

Biodiversity, Beauty and the Beast

- *Are beautiful landscapes always sustainable?*
- *Are sustainable landscape always beautiful?*
- *Is biodiversity linked to beauty?*

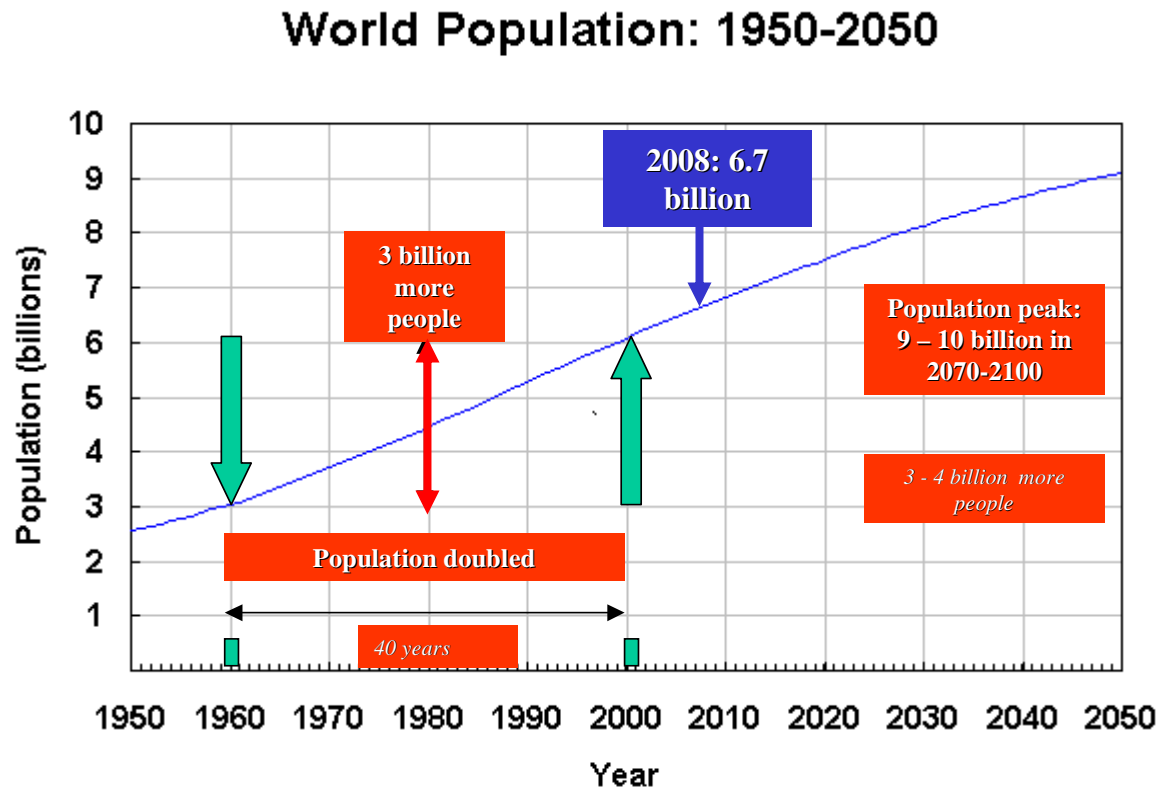
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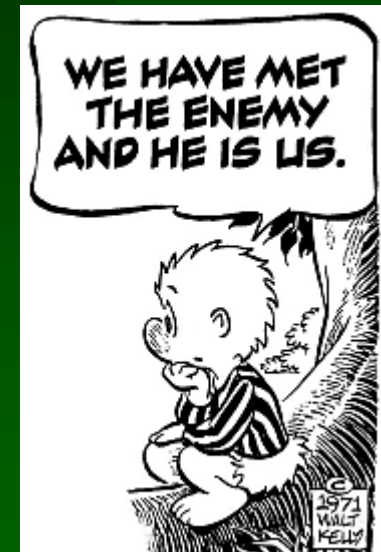


People – the ultimate problem, but also the ultimate solution



Source: U.S. Census Bureau, International Data Base 5-10-00.

As Pogo
said:

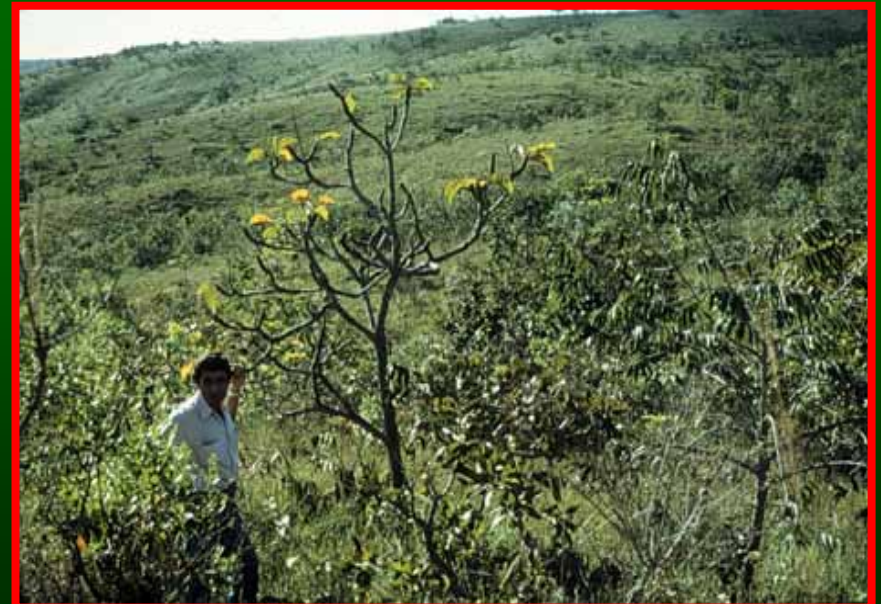


Human impacts on the world's forests call for a change in our relationship to them

China



Brazil



Forestry is about people - values, needs, desires

Wood

Recreation

Non-wood botanical products

Aesthetics

Water

Wildlife/fish

Biodiversity

Employment

Ecosystem processes

Economics - wealth creation

Spiritual values

Environmental protection

Bioenergy - fuel



Malaysia

NW Thailand

People's

Needs



Amazon



Malaysia

Java

How do we judge good forestry???

- Is “ugly” non-sustainable? Is beautiful sustainable?
- Is today’s condition permanent and a good indicator of the future?
- Is forestry that pleases our eyes and hearts today always the best for future generations?

Outline

- The issue of aesthetic judgment
- Sustainability in the face of change
- The complexity of the biodiversity issue:
the concept of “ecological theatre”

Definition of Forestry

- *The art (skill), practice, science and business of managing **forest stands** and **landscapes** to sustain an **ecologically possible** and **socially desirable** balance of values over appropriate spatial and time scales*

The Two Responsibilities of Forestry

1. To change the way in which a forest is managed as the desired balance of values and environmental services from that forest changes.
2. To reject current practices and resist proposed new practices that are inconsistent with the ecology and sociology of the desired values and services over ecologically appropriate temporal and spatial scales.

The need for a land ethic

- “A thing is right when it tends to preserve the *integrity*, *stability*, and *beauty* of the biotic community. It is wrong when it tends otherwise”

but

- “The evolution of a land ethic is an intellectual as well as emotional process. Conservation is paved with good intentions which prove to be futile, or even dangerous, because they are devoid of critical understanding either of the land, or of economic land-use”

Aldo Leopold, *The Land Ethic*

Responses to visual information: our eyes and our heart



Which images evoke the strongest emotional response?

Politically correct view of stand-level disturbance on B.C.'s Gulf Islands

Continuous forest cover system



Drought-induced mortality

Ugly!!!!



Time

Beautiful!!!



MAI -1 to 3



MAI 20 to 23



Disturbance

Does disturbance damage ecosystem productivity?

Both unsustainable





Preference?

Outline

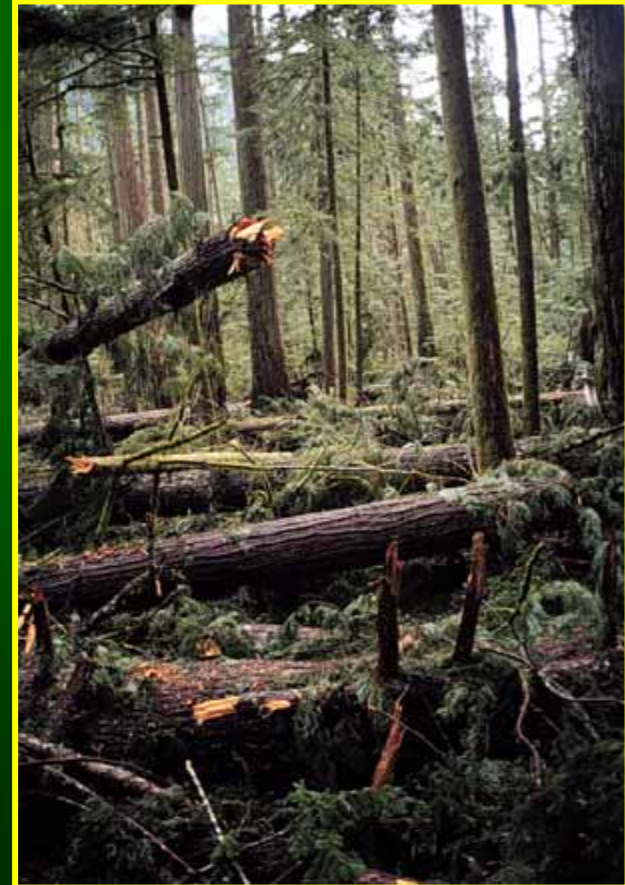
- The issue of aesthetic judgment
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Many if not most forest ecosystems are driven by and depend on disturbance

Landslide



Wind



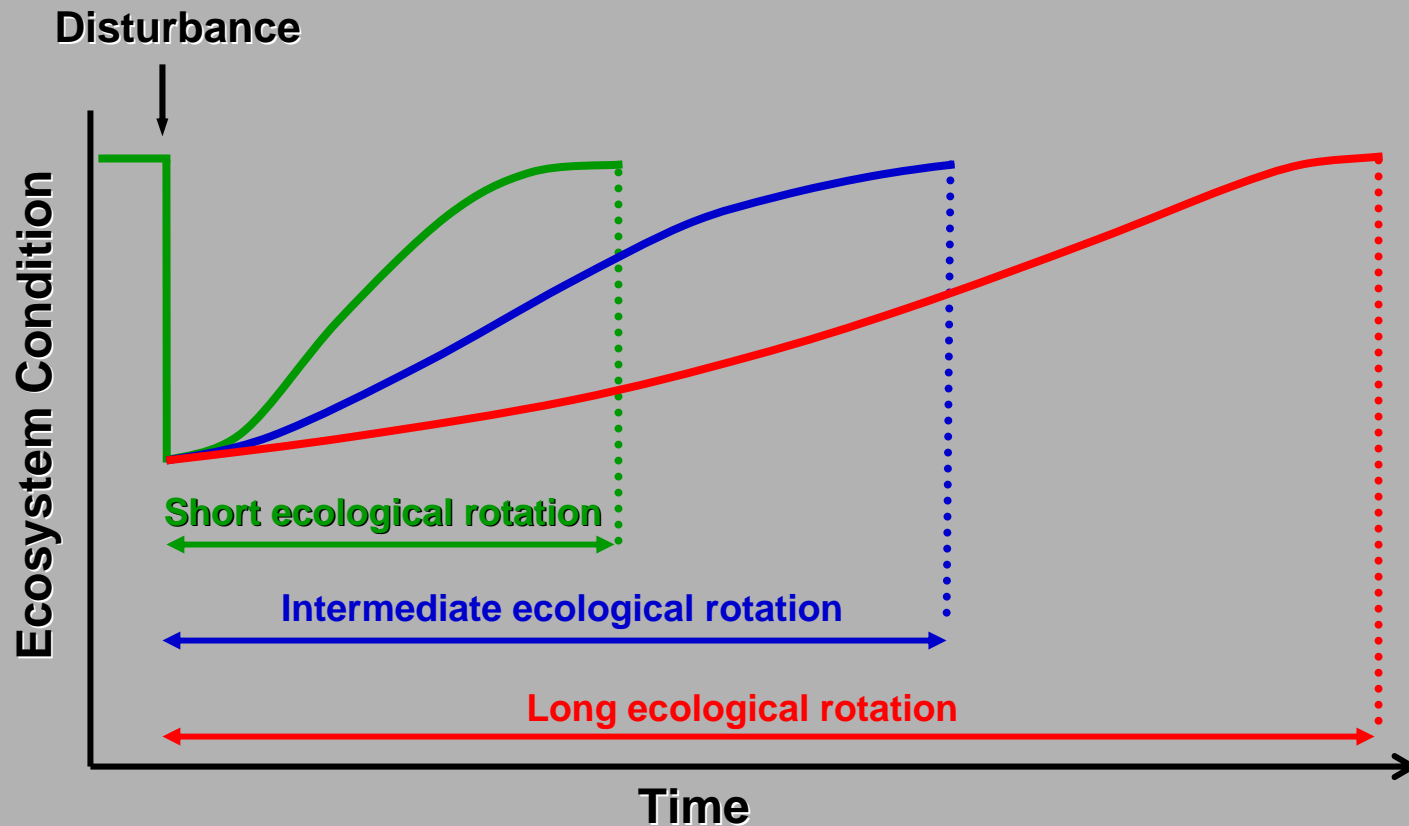
Fire

Insects

Six million+ ha Mountain Pine Beetle outbreak in BC

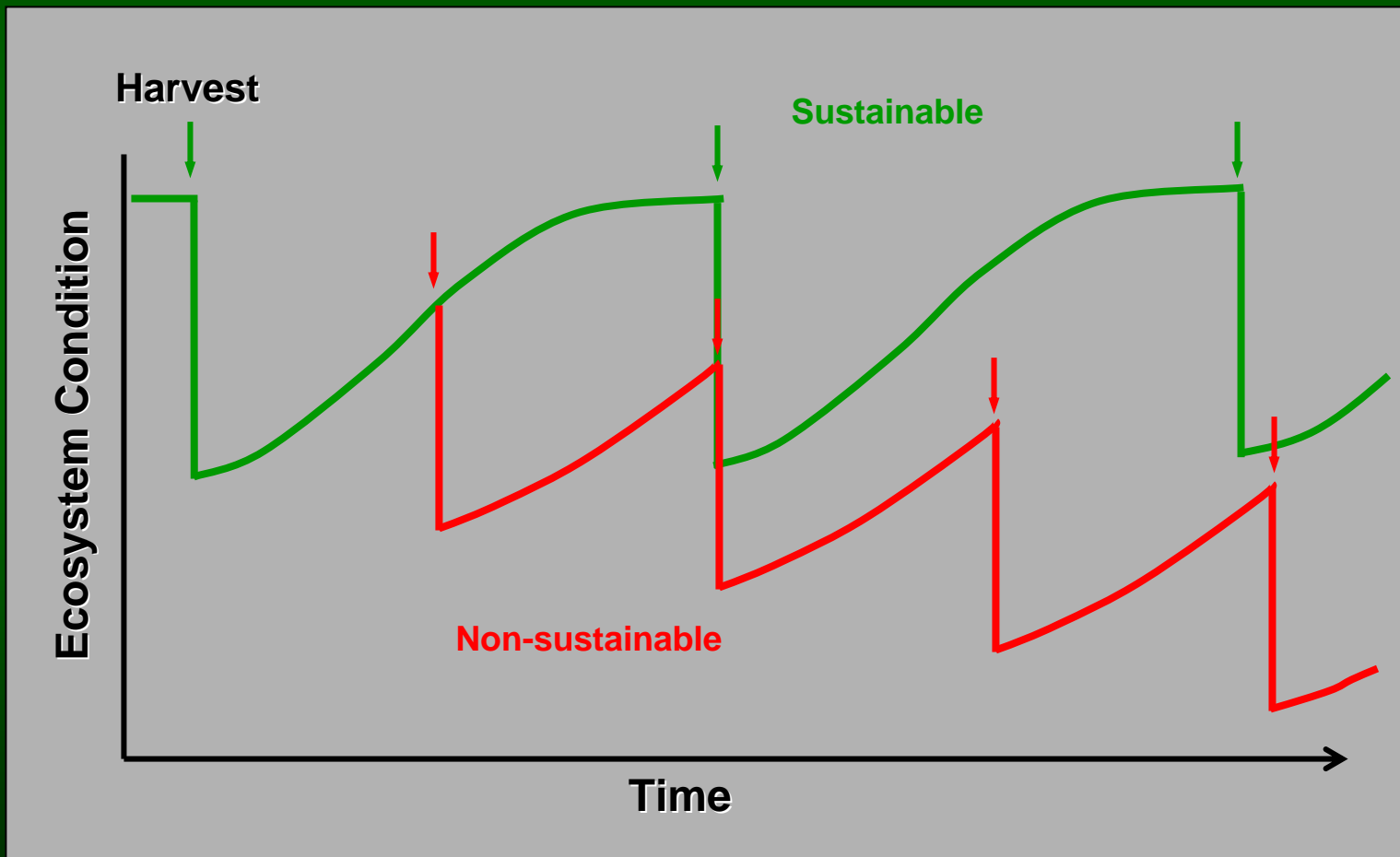


How to Evaluate Sustainability: The Concept of Ecological Rotation



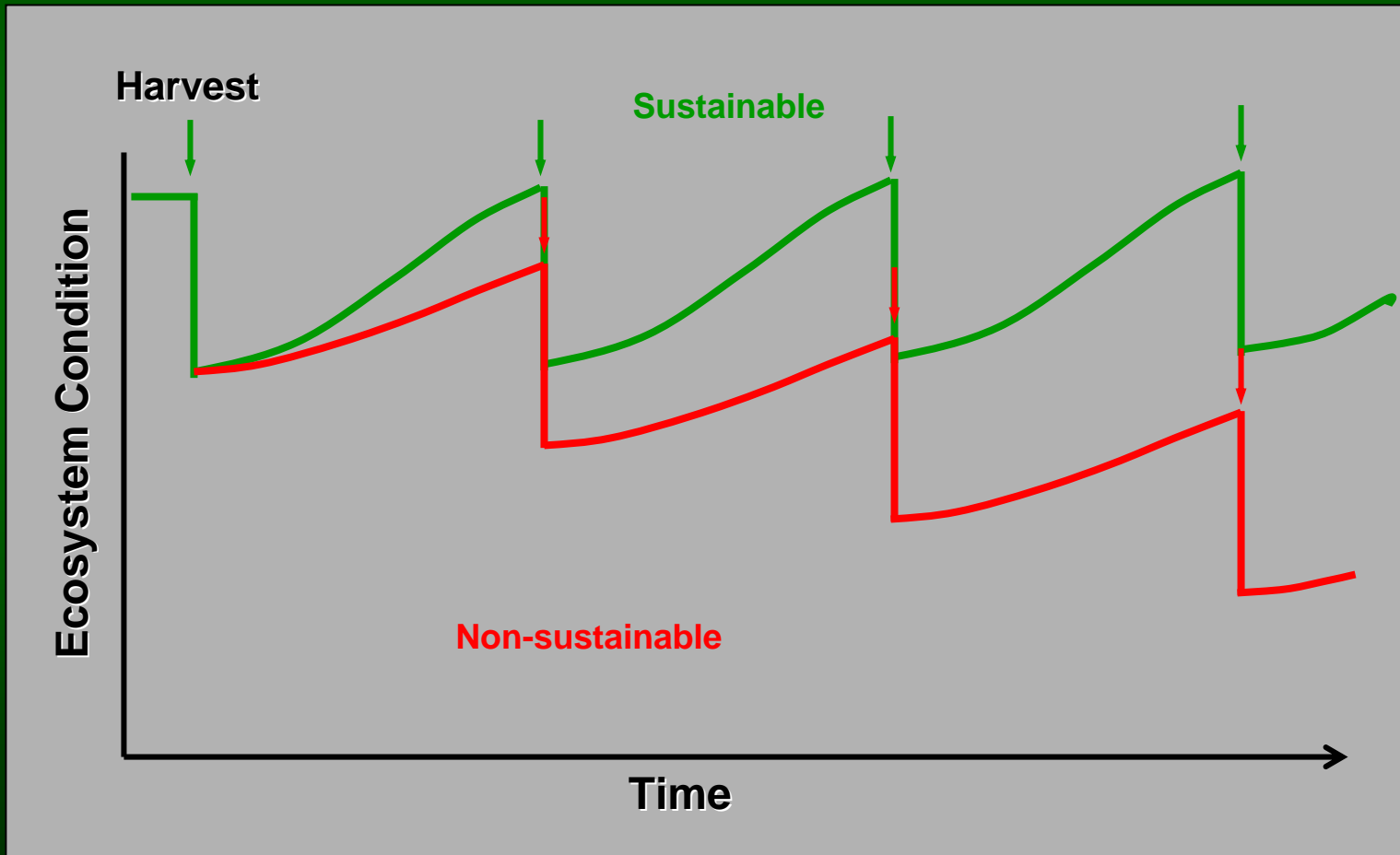
The Concept of Ecological Rotation

1. Rotation too short



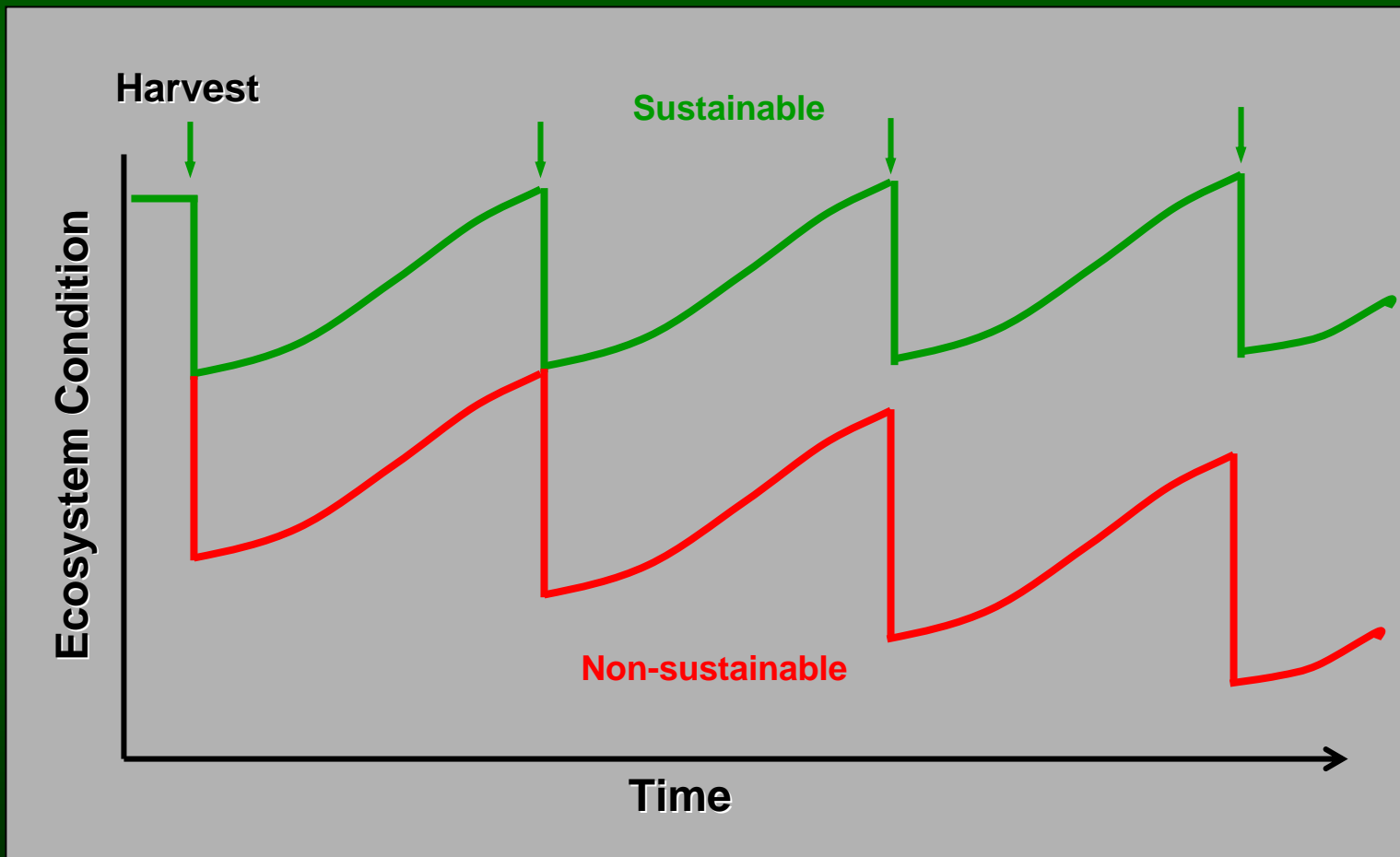
The Concept of Ecological Rotation

2. Ecosystem recovery too slow

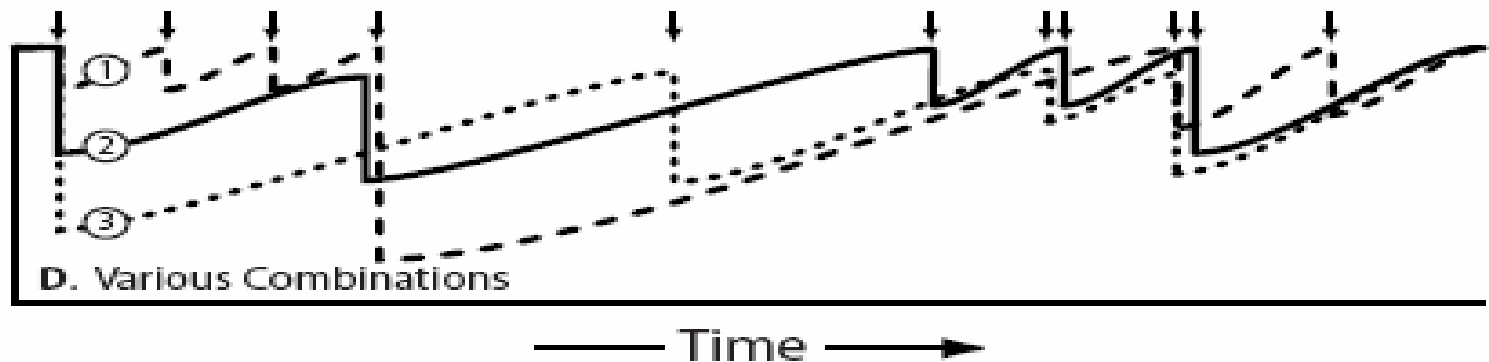


The Concept of Ecological Rotation

3. Degree of disturbance too great



Adaptive application of the ER concept

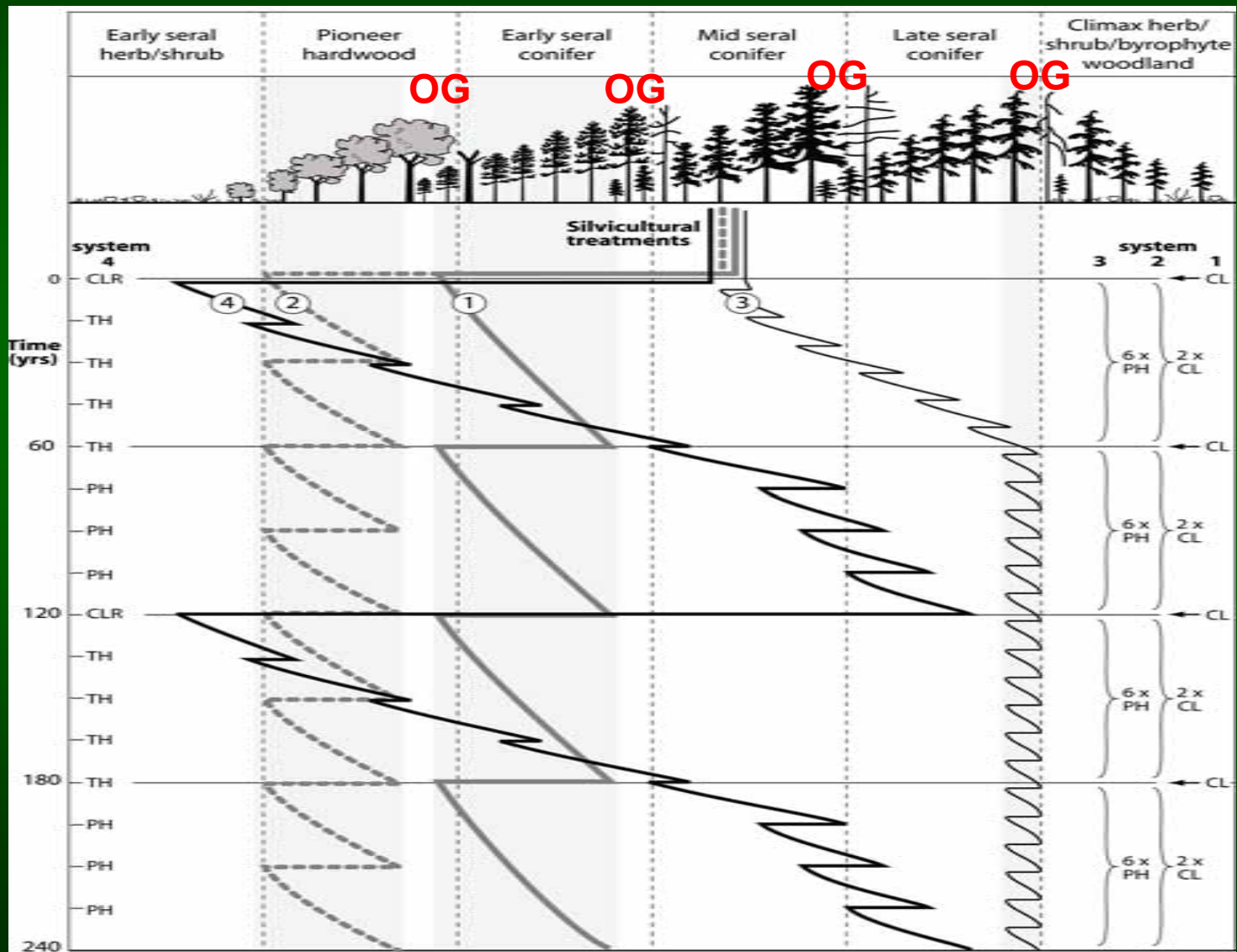


Inappropriate to repeatedly apply the same disturbance

Use varying combinations of severity and frequency

Application of The ET Concept

Seral Stage



T
I
M
E

Outline

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Biodiversity

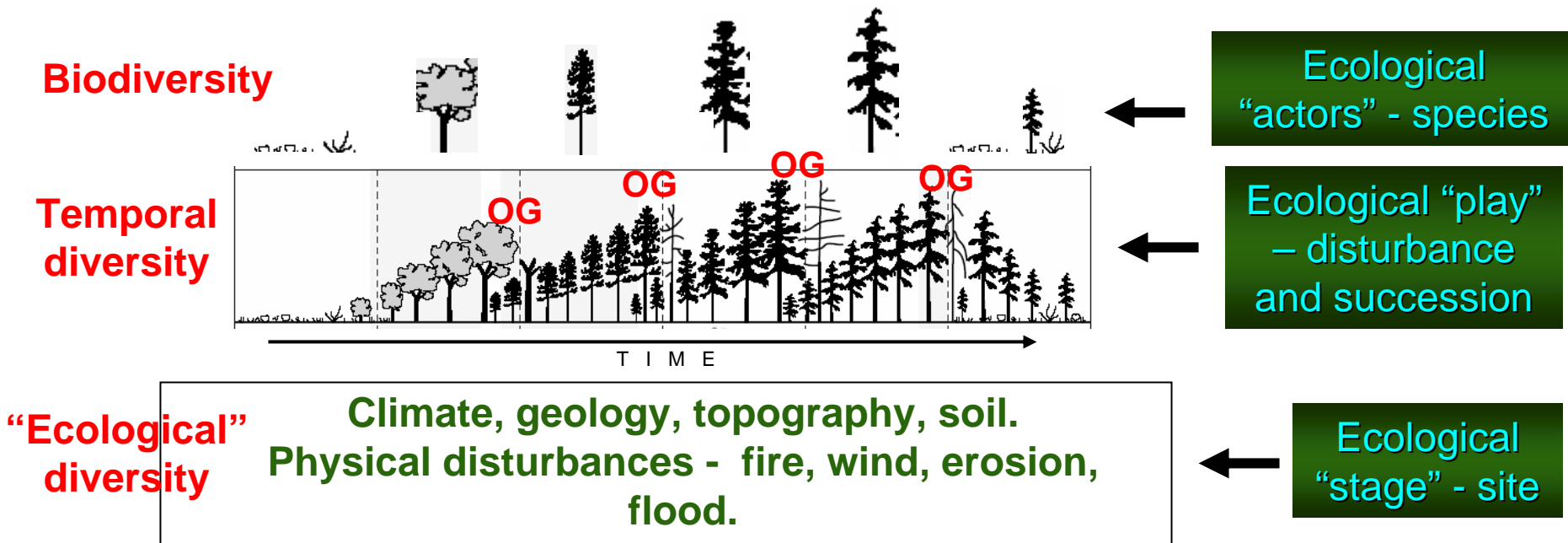
Nature's insurance policy
A Valuable legacy for humans

- **Multiple measures – there is no single “biodiversity”**
- **Multiple spatial scales: local, local landscape, and regional landscape**
- **Temporal diversity – everything changes**





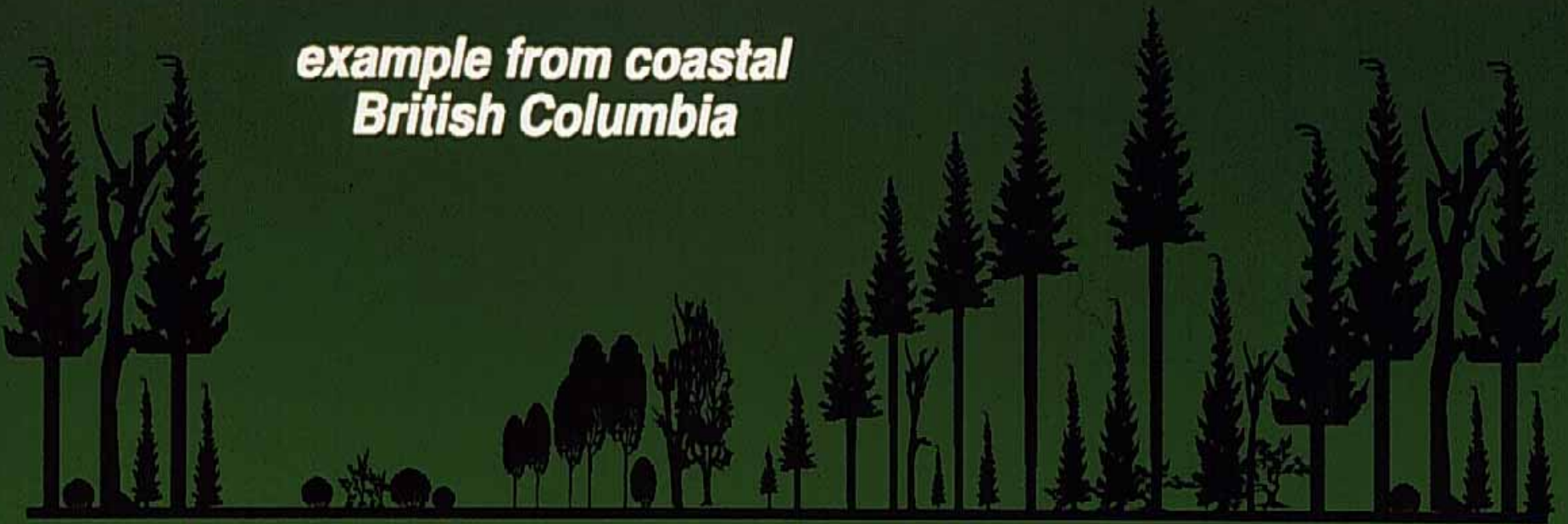
The Concept of “Ecological Theatre”



The ecological play is driven by disturbance

Natural Ecosystem Change Over Time: Succession

*example from coastal
British Columbia*



**"Old Growth"
or mature forest**

**Herbs &
shrubs**

Red Alder

**Douglas
Fir**

**Western
Hemlock/
Red Cedar**

Time not to scale

B

eauty and the “Beast” in Forestry

- Are beautiful landscapes always sustainable?
- Are sustainable landscapes always beautiful?”
- Are “small” and “gentle” always ecologically appropriate?



Ugly



Beautiful



Continuous forest cover system



Beautiful



Ugly

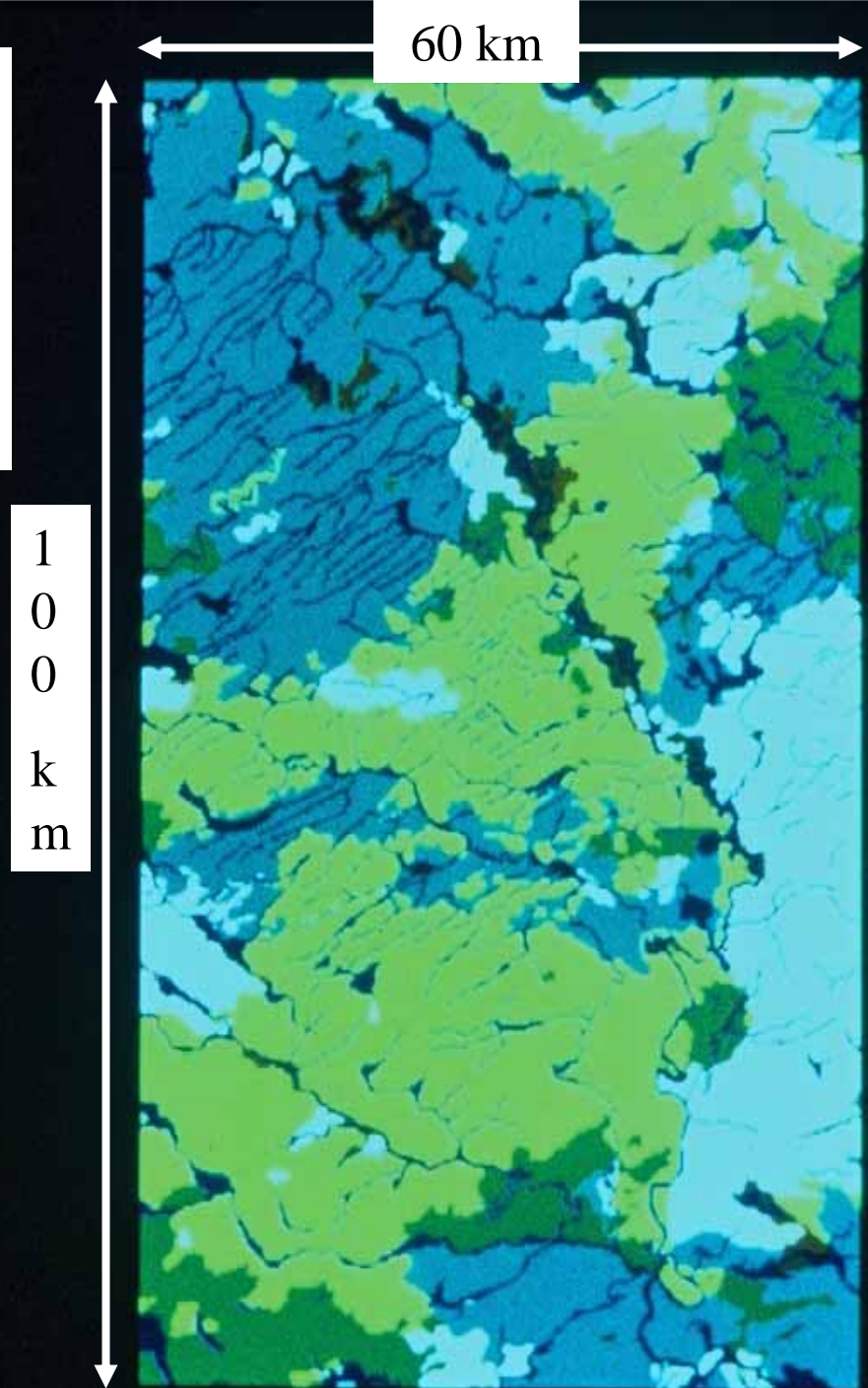


Drought-induced mortality

Natural landscape
forest age class pattern
in 1954 caused by
wildfire, central BC



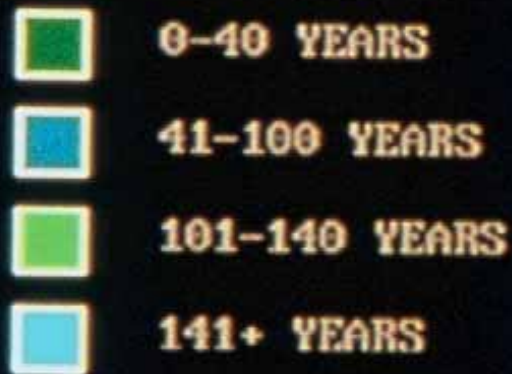
FOREST EDGE = 969 km
CORE AREA = 17,750 ha
LARGEST PATCH = 19%



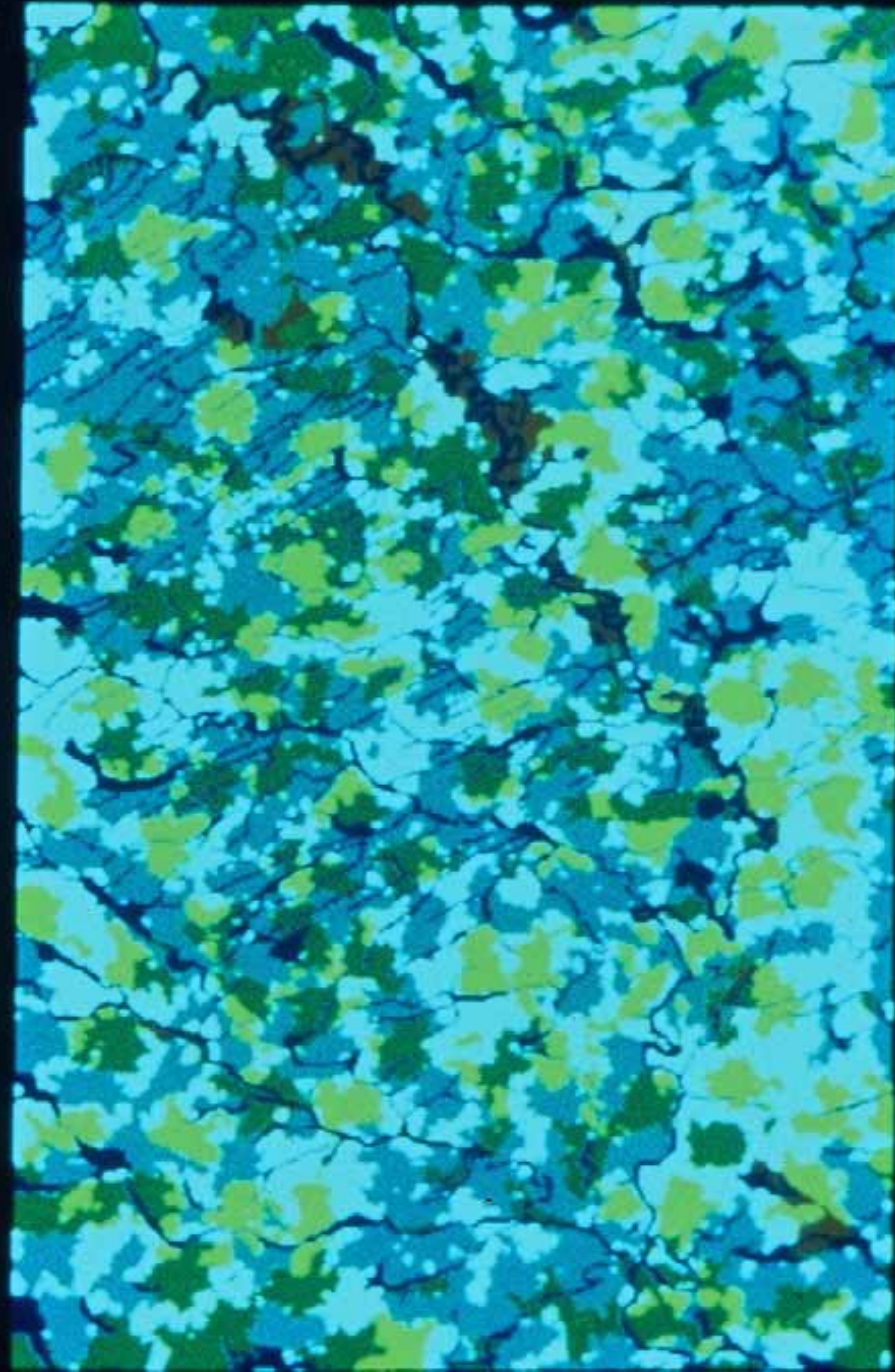


**62,000 ha salvage clearcut, central BC –
bark beetle mortality. Early 1970's**


Landscape age class pattern in the same area of central BC that would have resulted from anti-large clearcutting pressure from environmentalists



FOREST EDGE = 1,978 km
CORE AREA = 9,727 ha
LARGEST PATCH = 6%







Variable retention
system, BC. An
ecosystem-based
approach to harvesting
design

Forest Ecology and Management in Two Words

It Depends!

What planning tools are needed?

- Ecosystem management simulation models
 - hybrid models that combine traditional experience-based tools and process simulation

Why Ecosystem Management Decision Support Systems?

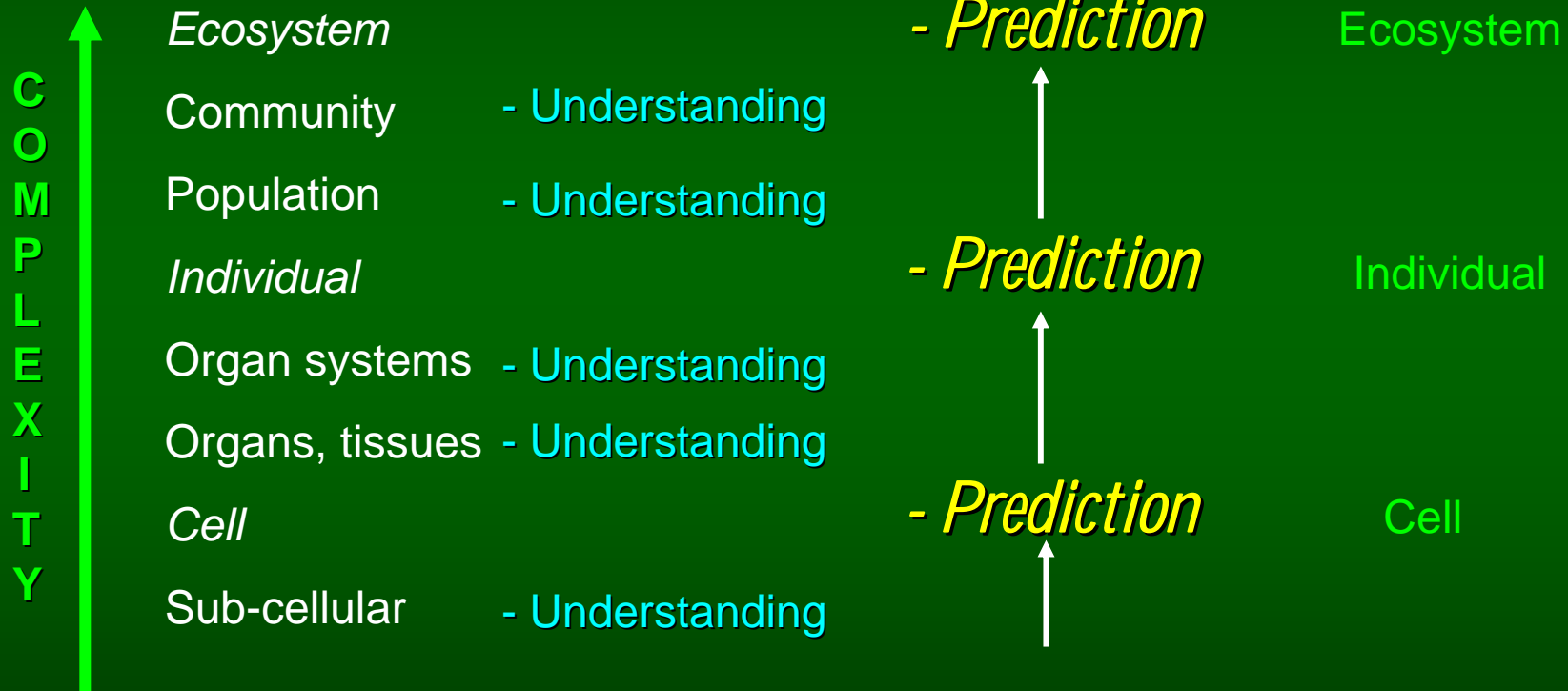
Management paradigms

- Zonation and adaptive management
- Emulation of natural disturbance and NRV - variable retention systems
- Concepts of “*ecological theater*” and “*ecological rotation*”
- Results-based forest regulation

All need
ecosystem
level
forecasting
tools

Levels of biological organization

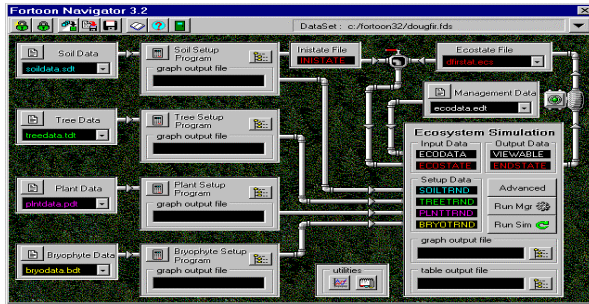
Levels of biological integration



Why Ecosystem management models: **PREDICTION**

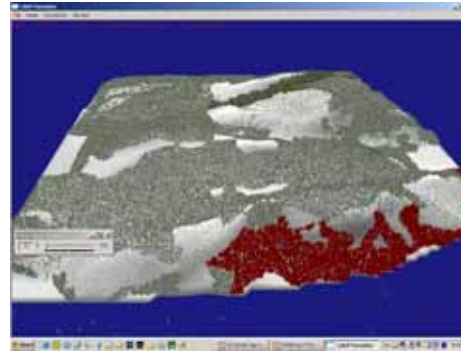
FORECAST

Non-spatial ecosystem management stand model

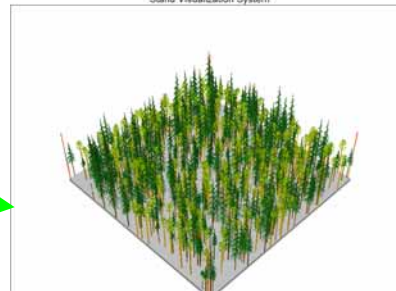


FORCEE:
Individual tree,
complex stand model

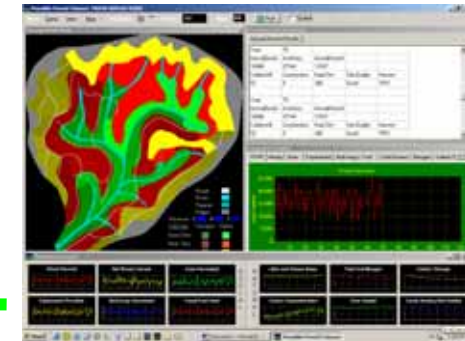
LLEMS Visualization
software – stand and
landscape



Stand
visualization




POSSIBLE FOREST
FUTURES:
watershed landscape
management model



LLEMS: local
landscape/complex
cutblock simulator

LLEMS
Local Landscape Ecosystem Management Simulator



- * Is this a clearcut?
- * What will the future forest species composition be?
- * How will Douglas-fir compete with western hemlock?
- * Will shade tolerant hardwoods be able to grow?

Legend: ■ Trees ■ Ecotone ■ Open

Large landscape model driven by stand-level ecosystem management model

**Forest-level Timber Supply Model
(ATLAS)**

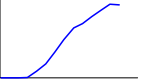
**Wildlife Habitat Supply Model
(SimFor)**

**Polygon-
Based**

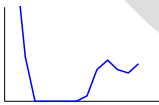
**Raster-
Based**

**Stand-level Model
(FORECAST)**

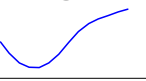
Merchantable
Volume



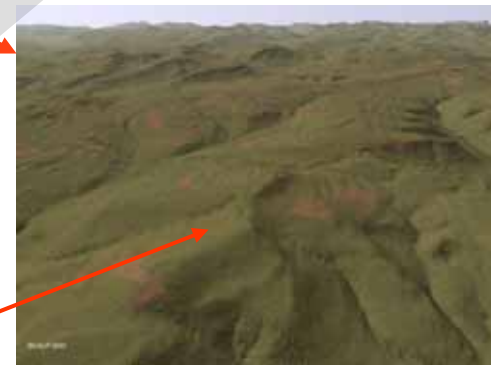
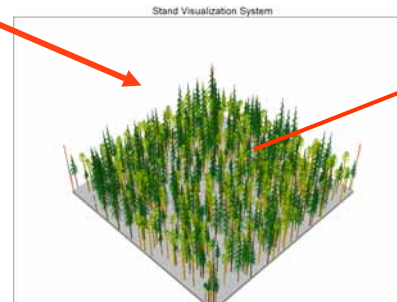
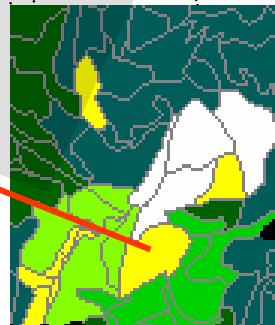
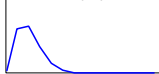
Snags (>25cm dbh)



Ecosystem C
Storage



Early Seral Shrub
Cover (%)



**Visualization
Software**

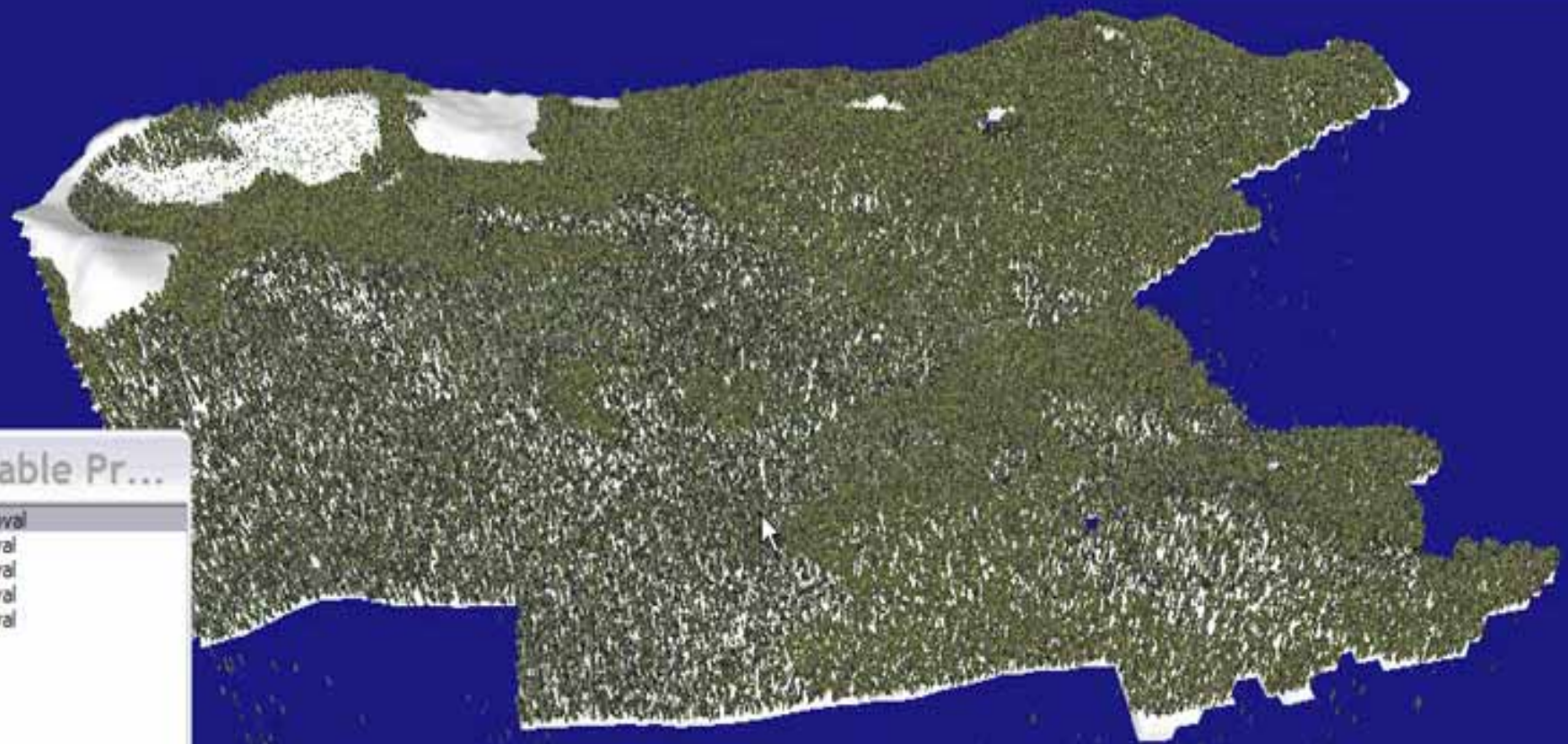
CALP Forester

File Edit Mode View

App: 172 Cull: 0 Draw: 0

Selected Stand

Species	%	Avg. Age	Merch. Vol



Available Pr...

- 100% Removal
- 80% Removal
- 60% Removal
- 40% Removal
- 25% Removal

Apply

Conclusions

- Sustainability is maintaining desired patterns of stand and landscape change through appropriate management of disturbance
- It will not be achieved unless complexity is addressed
- Incorporating complexity in management requires ecosystem management models
 - combined experience and ecosystem knowledge-based hybrid decision support tools