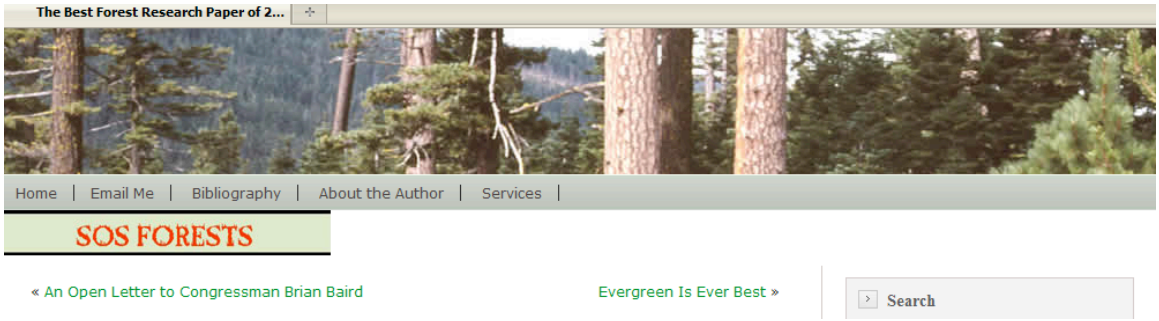
FROM: **HTTP://WWW.SOSFORESTS.COM/?P=171**

[ON KEN CARLONI'S Ph.D. thesis: Carloni produced the most comprehensive and creative interdisciplinary research project in my experience (I was privileged to serve on his committee at Oregon State University). He integrated from an extraordinary range of sources and methods, including history (sketches from nineteenth century expeditions), ethnography, archaeology, anthropology, geomorphology, meteorology, forestry and ecology.] It is a model for the kinds of studies that can illuminate long-term global human ecodynamics.



The Best Forest Research Paper of 2005

March 22nd, 2006

Forest Scientist Discovers Ancient Indian Trail System, Using Computers!

March 22 — by Mike Dubrasich, SOS Forests [*reprints allowed without authorization*]

An Oregon forest scientist has discovered (or rediscovered, to be precise) an ancient system of trails and campsites on the Umpqua National Forest. Dr. Ken Carloni of Umpqua Community College in Roseburg, Oregon, reported his findings last July in his doctoral dissertation entitled, "The Ecological Legacy of Indian Burning Practices in Southwestern Oregon".

Using a sophisticated computer system and software (Idrisi GIS from Clark Labs, 2002), Dr. Carloni modeled the most ergonomic (not too steep) and least cost (shortest) travel routes between ten known archaeological sites. The model was field-validated, leading to on-the-ground discovery of the ancient trails and additional sites, including an ancient summer village. The trail and campsite system in the Little River watershed is at least 2000 years old, and was used by Native Americans of the Yoncalla (Kalapuyan speaking), Upper Umpqua, (Athabascan speaking), Cow Creek (Tekelman speaking), and Molalla Tribes.

Strong indications seen in modern vegetation conditions and archaeological artifacts yield evidence of the actuality of Dr. Carloni's computer-predicted trail and campsite system. Among the evidence is the presence of ancient meadows and remnant open, uneven-aged,

park-like forests along the travel routes. Both types of vegetation are thought to have been maintained by anthropogenic fire (Indian burning).

In the same paper Dr. Carloni also reported strong evidence against climate as a controller of fire frequency prior to 1850. He compared precipitation history (derived from previous tree ring studies) and fire history (also from previous studies) with the ages of existing trees to see which factors (climate or fires) influenced tree recruitment, and whether climate history and fire history were correlated. They were not, according to his research:

Fire scar frequencies from 1590 to 1820 show no relationship to precipitation. However, from 1850 to 1950 a significant negative correlation ($p = 0.005$) exists between climate and scar frequency. These results suggest that in post-aboriginal times [but not earlier] high rainfall years are associated with fewer fires than low rainfall years …

Tree recruitment from 1590 to 1820 is [also] uncorrelated with yearly precipitation … [and] no correlation is evident between fire scar frequency and tree recruitment in the years from 1590 to 1820. From 1850 to 1939, however, dramatic positive correlations exist between fire scar frequencies and tree origins … This suggests that the recently observed short pulses of even-aged recruitment following wildfires (Pickett and White, 1985; Oliver and Larson, 1990; Bonnicksen, 2000) may be more of a post-aboriginal phenomenon.

Instead, Dr. Carloni reported, Native Americans were a prime factor in ancient fire ignition. The landscapes encountered by Lewis and Clark were not pristine, untrammeled wilderness. Dr. Carloni summarizes:

Intentionally or not, humans have been initiators of broadcast burning in nearly every habitat they have encountered worldwide (Pyne, 2001), and there is a long local history of burning for agro-ecological purposes in southwestern Oregon … A growing body of evidence documents the influence of Native Americans on their landscapes through the use of systematic landscape fire (Pyne, 1982; Boyd, 1986; Lewis, 1990; Robbins, 1997, LaLande and Pullen, 1999; Lewis and Fergeson, 1999; Williams, 2001; and others) …

Pacific Northwest native societies were deeply integrated into their landscapes, and used a wide variety of materials collected over extensive areas (Lewis, 1993; Boyd, 1986; Beckham and Minor, 1992; Blackburn and Anderson, 1993; LaLande, 1995; Williams, 2001). But local material cultures persist only to the extent that key species and habitats on which they depend remain abundant, productive and resilient (Perlin, 1989; Diamond, 2005). Archaeological evidence from the Umpqua indicates that material cultures remained relatively unchanged for approximately 2000 years before contact (Isaac Barner, pers. comm., 2000) suggesting that the stewardship practices of recent peoples were sustainable …

Historic Indian-set fires tended toward higher frequencies and lower intensities with regular intervals separating them relative to lightning sparked fires (Boyd, 1999; Lewis and Fergeson, 1999; Williams, 2001).

It was this recognition of the impacts on the landscape, of frequent, regular fires set by the ancient residents, that led Dr. Carloni to his discoveries.

Given the numerous historical reports of aboriginal burning in and near the Umpqua Basin, it is highly likely that the Indians of Little River were using landscape fire systematically for agro-ecological purposes as well. But if Indians were systematically burning forested landscapes, what ecological signals might we expect to observe?

At the landscape level, we should find historic meadows, savannas and parklands located near archaeological sites and near the historic trails connecting them. It is reasonable to surmise that Indians would burn more extensively and more often around the areas where they spent the most time …

The pattern of the modeled pathways fits the corridor, yard and mosaic pattern common to indigenous landscapes in many parts of the world (Lewis and Ferguson, 1999). It is also reflected in early sketches (see 2.16) and in the following quote from S.C. Bartrum, first Umpqua National Forest Supervisor, writing about conditions in 1899 on what is now the Umpqua National Forest: "There were no trails into the interior of the Reserve, only a very few short cattle trails close to the Reserve boundary line. There were of course the old Indian trails, indistinct and impassable in many places, routed to reach the apex of all high points, presumably for observation purposes regardless of location and grade, with grades varying from level to 35 or 40 percent, and some too steep for horse travel."

Some modern ecologists propose theories of forest dynamics that are altogether natural. However, the historical forest development pathways (what really happened) were mitigated by human beings, and evidence of this can still be found in the field. Dr. Carloni noted that other researchers besides himself have also found strong evidence of human influence over forest development:

Early descriptions of much of the forest as being in an open, park-like state (LaLande and Pullen, 1999) are consistent with the recent findings for stands in the Oregon Cascades and Coast Range (Tappeiner et al. 1997; Poage, 2000; Sensenig, 2002). Tappeiner et al. (1997) found early growth rates of old-growth trees to be more typical of trees grown at low stocking densities (100-120 trees/ha) than of trees currently growing in young, un-thinned stands (often >500 trees/ha). They suggest that periodic, low intensity fire was likely responsible for reducing stocking levels rather than self-thinning.

Vestiges of these open stands and their connections to native management are often found near sites with documented aboriginal activity and are evidenced by (a) very large, old "relic" trees with highly branched "open grown" architecture imbedded in a matrix of substantially younger, even-aged cohorts (Fig 2.12), (b) annual rings from relic trees

showing suppressed growth only as far back as the origin of the young even-aged cohort in which they are imbedded (pers. obs.), and (c) origin dates of the even-aged in-growth cohort that commonly post-date the period of Indian occupancy.

Dr. Carloni also noted that in the absence of anthropogenic fire, the vegetation has changed:

A shift in the proportions of tree species across the landscape also suggests a change in fire intensity … and reveals a trend toward recruitment of more fire intolerant "avoider" species (Agee, 1993) (e.g. hemlock, true firs) in the 1820-1990 time span compared to the 996-1820 period. This analysis suggests a change from a high frequency, low intensity fire regime that favored "resistor" species (e.g. Douglas-fir and ponderosa pine) to one that now favors fire avoiders …

While post-clearcut plantations are even-aged (and often single species), native stands in southwestern Oregon typically have a range of sizes and ages distributions … When an even-aged stand is defined as one in which 80% of the trees germinate within 3 decades, only 11 of the 180 stands in these two datasets are even-aged (6.1%) …

While the age and spatial structure (and therefore fuel structure) of young stands in southwestern Oregon increases their risk of high severity fire, mature stands are also at increasing risk. Because of their open understories and lack of contiguous crowns, historic old-growth forests would have been highly resistant to high mortality crown fires. But during the last century and a half, many late seral stands have become thickly in-grown with a younger, shade intolerant conifer seedling cohort dating from the late 1800s through the present.

Finally, Dr. Carloni provided some sage advice to land managers:

Evidence that the indigenous people had an active hand in influencing the fire regimes that shaped their landscapes has important implications for current managers. Rather than a conversion of unmanaged land to managed lands, the changes witnessed in the last 150 years are more indicative of a change from one management regime to another, with a brief period of passive management in the late 1800s and early 1900s. The message to land stewards is clear: taking no action will not tend to return the landscape to aboriginal conditions …

Landscape fires in southwestern Oregon have gone from (1) being regular, frequent, and of low intensity, to (2) being irregular, infrequent, and of high intensity … Increases in the time between fires and the intensity of the blaze have apparently also been accompanied by an increase in the size of fires …

While it is no longer possible to "restore" the forest to aboriginal conditions, it is possible to emulate indigenous ecosystem dynamics. A return to a "corridor, yard and mosaic" pattern is still possible in a warming climate. While a return to native dynamics for its

own sake is not a compelling reason to change current management, there are some important ecological and social reasons for doing so …

Since material cultures often reflect their landscapes (e.g. bedrock mortars in acorn country; woven nets, weirs, and traps where salmon run), stable human cultures infer stable landscape resources. And since local material culture was stable for at least 2000 years in southwestern Oregon (Beckham and Minor, 1992), then the pre-Euro-American socioecological system represents the last known stable state …

If we desire a predictable suite of ecosystem goods and services that are comparable (but not necessarily equivalent) to those available to native managers, then historic ranges of ecosystem conditions represent reasonable management sideboards. Given that the historic landscape of the Little River watershed is to a great degree the product of active aboriginal management, it will take active management on the part of land stewards to recreate and maintain analogous conditions.

And some sage advice to researchers, too.

The history of a landscape is intertwined with the history of its peoples; one needs to know both before one can really understand either.

Dr. Ken Carloni spent 13 years on this research, earning his doctorate from Oregon State University part-time while teaching full-time at UCC.

Superfluous notes:

1. Here is another news article about Dr. Carloni's research.

2. SOS Forests is proud and privileged to bestow these kudos upon Dr. Carloni. To be completely fair about it, however, Ken is a personal friend, a great guy, smart as a whip and sharp as a tack, so we might be biased.

3. UCC now has the status and distinction of having the best forest science faculty of any institution the state of Oregon.

4. Accredited institution, that is. SOS Forests is not accredited, or is self-accredited, which is pretty much the same thing. We don't need no stinking badges.

This entry was posted on Wednesday, March 22nd, 2006 at 8:27 pm and is filed under Anthropogenic Fire Theory, Forest History, Features of Forests. You can follow any responses to this entry through the RSS 2.0 feed. You can leave a response, or trackback from your own site.

2 Responses to "The Best Forest Research Paper of 2005"