Forest Products and Ecosystem Services
&
Opportunities for Income




Nisqually Community Forest

Part I. Forest Products and Ecosystem Services

The commercial production capacity of a forest can be organized into three basic categories: timber products, non-timber products and ecosystem services. Managing forests for biological diversity can translate to diverse economic opportunities and options for creating multiple revenue streams. Not all products listed below may represent an immediate economic opportunity. Some may require careful market development; others may simply provide value to members of the surrounding community who have traditionally relied on harvesting diverse products from the forest. The following document summarizes, in very general terms, these three categories of products and services.

TIMBER

The following timber species represent the most common species likely to be found and/or managed for within the target area for the Nisqually Community Forest. As a management philosophy, managing for a mix of species can translate to both economic and ecological resiliency. Including a mix of timber species in a management portfolio allows a forest owner to spread his investment out across a range of markets. Species diversity also provides a hedge against natural disturbances, in particular disease and pest infestations.

Douglas Fir

Douglas-fir historically has been the king of the timber species. Doug-fir is the most plentiful and versatile of Northwest species. The wood has strong contrast between reddish heartwood and pale sapwood and has excellent strength and stability. Applications include timbers and framing, interior finishes, furniture, industrial lumber - just about anything. Quarter-sawn clear lumber is highly prized for interior trim.

Douglas-fir logs are often sorted into one of the following five general grades:

> ***Export Grade*** – These are the highest quality logs. They are graded 'export' because they sell at a premium price to oversea markets. Chinese and Japanese merchants buy many of these logs and they are often shipped in cargo containers. Most Douglas-fir grown in privately owned timber plantations is produced targeting these valuable overseas markets. This is good business for private timber companies and their investors, but can be bad for local mills and local economies as the timber is not manufactured locally. Domestic saw mills often struggle to compete pricewise for export logs because they would have to buy the raw logs at high prices, yet sell the manufactured lumber into a deflated domestic marketplace.
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> ***Veneer Grade*** – Veneer grade logs are sliced or peeled and used to produce plywood. Prices tend to be fairly competitive with export markets and/or higher value domestic saw log markets.
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> ***Saw Grade*** – Logs sold to domestic mills to produce conventional structural lumber which is used for framing, posts, beams, etc.
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> ***Chip and Saw Grade*** – The outside of the log is chipped to create a square cant. The cant is then resawn to produce conventional structural lumber and the chips are sold to pulp or hog fuel markets. Hog fuel is used to produce heat and/or steam power. Many mills use hog fuel to produce power to run their kilns and then sell excess power back to the power grid.

Pulp Log – This is the lowest value product. Tree tops and/or log sections of poor quality (i.e., cannot be sawn to lumber) are sold to pulp markets.

Hemlock and Grand Fir

Hemlock and grand-fir produce a uniformly light-colored and soft wood used primarily for light framing, pressure treated lumber and moldings. The species are especially prevalent in coastal zones and as a later emerging species in mature forests. Hemlock and Grand Fir are of high value to both domestic and international markets. Hemlock is graded and sold similar to Douglas Fir (described above). Both Hemlock and Grand Fir are used to create pressure treated outdoor wood. Both have a porous fiber that readily soaks up the chemicals used to manufacture pressure treated wood.

SAW MILL COOPERATIVE

Currently, the only alternative to manufacturing logs in commercial saw mills are small-scale, portable mills. Portable mills are typically used when cutting logs to produce lumber for specific projects, such as board-and-batten siding, fence boards, post and beam timbers, etc. They are not used to produce high volumes of commodity grade lumber (e.g. dimensional lumber).

A potential economic development opportunity for wood products from a Community Forest is to network several small-scale portable mills together into a 'cooperative' that is capable of producing a range of value-added products. Further, lumber products produced from the Community Forest could be labeled as "locally grown" within the Nisqually watershed and/or "green" certified sustainably grown. These products could be sold at a higher retail price that similar products from commercial saw mills.

Western Red Cedar

Western red cedar is renowned for its rot resistant properties and superior stability and is suitable for a wide variety of exterior uses (i.e., siding, decking, soffits, gazebos, fences, etc). The species is capable of withstanding decades of exposure, but is not recommended for ground contact. White sapwood contrasts dramatically with the reddish, oil rich heartwood, which weathers to a lustrous silver if minimally treated.

Red Alder

Alder is king of the hardwoods for its value. It is the only northwest hardwood with significant commercial value that is sold commonly into commodity markets. In the past 20 years, alder has gone from a 'junk' tree to one of the most sought after Northwest species. It has good stability and workability and is used in a broad range of interior finishes and consumer items. Kiln dried lumber is a uniform amber while air dried can vary from pale white through a range of reds and browns. The highest log sort for alder is *veneer grade*. Veneer grade alder is usually sold and shipped overseas or to east coast markets where it is used to make veneer for plywood. Veneer grade alder can be as much as 2 to 3 times more valuable than saw log grade. *Saw Grade* alder is sold to local markets and used to produce furniture, cabinets, trim, molding, and flooring. *Pulp Sort* alder is sold to pulp and hog fuel markets.

Big Leaf Maple

Big leaf maple is an abundant, uniformly white hardwood found in wetter Northwest habitats. While not as hard as some of its eastern cousins, western big leaf maple performs well in a wide variety of interior finishes including trim, flooring, furniture and consumer items. Figured

wood is highly prized and used in instruments and fine furniture. Although large commercial hardwood mills purchase big leaf maple, prices tend to be so low as to hardly make it viable to remove from the forest. More commonly, maple sells to small mills, craftsmen and small scale wood manufacturers. *Figured Grade* maple is the highest value sort and is used in the manufacture of musical instruments, high end furniture and plywood. *Saw Grade* maple is used to produce flooring, furniture, trim and molding. *Pulp Grade* maple is sold to pulp and hog fuel markets.

Madrona, Cherry, Oregon Ash and Cascara

These hardwoods are considered minor niche market species that sell to small mills, craftsmen and small scale wood manufacturers. They are used in the production of furniture, crafts, cabinets, and flooring.

Non-timber Forest Products

Non-timber forest products encompass a wide range of other products that can be harvested and sold from a forest beyond just the trees. Typically these products are derived from plants that grow in the understory of the forest. Many of these products are very abundant and/or can be harvested in a sustainable manner that allows for their perpetual re-growth in the forest. The following categories summarize the most common non-timber forest products:

Floral Greens

Floral greens are sold to commercial flower shops and other private groups and organizations for use in flower arrangements, wreaths, swags, and garlands. These include salal, sword fern, Oregon grape, evergreen huckleberry, cattails, reeds, rushes, and evergreen boughs. Typically these products are harvested in large volumes by "brush pickers" and sold to large "brush sheds" that in turn wholesale the product to retailers around the world.

Medicinals

Many native plants have medicinal values and have been used by Native Americans for centuries. More recently, with the growing interest in alternatives to pharmaceuticals, consumer demand is increasing for plant-based medicines. Many plants can be used in their raw form to make tea. Other plants are better used if processed into tinctures, essential oils or other products. Markets for native medicinal plants range from large "nutraceutical" companies that purchase in bulk, to local crafters who process the material into value-added products for local sale. Examples of native medicinal plants include: willow, cascara, stinging nettles, Oregon grape, lichen (Usnea), Devil's club, and many more.

Edible Products

All forests in the northwest contain a wide variety of edible plants that can be harvested and sold. Edible plants can include those that produce berries, nuts, roots, stems or leaves. Other

common edibles include mushrooms and fern "fiddle heads". Edibles can be sold in raw form or processed into value-added products such as jams, teas, etc. Markets include farmer's markets, grocery stores, and restaurants.

Craft Products

Many forest products can be harvested and sold for use in craft projects. These include items such as: moss, reeds, cattails, small diameter woods (cherry, madrona, and willow), etc.

ECOSYSTEM SERVICES

Human life benefits from a diversity of resources and processes that are supplied by natural ecosystems. Collectively, these benefits are known as '*Ecosystem Services*' and include *products* like clean air and drinking water and *processes* such as water filtering and carbon sequestration. Resource demands on the earth's ecosystems are compounded as the world population continues to grow.

Natural resources are not invulnerable or infinitely available and the environmental impacts from human activities are becoming more and more apparent. Air and water quality are increasingly compromised; oceans are being overfished; and deforestation is releasing silt to rivers and exacerbating downstream flooding. Society is becoming increasingly aware of the need to better consider long-term ecosystem health and its role in supporting human habitation and sustainable economies. To help inform decision-makers, many economists, environmentalists, and scientists are collaborating to assign economic values to specific ecosystem services.

Scientists group ecosystem services into four broad categories:

1. Provisioning services:
- food
- water
- minerals
- pharmaceuticals, biochemicals, and industrial products
- energy (hydropower, biomass fuels)

2. Regulating services:
- carbon sequestration and climate regulation
- waste decomposition and detoxification
- purification of water and air
- crop pollination
- pest and disease control

3. Supporting services:
- nutrient dispersal and cycling
- seed dispersal
- primary production

4. Cultural services:

- cultural, intellectual and spiritual inspiration
- recreational experiences (including ecotourism)
- scientific discovery

The best opportunities for marketing and selling ecosystem services in the Nisqually Community Forest are in carbon sequestration and clean water. Carbon sequestration is the long-term storage of carbon dioxide or other forms of carbon to mitigate or defer global warming and climate change. Forests naturally store carbon and slowly release it back to the environment. Forests also retain and naturally filter impurities out of water.

Other ecosystem services that could be marketed and sold include:

- wildlife habitat
- flood storage/mitigation
- viewshed protection
- recreation
- eco-tourism

SUMMARY

If you maintain and manage a diverse forest you have a more diverse range of products and services to sell. Diversity offers multiple economic opportunities but does not necessarily translate to readily available markets. Community forest managers will have to engage in the development and operation of local niche markets to sell their products.

Part II. Opportunities for Income

Acquiring a large tract of biologically mature forest is highly unlikely due to the extraordinary cost associated with purchasing merchantable age timber, and this issue must be considered in evaluating opportunities for income. It is more likely that the forest initially acquired will be, on average, less than a merchantable age (e.g. 1 - 30 year old timber). This means that the first years of operation may yield minimal revenue from timber sales, while simultaneously requiring high operating costs while managers work to achieve a mature forest capable of supporting sustained annual timber yields. It will likely be necessary to generate revenue from other uses of the forest (e.g. recreation, brush harvesting, etc.) during this time to support annual operating costs.

Timber Sales

The best opportunity for significant revenue generation is from timber sales. In order to describe and quantify this opportunity the following general assumptions were determined:

1. Any commercial age timber stands will likely be young (~ 30 years old) and in need of their first commercial thinning.

2. Typical timber sales from a first-entry thinning of a young plantation average 20% export or domestic veneer grade logs, 60% domestic chip and saw grade, and 20% pulp grade. Current prices for these markets are approximately $600/mbf for export, $450/mbf for domestic, and $250/mbf for pulp.

3. A biologically mature forest in the northwest (50 years and older) can yield approximately 500 board feet per acre per year. A 'sustained' yield would be to harvest somewhat less per year than 500 board feet per acre.

4. The current market for softwood logs is an average of $450/mbf (as of January 2012). (This assumes an average value between pulp, domestic, and export markets)

5. On a 20,000 acre forest approximately 5,000 acres will be set aside and not be available for timber sale production due to regulatory requirements of the Forest Practices Act.

Based on these assumptions, following are three estimates (conservative, moderate, and optimistic) for annual timber sale revenue from a biologically mature forest with a net harvestable acres of 15,000 acres. These numbers reflect gross revenue and do not account for any operational costs (e.g. logging, trucking, road building/maintenance, timber sale management, etc).

Conservative Yield (100 board ft per acre per yr)	Moderate Yield (200 board ft per acre per yr)	Optimistic Yield (250 board ft per acre per yr)
Every ten acres would gross $450 per year ($45 per acre) 15,000 acres x $45 per acre = $675,000 per year	Every five acres would gross $450 per year ($90 per acre) 15,000 acres x $90 per acre = $1,350,000 per year	Every four acres would gross $450 per year ($112.50 per acre) 15,000 acres x $112.50 per acre = $1,687,500 per year

Principle of Resource Reinvestment

There will be concern and debate about the amount and intensity of logging that will occur on the community forest, as well as the markets into which logs are sold. In order to optimize revenue, forest managers could choose to harvest at a rate close to the sustained annual yield potential of the forest (Optimistic yield listed above). Additionally, logs could be sold to the highest value markets, such as export, even if this means reducing supply to local mills. Conversely, harvesting could be conducted at a rate lower than the sustained annual yield potential of the forest in order to optimize other benefits (e.g., eco-system services, biological maturity and recreation) and/or they could chose to sell logs for less than full value to local markets in support of local milling and manufacturing jobs.

A principle to consider in this discussion is the idea of 'Resource Reinvestment'. This principle states that the proceeds gained from the harvesting and sale of a natural resource are then utilized to reinvest in something of benefit to the public. Timber sales represent the most reliable opportunity for generating revenue from a community forest and the proceeds from this activity should be used to support forest management and operations and for other community forest functions such as public recreation, wildlife habitat enhancement, etc. A balance will need to be struck between the following two objectives:

1. Support the creation of local milling and manufacturing jobs - supplying logs to local mills results in minimal revenue return to invest in other community benefits;
2. Optimize revenue through export log sales – results in maximum profits which can be reinvested in other community benefits

Specialty Products and Niche Markets

The next best opportunity for revenue generation is to manage the forest to optimize the use of all timber product resources within the forest – not just conventional timber sale production. There is a lot of potential to harvest specialty grade species for sale to niche markets such as figured maple, veneer alder, spaulted logs, and craft woods. Savvy forest managers can work to maximize the profits from these market margins.

Specialty product markets tend to be more valuable than conventional markets because they are limited and in short supply. However, it takes a lot of coordination, communication, and

specialized training to supply specialty product markets and most large private timber companies don't invest the time and resources to this purpose. Forest managers and local mill operators have to be specially trained and tuned-in to: 1) recognize when these markets are present; 2) sort logs for conventional or specialized markets; and 3) mill specialty wood products that will sell.

Three components need to be present for a specialty market to function. They are:

1. Trained forest managers that recognize potential markets from raw forest products
2. Trained wood processor/mill operators knowledgeable in how to mill particular pieces of wood for specialized purposes
3. Buyers

Specialty woods are valued for: 1) crafts (particularly maple used in the manufacture of musical instruments); 2) flooring (maple); 3) furniture (maple and alder); 4) outdoor wood (cedar for fences, decks, etc.); and 5) utility poles (red cedar). Alder is the highest value specialty hardwood and is used in the manufacture of cabinets and furniture. Maple is also used for furniture, but its highest value is in the production of musical instruments. Typically less than 10% of all maple is of a high enough quality to use in musical instrument construction and it takes a trained eye when milling maple to recognize what to mill for this purpose and what to mill for furniture.

Long, straight red cedar (suitable for utility poles) is the most valuable specialty softwood (currently selling for about $1,500 per thousand). Comparatively, conventional saw log cedar currently sells for around $1,000 per thousand.

Floral Greens

The sale of floral greens (typically evergreen boughs, salal, bear grass and huckleberry) is the most profitable non-timber forest product. An active floral industry exists that purchases these products from commercial forests. This is usually done by: 1) contract (per ton basis); or 2) land lease. Land leases average around $5 per acre per year. Leased lands for this purpose can be marginal areas with less value for timber production.

Manufacturing

The community forest could venture into manufacturing wood products for sale. This could include certified and/or locally branded wood products from the Nisqually watershed, as well as other products such as rough sawn board and batten, fence posts and boards, oversize boards and beams, paneling, flooring, and trim. This could be gradually implemented in four stages:

Phase One: Hire existing small-scale sawmill operators to mill logs into sellable product

Phase Two: Construct a small sawmill and drying shed (kiln) and mill logs at a fixed site

Phase Three: Add additional equipment such as an edger and molder to produce products such as paneling, trim and flooring

Phase Four: Continue to grow operation to a larger scale

Revenue model (assumes Community Forest owns mill):

A small milling operation can add significant value to logs while creating additional opportunities for local job creation. Manufactured lumber products can sell for an average of $3/board foot. By way of comparison, this translates to $3,000/mbf for manufactured wood products vs. $450/mbf if raw logs are simply sold on the open market. This value assumes some minimally processed lumber products (e.g. rough sawn board & batten) will be sold for a lower value (e.g. $0.90/bf) and some finished lumber products (e.g. flooring) will be sold for a higher value (e.g. $5/bf).

A small milling operation can reasonably produce 100 mbf (100,000 board feet) of manufactured lumber per year. Based on this assumption, following is a revenue estimate for value-added manufacturing:

$300,000 – ***Gross Revenue*** ($3,000 x 100 mbf manufactured wood)

Expenses:

$ 50,000 – Stumpage ($500 x 100 mbf)
$ 40,000 – Logging & log transport ($400 x 100 mbf)
$ 35,000 – Primary milling ($350 x 100 mbf)
$ 40,000 – Facility lease/mortgage ($400 x 100 mbf)
$ 35,000 – Secondary processing ($350 x 100 mbf)
$ 30,000 – Sales and marketing ($300 x 100 mbf)
$230,000 – Total Expenses

$300,000 – Gross Revenue
$230,000 – Less Expenses
$ 70,000 – ***Net Revenue***

Ecosystem Services

Society is becoming increasingly aware of the need to better consider long-term ecosystem health and its role in supporting human habitation and sustainable economies. Many economists, environmentalists, and scientists are collaborating to assign economic values to specific ecosystem services and are working to develop markets to sell these services to willing buyers such as government municipalities, developers, and non-profit organizations.

The two markets with the most promise in this emerging area are the sale of carbon offsets to defer global warming and the protection of land and aquifers for drinking water and flood storage. Washington State has recently authorized programs such as 'Transfer of Development Rights' to help implement these types of programs.

Christmas Tree Sales

Starting a Christmas tree farm enterprise is a long-term commitment because the trees can easily take six to ten years to reach maturity. During this time there will be no revenue while incurring operating costs for activities such as clearing, planning, pruning, sales, and accounting. Additional revenue could be generated by providing complimentary services such as offering hay rides, a concession stand or other services. Some tree farms have large rooms or buildings that can be rented out for parties at other times of the year. This helps bring in additional income throughout the year.

Revenue model:

1. Convert 10 acres to Christmas trees @ 1,200 trees/acre
2. Manage each acre on a 7 – 8 year rotation
3. Sell 300 trees per weekend for four weekends from Thanksgiving to Christmas @ $25/ tree (1,200 trees): $30,000 gross revenue

Recreation and Commercial Use

The community forest could sell recreation permits allowing people to access and utilize the forest for a variety of recreational pursuits such as hunting, fishing, camping, horseback riding, mountain biking, snow-shoeing, cross-country skiing, etc.

The community forest could also sell commercial use permits to allow for commercial uses of the forest such as guided activities, classes and workshops, filming, etc.

Revenue model:

1. $10 annual permit
2. 2,000 annual users
3. $20,000 gross revenue

Firewood

The Community Forest could sell firewood cutting permits for people wishing to cut their own firewood or it could cut and sell firewood to local buyers. This is a good opportunity to optimize the value of non-merchantable logs and log components left over after a commercial harvest. Additionally, non-merchantable logs resulting from “pre-commercial” thinning could be utilized as firewood.

Revenue model:

1. Assume 500 cords of firewood/year
2. $50/cord fee
3. $25,000/year

Other revenue ideas

The following represent additional revenue opportunities that should be explored:

- Gravel pit

- Cell towers