Center for Sustainable Forestry Dean's Report

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Mission

The mission of the Center for Sustainable Forestry (CSF-PF) is to actively advance the concept and practice of sustainability. We strive to engage students, scientists, professionals, policy makers, and community members in continuing education and outreach in natural resources and environmental science and management. The CSF-PF seeks to identify the boundaries of sustainable forest ecosystems that include extracting forest products while maintaining ecosystem integrity. The center demonstrates best practices in ecologically-based forest management and provides education and research opportunities in sustainable forestry.

The mission of the CSF-PF is closely tied to the land as the operating budget requires revenue be generated through timber harvests, while also maintaining wildlife and old-growth structural reserves. This arrangement requires the CSF-PF to practice on-the-ground sustainable forestry, demanding creative solutions to the breadth of challenges in maintaining working forests. The CSF-PF strives to manage the land in a manner that provides an internationally renowned model of sustainable forestry. I first clarify the context of the CSF-PF's physical, timber, and financial resources as this context sets the stage for the proposed research and outreach program development.

Historical Background and the Creation of the CSF-PF

In 1926 a gift from conservationist and east-coast lumberman Charles Lathrop Pack enabled the CFR to purchase 334 acres of forested land located near Eatonville, WA. Since that time additional, gifts, timber harvests, and land purchases have allow Pack Forest to expand to its current 4300 acres of third-party certified, working forestland. For more than 80 years, Pack Forest has provided a forested classroom for CFR students, faculty, and affiliates. The Center for Sustainable Forestry was created in 2003 and combined with CFR lands constitutes the CSF-PF.

The CSF-PF was created to discover, teach, and demonstrate the concepts of sustainable forestry. The CSF-PF seeks to develop research and outreach programs supporting the college's unifying themes of sustainable forest enterprises and sustainable land and ecosystem management. The concept of sustainability brings an interdisciplinary set of economic, social, biological, and physical science to bear on understanding, managing, and using the products and amenities of forests so that they are maintained in a healthy, productive state for future generations.

Pack Forest has served as an important training center for CFR students since its inception. CFR undergraduate forestry students studied at Pack Forest for the summer or spring quarter for decades, ending in 2001 when enrollments dropped below levels that could justify the program's expenses. Pack Forest has been in transition since that time, and we continue to seek new ways to return student and faculty use to our facilities. Pack Forest remains the home to numerous forestry demonstrations and research projects and provides a location for future field trials and installations. It is important to recognize this history as our vision is tied to buildings, forest resources, and personnel that both reflect our past and that will help guide our future.

Financial Overview

Real Estate (Unknown value)

The CSF-PF is responsible for general oversight of real assets including the 4374 ac Pack Forest and the 160 ac Lee Memorial Forest near Maltby, WA. Management responsibility is primarily related to stewardship of the natural resources but protection of these assets from unwanted or illegal activities is also the CSF-PF's responsibility. The purchase or sale of real estate is also feasible and a real estate account exists for this purpose. The sale of timber for purposes of

purchasing additional land at Pack Forest has been the primary tool for expanding the size of the forest. Pack Forest was aggressive in purchasing land in the 1970's and 1980's but the process has slowed dramatically as the forest approaches its natural boundaries. Real estate transactions remain a possibility for Pack Forest and the CSF-PF has recently approached adjacent landowners about the availability of their forest land for purchase.

The sale of UW land is also a possibility although there are more complications with land sales than acquisitions as there are social and political issues related to the loss of forestland. All real estate decisions reside first with the Dean, then with the UW Real Estate office, and ultimately with the UW Board of Regents. We are currently exploring options to both purchase and sell land with two goals in mind: 1) secure the financial future of the CSF-PF, and 2) reposition our timber portfolio to increase stands that will reach rotation between 2020 and 2035—a time period where we will have low volumes of mature timber to harvest.

The CSF-PF is also exploring the sale of development rights from both Lee and Pack Forests. Pack Forest has 1200 ac of land zoned one housing unit per ten acres (R10) and this translates to 120 development rights. The entire Lee Forest appears to be zoned R5 and this would translate into 32 development rights however the sale of development rights from Lee Forest is complicated by restrictions on the deed. The sale or transfer of these development rights is a relatively new process and while programs exist in both Pierce and Snohomish Counties it will probably be years before we can realize a sale in this area.

The sale of development rights would provide a one time source of revenue, but it is unknown how proceeds of a real estate sale would be allocated within the UW system. The CSF-PF is working with the UW Real Estate office with the hopes that a sale could be used to form a land endowment in support of the land or to acquire additional land. The CSF-PF has ongoing conversations with Washington State Parks and the Department of Natural Resources regarding a potential 3-way land swap. We are exploring a deal where we would sell over 500 ac of land for incorporation into the Nisqually-Mashel State Park, and in exchange we would seek DNR land transferred to the University of Washington. The location of potential land acquisitions is to be decided and the Cascade Land Conservancy has identified several parcels as potential acquisition targets.

Cash Reserves: $1.5 million

The CSF-PF has reserves in two accounts totally approximately $1.5 million. The Dean holds a budget to which all revenues are deposited (the "Dean's Budget") and this budget is used to recharge our operating budgets following a formal annual budget request. The Dean's Budget has approximately $220,000 in reserve as of December 2008. The aforementioned Real Estate account contains excess revenue from recent timber harvests totaling $1.28 million. This amount may seem large, but represents the tremendous ebb and flow of timber revenue. For example, we made $835,000 on a timber sale in 2007, but less than $50,000 in 2008. In years with excess revenue funds are transferred to the Real Estate account, including a $400,000 transfer to the account following the 2007 sale.

The reserve account is essential to demonstrating sustainable forestry as it provides the necessary revenue base to: 1) fund operations when timber prices are low, 2) provide an emergency fund for handling large repairs, and 3) purchase land, for example when timber prices are low. We are currently pursuing land acquisition with the target of purchasing timber that will mature in 2020, which may be necessary to meet projected revenue shortfalls by 2025 (Table 3 below). I

understand the temptation to use these reserves in support of building renovations, program expansion, or perhaps supporting the CFR operations directly, however I am committed to keeping the revenue in support of the land from which it was extracted. The temptation to convert timber assets to cash is great but may lead to unsustainable harvesting.

Timber Resources and Harvest Schedule

Forest operations are self-sustaining and dependent on timber harvests. The majority of the forests are dominated by naturally regenerated and planted Douglas-fir timber but a variety of species and habitat types are represented across 4374 acres. Four hundred and sixty-one of the acres are in reserves of ecologically sensitive forests that are off-limits to cutting. There are also 118 ac adjacent to the main campus buildings and 78 ac of forest adjacent to the main entrance, and the junction of state HWY 7 and 161; all are retained as aesthetic buffers. If we subtract reserved stands, then 3717 ac of production forest are available to support operations.

The CSF-PF demonstrates sustainable forestry through timber harvests, and because forestry is a process that spans forest manager's careers, this process is intimately tied to past harvests. The mission of the CSF-PF and its long-term financial viability are also tied to the land's history. The time period 1970-2008 resulted in timber harvests across 78.9% of the production forestland similar to an industrial forestry model (i.e. 48 year rotation--Table 1). Harvests coincided with forest maturation following the Eatonville fire of 1926 (i.e., 50+ years post fire or planting).

Pack Forest has followed a long-term harvest schedule set in place under Dr. Chad Oliver and then Forest Manager Mason McKinley (packforest.org), and under this plan sustainable wood flow (one measure of sustainable forestry) is demonstrated. Some would argue this is *the* definition of sustainable forestry, but my vision provides stricter ecological benchmarks and therefore this schedule is no longer being followed. It is important to note that past harvests leave us with a relatively small pool of mature timber and a potential revenue gap between 2020-2030; stands harvested in the 1970's and 1980's reach commercial size between 2030-2050.

Table 1. History of timber harvests at Pack Forest by decade. The harvests are expressed as a percentage of total land and as a percentage of production forests. The size of Pack Forest increased in both the 1970's and the 1980's and acreage is an estimate of production lands for these time frames.

	Total land base (timber production land) in acres	Total acres harvested	Total land base harvested	Land production base owned at that time harvested
1970's	2880 (2200?)	644	14.7%	29.3%
1980's	4073 (3400?)	1105	25.3%	32.5%
1990's	4374 (3717)	720.7	16.4%	19.4%
2000's	4374 (3717)	462	10.5%	12.4%
Total 1970-2008	4374 (3717)	2932	67.0%	78.9%

Cash Equivalents of Timber Resources ($8.9-$11.8 million-merchantable volume)

The Center for Sustainable Forestry at Pack Forest is timber rich, but in many respects cash poor. I will first describe our wealth of resources and then address our limitations to accessing this wealth. I provide a summary of our timber resources here as a means of illuminating our financial reserves. Timber resources can be presented in a variety of ways depending on how one determines harvestable stands, projected timber prices and costs, and the order (or optimization) of the harvest schedule. I present what I perceive to be a high and low estimate of our resources here in an effort to establish transparency.

We currently have over 65 million board feet (MMBF) of standing mature timber, which is worth up to $25 million. However only 776 ac of mature forest habitat is in production classes. Excluding ecological, road, and campus buffer reserves our standing mature timber is over 32 MMBF. The maximum net (extracted) value of this timber is believed to be $11.8 million assuming 2007 timber prices, labor costs, and fuel prices. The stands are calculated to have added 3 MMBF over the last 5 years for an annual "on the stump" return rate of 2.1%. However, there are some very low productivity and "decadent" stands within our portfolio that are holding back the average growth rate, as some sites have volume growth exceeding 7%/yr.

Pack Forest's timber base provides a substantial revenue source to support center operations provided strong timber markets, low fuel prices, and reasonable access to mills. In fact, growth projections, and bucking algorithms used in Landscape Management Systems show a steady flow of both timber and revenue, with an increasing standing timber base when 6-7 MMBF are extracted in 5-year planning periods (Table 2). If there is a strong timber market and economy for the next 30 years then we would be well positioned to maintain our self-sustaining operation through timber sales. In fact, under these assumptions we could increase our yield, and perhaps create a source of revenue for the CFR. However, it is important to note that harvesting in this scenario assumes slopes <30%, insensitive soils (no harvest restrictions), and harvesting of the entire stand volume (minimal riparian and wildlife reserves). Therefore this estimate is clearly a best-case scenario description of our resources as stands on steep slopes, sensitive soils, and/or within riparian zones will reduce yields.

Table 2. Growth modeled projections of timber production, harvest volume, and revenue under optimal economic conditions. These projections include 2007 timber $ values, and labor costs. The harvests assume that all sites are clear-cut and timber is extracted on relatively flat slopes.

5-year harvest period	*Standing Initial Volume MMBF	Harvested Volume MMBF	Stand volume gained in period MMBF	Residual volume at end of period MMBF	†Timber revenue over 5 years ($millions)
2010-2015	32.33	7.26	2.14	27.21	$2.09
2015-2020	27.21	6.29	1.17	32.09	$2.12
2020-2025	32.09	7.24	6.78	31.63	$2.25
2025-2030	31.63	7.11	13.34	37.86	$2.24
2030-2035	37.86	7.72	15.86	46.00	$2.21

*Pack Forest stand data is supported by a continuous inventory. Growth modeling, bucking algorithms, and visualizations are all managed with the UW's Landscape Management System.

†Assumed net timber revenue of: $400/MBF for Douglas-fir, $450/MBF for red alder, $1000/MBF for western redcedar, and $10/ton for pulp.

The recent economic downturn emphasizes the potential limitations of using timber revenues to support CSF-PF operations. Our 2008 timber harvest revealed dramatically lower timber prices, and higher costs than we encountered in recent years. [One of our largest problems was increases in fuel prices and logging costs, which have now returned (temporarily?) to lower levels.] I used low price estimates as a means of demonstrating how the CSF-PF business model may be threatened by a weak timber market, the closing of mills, or higher fuel costs. Under this scenario I estimated timber prices and haul costs that were similar to what we received in 2008. Under these poorer economic conditions we must harvest an additional 3 MMBF per 5-year period (Table 3).

Table 3. Growth modeled projections of production and revenue in 2008 timber $ values, which include higher fuel costs, shipping costs, and depressed timber markets. The campus and road buffers are harvested in 2025 as all other sources of mature timber are depleted by that time.

5-year harvest period	*Standing Volume Beginning MMBF	Harvested Volume MMBF	Stand volume gained in period MMBF	Residual volume at end of period MMBF	†Timber revenue over 5 years ($millions)
2010-2015	26.2	9.90	1.51	14.79	$2.20
2015-2020	14.79	11.79	10.34	13.34	$2.23
2020-2025	13.34	12.17	2.47	3.64	$1.93
2025-2030	3.64	††9.27	14.46	8.83	$1.66
2030-2035	8.83	8.83	15.86	10.20	$2.21
2035-2040	10.20	10.20	12.85	12.85	$1.90

*Stands enter production-sized sorts around 50 years post harvest and therefore volumes increase as stands planted post 1970's-1980's harvests mature stand volumes increase.
†Assumed net timber revenue: $250/MBF for Douglas-fir, $250/MBF for red alder, $600/MBF for western redcedar, and $3/ton pulp.
††Additional timber volume comes from cutting campus and road buffers.

The low revenue projections demonstrate that Pack Forest will run out of sufficient mature timber to meet revenue needs by 2020. Low prices require harvests of 10-12 MMBF/5-year periods in order to generate the required $2.25 million in revenue (Table 4). In fact, during the two 5-year periods 2030-2035 and 2035-2040 we project harvesting every bit of the bucked volume that is grown in the previous 5 year period. To be clear, I believe we could harvest our timber supplies in this manner and still be achieving (one definition of) sustainable forestry as this harvest rate would be roughly equivalent to the maximum sustained yield (MSY). Therefore even under poor economic projections the CSF-PF is likely to be able to support our operations through timber harvest.

The conundrum for the CSF-PF is how do we demonstrate a new vision for sustainable forestry if our business model pushes us toward a MSY with reserves harvest schedule? In many respects a MSY scenario is analogous to industrial forest production (note the 48-year rotation for stands harvested 1970-2008—Table 1) and my vision of sustainable forestry is broader than this, emphasizing increasing ecosystem services while extracting timber revenue. This scenario results in harvesting all of the post-Eatonville fire stands by 2025, leaving a forest of ecological reserves surrounded by young or regenerating forests (see Appendix A for a comparison pre- and post-harvest schedule projected landscapes). This MSY scenario allows no ability to produce the next generation of mature and old-growth forests or structure. I argue this is not sustainable forestry; some will disagree with this conclusion.

Annual Revenue

- State Budgets: $47,017/yr
- Conference center revenue: $364,000/yr in FY'08
- Cell phone and radio tower leases: $62,000/yr FY'08
- Non-timber forest product sales $8000
- Timber sales: $450,000-$550,000/yr

Budgetary Summary

The Center for Sustainable Forestry at Pack Forest includes two self-sustaining budgets: Pack Forest Operations and the Conference Center, and then the Center for Sustainable Forestry, which has a separate budget. The total CSF-PF operating budget has been around $900,000/year over the last 3 years. The budgets are intertwined as they share administrative, fiscal, and maintenance personnel among, making it extremely difficult to accurately assign expenses.

The CSF-PF receives a small maintenance budget ($38,600 FY'09), and a modest budget to maintain our laboratory facilities ($8,417 FY'09) from the State of Washington. All other funding for the center is generated from the sale of timber, conference center rentals, cell-phone tower and radio station leases, sale of non-timber forest products, and grants and contracts. The CSF-PF needs to generate around $850,000/yr to maintain operations at our current level (Table 4).

Table 4. CSF-PF Personnel and FY '09 budgets. The total budget request in FY '09 is lower than in previous years as we have open staff positions and budget carryovers from FY '08.

	Forest Operations	Conference Center	Sustainability Budget	Totals
Budget	$326,797	$350,445	$156,867	$834,109
Permanent employees	4	4	1	9
Hourly employees	2	10	3	15
*Shared employees	7	3	3	13

*There are employees supported by multiple budgets including: Center Director, Assistant to the Director, Building and Grounds Supervisor, Grounds Keeper, Education Specialist, and seasonal field staff.

Key Personnel

- **Gregory J. Ettl, Director**. Administrative duties include: constructing and managing operating budget; direct supervision of 4 professional staff; forest harvest planning; public relations and building &maintaining partnerships in Pierce county; real estate leases, sales and acquisitions; fund raising; building & managing research opportunities with multiple universities; providing outreach tours for university and forestry professionals; and writing grants and contracts in support of basic operations. Faculty duties include: teaching one 5-credit course/year, additional guest lectures, serving on committees, supporting graduate students; developing an internationally recognized research program, and supporting *50% of salary through outside funding*.
- **Assistant to the Director**. Open position that was created when our Fiscal Specialist retired. Designed to provide 50% fiscal accounting, 25% human resources support, and 25% program development.
- **Terri McCauley, Conference Center Manager.** Supervises a total of 13 employees (Georgiann Crouchet—meal planning and kitchen staff, Suzy Bowles—custodian, Sandy Domici-program coordinator), manages all aspects of the conference center including:

promotion, sales, client relations, billing and general administrative oversight.

- **Duane Emmons, Forest Manager**. Supervises two permanent (Alvin Sharpe—road and vehicle maintenance, and wood utility work, Bruce Stamper—tree planting and precommercial thinning) and two hourly staff (Fern Vogel—trail maintenance, and Tom Touse—education specialist). Responsible for managing timber sales, field crew supervision, maintains forest inventory, provides GIS and logistic support for harvest and research activities, secures forest, maintains public relations, and manages forest certification issues.
- **Dale Halverson, Building and Grounds Supervisor**. Supervises one seasonal hourly employee (Gary Balthis) and maintains all buildings and grounds.

Future Leadership and Organization The Dean created the CSF-PF following Stan Humman's retirement and the Director of the CSF-PF was hired as a replacement to Mr. Humman. The Director resides 4 days/week on the Seattle campus and 1 day/week at Pack Forest. The placement of the Director primarily on the Seattle campus has increased day-to-day tasks of professional staff, and they are short on both time and resources to complete their assigned duties. An Assistant to the Director is expected to relieve this burden. The staff at Pack Forest has been reduced in size and budget since timber revenues were put under direct oversight of the Dean. There is currently no one within the organization who *believes* they can expand their role, and this has resulted in poor morale. The next logical step in reorganization is to place the best personnel in each position to optimize staff productivity.

Optimal Organization We need additional staffing to support many aspects of the CSF-PF operation. The needs are perceived to be most critical in regards to the Center for Sustainable Forestry Research division as the Center Director is the only person in this area. In many respects we are in a Catch-22: we need more staff to free time for program development and grant and contract writing, yet we lack funding to support the staff that would allow this to happen. The following suggestions are short-term and modest, with the knowledge that we lack funding for these positions.

- *Conference Center*—the conference center would benefit from a 12-month custodial position, and additional office assistance during peak season. At the moment staff increases are not possible as the conference center is marginally self-sustaining.
- *Forest Operations*—we are currently staffed strictly in support of forestry activities. We lack funding to handle most aspects of research including follow up on permanent plots, historic data files and papers, and ongoing research projects. We also have a poor understanding of what research has taken place on each site. Creating a database of past research, and making a list of prior publications are a high priority. One of our most glaring deficiencies is in the realm of wildlife biology as we lack current surveys of biota and have no base funding in this area.
    - Research Technician—a full-time research technician is required to monitor and maintain ongoing field trials and assist scientists with additional projects.
- *Center for Sustainable Forestry*—the research program currently consists of the Director, Tom Touse (a retired teacher working part-time on outreach), and Duane Emmons (Forest Manager) who provides GIS and LMS modeling support.
    - Full-time Education Specialist—in charge of outreach programs, and curriculum development.
    - Research Scientist—to provide capacity to work on multiple projects. At the moment all grants and contracts, writing and presentations are handled by the Director.

Space and Facilities

The CSF-PF campus includes 56,000 ft^2 of buildings, over 3 miles of campus roads, and 35 miles of forest roads. The buildings and campus have the capacity to house 138 people and are of mixed age with the vast majority of buildings built in the 1930's. The buildings historically housed CFR students and timber revenue subsidizes maintenance, custodial, and administrative staff. More importantly we have ever increasing expenses (mandated state salary increases ~$30,000 FY'08), and deferred maintenance as our annual $38,600 state maintenance budget is insufficient to keep up with maintaining facilities.

It is the Dean's intention that the conference center be self-sustaining. The conference was reduced from a 12-month schedule to 10-month operating schedule (closed November 15th – January 15th) in 2005 and all aspects of the operation have been cut. The conference center is currently able to provide sufficient revenue to cover 1/3 of its administration, and 70% its annual maintenance personnel, custodial needs and utility expenses. We consider the conference center's ability to support this ratio of expenses as an indication that it is self-sustaining. This hides the fact that we have a long list of repair needs including capital projects, and the vast majority of the buildings are stocked with vintage furnishing. If we consider all of the costs of operating these facilities we are running an annual deficit.

There is no money in our annual budget to support major repairs, purchases, or to replace aging equipment, and I believe our current state funding has created an unsustainable business model. We continue to seek ways to increase our revenue and reduce expenses but in the mean time we are running a deficit through increased deferred maintenance. We currently have over $300,000 in deferred maintenance (Appendix 2) including two buildings that are in need of rewiring and a number of campus roads with sink holes and soft shoulders. The age of our facilities would indicate that additional repair needs are likely to surface. For example, in 2007 we had a $210,000 (UW main campus paid 1/3 of this) expense to replace our fire hydrants (a routine inspection discovered pipes that were cracked), and another $14,000 to replace our phone system.

The Forest Operations are supported by an aging fleet of vehicles that is also in need of replacement. We have bought two used trucks (2001 and 2002 models) over the past couple of years but we are in need of replacing two vehicles immediately and up to another 5 vehicles over the next 5 years (Appendix 3). Finally, state law mandates that we maintain our forest roads as part of our road maintenance and abandonment plan (Forest Practices Act requirement) and the work requires the use of heavy equipment. We have a large dump truck, road grader, small bulldozer, and a small backhoe that we can use for these purposes—all of these vehicles are on the verge of complete failure and we spend $1000's each year to keep them running.

Cash reserves are the most likely source of funding for future major expenses at Pack Forest. I have spent the past year or so lobbying the state legislature to increase our state maintenance budget, to no avail, and the pending budget cuts make an increase (mandated cut?) unlikely in the foreseeable future. It is critical that the cash reserves stay with Pack Forest both from the standpoint of maintaining operations, but also as a means of demonstrating true sustainable forestry.

Research and Outreach Programs

The Center for Sustainable Forestry was created primarily to execute a new vision of sustainable forestry, but also as a mechanism for increasing revenue, where outside funding can support administrative costs. The preceding analysis demonstrates a need for outside revenue as a way to bridge the gap between an industrial forest model and an ecological-based sustainable forestry. Furthermore, the gap is large (>$100,000/yr) and requires a solution that will support staff salaries and building maintenance which constitute the majority of expenses.

Grants and contracts in support of research are also an important component to closing the revenue-to-expenses gap. The Director's position was designed as 50% administration, with the other 50% of time used to generate outside revenue. This model allows an opportunity for reducing expenses by paying the Director's salary from outside funds. One challenge to this model is that most funding opportunities are restricted to paying salary and benefits, and therefore have a minimum impact on the CSF-PF bottom line. In order for the CSF-PF to reduce the budget gap by more than $100,000, the research program must fund both the Director's salary and find a way to increase overall CSF-PF funding.

The historic buildings require an increase in dollars that can be committed to repairs and I have come to the conclusion that these buildings must be more fully occupied with paying clients in order to support their continued operation. The desire to define an ecosystem-based sustainable forestry, and the decreased timber revenues that come with an on-the-ground expression of that definition, require development of a solution that will bring substantial, continuous outside revenue to the CSF-PF. In the absence of this increased revenue, the CSF-PF will operate on essentially a maximum sustained yield approach, harvesting timber as it reaches maturity.

Research Agenda

Alternative silviculture—The CSF-PF intends to harvest using alternative silvicultural prescriptions where possible. The goal of these prescriptions is to demonstrate the production of both wood products and wildlife habitat. Current prescriptions include 1) development of a 2-3 cohort system for growing mixed Douglas-fir, western redcedar, and western hemlock in combination with variable green-tree retention, and 2) development of a selection system for producing a relatively balanced stand structure in mixed red alder, western redcedar, and Douglas-fir stands.

The CSF-PF is currently working on forest health assessments for Lake Isabella, Seaquest, Brooks Memorial and Squilchuck State Parks. In each case, the goal is to produce alternative silvicultural prescriptions in conjunction with management plans that improve forest health, minimize wildfire risk, advance structural maturation, and increase visitor enjoyment. We have $76,827 of funding in support of this work through June 30, 2009.

Auction-Based Sale of Ecosystem Services—The CSF-PF is working to develop a market for forest-based environmental services (e.g., water quality and quantity, wildlife habitat, and carbon sequestration). Sandor Toth and the Director recently received $50,000 from the USDA's NRI Managed Ecosystem's Program to develop an auction-based approach to selling ecosystem services from Pack Forest. The approach includes developing parallel management scenarios that emphasize various bundles of ecosystem services.

This work first involves applying different intensities of forest harvesting (length of rotation, and overstory retention) and optimizing the wood products, and ecosystem services produced under various scenarios. A preliminary auction scenario is currently being tested with groups of

stakeholders at a series of "mock auctions" to assess their willingness to purchase bundled packages of carbon storage and wildlife habitat. Drs. Toth, Rabotyagov, and myself are in the process of submitting a follow up proposal to USDA.

The goal of this work is a real auction that will produce revenue for Pack Forest, which holds the potential to bring millions of dollars in a one-time payment. The approach therefore is appealing because: 1) it allows the academic pursuit of testing this free-market approach to evaluating ecosystem services, and 2) it holds the potential of solving the budgetary gap described above.

Demonstration and Outreach

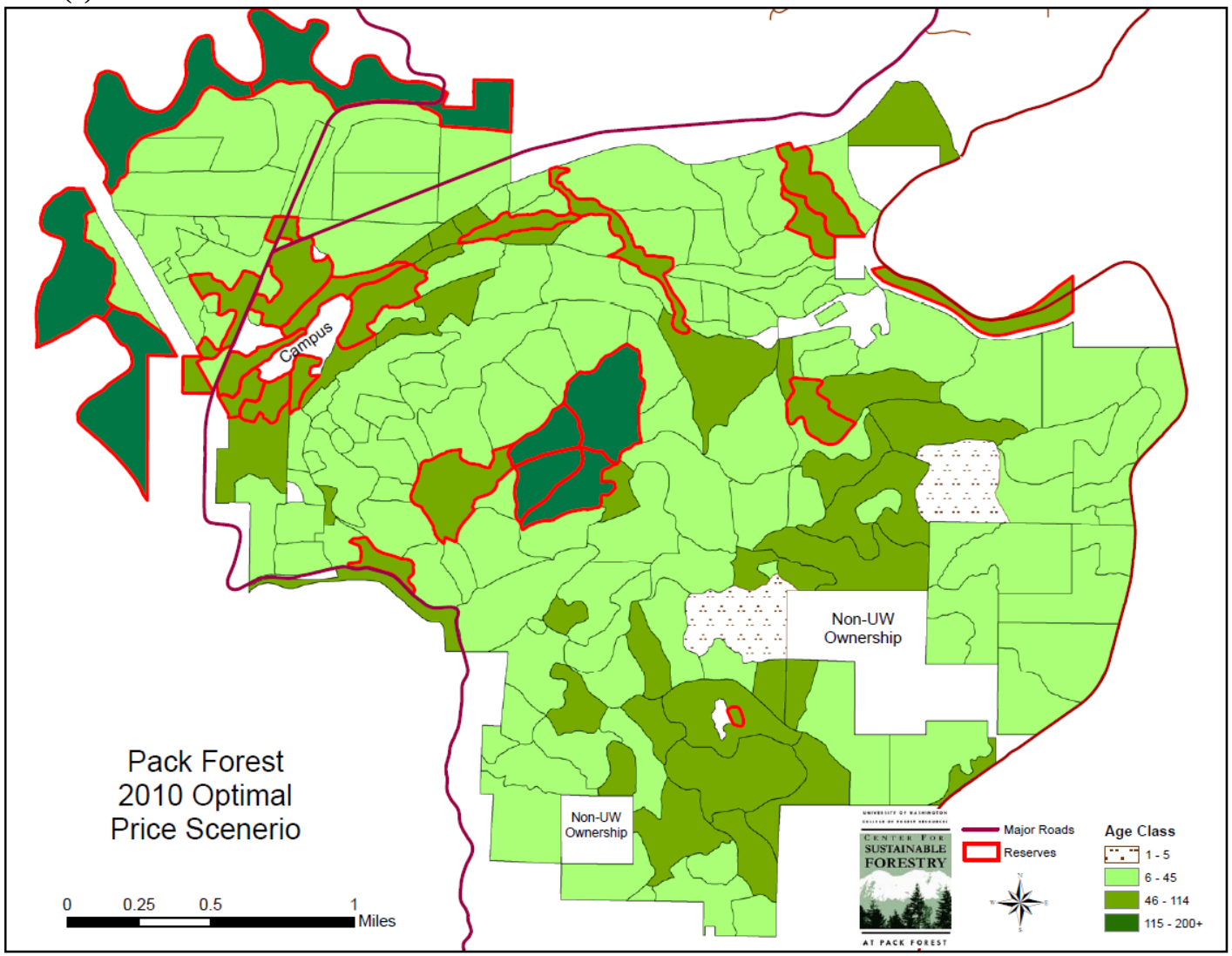
The Center's current forest management demonstrates innovative and experimental forestry practices that provide profits, while maintaining biodiversity. The Center offers a variety of educational experiences tailored to individual groups' age level and program needs. For example, the Center has developed a K-12 curriculum on a wide range of forest ecology topics from soil studies, to water quality monitoring, to species' habitat needs. Guided forest tours and adaptable classes for undergraduate, graduate, and adult groups are common and the CSF-PF provided tours for1838 people last year.

I propose dramatically increasing our outreach oriented education program at the Center for Sustainable Forestry at Pack Forest through the creation of the Pack Forest Institute (PFI). The CSF-PF has had preliminary conversations with Northwest Trek, Washington State Parks, the Nisqually Interpretive Center Board of Directors, and Mt. Rainier National Park on the formation of the PFI. We are currently in the planning stages of creating a series of programs that would involve: 1) classes being held at our facilities, 2) paying university personnel for administrative costs, 3) linking faculty and/or graduate students with field-based extension teaching opportunities. A wide range of educational programs including elementary, secondary, post-secondary, and adult-oriented education have been discussed. If successful, these programs would provide a steady flow of students through our facilities, thereby providing revenue for maintenance and administration of the CSF-PF and associated facilities.

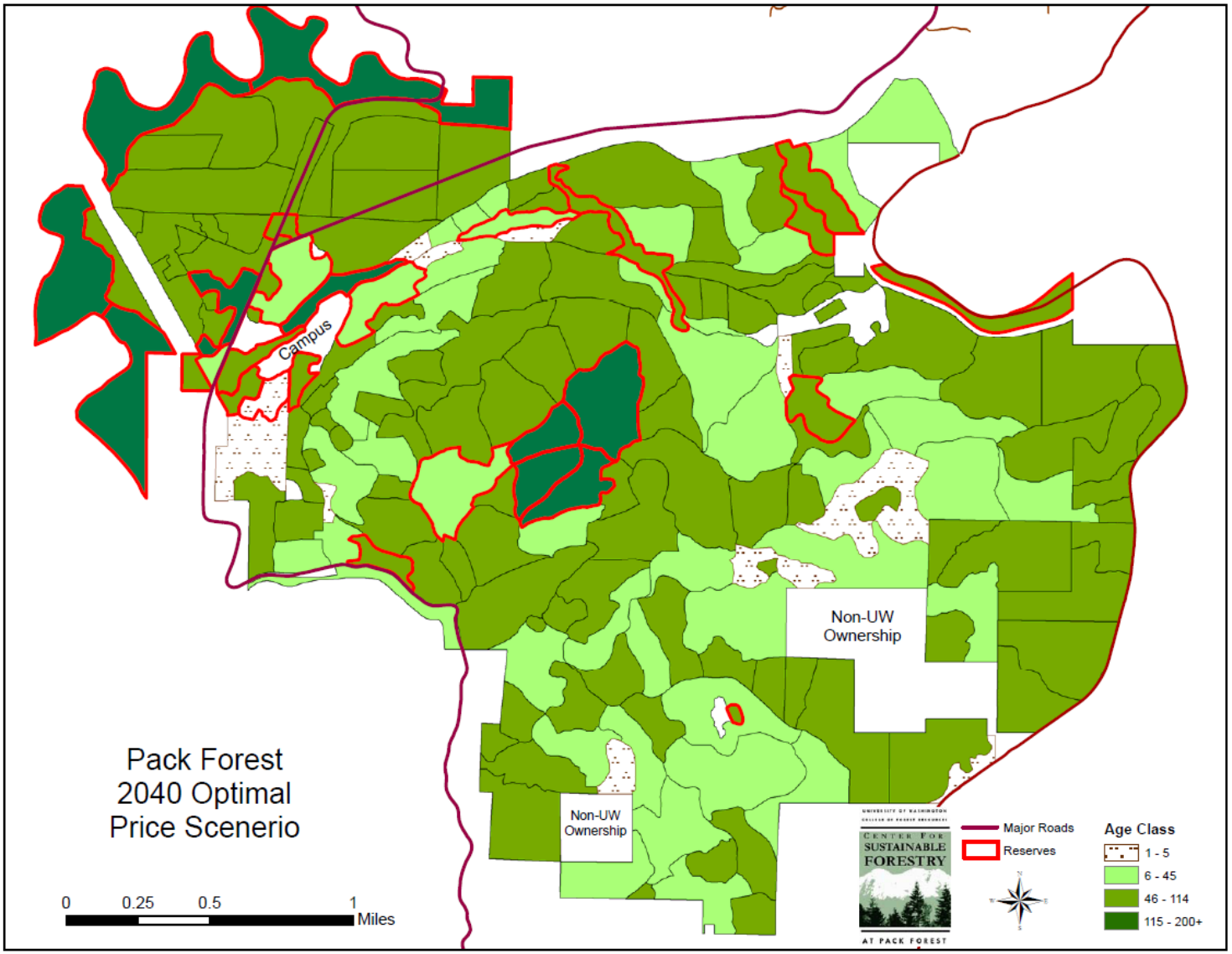
<u>Potential Programs</u>

- Mt. Rainier Institute—A cooperative program with Mt. Rainier National Park designed to bring underrepresented groups into an outdoor education setting. Approach would target groups of urban youths and lead them through multi-year curriculum designed to build math and science skills.
- Nisqually Interpretive Center—Our buildings could host the interpretive center providing interpretive materials linking sustainable forestry with preservation of salmon habitat
- Back to Nature Education Program—The CSF-PF could design a program that trains teachers to use their available outdoor space to encourage scientific exploration, experimentation, and expression.
- Washington State Master Naturalist Program—The CSF-PF could create the initial curriculum in support of the Washington State Master Naturalist Program in conjunction with Washington State Parks and Recreation and Molly Hukari who initiated this project.
- Family Weekends at Pack Forest. Educational family packages could include: forest plant identification, sustainable forestry tour, old-growth tour, conservation canine demonstration, river and/or lake activities, and perhaps a hike at Paradise in Mt. Rainier National Park.

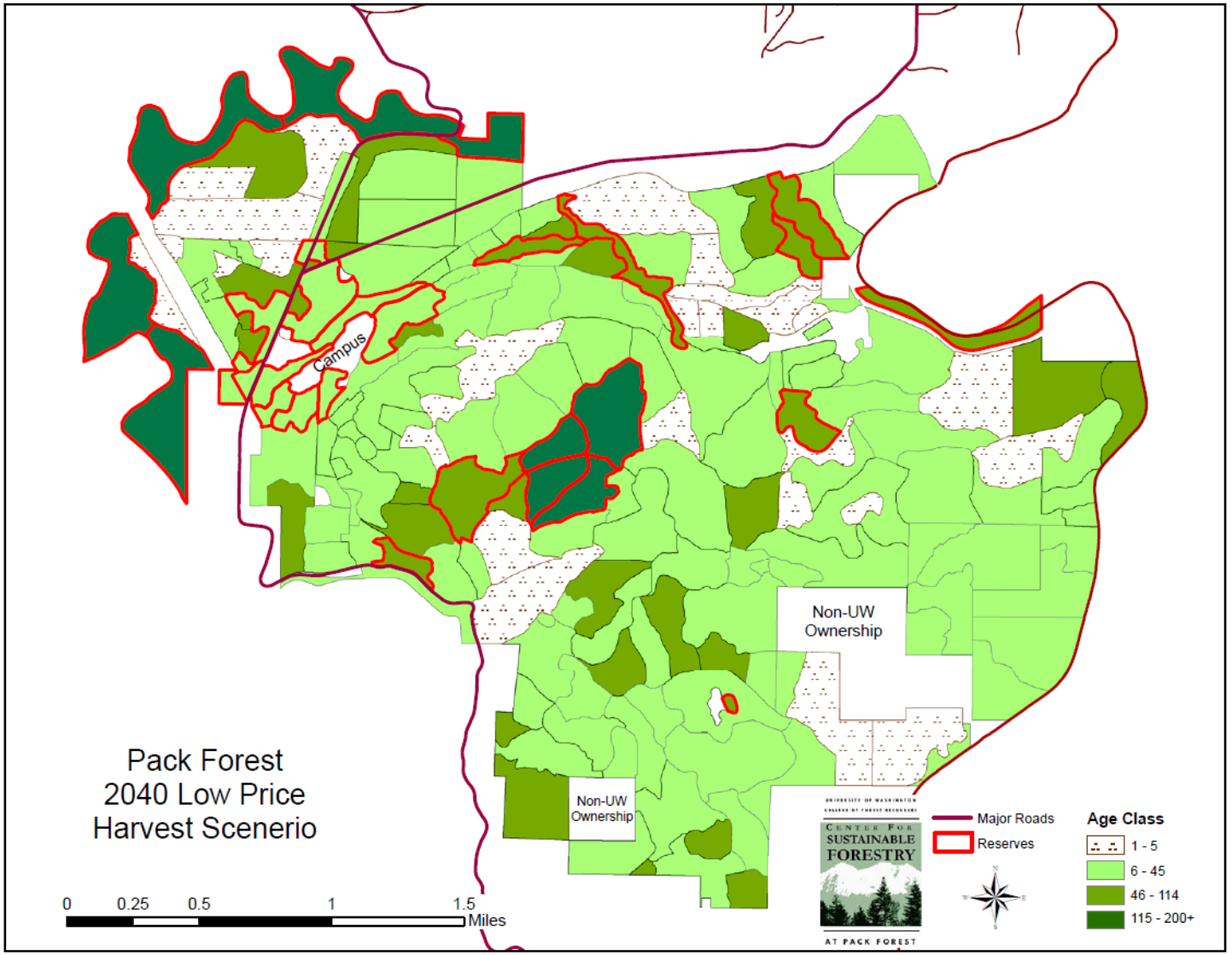
Appendix 1. A comparison of stand ages, and harvest reserves between the optimal timber harvest scenario in 2010 (a), when economic conditions are favorable from 2010-2040 (b), and with harvests required under weaker economic conditions from 2010-2040 (c).



a) Forest stand boundaries indicating ages and habitat, campus and road reserves in 2010.



b) Stand boundaries, indicating ages, and habitat, campus, and road reserves in 2040 if economic conditions are favorable from 2010-2040.



c) c) Stand boundaries, indicating ages, and habitat, campus, and road reserves in 2040 if economic conditions are poor from 2010-2040.

Appendix 2. Capital project repairs needed for Pack Forest.

Project	Importance	Pack Forest Location	Description	Materials	Labor in-house	Labor contract	Cost Estimate
Dining Hall Dorm Rewiring	Urgent Safety Hazard	Dining Hall	The Dining Hall, which contains a dormitory with overnight facilities for 22 people, was built in 1937. Parts of the dormitory still have the original wiring providing power to the lights and outlets. When inoperable lights have occurred in the last year, wires have been traced to burnt wires, a significant safety hazard for occupants as it could lead to a building fire.	x		x	Thompson estimates for breaker panels $6,000; to redo kitchen $8,000. In addition, he provided a rough estimate based on square footage (sf) is $15/sf x 4570 sf = $68,550.
Repair and Repave Roads	Hazard to logging trucks and conference center guests	All paved roads from the entrance through the campus area (adjacent to Convention Center, staff housing, and administrative facilities).	In 2005, an evaluation of Pack Forest roads was prepared. Access to campus for fire trucks and to meet Fire Marshal specifications requires widening, application of a crushed rock base, repaving to repair the degraded seal coat (causing slides and potholes), E8and repair of the main entrance slump, caused by the Nisqually earthquake in 2001. In addition, the thin coat of surfacing is insufficient to support use by logging trucks.	x		x	Dense-graded HMA is recommended, with at least 75 % of the coarse aggregate having at least one fractured face, as a leveling course. Minimum lift thickness is 36 mm (0.12 ft). Procedure: pulverize existing pavement, add crushed rock to achieve the correct paving surface, pave a 14' roadway with 2" of Class B asphalt, and place a 2 ft. wide crushed rock shoulder on both side of roadway. 6,000 ft. @ $24/ft. = $144,000
School House Rewire	Urgent Safety Hazard	Old School House	The Old School House was constructed in 1935. This building has original wiring with its original fuse box. The wiring needs to be upgraded to a breaker box with new lighting switches and outlets.	x		x	Replace fuse box with breaker box and install new lighting switches and outlets: $14,400.

Pack Hall and Dining Hall Window Replacement	Save money	Pack Hall and Dining Hall	Replace the old single pane windows with energy efficient windows. Double pane windows with low E coating are over 50% more efficient, providing a significant savings in heating costs.	x	x		14 vinyl windows: casement with sculptured grids in Pack Hall at $9075. 34 single hung vinyl windows in Dining Hall with sculptured grids: $20,245. All windows tempered glass, self-cleaning glass, lifetime installation & glass breakage warranties. Total cost with tax: $31,606.96. Pricing for wooden windows is estimated at 63,213.92 Quality Northwest Heating and Air Conditioning, the company that installed the McBride and Shower House heat pumps, gave a bid for $11,171.65 for parts and labor to install a heat pump and ducting for the office.
Administration Building Heating & Windows	Save money	Administration Buildings	The windows are original 1937. Double pane windows with low E coating are over 50% more efficient. Replace energy inefficient baseboard heaters with heat pump or other energy efficient heating system.	x	x	x	
Re-key Pack Forest	Security	All buildings and gates	Locks have not been re-keyed in about 28 years, since the early 1980s. With normal use, locks degrade. Security is also an issue, since keys have been lost, borrowed and not returned, and stolen.	x		x	University Campus Lock Shop estimated the cost at $10,000.
Fire Alarm System	Safety	All Buildings and environ	The fire alarm system was installed in 1994. After 14 years in use, it is beginning to have systemic problems: e.g. repeating trouble alarms, shorts in the wires, sensitivity to moisture, failing cards.	x		x	Technician says system does not need replacing, but moisture will affect underground cables which could be replaced.

Appendix #3
Budgeting for Pack Forest Vehicle Replacement

Pack Forest operates a fleet of ageing vehicles to carry out its forestry, maintenance and outreach functions. These vehicles are maintained through the Forest Operations budget (14-9671).

Vehicle Make	Year	Condition	Use
Dodge Dakota 4x4 4 door	2002	Excellent	Field Crews/Town
Ford F350 Service Truck	2001	Excellent	Heavy Equip Maint.
Dodge Cargo Van	1998	Excellent	Maintenance Crew
Chevy S-10 4x4	1987	Fair	Planting/PCT Crew
Chevy Suburban 2wd	1979	Poor	Trails Maint.
GMC Safari Van 2wd	1991	Fair	General Use
Ford F350 Flatbed Truck	1985	Good	Maintenance Dept.
Chevy Blazer 4x4	1983	Disabled	To be Surplused
Dodge D300 Service Truck	1976	Disabled	To be Surplused
Chevy Crew Cab 4x4	1989	Disabled	
Dodge 15 Passenger Van	1987	Poor	To be Surplused
Dodge 15 Passenger Van	1984	Poor	To be Surplused

The Service Truck and Dodge Cargo Van are equipment vehicles assigned to specific employees for their day to day maintenance work. The Cargo Van carries all plumbing, electrical and general maintenance supplies for the maintenance staff. The Service Truck carries heavy equipment tools, welder/generator and equipment to fuel and service the heavy equipment and other forest work.

All other vehicles are shared use vehicles, though employees are assigned vehicles to ensure that one individual or crew is responsible for the care, cleaning and general servicing of a particular vehicle.

With some limited exceptions vehicles need to be "multi-purpose" so that any vehicle can be assigned any task. Vehicles should be able to carry saw gas, chemicals and/or equipment in a separate compartment than occupants. A pickup with a closed canopy is ideal. All vehicles should be 4x4, otherwise these vehicles are unable to navigate unimproved roads or roads with snow/mud.

The Chevy Suburban and GMC Safari Van are 2 wheel drive only and unsuited for most forest use. In addition, these vehicles do not have a separate compartment for transporting saw gas, chemicals or other items and are not suited for general forestry use.

All vehicles older than 1996 should be replaced by 2008 per Governor Locke's Executive order 05-01.

In the past the forest has made due with purchasing surplus vehicles from either the Department of Natural Resources or the Washington state surplus dept. Purchasing vehicles that other departments have surplused often amounts to purchasing maintenance headaches.