

Discussion Presentation  
by Hamish Kimmins

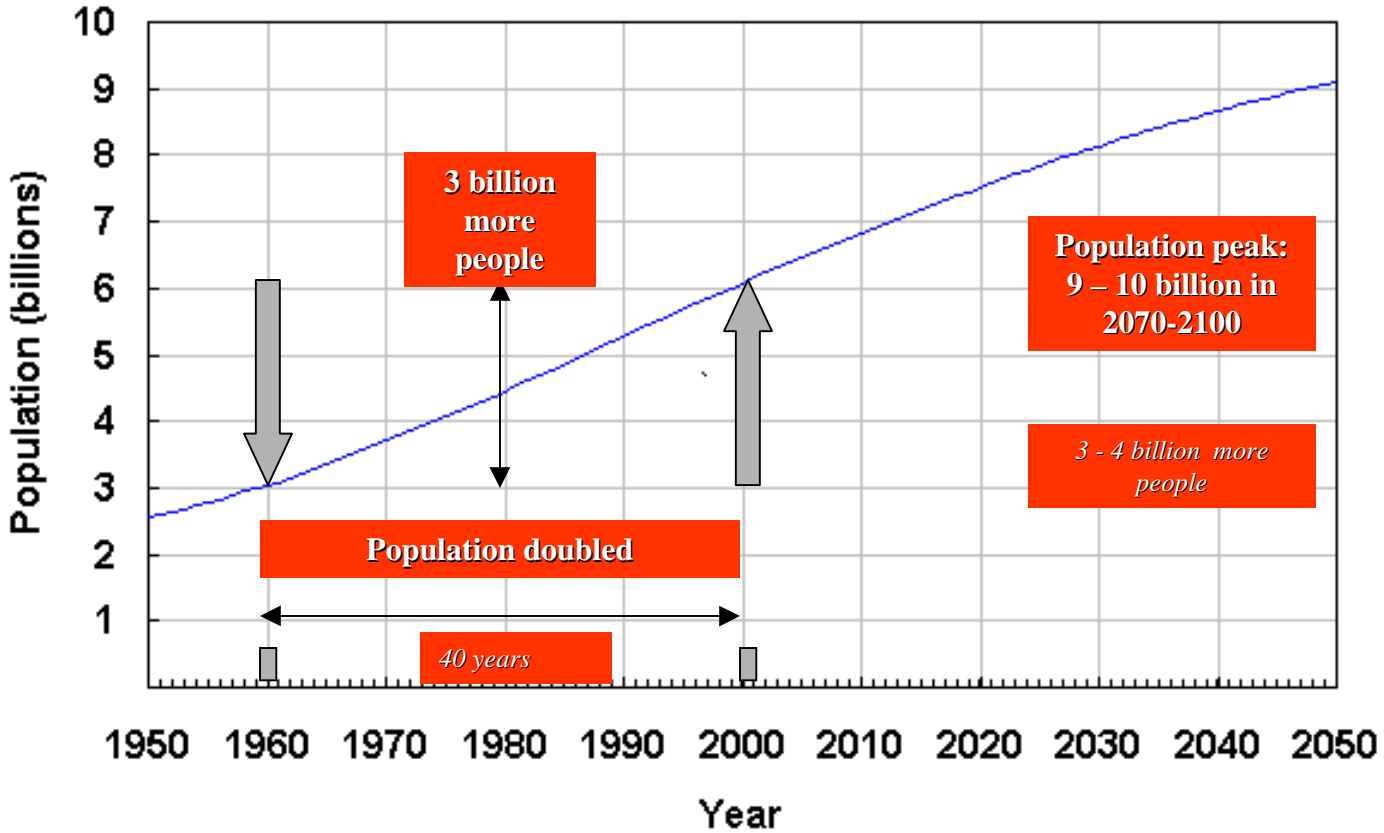
**Presented at the:**

**Forest Modelling for Ecosystem Management,  
Forest Certification, and Sustainable  
Management Conference**

**August 17, 2001**

**Vancouver, BC, Canada**

# World Population: 1950-2050



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

# Forest Modeling: Quo Vardis?

- Future paradigms of forestry
- Conclusions reached from the presentations
- Comparison with my modeling: how do our models stack up?
- Future directions: my personal bias

# Paradigms for a New Forestry

- **Sustainability**
- **Ecosystem management**
- **Adaptive management**
- **Zonation**
- **Variable retention**
- **Natural range of variation**
- **Results-based vs regulation**

All  
need  
forecasting  
tools

## Conclusions reached from the presentations

- Modelers appear to be responding to the changing decision support needs of foresters
- There is a growing recognition of the role of hybrid models
- Acceptance of the need to simplify complex process models (Landsberg), to adopt modular, hierarchical, meta-modeling strategies (Makela), and to model across scales of biological integration (Stage)

## Conclusions reached from the presentations, continued

- Many appear to accept the desirability and power of visualization output (Oliver, UBC, others). Fuzzy vs. analytical logic
- We must confront the data that drive our models and not just accept published coefficients that represent unknown data and complexes of variables. “learning models” (JPS) that reveal the calibration data and in which assumptions and data can easily be changed by users are desirable

## Conclusions reached from the presentations, continued

- Different types of modelers are increasingly coming together to group their sub-ecosystem models into ecosystem-level models, and thereby to expand the spatial scales, scope and power of their models
- There is a growing recognition that forestry issues are complex and large scale (landscape), that we need to drive landscape models with more complete stand models

# Conclusions reached from the presentations, continued

- There appears to be general acceptance of the corollary of Occam's razor: that models should be as complex as necessary while also being as simple as possible

*A problem is an issue that does not get solved.*

*An issue that gets solved is not a problem*

*Many problems persist because they are complex and the solutions that are offered are too simple*

## Conclusions reached from the presentations, continued

- There is merit in mining empirical data for further information – reverse engineering and back casting for data. The combination of understanding of processes and empirical measures of the results is a powerful modeling tool

# How do our models stack up?

- My group uses a modular, meta-modeling, hybrid approach that spans levels of organization from tree to stand to landscape
- *Wherever possible, we use a back-casting approach that estimates key process rates from measurements of their results*
- The data and virtually all assumptions are accessible to, and easily changed by users

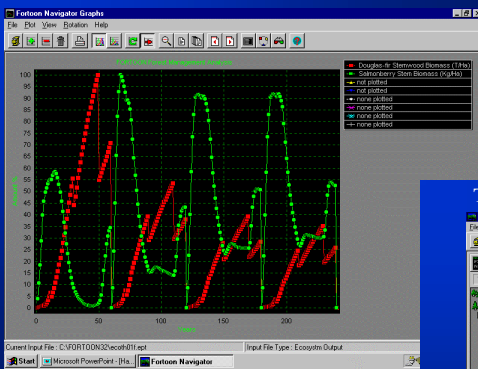
# What Types of Forecasting Tools Do We Use?

## FORECAST

Non-spatial, ecosystem management stand model

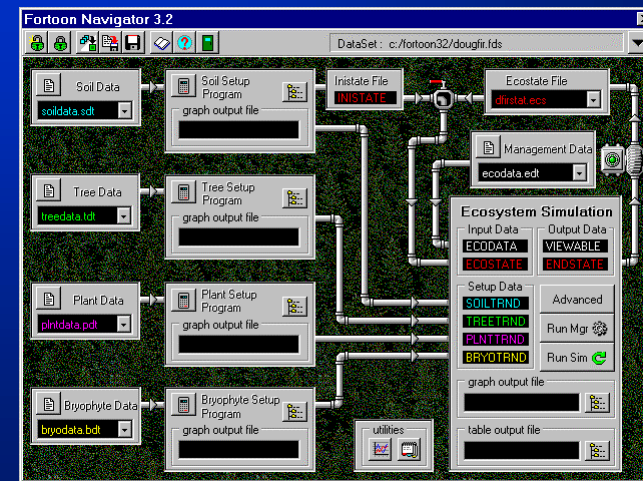
## NAVIGATOR : FORECAST User Interface

Effect of Douglas-fir over-story on shrub biomass



Timber management table:

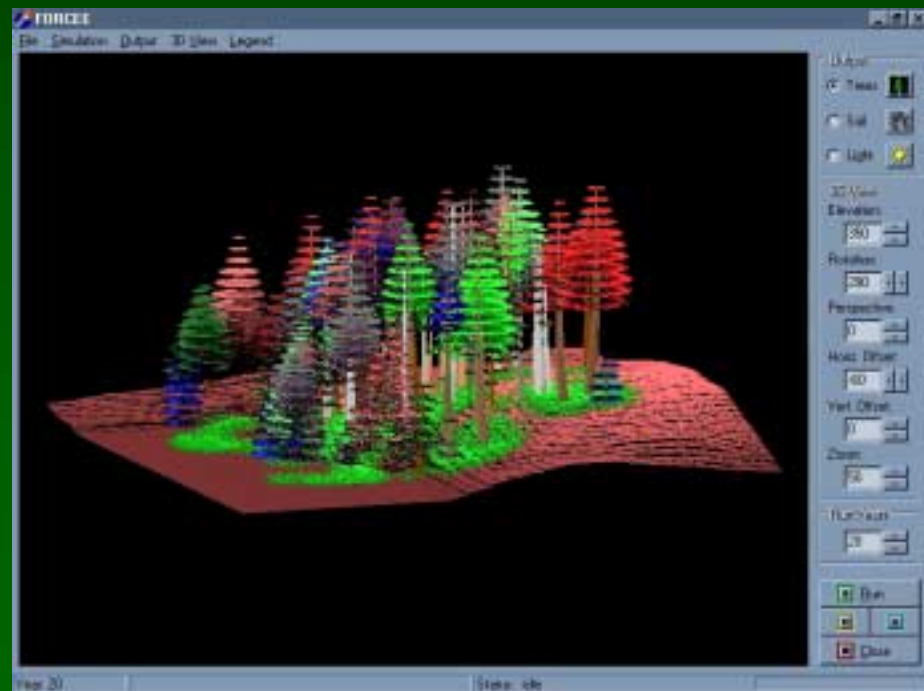
Table Type:	Management						
Thinning	Output						
Year	30						
Cycle	1						
Rotation	1						
Time	30						
Age	32						
Species	Stemwood	Stemwood	Branches	Fibres	Fuels	Slip	Total
Douglas fir	52013	7311	7195	4196	0	0	74706
Shrub	2948	385	3005	485	16356	124	23288
Market	75.2	32.5	30.3	57.4	0.0	0.0	185.4
Shrub	4.0	1.7	10.3	5.4	28.1	2.2	53.3
Phosphorus	6.1	5.0	2.5	12.6	0.0	0.0	26.3
Shrub	0.3	0.3	1.1	1.4	2.1	0.4	5.5
Market	59.8	10.4	15.5	38.6	0.0	0.0	104.4
Shrub	1.7	1.0	6.2	4.3	12.0	1.0	26.2
Plant		Nitrogen	Phosphorus	Phosphorus			
First Site Number	1960.0	520.0	125.0				
Permed Reswood	11.1	4.8	7.8				
Permed Fuel Number	752.2	414.3	550.0				
Permed Stemwood	0.0	1.3	4.5				



# What Types of Forecasting Tools Do We Use?

## FORCEE

Spatially-explicit,  
individual tree,  
ecosystem management  
model



# What Types of Forecasting Tools Do We Use?

## HORIZON

Landscape ecosystem  
management model  
model with stands  
simulated by  
FORECAST



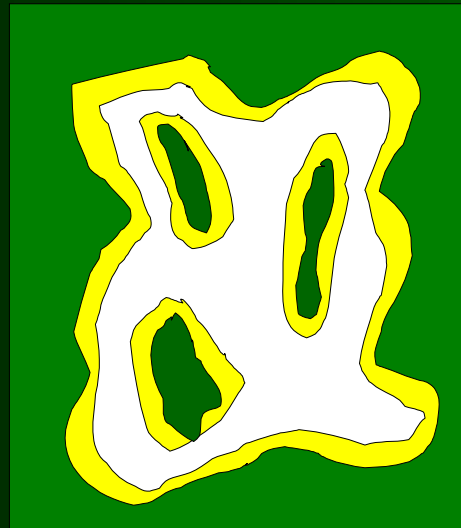
# What Types of Forecasting Tools Do We Use?

## LLEMS

Local landscape ecosystem management model for complex cut block design – under development

## LLEMS

Local Landscape Ecosystem Management Simulator



■ Trees ■ Ecotone ■ Open

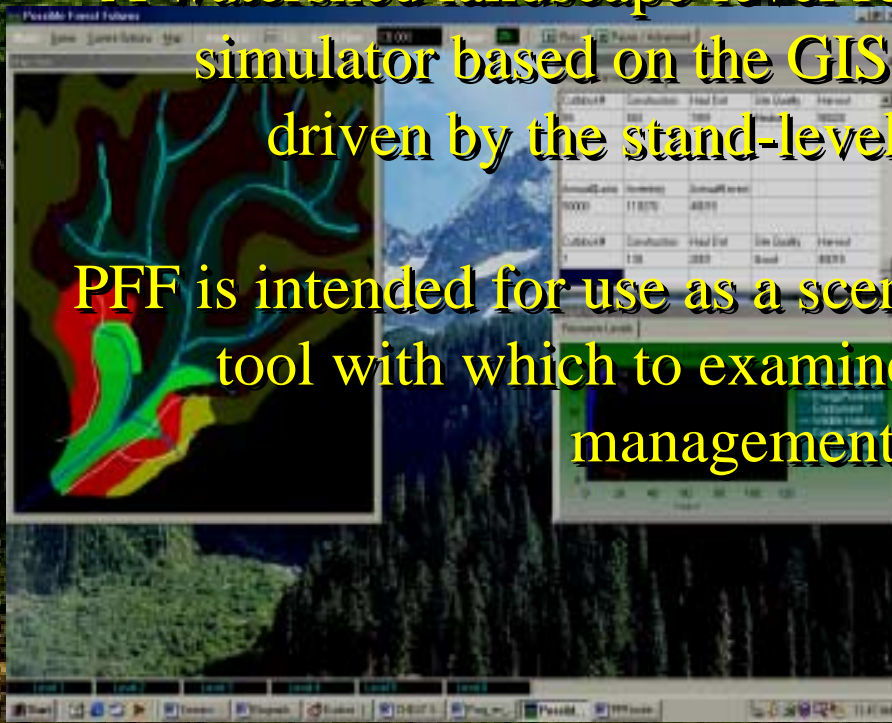
- \* Is this a clearcut?
- \* What will the future forest species composition be?
- \* How will Douglas-fir compete with western hemlock?
- \* Will shade tolerant hardwoods be able to grow?

# Possible Forest Futures

An ecologically based vision of the future forest conditions and values that could occur under alternative landscape management scenarios

A watershed landscape-level forest ecosystem management simulator based on the GIS model, **HORIZON**, and driven by the stand-level model, **FORECAST**

PFF is intended for use as a scenario analysis and educational tool with which to examine landscape/forest estate management strategies

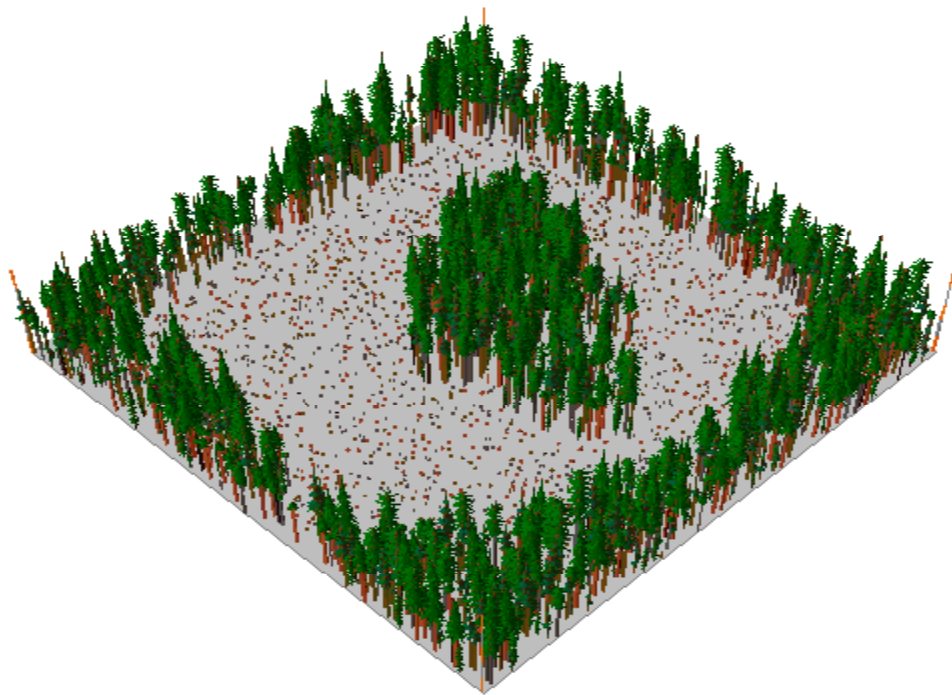


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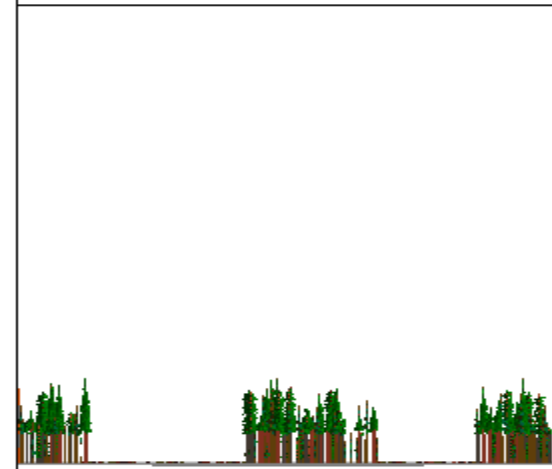
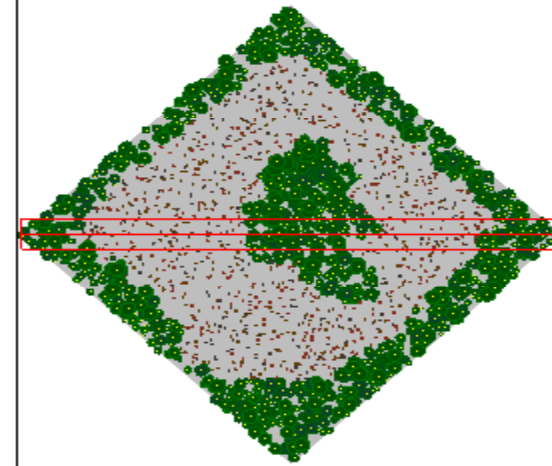
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# Stand-level Visualization

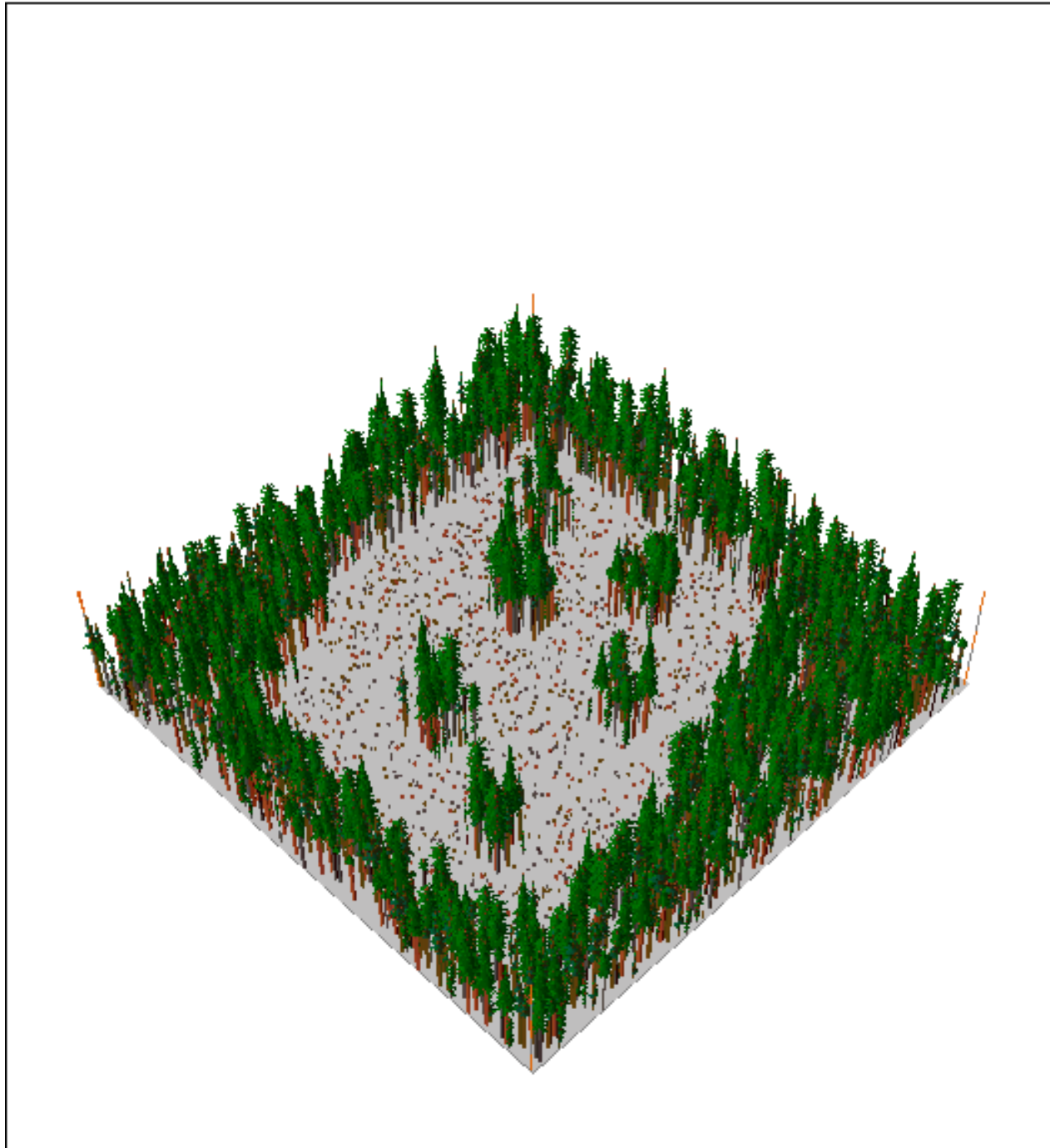
Stand Visualization System



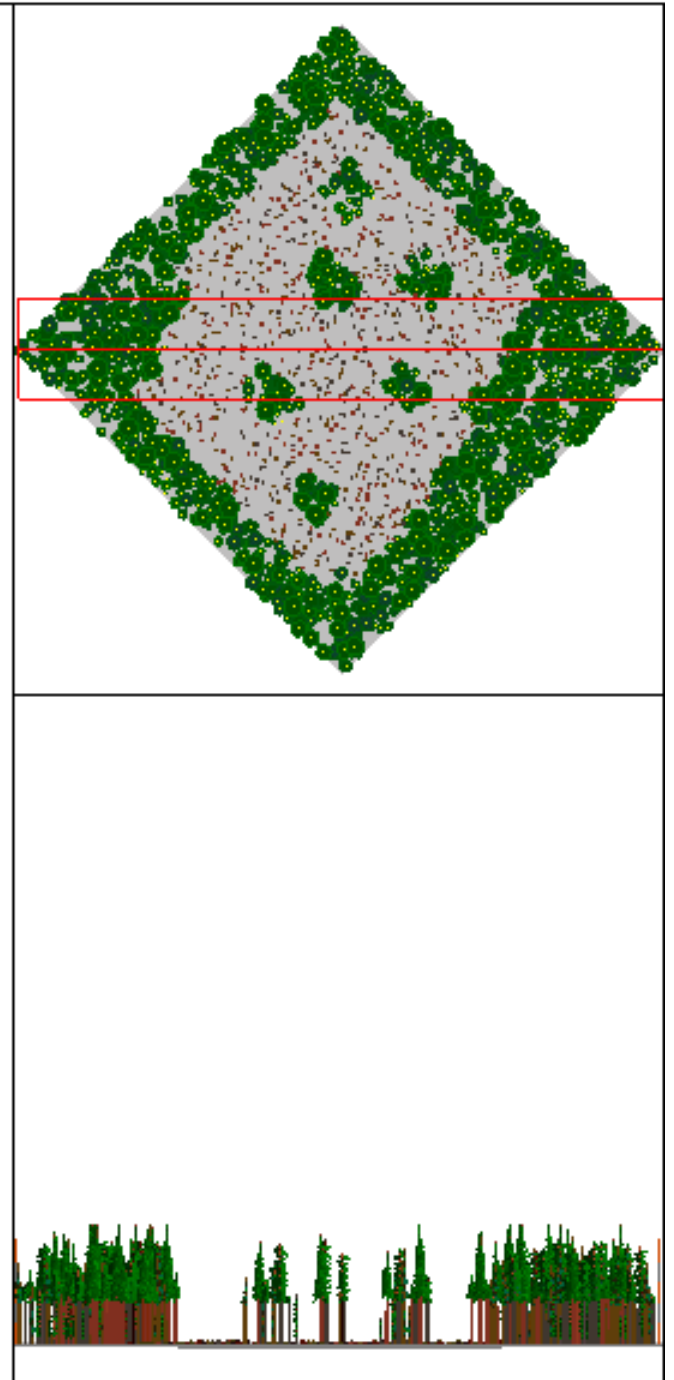
MASS\_partial2.SVS



Stand Visualization System



MASS\_partial3.SVS



# Stand-level Visualization

Year 5

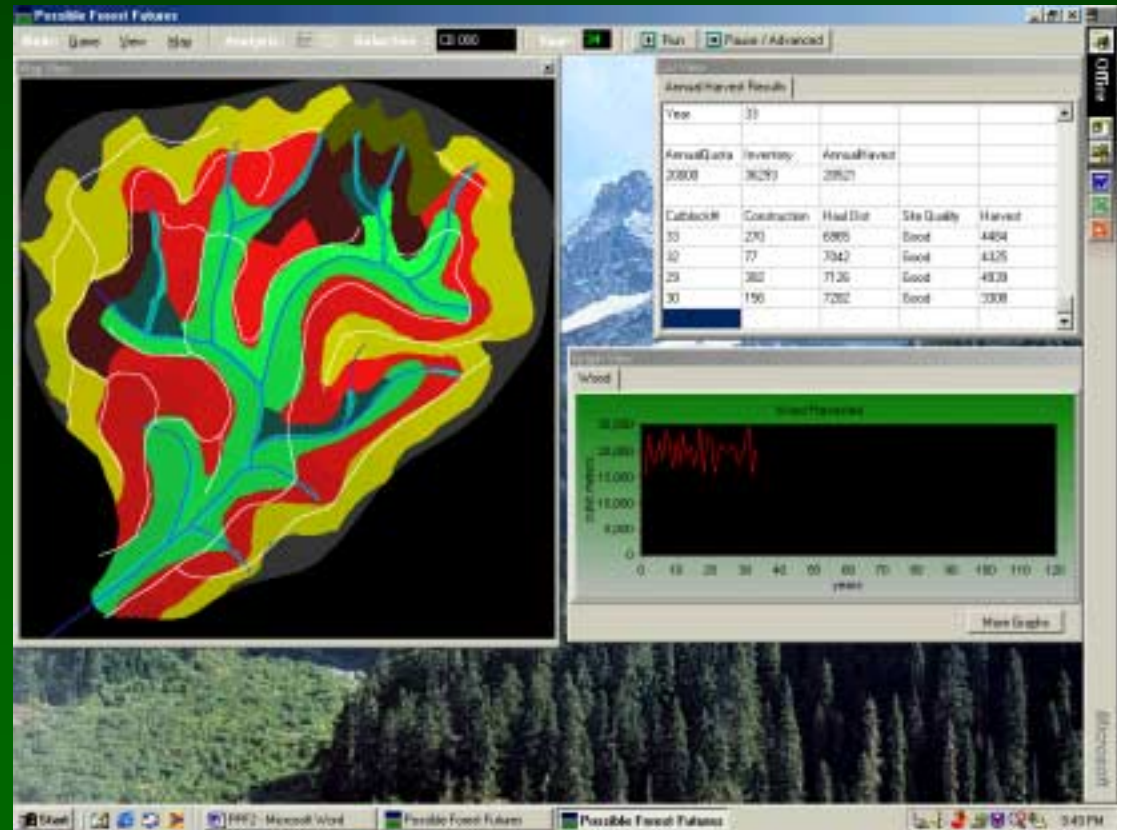


# What Types of Forecasting Tools?

Landscape management scenario analysis tool for education, extension and management gaming

## POSSIBLE FOREST FUTURES:

Multiple value, watershed management scenario analysis model



# Landscape Visualization

Forest Practices Code Scenario

Year 25

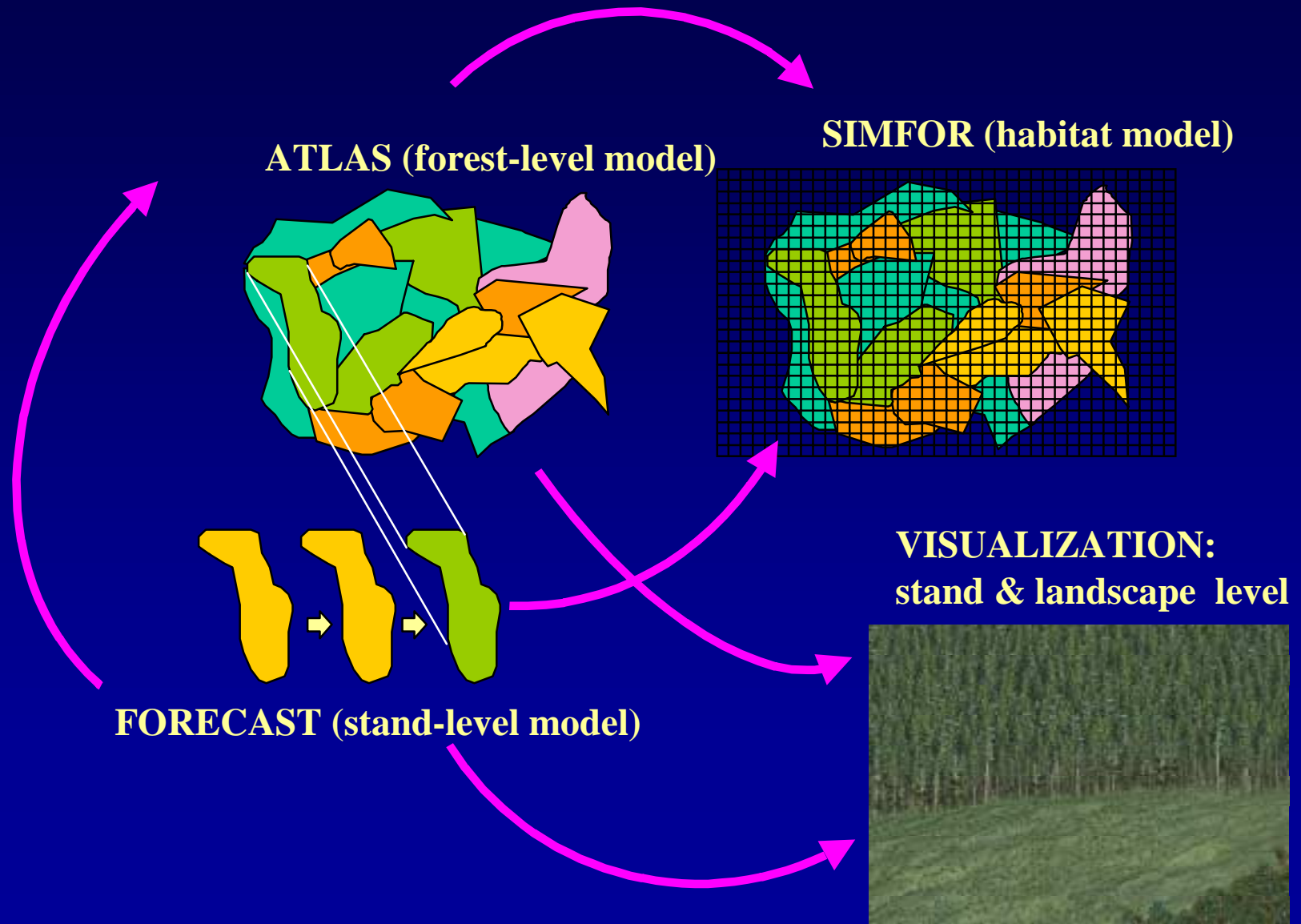


Zoning Scenario

Year 25



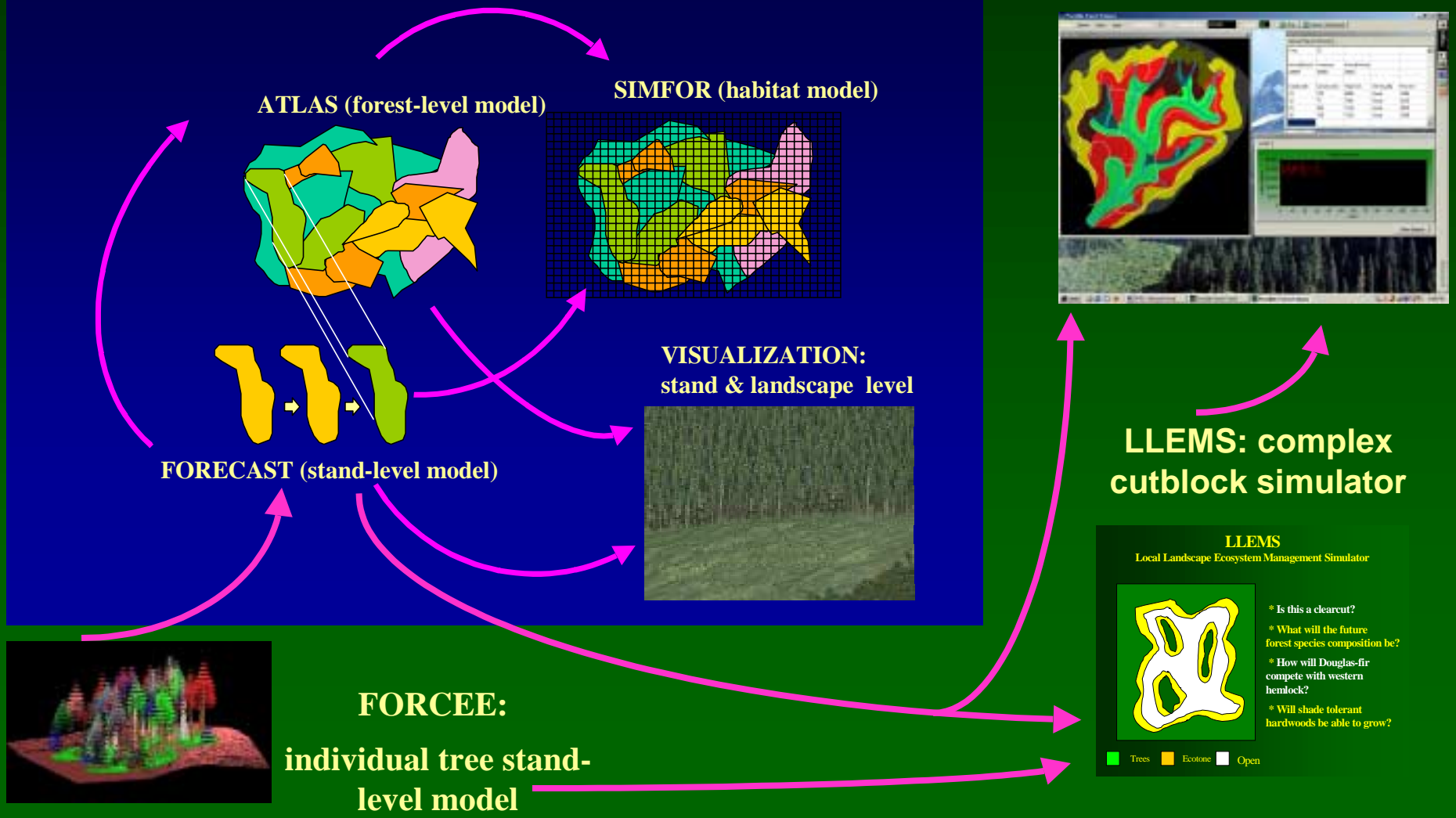
# DECISION SUPPORT SYSTEM



# Overall System of Ecosystem Management Models

## DECISION SUPPORT SYSTEM

## POSSIBLE FOREST FUTURES: based on HORIZON



## Future directions: my personal biases

- For many certification, sustainability, and ecosystem management applications, soil and climatic representations are needed
- Similarly, there is frequently a need to represent minor vegetation, fire, diseases, wind and animal effects
- We need new and improved ecosystem models as well as population and community models

## Future directions: my personal biases, continued

- Not enough has yet been done to develop management “games” from our analytical and professional models for educational, extension and public participation processes.

*Forestry is as much about people and their preferences as it is about forest ecology, biodiversity and other biophysical concerns. Our models need to become more people and social value oriented*