WILDLIFE ON WORKING FORESTS – CHANGES IN MOUNTAIN BEAVER MANAGEMENT

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AGEISS INC.

Wildlife Services NWRC National Wildlife Research Center

Aplodontia

- Monotypic genera
- Primitive morphological characteristics
- Endemic to the western U.S
- Various management practices

A. rufa

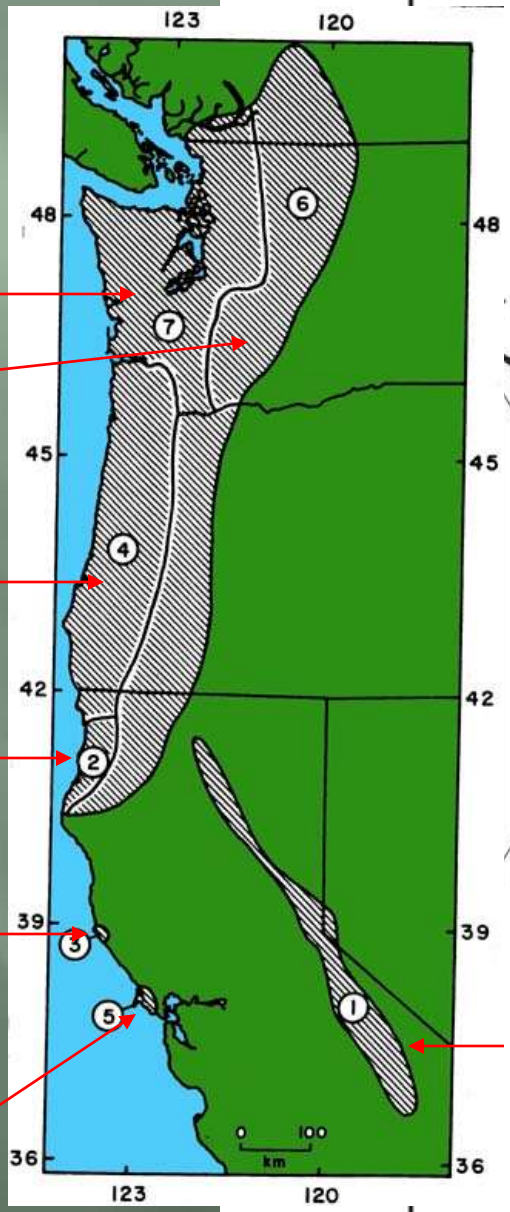
A. rainieri

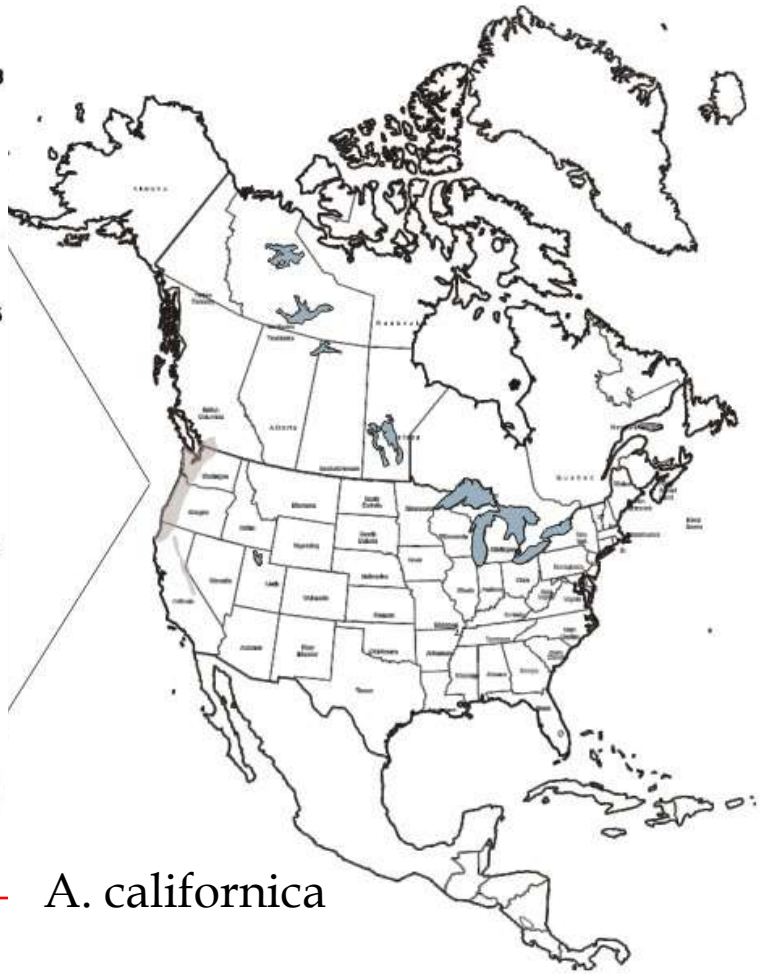
A. pacifica

A. humboldtiana

A. nigra

A. phaea





A. californica

- Management extremes
  - BC: listed as species of concern
  - CA: 5 subspecies, 1 federally endangered
  - OR/WA: pest species
- Management
  - Habitat differences
  - Forest practices and differences
    - NPS vs private
    - WA and OR vs CA

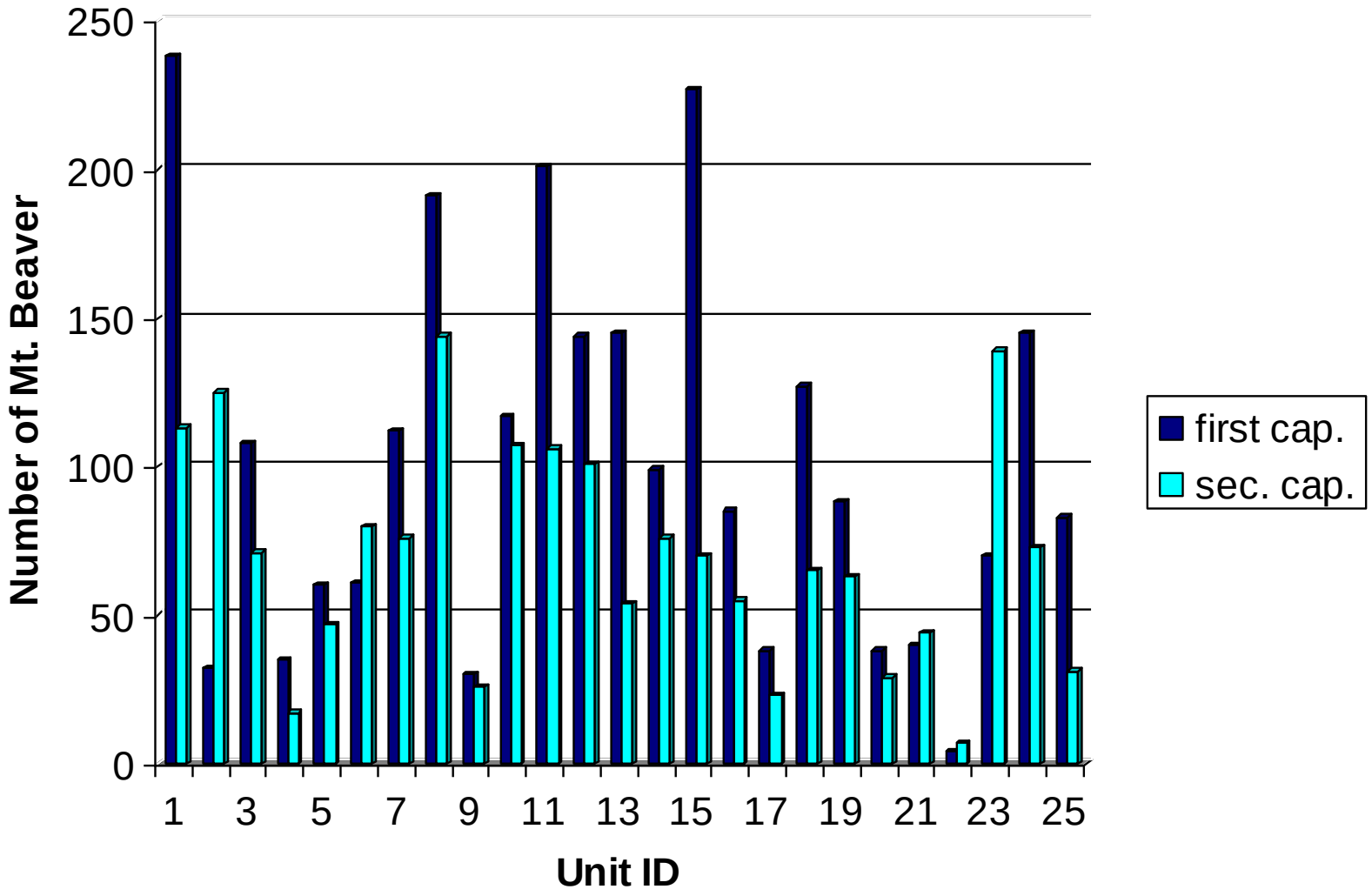
Why manage mountain beaver?

- Clip seedlings and lateral branches, girdle bases and undermine roots of larger trees
- 1979 survey: 0.1 million ha damaged (WA, OR, CA)
- 121,500 ha of Douglas-fir in PNW affected
- Successful regeneration limited without control

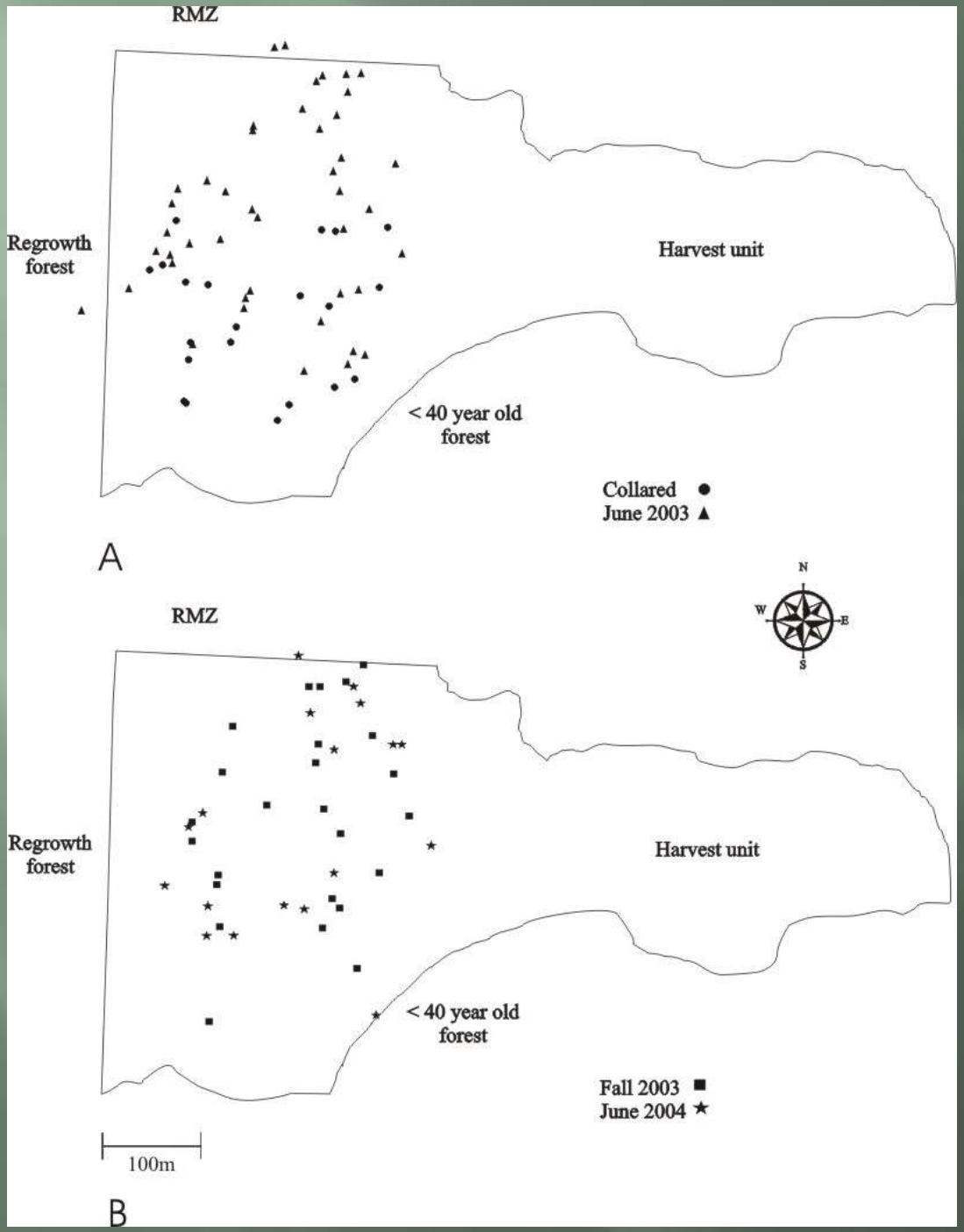
Management Tools

- Repellents and frightening devices
- Burrow disruption
  - Fumigants
  - Collapse burrows
- Traps
- Barriers
- **IPM**
- Silvicultural practices

Sample of Re-trapping Efforts



Reinvasion Potential

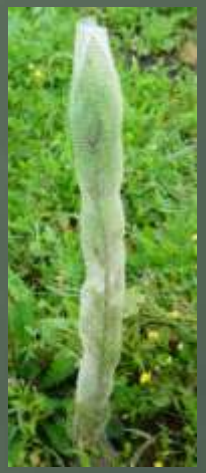


Spring 2003: 39 animals
Fall 2003: 25 animals
Spring 2004: 16 animals

Exclusions

Fencing – Good luck!

Tree shelter

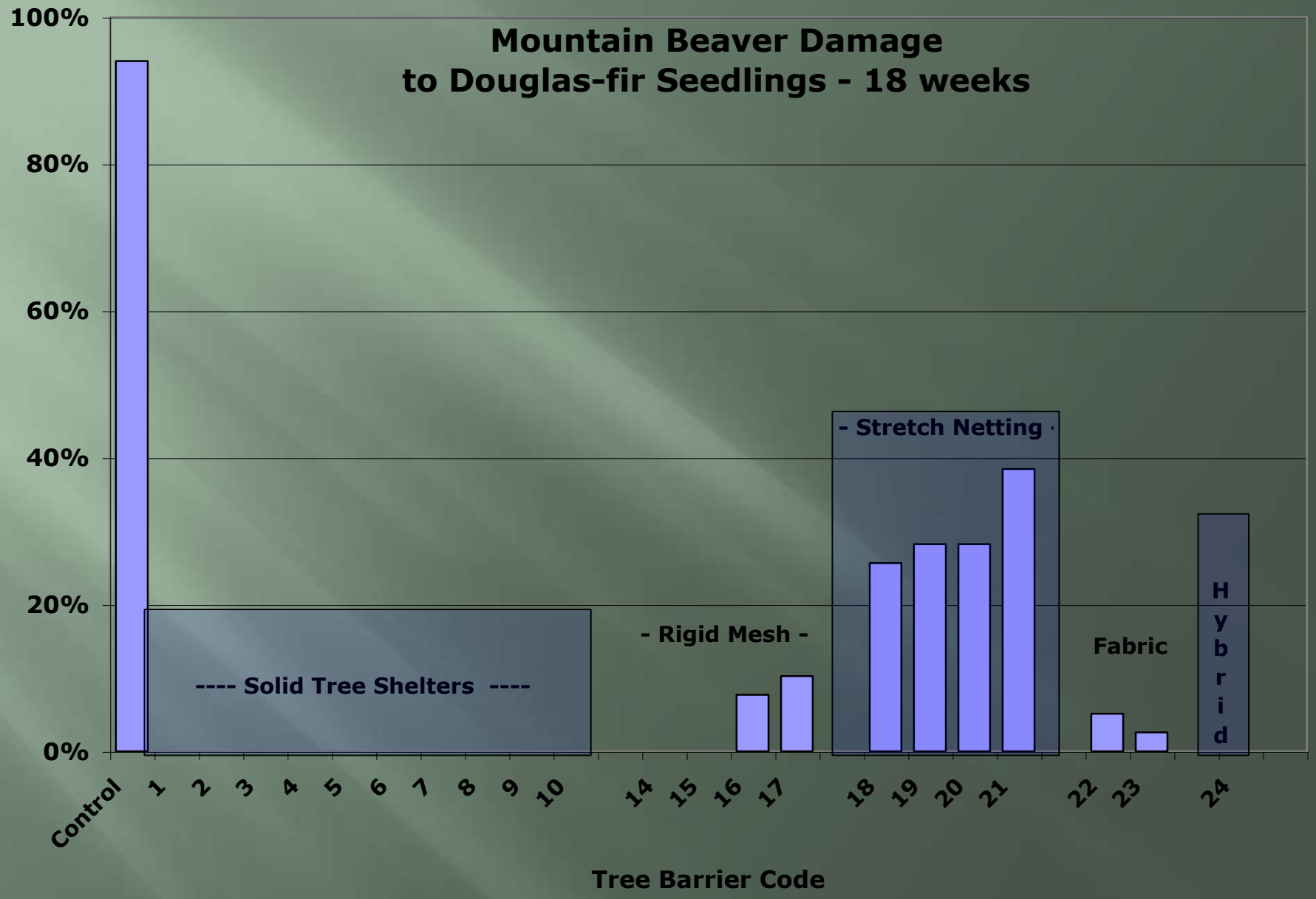


Protection net

Fabric sleeve

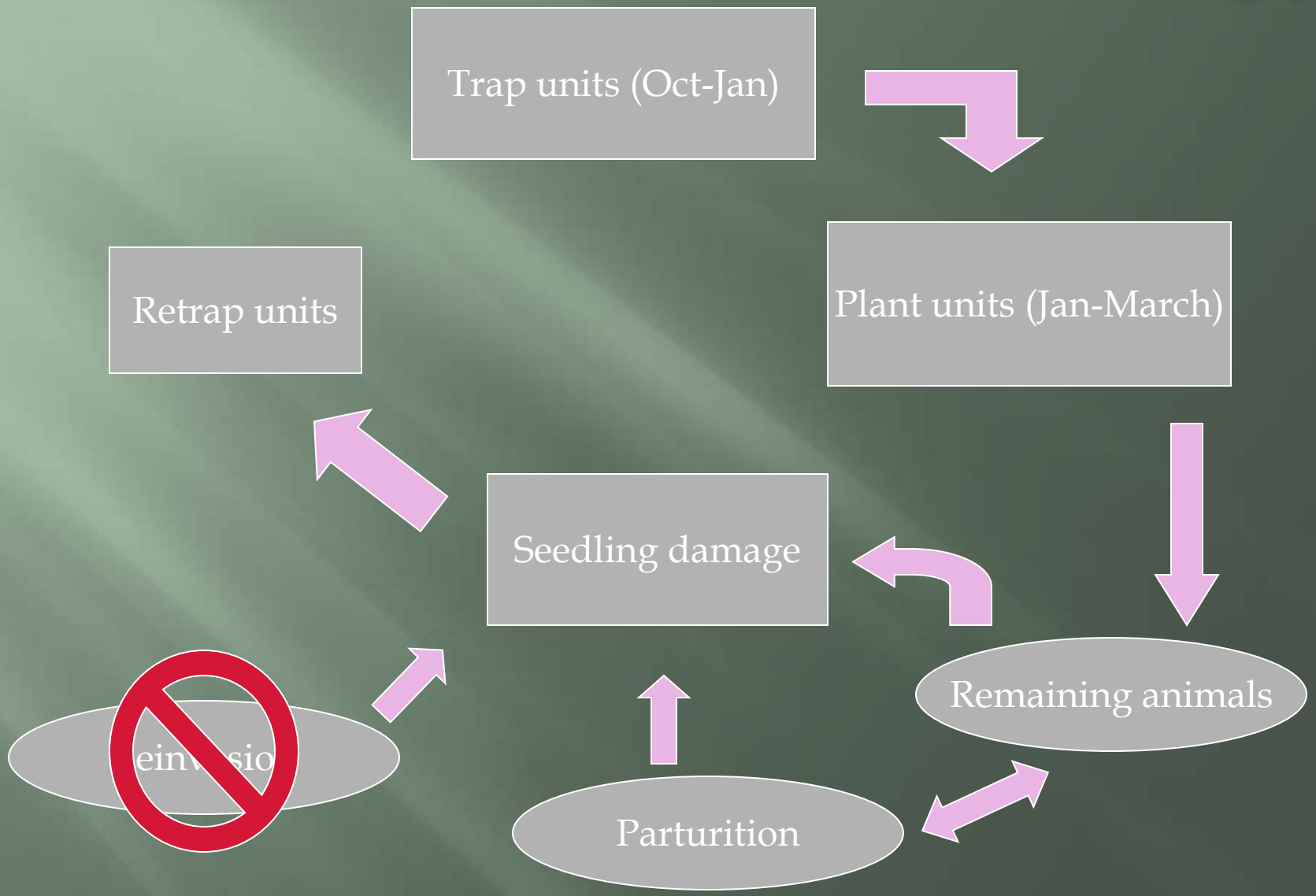
Rigid mesh tube

Fabric sleeve over rigid mesh


Mountain Beaver Damage
to Douglas-fir Seedlings - 18 weeks
100%
80%
60%
40%
20%
0%
---- Solid Tree Shelters ----
- Rigid Mesh -
- Stretch Netting -
Fabric
Hybrid
Control
1
2
3
4
5
6
7
8
9
10
14
15
16
17
18
19
20
21
22
23
24
Tree Barrier Code

Mountain Beaver Motivation

The Need for an IPM Strategy



Which IPM Strategy Do You Use?

- Trap then bait
  - Pros
    - Reduce population first, less bait
  - Cons
    - More cost
- Bait then trap
  - Pros
    - Baits cached underground by residents
    - Less cost
  - Cons
    - More bait in the environment
    - Bait hoarding

Economics of the two systems

- No difference in seedling damage
- Baiting hours more for treatment 1
- Trapping hours more for treatment 2

T1:Bait-Trap				
	Bait Cost/acre	Trap Cost/acre	Bait $/acre	Total $ T1/acre
Satsop	$8.76	$21.24	$10.19	$36.82
Canyon	$9.84	$23.71	$10.09	$48.12
AVERAGE	$9.30	$22.47	$10.14	$42.47
T2:Trap-Bait				
	Bait Cost/acre	Trap Cost/acre	Bait $/acre	Total $ T2/acre
D-Line	$9.84	$48.80	$7.09	$65.73
West Satsop	$5.92	$23.98	$3.74	$33.64
AVERAGE	$7.88	$36.39	$5.41	$49.69

Silvicultural practices

- Alternative forage
- Reduce stand openings
- Limit slash piles

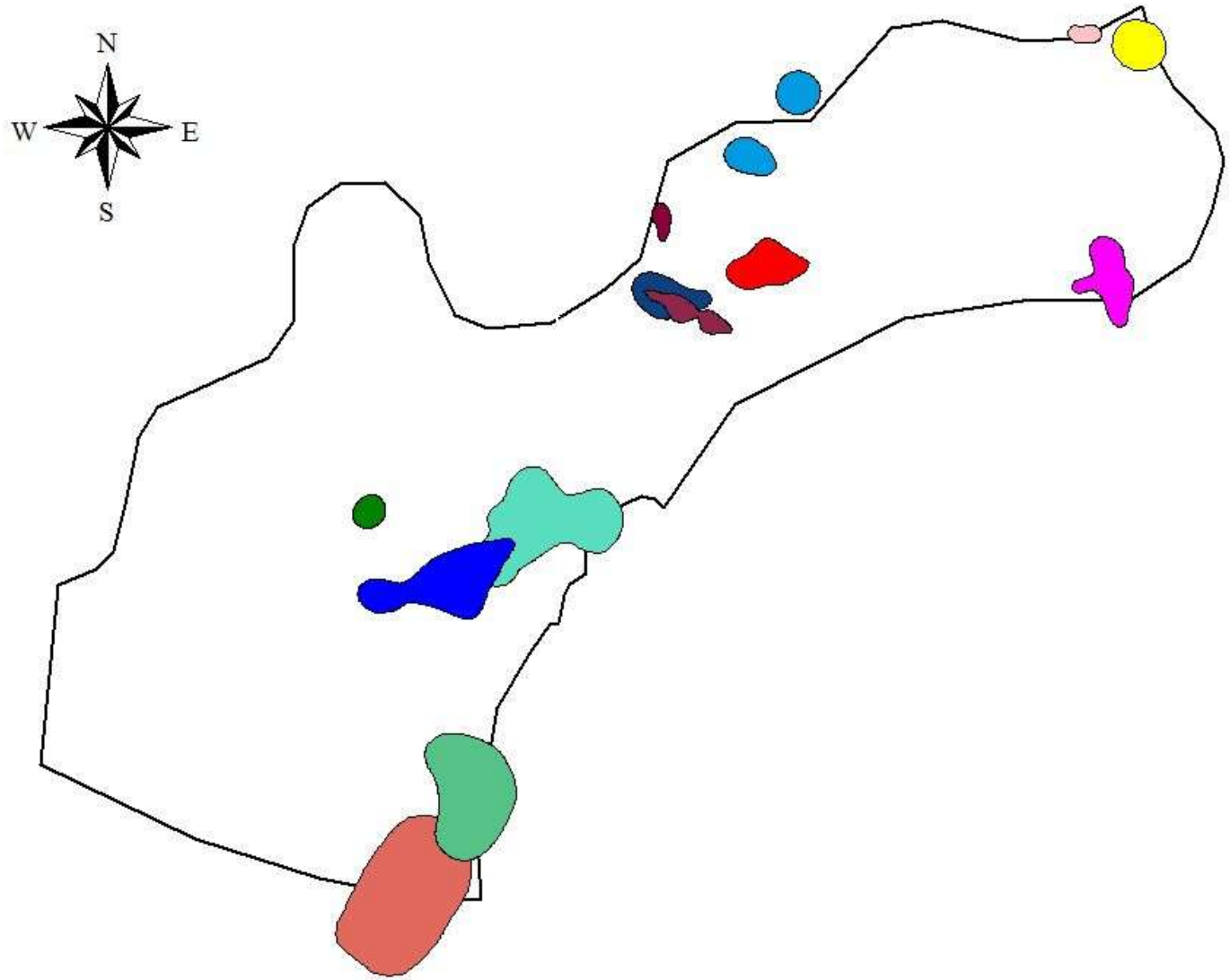
Impact of Forest Management Practices on Mt. Beaver Populations

- Sylvia (8.9 ha)– no herbicide treatment
  - 2002: 2.13 beaver/ha
  - 2003: 4.38 beaver/ha

- Donovan (16.6 ha)- herbicide treatment
  - 2002: 0.99 beaver/ha
  - 2003: 0.49 beaver/ha

- Vesta (20.3ha)
  - +40-year old stand in 2002 - 0.64 beaver/ha
  - Fall 2003 after harvest - 0.74 beaver/ha
  - June 2004 half herbicide treatment- 0.99 beaver/ha
  - June 2005 half herbicide treatment- 0.74 beaver/ha

Core Use Areas after Treatment



Home Ranges and Site Preparation

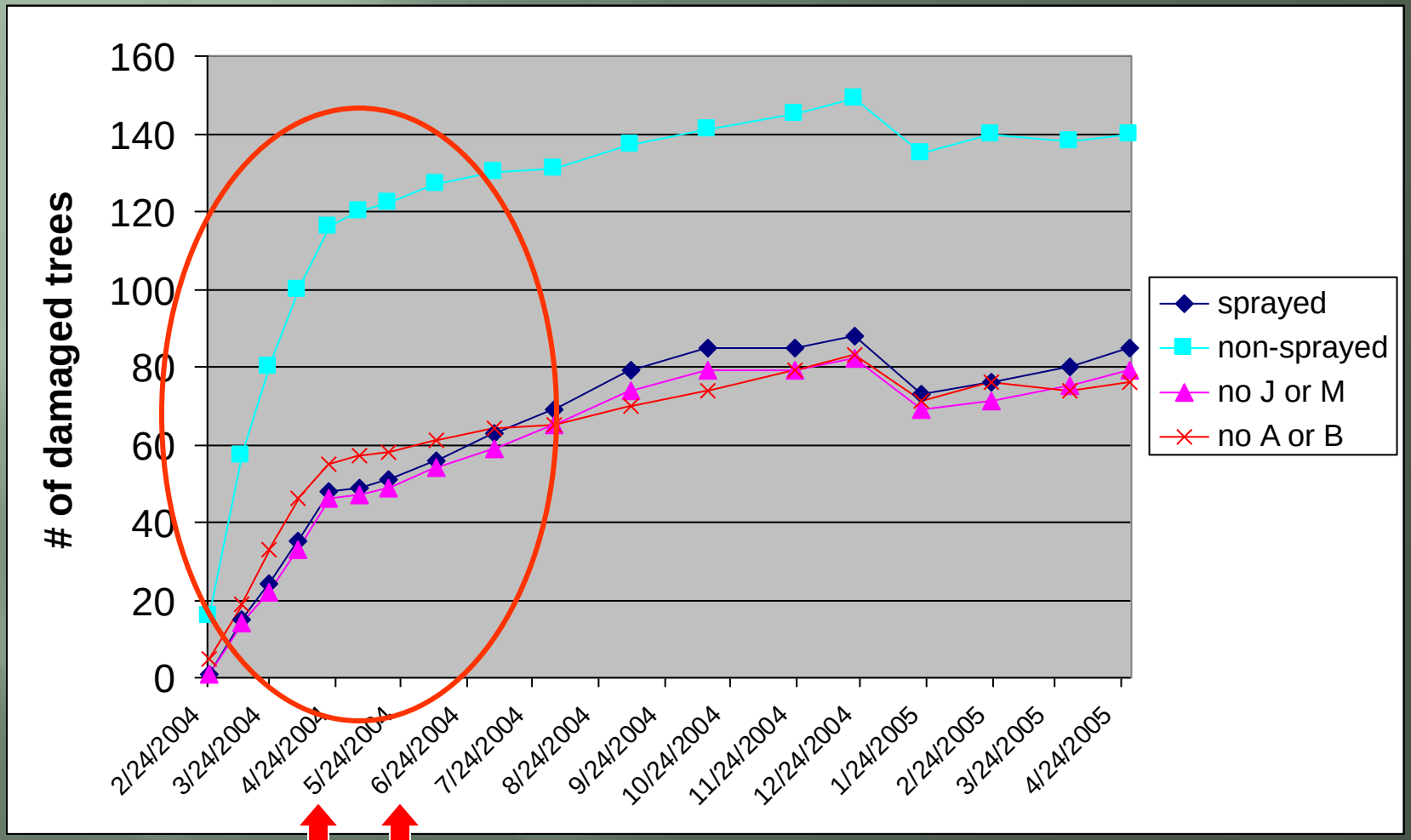
	Home range	Core	*n*
Pre-harvest	2.63 ± 0.51	0.48 ± 0.12	12
Pre-treatment	0.81 ± 0.19	0.12 ± 0.02	20
Treatment	3.37 ± 0.9	0.49 ± 0.13	5
No Treatment	0.82 ± 0.17	0.11 ± 0.02	8

Distribution of adult males and females and juvenile mountain beaver captured at 3 sites in coastal Washington

Unit	Harvest management	Year	Adult Females	Adult Males	Juveniles	Unknown[1] Juveniles
Donovan	herbicide	2002	8	8	0	
		2003	2	7	0	
Sylvia	none	2002	8	11	4	4
		2003	18	21	12	
		2004	3	13	4	
Vesta	forested	2002	6	7	NA	
	new clear cut	2003	7	8	2	
	none/herbicide	2004	4/3	8/5	8/6	
	none/herbicide	2005	8/2	3/2	9/2	

[1] Unable to distinguish gender in juveniles

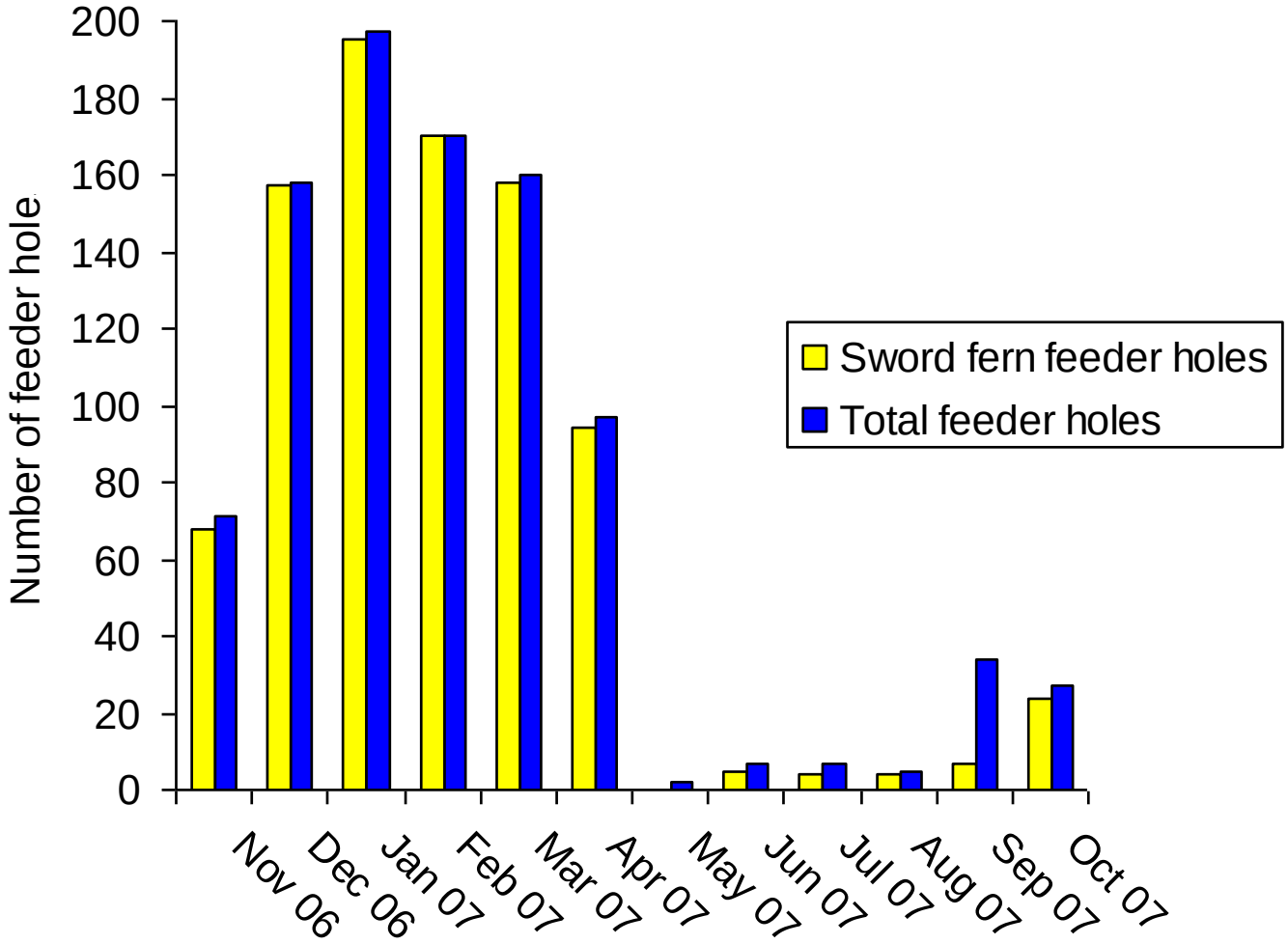
Vesta Tree Damage



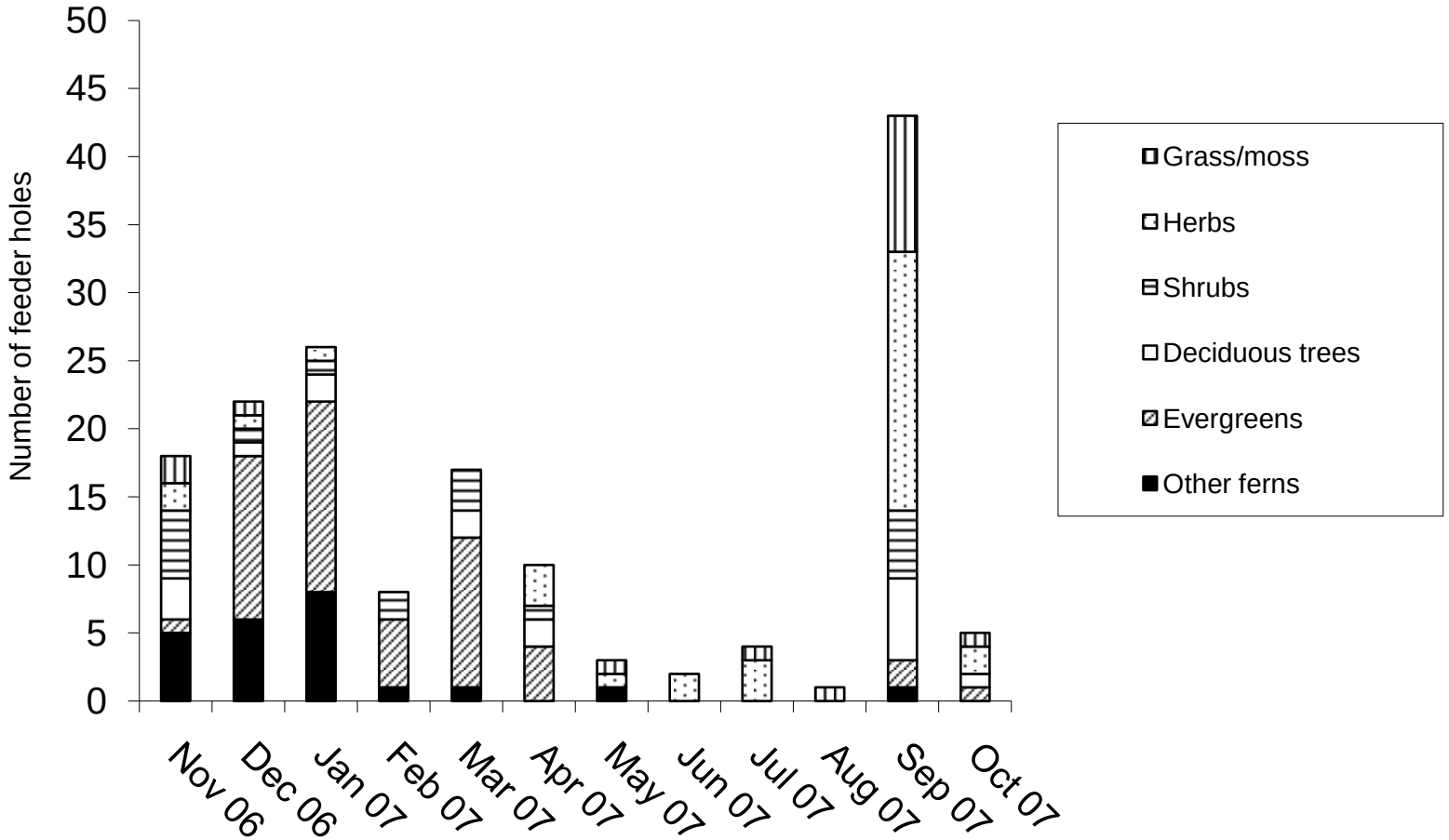
What's to eat?

- No direct correlation between herbicide treatment and damage
- Feeder hole caches do not "dry out" in PNW
- Are mountain beavers eating other plants?
- What are the fates of different plant species?
- Combination of field and pen trial information

Feeder Holes



Feeder holes without sword fern




2007-08-20 12:06:15 AM M 1/3 55°F
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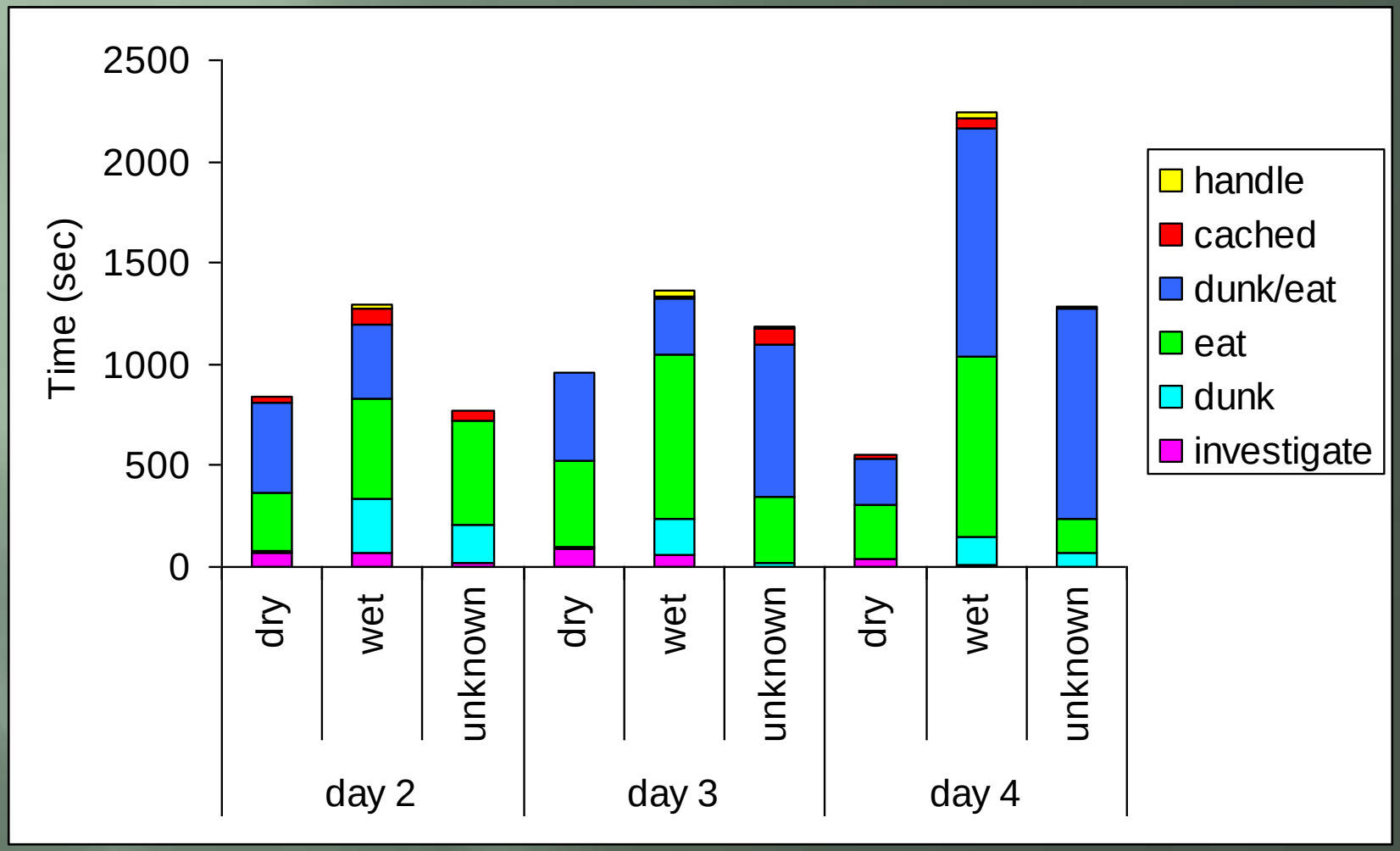
What is the Purpose of Feeder Holes?

- Two-choice test
  - Dry vs. wet
  - Salal and sword fern
  - Dried in oven at 40°C for 24 hrs
  - Individually marked
- Fate of sword fern
- Fate of salal
- Video monitored for 4 hours

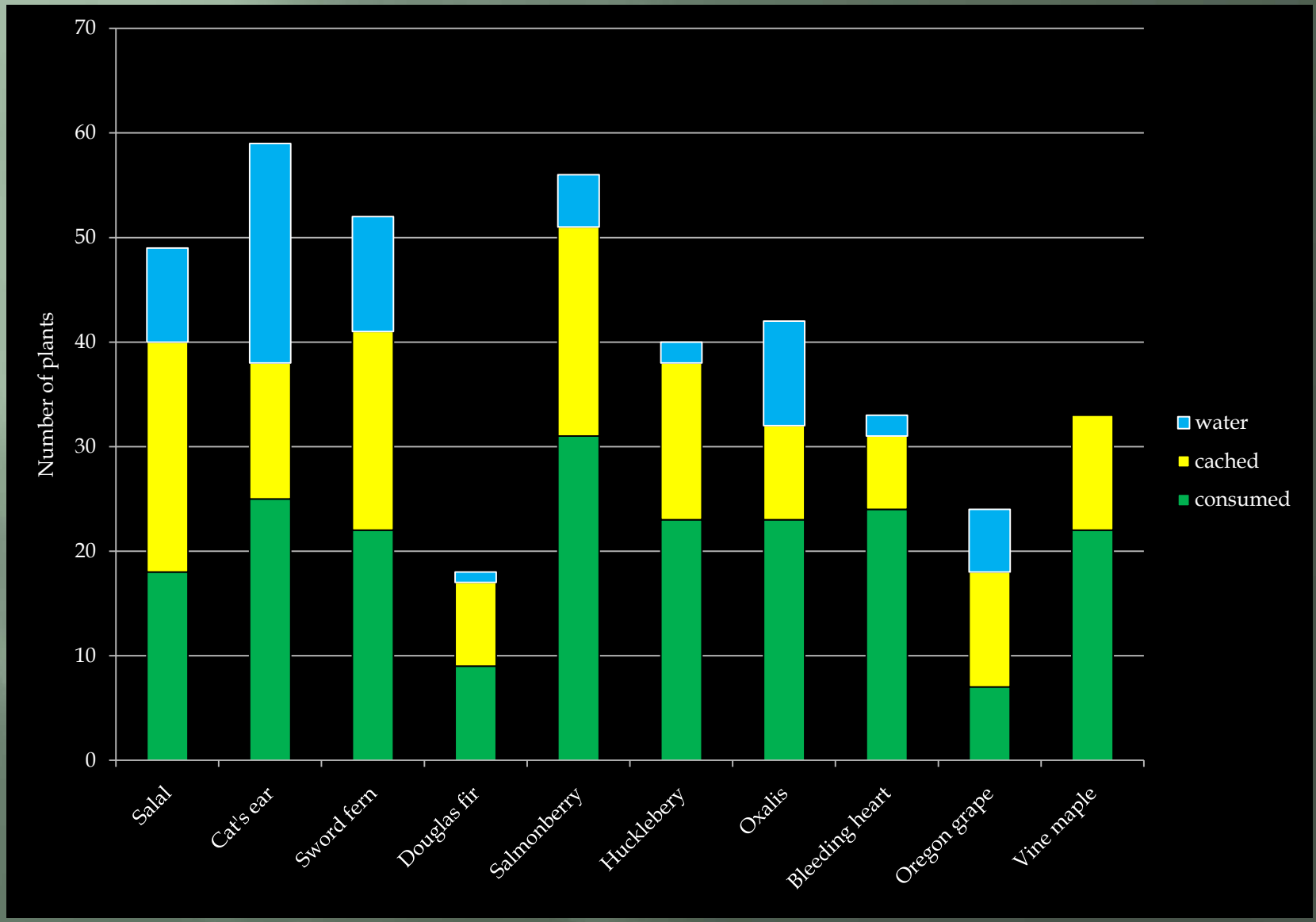
Sword fern


2500
2000
1500
1000
500
0
Time (sec)
dry
wet
unknown
dry
wet
unknown
dry
wet
unknown
day 2
day 3
day 4
handle
cached
dunk/eat
eat
dunk
investigate

What is Important: Taste or Water?

- On the menu
  - Plants that occur during the late winter months
  - Douglas-fir seedlings
- 3 blocks/pen
- Fate of each species

Results of Cafeteria Trial

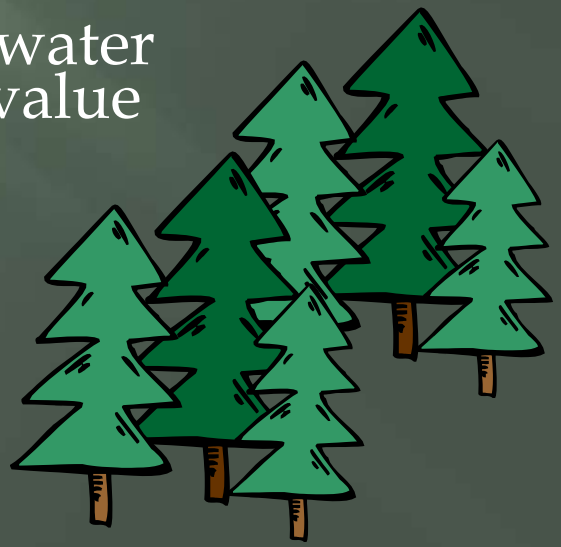


Plant Chemistry and Nutritional Quality

Component	Douglas fir	Salal	Sword fern	Cats ear	Salmonberry	Vine maple	Oxalis
Moisture (%)	64.5	57.1	66.9	84.8	64.6	50.8	89.3
Crude Protein (%)	3.1	2.9	4.0	1.5	5.8	3.2	2.01
Neutral Detergent Fiber (%)	14.9	15.1	18.6	7.7	15.1	28.0	2.8
Total digestible nutrients (%)	20.7	27.7	16.0	9.7	23.9	24.2	8.1
Net energy-maint. (Mcal/lb)	0.2	0.3	0.1	0.1	0.2	0.2	0.1
Relative feed value (digestibility and intake potential)	130.0	165.8	85.8	120.3	145.8	88.1	253.4

Results of foraging trials

- Sword fern preferred over salal
- Wet material preferred over dry to eat
- Forage soaked in water
- Cafeteria study – salmonberry and cat's ear preferred (not seen in field)
  - Cat's ear – high water but low nutrient content
  - Salmonberry – average water content, but high nutrient content
- Forbs (oxalis, bleeding heart) – high water content (88-90%) and very high feed value
- So what??
  - Site prep
  - Implications for endangered subspecies?



Pt. Arena mountain beaver

- Available habitat in 24 mi^2
- Manchester State Park populations: n = 24 and n = 16

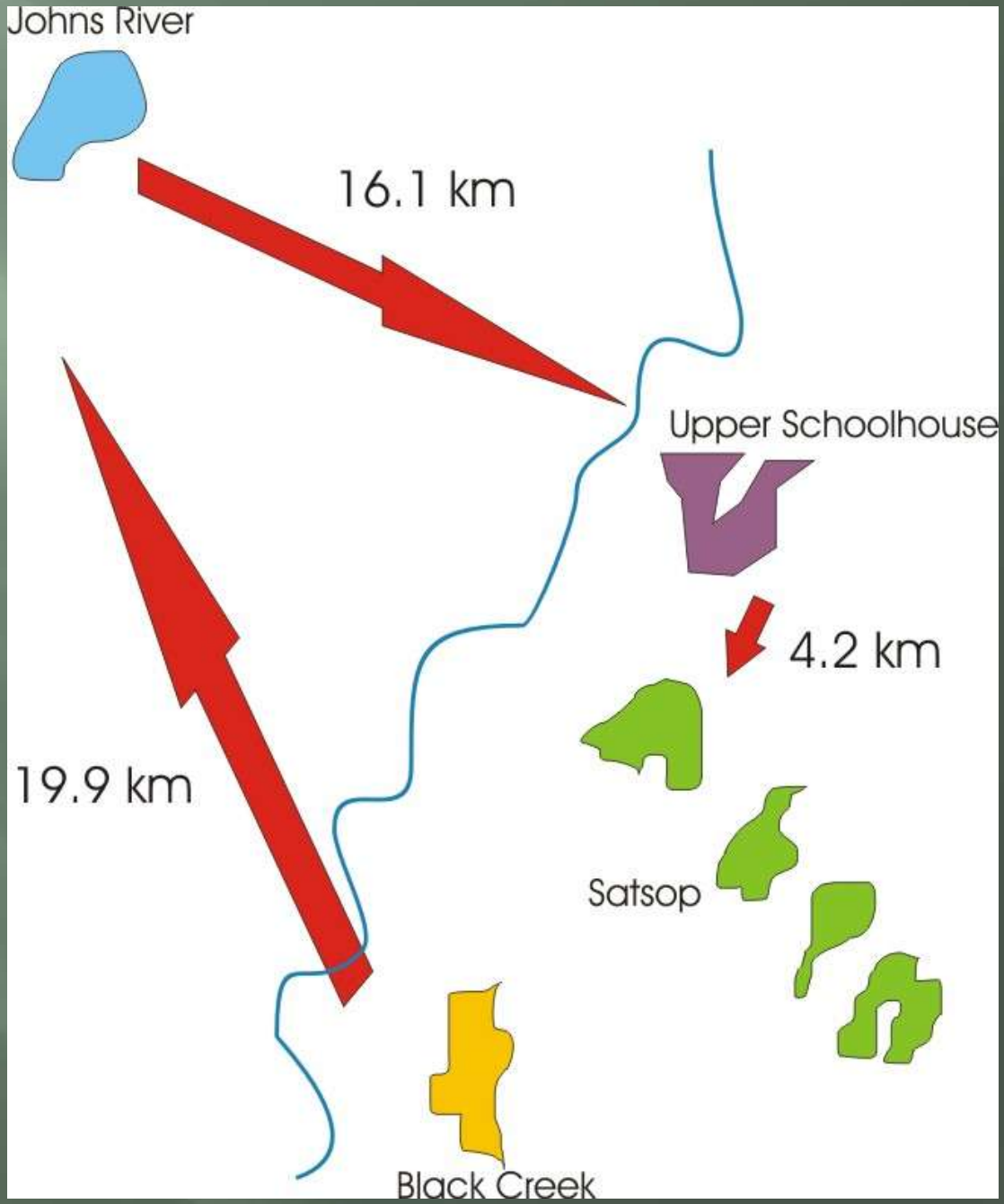
Plant Analyses

Component	Iris	Angelica	Ice Plant	Coyote Brush
Moisture (%)	23.64	15.6	85.7	11.9
Crude Protein (%)	5.1	6.8	0.7	8.8
Neutral Detergent Fiber (%)	36.5	20.0	4.4	39.9
Total digestible nutrients (%)	40.5	67.2	12.2	58.9
Net energy-maint. (Mcal/lb)	0.39	0.7	0.1	0.6
Relative feed value	107	287.0	293.3	133.7

Point Arena: endangered versus invasive species

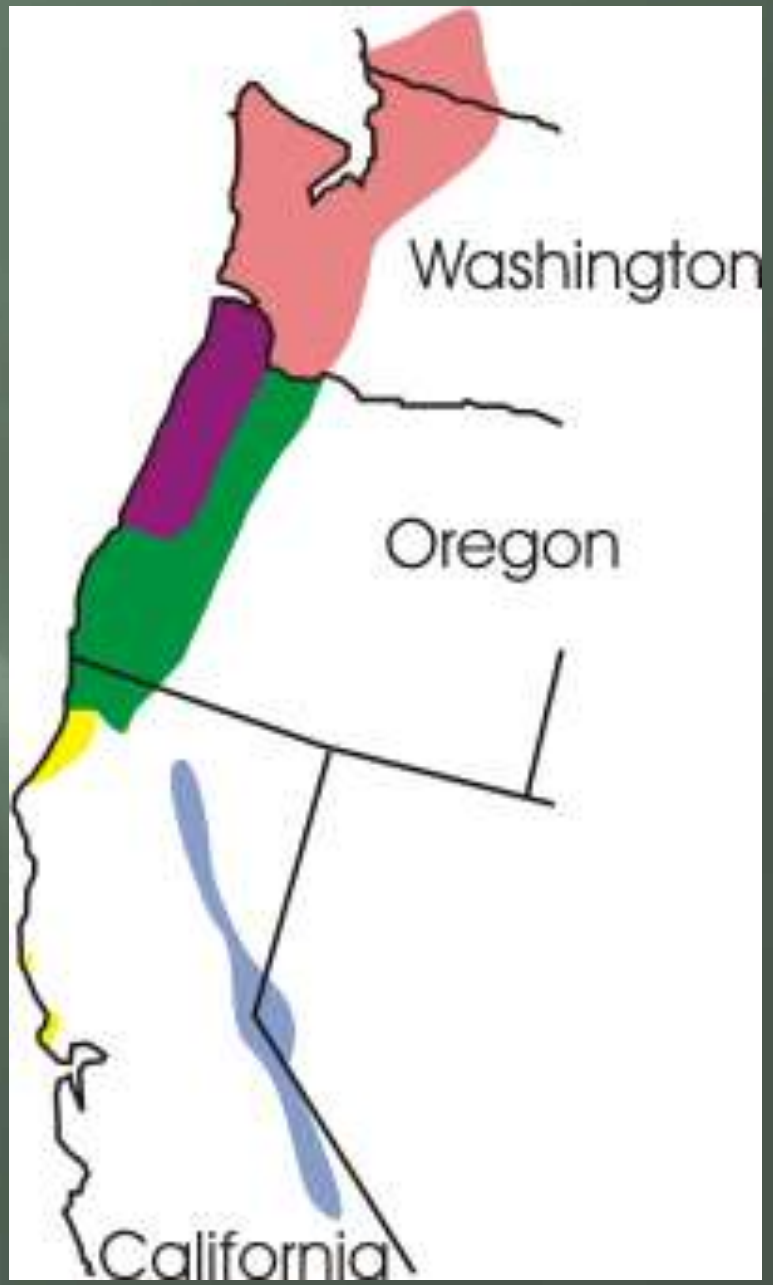
Gene flow and barriers

7 distinct demes



The New Phylogeny

- Distribution based on genetics
  - *A. rufa humboldtiana*, *phaea*, and *nigra* recent divergence
  - *A. rufa pacifica* distribution reduced (ancestral lineage), separate species designation?
  - New designation of subspecies name
    - *A. rufa rufa*
    - *A. rufa olympica*



Management Implications

- Forage preference and water necessity
  - Clear cut forest preference in the PNW
  - California forests more disjunct populations and closed-canopy habitat
  - Southern populations in drier habitat (limited feeder holes)
- Subspecies distribution changes
  - WA and BC one subspecies
  - OR reduced distribution of ancestral lineage, and possibly different species
  - CA more recent divergence of coastal subspecies
  - High population differentiation within CA subspecies (not well connected)

Acknowledgements

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