Objectives for Using Herbicides

- Site Preparation
- Woody Release
- Herbaceous Release
- Mid-Rotation Release
- Right-of-Way Maintenance

How they Control the Vegetation

- Kills top and roots – adsorption to reduce sprouting
- Adsorption
- Applied to soil
- Hormone-like herbicide

Mechanism

- Adsorption
- Resorption
Timing of Application

- Stage of Plant Development
- Condition of Leaves
- Growth Stage
- Soil Moisture

Selectivity

Why some species are affected or Not

- Differential Wetting
- Biochemical Differences
- Phenological Differences
- Timing

Chemical Techniques

- Foliar Spray
- Basal Spray
- Stump Spray
- Soil Applied
- Girdling & Injection
History

- Registered in about all crops and uses
- Cheap
- Agent Orange
- Dioxin
- Ban about 1980

The best thing to happen was to ban it for forestry.

Effectiveness

- Technique
- Timing
- Cost
- Biological
- Economic

Crop Safety

- Acceptable Damage
- Mechanical Methods Do Damage Trees

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On-Site Impacts
- Non-Target Organism
- Soil Health
- Ecosystem Recovery

Off-Site Impacts
- Drift
- Leaching
- Runoff
- Landscape Impacts

Measuring and Evaluation
- When to apply?
- Was the treatment applied correctly?
- Was the treatment a success?
- What were the other impacts?
Use of Chemicals

Most problem with pesticides arise from two categories of ignorance about their chemistry and biological effects. One form is hysteria on the part of the public, and the other is heedlessness or stupidity of complacent users. Education is the best solution to both problems. The public is not required to educate itself, but users are.


How to Apply Herbicides

- Helicopter
- Ground Equipment
  - Tractor
  - Skidder
  - Backpack
- Directed spray
- Bands or circles
- Bark application
- Basal spray and thinline
- Oil based
- Spot gun
Helicopter Nozzles

- TVB – Thru the Valve Boom
- Microfoil Boom (hay rake)
- Conventional Boom (not for herbicides)
- Rain Drop (not for herbicides)
What do we put in the tank?

- Carrier (water or oil)
- Aqueous sprays
- Oil sprays
- Invert emulsions
- Herbicide
- Adjuvant (increases the effectiveness)
- Surfactants
- Spreader-Stickers
- Cuticle penetration
- Buffers
- Ammonium salts

Herbicides for Silviculture

- Aqueous sprays
- Oil sprays
- Invert emulsions

Making Prescriptions

- Define goals
- Know your crop and site
- Identify weeds
- Know research results
- Read and re-read the label
- Read and heed the MSDS
- Use correct volume and application
- Use correct adjuvants
- Follow up on efficacy
Herbicides for Pine Silviculture

**Imazapyr**
- Chopper - BASF – Ester formulation
- Arsenal AC – BASF – Amine formulation
- Imidazolinone family
- Inhibits branched amino acid synthesis
- ALS (or AHAS)
- Isoleucine, leucine, valine

**Glyphosate**
- Roundup (not registered for forestry) – Monsanto
- Accord – DowAgro
- Rodeo – Monsanto (aquatic label)
- Various generics
- Family of its own
- Inhibits aromatic amino acid synthesis
- EPSP
- Tryptophan, tyrosine, phenylanaline

**Triclopyr**
- Garlon 4 – DowAgro – Ester
- Garlon 3A – DowAgro – Amine
- Pyridinecarboxylic acid family
- Behaves like auxin (IAA)
- Over stimulates cell metabolism
Herbicides for Pine Silviculture

- Hexazinone - DuPont
- Velpar L - Liquid
- Velpar ULW - Granule
- Oustar (+ sulfometuron) – Soluble granules

Triazine family

Inhibits photosynthesis by blocking electron transport which leads to lipid peroxidation and cellular disintegration

Herbicides for Pine Silviculture

- Sulfometuron - DuPont
- Oust XP
- Sulfonylurea family

Inhibits branched amino acid synthesis

- ALS (or AHAS) – Acetolactate synthetase
- Isoleucine, leucine, valine

Herbicides for Pine Silviculture

- Metsulfuron - DuPont
- Escort XP
- Sulfonylurea family

Inhibits branched amino acid synthesis

- ALS (or AHAS) – Acetolactate synthetase
- Isoleucine, leucine, valine
Herbicides for Pine Silviculture

Clopyralid
- Transline – DowAgro
- Pyridinecarboxylic acid family
- Behaves like auxin (IAA)
- Over stimulates cell metabolism
- Effective only on composites and legumes

2,4-D
- Various brands (read the label)
- Phenoxyacetic acid family
- Behaves like auxin (IAA)
- Over stimulates cell metabolism

Picloram
- Tordon - Dow-Agro
- Various formulations
- Pyridinecarboxylic acid family
- Behaves like auxin (IAA)
- Over stimulates cell metabolism
- Long Residual
Herbicides for Pine Silviculture

- Surfactants
  - Entry II (ethoxylated tallow amine)
    - Original Surfactant in Roundup
    - Excellent safety on pine
    - Cannot penetrate the cuticle of pine but can penetrate hardwood
  - Used for Release
  - Timbersurf 90
  - NU-FLM-IR
  - Sun-it II (methoxylated sunflower oil)

Herbicides for Hardwood Silviculture

- Tank mixes
- Synergies
- Less of both
- Complementary control
- Rule rather than the Exception

Same as herbicides for pine

Crop herbicides for plantations

Injection and basal sprays for natural stands
Certification

- Sustainable Forest Initiative: Use registered pesticides, follow label
- Forest Stewardship Council: Willow is one of the few, approved for insect control
- No transgenics

Transgenics

- Hysteria without substance. (If you don’t like herbicides, then you will hate GMO’s!)
- The Need for Sterility. (Resurrection of a Species - American Chestnut)
- Evaluation
  - Economics
  - Ethics
  - Hazard Potential