A conversation with Jan Henderson

Recently retired Forest Ecologist for Mt. Baker Snoqualmie and Olympic National Forests

Few people have had such an interesting career in the outdoors as Jan Henderson, recently retired Forest Ecologist for the Mt. Baker Snoqualmie and Olympic National Forests. Henderson's work took him into obscure and remote places of both forests, where he researched and mapped the ages of stands and reconstructed the ebb and flow of changing climates and species distributions going back thousands of years. He probably knows more about the forests of northwestern Washington than anyone else, and his body of work is fascinating.

Jan Henderson at work counting rings from an Alaska yellow cedar cut near Three Peaks in the western Olympics, estimated age 1500 years.

***TWC:** Jan, thanks for taking the time to talk with us. Many* Wild Cascades *readers have a great interest in your work. Can you tell us just a bit about the path that led you to become Forest Ecologist?*

JH: I grew up in Seattle and spent a lot of my early years on the salt water. In 1960, some friends asked me if I wanted to hike to a mountain lake to go fishing. With borrowed pack and sleeping bag, we hiked the nine miles into Lake Stuart in the Icicle. I was hooked. My interests soon changed away from fish in the lakes to the forests we hiked through or the peaks and views nearby. In college I pursued forestry, as the closest field to my interests. As a senior I took a job in a paleobotany lab, and began studying forest ecology and then botany, eventually doing my dissertation on the ecology of subalpine meadows at Mt. Rainier.

A professor's job at Utah State took me out of the area but allowed me to pursue intellectual interests in vegetation, climate and forest management. When a job opportunity surfaced that would take me back to the Seattle area and into the mountains, I packed up and moved back. My job was to inventory, classify and describe the vegetation of the Olympic and Mt. Baker-Snoqualmie National Forests for the purposes of helping guide the management of these forests based on the concept of potential natural vegetation. I had become all too aware that fellow faculty members spent minimum time in the field and maximum time squeezing as many papers out of their few field plots as possible. My new job required maximum time in the field and the rest analyzing and interpreting the data. That suited me and my personal interest to learn as much as I could about the ecology of Northwest Washington.

***TWC:** One part of your work that tree huggers find of great interest is "stand origination date" mapping and the reconstruction of ancient fire histories across the forests. Can you tell us about that, and what led you to it?*

JH: The process of learning about the ecology of the Olympic and Mt Baker-Snoqualmie NFs boiled down to just a few questions. What is the pattern of vegetation across the landscape? Why is it the way it is? And how did it get that way? The overall pattern of vegetation in a landscape is primarily driven by the pattern of the different environmental factors, such as precipitation, temperature, patterns of soil, snow, aspect and cold air drainage etc. In addition the characteristics of vegetation depend on how old the forests (or non-forest communities) are. In the PNW, the origination of forests can usually be traced back to the time of the last stand-replacing fire.

Old forests look and act differently from young forests, and I wanted to know the age (at least in a relative time frame) of the different forests and to try to determine which of their characteristics were due to the environment and which were due to age. In the course of taking data on species composition, elevation, site and location, we took data on tree ages and heights. Along with doing tree-ring counts to determine ages of trees, we also recorded information on rates of growth during different decades and growth anomalies that could be due to fire or other disturbance. By analyzing these data we were able to map the extent of forests of different ages, and from that plus fire scars and growth anomalies we were able to map not only the extents of current stand ages but to interpret the probable extents of previous large, stand-replacing fires.

The maps of these big fires indicated that a large fire throughout NW Washington in or about the year 1701 burned somewhere between three and 10 million acres. Much of it was mapped off of national forests in the Puget Trough. This was an interpretation of the measured patterns and a process of "connecting the

dots" between the Cascades and Olympics. Other times of large fires were about 1508 and 1308, although the 1308 date may have been simply the end of a long and active burning period that characterized the Medieval Warm Period in western Washington. Other small fires were also identified, but these three were by far the most significant. It is most interesting to me that all three occurred during periods when the climate is believed to have been quite a bit cooler, and probably also drier.

One aspect of the vegetation that can be interpreted from such data is based on the species composition that is represented in each of these three major age classes. The older forests show that they had to have started with a large component of Douglas-fir, even if they are now in what is the cool moist Pacific silver fir zone. Younger forests show fewer Douglas-firs in the same zone, indicating that the climate must have become either wetter or colder (or both!) over this period of time.

***TWC:** You have put considerable effort into researching and reconstructing the climate history of the Northwest and its continuing evolution. Some of your findings run counter to mainstream thinking. Where do you think the climate here seems to be heading?*

JH: Two things are virtually certain about vegetation of this area (and most other areas as well). First, every place in the landscape is different. I have never found two places (sites or sample plots) that I would be willing to say were "the same" ecologically. Second, every time period has also been different. Reconstruction of climate and vegetation history indicates that climate is always changing. I believe this is true at any time scale one wishes to use. If this belief is true, then there is every reason to believe that it will continue to change in the future, and that whatever this change brings will be something new.

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The causes of such climate change are many. Change in atmospheric and oceanic concentrations of CO_2 are only one part of the history of that change. At times in the past, changes in CO_2 may have had great effects on climate and at other times maybe not much at all. I believe the Sun has the major effect on Earth's climate and will continue to do so. The Sun and its relationship to the Earth, too, is always changing. Most people believe the great Ice Ages of the Pleistocene were caused primarily by changes in Earth's tilt relative to the Sun and its changes in orbit around the Sun. Many people believe the recurring major cycle of "Little Ice Ages" every 1000 to 1500 years is due to solar effects as well.

Based on this, I believe that climate of the PNW will likely be cooling in the next decade or so and maybe for several decades before it turns warmer again. The Pacific Decadal Oscillation is turning cooler. The Sun appears to be entering another quiet phase with low sunspot numbers and low electro- and geomagnetic energy. The short-term La Niña of the last two years will pass quickly. However, in the long run the proportion of El Niños and La Niñas may be related to whether a particular decade is "warm" or "cool." If the Sun continues to become less active (like it was during even minor "Little Ice Age" events) we could see a more prolonged cooling in the near future. In the last decade or two there has been a measurable downward trend in temperature, at least here in the northwestern US, that seems to support these predictions. We won't know, except in hindsight, whether this is just another short-term variation due to unknown causes or a more significant event.

***TWC:** Based on what you know about the way west-side forests have changed over the last thousand years in response to climate shifts, what do you think about the idea that "active management" is needed to help forests respond to prospective climate change? Is such a thing possible?*

JH: If we knew what would be different about climate in the future, we'd have a chance of prescribing some "active management' to anticipate such changes, but we don't. I believe there are three flawed assumptions. First, regarding climate change itself, we don't know the magnitude of any future changes in temperature or precipitation; we don't even know whether they'll increase or decrease. And we clearly can't separate natural climate changes from man-caused ones. Second, we don't have enough research or live experience with non-classical silviculture to prescribe with any assurance the outcome of these "active management" treatments. Consider how poorly we were able to predict the outcomes of recent "thinning." Third, we don't know enough about the ecology of different species to make a defensible prescription for "moving" species into anticipated future climates. I think the only defensible "active management" is to provide for a diversity of species within different stands or communities, and to provide for sufficient growing stock to weather future disturbances like wind or ice storms.

I believe we need to manage to conserve future alternatives rather than to target a particular future condition or climate.

Considering that climate is changing (including changes in CO_2 concentration in the atmosphere); has always been changing and will continue to change; one has to wonder if we have a very good idea about what a projected future condition might really look like. The presence of elevated CO_2 levels alone would certainly alter the successional development of any contemporary forests by increasing growth and biomass, plus inter-and intra-species competition, and would have to be incorporated into any pre-treatment analysis.

The wide range of possible future climate conditions here in NW Washington makes it virtually impossible to find a single good future target. If a warmer scenario gives us a target, what if the next 50 years are cooler? I believe that possibility is very real and should not be discounted. What about 100, 200, or 300 years from now? I believe it is almost certain that conditions then will be something other than what we can predict now!

Pacific Northwest species have survived greater magnitudes of change than are being predicted. They have a built-in genetic code that has evolved in the face of sudden and great changes in temperature, snow, precipitation, fog and wind. We need to give them more credit! I believe we need to manage to conserve future alternatives rather than to target a particular future condition or climate.

Look for Part Two of this interview in the Spring 2012 issue of The Wild Cascades.

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PART TWO

In Part 1 of this interview, published in the Winter 2012 *TWC*, Jan Henderson talked about how he became a forest ecologist, his "stand origination date" mapping and reconstruction of ancient fire histories, and his thoughts on climate shifts and their impact on forests. In Part 2, he discusses restoration logging, the most mysterious parts of Northwest forests, and his plans for retirement.

Counting rings on a 480-year-old Douglas-fir from the upper Sol Duc River in the Olympics.

TWC: NCCC has been skeptical about "restoration" logging, or thinning, and the idea that it can accelerate the development of "old-growth characteristics" in younger forests. What do you think of such claims? Any thoughts on its efficacy or lack thereof as regards naturally regenerated stands versus post-logging stands, and within those post-logging stands, the younger, replanted ones versus naturally regenerated older ones, such as early 20th century railroad logged areas?

JH: This is a very complicated question and would require a very complex answer, with not enough time or space here. There are many views on this subject and in my opinion there is not enough information to even make a scientifically informed opinion, although there are still lots of opinions.

Personally I think the idea of "restoration" in this context is a ghost. It appears to some people as a single faint image, to others as more defined but still vague images and to others, not at all. No one, in my opinion, has presented a good vision of what is being restored or even how to do it. Yet there is a strong momentum to do "something." Doing something that increases the diameter of residual trees has very little to do with actually restoring old-growth forests, and often does more harm in this regard by setting back the development of many other important old-growth related characteristics. Climate has changed so much during the lifespan of our older old-growth forests that we cannot prescribe a pathway to get from existing young-growth forests to achieve the species composition and structure that now exists in these old-growth forests. "You can't get there from here." Climate change is the big unknown in trying to prescribe a plan for "restoring" old-growth conditions based on existing old-growth forests. I believe the best we can do is prescribe "normal" conditions for such forests specific to the known current climate and let natural processes take the stand where it can go.

My experience has shown me that while these forests are very diverse spatially and temporally, they are also very resilient. They are self-organizing and most young forests are developing toward middle-aged structures and functions. There is a school of thought that there is a good reason why forests develop in the sequences they do. It has worked for millions of years and evolution has tested many possible pathways, and the ones that worked have survived. Perhaps these forests *need* to grow from one stage to another, and can't really skip a step because there are certain processes and effects that are dependent on some precedent.

One assumption sometimes used to argue for "restoration thinning" is that the forest in question is "overstocked" or otherwise not "normally" developing toward some natural old-growth condition. However, in my opinion, the stands that are actually outside the "normal" range of stocking are *not* the ones being treated. The ones often selected are well within the range of normal stocking and appear to be developing at a normal rate toward old-growth condition. This fallacy may be partially due to the practice of extrapolating results from one area to another. For example, to apply stocking guidelines from drier parts of western Oregon to wetter parts of western Washington can lead to this kind of mistake.

Most of the stands I have visited (and taken research plots in) that have been "thinned" have been diverted away from a normal successional trajectory. Many

of these stands now have excessive tree regeneration that now require future additional treatment, or have had much higher than normal mortality or damage to the residual trees.

I am concerned that trying to get stands with large-diameter trees faster reduces the likelihood of them actually developing into more normally developed old-growth forests. In many of these cases where the residual stocking following "thinning" is reduced below natural conditions, then I wonder where the future snags or down logs will come from? Or I wonder where the future energy (biomass) for many of the forests' organisms to live and function will come from if the stands become under- or over-stocked due to treatments now?

Personally, I see little significant difference, in the big picture, between naturally regenerated stands and most plantations. First, under wildfire, wind or snow/ice disturbance regimes there is naturally a wide range of post-disturbance conditions. This is partially due to the possible climate for the period of regeneration, the severity and extent of the disturbance, and the inherent environmental conditions of the site. Many "plantations" on these national forest lands also have had considerable natural regeneration. Sometimes the natural regeneration has out-competed many of the planted trees. This is common in wetter areas and especially in the silver fir zone. Railroad logging where "seed trees" of Douglas-fir were left often resulted in higher and more regular stocking of Douglas-fir. Early 20th century, non-seed tree "clearcuts" have a wide range in stocking and species conditions, but are often (not always!) "poorly" stocked with trees. Natural variation in stocking and species composition is caused by a number of variables at work, resulting in a wide range of conditions from various disturbances or treatments. I find it is very difficult to generalize about such conditions except for a small area. Site conditions such as precipitation or moisture are probably the most influential in controlling variations in stocking.

"Naturally" regenerated stands can refer to either stands of natural disturbance or from logging, although some "natural" disturbances have been artificially regenerated. Many recent wildfires have areas that have been planted with nursery stock. I have heard people claim that natural regeneration following natural disturbance results in lower stocking levels compared to clearcuts with planting. Any such generalization, in my opinion, is inappropriate since we can find many exceptions in NW Washington. It really depends on what, when and where.

TWC: What do you see as the least understood and most mysterious part of NW forest ecosystems, and where you would like to see research go in future?

JH: Having hiked in these forests for over 50 years and worked in them since 1964, I think I have learned a lot. I think if I had two or three more lifetimes I might feel like I could begin to understand what they are and how they really work. In this area we have had a rare opportunity to study original forests over a wide range of ages and conditions. Such forests are long-gone in many areas of the temperate world. Yet I don't think anyone really understands them or has much of a basis for taking an adamant stand about what they are or should be. I think most people underestimate their variability over both space and time.

The most mysterious communities could be those that are older than the ages of the oldest trees. These are few and far between and occur in the coolest and wettest areas. Some of these remnant, very old forests occur on Mt. Pilchuck, for example, and may not have burned or been disturbed for many thousands of years. Sometimes there is no mineral soil, or feet of well-decomposed plant material may be the rooting medium, with soil water that is very acid and discolored by high levels of partially decomposed humic acids or related compounds. We know very little about such forests.

TWC: Having explored so many forests, do you have any favorites? If you were to go out to the woods purely for enjoyment, where would you likely go?

JH: Since I view all forests and non-forest communities in this area as unique (yes, literally unique), I see every place as interesting and different. If I get to a point where I get some of my health back, there are places I would still like to go (yes, there are a couple I didn't get to) and many others I would like to return to. I don't go anyplace in the north Cascades that I do not see new things or things I am not curious about, even if I *have* been there many times before. Some of my permanent plots are especially interesting since I have been there several times before.

TWC: What will you do now that you are no longer punching in at the Forest Service timeclock?

JH: I have several projects ongoing. Many are projects I started while working for the Forest Service. One of them is making the data we collected available on-line. That has been a difficult and time-consuming project, which we may see some fruit from in the near future. I want to return to the permanent plots I installed and help maintain and re-measure them. Publishing the fire-history data is near the top of my list. I have done a lot of teaching and may start doing field ecology sessions again. I started writing an historic novel some time ago, set mostly in the Cascades, which I have resolved to go back and finish. That's more than enough to keep a retired ecologist busy.

TWC: Thanks so much for sharing your thoughts with us.

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