

California Landscapes Before the Invaders

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Abstract: A reconstruction of the pre-contact California landscape is difficult for the following reasons:

1. Early Spanish travelers were largely untrained as botanists or plant geographers, and they were dealing with a flora which had little in common with that of the Mediterranean rim. In addition, their interest in - and ability to describe - vegetated landscapes was modest.
2. The rates of floristic and vegetational change following Euro-American contact were so rapid that by the time botanists, plant geographers, and photographers arrived, landscapes at low and intermediate elevations had been greatly modified.
3. Climate change (and consequently vegetation change) have been constant factors for the past 10,000 years, so there is no single pre-contact century, decade, or year that is representative of the pristine California landscape.
4. We have not yet been able to extrapolate from the ethnobotanical scale to the "ethnoecological" scale; that is, how did gathering, tending, burning, pruning, and other forms of management affect entire vegetation types, landscapes, and ecosystems? Indigenous human populations were large enough, pervasive enough, and in place long enough to have influenced the pre-contact landscape - but in which ways and to what magnitude, we cannot be certain.

First, a proviso about the title of this talk - "California landscapes before the invaders." The last word - invaders - is a bit ambiguous. Does it refer to non-native humans from Europe or America, or does it refer to non-native plants and animals brought into aboriginal California by accident or on purpose? All the expressions we use for non-native plants (especially weeds) could equally apply to humans: invaders, aliens, naturalized, introduced, aggressive, competitive, undesirable, and pernicious.

Two years ago I had the opportunity to participate in a 5-month long workshop which discussed the impact our culture has on our perception of nature (Cronon 1995). As a rather naive, straight-arrow, 1960s trained scientist, this workshop was a troubling revelation. Science, it turned out, was not necessarily the best, most profound path to truth; it was certainly not the only path. Worse (to me), science was not at all monolithic and uniformly practiced, but was instead enormously biased by the cultural blinders which every scientist wears. Native Americans, Buddhist Japanese, western capitalists, citizens of developing third-world nations, and deep (green) ecologists from privileged economies all view nature differently. To some, nature is a nurturing mother figure, to others it is a machine to be manipulated; to some, humans are merely equal with all other organisms in nature, to others, humans are at the center of nature; to some, nature includes humankind, to others, nature excludes humankind. The worldview we call "the science of ecology" is, then, just one worldview; furthermore it's a worldview that is just as biased as any other. No doubt, the career path that any one scientist takes in his or her career, the questions investigated, the nature of the investigation, the interpretation of the results - all of these are filtered through the lenses of personality, personal history, and surrounding culture of the scientist. We see what our culture allows us to see. As one Chinese saying puts it, "The last thing a fish is likely to discover is water."

For example, let's take ourselves back to the culture of national socialist Germany in the mid-20th century (Groening and Wolschke-Bulmahn 1992, Pollan 1994). Landscape architects at the time adopted the views of Willy Lange, a widely regarded designer who wrote extensively in the first decade of the 20th century. Gardens, he said, were to be "nature gardens," designed according to the laws of nature and reflecting the surrounding natural landscape. In such landscapes, humans would feel and be nurtured by the biological harmonies of nature. Lange believed that different nations or races had evolved in different environmental settings, thus had different conceptions of nature. German gardens, therefore, must express the unique nordic understanding of nature.

By the 1930s, German gardens had become equivalent to the German people. Those plants considered to be "overfed, overbred, conspicuous, foreign" were to be eradicated, but "nothing native must be left out." When Germany annexed western portions of Poland, Heinrich Himmler's own staff developed landscape design rules so that Germans who moved there would feel at home and remain vigorous. Specific alien species were marked for elimination and were equated with the politics of their homeland. For example, the widespread forest weed *Impatiens parviflora* was referred to as a "Bolshevik Mongolian invader."

The mania for native plants in Germany during Nazi time is disquieting now, when the general public in California has become so aware of native plants and the impact of naturalized weeds on them (see, for example, such publications by the California Native Plant Society as Barbour et al. 1993). Does the lay public privately make some unspoken link between wanting the landscape to be kept native and wanting the political borders closed to foreign human immigration? I hope no one makes such a connection, and I am not suggesting that our modern concern with naturalized plants is a throwback to Nazi Germany. Certainly those of us attending this meeting are convinced that cogent arguments for the control of invasive plants are based on the science of ecology. (But let's not forget that science is practiced by ethnocentric humans.) End of proviso.

Why is it Difficult to Reconstruct Pre-Contact California Landscapes?

Anecdotes and suppositions about California landscapes prior to Euro-American contact in the early 19th century are numerous. Facts, however, are few. One of the major reasons that facts are few is that the first European explorers were neither botanists nor plant geographers, and they were encountering a flora almost totally different at the genus level from that of the Mediterranean rim.

This particular problem is highlighted in a book by Richard Minnich of UC Riverside and Ernesto Franco of CSU Monterey (Minnich and Franco 1997). They examine the earliest, most detailed accounts of the Californias: the diaries of Juan Bautista de Anza and Gaspar de Portola for Alta California (1771-1776); and by Juan Crespi and Junipero Serra (1769), Wincelous Linck (1776), Jose Longinos-Martinez (1792), and Jose Juaquin Arrillaga (1796) for Baja California.

Only Longinos-Martinez used Linnaean nomenclature (Linnaeus had only published his polynomial-binomial system in the mid-18th century); the rest used a variety of newly invented common names for the same plant. The common names were often quite a stretch and led to mistranslations by later historians. For example, chamise (*Adenostoma fasciculatum*) was called "rosemary." The Spaniards applied the common name "aliso" to sycamore (*Platanus racemosa*), but until recently historians erroneously assumed it meant alder (*Alnus*).

Diary comments about the landscape were typically floristic rather than vegetational. That is, lists of species seen without any comments on abundance or dominance are common. When vegetation was described, it was in ways which have been misconstrued by historians. Chaparral was often described as: "hillslopes dotted with little trees." Early translations interpreted this to mean "savanna," but ecologists Minnich and Franco were able to reinterpret the description as meaning shrub-covered slopes with occasional ash, bay, or pine projecting above the shrub canopy. Later diarists were clearer, using the terms "chamizo" to mean chamise chaparral and "madroño" for manzanita chaparral. As another example, "pasto" could have meant grassland or any land suitable for grazing, including scrub, woodland, and savanna. In Alta California, the early descriptions of central valley grassland are so vague that we cannot with any certainty know how much of the land was dominated by bunchgrasses, scrub, savanna, or by annual herbs.

A second reason it is difficult to reconstruct the pre-contact landscape is that the rate of floristic and vegetational change was rapid. By the time trained botanists and plant geographers came to photograph and to describe in the late 19th century, the landscapes at low and intermediate elevations had been greatly modified. George Gruell's forthcoming book of photographs of Sierran forests in the 19th century (Gruell 1997) claims to represent pre-contact vegetation, but questions can always be raised as to the nature of change which had already occurred between the time of the Gold Rush and the time of the photographs. Why were the photos taken where they were? Was the photograph taken because the area was accessible by

roads and rail, and if so had some degree of logging or burning already occurred? Was the photograph taken where the vegetation was particularly open and easy to pass through, allowing a greater vista to be captured, and if so were natural thickets ignored? We will never know for sure because pre-contact photographs do not exist.

A third problem in reconstructing "then" versus "now" is that the earth is a restless planet. Continents move, topography erodes or is uplifted, and climates change. That is, there is no single snapshot in time that represents the pre-contact "then." The Sierra Nevada Ecosystem Project (SNEP 1996) had to face this problem when responding to a Congressional mandate to summarize how Sierran ecosystems had changed since Euro-American contact. Paleobotanists, geologists, and dendroclimatologists point out in the SNEP report that climate and vegetation have been continuously changing since the last glacial retreat 10,000 years ago. On top of a general trend of warming and drying there have been inexplicable decades, half centuries, and millenia of unusually high or low temperatures and precipitation. Such environmental change undoubtedly affected vegetation patterns, so which year, exactly, should we pick as the "then" before contact?

Climate changes, of course, have continued to the present. For example, the first half of this century was unusually wet; could this be the reason why forests have thickened, rather than because of fire suppression? Vegetation change, in other words, would have occurred even without the arrival of Euro-American humans, plants, and animals, and we cannot know the degree of eco-system change that is due only to human history over the past 200 years.

A final problem in reconstructing the pre-contact landscape is our dearth of information about Native American impacts. We know that California had been settled by indigenous people who had been present for at least five thousand years, and who were distributed throughout the state. In a forth-coming book edited by historian Richard Orsi, anthropologist Kat Anderson dramatically summarized their pervasive presence this way (Anderson et al. 1996):

California was an inhabited land. Every part of the state had been seen, walked over, or settled upon. California's tallest peaks, largest lakes, longest rivers, and tallest trees had all been named. The state's promontories, declivities, and unusual rock formations were infused with meaning. Today's wilderness was then the location of gathering, hunting, burial, and sacred sites, connected by well-known and well-used trails. Wilderness was home.

Very few tribes had stories of migration and movement, most thought of themselves as having lived in their territory since the world was created. Euro-Americans, in contrast, were seen as being restless and abnormally mobile. The Pit River Indian name for whites meant "homeless wanderer."

The topography of the state, combined with long-term spatial stability of Indian populations, created an enormous cultural diversity only surpassed in mountainous Papua New Guinea. At the time of contact, more than 300,000 people were organized into 500 tribelets which were autonomous, self-governing, linguistically unique entities. Population density was relatively high, and California was home to about 10% of all North Americans prior to European contact, far out of proportion to California's relative land area.

Tribal territories often spanned several elevational or vegetational zones, and these were seasonally visited. Permanent villages were connected to a network of seasonal campsites. Gathering places near campsites had very old usage. Certain trees, clumps of grass, or shrubs were privately owned by individual families or tribelets. Collecting sites would become known through song, ceremony, and story. Gathering in a place where one's great, great grandmother had gone before showed deep respect for old ways. Clearly, deep ecological knowledge must have grown out of such long-term observation.

Kat Anderson's research, and that of other recent ethnobotanists, shows that Native Californians tended the land (Blackhorn and Anderson 1993, Anderson and Moratto 1996). They managed and manipulated portions of it so subtly that Euro-Americans often described the landscape as park-like, orchard-like, or garden-like without realizing that humans before them had made it so. Native Californians affected their landscape by:

1. setting light late summer fires,

2. coppicing shrubs,
3. harvesting and replanting herbaceous plants,
4. moving some plants from place to place (e.g., *Nicotiana clelandii*, *Juglans californica* var. *hindsii*, *Sambucus* spp., *Datura wrightii*, and possibly *Calochortus* species), and
5. weeding some basketry material collecting areas (e.g., wet meadows with white root sedge, *Carex barbaeae*).

Sometimes the scale of impact was regional. Susan Bicknell of the USDA Forest Service examined grass phytoliths in soils and concluded that the entire northern coastal prairie was anthropogenic, maintained by frequently set fires (Bicknell 1992). Burning in some wetlands elsewhere in California provided increased density of nesting wildfowl and greater plant species richness. Montane meadows were kept rich in deergrass, yampah, and clover (and devoid of encroaching trees) by burning. Surface burning in mixed conifer forest may have significantly added to the impact of lightning-set fires in maintaining low tree density and the predominance of pines over firs (Anderson and Moratto 1996).

Extermination, forced emigration, or suppression of cultural activities by Native Californians occurred so rapidly and thoroughly that living descendants have been able to retain only a small fraction of the knowledge of landscape management and its extent. Before we can confidently add the indigenous human factor into our reconstruction of the pre-contact landscape, we will require decades of study in a new branch of science, "ethnoecology." Ethnoecologists are ethnobotanists who extrapolate what is known about cultural uses of plants to the impact of such plant use at a landscape scale.

Progress Despite the Problems

The absence of facts has not prevented ecologists from speculating about pre-contact landscapes. Will Kuchler (1977) published a map of pre-contact natural vegetation of California, based on inferences from climate, soil, known history of grazing and clearing, and - he would admit this were he still alive - lots of intuition. It's the intuition that creates argument. Many southern California ecologists disagree with his map because it shows some areas as foothill woodland which today are chaparral. He believed that relatively mesic, north-facing slopes would change over time from chaparral to woodland if left unburned. We have no research evidence to support or refute his belief. Similar problems exist with other vegetation types that he mapped.

Historical records of land conversion, covering the last 125 years, give us a reasonably accurate summary of acreage losses of old-growth forest, tidal marsh, riparian forest, bunchgrass prairie, brackish and freshwater tule marsh, vernal pools, and coastal scrub (Jones and Stokes 1987, Jensen et al. 1993). Taxonomic surveys document the arrival and spread of our state's more than 1,000 species of naturalized plants, as well as the extinction of several native species. A few modestly old vegetation surveys, such as the Vegetation Type Map (VTM) Project of the 1930s give us a limited picture of forest conditions just after the imposition of fire suppression policies (Colwell 1988). Range surveys dating back to the same period give us some indication of meadow recovery following the intense overgrazing of Gold Rush years (SNEP 1996).

Some vegetation types are so closely tied to soil, geology, or topographic conditions that maps of the extent of the habitat can reveal past vegetation limits and modern limits can be compared. Using this method, John Hunter and others (Hunter et al. 1997) recently concluded that riparian forests in the Sacramento Valley used to occupy 235,000 ha prior to Euro-American contact. Aerial photography now shows that riparian forests are restricted to 7,900 ha and that their distribution is highly fragmented into 2,600 patches with average area of 3 ha each. We do not know what the minimum patch size might be for a fully functioning riparian ecosystem. My own guess is that 3 ha is one to two orders of magnitude too small to contain sufficient habitat for the widest-ranging bird and mammal species. Only three remaining patches are >100 ha in size. Hunter and his colleagues did not report the floristic composition of those remaining patches. To what extent were they dominated by introduced species of trees, shrubs, annual grasses, and forbs?

From a distance, as from a jet aircraft flying over the state at great elevation and speed - California's cover might still appear continuous, healthy, and relatively unchanged from pre-contact times. After all, areas of foothill woodland, desert scrub, montane forest, chaparral, and grassland still exist. Urban areas, agriculture, clearcuts, and pavement have not replaced all of our natural vegetation, nor have introduced species displaced all of our native flora.

But the vegetation types that remain are not the same ones that greeted the first Euro-Americans 200 years ago (Jensen et al. 1993). Desert scrub is degraded by over-grazing, purposely set fires, ORVs, and changed by invasive forbs, grasses, and shrubs. Montane forests have abnormally flammable, dense understories because of fire suppression and resultant overstories that are weakened by drought and atmospheric pollutants. Square miles of chaparral have been converted to grassland or homesites, coastal scrub to annual grassland and suburbs, and perennial grasslands to weedy annual pastures or farmland. Only 5-25% of our old-growth forests remain (depending on the forest type), less than a fragmented 10% of coastal wetlands and a meager 2% of interior wetlands are still with us. Furthermore, the quality of remaining fragments has been compromised by adjacent development. About one-fourth of our native plant species and one-fourth of our plant communities are threatened with extinction (Skinner and Pavlik 1994, Sawyer and Keeler-Wolf 1995). One-seventh of our flora is non-native and - in such cases as grassland - the non-natives constitute >90% of the cover and biomass

What Next?

To reclaim the original biotic richness of California, we must continue to acquire and protect undisturbed areas, and we must also begin a process of restoration and enhancement of much larger areas in California which lie outside the pristine preserves. Most conservationists today believe that the path to a healthier, more sustainable planet leads through the latter process. Our focus must be on improving the degraded landscapes, the low-elevation vegetation types adjacent to the densest human occupation, which have suffered the most severe displacement and change, and which are the least protected. As all of California's landscapes regain their diversity, integrity, complexity, and stability, so shall we who now live here.

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