Environmental Impacts of Non-Herbicidal Vegetation Management

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Presented by Louanne Brooks

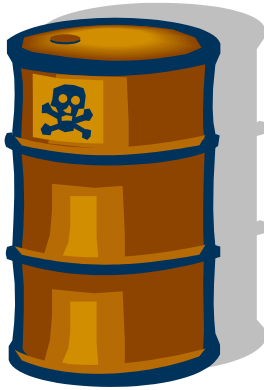
- Looking back over human history, *rationality* has been the anomaly. Being rational takes work, education, and a sober determination to avoid making hasty inferences, even when they appear to make perfect sense. Much like infectious diseases themselves — beaten back by decades of effort to vaccinate the populace — the irrational lingers just below the surface, waiting for us to let down our guard.
- Science loses ground to pseudo-science because the latter seems to offer more comfort. “A great many of these belief systems address real human needs that are not being met by our society,”

Herbicidal Methods

- Environmental impacts studied scientifically for 50 years showing positive impacts from herbicide use
- Herbicides are industry standards
- Excellent data and PR efforts have been put together demonstrating the benefits of using herbicides
- Presumed negative impacts of herbicides covered in popular press, internet pages, blogs, and other channels
- The utility industry continues to have “Non-Chemical” alternatives pushed on us

Non-Chemical Methods

- “Non-Chemical” or “without harmful chemicals” are the terms used by proponents of these methods
- Crosses over into “organic” methods
- <u>Suggested to be used by:</u>
  - Neighbors
  - Anti- Activists
  - Concerned Management
  - Natural or Green Proponents



Integrated Vegetation Management

- A system in which undesirable vegetation is identified, action thresholds are considered, and all possible control options are evaluated……..Choice of method is based on effectiveness, environmental impact, site, worker and public safety……..

OR

- An effective and environmentally sensitive approach to weed management that uses non-toxics and mechanical removal as the first approach…. Herbicides as a last resort

Impacts Of Not Using Herbicides

- Herbicides can have negative impacts
- **AND** negative environmental consequences result from a decision not to use herbicides.
- These impacts totally ignored by many land managers and the general public.
- EIS documents dismiss these impacts without discussion

Non-Chemical Methods vs Herbicides

My research shows "non-chemical" methods:

- Use a larger volume of chemicals
- Use more dangerous chemicals
- Expose people to more dangerous chemicals
- Have potentially greater environmental impacts
- Have lower worker safety records

- **Non-Herbicidal chemicals are not benign and have their own impacts**

Popular Non-Chemical Methods

- Natural Herbicides, Organic Herbicides
- Plastic mulch and barriers
- Weed burners and torches
- Grazing
- Mechanical methods: tractors, mowing, plowing, chain saw
- Manual methods
- Organic Notes

Natural Herbicides

- State of New York and MA researched these, they have been proposed for use from Seattle to Maine to Arkansas.
- Common products suggested include EcoExempt HC, Burn Out II, Scythe
- Mimic natural plant based chemicals
- Little or no ecotoxicity or worker exposure data is available, they are on the exempt list established by EPA
- MSDS for these products are thin and not very informative

Natural Herbicides

- EcoExempt HC – Clove oil and phenyl propionate
- Data just on the clove oil portion of this product, most of it collected by anti-herbicide project for Marin County, CA:
- Possible carcinogen
- Highly toxic to fish
- Severe eye, respiratory, and skin irritant.
- Used at 10 to 30 gallons of product to the acre. Burn down only, no long term control.
- The active ingredients may not be obtained from plants

WHAT?

- MA suggest clove oil use near water

Natural Herbicides

- Burn Out II – Citrus Acid and Clove oil mix
- LD50 3000 mg/kg, more toxic than Accord, Milestone VM, Arsenal, Escort, Tordon, Oust, ……
- Used at 10-25 gallons per acre. Only provides burn down, no long term control.
- Citric acid is not produced by squeezing lemons, it is a bio-chemical process utilizing sulfuric acid, calcium hydroxide, and other chemicals
- No ecotoxicity data available

Natural Herbicides

- Scythe is an organic herbicide made of pelargonic acid, which naturally occurs in many plants.
- Dow AgroSciences makes Scythe
- Raw materials include anhydrous butyl alcohol, sodium, ethyl malonate, heptyl bromide, potassium hydroxide, and hydrochloric acid
- You can't just squeeze the plants and have it drain out!
- Rainforest botanicals, anyone?

Natural Herbicides

- **<u>U. Mass Transportation Center Study</u>**:

- Natural Herbicides, Citric Acid, Acetic Acid, Clove Oil, Scythe®, etc = **$360 to $2400 per mile**
- Glyphosate = **$20 per mile**
- **Commerce/Work Needed to Pay Taxes**
- **This is an ENVIRONMENTAL IMPACT**

Natural Herbicides

- “Natural Herbicide”
  - Hours per year per mile = 24
- Glyphosate
  - Hours per year per mile = 8

Plastic Barriers

- Polyethylene barriers and permeable plastic weed mats
- Placed on the soil or over vegetation to stop weeds from germinating or kill vegetation
- Often recommended for for invasive species like kudzu. 2 years of use can give 90% control.

Recommended in sub-stations Structures, etc.

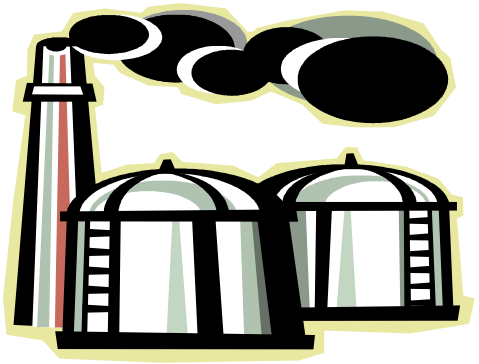
Plastic Mulch

Proponents of its use give these negatives:

- Non-selective, controls all vegetation
- Mosquitoes breed in rainwater puddles on sheets

- Research shows: can raise soil temperatures by 10^{O} C or more, resulting in potentially negative effects on soil flora and fauna

Plastic Mulch



- 1328 POUNDS of 6 mil polyethylene needed to cover one acre: $2000/acre
- Oil and natural gas are the raw materials Greenhouse gases released in manufacture
- More than 200 degradation products: alkanes, alkenes, ketones, aldehydes, alcohols, carboxylic acid, keto-acids, dicarboxylic acids, lactones … whose impacts have not been studied.

FACT: 14 ounces of Milestone VM herbicide gives a similar or better level of control of kudzu.

Plastic Mulch Paradox

- Plastic mulch used by organic growers who dislike big chemical companies
- Containers of plastic weed cloth in Wal-Mart feature big letters, “non-chemical weed control”
- USDA has even researched plastic mulch in farming uses under the category non-chemical
- Polyethylene and other plastics made by Dow Chemical and other chemical giants

FACT: Polyethylene is clearly a chemical method with environmental impacts that should be considered.

Weed Burners and Torches

Weed Dragon advertising text:

- Weed Dragon 100,000 BTU Weed Burner
- Environmentally safe way to eliminate weeds
- No chemicals (???)
- No dangerous threats to our environment

- Recommended for brush control all over the country, substation weed control in Seattle and others

Weed Burners and Torches

- Uses a flammable, explosive chemical: propane
- Burning vegetation produces greenhouse gases
- Danger of personal injury and property damage. Substations????
- Pounds of propane per acre use higher than herbicide
- Propane contains radioactive compounds including radon, lead, polonium, and bismuth
- Heat damages soil flora and fauna?
- Wildfire? Smoke?

Propane Properties from MSDS

- 1.2% concentration in air = LC50
- MSDS:
  - health hazard high
  - flammability extreme
- MSDS text ….Cancer, target organs, developmental hazards – inadequate data to evaluate the cancer hazard

FACT: Propane burners are clearly a chemical form of weed control with environmental impacts that should be considered

Propane Use for Barberry Control

"Foliar spraying is definitely quicker than torches as we covered 2.7 acres today using 26 oz/acre of glyphosate and 3 hr/acre (rough, rocky terrain). It would have taken 6 hr/acre and 24 lbs/acre of propane to do the same work."

Jeff Ward, Dept of Forestry and Horticulture, The Connecticut Agricultural Experiment Station

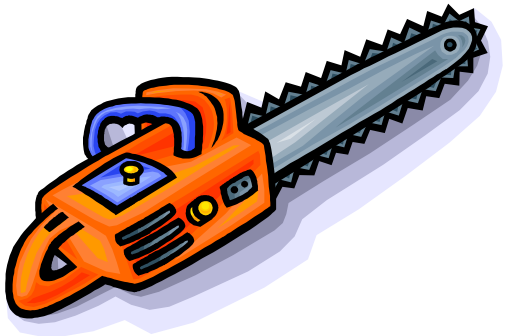
Grazing

Hair Sheep During First Pass 300 per Acre

Mechanical Methods

All mechanical methods utilize fuel and lubricating oils, and some use hydraulic fluids

- Mowing
- Bulldozing, other heavy equipment clearing, raking, shearing
- Mulching machines
- Chain saw and other hand-held mechanical saws



WARNING

NO SMOKING STOP MOTOR

Smoking and running engines can ignite a spark. To reduce the risk of fire, extinguish all smoking materials and turn off engine before fueling process.

ALWAYS extinguish cigarettes before getting out of your car.

NEVER leave engine running during fueling process.

Electrical Discharge Warning

Cellular phones, pagers and personal electronic devices may cause electrical discharge. Do not use while fueling.

NEVER use electronic devices during fueling process.

NEVER allow children to use pump. Only persons of licensed age should use pump. Keep children away from pump area. Do not allow children under licensed age to use the fuel dispenser.

HEALTH WARNINGS

- Gasoline is harmful or fatal if swallowed.
- Long-term exposure to vapors has caused cancer in laboratory animals.
- Avoid prolonged breathing of vapors.
- Keep face away from nozzle and gas tank.
- Keep away from eyes and skin.
- Never siphon by mouth.
- For use as a motor fuel only.

Static Electric Spark Explosion Hazard

A static electric spark can occur when filling portable containers sitting on truck bed liners or on any vehicle's carpeting or floor matting. This spark will explosively ignite a gasoline vapor fire. SERIOUS INJURY OR DEATH COULD OCCUR. It is unlawful and dangerous to dispense gasoline into unapproved containers.

NEVER fill portable containers that are in or on vehicle.

ALWAYS place containers on ground. Keep nozzle in contact with container while filling.

BEFORE fueling, discharge any static electricity build-up by touching your bare hand to a metal surface away from the nozzle.

DO NOT re-enter your vehicle while gasoline is pumping. Re-entry could cause static electricity build-up.

DO NOT OVERFILL TANK OR PORTABLE CONTAINER.

Hold-Open Latch Warning

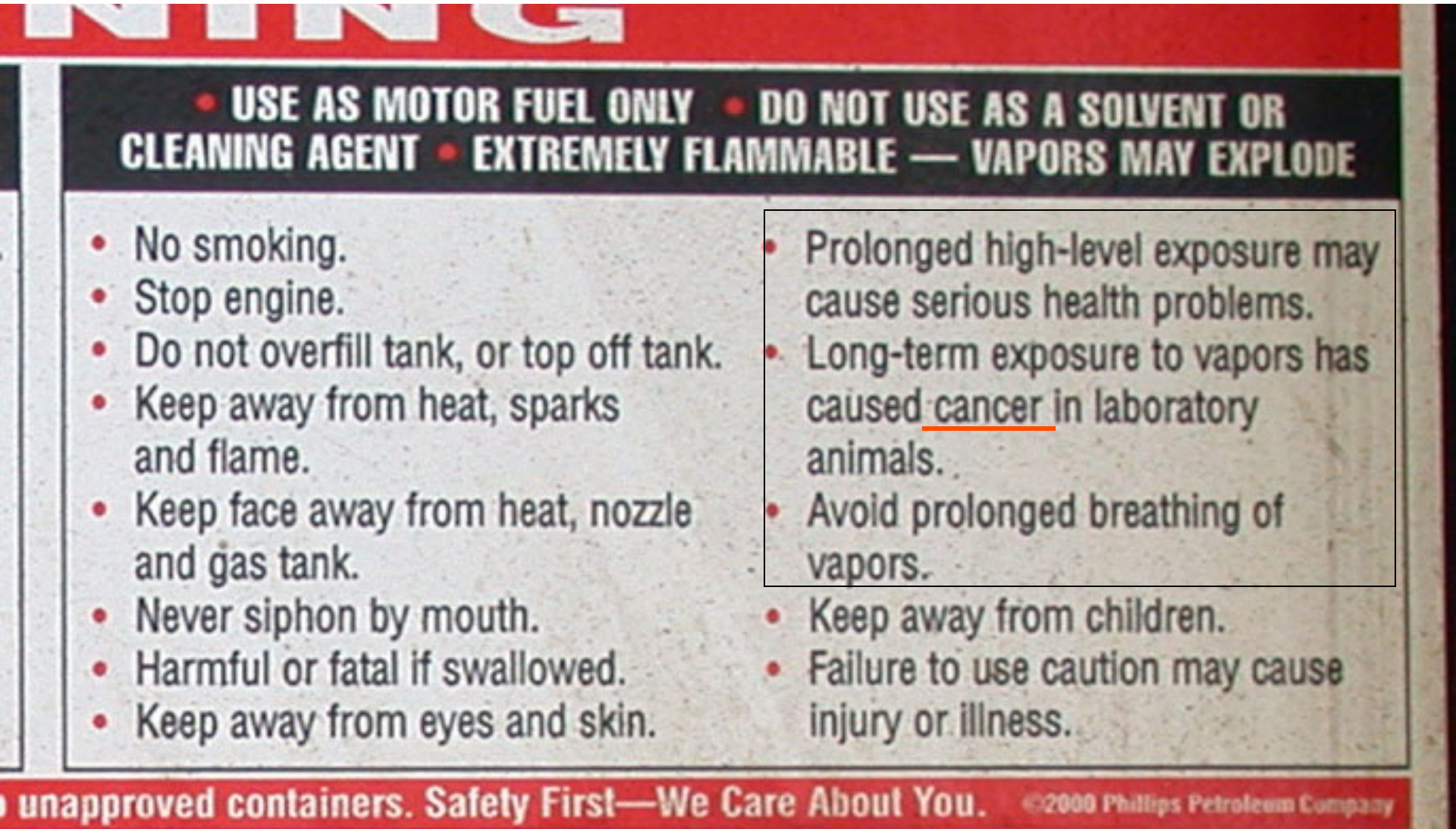
Persons using dispensers with hold-open latches must remain at the refueling point during fueling process.

NEVER leave refueling area when using dispensers with hold-open latches.

IN CASE OF FIRE

- DO NOT REMOVE NOZZLE FROM VEHICLE.
- Evacuate all passengers from the vehicle and refueling area.
- Activate Emergency Shutoff Switch.
- Notify attendant.
- Call 911, if no attendant is on site.

Gasoline Label



Mechanical Methods
Gasoline

- The LD50 around 635
- Mixture of up to 15 chemicals
- Cancer hazard, flammable, and contains chemicals that can damage the body and internal organs
- Gasoline ~ 2-10 times more toxic than popular industrial herbicides
- Spills extremely dangerous to fish and wildlife. Do you have a spill plan for fuel?
- Diesel less toxic than gasoline, but has many of the same drawbacks, exhaust gases

Mechanical Methods
Fuel

Swedish Board of Occupational Safety and Health study of mechanical clearing found that:

- Workers are exposed to poisonous gases and fumes from combustion of 14 liters of fuel per hectare
- Operations deposited an average of 7 liters/hectare of minimally tested fuels and lubricants unburned thru the exhaust
- Chain saw bar oils remains in the soil for up to ten years

Mowing, Utility ROW

- Mowing reduces quality of wildlife habitat compared with herbicidal methods.

  50 years of study, Bramble and Burns in Pa.

- Mass. study found better wildlife habitat on sprayed lines compared to mowed and better brush control. At one year, no herbicide residues were found in the soil, but bar oil and hydraulic fluid residues were found in the mechanically cleared areas.

  ECI & Tufts University

Mechanical Methods, Mowing

- Fuel use
- Rutting
- Soil erosion
- Destruction of animal nesting sites
- Direct death to animals

Turkey eggs on ROW

Mowing in a Wetland

- Mowing and cutting almost always the first choice here, but are more polluting and damaging


More chemical used to cut this than spray

Aerial Herbicide Application


Herbicide Treated ROW


Turtle Sushi

Mechanical Methods
Rough Turf Mowing

- Roadside and rough turf type mowing consumes .5 to 1.5 gallons gas/acre mowed
- Spray trucks can apply herbicide and growth regulators to eliminate one or two mowings using .04 to .1 gallons/per acre sprayed, depending on swath width
- Mowing uses 3.5 to 11 pounds of fuel/acre
- Spraying used .5 to 1.2 pounds of fuel, herbicide, and growth regulator per acre, with less greenhouse gas emissions

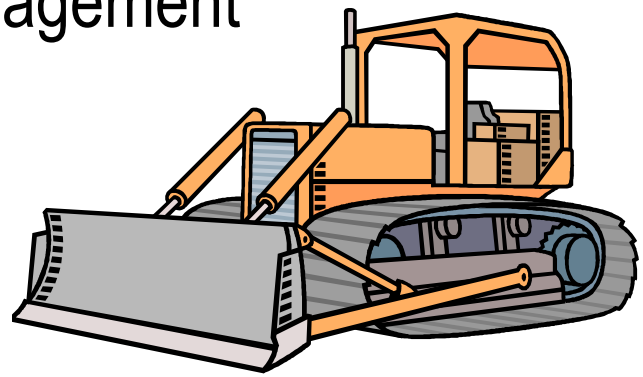
Mowing or Spraying 30 acres

	Mowing	Herbicide and Growth Regulator
Fuel	30 gallons	1 gal
Herb and Growth Reg		3 pounds
Toxicity of Chemicals Used	**Higher**	**Lower**
Greenhouse Gas Emissions	**Higher**	**Lower**
Wildlife Habit Value	**Lower**	**Higher**

Mowing on Slopes

Mechanical
Total Clearing

- Bulldozer, KG blade, shearing and piling
- 5 tons of soil/acre lost on gentle slopes in the SE, soil compaction and habitat loss.
- Fuel use is high
- Habitat loss is high
- Clearing along streams causes severe erosion
- Not generally used for vegetation management

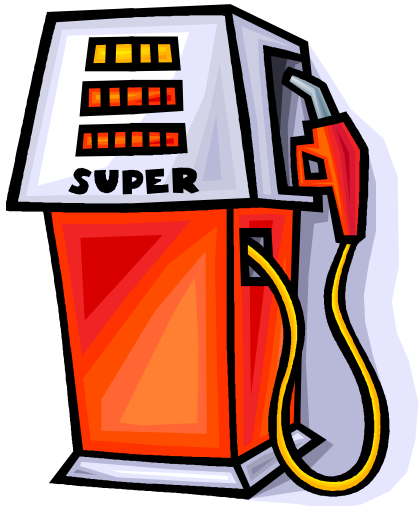


Hand and Manual Methods

- Hand pulling weeds. Hand saws, machete,
- Weed wrenches
- Hoes, shovels, etc
- Can be quite effective and environmentally sound close to home and on flat ground away from water
- Requires a large amount of time and manpower
- Useful for small areas or where there is a large, local, volunteer labor pool or money is no object

Hand and Manual Methods

- The mechanized travel needed to get labor to the treatment site uses a very large use of fuel per acre, negating any potential "environmental" benefits
- Pulling of deep rooted species around water or on steep slopes can lead to erosion and site degradation
- Disturbed soil welcomes new invaders
- Seattle City Light, one day of spraying saves 6-8 weeks of labor
- One day of kudzu pole spraying = hundreds of hours of hand cutting



Organic Methods

- People focus on insecticide reductions when thinking of organic methods
- In organic cropping, tillage treatments are often used to replace herbicides for weed control
- Biotech crops that allow greater herbicide choices are not allowed in organic systems

- Wear Organic Cotton,
  protect the environment ????

Weed Control in Organic Cotton vs Reduced Tillage Cropping

- Organic cropping replaces herbicides with tillage
- 0-3 tillages for conventional, 8 to 12 for organic cropping
- Fuel use is dramatically increased in organic cotton production vs no till or reduced till cotton
- 4.8 to 7 gals diesel for organic vs 0 to 1.8 gals diesel
- Tillage increases erosion and soil compaction. Bare tilled ground looses 12 tons soil/acre/year, 93% veg. residue cover looses 1/3 ton/acre/year.
- No-Till fields have 3 to 6 times as many earthworms

Non Chemical Weed Formula for Home

- 4 cups household vinegar or some call for bleach (37% of household poisoning of children)
- 1 cup salt
- Tablespoon of dishwasher detergent “ to make it stick to the plants” or “for bonding”
- Isn’t dishwasher detergent a mix of chemicals?
- Try planting something after use. Stick your hand in the solution for a while.
- Others include 20% acetic acid, bleach, bleach and salt, add some lemon juice here and there. Chemicals?

Non-Herbicidal Methods

- Are not benign
- Use toxic chemicals, often at high rates
- Have their own environmental impacts
- These impacts need to be considered by land managers and project planners
- The term non-chemical is inaccurate and needs to be thrown out and new terminology developed
- Education is needed to show risks from everyday chemicals

New Terminology

- The industry needs to be sure that Integrated Vegetation Management is not re-defined by anti activists
- We need to quit calling mowing, cutting, plastics, “non toxic product” solutions “Non-Chemical”.
- IVM as practiced is really Ecosystem Management to Control Plant Succession
- Non Herbicidal Methods could be termed “Chemical Intensive Greenhouse Gas Producing Unnatural Vegetation Management Causing Greater Environmental Impact” CIGGPUVMCGEI for short

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