The Forest Steward's Journal

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Journal of the Forest Stewardship Foundation

The MISSION of the Forest Stewardship Foundation is to "educate and inform landowners, natural resource professionals and the general public about the science and ecology of forest lands, the many values 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.

Montana Climate Change

Climatic Influences on Forests Across Montana – Strategies for Conservation and Functional Retention (Part 1)

(Ed Note – The Forest Steward's Journal is proud to bring you Part 1 of Dr. Peter Kolb's perspective on the subject of climate change and Montana forest management. Part 2 will follow in the Spring 2013 edition of the publication.)

Pony Fire, Mammoth, MT, July 4, 2012. Forest Service Photo

by Peter Kolb (PhD), Montana State University Extension Forestry Specialist

Climatic variability is a topic that has received a lot of attention this past decade, in part because new technologies coupled with research allowed both measurement and reconstruction of the past climate with a degree of accuracy never before possible. As data sets developed the fact that there was a warming trend across many areas of the northern hemisphere became increasingly relevant because there seemed to be a strong correlation with an increase of forest disturbance events.

Please See Climate on PAGE 5

From The Chair

by Ed Levert, Chair, Montana Forest Stewardship Foundation

Those of you who attended the Helena Forest Landowner Conference last Spring had the opportunity to hear Dr Peter Kolb's excellent presentation on Climate Change and Adaptive Forest Management. Dr Kolb did not get into the cause of a warmer climate, but gave a very interesting history lesson on our past weather and what steps you as a forest landowner can take to lessen the impact, if this weather trend continues. Back by popular demand, Peter's article will give all of us important information to think about.

Please See From the Chair on Page 2

From the Chair...continued from page 1

So what is going on with the Foundation these days? Recently we signed a Memorandum of Understanding with the Montana Forest Stewardship Steering Committee(MFSSC) that clarifies our intent to work cooperatively in bringing educational subjects of interest to Montana's forest landowners. This is a big step forward, because we can serve as the non-profit organization that can solicit funding for MFSSC's programs and/or deliver needed educational subjects that MSU Extension Forestry may not have the means to deliver. Working together just makes good sense.

Another exciting endeavor that we are involved with is the Foy's Lake Community Forest in Kalispell. As will become evident when you read Jim Watson's article, this small group of movers and shakers have pulled off an amazing achievement. We have not determined what exactly the Foundation's role will be in the educational area, but what an opportunity is presented. I hope we can tap into Kalispell area landowners to help us assist Jim in this great project.

Some of you have asked about our future conservation workshop schedule. We did a workshop in Red Lodge in June and intend on offering a modified workshop at the next Helena Forest Landowner Conference in April. If you have been unable to attend a workshop mark down the date.

Should you join the Forest Stewardship Foundation?

By joining us you become a part of a small but energetic organization that gets things done. We are all volunteers, but in 2011 we were able to co-sponsor the Helena Landowner Conference and two conservation easement workshops. We also contributed $2500 to MSU Extension Forestry to help fund a stewardship workshop. Plus, twice a year we publish and distribute over 1,200 Forest Steward's Journals.

We know money is tight, but our dues are still only $25. We currently have 90 members so you can do the math and see that we don't have much of an operating budget once we publish and mail the Journal. Your membership and contributions mean a great deal to our continuing success. Please note the membership application envelope attached and join our organization.

Thank you very much for your help.

Foy's Community Forest

A Local Model for Forest Management

By Jim Watson, Foy's Community Forest

Thanks to a $400,000 grant from the US Forest Service, Northwest Montana is going to have a Community Forest. Owned and managed by the community, this forest will be dedicated to education, recreation, public access and forest products. Flathead County and the non-profit Foy's to Blacktail Trails have been working on the Foy's Community Forest project since 2007. To date Foy's to Blacktail has purchased and donated to Flathead County 150 acres of a 320-acre timbered parcel, and is working to purchase the remaining 170 acres. The grant will be used to secure a portion of the remaining 170 acres. The project is adjacent to county-owned Herron Park near Foy's Lake.

So far over a million dollars has been raised and spent, not including the Community Forest grant. Funding partners are Montana State Park's Recreational Trails Program ($295,000), Montana Fish and Wildlife Conservation Trust ($120,000), Flathead County ($100,500). These public funds have been matched by private donations of $518,500.

> ***"When larger scale harvests are required, we can invite the public out to observe and learn through harvest demonstrations. Local loggers can use this opportunity to showcase their skills and demonstrate low impact equipment and techniques that are appropriate for small scale intensive management of woodlands in the wildland-urban interface."***

This was the first-ever round of grants for Community Forests, and the Forest Service only awarded ten grants in the entire country. The Forest Service was looking for exemplary projects that would serve as national models, support local timber industries, support public recreation, access and education, and protect working forests from conversion to other uses. They were especially looking for projects that demonstrated strong local support. Foy's Community Forest has all of these attributes but truly excels in community support. The list of supporters and partners is far too long to list here but includes conservation, recreation, education, and timber interests. Support from the Foundation and Tree Farm was instrumental.

The Community Forest land will be encumbered by a permanent deed restriction that requires the property to remain in a forested condition, not subdivided or developed, and managed according to an approved forest management plan. Flathead County takes this seriously and intends to adopt the management plan as part its Parks Plan and Growth Policy, making the plan a public document to be reviewed

Please See Community Forest On PAGE 4

Foy's Community Forest – Trails, Recreation, Timber Management and Much More
PHOTO CREDITS: TOP; Liz Seabaugh. BOTTOM THREE: Jessica Lowry

Community Forest…continued from page 3

every five years. Though not complete yet, it is expected that the plan and forest will be certified and monitored by Montana Tree Farm and DNRC. The county intends to use revenue derived from forest management to further support and improve the Community Forest.

The Foy's Community Forest is historically a working forest and is currently heavily used for recreation. In addition to land purchase, at least $100,000 has been invested in designing, building and improving a multi-user, multi-season trail system on the property. On average, 100 people use the project area each day. Because of its accessibility, the project area is ideal for education. Many of the trail users are from urban backgrounds and know very little about working forests and active forest management. Some live in town and many live in subdivisions that were once working forests. These small-acreage landowners typically want the benefits of living in the forest, but due to lack of knowledge, are afraid to actively manage their timber. This leaves their properties at risk for fire, insect and disease damage. We can use the community forest to teach them how to manage their property and to teach their neighbors in turn.
The Community Forest is only a few miles from several schools and represents an ideal opportunity for Project Learning Tree. We can design a classroom in the woods specifically to serve PLT. Herron Park has an ample parking lot and two vault toilets. School buses are already a common sight at the park. Having a formal interpretive trail and established curriculum will make it even more attractive.

Flathead Future Farmers of America (FFA) is the largest chapter in Montana, and their forestry team routinely competes at the national level. Flathead Valley Community College has a forestry team and is linked to the state's university system for degrees in forestry. Both schools would like to participate in forest management through research, prescription planning and actually cutting trees. When larger scale harvests are required, we can invite the public out to observe and learn through harvest demonstrations. Local loggers can use this opportunity to showcase their skills and demonstrate low impact equipment and techniques that are appropriate for small scale intensive management of woodlands in the wildland-urban interface.

Getting this Community Forest grant opens the door to opportunity--and hard work. The most valuable assets to the project are dedicated individuals who are experts in forestry and education: people who bring their personal passion to this project. As we write the management plan and begin to implement it please think of what you and your company can do to make this dream something we are all proud to be a part of. The list of work to be done is extensive:

* Develop a guidebook for a self-guided tour of the property that explains the different forest types, explains understory management, multi-species and multi-age management, wildlife habitat management, fire-wise management;
* Develop and sign an interpretive trail for school kids;
* Any other relevant tasks you can imagine and will help implement.

This community forest is a labor of love and can be as dynamic as the forest it is housed in. This is your invitation to get involved in a community asset that will enhance life and learning in the Flathead Valley for many generations.

For More Information About Foy's Community Forest

CONTACT JIM WATSON AT Jim@SpringBrookRanch.com FOR MORE INFOMRATION OR A COPY OF THE FOY'S COMMUNITY FOREST MANAGEMENT PLAN

READ ONLINE ARTICLES ABOUT FOY'S COMMUNITY FOREST AT:
http://www.abcfoxmontana.com/news/local/US--167722055.html
http://www.flatheadnewsgroup.com/bigforkeagle/article_7f8656d6-f76f-11e1-858d-0019bb2963f4.html
http://www.fs.fed.us/news/2012/releases/08/community.shtml
http://www.dailyinterlake.com/news/local_montana/article_0617b898-f185-11e1-b869-001a4bcf887a.html

OR VISIT THE FOY'S COMMUNITY FOREST WEBSITE AT
http://www.foystoblacktailtrails.org/

Climate…continued from page 1

Across the western United States warmer winters and earlier spring facilitated increased drought which in turn promoted wildfires and insect outbreaks of uncharacteristic size and severity. Over the past decade Montana suffered wildfires and tree killing insect outbreaks that cumulatively impacted approximately 45% of our forested landscapes which equates to approximately 11.5 million acres of the total 25 million acres of forest (Table 1). Although bad fire seasons have been documented to periodically occur over the past millennia and certainly in the past century, and episodic bark beetle and defoliator outbreaks had also been experienced as recently as the late 1970's, the combined impacts and magnitude of these events over the past decade surprised even historians. Montana was not alone in these types of events with a global 2005 fire season resulting in 5 million acres of forest burning through central Alaska forests as one large event and 50 million acres estimated to have burned across Siberia. Since then a mountain pine beetle outbreak killed over 30 million acres of lodgepole pine forest across British Columbia with additional millions of acres suffering from severe bark beetle mortality across, New Mexico, Arizona, Wyoming and Colorado. Initially the increase in wildfire impacted areas across

Montana Forest Impacts Years 2000-2010

Acres Burned Annually		Acres with significant Bark Beetle Mortality	
Year	**Acres**	**Year**	**Acres affected**
2000	1,160,145	**2000**	103,920
2001	146,819	**2001**	223,892
2002	110,309	**2002**	450,134
2003	736,809	**2003**	493,785
2004	18,445	**2004**	730,782
2005	103,294	**2005**	1,213,602
2006	1,047,118	**2006**	1,000,289
2007	778,079	**2007**	948,517
2008	166,842	**2008**	1,905,355
2009	48,912	**2009**	3,810,080
2010	56,710	**2010**	2,205,971
Total:	***4,373,482***	***Total:***	***13,086,327***

Table 1. Reported acres from Forest Service and MT Department of Natural Resources and Conservation. This does not include significant acres impacted by Douglas-fir beetle, spruce budworm and other pests. Insect impacted acres are detected through aerial surveys every year that record recently killed (red) trees and thus total acres may represent the same acres several times depending on the speed of attack – where potentially 30% of trees were killed one year and similar proportions killed in subsequent years, doubling or tripling actual acres impacted. Actual total impacted area is estimated between 4 and 7 million acres.

the western United States was largely blamed on past human interference, where a fire suppression strategy implemented following the infamous 1910 fires sought to suppress all wildfire starts before they burned more than 10 acres by 10:00AM the following morning. This policy, aggressively pursued by hard working and motivated fire crews was quite effective for over 50 years and most certainly kept most wildfires from developing into larger landscape events during that time. Fuels and tree regeneration that normally would have been consumed in some burn mosaic on the landscape accumulated to greater density than might otherwise have occurred. The other part of the human interference matrix that has since been documented with greater relevance was the displacement of Native American people into reservations by the 1870's and thereby the restriction of their widespread wildfire setting activities that had been part of their culture and the landscape development across the northern and central Rockies for multiple previous centuries. Thus by the early 1980's Montana forests had grown denser, more expansive, and woody debris had accumulated to higher levels than probably any time in previous history.

But what about climate effects and the rest of the affected northern hemisphere? Had fire suppression also been at work

Continued on Next Page

in Siberia, Alaska and British Columbia with similar impacts? Numerous studies have clearly shown that the Earth's climate has been in a continual state of change for as far back as it possible to measure, and based on analysis of an Antarctic ice core in the 1950's has fluctuated rather dramatically over time (Figure 1), allowing for ice ages and warm periods with relative predictable frequency.

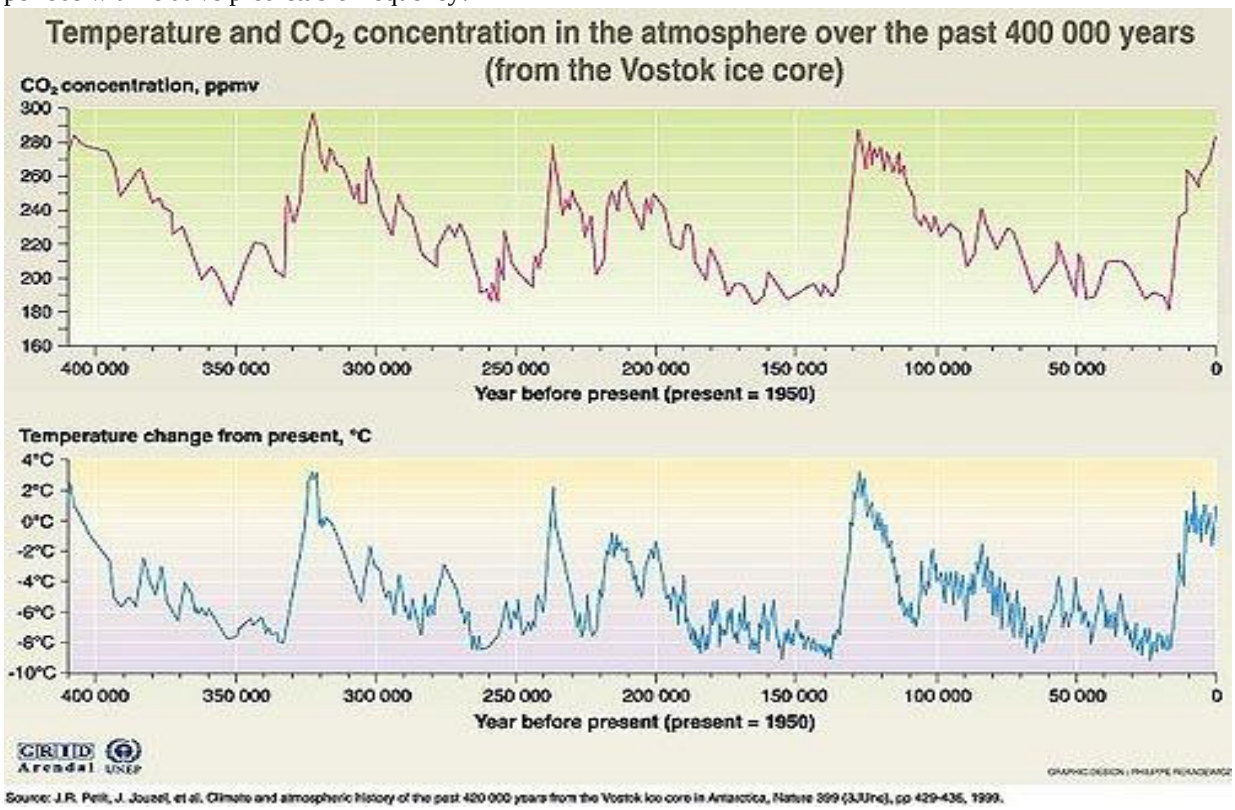

Figure 1. The Earth's climate reconstruction based on isotope analysis of gas trapped in a core of the Antarctic ice cap over a period of 450,000 years. The axis on the right shows temperature changes from our current average air temperature "0". Prolonged cold periods lasting about 80,000 years deviations between -4 and -8 colder than present are the great ice ages that have impacted the Earth, speculated to be due to the "wobble" of the Earth on its axis. The most recent 10,000 year warm period that we are still in and that allowed humans to reach their current advanced state of "civilization" is the very short plateau at the far right and, the longest stable warm epoch over the past half million years.

The climatic stability we all seem to believe exists due to our extremely limited lifetime experience is in fact a myth. Even climatic reconstructions of the past "stable" centuries show rather profound natural fluctuations. Figure 2 is a climatic compilation of seven different studies that examined tree rings across the northern hemisphere and reconstructed the climatic history of each location for the past 1000 years. Although there are minor variations across locations, just as occur today (a heat wave in Montana may occur simultaneously with a cold summer in Europe), the greater trends are remarkably the same showing global and episodic climatic changes. The impacts of these fluctuations on human populations where severe and what were mysteries of human civilization collapse until recently can now be better explained. For example, the period from 900 AD until 1200AD, known as the "medieval dark ages" is also known as the "medieval optimum" to climatologists. During this time agriculture in northern countries flourished resulting in a human population explosion and resulting wars over territory and exploration for new lands, most dramatically documented by the colonization Iceland and Greenland by Vikings. However, for equatorial countries such as Egypt and India the warmer temperatures resulted in documented drought and famine. As the medieval optimum started to transition into the cooler mini-ice age, profound climatic fluctuations occurred that can further be correlated with additional collapses of civilizations such as the disappearance of the Anasazi culture during a 300 year drought across the present day SW United States, the infamous famine and bubonic plague across England and Europe during which 75% of the European population perished, and the death and retreat of the Vikings from Greenland and Iceland.

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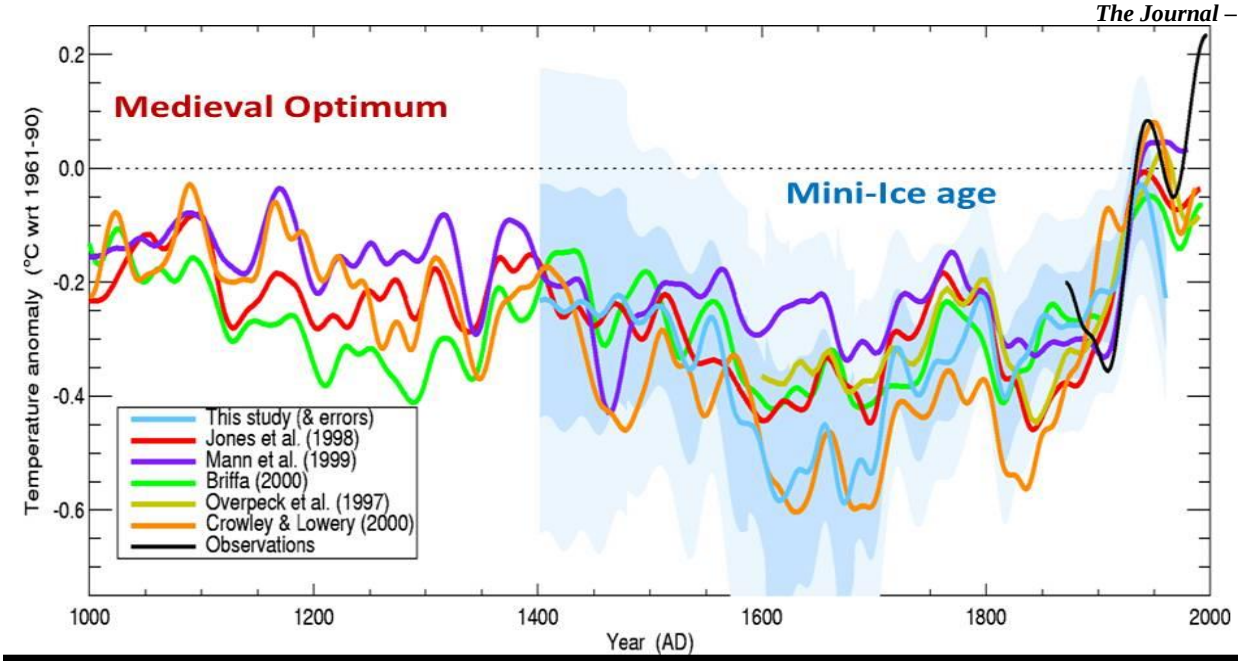
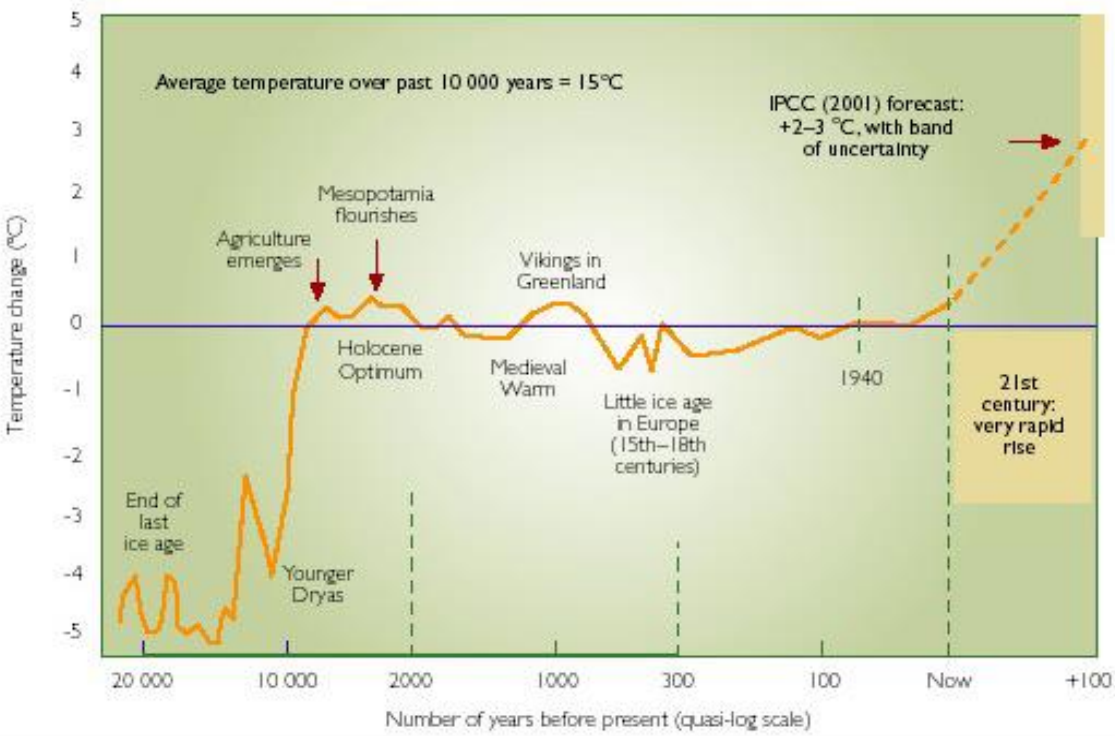


Low-frequency temperature variations from a northern tree ring density network
Keith R. Briffa, Timothy J. Osborn, Fritz H. Schweingruber, Ian C. Harris, Philip D. Jones, Stepan G. Shiyatov, Eugene A. Vaganov. Published in *Journal of Geophysical Research* 106 D3 (16-Feb-2001) 2929-2941

Figure 2. Compilation of tree ring analysis for the northern hemisphere showing climatic fluctuations over the past 1000 years. Lines are averages and shaded areas are data variations, showing that individual years or decades may actually have varied tremendously from the average. For example, although on average the year 1400 was cooler than present, individual years or multiple year periods may have been much warmer than present.



Variations in earth's average surface temperature, over the past 20,000 years

Figure 3. A historical chart showing last 10,000 years climate trends and human history. A projection of the future climate based on human caused global impacts is dashed line on right.

A summary of the past 10,000 years of climate (Figure 3, page 7) further elaborates how fluctuations in temperature occurred. Correlations of human civilizations rise and fall may have depended on their ability or inability to adapt their land management practices to these changes.

Climatic trends, however, are not as simple as is shown on long term graphs of average temperatures. In the case of the northern and central Rockies, moist Pacific air masses moving eastward provide most of the regions moisture though can collide with dry and often cold continental air masses that are drawn south and west from Alberta by clockwise rotating atmospheric high pressure cells. To further complicate the weather, hot dry air moving north-east from California across Nevada and into southern Idaho create dry volatile lightning storms that can be drawn further northward by a shifting jet stream. Which of these three weather patterns dominates the region is associated with larger global influences emanating from the Pacific Ocean. Forests across Montana have thus historically been subjected to highly variable weather and a great deal of climatic variability.

Surrounded by dry prairie ecosystems where annual precipitation averages 11 inches per year, Northern Rockies forests are largely a result of wet air masses from the Pacific being lifted by various North-South mountain ranges and the rain and snow condensation that results. One of the most drought adapted tree species, ponderosa pine, starts to occur where annual precipitation reaches a minimum of 16 inches with other species finding survivable conditions as increasing precipitation occurs. The wettest forests in the region are characterized by western red cedar and hemlock that require 30 inches precipitation or more per year and relatively humid air. Water and temperature are the key elements that determine where tree species can grow and how well, as well as what types of disturbance occur and potentially with what magnitude. All of the western United States is most influenced by east moving air masses that develop over the Pacific ocean. As has become common knowledge over the past decade, the Pacific Ocean surface temperatures fluctuate in what is known as El Nino and La Nina events – also referred to as El Nino Southern Oscillation (ENSO). These roughly 10-year cycles determine rain and drought events across western South America and southwestern North America, and are reported to influence north Pacific water temperatures in an opposite though much less predictable effect called the Pacific Decadal Oscillation (PDO). It is the PDO that has greatest influence on temperature and moisture effects across the northern Rockies and this influence can vary significantly over time (Figure 4).

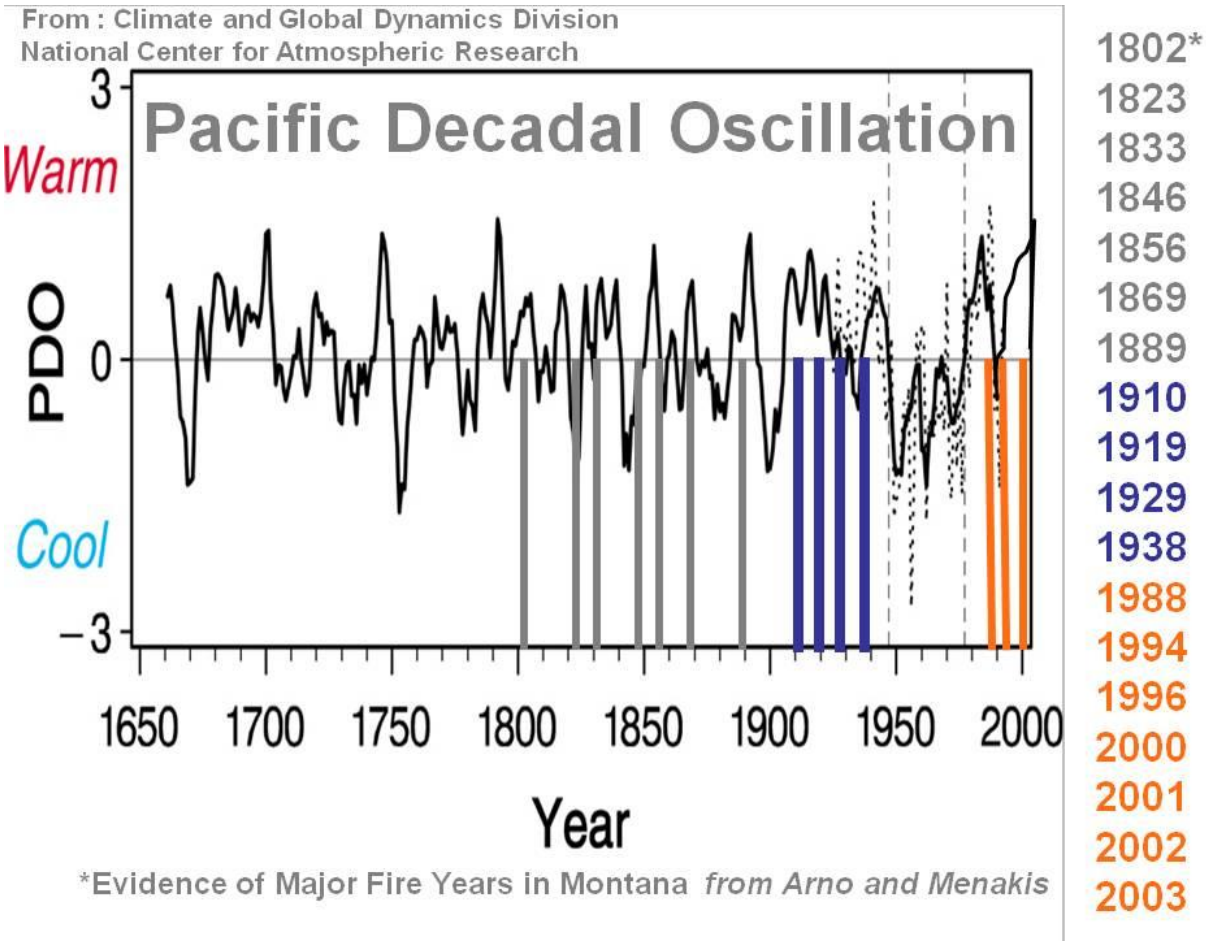


Figure 4. (Bottom of page 8) A graph of the Pacific Decadal Oscillation which is the largest climatic influence on the northern Rockies. The extended cool period from 1945 until 1976 is one of the longest cool periods on record. Cooler and wetter periods promote greater tree growth and regeneration, leading to denser forest, and may reduce wildfire frequency and severity. Major wildfire years (right column) determined by tree fire scar analysis across the Northern Rockies superimposed on the graph of PDO shows a correlation between major fire years and warm spikes in air temperature.

Furthermore, fluctuations in the PDO are highly correlated with fluctuations in wildfire activity and bark beetle activity (Figure 5). In summary, the key factors in Northern and Central Rocky Mountain forest development and function over the past 10,000 years might be described as: A conglomeration of multiple tree species, each with different and unique life strategies and advantages for surviving on a highly varied geologic and topographic substrate that interacts with highly variable climatic patterns that are driven by north Pacific ocean temperatures. The persistence of these tree species is in turn due to their continual evolution through natural selection to take advantage of and possibly become dependent on periodic environmental changes including natural disturbance events such as wildfires, coevolved insects and diseases, floods, avalanches, landslides and interactions with mammals and birds such as but not exclusively bison, elk, deer, bears, rodents, finches and other specialized birds such as Clark's nutcracker, and human populations. So what does this mean in the context of modern day climate change, wildfires, insects and diseases, human caused events and the future of the northern and central Rockies forests?

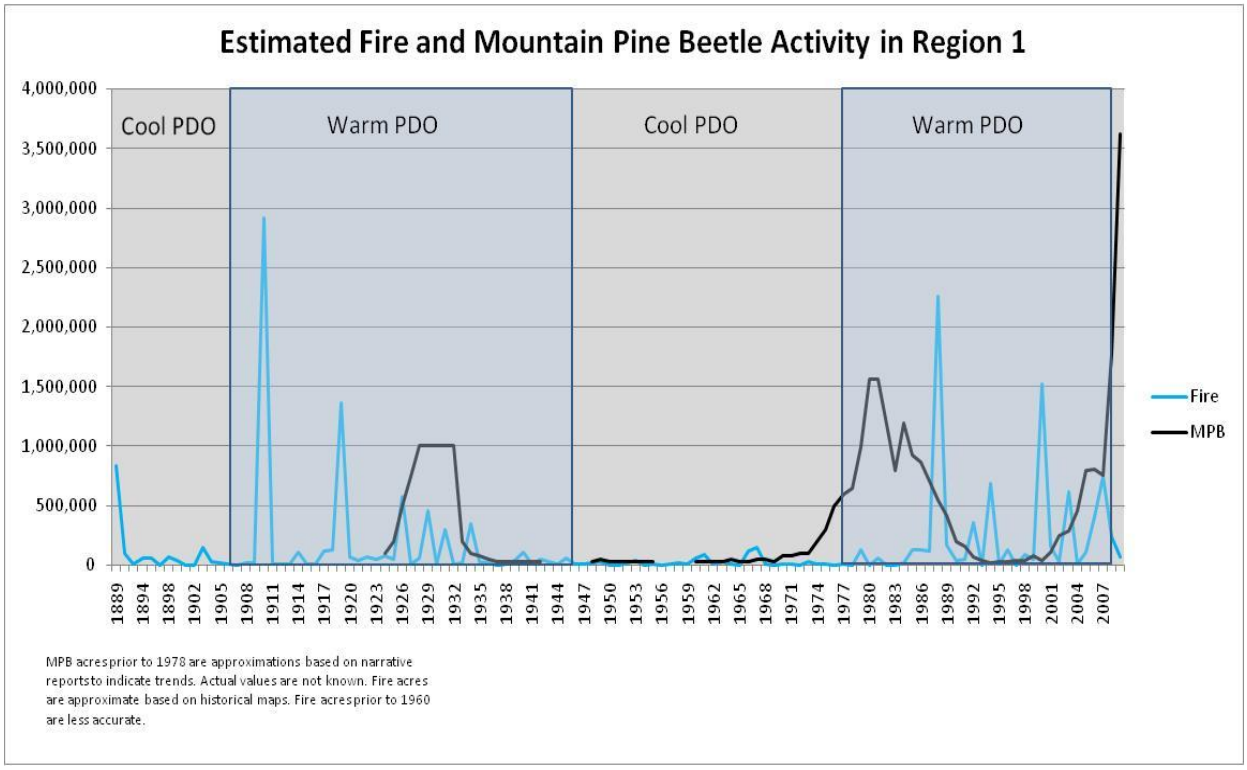


Figure 5. Historical fluctuation in the PDO and severe fire years as determined from coinciding wildfire scars from across the northern Rockies. Severe fire years occur during warm periods of the PDO. (From Barry Bollenbacher – silviculturist Forest Service Region 1)

The history of the forests across our region indicates that they have survived because of their great resilience to changes in key environmental drivers, and in fact are defined in every microsite by the local history of site specific disturbance processes. The documentation of local disturbance histories, however, should not mean that such disturbances are required for the system to continue to function. Many alternate forest species combinations and interactions are often possible on any given site and disturbance history simply tells us what forests encountered in the past and survived, not what they can survive in the future. Forest resilience may be defined as "the ability of a landscape to remain occupied by local tree species in a variety of densities, sizes and species combinations". It would be fair to speculate that based on the past climatic reconstructions and the accumulated knowledge of each individual species physiological abilities and genetic diversity that northern Rockies forests have varied tremendously in their expansiveness and species composition across the last 10,000

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years, more than likely covering much less area and being more transient across most landscapes. Starting with the past ice age forests existed as small pockets of trees between ice fields and lakes. As the climate transitioned to a rapid warming period trees expanded their ranges as seed production and movement allowed, tempered to sites where water was available. As shown by Figure 3, the first 8,000 years (Holocene optimum) following the past ice-age was quite warm, perhaps analogous to our future warmer climate, followed by a 1,000 cool period when tree species could have expanded their ranges based on water availability and another 500-year warm period (medieval optimum) when species ranges again shrank due to drought, wildfires and insects. Based on climatic history, the actual present day forests that we expect to function and exist into perpetuity only developed into their present day distribution and function during the past 700 years and may now be naturally transitioning into an entirely new configuration across the landscape. So what role can management play and how will human populations have to adapt to the "new forests" of the future? Stay tuned for the next edition of the Forest Foundation newsletter.

(The Montana Forest Stewardship Foundation expresses its gratitude to Dr. Kolb for the time, energy, research and thought he devoted to this article for the Journal. All of us at the Foundation very munch anticipate Part 2 of Dr. Kolb's article and publishing it in the next edition of the Journal.)

SAVE THE DATE:

FOURTH ANNUAL FOREST STEWARDSHIP FOUNDATION WORKSHOP
APRIL 15
HELENA, MONTANA