Study of the Future of Washington Forests and Forestry Industries

Introduction

The Washington State Department of Natural Resources (DNR) has requested a proposal to conduct several studies in response to the State Legislature's request for a report on the future of Washington forests. This report is to examine the economic, recreational, and environmental trends influencing the forest land owners, forest products industry and secondary manufacturing sectors in Washington State. The full text of the Scope of Work can be accessed via the following web link:
http://leap.leg.wa.gov/leap/Budget/Detail/2005/so0507bill0330F.pdf

For this study, the legislature established the following scope of work, and directed that the DNR should contract with the University of Washington's College of Forest Resources to provide:

a. An update of the 1992 timber supply study for Washington State that was conducted by the University of Washington. The update may be accomplished by reviewing the most recent similar data available in existing reports, examining a sample of the original 1992 study sample of lands and through other existing data sources that may reveal relevant trends and changes since 1992.
b. An independent assessment of the economic contribution of the forest products industry, and secondary manufacturing sectors, to the state. This assessment will also examine some of the macroeconomic trends likely to affect the industry in the future.
c. A comparison of the competitive position of Washington's forests products industry globally, and with other leading forest products states, or regions, of the United States. This evaluation should compare the relative tax burden for growing and harvesting timber between the states or regions and the relative cost of adhering to regulations, and identify the competitive advantages of each state or region.
d. An assessment of the trends and dynamics that commercial and residential development play in the conversion of the state's forests to non-forestry uses. The assessment will involve gathering relevant data, reviewing that data, and analyzing the relationship between development and the conversion of forest land uses.
e. Recommendations on: (i) policy changes that would enhance the competitive position of Washington's forest products industry in Washington State; (ii) policy changes that would, to the extent possible, ensure that a productive forest land base continues to be managed for forest products, recreation, and environmental and other public benefits into the future; and (iii) policy changes that would enhance the recreational opportunities on working forest lands in the state.
f. Based on the information derived from (a) through (d), of this subsection, an assessment of the expected rate of return from state granted lands. This section of the report shall also review reports prepared by the department over the past ten years that describe the investment returns from granted lands. The review of these previous reports shall compare and critique the methodology and indicators used to report investment returns. The review shall recommend appropriate measures of investment returns from granted lands.
g. Analyze and recommend policies and programs to assist Cascade foothills area landowners and communities in developing and implementing innovative approaches to retaining traditional forestry while at the same time accommodating new uses that strengthen the economic and natural benefits from forest lands. For the purposes of this section, the Cascade foothills area generally encompasses the non-urbanized lands within the Cascade mountain range and drainages lying between three hundred and

three thousand feet above mean sea level, and located within Whatcom, Skagit Snohomish, King, Pierce, Thurston, and Lewis counties.

Project Organization

The study proposal is generally organized around research items (a), (b), (c), (d), (f) and (g) in the Legislative scope of work. These research efforts will serve as analysis inputs to the recommendations for policies and programs that are stipulated in item (e) and provide assessments to respond to item (g). Potential collaborative forums are herein proposed, to be led by the DNR with the assistance of the College of Forest Resources, to address items (e) and (g) in conjunction with Northwest Environmental Forum participants. The overall organization for the project within the College of Forest Resources is summarized in Table 1, identifying the lead research organizations involved in each study. Based on the Legislative criteria, the DNR proposed five study areas; a scope of work is being developed for each area as shown in the top half of Table 1. The bottom half of the table outlines the expected collaboration required for the development of the policy and program recommendations.

1. Timber Supply and Forest Structure Study - including regional impacts, both economic and ecological, across owner groups while addressing land use conversion pressures primarily on the westside of the Cascades and forest health issues primarily on the eastside.

2. Economic Contribution Study – providing an understanding of the role of the forest sector in the state economy under changing pressures.

3. Competitive Position Study – an analysis of Washington's changing competitive position with respect to other domestic and international suppliers as influenced by timber harvest levels and costs that are being driven by growth pressures, productivity trends, regulatory constraints, taxes, and other incentives or disincentives.

4. Land Conversion Study and Cascade Foothills Forestry Viability – assessing the trends and dynamics contributing to forest land conversion, the impacts of conversion to the working forest land base, and a review of the tools and policy levers that may influence the rate of conversion and retention of working forests. The College of Forest Resources and Cascade Land Conservancy will work collaboratively to build consensus recommendations, developed by a work group of forestry stakeholders drawn from Northwest Environmental Forum participants, for preserving forestry as a viable industry in the Cascade Foothills and maintaining forestry's economic and ecological benefits.

5. State Granted Lands Return on Investment Study – an assessment of the expected rate of return from trust granted lands and a review and critique of methodologies used and their appropriateness for investment decisions.

Each of these studies will examine the impact of a range of different alternatives, providing a rich array of information from which to develop policy recommendations under a collaborative DNR-CFR process to inform the Legislature.

Table 1. Summary of studies and research objectives (*Letters in parentheses correspond to sections in the Legislature's Scope of Work)*

Problem Definition	1. Timber Supply and Forest Structure Study	2. Economic Contribution Study	3. Competitive Position Study	4. Land Conversion Study and Cascade Foothills Forestry Viability	5. State Granted Lands Return on Investment Study
Lead	RTI/CINTRAFOR	CINTRAFOR/RTI	CINTRAFOR	CFR/URBAN ECOLOGY/TNC/CLC/ TPL/ COMMENSPACE	UW CONSULTANTS (CFR/ECONOMICS/ BUSINESS)
Research, Assessment, and Alternatives Proposals (UW-CFR)	Timber supply and forest structure study (a)	Economic contribution to Washington and trends (b)	Competitiveness of timber and forest products industry, including taxes & regulations (c)	Development trends and conversion pressure (d)	Economic analysis of investment returns for trusts lands (f)
Policy Recommendations (DNR/CFR)	Competitiveness enhancements (ei) Land use stability and multiple values (eii) Enhance recreation opportunity on working forests (eiii)	Competitiveness enhancements (ei)	Competitiveness enhancements (ei)	Recommend innovative tools to retain working forests (g) and build consensus strategy for forest conservation. *(CLC and CFR, in consultation with the Northwest Environmental Forum, and under the guidance of DNR)* Enhance multiple value opportunities on working forests (eiii)	Recommend appropriate measures of ROI (f)

1. Timber Supply and Forest Structure Study

Statement of intent and connection to policy issues:

The timber supply study will update projection information developed in prior studies (prior data for 1990 Westside; 1992 eastside). Like the prior study it will provide potential ranges of future harvests, log supplies, and representative ecological measures including selected habitat indices for which models available in the literature are currently available. Projections will be provided for 5 timbersheds on the Westside and 2 on the eastside, highlighting differences across owner groups. The data will be further subcategorized by upland and riparian zones since treatments will differ but the data samples will not be sufficient to provide spatial insights within the zones and regions. It will provide an analysis of why the harvest levels have dropped well below prior projections and how this has affected the forest inventory and forest sector economics. It will provide insight on past and prospective forest management changes and their impacts relative to objectives. It will provide insight on ecological and habitat changes linked to the harvest decline and changing forest practices along with a range of future projections.

Information provided by the timber supply study in concert with other information on competitiveness and land use should contribute to a better understanding of the impact of polices past and prospective. It should be recognized the forest treatments and resulting harvest provide the source data not just for logs to be processed but also for the jobs required and the forest structure produced with their array of ecological functions. In concert with other information on economics, competitiveness and land use change the timber supply projections should provide assessment information of use in teasing out answers to key questions like:

- Harvest levels declined differentially but on all owners and regions. What were the causes and what can be expected in the future? What alternatives might be important in the future?
- Will the projected harvest support existing mills and announced expansions?
- Management practices have changed with lower timber values reducing thinning and with more emphasis on high-density short rotations. This results in different impacts on economics (a different production function) and different ecological impacts. What are the future implications?
- Processing infrastructure changed significantly resulting in fewer but larger mills, and there has been a flight of capital to the South and Overseas. What were the causes and what can be expected in the future and with what impacts?
- Direct employment and income supported has declined. What about indirect employment? Do the above factors explain all of the important impacts or are their other factors affecting employment trends such as ebusiness?
- Value growth through 1990 came from Exports, increased wood utilization and increased Secondary Mfct. Where can it come from in the future?

Backgound:

The last comprehensive timber supply study was completed in 1992 for the westside of Washington (Adams et al. 1992) and in 1995 for the eastside of Washington (Bare et al. 1995). The westside study analyzed timber supply from industrial private, non-industrial private, other private, Department of Natural Resources, national forests, and other public lands by geographic timbersheds. It described the current state of westside timber resources for each of the ownerships, provided an overview of the harvest projection analysis, projected harvests to 2085 by ownerships and timbersheds, analyzed impacts of harvest projections on forest industry employment and wildlife habitat, and explored opportunities to improve management on nonfederal timberlands. The westside report benefited from an enhanced inventory by the

Forest Inventory and Analysis (FIA) unit of the U.S. Forest Service. The eastside report identified the range of potential future timber harvests, examining key questions regarding future timber supply by different ownerships. It also examined opportunities to improve management practices and forest health issues.

A study completed in 1996 provided new perspectives for intentionally managing forest structure to provide desired old forest conditions and habitat, introducing the concept of biodiversity pathway management (Lippke et al. 1996, Carey et al. 1999). The concepts were demonstrated for a single sub-region. A later study extended the analysis on forest structure, sometimes referred to as structure based management, for habitat on the westside of Washington (Lippke/Bare et al. 2002).

The primary data sources used for these studies included FIA data for state and private forest lands, DNR inventories for DNR lands, industry inventories for westside industry, and USFS CVS data for federal lands. All of these data were plot-based and not GIS-based. Proposals were developed in 1999 for a mixed plot/GIS/remotely-sensed database including more custom calibration of growth models. The report of this working group provides a goal for a desirable forest planning projection system, but cost and time will require compromises in the analysis approach taken in this study. The economic impacts of proposed spotted owl rules were examined on non-federal lands (Lippke and Conway 1994) and the efficacy of various protection strategies were evaluated for the DNR HCP (Bare et al 2002).

Many individual-owner case studies have been completed on both the eastside and westside (Zobrist and Lippke 2003, Zobrist et al. 2004 and 2005, Oneil 2003 and 2004) exploring the impacts of current regulations and the opportunities for management plans producing at least as much protection at lower cost. These case studies provide a wealth of data on management alternatives and their impacts. A small business Economic Impact Study was completed evaluating the impact of the Forest and Fish regulations (Perez-Garcia et al. 2001).

Critical Data Sources:
The major facets to timber harvest level projections are the current inventory and projected management strategies, the changing available land base, and the growth and yield response to management intentions. A study on land use changes is currently underway (Rogers et al. 2005) with FIA sponsorship and will be available to support changes to the land use assumptions from prior studies. Studies on management intentions were completed by the American Forest and Paper Association for the Forest Service's Resources Planning Assessment and reported on by Pierson (2003). A survey of management intentions was completed by the Stand Management Cooperative (Briggs 2001) and a new survey is beginning to take form that should be available in time to support the management assumptions used in this study. The Cooperative has completed an updated growth and yield model (Organon8) based on many years of plot measurements which will be available for this study. The data and new model characterize a significantly higher growth rate for intensely managed stands for the first several decades in comparison to earlier studies while more accurately tracking experimental plot data. With the availability of a new growth model that will be more responsive to treatments, we can expect significant change in management intentions over time and hence ultimately in the forest inventory. It will take time for various owners to respond to this new information so it will not be practical to predict accurately their response but rather, in consultation with advisory groups, we expect to demonstrate a possible range of responses.

The Rural Technology Initiative will manage this study with inputs from the economic study and land conversion study while providing timber supply, economic, and ecological outputs for the other studies.

Methodology for Study 1
While it would be desirable to combine GIS-based stand information with FIA and other sources of plot data, such a program would be too ambitious for the budget and time available. Instead, we will update the plot data used in prior studies with the current inventory where available using the growth increments from the prior inventory to the current inventory to calibrate growth projections between surveys. Remote sensing information and reported harvest data will be used to overlay management treatments on the plot data. This will provide a basis for updating the prior enhanced FIA survey as the starting condition for the updated timber supply analysis. In effect we will have the same number of sample plot points as were used in the prior supply study even though only that fraction of them that were recently surveyed will be updated by field measurement. The others will be updated by evidence of treatment from remotely sensed data and by growth simulations that have been calibrated to correspond to that observed across the recently surveyed plots.

Timber growth and yield analysis will be calibrated to Stand Management Cooperative growth and yield models, an update from the prior timber supply studies, and an updated set of management intensity assumptions based on the RPA and Stand Management Cooperative survey information. The growth and yield models can be used with the Landscape Management System (LMS) to provide tree-by-tree stand data that will be linked to a number of habitat and biodiversity measures, carbon, and economic measures for representative sets of stands (if not all plot points) scaled to be representative of the timbershed (McCarter et al. 1998). On the eastside, fire and insect risk will be similarly projected using LMS (Cedar and McCarter 2004, Lippke and Comnick 2005 in press) based upon the region specific variant of the Forest Vegitation Simulator (FVS). LMS provides a comprehensive array of ecological outputs for each treatment profile that are important in evaluating the importance of non-timber objectives. Carbon links and other product environmental values were developed by the Consortium for Research in Renewable Industrial Materials (Bowyer et al. 2004, Lippke et al. 2004). Fire risks

and a method for evaluating treatments were developed in Mason et al. (2003). Habitat measures are characterized in (Ceder 2001 and 2004, Ceder and Marzluff 2002, and Marzluff et al. 2004). The relative value of timber and environmental attributes has been researched and treatment impacts can be illustrated (Xu et al. 2003, Lippke et al. 1999, Lippke and Bishop 1999) for use in Study 4.

Sensitivity analysis will be used to analyze alternative assumptions and their impacts on various output metrics and projected timber harvest levels. Harvest schedules will therefore be based on the most recent inventory and reflect the changing maturity level of that inventory in order to establish the annual harvest rather than defining a theoretical optimal flow strategy that might defer harvest from one decade to another.

Representative Task List for Study 1 (cost estimates provided for each set of tasks)

- Preview technology and methodologies and write proposal *(estimated budget: $18,000)*
- Collect data and develop a database protocol for updating data (west& east) *(estimated budget: $20,000)*
  - Obtain FIA and CVS inventory data and arrange for proprietary location of plot points.
  - Obtain DNR and Tribal inventory data as available.
  - Identify timbersheds and ownership groups, uplands, and riparian zones in the inventory. Landowner class distinctions will be carried to the limits of the inventory data. That will include non-industrial private, industrial private, tribes, state, federal, and other public. Separate estimates for other class distinctions such as TIMOs and REITs will be provided if the quality of the allocations are judged to be adequate however it is unlikely that these owners can be identified with their own forest inventory data limiting such owner specific insights to share allocations of aggregate data. It seems doubtful that the management intentions of TIMOs would be significantly different than other commercial industry although their willingness to sell land may be different.
  - Obtain remote sensing data sources to use for updating older plot data
- Update FIA plot data and scope and group other data identifying representative stands and appropriate scale factors (east & west) *(estimated budget: $28,000)*
  - Identify recent harvest and thinning treatments.
  - Evaluate decadal changes in the inventory and calibrate growth models for updating the initial inventory.
- Based on ongoing land conversion studies, calibrate the changing forestland area over the projection period (mostly an input from (task 4). *(estimated budget: $5000)*
- Update the inventory for an estimated starting inventory and stratify the inventory by upland types and riparian zone identifiers east and west. *(estimated budget: $18,000)*
- Form an advisory group to review the analysis plan, data quality issues, management intention surveys and related treatment plans. *(estimated budget: $10,000)*
- Evaluate management intention surveys and integrate across surveys for a series of management scenarios specific to ownership groups. Consult with advisors on likely changes in owner intentions as a baseline strategy and the identification of important optional alternatives (east & west) that may reflect a range of uncertainty or tease out the cost/benefit of alternative management strategies. *(estimated budget: $30,000)*
- Evaluate any recently developed ecological metrics that can be linked to LMS outputs to make it easier to compare findings to other studies such as the DNR SHC study, stand structure classes, and habitat class definitions in the regulations. *(estimated budget: no cost - provided by other studies). WDFW has requested consideration for reporting baseline habitat and structure class information by regions more useful for ecological assessment although potentially compromising the usefulness of regional economic analysis. We will*

attempt to provide both for the baseline management plans since they will serve different uses.

- Define and test alternative management treatments needed to characterize management intention alternatives on all stand types (hundreds of different treatment pathways that can be used at any starting age. Evaluate both harvest economic and ecological outputs. *(estimated budget: $30,000 west, $20,000 east)*
- Select from these scenarios several alternatives that provide a range of management alternatives for a statewide analysis. Consult with advisors in selection of alternative management strategies. *(estimated budget: $20,000 west, $15,000 east)*
- Develop Economic input data specific to regions. *(estimated budget: $18,000)*
  - Develop log and haul cost assumptions (harvest/treatment costs sensitive to diameter and volume scale) and regeneration costs tied to management treatments and owner groups.
  - Develop a log price series from the historic data and representative prices for any alternatives such as biofuel.
- Develop log flows for pricing out logs and determining processing jobs. *(estimated budget: $10,000*)
  - Develop market value, job and tax assumptions linked to log quality and log allocation. Much of this can be based on a just beginning economic impact study for the OESF and extending this analysis statewide (Study 2) by adding extensions to other regions.
- Develop non-market values for the treatment alternatives where possible, such as the avoided costs of fire impacts (we should not leave out avoided cost analysis when it can be provided directly). *(estimated budget: $10,000 for avoided fire costs – others omitted)*
- Generate harvest schedules based on mature inventory using the pre-tested management alternatives and their harvest, economic, and ecological outputs. (It would cost much more to adopt alternative scheduling models.) *(estimated budget: $10,000)*

Westside

- Develop a stratification of management scenarios across ownerships that characterizes Westside (with input from advisors). *(estimated budget: $20,000)*
  - A baseline scenario meeting FPB regulations for harvest and other metrics, the DNR HCP and recent trend level treatments including minimal thinning by most owners especially within the RMZ.
  - Alternative 1 with more thinning in the RMZ testing ecological changes, economic costs and potential ecological benefits, i.e. thinning will generally enhance ecological outputs at no or low cost.
  - Identify the degree to which this may require adaptive management changes in the regulations vs. a simpler acceptance of alternative plans (this has been omitted).
  - Alternative 2 introducing some longer rotations to examine the cost or incentives required to motivate management treatments to produce more older forest functionality.
  - Alternative 3 assumes a reduction in management intensities that might result from lower prices and more competition.
  - Several other alternatives will be characterized at the stand level but not scaled up across all regions and owner yet still providing a substantially larger array of sensitivity information for consideration in policy analysis.
- Perform simulations and analyze these alternatives and prepare a presentation on results. *(estimated budget: $50,000)*

Eastside

- Develop a stratification of management scenarios across ownerships that characterizes Eastside (with input from advisors). *(estimated budget: $20,000)*
  - A baseline scenario meeting FPB regulations for harvest and other metrics with trend level treatments on all owners which can generally be characterized as selective harvesting on non-federal lands and minimal thinning on federal land.
  - Alternative 1 with more thinning in the RMZ and Upland forests to reduce fire and insect risk limited to sustainable management scenarios for non-federal lands and overstory retention thinning on Federal land.
  - Alternative 2 with some retention management to complement federal retention to see what it would cost to produce some additional restoration of old forest conditions while reducing fire and insect risk.
  - Similarly to the Westside, several other alternatives will be characterized at the stand level but not scaled up across all regions and owners yet still providing a substantially larger array of sensitivity information for consideration in policy analysis.
- Perform simulations and analyze these alternatives and prepare a presentation on results. *(estimated budget: $50,000)*

East and West biofuel overlay:

The impact of additional biofuel processing for the alternatives that have increased thinnings will be analyzed to test the availability of biofuel volumes and market economic impacts. This would be a reallocation of log flows and product economics, not a change in standing timber. *(estimated budget: $20,000)*

- Prepare interim reports for first year review: *(estimated budget: $10,000)*
- Prepare presentations of findings. *(estimated budget: $20,000)*
- Prepare final reports. *(estimated budget: $20,000)*
- Post results on website and prepare streaming video of presentations. *(estimated budget: $25,000*)

Additional Sub-Study Options

1. ***Westside Spatial Analysis Subsample*** (optional if the time, funding, and inventory data are available): For a specific area across all owners requiring proprietary data for a riparian/upland contiguous area (probably southwest Washington region) heavy to private, provide a subsample of a spatial landscape over multiple owners for GIS habitat analysis over time. The same management alternatives would be analyzed to compare the power of a small snapshot of a quality spatial database to the statistical sample (i.e. a sub-sample demonstration for CMER/WDFW to determine if such an analysis can satisfy monitoring and prediction needs). The cost of such a sample analysis was estimated at $30,000 if there are no additional modifications to the metrics available in LMS.

2. ***Eastside Spatial Analysis Subsample*** (optional if the time, funding, and inventory data is available): For a specific area across all owners, demonstrate the level of data quality required for designing fire treatments as a higher standard than needed to develop an awareness of high fire and/or insect risk. Determine if there exists a high density plot point ground-based spatial sample of a small region to compare to a remotely-sensed sample and the low density statistical sample. This should establish the quality of data needed to go beyond an awareness of a forest health problem to a level of detail that can be used to adequately design fuel reduction treatments at the stand level. It is likely

that either remotely-sensed data or the low density statistical sample can identify a forest health problem but neither with the data quality desired to design an effective treatment program or force accountability on owners. LIDAR may produce the quality needed if we can find a suitable sample. Estimated additional cost is $60,000.

3. ***Eastside Dynamic Simulation of Alternatives*** (optional if the time, funding, and inventory data is available): For an eastside subsample using the best treatments to reduce fire, introduce the probability of fire as a function of the treatment alternative, demonstrating to what degree fire risk can be reduced and costs avoided or other benefits gained such as the reduced cost to fight fires and the increase in carbon stored. Estimated additional cost of $30,000 however, an adequate subsample demonstration of this may be provided by the Consortium for Research on Renewable Materials in their Phase 2 research plan which includes an analysis on the Inland West (CORRIM Phase 2, 2004 at http://www.corrim.org).

Anticipated Outputs per decade*:* (upland and riparian for each ownership/region and aggregation to east and west and entire state)

- Harvest by diameter class
- Harvest cost
- Harvest revenue and management cost
- Acres treated over time
- SEV, Total Forest Value and cash flow for owners
- Rural jobs direct and indirect
- Estimated Tax Receipts, state, local and federal
- Stand structure differentiation driving habitat suitability measures, and assessments of the portion of time stands are similar to old forest functions and/or some other desired condition such as amount of LWD potential
- Carbon in the forest, products, biofuel and displaced fossil energy from products and biofuel
- Aesthetic examples of treatments at the landscape and stand level (e.g., stand visualizations)
- Cost to produce the several levels of improved habitat and other ecological functions (from the alternative scenarios)
- Cost and potential benefit of adequate spatial inventory data vs. non-spatial statistical plot data (optional if funds available)
- Maps of health problems and habitat on spatial samples (optional if funds available)

2. Economic Contribution Study

Forest land owners and the forest products industry have always been important contributors to the Washington economy, particularly in rural, timber-dependent areas. The role of the forest sector on the state economy can be captured in several ways, such as analyzing changing business level measures collected in state statistics and by understanding the linkages between the forest sector and the state's economy as best characterized by input/output and econometric models. Conway and Associates have analyzed the economic role of the forest sector on the state several times over the last two decades (Conway 1994, Lippke and Conway 1994). The Conway model, developed as a multi-sector state model linked to the forest sector, has not been updated in over a decade as a consequence of definitional changes in data collection procedures that have not allowed a historical bridging of sector level data over time. The Conway model has characterized regional share shifts such as regional direct and indirect jobs related to the forest sector activity, an important aspect of this study. Our analysis of the forest products industry will assess the current role of the primary and value-added wood industries in the Washington economy, the relative contribution of each over time based on the state's sector level data, and project their likely contribution in the near future using input from the Timber Supply and Forest Structure Study. Recent research completed by CINTRAFOR has projected an expansion of primary industry investments (Perez-Garcia 2003, 2004). We will link the investment potential to future economic contribution and their impact on value-added wood industries and forest land owners. Ongoing research by CINTRAFOR (Perez-Garcia 2005, Perez-Garcia et al. 2005) and a Ph.D. dissertation on Washington's sawmilling sector will contribute to the study's findings.

It should be noted that economic modeling limitations are endemic. State-collected data undercounts the many sole proprietors that make up a large part of the forest sector such as contract loggers. Haulers are largely included in the general transportation sector and thus not allocated as a forest sector job. Administrative personnel are now considered part of a separate sector and considered outsourcing rather than a part of a specific sector. Secondary manufacturing such as trusses and engineered wood products continue to expand within the primary processing sector complicating the analysis of secondary manufacturing contributions and productivity. The economic impact of managing forests under different treatment paths cannot be modeled by an average impact across the sector, as it leaves out the impact of the technology changes associated with different treatment paths. Engineering estimates of the jobs required for different treatments will be used in the timber supply analysis to generate the estimate of direct jobs. Indirect impacts will be developed using models of the state economy. Changes in definitions have compounded the problem of developing statewide economic models however each available data set provides some insights on the changing structure of the forest sector and economy and will be evaluated.

CINTRAFOR will manage the Economic Contribution Study and will work closely with RTI to link the study with the Timber Supply and Forest Structure Study. CINTRAFOR will also work conjointly on the Competitive Position Study.

Methodology for Study 2

We will analyze the latest state economic data and develop the best possible links with existing state economic models in consultation with state modelers. We will utilize the results from the Timber Supply and Forest Structure Study to project future contributions utilizing the links established earlier.

Representative Task List

- Analyze Gross Business Revenue (GBR), value-added and employment data from Department of Revenue from 1980-2004, by industry sector (estimated budget: $40,000)
  - Show trend of forestry and wood products sector relative to other major sectors within Washington economy
  - Analyze the changing trends conjointly with the Competitive Position Study and Timber Supply Study to identify the key factors driving change within specific industry sectors
- Analyze the economic impact of forest activity across regions, both rural and urban (estimated budget: $25,000)
  - Comparative assessment of income disparity between timber dependent communities and urban communities
- Create a business as usual projection for Washington forest products sector (estimated budget: $13,138)

The following tasks cannot be performed as a result of the budget reduction

- Collect primary data from forest products manufacturers in Washington to supplement secondary data
- Analyze GBR and employment data statewide and by county using a trend analysis to observe changes over time at the country level
- Update economic model databases and establish links between current data sources and existing models that link the forest sector to state and regional economic impacts

Additional Sub-Study Options

1. Database of the Washington Forestry and Forest Products Industry (optional if the time and funding are made available): Update of an earlier industry database project completed in 1995 designed to provide information on raw material use, sources of raw materials, wood waste use and disposal, species mix, type of equipment used, product mix, domestic markets served, export markets served, distribution channels used, number of employees, annual sales. This database would be updated and expanded to include all primary and secondary wood products manufacturers in Washington State. Estimated cost of updating and expanding the database would be $40,000.

2. Economic Contribution of Forest Ecosystem Services: Ecosystem services are the benefits provided by forests that positively impact and enhance human well being and that are directly used by people. Forest ecosystem services, composed of both environmental services and economic services, are "products" that are typically not bought and sold in the marketplace. As a result, their economic contribution is grossly undervalued and rarely considered in decisions regarding forest use, valuation and conversion. This optional sub-study, which would develop a methodology for estimating the environmental and economic services provided by forests in Washington, would provide a much more accurate estimate of the economic contribution of forests and help forest managers make more informed land-use decisions. The estimated cost of this sub-study would be $82,000.

Anticipated Outputs:

- A description of the role of the forestry and the forest products industries in the economy of Washington state
- The economic contribution of the forest products industry on a regional basis (including timber dependent regions and communities relative to urban areas).
- Changes over time at both the state level and at the county level of key drivers using urban and rural distinctions.

- A projection of the contribution of the forestry and logging, primary manufacturing, and secondary manufacturing into the near future.
- Regional economic and productivity trends such as wage costs, productivity across stages of processing.
- An economic impact analysis table (gross product, income, direct and indirect jobs, and taxes) related to forest sector activity levels.

3. Competitive Position Study

The demand for commercial forest lands is a derived demand. Demand drivers such as housing determine the profitability of commercial forest lands in the short term. Other important profitability factors include the cost of growing and harvesting timber with the growing costs very important to investment and long term supply availability. Harvesting costs are important in the short term and harvest restrictions can have important consequences in both the short term and long term.

Strong growth in the housing sector in the U.S. has provided consistent demand for forest products manufactured in Washington State over the past 15 years. However, over the same period, weak export markets and a changing competitive environment have moderated international demand for forest products from Washington State. A strong U.S. dollar, changing preferences, and increased competition have all had an adverse impact on the international competitiveness of the Washington forest products industry. This trend was exacerbated by the 1997 Asian financial crisis. Domestic markets are more important to Washington producers than ever before.

Timber harvest restrictions and regulatory constraints over the past 15 years caused costs of producing timber to increase and the closure of many production facilities in Washington State. High valued log exports and plywood production were most affected. A greater number of value-added manufacturers appeared and their value of production has increased. The demand for commercial timber has shifted to one that is primarily lumber oriented. Commercial forest land profitability has changed as restrictions and the composition of the forest sector have shifted.

This study will determine the competitive position of Washington's commercial forest lands. We will examine economic and other factors that determine the likely present and future profitability of the various classes of Washington's commercial forestlands. We will look at regulatory constraints and tax burdens (harvest and ad valorem taxes) on the competitiveness of the forestry sector in Washington based on recently analyzed case studies. We will illustrate the linkage the wood products manufacturing sectors have with commercial forest lands. The competitiveness of the commercial forest lands is dependent on the competitiveness of the forest products industry and its contribution to Washington State's economy. A component of this analysis will be identifying those industry sectors where Washington has (or is expected to have) a competitive advantage and determining how to best support investment and development of those sectors. CINTRAFOR has completed a number of competitiveness studies including a broadly based study of changing export trends (Lippke et al. 2000, Lippke 1999), analysis of the changing Japanese market (Eastin et al. 2002, Eastin 2001), and several competitiveness issues have been identified in county level impacts (Perez-Garcia 2005; Lippke et al. 2000) and regional level impacts (Perez-Garcia and Marshall 2002).

Methodology for Study 3

This study will update and expand on past research by CINTRAFOR that looked at the international competitiveness of the forest products sector in the Pacific Northwest (Eastin et al. 2003, Lippke et al. 2000, Eastin et al. 2000, Boardman et al. 2004, Cunningham and Eastin 2001, Eastin 2002, Eastin and Braden 2001, Eastin et al. 2002). A recent analysis by CINTRAFOR for Oregon that used the CINTRAFOR Global Trade Model (CGTM) to study the economic, social, environmental, and other factors that affect the competitiveness of Oregon's

forest sector (Perez-Garcia 2003) will be extended to include the impacts of Washington's forest sector.

With these data sources and prior studies updated we will:

- Describe the linkage between forest land owner profitability through valued-added manufacturing competitiveness.
- Assess the domestic competitiveness of the forestry and forest products industries.
- Assess the international competitiveness of the forestry and forest products industries.
- Relate the competitiveness of manufacturing and value-added production to commercial forest lands.
- Project the impact of future macroeconomic trends on the future competitiveness of the forestry and forest products industries using input from Study 2.
- Estimate the impact of taxation and regulatory constraints on the competitiveness of the forestry and forest products industries.
- Identify a number of alternatives that could increase the competitiveness of the state's forestry and forest products sector.

Major Tasks

- Evaluate macroeconomics and other factors affecting competitiveness. *(estimated budget: $37,235)*
- Evaluate taxes. *(estimated budget: $18,617)*
- Evaluate regulations. *(estimated budget: $18,617)*

The following task cannot be performed as a result of the budget reduction

- Evaluate emerging non-market services

Representative Task List

- Describe the linkage between forestry through value-added manufacturing
  - Analyze log consumption patterns by sector
- Assess the domestic competitiveness
  - Utilize CINTRAFOR data on production cost (including raw material costs) for major industry segments at the regional and national and levels.
  - Use the CINTRAFOR Global Trade Model to evaluate the competitiveness of the major sectors of the forest sector, including logs, softwood lumber, hardwood lumber and plywood with respect to domestic competing regions.
- Assess the international competitiveness
  - Utilize CINTRAFOR data on production cost (including raw material costs) for major industry segments at the international levels.
  - Discuss trends in forest products exports from Washington State.
  - Analyze import data for wood products for Washington's major trade partners.
  - Identify and discuss implications of trade distorting regulations that influence competitiveness at the national and international levels.
  - Identify and discuss implications of trade flows that influence competitiveness at the national and international levels.
  - Use the CINTRAFOR Global Trade Model to evaluate the competitiveness of the major sectors of the forest sector, including logs, softwood lumber, hardwood lumber and plywood with respect to international competing regions.
- Relate the competitiveness of manufacturing and value-added to commercial forest lands
  - Determine the breakout of log use by sector from the trade model simulations
  - Estimate stumpage value and returns to forest land owners

- Project the impact of future macroeconomic trends on future competitiveness
- Collect and analyze information on the following:
  - GDP projections
  - Interest rates
  - Exchange rates
  - Housing starts
  - Repair and remodel expenditures
- Conduct interviews with industry managers and experts to identify future macroeconomic trends and their impacts on the forestry and forest products industries.
- Evaluate the impact of future macroeconomic trends on the forestry and forest products industries. Macroeconomic trends of interest include housing starts, repair and remodel expenditures, changes in GDP and interest rates, changes in exchange rates, carbon tax schemes, biofuel subsidies, changing manufacturing technology and product mix (engineered wood products), environmental purchasing standards.
- Collect and analyze changing regional comparative advantages in terms of relative:
  - Regional productivity
  - Wages
  - Wood costs
  - Other costs
  - Transportation
- Evaluate the impact of the trend changes in comparative advantages on sectors in the forest industry
- Utilize the data collected to model the demand and supply factors and their influence on Washington's forest sector using the economic trade model.
- Estimate the impact of taxation and regulatory constraints on the competitiveness of the forestry and forest products industries
- Conduct interviews with forest products division within Washington CTED to identify current taxes and regulations on the forestry and forest products industries.
- Conduct interviews with forest products division within Washington DNR to identify current taxes and regulations on the forestry and forest products industries.
- Conduct interviews with industry managers to identify (and where possible quantify) the impacts of current taxes and regulations on competitiveness.
- Identify taxes and regulatory constraints that impose substantial burdens on forest owners (both small private forest owners as well as larger industrial forest owners) and provide disincentives to new investments and the adoption of improved forest management technologies.
- Identify taxes and regulatory constraints that impose substantial burdens on forest products manufacturers and provide disincentives to new investments and upgrading manufacturing technologies.
- Identify alternatives for enhancing the competitiveness of the forestry and forest products sector
- Identify the key drivers affecting competitiveness and any opportunities for changes
- Conduct interviews with industry managers and industry experts to identify policy alternatives that would promote the competitiveness of the forestry and forest products industries.
- Conduct interviews with state policy makers to identify policy alternatives that would promote the competitiveness of the forestry and forest products industries.

Additional Sub-Study Options

1. Comparative Study of the Forest Products Industry in Washington State and British Columbia (optional if the time and funding are made available): The University of British Columbia has just completed a comprehensive competitive assessment of the forest products industry in British Columbia. The combination of geographic proximity and the similarity of the timber resource between British Columbia to Washington State leads to competition in both the domestic US and Asian markets. The researchers at UBC have agreed to participate in a collaborative project that would provide a baseline competitive assessment of the forest products industries in British Columbia and Washington State. With the data already having been collected in BC, we would need to acquire similar data for Washington in order to perform the competitive assessment. The results of this sub-study would help to provide industry managers and government policy makers with a clear understanding of the competitive position of the forest products industry in Washington. The estimated cost of this sub-study would be $58,000.

Anticipated Outputs

- Comparative cost structures at regional, national and international levels.
- A ranking of the competitive position of forest products industry, nationally and internationally.
- A table of the competitive advantages and disadvantages within specific industry sectors.
- A listing of alternative scenarios to measure competitiveness of timber and primary producers.
- A listing of factors that have the greatest impact on the competitiveness of the forestry and forest products industries.
- Projections of the competitiveness of the timber and primary producers over the next several decades.
- Discussion of the likely impacts of future macroeconomic trends on the competitiveness of the forestry and forest products industries.
- Identification of those macroeconomic trends likely to have the greatest potential impact on the competitiveness of the forestry and forest products industries.
- Demand projections for forest products into the near future.
- Impact of existing taxes, policies and regulations on the competitiveness of the forestry and forest products industries.
- The effects of taxes on cost of producing timber relative to other regions.

4. Land Conversion Study and Cascade Foothills Forestry Viability

Washington's forested landscapes are changing at a rapid pace. As privately-owned forests are converted into residential and commercial development, owners of Washington's working forests are finding it increasingly difficult to maintain their lands in productive forestry uses. The conversion of these forested areas also constrains the social, biological, and ecological functions of remaining forested areas. As an expanding exurban population places increased development pressures on Washington's forests, it is becoming more important to fully understand where conversion is occurring, what factors are associated with the conversion, and how the rate of conversion might be slowed through innovative land owner and institutional programs.

While there are many groups in Washington working on these important issues, there is no single data source or analysis that cohesively describes the status of the forest land base across the entire state. This study provides a rare opportunity for some of these groups to work collaboratively to build a conceptual model for analyzing and displaying both the current status of forest land area statewide, along with factors that may be associated with the potential conversion or non-conversion of working forests.

While most agree that forest land in the Cascade Foothills is currently at high risk for conversion to low density residential development and other incompatible land uses, there is widespread uncertainty about how to alleviate conversion pressures on forest land owners, while at the same time maintaining or enhancing a high standard for stewardship of ecological and public values provided by working forest lands. The Cascade Agenda Forestry Work Group activities, led by Cascade Land Conservancy, will provide major support in preparing recommendations for item (g). This analysis is expected to provide decision makers, forest landowners, and planning officials with an overview of where forest land is being converted to non-forest uses and, in specific regional examples, factors associated with conversion.

One key objective of the Cascade Agenda is conservation of working forest lands in the Cascade Foothills. Outright purchase of these lands for preservation (without timber production) is cost prohibitive and would have significant negative impacts on the state's economy and quality of life for local communities. Therefore, the Cascade Agenda recommends that the most appropriate and most feasible way to conserve the foothills land base is through maintaining working forests and the viability of the forestry industry in the region. This activity will convene a working group of stakeholders and experts to develop a consensus on how to aid forest land owners and ameliorate conversion pressures, while also encouraging and supporting management of these lands for the multiple public benefits they can provide. These stakeholders will include large and small forest land owners, community representatives, agency staff, tribes, and environmental advocates.

For the purposes of this project, the Forestry Working Group will be supported by CFR analyses, and will focus its initial discussions (to be concluded in the autumn of 2006) on the Cascade Foothills region in King, Pierce, and Snohomish counties, with recommendations for next steps or identification of differences that would require alternative approaches in Whatcom, Skagit, Thurston, and Lewis counties. The objective of the Cascade Agenda Forestry Working Group is to develop consensus and recommendations on policies and programs to assist landowners and communities in developing and implementing innovative approaches to retaining traditional forestry and accommodating new uses that strengthen both economic and natural benefits of forest lands.

Methodology for Study 4

This study will gather existing and new data to identify land use classes across the state and analyze where areas of potential forest land use (both working and non-working) have changed to other non-forest land uses, as well as identify those factors that appear to influence forest land conversion. Additionally, the study will identify the range of policy and market incentive options and potential programs that may assist forest landowners in keeping their forested landscapes intact.

This study will be a collaborative effort in both the technical and review stages among the College of Forest Resources, land use planning experts, and land conservation groups. Partnerships with land conservation groups (The Trust for Public Land, The Cascade Land Conservancy, and The Nature Conservancy) and a local GIS consulting group (CommEn Space), which is contracted by all of the above groups, will allow use of their data sources and technical expertise to analyze ownership patterns and other conversion influences in areas where potential forest land use has changed to other non-forest uses. CFR will provide early results to the Cascade Agenda Forestry Work Group and will utilize Work Group members as an advisory and technical resource to CFR in completing this study.

The study will be organized around six components

1) Identify possible factors associated with conversion
2) Review owner incentives and disincentives to minimize conversion
3) Identify the amount and location of potential forest land use conversion in Washington
4) Analyze conversion patterns in relation to different ownership types and other associated factors (determined from previous steps)
5) Developing innovative ideas to retain working forests in the Cascade Foothills
6) Display and organize the data and analysis for reaching a broad audience and make it available for future decision making, monitoring, and research projects

Representative Task List for Study 4

1) Identify possible factors associated with conversion *(estimated budget: $5,108)*

- Review existing literature and case studies and consult with experts on land conversion issues to identify potential factors associated with the likelihood of areas to convert from forest to non-forest uses. Examples include, but are not limited to:
  - Wear and Bolstad's analysis of land use changes in southern Appalachia (Wear and Bolstad 1988)
  - Turner et al.'s (1996) analysis of land ownership and land cover change on the Olympic Peninsula
  - Kline and Alig's research on land use change in Oregon and across the nation (Kline and Alig 1999 and 2001, Kline et al. 2001)
- Consolidate existing data associated with possible land conversion, such as parcel-level forest industry ownership, urban growth boundaries, transportation corridors, protected lands, and historical land use zoning patterns (most already acquired by either CommEn Space or the College of Forest Resources), to use in following analyses.

2) Review policies and programs (both in Washington and elsewhere) that can be used to reduce pressure to convert to non-forest land uses *(estimated budget: $15,217)*

- Review and analyze existing literature on innovative approaches to economic valuation and market incentives for non-market services produced by forest land owners. This will include a review of the broader literature on non-market values, with the objective of determining the degree to which the non-market values derived in other studies, or the procedures they used, can be applied in Washington. Examples of the literature in this

field include but are not limited to: Landell-Mills and Porras 2002, Lippke 1997, Lippke et al. 1999 and 2002, Lippke and Fretwell 1997, National Research Council 2005, and Xu et al. 2003.

- Review and analyze the history and current status of policies and programs impacting forest conservation. Evaluate current policies for incentives and disincentives to maintaining working forests in areas susceptible to conversion. This analysis will include a review of county and statewide economic and growth policies and interviews or surveys of officials, landowners and professionals familiar with land conversion issues aimed at identifying effective programs and evaluating the likelihood of success in Washington State.
- Provide background research to explore concepts for new incentives and land owner assistance programs derived from discussions in the Northwest Environmental Forum and the Cascade Agenda Forestry working group.
- Use Cascade Agenda Forestry Work Group and Cascade Agenda's Rural Growth, Innovative Financing and other work groups' expertise relevant to forest land issues, such as Community Forest Bonds, Public Development Authorities, Transfer of Development Rights, and incentives for landowner stewardship, and programs of other transaction-based conservation groups such as The Nature Conservancy and The Trust for Public Land.
- Advise the Cascade Agenda Forestry Work Group regarding the efficacy/applicability of innovative tools, such as:
    - Compensating landowners for ecosystem services, such as carbon sequestration or water storage/recharge.
    - Identifying low-cost sources of financing for small forest landowners.
    - Examining ways to support small forest landowners, by way of example:
        - Technical support for permits, management plans, and stewardship
        - Scholarship programs at Washington Universities
        - Group health care plan
        - Other concepts
    - Creating forest management co-op for rural landowners and small forest landowners who want to maintain forest health and reduce fire hazard, and (where acreage and forest age allows) receive modest revenue.
    - Riparian corridor stewardship
- Relate the above to forest land conversion patterns and associated factors in following steps.

3) Identify the amount and location of potential forest land use conversion in Washington *(estimated budget: $15,325)*

- Conduct satellite image and GIS analysis to determine the distribution of potential forest land use (both working and non-working) in 1988, 1996, and 2004 for all of Washington. Analysis for western Washington will be completed under contract with the U.S. Forest Service's FIA Program for private, tribal, military, and municipal lands (Rogers et. al in Prep); federal lands are not included since methods were developed to match a similar study done in Oregon (Azuma et. al 1999 and 2004). Land use definitions are derived from five commonly-used classifications: forest, agriculture, grassland/rangeland, urban/commercial, and low-density residential (Homer et. al 2004, Lindgren 1985, Andersen et. al 1976).
- Use methods developed in previous work to replicate data process for eastern Washington.

- Calculate and display the amount of potential forest land use area that was converted to non-forest uses, such as urban, commercial, or low-density residential, from 1988 to 2004 for the entire state.

4) Analyze conversion patterns in relation to different ownership types and other associated factors *(estimated budget: $51,083)*

- Identify different ownership types in areas of forest land use using existing data from land conservation groups, the Rural Technology Initiative (Rogers 2003a, 2003b), and Washington Department of Natural Resources' Small Forest Landowner Office, to determine how ownership type may be associated with land conversion at a broad scale.
- In representative, yet diverse, areas throughout the state, conduct detailed analysis of both spatial and non-spatial associations with the likelihood of areas converting from forest use to non-forest use (these areas will be limited to where existing data are available for analysis).
- Build a conceptual model that will allow decision makers and researchers to further investigate the factors associated with forest land conversion on a local scale.

5) Develop Policy Recommendations for the Cascade Foothills *(estimated budget: $64,000)*

- Establish the Cascade Agenda Forestry Work Group composed of appropriate stakeholders and experts drawn primarily from participants in the Forest Forum. The work group and/or subcommittees will meet on at least a monthly basis.
    - Identify and recruit work group members
    - Coordinate meetings
- Build consensus among stakeholders and experts
    - Brief the Work Group on the findings of the Land Conversion Study and other CFR research, as well as the findings of other Cascade Agenda work groups.
    - Coordinate interaction between the Forestry Working Group and other Cascade Agenda work groups so as to establish integrated strategy recommendations among work groups.
    - Identify potential opportunities for immediate improvement.
    - Build consensus among stakeholders on what is needed to retain an active forestry industry and improve ecosystem function.
    - Identify next steps for implementation of the consensus recommendations.
    - Work Group to report its findings and recommendations to either a full Northwest Environmental Forum or a segment of the Forum (to be determined after consultation with DNR), for review and input.
    - Provide final recommendations to the DNR, incorporating Northwest Environmental Forum input, and collaborate with the DNR in its reporting to the State legislature.
    - Advise the Cascade Agenda Coalition and Leadership Team of community consensus on forest conservation measures, and seek active support in implementing next steps.

6) Display and organize data and analysis for a broad audience and support future decision making, monitoring, and research *(estimated budget: $25,433)*

- Collaboratively design and test different methods for displaying and organizing complex spatial and non-spatial relationships in forest land use conversion at different scales so that this information can inform the discussions of the Cascade Agenda Forestry Work

Group, the Northwest Environmental Forum, the DNR, the Washington State Legislature, and other interested parties.
- Create a document summarizing the findings of the land conversion study and the recommendations of the Cascade Agenda Work Group. Present this information to the DNR and legislature in advance of the 2007 session.

Anticipated Outputs:
- Identification of areas of high, medium, and low levels of forest land use change in both spatial and tabular form at a statewide level.
- Description of forest land use conversion patterns by ownership types at a statewide level and detailed parcel-level information for specific areas in the state.
- Identification of factors which are associated with forest land use conversion and how to assess those factors at regional or local levels.
- Assessment of the effectiveness of innovative approaches for valuing non-market services provided by Washington's forests.
- Identification of incentives and disincentives that either facilitate or impede maintaining working forests in areas susceptible to land conversion and programs that may minimize the conversion of forest lands to other non-forest uses.
- Visual display of forest land conversion data in easy-to-read and interpret maps and images.
- Recommendations for DNR support and Legislative Action for 2007 session.
- Consensus and mobilized diversity of stakeholders to support recommendations.
- Recommendations for non-legislative actions and identification of next steps.

Additional Sub-Study Option

1. Impact of Timber Harvesting on Forest Conversion (optional if the time and funding are made available): Using completed Forest Practices Applications (available from Washington DNR) and correlated forest excise tax (available from Washington Department of Revenue) data, it would be possible to more accurately determine rates of conversion (or potential conversion) and the intensity and magnitude of classified forest land actually being used as a working forest. Since this data compilation would be monumental, this scale of data could only be made available and added to the analysis for the land conversion study with additional funds. It is estimated that the cost of this additional analysis would be $35,000.

Estimated Timeline

Considering the substantial collaboration between CFR and CLC, a separate timeline is provided for this activity (the major milestones match the other four studies).

Land Conversion Study and Policy Recommendations

Month, Year	**Land Conversion Study**	**Policy Recommendations**
January, 2006	Identification of factors contributing to forest land conversion completed	Recruit work group members and begin regular meetings
February, 2006	Submit 1st progress report	
March, 2006	Research and analysis on policies and programs affecting forest land conversion complete Land use change analysis complete	Brief work group on factors contributing to forest land conversion and land use change analysis. Interact with other Cascade

		Agenda work groups to create integrated conservation strategy.
April, 2006		Discuss applicability of various conservation tools to Cascade Foothills landscape.
May, 2006		Identify opportunities for immediate action.
June, 2006	Submit 2nd progress report	Seek consensus on appropriate policy recommendations, advanced through DNR, Work Group and Northwest Environmental Forum members, and other stakeholders for input and alternative recommendations.
July, 2006	Significant findings complete for conversion analysis	Finalize consensus recommendations of Work Group.
September, 2006		CFR and CLC staff to complete draft report on findings of land conversion study and consensus recommendations. Work Group review and approval of final report recommendations.
October, 2006	Additional analysis complete for conversion analysis	Convene Northwest Environmental Forum with DNR and brief on final draft of report recommendations. Revise, produce final report for DNR review and approval.
November, 2006		Working with DNR and Forest Forum, CFR and CLC staff, provide legislative briefing on final report on findings of land conversion study and consensus recommendations.
December, 2006	Present preliminary findings, all studies	Work Group component of Study completed. If additional funding secured Work Group may be available as a supporting resource to ongoing CFR and Forest Forum efforts.
February, 2007	3rd progress report	
April, 2007	Submit draft report	
June, 2007	Submit final report	

5. State Granted Lands Return on Investment Study

Return on investment (ROI) measures the periodic income that granted lands produce. Granted lands are an investment asset with income-producing potential. If appreciation takes place, and income is not generated, then ROI measures the change in value of the land holding. When periodic income occurs and appreciation changes the value of trust lands, ROI measures the ratio of land value appreciate plus income generated over the asset value.

Alternative approaches exist that can measure an asset's income producing capability, and there are various approaches and assumptions one may adopt when calculating ROI. There are as well multiple methods one can use to determine asset value. Establishing the asset value of DNR land is unique and requires special attention. There are also alternate measures of income streams and their relationship with the present value of the asset. The Internal Rate of Return (IRR) can be used to relate a stream of periodic payments or revenues to the initial investment. ROI and IRR are but two financial measures that decision maker consider when evaluating investment options.

As requested by the state legislature and DNR, the study will involve DNR personnel. The study will also consult with experts most likely to be knowledgeable about investment criteria for state trust lands, including as needed the University of Washington's Economics Department.

Methodology

We will collect previous reports such as those prepared by Deloitte & Touche, LLP (1996) that deal with the economic analyses of granted lands assets, and review these reports for their study methodology and findings. We will work cooperatively with DNR to organize the data required to complete the valuation of the trust asset. We expect this can be obtained from the SHC plans without collecting additional data except perhaps for the eastside.

Data Components of Trust Value Analysis and Economic Impact Analysis

- Revenue Stream
  - Timber prices (need data to determine this)
    - Volumes of timber harvests
    - Other revenue streams
      - recreational
      - non-timber
- Factors affecting Revenues
  - Export Restrictions
  - Environmental & regulatory constraints
- Cost Stream
  - Management costs
  - Administrative Costs
  - Regulatory Costs (may be tied in with the impact on revenue: 2b)
- Market Value Assessment Data.

Representative Task List

- Produce a technical assessment of ROI for State Granted Lands. *(estimated budget: $22,236)*
  - A review of reports prepared by the Department over the past 10 years that describe the investment returns from granted lands.
  - A review of the methodologies pursued by previous analyses and the assumptions regarding land trust investments and return on investments.

- Estimate and discuss the appropriate measures of investment returns from granted lands.

Anticipated Outputs

- We will provide a summary and evaluation of the previous work completed on DNR trust land valuation. The summary will include a discussion of the legal requirements for trust land investment and the relationship between state general capital funds and capital funds available for acquisition of trust lands.
- We will produce an assessment of the expected rate of return from state-granted lands. It will describe the methodologies and indicators used to report investment returns, and recommend appropriate measures of investment returns from granted lands.

Estimated Timeline

The estimated timeline for the project is summarized below. This timeline is based on a project start date of September 1, 2005.

Major Milestones	Time Period
Timber supply and Forest Structure Study - Study 1	9/1/2005 – 3/31/2007
Economic Contribution Study – Study 2	9/1/2005 – 6/30/2006
Competitive Position Study - Study 3	9/1/2005 – 3/31/2007
Land Conversion Study - Study 4	1/1/2006 – 3/31/2007
State Granted Lands Return on Investment Study – Study 5	7/1/2006 – 3/31/2007
Submit first progress report – progress report and data issues	2/20/2006
Submit second progress report – preliminary findings	6/30/2006
Presentation of preliminary results – integrated yet preliminary findings all studies	12/01/2006
Submit third progress report – summary of activities and major issues	2/20/2007
Submit draft report - Integrated draft report available for review	4/30/2007
Submit final report	6/30/2007

Names and Qualifications of Research Personnel

The Center for International Trade in Forest Products (CINTRAFOR) has the background, experience, and qualified researchers to manage and successfully complete the competitiveness and economic impact studies. A brief description of CINTRAFOR is provided as well as short summaries of the background and qualifications of the members of the project team.

Established in 1984, CINTRAFOR addresses opportunities and problems related to the international trade of wood and wood fiber products and the impact of changing regulations on the forest resource in the US and around the world. Emphasizing forest economics and public policy impacts, international marketing, technology developments, and value-added forest products, CINTRAFOR's research results in a variety of publications, professional gatherings, and consultations with public policymakers, industry representatives, and community members.

Over the past fifteen years, CINTRAFOR has worked with a wide variety of researchers, trade associations, government agencies, and industry organizations around the world to develop a better understanding of the relationships between the forest resource, the wood processing industry, international trade, and the international competitiveness of the global forest products industry. This broad range of experience has helped CINTRAFOR develop an extensive network of professional contacts with public and private forestry-related organizations within the US and around the world.

The Rural Technology Institute (RTI) was created in 2000 as a University of Washington and Washington State University cooperative center as a response to rural timber community needs for better technology to respond to the increasing complexity of managing forest land to satisfy changing environmental pressures while remaining economically viable. RTI has developed many networking links with rural communities and has completed numerous case studies to evaluate what factors contribute most to environmental protection and economic sustainability. RTI has conducted multiple training sessions across the state, given hundreds of presentations, and provides a comprehensive website that attracted 30 thousand non-UW users and 1.5 million page visitations in the first 5 months of this year. RTI faculty and staff contain expertise in growth and yield modeling, landscape simulation analysis, GIS and database analysis, habitat and stand structure analysis, fire risk and insect risk analysis, economic analysis, forest engineering, and programming. RTI technology has contributed to the development of a Habitat Conservation Plan for small owner groups. The GIS group within RTI has been a pioneer in developing GIS databases to characterize ownership patterns and management issues across the landscape. The faculty and staff are in constant contact with science and technology experts in all disciplines and concentrate on using science to solve practical forestry problems. RTI features the latest technology for solving complex forestry related problems and provides over one hundred streaming videos on technology applications, available for web access and distant learning.

Study Personnel

Brian Boyle, Program Administrator

Brian Boyle is currently leading efforts at the University of Washington to create a cross-disciplinary Environmental Forum to help decision makers confront complex natural resources problems. He also chairs the Visiting Committee at the UW's College of Forest Resources, serves on non-profit and corporate boards, and works as a leadership consultant. From 1997 until May 2002, Mr. Boyle led the Natural Resources Initiative of Battelle Memorial Institute's Pacific Northwest National Laboratory. From 1981 until 1993, Mr. Boyle was Commissioner of

Public Lands of Washington State. He was elected three times to this constitutional position. Under his direction, the Washington State Department of Natural Resources produced record income for schools and universities and became a national model for environmental conservation. Declining to run again for office in 1992, he became a Visiting Professor at the University of Washington in 1993-94. Mr. Boyle has served as chief executive of two non-profit corporations, worked in the metals industry as a metallurgist and production manager, and in his earlier youth in Butte Montana, was an underground miner. In mid-career (1975-79) he was a county commissioner in Cowlitz County, Washington.

***Bruce Lippke, Professor and Director, RTI (Research Leader for Study 1*)**
Bruce Lippke is also President of a 15-institution research consortium (CORRIM) developing life cycle environmental analysis for renewable building materials. For ten years, he was the Director of CINTRAFOR and was involved in many timber and economic studies. He will be responsible for the overall project management of the timber supply and forest structure analysis and will provide co-leadership on the economic impact study where it is directly related to the timber supply analysis. He was co-author of the Washington State Eastside Timber Supply study in 1995, the analysis of the economic impact of spotted owl rules first in 1990 for the northern spotted owl range (California to Washington) followed up by an analysis of proposed alternative policy rules for the Washington Forest Practices Board. He was a principal investigator of a Washington Forest Landscape Management study to develop management pathways, sometimes referred to as biodiversity pathways, as a means to intentionally create old forest functions for habitat in order to avoid future listings of endangered species. He led the analysis of the costs and incentive needs for such treatments. He was also co-author on an evaluation of alternatives to the proposed DNR HCP demonstrating the use of these biodiversity pathways to increase habitat protection at lower cost. Under his direction, the Rural Technology Initiative has developed assessment procedures to evaluate the degree to which treatment alternatives improve ecological function while at the same time motivating sustainable forest economics providing an in depth characterization of regulatory impacts. The assessment procedure is in turn used to develop simple to use management templates demonstrating how to integrate the use of the best science, technology, and economics, and support easy field implementation.

Dr. Ivan Eastin, Professor and Director, CINTRAFOR, (Research Leader for Study 2)
Dr. Eastin will be responsible for the overall project management of the Economic Contribution Study and will be a member of the research team working on the Competitive Position Study. He has extensive experience managing multi-disciplinary projects in the areas of forestry, international trade, and the forest products industry in the U.S. and around the world. He has experience managing projects funded by public agencies, international development organizations, private companies, and industry associations. Dr. Eastin has managed a wide range of projects related to the forest products industry covering a variety of topics, including the illegal trade of wood products, marketing and utilization of lesser-used timber species, marketing and utilization of non-timber species, sustainable forest management, new product introduction, forest products marketing, competitive assessments of the U.S. and Canadian forest sectors and forest products industries, analysis of the Canada-US Softwood Lumber Agreement and its impact on lumber exports from Canada into the U.S., raw material use in the primary and secondary wood processing industries, and the impacts of tariff and non-tariff barriers on international competitiveness. He has conducted extensive research in Japan as well as in Ghana, Liberia, the Philippines, Singapore, Malaysia, Korea, the United Kingdom, the U.S., and Ireland.

Dr. John Perez-Garcia, Associate Professor, CINTRAFOR (Research Leader for Studies 3 and 5)
Dr. John Perez-Garcia will be a co-PI on the Competitive Position Study (Study 3) and will be responsible for the economic and trade modeling for this study as well as the Economic Contribution Study. Dr. Perez-Garcia will also be a member of the research teams working on the Timber Supply Study and the State Granted Lands Return on Investment Study. He has over a decade of experience with the CINTRAFOR Global Trade Model that is used in a variety of trade policy and economic assessment studies. His recent research includes economic assessments of resource availability and sawmills analyses in Washington and Oregon.

Dr. Gordon Bradley, Professor (Co-Research Leader for Study 4)
Gordon Bradley's teaching and research interests include environmental policy, planning, urban ecology and urban forest landscapes. His research and consulting clients include public agencies at the federal, state and local level and numerous private natural resource management companies. The focus of his research is on human response to land use change along the urban to wildland gradient, and the relationship between forestlands and the built environment. Extensive research and consulting also revolves around forest practices in visually sensitive areas. An ongoing study on Capital State Forest involves the visual preferences of various interest groups to different harvest patterns. Dr. Bradley edited Land Use and Forest Resources in a Changing Environment: The Urban Forest Interface (1984, University of Washington Press), and Urban Forest Landscapes (1995, University of Washington Press). He currently serves on the Board of Editors for Urban Ecosystems. Dr. Bradley serves on several state and local advisory panels, and served two terms on the National Urban and Community Forestry Advisory Council, a 15-member panel appointed by the Secretary of Agriculture.

Luke Rogers, Senior GIS Specialist, RTI (Co-Research Leader for Study 4)
Luke Rogers is the GIS Specialist for the Rural Technology Initiative and has nearly a decade of GIS experience in education, research, and industry. He has been the lead project manager for numerous GIS-related projects, including a statewide small forest landowner database for Washington in 2001, parcel-level identification of possible fish barriers in water resources inventory areas across the State, and a land use change analysis for western Washington. While a student at the University of Washington and working with the Department of Natural Resources, Luke designed many custom ArcInfo and ArcView GIS applications for landscape management.

Other Research Personnel
Larry Mason is the Project Coordinator for RTI, an expert in sawmill operations, and has been the lead on several studies targeted at better understanding fire risk reduction methods and biofuel processing opportunities. Most recently, Larry was the lead on a project in the Olympic region to determine how the region could sustain mill production having been mandated to reduce pollution. He demonstrated that through cooperative efforts they could solve their waste problem and increase biofuel production. He managed a major study for developing strategies and support tools to reduce fire and insect risk while better understanding the cost avoidance and non-market benefits which provide the justification for investments in fuel reduction treatments and bio processing. He also managed a study for the Department of Natural Resources to determine how the market would respond to increased small diameter material. He will manage the reviews of the literature and current activities, the surveys and contribute to the fire risk reduction, bio fuel alternatives and avoided cost analysis. Larry has a B.S. in Forest Management and an M.S. in Silviculture from the University of Washington.

Kevin Ceder is a Forest Technology Specialist for the Rural Technology Initiative at the University of Washington. Kevin has developed software tools for evaluating fire risk, wildlife habitat, and many other impacts of treatment strategies. He has performed growth and yield modeling, fire modeling, and wildlife habitat modeling as well as analyses to support studies examining fire risk reduction and understanding non-market values. He has linked habitat suitability metrics and fire analysis tools to LMS for predicting how habitat changes and fire effects and behavior changes as a function of treatment and growth response. These tools are provided as part of the Landscape Management System. Kevin had a B.S. in Forest Resource Management (1999) and a M.S. in Silviculture and Forest Protection (2001) from the University of Washington. He has been involved in forestry and logging for nearly 20 years and with RTI for 4 years.

Kevin Zobrist is a research scientist and lecturer in forest economics with the Rural Technology Initiative at the University of Washington. His research areas include non-industrial private forest landowners, economic impacts of policy and regulation, forest management templates for biodiversity and economics, and the use of forest technology. He also teaches a course in forest economics. Kevin received a B.S. in forest management in 2000 and an M.S. in forest economics in 2001, both from the University of Washington. He has conducted many case studies in the evaluation of sustainable forestry alternatives. He has demonstrated how to use assessment criteria for producing the desired future conditions that are the objective of the regulations while reducing cost and justifying sustainable forest management. These tools have provided the basis for a multi-owner Habitat Conservation Plan. He will contribute to the literature reviews, and assessment of sustainable management alternatives.

James McCarter is a research scientist with the Rural Technology Initiative at the University of Washington. He is a silviculturist with particular emphasis on density management and growth and yield modeling. He was one of the original developers of the Landscape Management System and continues to develop applications of growth and yield, simulation, and visualization for use in computer-assisted analysis of natural resource management options. Dr. McCarter received a B.S. in Forestry in 1981 and an M.F. in Forest Management/Silviculture in 1984, both from the Utah State University. He received his Ph.D. in Silviculture and Protection from the University of Washington in 2001.

Ara Erickson is a Forestry Research Consultant with the Rural Technology Initiative and will be working on land use conversion study, facilitating the technical and editorial collaboration among the land conservation groups, CommEn Space, and the College of Forest Resources. She has an M.S. in Forest Resources, with a focus on urban forest management, from the University of Washington, and a B.S. in Forest Resource Management from U.C. Berkeley. Ara has managed or worked on research relating to street tree management in inner-city environments, visual perceptions of forest harvesting patterns, land use change using GIS and remote sensing, parcel identification of small forest landowners, and various other GIS and social science projects. She previously worked as an environmental consultant in Redmond, WA, and as an outreach coordinator for forestry programs in California.

Matthew McLaughlin is a Digital Information Specialist for the Rural Technology Initiative. Matt has designed, developed, and managed the RTI website for nearly 4 years. He has outreach videography expert, has produced over 100 streaming video available on the web and CD, produced a streaming video tutorial and has assisted several organizations to successfully launch their own streaming video programs for distant learning applications. Matt will manage a website for the entire project and has extensive database and digitizing experience, which will

be utilized in the land conversion study. He has a B.A. in Business Administration from the University of Washington,

Alicia Robbins is the Program Manager at the Center for Sustainable Forestry at Pack Forest, and will be a member of the research team looking at innovative valuation methodologies, incentives, and disincentives. Ms. Robbins has a M.S. in Forest Economics and a M.A. in International Studies, both from the University of Washington. She has six years of experience in studying and working on issues related to natural resource policy and incentives-based approaches to resource management.

Urban Ecology Staff
The land conversion study will rely on expertise from remote sensing and land use planning staff from the Urban Ecology Project, an interdisciplinary research and education effort involving a large number of faculty, staff, and students from a variety of UW Colleges as well as members of government, industry, and policy-makers.

Graduate Research Assistants, CINTRAFOR, U of W
CINTRAFOR employs a number of graduate research assistants who support our market analysts and faculty in carrying out marketing and economics studies. Currently CINTRAFOR has three research assistants who will contribute to this project. One of these graduate students has extensive experience in China and provides Chinese language skills to our research team. The second research assistant has a forestry degree and an MBA in marketing. The third graduate student has a forestry degree and is conducting extensive research on the WA sawmill industry. Two graduate students will be involved with the land conversion study, each bringing knowledge and experience in land use planning and conservation issues, GIS and remote sensing, database management, and forest industry challenges and opportunities.

Graduate Research Assistants, RTI, U of W
RTI employs graduate research assistants in the areas of GIS analysis, landscape management, and economic analysis. Elaine Oneil, a Ph.D. candidate and contributor to the study has provided a comprehensive analysis of treatments that reduce fire and insect risk with sustainable forest economics. She is developing site specific criteria for evaluating forest carrying capacity to reduce insect risks. Other students are contributing directly to the development of databases characterizing forestland conversion. A new Ph.D. in wildlife science skilled in GIS will join the support team for analyzing changes in habitats.

External Cooperators

CommEn Space
CommEn Space, Community and Environment Spatial Analysis Center, is a non-profit organization focusing on supporting Northwest conservation efforts by providing access to the highest level of GIS and mapping technology available. CommEn Space distinguished their group through an approach that combines outstanding technical expertise with a broad understanding of organizational needs and issues facing non-profits and local government agencies using technology. Through work with dozens of regional environmental organizations and numerous state and local agencies, CommEn Space has amassed tremendous experience in working with regional geospatial data, modeling ecological processes, facilitating conservation planning and producing powerful, highly communicative cartography and web maps. Personnel involved in this project include Chris Davis—Director, Tim Schaub—GIS Analyst, Matt Stevenson—GIS Analyst, Christopher Walter—GIS Analyst, Jessemine Fung—GIS Analyst, and Karsten Vennemann—GIS Analyst.

Trust for Public Land
The Trust for Public Land (TPL) is a national, nonprofit, land conservation organization that conserves land for people to enjoy as parks, community gardens, historic sites, rural lands, and other natural places, ensuring livable communities for generations to come. Since 1972, TPL has worked with willing landowners, community groups, and national, state, and local agencies to complete more than 2,700 land conservation projects in 46 states, protecting nearly 2 million acres. TPL has helped states and communities craft and pass 192 ballot measures, generating over $35 billion in new conservation-related funding. TPL will be involved in the review process and data provision for the land conversion study.

Cascade Land Conservancy
Cascade Land Conservancy (CLC) is an entrepreneurial nonprofit land conservation organization, with a core service area of King, Kittitas, Pierce, and Snohomish counties in Washington state. Utilizing a variety of innovative conservation methods, CLC works to strategically conserve and steward critical landscapes that span their service area – from headwaters to estuaries, and foothills forests to urban centers. CLC is uniquely positioned in the conservation community: known for their willingness to take bold steps in partnership with public and private organizations in order to address the community's desire for a healthy environment and vibrant economy. CLC's comprehensive Conservation Agenda identifies core conservation lands in the four-county Central Cascades region and proposes over 90, primarily market-based strategies to secure the economic, community, and ecological values of these lands for future generations. CLC will be involved in the review process and data provision for the land conversion study, as well as taking a lead role under Item g's policy recommendations. Personnel involved in this project include: Gene Duvernoy, President, Michelle Connor, Vice President for Cascade Agenda Programs, Alison Van Gorp, Project Associate, and Jeff Pavey, Project Assistant.

Gene Duvernoy: Gene Duvernoy's career in resource and land conservation has included positions with government, research institutions, law firms and the private sector. Over the last decade he has led the Cascade Land Conservancy to national prominence with its development of bold, innovative and successful conservation strategies resulting in the conservation and stewardship of tens of thousands of acres of critical resource lands and landscapes throughout Washington State. In 2004 the Municipal League of King County recognized Gene's work with its Jim Ellis Regional Leader Award

Michelle Connor: Michelle Connor has been with the Cascade Land Conservancy since 1994. Michelle has been directly involved in the creation of the bold, innovative and successful conservation strategies that CLC is recognized for. She was named Vice President Conservation Programs in 2004, overseeing all conservation transactions, stewardship activities and special projects of the conservancy. She was recently named Vice President in charge of implementing the Cascade Agenda. Michelle received her Master of Science degree from the University of Washington's College of Forest Resources and bachelor's degree from Evergreen State College.

Alison Van Gorp is a Project Associate with the Cascade Land Conservancy. She works on the Cascade Agenda, a vision and action plan to conserve 1.26 million acres in the Central Cascades region over the next 100 years. Alison's research and work experience is in innovative approaches to land conservation, land use planning and growth management, focusing on community involvement and a long-term, regional perspective. She received a BA in Biology and Environmental Studies from the University of Colorado – Boulder in 2000 and a

Masters in Environmental Management from Yale School of Forestry and Environmental Studies in 2004.

Jeff Pavey recently joined Cascade Land Conservancy as a Project Associate and is responsible for coordinating Cascade Agenda activities. He has over two years of experience conducting policy analysis and managing projects for a variety of organizations. Jeff is a published writer, an experienced mediator, and holds Master in Public Administration from Indiana University School of Public and Environmental Affairs.

The Nature Conservancy

The Nature Conservancy's mission is to preserve the plants, animals and natural communities that represent the diversity of life on Earth by protecting the lands and waters they need to survive. TNC has developed a strategic, science-based planning process, called Conservation by Design, which helps identify the highest-priority places—landscapes and seascapes that, if conserved, promise to ensure biodiversity over the long term. The Nature Conservancy has five priority conservation initiatives to address the principal threats to conservation at the sites where they work, focusing on fire, climate change, freshwater, marine, and invasive species. TNC will be involved in the review process and data provision for the land conversion study.

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