#### Assessing Present-Day Forest Landscapes in the Context of Historical Disturbance Regimes

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#### Human Impacts on Coast Range Landscapes

- Timber harvesting
- Loss of old growth
- Forest fragmentation
- Intensive forest management



## Possible Ecological Consequences

- Edge effects
- Threatened and endangered species
  - Spotted Owl
  - Marbled Murrelet
  - Pacific Salmon
- Carbon storage
- Impacts on aquatic systems



# Historical Wildfires – Tillamook Burn





# Historical Range of Variability

- Native species persisted in dynamic landscapes
- HRV may serve as an indicator of sustainability
- History as "working model" for coarsefilter conservation strategies



# **Key Questions**

- What was the range of variability in forest vegetation prior to Euro-American settlement (1850)?
  - Amounts of major forest types
  - Spatial pattern of forest mosaic
- Is the current landscape within the historical range of variability?

# LADS Modeling Approach



## Fire Size Distributions

- Source: Historical forest vegetation maps (Peter Teensma)
- Fires larger in coastal zone than valley margin zone
- Modeled as a lognormal random variable



# Fire Severity

- Source: Dendroecological Field Study (Peter Impara)
- Fires were mosaics of high- and moderate-severity disturbance
- % high severity modeled as uniform random variables



# Fire Frequency

- Source: Dendroecological (Peter Impara) and paleoecological (Colin Long) studies.
- Estimates of Natural Fire Rotation
  - Coastal Zone 200 years
  - Valley Margin Zone 100 years
- Converted to # of fires/decade
- Modeled as Poisson random variable



#### Fire Shape Calibration



### **Successional Pathways**



#### Pre-Settlement vs. Current Landscape Patterns



#### Variability at Three Spatial Scales



Years Before Present

### Historical Range of Variability – % of Landscape

- Old growth was the dominant patch type in historical landscapes
- Area of young patches has increased
- Area of mature and old-growth patches has decreased



% of Landscape

## Historical Range of Variability – Largest Patch

- Largest patches in the historical landscape were old growth
- The largest old-growth patch in the current landscape is smaller than occurred historically
- Young forests form the matrix of the present landscape



Largest Patch (km<sup>2</sup>)

### Historical Range of Variability – Isolation Index

- Computed as mean distance from each patch type
- In historical landscapes, old growth was the least isolated
- Isolation of regeneration, young, and mature patches is reduced in the present landscape
- Old growth isolation has increased



Isolation Index (km)

# Key Findings – Historical Landscapes

- Old growth was the dominant patch type in pre-settlement landscapes
- The largest area of old growth was in patches > 100,000 ha
- However, most mature and old growth patches were < 100 ha
- Most of the landscape was < 1 km from the nearest old growth patch



# Key Findings – Current Landscape

- Current landscape is outside HRV
- Less old growth than expected under the historical disturbance regime
- No large old growth patches
- Increased distance to nearest old growth patch



## **Possible Ecological Implications**

- Species associated with LS/OG habitats
- Area-sensitive species
- Refugia for disturbance-sensitive species
- Linkages between disturbance regime and watershed processes

