Early Intervention Strategy for Spruce Budworm Can we contain outbreak spread?

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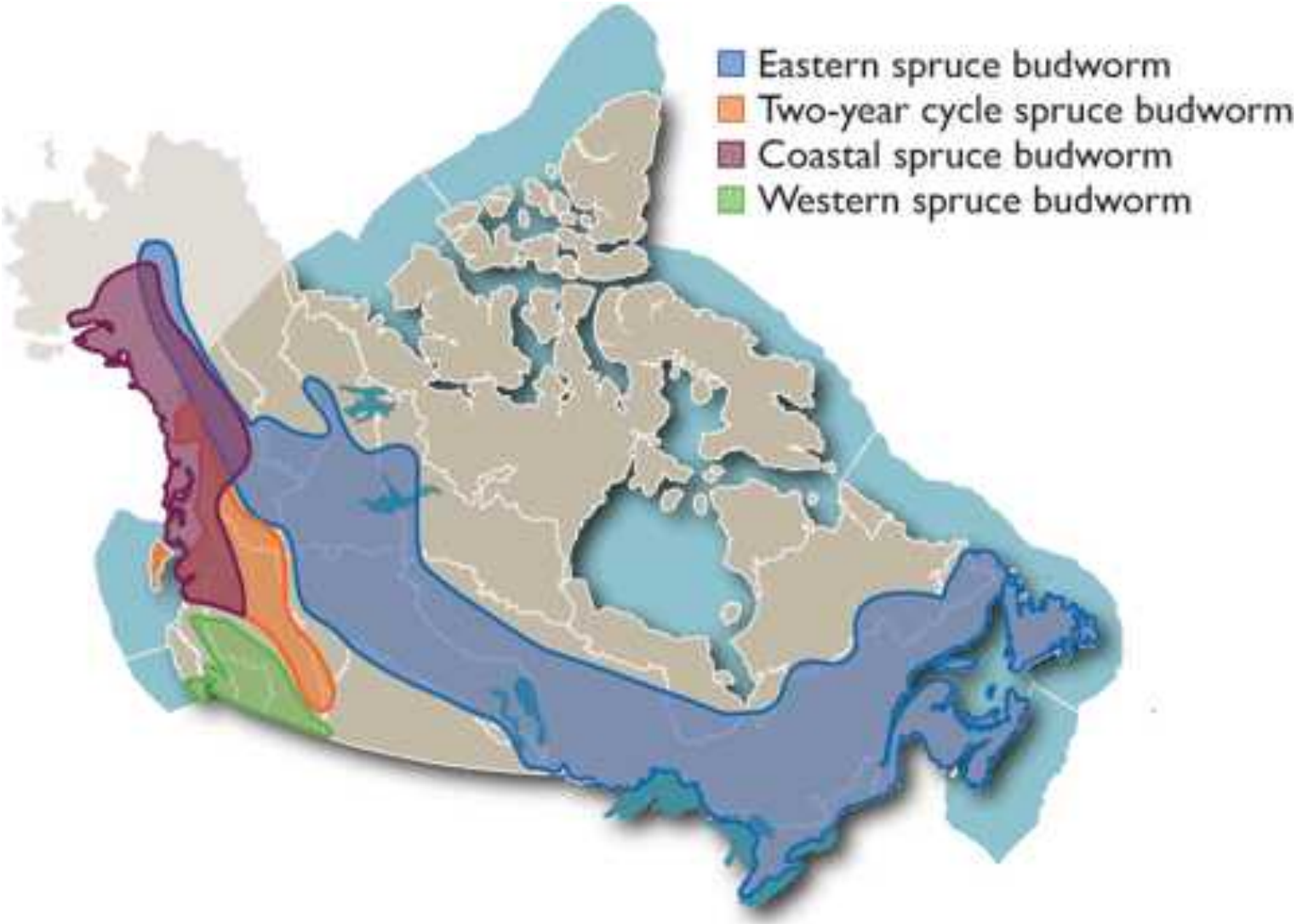

Eastern spruce budworm
Two-year cycle spruce budworm
Coastal spruce budworm
Western spruce budworm

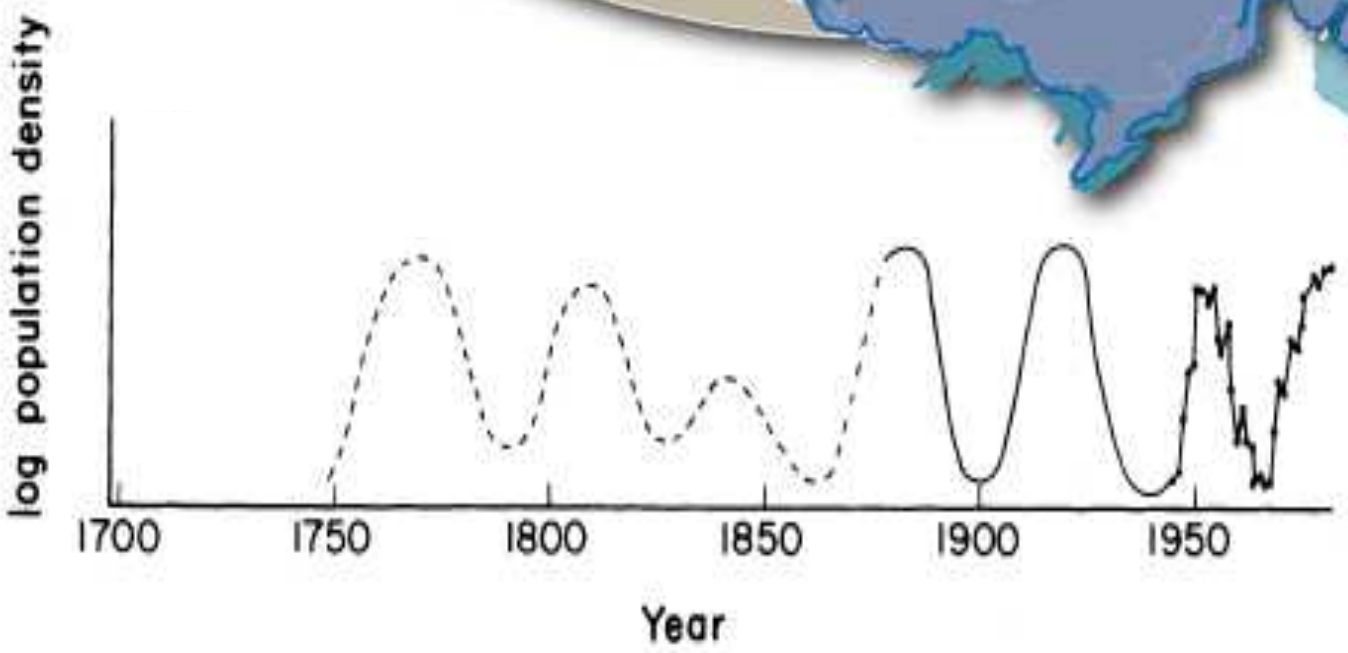
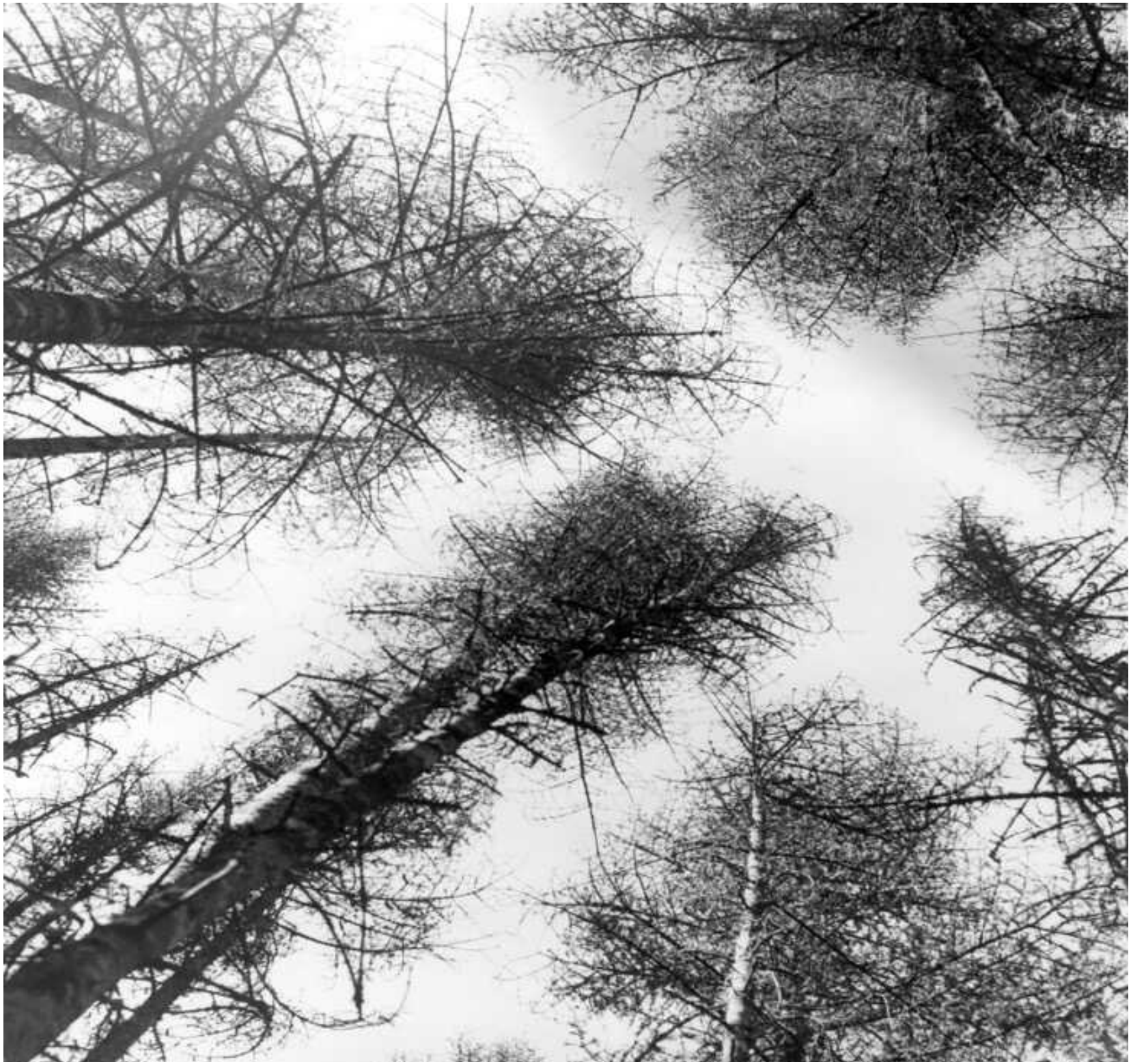

log population density
1700
1750
1800
1850
1900
1950
Year

Photo: Michigan State University



Forest disturbance intervention: control or protect?

- Control strategy
  - Suppression
  - Contain spread
- Protection strategy
  - Let disturbance “run its course”
  - Protect most valuable resources

Forest pest management favours protection strategy

- Protect high valued stands
  - Let outbreak peak and decline naturally elsewhere

- Main strategy for spruce budworm management
  - “Foliage Protection Strategy”
  - Past population control attempts failed

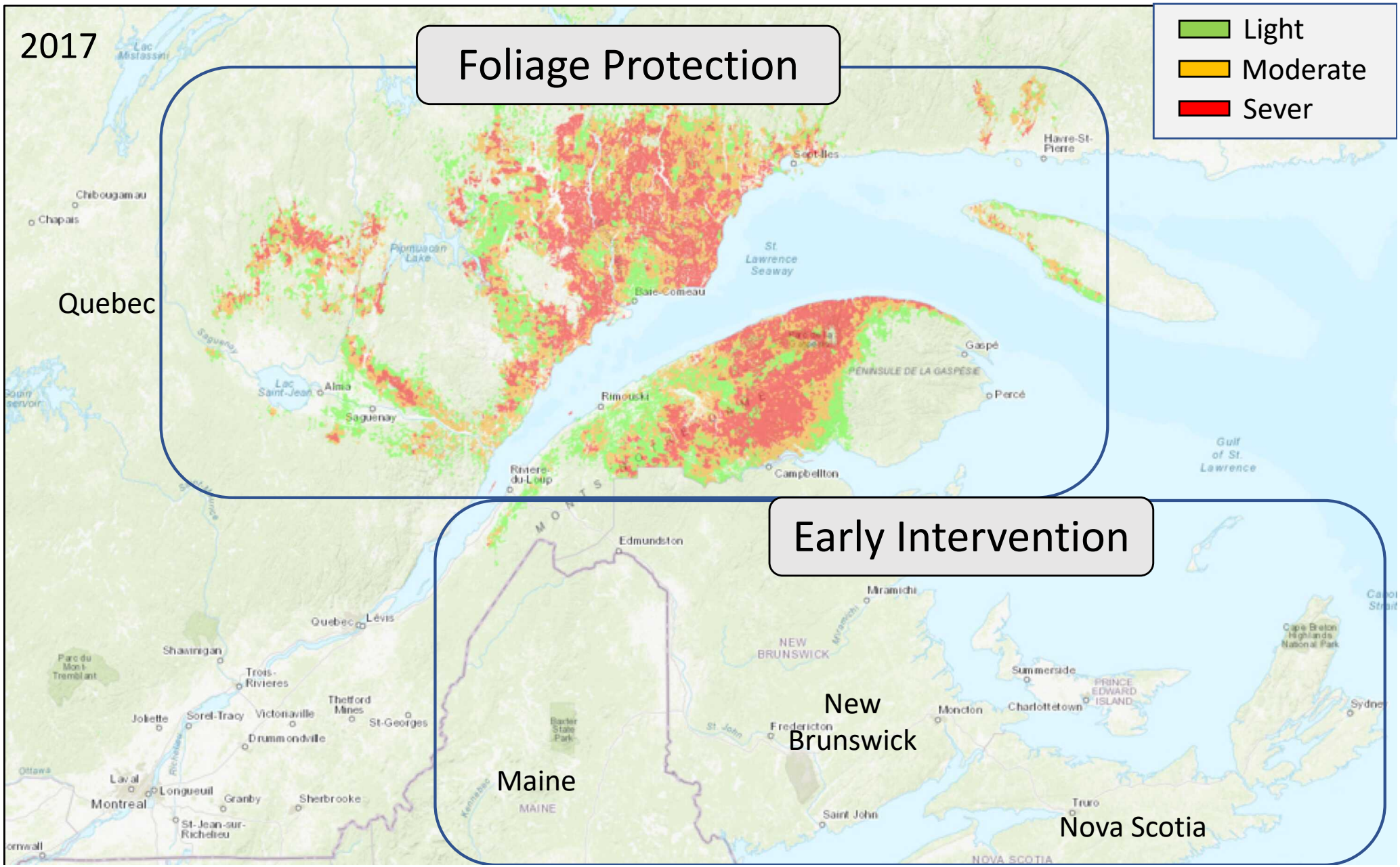
NRCan

Time to revisit the idea of population control

- Better understanding of outbreak spread & population dynamics

- Advances in treatments & monitoring technology

Current outbreak is causing significant damage across Quebec



Early Intervention Strategy: a novel approach to budworm management

- Area wide management for population control
- Targeted treatments
- Monitor efficacy and non-target impacts

Early Intervention Strategy: a novel approach to budworm management

- Area wide management for population control
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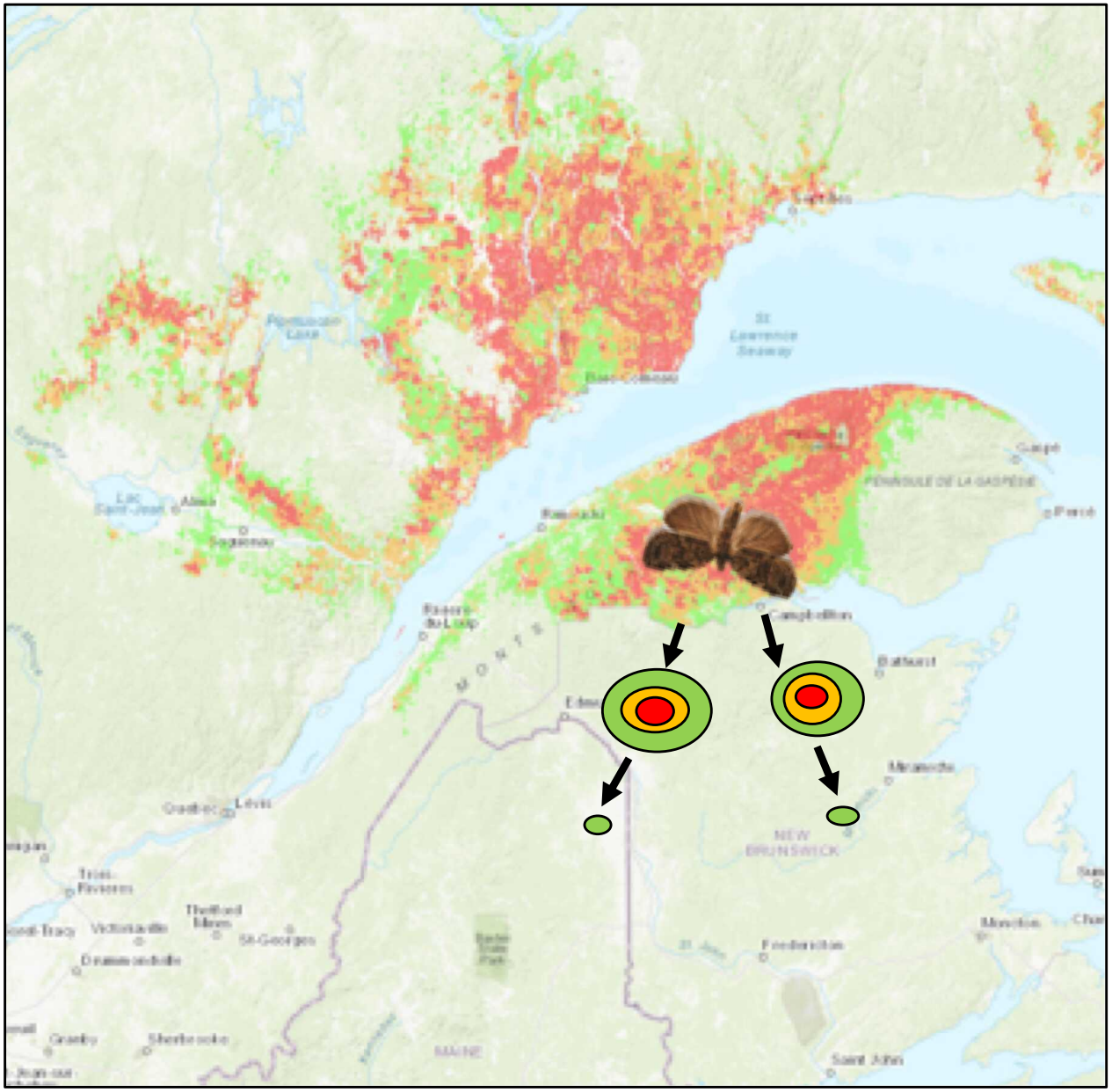
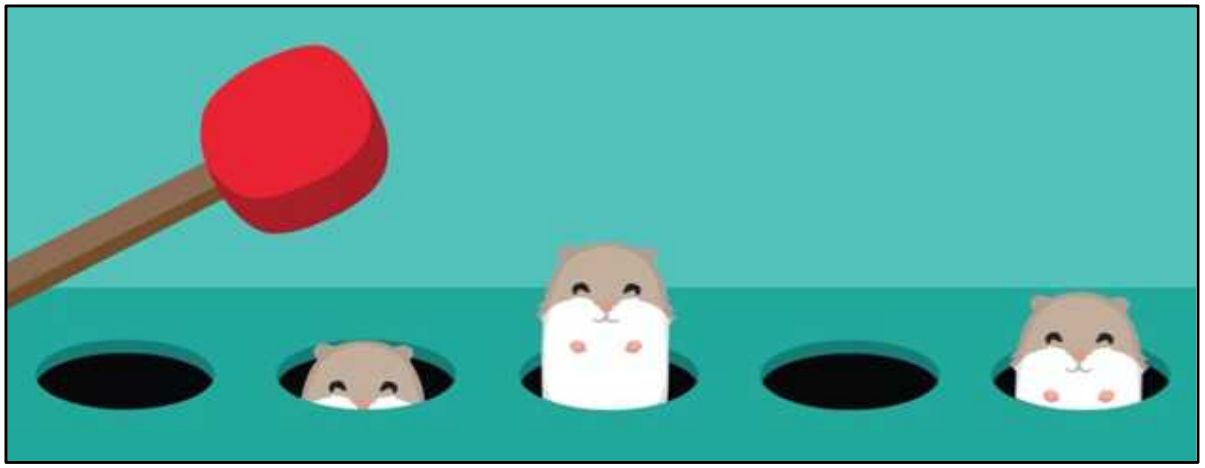
How does EIS work??

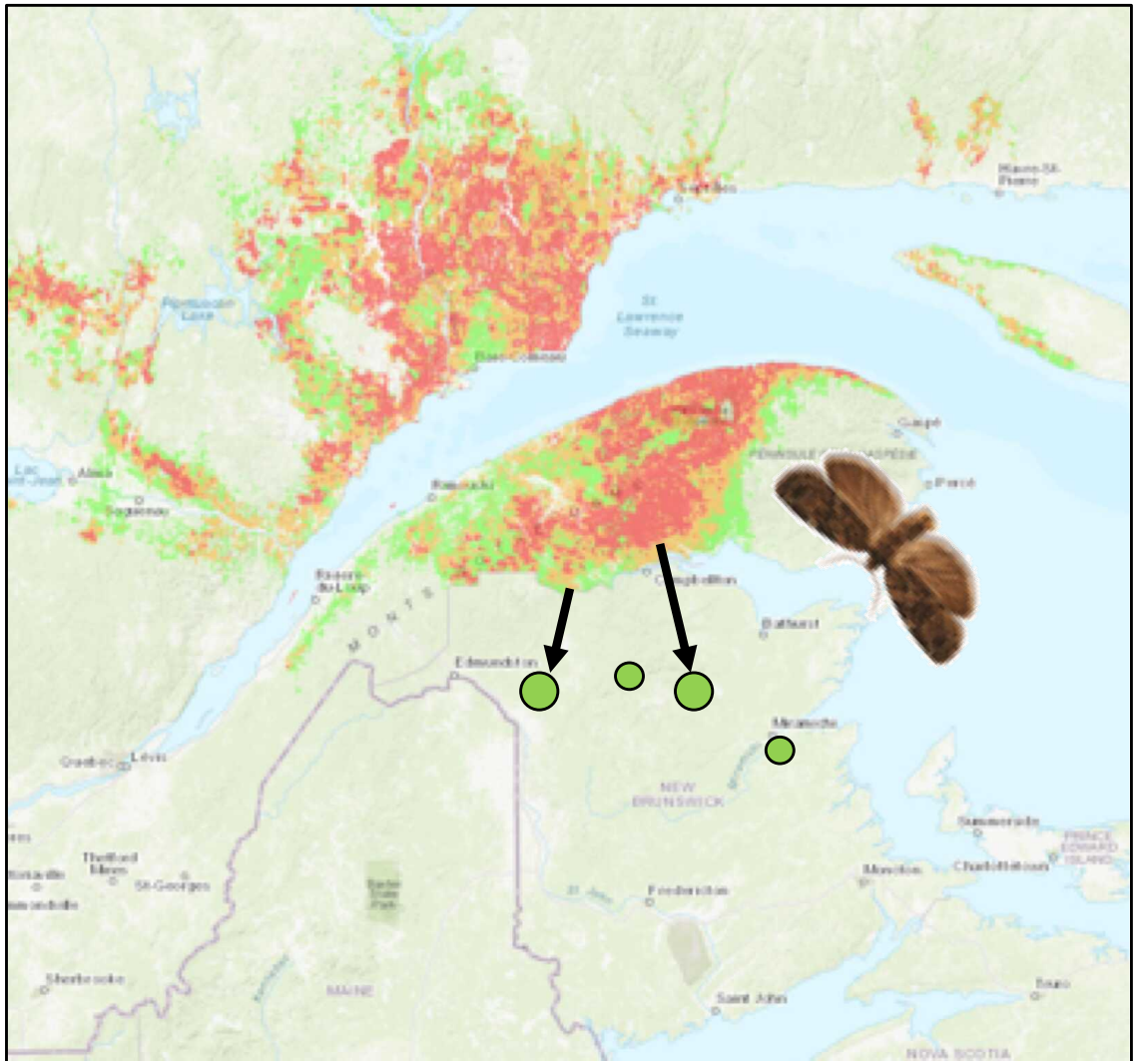
What will drive the outbreak in Atlantic Canada?

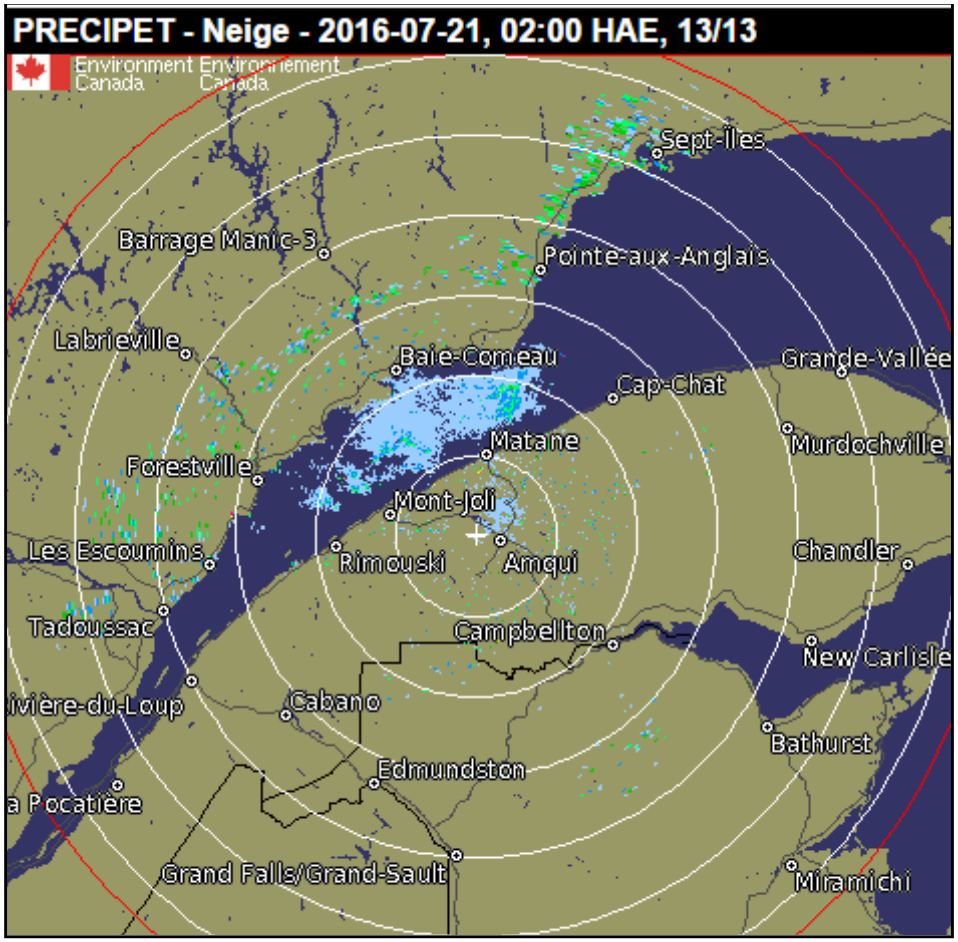
- There are a few theories…
- Epicenter hypothesis
  - “Hot spots” drive regional population growth and spread

Hot spots will drive population growth and spread

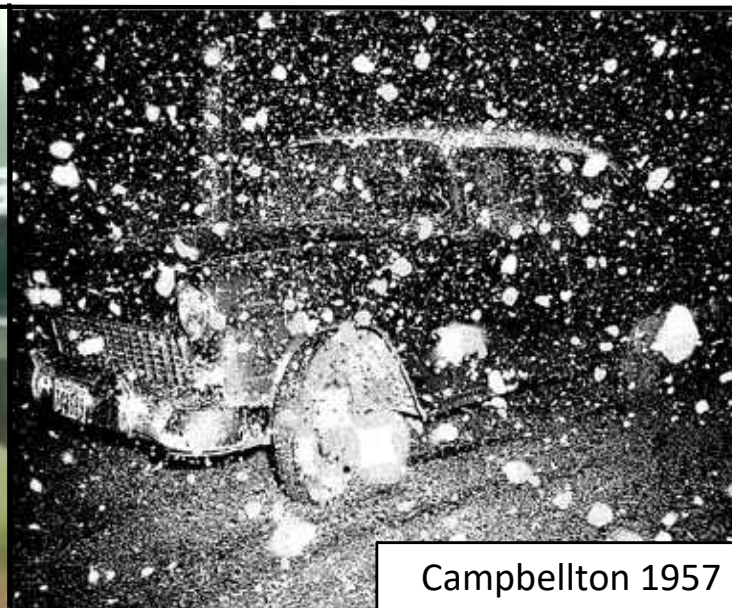





Edmundston
Bathurst
Miramichi
Campbellton
Dalhousie
Fredericton
Moncton
Saint John
Sherbrooke
MAINE
NEW BRUNSWICK
NOVA SCOTIA
PRINCE EDWARD ISLAND



Campbellton 2016



Campbellton 1957

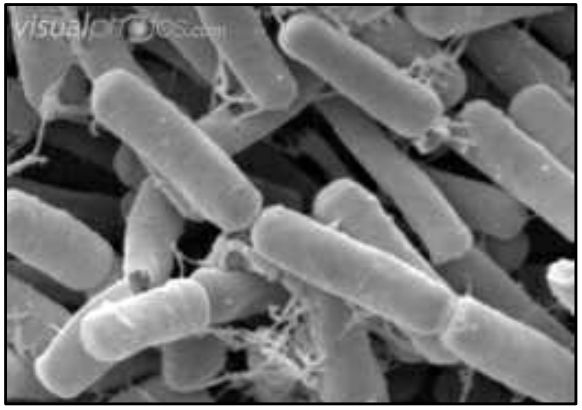
Sounds great but population control failed in the past….

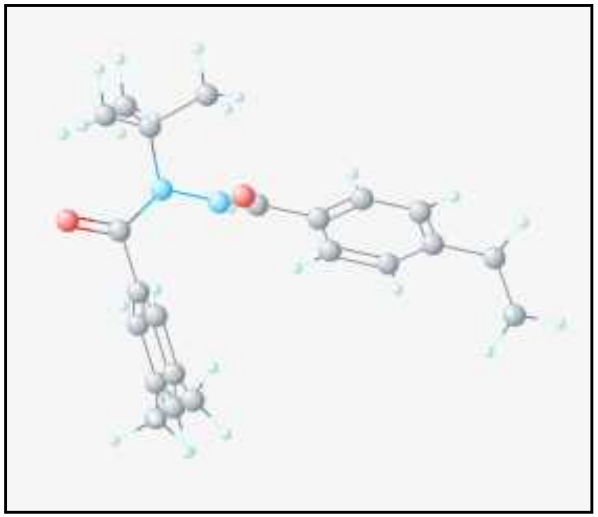
1950's

Broad spectrum

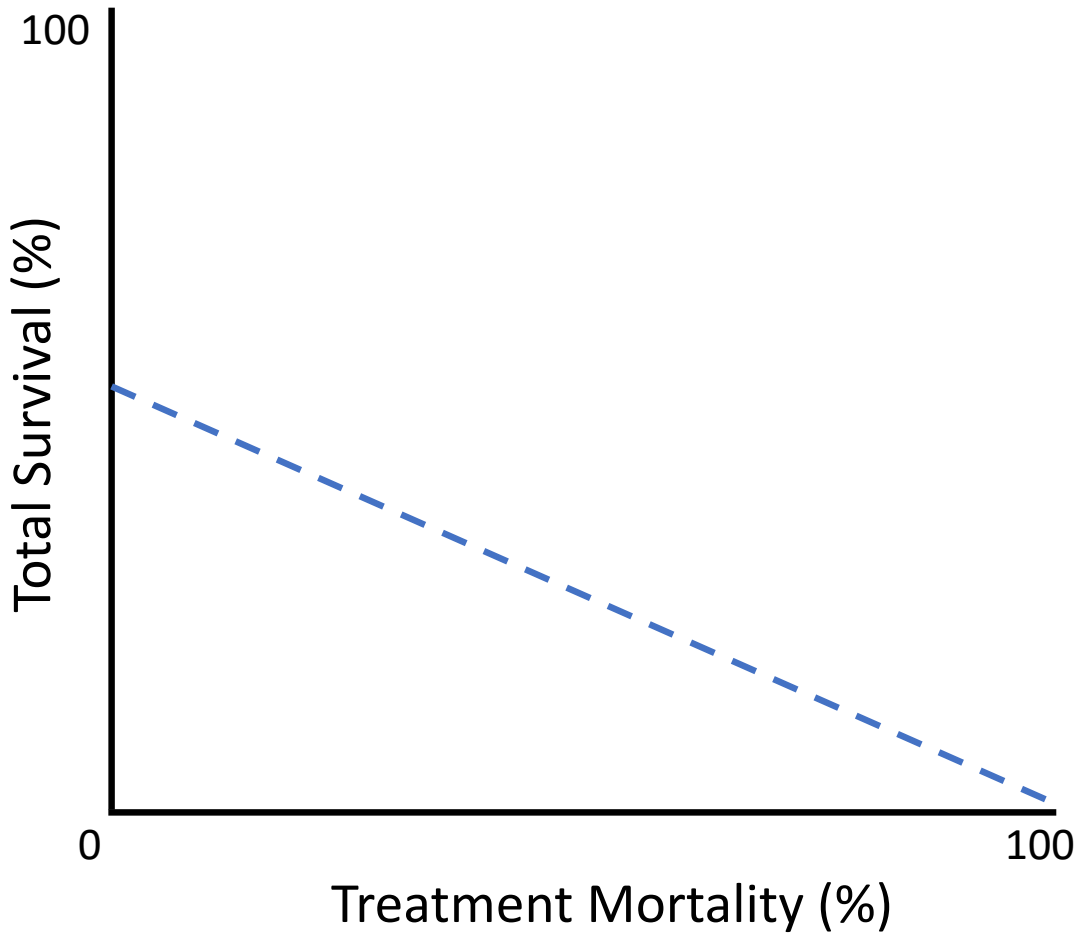
Today

Targeted treatments



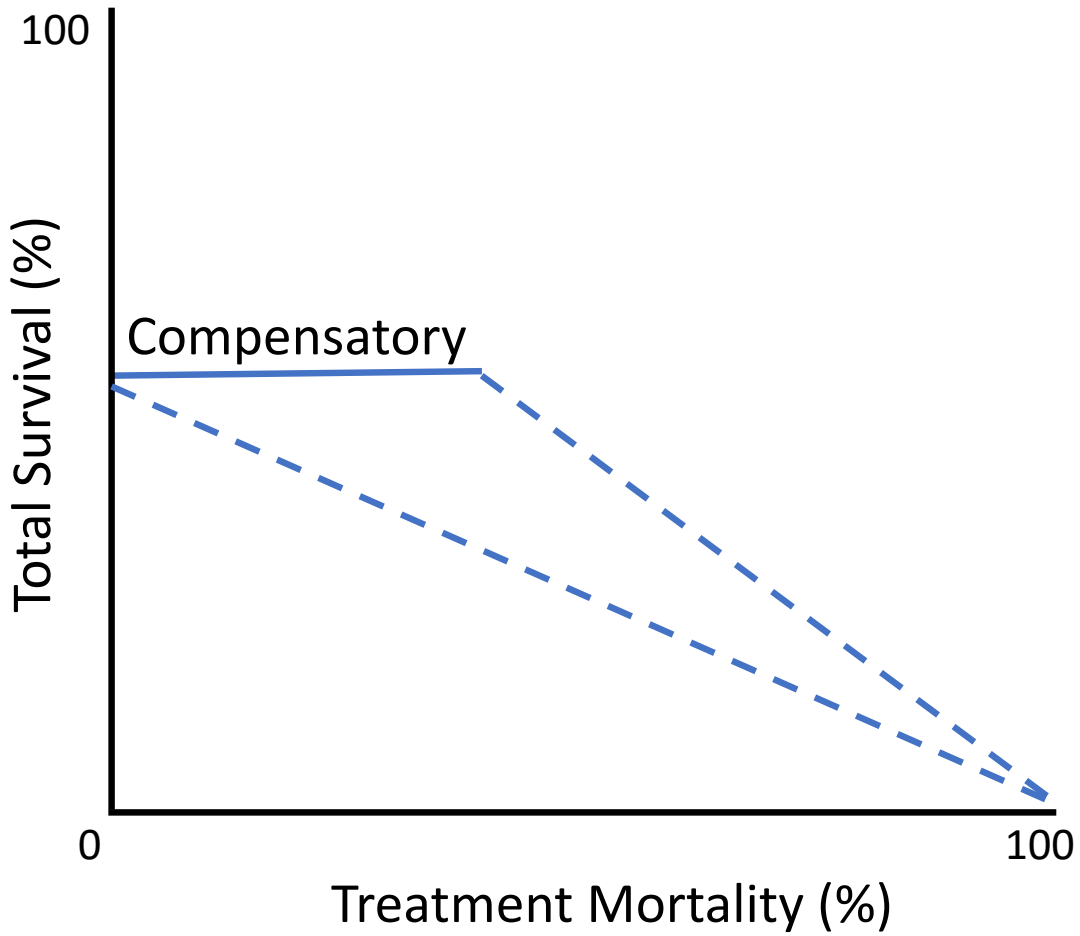


For population control to succeed mortality needs to be additive

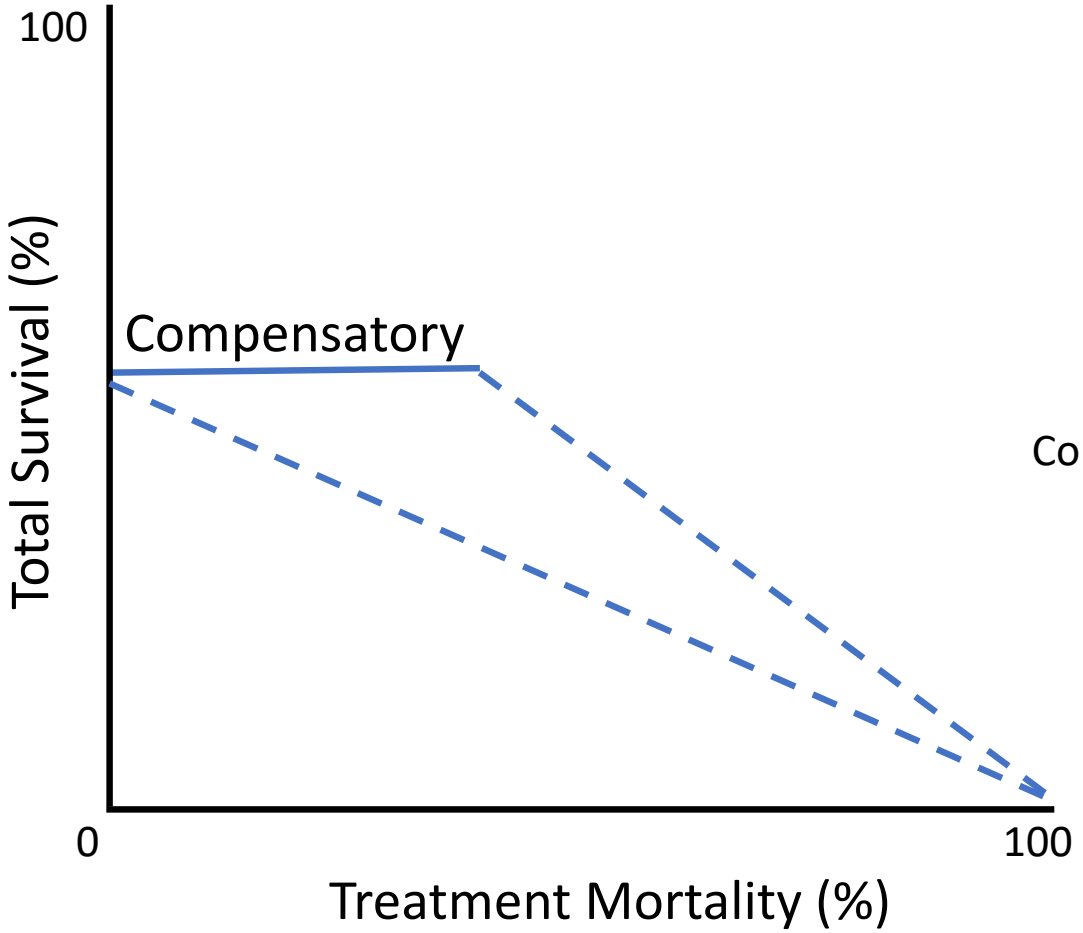


Additive mortality:
adds to the number of deaths that occur naturally

For population control to succeed mortality needs to be additive

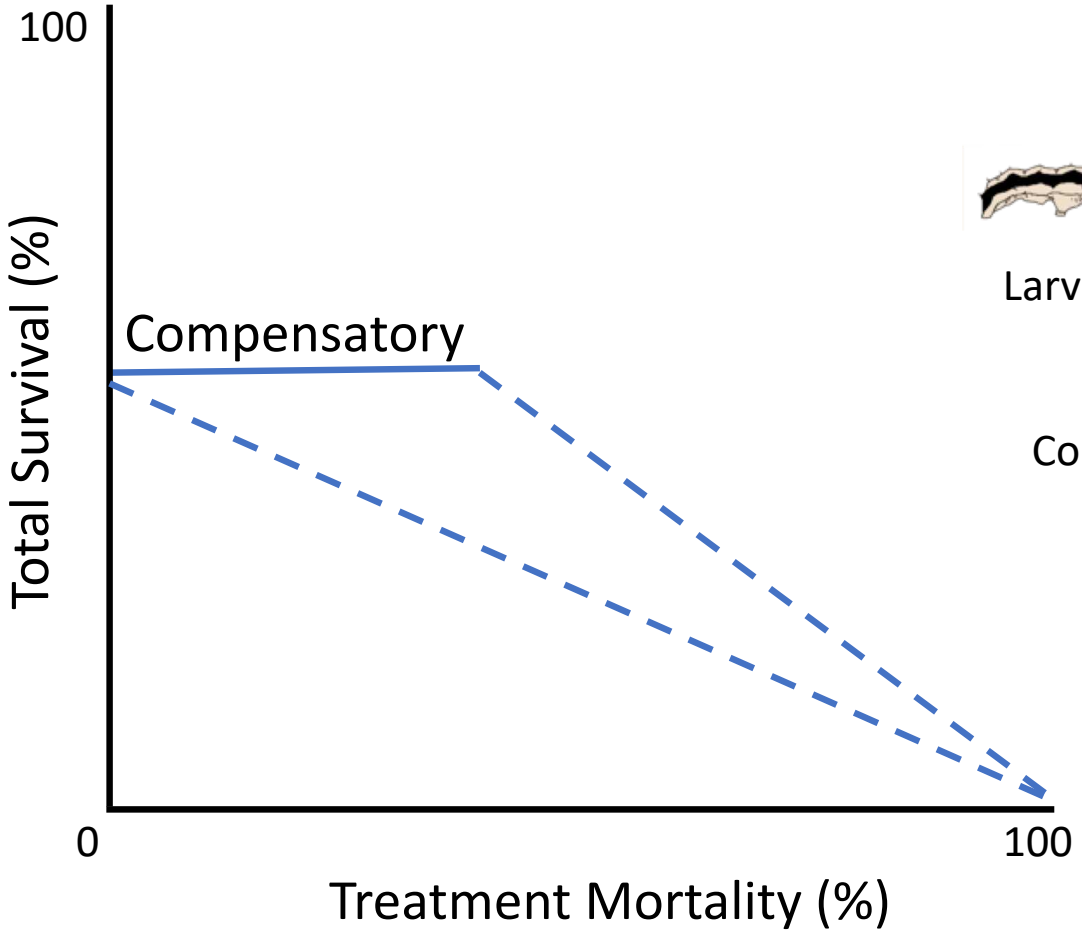


For population control to succeed mortality needs to be additive



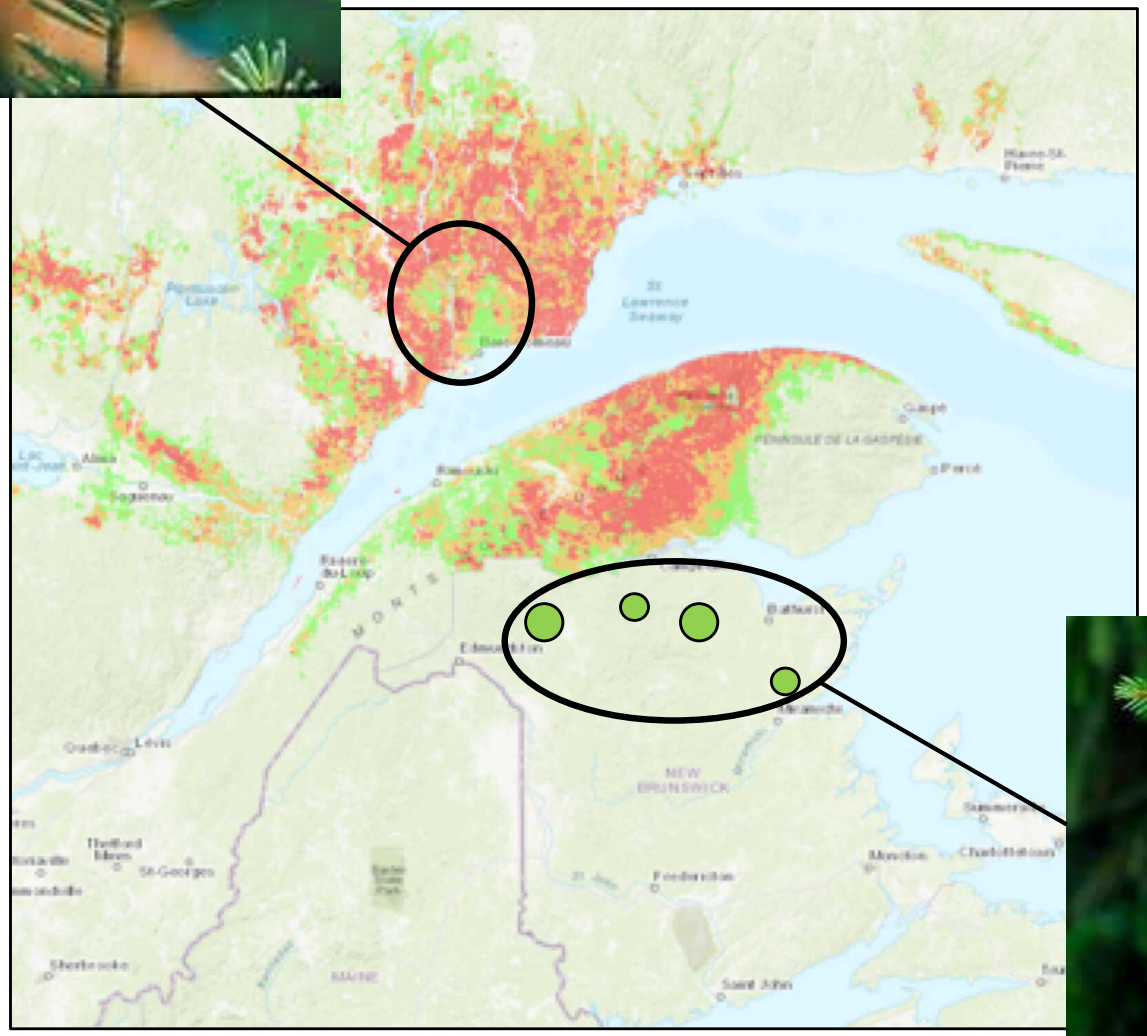
Competition

For population control to succeed mortality needs to be additive

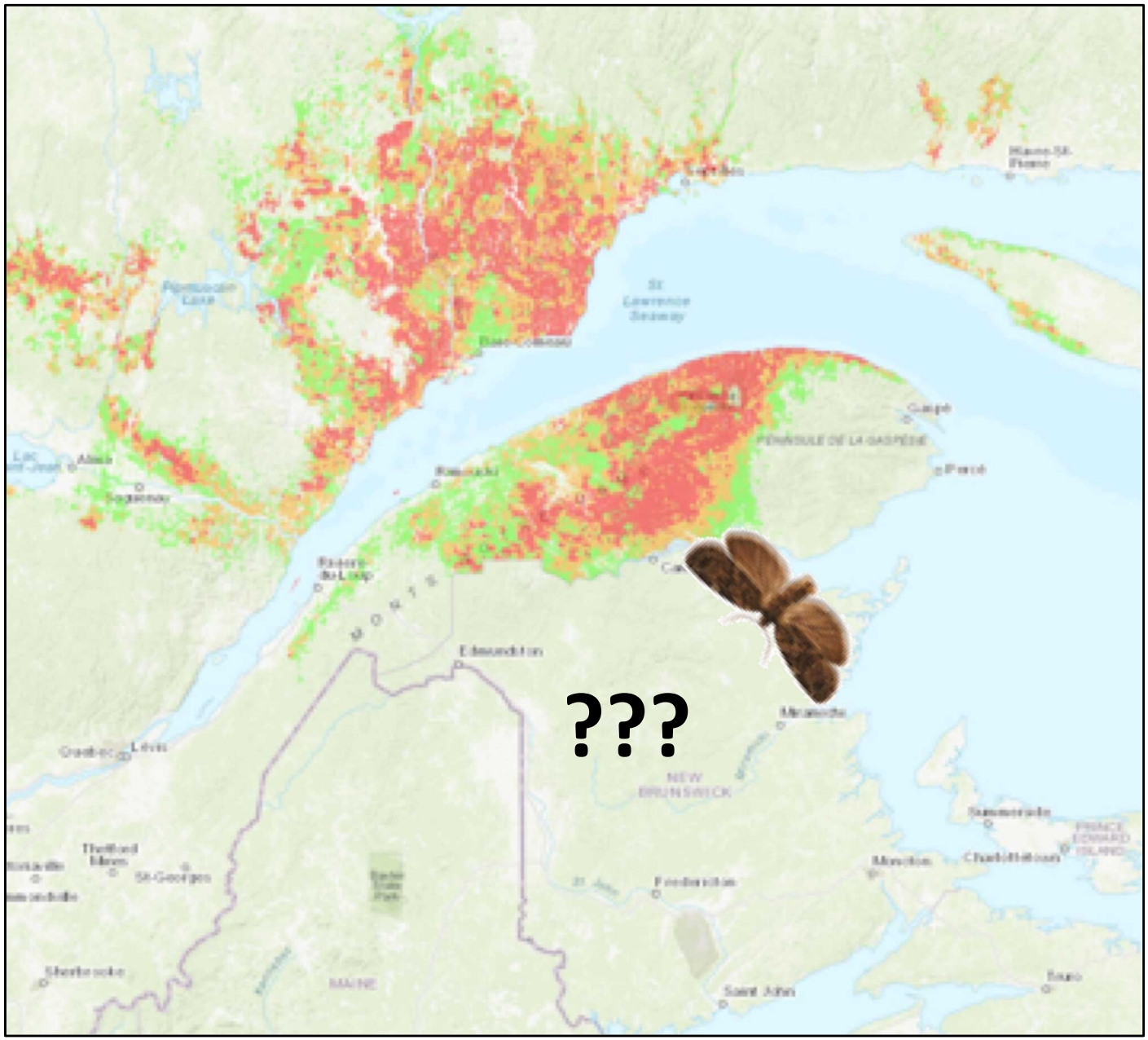


Larval survival

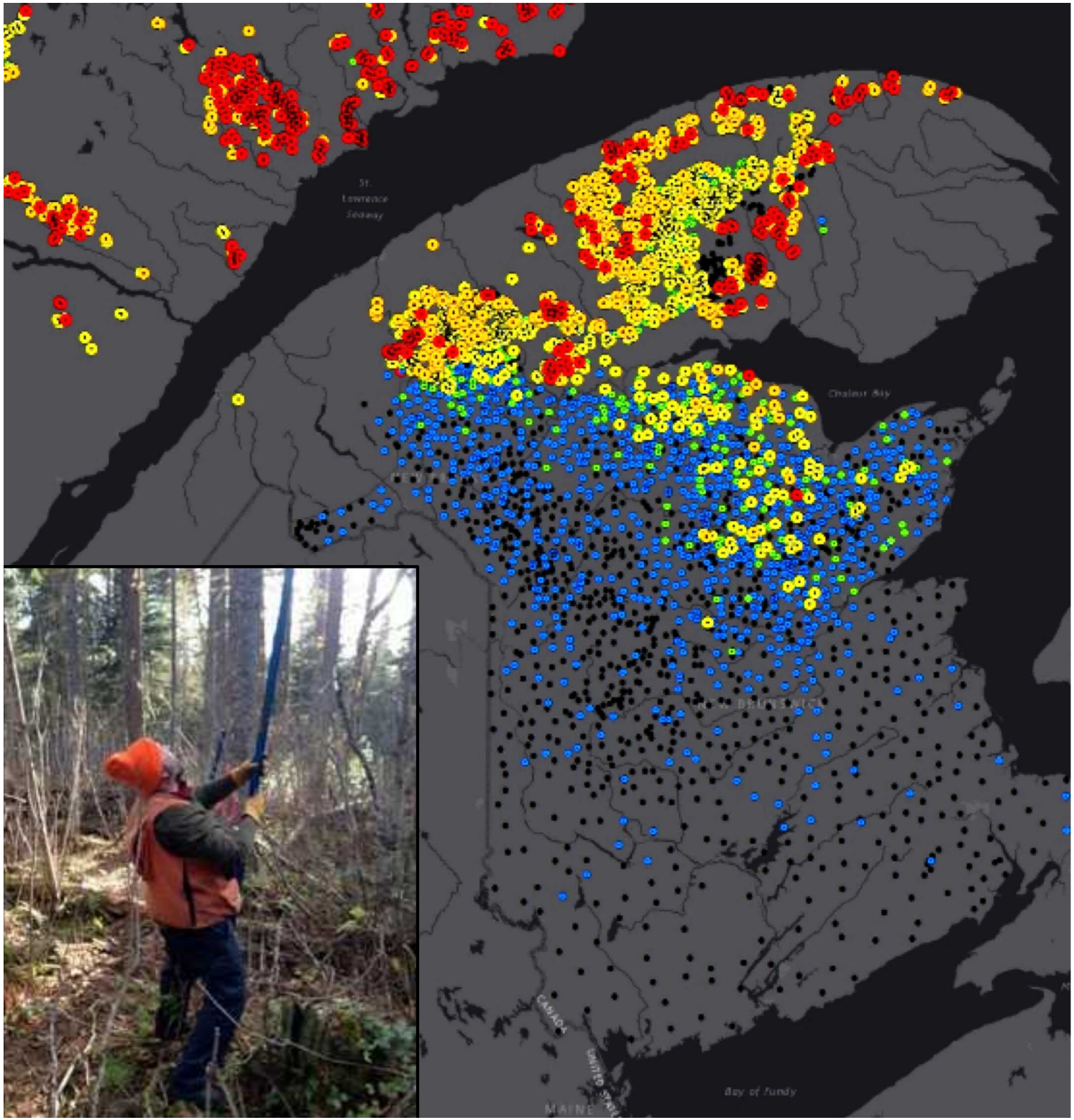
Competition


Gaspé
PENINSULE DE LA GASPESIE
Rimouski
Baie-St-Paul
Alma
Saguenay
Rivière-du-Loup
Edmundston
Bathurst
Miramichi
Lévis
NEW BRUNSWICK
Moncton
Fredericton
Saint John
Sherbrooke
MAINE

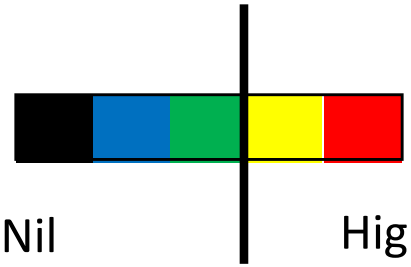
How do we find and treat hotspots?

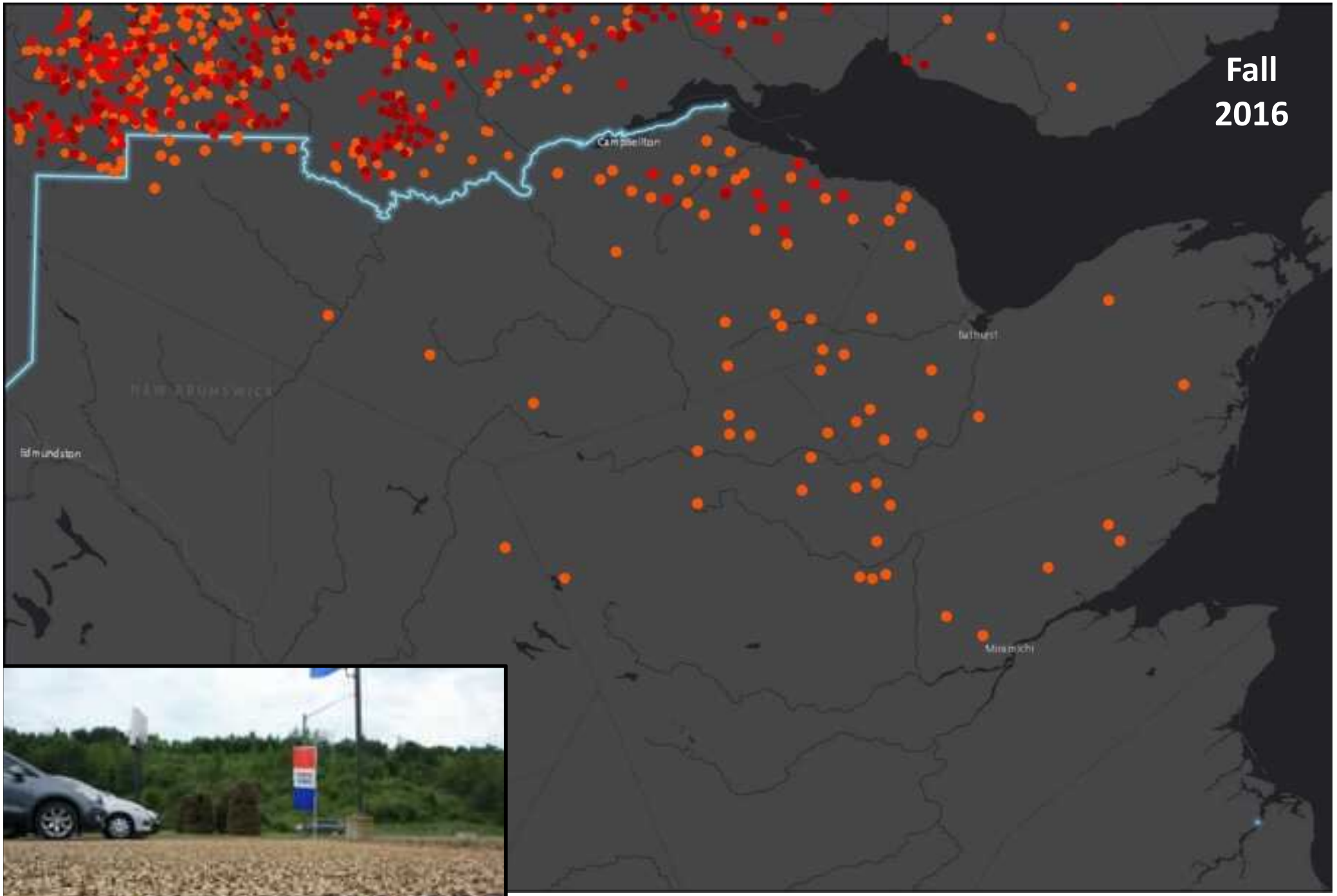


2016

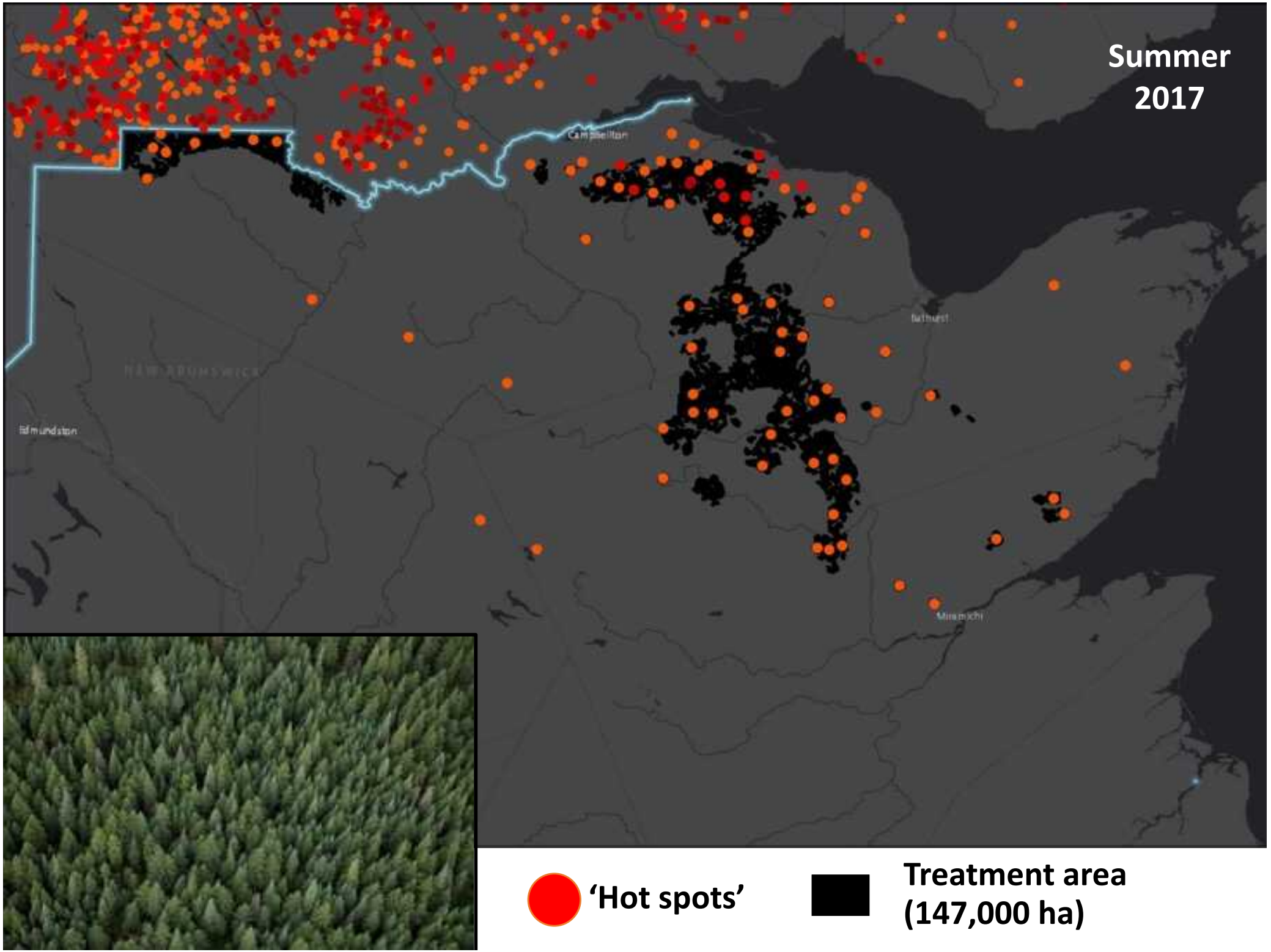


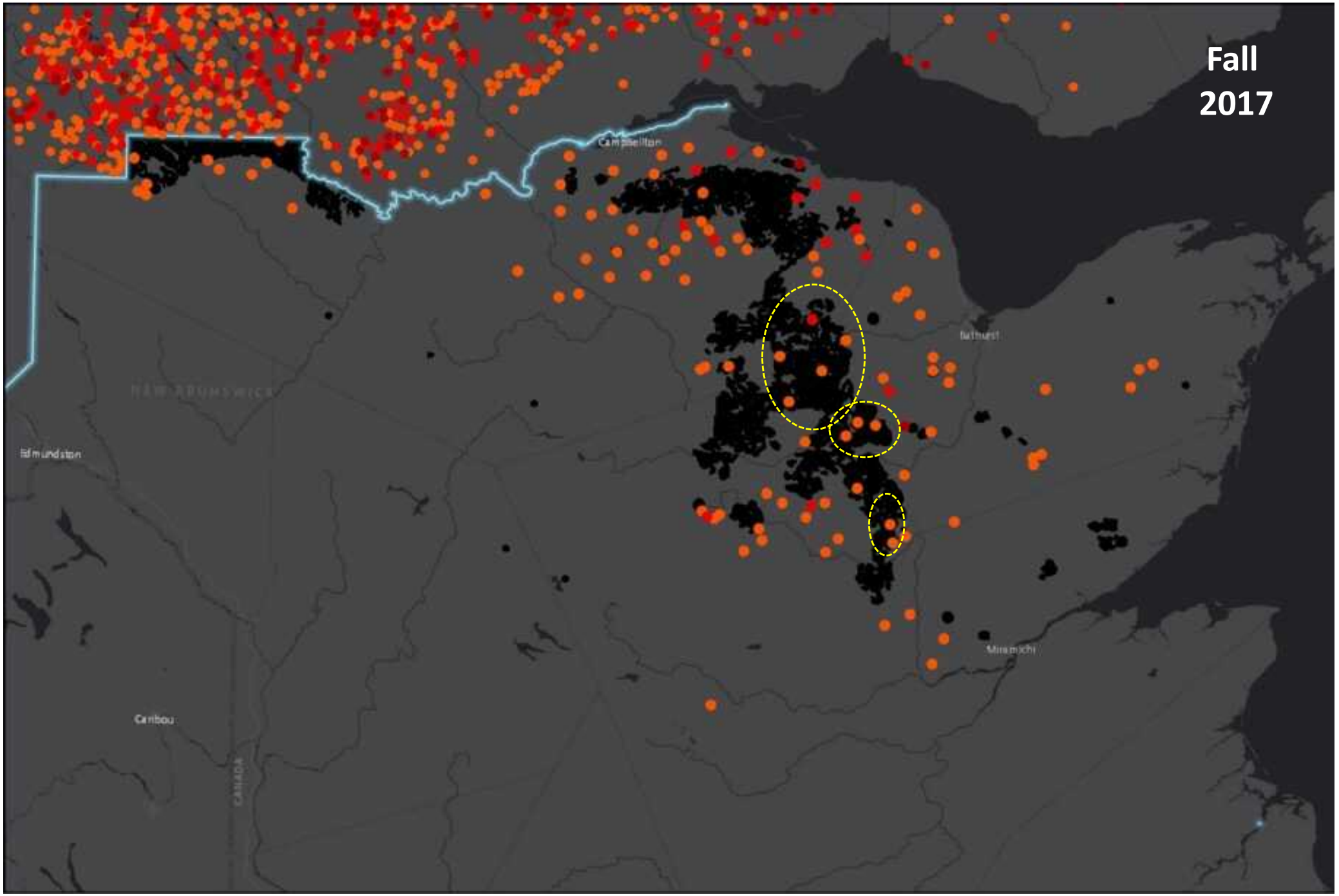
‘Hotspot’
>7 Young larvae/branch





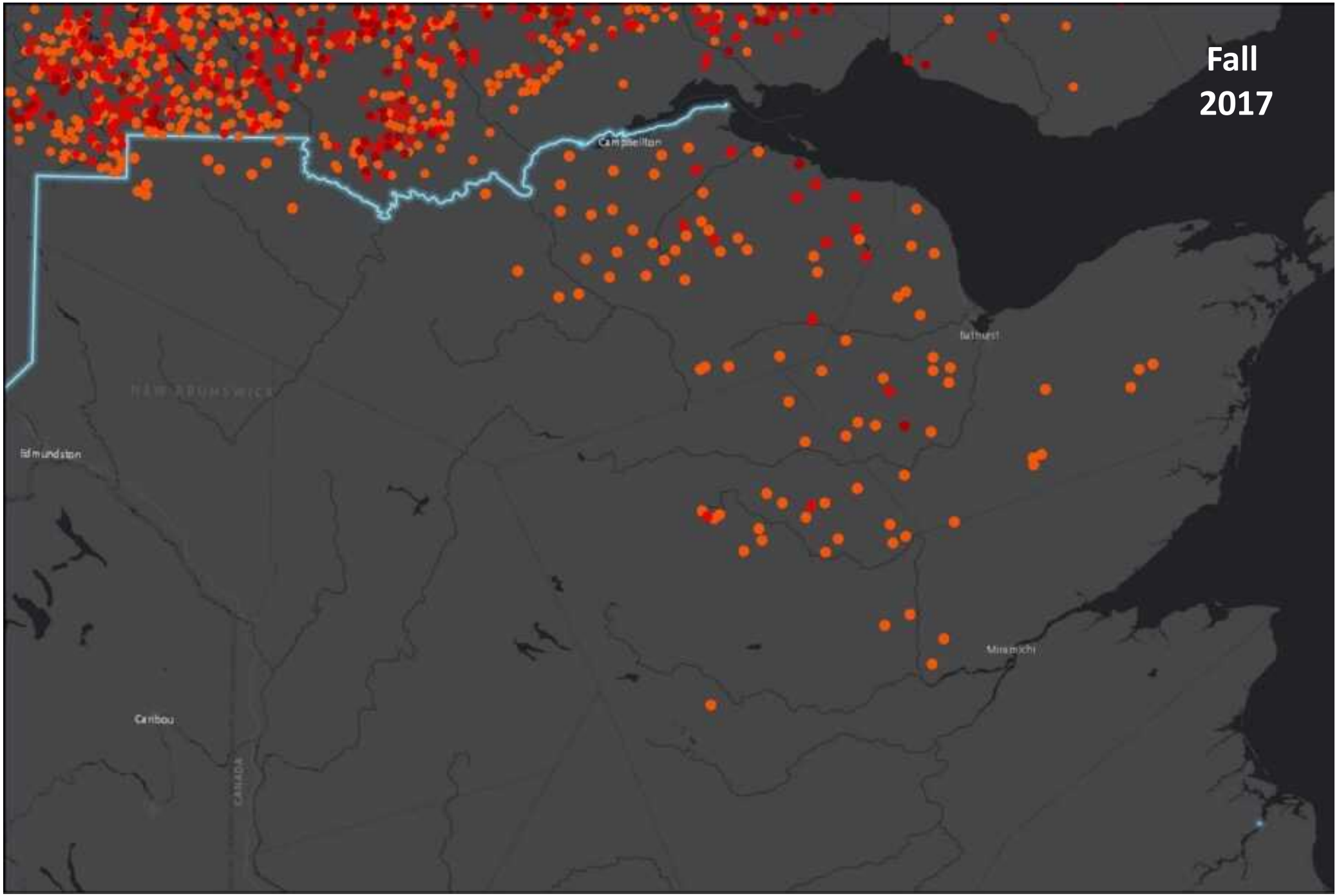
‘Hot spots’


Summer
2017
Campbellton
Bathurst
Edmundston
Miramichi
'Hot spots'
Treatment area
(147,000 ha)

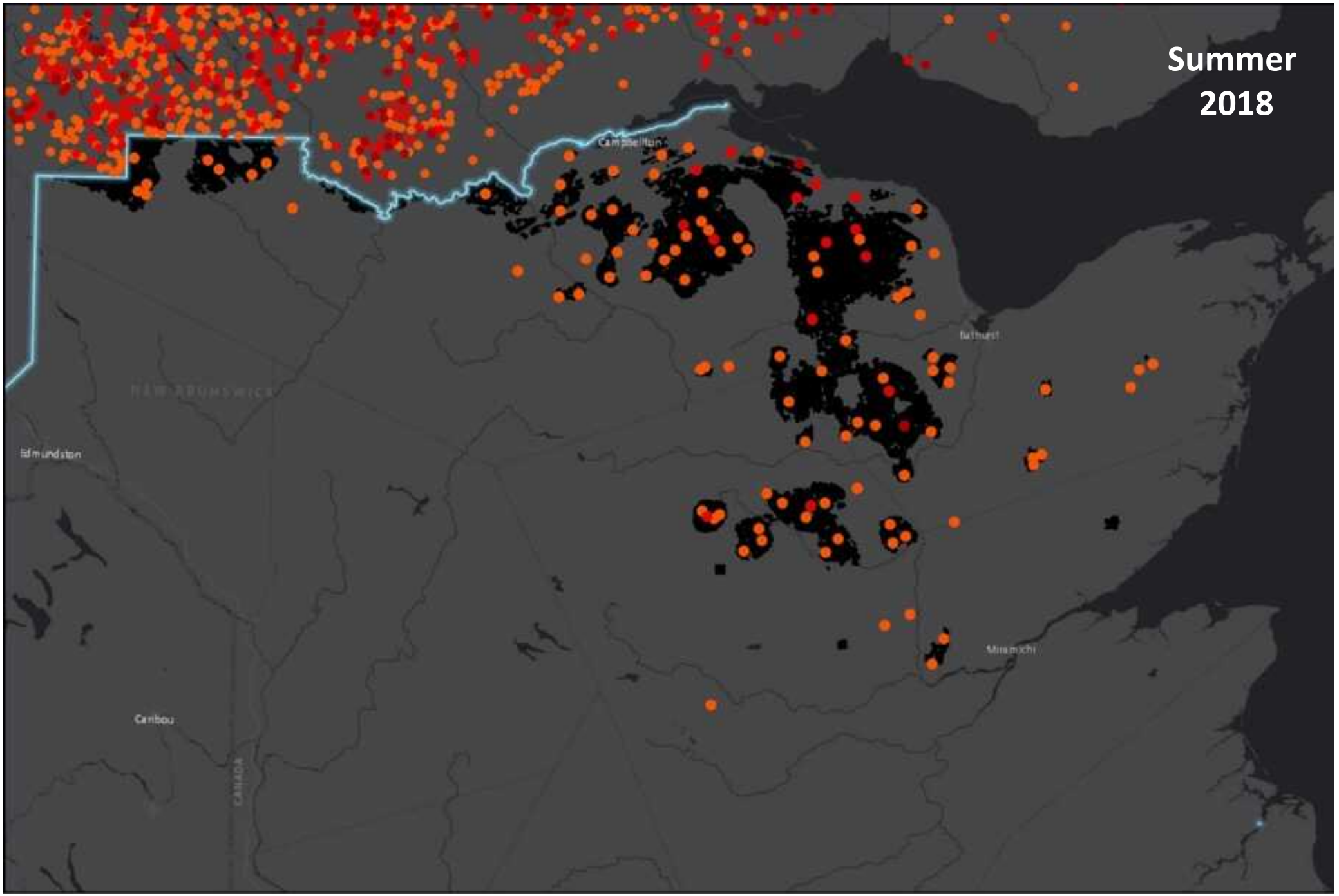


‘Hot spots’

Treatment area
(147,000 ha)

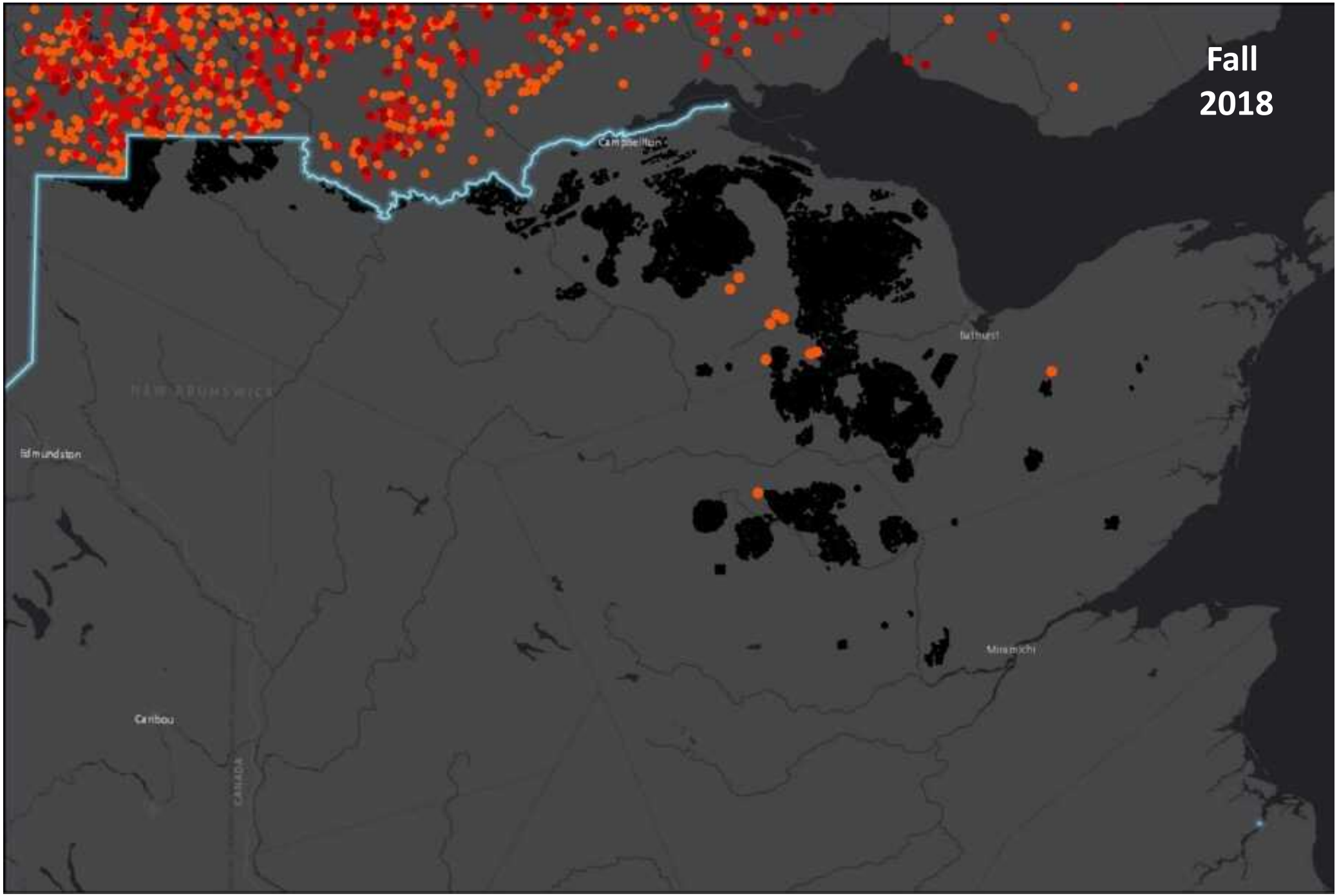

Fall
2017
Campbellton
Bathurst
Edmundston
Miramichi
Caribou
CANADA

‘Hot spots’



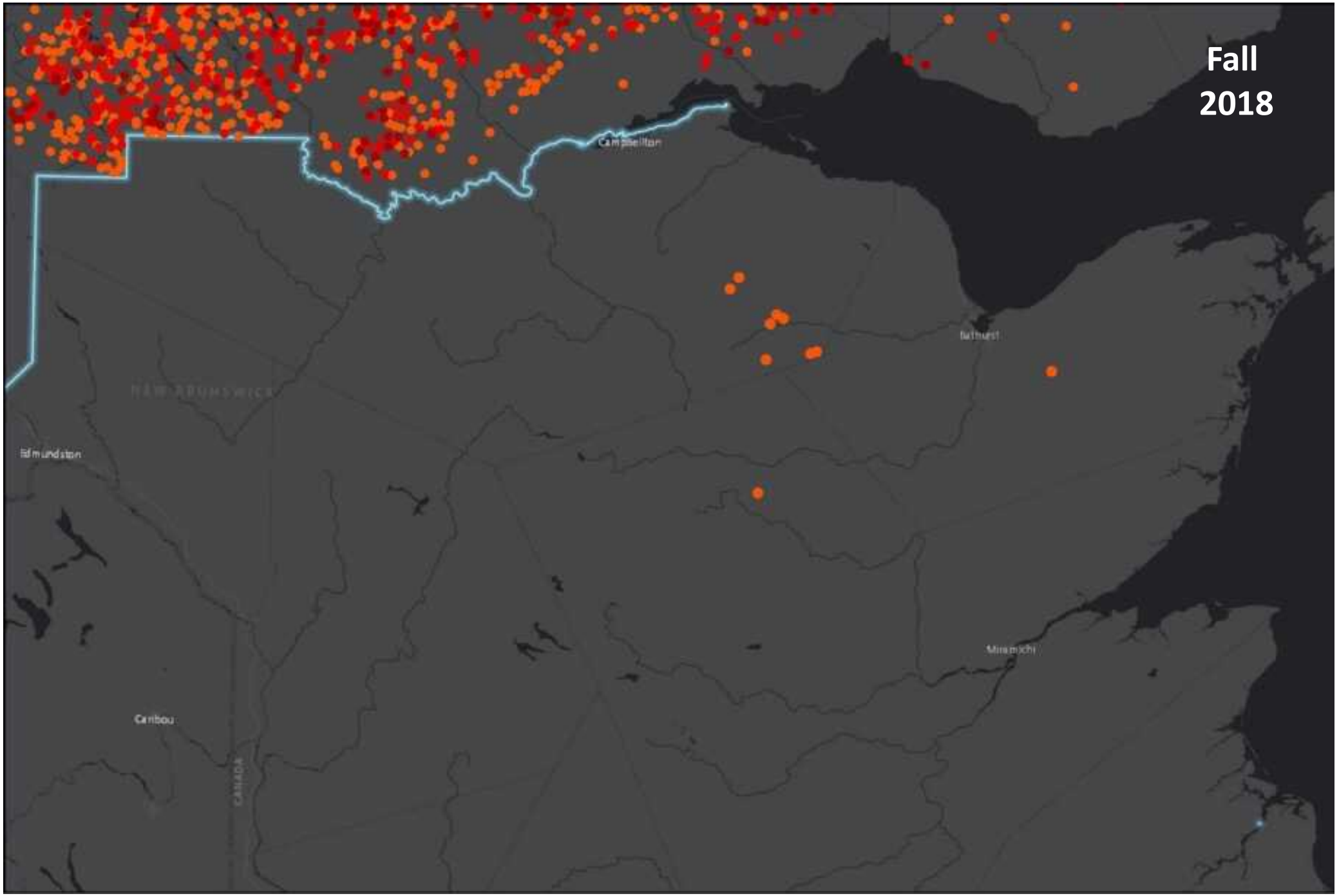
‘Hot spots’

Treatment area
(220,000 ha)

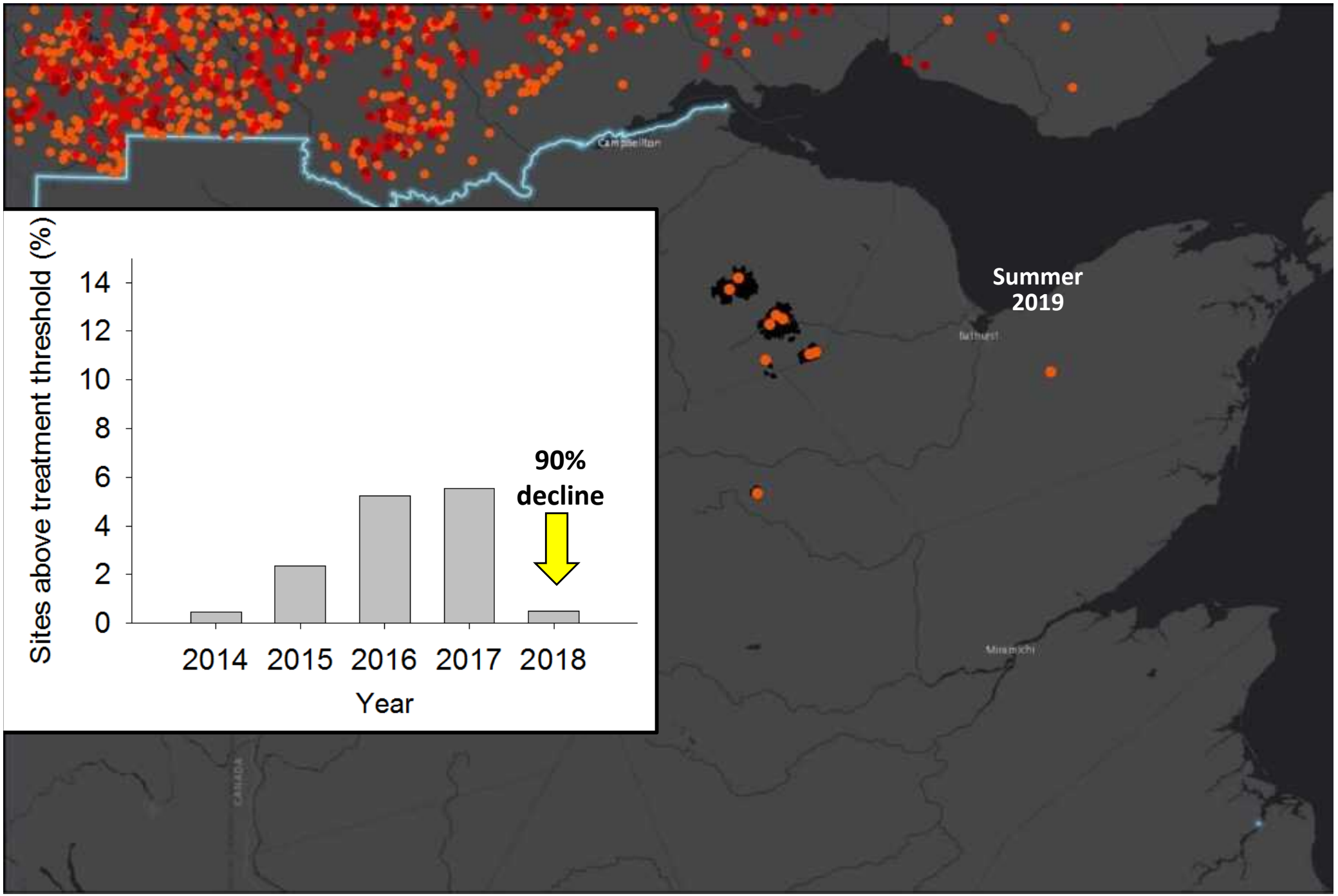


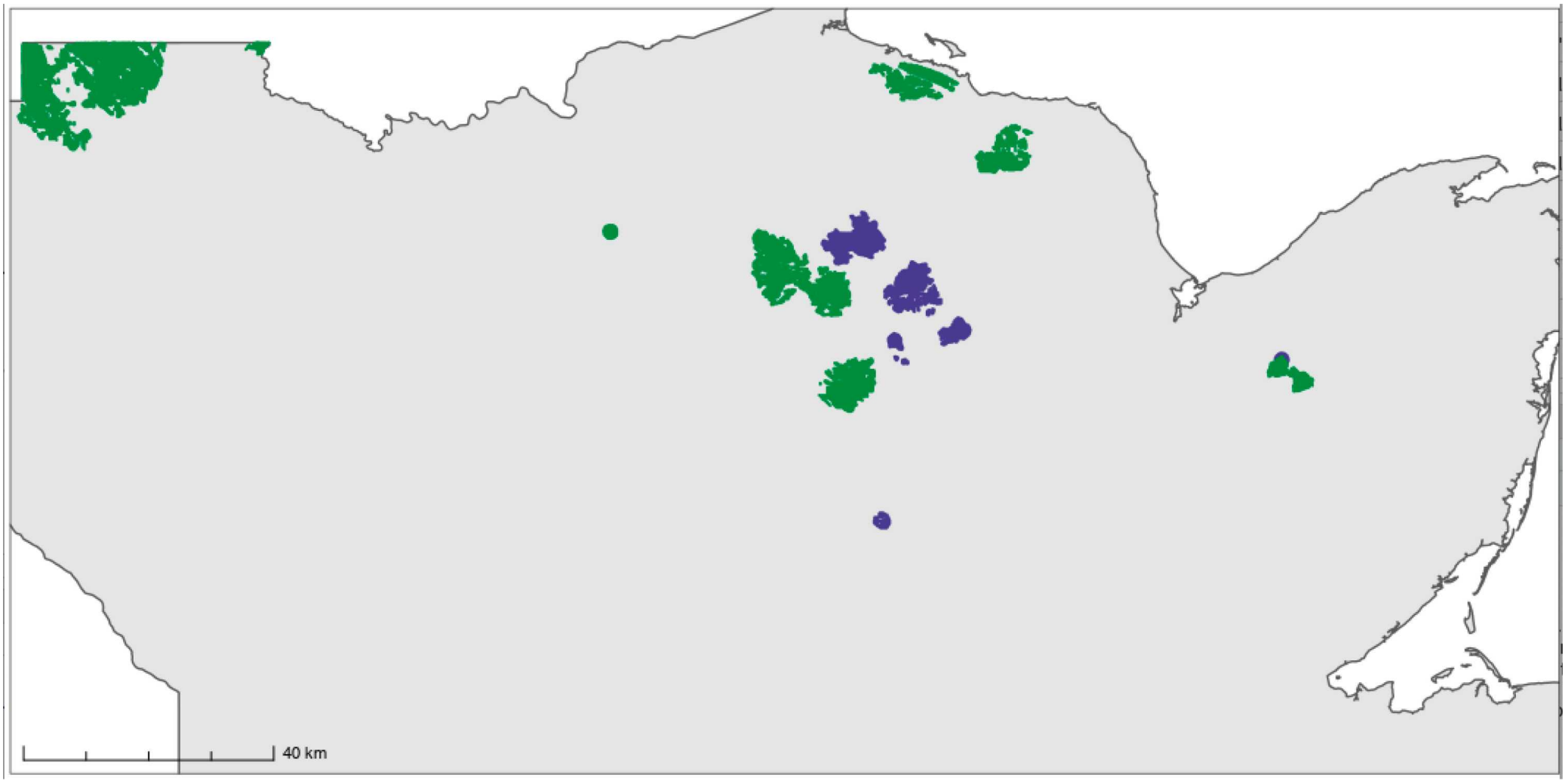
‘Hot spots’

Treatment area
(220,000 ha)


Fall
2018
Campbellton
Bathurst
Edmundston
Miramichi
Caribou
CANADA

‘Hot spots’


Campbellton
Summer
2019
Bathurst
Miramichi
CANADA
Sites above treatment threshold (%)
14
12
10
8
6
4
2
0
90%
decline
2014
2015
2016
2017
2018
Year
'Hot spots'
Treatment area
(10,000 ha)

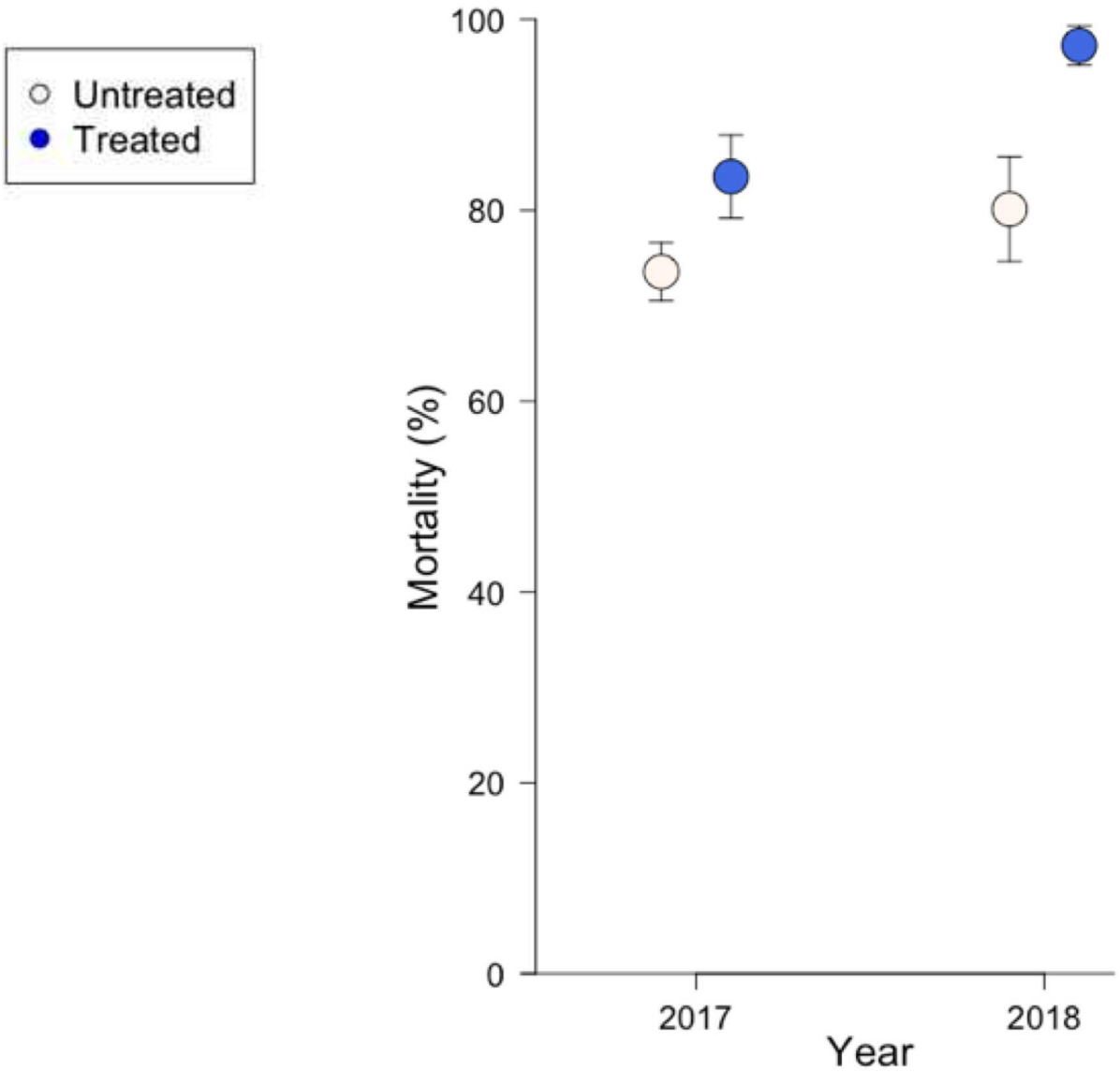


2019 10,000ha

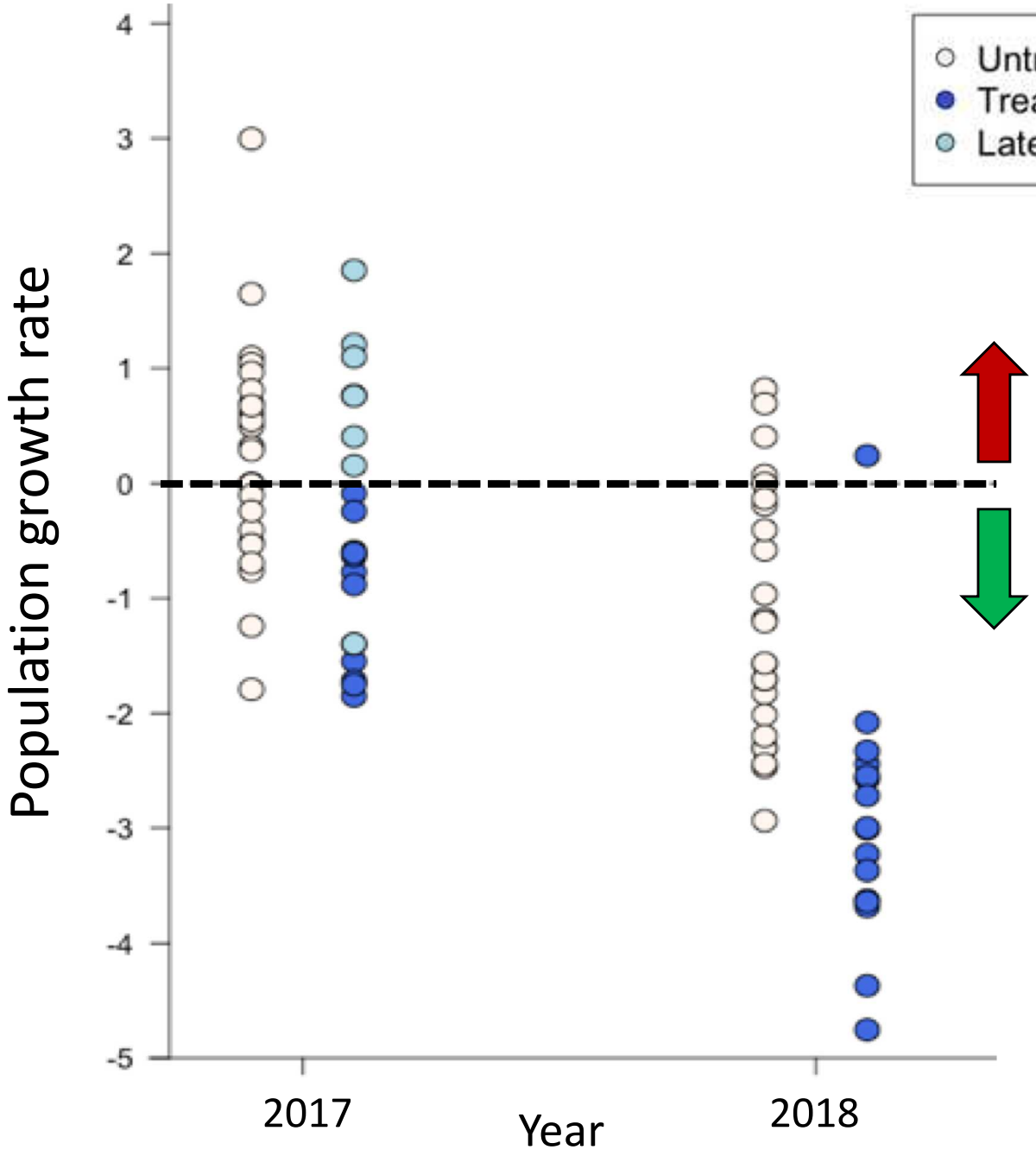
2020 ~ 35,000ha

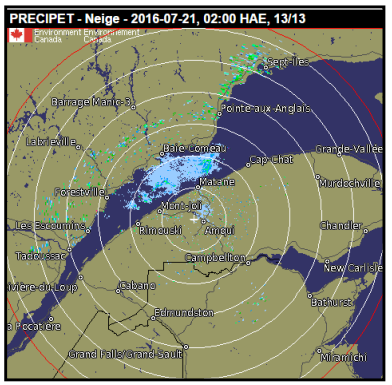
2020 area not finalized at this time

Mortality only slightly higher in treated sites

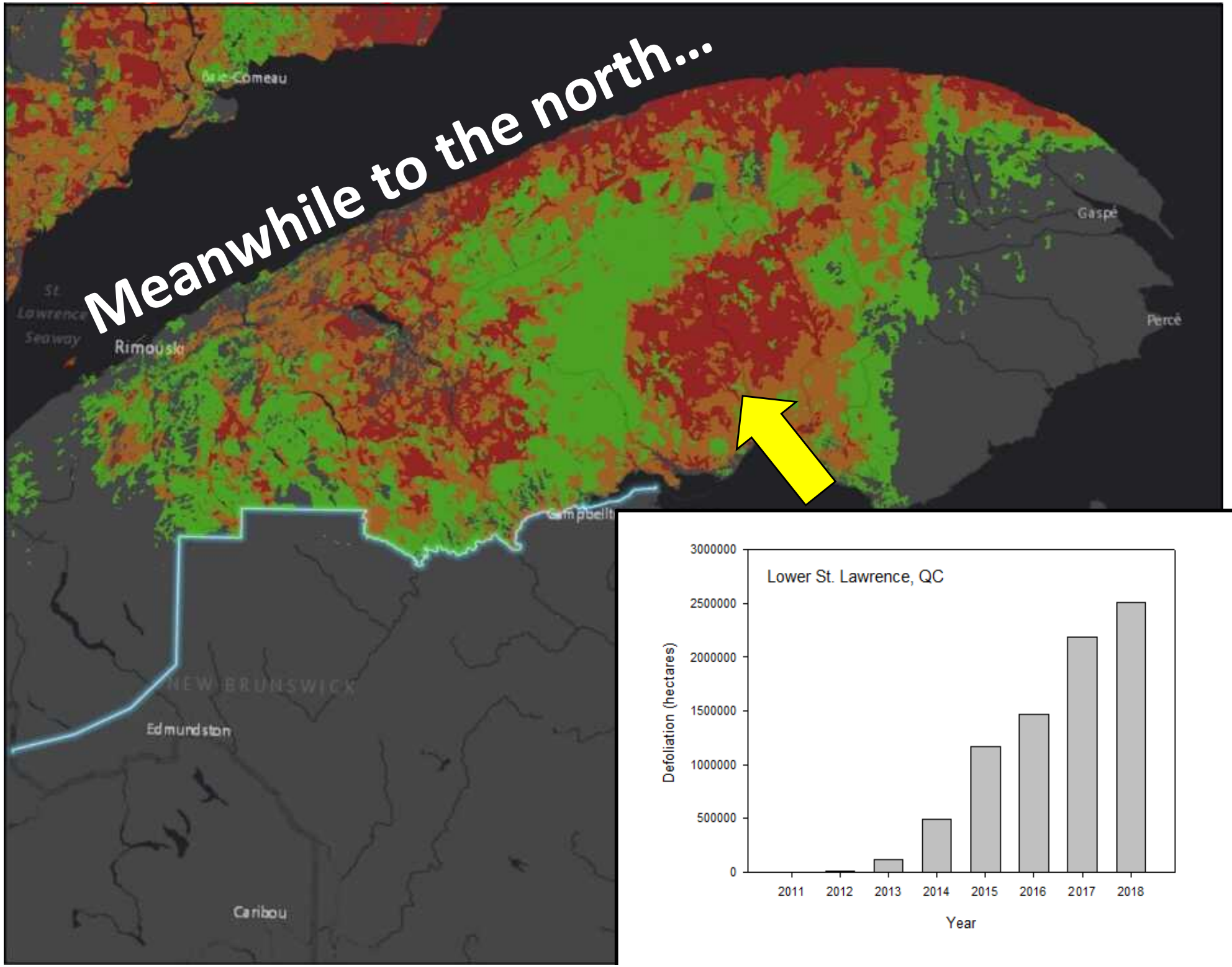


Negative population growth rate after treatment



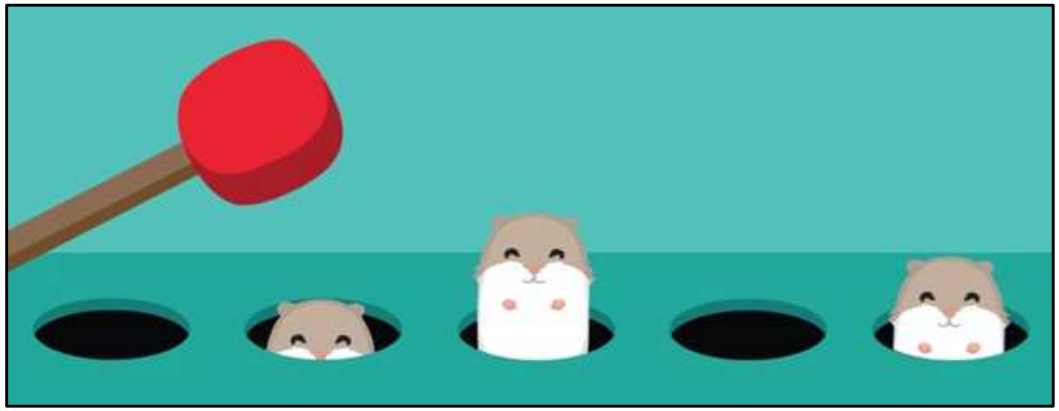


Meanwhile to the north…



Is Early Intervention working?

- Results are encouraging
- A little additive mortality goes a long way
- Is it sustainable? Can we outlast the ongoing outbreak in Quebec?



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Article

A Conceptual Framework for the Spruce Budworm Early Intervention Strategy: Can Outbreaks be Stopped?

Robert C. Johns [1,*], Joseph J. Bowden [2], Drew R. Carleton [3], Barry J. Cooke [4], Sara Edwards [5], Erik J. S. Emilson [4], Patrick M. A. James [6], Dan Kneeshaw [7], David A. MacLean [8], Véronique Martel [9], Eric R. D. Moise [2], Gordon D. Mott [10], Chris J. Norfolk [3], Emily Owens [1], Deepa S. Pureswaran [9], Dan T. Quiring [11], Jacques Régnière [9], Brigitte Richard [12] and Michael Stastny [1]

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