How (and Why) to Incorporate Tree Injection into Your Business and Municipality

Jim Zwack, M.S.

The Davey Institute

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Personal Introduction

- B.S. Urban Forestry
- M.S. Tree Physiology
- University of Minnesota Landscape Arboretum
- Rainbow Treecare Scientific Advancements
  - Vice President of Sales
  - Products for PHC programs
- The Davey Institute
  - Director of Technical Services
- Chairman, TREE Fund

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A Re-Occurring Truth…

- There's never a good time to deliver a presentation
- Human behavioral and psychological variables get in the way of learning
- Here's why:

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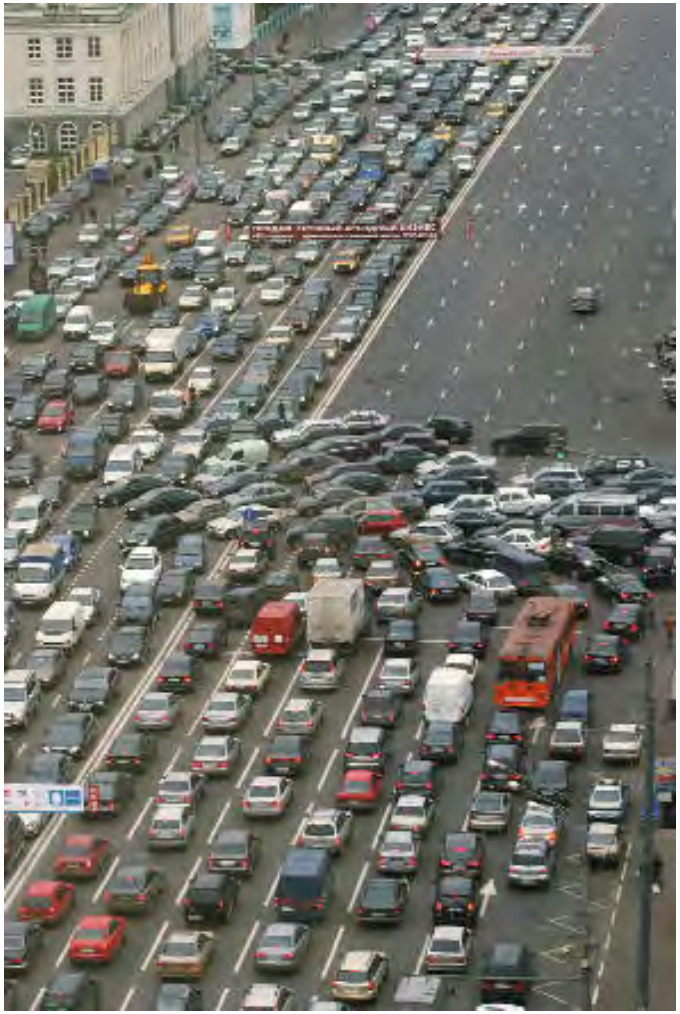
The First Session



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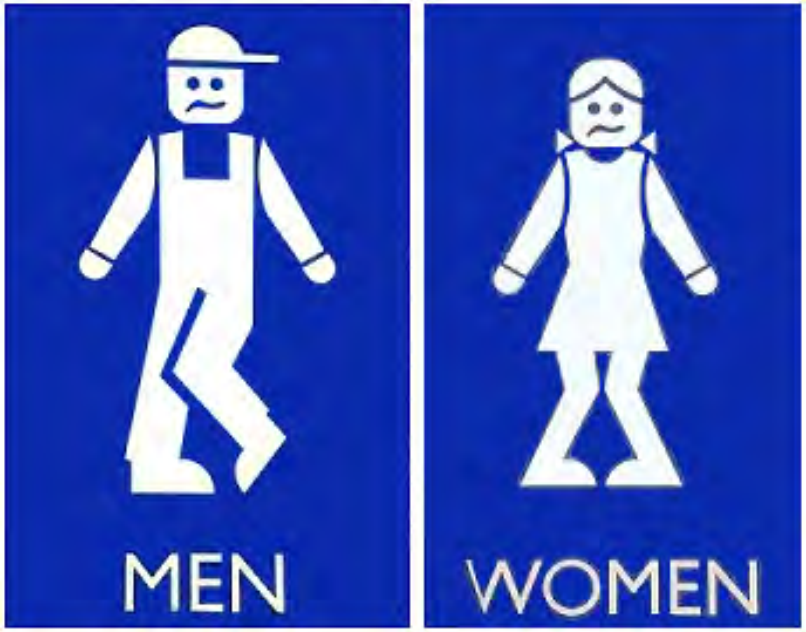
Before the Break



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Right Before Lunch

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Right After Lunch

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Last Session of Day

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Agenda

- Definitions, timelines, etc.
- PHC Complexity
  - Embrace it!
- Four reasons why to inject trees
- Four guiding principles for “What and How”

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Pest Management Timeline

- 1940's and 1950's
  - Huge increase in the number of chemicals available
  - Chemicals were thought to be the miracle cure for all problems
- 1960's
  - Rachel Carson wrote "Silent Spring"
    - The first widely read book warning about the impact of pesticides and the environment
  - Led to more regulation of pesticides and development of new ideas on how to manage pests

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1970's and Early 1980's

- Initiated the concept of "IPM"
  - Integrated Pest Management
    - Management (not annihilation)
    - Use a variety of techniques
  - Originally developed for agricultural crops
- Still "pest focused"

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Late 1980's, 1990's, and Today

- Plant Health Care (PHC)
  - Focus on plant system vs pest
  - Healthy plants will be less prone to pests
  - Favors proactive treatments that improve plant health rather than reactive, pesticide treatments
- Development of alternatives to spraying, such as soil and trunk applications
- Development of less toxic pesticides

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  - **Embrace it!**
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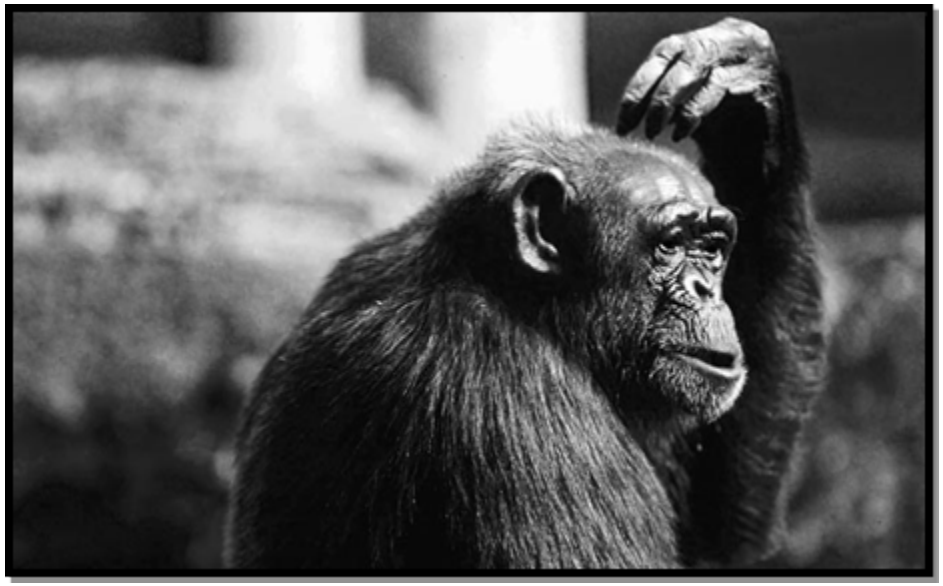
It’s a Complex World

- 700+ tree species in North America
- 90,000+ insect species
- Abiotic, diseases, etc.
- Products, doses, timing, etc.



A Desire to Simplify

- How many combinations of tree species, pests, pathogens, products, doses, timing, etc. are there?
  - Too many…
- There is only so much human “bandwidth”
  - Limit our techniques?
  - Limit our products used?
  - Choose broadest spectrum?

Embrace the Complexity

- Affirms the profession of Arboriculture
- After all, would you trust a medical doctor whose only recommendations were aspirin and rest?
- The cost of simplicity/convenience is customer service and loyalty
  - Clients become internet experts in minutes
  - Less willing to accept unsophisticated plans

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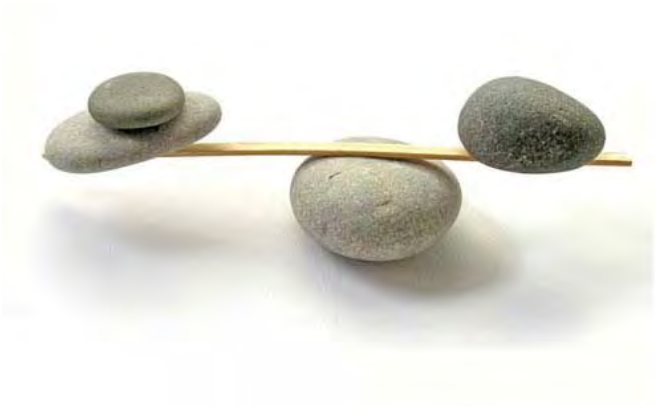
The Business of Complexity

- Challenges to “pulling it all off”:
  - How well do our arborists identify specific problems?
  - How effective are we at communicating solutions to our clients?
  - Do we have reliable and detail-oriented technicians to perform this work?
- What about the voice of the client?
  - Do their preferences for <u>how</u> we administer solutions matter?



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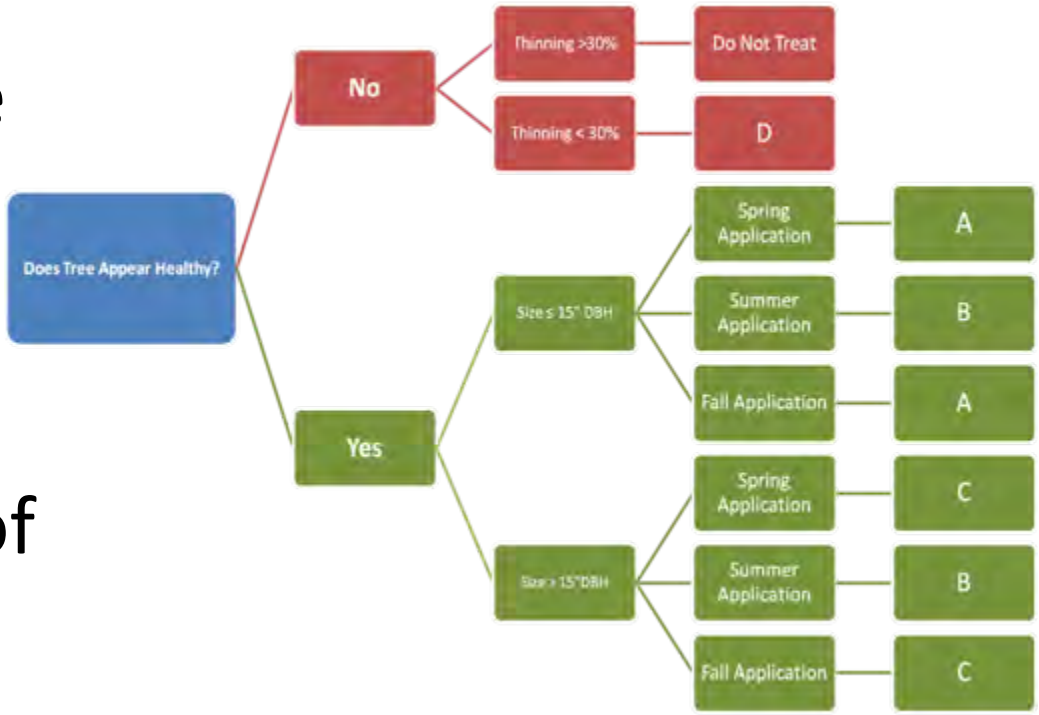
Sophisticated Solutions

- Some pests like EAB have multiple solutions
- Products, treatment methods, timing of applications, etc.
- Impact on clients?



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Sophisticated Solutions

- Less about “Right and Wrong”
  - More about “Pros and Cons”
  - Savvy arborists recognize this
- Knowing multiple options are effective for EAB, how do you handle clients that:
  - Want the lowest annual cost?
  - Want to minimize exposure to their pets?
  - Don’t want to see you every year?
- Who is “right”?
- Our actions can either fulfill or negate the goals of our clients

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Changing World

- Practices that were once common, such as spraying large trees, are entering the twilight of their relevance

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Changing World

- The new era of pest, disease, and abiotic stress management will continue to head in the direction of:
  - More specific products to favor beneficial insects and pollinators
  - Increased scrutiny on environmental fate of products
  - Closed application systems
    - a.k.a. tree injection

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- **Four reasons why to inject trees**
- Four guiding principles for “What and How”

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Tree Injection

- Do you consider tree injection to be a “hot button” issue in Arboriculture? Many do.
- What drives this?
- Concerns about wounds…

Concerns About Wounds

- We go out of our way to avoid these:

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Concerns About Wounds

- Whether you drill, prick, poke, prod, gouge, infuse, inject…
- There is still some sort of opening that wasn't there before
- Is this progress?

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In My Opinion…

- I do not advise using tree injection for every problem out there
  - “If your only tool is a hammer, all your problems start looking like nails”
- Nor do I advise adamantly opposing these techniques
- Case by case basis

4 Reasons for Tree Injection

- **No other option exists**
- Speed of efficacy
- Exposure
- Regulatory restrictions

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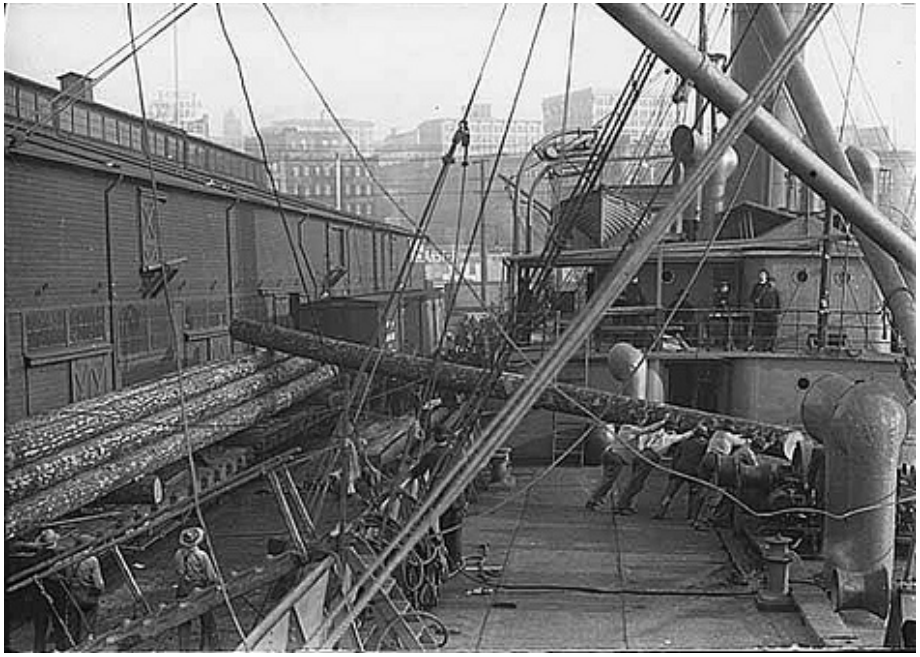
No Other Option - Dutch Elm Disease

- Introduced to the United States in Cleveland, Ohio (ca. 1930) in a shipment of logs from Europe.
- 100's of millions of trees have been killed.



Dutch Elm Disease

- Three Strains of Pathogenic Fungus
  - *Ophiostoma ulmi* (non-aggressive)
  - *Ophiostoma novo-ulmi* (aggressive)
  - Two Races of Aggressive D.E.D.
    - EAN (European Strain)
    - NAN (North American Strain)
  - *Ophiostoma himal-ulmi*
    - New, virulent strain
- Sticky spores!
- Transmitted by insects

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Protecting Healthy Trees – Options?

- Spraying to manage insects?
  - “Can’t hurt”
  - How many bites does it take to transmit a spore?
- Inject a fungicide into healthy trees
  - Prevents DED from overland spread of fungus
  - Will not prevent root-graft spread
  - No proven fungicide sprays
- Highly successful

4 Reasons for Tree Injection

- No other option exists
- **Speed of efficacy**
- Exposure
- Regulatory restrictions

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Speed of Efficacy

- Time until efficacy of Imidacloprid:
  - Soil application 30-60 days
  - Tree injection 14-21 days
- Reasons why to inject?
  - Missed your timing window
  - Client accepted service late
- Depending on the problem:
  - 1 time only
  - Transition to less invasive

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4 Reasons for Tree Injection

- No other option exists
- Speed of efficacy
- **Exposure**
- Regulatory restrictions

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Exposure

- Kids and pets
- Applicators
  - See any potential PPE violations?

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Exposure

- Houses, cars, etc.
  - Chemical trespass
  - Litigation
- Environment
  - Bodies of water

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Exposure and Tree Injections

- Tree injections are not without risk
- Applicators
  - Mixing and handling
  - Equipment failure
- Environment
  - Spills, leaks, equipment failure
  - Pollinators still affected

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Exposure and Tree Injections

- People perceive these techniques as carrying less exposure

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4 Reasons for Tree Injection

- No other option exists
- Speed of efficacy
- Exposure
- **Regulatory restrictions**

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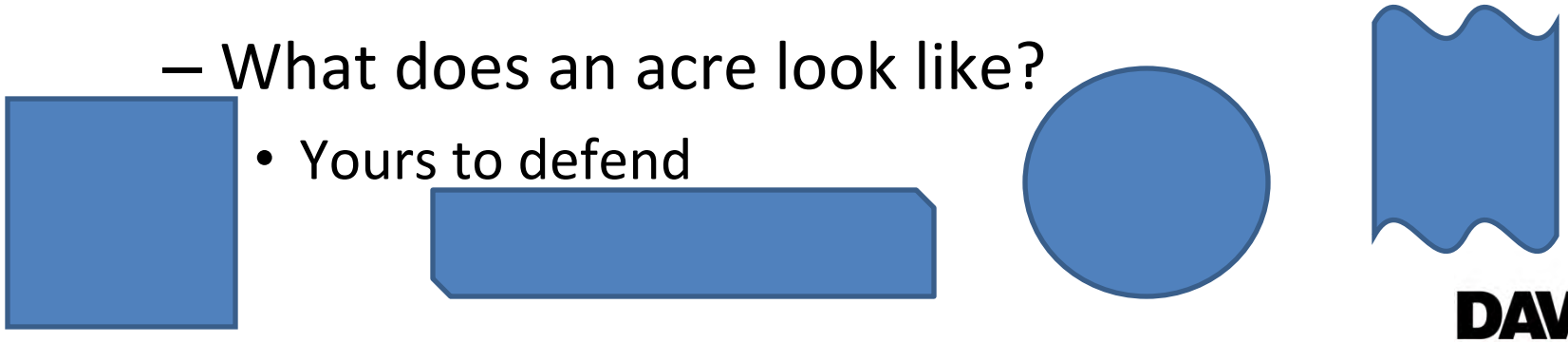
Regulatory Restrictions

- Imidacloprid labels restrict application to 0.4lbs of a.i. per acre per year
- This limit includes all turf and tree applications
- What is an acre?
  - A unit of measure that is 43,560 sq. ft.
  - What does an acre look like?
    - Yours to defend



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Regulatory Restrictions

- For trees, this is roughly 64 inches of DBH per acre per year at the highest application rate
  - Properties smaller than 1 acre may receive a proportional amount
  - e.g. ¼ acre lot = treat 16” DBH
- Multiple PHC products can overcome regulatory issues
- Tree injections do not carry the same restriction for per acre usage

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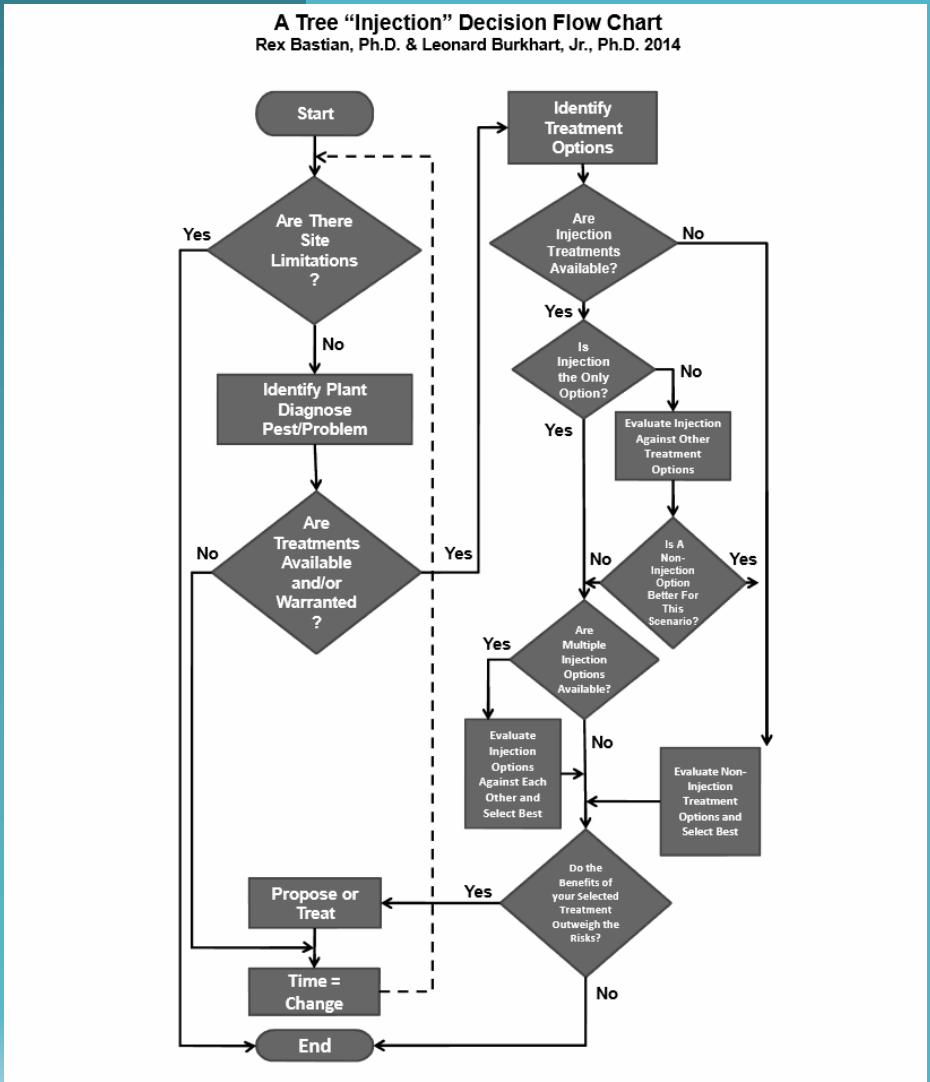
“Decision Tree”

- A thought process, not an exact roadmap
- Helps ensure we do not miss something
- Considers all injection and non-injection treatment options

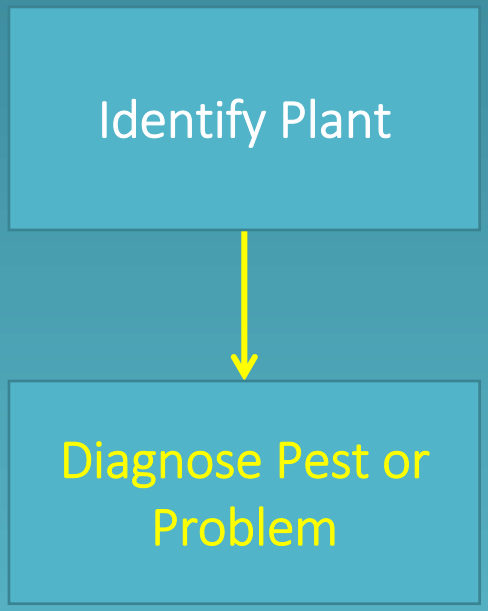


Plant Identification
(Step 1)

Identify Plant

- **Do you know what the plant is?**
- **Do you know what is normal for the plant?**

Diagnosis (Step 2)



Pest or Problem

- **Look for symptoms and signs**
- **Patterns over Space and Time?**
- **Place in Life Cycle/Infestation**

Site Limitations

- **Environmental Restrictions**
- **Client Perceptions and Attitudes**

Diagnosis

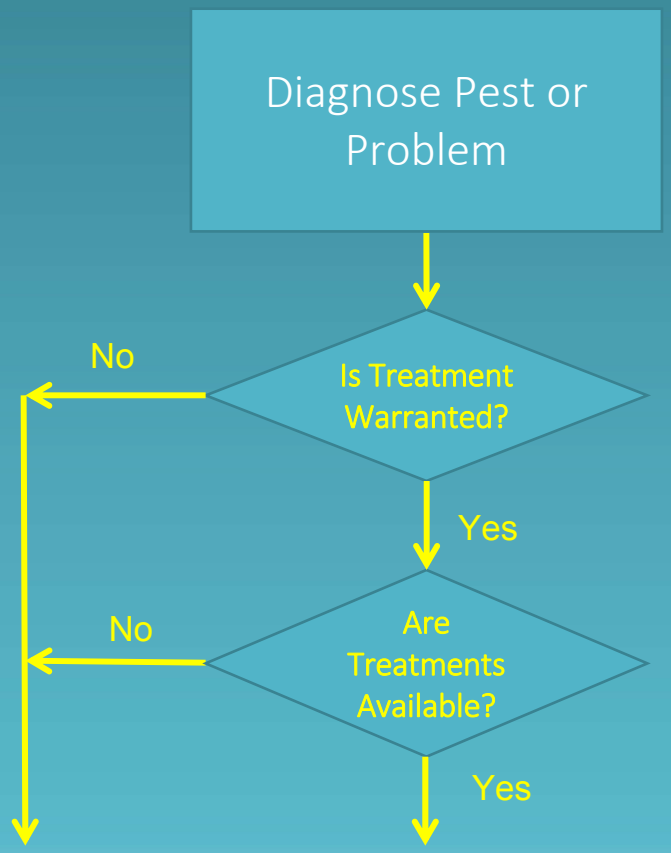
(Multi-Discipline Knowledge)

1. Plant Identification & Horticultural Knowledge
2. Entomology
3. Plant Pathology
4. Soil Science & Plant Nutrition
5. Abiotic Factors (Weather and Human Induced)
6. Continued Education on new pests or new research findings of existing pests

Causal Agents of Plant Problems

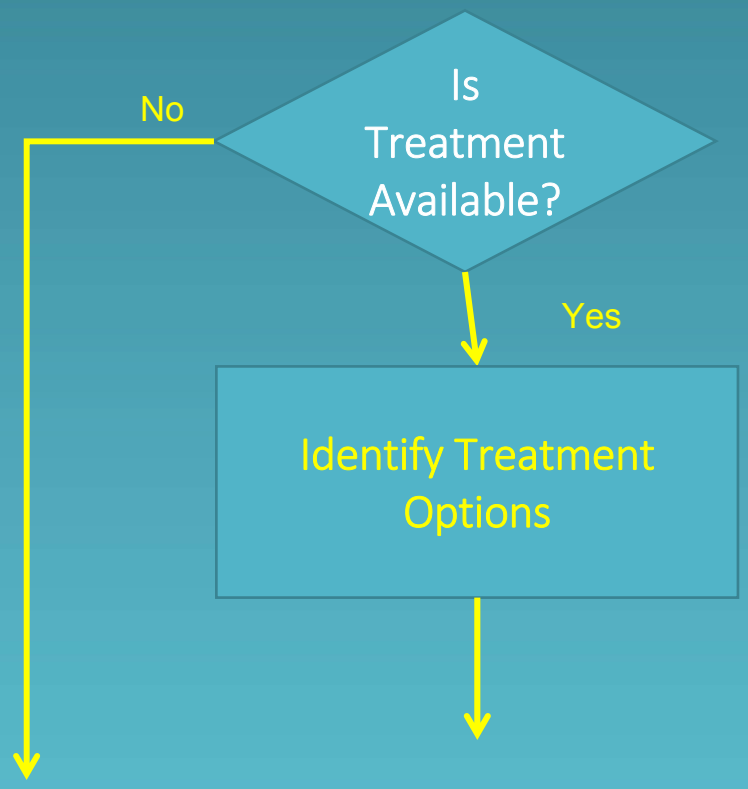
Biotic – infectious/living	Abiotic – non-living
• Fungi • Bacteria • Viruses and Viroids • Nematodes • Phytoplasmas • Parasitic Higher Plants • Insects / Arthropods • Mollusks • Weeds & Invasive Plants • Animals	• Temperature Extremes • Moisture Extremes • Soil Problems • Nutrient Deficiency or Toxicity • Wind / Air Pollution • Pesticide Toxicity • Improper Cultural Practices

Now, We Start Making Decisions



- **Obviously, if treatment isn't warranted, we are finished**
- **Also, if no treatments are available, we are in a similar boat**

Identify All Treatment Options



- **Spray**
  - **Foliar**
  - **Trunk**
- **Soil Applications**
- **Trunk Injections**

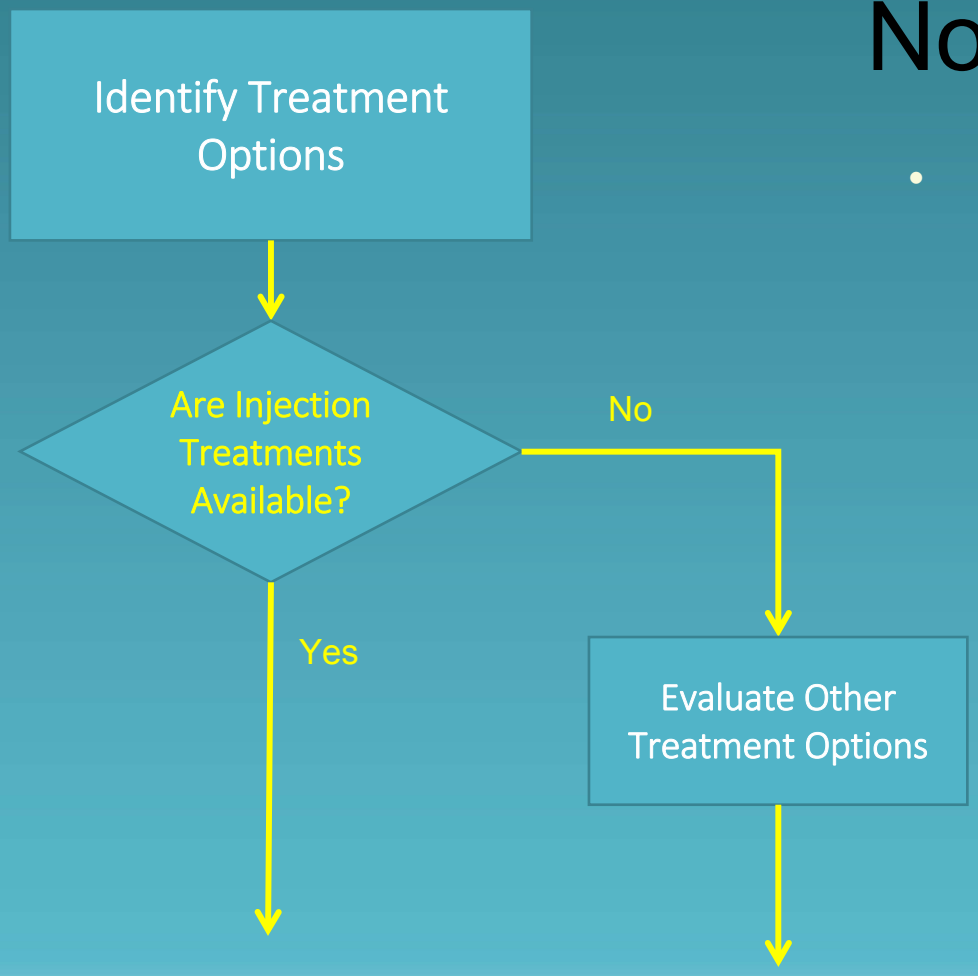
Trunk Injection

Disadvantages

1. Wounding
2. Application Time can be Slow
3. Cost of Injection Equipment
4. Some Injection Equipment can Limit Available Products
5. Pesticides still affect pollinators

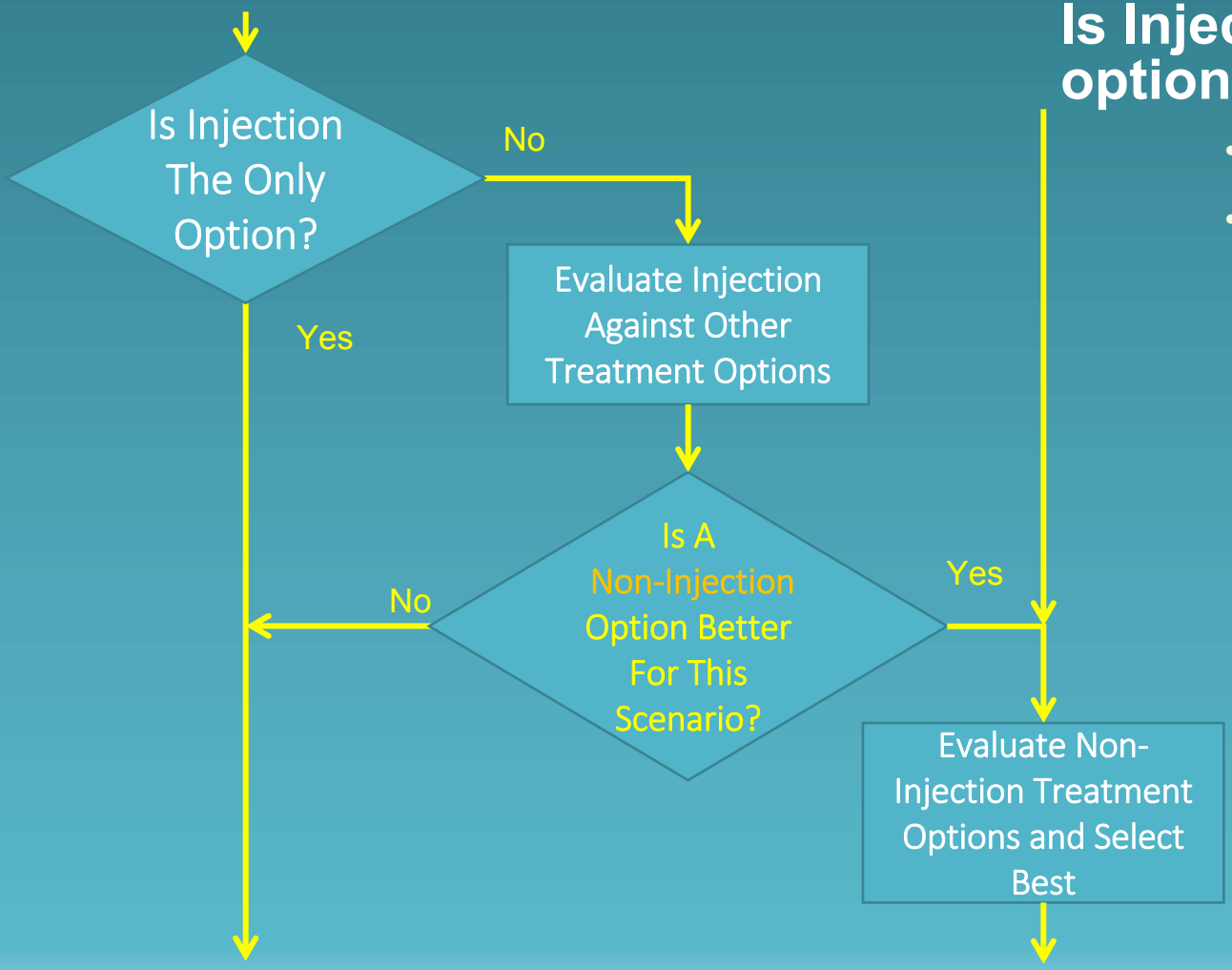
Advantages

1. Eliminate Spray Drift
2. Reduced Worker Exposure
3. Reduced Pesticide Exposure to Natural Enemies
4. May be able to Reduce Total Pesticide Load



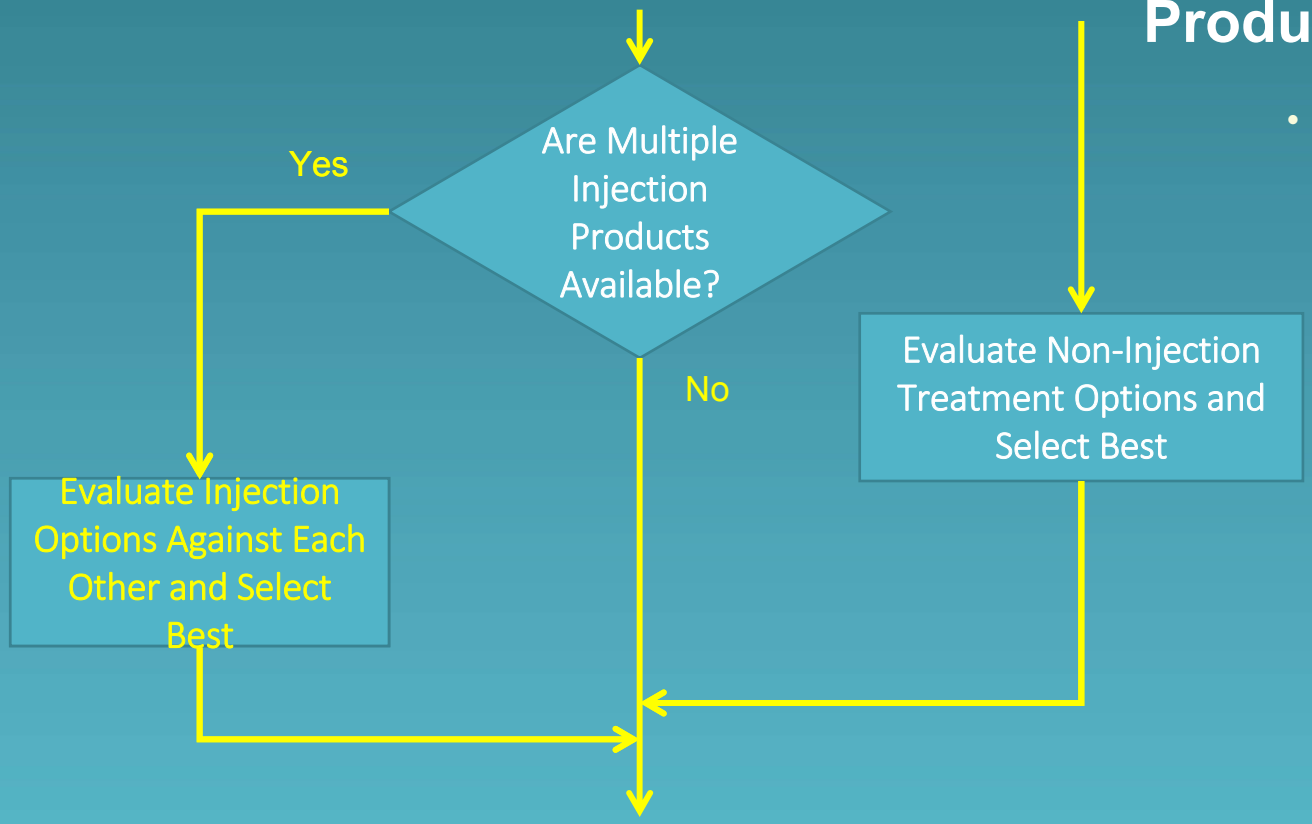
Now, More Decisions

- For this Pest/Concern, are there any injection treatments available?
  - If not, we have to evaluate the non-injection treatments we have available to us



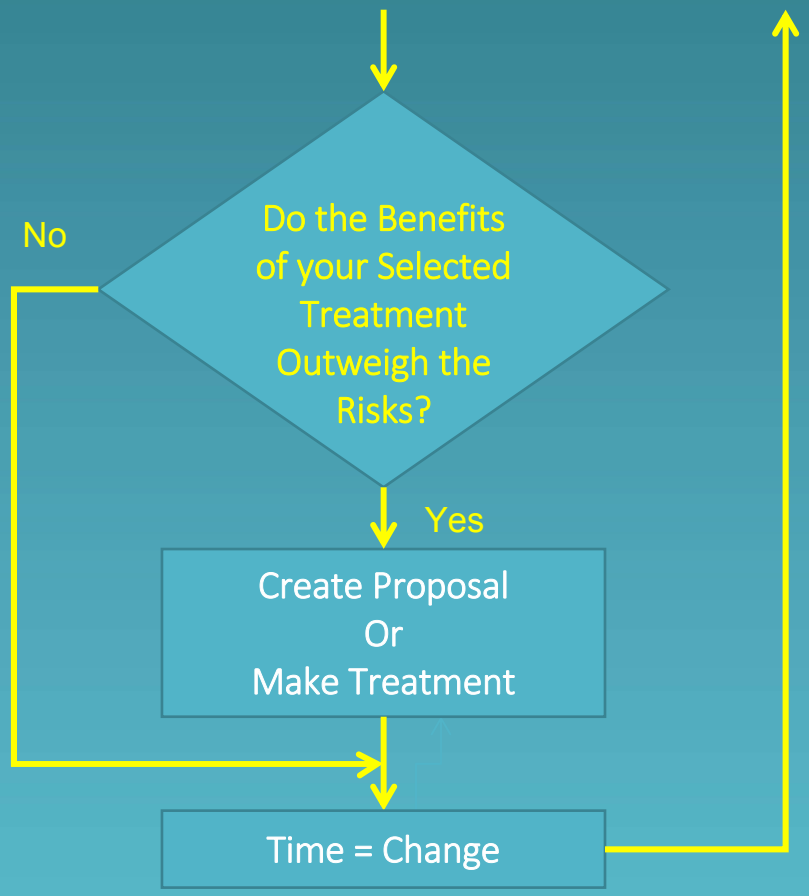
Is Injection our only option?

- **If so, we still aren't finished**
- **If other options exist, we must compare and decide**
  - **Do the non-injection options have advantages compared against the injection options?**
    - **If they do, then we are back to evaluating the non-injection techniques**



Multiple Injection Products

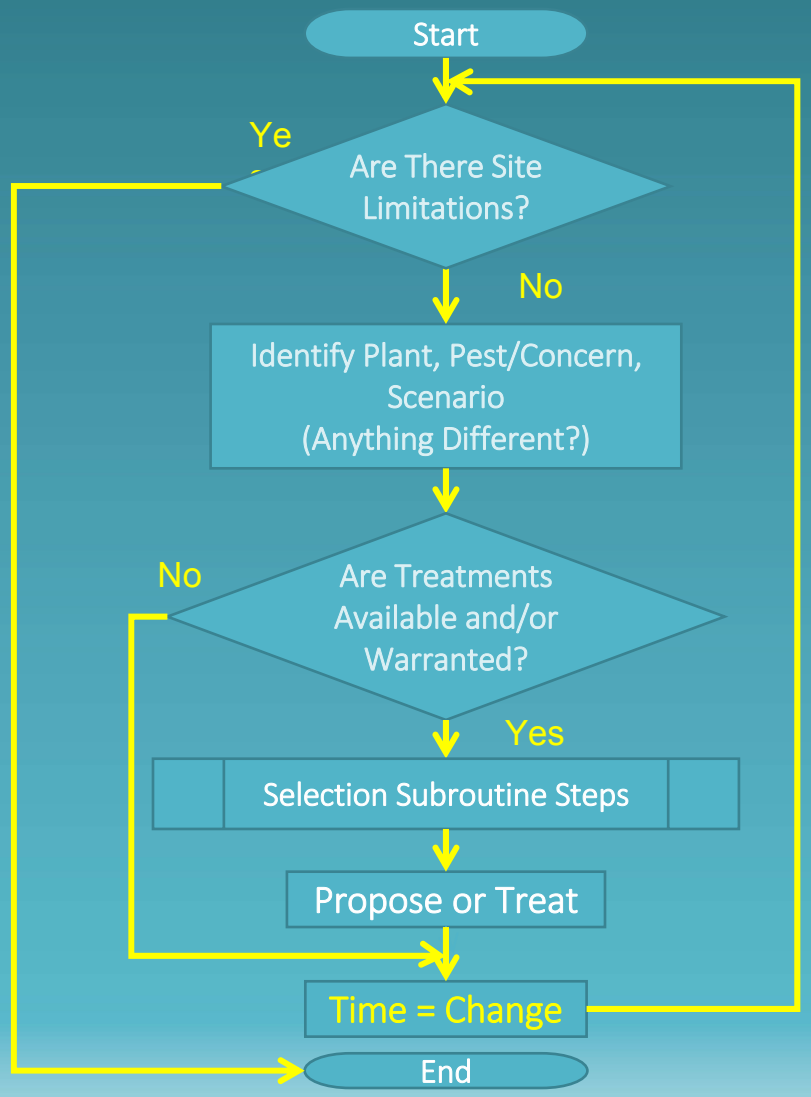
- When available, they need to be compared to decide which is best
  - Active Ingredients
  - Different Techniques
  - Cost of Implementation
  - Degree of Wounding
  - Speed of Movement



The Final Decision

Lastly, decide if the benefits of the selected treatment outweigh the risks of applying that treatment

- **If they do, propose our selection to our client or make the application if we are the decision maker**



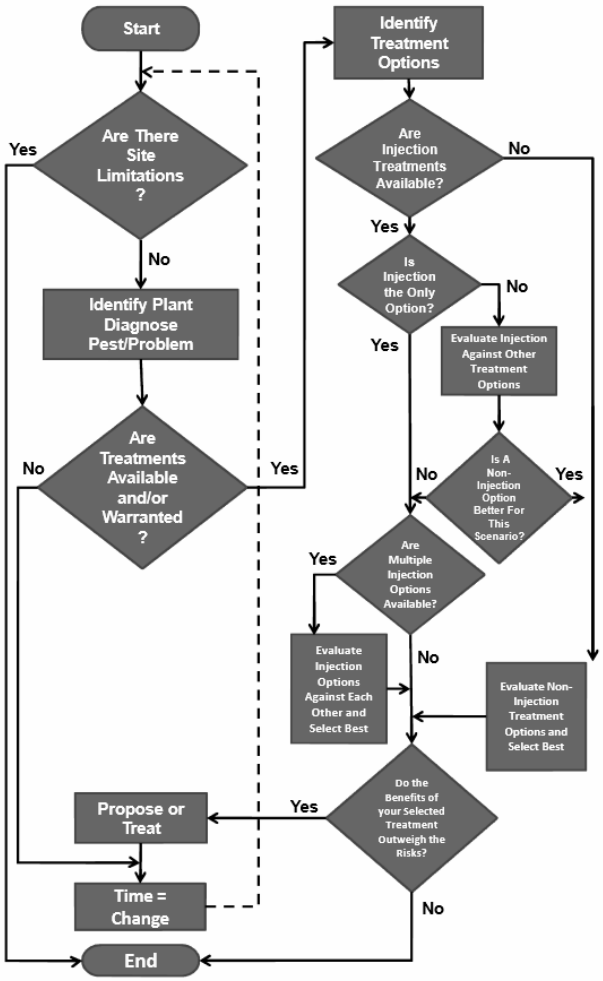
Things change…

Change may affect how a problem is managed.

- **Requires monitoring!**
- **New information/materials/techniques become available**
- **Older materials/techniques may no longer available**
- **Scope of problem has changed**
- **Client attitudes have changed**
- **Laws have changed**
- **Product failure**

A Tree "Injection" Decision Flow Chart

Rex Bastian, Ph.D. & Leonard Burkhart, Jr., Ph.D. 2014



Summary

Identify the Plant (know what is normal)

Diagnose the Problem

- Inspect for Insects (good or bad)
- Inspect for Disorder (disease or abiotic)

Determine if a Product is available to Manage Problem

Four Guiding Principles

1. Trees with basal rot/decay are not good candidates for injection
   - Is “what you are injecting for” a bigger issue?
   - Where is the material going?
2. Avoid annual injections on the same tree

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Four Guiding Principles

3. Use methods supported by peer-reviewed research published in scientific journals
   - Controls vs. treatments
   - Replicated trials
   - It's your reputation
4. Get help from the experts

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