The Forest Steward's Journal

Summer 2023 Volume 38

Journal of the Forest Stewardship Foundation

The MISSION of the Forest Stewardship Foundation is to "provide education and information to forest landowners, natural resource professionals and the general public about the science and ecology of forest lands, the many value derived from forested lands and the principles of sustainable forest land development."

DISCLAIMER: As in the past, we again advise that this information is submitted for your interest only. The Foundation's mission, as indicated above, is to "educate and inform", not to advocate or persuade. The Foundation takes no position, either endorsing or opposing, approving or disapproving, any of the assertions or arguments in the contributed information.

From the Chair

As we enter into the dog days of summer we want to thank our readers for the wonderful support that our Foundation has received over the past 30 years. It is amazing to believe that the founders of the Forest Stewardship Foundation had the foresight to create this organization. They recognized the importance of forest resource education after attending the first Forest Stewardship Workshops, created by Bob Logan of MSU Forestry Extension and assisted by board member Gary Ellingson.

This journal edition features our new board member, Zoe Leake, whom gives those who might have missed this years' outstanding landowner conference a summary of the great presentations we heard.

Our newest board member, Rick Moore, who recently retired as a service forester for the Kalispell DNRC office offers his considerable experience in evaluating the importance and link between the articles by Glenda Scott: " Preparing to Plant-Selecting the Right Tree for the Right Place" and Molly Retzlaff's, Advances in Whitebark Pine Germination. The threats to whitebark pine are all too real and Rick encourages forest landowners to recognize that they can play a role in maintaining this important species. Rick states that planting high quality, disease resistant whitebark pine seedlings on your property, even as low as 3,400' elevation, will increase the diversity and health of your forest.

In conclusion I would like to remind our readers that our Foundation dues have remained at $25/year for the past 30 years. Our membership has hovered at about 130, but we believe it is important that all 1200 of our journal recipients receive the benefits of a membership. I encourage our non-members to join and help us with our mission. Go to our website at https://www.ForestStewardshipFoundation.org for more information.

Ed Levert CF, Chair

Summary of the 2023 Landowner Conference

By Zoe Olivia Leake

This year's annual conference, as in years past, was held at the beautiful Delta Colonial Hotel in Helena. Attendance was a mix of foundation members, private landowners, agency folks, industry foresters, representatives from other foundations and more. After an introduction from Board Chair Ed Levert, Michael Schaedel gave the opening session of the day.

Schaedel is the forester for Montana Nature Conservancy and discussed the recent forest management The Nature Conservancy (TNC) has been conducting – most notably an extensive project up the Gold Creek drainage in partnership with the Bureau of Land Management (BLM). This timber sale was anything but simple, with the ultimate goals of

reducing fuels and improving forest health. The project generated more saw timber than anticipated, but mostly produced an incredible amount of slash from thinning non-merchantable material. This pre-commercial thinning (PCT) presented the perfect opportunity to experiment with biomass innovations. An enormous piece of tracked machinery called an air curtain burner was brought in from Oregon to turn massive piles of slash into biochar, a nutrient dense material that can be utilized to enrich agricultural ground or even neutralize acidic soils in mine reclamation. This groundbreaking experiment tested whether producing biochar onsite rather than at a facility such as a sawmill would be feasible in Montana. Results and opinions were mixed. However, we can all agree that the project overall was a huge success for Schaedel, TNC, BLM, and of course the ecosystem they are working to protect and restore.

Morning breakout sessions took us into the weeds of forest management in Montana with talks by Dan Reinhart, Sam Scott, Lorrie Woods and Dr. Edwin Burke. Dan Reinhart is a retired Vegetation Ecologist for the US Park service and discussed Whitebark Pine ecology and management. Whitebark pine, a keystone species, is suffering greatly from blister rust, causing significant losses across the West. Recently the tree species has been listed as Endangered, which could have significant impacts on forest management. Large scale projects are being undertaken across the state to help mitigate the issue and avoid extinction if possible. Sam Scott is an Economist for the University of Montana Bureau of Business and Economic Research (BBER). His extensive yet approachable update on Montana's Wood Products Market and Infrastructure painted a picture of gradual decline. This downward spiral has effects big and small across the state, all of which are detrimental to the future of our forests and communities. BBER is a wealth of meaningful research – see the website or reach out to Scott for more information. Lorrie Woods is a Professional Forester who spent her career working for industry, employing active management on public and private land. After a long and full career in the woods, she is a wealth of knowledge when it comes to projects geared towards improving forest health. Her discussion on designing and executing a successful pre-commercial thinning was informative for anyone considering taking on a PCT project on their land. Dr. Edwin Burke is a professor at the University of Montana's W.A Franke College of Forestry and Conservation. Burke had an interactive conversation about the properties, uses, and identification of familiar woods in Montana. Blocks of wood were handed out with a variety of tools such as string and magnifying glasses to closely examine the wood. Participants learned to identify growth rings and interpret the vigor of the tree based on the growth ring's size and spacing.

Ali Pons, Manager of the Montana Fish, Wildlife and Parks Rehabilitation Center gave the lunch presentation, discussing the rehabilitation of Montana's wildlife. Pons spoke to the different kinds of wildlife they take in, from owls to grizzly bears. Each species is different in the care they receive, especially the way they are fed. Some animals are eventually released back into the wild, while others establish a permanent residence at the rehab center. For example, Grizzly bears are exceptionally smart. They quickly learn behaviors and easily figure things out, which makes them especially tricky to care for and basically impossible to release back into the wild. The rehabilitation center is always looking for donations – not just money, but also meat! Information on how to donate can be found on their website.

Afternoon breakout sessions featured Dr. Peter Kolb, Aaron Lug, and Amy Seaman. Dr. Peter Kolb with Montana State University Extension Forestry gave a talk about successional ecology in forests. Our forest habitat types in Montana are fire adapted, and in the absence of fire the system has become out of whack. Kolb discussed the natural successional patterns of our forest ecosystems, which allows us to make better decisions as landowners and managers. Aaron Lug with the Spotted Bear ranger district walked listeners through the forgotten art of using hand tools. Lug covered the type of crosscut saw frequently used in Montana for Wilderness trail work, along with several other common tools you might see a trail crew shouldering. A slideshow of photos showcased some of the impressive projects Aaron and his team have worked on in the Wilderness, and what simple tools were used on these complex jobs. Amy Seaman with Montana Audubon Society turned her audience into experienced backyard ornithologists with a presentation on forest bird identification in Montana. She covered several of the most common species we might find in the woods, showing photos and playing clips of the birds' songs to help with identification. The highlight of the presentation was the report of Amy's Black Swift research – an elusive bird found behind waterfalls. Research is primarily being conducted within Glacier National Park, where Amy and her team chase waterfalls looking for Black Swifts. Seaman is clearly wildly passionate about her work – her enthusiasm for Montana's birds was contagious.

The long day of informative talks and peer socializing came to an end with closing statements from Gary Ellingson, DNRC service forester and MFSF board member responsible for organizing this year's event. We would like to thank everyone for your attendance, and a special thanks to our silent auction donators and bidders for the incredible silent auction this year. See you next year!

Submitted by Zoe Leake, Foundation Board Member and Forester at Pyramid Lumber Company

Preparing to Plant-Selecting the Right Tree for the Right Place

By Glenda Scott

Successful planting projects begin with thoughtful consideration of your forest goals bounded by an understanding of the environmental factors affecting plant establishment and growth. The following key factors should guide your selection of the species and seed source for planting. The entire planting project is multi-faceted from site preparation, to ordering trees, planting and monitoring. Plan ahead to ensure you meet your planting timelines!

SPECIES SELECTION

In the Northern Rockies, the lower limits of coniferous forests are controlled by moisture, and the upper limits are controlled by temperature. This is most obvious at lower elevations where tree cover transitions to grassland due to limited water supply, and at high elevations where cold long winters limits tree establishment. These factors are also significant along an environmental gradient where species transition from one condition to the other. A simple example is the transition from ponderosa pine to Douglas-fir to lodgepole pine, where ponderosa pine is most drought tolerant and lodgepole pine most cold tolerant. The genetic variation within species based on elevation and geographic location further refines tree survival and growth.

Successional Stage

Cover type on a specific site is constantly changing, either advancing in succession or retreating after disturbance. It is assumed you are planting after a disturbance event like fire, harvest, insect, disease, or windthrow. The event may have killed all the overstory, only a part of the overstory, or only certain species, resulting in a change in the ecological successional stage. Understanding the current, post disturbance, successional stage and the environmental processes in play is key to identifying the species that will be most successful for regeneration. Habitat types are useful for predicting ecological succession and vegetation patterns. Refer to the Forest Habitat Types of Montana https://www.fs.usda.gov/rm/pubs_int/int_gtr034.pdf for an understanding of the habitat type classification system.

You will want to select tree species for planting that fit the current successional stage. Regenerating with early seral species, those intolerant of shade, is most successful after major disturbance when tree cover is sparse. In general, early seral species have faster initial growth rates, high resistance to frost and heat insolation damage, and lower insect and disease problems. Where possible, it's typically preferred to plant a mix of species. However, do not plant species inappropriate for the successional stage in an attempt to increase diversity. After the initial trees are established, the site will transition to more shade tolerant, late seral, species, until there is another disturbance event. On sites with a residual overstory, planting a mix of mid to late seral species which are moderately tolerant and tolerant to shade will be successful. Note that early seral species require open sunlight and will not compete well under the canopy of residual trees; they may survive initially, but will be outcompeted as shade hinders their growth.

Site Factors

Topographic features influence the microclimate of the seedling environment. The difference between a north and south aspect influences the level of insolation (solar radiation) and snow accumulation, which directly affects the moisture and temperature of the seedling environment.

South- and west-facing slopes, which receive the most afternoon sun, may be difficult to regenerate without shade. Seral species are most likely to survive the best, however, only if every effort to make the limited moisture available to the seedling is taken. Refer to planting considerations below. In some cases, the driest sites may transition to woodlands or grasslands. Slope steepness further accentuates the effects of aspect, increasing the need for shade and minimal competing vegetation.

Cold air drains down mountain valleys at night or settles in dips and depressions creating frost pockets. Species and seed sources not adapted will be damaged or killed by the frost. Evidence of frost pockets may be in vegetation that is distinct from surrounding slopes and characteristic of higher elevations.

The variation in latitude and elevation across Montana are major defining characteristics for vegetation. West of the Continental Divide, the climate is marked by moisture-laden air masses from the Pacific Ocean and mild weather except during mid-summer dry periods. Weather east of the Divide is characterized by warm summers and very cold winters typical of continental climates. These striking differences limit the range of western larch, western redcedar and western hemlock to the west side of the Rockies.

Elevation further influences cover types affecting both moisture and temperature regimes. Lowlands are semi-arid and support the dry or very dry cover types. Mountains are cooler with greater precipitation and depending on the latitude, support a variety of tree species.

continued on next page ☞

There is substantial genetic variability within species and between seed sources (locale of seed collection) to frost and cold hardiness. Thus, adaptations of a single species can vary greatly between geographic locations. For example, lodgepole pine is considered cold adapted but only within a limited elevational band of its current location, above which it is not adapted.

Disease and Insects

Insect and disease damage are best managed by using sustainable forestry practices that incorporate both species and age diversity. However, when regenerating a site damaged by insects or disease, consider species that are not the preferred the host. For example, where laminated root disease (Phellinus weirii) causes heavy Douglas-fir mortality, preferred species may be western larch and ponderosa pine.

RELATIVE ADAPTATIONS	
Shade Tolerance	**Intolerant of shade (early seral):** western larch, quaking aspen, ponderosa pine, western white pine, lodgepole pine, limber pine, whitebark pine **Moderate tolerance (mid-seral):** Douglas-fir, Engelmann spruce **Shade tolerant (late seral):** grand fir, western hemlock, western redcedar
Cold and Frost Tolerance	**Most tolerant:** lodgepole pine, subalpine fir, Engelmann spruce **Moderate tolerance:** western white pine, western larch, ponderosa pine, Douglas-fir **Lowest tolerance:** western hemlock, grand fir, western redcedar
Drought Tolerance	**High tolerance:** ponderosa pine, limber pine, lodgepole pine **Moderate tolerance:** Douglas-fir once established **Low tolerance:** western redcedar, etc.
Fire Adapted	**Very adapted:** Mature western larch, ponderosa pine and Douglas-fir **Moderately resistant:** lodgepole pine to ground fire but has high regeneration capacity after fire

Planting Considerations

Tree seedlings are most vulnerable to low moisture and temperature extremes during the early years of establishment. Even though early seral species are adapted to full sunlight, they are susceptible to heat damage during the seedling stage, especially on high energy aspects. Sufficient soil moisture must be available for the roots to uptake the water for physiological processes including photosynthesis and respiration. Thus, planting dry sites right after snow melt is preferred. On cold sites, planting should be delayed until the soil warms to allow water movement through the roots, generally 40 °F at rooting depth. This may only be a short period of time but should be considered. On most sites, seedlings will benefit from site preparation to reduce competing vegetation and ground level shade (shaded microsites) to reduce surface temperatures. Overhead shade is commonly needed on drier sites. Frost prone areas will benefit from similar protection methods to modify cold air settling. All sites need protection from wildlife browsing and livestock grazing. After establishment, trees are hardier to environmental extremes, but during early establishment they are vulnerable as they adapt to the new environment.

Recent years have seen summers grow longer and warmer, impacting both the wildland fire season and reforestation success. The general trend in seedling survival mirrors bad fire seasons resulting in higher mortality in young seedlings. Adopting the best planting practices becomes increasingly important. You may want to increase the planting density to allow for high mortality however not to the extent that trees are competing for limited moisture.

SEED SOURCE and SEED TRANSFER

Seed zones are developed to divide tree habitat into zones where there is little genetic variation. They are based on fairly 'fixed' delineations resulting from extensive provenance testing In Montana, the seed zones commonly follow major drainages. Plant materials can be transferred within the seed zone and compatible elevation bands with little risk of being poorly adapted to their new location. Seed transfer rules guide the movement of seed within the zone or in some cases between nearby seed zones. They identify where seedlings of a known seed source will be adapted and can be safely planted based on adaptive traits.

The traditional seed transfer model assumes that seedlings are best adapted to the location where the seed was collected. Some landowners collect cones from their planting area and provide them to the nursery to grow the seedlings for outplanting. However, this is typically not practical, so reputable tree seedling nurseries have a seed bank of source-identified seed. Customers order seedlings for larger outplanting projects based on the geographic and elevation of the planting site; the nursery matches the seed zone to the planting site. A nearby seed zone or elevation band may be suitable for transfer if it is cooler or moister than the seed source, but it is not suitable if it is drier than the source zone. Experience has shown that planting seedlings with 'off site' seed is not successful resulting in early mortality or maladapted trees that later succumb to environmental conditions.

Seed Transfer in a Changing Climate

There is significant research and scientific discussion on how the traditional approach to "local seed" should or will be modified in response to the changing climate. Predicting change increases in complexity very quickly since individual species will not shift independently, but rather whole plant communities and ecological processes will shift. There may be novel relationships based on these changes resulting in modifications in transfer rules. At this time, it is generally considered safe to move tree seed within its current range but slightly modified to match the climatic conditions of the establishment site, such as a slightly cooler or moister site condition, but other sorts of assisted migration is risky and may result in poor survival or the effects of off-site plantations. We should expect future "climate adapted seed transfer" guides to incorporate the changing climatic conditions of the planting site relative to that of the seed source into transfer rules. As more research and experience occurs, this may result in greater shifts in species extent and elevational bands recommended for planting.

SEEDLING ORDERS

When you are ready to order seedlings, utilize reputable tree seedling nurseries who can guarantee the seed source and who follow accepted seed transfer rules. With the nursery manager, discuss the available seed sources, as well as recommended stock types and seedling characteristics. The Montana Conservation Seedling Nursery dnrc.mt.gov/Forestry/Conservation-Nursery/ is one nursery available to Montana landowners for conservation projects. Tribal and private native plant growers may also be available for seedling production. Landscape nurseries typically do not use local source identified seed – these are suitable for landscaping purposes but do not produce seedlings with long term site adaptations specific to your planting site.

In all cases, plan early! Be prepared to order seedlings at least 1 to 2 years in advance of your planned planting season. This means – be ready to order in the fall of 2023 for a spring 2025 planting project.

There are many sources available to aid in your understanding of planting and forest succession. This article relied heavily on the compiled information in the Reforestation Handbook, US Forest Service FSH 2409.17, Ch 2 fs.usda.gov/cgi-bin/Directives/get_dirs/fsh?2409.17, and Forest Habitat Types of Montana (Pfister et.al. 1977) fs.usda.gov/rm/pubs_int/int_gtr034.pdf.

Glenda Scott is Silviculturist/Reforestation Specialist (retired) with the US Forest Service. She is currently a Forest Stewardship Advisor and member of the MT Forest Stewardship Foundation.

Advances in Whitebark Pine Germination at the U.S. Department of Agriculture, Forest Service, Coeur d'Alene Nursery *By Molly Retzlaff*

USDA, Forest Service, Coeur d'Alene Nursery, Coeur d'Alene, Idaho

Whitebark pine (Pinus albicaulus Engelm.) is a high-elevation foundation species that acts as a critical food source for many species such as grizzle bears and Clark's Nutcrackers. This species was recently listed as a threatened species under the Endangered Species Act. Populations are rapidly declining due to white pine blister rust (Cronartium ribicola Fischer), Mountain pine beetle (Dendroctonus ponderosae Hopkins), and successional replacement by more shade-tolerant species. Restoration in whitebark pine ecosystems is challenging and costly but essential to the continued existence of this important species. Whitebark pine seedlings are germinated and grown in the USDA Forest Service, Coeur d'Alene Nursery as part of the ongoing restoration effort (Photo 1). The CDA Nursery has grown whitebark pine since 1988 and ships hundreds of thousands of trees back to national forests each year. In the 2022 growing season alone, 125 thousand seedlings returned to the landscape. The CDA nursery is continually modifying the propagation protocol for whitebark to streamline the seed preparation process and maximize germination. Each year, small improvements lead to better production numbers and a more efficient use of time and growing space.

The mission of the USDA Forest Service, Coeur d'Alene Nursery is to provide high-quality plant material for restoration and reforestation to the USDA Forest Service's National Forest System, and to other public land management agencies such as tribal agencies, the Idaho Department of Lands, and the Natural Resources Conservation Service. On average, the nursery grows 120 thousand whitebark pine seedlings per year. These numbers continue to rise as more national forests join in the restoration efforts of this species. Whitebark pine are hand sown and grown at the nursery for two years before being shipped back to the client. This additional time and care results in an expensive product ($2.25/tree vs. $0.58/tree for traditional 1-year conifer species). Successfully growing whitebark pine seedlings in large numbers is often hampered by low germination rates due in part to the complex dormancy requirements of this species. In 2022 the average germination per lot was 64%. Germination is

continued on next page ☞

highly variable between lots, some had germination rates as low as 3%, while others topped 85%. This variability adds to the difficulty of growing this expensive product.

Whitebark pine thrives in harsh, high elevation sites (Arno and Hoff 1989). Growing in such a habitat means that this species has developed some unique characteristics, including embryo dormancy. Field studies have shown that whitebark pine can germinate up to two years after caching by Clark's Nutcrackers, and that there may be a link between spring precipitation and delayed germination (Tomback et. al 2001).

In a nursery setting, whitebark pine seeds require both a moist warm and moist cold stratification totaling 120 days for optimum germination, mimicking the freeze-thaw patterns of these high elevation ecosystems (Arno and Hoff 1989). The seeds are first rinsed in a bleach solution to reduce the pathogen load on the seed coat. Mold is the leading cause of seed lot failure during stratification. Next, the seeds are then placed in a cold running water soak for 5 days to reduce germination inhibitors and start the breakdown process of the seed coat's natural defenses. Following that, the seeds are then placed in mesh bags and buried in a container of moist perlite and placed in a germinator for 14 days at 74˚F. Lastly the seeds, in their tubs of perlite, are placed in a cold stratification room for 104 days at 36˚F. This warm/cold process simulates what the seeds experience in nature.

Pre-Treat	*Parent Material*	
5-day cold running water soak	Course-grade perlite	
Warm Strat	*Cold Strat*	*Sow*
14 days @ 74˚F	104 days @ 36˚F	Hand sow into warm greenhouse

The impermeable seed coats of whitebark pine have led to a difference in seed processing, protocols between nurseries, chiefly what parent material to stratify seeds in and to scarify seeds or not. Sand is the most used parent material for stratification; however, it is very heavy when wet, and messy. It is also not easy to determine if seeds are molding without removing them from the sand. Perlite is a cleaner, easier option. The perlite is a lightweight material that makes it easy to check for mold on the seeds and monitor moisture levels. Results from small studies done at the CDA nursey have found no measurable difference between germination rates of seeds stratified in sand verses perlite.

Scarification of whitebark pine seeds is a time consuming, expensive process involving hand nicking individual seeds, or mechanically sanding them after stratification. Scarification is no longer a part of the nursery whitebark protocol. Eliminating this step removed a time-consuming bottleneck in the seed preparation protocol as the mechanical sanders used at the CDA nursery could only process a maximum of 9 pounds of seed per day. In 2022, the nursery sowed a little over 76 lbs of seed. This is the most significant change in the new protocol and has vastly streamlined the process of preparing whitebark pine seed for sowing.

Once the seeds have completed cold stratification, they are hand sown into containers in warm greenhouses (Photo 2). This usually occurs at the start of March. The containers are kept moist and the daylength is extended to 20 hours with the help of 1000W bulbs hung in the greenhouses. After 4-6 weeks, the seedlings germinate and a new generation of whitebark pine beings to grow.

As with all ongoing research, the Coeur d'Alene nursery continues to modify its existing whitebark pine germination protocol to find the most efficient and effective ways to maximize seedling germination. The results from diligent observation, note taking, and constant small-scale experiments will continue to help streamline the germination protocol and further the restoration of this important species.

References:

Arno, S. F.; Hoff, J. R. 1989. Silvics of whitebark pine (Pinus albicaulis). USDA Forest Service: General Technical Rep. INT. p. 253-264.

Tomback, D. F.; Anderies, A. J.; Carsey, K. S.; Powell, M. L.; Mellmann-Brown, S. 2001. Delayed seed germination in Whitebark Pine and regeneration patterns following the Yellowstone fires. Ecology 82. p. 2587-2600. doi:10.1890/0012-9658(2001)082[2587:DSGIWP]2.0.CO;2

Mature Whitebark pine in the greenhouse.

Whitebark trees ready for planting.


Hand-sowing Whitebark pine.


Newly germinated Whitebark pine growing in the greenhouse.

Save the Dates

Idaho Outstanding Tree Farmer of the Year Tour
Near Clark Fork, Idaho • September 16, 2023
Montana folks are welcome to attend!

Montana Tree Farm Fall Tour
Troy, Montana area • October 7, 2023

Diplodia Shoot Blight

By Jill Hautaniemi, US Forest Service Forest Pathologist

If you've driven through western Montana in the past couple of years, you may have noticed ponderosa pine with dead branches and patches of orange or gray foliage in the crown. These trees can be seen in communities throughout western and central Montana, especially in the Bitterroot and Flathead valleys. So, what is happening to our ponderosa pine?

Diplodia shoot blight (sometimes known as pine shoot blight) is a native fungus often found growing on pine shoots without causing disease or visible symptoms. It is an opportunistic pathogen, striking when the tree experiences a stress like drought or wounding from hail damage. After the stress event occurs, the disease develops rapidly, with branches dying within a few months. With the hot, dry summers of the last few years, our trees have been drought-stressed, and this stress has created ideal conditions for opportunistic diseases, especially Diplodia shoot blight. Adding to and compounding the woes of ponderosa pine is another native pathogen, western gall rust, which creates round, woody galls on the branches of two- and three-needled pines. These galls eventually girdle the branch they grow on and cause damage, often in conjunction with Diplodia shoot blight.

Diplodia shoot blight can be identified by the branch mortality it causes, and by the dead needles it retains for years after the branch dies. Fruiting bodies of this fungus grow on the infected needles and stems, and on the scales of second-year cones. These fruiting bodies can be seen by the naked eye as small, raised bumps emerging from the host tissue. They can appear gray or black, and swell when wet. This pathogen also causes small resinous cankers or lesions on shoots.

These two diseases are not usually a management concern in forests. Ponderosa pine forests will lose some branches to gall rust and Diplodia, but the damage is limited, and they recover after a few growing seasons. A highly susceptible tree might be killed, but it is not considered a major concern on the landscape scale. Recently, however, we have been seeing extreme impacts from Diplodia in urban ponderosa pine, where some trees have lost over half their crown to the disease. Trees do not usually recover from such severe damage, and the most impacted trees are likely to die within the next two years.

Is there anything we can do to help our trees? One of the best ways to help a tree impacted by Diplodia shoot blight is to alleviate water stress by watering regularly during the

continued on back page ☞

Forest Stewardship Foundation
PO Box 1056
Libby, MT 59923-1056

Return Service Requested

NONPROFIT ORG
US POSTAGE
PAID
MISSOULA, MT 59801
PERMIT No. 569

The Forest Stewardship Foundation is a Montana non-profit, public benefit corporation qualified under the 501 (c)(3), IRS Code.

The Forest Steward's Journal is a publication of the Forest Stewardship Foundation. Comments, articles and letters to the editor are welcome.

hottest and driest parts of the summer. Removal of nearby vegetation can also increase available water for the tree, as it reduces nearby water competition. Avoid unnecessary wounding of the tree, and when pruning, sterilize tools between trees with a bleach or alcohol solution. While reducing sources of stress is important for helping a tree recover, do not apply fertilizer, as nitrogen exacerbates Diplodia infections. Fungicide applications can prevent Diplodia shoot blight, but do not cure existing infections. If you are concerned about a ponderosa pine on your property, consult with a local arborist.

This article was written and prepared by U.S. government employees on official time, and it is therefore in the public domain and not subject to copyright.

A tree with Diplodia shoot blight in Big Fork, about one year after a severe hailstorm.

A second-year ponderosa pinecone with fruiting bodies of fungus that causes Diplodia shoot blight. These are visible as the small black dots on the cone scales.