Forest Management for Small Landowners

Growing Western Red Cedar

Bryon Loucks

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Introduction

Western redcedar (*cedar or WRC*) is a conifer species that is very different from other conifers.

- Like Douglas-fir, which is not a true fir, the WRC is not a true cedar. The true cedars are found in the Himalayas and the Mediterranean area. No varieties of true cedar are native in the U.S., although many people plant them as ornamentals.
- Its needles are unlike other conifers. They overlap each other, like a shingle roof.
- In older trees, the heartwood is very resistant to rot.

Western redcedar

Cedar has always carried a high market value in the Pacific Northwest, but as the supply of it has diminished, the price has risen higher and higher. In 2019 the price almost hit $2,000/MBF several times. The question in everyone's mind is "will the demand for cedar continue?" There is no answer to this question, but you could ask yourself the same question for almost any commercial tree species.

Old growth cedar was easy to split and was highly resistant to decay, so was it used extensively for roof shakes. Second growth cedar grown now is mostly used for fencing and other similar products.

Soils

Planted cedar (*like planted alder*) does not grow exactly like a naturally seeded tree. Primarily they do not like standing water or wet soils. If you have good soil for Douglas-fir, it will also be excellent for cedar.

Winter Dormancy and Frost Hardiness

In the fall, plant growth begins to slow down, and winter dormancy begins. The process is triggered by the shortening daylight hours and reduced temperatures. All plants go through this phase but not all plants begin or end at the same point in time.

Frost hardiness is similar to dormancy but not the same. After around 450 hours of nighttime temperatures between freezing and 40˚ Fahrenheit are recorded, then nurseries generally assume the seedlings have enough cooling hours to lift, pack, and store for field planting. This magic point is generally reached around the end of December or in some years, early January. Those cooling hours give the seedlings a layer of protection from early spring frost after planting. However, they provide no protection if the seedling goes through a warming spell and breaks new vegetative buds. The bud growth is highly susceptible to frost action. If the seedlings are lifted

before the 450 hours are reached, the plants are susceptible to extreme or adverse weather conditions such as a winter cold spell.

If you plant seedlings from your local area, then you have an additional layer of protection in that they will have evolved to break bud after the date of most hard frost. A seedling from 2,000 feet will break bud long after a seedling from 500 feet elevation.

Nursery Issues

- Since few forest landowners are planting cedar, the nurseries are reluctant to raise stock on speculation. All it takes is one to two years of bad sales for a nursery to decide to not raise cedar.
- Cedar does not break bud like other trees which makes it very difficult to tell when it has started new growth and stopped in the fall. About the only way to tell in the spring is to measure a known terminal every week. We do know that it starts its growth phase earlier than most conifers in the spring and grows later into the fall than other conifers. But since it is difficult to tell when it shuts down in the fall, it is also difficult to know when to start and end the collection of cooling hours.
- Before you make plans to plant cedar, be sure to check the market availability of seedlings. The Department of Natural Resources Webster Nursery has a good track record of raising WRC for public sale, but because availability is limited,contact the DNR to inquire the best way to purchase from them.

Growth Rate

Most foresters will tell you that cedar is a slower growing species than Douglas-fir. However, some companies that are planting cedar and fencing the site to protect it from animal damage feel the juvenile growth is just as good as Douglas-fir. Little research has been done on growth and yield of cedar because it has never been considered a profitable species to plant.

If the trees can be protected beyond the browse and rubbing stages, they should have as rapid a juvenile growth as most conifers. In one of the fenced sites, I am familiar with, the growth rate has kept up with most Douglas-fir.

How Many Trees to Plant

No one knows just how many trees should be planted. One research forester told me that when planted closer than Douglas-fir, the species is a bit more cylindrical in its growth. If so, a few more seedlings per acre can be planted, and the yield per acre should be like Douglas-fir and perhaps better.

Look at *Chapter 13, "Growing Douglas-fir"* for some ideas on seedling spacing, then add a bit more if you believe the above.

Whatever level you plant, watch the growth rate for crown closure and ground plant reduction for an idea of when too thin to lower stocking.

Interplanting:

As a young forester I noticed in our company land exam records that natural cedar was never mentioned in the 5-year "free-to-grow" exam, but would appear 10 years later, in the pre-PCT exam (*gathering information on stocking, height, and diameter before pre-commercial thinning at age 13-17*). I wondered if cedar could be interplanted into a 3- to 5-year-old plantation that was young enough to provide some cover and yet not exclude the needed light for growth.

Cedar interplanted in the brush

Cedar is a semi-tolerant species, meaning it will grow in a semi-shaded environment. It likes sunlight, just not the hot sunlight of a late summer afternoon. The healthiest looking cedar are always those with partial shade.

- I never had a chance to try this on industrial lands but have been trying it on our personal tree farm for the last few years and it seems that some of the cedars are staying hidden and avoiding deer browse.
- As this article is being written in 2020, we have just finished interplanting 2,100 plug +1 cedar seedlings in the holes and brushy areas of a 3-year-old, 26-acre Douglas-fir plantation. If past experiences are any indication, we will have about 50% of them non-browsed next year, and an unknown number surviving until the thinning stage. That isn't great survival, but we are willing to accept it to both fill in some of the lightly stocked areas and add some diversity to the stand.
- I recently learned that fellow forester and forest landowner Duane Weston has been successfully doing this for over 30 years on the Pilchuck Tree Farm in Snohomish County.

> *As so often in life, we think we have a great new idea, only to discover one or many "someone's" had thought of it long before we did! Way to go Duane!*

Wildlife Damage – Browsing

Columbian black-tailed deer (*Odocoileus hemionus columbianus*) and Roosevelt elk (*Cervus canadensis roosevelti*) can do mild to severe browsing to trees of any species, but they are especially fond of western redcedar. The intensity of the problem will vary by location and time of year. Most areas will have spring browse issues, but some areas of the state do have winter browse issues, and some have issues in spring, fall, and winter. If you want to plant cedar, check with your neighbors to learn when they experience the browse and any of their experiences before you plant or try any of the protection methods described below.

Browse is usually a bigger problem on cedar than on Douglas-fir. To deer, cedar is like a bowl of ice cream to a young child! Deer and elk both like cedar so much that they often will browse not just the terminals, but all the lateral branches too, leaving just the stem. Douglas-fir often become bushy from browsing but usually will recover and outgrow it. Often cedar can't bounce back from the heavy browse it receives, so deer and elk browse can kill it! Most landowners who plant cedar find that some protection is required to establish a cedar plantation.

10 year old heavily browsed cedar

Also see *Chapter 10, "Wildlife Issues"*

Browse Protection Methods

Rigid Seedling Tubes (Vexar)

Vexar can be placed over the seedling and secured with two bamboo stakes. Tubes must be pulled up as the tree grows. Vexar comes in various sizes, 3¾- to 6-inch in diameter and 18- to 36-inch heights. The largest diameter works best.

Ced[illegible]

- Before you spend the money for tubes and bamboo, make sure that you realize that they take a lot of maintenance. Even if you are watchful, the deer and elk will pull them off and browse the trees before you get there to repair them. Each year, and sometimes during the summer season, you will need to pull them up to protect the terminals.
- The tubes also tend to create high angle branching and deformities on lateral limbs and there can be major growth reduction.
- Another issue is that deer are extremely smart and will learn how to find ways around almost anything you can do. See our personal story below.

Tiller netting

Tiller Netting

A fellow forester, Tom Westergreen, who lives in Whatcom County uses lightweight Tiller netting that he places over the entire seeding prior to the winter months, which is

when he has browse problems. He takes it off in the spring so the netting does not confine the new growth and puts it back the following fall. He has no spring or summer browse so can let the terminal grow without all the netting "pull-up" operations.

Repellents

There are several "big game repellents" on the market (DeerAway, Plantskydd). They are effective but wear off in sunlight and rain. They are sprayed on the tree or terminal and need to be resprayed two or three times over the browse season as the seedlings grow. The biggest disadvantage is the cost in both product and labor, and the need to be timely with your treatments. Home remedies like bars of soap and fabric dryer sheets have not proven to be effective. (*See Ch. 10, Wildlife issues for more information)*

Bud caps

Some people like bud caps, but I do not believe they are effective on Douglas-fir and especially not on cedar. To me, installing them is a very time-consuming process to protect only 1 to 3 inches of terminal growth. I have seen where deer will reach down inside netting to browse the terminals and assume they do the same to bud caps. In addition, a newly planted seedling is very succulent and with a bud cap on the terminal, it may tend to fall over, especially with rain and wind action.

Bud cap on Douglas-fir

A few years ago, I frequently drove past a newly bud-capped plantation that had 99% of the seedlings in an extremely bent over position - definitely not good for the seedling height growth!

Plant with a Sitka Spruce

- Plant two seedlings right next to each other, one cedar and the other spruce, the sharp needles of the spruce may deter the deer from browsing. The spruce may protect the cedar if it grows as fast or faster than the cedar.
- At some point the landowner will have to come in and remove the spruce because the two trees are too close to each other to both continue living.
- One serious disadvantage is the doubling of cost for planting, tending, and thinning the stand!
- This was first done on industrial forests in the coastal areas of Washington and Vancouver Island where Sitka spruce grows naturally. The companies that tried it that operated along the coast had good to average results.
- Now numerous small landowners in the I-5 corridor have tried it, and some have been very satisfied. Between the Sitka spruce growing slower in the I-5 corridor, and the Spruce budworm, the cedar may outgrow the spruce leaving it free for deer browse.

Browse Resistant Cedar

Deer and elk eat a variety of vegetation, both woody shrubs and trees like cedar and Douglas-fir and ground forbs and grasses. The palatability of those foods can vary by texture, toughness to chew, and the flavors produced by its chemicals. When a plant like Douglas-fir or cedar has young succulent spring growth and it taste good or is chemically made up of compounds they need (*like calcium for antler growth*), then the animals are more likely to browse them. For many landowners this happens every spring (*new vegetative growth*), fall (*when other ground plants die back*), and in some cases all year long!

The British Columbia Ministry of Forests has had a cedar genetic improvement program since the late 1990s. When a company or agency has a genetic improvement program, they take many daily, weekly, and monthly measurements. From those visits, the Canadians learned that certain cedar trees were browsed more than others. This led to investigating the role of terpenes in the plants.

Plants have several ways to protect themselves (*waxy coatings, toughness, thorns, color, and taste*). The taste or flavor is affected by plant secondary metabolites, including those in the terpene group, and particularly the monoterpenes (*terpenes are responsible for the way a plant smells*). Cedar trees with higher levels of monoterpenes seemed to have less deer browse than plants with lower levels. Other terpenes are present but did not seem to have any effect on deer browse.

By the early 2000s, the BC foresters were trying to isolate the trees with high levels of monoterpenes in the hope of growing cedar seedlings that did not get browsed. Port Blakely in western Washington and the DNR Webster Nursery were instrumental in acquiring some of these seedlings for testing.

A lot of companies, small tree farmers, and foresters were excited to think of having a browse-free cedar! Unfortunately, the field tests were not as successful as they hoped for. As of 2020 there still are no browse-resistant cedar seedlings available. We can only hope that in the future the scientists will be able to produce such seedlings.

Fence the Site

This may sound like a very expensive option but look at the advantages!

- It eliminates the very time consuming and expensive netting and Vexar options.
- As well as preventing browse, it also eliminates later antler rubbing that can kill or severely damage trees and set them up for root or tree bole rot.
- A fence offers the trees a chance to grow with no interference. Fenced sites of cedar have shown a remarkable growth increase over other protection methods.
- Cedar has been considered as a slower growing species than Douglas-fir, but many foresters feel a fenced cedar stand will match the growth of a Douglas-fir stand!
- Cedar can be planted a bit closer than Douglas-fir due to its conical shape occupying a slightly smaller “footprint” area than Douglas-fir.
- The fence protection will allow a bough operation that will help reduce the fencing cost.

If you like this idea, then look for ideas of how to construct a sturdy fence at least 8 feet in height. It does not have to last the entire life of the plantation. 15-20 years would be more than long enough. I have heard of some work being done with the plastic snow barrier material that may be worth looking into.

Cedar in fenced site

I can tell you that at least one small company and some of my tree farm friends are trying fencing because nothing else worked for them. They all feel the expense may not be any greater than other methods, and the long-term benefits of fencing outweigh other options.

Our Experience with Vexar on the B & D Tree Farm

- We have always had a high deer population and major deer browse problems on our Douglas-fir plantations for two reasons.
    - We do not allow modern rifle hunting because homes and children are nearby.
    - Our clearcuts have been small (5- to 8-acres) with lots of cover for the deer in adjacent stands.
- A dozen years ago, we planted two small areas with cedar because they would be shaded by adjacent older stands. Because we expected browse on the cedar seedlings, we put 6” x 4’ tubes with 2 bamboo stakes on the cedar seedlings, and with much maintenance, managed to get a decent cedar stand established.
- However, with more recent plantings, the deer seemed to have learned how to defeat the Vexar tubes.
    - They pulled the tubes up and off the stakes (even with the stakes threaded through the Vexar), then browsed the trees. So, we added two plastic ties to secure the tube to the stakes, which made it harder for us to pull the tubes up as the trees grew.

13 year old cedar that had been protected with Vexar

Vexar pulled off by deer

- Then they started leaning on the staked trees until the stakes broke and they could get to the seedlings.

Our Experience Building a Fenced Site

During the 2021 – 2022 seasons we scarified a 15 acre logged unit that had a very heavy root rot infestation of *Phellinus weirii*. We decided that we had too much *Phellinus* and needed to plant an alternate species that would be tolerant to the diseases. We selected Western Red Cedar because of its 25 year historical growth and an assumption that it would still be valuable at harvest time. If we are correct, the fence may pay for itself in 10 years.

Mike Warjone of Port Blakely Tree Farms, wrote an article on fencing in the Northwest Woodlands, Fall 2020 issue. In that article he found that a one acre fence would have cost around $5 per tree to build. The larger the area, the cheaper per seedling. Their break-even point was at 20 acres. If you are good with your hands, have the necessary equipment to clear a path, take out stumps, have an excess of fencing material, then you can probably build your fence at a lower cost than an industrial company. If you are still interested, then the following is my personal research and experience preparing a fenced site in 2021.

- As mentioned above your lowest cost per tree will be on something 20 acres or greater in size.
- A small dozer or excavator works well to pioneer a fence line, cutting the humps, and filling in the holes.
- Try for a square or rectangle fence to reduce the number of corner posts needed. Each corner or change of direction (*dip in ground, peak in ground, change in direction*) can mean some combination of 5 or more posts will be needed. If you only have deer issues (*and not elk*) then you might get away with fewer supportive corner posts.
- We used old telephone poles cut in 12-foot lengths and 10-foot bracing post on either side, then telephone line posts between 3 or 4, 12-foot steel T-Post.
- A lightweight wire was strung tightly along the top of the fence to hold the netting in place.
- We used plastic deer fence 8 feet in height, but you can also use something I call hog-wire (rectangular with 1x4 on bottom and 4x4 on top), or non-climb horse wire fencing (there probably are multiple options on the wire.
- If you want to harvest boughs from the young seedlings and into the tree stage, then consider some 6 foot or larger gates. You will need some kind of access and wide enough to accommodate tractors or ATVs to the site. There are several commercial gate companies that make 7.5-foot gate in 6, 8, & 12 foot widths (*the company we purchased our game fence from also had the gates*).
- Your fence and gates will need to be 7.5 to 8.0 feet tall to stop deer from jumping over. This means 10-foot post and most likely 12-foot corner post (*try for 12-foot post on the corners and dig 4 foot holes*). If you know you are going to build a fence prior to logging you can also mark fence line trees that can be high topped at 8 feet. They may rot out in 10 years but in many cases that is enough time.

- The bottom of your fencing should overlap the ground approximately 6 inches so deer do not squeeze under the fence (*Because of the undulation of most forest ground, you may find you will need a 5-foot bottom fence that can overlap the ground a full 12 inches*). When Port Blakely Company built their first deer fence, they found that the deer were very inventive in getting under the fence when they could not go over or through the fence. We placed logs, short chunks, and left over log trimmings on the ground, on top of the plastic netting to help prevent deer access at the ground level.
- Consider planting rows of trees like a Christmas plantation, if the ground is clean and uniform enough to do so. It will make it much easier to manage the stand and harvest boughs in future years.
- Also consider planting alternate rows of Port Orford Cedar POC) *Chamaecyparis lawsoniana.* In Oregon there is a root rot (*Phytophtora lateralis*) that attacks the POC, but if your ownership is isolated enough, it may not affect you. By keeping POC separate you can sell the boughs for a higher price and POC can be harvested 9-10 months a year while WRC is mostly a fall pre-Christmas bough crop.

> There is another approach that some are taking and that is planting Port Orford Cedar as the single species due to its bough value. This would be followed by a topping program as the tree reached a height that made it difficult to reach the bough branches. One disadvantage of this is that you cannot hold the POC for final harvest since the only mill in the region that buys POC is down in southern Oregon. The wood is still very valuable to home hobbyists and many construction projects (*far more so than WRC*) so if you know of a small mill that would consider taking your wood then it may be an option.

As is often the case, there is more than one way to look at your fencing project:

- If you have minimal browse and/or antler rub, then you can cut some of the traditional fence building rules by not worrying too much about the corner post and to some extent wander around the site.
- If you know there will be no deer or elk browse damage, then a fence that will last 5 years may be OK for you and depending on where you live you may be able to use non-pressure treated post (*this can be risky*). However, if you do have rubbing damage then you will need something that will last 8-10 years.
- You might be able to get away with a lightweight fencing product but if a deer does get inside it can take 10 men and a mule to get that deer outside the fence! Port Blakely had this experience on their first fencing project and the deer would run all around the inside and occasionally hit the fence at full charge. If you do cut too many corners, you may find your fence cannot withstand the full charge of a running deer. I hate to think what an elk could do if inside your fence. Remember it does not matter how good of a job you do building your fence if someone leaves the gate open!

Wildlife Damage - Antler Rubbing

From mid-summer through fall, male deer and elk need to rub their antlers to remove the velvet (*also known as horning*). They prefer trees that are 5-10 feet tall with a bole that has become stiff. Pine trees are their first choice, followed by cedar, then Douglas-fir. If you don't have any pines, then cedar becomes their species of choice!

Antler rubbing

There is not much you can do to protect the young trees from rubbing damage. If you are lucky, the damage will be confined to one side of the tree, and it won't die. If you are unlucky, they will break the tree off at the 3- to 4-foot level. Elk are larger and have a more massive set of antlers, so can do even more damage than deer, and for a longer period of time. (*Elk will also straddle the tree and walk it down to browse the top branches.*)

We have been leaving the Vexar tubing on the base of the cedar after the terminal is above the browse level, to try to hinder or maybe even stop the rubbing damage. The issue we are having now is that the Vexar begins to break down in 3-5 years, leaving a messy area around the trees. It's too early to say if this will be successful. My fear is that the deer or elk will just rub the tree a bit higher up the tree bole.

Closing Comments

Douglas-fir is the bread and butter of most forest landowners in western Washington and can be pretty much grown by following well-established procedures. Cedar is an extremely valuable product to raise but does not have the same "recipe for success."

- Cedar is a more difficult species to grow in the nursery.
- It will take more time and effort to raise.
- It is not as forgiving as Douglas-fir from browsing and environmental factors.
- Animal damage is a serious problem and can kill cedar.
- If the browse does not kill the tree, then antler rubbings can cause a lot of stem damage.
- Fortunately, not everyone will experience cedar browse like I have described, but for those who do, it can be a very painful experience.
- Overall, it is much more difficult and time-consuming to get a stand of cedar established than a stand of Douglas-fir.

References

Diversifying Your Forest with Western Redcedar. Fellow retired forester Tom Westergreen, who lives and worked in Whatcom County, has written an excellent paper on his experiences with western redcedar.

The articles below relate to browse resistance research.

Breeding for Growth Improvement and Resistance to Multiple Pests in *Thuja plicata*. John H. Russell and Alvin D. Yanchuk. USDA Forest Service, Pacific Southwest Research Station, General Technical Report PSW-GTR-240.

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