Partners News

April 2018

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Contact Us

Partners in Forestry
Landowner Cooperative

6063 Baker Lake Road
Conover, WI 54519

partnersinforestry@gmail.com

715-479-8528

PIF's Website:
www.partnersinforestry.com

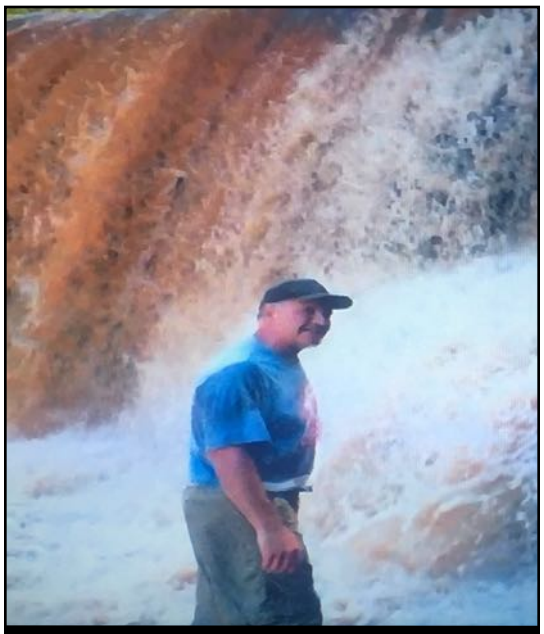
Have you paid your PIF dues?

Think Spring

Inside this issue:

JOE'S COMMENTS, SPRING 2018

If any one has wondered where the Partners News is in the past few weeks, the blame for a late issue lies solely with me and too many unpleasant and unforeseen circumstances to allow me the necessary time and focus. In mid February I was already long burdened by several other challenges when my brother Steve died unexpectedly.



Coach Steve leading the sixth annual Water-Rocks summer school outing at the base of O-kun-d-Kun Falls on a raging Baltimore River, June 2005
Photo from Fort Atkinson High School Science Department

Steve was a long time PIF member, a retired biology and science teacher who loved the outdoors, and a revered coach as demonstrated by the long lines down the street at his wake in mid February. At one point a part of the line was over 20 men, mid 30's, proudly from Steve's 1999 championship football team. His girl track athletes were equally as passionate about their coach. At just 70 he still had a lot to offer. In his later teaching years he would organize a group of students and teacher-chaperones and make a northwoods field trip called 'water, woods and rocks' to fulfill summer school credits. These trips included as much recreation as education, including rafting trips down the wild Montreal River canyon, kayaking the rapids in the Prairie Dells, paddling northwoods lakes, tours of UP waterfalls and more. I recall early June 2000 when Steve gave his students instructions on the banks of the Montreal River. The rapids were roaring after a week of consistent rain. My daughter Rachel, just 14 at the time, was already a well accomplished raft guide, and Steve was explaining to 17 and 18 year olds the importance of obeying the commands of this young gal who stood maybe just 5' tall. Split between four runs that day, 26 students were given a life time memorable experience, deep in 200 foot deep canyon walls on the very border of Wisconsin and the far western corner of the UP, between Saxon Falls and Superior Falls.

One participant called these field trips "an unforgettable, intensely enjoyable, boot camp style crash course in the north-woods and its water and geology." Every day was Earth Day or Arbor Day to Steve, who would nurture dozens-even hundreds of young trees in pots to protect them from the elements and from deer browse until they were strong. He spent many hours carrying turtles off of roadways. To whomever he talked he was passionate about careful and sustainable resource management. I truly hope several of his students carry on and maintain a conservation legacy he installed in them!

Following the joy of completing the Pilgrim Forest Legacy easements and keying on even further UP conservation, I was dealt a disappointment when the WDNR dropped a conservation project within the NHAL that I had put many hours into with the land owner. Oddly, they waited until long after they had completed the appraisals and the baseline field work. Yet another symptom of the growing lack of respect for our conservation programs.

In August of 2017 I was forced to file a law suit in Marquette County, to continue to use an access easement blocked by an ignorant neighbor, who I desperately tried to reason with. The easement was recorded for the 40 years of our ownership and served our predecessor prior to us, and Fred, this ignorant fool thought he should simply block it off because perhaps it was not in the exact location it should be. The law was soundly on our side as the judge cited several instances in law while awarding us summary judgment at the March 5th trial. We are to get the easement surveyed, so as the judge says 'this nonsense never happens again.' Fred's actions and threats were startling enough that the judge gave us a Writ of Assistance, ordering the sheriff's department to help us as needed and arrest and jail Fred should he further impede our access.

This ridiculous experience is expensive, is a negligent waste of good time and causes a lot of stress. I spent many hours answering discovery, writing numerous pages of answers, as they attempted to misstate facts. I lost way more than the time I would have devoted to an issue or two of Partners News. We are to have the surveyed easement recorded by June 11th when a settlement conference is to be held. I am certain I will have more to say on this matter.

I have said this before: *IF* any of you have access easements to or across your property, please learn the law. The grantee of the easement is the dominant estate, the grantor becomes servient to the grantee. An invaluable guide about easement issues in Wisconsin is called Wisconsin Law of Easements by Jesse S. Ishikawa, published by the State Bar Association. Know your rights and protect your rights, but do not infringe on another's rights. And avoid whenever possible an unpleasant experience as this lawsuit was for me. I suggested to Fred before he blocked the road and started his threatening behavior to obtain this book. He abruptly hung up the phone on me. Good neighbors are to be cherished, and I do have some good ones also.

Given the excitement of spring, and the hope and joy it brings being just around the corner, I will turn away from these distractions of the past few months. In this era of mass produced plastic garbage, there is still a breed of craftsmen and women who do incredible things, in very sustainable ways, with our natural resources. In this era of road rage and material excess there is still a breed caring for the earth and for others by sharing, networking and assisting in sound practices which will benefit future generations. For them we should always be grateful, in the true spirit of Earth Day and Arbor Day!

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UPDATE: WILDCAT FALLS PROJECT! A COMMUNITY FOREST CONCEPT. STEPPING UP PROTECTION OF THE LAND.

As a follow up to our December story, a conservation minded partnership has secured title to the Wildcat Falls property and has reached out to Northwoods Alliance and PIF for assistance in achieving a permanent and publicly beneficial conservation solution.

Fundraising is now under way to achieve a permanent conservation legacy for 160 acres including Wildcat Falls, in the Upper Peninsula near Watersmeet, Michigan. This effort undertaken by the Northwoods Alliance and Partners in Forestry is supported by Copper Country Chapter of Trout Unlimited, Friends of Sylvania, Jack Parker & Associates, Keweenaw Land Trust, Upper Peninsula Environmental Coalition (UPEC) and the Wilderness Society has been given a boost recently by a $10,000 UPEC Community Conservation grant. The UPEC grant is intended to leverage our fundraising capacity at the local level, and was made possible by deceased PIF member and conservationist Tom Church. See summer 2013 Partners News 'Remembering my Friend Tom'.

We anticipate about $260,000 will be needed to reach the overall goal. It is our hope that 2018 will be a strong enough fundraising year for continuing momentum in January 2019 to apply for a USFS State and Private Forestry Community Forest and Open Space Conservation Program Grant requesting 50% of the goal. With significant funds secured we could feel comfortable also asking private foundations for help. Optimistically 50% from USFS, 25% locally raised and 25% from conservation foundations could be a possible scenario to reach our goal.

We need your help! We need to maintain momentum!

What can you do?

- Request (from PIF) the document Wildcat Falls, A Community Forest Concept and share it with your network of folks who may be able to help.
- Attend a field day to Wildcat Falls or an organized meeting coming up to promote this opportunity.
- Visit Wildcat Falls and become energized by its appeal, the way many of us have.

Fundraising is conducted by the Northwood Alliance Inc., a 501 (c) 3 non profit and a 509 (a) 2 public charity. Checks can be made out to Northwood Alliance Inc. with Wildcat Falls in the subject line and sent to Partners in Forestry.

The future of this priceless gem is no longer in jeopardy if we all act together!

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Watch the next issue for a report from member Joel DeAngelo from his Sugar Shack and learn about his experience in tapping maples.

TAPPING MAPLES

Submitted by Joel DeAngelo

THE BAGS IN THE PICTURE ARE ON TREES WE HAVE NOT TAPPED IN THE PAST AND WEREN'T TAPPED WHEN WE STARTED THE SEASON. THESE TREES ARE ON THE NORTH SIDE OF MY FOOD PLOTS. THE SUN IS LOW IN THE SOUTH SO THESE TREES GET MAXIMUM SUNLIGHT NOW. MOST OF OUR TREES ARE ON THE SOUTH SIDE IN THE WOODS AND GETTING LITTLE SUN. THESE SOUTH SIDE TREES ARE ALSO CLOSER TO OUR STOVE, SO EASIER TO ACCESS INDEEP SNOW.

WE MOVED NON PRODUCING TAPS TO THESE TREES ABOUT A WEEK AGO. WE WILL MOVE MORE TAPS TOMORROW TO THIS SIDE OF THE PROPERTY NOW THAT THE SNOW IS MELTING AND WE HAVE BETTER ACCESS TO THEM.

SOME OF OUR BEST PRODUCING TREES ON THE SOUTH SIDE DON'T START RUNNING HARD UNTIL THE END OF THE SEASON, LIKE THE FIRST WEEK OF APRIL.

3/26/18:
17 GALLONS COLLECTED FROM 39 BAGS.

3/28/18:
NEXT BOIL

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PIF note: In learning from VP John Schwarzmann of his research on hardwood-hemlock regeneration and success of growth on tip-mounds, we are happy to present this informative feature from John, edited by him for Partners News.

To make the tip-mound discussion easier to comprehend for the non-professional, scientific citations have been removed and jargon has been reduced to the extent possible. This tip-mound discussion is a draft created for a scientific journal in collaboration with other researchers. This version however, solely represents the views of John Schwarzmann.

TIP-MOUND DISCUSSION

John Schwarzmann, Forest Supervisor
Board of Commissioners of Public Lands

Following a moderate severity windthrow where 30 -60% of the canopy trees are tipped or broken, many treethrow gaps exhibit tip-mounds, pits, mineral soil, and the uprooted tree (tip-mound complex) along with distinct zones of relatively undisturbed low and high-light areas that create a diversification of germination niches in hemlock/hardwood and northern hardwood forests. These ecosystems experience soil, light and substrate changes that create favorable conditions for light-seeded species to germinate and grow into the canopy.

Disturbance with tip mounds stimulates the discussion here in

To evaluate the role that new tip-mounds play in forest stand dynamics, a recent collaborative study between the US Forest Service Northern Research Station in Rhinelander and the WI Board of Commissioners of Public Lands (BCPL) focused on the full life cycle from seedlings to mature canopy trees as a basis of ascertaining the competitive advantage of particular microtopographic features. The study looked at four mature northern hardwood areas that received moderate severity blowdowns in 2000 and 2001 in northern Wisconsin. It found a significant association between overstory hemlock and tip-mounds as well as a slightly less significant association for yellow birch indicating that tip-mounds provide a long-term competitive advantage to these species relative to pits and undisturbed areas following moderate severity disturbance on well to somewhat excessively drained soils in hemlock/hardwood forests. Studies in Massachusetts also found similar long-term growing advantages for birch species growing on tip-mounds following catastrophic disturbances in the Harvard Forest.

The USFS-BCPL study also showed that new tip-mounds support high densities of light-seeded species that can grow above browse height (2m) in as little as thirteen years. Over 80 percent of young tip-mounds contained sapling light-seeded species with 60 percent of new tip-mounds containing sapling yellow birch above 2m in height. Paper birch, *Betula papyrifera* was the second most common light-seeded species on new tip-mounds and demonstrates how new tip-mounds may help pioneer species like paper birch persist at low levels in late successional hemlock/hardwood forests.

For all regeneration sizes, the moderately disturbed areas were significantly associated with yellow birch and all light-seeded species combined supporting a nearly ten-fold increase over undisturbed areas. A similar significant association between seedlings of light –seeded species and new tip-mounds was also found in a study of substrate dynamics following catastrophic windthrow in Massachusetts. Sugar maple and eastern hemlock regeneration


Tip mound in the study area.

were not significantly associated with any substrate or microtopography in this study meaning that they germinated and grew on all substrates nearly equally well.

We explain the long-term competitive advantage that new tip-mounds provide for browse-sensitive light-seeded species as a complex of diverse factors, with some of the most important being; i) altered soil properties in tip-mounds relative to pits and undisturbed areas leading to a favorable seedbed for light-seeded species and less competition from sugar maple and ferns ii) long-term mound stability; iii) juxtaposition of tip mounds and large gaps providing higher moisture and light resources for trees relative to darker, undisturbed areas; iv) lower canopy shoulder heights following disturbance; v), lower deer browsing pressure allowing trees to reach sapling sizes > 2 m in height;

A key property that helps explain the association between light-seeded species and new tip-mounds is the relationship between germination temperatures and higher upper horizon soil temperatures (0 -12 cm depth) in summer compared to adjacent pits and undisturbed areas, a characteristic that can persist even for old mounds. New tip-mounds are generally found in a higher light environment than old mounds and would therefore likely experience even greater upper soil horizon temperatures than those reported for old tip-mounds. Yellow birch and Eastern Hemlock seeds require high germination temperatures relative to sugar maple. Studies have shown that at 64 degrees Fahrenheit, 62% of yellow birch seeds and 64% of hemlock seeds germinated. Even as high as 84 degrees, 60% of yellow birch seeds still germinated. A study in New York found the largest soil temperature differences between tip-mounds and adjacent pits and undisturbed areas in May and early June during the highest incidence of seed germination for most light-seeded tree species in the temporal climate of the Upper Great Lakes states. Sugar maple on the other hand has an optimal germination temperature of 34 degrees Fahrenheit when most seeds germinate shortly after snowmelt in early spring. Stark differences in germination temperature likely play a role in why sugar maple seedlings are much more common on undisturbed areas than new tip-mounds in our Northern WI study.

Another key feature favoring light-seeded species on new tip-mounds is the long duration of exposed mineral soil. In our study, tip-mounds still had exposed soil (9% of mound surface area) more than 13 years after a blowdown providing ample time for multiple occurrences of good to excellent yellow birch or hemlock seed crops to rain seeds upon the tip-mound. Good to excellent seed crops occur for yellow birch every 2.7 years with a 1-8 year range. Small seeds that fall into pits and flat areas, however, often get smothered by leaf litter or mineral soil is covered by leaf litter in less time than the frequency of good seed crops.

In our study, few seedlings from trees species with heavier seeds were present upon new tip-mounds. Lack of a suitable seedbed for large seeds is likely a major reason. In many cases, large seeds may simply roll off of steep-sided tip-mounds such as the round-seeded American basswood, *Tilia Americana.* Ash and maple samaras are easily visible to birds and rodents or cannot easily lodge in the soil.

Tip-mounds frequently feature the burying of the nutrient rich A horizon (top mineral soil horizon) and inversion of lower horizons. Discrepancies in soil properties between mounds, pits and undisturbed areas plays an important role in diversifying germination niches which may lead to a segregation of tree species and reduced competition for seedlings in some soils. In our study, we found no association for sugar maples > 10.0 cm DBH and microtopography. In contrast, we had a strong negative correlation between new tip-mounds and sugar maple

seedlings similar to a New York study where sugar maple seedlings were positively associated with undisturbed areas relative to pits and old mounds. Old mounds were drier, poorer in nutrient content, had a lower cation exchange capacity, less organic matter, less litter cover, a thinner A horizon and less snow accumulation in comparison to pits. In areas without hemlock, the old mounds were also more acid, warmer in the summer and colder in the winter and more subject to frost heaving than pits. Trends in pH and Calcium concentration for old mounds and pits were the same as for the recent tree falls.

In contrast to the negative associations between mounds and sugar maple in the above studies, studies in Pennsylvania and Michigan's upper peninsula found a strong positive association between old mounds and mature sugar maple trees. Strong podzolization of undisturbed sites in the Michigan sites suggests that low calcium and magnesium levels in the top soil horizons (0-15 cm depth) may increase sugar maple seedling mortality and restrict the pool of viable regeneration to old mounds where horizon inversion created more nutrient-rich spodic horizons closer to the surface. Podzolization describes the process where acidic groundwater leaches iron out of upper soil minerals. The iron gets redeposited in lower soil horizons at more alkaline conditions. This process is extremely common under hemlock forests since hemlock needles are very acidic and contribute to very acidic upper soil groundwater. Many soils under long-term hemlock ecosystems have iron deposits in lower soil horizons that form a hard iron barrier called a hardpan. These soils are often very low in nutrients such as calcium and magnesium in the upper soil profile.

A comparison between the soil chemical properties of the Upper Michigan soils areas with those reported for a wide range of unglaciated soils on summit and backslope positions of the Allegheny Plateau in north central Pennsylvania and southeastern New York that experienced sugar maple mortality in the 1980's and 1990's suggests that old-tip mounds may be acting as nutrient refuges for sugar maple regeneration on soils with low calcium and magnesium concentrations in upper soil horizons. Calcium and magnesium levels were lower in the upper 5 cm of soil where seedlings would germinate than the unglaciated Allegheny soils that have experience sugar maple declines. The close relationship between sugar maple seedling survival and calcium levels has been demonstrated in fertilization experiments. Sugar maple seedling survival and growth has been shown to increase significantly following calcium fertilization at the Hubbard Brook Experimental Forest in New Hampshire. After a lag of 3 to 8 years**,** there were statistically significant increases in survival, crown vigor, diameter, and basal area growth, and flower and crop production for sugar maple on limed compared with unlimed areas.

Relative to the calciphilic sugar maple which shows growth declines below threshold levels of Ca and Mg both yellow birch and hemlock are less calcium and magnesium dependent and likely maintain species mixtures with sugar maple by exploiting areas with lower concentrations of these two nutrients.

Trees growing on new tip-mounds relative to pits and flat areas may also benefit from lower levels of herbaceous competition, especially regarding highly competitive ferns and berry species that rely upon rhizomes for a fast rate of spread. In Pennsylvania , a study measured significantly less hayscented fern *Dennstaedia punctilobula* and overall vascular herb cover on mounds than in pits and flats following a catastrophic blowdown. Four growing seasons after disturbance, they found only 6.7% of mound surface area was covered by herbs as opposed to 73.8% herb cover on adjacent undisturbed soil patches. The long duration of exposed mineral soil in our study on new mounds also suggests that tree seedlings enjoy a competitive advantage with regard to reduced herb competition

on new tip-mounds. Lack of a continuous soil surface in conjunction with more extreme soil properties may explain the reduced herbaceous cover.

Tip-mounds longevity is critical to the role they play in the dynamics of natural forest ecosystems. If tip- mounds eroded rapidly, their ability to provide a competitive advantage as a long-term microsite would be dubious. A recent tip-mound study used a variety of methods including tree-ring analysis, and radiometric ^{210}Pb and ^{14}C dating to estimate tip-mound longevity in European beech forests as well as in sand-textured northern Michigan soils that were podzolized. On fine-textured beech sites, treethrow microtopography persisted for 220 years and exceeded 1700 years on sandy loams. On the sand textured Michigan podzolized soils, they estimated the maximum age of a mound to be 5,260 years $\pm$30 BP. These ages suggest that mound erosion is often slow enough to allow mound regeneration to grow into the canopy. In our study, dominant yellow birch and hemlock trees > 50 cm DBH were often present growing upon old tip-mounds and overstory hemlock were significantly associated with tip-mounds. Had tip-mounds of all ages been unstable or a poor microsite, it is doubtful they would have grown to such a large size and competitive canopy position. The Upper Michigan tip-mound study found a disproportionately high numbers of canopy trees on mounds for all categories of tree diameter although the frequencies were highest for the oldest trees.

Presence of trees may also contribute to tip-mound stability and slow the erosion rate. In our study, it was not unusual to see new tip-mounds completely surrounded by a lattice of tree roots holding the soil in place. Redevelopment of fine roots could contribute to the physical stability of the mound and pit sides, which have been known to maintain slope angles, of 30° or 40° or more for periods of at least two to three centuries. Uprooting creates tip-mounds with lower soil density, and with deeper rooting distances to hard pans and mottles caused by high water tables in comparison to pits and undisturbed areas. The lower soil density and higher moisture contents of new tip-mounds below a 10 cm depth likely creates favorable conditions for roots to completely utilize the entire tip-mound soil profile.

Juxtaposition of new tip-mounds growing within large gaps increases light and moisture available for growth in comparison to seedlings that get established in undisturbed areas. A 2007 study at UW Kemp Station in Lake Tomahawk, WI found that 67% of the total gap area in moderately disturbed hemlock/hardwood stands were larger than 500 m^2 (5000 square feet) Gap Light Index values calculated as a measure of the total seasonal photosynthetically active radiation reaching the point in the understory where the photo was taken exceeded 20% in approximately 73% of sampled points. Another Upper Michigan study in the Huron Mt. Club lands in 2007 examined the influence of treefall gaps on soil properties and processes in old growth northern hardwood-hemlock forests in the upper Great Lakes region, USA. They found significantly greater solar radiation, soil moisture contents and soil temperatures in gaps compared to adjacent closed canopy plots. Another characteristic of large gaps that favors tip-mound regeneration is the large number of windthrown trees crush or tip advanced regeneration of shade-tolerant species such as sugar maple. In the absence of these destructive forces, gaps are usually captured by the tallest advanced regeneration. Generally, small canopy gaps maintain shade tolerant species such as sugar maple whereas large canopy gaps allow for the recruitment of shade mid-tolerant species such as yellow birch.

In our study, the nearly 23% reduction in the canopy shoulder height (Height of the widest part of canopy trees) will likely decrease the time required for saplings to successfully capture the gap. For successful saplings, gap capture generally occurs 28-37 years after gap formation by trees growing at a mean post-release height increment of 40 -50 cm/yr. The canopy shoulder height reduction in our study sites would correspond to a decreased gap capture period requiring only 22-29 years, increasing the likelihood that crown expansion would not suppress existing saplings. On tip-mounds, distance to canopy shoulder height is further reduced by the elevated growing site.

Gap capture can potentially be strongly influenced by the rate of lateral gap closure where 200 m^2 (2000 square feet) is a key gap size below which successful gap capture by yellow birch is negatively correlated with gap area. A 2004 study used a light attenuation model 1 meter above the ground to estimate that yellow birch would need at least 20% full sunlight to outcompete sugar maple. Mean canopy opening size increased nearly five-fold to more than 574 m^2 in disturbed areas in our study compared to adjacent undisturbed areas, increasing the area above 20% full sunlight.

The time for gaps to shrink from 574 m^2 to 200 m^2 depends upon the species composition and radial crown growth rates. Mean crown growth rates for northern hardwoods were estimated at 9.0 cm/year and for hemlock it is less at 6.0-7.0 cm/year in a northern Wisconsin study. Using a mean radial crown increment of 8.0 cm/year which corresponds to nearly equal basal areas of hardwoods and hemlock at our study sites, it would take approximately 35 years for the mean gap area in our study to fall below the 200 m^2 threshold in a circular gap, a duration well above the 22-29 year estimated gap capture time for tip-mound yellow birch saplings.

Despite the fact that new tip-mounds were often less than 2 meters in height, and white-tailed deer *Odocoileus virginianus* adults are large enough to reach most mound heights, tip-mounds in our study afforded protection to browse-sensitive birch species. Browsing was significantly greater off mounds than on mounds for yellow birch and all light-seeded species pooled. It was rare to find browse-sensitive species such as yellow birch and hemlock growing above 1 meter in height other than on mounds or in conifer cribs. Destructive sampling of heavily browed seedlings outside of these microsites showed that they would sustain repeating browsing episodes over a three to eight year period and then senesce or succumb to competition from herbs. The ability for new tip-mounds to protect seedlings against excessive deer browse pressure was also found in studies following a catastrophic blowdown in a Pennsylvania hemlock/hardwood stand. Hemlocks on mounds were larger, more abundant, and browsed less often then hemlocks off of mounds.

The combination of two or more intertwined conifer crowns greater than 1 meter in height ("cribbing") overtopping well-decayed wood was a second important site where browse-sensitive species like yellow birch grew past deer browse height (2 meters or 6.4 feet). Both hemlock and yellow birch seedlings are significantly associated with well-decayed hemlock and yellow birch stems and large branches that are lying on the ground and often persist for at least a decade. In the absence of moderate severity disturbance most of the yellow birch seedlings growing on stems and large downed branches will, however, eventually die from deer browsing or low light conditions. Following disturbance, however, the low to moderate numbers of seedlings growing on this

rotting wood suddenly finds a more hospitable environment with higher light levels and some of those seedlings will likely experience less deer browsing by protection from cribbing.

We hypothesize that reduced browse impacts were the result of both fast growth rates of seedlings and saplings upon mounds and deer movement was impeded by the abundant, horizontally-structured stems and branches up to 3 meters (9.6 feet) in height. Some of the dominant yellow birch saplings in our study were 7 - 9 meters tall (22 to 30 feet) in only thirteen growing seasons. Not only can downed wood form a barrier for individual or groups of seedlings, the large pulse of downed wood following a moderate severity or catastrophic blowdown appears so dense in some areas as to potentially hinder deer flight in avoidance of predators. While our study design did not provide enough data to find significant associations, the role that cribbing plays in regeneration of browse sensitive species following moderate severity disturbance deserves further study especially regarding the relationship between downed trees and deer movements.

Interestingly, only about one quarter of all new tip-mounds supported hemlock, and all stems were seedlings between ½ meter and one meter in height. Mature hemlock was positively associated with tip-mounds so the mound affinity for hemlock is not as obvious as for yellow and white birch thirteen years after disturbance. Since hemlock is very shade tolerant, existing hemlock seedlings may persist and grow over many decades and eventually reach the canopy. Our study may also underestimate hemlock recruitment if seedling establishment proceeds gradually over several decades, which appears to be very plausible given the long-term exposed mineral soil.

Another explanation may be gradual recruitment of hemlock on old tip-mounds, especially if the old tip-mound supports well decayed hemlock wood as a germination site. The downed wood pulse following moderate severity disturbance on our study sites supports this assertion. Large downed wood covered 20% of our 2 meter regeneration plots and old tip-mounds covered 15-24% of our study sites. Assuming a random distribution, downed wood covered 3.0-4.8% of all old mounds in our study sites which corresponds to 35-59 old mounds/hectare or 13 to 23 per acre (8.16 m^2 mean old mound area). The nearly equal numbers of hemlock seedlings in undisturbed and disturbed sites in our study supports the hypothesis that hemlocks use both new and old mounds for germination and are not as dependent upon new mounds as light-seeded species for their preferred regeneration niche.

New tip-mound density also plays a crucial role in stand dynamics and whether they provide enough growing niches to form the dominant regeneration event for light-seeded species. Following a moderate severity windthrow disturbance the new tip-mound density will vary based upon factors such tree species, levels of internal wood rots, topographic position, windspeed and soil depth. In our study, 2.5-5% (mean of 3.2%) of disturbed areas consisted of new tip-mounds with a mean of 38-76 per hectare (15 to 30 per acre) across our four study sites. The 2007 Lake Tomahawk study estimated 70 new tip-mounds per hectare (27/acre) in three mature/old-growth hemlock/hardwood stands following moderately intensity windthrow disturbances in northern Wisconsin.

Comparing the density of yellow birch on new mounds above browse height with the density of dominant and co-dominant yellow birch trees in the canopy also supports the hypothesis that moderate severity disturbance is the dominant regeneration event for yellow birch and perhaps other light seeded species over the lifetime of the oldest trees in the stand. For example, at four sites in federal wilderness or state natural areas with little or no evidence of past timber harvest , the density of canopy yellow birch trees varied from 13 to 38 trees per hectare, (6 to 15/acre) including snags. In our study, 23-46 new tip-mounds per hectare (9 to 18/acre) were occupied by one or more sapling yellow birch trees above browse height. While competition induced self-thinning will reduce overall sapling numbers over time, each new tip-mound will likely host one or two dominant stems. The density of new tip-mound sapling yellow birch, therefore, exceeds or is similar to the densities of canopy yellow birch in undisturbed areas.

Management Recommendations

Moderate severity disturbance resulting from blowdown is a rather infrequent event in northern hardwood/hemlock hardwood stands occurring once approximately every 300-390 years in mature and old-growth stands in the upper Michigan. Despite their infrequent occurrence, there is a high probability of partial stand destruction at least once in the lifespan of a cohort of long-lived tree species such as yellow birch, sugar maple and Eastern hemlock. The post-disturbance changes in forest structure, substrate conditions and light environment represents a unique opportunity to regenerate a diverse cohort of browse-sensitive, light-seeded species on well or somewhat excessively drained soils.

Management practices following blowdown usually involve salvaging the largest, most valuable stems. Severing the stem from the tip-mound often results in tip-mounds swinging back into the pit either by the force of gravity alone and/or through the elasticity of bent roots leaving an upright stump and little exposed mineral soil. Other studies found that half of all tip-mounds hinged back into the pit after salvaging. Failure to maintain new tip-mounds may lose the best opportunity in several centuries to regenerate light-seeded, browse sensitive species. We recommend that managers should maintain new tip-mounds by: 1) Designate a portion of windthrown trees to be unsalvaged, especially near yellow birch seed trees in high light environments or near other browse-sensitive, shade-tolerant seed trees in small gaps. 2) Reserve long-lived conifers such as eastern hemlock, northern white cedar *Thuja occidentalis,* white spruce *Picea abies* and eastern white pine *Pinus strobus* if possible. Intertwined crowns of rot-resistant branches can impede browsing on time scales long enough to allow browse-sensitive species to grow past browse heights. In addition, hemlock woody forms an excellent nurse log for yellow birch and hemlock regeneration. 3) In cases where the main stem is salvaged, the tip-mound can be prevented from swinging back into the pit by propping the base of the mound horizontally with a large-diameter (> 30 cm diameter) 10-14 ft.-long log prior to severing the main stem. A low-grade log or large pulpwood is frequently used for such purposes. Loader arms on timber forwarders can prop tip-mounds efficiently. On WI Board of Commissioners Lands in northeastern Wisconsin, propped new tip-mounds following a blowdown in 2013 have remained upright to date. 4) Reserve damaged standing yellow birch trees for future seed production. Yellow birch is more wind firm than hemlock and sugar maple and is known to cast off branches in storms to reduce wind shear. These trees are nevertheless important seed sources and even heavily damaged trees may produce a stress seed crop before senescence.

It may also be a good idea to maintain new tip-mounds in other forest ecosystems besides hemlock/ northern hardwoods. The competitive advantages that new tip- mounds provide to light-seeded tree species following moderate severity blowdowns may not be confined to these ecosystems. Both mid-tolerant and shade tolerant, light-seeded tree species may be adapted to regenerate following moderate severity blowdowns in any forest ecosystem where the recurrence interval of moderate severity blowdowns is shorter or nearly equal to the maximum lifespans of dominant light-seeded tree species. In the Upper Great Lakes area of North America, the maximum lifespan of yellow birch approaches 350 years and for hemlock it surpasses 370 years. These lifespans are similar to the recurrence interval of heavy partial windthrow disturbance.

Given that high winds still cause moderate severity disturbances in northern hardwood stands, we recommend artificial tip-mound manipulation only where seed trees for light-seeded species are rare or declining. We recommend small-scale attempts at shaving the tops of old mounds to expose mineral soil with the front blade of a forwarder in large gaps or shelterwood areas for yellow birch reproduction and in small gaps to stimulate hemlock regeneration. Large-scale creation of new tip-mounds would usually require the utilization of large bulldozers and could increase the likelihood of the introduction of invasive species or soil compaction. For these reasons, we do not currently recommend artificial tip-mound creation until additional research has fully evaluated the impacts of creating or manipulating mounds to stimulate tree regeneration.

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Forester, CPA, forest tax expert and PIF member (and PIF tax preparer) Geary Searfoss found time for this great story on Climate Adaptation before becoming buried in the tax season. Geary has been a true asset to PIF.

FOREST MANAGEMENT IN LIGHT OF A CHANGING CLIMATE – GEARY SEARFOSS

Farming is a challenge. A farmer has to make decisions about what to plant using just general forecasts about the upcoming growing season. He also makes these decisions without knowing in great detail the extent of the pest problems he will likely encounter or the market he will be selling into.

Growing trees is even more challenging. The decisions we make on what to plant not only need to consider the upcoming growing season but quite possibly the growing seasons for the next 60 to 80 years. Insects and diseases can show up during the tree's life cycle that weren't even on the radar when the trees were planted or regenerated.

Enter climate change. Most scientists agree that our climate is warming and indeed, our experience over the last couple decades lends credence to that conclusion. (I heard recently on public radio that temperatures in northwest Wisconsin average three degrees warmer than they were sixty years ago). Even if you don't believe that climate change is man caused, or even a real phenomenon, as an investor in timber, ignoring a potentially warming climate could result in making some significant mistakes.

The personal situation that led me down this road was what to do with my black ash swamps. My property is located in southeastern Sawyer County. Two summers ago an Emerald Ash Borer was found within 5 miles of my property. In preparation for the inevitable, I had been thinning my black ash swamps prior to this find, but now I figure I need to start converting those stands to a different species. But what?

My first thought, since the soils are wet, was to convert the sites to tamarack. As an experiment I purchased some seed, cleared some black ash, and direct seeded. Then I attended this session on adapting our woodlands to a changing climate. What I found was that tamarack is on the list of species that may decrease in abundance as the climate warms. Tamarack requires a cold climate and is susceptible to drought - two characteristics that will work against the success of tamarack in a warming climate. Perhaps converting to tamarack isn't the best decision.

The Northern Institute of Applied Climate Science (NIACS) has developed a climate change response framework. As part of this framework they have developed forest adaptation resources for forest land managers. They define adaptation as action intended to enhance the ability of ecosystems to adapt to climate change and its effects. Adaptation actions can be used to avoid loss of forest cover, declines in forest productivity, alterations of the ecosystem processes, reductions in the environmental benefits that forests provide people, and other potential impacts.

There are three broad options for responding to climate change. The first is resistance. This includes actions taken to improve the defenses of the forest against anticipated changes. The second option is resilience. These are actions taken to accommodate some degree of change, but encourage a return to prior conditions after a disturbance, either naturally or through management. The third option is transition, which include actions that intentionally accommodate change and enable ecosystems to adapt if we respond to changing and new conditions. Since I am facing Emerald Ash Borer anyway, I'm looking to transition my black ash swamps to something that will do well in the changing conditions.

There is a lot of interesting information on the forest adaptation website, www.forestdaptation.org. What was most interesting to me is a handout found at the same web site (/northwoods_tree handouts). There's one that covers Northern Minnesota, another that covers Northern Wisconsin and the western upper peninsula of Michigan, another that covers the eastern upper peninsula and the northern lower peninsula of Michigan, another that covers the driftless area of Minnesota, Wisconsin, Illinois, and Iowa, and yet another that covers Southern Wisconsin. Since I am in Northern Wisconsin I chose that one.

On the back of this handout are adaptability ratings for various species based on two scenarios: a low climate change scenario and a high climate change scenario. Under the high climate change scenario, species that are projected to decrease by more than 20% by the year 2100 include balsam fir, black ash, black spruce, butternut, eastern white pine, jack pine, northern white cedar, paper birch, quaking aspen, red pine, sugar maple, white spruce, and yellow birch. Species that are projected to increase by more than 20% include basswood, butternut hickory, black cherry, black oak, black walnut, bur oak, ironwood, shagbark hickory, silver maple, white ash, white oak, and one that interests me for my situation, hackberry.

There are also species that they project will be suitable for Northern Wisconsin that we weren't able to grow in the past. Those possibly include black hickory, black gum, blackjack oak, chestnut oak, common persimmon, eastern red cedar, gray birch, northern catalpa, Ohio buckeye, osage-orange, sassafras, sweet gum, and sycamore. Growing up in northwest Ohio where sassafras was native, I have fond memories of boiling the roots of that plant to make sassafras tea. Hmmm, that gives me an idea.

Going back to hackberry, further research shows that it grows best on moist alluvial soils though it will grow on a wide range of soil types. Though sites with a permanently high water table are unfavorable, periodic flooding is not detrimental. My sites all have drainage and are only inundated with water during the snowmelt and significant precipitation events. Hackberry has limited lumber value but apparently the birds like its fruit that persists into the winter months. Deer and rabbits apparently like to browse the young seedlings but hey, what's new? Perhaps I will do a trial using hackberry.

Another idea came from a local horticulture instructor. He's been working with a northern strain of bald cypress. The normal range of bald cypress extends into southern Illinois and Indiana but he has had success planting it locally (the Hayward area). That would be pretty cool, eh? Bald cypress in northern Wisconsin? My old Ag Handbook 271 says bald cypress is tolerant down to -20F. Don't think I'm quite ready to say that temperatures colder than that are a thing of the past – but it sure is tempting.

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Have you checked out PIF's website? www.partnersinforestry.com

The website is for members to expose your business, service or tree farm, share thoughts, ideas, articles, photos, and links. This is your COOP, we need your input as much or more than your dues.

LET THEM EAT WOOD

By Paul Hetzler, Cornell Extension

Nearly all historians agree Marie Antoinette probably never coined the phrase "Let them eat cake," a saying already in popular culture before her time. The phrase was ascribed to her by opponents to bolster her reputation as callous and arrogant. She would have seemed far more benevolent if she had said "Let them eat wood."

From remote villages to five-star urban restaurants, people around the world consume all manner of delectable dishes featuring second-hand wood. Although that is not generally how it is featured on the menu. Mushrooms such as inky cap, oyster and shiitake have a voracious appetite for wood, a substance that very few organisms eat because it is so hard to digest. Anyone who has tried to dine on lumber can attest to that.

Wood is made primarily of cellulose along with varying amounts of lignin. This latter compound is to cellulose what steel reinforcing rod is to concrete. There is far less of it but it imparts a great deal of strength and resilience. Even professional wood-eating bacteria in the gut of a termite cannot digest lignin. Only certain fungi have that superpower.

There are three basic groups of wood-decaying fungi: soft-rot, brown-rot and white-rot. In scientific terms these coteries are not closely related even though they have the same last name. Apparently for fungi, "rot" is like our "Smith" in that respect.

Soft-rot fungi are very common, causing garden-variety decay in tomato stakes and fence posts. Wooden ones, at least. Brown rot is less common. At some time or other you've probably seen its handiwork. This fungus results in a blocky pattern, turning wood into miniature, spongy brown bricks. While brown rot needs moisture to do its dirty work, it is sometimes called dry rot because it readily dries out and is often seen in that condition. Both soft-rot and brown-rot fungi consume only cellulose, eating around lignin like a kid who avoids the Lima beans lurking among the tasty food on their plate.

White-rot fungi, on the other hand, belong to the clean-plate club, digesting every component of wood. This category of fungi can cause serious decay in hardwood trees, although a few species attack conifers. Foresters hate it, but foodies love it. It is the group that gives us *Armillaria mellea*, a virulent and devastating pathogen that produces tasty honey mushrooms.

Shiitake and oyster mushrooms are white-rot fungi, although they are saprophytes, akin to scavengers like turkey vultures, not predator-like pathogens. So we don't have to feel guilty about eating them. Regionally, shiitake farming has, um, mushroomed over the past decade. It is a source of supplemental income for farmers and a source of fun and good food for anyone who wants to try it.

Shiitake prefer oak, beech, maple and ironwood, more or less in that order. To cultivate shiitake, bolts (logs) made of one of these hardwoods are needed. Bolts are typically about four feet long and range from three to eight inches in diameter. Such logs will bear mushrooms for roughly one year per diameter inch. A series of holes are drilled in the logs, and these are filled with mushroom "seeds" called spawn.

As of September 2015, NY State has recognized "actively managed log-grown woodland mushrooms" as a proper—and significant—farm crop. This allows farmers to designate land they use for growing mushrooms as agricultural, making them eligible for tax breaks. (Thanks to Senator Patty Ritchie for helping this come about.) However, the 2015 law does not extend to wild-harvested mushrooms.

Cornell University has been quite proactive in promoting mushroom farming as a source of income for rural residents. In a 3-year study that wrapped up in 2012, Cornell and its research partner institutions determined that that farmers could turn a profit in just 2 years. They found that a 500-log shiitake farm could potentially earn $9,000 per year.

Steve Gabriel, Cornell's mushroom-farming expert, points out that raising log-grown mushrooms is sustainable and environmentally friendly, in addition to being a viable income source. You can find a great deal more information on the website Professor Gabriel administers: www.cornellmushrooms.org

Note from Joe: We are proud to present these informative features from Paul. We have talked about Forest Farming for years, and this expands that discussion. I will bet mushroom grower and PIF CPA Geary will have an opinion on the NY State Ag. designation for mushroom growers. For more on wood decay and fungi please see Partners News July 2011 interview with Mycologist Dana Richter who runs the wood decay testing laboratory at Michigan Tech. Though that interview was geared toward preserving, the fungi-decay issue was within.

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Future Articles

If you have questions that you would like to see addressed in the newsletter, suggestions for, or have articles for, future newsletters, please contact us at partnersinforestry@gmail.com or by mail:

Partners In Forestry
6063 Baker Lake Rd
Conover, WI 54519

- Coming up soon is a discussion with Chuck Abitz, WDNR Managed Forest Law Specialist. Any one in MFL will be interested in this interview.
- More from our own John Schwarzmann, who is involved in ongoing silviculture research, as Forest Supervisor of the Board of Commissioners of Public Lands.
- We have asked the UW Center for Cooperatives to assist our partnership with Northwoods Alliance in hosting a series of field days with which we hope to highlight all the values of land protection. Plan on attending these valuable sessions. Tentative date for Quita Sheehan and Mike Peczynski to lead an excursion of the Upper Wisconsin River Legacy Forest is July 9, when there could be some active young Spruce Grouse chicks. We also hope to put together events for the Tenderfoot Reserve to see magnificent old growth, Wildcat Falls to promote the Community Forest concept, the NHAL to discuss silviculture and wildlife, a site to see the Tip Mounds John refers to here in and more. We will try to have a full schedule next month.

Based on the importance of water to all of us, PIF wishes to share this story with you with. We have long discussed the direct link from proper management of woodlands to clean water. Last year we talked about the MDNR Forests for Fish program. Clean water for the future is our responsibility as land managers. Paul affirms that here. There is some correlation to this story from Joe's 2008 essay titled, Water, A Tragedy of Responsibility centering on the Central Sands. (under the Conservation heading at www.partnersinforestry.com)

WATER WELLNESS

By Paul Hetzler, Cornell Extension

If you don't plan to send your water to university, why bother having it tested? Academic testing is similar to water testing in that they both involve many diverse "subjects," and that a passing grade in one domain does not necessarily apply to other areas.

Everyone knows that acing an algebra exam won't help your grade in anthropology, history or theatre class. The same logic applies to water. A coliform test can tell if your well is impacted by septic leakage or manure runoff, but it won't tell you if residues from agricultural chemicals or spilled gas or oil are getting in your water. Those are very different kinds of tests.

Nationwide, about 15% of the population rely on wells for drinking water. In rural areas, however, a much higher proportion depends on groundwater. For example, in St. Lawrence County NY, 42% of residents use wells. We are very fortunate in our little corner of the planet to have such easy access to fresh water. Across the northeastern and some of the mid western US in general, most aquifers are shallow; on average less than 80 feet below the surface. In some parts of the West, Southwest and Midwest, one has to drill 250-300 feet to find water. Another blessing is that our aquifers completely refill annually, unlike in some states where wells have to be deepened every few years because there is essentially no aquifer recharge.

While no well is pollution-proof, a dug well is more at risk for contamination from surface runoff. A drilled well is more secure, but regardless how deep it is, it's still vulnerable to surface contamination near the wellhead. There is no such thing as a well drilled into "solid rock." If there were, you'd have a dry hole in the ground. Water flows into a borehole at various depths through bedding planes (in the case of sedimentary rock), and joints and fissures. Contaminants can sometimes be drawn into a well along those same channels.

Broadly speaking, there are three categories of water quality measurements: Biological, inorganic, and organic. In terms of biological, the most common indicator of potential disease pathogens in the water is the presence of coliform bacteria. Some coliforms are harmless and occur naturally in soil, but fecal coliforms live exclusively in the digestive tract of warm-blooded animals. The presence of fecal coliform bacteria could indicate pollution from a septic system or from animal manure. It's a good idea to do an annual total coliform test on your well water, which is fairly inexpensive. Should you need to disinfect your well, the Department of Health can give you instructions for doing so.

Contaminants such as nitrate, lead, arsenic, cadmium, chromium, copper and cobalt, whether from natural or human sources, are called inorganic. So are nitrates, which can sicken or even kill infants, from agricultural fertilizers. Even though older children and adults aren't affected by nitrates, a high level suggests that pesticides, or pathogens from manure, could also be getting into the water. Many older pesticides contained high levels of lead, arsenic and copper, heavy metals which do not break down, and some farms still have high levels of these metals in the soil. Cadmium and chromium are released from smelting operations, and also when colored paper is burned. These heavy metals can leach into the groundwater.

Water hardness (from calcium and magnesium), as well as iron, chloride and sulfur are natural inorganics that can leave deposits and stains, or

cause objectionable smells or tastes. At very high levels, some of these elements can be toxic. Prices vary, but testing for inorganics is not too costly. There is usually a flat-rate for setup, and a per-element cost on top of that.

"Organic" is a misleading term, because while eating organic food is good, consuming organic chemicals is definitely not. Pesticides, degreasers, gasoline, oil, antifreeze, and many paints are all organic chemicals. How do organic pollutants get into our water? It's shockingly easy to pollute groundwater where it rains a lot and the distance to groundwater is relatively small. Leaky fuel tanks (or tank overfills), floor drains in garages, and even surface spills can contaminate wells.

We've all heard that oil and water don't mix, but that's a partial truth: they don't mix much, but more than enough to pollute water. Benzene, a constituent of gas and diesel, is 0.018% soluble in water. Given that the allowable limit of benzene in drinking water is 0.07 parts per billion (ppb), the concentration of benzene near a gas spill could be something like 180,000 ppb! (Fortunately, the odor threshold for benzene is 50-100 ppb, so you'd never be drinking benzene at that level).

It's not uncommon for chemicals like paint thinner or degreasers that get washed down the drain at home to enter groundwater through septic leach fields, and find their way into drinking water. Many chlorinated solvents like degreasers or dry-cleaning fluid, have high odor thresholds, meaning one could be drinking high levels without detecting it. Fuel oil spilled in your garden could disappear in one season if you added manure and rototilled often, but under the ground, organic chemicals break down very slowly, taking decades; even generations.

Because groundwater is not static but is always (slowly, in general) flowing, contamination from previous incidents can suddenly show up years later. A corollary to that is the fact that contamination from one property can (and does) migrate onto others' properties.

Testing for organics is complicated: for example, checking for gas and solvents, pesticides, and antifreeze all require different tests. It can also be expensive. The cost of testing for gasoline and/ or solvents varies by lab, but usually less than $100. For pesticides, though, it can run many times that amount per sample.

Most contaminants can be removed with the right kind of filtration system, but systems can be quite expensive to maintain. Occasionally, drilling a new well up-gradient from the contaminated area is more cost-effective, and safer, than continued filtration.

The take-home message is that anything that goes onto the ground or down the drain has the potential to get into the drinking water. Let's work together to keep our well water—and that of our neighbors—well.

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Trap Trees

Paul Hetzler, Cornell Extension

When I hear the phrase "trap tree," an image of Charlie Brown's kite-eating tree in the *Peanuts* comic strip comes immediately to mind. But trap trees, or sentinel trees, are meant to nab a much smaller airborne object, the emerald ash borer (EAB).

The idea is to make certain ash trees more attractive to EAB, to serve both as a monitoring tool and as a means of slowing the rate of ash death. Early in the growing season, a chosen ash tree is girdled, which stresses it and induces it to create certain phenols and alcohols not present in healthy trees. It is on this chemical signature that the adult emerald ash borers home in.

According to Aaron Barrigar, a Forest Conservation Technician with the Saint Regis Mohawk Tribe Environment Division, "Girdling ash by removing the bark and phloem around the entire circumference of the trunk creates an effective attractant for emerald ash borer. EAB adults lay more eggs on stressed ash trees than on healthy trees, which is why girdled ash are effective detection tools for the insect."

An ideal trap tree can be any black, green or white ash between four and ten inches in diameter (as measured 4.5' off the ground), but must be healthy and have full sun on at least one side. It should have easy access, and not be within striking distance of any utilities, roads or buildings. The tree is girdled in late May to early June, shortly after leaf-out.

Barrigar cautions that while the bark must be cut through, the sapwood has to remain intact. "If you cut into the sapwood, it disrupts xylem cells that transport water. This can cause the trap tree to die and be ineffective as a trap. You want the tree to stay alive during the summer."

After EAB emergence is over, usually in late fall, the trap tree is felled, limbed, and placed up on sawhorses. Using a sharp draw-knife, the bark of the entire trunk is carefully peeled to look for emerald ash borer galleries and larvae.

The Saint Regis Mohawk Tribe's Environment Division began its sentinel tree program in 2013, far ahead of any surrounding communities. Trap trees are monitored in and around Mohawk territory at Akwesasne. Along with Barrigar, Wayne Samphier, also with the Tribe's Environment Division, heads up the program. Both are active members of the St. Lawrence County EAB Task Force, a volunteer group formed at the behest of Paul Hetzler, Natural Resources Educator with Cornell Cooperative Extension.

With a focus on community education and outreach, the EAB Task Force comprises foresters, arborists, utility managers, teachers, Village, Town and County officials, as well as concerned citizens. Given that EAB has been found in two locations in St. Lawrence County, one in Franklin County, and one in northern Oswego County very near the Jefferson County border, the EAB task force feels a particular urgency in getting the word out. The group is planning to create as many as twenty sentinel trees around St. Lawrence County this spring. The Mohawk Tribe's Environment Division is even more ambitious, with plans for nearly two hundred.

In December 2017, one of Barrigar and Samphier's trap trees in St. Lawrence County yielded several dozen live EAB larvae in addition to a maze of galleries. There was evidence that the tree, a green ash on the edge of a wetland in Robert Moses State Park, may have been infested for more than one year.

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There was a presentation on EAB at last month's WHIP meeting making Paul's story more meaningful.

Though this experience talked about here is out of our direct region we find it worthy to share the meaningful actions of these folks. Please contact us for information on EAB or other threats, and we shall attempt to direct you to proper channels for help. EAB is spreading here as it is in the northeast.

PIF immensely appreciates our relationship with the folks at Cornell. The NE forests are our forests here in the upper midwest for the most part. Please check out the Cornell Forestry Blog http://cornellforestconnect.ning.com/ *Paul paid Joe a compliment recently by asking to submit a past writing of his.*

BITS AND PIECES

Does any one else have concerns for the future of our natural resources these days? While this story apparently has to do with diversity of the department's employees, the attitude of Mr. Zinke and the greater administration toward bio-diversity is a big concern to many concerned about the fate of our natural resources. A headline from main stream news channels in late March reads (Interior Chief) Zinke Told Staffers He Didn't 'Care About Diversity'

Wanted: Wild Bees (Extracted from a story in the journal Science.)
Many ecological experiments have demonstrated increased pollination from more different species of bees and pollinators and a new study published from Rutgers confirms this. Researchers found over 100 species of wild bees pollinating not only crops, but a vast array of flowering plants. Their finding showed that 55 or more species of active pollinators goes a long way toward keeping the earth inhabitable for humans and the results were similar for other eco system matters as well. Ecologist Rachael Winfree, the lead author from Rutgers-New Brunswick plainly stated that these results demonstrate the necessity of bio-diversity to human existence. (Hear that Mr. Zinke?) Scientists estimate that over half of the world's food production is a direct result of wild pollinators.

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An interesting story in the journal Nutrition, talks of a study in Kenya followed up by another in the USA showing a direct link from Monosodium Glutamate (MSG), a common food additive, to chronic pain. If pain keeps you from enjoying your woods and outdoor activities, please check this out.

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In our ever consistent coverage of Lyme Disease:
A new blood test called the Tick Borne Disease Serochip shows promise to revolutionize the diagnosis of tick borne diseases by offering a single test to identify and distinguish between Borrellia Burgdoferi (Lyme disease) and seven other tick borne pathogens. Lead by scientists at Columbia University's School of Public Health Center for Infection and Immunity, the report was revealed in the journal Nature.

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Western Wisconsin recently made the headlines in a national farm journal, but in a negative way. With graphic arial imagery. The story titled "Get the Facts: Fracking and Farmland" describes the destruction of farms and forests from the frack sand mining craze. It is all about Silica, and western Wisconsin has some of the best in the world apparently, as it is even shipped to Saudi Arabia. According to one resource professional in the PIF network, "It takes a very long time, centuries in some cases, for petrochemicals (esp. halogenated ones) to degrade after they enter the aquifer. This is the primary reason I am so horrified by hydrofracturing. Everything is deemed "safe" at first, even when logic and science indicate it will be anything but safe. By the time there is a preponderance of evidence to the contrary, much damage had been done."
And we think we only pay for our fuel at the pump! See photo page 15 Partners News Sept. 2012.

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The next two stories we wanted to have for you in early winter, however, better late than never.

Richard is a colleague of Paul Hetzler at Cornell, the second story on coyotes from the Northern Woodland.

Let us hear from you!

Sunday, November, 2017

MARCESCENCE: AN ECOLOGICAL MYSTERY

BY RICHARD GAST

Young beech trees retain their leaves throughout the winter months, We're blessed to live in an area that offers some of the most beautiful fall foliage found anywhere in the world. And this fall proved to be one of the most remarkably enduring that I've ever experienced; the maples, birches, poplars, oaks, and beeches creating a landscape literally exploding in shades of gold, crimson, and orange, which lasted for several weeks.

As cold weather approaches, many species of trees shed their leaves as a strategy to reduce water loss and frost damage. Triggered by hormone change (the balance of auxin levels between leaves and branches), it's all part of an important and complicated process known as abscission; in which trees seal off the point where the leaf petiole connects to the twig (the abscission layer).

With winter upon us, the deciduous trees in our yards, along the roads, and in fields and forests have all lost their leaves. Or have they? Look around. There are often juvenile, deciduous trees that somewhat defiantly hold onto their brown, bleached, withered leaves long-into, and even throughout the winter; until wind or snow break them off or they are finally forced off by expanding buds, come spring.

There's a name for this winter retention of leaves; marcescence (mahr-CESS-ents) from a Latin root meaning 'to shrivel'. And while scientists understand how tree genetics and environmental factors contribute to the occurrence of marcescent (withering without falling off) foliage, no one can say with absolute certainty why it happens.

The simple explanation is that sexual maturity determines whether the leaves fall off or not. But speculation and debate abound. One commonly accepted belief is that by concealing next year's growth; the tasty, nutritious, new-twig growth and buds that lie beneath them; the desiccated, bitter-tasting, difficult-to-digest leaves, which have little food value, may act as a deterrent to browsers, such as deer and moose.

The retained leaves may also help protect the young trees from exposure to damaging winds. And, by trapping falling and wind-blown snow and directing it to the base of the tree, which results in more moisture at the base of the tree throughout the winter and into the coming spring, the withered-but-steadfast leaves may help alleviate potential water-stress issues, too.

A growing number of botanists, biologists, and ecologists believe that marcescence is tied to nutrient cycling and availability; the theory being that young understory trees with smaller root systems, especially those on marginal soils, may benefit by waiting until the spring to release their leaves to

decompose into the soil. In doing so, they are essentially recycling their own leaves; providing additional organic matter to the soil in the root zone, just in time to make those nutrients available for spring growth.

Whatever the reason (if, in fact, there's any reason at all), the sight of a small stand of young beech alongside the road; their dried, bleached, marcescent leaves highlighted by the midday sunshine, can add interest and texture to bleak, white and grey winter landscapes. And then there's the wonderful sound of marcescent leaves trembling and rustling; rattling in the breeze; almost magically breaking the stillness of the woods along the trail in the silent, early hours of morning, and the peaceful feeling that brings. And the fact that they may also provide protection from the elements and predators for birds visiting backyard feeders.

Nature can be remarkably beautiful, even in the dead of winter. And even though the Old Farmer's Almanac is calling for a cold winter with a lot of snow across the northeast, winter can still be one of the most fascinating and appealing times of year. You just have to get into it.

Did You Know?

- The word 'autumn' originated from the French word 'automne', which comes from the Latin word 'autumnus.'

- The word 'harvest' comes from the Norse 'haust', which means 'to gather or pluck.' According to Dictionary.com, the term harvest was used to describe autumn until sometime in the 17th century, when poets coined the phrase 'the fall of leaves', which was eventually shortened to 'fall'.

- During the fall, in response to colder temperatures and less light, leaves stop producing chlorophyll, the green pigment that helps capture sunlight to power photosynthesis. As the green fades, the leave's other pigments shine through, such as orange and yellow carotenoids and vibrant red anthocyanin.

- Scientists believe global warming may eventually affect autumn colors. As the world warms, leaves may delay changing their colors. Some trees may not use their sugars to create red pigments at all. They may, instead, use that fuel to grow new twigs. Global warming may also alter the habitats of trees, such as the sugar maples, which produce some of the most vibrant fall colors.

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Sunday, November, 2017

Coyotes Prepare for Winter

Eight years ago, my husband and I planted 128 fruit trees on a hillside, mostly apples, but the back few rows included stone fruits.

Our apples began producing with gusto after only a few years. We made gallons of cider and sold bushels of heirloom apples. But the plums have required patience. Their blossoms are so delicate and our springs so unpredictable that after eight years, there are still varieties we have yet to taste.

Over these eight years, we have been loyal. We have not eaten anyone else's plums. This year, we were rewarded when all five of our small Stanley plum trees produced dark blue fruit. By the end of September, they had almost ripened.

Then one morning, all the plums were gone. At base of the trees, I found torn and pierced skins, and barren pits. My later discovery of a long, tapered blue scat, found on a raised rock, confirmed my suspicion.

Eastern coyotes, I should have known, also like to eat plums. Canis latrans var. and I share a similar world view. I would have eaten all the plums too. Greedy, some might say, but I would describe it as opportunistic. Coyote researchers agree that coyotes are fluid when it comes to diet. They are true localvores, eating what is available, when it is available.

Fall is fat times for the coyote and the farmer. We are both busy preparing for winter. My family is stockpiling food. Our root cellar is full, the jam is put up, and dried peaches, like slivers of the sun, are secreted away until the dark of winter. The coyote's cellar is its body. It is fueling up on the sugar from fall's fruits, proteins from prey and fats from seeds and nuts. Its varied autumn diet prepares its muscles, flesh and even fur for the hard winter. Its ragged summer coat falls away and a thicker winter coat takes its place. With its long, coarse guard hairs and thick undercoat, the 30 to 50 pound canine assumes a much heftier appearance.

There is much for these generalized opportunists to eat in the fall, but it's their frequent consumption of small rodents that lets me forgive them for eating my plums. In the earliest hours of an October morning, I saw this in action as I watched a lone coyote pause with ears tilted toward the ground. It leaped forward, thrusting its snout into a tangle of dead grass, and came back up with a small rodent gripped in its jaws. If you are a fruit farmer, a worse fate than a coyote stealing your plums, is a vole gnawing your trees.

This autumn's nights have been filled with the howls and yips of the local coyote pack. In winter, this sound may dwindle. Male juveniles tend to leave in search of their own territories and mates, although young females will often stay with their parents for an additional year or two. These females will help to maintain the pack's territory, hunt larger prey such as deer, and raise the next litter of pups.

Only once in my twenty years of winter tracking did I ever come across a fresh coyote kill. A young deer, scattered and torn – fresh tracks laying out the tale of its final moments, pulled down by three coyotes. When I returned three days later, all that was left of the deer was a few ribs and one hoof.

Winter is hard on coyotes and clearly hard on deer. Evidence from many coyote studies conducted throughout the eastern United States, show that deer are the dominant winter food for coyotes, but it doesn't follow that coyotes are the main reason for deer mortality. According to Will Staats, a New Hampshire Fish and Game regional wildlife biologist, most deer consumed in the winter by eastern coyotes are winterkill or roadkill.

As fall tips towards winter and the night grows quiet, I reflect on coyote and me. We have much in common. We eat what we can, when we can. My family lives large off our farm during harvest season. We eat like kings, or perhaps coyotes. We pack it on ahead of winter, and thicken our coats to endure the cold. If I could, I would grow my underfur too, and howl at the night sky as my own growing children begin to slip away to new terrain.

Susie Spikol Faber is Community Program Director for the Harris Center for Conservation Education in Hancock, New Hampshire. The Outside Story is assigned and edited by Northern Woodlands magazine.

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PORCUPINES AND THE SODIUM – POTASSIUM BALANCE.


Photo: Casey Clark

When I was growing up, my family rented a vacation home on a lake in the northwoods. One night we were awakened by our dogs barking. Soon we heard a persistent gnawing on the outside of the house. My Dad went to investigate. His flashlight beam revealed a large porcupine with black, beady eyes. My father scared it away, but it returned other nights.

Why would a porcupine chew on a house? It's not so much the wood they're after; it's the finish. Most paints, stains, and wood glues contain salt. And porcupines crave it, just as we humans crave potato chips and roasted peanuts.

A porcupine's yen for salt kicks in as they transition from a winter to a spring diet. During winter, porcupines become somewhat sedentary, holing up in rock caves, hollow logs, or abandoned buildings, and making only short forays from their dens to feed on the inner bark of trees; hemlock and white pine are favorites. Porcupines are able to extract nutrients from this low-quality food because of their large caecum, a sac at the junction of the small and large intestines. The caecum contains digestive bacteria that ferment the finely ground plant fiber so the body can absorb it. Even with this special ability to use bark for food, the animals lose weight in winter.

As spring warms the forest, a porcupine's diet and behavior change rapidly. The animals spend much of their time in trees feasting on swollen buds. They chew off a branch and hold it with their forepaws while they nip off the buds. You can find these "nip-twigs" littering the ground below a porcupine feeding tree. When the vegetation returns, porcupines will often leave the trees to feed on the ground.

Grasses, clover, violets, dandelions, and raspberry leaves and canes are favorite foods.

All this spring and early summer feasting leads to rapid weight gain, but also a sodium deficiency. Green plants are low in sodium and high in potassium. According to Uldis Roze, author of The North American Porcupine, porcupines and other herbivores need both sodium and potassium to activate nerves and muscles, but must maintain a 1:1 ratio of these

two ions. If the amount of potassium significantly exceeds the amount of sodium, the animal can die. Plants contain potassium to sodium ratios as high as 500:1, so porcupines feeding on green vegetation must excrete excess potassium and seek out salt. For the same reason, other herbivores like moose and snowshoe hare often congregate at roadsides in spring to feed on salt left over from the winter.

Roze has studied porcupines extensively. In one experiment, he attached salt-impregnated wooden pegs to a cabin, then observed porcupines through the windows as they came to chew on the wood at night: "I felt trapped inside a bass viol as the house vibrated under their powerful teeth. This was porcupine music, the sound of the wood saws." Roze discovered that porcupines preferred the wooden pegs with the highest concentrations of sodium. When he added potassium, they chose pegs with the most balanced sodium to potassium ratios. In his study, females came to the cabin in search of salt more often than males. He attributed this to hormones associated with pregnancy and lactation, which prompt a craving for salt; nursing mothers lose sodium in their milk. Roze observed the rate of salt-feeding by his porcupines peak in May and June, with a second minor peak in August and September, when they were feeding on large numbers of apples. Apples are acidic, impairing sodium resorption in the kidney and causing the animals to lose sodium in their urine. The salt drive dissipates in winter, when the animals are less mobile and get by on sodium that's stored in their caecum.

Before plywood outhouses and sweaty axe handles were available for porcupines to chew on, where did they find salt? Early naturalists observed the animals swimming to reach yellow pond lilies and other aquatic plants, and even quarreling over the sodium-rich leaves. Porcupines eat mud at natural salt licks along riverbanks and gnaw on fresh bones in animal carcasses, which contain both sodium and calcium.

So if a mother porcupine begins to chew on the salty handle of your favorite tool or canoe paddle, perhaps you'll be more sympathetic – and remember to put it out of the animal's reach.

Story by:
Susan Shea and reprinted from Northern Woodlands

Note from Joe: Most all of us in the north have our favorite porcupine stories. We have had a baby porcupine in our basement after going through a screen, have learned to watch for them when removing lumber from my big shed, have watched them chewing endlessly on trees, had one chew a hole through our shake roof where the chimney creosote had saturated and by all means keep them away from your dogs. I recall visiting my uncle Doc Thiede at Wit's End Tree Farm in Oneida County long before I had learned to live with porcupines. He had seen so much damage from these gnawers, brake lines, radiator hoses, stripping the plywood siding off the generator shed and pulling quills from the dogs gums, he commented, 'Everything in nature has its place and its value, but what in the hell is the value to these damn porcupines?'

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READERS' COMMENTS

Readers are encouraged to comment, criticize, or praise our work as they see fit. We appreciate hearing from you and sharing with you, that is the COOP spirit.

On our continuing commentary about Glyphosate member Ron Schwartzlow from southern Wisconsin sent us a couple stories exposing the other side of the issue. With his personal comment *"When I was actively farming I could not even purchase chemicals to apply to my crops with out taking classes to a permit. Now any one can purchase Glyphosate from most any where."*

Ron also commented on the Wild Parsnip story. He told us about a shovel modification used to more effectively cut the tap root of invasive species such as parsnip. Check out the Prairie Bluff/Prairie Enthusiast website and click on Parsnip Predator. This looks like a worthy and effective tool for our tool rack in our invasive tasks.

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Also Land O Lakes member Cheryl Pytlarz tells us about her love for organic gardening while using chemicals as needed for her landscape work. Note she also makes mention of a Predator Shovel.

I read your PIF newsletter article reprinted from Ag Journal news about glyphosate. I have an agricultural background back to 1981 when I graduated from UC Davis with an agricultural BS in Soil and Water Science. From there I worked on multiple farms both organic and conventional. I have organically garden in a large scale for 15 years where non-naturally occurring chemicals are taboo.

On the other side of the coin is my experience in native landscape restoration. I have been involved with prairie, wetland and woodland native landscape restoration since 1997, here in the northwoods, my own properties, Sylvania Wilderness, and all throughout Lake County, IL. In these landscapes those taboo chemicals are in my back pocket. Early on when learning about native restoration I certainly tried the mechanical way. Common sense set in pretty quickly and now I don't hesitate to use the chemicals such as glyphosate to address invasive species. I have actually witnessed restoration success that one could consider a miracle, the removal of buckthorn where the understory was ONLY bare soil. With the buckthorn removed and killed using Garlon 4, the seed bank in the bare soil, with the presence of sunlight, germinated into a high quality sedge wetland with many rare wetland plants.

Don't misunderstand. The chemicals are used as sparingly as possible to get the job done. Other tools involved are the chain saw, hand saw, weed and bush whackers, hand clippers, Predator Shovel, gloves.

This dichotomy between growing food, no chemicals, with native landscape restoration, chemicals required, is kind of strange to juggle in the mind. I have it resolved that at least I am not ingesting the chemicals because I keep it out of my food and the chemicals help me bring back a landscape that is beautiful and more biologically diverse. For my food the chemicals are an enemy, for the native landscape they are a beautiful tool to get the job done.

I guess a love-hate relationship sums it up.

I have included before and after pictures of the buckthorn-sedge meadow I described. Also attached is my northwoods vegetable garden where no chemicals are allowed. (Photos are on the next page)

Cheryl Pytlarz's Pictures

Before - 1997

After - 2012

Garden

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