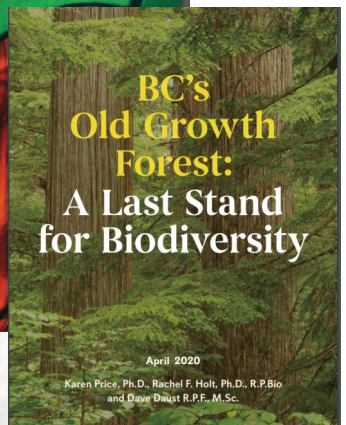
Ecosystem Based Management in small tenures

Landscape Planning and Stand-level Practices

EBM has a long history in BC

Stemming from…

Concern for old growth and more



What are the concerns?

- Loss of biodiversity and ecosystem resilience
  - Especially of species that need old forest and large patches of forest
  - Loss of ability to adapt (e.g., to climate change)
- Little old forest left -- at low elevations, on productive sites.
- Loss of resources important to Indigenous People
  - Monumental cedar for example
- Loss of opportunity for future generations

Past and Existing initiatives to learn from

- Old Growth Strategy
- Clayoquot Sound
- MacMillan Bloedel (zoning and Variable Retention)
- Great Bear Rainforest Order
- Haida Gwaii LUO

Existing initiatives had commonalities

- Three-legged stool – ecosystems, social, economic
- Two to three key scales of forest management
  - Regional
  - Landscape
  - Stands

Regional Scale:

- Large protected areas
- Large areas of zoning
- Other land uses:
  - Private land
  - Agriculture
  - Forestry
  - Oil and gas

Landscape scale: Managing ecosystems and habitats

- Reserves
- Zoning
- Managing landscape seral ages and patterns

Reserves

Keeping some areas unmanaged …

- Main way of accommodating needs of species and ecosystem functions we don’t know well
- Safeguard against inevitable impacts/mistakes on managed landbase
- Baselines for comparisons to managed stands

What makes up reserve systems?

- Existing protected areas:
  - Parks
  - Old Growth Management Areas (OGMAs)
  - Ungulate winter Ranges (UWRs)
  - Wildlife Habitat Areas (WHAs)
- Non-harvestable landbase
  - Riparian areas
  - Unstable terrain
  - Visually sensitive areas

What makes up reserve systems?

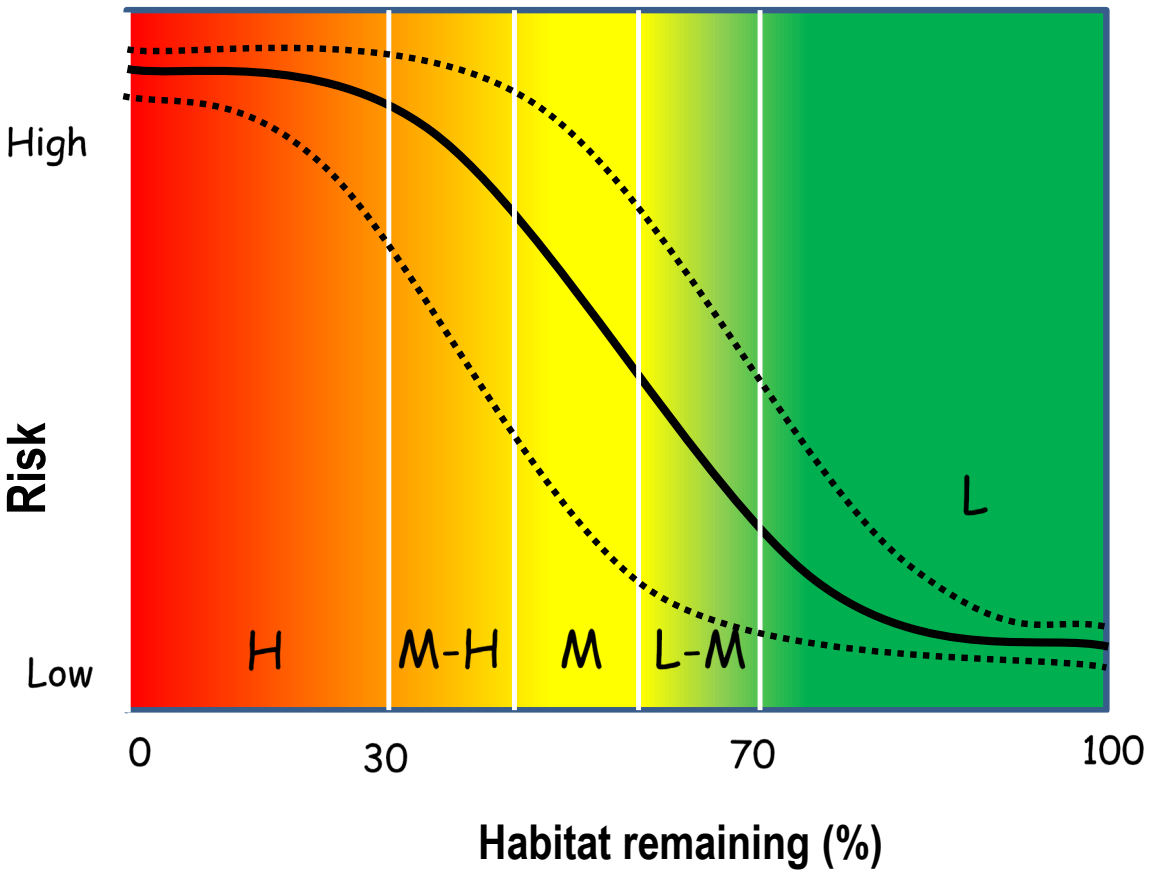
- Design elements
  - Representation of Ecosystems
  - Connections
  - Edge/interior
  - Focal species habitat
- Social values
  - Indigenous values
  - Community values

Reserve Design

Want to be able to answer the questions:

- Do you have enough?
- Is it the whole variety?
- Is it well-distributed?
- Is there interior?

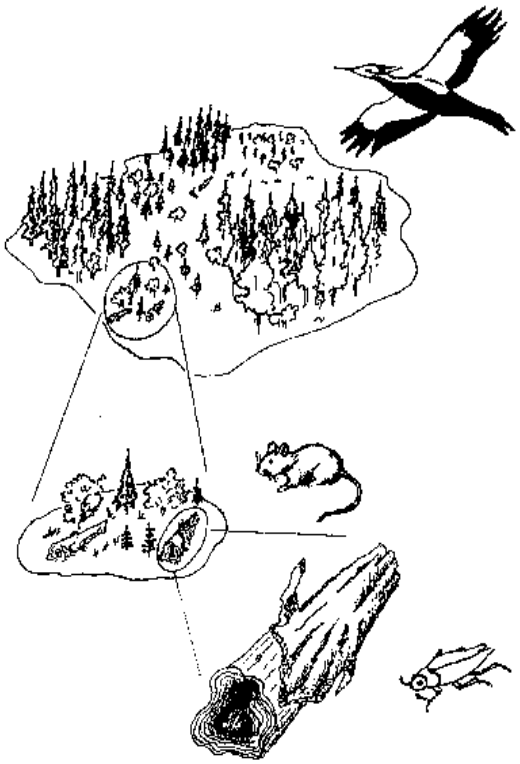
Risk to ecological integrity



Representation

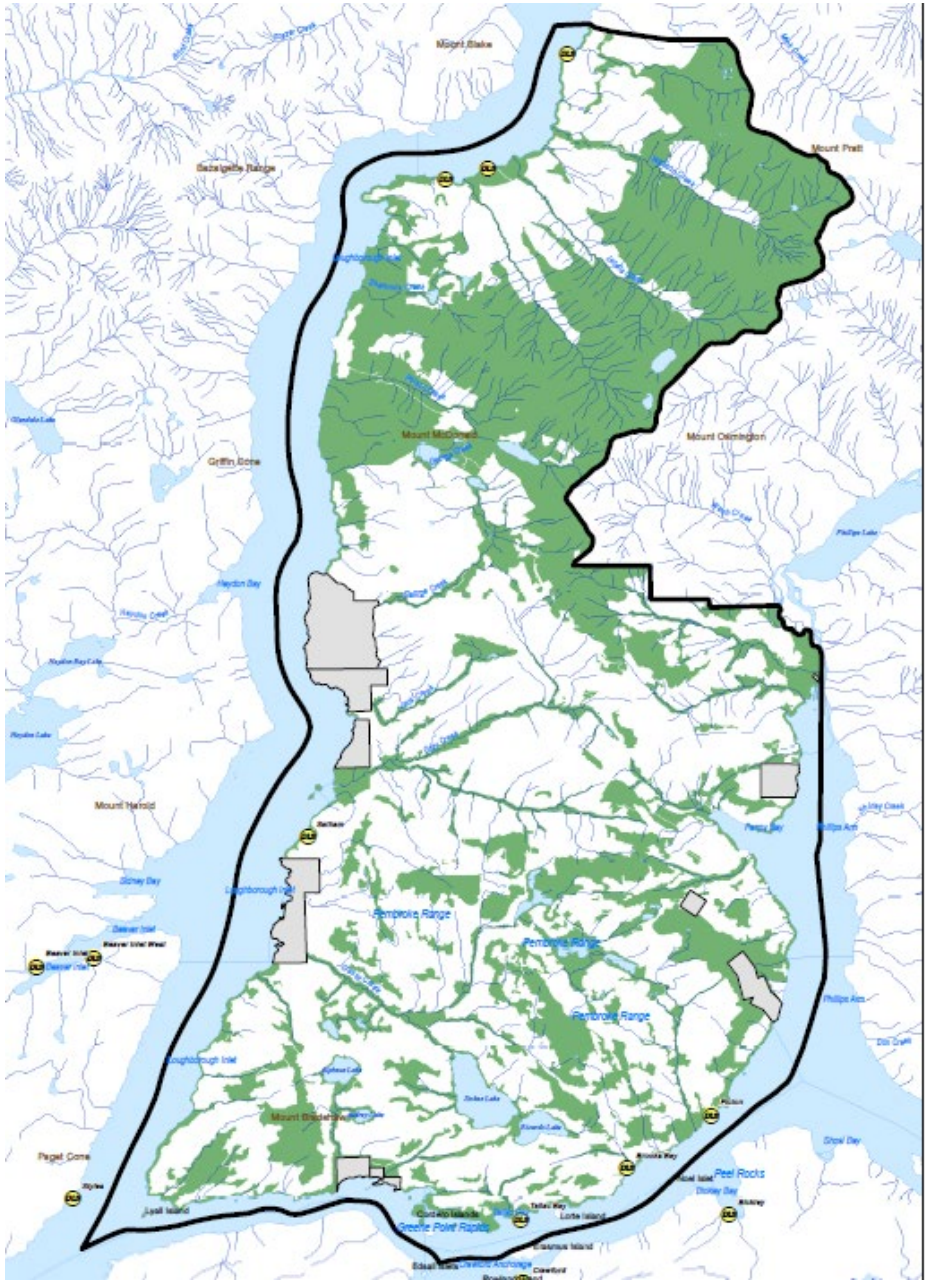
Connectivity

- Organism specific
- Variety of scales
- Landscapes can be connected and still have little habitat
- Connections may be stepping stones, corridors,

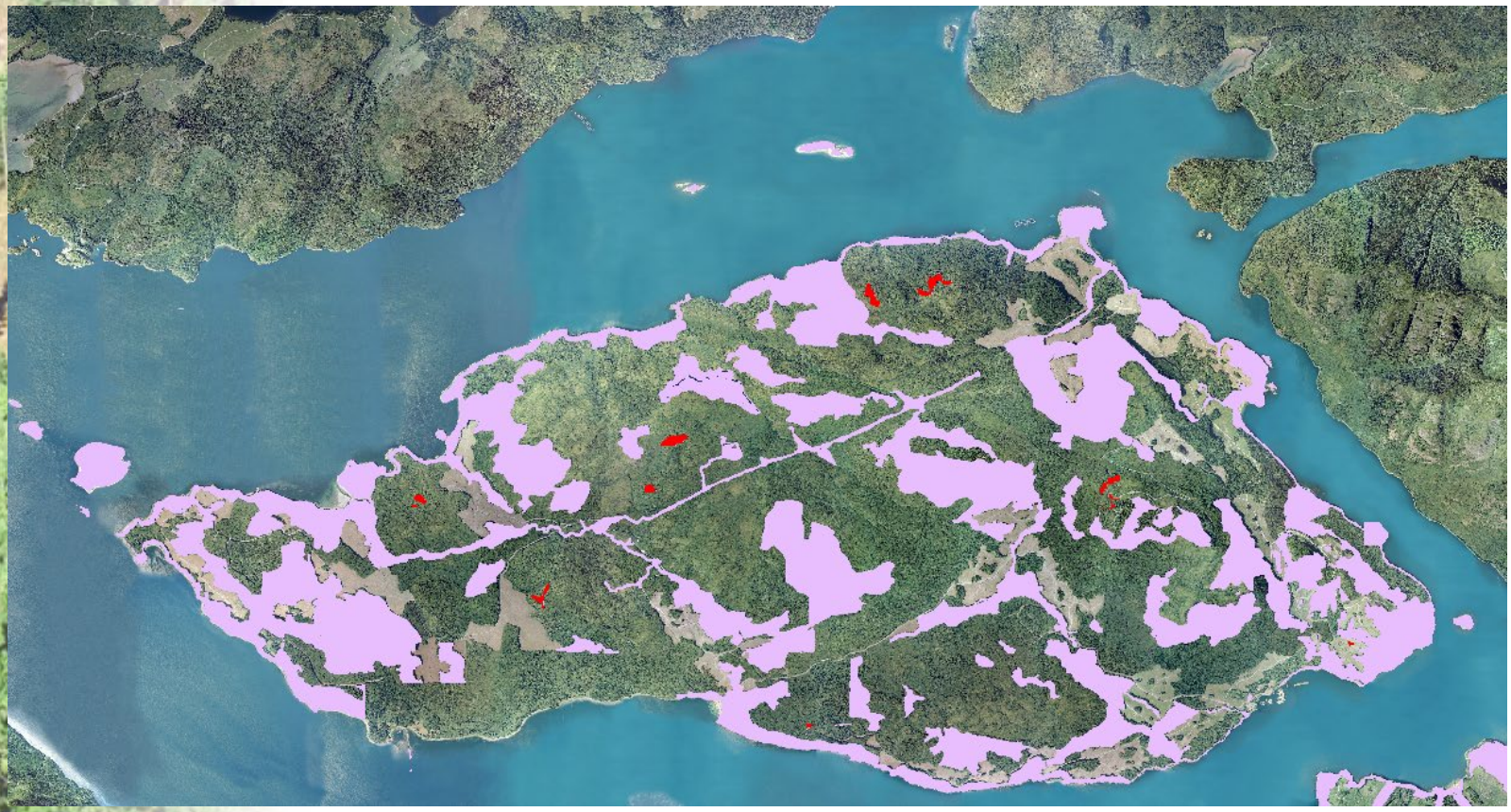


Why forest interior? Edge effects

- depth of edge distance varies by:
  - forest type
  - tree density
  - site aspect
  - slope
  - solar insolation
    - aspect, slope, latitude, season
  - site history


Mount Pratt
Mount Darlington
Mount Harold
Pembroke Range
Peel Rocks
Lyall Island

Reserves

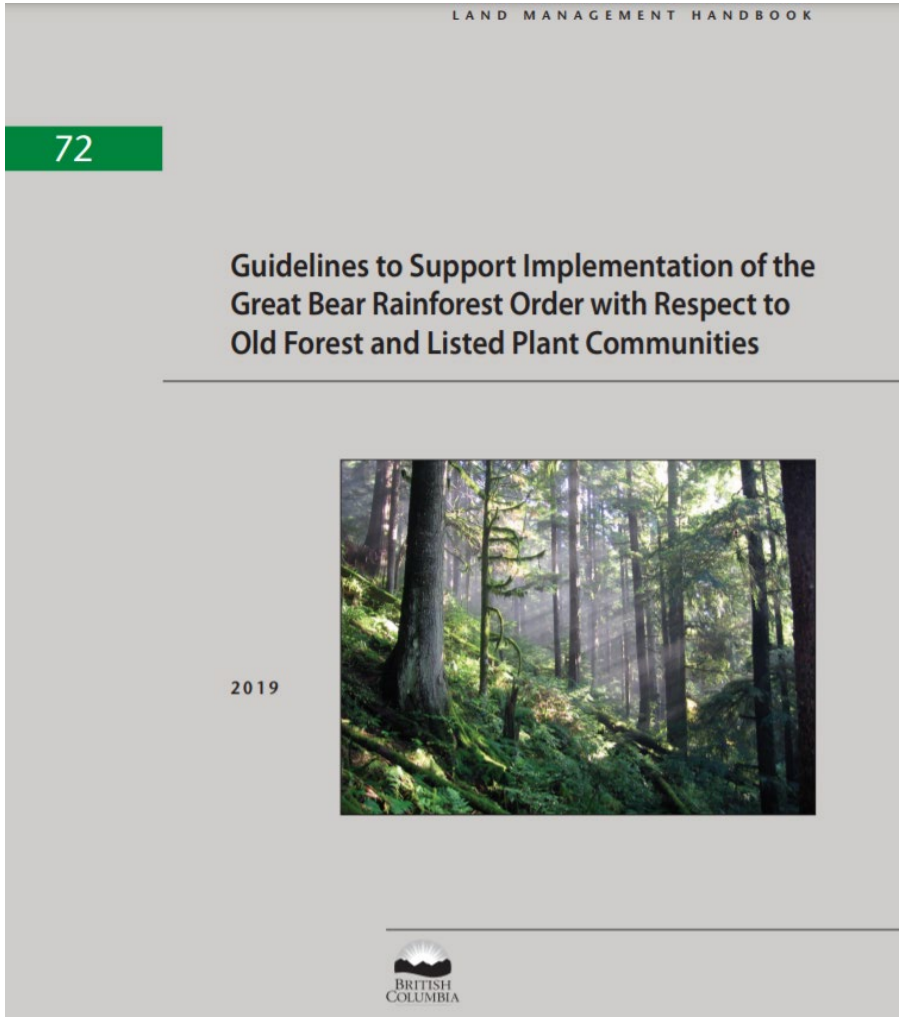


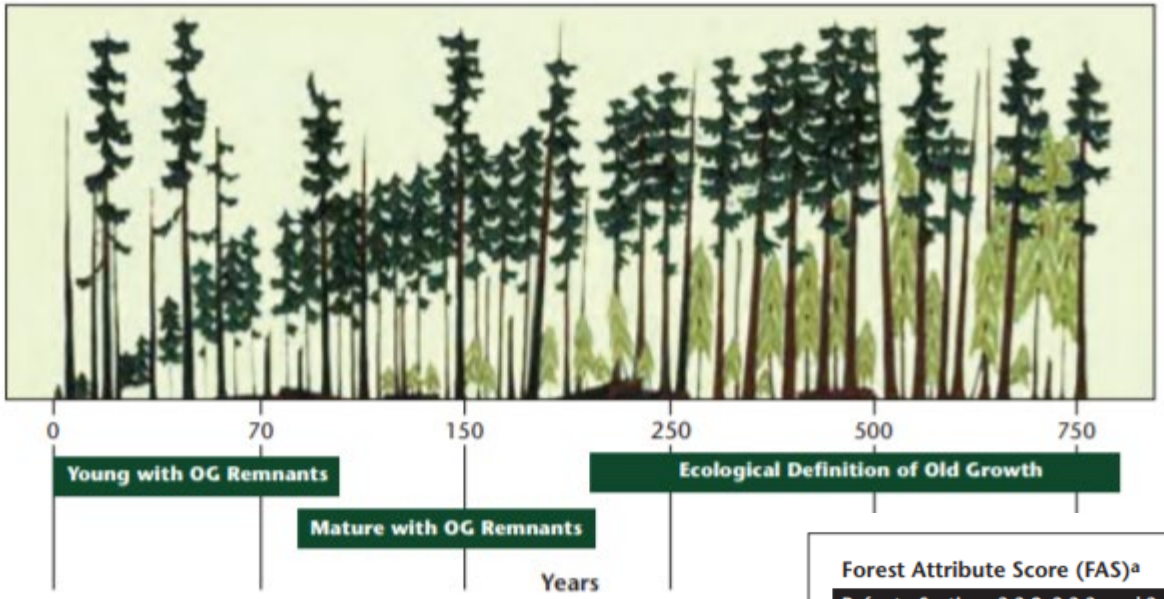
Edge and interior

Ideally…Reserves are old forest

- But most often in southern low elevation coastal areas, we need to recruit mature and younger stands because there isn't enough old left
- What makes good recruitment?
  - Productive, old structures
    - LMH 72

Recruitment for old forest





Forest Attribute Score

Forest Attribute Score (FAS)[a]

Refer to Sections 3.3.2, 3.3.3, and 3.4 for methods of field assessing FAS attributes

(1) Density of VOTs (Veteran Overstorey Trees)

dbh < 100 cm

• ≤ 4 sph	0.0 pts
• 5–9 sph	0.5 pts
• ≥ 10 sph	2.0 pts

dbh ≥ 100 cm

• 1–4 sph	1.0 pt
• 5–9 sph	2.0 pts
• ≥ 10 sph	3.0 pts

(2) Density of snags ≥ 50 cm dbh and ≥ 5 m tall

• ≤ 4 sph	0.0 pts
• 5–14 sph	1.0 pt
• > 14 sph	2.0 pts

(3) Vertical canopy differentiation

• Simple	0.0 pts
• Moderate	1.0 pt
• Complex	2.0 pts

(4) Understorey shrub and herb cover (excluding conifers and bryophytes)

	Old Forest	Listed Community
• Sparse	0.0 pts	0.0 pts
• Patchy	1.0 pt	1.0 pt
• Consistent/well developed	2.0 pts	2.5 pts

(5) Coarse woody debris pieces ≥ 50 cm diameter and ≥ 10 m length

• Few to no pieces	0.0 pts
• Some pieces	0.5 pts
• Common pieces	1.0 pt

(6) Disturbance history

• Intensive harvest (numerous/obvious stumps)	0.0 pts
• Selective harvest (scattered stumps often moss covered)	0.5 pts
• Natural disturbances (e.g., fire, wind)	1.0 pt

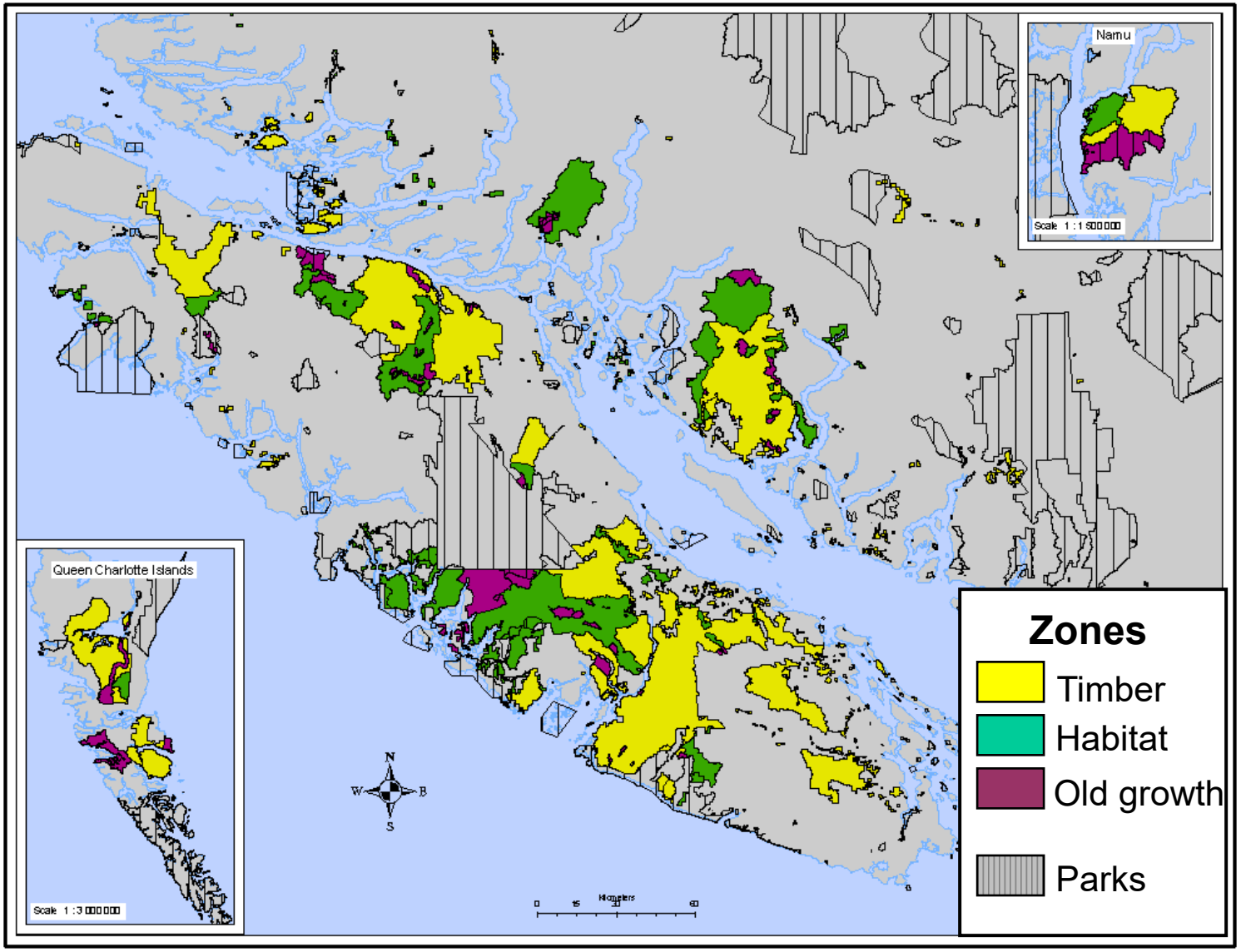
SCORING

If total score > 6 then **PASS**

Landscape scale: Managing ecosystems and habitats

- Reserves
- Zoning
- Managing landscape seral ages and patterns

Landscape Zoning



Characteristics of Zones

10% in Old Growth Zone

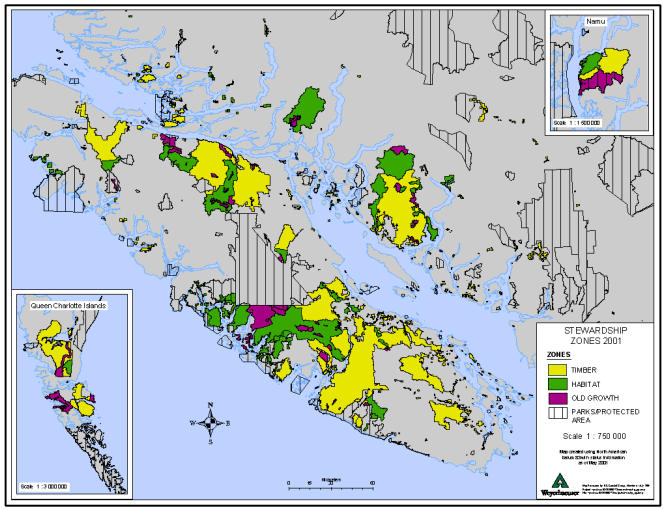
- 1/3 avail for harvest
- min 20% retention

25% in Habitat Zone

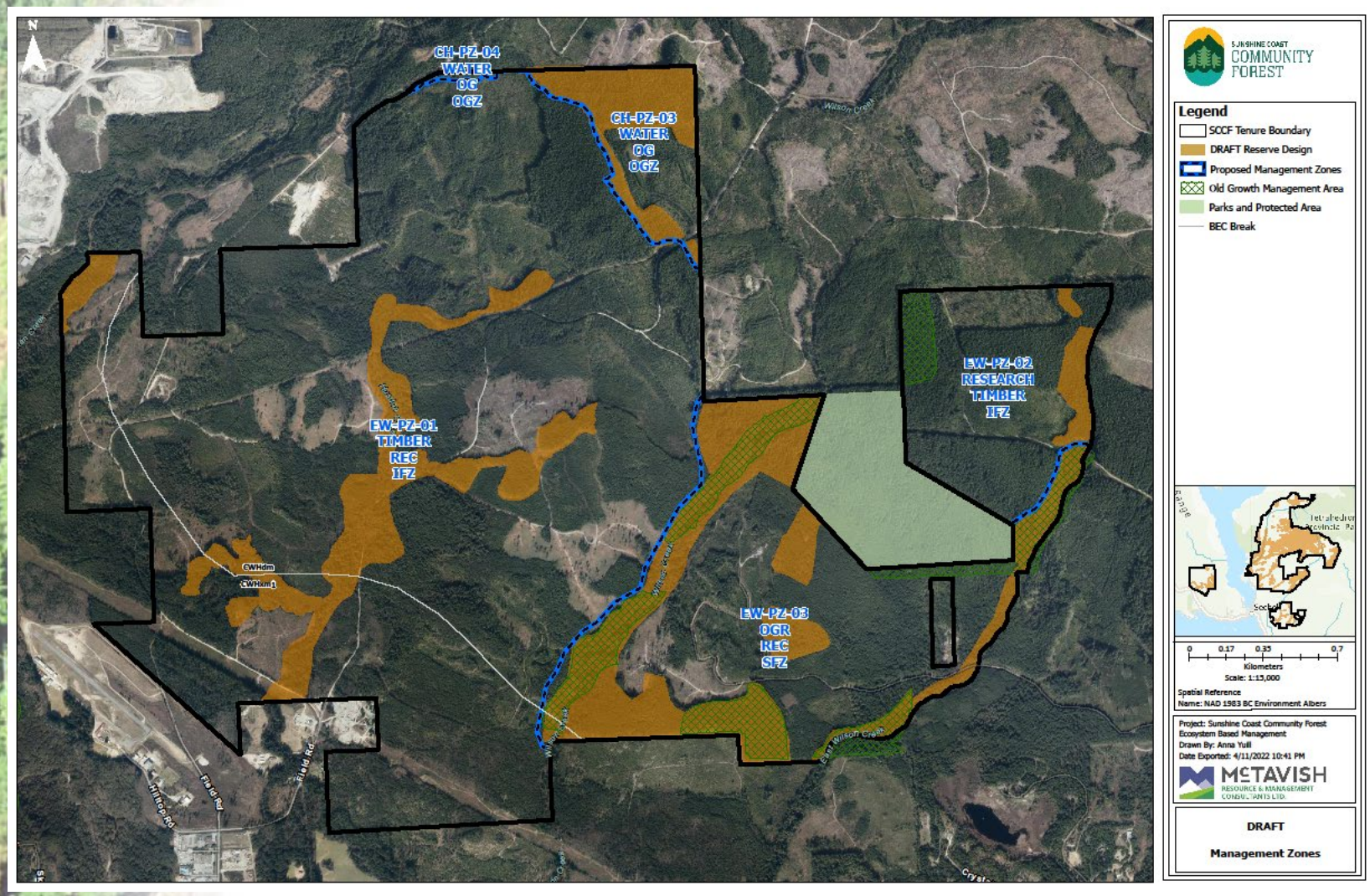
- 70% avail for harvest
- min 15% retention

65% Timber Zone

- 80% available for harvest
- 5 to 10% retention



SCCF zoning ideas



SCCF Ideas for Landscape Zones:

- Recreation?
- Fuel management?
- Water flow and quality?
- …

Landscape scale: Managing ecosystems and habitats

- Reserves
- Zoning
- Managing landscape seral ages and patterns

(more on) Landscape level: pattern of harvest

- Seral distribution
- Patch size and forest interior (old and young)
- Connectivity

Planning landscape harvest pattern

- Amount of footprint in an area
  - Don’t have every area looking the same
- Seral distribution/connectivity
  - Old/mature connections? Young areas?
- Patch size and forest interior (old and young)
  - Core areas through time?

Landscape scale: Managing ecosystems and habitats

- Reserves
- Zoning
- Managing seral ages and patterns

Stand-level: Maintaining habitat structure

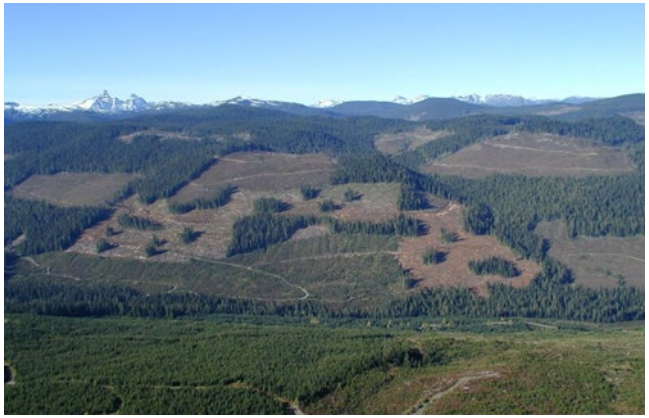
- Large live trees
- Snags
- Down wood
- Shrubs
- Vertical complexity
- Horizontal complexity

Why leave structure?

- Habitat to lifeboat some species
- Allow dispersal of species
- Create older forest function more quickly
- Soften harvested matrix

- Social/visual

Leaving Structure = retention



:

- patches, dispersed
- different amounts and patterns

Examples of VR approaches

Timber emphasis

Group retention - 13%

Habitat emphasis

Mixed retention - 19%

Old growth emphasis

Group selection

Mixed retention - 16%

Two-pass retention - 53%

Standing stem harvesting

Adaptive Management Program

Recognized the need to learn

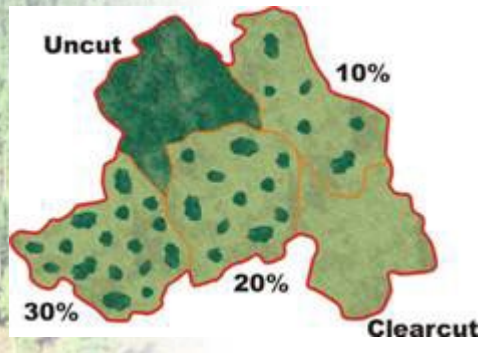
- Passively from what was being done
- Actively from experiments

then revise and continue.

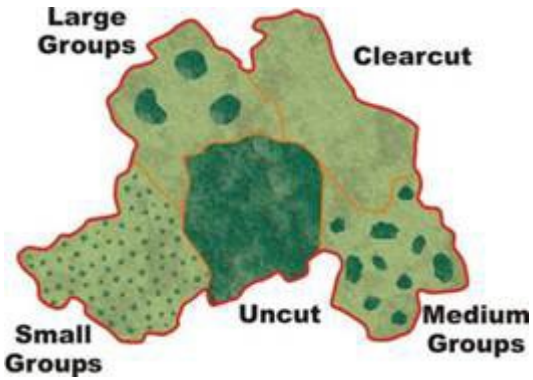
That was the idea up front, not a belated thought

VRAM Experimental Sites

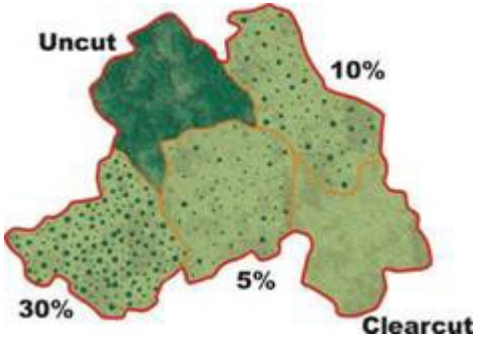
Five comparisons



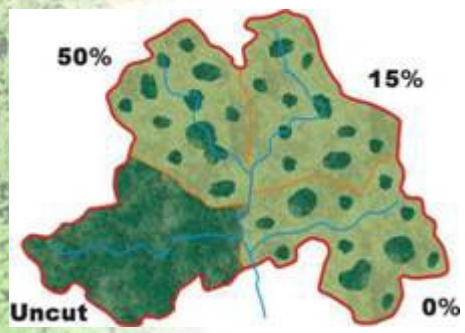
Group Retention



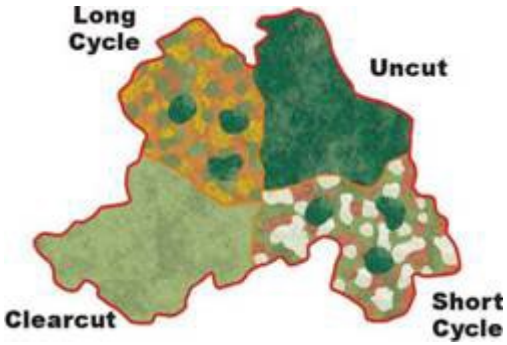
Group Size
15% retention



Dispersed Retention



Riparian Retention
15% retention

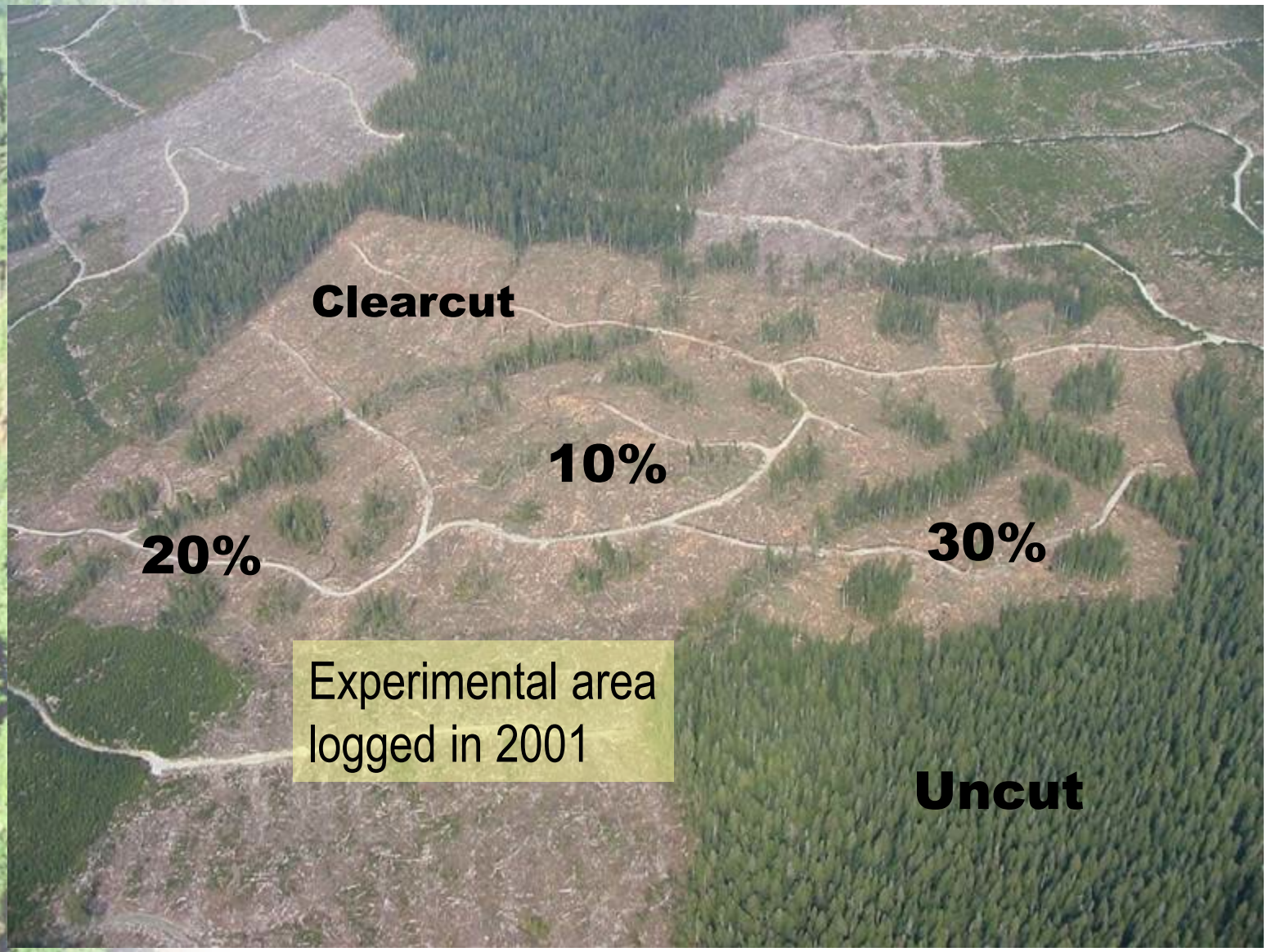


Group Removal
Short-cycle (5–7yr)
Long-cycle (20–30yr)

Each area replicated 3 times
100 ha each

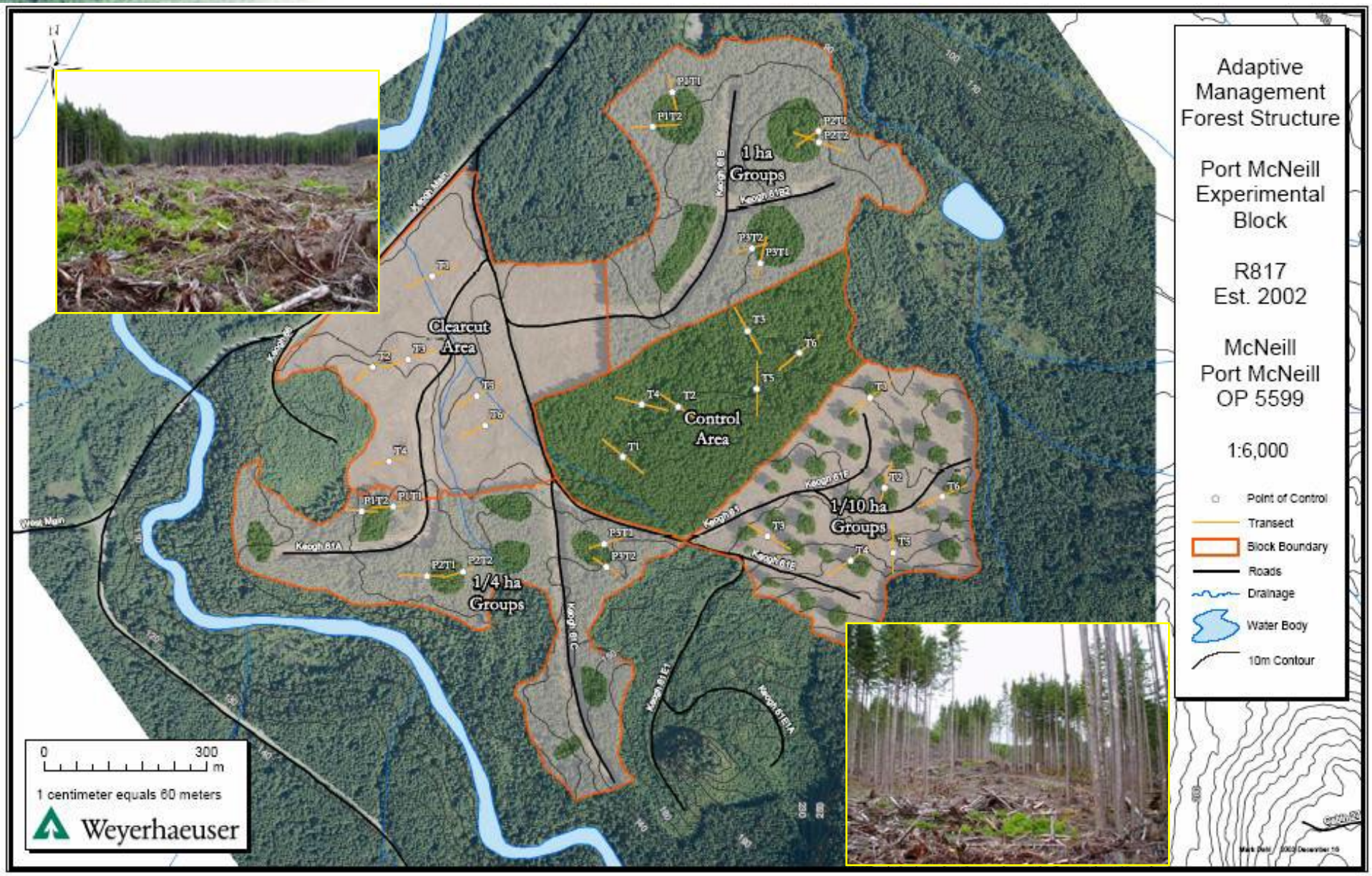
Weyerhaeuser

VRAM Tsitika – Group Retention



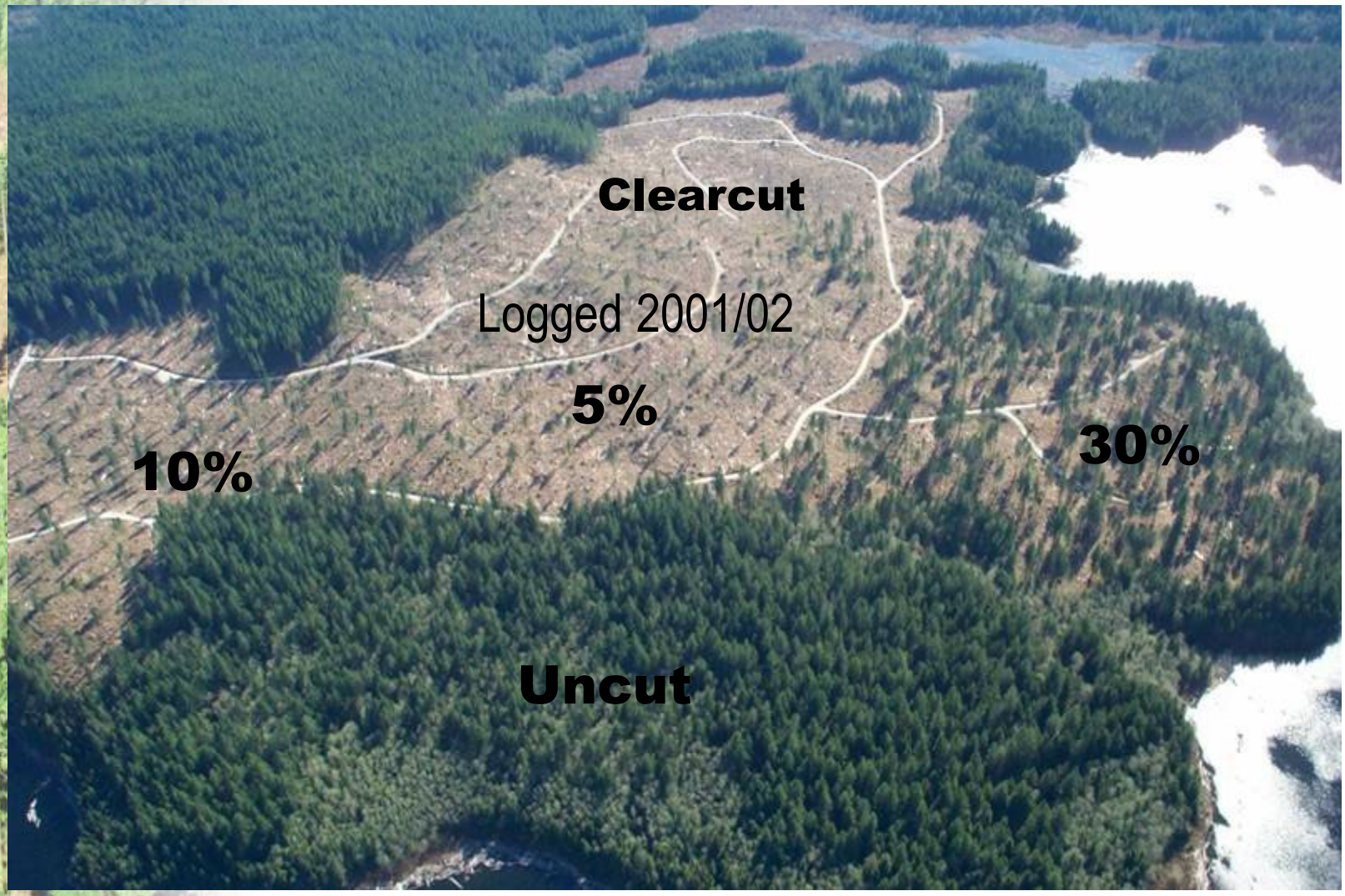
North Island Timberlands

VRAM Cluxewe – Group Size



Port McNeill Timberlands

VRAM Horseshoe Lk. - Dispersed



Stillwater Timberlands

Adaptive Management

Monitoring

Implementation

Did we do what we said we would?

- Amounts?
- Shapes?
- Key attributes as biological control points?

Effectiveness

Did it work as we expected?

- Are key structures retained and recruited over time?
- Are they used by organisms as predicted?
- Are ecological functions maintained?
- Did we get windthrow?
- Have we created a forest health problem?
- Are young trees growing well?

Structural Monitoring

Basic Findings:

- Patches/groups generally better than dispersed
- Dispersed better for large live trees
- Larger groups better (small groups had fewer large snags, were vulnerable to windthrow, higher logging costs)

Edge Effects:

- Few edge effects
- At most, within 10m of edge
- May develop with time

Habitat Benchmarks

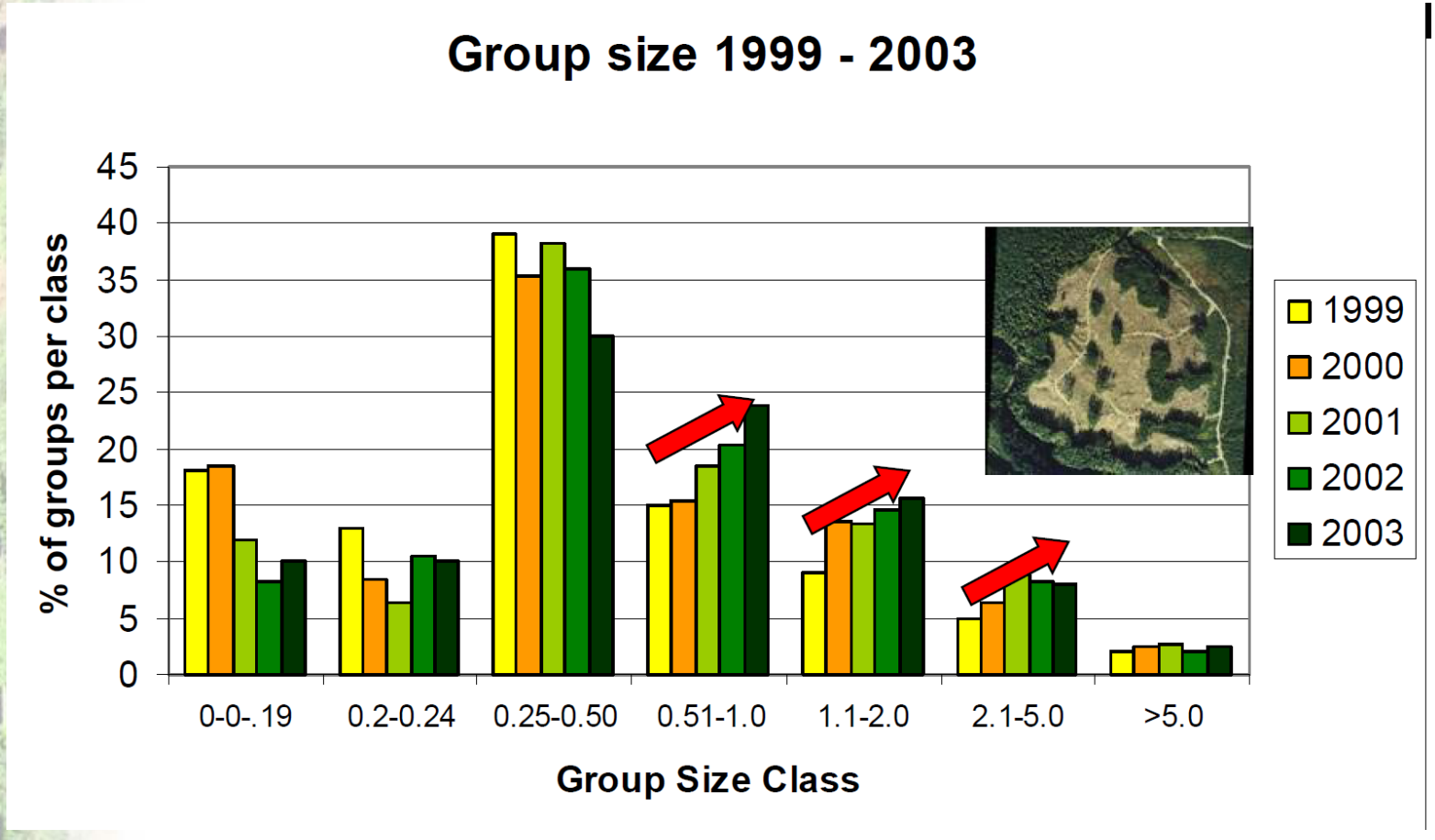
- Comparisons of retention patches to benchmarks
  - Initially fewer large trees/ha
  - Less basal area/ha

Structural Monitoring

Linking to management

- Select and refine stand-level practices
  - Identify weakest aspects
  - Suggest better alternatives
    - shift emphasis on ecological anchors or increase patch sizes (e.g., tall snags)
- Guide landscape-level planning
  - Suggest mix of retention
- Assess long-term trends

Stand level Practices: revising over time



Goal: Not losing native species or subspecies due to human-induced disturbance

Not a lot of species monitoring in BC

- **Hunted species** by hunter returns and some population surveys, monitoring transplants

- **Species at risk** some surveys (but years since we did more than inventory of NOGO and MAMU for example)
  - **Other species at risk?** On the coast NOGO and MAMU are the big ones.
  - Sometimes check if WHAs or UWRs in places expected to be good, but we don't usually check if the animal use them

- **Birds –** volunteer efforts

Maintaining species

- Which ones to check?
  - Umbrella; keystone; species at risk, representative of many guilds …
  - Expensive to monitor!

Species monitoring

Pilot studies and experiments

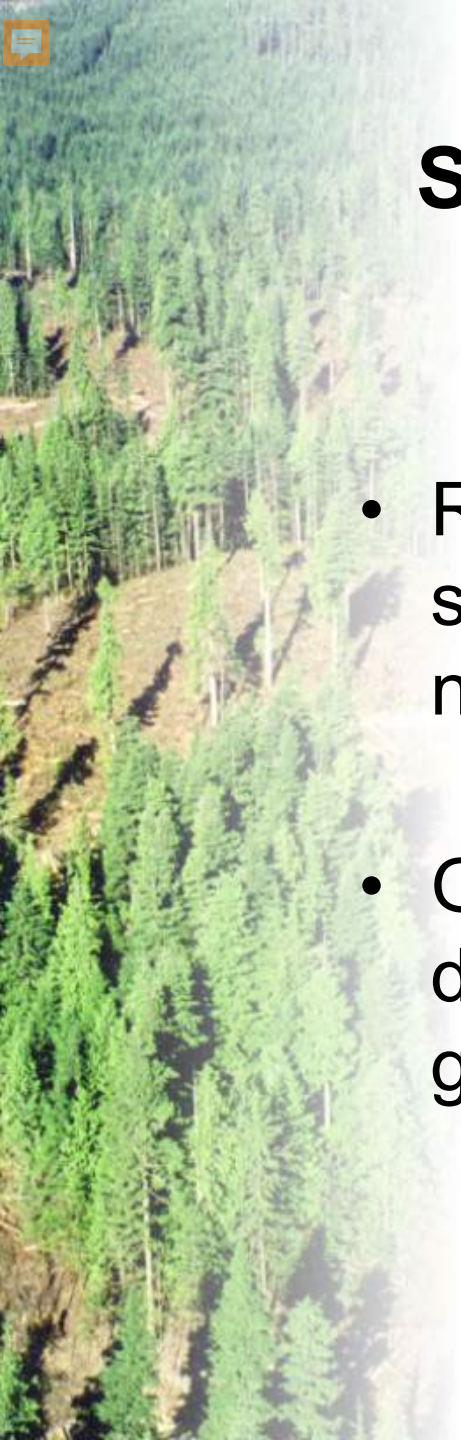
Species group	Operational Monitoring						VRAM Sites
	1999	2000	2001	2002	2003	2004	
Birds	X	X	X	X	X	X	X
Bryophytes	X				X		
Canopy epiphytes			X	X	X	X	X
Carabid beetles			X	X	X	X	X
Amphibians	X	X	X	X	X	X	X
Gastropods	X	X	X	X	X		X
Lichens		X					
Mycorrhizal fungi			X		X	X	X
Squirrels		X					
Vascular plants	X	X	X	X	X	X	X

Species Monitoring

Two Key Questions:

1. **What is effect of retention type and level on organisms?**

2. **Are there edge effects?**



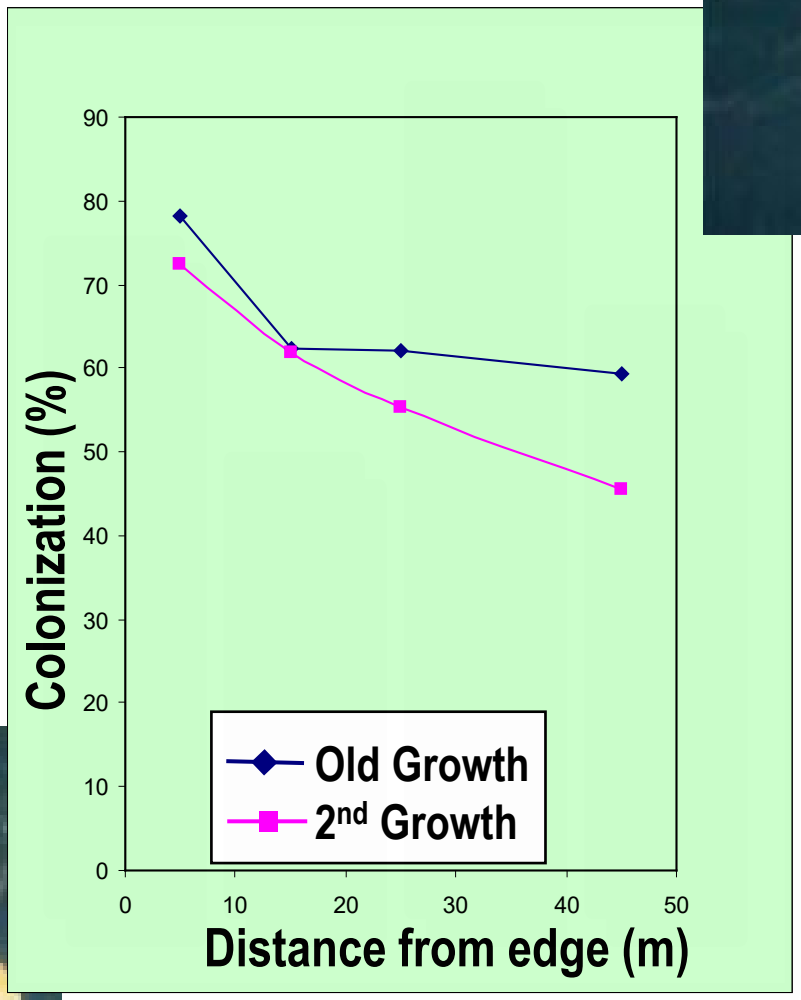
Summary of initial results of species monitoring

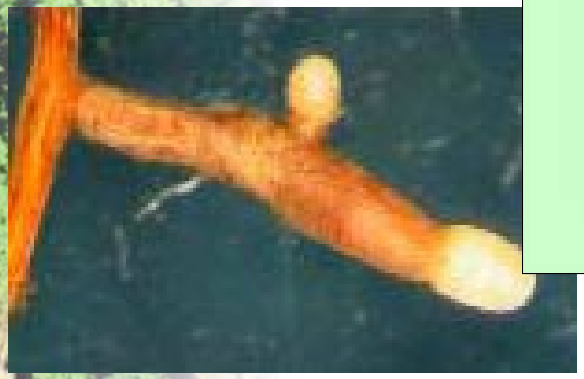
- Retention shows potential for maintaining species from the original forest that would not otherwise be present in a clearcut

- Group retention is generally better than dispersed for maintaining species and larger groups better

  (within the 0 – 30% range tested)

Mycorrhizal fungi

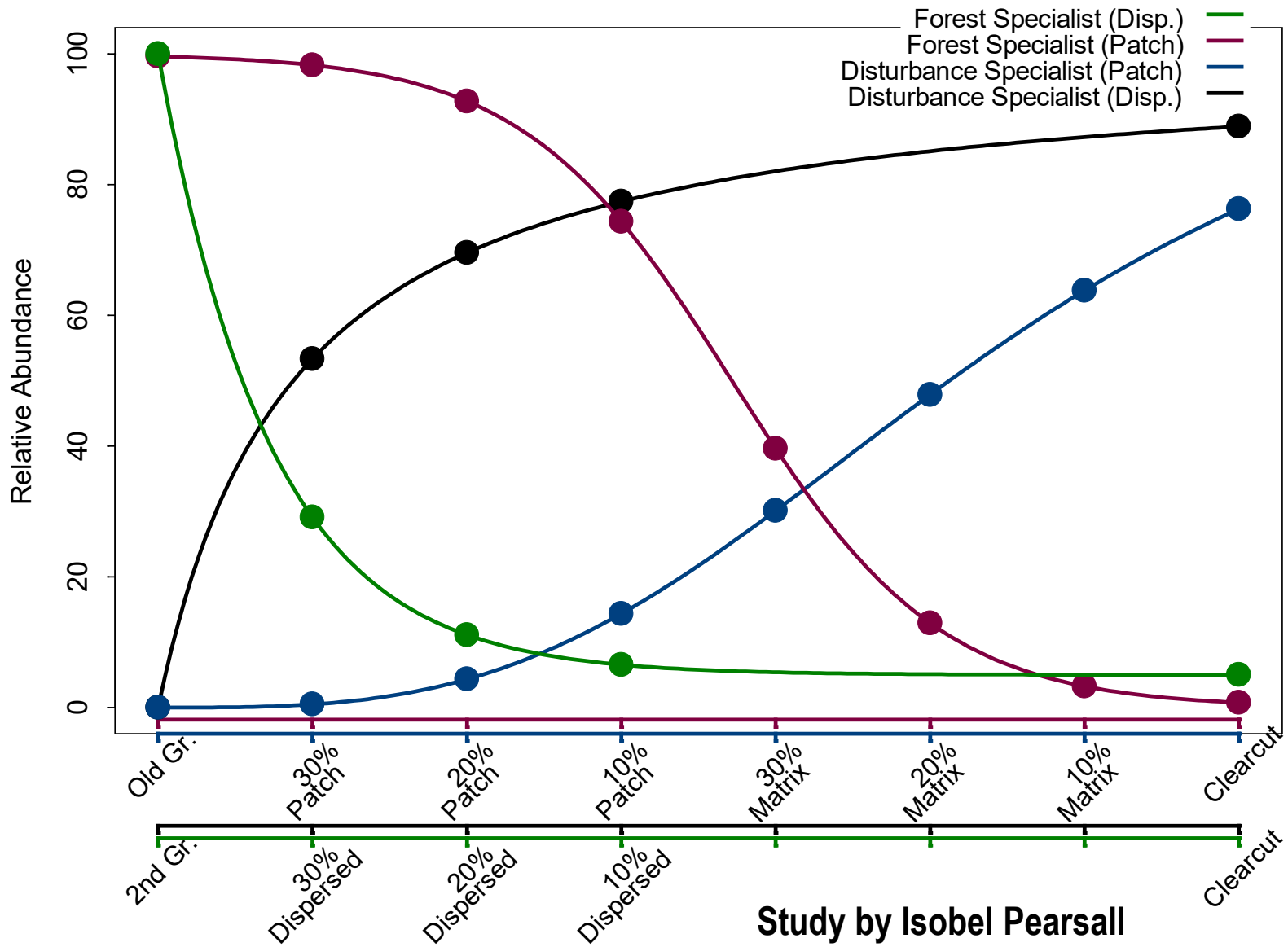




Study by Trofymow and Outerbridge

Carabid Beetles

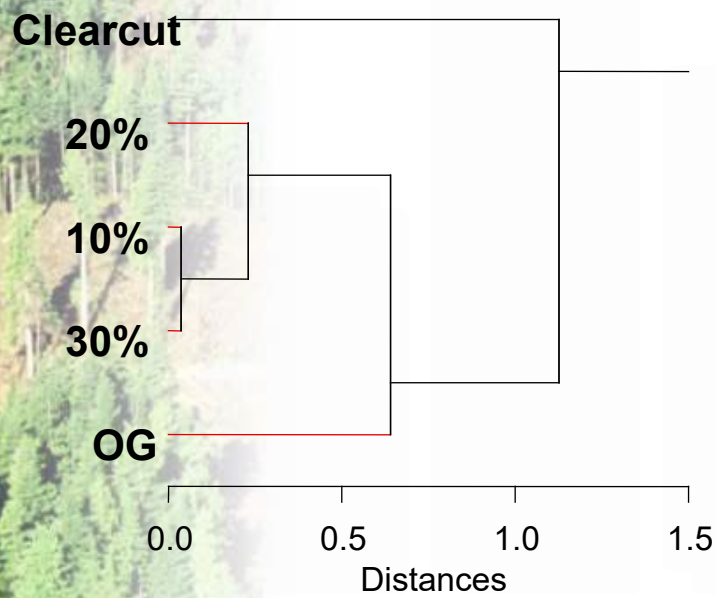
Carabid Beetle Abundance in VR



Study by Isobel Pearsall

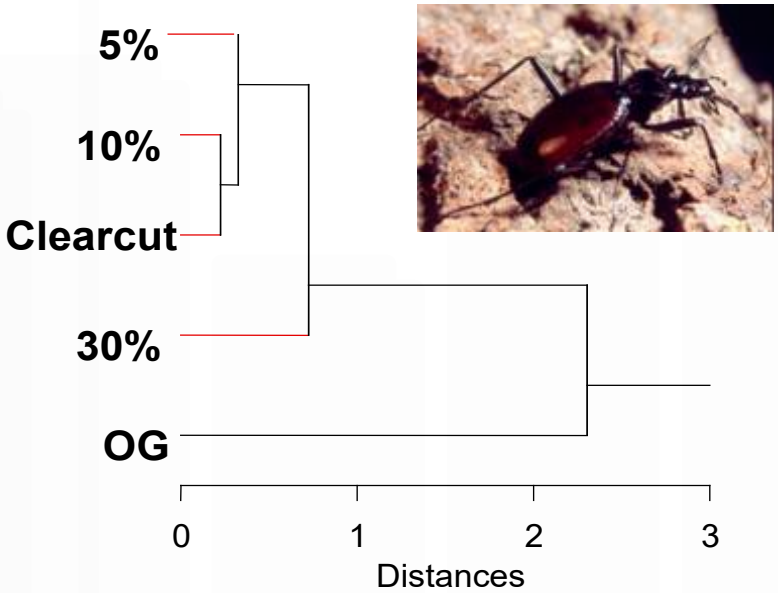
Carabid Beetles - Cluster Analysis

Tsitika (Group Level)



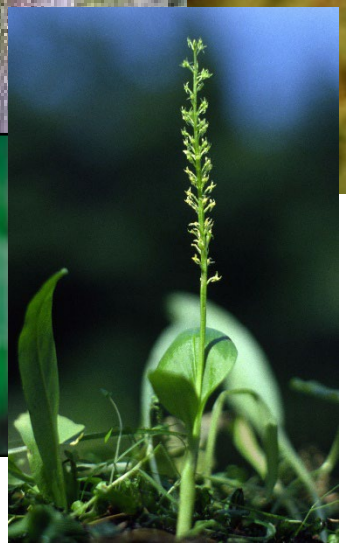
- Patches more similar to uncut old growth than the clearcut.

Powell River (Dispersed Level)

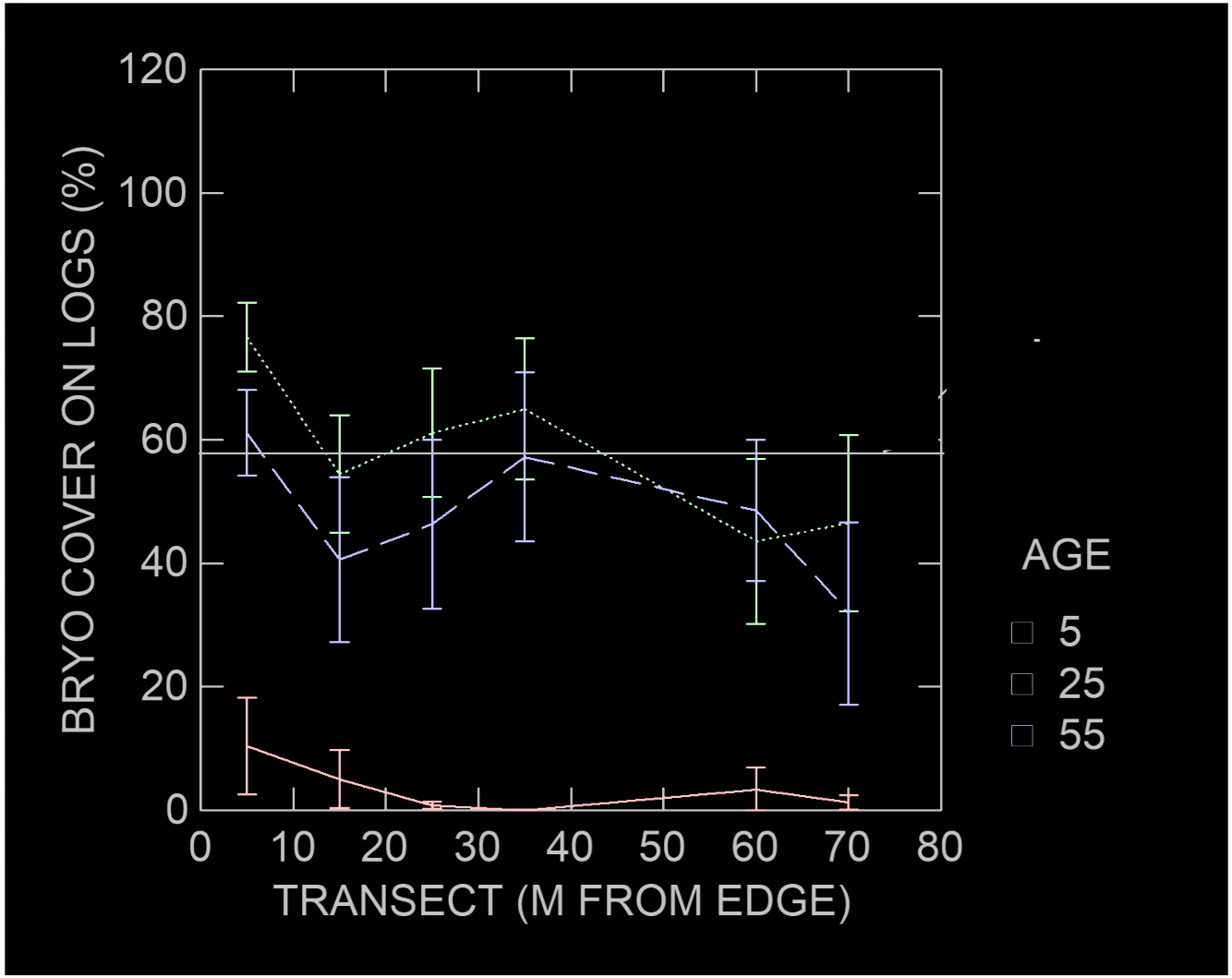


- 5% and 10% dispersed retention did not differ from the clearcut
- 30% dispersed retention provided more habitat for forest species

Bryophytes and vascular plants



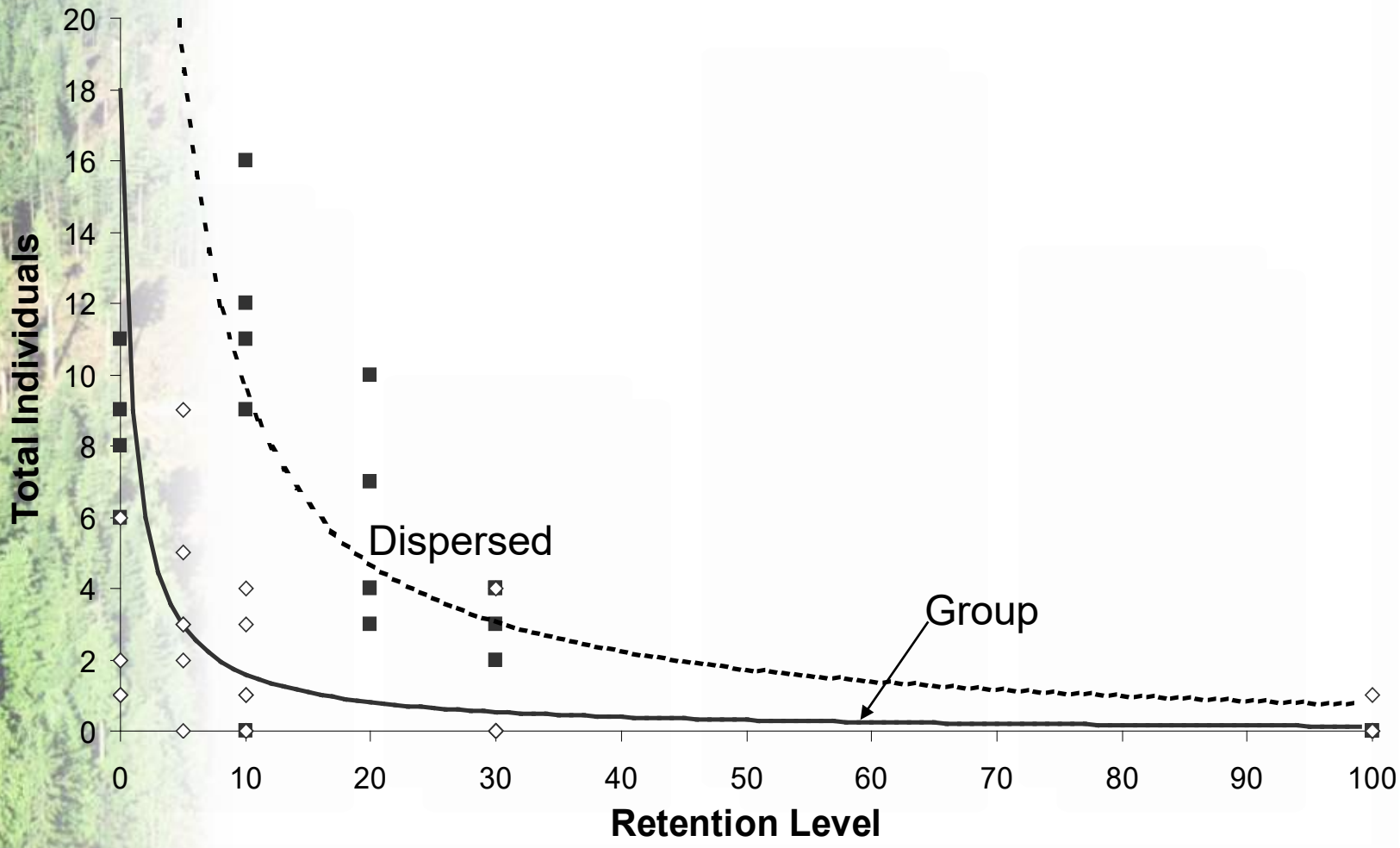
Bryophyte Cover on Logs



Study by Kella Sadler

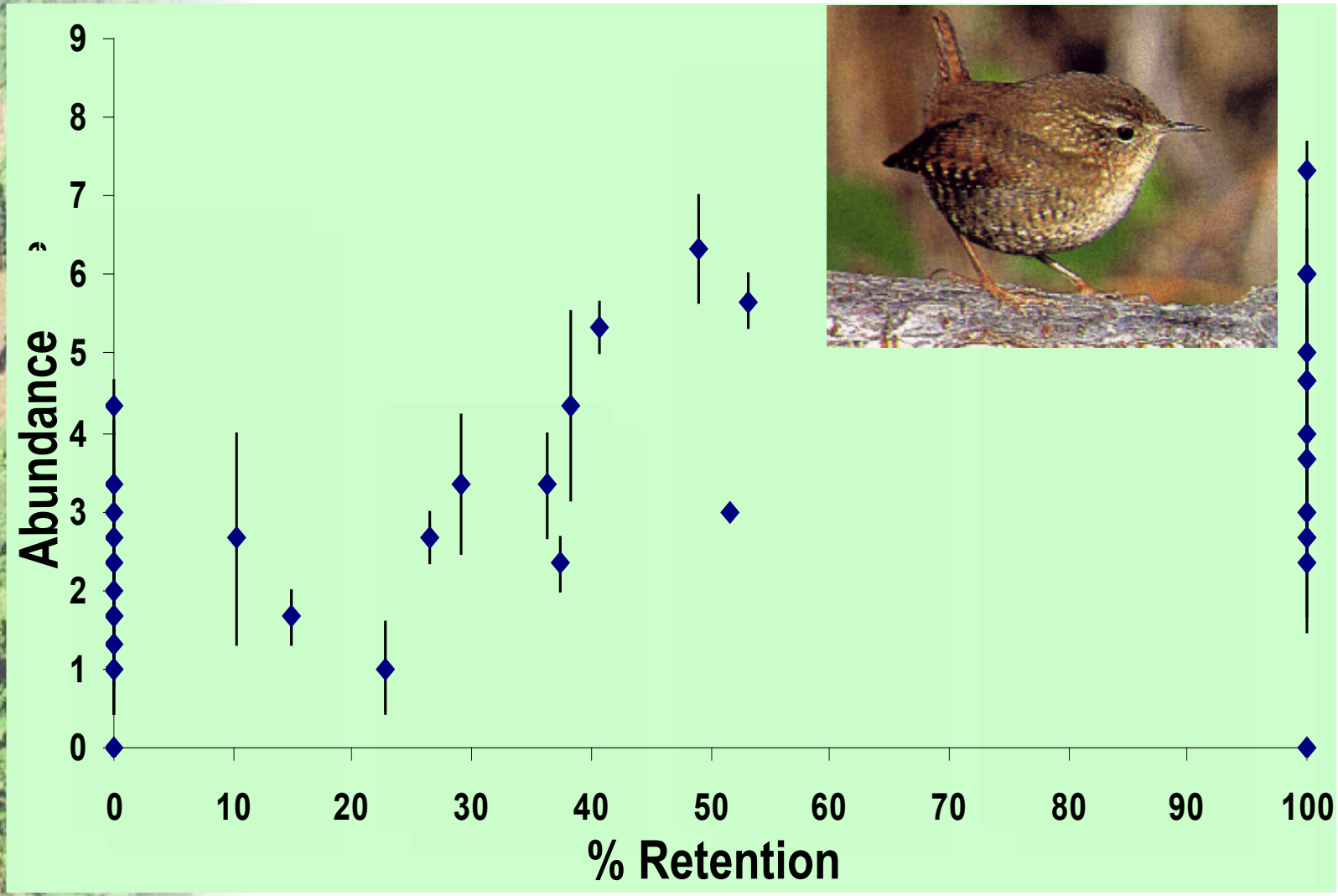
Forest Birds

Dark-eyed Junco - Experimental



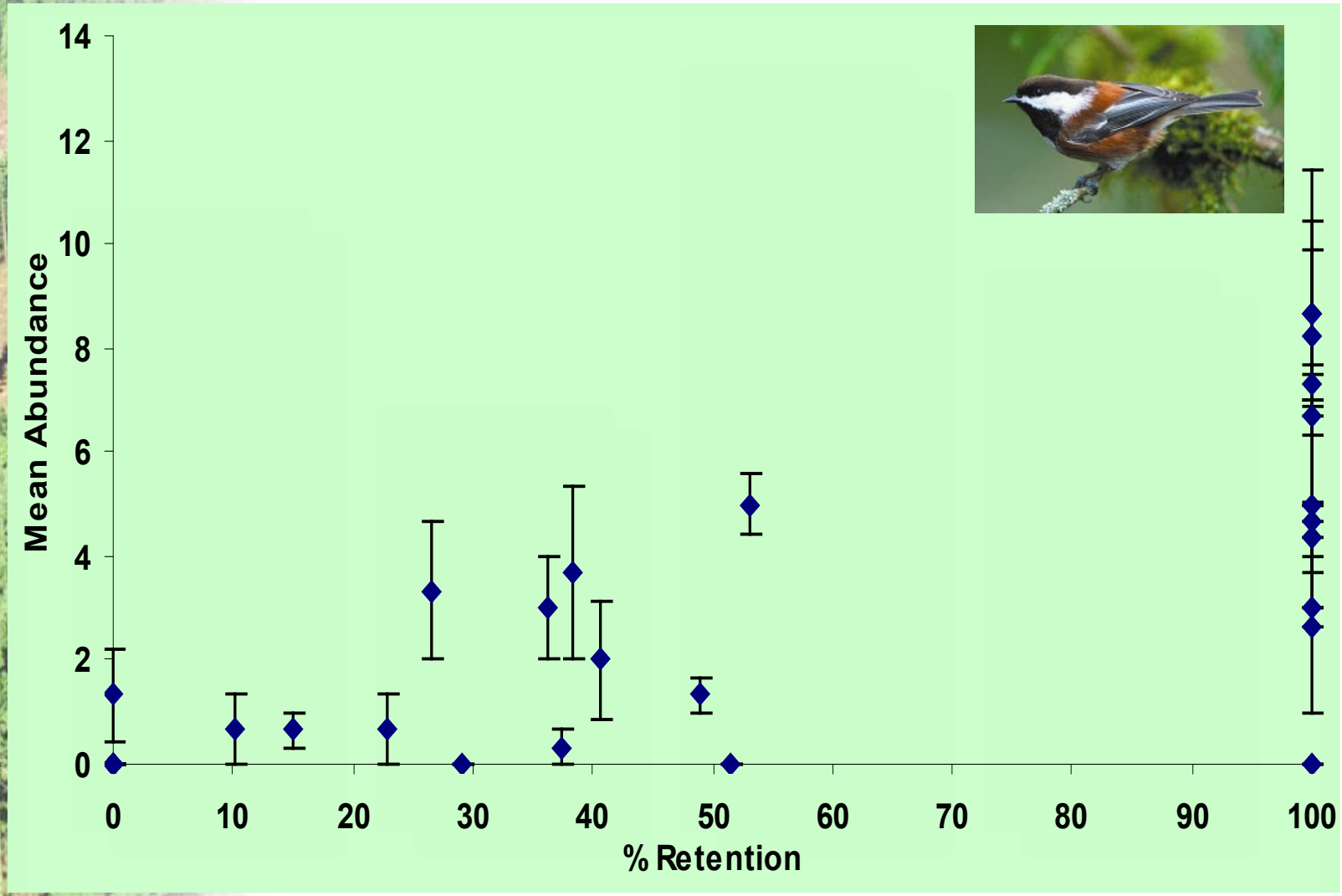
Study by Ann Chan-MacLeod

Pacific Wren

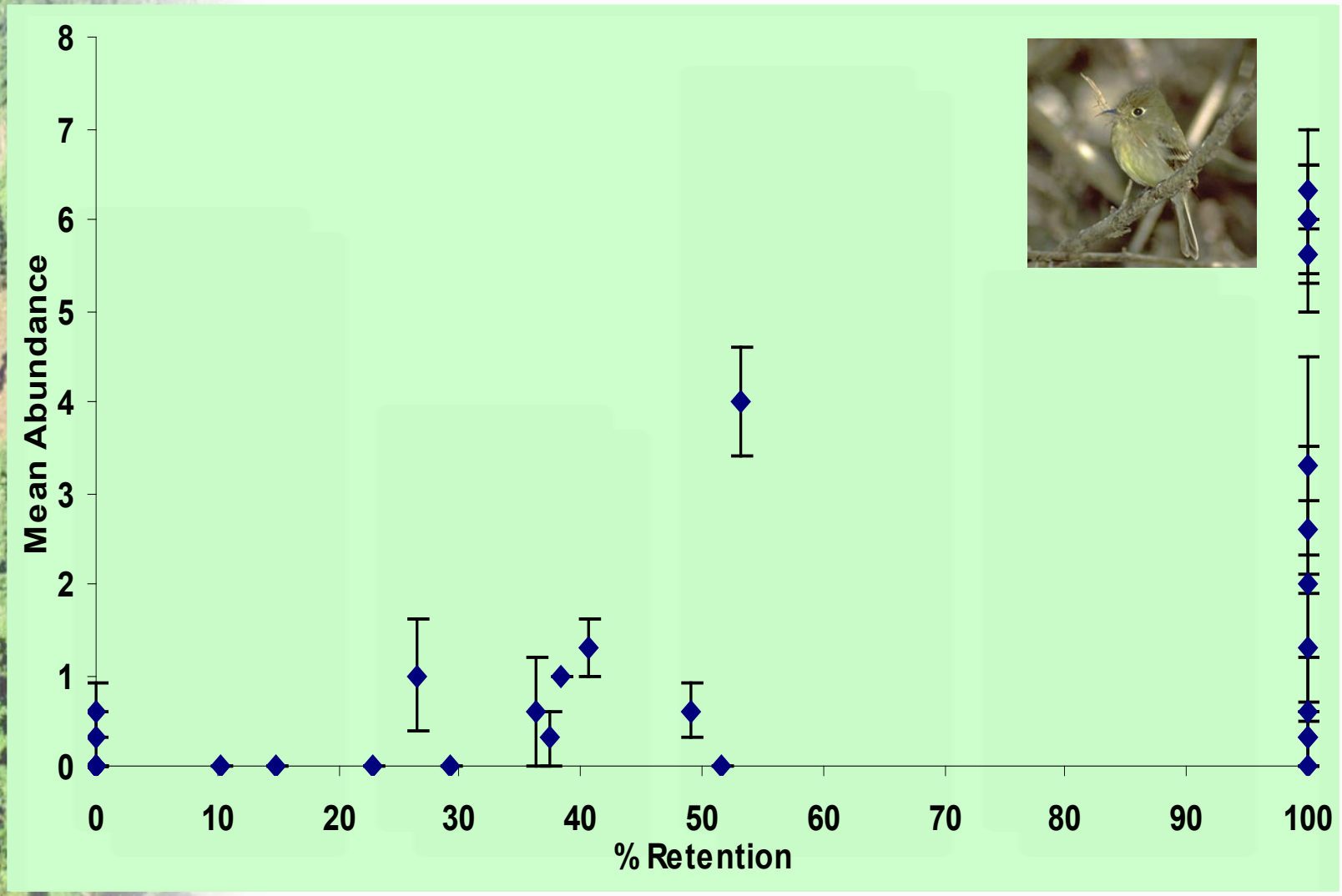


Study by Mike Preston

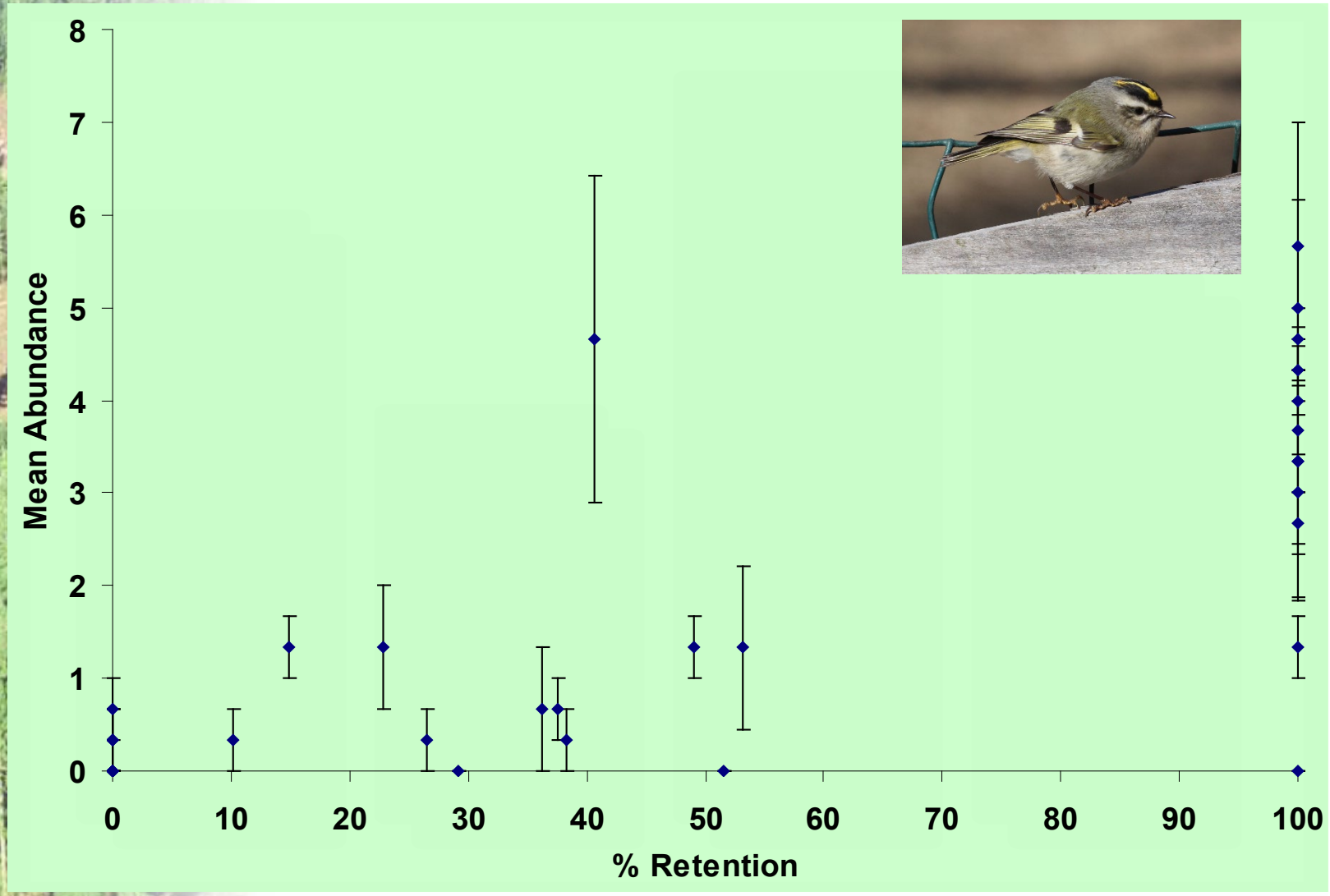
Chestnut-backed Chickadee



Pacific-slope Flycatcher

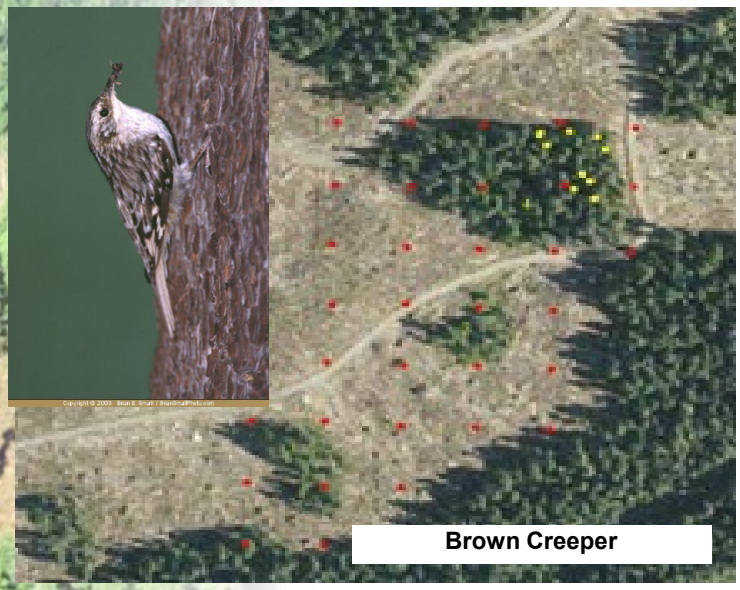


Golden-crowned Kinglet

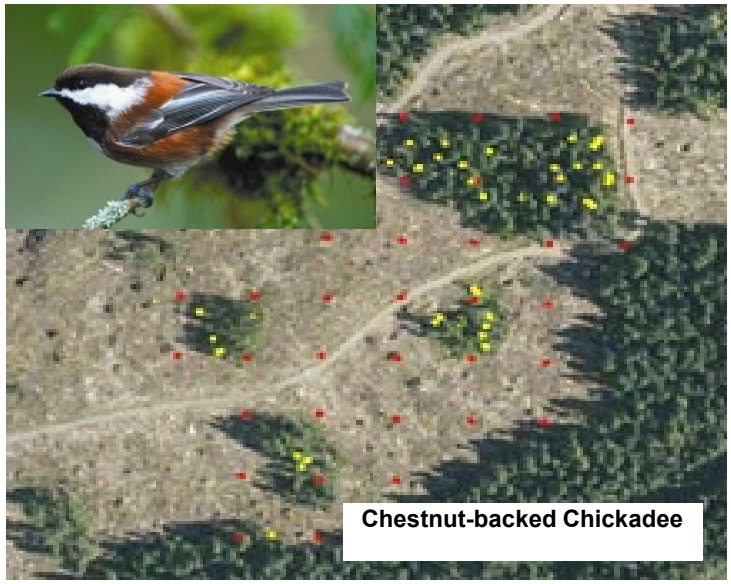


Species monitoring - birds

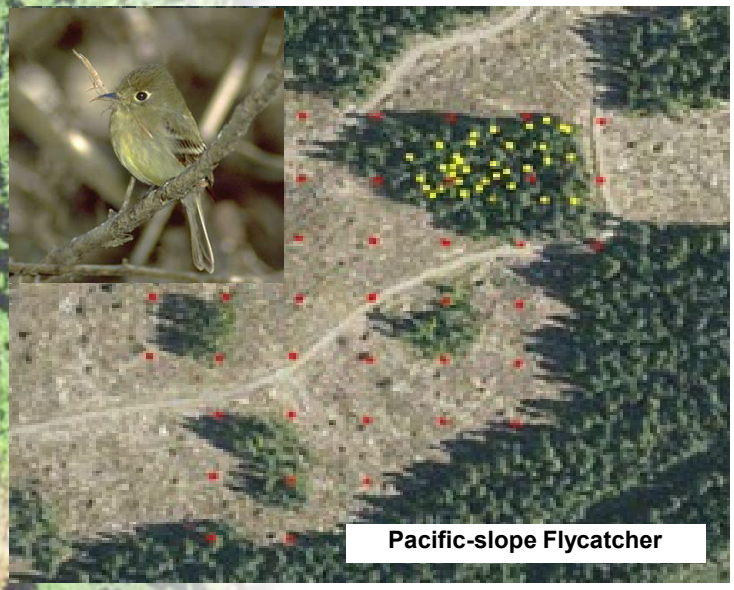
Study by Mike Preston, SFU



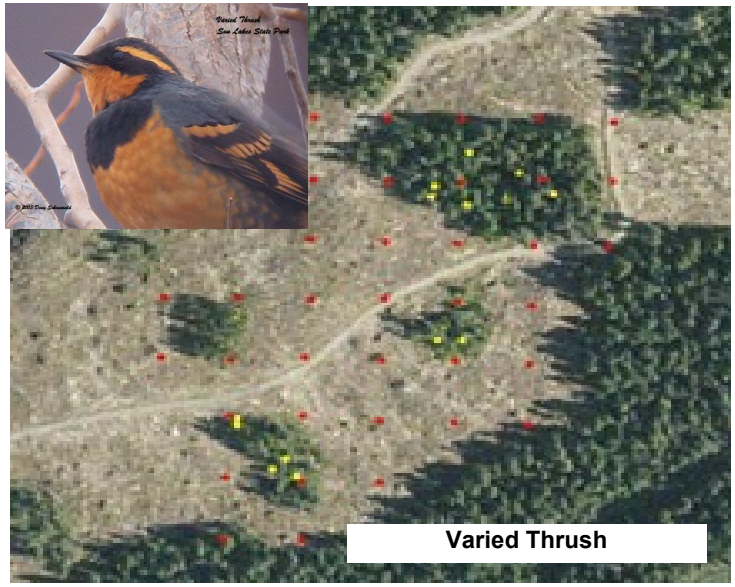
Brown Creeper



Chestnut-backed Chickadee



Pacific-slope Flycatcher



Varied Thrush

Changes in bird communities with harvesting

Study by Mike Preston, SFU

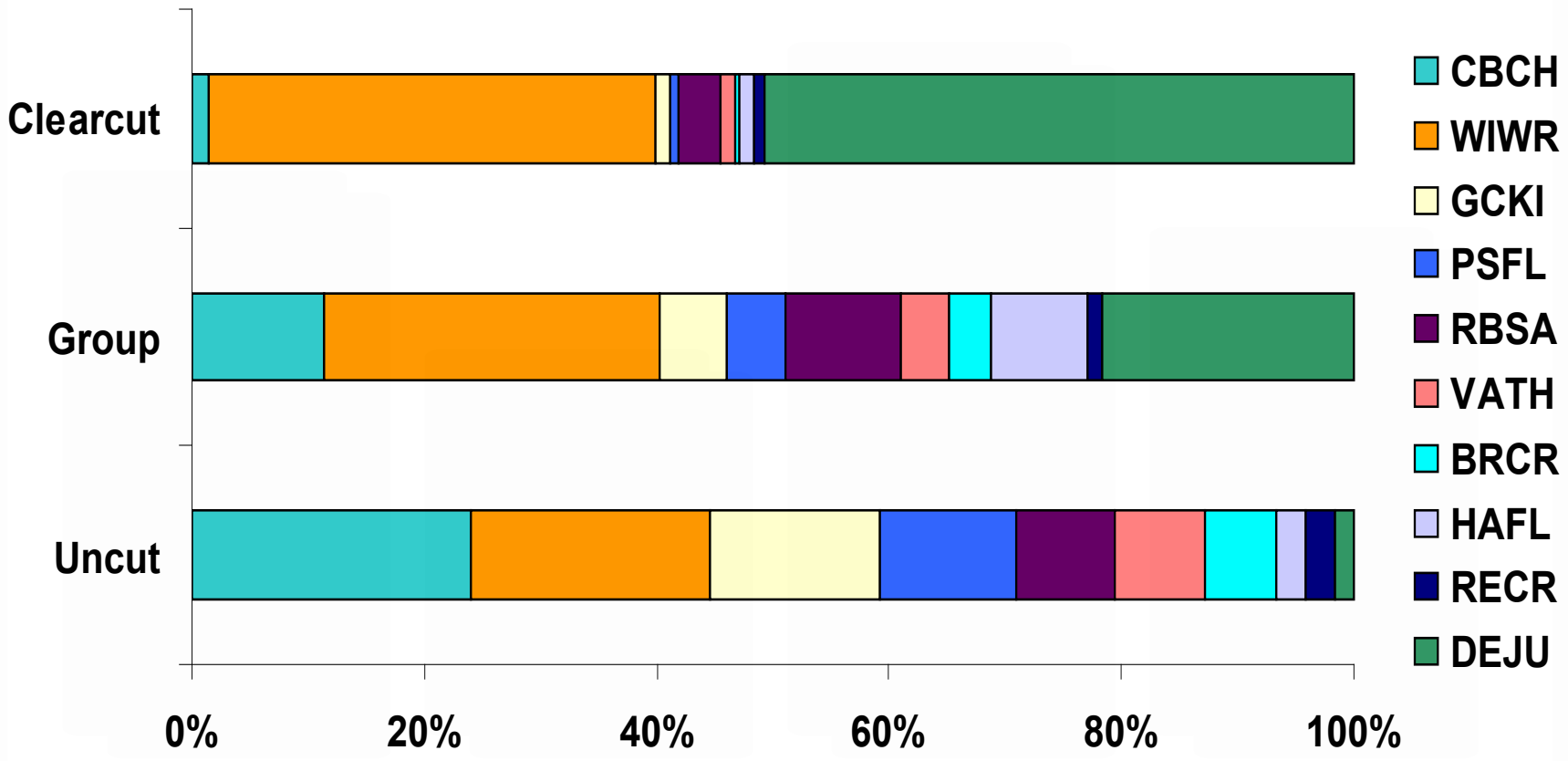
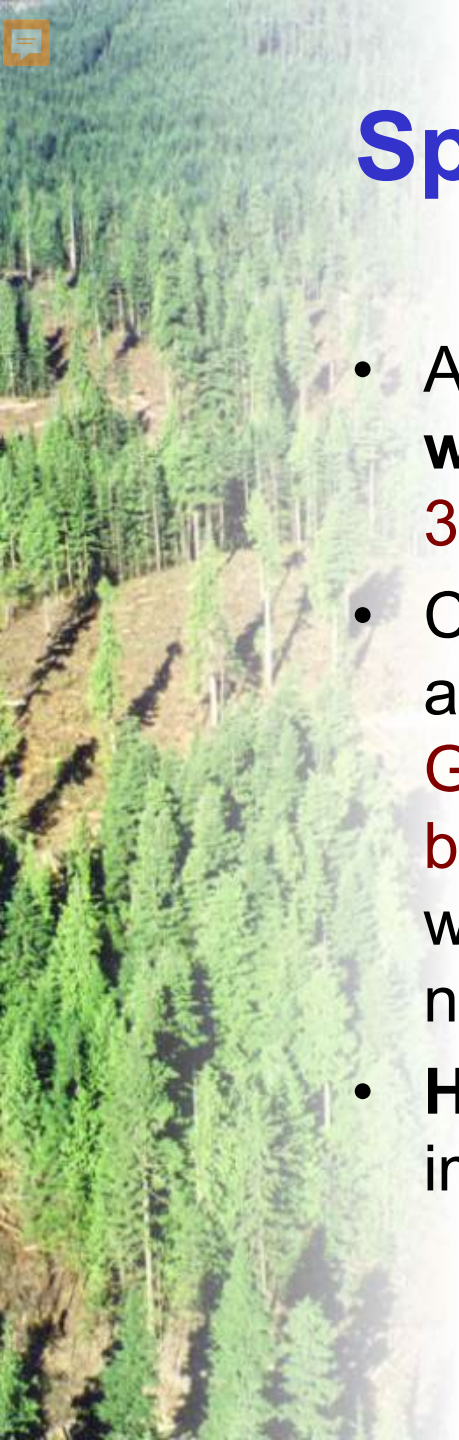


Figure 4. Percent frequency of occurrence in each treatment of the 10 most common species detected in uncut stands. Species codes and full names are given in Appendix 1.

Group retention maintains more similar distribution of common species from uncut stands than a clearcut

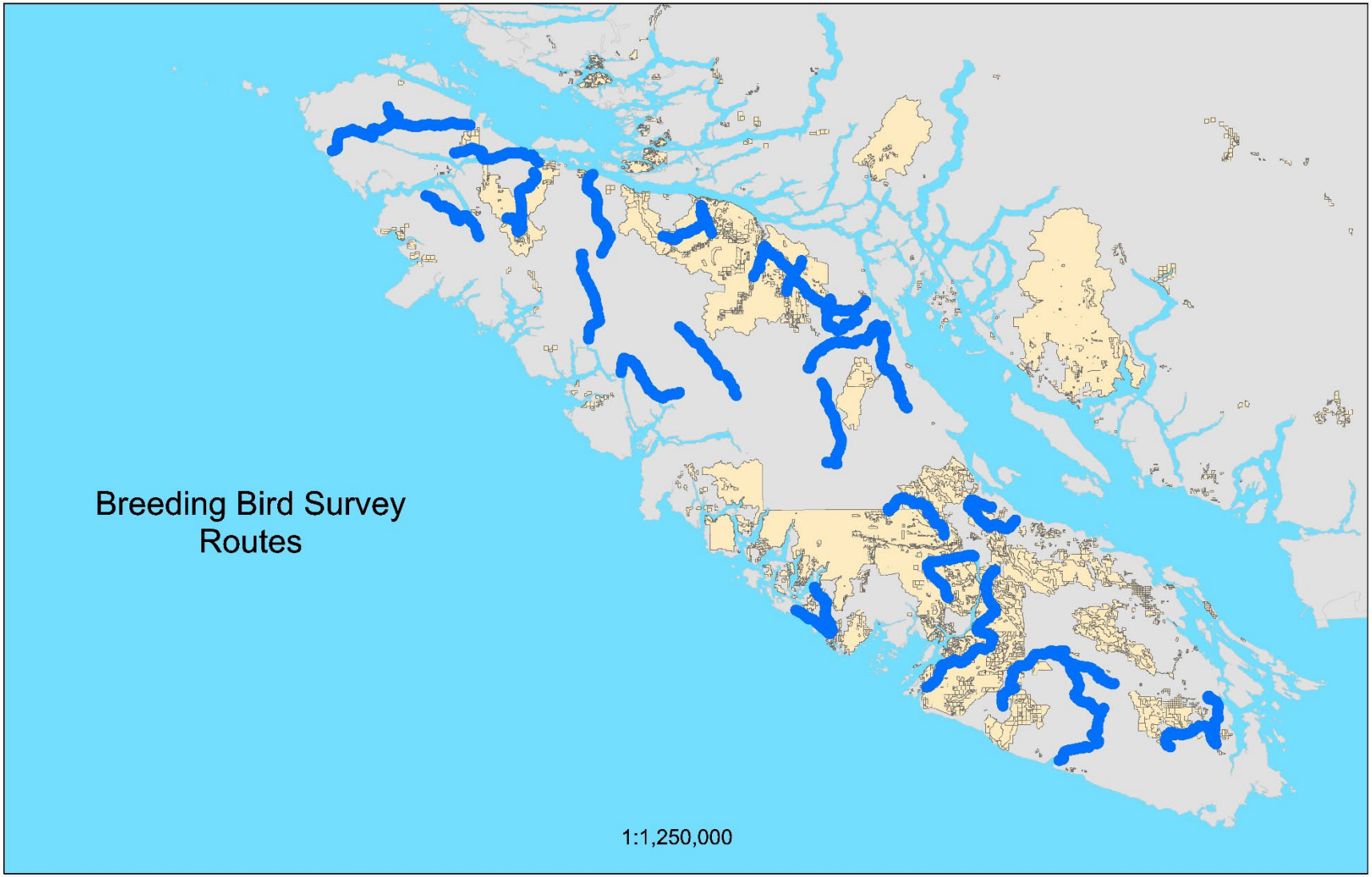


Species monitoring - birds

- Abundance, richness and diversity **increased with patch size** (based on 33 patches, 0.25 to 3.2 ha)
- Characteristic species of late-seral stands such as Brown Creeper, Chestnut-backed Chickadee, Golden-crowned Kinglet, Varied Thrush, Red-breasted Sapsucker, and Townsend's Warbler were present in **Group Retention cutblocks**, but not in all stands nor in consistent numbers.
- **Habitat features** other than group size are important factors for species presence

Research by Mike Preston, SFU

Summer bird transects – VI



Gastropods and Salamanders

Gastropods (snails & slugs)

Why monitor them? They are sensitive to forest floor conditions, moisture, humidity

What have we found so far?

- Total of 27 species from VI surveys (6 slugs, 6 large snails and 15 small snails)
- Few species above 400m; abundant on low-elevation deciduous sites
- A lot of variability by site and season of year
- Two rare species: dromedary and warty “jumping” slugs

What about VR treatments?

- Generally, there are more snails & slugs in uncut forests compared to recently logged sites
- VR groups had more of some species than the cut areas of the block.

Dromedary Jumping-slug

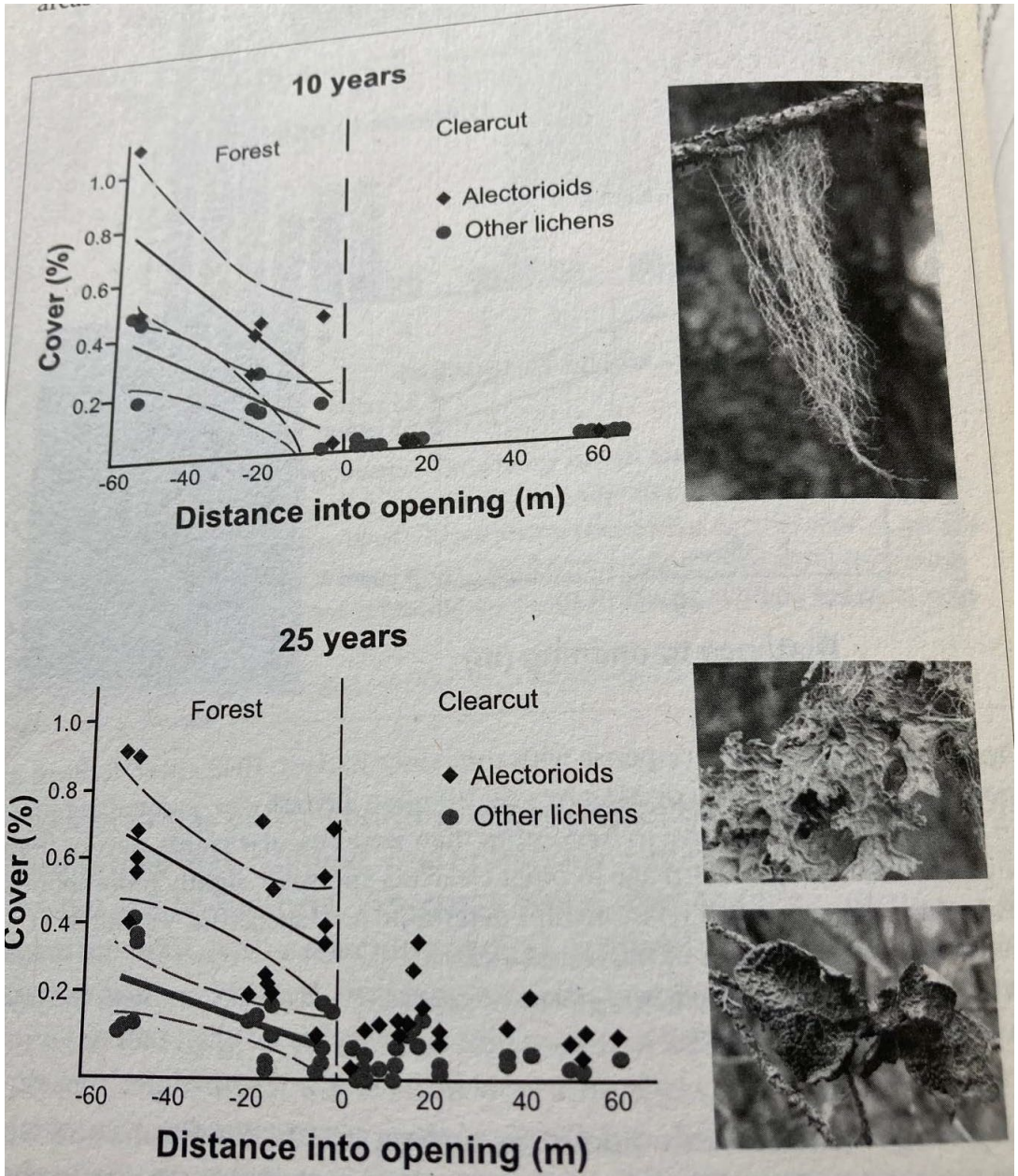
Hemphillia dromedarius

Canopy Epiphytes

Methods

- Canopy branch sampling and inventory
- Manual tree climbing
- 16 trees per treatment/site

Canopy epiphytes



Aquatic Amphibians- Wetland Survey

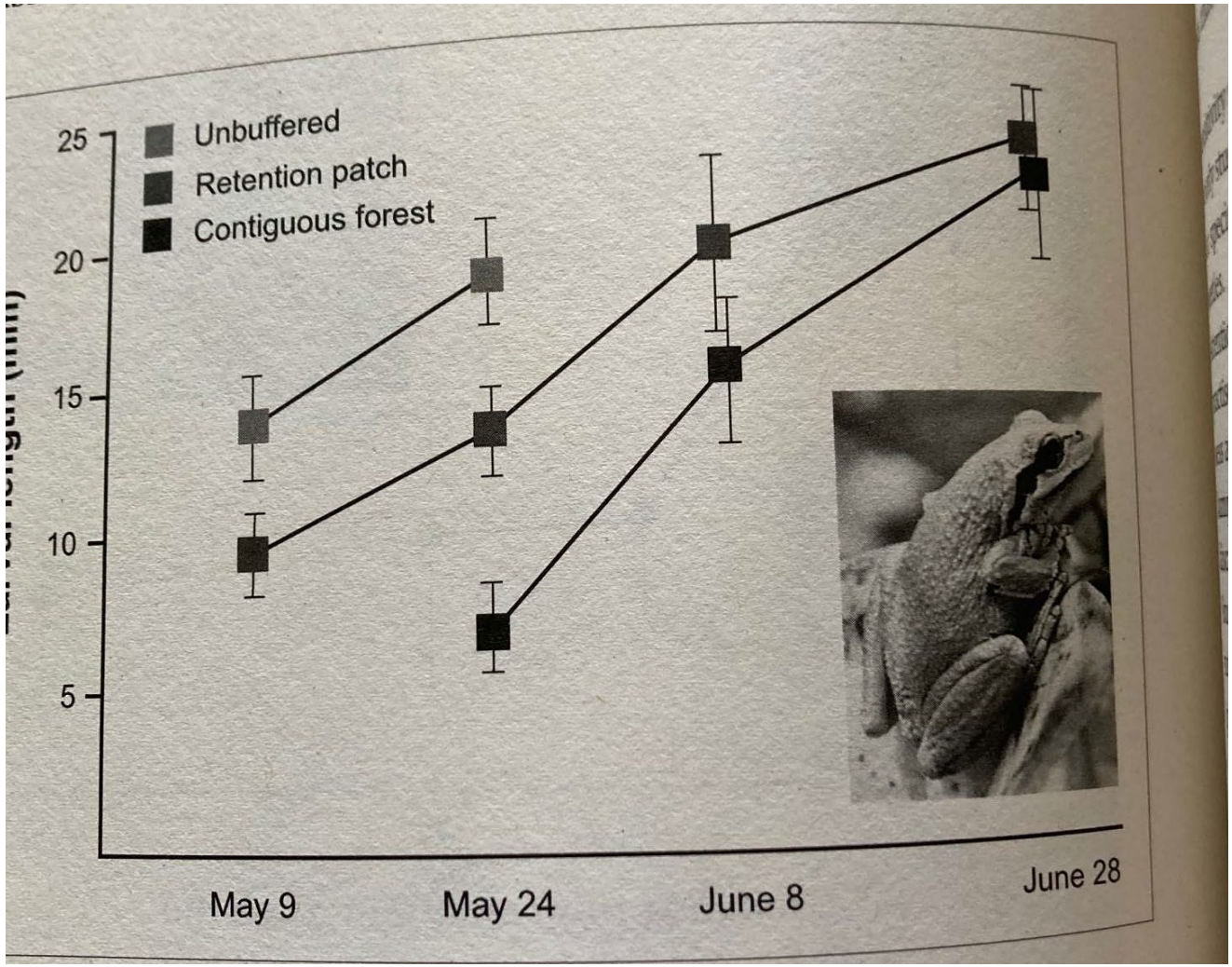
Objectives

- Survey for small wetlands in dry variants (CWHxm)
- Locate potential amphibian monitoring sites
- Compare buffer treatments

Results

- South Island - 6,407 wetlands / 663 ha
- North Island - 2,160 wetlands / 314 ha
- Five amphibian species identified during surveys: **Northwestern salamanders, Long-toed salamanders (not NI), Rough-skinned newts, Pacific tree-frogs, and Red-legged frogs**.

Amphibians


Unbuffered
Retention patch
Contiguous forest
25
20
15
10
5
May 9
May 24
June 8
June 28

Squirrels

Life history - closely tied to seed, fungi and snags.

Sites observed - 4 Variable Retention sites

Findings

- Squirrels use patches soon after harvest.
- They move between patches.
- They also use young second growth.

Summary of initial results of species monitoring

- VR shows potential for maintaining species from the original forest that would not otherwise be present in a clearcut

  (so far)

- Group retention is generally better than dispersed for maintaining habitat

  (within the 0 – 30% range tested)

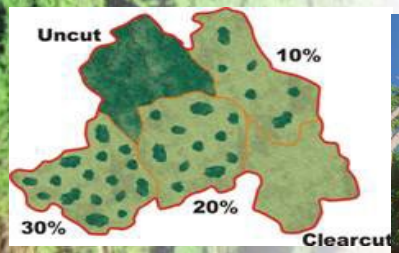
- As expected, species respond differently to logging; pilot studies have identified candidate “indicator” species for monitoring

  (those that prefer/require older forest conditions)

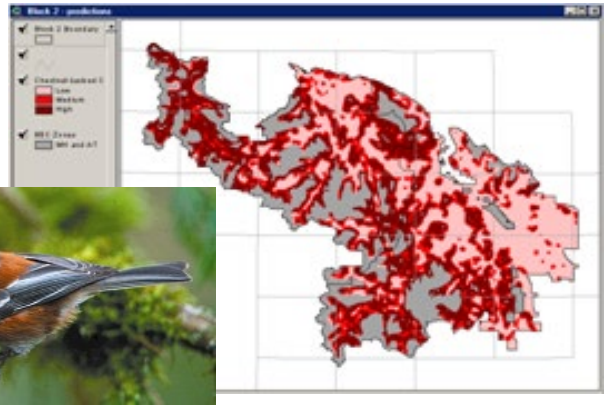
Species Monitoring

Linking to management

- Synthesize study results (models)
- Combine results from indicators
  - projecting landscapes
  - projecting habitat structures
  - tying to organism needs



Group Retention



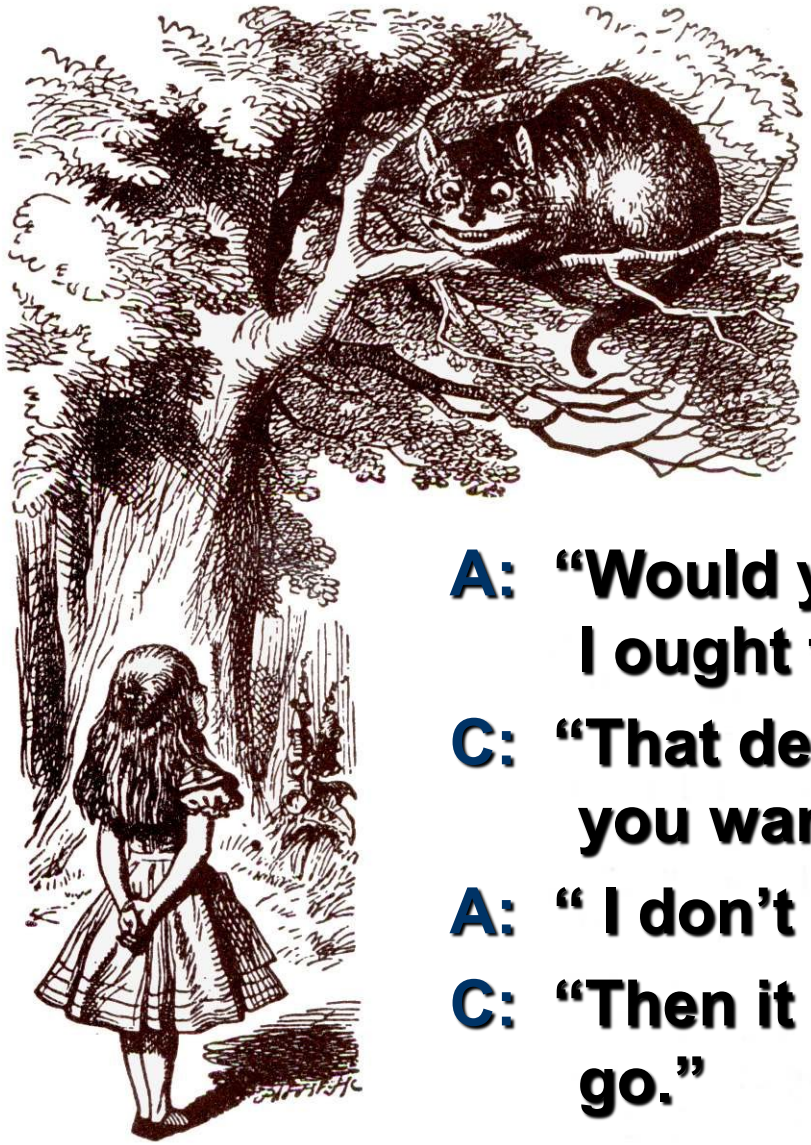
Summarizing…

- Two key scales:
  - Landscape
    - Reserves
    - Zoning
    - Harvest pattern
  - Stands
    - Retention of structure
    - And … other actions to increase diversity (brushing, planting, pruning)…

Those are approaches to consider

But it takes some planning and buy in:

- What are the important values to sustain?
- Think about about reserve design, old forest recruitment and zoning
  - How to collaborate with landowners/neighbouring licensees
- How and where to implement stand retention



Lessons from the Cheshire Cat

A: "Would you tell me , please, which way I ought to go from here?"

C: "That depends a good deal on where you want to get to."

A: " I don't much care where - "

C: "Then it doesn't matter which way you go."

Thank-you!