Issue No. 47—Spring 2020

Montana Family Forest News

Tree Seedlings – Species, Timing, Natural or Planted?

Tree regeneration can be most frustrating for landowners and professional foresters alike. All too often you don't get enough to fully restock the forest, or you get far too many seedlings that develop into a stressed and stagnant stand of saplings that are ready to explode into a ball of flame when the next hot summer promotes a wildfire. This issue explores the different factors and considerations for meeting your objectives. Like most forestry applications, there is no absolute "right and wrong", and a lot depends on what and when you manipulate your forested site, and a good dose of luck. Success requires an open mind, a willingness to experiment a little with your specific site parameters, patience, and a desire to make the best of what you get. For growth, trees need to be close enough to promote self pruning, and far enough apart to allow for adequate light and soils resources. The ideal spacing changes as trees get older and is specific for each species and site. Wildlife cover may require dense clumps of trees in certain places, where as wildfire hazard reduction wider spacing. Your forest is your canvass, and how you select and manipulate your trees is your vision. This issue offers the perspective of how to get the right tree regeneration from several experienced and knowledgeable landowners/foresters.

From the Editor's Desk

This newsletter is possible through funding from the Renewable Resources Extension Act (RREA). It highlights numerous articles focused on information and resources that forest landowners can use to better their knowledge and potentially implement on their own land. The overall concept is to provide articles that capture one's attention based on current issues and updates on various organizations on a state and national level. Our goal is to provide articles that will give important information and encourage landowners to develop new ideas towards their land. If you wish to view the full color version of this newsletter and for additional articles such as landowner spotlights please go to our website at http://forestry.msuextension.org/publications.html

Warm regards,

Christina Oppegard

Designer:
Christina Oppegard
MSU Extension Program Manager

Editor
Peter Kolb
MSU Extension Forestry Specialist

Advisor:
Cindy Peterson
MSU Extension Associate Forestry Specialist

Financial Contributors:
Montana Tree Farm
Montana Stewardship Foundation
Montana State University Extension Forestry
Montana Forest Owners Association

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A Message from Maryland

By: Jared Richardson, Montana Tree Farm Chair

Several of us from the Montana Steering Committee have just returned from the American Forest Foundation's National Leadership Community Conference (commonly known as the National Tree Farm Meeting) hosted in Baltimore, Maryland. This meeting is hosted annually in a different location throughout the country and highlights important issues the local Tree Farmers are facing and how they are tackling them. One common theme at this year's meeting was getting landowners engaged and involved and taking advantage of cost share programs. There are a myriad of cost share programs available in Montana with many county or region specific pools of cost share dollars available; please contact your Tree Farm inspector to see what programs you qualify for.

One interesting topic covered in Baltimore related to having impacts on forest health at a watershed level. Much of Maryland's forested land is within the Chesapeake Bay watershed (which spans six states but the bulk of it lays within Maryland) and how essentially anything done on forest land in Maryland could ultimately impact the Chesapeake Bay Ecosystem. Another key point was that much of the trees on forested land in the Eastern and Northeastern US is essentially the same age (60-80years) and is in the middle stages of forest succession. There is little variation in forest cover across millions of acres and many wildlife and plant species depend on both early and late successional forest types. Tree Farmers are poised to have an impact on a large scale by managing their forested properties to diversify the dominant tree type and age, promote best management practices and responsibly use pesticides and herbicides.

Another repeated topic was that of diversity and inclusion and at this year's conference there was a lot of discussion about "people who don't look like me." Keynote speaker Mary-Frances Winters talked about how we have different backgrounds and experiences and how that shapes our world views and influences how we interpret situations. It was a good reminder that Tree Farmers have different stories and own and manage their lands for different reasons. One important takeaway from all of the discussion about diversity was that despite our differences everyone involved with Tree Farm shares a passion for Wood, Wildlife, Water, and Recreation and that if you have questions about your property or are having a difficult time with an issue, the network of people in the American Tree Farm System is a great resource help you.

We also did a workshop where AFF staff asked for feedback on what should go into the next round of ATFS Standards which will begin go into effect by 2021 and must be fully adopted by 2022. Thing's like "Keep it Simple" and "How do I identify FORI?" were repeated often from folks across the country. So I will close with the request that if you have concerns or something specific you would like to see go into the new ATFS Standards for Sustainability please reach out to me and I will make sure it gets relayed to the National Office. With that final message, spring breakup is upon us (in most places in our vast state), the snow will soon melt and we can start to think about working on all those projects that the snow put a halt too. Until next time, happy Tree Farming!

2019 Chrisman/Wiley Family Forest Field Trip Experience

Submitted by: Holly McKenzie, current vice chair for Montana Tree Farm Steering Committee

Photos are courtesy of Holly McKenzie, Montana Tree Farm

This past June we were treated to a unique field trip experience in the North Fork of the Flathead River Valley. Your past chair for Montana Tree Farm, Allen Chrisman,manages a Tree Farm on family property just south of the Canadian border. He and his sister Kari Wiley, husband Tim, and Charlotte Chrisman hosted a tour and luncheon at the old homestead. There were approximately 35 landowners in attendance.

Sharing your tree farm is something any landowner is welcome to do during the year and although we highlight several tree farms during our Annual Fall Meeting, we never get to see the bulk of great management so many of you are doing on your forested acres. Allen Chrisman lined up the details of the tour and designed some postcard invitations to send out to tree farmers in the greater vicinity. He invited in key speakers for the day and it was a casual and relaxing event where we could all learn from a recent harvest, thinning, and planting on the Chrisman/Wiley forest.

The tour started at the Sondreson Hall, a community center north of Polebridge, Montana, where we met for coffee and snacks and an overview of the recent project we were going to see. Our tree farmers have a long history of working with the Natural Resources Conservation Service to get cost share funding for pre-commercial thinning work. Our local NRCS conservationist, Sean Johnson, was there to answer questions about EQIP (Environmental Quality Incentives Program) thinning. Long time steering committee member, Mark Boardman, from F.H. Stoltze Land and Lumber Company, was the forester helping Allen market his logs and manage this recent timber harvest.

We carpooled up to the Chrisman / Wiley Family Forest and stopped to view several acres of commercial thinning and overstory removal where some massive old legacy larch guard the entrance road into the cabins. Shelby George and Floyd Quiram were the loggers who had thinned the forest during the past winter and they were both on site to answer questions and discuss challenges on this parcel.

We stopped at a pre-commercial thinning stand where Allen has been thinning out young lodgepole pine to a 9-12 foot spacing. We had our DNRC service forester, Rick Moore in attendance to discuss the slash disposal options on this site and the opportunities for nutrient recycling of tops and limbs, and pulpwood following logging projects.

A delicious lunch broke up the afternoon. The Wileys and Chrismans have a lovely cabin with fantastic views and they provided a meat entrée while the Tree Farmers in attendance brought potluck items to share. It was a beautiful day with very few mosquitoes! You never know when you head out in June what Mother Nature might dish up!!!

The Chrismans/Wileys also showed off the bear rub trees in their Cabin Complex. Game cameras mounted on neighboring trees captured excellent photos of grizzly and black bears enjoying "scratching their backs" on the trees. Allen likes to quip that "we grow grizzly bears and harvest the occasional lodgepole pine sawlog," and the photographic evidence "bears" that out!

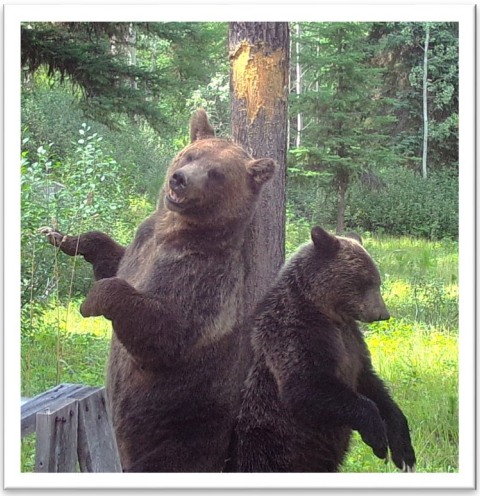

Photo by: Allen Chrisman, game camera

For the remainder of the afternoon, we hiked to a tree planting unitwhere regeneration harvest took place and scattered western larch and Englemann spruce seedtrees were left to stand sentinel over the planted seedlings. 5,400 western larch, Douglas-fir, blister-rust resistant western white pine, and ponderosa seedlingswere planted at a 12' spacing. Survival looked excellent at our June tour. Summer 2019 was cool and wet which allowed for better seedling survival rates than the previous two summers

Photo courtesy of Holly McKenzie

with hot dry smokey conditions. While the unit was planned for natural regeneration, excess seedlings were available in May from Stoltze. Couple that with funds available through the harvest, and Stoltze's planting contractor available to plant the seedlings, and the Chrismans/ Wileys jumped on the chance to get their new stand established immediately.

Our last stop was a hike to the lower riparian zone and legacy stand of Douglas-fir trees. The Chrismans and Wileys are facing some Douglas-fir bark beetle attacks on their larger trees and we had time to discuss options and opportunities for this portion of the property. There were also some nice aspen stands where conifer trees were encroaching and threatening to outcompete the aspen, therefore they were removed or thinned during the recent logging project. In the same manner, conifer trees encroaching into natural meadows were removed. These treatments will enhance the wildlife habitat values in the stands. We reviewed a dry stream crossing where the loggers helped to choose a safer, stable route to prevent erosion and un-necessary soil damage when spring runoff occurs.

All in all, this tree farm tour was a great opportunity to learn and grow with other fellow Family Forest Owners! Consider organizing your own educational field trip opportunity. The Montana Tree Farm Steering Committee is willing to help. It may fit in well with our next Annual Fall Meeting tour for your region of Montana as well. If you would like more information or would like to host a Forestry Field Day, email us at montanatree-farmsystem@gmail.com.

Photos are courtesy of Holly McKenzie, Montana Tree Farm

montana TREE FARM system

You're Invited!

Montana Tree Farm's Steering Committee cordially invites you to join the statewide Annual Tree Farm Meeting. The event kicks off with coffee and pastries at Mark's Lumber followed by two Tree Farm field tours. Transportation will be provided. The tours will be followed by lunch, a silent auction, and a short business meeting.

Tree Farm Annual Meeting
Saturday, October 3, 2020
8:00 am to 2:30 pm
Mark's Lumber, 15 Lump Gulch; Clancy, Montana
8 miles south of Helena!

To register, simply fill out the form below.
Mail the form along with a check for registration to:

Montana Tree Farm Program
PO Box 17276
Missoula, MT 59808
For Questions Please Call 892-4141 or e-mail glynholly@gmail.com

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Montana Tree Farm Annual Meeting Registration Form
Saturday, October3rd, 2020
Registration form and $30 fee per person ($12.00/person for 18 years of age and under) are due to Montana Tree Farm by September 30th.
Attendance limited to 100. Pre-registration required.

Name(s): _____

Postal Address: _____

Phone : _____ E-mail: _____

Lunch will include: Catered Meal served in the Mark's Lumber Planer Building.

Number of persons attending: _____ Amount enclosed: $ _____
*If tour is filled, late applicants will be notified as soon as possible.

Mary Naegeli Memorial Scholarship

$1,000 in 2020

MT Tree Farm offers a $1,000 scholarship annually to a resident of Montana enrolled (for the first time) or attending any accredited institution of higher education, on a full time basis, have a cumulative grade point average of 2.5 or above, and must demonstrate an interest in forestry.

Applicants must have a Tree Farmer or a Tree Farm Inspector as a reference. Perhaps you know someone who qualifies for this scholarship. If so, please let them know about this great opportunity.

Contact Cindy Peterson at 406-243-4706 or cindy.peterson@umontana.edu to be connected with one. Form more information and how to apply go to: http://www.mttreefarm.org/about-us/scholarship.html application are due May 31, 2020.

The objective of this scholarship is to help a student with an interest in forestry and also to provide information to students about Tree Farm and the family forests of Montana. Making a connection between future foresters and land managers can lead to the development of long term personal and professional relationships.

Mary Naegeli Memorial

Each year the Montana Tree Farm System recognizes a deserving college student with an interest in forestry and a resident of Montana with a monetary scholarship. At the 2017 Montana Annual Meeting, the membership unanimously approved a recommendation to name the scholarship the Mary Naegeli Memorial Scholarship after long time Tree Farm member Mary Naegeli

Would be willing to support the Montana Tree Farm System by contributing to the Mary Naegeli Memorial Scholarship?

YES, I would like to show my support in promoting the Tree Farm System by contributing to the Mary Naegeli Memorial Scholarship:

$_____.

Please make your check payable to **Montana Tree Farm System** and return it with this slip to:

Montana Tree Farm System, Inc.
P.O. Box 17276
Missoula, MT 59808-7276

The Montana Tree Farm System is a 501 (C) (3) Organization

DENNIS SWIFT MEMORIAL

Tree Farm Inspector Recognition Award

Each year the Montana Tree Farm System recognizes the top Tree Farm Inspectors at the annual state tree farm meeting. These inspectors along with the many other Montana Tree Farm Inspectors volunteer their time, equipment and vehicle use in promoting the Tree Farm System through their certification and inspection activity.

Are you willing to support Montana Tree Farm Inspectors by contributing to the Dennis Swift Inspector Recognition Award?

YES, I would like to show my support in recognizing the importance of our Montana Tree Farm Inspectors in promoting the Tree Farm Program by contributing to the Dennis Swift Inspector Recognition Award:

$_____.

Please make your check payable to Montana Tree Farm System and return it with this slip to:

Montana Tree Farm System, Inc.
P.O. Box 17276
Missoula, MT 59808-7276

The Montana Tree Farm System is a 501 (C) (3) Organization

We want you... and your nominations!

The Montana Tree Farm committee is looking for nominations for Tree Farmer, Educator, and Logger of the Year. Nomination forms can be found at www.treefarmsystem.org/montana the "Awards" section. Please contact Allen Chrisman at 406-249-3160 or achrisman52@gmail.com for more information.

Nominations are due by July 1, 2020.

Image credit: https://corrvnons.wikimed ia.org/wiki/File:Uncle_Sam_9628pointirg_finger%29.jpg

Tree Regeneration in Western Montana

By :Debra Parker Foley, President, Montana Forest Owners Association

Over 16 years agao, both natural successional tree regeneration and tree plantation occurred on my non-industrial private forest, after experiencing a stand-replacing wildfire on 23 acres of Douglas Fir /Ponderosa Pine/Western Larch habitat in Western Montana.

Before acquiring the 23-acre property, it had been commercially logged several times since the 1970s, leaving it over-stocked with second and third-growth Douglas-fir, suppressing further understory growth of natural successional tree species. Before the stand-replacing fire, I had been conducting mechanical thinning on my property as much as was affordable, since logging prices were not able to pay for the thinning operation at that time.

Since climate and distance to a living tree are two of the most important factors in determining tree regeneration responses, these factors should be considered when making post-fire or mechanical clear-cut tree planting decisions to give the best likelihood of success for tree regeneration.

My property is mostly north-facing, with adequate soil moisture. After the stand-replacing wildfire in 2003, natural regeneration of Douglas-fir, Ponderosa Pine and Western Larch occurred. Ponderosa Pine and Western Larch were also planted after I conducted a salvage log of the fire-killed stand. Fortunately, log prices at the time had increased, helping to pay for the salvage log and also make some needed income. Also occurring was the prolific natural regeneration of Aspen from seed sources, which were suppressed by the extensive Douglas Fir regeneration after the previous commercial logging over the past 40 years. Not all sites are as conducive to natural regeneration. Over the years, climatic changes and moisture may have changed on a previously forested site causing the vegetative regeneration to move into a different ecological habitat type resulting in lower tree regeneration.

Has the property been affected by climate change, resulting in different natural tree regeneration? Will a property owner be replanting trees? If so, what species of trees will be most apt to do well without any added costs for management. These are factors that forest landowners must consider when conducting tree harvests and/or after stand-replacing events, i.e., wildfire, beetle-kill on their property; and what management decisions need to be made.

Managing an Overabundance of Regeneration

By: Paul Cockrell, Montana Forest Stewardship Steering Committee Chair

My wife Diane and I own 160 acres of forest property in the lower Blackfoot River corridor. The elevation ranges from 3400 feet to almost 4100 feet. The terrain is fairly steep with south, west and east facing slopes. There is a good road system and numerous skid trails that provide fair access to the trees and property. The dominant tree species are ponderosa pine and Douglas fir. The property also has some scattered larch and several pockets of young lodgepole pine. Tree regeneration on our property is too good, particularly with the shade tolerant Douglas fir.

Interested in learning more about how best to manage my property, I enrolled in one of the 2011 Montana Forest Stewardship workshops offered by MSU Extension Forestry. Prior to taking the workshop, my understanding of forest management practices and forest health was limited. After completing the workshop, I quickly realized that I had a dense overstocked tree property in need of immediate attention if I wanted to keep it in a good healthy condition.

I was able to secure assistance from the NRCS's EQIP program and others to help with the costs of the thinning work that needed to be done. In places that allowed for it, I wanted to chip the saplings and branches. In less than accessible areas I hand piled and burned them. I started out renting a chipper, and when a good used chipper came up for sale, I bought it. Most of the wood chips have been left in piles in the woods, but I have used a dozen or more pickup loads for landscape mulch around the house. The wood chip piles quickly shrink down in a couple years to a fraction of their original size. The chip piles hold considerable moisture that they release into the dry summer months, provide some nutrients, and can be used to reduce skid trail erosion during spring runoff.

In places where it has not been practical to bring the wood chipper to the thinned trees, I have been able to bunch the saplings, use a choker, cable, and snatch block to haul them to the chipper. A lot of work, but acre by acre, the thinning is starting to make a big difference in the health, and increased growth of the remaining trees.

We are now seeing an increase in ungulate use of our property. Improved wildlife conditions has been an important goal for our property since purchasing it. The deer, elk, and lately the occasional moose are now enjoying the improved habitat that the thinning work has provided. Fuel load and fire hazard reduction, another top concern for private land forest owners, have been an added benefit.

Managing an overabundance of regeneration is a never ending job. If I've learned anything, it would be thinning and disposing of small regeneration is much easier than waiting for the trees to get bigger and then trying to deal with it!

The Montana Forest Stewardship Steering Committee is looking for interested Montana forest land owners who have completed the Montana Forest Stewardship workshop to serve on our committee. Anyone with questions or interest can contact me at 406 369-2222 or by email at cockrell123@gmail.com. Happy Forestry!

Photos by Paul Cockrell

Forest Stewardship Foundation

By: Ed Levert, Forest Stewardship Foundation Chair

Mark your calendar! The 11th annual forest landowner conference will return to Helena on May 1 at the Delta(Colonial) Marriot . This year's conference is titled "Becoming the Best Forest Steward Possible" and is being co-sponsored by Northwest Management, Inc. There will be numerous breakout sessions of interest to both forest landowners and professional foresters. Make plans to attend the conference by checking out the agenda and registering online at www.ForestStewardshipFoundation.org. . To reserve a room call 406-443-2100 and receive the special rate for the conference of $101.00/night for a single occupancy and $117.00 for a double occupancy plus tax.

You can help the foundation's efforts by donating items for the silent auction. Please contact Sam Gilbert at gilbertas@centric.net or call at 406-410-0546 for more information or check our website for information on donating items for the auction.

Forest Insect and disease issues are always of interest to landowners and foresters so we are sponsoring with the Montana DNRC to bring you a free workshop on this subject the following day, May 2. The workshop will be indoors and at the Delta(Colonial) Marriot from 8AM -12PM. This is an opportunity to bring in samples of your own for identification and receive a valuable guide to forest insects and disease.

If you aren't already a member of the Forest Stewardship Foundation you can join this small energetic organization by registering online with a low dues payment of only $25/year.

Upcoming Events

11th Annual Landowner Conference - Helena, Montana

Is canceled and will be reschedule for 2021

Information is available at:
https://www.foreststewardshipfoundation.org/forest-landowner-conference

Forest Regeneration-What to Consider

By: Ed Levert, Forest Stewardship Foundation Chair

An old Greek proverb says, "A society grows great when old men plant trees." Well an old man might decide he doesn't need to plant trees depending on his objective, but you get the gist. Regardless of what your objectives are, there are a host of considerations when it comes to regenerating a new forest.

If you are planning a timber harvest and there is concern about establishing a new stand, you need to consider many factors including: 1) What species are desirable? 2) Do I have a suitable seed source? 3) Will I have adequate site preparation for seral species, i.e western larch, lodgepole pine, ponderosa pine to either get natural regeneration or planting success? 4) Do I already have enough advance regeneration that all I need to do is protect them while logging and open the stand up enough to release them. 5) Planting a new stand may sound attractive and it certainly can be, but look before you leap. Let's look at each of these factors.

Species- What are your objectives? You need to be looking at species that are adapted to your site. What species do you have now? What species might have been there in the past? Often time a little investigating can turn up new information such as you find old larch stumps, but no live larch trees, indicating that the site might have been high graded years ago, allowing more shade tolerant species to survive.

Seed Source- So do you have healthy, vigorous trees suitable to leave for seed trees or seed trees from an adjacent forest? Natural regeneration is certainly a legitimate prescription for establishing a new stand. Remember, don't put all of your eggs in one basket or depend solely on one species. Diversity over time is your best assurance against insects and disease. That might mean that if you only have one or two species of a suitable seed source you might want to also interplant other species.

Site Preparation- This is a big factor for establishing a new stand. It is not only important to have enough soil disturbance to allow species such as western larch or ponderosa pine to germinate and thrive, but also to minimize the competition from grass, forbs and shrubs. If you aren't careful the grass and shrubs already present are now going to be released and overtop your regeneration. Excavator piling is the most common method of site preparation today unless your site is too steep. If you have the resources and are willing to take the risk of an escaped fire, you can elect to broadcast burn those steep slopes often with good results.

Advance regeneration- So you have a moist site that has an understory of climax species such as grand fir, Englemann spruce, Douglas fir and western hemlock. If the stand hasn't been suppressed for too long and the logging has not damaged the trees excessively you could very well see a terrific growth response from the suppressed stand and not have to do anything. This may be an appropriate response in limited areas, but there are a host of reasons not to make this a general practice. These stands are generally very susceptible to a host of insect and disease issues such as root rots, stem decay, spruce budworm, etc. not to mention susceptibility to wildfire.

Planting- If for reasons discussed above you feel you need to plant than here are some points to consider. Planting can get you a 2-3 year jump on the competition which is no small matter. Don't skip on the quality of the seedlings, the bigger the better. I like container stock, as they are easier to plant and there is less chance of damaging the roots during planting. Are your seedlings from an acceptable habitat and elevation? If you have grass or shrubs present in a planting site make sure you create at least a 2' diameter scalp. You'll need a hoe dag or scalping tool for this. Don't forget to put logs or rocks next to your planted trees for shade when you plant on south or west slopes. Although normally you plant in the Spring, Fall planting can be a great alternative as long as you have enough moisture. Fall planting is especially attractive if you have access problems in the Spring. Often time it is difficult to find a Fall source of seedlings. Check with Montana's State Nursery at mtnursery@mt.gov for planting stock or for those of you who live closer to Idaho you might check out the seedling program available through the Idaho Forest Owners Association.

In summary I hope all of us old men and women give our particular situation plenty of forethought before we harvest timber. While I may not have covered all the important factors in making the decision of how to regenerate your stand, I hope I have at least caused you to think things over. Calling a professional forester before making that decision could save you all sorts of grief.

First, Put Out the Fire!

A new book by Jim Peterson – founder of the Evergreen Foundation and magazine

DALTON GARDENS, IDAHO – What has already been called "possibly the most important wildfire book of our time" has gone to press and is scheduled for a late March unveiling at the Idaho Forest Owners Association annual meeting in Moscow, Idaho.

First, Put Out the Fire! by Evergreen Foundation founder, Jim Petersen, explores the regulatory and environmental factors leading to the West's wildfire pandemic. Petersen has been a working journalist for 56 years. Science-based forestry has been the focal point of his research and writing since 1986.

"First, Put Out the Fire!" is a fast-paced treatise about the devastating impacts of wildfires in western national forests," said Phil Aune, a U.S. Forest Service retiree who reviewed the book. "Jim's narrative style and his grasp of forest history is exceptional. This is an excellent book that deserves its own niche in forestry and forest policy classrooms."

Petersen said that, while it took him about 18 months to write the book, it is based on more than 30 years of researching, interviewing and writing.

"It's a summation of issues and events that have shaped federal policy formation since our national forest system was founded in 1905," he explained. "These policies have always tracked with society's felt necessities in a pattern that looks very much like a sine wave. Today, the major influence is climate change. Following World War II, it was timber supply. But present concern for forests and the environment can be traced to *Man and Nature,* a small but very influential book written by George Perkins Marsh in 1864, the year before Lincoln's assassination."

Petersen's wife, Julia, Evergreen's resource and marketing director, says copies of *First, Put Out the Fire!* will be available via PayPal on the Foundation's website www.evergreenmagazine.com on March 15 and at the Idaho Forest Owners annual conference in Moscow, March 30-31.

And the source of the book's title? "We have two kinds of fires burning in our nation," Petersen explained. "Killing wildfires are consuming our nation's forest heritage by the millions of acres annually. Then there are the political fires that burn in Washington, D.C. that make it virtually impossible for the U.S. Forest Service to do the forest management and restoration work necessary to reduce the risk and frequency of wildfire."

www.evergreenmagazine.com 406-871-1600

7666 N. Fifteenth Street . Dalton Gardens, Idaho 83815

Contacts:

Jim Petersen jim@evergreenmagazine.com or 406-871-1600

Julia Petersen, julia@evergreenmagazine.com or 971-241-6631

Do Trees Get Viruses?

By: Peter Kolb, MSU Extension Forestry Specialist

Viruses are a unique life form that may represent the most simple form of life as we know it. Some might even question if it is actually a life form or simply a self replicating complex molecule. Unlike singe cell organisms that we all learned about in High School biology, that have a cell wall, nucleus, vacuoles and other organelles that offer a picture of a complex biological system that can replicate itself, viruses are basically protein shells that protect a genetic strand of ribonucleic acid that has the ability to insert itself into the DNA strand of another organism. It then "steers" the host DNA into replicating more strands of viral RNA and the protein shell that houses it. This can kill the host cell, or sometimes just weakens it since it robs the cell of energy for its own replication. Sometimes it disrupts cell DNA and function enough to grow weird shapes. Once a virus has inserted itself into an organism it can be close to impossible to eliminate since it remains a part of the host DNA. Many times the host learns to live with the implanted virus by developing biochemical means to stop it from replicating, or growing protective cells around the virus that results in abnormal growths such as burls on tree branches or stems. A technique of gene splicing to create genetically modified plants actually use a modified virus to implant the desired new DNA into the host plant.

Mosaic discoloration of leaves or needles is often a symptom of a plant virus that has been vectored by a leaf sucking insect such as aphids and leaf hoppers. There is no cure or treatment for tree based viruses other than removal of the infected tree and control prevention by controlling the insects that transmit the disease. Picture from the University of Maryland.

Plants, animals and humans all have their own unique viruses, though the vast majority cannot cross from one species into another. That said, the simplicity of a virus allows it to have greater success at taking advantage of mutations. Every time DNA or RNA is replicated from it original, small errors take place when a chemical bond does not connect properly. It is like photocopying a picture, every time you take a copy and copy it again, small errors make it fuzzier. 99.999% of these errors either cause no impact, or are harmful to the organism, but a rare error may give the organism a new way of doing things. For a virus this may be a new way of chemically connecting onto a new surface or host. Related species have more similar DNA, thus a virus that attacks sugar maple may eventually be able to mutate and attack Rocky Mountain maple, but not cottonwood trees. Viruses, because of their very simple needs for replication can mutate faster because they need fewer things to "go right" within a mutation to jump to another species. That said, the jump still can only take place to closely related species, and thus you should have little fear that a plant or tree virus will mutate and infest humans. On the other hand, a virus that is found in apes or pigs has a much stronger chance of jumping to humans. Some skin viruses have also shown themselves to be capable off jumping from livestock to humans.

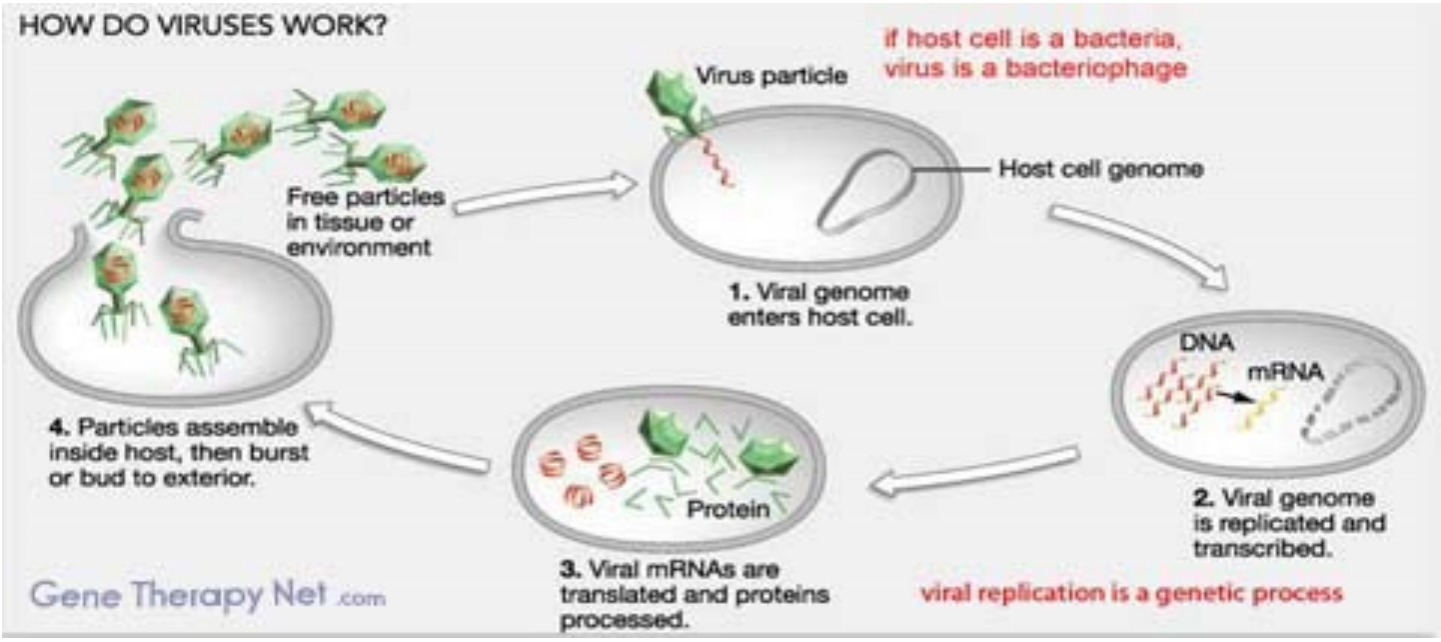
Viruses are true parasites and cannot replicate themselves without another organism. Most of their existence is basically sitting around and waiting to land on the right surface. For this reason, viruses can persist for long periods of time protected in their shells, and is also the reason that space missions have been carefully decontaminated since some scientists have postulated that space might harbor some new and dangerous virus that

when brought to Earth may wreak havoc with living organisms. Though have no fear, to-date no such viruses have been found. That said, because they are the smallest of all "living" organisms, they are very hard to detect until they cause some change in the way another organism grows. Other scientists have also postulated that the melting of perma-frost may expose some long frozen and isolated virus that was responsible for the demise of Neanderthals or Mammoths.

Burl on an ancient western red cedar in Glacier National Park is most likely caused by a century of virus alteration of tree DNA in cambium layer in the stem.

You may have seen illustrations of various virus shapes. Although some plant viruses have complex shapes, most are either tubular or spherical. Many are carried from one host to another by specific vectors, such as insects. Some are carried in pollen and transferred to seeds and seedlings. Commercial vegetative propagation can also be a significant means of dispersal for cultivated woody plants. Because viruses infect all host tissues and can migrate across graft unions, healthy scions soon become infected when grafted to a diseased rootstock and vice versa. Common mechanisms of natural dispersal are through parasitic organisms such as arthropods, nematodes, arachnids, parasitic plants, and root-infecting fungi. Plant cell walls and cuticles are mostly impermeable to viruses and as a result the walls must be damaged, for example by arthropod feeding that also carry and transmit the virus. Some 400 insects are known to transmit about 250 different viruses.

Most viruses have a difficult time surviving outside another living organism because their simple protein cover is pretty thin. One of the most virus damaging agents is the high energy ultra violet light from the sun. The same ultra violet light that sunburns our skin and causes cancer by damaging cell DNA with its energy, also damages or totally disrupts virus RNA. As the solar angle increases closer to perpendicular to the summer solstice, sunlight has to pass through less atmosphere, and thus less UV radiation it blocked by water vapor and ozone making it more intense on the Earth's surface, and thus creating a more hostile environment for viruses. Viruses in leaves and stems are protected by the trees natural sun-blocking mechanisms.



Forest Regeneration—the good, the bad and the ugly!

By: Peter Kolb, MSU Extension Forestry Specialist

Any walk through a forest offers an overwhelming number of things to look at, and the more you learn about a forest, the more you see. With a little bit of practice anyone can learn to identify the different tree species in a particular area. A little more practice and you can learn to estimate each species age and the physiological condition of any tree you might look at. The presence of tree seedlings and saplings is another forest component that may start to attract your attention, especially when dense clumps of seedlings impede your walk. Tree regeneration, especially for particular species, is one of those core elements of any forest conservation and management plan. For a professional forester, regenerating a forest is as essential as estimating tree wood volume and developing a harvesting plan, but it can be much more challenging than the other two.

Picture 1. *Patchy tree regeneration is the result of a specific tree species seeds landing in a spot with the conditions needed for seed germination, rootlet contact with a water source, and minimal seed and seedling predation from rodents and fungi.*

The vast majority of tree species reproduce by producing seeds on an annual basis. If a tree is healthy and vigorous, seeds are produced every year, starting with flowering in the spring, seed production in summer and seed drop through the fall and winter. The vast majority of native Montana conifer species grow seeds inside of cones, that open and drop their seeds between September and April. Some, such as lodgepole pine may produce a percentage of serotinous cones, which stay closed for up to 30+ years and have been designed by nature to protect seeds from insects, diseases and wildfire. The heat of the latter opens the cones and releases the seeds in vast quantities to repopulated post-wildfire scorched earth with tree seedlings. Others, such as the Pacific Yew or juniper species produce a berry, popular with birds that ingest the fruit and spread the seed after it passes through their digestive system. Whitebark and Limber pine produce very nutritious large seeds that remain protected in cones and wait for birds, such as the Clark's nutcracker to pry them out of the cone and bury them in caches in the soil. One nutcracker may deposit as many as 1000 seed caches in the soil every year for feasting at a later date—precisely remembering 99% of the locations. Also known as "stone pines", related species are found around the world and have the same relationship with cousins of the Clark's nutcracker. And then there is the larch species, that produces seeds about the size of a sesame seed on your hamburger bun. Its strategy is to produce a very light seed with wings, that can float for miles across a wind current in order to colonize disturbed soils where ever they may be. Each tree species has its own unique strategy for sowing its seeds and thus maintaining itself across a landscape. One might wonder about all of these unique and amazing strategies that different species have developed, but consider that the pine family (pine, larch, spruce and fir) has been around for 150 million years. That offers plenty of time for multiple seed strategies to develop and then subsequently succeed or fail.

Producing seeds in copious amounts is an energy commitment for trees, and thus most tree species will produce some seeds every year, but massive seed crops every several years. This allows for trees in stressful environments to store energy for one major seed crop every 2-30 years. Wildlife biologists call these "mast crops" for animals that rely on tree seeds for a major portion of their diet such as wild turkeys, squirrels and even Grizzly bears that in some areas can become dependent on whitebark pine seeds in order to put on enough fat to hibernate.

For the trees, producing a somewhat unpredictable seed crop might be an evolved strategy to periodically starve out predators to keep them from building into dense populations that eat all the seeds every year.

Tree seed production and physiology is tied to the specific strategy each species may have for seed dispersal, seedling and tree growth, and survival in an environment with stressors such as heat, drought, fire, snowpacks, predators and diseases. Specific trees species zones exist because individual tree species seeds at some point in time landed on a location where they were able to germinate, grow to reproductive maturity, and regenerate again over decades, centuries and even millennia. There is an ecological term for this called "Ecesis" that differentiates between tree species natural ranges versus those where they only survive because they have been planted and cared for by humans. The latter is most easily explained by the development of windbreaks and urban trees planted in the valley bottoms of western Montana and prairie regions of central and eastern Montana. Using soil water conservation techniques as well as artificial watering, a tree can be planted in an area where it would never naturally occur, and promoted to survive and grow. However, trees planted in such locations almost never successfully reproduce because the conditions are too extreme for seed production or seedling survival.

Picture 2. The distinct lower tree line seen on the High Wood Mountains where conditions become too harsh for tree seedlings to establish. Trees visible around homes in foreground have been planted.

How to get the right tree species to grow in the location a forest landowner or manager wants, remains both an art and a science. First it requires that a seed or seedling source exists, second, the right soil surface condition that species seeds or seedlings need to germinate on or grow must be created, and third, the right weather conditions must prevail for the new seedlings to survive. A fourth component may be that insects, diseases, rodents or larger animals do not eat the seedlings before they can mature into trees, and a fifth that an undesirable tree species does not outgrow and suppress the species you want to promote. A common example in NW Montana might be site preparation for western larch regeneration, only to have the site inundated by development of dense grand fir and Douglas-fir seedlings. So what can you control, when do you need some luck, and what management actions can you take to get the results you desire?

Managing Sunlight

Sunlight availability is a primary regulator for many tree species natural regeneration. Pioneer or "seral" trees species are specifically adapted to colonize disturbed sites where full sunlight is available. More accurately, they can only establish in full sunlight because they have specific traits that allow their needles to reflect 30-60% of full sunlight in order to avoid overheating. At Montana latitudes, full sunlight during summer maximum solar output (summer solstice June 21) provides about twice the energy a tree seedling can use and the sun's energy can overheat seedlings.

Picture 3. Abundant conifer seedling recruitment in an opening that gets full sunlight in the morning and shade in the afternoon. Note the lack of seedling recruitment underneath dense mature trees.

Additional heat from the soil surface can add to heat overload. Pioneer tree species leaves have developed specific mechanisms to avoid heat, reflect excess sunlight and radiate heat from their leaves. Ponderosa pine needles are triangular in cross section and secrete thick wax on needle surfaces to reflect 50% of the light that hits them. Lodepolepine needles are similar and are also twisted like a corkscrew. This is why they may shimmer with a silver reflection in full sunlight. Blue spruce needles are coated with an extremely thick silvery wax that reflects blue light wavelengths (the highest energy wavelength found in visible light). Western larch seedlings try to avoid heat by growing tall very quickly and escaping the hot boundary layer air close to the soil surface. All pioneer tree seedlings need access to soil water, which is why they grow best on bare mineral soil.

Picture 4. A 3-week old ponderosa pine seedling can shed it lower needles as a heat shield and at this stage may have a tap root 2 ft long to acquire enough soil water to keep cool by transpiring water. Few other species can do this.

Picture 5. Newly germinated seedlings are very sensitive to soil surface temperatures that may reach 160 °F in full sunlight. Plant tissue dies if it reaches 150 °F for more than a minute.

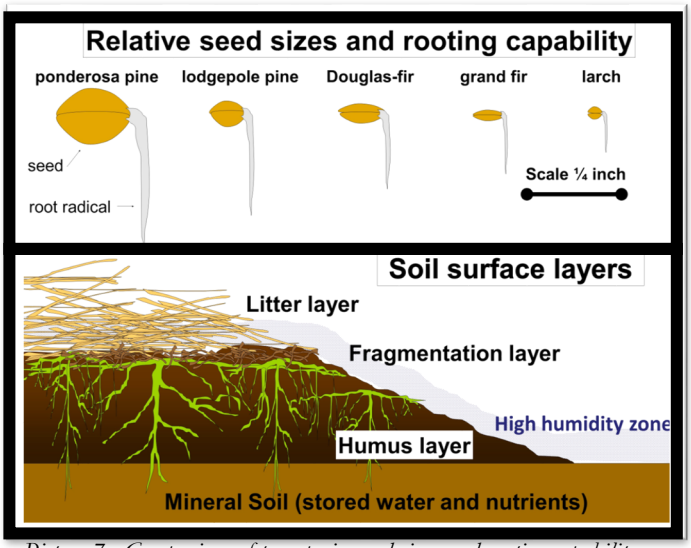
Picture 6. A 4-week old Douglas-fir seedling is designed to absorb most of the light that hits it, thus can grow better in the shade, but quickly overheats in the full sun.

A full tree canopy will transmit only about 10% of the sun's energy to the soil surface. Trees adapted to reflect 50% of the suns energy to avoid overheating, will also reflect this same percentage in the shade—leaving them with only 5% sunlight, not enough energy to grow. Alternatively, tree species with seedlings that are shade adapted such as grand fir or western red cedar will absorb all the light and survive. Alternatively, they overheat and die in full sunlight. The amount of sunlight transmitted through a mature trees canopy will vary with tree species and tree density —with larch transmitting between 30-60% full sunlight, ponderosa pine and lodgepole pine 20-40%, Douglas-fir 10-30%, grand fir 5-20% and western red cedar 3-15%.

These canopy shading differences occur because different species have different needle shapes to take advantage of different canopy positions. Douglas-fir has intermediate sun tolerance, which means its needles absorb more light than those of pines and larch, allowing it to grow in moderate shade, but not in full sun on hot dry south and west slopes where it can also overheat. Grand fir and western red cedar have very efficient light absorbing needles which allow them to grow in deeper shade, but they easily sunburn as seedlings exposed to full sun. As these trees grow taller the increased effects of air circulation can help keep their needles cooler, and more extensive roots can acquire more water for transpiration, both of which can allow them to tolerate more full sun than as seedlings.

Managing soils

Although sunlight is a key component that allows seedlings to produce sugar through photosynthesis, water is equally important. In wet climates such as coastal Oregon and Washington, soil surface organic matter offers a good sponge for holding water. However, it also traps heat and dries out because it cannot conduct heat from its surface such as a mineral soil can. Thus in more temperate climates that suffer summer drought, soil surface organic matter can get excessively hot and impede a newly germinating seed from gaining access to consistent water that is available in the mineral soil. In addition, thick organic layers can harbor fungi, insects, arthropods and rodents that like to make meals of tree seeds, especially when they are lodged in these layers under the winter snow.



Picture 7. Comparison of tree species seed sizes and rooting capability after germination (top). Organic matter layers (bottom) typically found on the soil surface. A high humidity air layer next to soil helps seeds hydrate and germinate in the spring, but also heats up during summer drought.

Some confusion can occur about the role of soil surface organic matter as we are often told that this layer is essential for a healthy forest. Forests are dynamic and go through different stages of development that are unique to the forest type, and forest age. Most tree species seedlings within the Northern Rockies ecosystems are adapted to take advantage of one of many disturbances that disrupt the plant community and expose mineral soil. Tree seedling recruitment, especially for species that are considered "pioneer" species, is actually greatly enhanced when thick organic layers are disrupted.

Picture 8. Thick organic layer often found under ponderosa pine. When on hot dry sites these can accumulate into very thick layers that impede seedling development and decompose very slowly, trapping nutrients.

Soil surface organic layers play a specific role in maturing forests and are the site of much of the soil nitrogen cycle, where organic material breaks down and releases trapped nutrients. It also provides an environment for free living nitrogen fixing bacteria to exist. Nitrogen, one of the greatest limiting nutrients for tree growth, does not naturally occur in most soils but is accumulated only by the action of lightning, free living soil bacteria, and bacteria that form symbiotic root nodules with specific plants such as lupins and ceanothus and alder shrubs. The organic layer also traps water from snowmelt and rainfall, allowing it to slowly percolate into the soil rather than run off. Tree species that are adapted to colonize under an existing tree canopy where soils do not get too hot, have developed small angular shaped seeds that can fall into cracks and crevices of the organic layer. There they are more protected from predators and also have a better chance of accessing soil water in the deeper and more decomposed layers of

Picture 9. Douglas-fir, larch and grand fir needles contain higher nutrient levels than pine needles, and thus decompose faster and create a better seed bed. Seedling development in such sites is more limited by light availability.

Picture 10. Thinning the larger trees in this stand to enhance ponderosa pine and western larch growth left 20% of the more mature stand with Douglas-fir. Enough soil was disturbed and light penetrates the canopy to result in unwanted dense Douglas-fir seedling recruitment, that is now a fire hazard.

Picture 11. An opening that is as wide in diameter as the surrounding trees are tall is typically the minimum size required to allow enough light for shade intolerant species to establish. For south/west aspects the opening can be smaller and north/east aspects the opening needs to be larger.

Alternatively, the larger seeds of pioneer tree species, that need more energy to grow an aggressive rootlet to find water under hot soil surfaces, tend to hang up on the surface of organic layers, where they more easily fall prey to seed predators. Should they survive, their rootlet may not be able to grow through the organic layer into mineral soil to find water during summer drought. The light seeds of other pioneer species such as western larch, designed to fly long distances in a random search of disturbed sites, do not have the energy for their tiny roots to penetrate a dry organic layer to find soil water.

Soil surface organic layers in the Northern Rockies are rich in nutrients, but often poor in summer water supply. For this reason mature trees and surface vegetation grows a thick mat of fine feeder roots right in the boundary between mineral and organic layers. This can also create a highly competitive rooting environment for a tiny tree seedling with its diminutive rootlet. Thus competition for water in this layer also creates a highly hostile environment for any new seedling trying to establish itself as a newcomer where existing vegetation roots are already locked in a death struggle for limited resources. Without soil scarification, that exposes mineral soil and kills off some of the competing vegetation, freshly germinated tree seedlings stand little chance for survival.

The Implications of forest management

Sometimes forest management actions are taken to improve existing tree species composition and growth. Selective thinning removes species that may not be well suited to grow on a particular site, are not desirable to the objectives of the landowner, and/or are not desirable for a future wood market. We also thin forests to reduce risks from wildfires, specific insects and diseases, and to improve wildlife habitat. These practices are not intended to recruit tree seedlings, though sometimes they do. Other techniques, often referred to as "harvest regeneration cuts" are specifically intended to remove wood volume and actively recruit tree seedlings to replace the cut trees. In both types of forest manipulation, there can be unintended consequences if the tree seedling physiology of the local tree species is not thoroughly understood. For example, a thinning practice for fire hazard reduction on a South or West aspect allows enough direct sunlight to reach the forest floor, and the action of removing trees disturbs enough of the soil surface organic layer so that tree seedling requirements of adequate light and exposed mineral soil are met, resulting in massive unwanted seedling development. The opposite effect can occur when small openings are created on a North or East aspect with the intention of creating minimal forest disturbance but provide enough light to recruit pioneer tree species such as larch or pine. Because direct sunlight on these aspects is blocked by the slope and topography, only non-target shade tolerant species regenerate the site. Sunlight availability and soil scarification are the two easiest factors to control when designing a forest management plan.

And although it is often stated that a harvest was not designed to be a "regeneration" harvest, any manipulation of a tree canopy will result in some impact on tree seedling recruitment and should be considered.

Some of the other important factors that strongly influence the density and species of tree seedling recruitment are weather, rodent and bird populations, type of understory vegetation, tree cone (seed) production and timing, seed and cone insects, and type of forest floor disturbance. Many of these we can observe but are difficult to control. That said, they can all be influenced to some degree by how well we observe local conditions, design our treatment, implement the treatment, and follow up with subsequent management actions.

Forests of the Northern Rockies are comprised of distinct forest zones, where assemblages of not only tree species but also understory plants exist because of water and temperature gradients from the local climate. But as we have experienced over the last decades, climates fluctuate between moist and dry years as well as warm and cold years. Cool wet trends allow for many tree seedlings to establish and grow where previously they may have been limited by drought and heat. Thus we may plan for a tree regeneration harvest that is followed by several years of hot dry weather, and regeneration fails—both natural and planted seedlings.

Moisture and temperature can be influenced by the size of an opening—the larger the more sun and heat, the smaller the cooler and potentially more water. It can also be influenced by the shape of an opening—longer and narrow towards the sun allows for intense sunlight for part of the day, versus perpendicular to the suns path—more shaded and cooler during the day. Soil water can also be influenced by managing competing vegetation. If we are in for a hot dry summer, grazing or otherwise treating grasses and forbs is more important for seedling survival than on a cool wet summer.

Picture 12. A thinning study of pole sized ponderosa pine on a south slope was implemented in the 1980's to study the effects of spacing on tree growth and response. An unintended effect was the response of thinning on tree seedling recruitment. Original stand with pine grass and elk sedge understory (top) kept most tree seedling recruitment out. Thinning to 14x14ft, 20x20 ft and 30x30 ft showed that the latter two allowed for Douglas-fir seedling establishment. A beetle outbreak in 2005 killed more of the trees in the more closely spaced treatments than wider spacing which why the advanced Douglas-fir regeneration appears to be only under mature trees. Lack of disturbance of the pine grass and elk sedge, which forms a very competitive environment for surface water has slowed down any ponderosa pine recruitment in the openings.

Picture 12. Soil disturbances of any sort typically results in tree seedling recruitment and may even be more important than sunlight. Left picture shows how a small spot fire from a lightning strike created a mineral soil and thin ash/charcoal bed that allowed larch seedlings to establish in a thinned stand of mature trees. No other seedling recruitment can be seen in other locations. Right picture shows the typical result of a roadbed where exposed mineral soil allowed for copious tree seedling establishment. The sunnier right side of the picture allowed pines to establish whereas the shaded left side only allows for shade tolerant grand fir.

Picture 13. Large woody debris left on side might offer shaded microsites that have more available water, but also offer more shelter for rodents that eat all the tree seeds that may find good potential growth sites. Rodent populations cycle, so a good seed year during a low rodent cycle may result in good seedling recruitment.

Northern Rockies forests tend to follow natural cycles of species occupancy that may occur over 100 to 1000 years. Historically managers followed the rule of requiring tree regeneration within 5-years after a harvest. This was to keep a steady supply of wood fiber growing. Understanding how the natural history of these forests works should give us much broader allowances. Trying too hard to get tree regeneration often results in the problem of dense stands of young trees that are expensive to treat with little return other than fire hazard reduction. Strategic soil scarification may serve us better. Thinning regeneration when it is < 2ft tall may also be cheaper and more effective than waiting until seedlings are 10ft tall.

Picture 14. A side by side thinning treatment with a light burn (left) that did not impact pine grass and elk sedge shows little seedling regeneration. Mechanical scarification (right) with a small excavator under trees that peeled away grasses and sedges resulted in dense Douglas-fir regeneration.

Picture 15. Getting it just right (left) requires good timing and the right combination of manipulating sunlight, soil disturbance and a little patience. If your plan is for 100-300 year old mature trees, waiting 10 years for the right combination of a good seed crop, wet spring and summer, and low rodent population is a reasonable time frame to wait. Some periodic minor scarification can help if seedling recruitment is slow. The alternative of too much scarification coupled with a good seed crop may come back to haunt you with the expensive requirement of a precommercial fire-hazard reduction thinning (right). Thinning dense regeneration when it is very young (1-2 ft tall—below) is much easier and less expensive than waiting until it is 4—8 feet tall and can be accomplished with a saw attachment to a weed trimmer or brushhog on a tractor versus the hard labor of using a chainsaw and piling young trees or more expensive slash buster on an excavator or hotsaw.

What about planting?

Many conifer forests across the United States are regenerated by planting seedlings. The advantages of planting is that seedlings come from a known genetic source that has been selected for superior growth at specific elevations. For some species such as western white pine, further selection has been made for disease resistance to white pine blister rust. Planting also allows you to forgo the uncertainty of good seed crops, seedling placement (you plant seedlings where you want them) and timing - a site is typically planted the spring following a harvest. Weed control can also be implemented around seedlings. The down side it that there is the cost of the seedling, and of planting. A hot dry summer may still confound seedling survival and wildlife seem to prefer to eat nursery seedlings versus natural seedlings.

Picture 16. Different container sizes indicating cubic inch rooting space. S-30 and S-10 are often the most hardy for harsh sites, S-05 and S-100 for moist sites.

Different seedling types can be bought, based on their genetic origin and container size. Most conifer seedlings are grown in containers in greenhouses. Container sizes determine seedling size. If you are planting hundreds of seedlings, smaller seedlings in smaller containers are easier to plant well, and may have better root to shoot ratios that allow for good site adaptation. Larger container seedlings are more tolerant of snow and animal damage, but need to be planted where adequate water is available as they have smaller root to shoot ratios. The Montana DNRC nursery grows quality conifer species at cost specifically for landowner reforestation and conservation planting needs.

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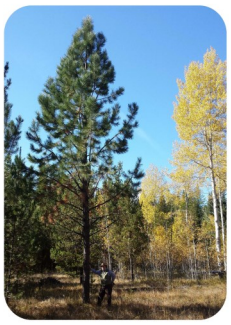

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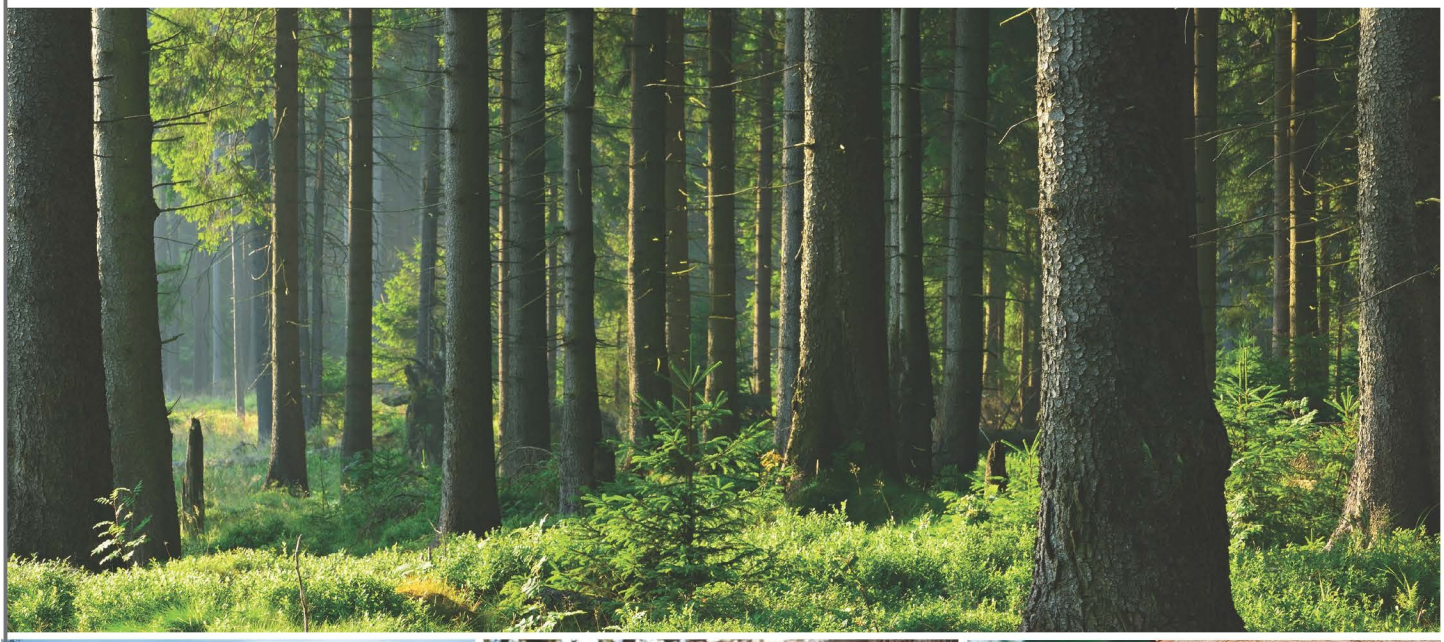

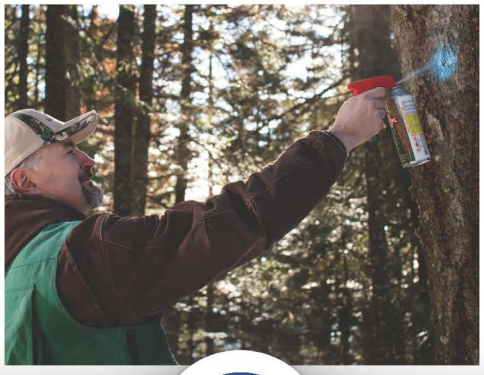

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SFI-01200

Germany Forest, Culture and History Study Tour

May 16-29, 2021

2017 study group in Thuringia with castle Lauenstein in background

Spend 2 weeks in scenic Bavaria and Thuringen experiencing forestry, history and culture. Tour starts in the ancient Bishop seat and University town of Freising, just 15 minutes by bus from the Munich International Airport. A few days will be spent examining the arboretum of the King of Bavaria's estate in Munich as well as the University Forest and educational forest nature walk. From there we will visit Munichs municipal watershed forest, Salzburg, the Sound of Music landscape and historic salt mines. Then it is north to the amazing old city of Nuremburg and surrounding area including the ultramodern Binder sawmill. We will travel further north into the vast forests of Thuringia with some stops at a Napolean era fortress, medieval castle, slate mine, and the ancient Castle Wartburg where Martin Luther translated the bible from Greek to German, thus starting the Reformation, and the fantastic and historic city of Erfurt which escaped bombing during WWII and thus allows for exploration of 800 year old buildings, alleyways and Cathedrals. With a few exceptions this tour will showcase areas that are off most normal tourist paths and how German culture evolved and integrated itself with nature - a task that it continues to pursue with biomass energy.

We will travel with a charter bus and stay at comfortable local hotels. Most breakfasts and some dinners included.

Cost: approximately $3500 per person and your own airfare (will depend on currency exchange and economic situation).

Maximum number of participants is 20 due to logistics, first come first serve and will require a $200 nonrefundable deposit by September 12, 2020.

Contact Peter Kolb (406-243-4705) or Christina Oppegard (406-243-2773) for questions or to reserve a spot.

2020 Calendar of Workshops and Events

Workshop/Events	Date	Location	Information
MT Forest Landowners Conference	May 1	Helena	https://www.foreststewardshipfoundation.org/forest-landowner-conference
Forest Insect and Disease Workshop	May 2	Helena	https://www.foreststewardshipfoundation.org/forest-insect-and-disease-workshop
Forest Stewardship for Loggers	April 15-16	Lubrecht Forest	Contact MLA
Forest Stewardship	May 7-8 & 15	Frenchtown	Workshop is full
Forest Stewardship	June 4-5 & 12	Bozeman	Workshop is full
Forest Stewardship	July 16-17 & 24	Columbia Falls	Workshop is full
Forest Stewardship	August 6-7 & 14	Clancy	Register by July 15th
Forestry Mini-College	March 13, 2021	Missoula	Register by March 8, 2021
MT Natural Resource Youth Camp	July 14-19	Lubrecht	Deadline June 12th
Considerations for Thinning a Mature Forest	May 20	Three-Mile Wildlife Management near	Register by May 13th
Evaluating Forest Soils	September 3	Lubrecht Experimental Forest	Register by August 27th
Tree selection , harvesting options and slash treatments	September 4	Lubrecht Experimental Forest	Register by August 28th
Slash Pile Burning Practicum	November	TBA	TBA
Germany Forest, Culture and History Study Tour	May 16-29, 2021	Bavaria and Thuringen, Germany	Reserve Spot by September 12, 2020
Project Learning Tree	See online calendar for event schedule		

Registration information: http://forestry.msuextension.org/calendar.html#mfsp

We would like your Feedback

If you like/dislike certain things about this newsletter or have ideas for future topics.
Please send us your thoughts!

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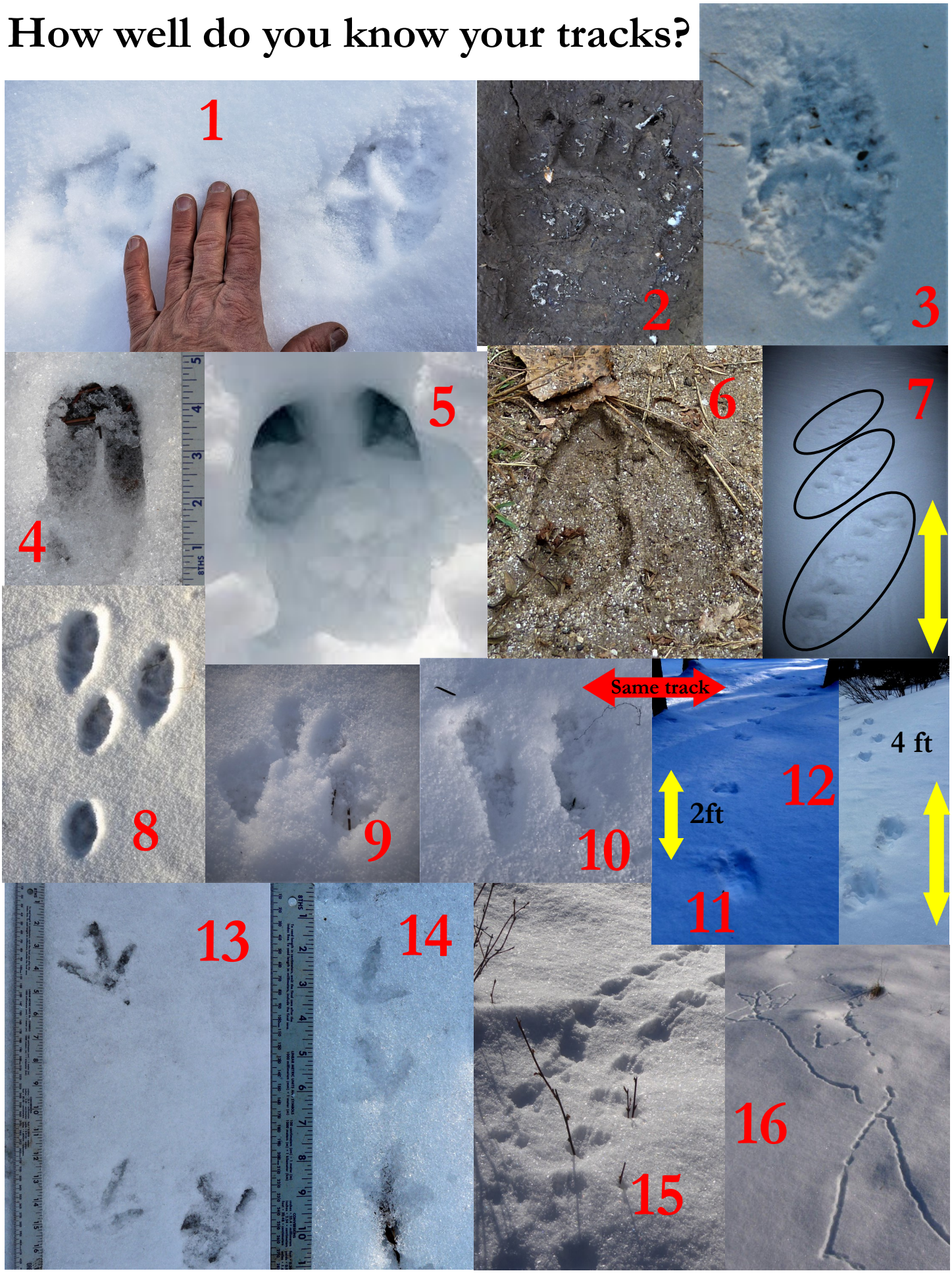
Tracks

1. Wolf: Large dog like prints though often the space between toes will spread out more as wolf feet are webbed and can widen when in soft mud or snow . Space between tracks can be 2-4 feet. Coyote tracks can be similar but average about 1/3 the size, fox about 1/4 to 1/5 the size.
2. Black Bear Hind Foot: Note foot pad shape and points in front of toes where curved claws hooked into the mud. Although there is a difference in angle between toes and pad between black and Grizzly bears this can be hard to see.
3. Grizzly Bear Hind Foot: Adults have larger tracks but straighter longer claws will give the impression of longer toes. Younger grizzly tracks can be very similar to those of a black bear.
4. White Tail Deer: These can vary a lot in size with yearlings tracks half as big and large does and bucks 1/3 larger. Mule deer are very similar but can be rounder and larger. White tails tend to drag their feet in the snow leaving very characteristic drag marks even in shallow snow between individual prints.
5. Moose: Aside from being considerably larger (2-3x) than deer tracks , moose toes tend to splay apart when they land, perhaps an adaptation to walking in mud or deep snow. A running deer or elk and can also show splayed toes though not as consistent as a moose.
6. Elk: Like a deer, elk tracks tend to keep their toes together unless running or jumping. Small elk can easily be confused with a large mule deer or large elk with moose tracks.
7. Mountain Lion: Individual tracks look similar to a wolf though often wider rounder prints that may or may not show claw marks. When lions lope such as in the picture they leave a pattern of diagonal tracks in groups of 4, then a jump space and 4 more in-line as shown by the circled groups.
8. Cottontail Rabbit: Most rabbits and hares will leave characteristic inline two front paws prints, and then two wider spaced hind paw prints in a "Y" configuration. The specific species will depend on habitat with low elevation brushy and riparian areas more conducive to cottontails, upland conifer forests to snowshoe hares and sagebrush and prairie more to jackrabbits. The later all have larger tracks than cottontails. The open end of the Y points in the direction of movement.
9. Pine Squirrel: Smaller but similar to rabbits though the front paws land next to each other whereas rabbit front paws land behind one another.
10. Pine Marten: All of the weasel family tend to move so that hind feet land right behind the front feet leaving tracks with two indents spaced 1-3 feet apart. Weasels and Ermine tracks are about 1-2 inches between feet, pine marten and mink 2-3 inches apart, and Fishers 3-4 inches apart.
11. Pine Marten: Pattern of tracks over the snow-distance between prints can vary based on how fast they are running and the size of the individual. Habitat can help determine if it is a mink or marten, size if it is a weasel or larger cousins. All will cover a lot of distance, whereas squirrels usually just between trees.
12. Coyote: As opposed to a mountain line or any in the cat family, the pattern of tracks is uniquely different and individual paw prints will not be in-line like the cat family but more of a "Y" or "H".
13. Turkey: The large size and distance between steps makes these tracks unique. Turkeys prefer to walk so tracks will be consistent over distance. Ravens can be somewhat similar but will only walk short distances before they fly.
14. Grouse: Although individual tracks look like a smaller version of a turkey-grouse will "march" with individual tracks close together.
15. Deer Mouse: Individual hops on the top of the snow with tail drag marks are very characteristic of these little rodents. These are often found between hollow logs, trees and slash piles.
16. Meadow Vole: Smaller shorter legs cause meadow voles to tunnel through the snow, often leaving half tunnels with little running feet marks within the tunnels. Though they usually tunnel under the snow sometimes they will run over the surface.

How well do you know your tracks?



MONTANA STATE UNIVERSITY
EXTENSION
Forestry Program

MSU Extension Forestry
W.A. Franke College of Forestry and Conservation
32 Campus Drive
Missoula, MT 59812-0606