TREE INJECTIONS SYSTEMS

USE OF INJECTION SYSTEMS FOR DELIVERING PESTICIDES AND NUTRIENTS

USES OF TREE INJECTIONS

- **Effective method for treating trees for:**
  - Vascular wilt diseases (DED, OW)
  - Phloem-feeding insects
  - Flat-headed borers (EAB)
  - Foliage-feeding insects
  - Insect-vectored diseases
  - Micronutrient deficiencies

- **Good for treating large trees**
- **Used where sprays are prohibited**
- **Compatible with client's desires**

BENEFITS OF TREE INJECTION

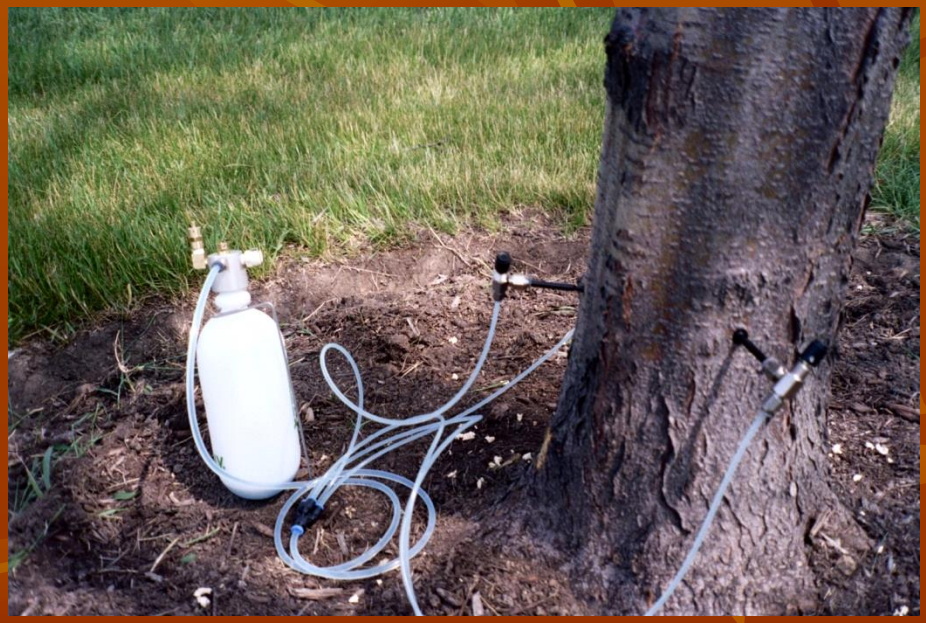
- Quicker uptake of product
- Less exposure to applicator and environment
- Better distribution of product
- Greater treatment window

DISADVANTAGES OF TREE INJECTION

- Requires wounding the tree
- Dry soils can limit uptake
- Lack of transpirational pull can slow down or limit uptake

DISADVANTAGES OF TREE INJECTION

- Within tree distribution may vary by species
- Can be time consuming
- Requires monitoring



TYPES OF TREE INJECTIONS

- **MACRO-INJECTION**
  - Deliver large volumes (i.e. quarts or gallons)
  - Use multiple injection ports from a common source
  - Pressurized by pumps/compressed gas canisters

- **Advantages**
  - High volumes can be injected
  - Helpful for large trees
  - Helps reduce vascular tissue damage with high concentrations

MACRO-INJECTION

- **Disadvantages**
  - May give uneven distribution within the tree
  - Uneven distribution may result in chlorotic areas, less growth regulation, or variable insect and/or disease control
  - Not appropriate for injection of undiluted materials

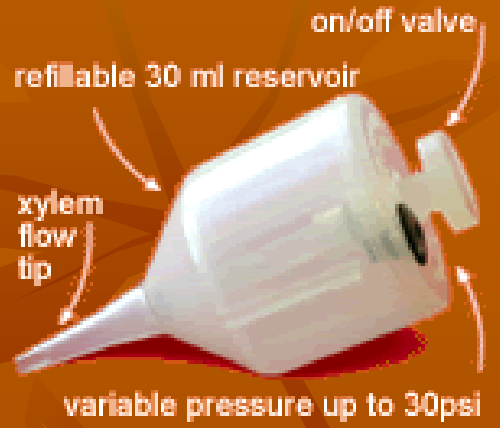
USES OF MACRO-INJECTION

- Dutch elm disease (DED)

- Oak wilt
- Foliar diseases
- Chlorosis

MICRO-INJECTION

- Small volumes (i.e. ml. or oz.) for delivery directly into xylem
- Preferred method for concentrated materials with low phytotoxicity
- Allows for resetting micro-injectors
- **Equipment includes:**
  - **Capsule injectors** (single-use prefills or re-usuables)
  - Injection system with multiple ports
  - Pumps/compressed gas container



MICRO-INJECTION

USING MICRO-INJECTION

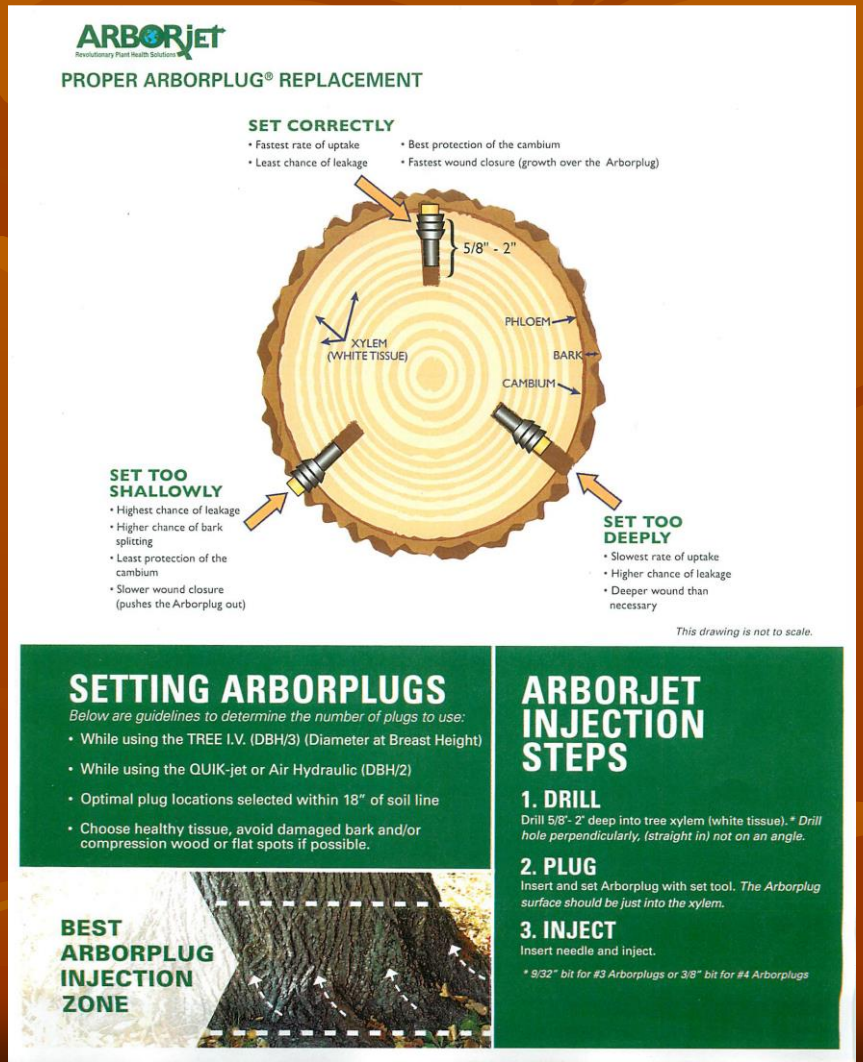
- Closed system of treatment for delivering nutrients or pesticides directly into plant vascular system

- Curative or therapeutic

- Involves drilling 11/64 inch holes into tree's root flare and inserting nozzle of plastic or metal unit fill with injection material

SETTING UP A MICRO-INJECTION SYSTEM

- **Determine DBH** of tree to be treated
- **Divide DBH by 2** and place injection sites about **6 inches apart** equally spaced around the root flare area
- **Avoid damaged areas, included bark, diseased areas**



USES OF MICRO-INJECTION IN PHC

- **Leaf feeding insects:** Japanese beetle, leafminers, leaf beetles

- **Sap feeding insects:** plant bugs, aphids, leafhoppers, mites

- **Wood-boring insects:** emerald ash borer

INFUSION IMPLANTS AND CAMBIAL ZONE INJECTIONS

- **Tree infusion** can be done with either macro-injection or micro-injection with low or no pressure with material transported via sap flow
- **Implants** are dry materials (i.e. pills, powders, tablets that are inserted into a drill hole in sapwood

INFUSION IMPLANTS AND CAMBIAL ZONE INJECTIONS

- **Cambial zone injectors** are unique micro-injection application using a blunt hypodermic-type needle pressed through the bark and into the sapwood

SOIL DRENCHES AND INJECTION

- Basal soil drenches for pesticides and nutrients
- Soil injection for pesticides and nutrients

BASAL TRUNK SPRAYS

- Spray is applied to the trunk and allowed to soak through the bar
- Used for wood-boring insects (i.e. EAB)

APPLICATION CONSIDERATIONS

- **Tree Species**
  - **Ring-porous** species (i.e. ash, oak)
  - Have large early-wood xylem vessels
  - Faster uptake
  - **Diffuse porous** species (i.e. maple, birch)
  - Sap flow is fastest in outer most xylem (most recent growth rings)
  - Conifers – uptake is slower due to smaller diameter **tracheids**, resin flow plugging up injection sites
- Residual activity
- Application timing (most important!)

APPLICATION CONSIDERATIONS

- **Tree phenology:** most products applied in spring/summer
- **Pest biology**
- **Environment factors:** soil water, temperature, light, humidity,wind
  - **Temperate zones** temperatures below 50F or higher than 90F will reduce sap flow
  - **Transpiration greatest:** soil moisture, clear sky, moderate temperatures, low humidity, light breeze
- **Overall tree health**
- **Treatment formulations**
  - Water-based products are easier to inject

APPLICATION CONSIDERATIONS

- **Properly measure tree DBH**
- **Know the pH of your water supply**
- **Properly locate and install injection sites**
  - **Macro-infusion:** 1 site per 0.5 in. of DBH
  - **Micro-infusion:** 1 site per 4 to 6 in. of DBH
  - Evenly spaced around tree in root flares, if possible
  - Select healthy tissue and avoid cankered or decayed areas
- **Use the correct pressure and do not over pressurize the system**

PROPER (L) VS. IMPROPER (R) PLUG PLAGEMENT

SUMMARY

- Types of tree injection systems
- Advantages of tree injection
- Disadvantages of tree injection
- Macro-injection
- Micro-injection and micro-infusion
- Soil injection and soil drenches
- Basal bark sprays
- Uses of tree injection

END OF PRESENTATION