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Coppicing

A method of harvesting wood products while regenerating a forest

Forests around the world have evolved with and through disturbance. For millennia, tree and shrub growth has been periodically set back by fire, floods, disease, insect outbreaks, and animal browse/trampling. In response to this, many trees and shrubs evolved the ability to send new growth up from their stumps (called "shoots") and/or roots (called "suckers") when they are cut.

Figure 1. A coppiced "stool" with one year of regrowth

Coppicing is the practice of cutting trees and shrubs in a way that stimulates them to shoot or sucker back up. Evidence of coppicing dates back to pre-history, with the practice providing early humans with a sustainable source of wood products for fuel, building and crafting materials, and livestock fodder. Although the name "coppicing" is rarely used in North America, the practice continues to be prevalent in modern forestry, eliminating the need to replant cut-blocks of species that can shoot/sucker back up such as trembling aspen (*Populus tremuloides*) or balsam poplar (*Populus balsamifera*).

The following factsheet provides a brief overview of the relevance of coppicing for landowners in Alberta, ideas for different coppicing systems, and guidance on proper design and management of a coppiced forest.

Why Coppice?

When properly done, coppicing has the potential to provide landowners with two main benefits:

- **A sustainable source of wood products**, such as biomass/firewood, lumber, mulch, fodder for livestock, and crafting materials (e.g. basketry, tool handles, furniture, etc.). Wood for these products can be harvested with relatively low input costs at regular intervals that can range from 3 years (e.g. for willow as biomass) to 50+ years (e.g. for oak as lumber). Well-managed coppicing can even extend the lifespan of certain species, and there is evidence of trees that have been continuously coppiced for centuries.

- **Forest regeneration and potential expansion.** Coppicing opens up gaps in the canopy for sunlight to penetrate, increasing productivity in the understory. If done at an appropriate scale, this can improve habitat for many species of wildlife. Further, coppicing can promote the expansion of forests into non-forested areas through root suckering, if it is done to species that can send up root suckers (see Table 1).

Table 1. A list of common tree and shrub species in Alberta that are capable of root suckering.

COMMON NAME	SCIENTIFIC NAME	COMMON NAME	SCIENTIFIC NAME
TREMBLING ASPEN	*Populus tremuloides*	Red-osier dogwood	*Cornus sericea*
BALSAM POPLAR	*Populus balsamifera*	Snowberry/buckbrush	*Symphoricarpos ssp.*
PLAINS COTTONWOOD	*Populus deltoides*	Rose species	*Rosa spp.*
SASKATOON	*Amelanchier alnifolia*	Raspberry species	*Rubus spp.*
CHOKE CHERRY	*Prunus virginiana*	Beaked hazelnut	*Corylus cornuta*
PIN CHERRY	*Prunus pensylvanica*	Round-leaved hawthorn	*Crataegus chrysocarpa*
WOLF WILLOW	*Elaeagnus commutate*	Silver buffaloberry	*Shepherdia argentea*
Sandbar Willow	*Salix exigua*	Seabuckthorn	*Hippophae rhamnoides*

Planning a Coppicing System

There are a variety of different types of coppicing systems. **Simple coppicing systems** involve the management of a single species of tree or shrub to create an even-aged single-story structure in each "coup" or "cut-block" (section of forest to be coppiced on rotation). **Coppicing with standards** involves the integration of an understory coppicing system with a partial overstory of "standard" trees that provide timber or other products and are typically on a slower harvesting rotation. **Pollarding** is the coppicing of trees or shrubs at a height above where livestock can browse, facilitating the integration of livestock into the rotations.

Figure 1. A coppice in progress in Europe among standard trees

Each of these types of coppicing systems can be done with different species, in different layouts, on different rotation intervals, and to meet different goals. For

example, while coppicing is often associated with forested environments, it can also be applied in more open agricultural landscapes in the form of coppice-able shelterbelts or riparian buffers. In such cases, each coup may provide ecosystem services that benefit surrounding crops or livestock (e.g. shelter, snow trapping, pollinator habitat) while also being an alternative source of revenue.

Given the number of options out there, it is highly recommended that you take time to carefully plan out how your coppicing system could be designed to complement other activities occurring on your land base before getting out the chainsaw. Key questions to ask yourself include:

- **What wood products do I want?** Desired wood products will affect the species you choose to coppice and the age of the species at coppicing. Table 2 includes a list of wood products of common species in Alberta that can be coppiced. Note that coppicing can also increase production of non-woody products – for example, coppicing an aging saskatoon stand can rejuvenate berry production, if the regrowth is pruned properly (AARD, 2013).

Table 2: A list of species commonly found in Alberta woodlots, and the potential wood products each can provide.

COPPICED SPECIES	COMMON WOOD PRODUCTS
TREMBLING ASPEN (P*OPULUS TREMULOIDES)*	Engineered wood products (Oriented Strand Board (OSB), Oriented Strand Lumber (OSL), Plywood, etc.), Pulp
BALSAM POPLAR (P*OPULUS BALSAMIFERA*)	Engineered wood products, Pallet wood, Bioenergy Fuel
WHITE BIRCH (B*ETULA PAPYRIFERA*)	Hardwood Lumber, Pallet wood, Ornamental wood
WILLOWS (S*ALIX* SPP.)	Ornamental wood, Bioenergy fuel
RED OSIER DOGWOOD	Ornamental wood
CHERRIES (*PRUNUS* SPP.)	Tool handles, Carving wood, Smoking wood

- **How often do I want to be able to harvest these products, and in what quantity?** The desired frequency and volume of harvest will affect the species you choose (faster or slower growing) and the size of your coup). A coppicing system may be sustainably harvested every year if the number of coups equals the number of years in the planned rotation.

- **What additional services do I want to enhance through coppicing?** Coppicing systems can be tailored to provide a number of other ecosystem services. A list of these services is provided in Table 3, along with basic tips for designing your coppicing system to provide them.

Table 3: A list of non-monetary benefits to coppicing

SERVICE	EXPLANATION	DESIGNING FOR THE SERVICE
INCREASED BIODIVERSITY	Coppicing systems create a heterogenous forest structure with patches of younger and older trees and shrubs, which can provide diverse habitat sites.	When a coppice is established, cutting coups of different shapes and sizes on staggered intervals allows for varied forest and age structures that can support a high biodiversity. This can be furthered by leaving standards and avoiding harvesting in sensitive riparian area or during bird nesting season.
WOODLAND EXPANSION	Coppicing stimulates new growth from the roots of certain species of trees and shrubs that can sucker (see Table 1)	Strategically coppicing trees and shrubs on the edges of forests can help to stimulate suckering and new growth outward
IMPROVING TREE HEALTH	Coppicing rejuvenates a tree by maintaining a youthful stage of growth.	Coppicing healthy older trees and shrubs may stimulate regrowth and improve their longevity. Note that trees and shrubs that are severely stressed or dying may not recover from being coppiced.
CARBON SEQUESTRATION	As trees take in carbon from the air as they grow, the repeated harvesting of a fast-growing wood can allow for the storage of a large amount of carbon.	If a woody crop is harvested at the peak of the species carbon sequestration rate, a maximum amount of carbon can be pulled out of the air and stored. It is best if the wood products are used for long term wood products, like lumber or ornamental wood, to ensure the carbon is stored for a long time.
FIRE RISK REDUCTION	Coppicing can remove older wood or brush that may be a fire hazard. Or prevent it from getting old enough to become a hazard.	The initial coppice may thin out and remove older wood that may pose a fire hazard. Timing subsequent coppices to prevent dead wood from accumulating will lower the fire hazard in a forest.

Implementation

Coppicing can be implemented in a variety of different ways, depending on the scale of the system and type and size of wood being harvested. For centuries, coppicing systems were managed using a variety of hand tools, including specialized axes, billhooks, and saws. Nowadays, large scale coppicing of trembling aspen is done by the forestry industry on crown land using specialized commercial harvesters. Recent years have also seen innovations in machinery that can efficiently coppice rows of short-rotation species (e.g. willow) growing in agricultural settings.

Figure 3. A willow coppice being harvested for biomass

Irrespective of the scale of the system and the equipment used, the following best practices are almost always recommended when implementing coppicing:

- **Coppicing in the dormant season**. Coppicing should be done when trees are without leaves, as a relatively high proportion of the trees' energy will be in their roots. If larger equipment is being used, coppicing should only be done when the ground is completely frozen to reduce damage to soil.
- **Making clean cuts**. To reduce the spread of disease and allow for rapid healing and regrowth, a coppiced stump should be cut smoothly across (ideally at an angle so that water does not pool on it), with care taken to avoid ripping its bark or leaving uneven surfaces.
- **Choosing healthy trees/shrubs**. Coppicing can rejuvenate a tree with energy to bounce back, or it can be the final blow to a tree that is already in its final years. Counterintuitively, regular coppicing can actually keep a tree "young" and healthy, with some coppiced trees reaching over 2,000 years in age!
- **Balancing growth and harvest cycles to prevent nutrient depletion**. Very short rotation times (like those for willow) may result in a degradation of soil nutrient stores. However, this may be counteracted with the use of fertilizer (e.g. manure, compost) to maintain efficient harvesting schedules.

Conclusion

Coppicing trees and shrubs can provide valuable wood products while regenerating forests without the need for manual planting. The technique has a long history among diverse cultures around the world and continues to be practiced within Alberta's commercial forestry sector, albeit with different terminology, equipment, and operational scale. There is significant potential to build on both traditional and modern knowledge and practices in designing and establishing coppicing systems on private woodlots and farms in Alberta that can provide alternate income sources and ecosystem services.

To learn more about coppicing and its appropriateness for your context, check out some of the resources below or contact the Agroforestry and Woodlot Extension Society directly.

Further Reading

Unrau, A., Becker, G., Spinelli, R., Lazdina, D., Magagnotti, N., Nicolescu, V.N., Buckley, P., Bartlett, D., Kofman, P.D. (Eds.) (2018). *Coppice Forests in Europe*. Freiburg i. Br., Germany: Albert Ludwig University of Freiburg. Available from:https://www.eurocoppice.uni-freiburg.de/intern/coppiceineurope-volume/coppice-forests-in-europe-2018-09-10-final-small.pdf

Alberta Agriculture and Forestry. 2017. *Woodlot Management Guide for Alberta.* Department of Agriculture and Forestry, Crop Extension Branch, Edmonton, Alberta. Available from: https://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/apa15536/$file/woodlot-book%20rd.pdf?OpenElement

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