Issue No. 19: Fall / Winter 2010

Whitebark Pine Ecosystem Foundation

Nutcracker Notes

WELCOME WPEF CANADA

Helen Ridge, Banff National Park. Photo by Cyndi Smith.

Limber pine, Oldman River basin, Alberta, see article by Dave Sauchyn.

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Whitebark Pine Ecosystem Foundation
***Nutcracker Notes,* Issue No. 19; Fall/Winter 2010**

CONTENTS **PAGE**

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Our Mission: The Whitebark Pine Ecosystem Foundation (WPEF) is a science-based nonprofit organization dedicated to counteracting the decline of whitebark pine and enhancing knowledge of its ecosystems.

Membership Information and an application is found at <www.whitebarkfound.org>

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5775 West US Highway 10
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Director's Message

Diana F. Tomback and
WPEF-Canada's Randy Moody

WPEF and WPEF-Canada

This is the first issue of *Nutcracker Notes* to communicate news and information from both WPEF and WPEF-Canada. With the signing of a Memorandum of Understanding on August 27, 2010, we have established a collaborative working relationship between WPEF and WPEF-Canada for promoting "the conservation of whitebark pine ecosystems across the international border by supporting restoration, education, management, and research projects…" WPEF remains the umbrella organization, handling dues, website, and the publication of *Nutcracker Notes*, but WPEF-Canada will have its own Board of Directors (BOD). A representative of each BOD will attend one board meeting of the other organization each year, so that some of our efforts are coordinated. We believe that two organizations can work to best advantage within our two countries but also present a united front in garnering public support.

This is a crucial time to raise trans-boundary awareness of whitebark pine. Accelerated losses from outbreaks of mountain pine beetle, white pine blister rust, and successional replacement by shade-tolerant trees throughout Canada and the western United States have led to the assessment of whitebark pine by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as endangered, which may lead to listing under the Species at Risk Act; and to a year-long evaluation by the U.S. Fish and Wildlife Service for potential listing as an *endangered species* under the federal Endangered Species act.

WPEF-Canada

The timing of the creation of the WPEF-Canada could not be better given the recent "elevation" of whitebark pine by COSEWIC. Many individuals have expressed some confusion over what the creation of the Canadian group means. In a nutshell, memberships and communication will continue to be handled through the WPEF as they have been performing this task for several years. Currently WPEF-Canada serves as a recognized voice north of the border. We will apply pressure to get conservation and restoration goals accomplished, and will try to help secure more funding and be actively involved in project implementation. What we need most at this point is involvement, so click on the WPEF website (whitebarkfound.org) to join the foundation and if you want to join our board or have a higher level of involvement, contact Randy Moody (Randy@Keefereco.com).

High Five Symposium

The 'High Five Symposium: The Future of High-Elevation Five-Needle White Pines in Western North America," held June 28-30, 2010, on the University of Montana campus, was a major success. The intent of this symposium was to raise awareness and exchange information about management options for six ecologically important high elevation western pines currently under threat. More than 230 people attended the meeting, which exceeded our expectations. The program included a keynote presentation from Dr. Robert Mangold, Director of Forest Health Protection, U.S. Forest Service, and seven plenary talks, plus three concurrent sessions of contributed and invited papers that ran from late morning through early evening over two days. We are grateful to Dr. Mangold and the plenary speakers for thoughtful overviews which provided important background material for talks in the concurrent sessions. On the third day, we traveled to Snowbowl Ski Area near Missoula, for an informative field trip to a whitebark pine restoration project.

We thank WPEF board member Carl Fiedler for overseeing all aspects of conference and Deb Graham of Continuing Education at the University of Montana for serving as our liaison to organize the conference on campus. Board member Bob Keane assembled the program, Dan Reinhart for arranged the poster session, and Bryan Donner organized the field trip. Thanks also go to members of the High Five Symposium Steering Committee, representing U.S. and Canadian agencies, universities, and NGOs.

A number of sponsors helped make the symposium possible: Crater Lake Institute and Crater Lake Natural History Association; the National Park Service, including the Greater Yellowstone Inventory and Monitoring Network (IMN), Sierra Nevada IMN, Upper Columbia Basin IMN; NPS Rocky Mountains Cooperative Ecosystem Studies Unit; Natural Resources Defense Council; Parks Canada; The Nature Conservancy; University of Montana College of Forestry and Conservation; USDA Forest Service Northern Region, and Rocky Mountain Research Station. In addition, we are grateful to American Forests for bringing attention to the plight of the high five white pines to their membership and for providing copies of their special report "Whitebark Pine: an Ecosystem in Peril" to the High Five Symposium attendees.

Petition to List Whitebark Pine as Threatened or Endangered

In December, 2008, the Natural Resources Defense Council submitted a petition to the U.S. Fish and Wildlife Service to list whitebark pine under the Endangered Species Act. The first level of review was a 90-day finding, but a back-log of challenging cases delayed the agency's response, which was finally published in the July 20, 2010 Federal Register, Vol. 75 (p. 42033-42040). The conclusions were as follows: "Based on our review, we find that the petition presents substantial scientific or commercial information indicating that listing *P. albicaulis* may be warranted." The next step is a 12-month status review. The U.S. Fish and Wildlife Service called for information from federal agencies, Native American tribes, universities, and other sources with a target date of September 20, 2010.

2011 Annual Meeting--Cody, Wyoming

Our next annual members' meeting and Science and Management Workshop will be held at the Draper Museum of Natural History in historic Cody Wyoming on September 16 and 17 (see announcement in this issue). This meeting is noteworthy for several reasons: WPEF will be celebrating its 10th anniversary, this is the first official joint meeting of WPEF and WPEF-Canada members, and the venue is superb. In addition, we have many choices of places for field excursions to observe first-hand the status of whitebark pine in the Greater Yellowstone Ecosystem. For all members, this is a "must-attend" meeting and a great family travel destination at a beautiful time. ■

2011 Conference—Save the Date!

Announcing the 2011 Annual WPEF Members' Meeting plus Science and Management Conference. We will gather in historic Cody, Wyoming, eastern portal to Yellowstone National Park,on September 16-17, 2011. We meet at the Draper Museum of Natural History, part of the Buffalo Bill Historical Center which is one of America's largest museum complexes. The Draper Museum is a state-of-the-art natural history museum that explores human interaction with the Greater Yellowstone ecosystem.

On Friday, September 16th, we have a day-long series of presentations, with leading experts on whitebark and limber pine ecosystems. There are open slots for contributed papers and posters. Then an evening program geared to a broad audience (public and media invited) presents the natural history of whitebark pine and highlights examples of restoration. Also, join us for birthday cake as WPEF celebrates our 10th anniversary.

On Saturday the 17th a field trip takes participants to spectacular whitebark pine habitats in the Yellowstone vicinity guided and interpreted by local experts. Please save the date. Planning is underway. Information about lodging and further details will appear in the next issue of *Nutcracker Notes* (in May 2011). Information and a call for papers will also be e-mailed to WPEF members, and will be posted on our website: www.whitebarkfound.org. For now, questions can be addressed to Meeting Coordinator Michael Murray at michael.murray@gov.bc.ca. ■

High-Five Symposium – a Recap

Carl Fiedler, Conference Coordinator

In 2008, conversations began at the Whitebark Pine Ecosystem Foundation (WPEF) annual meeting about the need for a state-of-knowledge symposium. Previous symposia focused on whitebark pine were held in 1989 and again in 2000. The seminal reference on whitebark pine "Whitebark Pine Communities: Ecology and Restoration" (Tomback, D.F., S.F. Arno, and R.E. Keane, editors) was a product of the 2000 symposium. Rapid spread of white pine blister rust, growing concerns about changing climatic conditions, and recent irruption of the mountain pine bark beetle in five-needle pines provided compelling reasons for holding another symposium. However, the WPEF's modest financial reserves made sole sponsorship of a symposium risky, given the difficult economic conditions and uncertainty about potential attendance. Fortunately, the generous pledges of 10 symposium cosponsors (Crater Lake Institute, Crater Lake Natural History Association, Greater Yellowstone I&M Network, National Park Service, Natural Resources Defense Council, Parks Canada, Rocky Mountains Cooperative Ecosystem Studies Unit, Sierra Nevada I&M Network, The Nature Conservancy, Upper Colombia Basin I&M Network, UM College of Forestry and Conservation, and USDA Forest Service – Northern Region and Rocky Mountain Research Station) provided the financial foundation that allowed planning for the event to proceed.

As plans for a third symposia took shape, the idea of including all high-elevation, five-needle pines (whitebark, limber, foxtail, southwestern white, Rocky Mountain bristlecone, and Great Basin bristlecone) gained momentum. These other pines share many of the same problems as whitebark, but are even further under-the-radar in terms of general awareness and efforts on their behalf. In addition, research findings and management experiences related to any one of these pines may have applicability or transferability to the others. However, expanding the symposium to include six species – coupled with the increased geographical and topical breadth associated with this expansion – required creating a broad-based (23-member) Steering Committee to help develop topics

and identify potential speakers. Once the general program and session formats were developed, moderators arranged topics/speakers within their respective sessions.

The High-Five Symposium had several primary objectives: 1) Bring all attendees to a general level of understanding about the ecology, threats, and restoration needs and strategies related to high-elevation, five-needle pines in western North America, 2) Provide a venue where attendees could meet and discuss with others virtually all aspects of five-needle pines, and 3) Generate the energy and critical mass to move research and management (restoration) to the next level in terms of priority, scale, and effectiveness.

The indoor portion of the symposium consisted of a two-day program of plenary sessions, special/technical sessions, and poster presentations. It was held June 29-30, 2010, in the University Center on the University of Montana campus in Missoula. The program was comprised of a keynote address, seven plenary presentations that focused on high-elevation, five-needle pines in general, 82 special session presentations, 23 technical papers, and 21 poster presentations. Nearly 100 presentations focused on individual species; of these, 75 percent focused on whitebark pine, 20 percent on limber pine, and five percent on the other four high-elevation, five-needle pines. These lopsided numbers provide a rough measure of the very limited research and management activity in foxtail, Great Basin bristlecone, Rocky Mountain bristlecone, and southwestern white pine ecosystems. Conversely, they reflect very substantial activity aimed at whitebark pine, and to a lesser degree, limber pine.

A total of 231 scientists, managers, administrators, educators, students, and citizens registered for the symposium. Several dozen additional guests sat in on individual presentations or attended the poster session. The international registrant traveling the greatest distance to attend the symposium was Mee-sook Kim from Seoul, Korea. The most distant Canadian registrant (Alana Clason) came from Smithers, British Columbia; the U.S. citizens that traveled farthest came from Honolulu (Stacy Jorgensen) and Worcester, Massachusetts (Colin Peacock).

A special no-host Discussion/Question-and-Answer session was held in the University Center Ballroom immediately after the final oral presentations on June 30. Despite two long days packed with presentations, approximately 150 hardy folks stayed on to attend the open-microphone session. One objective of this event was to generate ideas from attendees on how to better coordinate restoration and monitoring activities across different states, provinces, and ownerships. Another objective was to solicit opinions on alternative models for synthesizing data and providing consistent guidance and communication among different field-level entities. A third objective was to get a collective sense from attendees of whether the WPEF should be expanded to include all high-elevation, five needle pines. No single, straightforward solution or model emerged relative to either of the first two objectives, and opinions were split relative to the third. However, the open-discussion format provided some useful ideas for future direction and activities for the WPEF.

The third day of the conference (Wednesday, July 1) entailed a field trip to the Montana Snowbowl ski area. Despite forecasts for rain, sunny skies prevailed. Four school busses carried about 100 participants to drop-off points within the ski area, located approximately 10 miles northwest of Missoula. Participants were divided into eight “color-coded” groups, and then led by designated guides for 20-minute visits at each of eight stations scattered across the mountainside. At each station, one or more speakers made a presentation in their area of expertise, and then answered questions or directed discussion. At Station 1, Bob Keane gave an overview of his whitebark pine restoration project at the ski area. Station 2 featured Holly Kearns and John Schwandt presenting the latest findings on blister rust-pine interactions, including resistance, host species, and spread. At Station 3, Mary Frances Mahavolich, David Foushee, John Errecart, and Mike Mueller described the whitebark pine genetic restoration program in the Inland Northwest. At Station 4, Shawn McKinney presented the latest findings on pine/nutcracker/squirrel interactions, and associated research and management implications under changing climatic conditions. At Station 5, Dan Reinhart discussed operational and philosophical challenges to restoring whitebark pine ecosystems in wilderness, backcountry, and roadless areas. At Station 6, Glenda Scott described operational whitebark pine regeneration strategies, from cone collection to regeneration success. At Station 7, Jane Kapler Smith directed an interactive discussion of educational opportunities in high-elevation pine ecosystems. Finally, at Station 8 John Waverek discussed prescribed burning as a tool for restoring whitebark pine ecosystems. The field trip was organized and orchestrated by Bryan Donner, and returned to the UM campus at exactly 5:00 pm.

Four optional field trips--one guided and three self-guided--were offered on Thursday, July 2 after the conference adjourned. The guided trip led by Steve Arno involved a dozen people who assembled at the Lincoln, MT ranger station and were welcomed by ranger Amber Kamps, who described the district’s whitebark pine restoration activities. Then the group hiked to and beyond 6400-ft Lewis and Clark Pass on the Continental Divide where they saw mixed communities of limber pine, whitebark pine, and other species. Also, accompanied by the district’s fire

management staff, participants visited some of restoration burns in this area.

The three self-guided field trips targeted different locations in the Bitterroot Range south of Missoula, using maps and directions provided by WPEF, to see whitebark pine in mixed and pure stands and growing as krummholz amidst some beautiful mountain country.

In summary, the symposium was a highly successful event due to the extraordinary efforts of many individuals and the ten symposium co-sponsors The diverse array of speakers, nearly all of whom traveled on their own resources, contributed greatly to the "buzz" that accompanied the conference. A couple of post-conference comments seem representative of participants' reaction: "…far and away, one of the best conferences I've ever attended. Nope, probably the best. I've been thinking about it ever since I left Missoula." "Best field trip I've ever been on." "Wow, what an outstanding conference."

WPEF hopes that the energy and enthusiasm that came out of the conference can be maintained and built upon. For conference participants who are not WPEF members, please consider joining. A vibrant, growing organization is needed to help ensure a future for high-elevation, five-needle pine ecosystems. ■

An Interview with Helen Smith, WPEF Secretary

Editor: What sparked your interest in whitebark pine and induced you to become a charter member of WPEF a decade ago?

Smith: After completing a Bachelor of Science degree in wildlife biology at The University of Montana in 1995, I started working in fire research at the Missoula Fire Sciences Laboratory. I'm not sure I knew much more about whitebark pine than its name. However, working with scientists Bob Keane and Steve Arno introduced me to this tree and the perils it faces as well as the amazing ecology of whitebark pine ecosystems and the challenges involved in trying to sustain them. I was asked to help document the first meetings of the ad hoc group interested in starting this organization, and I've been with WPEF ever since.

Editor: As a native of central Montana, do you have some favorite whitebark pine country there?

Smith: I love the front range of the Rocky Mountains where limber pine and whitebark pine both grow. I'd love to spend more time there. I've work a lot in the Little Belt Mountains and have had the opportunity to visit some beautiful whitebark stands there.

Editor: What aspects of whitebark pine ecosystems do you find most intriguing?

Smith: The relationship between the Clark's nutcracker and whitebark's indehiscent cones [that don't allow the seed to fall out]. The evolutionary adaptations and the synergy of the two species are fascinating to me. It really makes me think about the wonders of nature and how and why things work the way they do. It also makes me look at other animal behaviors or traits and think, "There must be a reason for this."

Editor: What other interesting things have you learned by being involved with the WPEF?

Smith: The most notable is the work done by Cathy Cripps and her colleagues on the ectomycorrhizal fungi associations in whitebark pine systems. This seems like such an important component of the ecosystem, yet because they are so small and located underground, it seems like the researchers are just starting to uncover the composition and other keys to their significance.

Another significant update to earlier science that I first heard about at the WPEF annual meeting in Lincoln is Teresa Lorenz' work on nutcracker movements. Differences in science findings makes me wonder if they are due to ecosystem features of the different study areas, if the birds have changed habits since the early work, or if there is something else that we haven't even touched on yet. I wonder what researchers would find if they revisited Diana Tomback's 1970s study sites and used the telemetry tracking methods that are now available. ■

Mail-in Voting--a Success

Cyndi Smith, Associate Director

To encourage broader participation in elections for WPEF board members, we revised our process in March 2010, by sending out a pre-stamped, pre-addressed ballot card to each member. I'm happy to report that mail-in ballots were received from **67%** of our members, as compared with only 15% in the 2009 election.

Diana Tomback was acclaimed as Director and Helen Smith as Secretary. Four people ran for two general board member positions – Bob Keane and Michael Murray were re-elected.

I am accepting nominations for the following four

positions, which will be voted for in March, 2011:

Associate Director
Treasurer
General Board Member
General Board Member

Please check the website www.whitebarkfound.org to download the nomination form, which includes a description of the duties of each position. Nominations will close February 1st, 2011. If you have any questions, please contact me at cyndi.smith@pc.gc.ca. ■

"Members Only" Info—What is it?

Bryan Donner, WPEF Membership and Outreach Chair

The "Members Only" area is a common feature of many organization web sites. The Members Only area on WPEF's site can be accessed with a user name and pass code that is supplied to members upon joining the foundation or whenever the pass code is changed. The most recent pass code change was in July 2010. If you forget the user name or pass code, please contact me (donnermt@yahoo.com) or Bob Keane (rkeane@fs.fed.us) and we'll get that information to you.

WPEF's Members Only area is a benefit of membership that features the following attributes:

- Members can view all issues of ***Nutcracker Notes*** dating back to 1993. Also, an index of all past articles (numbering nearly 400) is shown in an Excel spreadsheet.

- The Elections page contains information about when the different executive committee and director positions are up for election. A link to the nomination form and the most recent election ballot is also located here.
- A page labeled "Board Business" contains several links of interest to WPEF members. The WPEF Secretary maintains an annual Foundation Calendar that displays WPEF events throughout the year. A WPEF Executive Handbook describes the duties of each of the Board of Directors positions; an excellent resource for those who are considering running for one of the BoD positions. Also on this page is a link to a brief list of those current members as of February of each year. Lastly, this page contains the minutes to Board meetings for the past 10 years.
- WPEF Bylaws are posted on the Bylaws page.
- The Committees page displays the current committees and lists committee members. This is a good resource for members to see what committees are available for volunteers. ■

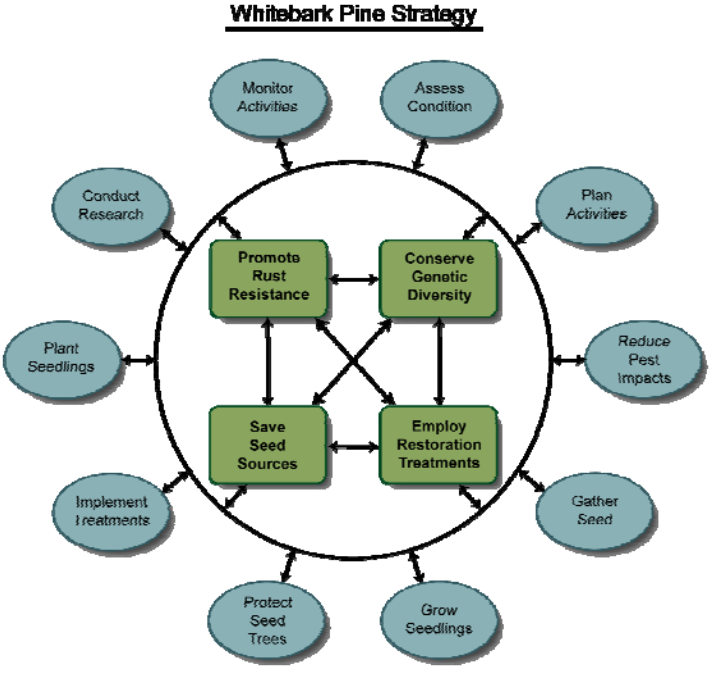
Bristlecone Pine Jigsaw Puzzle

A beautiful new educational jigsaw puzzle features the bristlecone pine ecosystem (a snapshot of it appears on our back cover). This is one of several large puzzles and prints painted by Larry Eifert and sponsored by the Crater Lake Institute. The 500-piece bristlecone puzzle is available for $16 postpaid from Crater Lake Institute, PO Box 2, Crater Lake, OR 97604 (e-mail: m13cli@yahoo.com). Whitebark pine prints and puzzles are also available and can be viewed at www.craterlakeinstitute.com/store. ■

Range-wide Strategy for Restoring Whitebark Pine

Bob Keane, USDA Forest Service,
Missoula Fire Sciences Lab

The dramatic loss of whitebark pine across much of its natural range poses serious consequences for high mountain ecosystems, both in terms of impacts on biodiversity and also losses in ecosystem processes. More than 90 percent of whitebark pine communities occur on public land in the United States and Canada. Thus, it is important that government land management agencies recognize their critical role in ensuring the future presence of this valuable ecosystem component. This is best accomplished through coordinated (trans-boundary) and comprehensive restoration efforts, including shared expertise for conserving seeds and growing blister rust-resistant seedlings, protecting trees, restoring ecosystem processes, and promoting natural regeneration.



The first step towards effective restoration of whitebark pine ecosystems is the development of a document that details a comprehensive strategy to address the complex issues and barriers at multiple spatial, temporal, and organizational scales. After more than six years of work, a draft version of "A range-wide restoration strategy for whitebark pine (*Pinus albicaulis)" is now available for review.* This report details a multi-scale strategy for restoring whitebark pine across its range in the western United States and Canada. It was compiled by researchers, land managers, and resource specialists for use as a reference for prioritizing, designing, and implementing successful whitebark pine restoration activities across many scales from stands to landscapes to regions.

The whitebark pine restoration strategy (see figure) consists of a set of principles to guide the design, planning, and implementation of restoration activities: 1) enhance rust resistance, 2) conserve genetic diversity, 3) save seed sources, and 4) employ restoration treatments. These guiding principles are then used to implement the whitebark pine restoration strategy using a set of possible actions: 1) assess condition, 2) gather seed, 3) grow seedlings, 4) protect seed sources, 5) implement restoration treatments, 6) plant burned areas, 7) monitor activities, and 8) support research.

The strategy is organized by six spatial scales of analysis and organization: 1) range wide, 2) region, 3) forest—e.g., national forest or national park, 4) landscape--e.g., watershed, 5) stand, and 6) tree. At each scale, we present four important factors in the restoration strategy: 1) assessment, 2) restoration actions, 3) management concerns, and last, 4) an example. Actual restoration plans are presented for the coarse scale strategies while illustrated examples are presented for the finer scales (tree, stand, and landscape).

We would appreciate any review comments on this strategy. The draft strategy is available at http:// rkeane.home.bresnan.net/ under the file name wbp_gtr_reststrategy.pdf. All comments are due to me via e-mail (rkeane@fs.fed.us) by February 1, 2011. Hopefully this strategy will help us to move forward in the long journey leading to restoration of whitebark pine ecosystems across the landscape. ■

2010 Whitebark Restoration Program

John Schwandt, Program Coordinator,
USDA Forest Service, FHP, Coeur d'Alene, ID
jschwandt@fs.fed.us

The Forest Health Protection (FHP) sponsored Whitebark Pine Restoration Program for 2010 was another great success. We received 39 proposals from across the West requesting more than $700,000 in funding. Once again it was extremely gratifying to see these proposals provided matching funds that exceeded the FHP requests (nearly $900,000).

Project Title	Location
Assessments	
Regeneration Surveys in old Burns in Northern Idaho	Selkirk Mts
GYA -Re-survey permanent plots	Greater Yellowstone Area
Great Burn Whitebark Pine Survey	1910 Great Burn
Operational Cone Collections	
Cone collections for all Washington and Oregon NF	11 National Forests in Or & Wa
Operational Cone Collection - Powell RD	Clearwater NF
Operational Cone Collection - Avery RD	IPNF; St Joe NF
Consolidated cone collection - Greater Yellowstone Area	Greater Yellowstone Area
Operational Cone collection - Flathead NF	Flathead National Forest
Operational Cone collection - Lolo NF	Lolo National Forest
Plus Tree Collections	
Plus tree cone collection	Glacier National Park
Region 1 - Plus tree cone collection	Northern Id & western Mt
Restoration Treatments	
Alice Creek restoration (slash & burn competing veg)	Helena National Forest
Upper Beaver WBP Enhancement Project (slash & burn)	Kootenai National Forest
Toboggan Fire WBP Restoration Planting Proposal	Clearwater NF; Powell RD
Black Butte Planting Project	Deschutes NF, Sisters RD
Sowing seed for Heller Cascade Planting	IPNF; St Joe NF; Avery RD
Sowing seed for Gallatin Planting project	Gallatin National Forest
Sow seed for 2011 Chippy Creek Fire planting project	Lolo NF, Tompson Falls RD
Cloud Cap Whitebark Pine Planting Project	Mt Hood - CloudCap/Tilly Jane
Sow seed for 2012 Chippy Creek Fire planting project	Lolo National Forest
Outreach & Education	
Saving Whitebark Pine: A Special Report	Nation-wide distribution

Since we received only $150,000 in FHP funding from our Washington Office, the requests continued to far exceed available funding. Fortunately the Regional FHP offices were able to provide additional funding that doubled the original amount to $300,000 and cooperators more than doubled this amount by contributing over $600,000 in matching funds for the selected projects.

As a result we were able to fund a total of 21 projects in 2010. About 50% of the funds were used for eight cone collection projects, 36% of the funds were used for the nine restoration treatment projects, while less than 10% of the funds were used on the three assessments and less than 5% of the funds were used for the one outreach project.
One of the most gratifying aspects to this program is the wide support that this program continues to receive from a very diverse group of partners. The Request for Proposals (RFP) for FY 2011 is currently out and has a deadline of December 6, 2010. Please contact John Schwandt if you have any questions or need RFP forms. ■

Climate History from Limber and Whitebark Pines

Dave Sauchyn, University of Regina
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Tree rings provide both climate information and an absolute annual chronology. The precise measurement of tree-ring width, and calibration of this climate proxy using instrumental weather data, enables us to reconstruct the climate variables that most limit annual tree growth. In the dry climate east of the Rocky Mountain crest, tree growth is limited each year mostly by available soil moisture. Therefore tree rings are a proxy of precipitation and drought. The strongest climate signal in the tree rings occurs at sites with an extreme local climate. Trees growing at exposed or dry sites or at their climatic margins (e.g., upper and lower tree-line) generally are climatically sensitive. They also tend to be the oldest trees in a forest, and provide the longest tree-ring chronologies, because these sites support only sparse fuels.

In the Prairie Adaptation Research Collaborative (PARC) Tree-Ring Lab at the University of Regina, we have collected samples of old wood from about 150 sites spanning 20 degrees of latitude from “island forests” (on isolated mountain ranges) of north-central Montana to the boreal forest of the central Northwest Territories. Most of our sampling sites are on the eastern slopes of the Rocky Mountains. This is where we find the oldest trees, among them whitebark pine and limber pines.

The accompanying table lists the names and locations of the four sites where we collected samples of whitebark pine and the 16 sites where we collected limber pine. Numbers in the last column are the length of the tree-ring chronology (the dating is not yet complete at four sites). Where these numbers are relatively small (less than 300 years) they represent the age of living trees determined from small diameter (4 mm) increment cores. The longer tree-ring chronologies, including those nearly 1000 years in length, were derived from samples of living and dead wood. The age of the dead wood is determined by cross-dating, which is the fundamental principle of dendrochronology (tree-ring research). The calendar years can be transferred from living wood and to dead wood, as long as the samples overlap in age. The period of overlap will be characterized by the same ring-width pattern for trees growing in the same forest and exposed to same year to year variation in available soil moisture.

Figure 1 shows the tree-ring width chronology from limber pine in the Whalebacks of southwestern Alberta between the Oldman and Highwood Rivers. A dimensionless ring-width index is plotted every year from 1218 to 2004. As show in Figure 2 (on front cover) these pines are in a very open stand on a dry site. Therefore high values of the ring width index represent wet years and low values represent dry years. There is a lot of variability from year to year and also some inter-decadal variability. The tree rings pick up the dry years of the 1930s and the 1980s. They also suggest drought in the 1790s. Other studies have found sand dune activity and low water levels at this time. Thus our reconstructions of climate and water from the tree rings show that the droughts of the past century were comparable to earlier droughts, based on tree ring chronologies from the limber pine.

The whitebark pine grow at upper tree-line where summer heat is presumed to be the limiting growth factor. Thus the whitebark pine should give us a seasonal temperature record for the past millennium; but we have not yet compiled that story.

SITE	°N	°W	YEARS
Whitebark Pine			
Sarbach Lookout, Banff NP, AB	51.92	-116.75	439
Vicary Mine, AB	49.77	-114.53	
Waterfowl Lakes, Banff NP, AB	51.85	-116.63	
West Butte, Sweetgrass Hills, MT	48.93	-111.535	441
Limber Pine			
Buhrmann, AB	49.93	-114.03	296
Beazer, AB	49.1	-113.46	118
Emerald Lake - Crowsnest Pass	49.6	-114.6	555
Hawkeye Mesa, AB	49.66	-113.78	466
Lee Creek, AB	49.14	-113.45	
Oldman River - Whalebacks, AB	49.8	-114.2	805
Olin Creek - Porcupine Hills, AB	49.733	-114.085	
Ridge Crest - Whalebacks, AB	49.917	-114.267	207
Saskatchewan Crossing, AB	51.97	-116.72	899
Siffleur Ridge, AB	52.048	-116.398	991
Whirlpool Point, AB	52	-116.45	946
Whistler Mountain, AB	49.34	-114.31	
Windy Point, AB	52.15	-116.4	439
YaHa Tinda, AB	51.7	-115.4	270
Cut Bank River, MT	48.61	-113.26	157
South Milk River, MT	48.65	-113.26	116

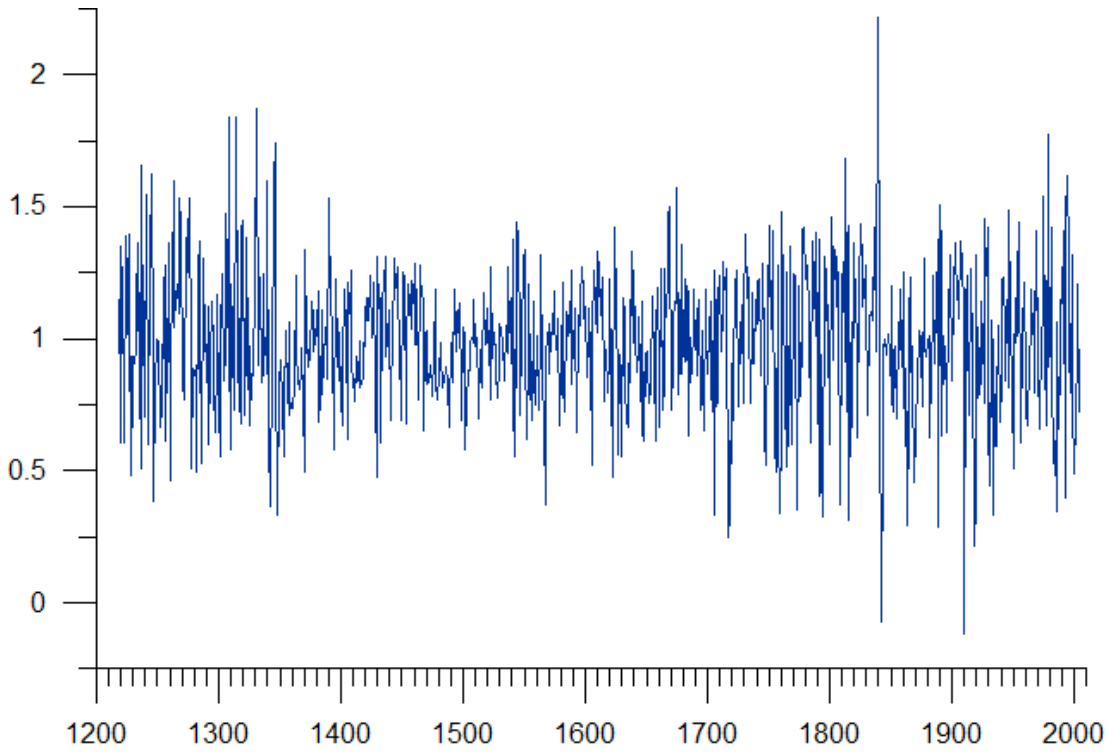

Figure 1. Tree-ring width chronology for limber pine from the Whalebacks, Oldman River basin, southwestern Alberta. Annual ring width is plotted as a dimensionless index. ■

Exploring Whitebark Pine at its Northwest Limit

Sybille Haeussler, University of Northern B.C., and
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Despite funding challenges, the Bulkley Valley Research Centre continues its efforts to study the dynamics and condition of whitebark pine ecosystems at their northwest limit near Smithers in west-central British Columbia and to begin a small-scale restoration program. Previous Nutcracker Notes reports by Haeussler (2008) and Clason (2010) have described some of the work to date. We also enjoy helping Sierra Curtis-McLane (2010) of the University of B.C. Centre for Forest Conservation Genetics with her assisted migration trial sites near Smithers.

Whitebark pine ecosystems in west-central BC are remote and mostly unroaded, which constrains our ability to do research on a shoestring budget. In 2009 I joined University of Alberta graduate student Alana Clason and two field assistants at a fly-in fishing cabin on Coles Lake, 150 km south of Smithers, where we spent several weeks revisiting old whitebark ecosystem classification plots established in the 1980s. Alana successfully defended her masters thesis in July 2010 and now plans a whitebark-focused PhD project at the University of Northern BC. This summer, two research trips were made into the wonderful new Nenikëkh/Nanika-Kidprice Provincial Park, once by canoe and once courtesy of the BC Floatplane Association. The BC Forest Service continues to assist us in supplying vehicles, radios and drivers for 4 x 4 forays into the rough, roaded territory surrounding Morice Lake. Thanks to all our volunteers and supporters.

From these adventures we have learned many things about whitebark pine ecosystems in the far northwest. Much of the news is discouraging, but there are some rays of hope. Many of our observations will come as no surprise to whitebark pine observers further south, but others may be unique to our region. We welcome your feedback.

From 1977 to 2002, the Pacific Decadal Oscillation (PDO) was in a dominantly positive (warm) phase. This was a period of major decline for whitebark pine ecosystems in west central BC. We are not aware of any significant forest fires that burned in whitebark pine territory during this period. Meanwhile, white pine blister rust continued its relentless spread –perhaps exacerbated by mild, moist conditions. There were patchy outbreaks of mountain pine beetle across the region from the late 1980s to early 1990s. At Coles Lake, virtually all mature to ancient whitebark pine trees alive in the early 1980s died during this period (Fig. 1). The massive early 2000s pine beetle epidemic did not affect Coles Lake because so few sizeable pine trees remained! We expected subalpine fir to increase in the absence of wildfire and following the death of the pines, but this did not occur because there was also a severe balsam bark beetle (*Dryocoetes confusus*) outbreak and above-normal levels of 2-year cycle budworm (*Choristoneura biennis*), which together caused substantial subalpine fir decline. The decline of pines and subalpine fir, accompanied by an increase in mountain hemlock (*Tsuga mertensiana*) suggests that the Engelmann Spruce-Subalpine Fir biogeoclimatic zone on the eastern slopes of the Coast Mountains has been transitioning towards a Mountain Hemlock zone-like forest as predicted by Hamann and Wang (2006).

In direct contrast to this ingrowth of wet-climate species, however, the frequency of wildfire on the east slopes of BC's Coast Mountain Range may have increased since 2003. In addition to many wildfires in the Bella Coola-West Chilcotin region to the south, there have been two major fires in whitebark pine habitat of west central BC: the 2004 Nanika Burn at Kidprice Lake, and the Gosnell Fire of August 2010. These crown fires burned through subalpine fir stands, but ridge crests within both fires contain excellent habitat for whitebark pine regeneration. In the Nanika Burn we located just 4 whitebark pine seedling clumps in a several-hectare search area. This abysmally low figure corresponds closely to sapling densities of 2.9 clumps/ha recorded in the 1974 Burnie Burn (Haeussler et al. 2009). We propose to supplement this natural regeneration with planting and direct seeding of stratified seeds along ridge crests. Since subalpine fir and lodgepole pine are both regenerating vigorously in the Nanika Burn, we think it will be appropriate to uproot competing seedlings in the vicinity of planted and seeded whitebark pines. Mountain hemlock does not regenerate readily after wildfire in this area.

On a brighter note, the 2000s mountain pine beetle epidemic appears to have exhausted itself over most of west central BC (though it continues to grow near Smithers). Two types of whitebark pine stands remain. Near Kidprice Lake, there are several wildfire-origin stands (apparently dating from the negative PDO phase of 1947-1976) with little mountain pine beetle damage. These immature stands contain seed-bearing whitebark pine trees with minimal blister rust infection, and will be our first priority for cone caging and seed collection to begin in 2011. There are also many residual stands near timberline (1500 – 1800+ m elevation) but these may not be appropriate for regenerating mid-elevation wildfires and beetle-affected stands (800-1200 m) (Reinhard Stettler, pers. comm., June 2008), particularly in light of climate change. Outside of the Provincial Park, we will plant a

small trial using more southerly seed sources in 2011.

Our most encouraging discovery is that healthy whitebark pine seedlings (<30 cm tall) are common in the understory of immature and mature lodgepole pine forests on gravelly fluvial deposits. We initially discounted these stands as they had no visible overstory or mid-canopy layer of whitebark pine. Clark's Nutcrackers appear, however, to have been caching beneath the lodgepole pine trees and the canopy and understory layers are sufficiently sparse that the whitebark seedlings are healthy, although growing slowly. With the death of overstory lodgepole pine from pine beetles, these seedlings may now release. We are considering facilitating their growth by cutting or girdling neighbouring subalpine fir and lodgepole pine regeneration and would appreciate advice from others who have done restoration work in similar stands. We are also curious if there is a cue that lures the Nutcrackers to cache in these dry, open lodgepole pine-lichen ecosystems or whether this is the only type of forest understory in which cached seeds survive and grow.

We have not yet been able to track the behaviour of Clark's Nutcrackers in our area. A few birds are invariably present in whitebark pine stands in July and August, even in poor seed years, but disappear in September and October. They appear to be in severe competition with red squirrels to strip all of the whitebark cones before they are fully mature. We don't know if they are caching unripe nonviable seeds in the recent wildfires or mostly caching elsewhere (under dry lodgepole pine? near timberline?). What do they use as their alternate food source? Nearby trees include subalpine fir, mountain hemlock and a few lodgepole pine. Perhaps they travel 50 km west to the nearest stands of Douglas-fir. Intriguingly, the northernmost contiguous stands of whitebark pine lie at the same latitude as the northern limit of Coastal Douglas-fir (at Gardner Canal), and the northernmost isolated stands coincide with isolated northernmost stands of Interior Douglas-fir near Fort St. James. The complexity of these relationships compels us to learn more.

Details of our work are posted on the Bulkley Valley Research Centre website at: http://bvcentre.ca/research/project/testing_ecological_resilience_theory_in_pine-lichen_ecosystems_of_west_cent/

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Figure 1. Ghost forests at Coles Lake, BC after late 1980s mountain pine beetle. ■

Imitating lightning strikes for whitebark pine restoration

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A restoration burn for whitebark pine was first planned in Waterton Lakes National Park in 1999. The site was at Summit Lake in the Subalpine Ecoregion, an open coniferous forest of subalpine fir, Engelmann spruce and whitebark pine, with a dwarf herb/shrub layer of huckleberry and beargrass (Achuff et al. 2002). Many of the whitebark pine are dead or dying from white pine blister rust or mountain pine beetle (Smith et al. 2008). Regeneration of whitebark pine is present but healthy seedlings are few due to blister rust and competitive exclusive by faster-growing conifers. Whitebark pine is listed as Endangered in Alberta (Government of Alberta 2010), and has been assessed as Threatened

at the national level (COSEWIC 2010) and is awaiting legal listing.

A prescribed burn was initially planned but cancelled due to (1) the high complexity of the burn, (2) the probability of damaging and/or killing the last remaining seed trees, and (3) a restriction on water use from Summit Lake (the closest water source if suppression was required). The restriction is due to the presence of an aquatic plant, Bolander's quillwort (*Isoetes bolanderi*), which is listed as Threatened under the federal Species at Risk Act (COSEWIC 2006). Cutting, stacking and burning competing vegetation was considered, but the area is bisected by a popular hiking trail and visibility of cut stumps was considered inappropriate in a wilderness zone. The final approved plan was to use a torch to replicate small lightning strikes, the objectives being to (1) burn competing vegetation to allow release of whitebark pine seedlings, and (2) to create forest openings that would encourage seed caching by Clark's nutcrackers.

The burn plan called for 26 randomly located plots (to imitate lightning strikes), each approximately 60 meters in diameter (0.3 ha), for a total treated area of eight ha. The plot size is the minimum area recommended by Keane and Arno (1996). The burning technique involved using a torch to burn all competing vegetation (i.e. anything not whitebark pine) within a 15-m radius of the torch (the length of the ignition hose). The torch was built in-house to the specifications of the Park's Fire Specialist. This required helicopter support to position a 205-liter barrel of fuel (60/40 diesel-gasoline mix) at each plot. The torch unit was moved between plots by hand (see photo on back cover). Every effort was made to avoid burning any whitebark pine trees or regeneration. The burning operation only occurred during periods of low Fire Danger to prevent fire escape, minimize subsequent ignitions due to fire brand spotting, and aid extinguishment if required.

Twelve plots were completed in October 2009, prior to a heavy snowfall. Eleven plots were burned in September 2010, but the remaining three plots are unlikely to be completed due to heavy snowfall and the high cost related to equipment and personnel mobilization for small return.

On 21 of the plots, fire behavior included easy torching and candling, with flame lengths greater than 10 m. Although there was high surface moisture, there was easy ignition of large diameter ground fuels, with fuels burning for 24-48 hours with moderate consumption. The crown fraction burn was 75-100%. Two of the 23 plots were attempted with 10-25 cms of snow on the ground and ice/snow on conifer branches, but the burning operation had to be suspended due to poor fire behavior. As part of the restoration, in late September 1000 WHITEBARK PINE seedlings were planted in the plots, utilising burned and unburned areas. These will be monitored closely for survival and health.

The use of a terrestrial torch system to burn small plots that mimic lightning strikes is a viable technique in areas where prescribed burns and other silvicultural techniques are not acceptable or possible.

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Can Dogs Locate Whitebark Seed Caches?

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A Belgian sheepdog named Basil has us wondering. Basil has been in training since puppyhood to use his sense of smell to find target odors, with the hopes that one day he would go to work to assist in wildlife or plant research surveys. The remarkable olfaction capabilities of dogs have long been applied for the detection of drugs, explosives, missing people, avalanche victims, and more recently, early detection of cancer in humans. Biologists are also now increasingly using dogs to search for rare plants or newly-established invasive plants, animals (desert tortoise, bog turtles, Gila monsters), as well as wildlife scat (wolf, lynx, wolverine, fisher, bobcat) and even marine scat (right whales and killer whales).

Dogs that perform well in scent detection work are typically energetic, with high play drive, trainability, focus, agility and a certain independence and strong work ethic. The breed of the dog is not as important as its temperament. In fact, some organizations, like the Montana-based Working Dogs for Conservation, often find mixed breed dogs in animal shelters and put them to work performing surveys.

Basil began his conservation training sniffing out cottonballs globbed with fragrant hair gel. He was presented with a row of concrete blocks with glass jars hidden inside, one jar containing hair gel. When Basil showed any interest in the jar with gel, he was rewarded with special treats, a favorite being chicken. He was next trained to sit in front of the target jar to wait for his food reward, and to point with his nose to the correct jar. Once he got the game, we ventured to tossing jars in the field, hidden in bushes, log piles, down holes, in tall grass, by creeks, and in a variety of environmental conditions - rain, snow, wind, and warm weather.

This summer, Basil switched from finding hair gel to the more subtle aroma of an Idaho giant salamander, a rare species which in its terrestrial form is difficult for biologists to find. He has shown good potential and more work is planned for next year. This fall, Basil's training efforts included finding whitebark pine seeds (see photo on back cover). As with the other scents, he was first introduced to the seeds by hiding them among a row of jars. He honed on the seed jar quickly, and we have begun hiding seed caches outside, in a variety of locations and conditions to maximize Basil's exposure and searching experience. Several challenges have become apparent in working with whitebark pine seeds. One, the seeds probably emit only a small aroma plume compared to other scent targets such as bear scat. Consequently, we need to do detailed searches where the dog typically works on-leash closely examining areas much like in mine-detection work. A second challenge is limiting the scent left by humans when hiding seeds in training. Basil has shown a keen ability to track the path of humans to help lead him to seed caches. We are working through these challenges with creative seed placement and working on leash to thoroughly vet search areas.

Further training and testing are needed to develop and demonstrate Basil's proficiency in finding seed caches. Basil and his handler Lisa are learning on a daily basis and are given support by the seasoned handlers from Working Dogs for Conservation. The possibility of using canine scent detection to find whitebark pine caches could open many doors for improving our understanding of whitebark pine seed caching by Clark's nutcrackers. Researchers could determine optimum nutcracker caching habitat and identify areas where nutcrackers prefer to cache without the time-consuming and difficult task of observing actual birds. Dogs could also be used to estimate how many caches are reclaimed by nutcrackers. Managers could use seed-sniffing dogs to determine if a unit needs to be planted with whitebark pine seedlings. Dogs like Basil may be the next "best friend" in the restoration and conservation of whitebark pine.

Whitebark Pine Regeneration in the Greater Yellowstone

John Fothergill,

As whitebark pine forests suffer increased mortality from white pine blister rust and mountain pine beetle, recruitment of seedlings will be essential for sustaining this keystone species. Since 2004 the National Park Service Inventory and Monitoring Program has been conducting a long-term health monitoring project on whitebark pine in the Greater Yellowstone Ecosystem (GYE) (described in *Nutcracker Notes* no.15). One component of the monitoring program is documenting recruitment rates of seedling whitebark pine (< 1.4 m) and their health status in relation to blister rust infection. This article summarizes trends seen so far. Between 2004 and 2007, crews installed 176 permanent 10 x 50 m monitoring transects in 150 whitebark pine stands throughout the GYE. Stands were selected by a random sample of all known whitebark pine stands greater than 2.5 hectares. Ninety-eight stands were remeasured during the 2008

and 2009 field seasons. Whitebark seedlings within the transect were counted and observed for blister rust infection. The complete monitoring protocol can be found online at http://www.greateryellowstonescience.org/subproducts/14/72.

A total of 7606 whitebark pine seedlings were sampled across all transects with densities ranging from 0-625 seedlings per transect (500 m²). The mean density of whitebark pine seedlings across all transects was 43.5 seedlings/500m². Seedling densities were greatest in cover types dominated by either whitebark pine or lodgepole pine overstory and least in spruce/fir and Douglas-fir dominated stands. (Fig. 1)

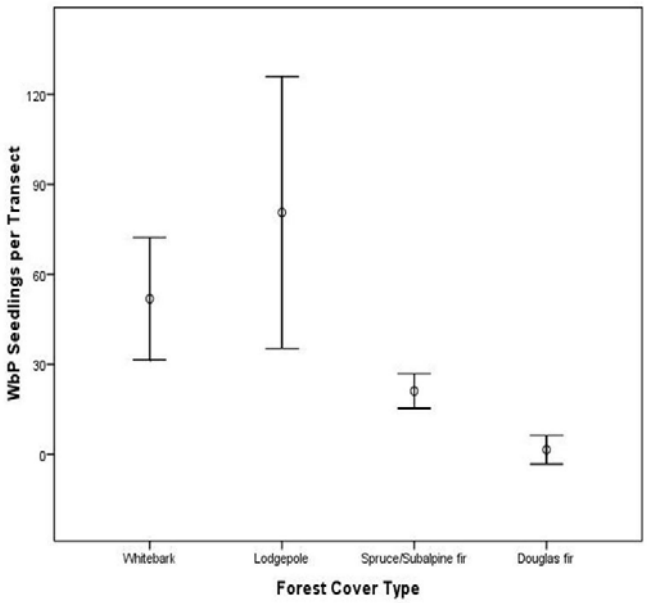

Figure 1 Lodgepole pine cover types contained the highest densities of whitebark pine seedlings. Bars represent 95% confidence intervals around the mean density.

The highest whitebark pine seedling densities were found in mature lodgepole pine forests, but there was a great deal of variability**.** No significant relationship was seen between the total basal area of a stand and the density of seedlings. The rate of rust infection of seedlings was less than typically found in overstory trees in the GYE, .20 (± 0.037 SE) for trees greater than 1.4 m, with only 2.8% of seedling infected (GYWPMWG 2008).

For the 98 transects revisited in the 2008 and 2009 field seasons the average seedling density has increased from 35.7 seedlings/500m^2 to 45.9 seedlings/500m^2. Similar to seedling density, the average percentage of seedlings infected with WPBR per transect has also increased during this same time period from an average of 4.01 percent seedlings/500m^2 to 6.98 percent of seedlings/500m^2. The percentage of the total number of WPBR infected seedlings increased from 2.1 to 3.3 percent for the 98 revisited transects.

The recent reduction in overstory cover due largely to beetle-caused mortality may have aided in the increased density of whitebark pine seedlings. However, with the loss of cone bearing whitebark pine ongoing it is doubtful this trend will continue. Blister rust infection rates have also increased and can be expected to continue to increase as seedlings grow larger (becoming a bigger target exposed to fungal spores) and are exposed for a longer period of time. With the increasing trend of blister rust infection in seedlings and the continued loss of cone bearing whitebark pine, monitoring stand recruitment will continue to be integral to our understanding of these dynamic forest ecosystems, and may warrant more attention by researchers and land managers.

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Sugar pine, Kings Canyon National Park, CA. Photo by S. Arno.

Bristlecone pine painting by Larry Eifert available as an educational jigsaw puzzle. See article, page 7.

Imitating lightning.
Photo by Randall Schwanke, Parks Canada.

Basil searching for seed caches.
Photo by Lisa Holsinger.