Carpenter Ants: Canada's Answer to the Termite

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Rio Tinto Minerals

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OUTLINE

- **Introduction**
  - **Carpenter ant biology/ecology**
- **Incidence in the utility industry**
  - **Survey results of ant incidence in poles in Western Canada.**
- **Control**
  - **General control**
  - **Control in/around utility poles**
- **Conclusions**

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Importance of Ants

- **Scavengers and predators. Can help control pest insects.**
- **Soil formation and nutrient cycling. May surpass earthworm.**
- **Pollination**

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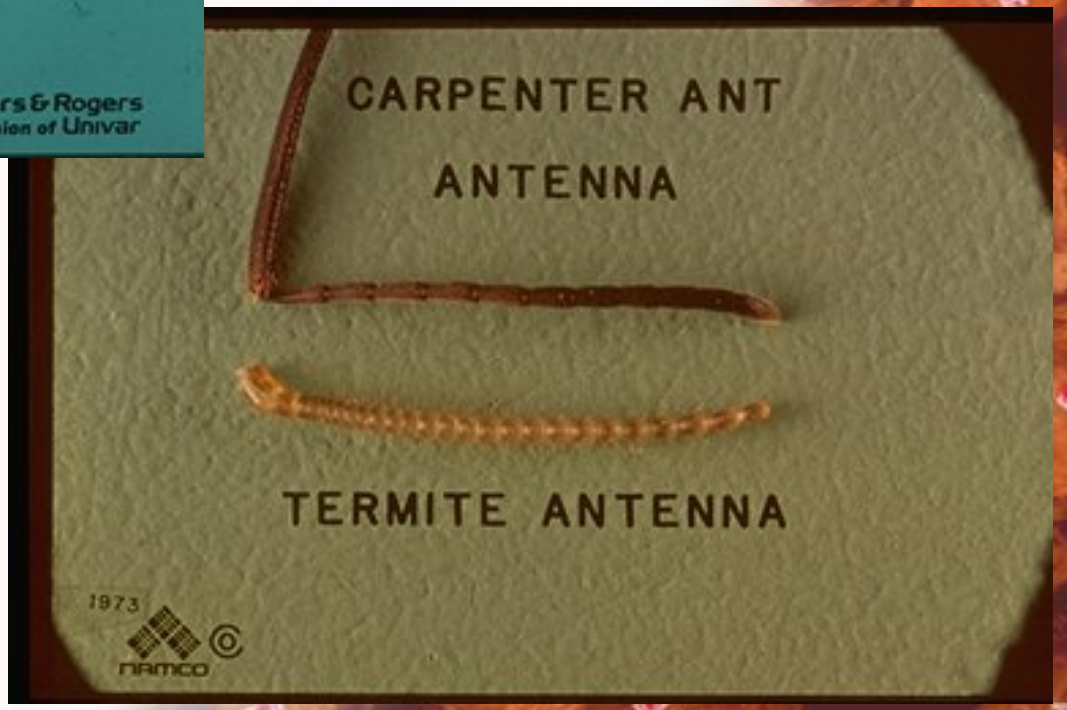
Ants - Termites

- **Termites**
  - **Straight antennae**
  - **Non-constricted abdomen**
  - **Equal wing size (Isoptera)**



- **Ants**
  - **Elbowed antennae**
  - **Constricted abdomen (waist)**
  - **Unequal wing size**

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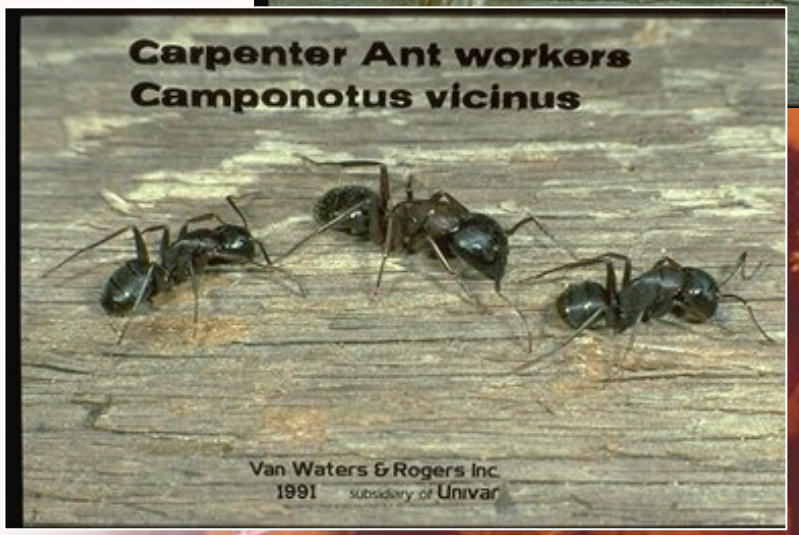
Carpenter Ants

- Genus C*amponotus*
- Can cause severe structural damage.
- Polymorphic castes after 1-2 years.
- Can have more than 100,000 workers and live 10 + years.
- Usually around 3,000-50,000 individuals after several years.
- Form parent and satellite colonies.



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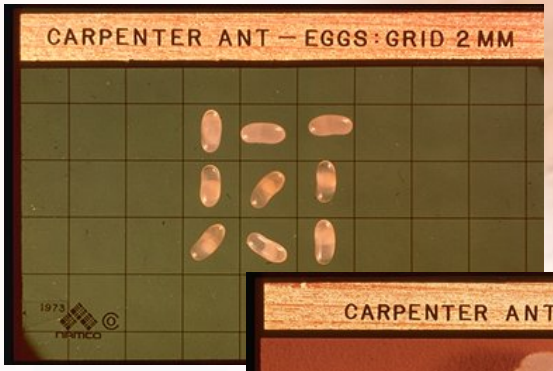
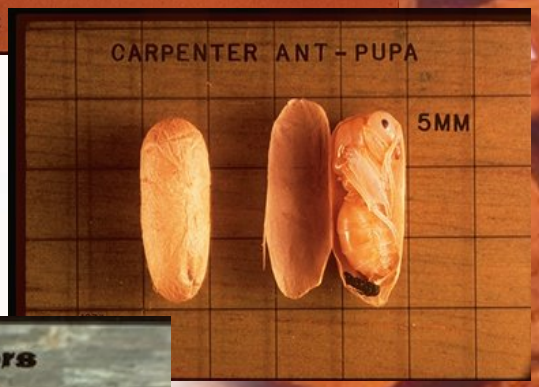
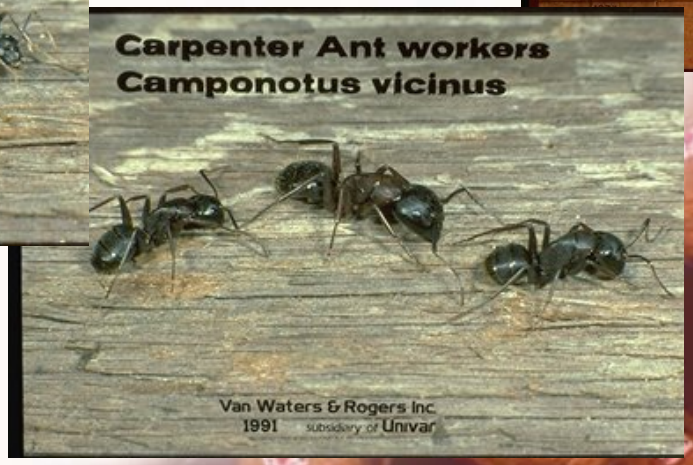
Biology: Life Cycle

- **Egg, larvae, pupae, adult.**
- **Adult worker ants perform various tasks.**
- **Workers, males, reproductive females.**







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Life Cycle

- **Reproductive flight**
- **Wingless queens search for nest (claustral colony founding).**
- **Lay eggs and produce minor workers.**
- **Larger, major, workers produced after 1-2 years.**
- **Eventually other worker types and reproductives produced.**

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Life Cycle: Larvae

- **Light colored, helpless, dependant on workers.**
- **Workers feed, groom, and transport.**
- **2-3 weeks**

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Life Cycle: Pupa

- **Pupate in cocoon**
- **2-4 weeks**
- **Emerging adults cannot free themselves.**

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Life Cycle: Workers

- Sterile females
- Most numerous caste
- Small percentage (10%) leave colony and gather food (older).
- Most stay in colony and relay food, tend brood, defend, construct.
- Live a few months to 7 years.
- Workers can be separated by age and size.
- Age:
  - Foragers: oldest
  - Nurse ants: youngest
- Size
  - Dimorphic
    - Major and Minor

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Life Cycle: Queens and Drones

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Life Cycle: Queens and Drones

Queens

- **Largest individual in a colony.**
- **Find nesting site**
- **Virgin with wings, lose wings after mating.**
- **Some colonies have one queen some many.**
  - **Monogynous**
  - **Polygynous**

Drones

- **Not long lived**
- **Die shortly after mating.**
- **Huge thorax for wing muscles. Even though most are bad fliers.**
- **Small head, Large eyes**

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Carpenter Ant Habits

Foraging

- **Central place foragers, move on trails to search for food and return it to nest. Also use trails to move brood.**
- **Form trails in straight lines in open areas, also follow structural guidelines.**
- **Seasonal, with peak foraging in summer.**
- **Heaviest activity between sunrise and sunset.**
- **Number of trails from colony varies with size and age of colony. Number and size of trails indicates health of colony.**
- **Trails important in baiting programs, killing ants on a trail will do nothing to colony.**
- **Only around 10% of colony population out on trails.**

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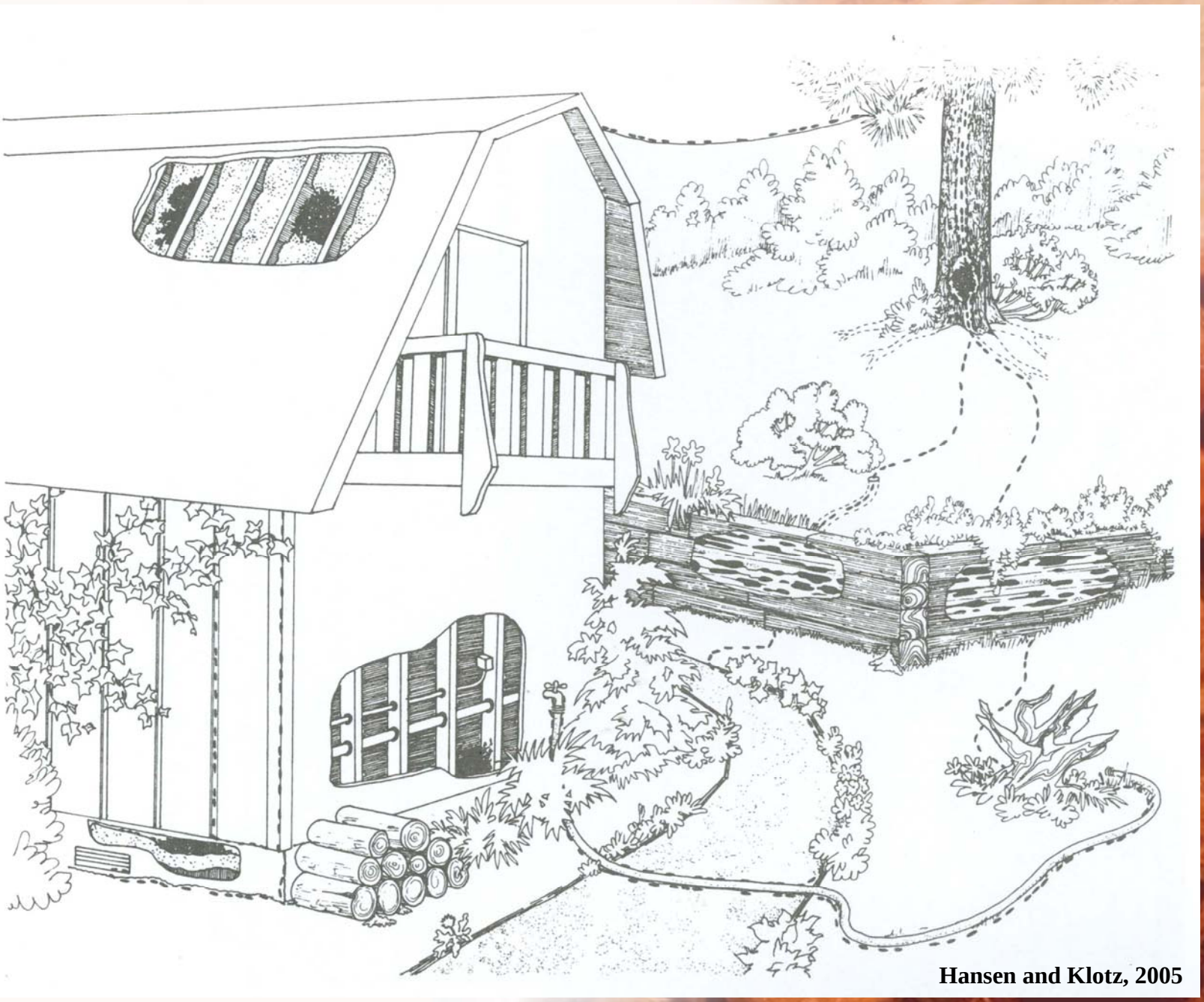

Hansen and Klotz, 2005

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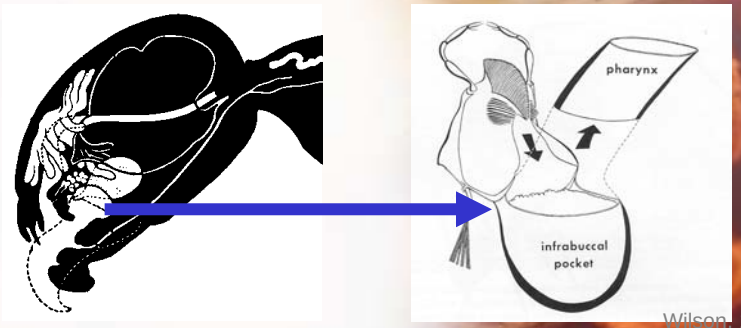
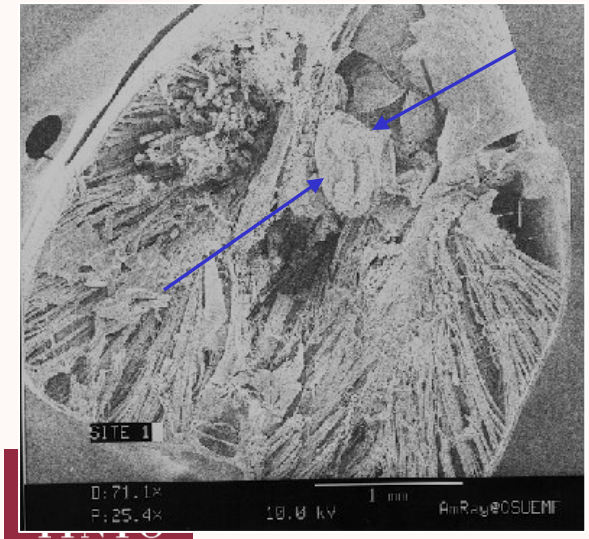
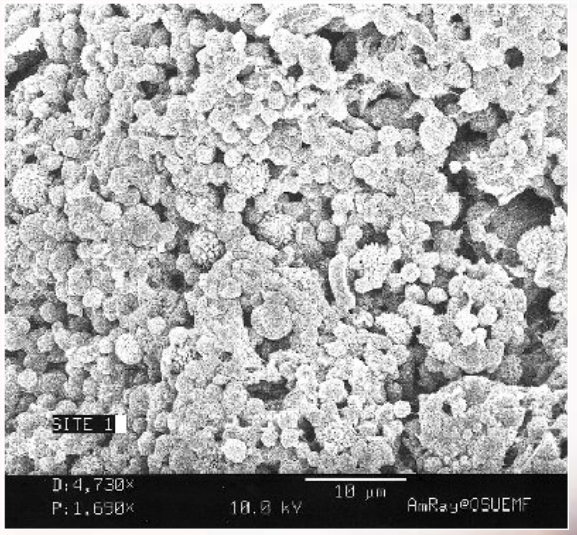
Carpenter Ant Feeding

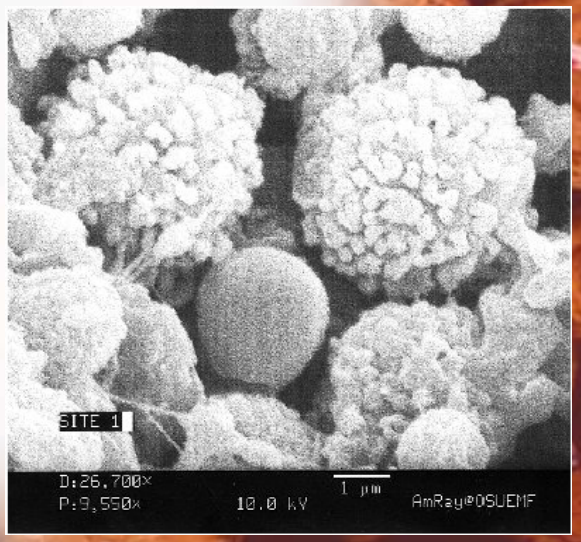
- **Workers forage for carbohydrate and protein sources.**
- **Workers cannot ingest food particles larger then 150 microns.**
- **Large particles filtered by infrabuccal pocket.**
- **Diversity of microorganisms, including yeast like cells in the infrabuccal pocket, that may affect nutrition.**



Wilson, 19







Mankowski and Morrell, 2003

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Ant Decapitating Flies

- ***Camponotus vicinus*** **colonies can be parasitized by the ant decapitating fly *Apocephalus horridus*.**

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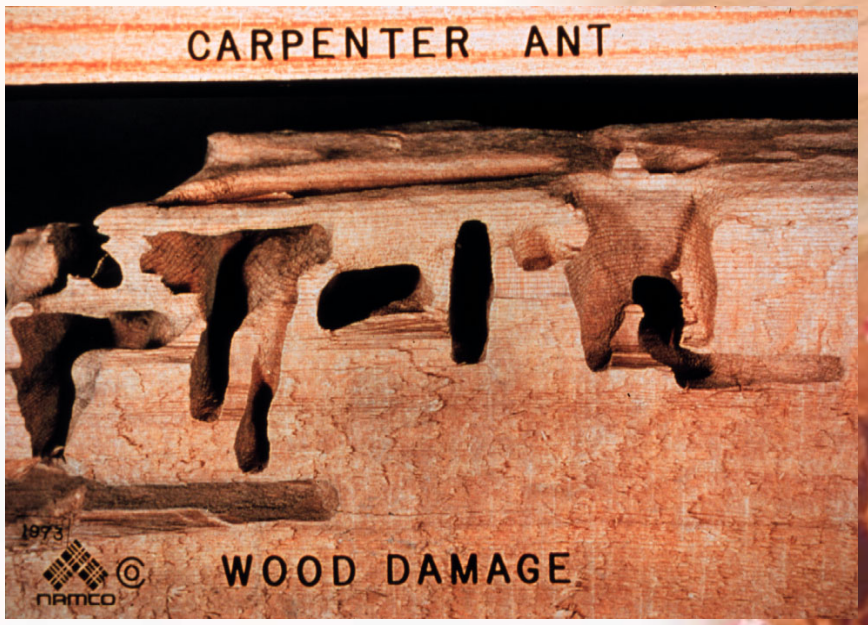
Carpenter Ant Habits

- **Some species nest in and excavate wood.**
- **Usually wood with high MC.**
- **Do not digest wood.**
- **Excavate clean, smooth, usually laminar galleries.**
- **Pile excavated material (frass) outside of nest.**
- **Feed on sugar and protein sources.**



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Carpenter Ant Species in Canada

- ***Camponotus herculeanus*** **– Throughout**
- ***Camponotus modoc*** **– British Columbia, Alberta.**
- ***Camponotus noveboracensis*** **– Throughout**
- ***Camponotus pennsylvanicus*** **– Ontario, Quebec, Maritime provinces.**
- ***Camponotus nearticus*** **– Throughout**
- ***Campontous vicinus*** **– British Columbia, Alberta, Saskatchewan.**

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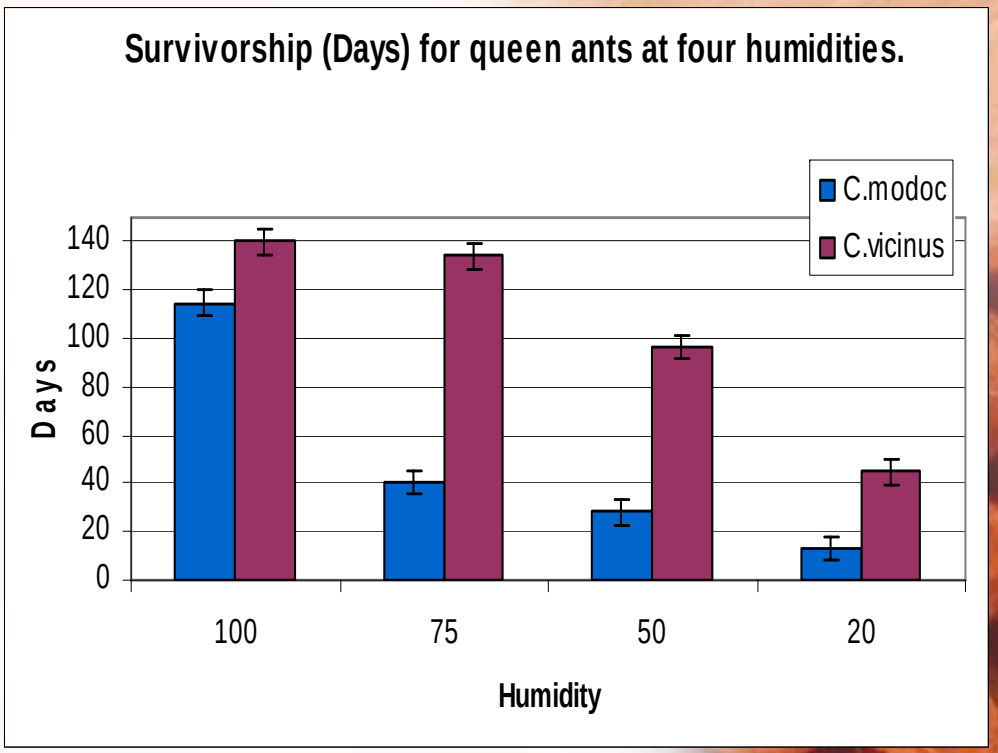
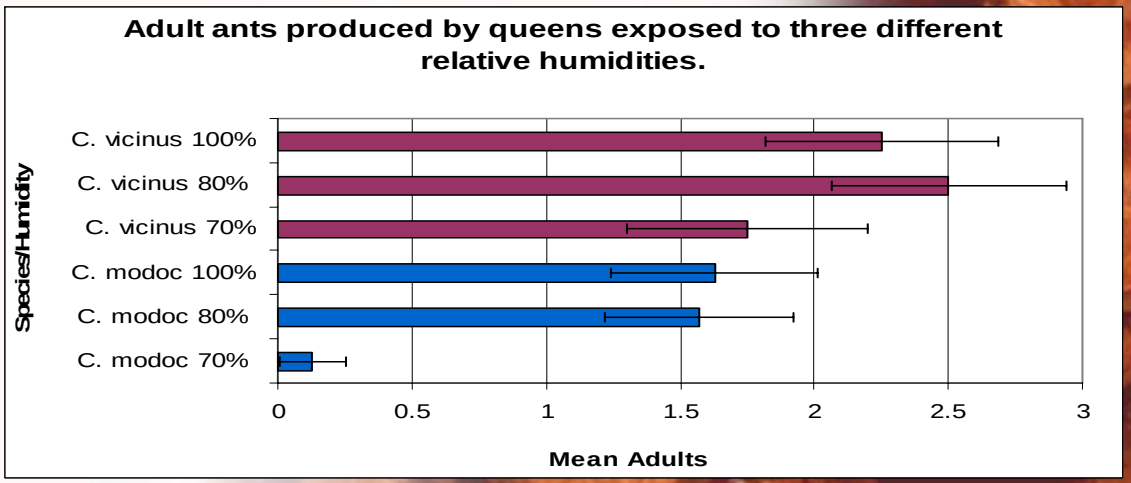
Desiccation Resistance

- ***C. vicinus*** **queens lived significantly longer than *C. modoc* queens at all four humidities.**
- ***C. modoc*** **produced significantly fewer colonies at 70% RH than at higher RHs and fewer colonies than *C. vicinus* at the same RH.**
- **No significant difference in the number of colonies produced by *C. vicinus* at the relative humidities.**





Mankowski and Morrell, 2001

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Economic Losses

- **42,000 annual control treatments in Washington; 1985. 50,000 in 1994.**
- **$100,000,000 estimated annual damage (cost of treatments).**
- **In 1982 a NE utility found 70% poles infested and cost to replace was 167,000.**
- **Another NE utility replaced 100-250 poles per year at 4-11 Million $ (Shields, 2000).**
- **Standing Timber ?**
- **Other construction products: Foam insulation.**

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Incidence in the Utility Industry

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Carpenter Ant Damage

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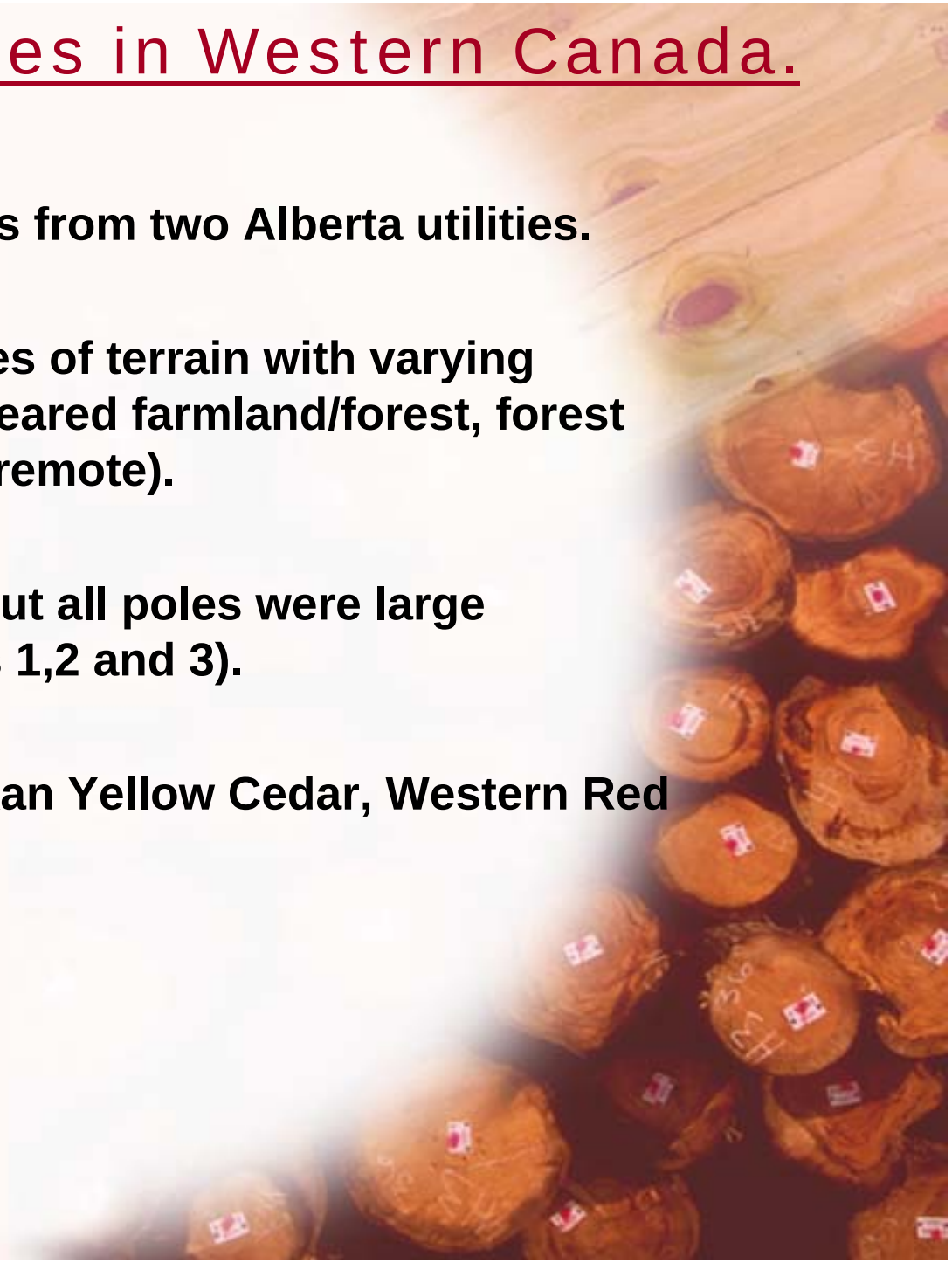
Ant Incidence in Poles in Western Canada.

- **Genics sampled 16,723 poles from two Alberta utilities.**
- **Sampling covered three types of terrain with varying rainfall: prairie/grassland, cleared farmland/forest, forest (remote), and forestry area (remote).**
- **Pole size differed in areas, but all poles were large transmission poles (Classes 1,2 and 3).**
- **Tree species of poles: Alaskan Yellow Cedar, Western Red Cedar, and Douglas-fir**



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Ant Incidence in Poles in Western Canada.

Area	Lines	Geography	Annual Rainfall	Total Poles Sampled	Ant Infestation Incidence	Percent Incidence	Cost of Replacement Per Pole	Total Cost ($) of Damage
1	6	Grassland Prairies	< 10"	5,589	62	1.1	$1,000	$62,000
2	12	Cleared Farmland Forest	> 10"	7,723	269	3.5	$1,000	$269,000
3	1	Forest (Remote)	> 20"	1,642	166	10.1	$5,000	$830,000
4	3	Forestry Area (Remote)	> 20"	1,769	224	12.7	$10,000	$2,240,000

Wall, 2006

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General Control

- **Find main colony and spray.**
  - **Fumigants (Sodium methyldithiocarbamate)**
  - **Liquids (Borates, Organics)**
  - **Dusts (Borates, Organics)**
- **Baits:**
  - **Liquids (Boric acid)**
  - **Granular (Borates, Organics)**
- **Boron rods**
  - **Boron (Impel®, Cobra®)**
- **Adjust contributing factors**
  - **Difficult outdoors.**

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Control In/Around Utility Poles

- **Soil fumigant Sodium methyldithiocarbamate = VAPAM®, Metam Sodium to treat carpenter ant infestations.**
  - **Some utilities dropped use because of the compounds toxicity and difficulty in use.**
  - **License required for use.**

- **Many are switching to less toxic forms of control**
  - **Liquid or dust applications of borates directly to colony.**
  - **Baiting may also be used to kill of parent/satellite colony.**
  - **Poles checked every 6 years in some locations: If intense ant area then borate rods may be applicable.**

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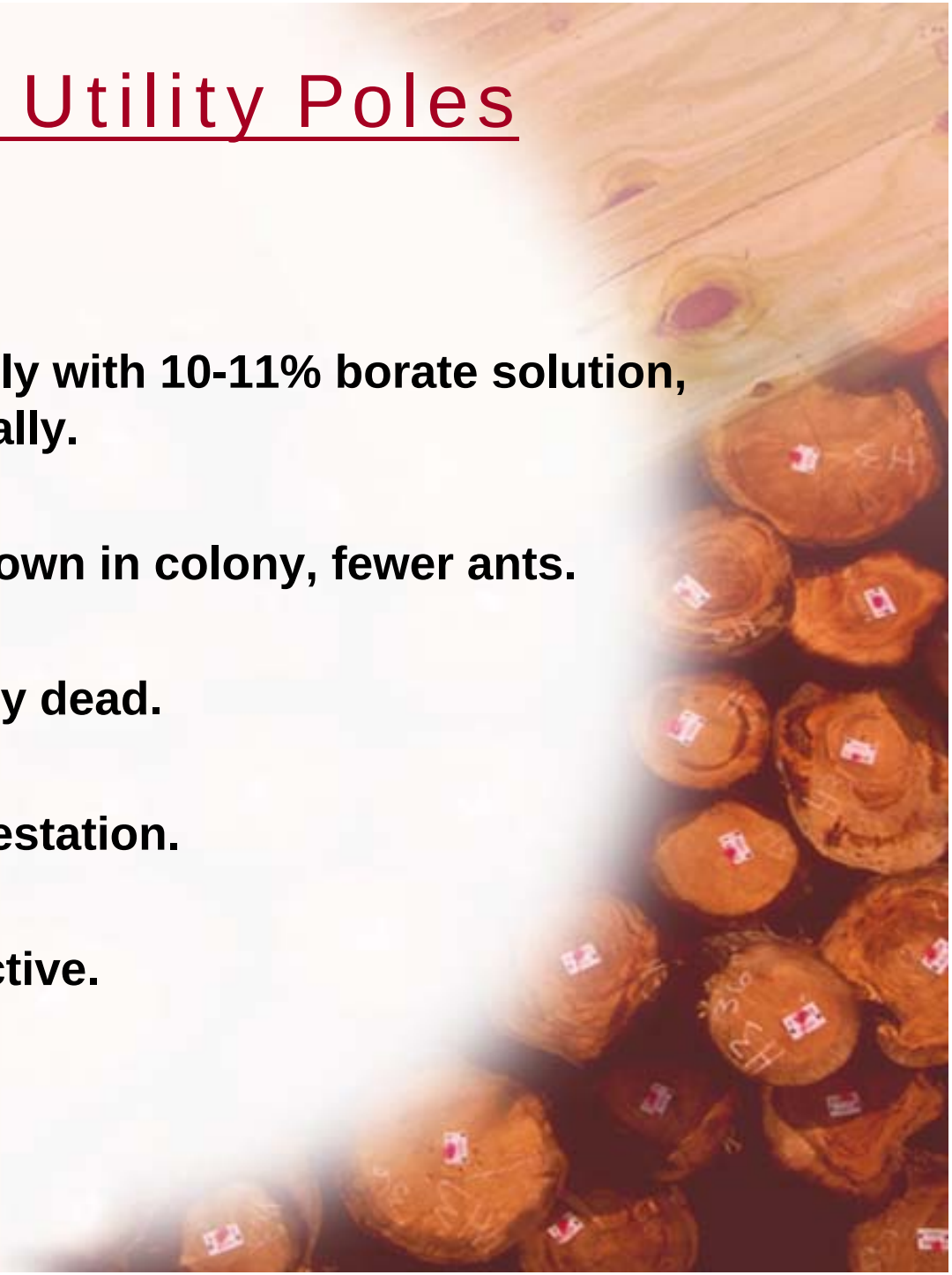
Control In/Around Utility Poles

- **Borate Spray treatments:**
  - **Colony sprayed directly with 10-11% borate solution, and checked periodically.**
  - **After 1 month: Slow down in colony, fewer ants.**
  - **After 6 months: Colony dead.**
  - **After 1 year: No re-infestation.**
  - **Found to be 90% effective.**



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Borate Treated Wood Products

- **Low environmental impact**
- **Low acute toxicity**
- **Colorless and odorless (except dyes)**
- **Nonvolatile and non-corrosive**
- **Strength properties similar to untreated wood**

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Properties of Borate Preservatives

Disodium Octaborate Tetrahydrate (DOT)

- $Na_2B_8O_{13}\cdot 4H_2O$
- *Tim-bor* ® Industrial (U.S. Borax)
- Amorphous solid
- High solubility in H_2O
- Diffusible preservative
- Near neutral pH
- Compatible with colorants
- Analytical methods for Boron
    - Titration, ICP, AA
    - Curcumin spray indicator

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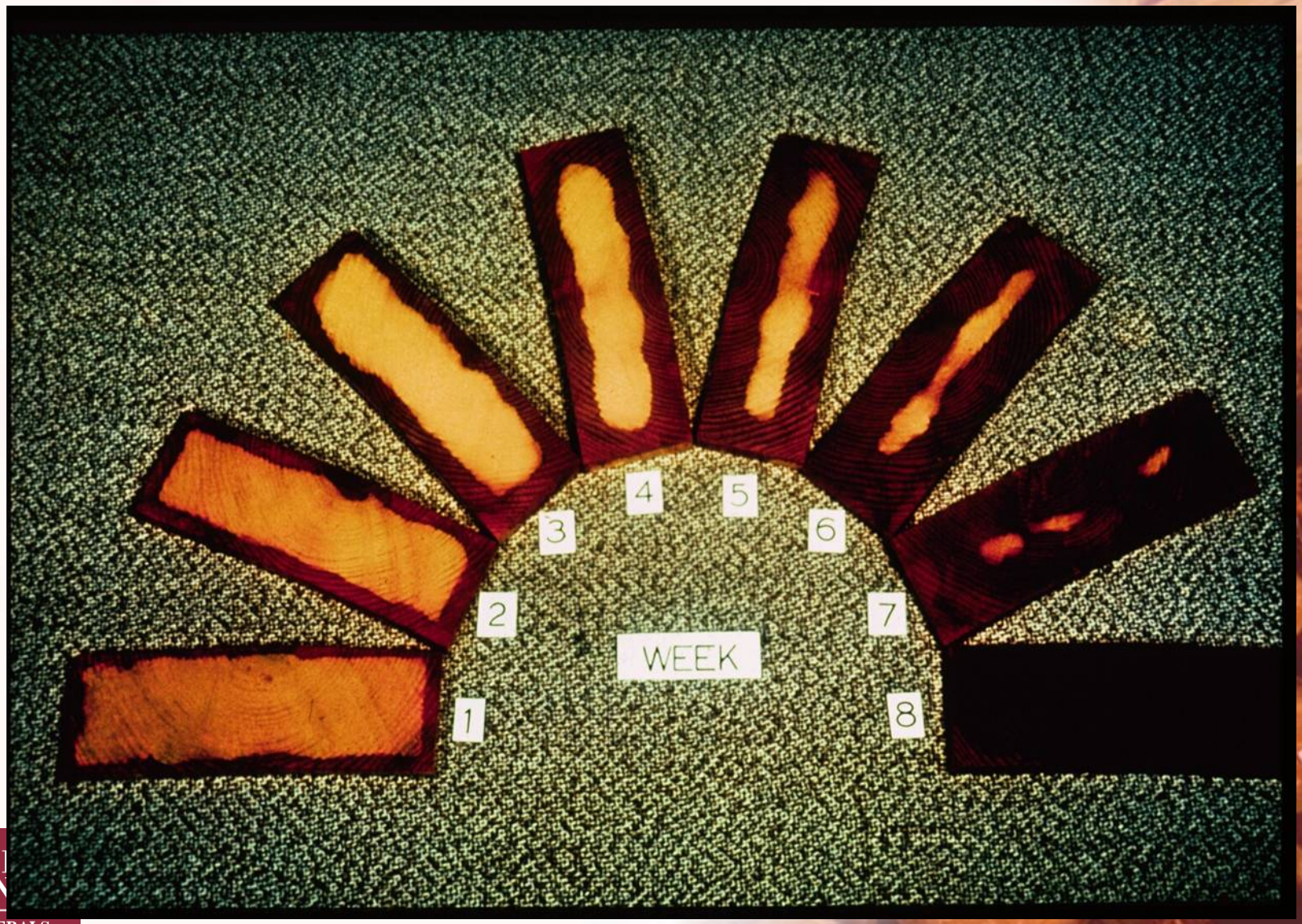
Borate Deposit – Boron CA

Borates and Diffusion



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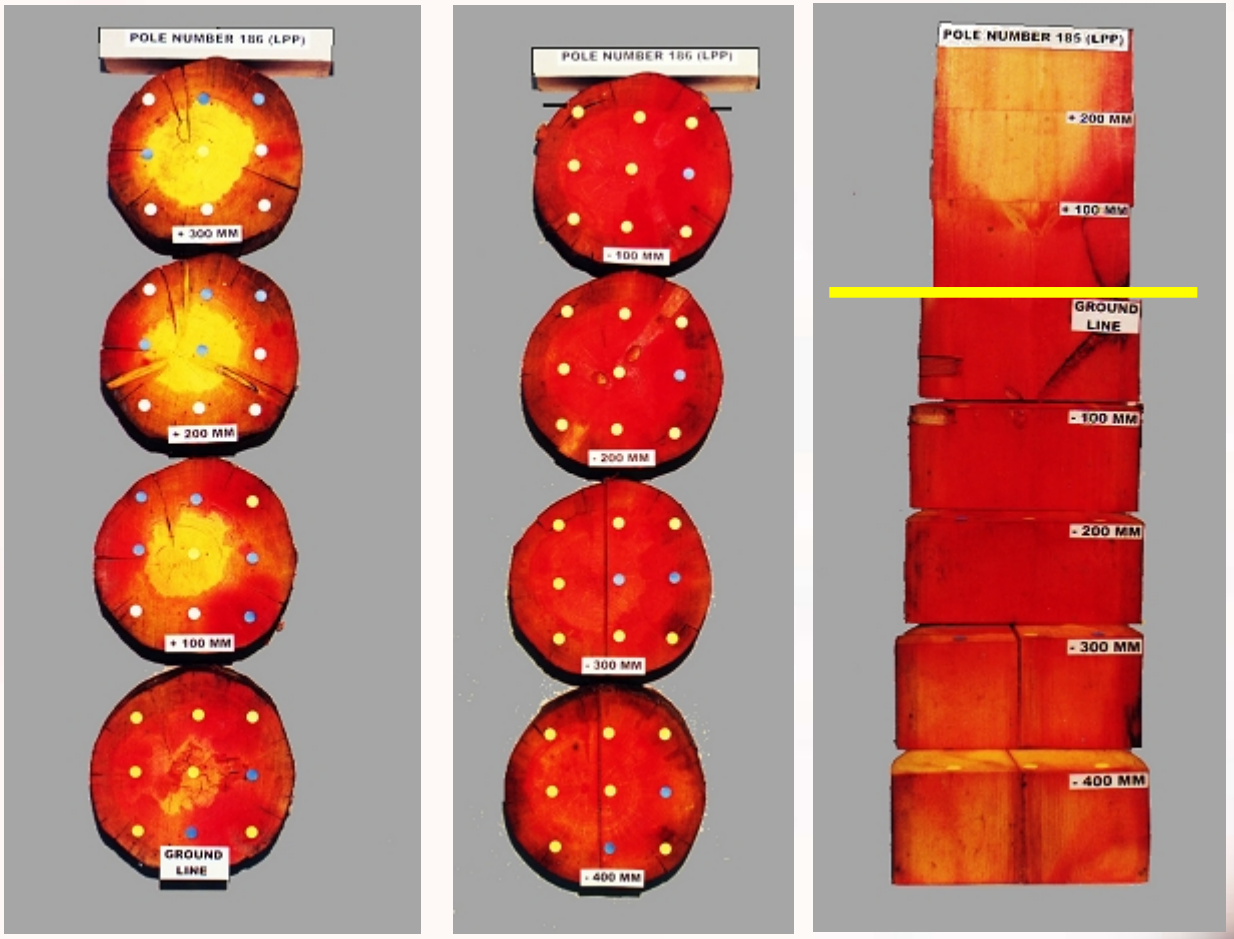
Boron Distribution From Fused Rods After 5 Years

Above- ground **Below- ground**



Groundline

- **1.5% BAE for ant repellency (Lloyd, 2002)**

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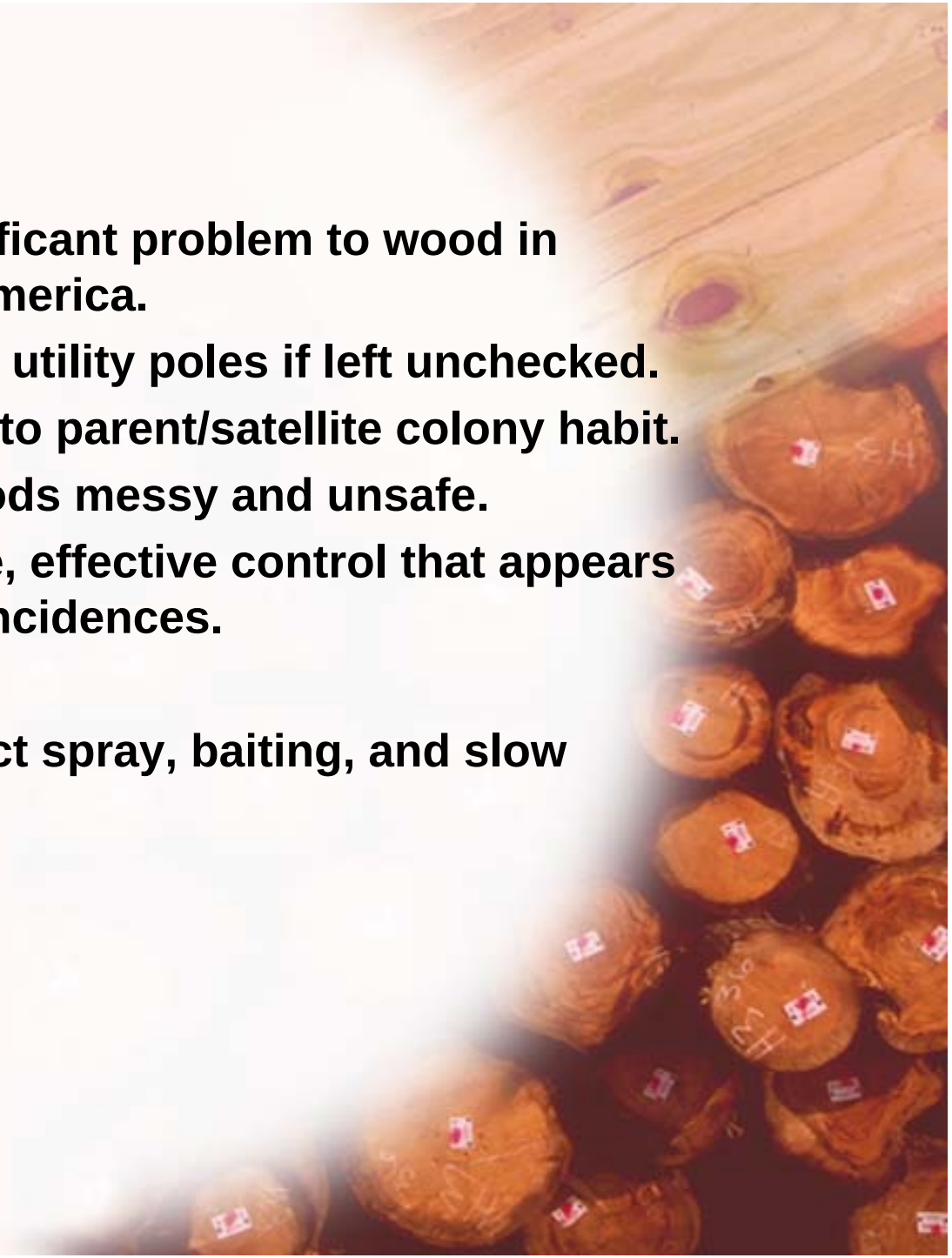
Conclusions

- **Carpenter ants can be significant problem to wood in service in northern North America.**
- **Can be major problem ($) in utility poles if left unchecked.**
- **Control can be difficult due to parent/satellite colony habit.**
- **Some current control methods messy and unsafe.**
- **Borate treatments offer safe, effective control that appears to be long lasting in some incidences.**
- **Future:**
  - **Use combination of direct spray, baiting, and slow release rods.**



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