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# **Impacts of the mountain pine beetle epidemic on wildlife – state of knowledge and knowledge gaps**

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# Outline of Presentation

## 1) What we know

- Which wildlife are impacted and what are their requirements?
- Effects of Salvage Logging and Beetle Control
- Effects of Unsalvaged MPB Stands

## 2) What we need to know

## 3) Research Priorities

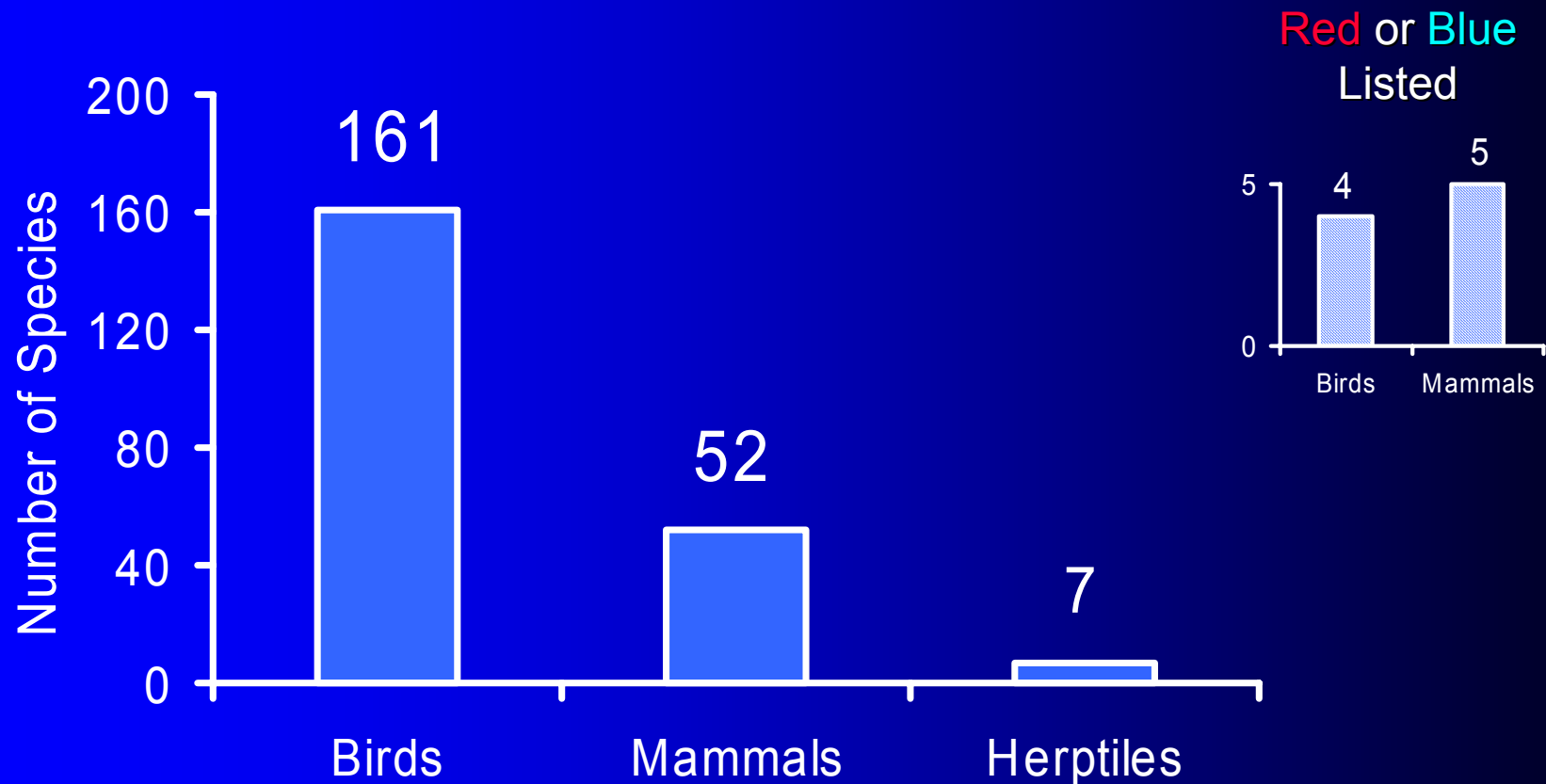
## 4) Research Participants

# State of Knowledge

- **Very few studies have directly addressed the effects of mpb on wildlife.**
- **Limitations to extrapolating existing literature (salvage logging after fire or defoliation by other insects; mpb effects at much smaller scale) to current situation**
- **At least 10 recent studies addressing this issue but results are preliminary or unavailable.**
- **Our knowledge of mpb impacts primarily based on natural history of wildlife.**

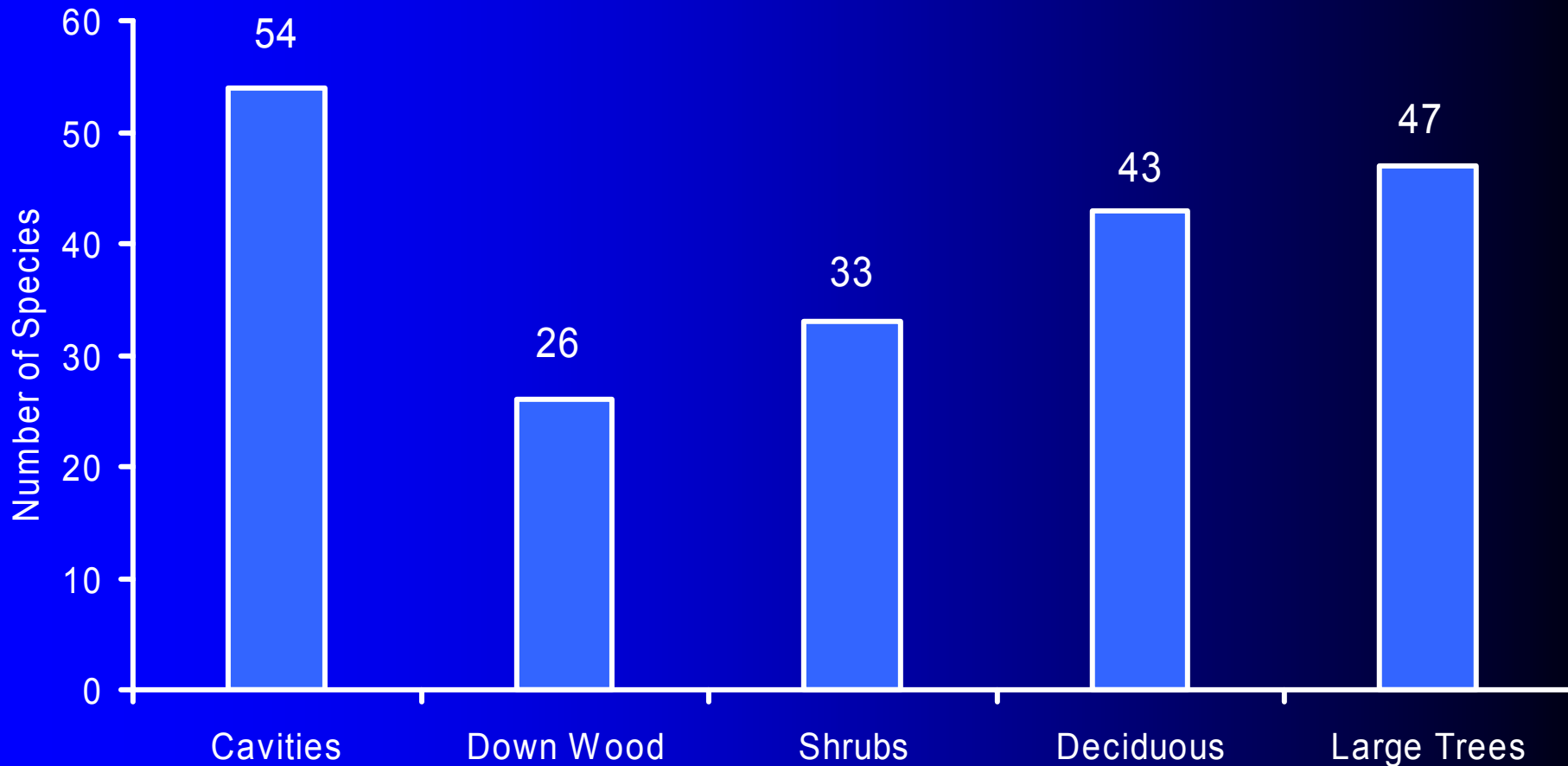
# What we know

## Wildlife Species Occurring in MPB Infested Regions



# What we know

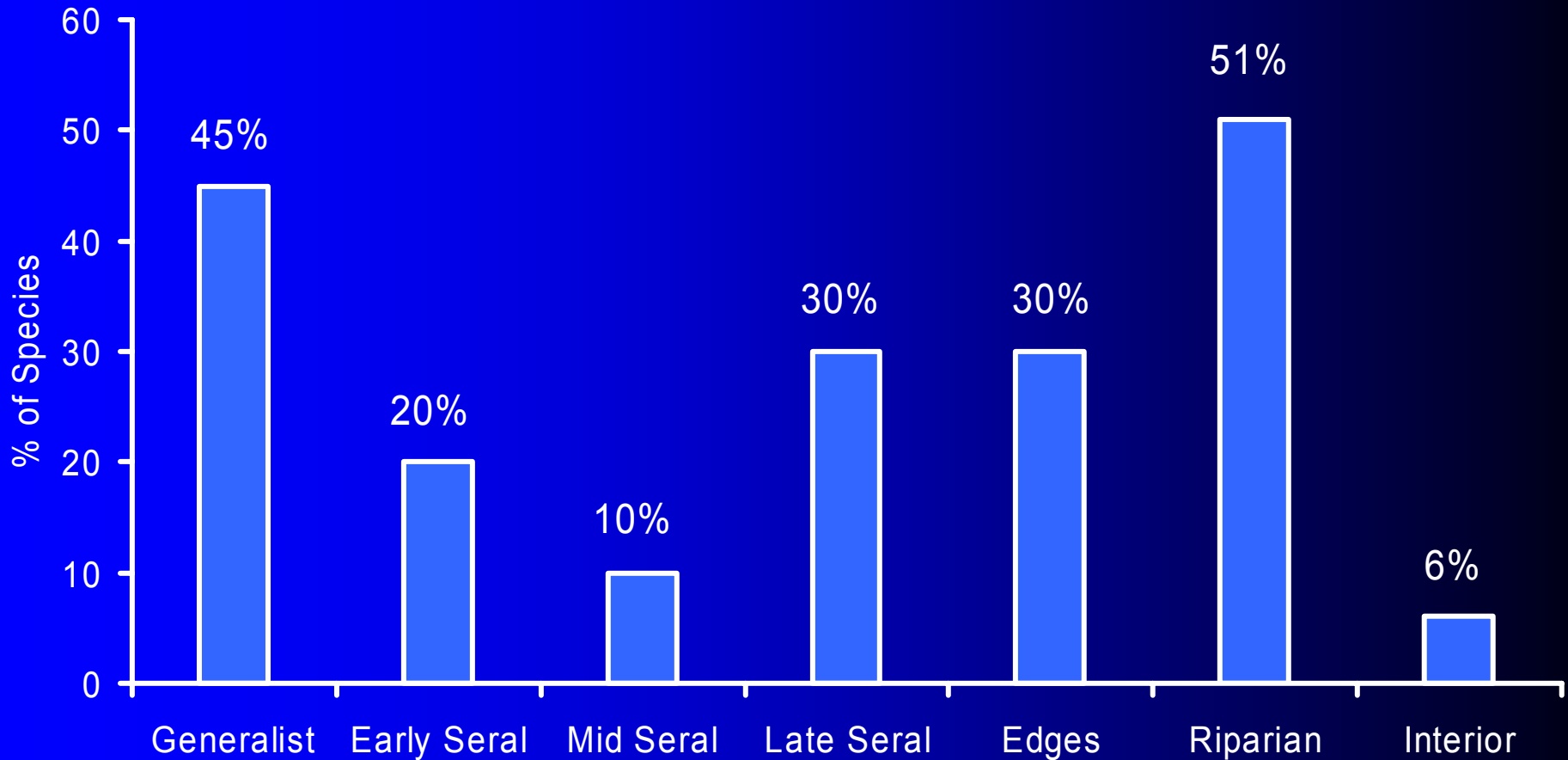
## Important Forest Structural Attributes



- Bunnell, Houde & Squires – Prince George, Quesnel, Lakes TSA  
- Chan-McLeod – Williams Lake TSA

# What we know

## Use of Habitat Types



- Bunnell, Houde & Squires – Prince George, Quesnel, Lakes TSA  
- Chan-McLeod – Williams Lake TSA

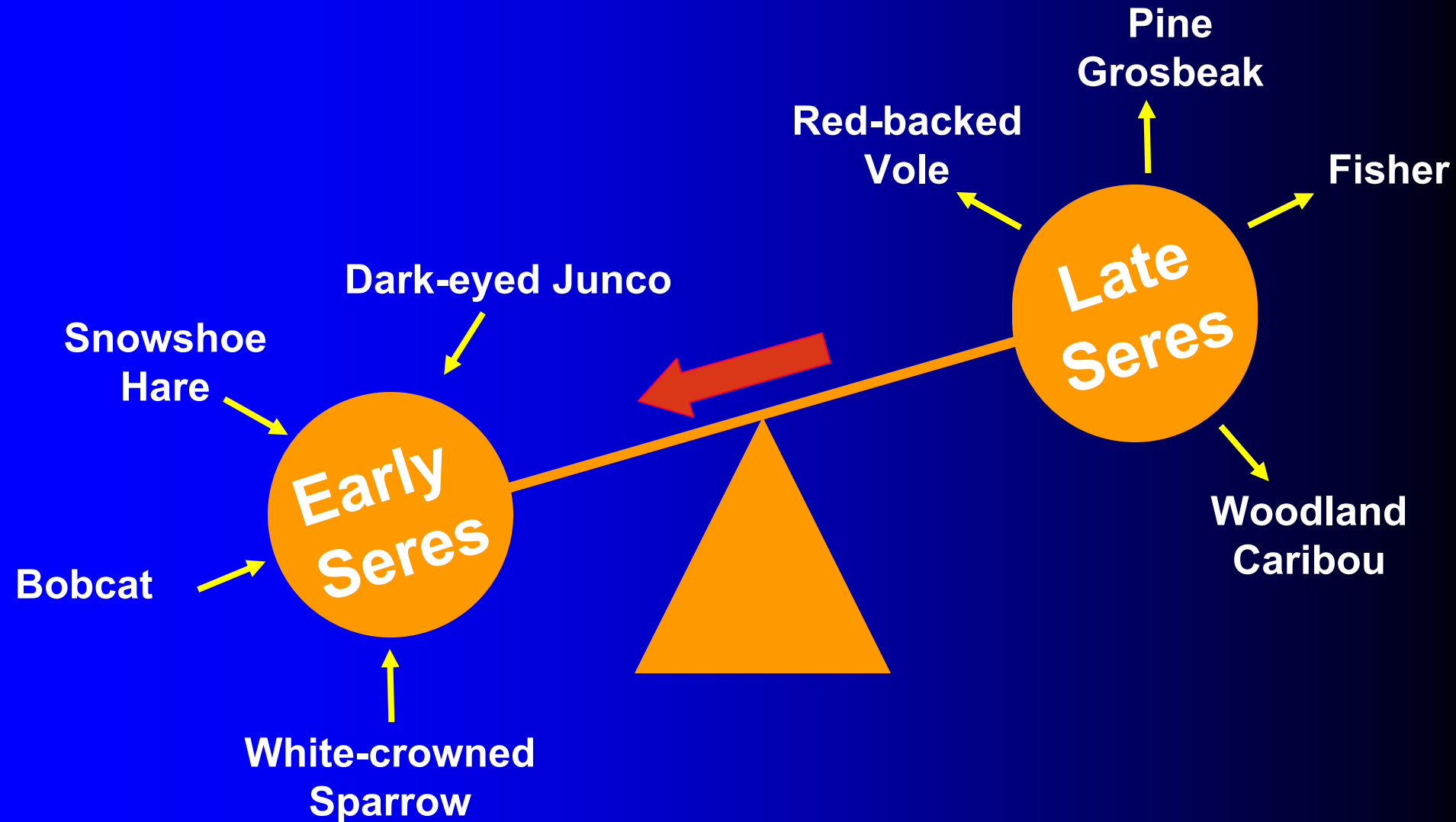
## **What we know**

### **Non-specificity for Lodgepole Pine**

- **Very few wildlife species prefer lodgepole pine forests and none are obligate users.**
- **Wildlife species should be able to satisfy requirements from non-pine forests.**

# What we know – Logging effects

Shifting age class distribution to early seral stages



# **What we know – Logging effects**

## **Harvesting factors that affect wildlife**

- **Retention pattern**
  - Dispersed vs aggregated; minimum effective patch size
- **Retention level**
  - 20% to 30% retention levels relatively effective (documented in other ecosystems)
- **Cut block size**
- **Residual tree species**
- **Site preparation**
- **Site features (e.g., riparian)**

# **What we know - the unsalvaged stand**

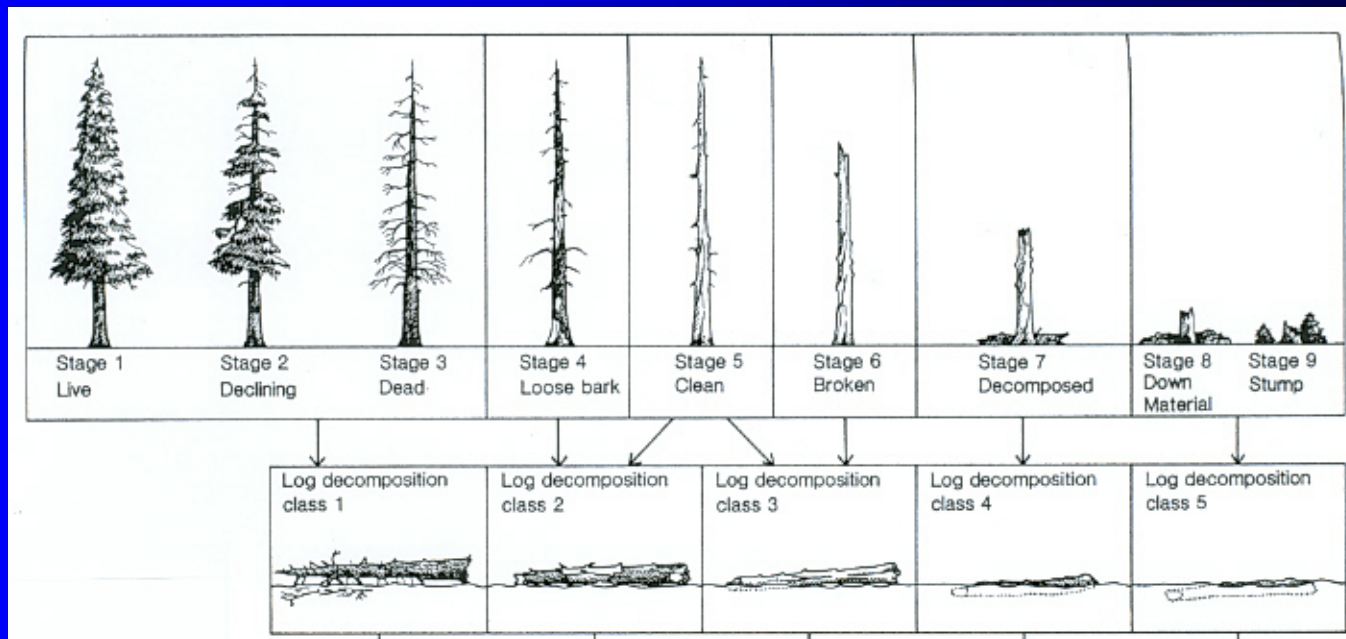
## **MPB as a food source**

- **MPB is an important food source for woodpecker populations, which have sometimes increased dramatically after beetle epidemics (e.g., Koplín 1969, Amman 1984, Martin)**
- **Especially critical food supply for Three-toed woodpecker and Black-backed woodpecker (e.g. Steeger and Dulisse 1997; Fayt 2003)**
- **Ephemeral food supply**

# What we 'know' – the unsalvaged stand

## Time since death

- Wildlife species that are most immediately affected are those that consume parts of the living tree (foliage, bark, seeds).
- Wildlife species that use the forest as cover will be impacted later, the timing of which will depend on post-beetle stand dynamics.



# **What we 'know' – the unsalvaged stand**

## **What is the timeframe for changes?**

- 0-5 YRS** Preliminary results suggest that in the short term (up to 3-5 years post-beetle), songbird communities may be more affected by standard habitat attributes than by the deterioration and loss of foliage and small limbs (Chan-McLeod and Klinkenberg).
- 3-8 YRS** Woodpeckers excavated cavities in mpb-killed trees 3 to 8 years after tree death (Bull 1983)
- 8-10 YRS** Snag persistence
- 38 to 63% standing at year 8 (Lyon 1997; Bull 1983)
  - 50 to 75% standing at year 10; most fallen 15 – 20 years (Lewis & Hartley)
  - aggregated retention and dry sites = less windthrow (Nishio & Mitchell, Lewis & Hartley)

# What we 'know' – the unsalvaged stand

## Other important factors

- **Post-stand dynamics**
  - Nuthatches avoided nesting in mpb-killed trees because lodgepole pine does not decay to a sufficiently softened condition before falling down (Steeger and Hitchcock 1998)
- **Amount and type of residual trees**
- **Surrounding landscape**
  - Neighbourhood forest cover
  - Degree of infestation

# What we need to know

- **Our current knowledge is primarily extrapolated from studies in non-pine forests and in non-epidemic situations.**
- **Functional relationships discussed to this point must be quantified for wildlife species in lodgepole pine ecosystems, under the scenario of a beetle epidemic.**

# What we need to know

## Effects of logging

### *At the Stand Level:*

- What should be the targets for retention pattern, retention level, patch size, cutblock size, residual tree characteristics, critical habitat structures?
- How effective are these targets at maintaining wildlife?

### *At the Landscape Level:*

- What are effects of large-scale logging?
- How do we maintain landscape connectivity for migrating or dispersing wildlife?

# What we need to know

## Unsalvaged MPB Stands

### *At the Stand Level:*

- What is the value of unsalvaged stands as wildlife habitat, and how does this change over time?
- How does the residual green component (% live, species composition) affect habitat values?

### *At the Landscape Level:*

- How does the surrounding landscape (forest cover, degree of infestation) affect the value as wildlife habitat?

# **What we need to know**

## **Salvaged and Unsalvaged**

- **How to distribute mosaics of different harvest regimes and unsalvaged stands across space and time?**

**(Currently studied by Seely and Nelson, Steventon et al.)**

# Research Priorities

- 1) **Habitat value of unsalvaged stands over time**
- 2) **Mature forest-dependent wildlife**
  - how to mitigate harvesting effects
- 3) **Mature forest-dependent species that are red or blue listed (e.g. woodland caribou, fisher)**
- 4) **Large scale issues**

# Research Participants

**The enormous scale of the current epidemic stresses the critical importance of a cohesive strategy and coordination**

- **Among researchers in different disciplines (cross-taxa; cross-scale; cross-discipline)**
- **Between salvage operators and researchers (both informally and perhaps formally, through adaptive management process)**

# Conclusions

- **Mature forest-dependent wildlife will be most vulnerable. For these species, the value of salvage logged stands will increase over time, while the value of unsalvaged stands will decline. We must identify when this cross-over occurs so we can better balance the different forest mosaics across space and time.**
- **Natural history knowledge indicates opportunities for mitigating detrimental impacts, in both salvaged and unsalvaged situations. Some of this knowledge can be exploited immediately in salvage operations.**
- **Knowledge deficiencies are so vast that coordinated research effort is critical.**