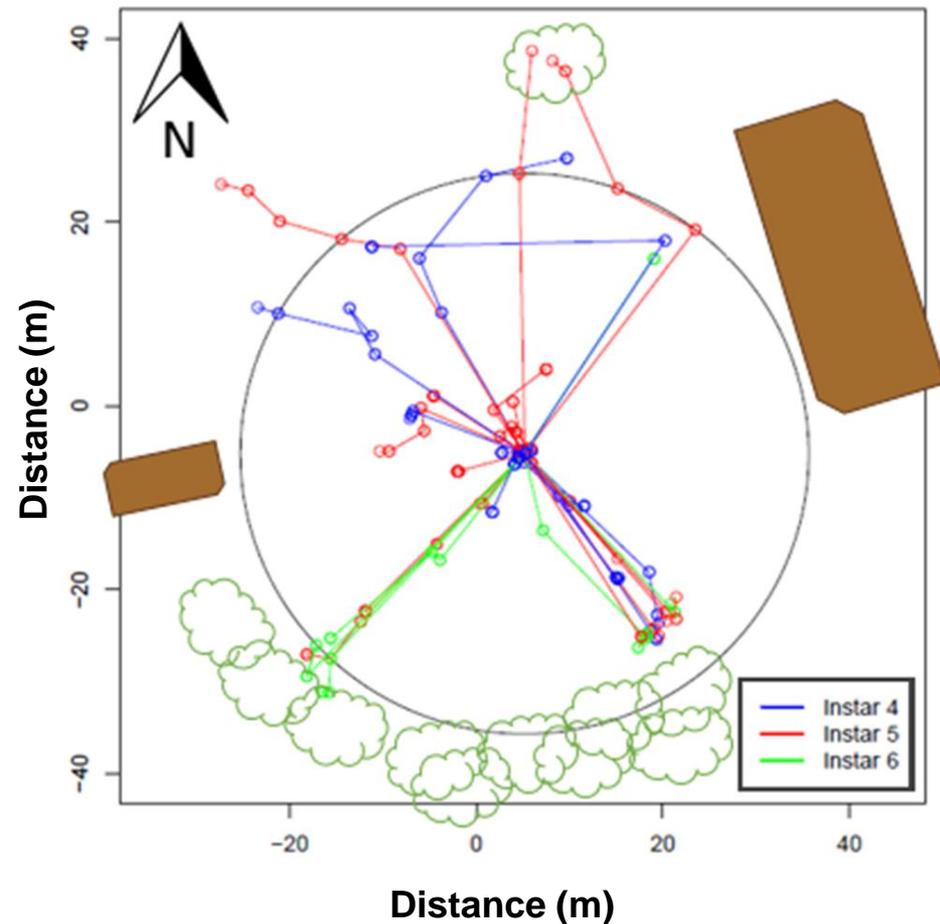


## By feeding regime



# Orientation of larval dispersal

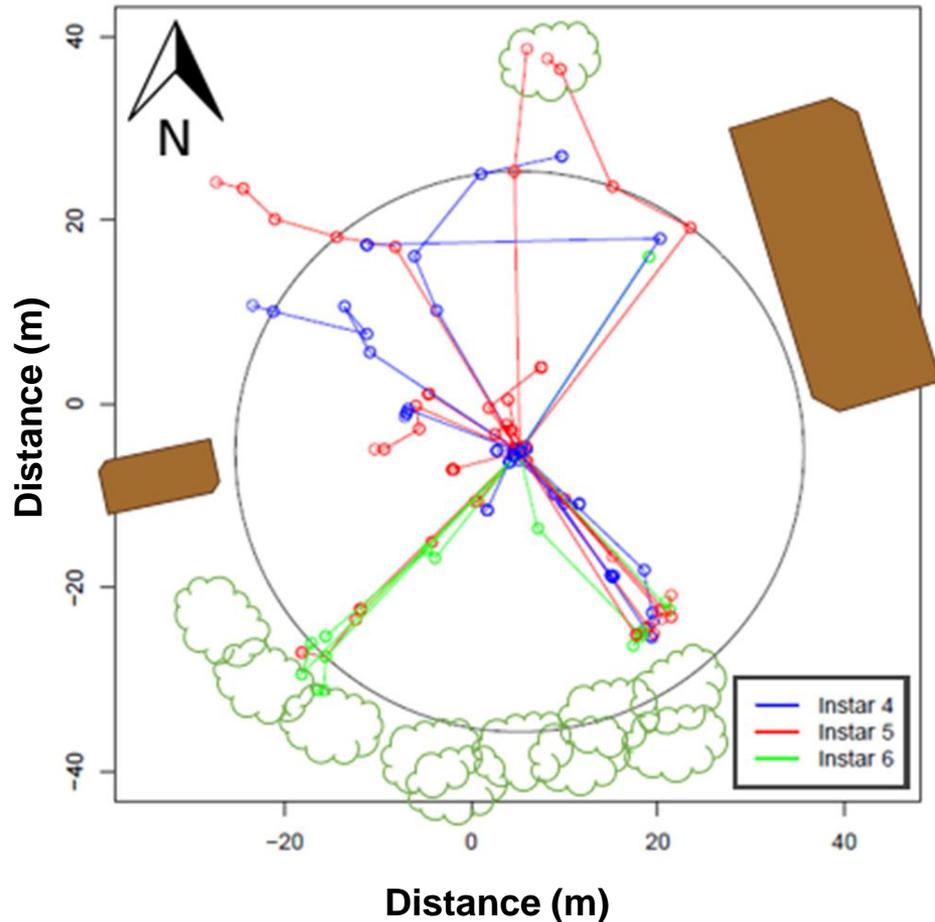
## By instar



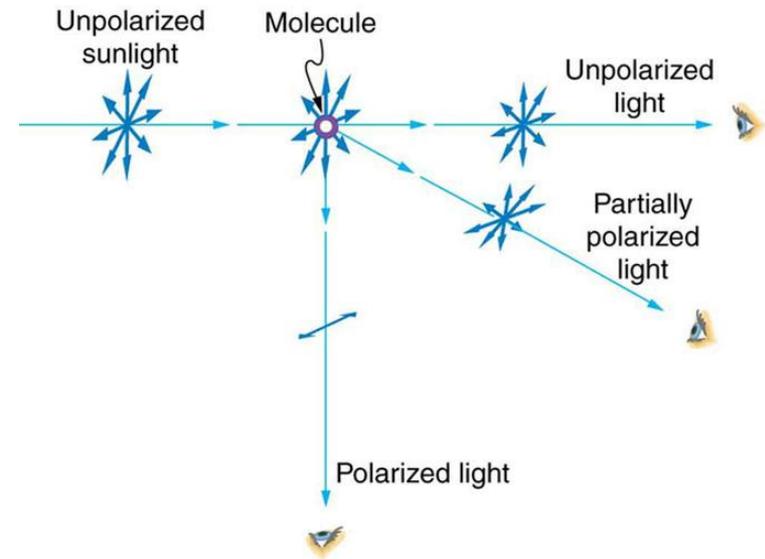
Polarized light and visual stimuli appear important for larval orientation (Doane and Leonard 1975; Roden, Miller, & Simmons 1992; Ahmad 2012).

# Orientation of larval dispersal

## By instar

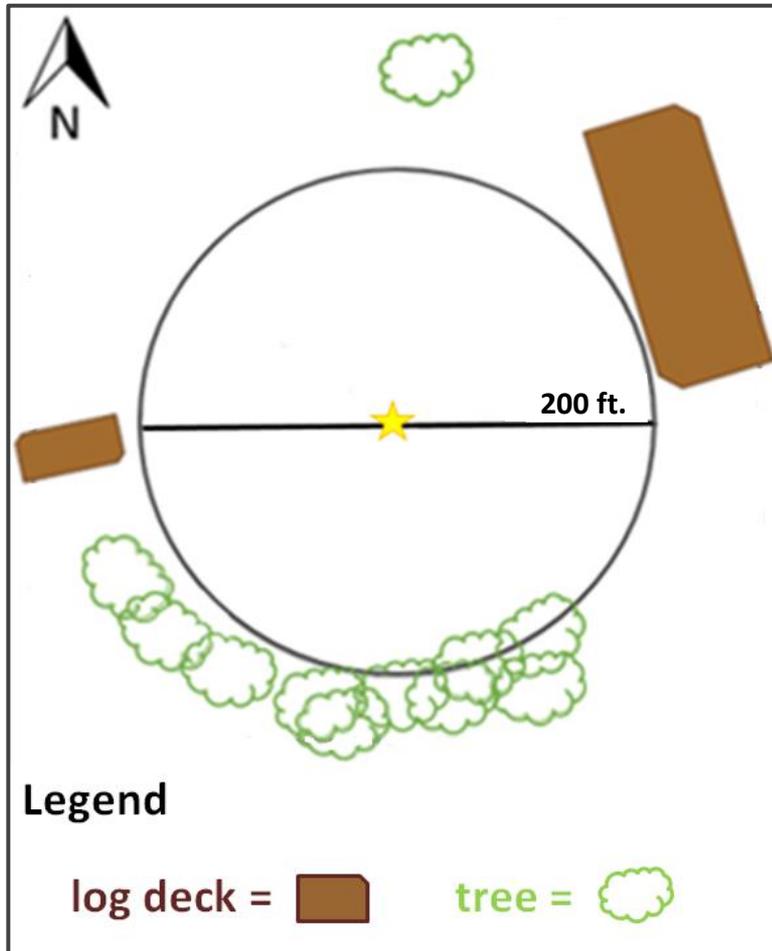


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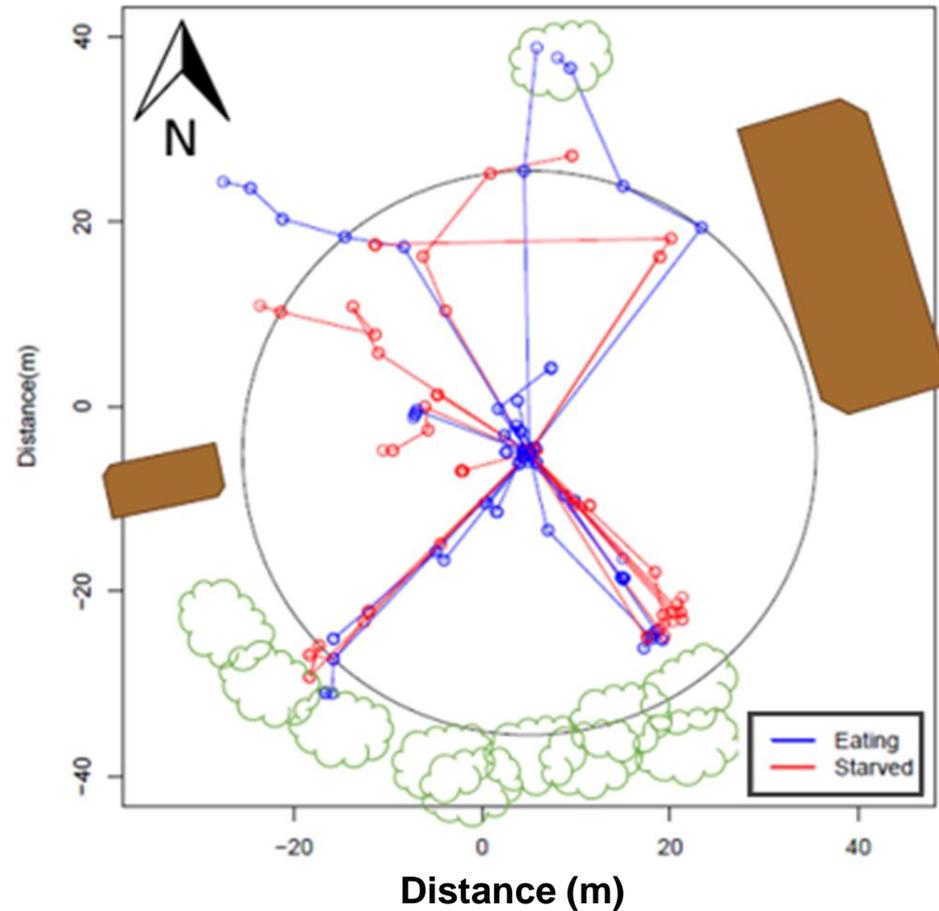


# Orientation of larval dispersal

## Long-distance visual stimuli



## By feeding regime



# Applications and future research



Late instar gypsy moth larvae are **capable of dispersing across the vegetation-free buffer zone.**



# Applications and future research



Late instar gypsy moth larvae are capable of dispersing across the vegetation-free buffer zone.



A summer 2016 study is proposed to evaluate long-distance dispersal of late instar gypsy moth larvae.



# Applications and future research



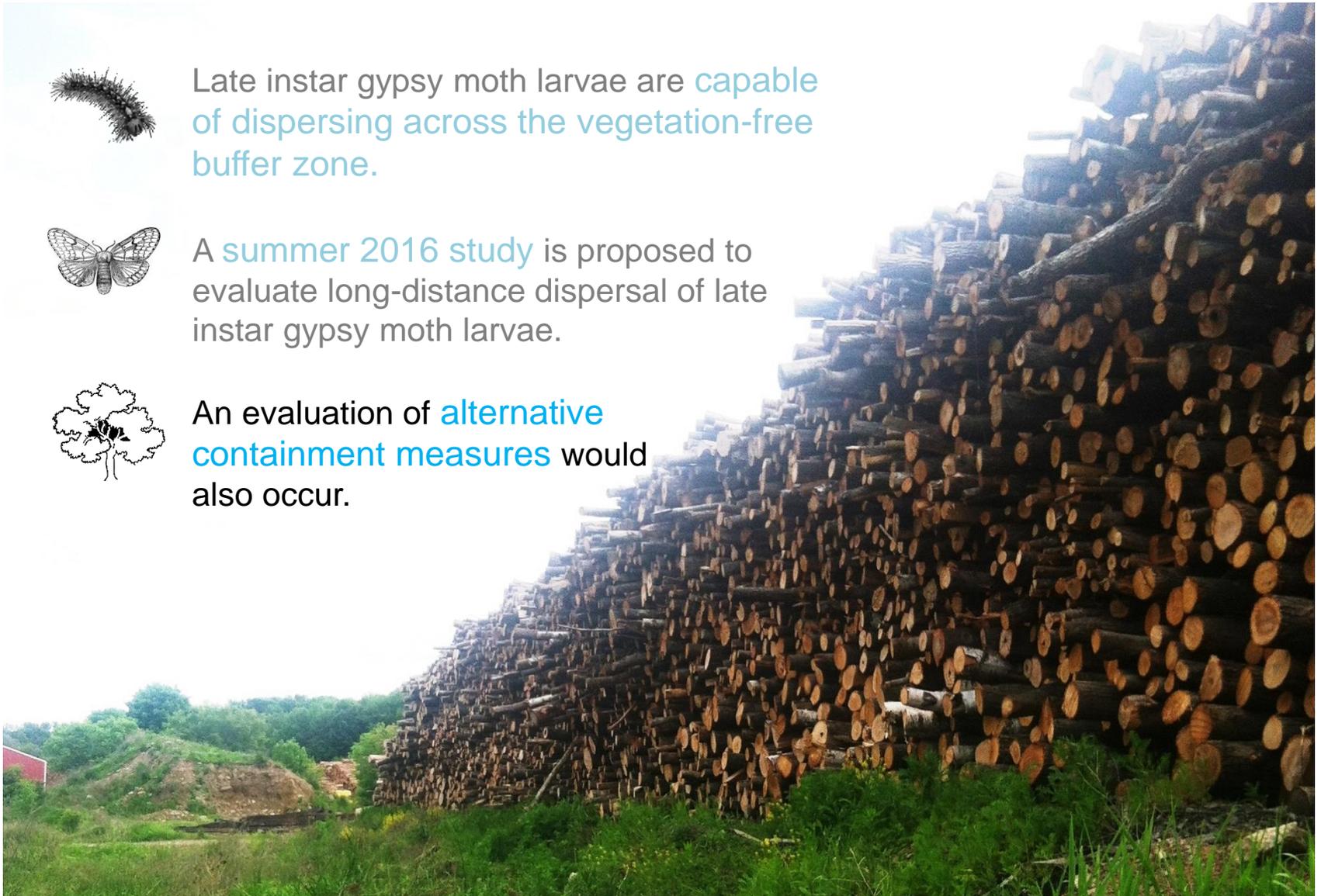
Late instar gypsy moth larvae are **capable of dispersing across the vegetation-free buffer zone.**



A **summer 2016 study** is proposed to evaluate long-distance dispersal of late instar gypsy moth larvae.



An evaluation of **alternative containment measures** would also occur.



# Applications and future research



# Applications and future research



# Acknowledgements

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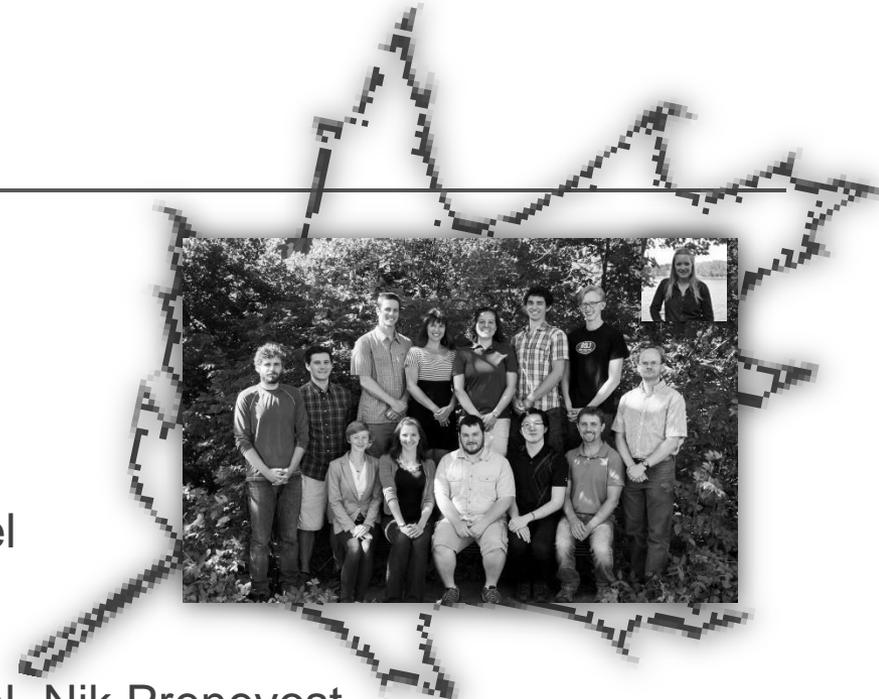
**Expera Specialty Solutions Paper Mill:**

Rob Meyer and other staff

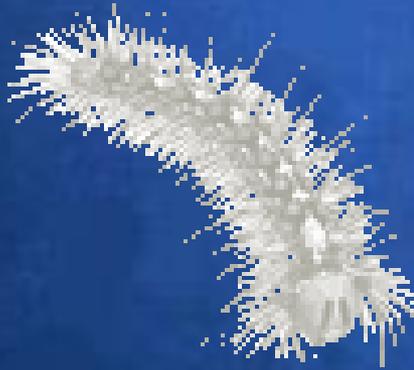
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Rachael the Worm Wrangler



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# Questions?