

Herbicide Soil Reactions and the Impact of Site Factors

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Vegetation Control methods

Site-Prep & Release

- Mechanical
- Herbivory
- Fire
- **Chemical- Herbicides**

.....I am going to focus on herbicides

Vegetation Control...

- Increases site resources- Water, Nutrients, Light, & Real Estate
- Critical for seedling survival
- Aids in maximizing site productivity
- Levels of vegetation control depend on management objectives

...is efficacy dependant on site type?

Outline:

- Factors influencing herbicide movement & availability
- Benefits of vegetation control
- Control timing and intensity considerations



Movement & Persistence

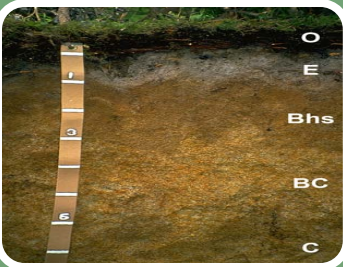


Herbicide Mobility



Organic Matter matters!

- Typically negative charged
- Lower pH means less repulsion and more bonding



Soils

- Particle Size-The greater the surface area (small particles, clay etc.) the greater the sorption
- Soil pH influences herbicide charge



Other Important Mobility Considerations...

- Water solubility of the herbicide
- Degradation rate
- Use rate, increased rate = increased risk

Herbicide Charge and Mobility

	No leaching	Possible leaching	Probable leaching
Herbicide charge	Cation	Weak Base or Non-ionic	Weak Acid

- The charge of the herbicide is very important factor
- Soil pH also influences the charge of some herbicides
- Most soils have Cation exchange
- Volcanic ash - Anion exchange

Common Herbicide Attributes

Herbicide	Mobility	Solubility (mg/L)	½ Life (days)
Glyphosate - Round-Up	Immobile	15,700	47
2, 4-D	High	900	10
Imazapyr – Chopper	Moderately	11,272	25-142
Fluroxpyr – Vista	High	4000	11-38
Metsulfuron-methyl - Escort XP, Oust Extra	High	2790	30
Sulfometuron-methyl – Oust	High	300	20-28
Picloram – Tordon	High	430	90
Triclopyr - Forestry Garlon	High	430	30
Clopyralid – Transline	High	1000	40

Mobility, Solubility & Persistence

- What does this mean?
 - Most of the listed herbicides, with a few exceptions, all have similar mobility classifications
 - Very water soluble
 - Very persistent
- What this doesn't tell us...
 - Effects from various slash loads
 - Effects from litter layer depth
 - Effects of broadcast burn
 - Effects of Volcanic ash on herbicide mobility
 - Effects of soil type

Why use Herbicides

Giving your plantations every possible advantage



Why use Herbicides?

Why:

- Growth response
- Seedling survival
- Increases growing season
- Reduced animal damage

Considerations:

- Competition Threshold
- Critical-Period Threshold



Competition & Productivity

Losses in Productivity

Height - shade at half the tree height and higher

Diameter - 20% cover within 2.1m radius of tree

Wagner and Radosevich 1991

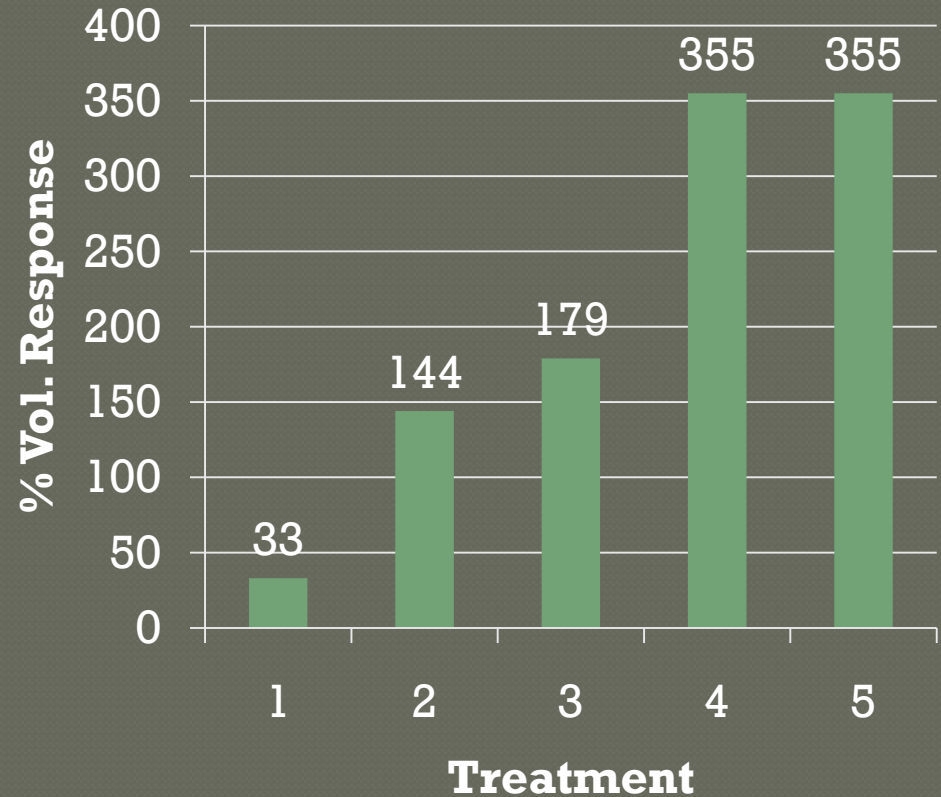
Competition & Productivity

- Maximum early growth requires vegetation control at planting
- Compensation for 1 missed year at planting = at least 2 more years of vegetation control



VMRC- Growth Response in DF Seedlings

Trt	2005 Application	2006 Application	2007 Application
1	F-SP	--	--
2	F-SP	S-R	--
3	F-SP	S-R	S-R
4	F-SP	S-R G-R	S-R
5	F-SP	S-R G-R	S-R G-R



F-SP = Fall Site Prep
S-R = Spring Release
G-R = Glyphosate Release

IFTNC Fertilizer and Herbicide Rate Trial



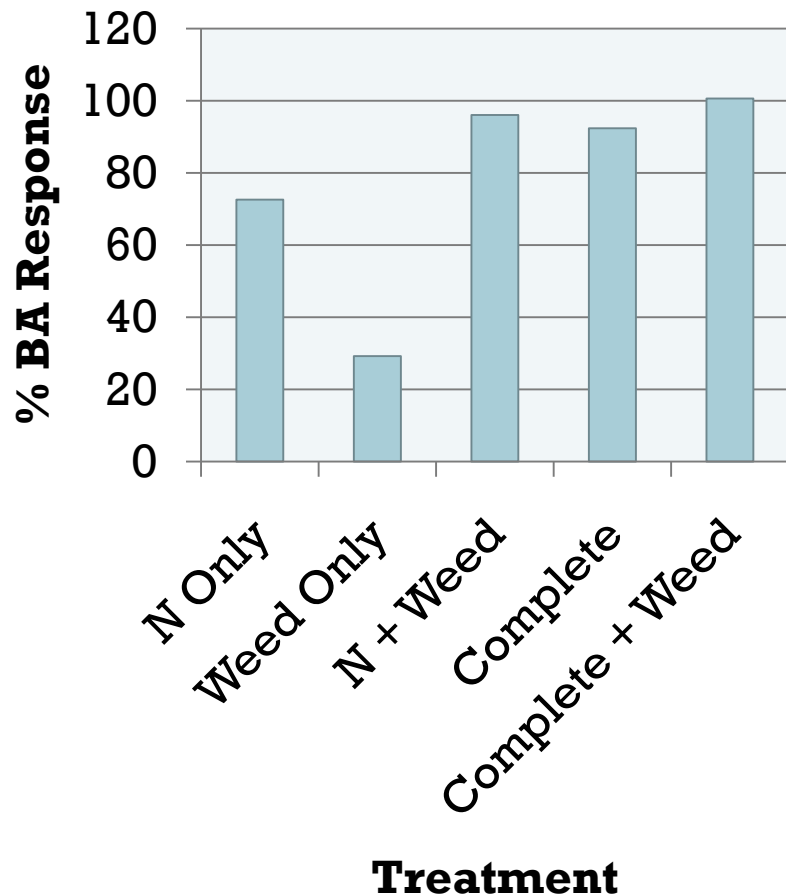
- ~15 year old Ponderosa Pine
- Treated with herbicide, fertilizer, herbicide & fertilizer, and no treatment
- Combination of Herbicide and fertilizer has additive properties

DIAMETER RESPONSE

TRT	N-RATE	WEED-RATE	% Response
1	0	0	
2	0	2	55
3	0	4	46
4	29.3	0.59	53
5	29.3	3.41	57
6	100	0	10
7	100	2	80
8	170	0.59	40
9	170	3.41	85
10	200	0	23

IFTNC Tornilla Western Larch Demo

2-year Basal Area Response



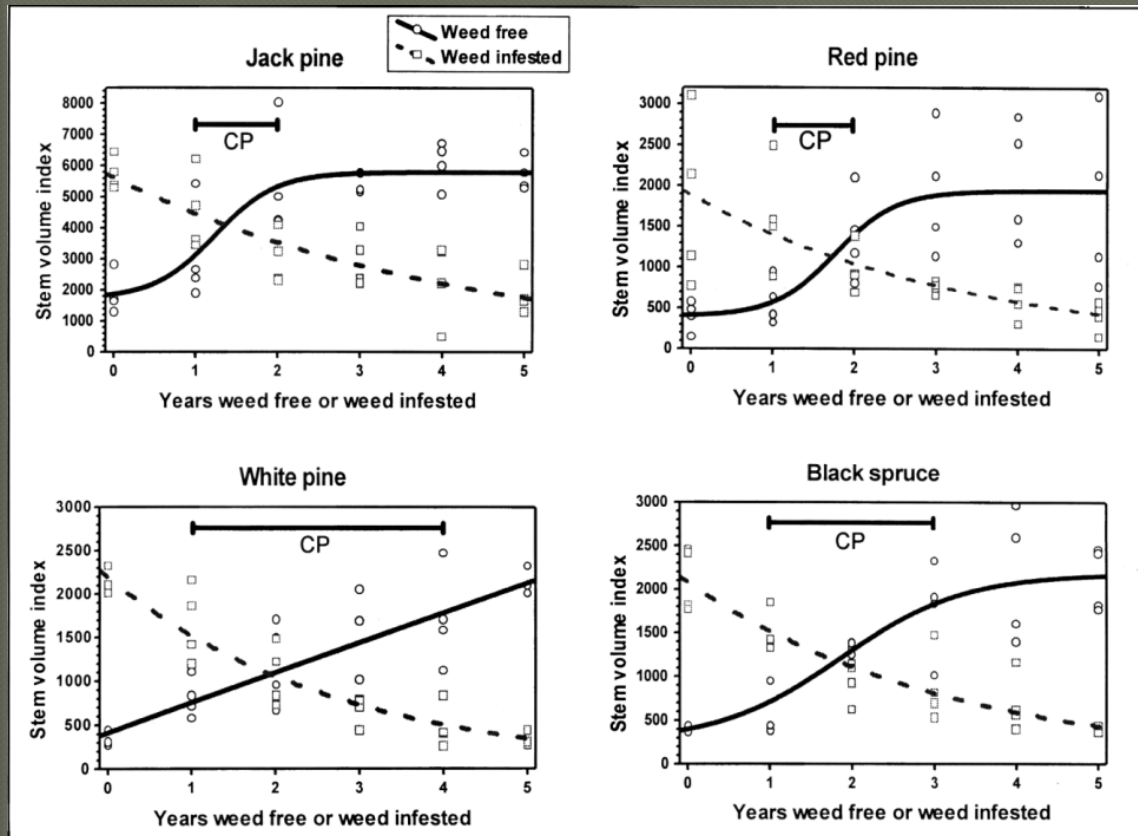
- Volcanic ash over metasedimentary parent material
- Herbicide and fertilizer produced the best response
- Highest diameter response was for N+Herb, N,K,S and B +Herb, N,K,S,B,Cu,Zn,Mg and Fe +Herb at 44%
- Poorest growth response was the Herbicide-Only, which was 12%

Things to Consider

- Competition & Critical-Period Threshold
- Herbaceous vs Woody Competition

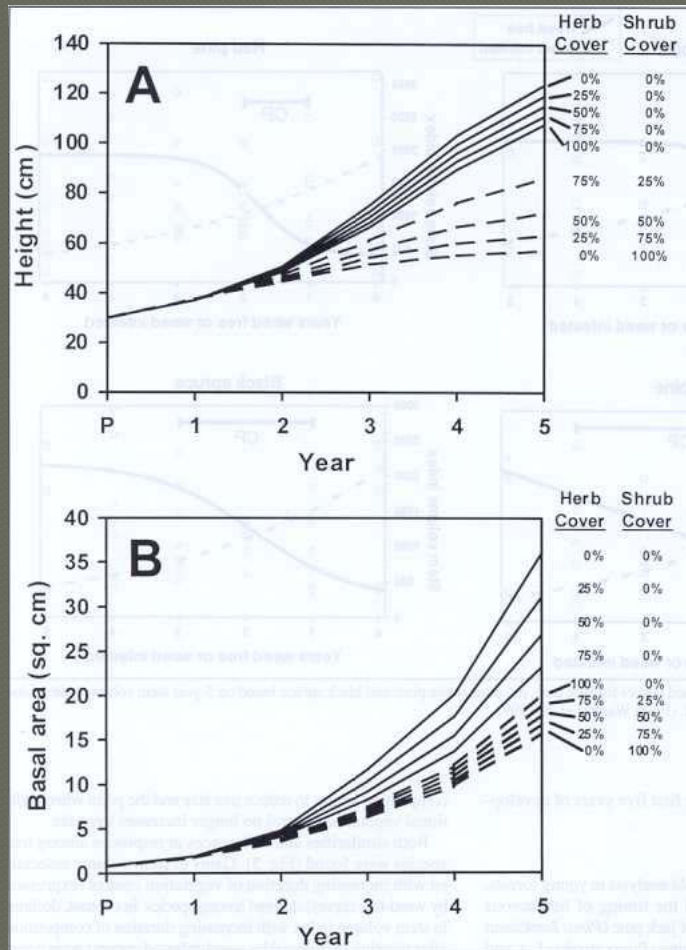


Common Critical-Period Thresholds



- Time period in which weed control must occur to prevent yield loss
- Determined by attribute desired - survival, basal area, height...

Common Competition Thresholds



- Level of veg. where an abrupt increase or decrease in the rate-of-change in tree growth or survival appears
- Influence of shrub and herbaceous vegetation cover on 5-year height (A) and basal area (B) of Douglas-fir

Woody vs Herbaceous Competition

- 20-30% of site productivity achieved through woody species control
- 70-80% achieved by controlling the remaining herbaceous cover.
- 20% cover affects Douglas-fir productivity (usually herbaceous)
- Seedling height affected when cover is 120% of seedling height (usually woody)

Management Implications...

- Site type modifies herbicides effectiveness, availability and movement
- Herbicides are important treatments Intensive & Intermediate Silviculture
- Threshold guidelines that help managers determine timing & intensity of treatments
- Increases site resources
- We can increase productivity in the “Eastside”, and veg. control is a key component that should be a priority

What we want to know

- Can we accurately predict herbicide movement and effectiveness by site type?
- How does management activities (whole tree vs bole only, broadcast burn, thinning, etc) effect herbicides?
- What Herbicide and rates are best for common species by site type for release and site prep.?
- What are the “Critical-period thresholds” & “Competition thresholds” for common species by site type?
- Can a geospatial map be developed to guide herbicide uses by site type?

References

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