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Adaptations in the Nova Scotia Tree Fruit Industry

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NOVA SCOTIA TREE FRUIT INDUSTRY

THE INDUSTRY'S INVESTMENT

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Investment costs are increasing, risks are rising

- High investment costs
  - Goal of high, early yields
  - More trees per acre
  - Anchored with trellis
  - Improved fruit quality & value
  - Preparing for mechanization and automation

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On-farm nurseries offer more control in some respects but create more risk

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Climate change exposes us to more extremes

- Cannot directly relate events to climate change but will discuss extremes
- Proactive and reactive adaptations
- No shortage of hot, cold, dry, and wet over the last 2 years

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EXAMPLES

EXTREME WEATHER AND ADAPTATIONS

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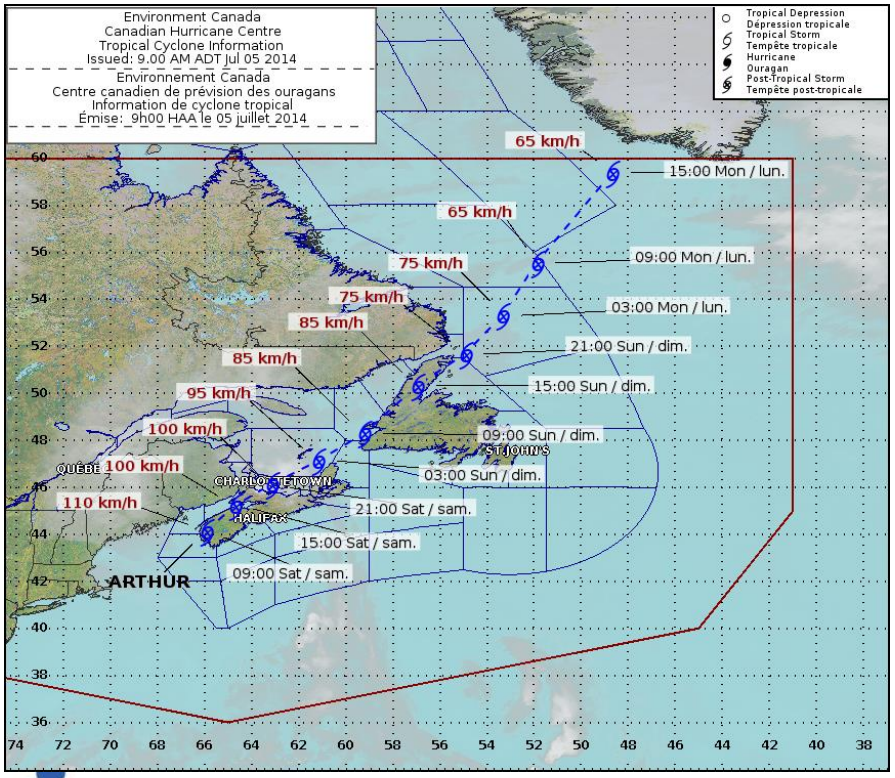
Post-tropical storm Arthur in 2014 spread fire blight

- Fire blight infection isolated in pockets
- Rotating storm system with wind and rain moved bacteria everywhere



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Sanitation and modeling are key adaptations to manage fire blight and lower risk for next trauma

- Proactive:
  - Modeling 78% use Maryblyt
  - Industry alerts
  - Tools like antibiotics at bloom, prohexadione calcium
  - Deer fence
- Reactive:
  - Monitor for symptoms
  - Accurate diagnosis

Bacterial

Fungal

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5 years later… relatively good control even under high risk

2019-06-08		7.6	19.4	13.5	0	☐	☐	24	+--L		27	-
2019-06-09		5	22.7	13.9	0	☐	☐	48	+--L		30	-
2019-06-10		11	24.1	17.6	0	☐	☐	85	+--+M		35	-
2019-06-11		8.9	24.2	16.6	12	☐	☐	121	++++I		39	-
2019-06-12		10.1	22.5	16.3	0	☐	☐	121	++++I	7a	42	-
2019-06-13		9.6	24.5	17.1	7	☐	☐	133	++++I	16a	47	-
2019-06-14		10.1	22	16.1	0	☐	☐	121	++++I	22a	51	-
2019-06-15		9.1	23.4	16.3	0	☐	☐	109	++-+H	30a	55	-
2019-06-16		15	23.1	19.1	0	☐	☐	121	++-+H	41a	60	-
2019-06-17		14.1	24.6	19.4	2	☐	☐	133	++++I	52a	66	-
2019-06-18		10.9	23.3	17.1	0	☐	☐	145	++-+H	60a	70	-
2019-06-19		12	25	18.5	0	☐	☐	170	++-+H	70a	76	-
2019-06-20		12	24	18	0	☐	☐	170	++-+H	80a	81	-
2019-06-21		14	20	17	17	☐	☐	133	++++I	87a	85	-
2019-06-22		12	21	16.5	0	☐	☐	109	++++I	94a	88	-
2019-06-23		11	20	15.5	0	☐	☐	73	+--L	100a	91	-
2019-06-24		10	21	15.5	0	☐	☐	48	+--L	99b	94	-

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Improve opportunity for rapid recovery with storm preparedness

- Lessons from the field
  - Train young trees asap
  - Have streptomycin available to treat orchards within 24 hours of trauma
  - Ensure equipment is accessible = saws, shovels, fuel, equipment parts
  - Long-term = insurance coverage for equipment and orchards

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Hail can damage fruit and is a fire blight trauma event

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Do hail net investments pay off?

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Many considerations. Stay tuned.

- Life of materials?
  - Netting and posts
- Ongoing maintenance
  - Rolling and unrolling
- Light reduction and fruit colour
  - 12-25% less light
  - No sunburn issues for secondary benefits
- Incidence of hail and severity of damage
  - Time spent sorting to salvage
  - Guarantee of supply
  - Does it justify high capital cost?

Extreme wind tested support systems and led us to evaluate minimum requirements

- High winds last fall
  - Trellis and tree damage
  - Bruising and fruit drop
- Design sturdy support systems
  - Tool by Dal AC Dr. Havard 2017
  - No more than 30 ft between posts
  - Investment supports high yields

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Hot and dry spells during summer limit tree growth, increasing interest in irrigation

- Local research in the late 90s
  - Irrigation recommended in high density systems
  - Hard on dwarfing rootstocks
  - Limited irrigation in Nova Scotia but some investing
- Nursery trees are vulnerable
  - Roots not yet established
  - Risk terminal bud set before budding
  - Trees can desiccate from the tip downward
  - Drip tape in many nurseries

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Just because it worked before doesn't mean it will work now – unexpected results

- Hot and dry in replant disease situations
  - Effects worse where root quality is poor
- Risk of spray injury in hot weather
  - Abnormally hot weather? Heed warnings on product labels.

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Above-average rainfall stresses importance of site selection

- Challenges outside of control
  - Delayed fungicide and lime application
  - Pesticides washed off and re-applied
- Site selection & prep
  - Equipment stuck
  - Trees collapsed
- Take notes on drainage in bare fields

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There is no substitute for a well-drained and deep soil, but modifications can be made

M9 restricted by hardpan

1.5 foot (45 cm) depth

Soil pits & discussions

Drainage is only as good as designed

- Consider
  - Worst case scenario
  - Tighter spacing to prevent waterlogging
- Depends on soil type, location of hardpan
- Not an engineer but asking questions

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Heavy rainfall created gullies and exposed root systems, requiring maintenance

- Exposed root systems – caution with herbicides
- Mitigate erosion?

Winter frost was deep and long-lasting, leading to frost heaving

- Frost at 50 cm from mid-Feb to early April
  - Most years no frost at this depth
- Vulnerable to herbicide damage
  - Maintenance

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Spring freeze caused crop loss, and damaged fruit and nurseries

No frost-protectant infrastructure, leading to only reactive adaptation

- 1 in 50 year event
- Is frost protection cost-effective?
  - Probability and risk
- Reactive adaptation only
  - Reduce spray programs
  - Reduce vegetative growth
  - Sort fruit at harvest

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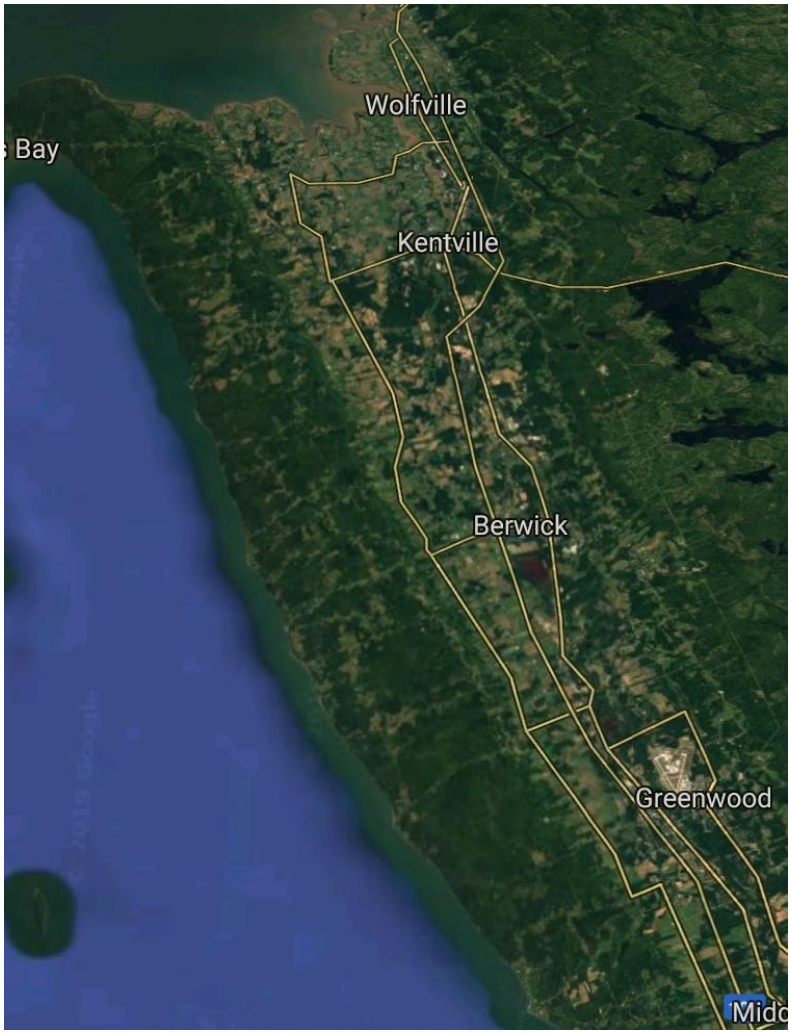
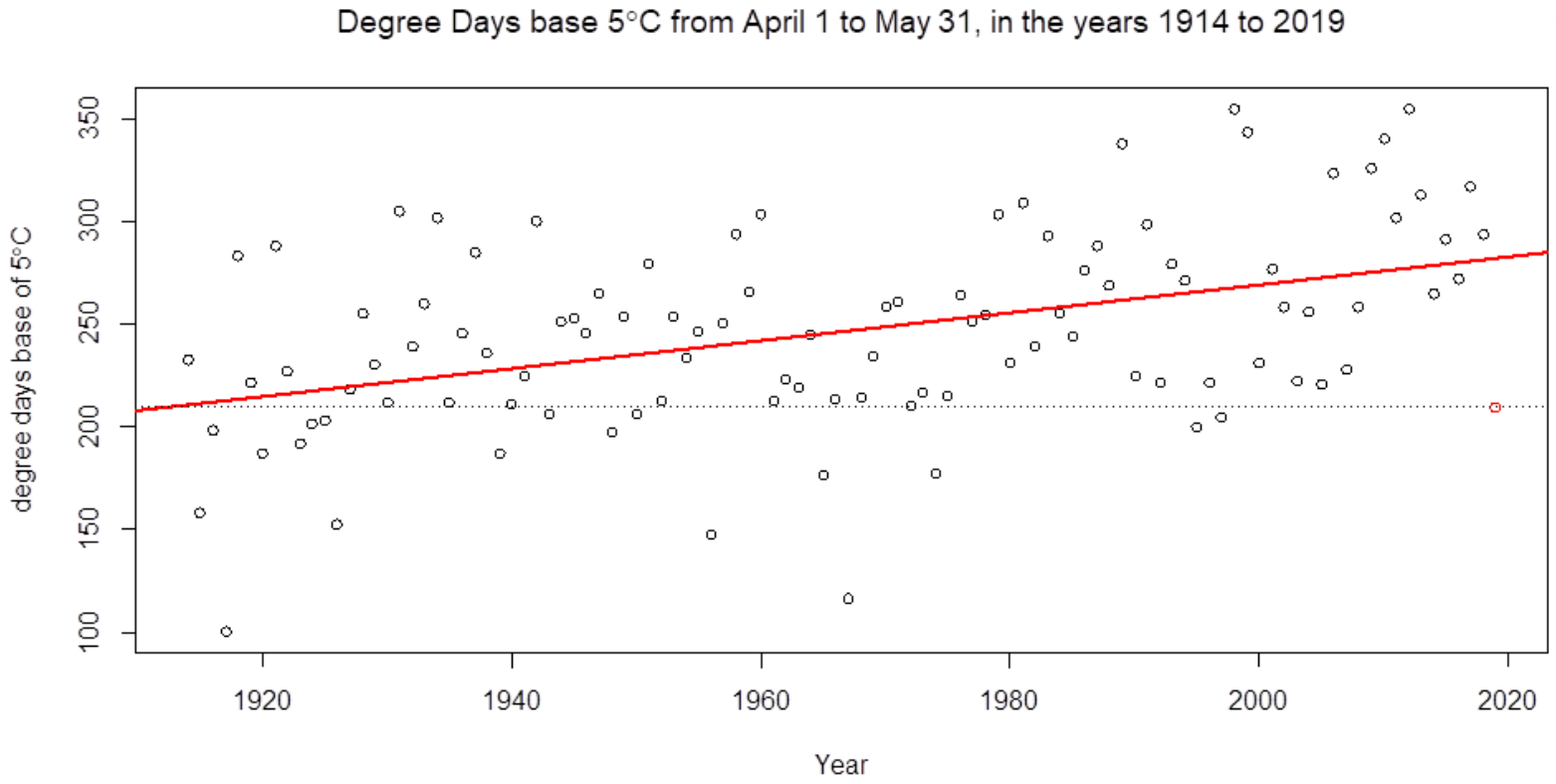
Site selection and design determine probability and risk of frost-damage

- Typical frost pockets were hardest hit so consider site
  - If cold air is trapped, it accumulates
    - Design pathways through woodland to let cold air escape
  - Elevation
    - Extra elevation worked in favour
    - Diversify orchard blocks to make an operation more resilient to weather



Cold spring complicated pollination but trend is still warming

- Poor pollination conditions – moderate fruit set
- Gaining degree days



Expanding range of suitable climate for **invasive insects or multiple generations**

- Incoming
  - BMSB committee
- Arrived
  - Potato leafhopper flies in on warm currents every year now
- Second generation
  - Leafroller
- Pest monitoring & evolving spray programs

RESEARCH AND EDUCATION

SUPPORTING ADAPTATION

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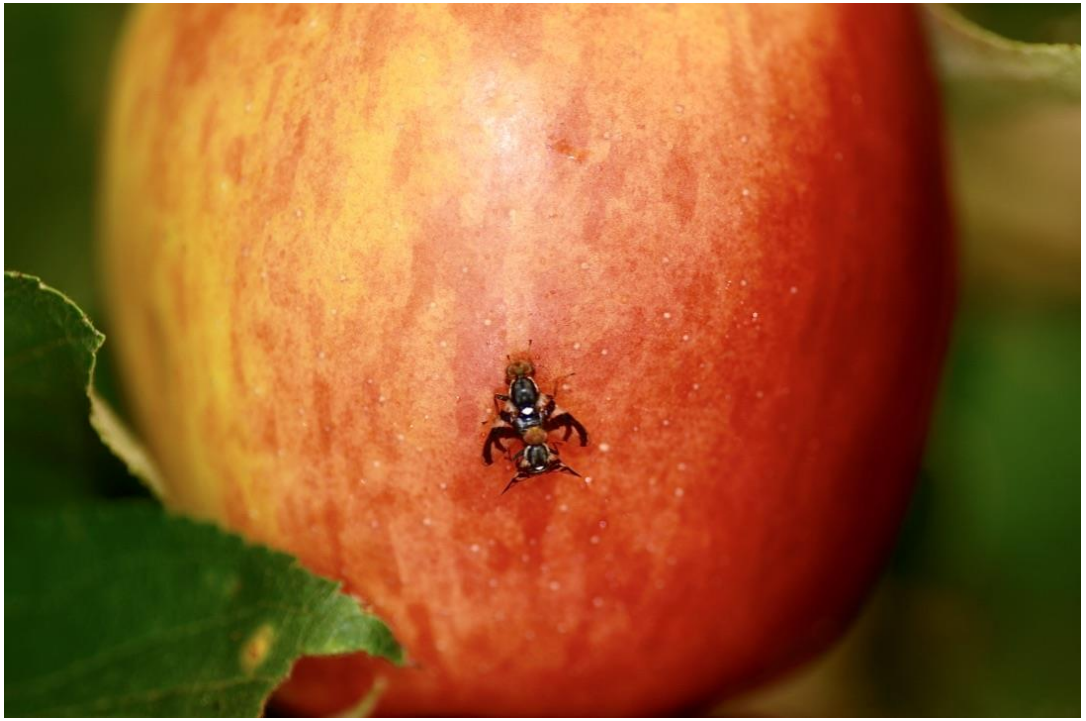
Research to take on the risk and demonstrate new practices

- Replant disease
- Apple maggot
- Irrigation



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Education to enable adaptation

- Orchard tours & educational sessions
- Newsletters
- The Orchard Outlook Podcast
  - Ep1. Dr. George Sundin, fire blight (Aug 7)
  - Ep2. Dr. Suzanne Blatt, apple maggot (Aug 21)

www.perennia.ca/learning

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Summary of proactive and reactive adaptations in the tree fruit industry

- Pest modeling & monitoring
- Orchard sanitation
- Industry-wide alerts & recommendations
- Accurate disease diagnosis
- Maintenance of exposed roots
- Site selection and design
- Evolving spray programs
- Infrastructure
  - Deer fence
  - Irrigation
  - Tile drainage
  - Sturdy trellis
  - Hail netting?
  - Frost protection?
- Research
- Education

Keep an open mind & update best practices