

# Attachment 1: Model Scenarios and Outputs

## 1. Introduction

The purpose of this attachment is to describe the characteristics and results of six modeling scenarios for the three North Coast districts (Astoria, Tillamook, Forest Grove). Two of the scenarios are updates to those presented to the Board at the November, 2008 meeting and four are new scenarios. The scenarios are listed from least constrained to the most constrained below:

### Scenarios

- |  |        |
|--|--------|
| • Wood Emphasis with FPA Resource Site Protection  | New    |
| • Wood Emphasis with State Forests Take-Avoidance  | New    |
| • Performance Measure (PM) with a Revenue Emphasis | New    |
| • Performance Measure with Structure and Revenue   | Update |
| • FMP with HCP (40% Complex Structure)             | New    |
| • FMP with HCP (50% Complex Structure) – Base Case | Update |

All of the Tillamook models incorporated yield tables that have been updated since the November Board meeting based on analyses conducted by ODF staff (see Section 3). The distinguishing characteristics of each scenario's strategies and outputs are described in the order as follows:

### Strategies

- Riparian Management Strategies
- Species of Concern Strategies
- Complex Structure (LYR and OFS Goals)
  - Short Term (20 years)
  - Long Term (approx. 80 years)
- Landscape Design – designated locations for the development of complex structure

### Outputs

- Annual Volume Harvest
- Development of Complex Structure (LYR and OFS Goals)
  - Short Term (20 years)
  - Long Term (approx. 80 years)

Volume and structure outputs are discussed as totals for the three districts. Volume outputs for each district are summarized in Table 1.

## 2. Model Descriptions

### A. Wood Emphasis with Forest Practices Resource Site Protection

This model is consistent with the Oregon Forest Practices Act and Rules (FPA). This model has the fewest constraints to harvest. This model is a new scenario.

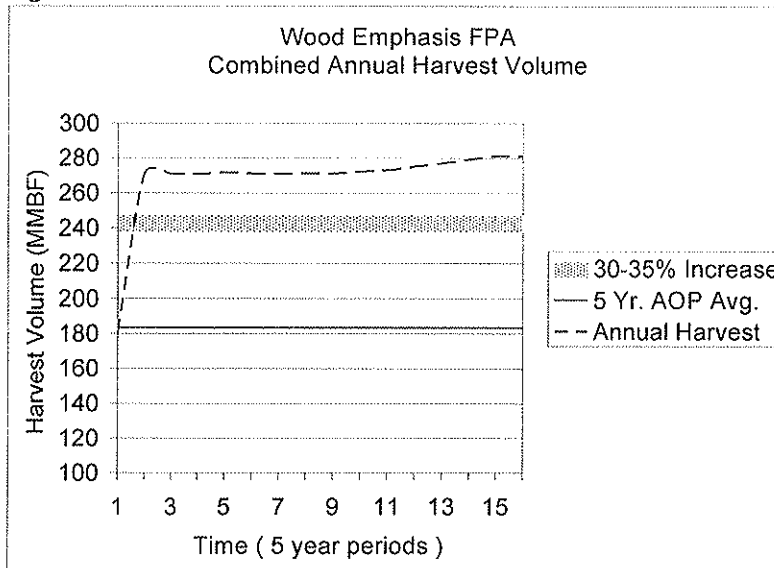
#### Strategies

- Riparian Areas are managed according to the FPA Rules
- Species of Concern are protected through:
  - Northern Spotted Owls – a 70 acre core area is protected for each site
  - Bald eagles, osprey, and great blue herons are protected through the FPA Resource Site Protection Rules.
- No goal for complex stand structures
- No specified landscape design

#### Outputs (Figures 1 and 2)

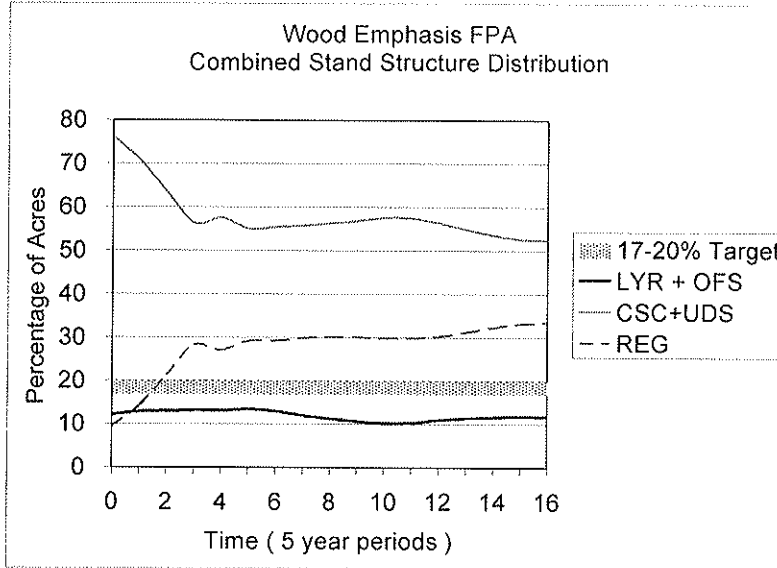
- This scenario maintains a harvest volume of 272 MMBF per year, starting in the second period (5 to 10 years). This is a 48% increase in volume compared to current harvest objectives.<sup>1</sup>
- The amount of complex structure (LYR and OFS) starts at 13%, then fluctuates between 10 and 15% of the landscape, and ends with 11% at 80 years.

**Figure 1**



<sup>1</sup> Based on five-year average harvest objectives for the three North Coast districts (AOPs 2002-2006) = 183MMBF

Figure 2



### B. Wood Emphasis with State Forests Threatened and Endangered Species Policies

This model is consistent with the Oregon Forest Practices Act and Rules, and it includes the State Forest's approach to meet 'take avoidance' requirements of the federal Endangered Species Act.

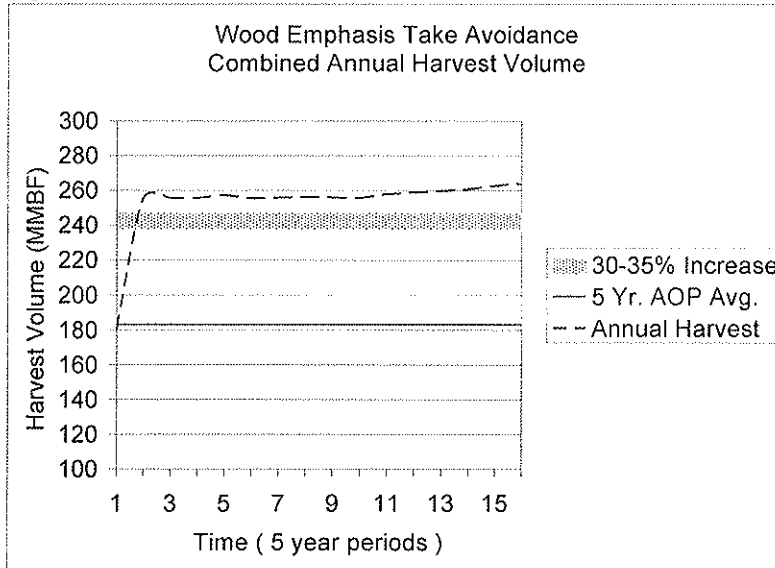
#### Strategies

- Riparian Areas are managed according the FPA Rules
- Species of Concern are protected through:
  - State Forests strategies for
    - Northern Spotted Owls – the 40% “best habitat” within each 1.5 mile circle is protected
    - Marbled Murrelets – each occupied stand and a buffer is protected (the size of each area is variable)
  - Bald eagles, osprey, and great blue herons are protected through the FPA Resource Site Protection Rules
- No goal for complex stand structures
- No specified landscape design

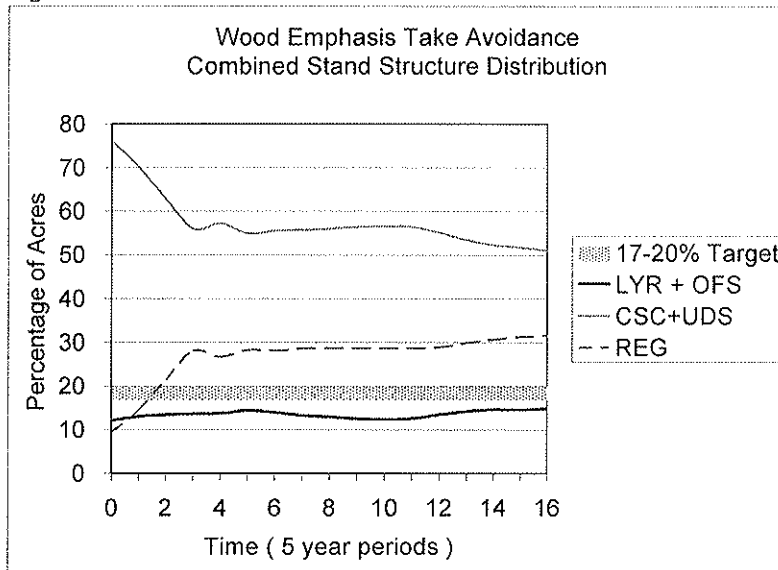
#### Outputs (Figures 3 and 4)

- This scenario maintains a harvest volume of 256 MMBF per year, starting in the second period (5 to 10 years). This is a 40% volume increase over current harvest objectives and 94% of the volume from the Wood Emphasis with FPA Resource Site Protection scenario.
- The total complex structure rises from the current 13% level to 15% in 70 years then levels off.

**Figure 3**



**Figure 4**



C. Performance Measure with a Revenue Goal

This model was designed to achieve Performance Measure 3 (a 30% increase in revenue over current), without the goal of Performance Measure 6 (20% complex in 20 years). It is consistent with the Oregon Forest Practices Act and Rules, and meets the ‘take avoidance’ requirements of the federal Endangered Species Act. This new scenario was created at the request of the Board of Forestry.

Strategies

- Riparian Areas are managed according to Appendix J of the *Northwest Oregon State Forests Management Plan Aquatic and Riparian Strategies*.

- Species of Concern are protected through:
  - State Forests Take-Avoidance Strategies for:
    - Northern Spotted Owls – the 40% “best habitat” within each 1.5 mile circle is protected
    - Marbled Murrelets – each occupied stand and a buffer is protected (the size of each area is variable)
  - Bald eagles, osprey, and great blue herons are protected through the FPA Resource Site Protection Rules
- No goal for complex structure
- No specific landscape design

Outputs (Figures 5 and 6)

- This scenario achieves a harvest volume of 236 MMBF per year, starting in the second period (5 to 10 years). This is a 29% volume increase over current harvest objectives and 87% of the volume from the Wood Emphasis with FPA Resource Site Protection scenario.
- The scenario achieves 20% complex structure in 80 years.

**Figure 5**

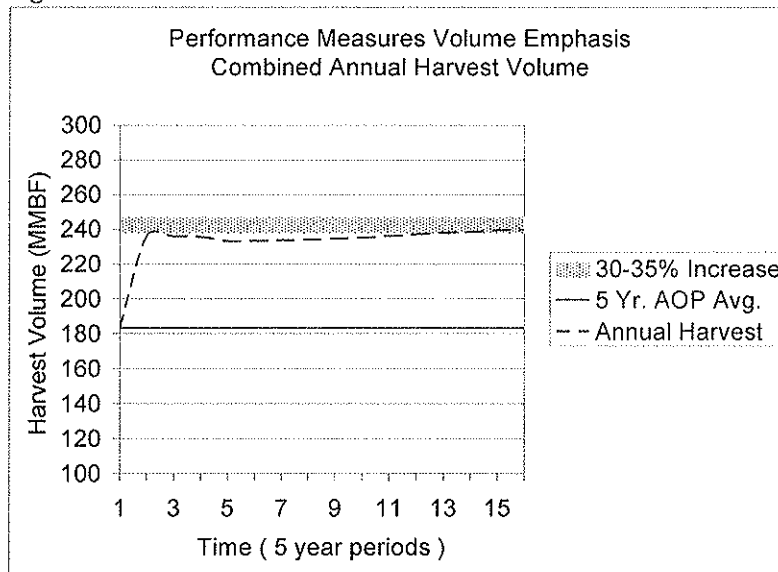
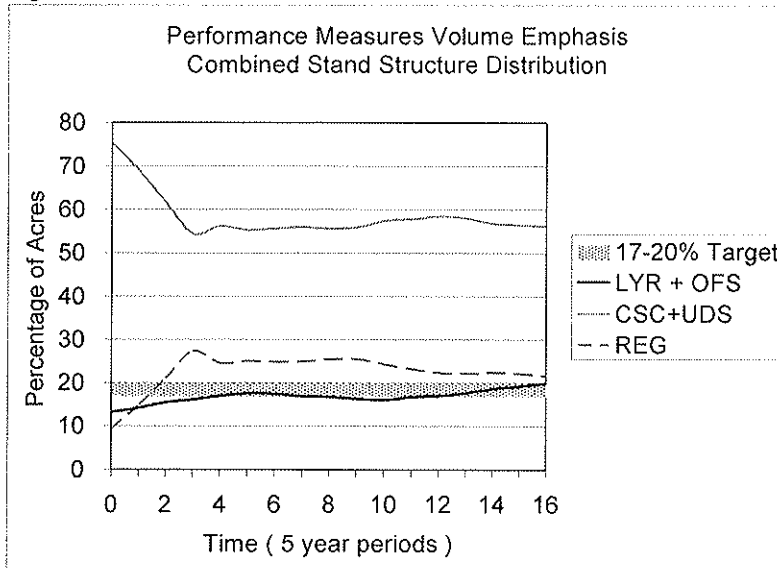


Figure 6



#### D. Performance Measure with Structure and Revenue Goals

This scenario attempts to achieve both Performance Measures 3 and 6. It is consistent with the Oregon Forest Practices Act and Rules, and meets the ‘take avoidance’ requirements of the federal Endangered Species Act. The scenario applies Structure Based Management and Landscape Design concepts from the *Northwest Oregon State Forests Management Plan*, but does not attain the plan’s specified complex structure ranges.

#### Strategies

- Riparian Areas are managed according to Appendix J of the *Northwest Oregon State Forests Management Plan* Aquatic and Riparian Strategies.
- Species of Concern are protected through:
  - State Forests Take-Avoidance Strategies for
    - Northern Spotted Owls – the 40% “best habitat” within each 1.5 mile circle is protected
    - Marbled Murrelets – each occupied stand and a buffer is protected (the size of each area is variable)
  - Bald eagles, osprey, and great blue herons are protected through the FPA Resource Site Protection Rules
- There is a goal for 20% complex structure in 20 years.
- The landscape design designates 20% of the district for the development of complex structure.

#### Outputs (Figures 7 and 8)

- This scenario achieves a harvest volume of 220 MMBF per year, starting in the second period (5 to 10 years). This is a 20% volume increase over current harvest

objectives and 81% of the volume from the Wood Emphasis with FPA Resource Site Protection scenario.

- This scenario achieves 20% complex structure in 25 years and approaches 30% complex structure in 80 years.

Figure 7

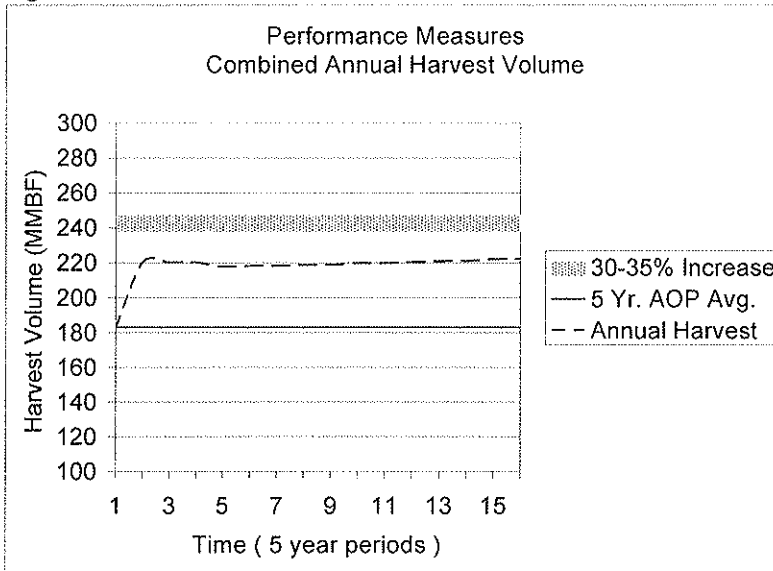
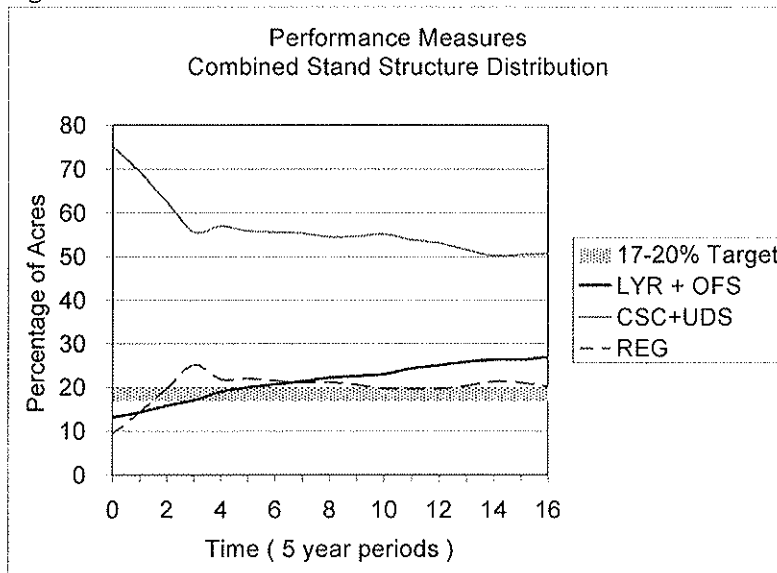


Figure 8



E. Forest Management Plan with HCP (40% Complex Structure)

This scenario is similar to the Base Case described below, except the long-term goal for complex structure is 40% and the landscape design designates 40% of the district for the development of complex structure.

## Strategies

- Riparian Areas are managed according to Appendix J the *Northwest Oregon State Forests Management Plan* Aquatic and Riparian Strategies.
- Species of Concern are protected through the State Forest Take-Avoidance Strategies for the first five-years, then the draft HCP strategies.
  - State Forests Take-Avoidance Strategies for:
    - Northern Spotted Owls – the 40% “best habitat” within each 1.5 mile circle is protected
    - Marbled Murrelets – each occupied stand and a buffer is protected (the size of each area is variable)
  - Draft *Western Oregon Habitat Conservation Plan* Strategies for:
    - Northern Spotted Owls – large clusters of habitat and priority circles until the long-term complex structure goal is attained
    - Marbled Murrelets – each occupied stand and a buffer is protected (the size of each area is variable) until the long-term complex structure goal is attained.
  - Bald eagles, osprey, and great blue herons are protected through the FPA Resource Site Protection Rules
- There is a goal for 20% complex structure in 20 years.
- There is a long term goal for 40% complex structure.
- The landscape design designates approximately 40% of the district for the development of complex structure.

## Outputs (Figures 9 and 10)

- This scenario reduces harvest volume to 169 MMBF per year, as soon as it is implemented. This is a 8% volume decrease compared to current harvest objectives and 62% of the volume from the Wood Emphasis with FPA Resource Site Protection scenario.
- This scenario achieves 20% complex structure in 10 years and 40% complex structure in 70 years.

Figure 9

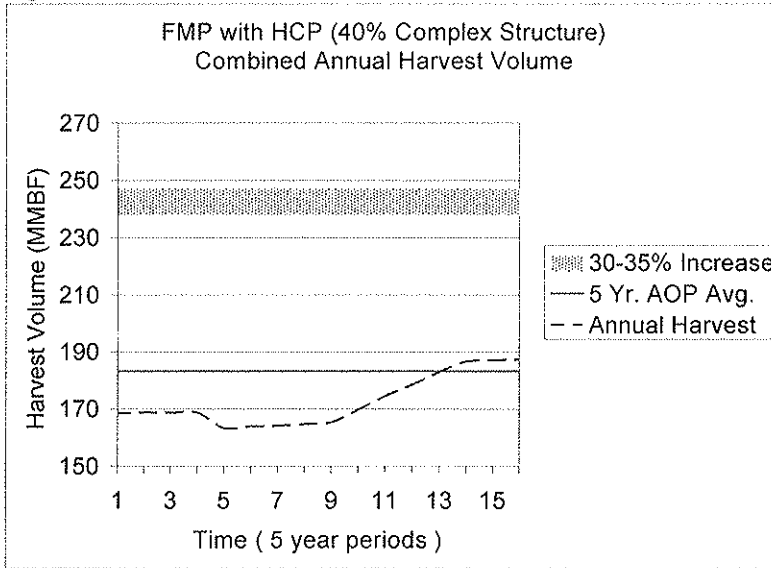
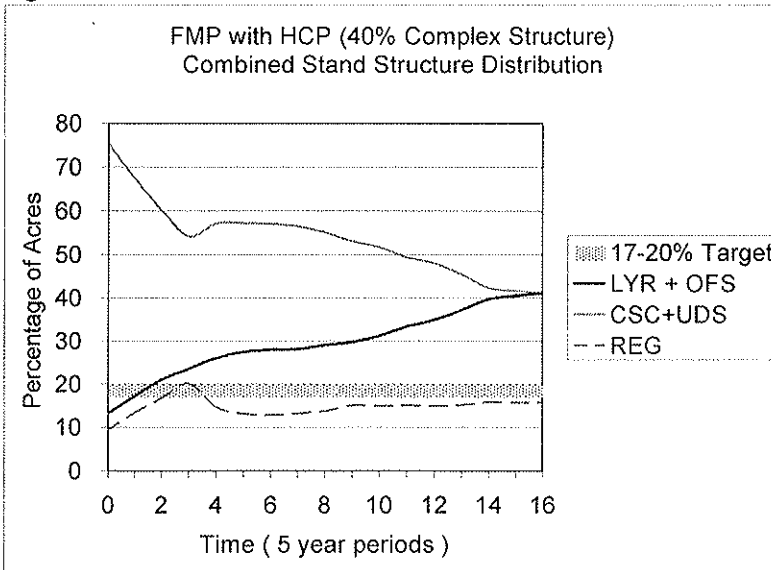


Figure 10



F. Forest Management Plan with HCP (50% Complex Structure) – Base Case

This scenario is designed to simulate the current management of these forests (i.e. consistent with the *Northwest Oregon State Forest Management Plan* and the current district implementation plans). The northern spotted owl and marbled murrelet strategies from the draft *Western Oregon Habitat Conservation Plan* have been added to this scenario since the November Board meeting.

Strategies

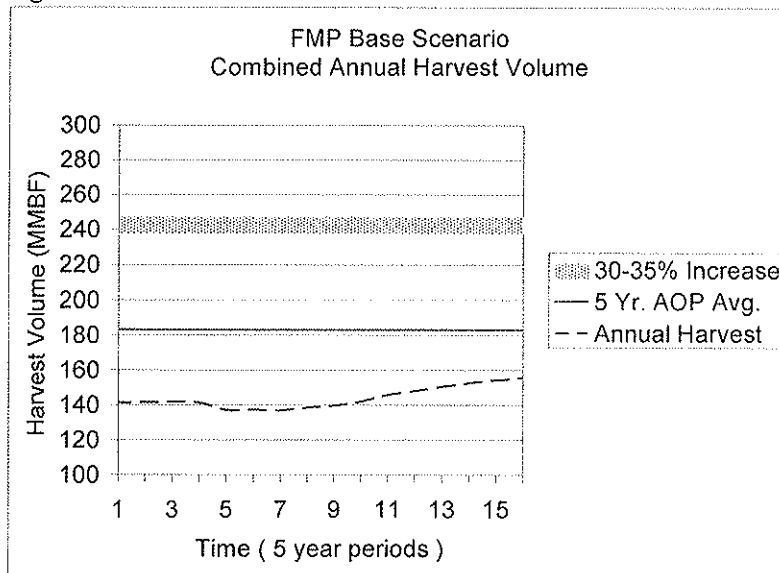
- Riparian Areas are managed according to Appendix J the *Northwest Oregon State Forests Management Plan* Aquatic and Riparian Strategies.

- Species of Concern are protected through the State Forest Take-Avoidance Strategies for the first five-years, then the draft HCP strategies.
  - State Forests Take-Avoidance Strategies for:
    - Northern Spotted Owls – the 40% “best habitat” within each 1.5 mile circle is protected
    - Marbled Murrelets – each occupied stand and a buffer is protected (the size of each area is variable)
  - Draft *Western Oregon Habitat Conservation Plan* Strategies for:
    - Northern Spotted Owls – large clusters of habitat and priority circles until the long-term complex structure goal is attained
    - Marbled Murrelets – each occupied stand and a buffer is protected (the size of each area is variable) until the long-term complex structure goal is attained.
  - Bald eagles, osprey, and great blue herons are protected through the FPA Resource Site Protection Rules
- There is a long term goal for 50% complex structure.
- The landscape design designates approximately 50% of the district for the development of complex structure.

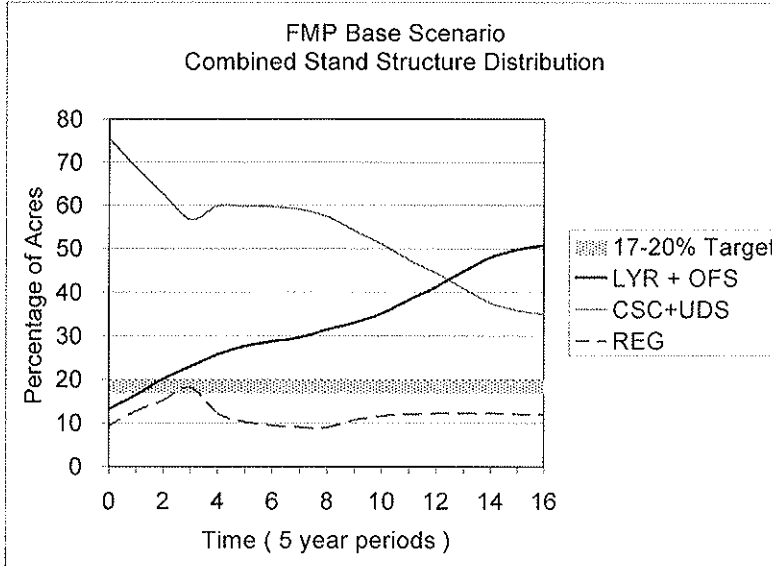
Outputs (Figures 11 and 12)

- This scenario reduces harvest volume to 142 MMBF per year. This is a 22% volume decrease compared to current harvest objectives and 52% of the volume from the Wood Emphasis with FPA Resource Site Protection scenario.
- This scenario achieves 20% complex structure in 10 years and 50% complex structure in 75 years.

**Figure 11**



**Figure 12**



Volume outputs are summarized by district in Table 1.

**Table 1 – Harvest Volume (MMBF) by District**

Model Run	Astoria	Forest Grove	Tillamook	North Coast Total
Wood Emphasis – FPA Cores	103	70	99	272
Wood Emphasis – SF Take Avoidance	98	66	92	256
PM Volume Emphasis	85	62	88	236
PM Structure w/ Best Volume	85	62	73	220
FMP w/ HCP (40% Complex)	61	58	50	169
FMP w/ HCP (50% Complex)	52	47	43	142

### 3. Tillamook Yield Table Correction

#### Summary

The Tillamook district has observed a significantly lower level of operational harvest volume, as compared to what the Stand Level Inventory was projecting. It is currently accepted that this discrepancy may be due to a low percentage of measured stands, and has made a volume reduction method necessary to improve model output accuracy. For the Performance Measure report of November 2008 this reduction took the form of a fixed reduction of the model output. For the current report, this method was improved upon by applying reductions to model data instead of model results, and also applying a variable reduction based on stand characteristics. This variable reduction was determined through a regression analysis on planned and observed harvest volumes.

#### Regression Adjustment Method

A regression based adjustment method was used to improve the accuracy of the Tillamook yield table projected volumes. Pre-harvest timber cruise data was found to be a

good proxy for actual cut out volumes, and were used to provide 169 samples of comparison against yield table volumes. A linear regression model derived from the difference between timber cruise and planned yields was used to correct the starting yield volumes (Figure 12). Descriptive variables for the difference between cruised and planned volumes included the original planned volume, site class, Swiss needle cast zone, and latitude. The regression model returned an  $r^2$  value of 0.62.

Only the beginning volumes were adjusted based on the regression, and period-on-period percentage growth increases of the original yield tables were replicated for later time periods in the adjusted volumes. An example of the original and adjusted volume for one stand is shown in Figure 13. It should be noted that this adjustment method resulted in a volume decrease for most stands, but depending on the stand condition it could also result in an increase or no change.

Figure 13

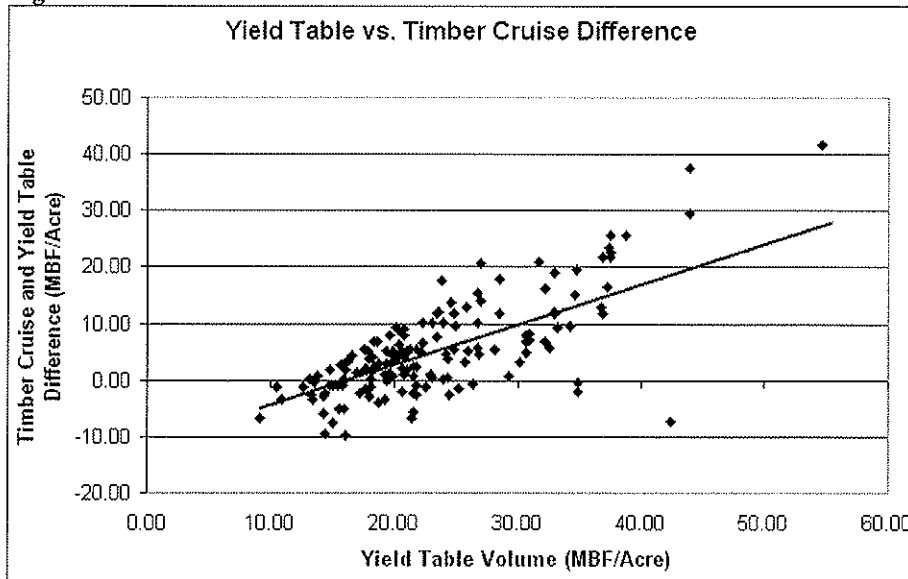
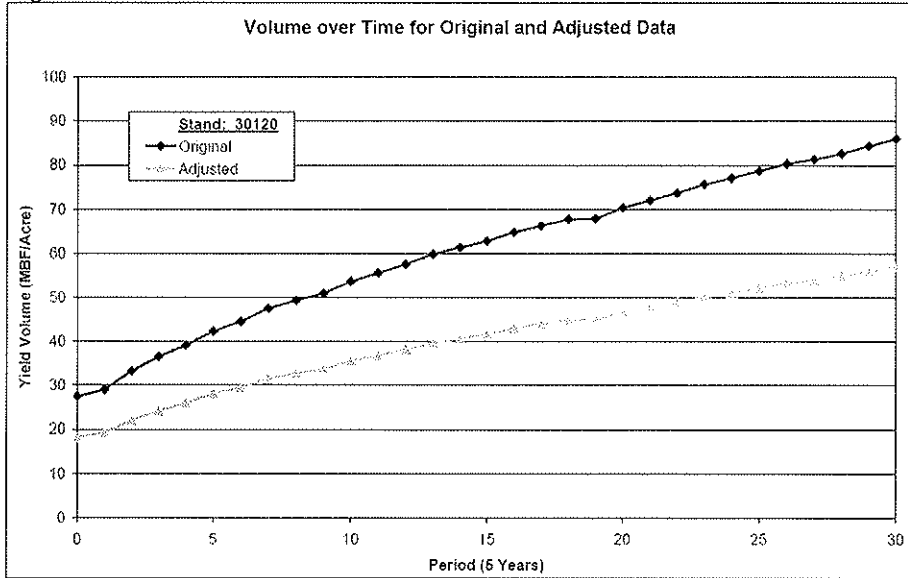


Figure 14



### Adjustment Results

Using the adjusted input yield data, the harvest scheduling model results varied for different model scenarios. In general, the overall volume was reduced approximately 20% to 25% and acres cut were increased.