AN ENVIRONMENTAL HISTORY
of the
LITTLE APPLEGATE RIVER WATERSHED

Jackson County, Oregon

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EXECUTIVE SUMMARY

The Little Applegate River watershed is located within the eastern Siskiyou Mountains of Jackson County, Oregon. For the past several thousand years, the watershed has experienced a variety of human activities that were closely associated with the management and use of natural resources. Aside from the key factor of human-set fire (which had a pronounced effect on the floral composition and character of the eastern Siskiyous), prehistoric inhabitants had comparatively limited and not readily visible impacts to the land.

In contrast, historic period activities—beginning with the placer mining of the 1850s gold rush—have had widespread and sometimes visually dramatic impacts within the Little Applegate drainage. Anthropogenic fire continued to act as a major factor well into the twentieth century. Various forms of placer mining were most intense during the 1850s, the 1870s-1880s, and the 1930s. Irrigation and grazing became significant uses—and impacts to the environment—during the 1890s through the 1920s. Timber harvest, although active since the mid-nineteenth century, became a major environmental factor only since World War Two.

Natural "catastrophes" (for example, destructive windstorms and fires) have been recorded regularly within the eastern Siskiyous over the past 150 years. However—with the notable exception of highly erosive floods' impact to the Little Applegate watershed's riparian areas—these events have evidently played a lesser part in the notable environmental changes of the recent past than have human activities combined with gradual, ongoing climatic change or vegetational processes.

Major human-caused or human-influenced factors of environmental change have included the following:

- 1820s-1840s beaver trapping had subtle hydrological effects, particularly in the lower and uppermost portions of the Little Applegate basin.

- Placer gold mining, particularly the large-scale hydraulic mining of the 1870s and after, lowered water quality significantly along the lower Little Applegate as well as further downstream in the main river. Both resident and especially anadromous fish were adversely affected during critical periods of the life cycle.

- By the 1880s, irrigation diversions from the Little Applegate began to have significant effects on the river's seasonal water volume and fish habitat. This trend may have peaked in severity during the 1940s.

- The presumed open "gallery" of mature conifers and hardwoods within the lower river's riparian zone experienced major change from early logging, grazing, and flood erosion.

- Deer, elk, and other game animals were heavily hunted during the mid-to-late nineteenth century. Although deer populations eventually recovered, elk became locally extinct until very recent times. Predators that competed with human hunters or that preyed on livestock were the focus of concerted eradication campaigns; in the case of the wolf and the grizzly bear, these campaigns were successful by around the turn of the century.
- **Heavy grazing**, by both sheep and cattle, characterized the Little Applegate watershed during the late nineteenth century, with locally severe overgrazing in some areas by the early twentieth century. Some of these areas suffered loss of forage, invasion by exotic plant species, and considerable erosion; in places, the legacy of early-twentieth century range practices remains clearly visible.

- Logging during the nineteenth and early twentieth centuries had localized effects on soil and vegetation. Since World War Two, intensive timber management and associated road building have resulted in much more widespread effects to the watershed's soil, vegetation, and hydrology.

- Over the past 150 years, anthropogenic fire at first increased in volume and intensity and then, after the turn of the century, underwent a dramatic decrease. Wildfire also declined abruptly. Much of the watershed's current vegetational character can be attributed to the success of fire suppression efforts since 1920. These efforts have contributed to reduction in the size of grassy openings, to denser brushfields and forest, and to changes in forest stands' species composition and age-class.

**Some Recommendations for Further Research:**

- Investigation into the long-term climatic and vegetational history of the eastern Siskiyou Mountains has barely begun. Two specific, potentially fruitful research endeavors would include:

  - **Dendrochronological study** of the past 300-400 years of climate, using available increment-boring cores, as well as stumps and tree-trunk slabs from the eastern Siskiyous. The study could help determine past drought/wet cycles experienced by the region, as well as provide additional information on fire history.

  - **Palynological study** of lake sediment pollen profiles from a number of lakes and ponds in the eastern Siskiyous: e.g., Monogram Lakes, Tamarack Lake, Towhead Lake, Lonesome Lake, Azalea Lake, Steve Lake, Miller Lake, and Bigelow Lakes. The study would seek to determine sequences of climatic change during the past several millennia, as well as to obtain information on large-scale vegetational change that resulted from those climate fluctuations.

- As part of watershed restoration efforts, natural resource specialists and federal land managers may actively seek (1) to restore fire more to its "natural," historic role as an environmental factor in the eastern Siskiyous and (2) to enhance the maintenance/re-establishment of formerly more common vegetation species and communities. In doing so, it will be important to explore avenues for research experiments that apply prescribed fires in a variety of vegetation communities. Such experiments might include small-scale burns that focus specifically on determining and eventually replicating the probable historic burning patterns and practices of earlier Little Applegate watershed residents.

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I. INTRODUCTION

This report provides a brief history of the Little Applegate River watershed, a relatively small portion—little more than 100 square miles—of southwestern Oregon. It is an "environmental history," one that concentrates on the human dimension of the local ecosystem. That is, rather than focus on tracing the economic, social, or political developments experienced by human residents of the watershed, the narrative deals with reciprocal relationships between people and the land: how each helped to change the other. In particular, it explores how people—from native hunters/gatherers through miners, ranchers, and federal land managers—have influenced various kinds of "natural" processes within the watershed. Changes in stream flows, fisheries, wildlife populations, and vegetational patterns are the major "changes in the land" that the report examines.¹

A. Goals and Limits of the Study

This report is prepared as part of the "pilot watershed analysis" of the Little Applegate Watershed Analysis Area. Watershed analysis is an outgrowth of the Federal Ecosystems Management Assessment begun in 1993. Watershed analysis explicitly calls for "an understanding of the interactions between land-use activities, the physical environment, and the biological environment in an area" ("Federal Agency Guide for Pilot Watershed Analysis" 1994:7).

¹"Environmental history" as a sub-field of American historical practice has roots dating back to the late nineteenth century. In the early twentieth century, two historians, Walter Prescott Webb and especially James Malin, helped establish what is now known as environmental history with their path-breaking works on the Great Plains. Webb studied the effect that the Plains environment had on American culture; Malin took the reverse approach, which is the same general direction of most recent environmental history: cultural impacts to the land. In recent decades, the field has expanded apace with the nation's growing concern over environmental questions in general. Three influential examples of recent environmental history include Donald Worster's study of the Great Plains "Dust Bowl," Richard White's investigation of Puget Sound's Island County, and William Cronon's examination of ecological change in colonial New England. For historiographical reviews of the topic, see Opie (1983), Worster (1984), and White (1983).

Changes in public policy over the past decade or two have increased the interest of federal land-management agencies in basic questions of environmental history: "How did the land [and its various resources] get this way?" "What part have human beings played in the transformation?" The Little Applegate watershed study is simply one localized attempt to find answers to these questions.

Although the report traces the watershed's environmental history up through the present, it concentrates on major trends and events prior to the 1950s. Most of the quantitative data available to the pilot study's resource specialists dates to the post-War decades, particularly the 1960s and later. Due in part to time constraints of the project, the report does not attempt to incorporate this large body of recent, detailed information (for example, data on post-1950s harvest unit locations or the drainage characteristics of logging roads). Much of that information is already familiar to the pilot study team in any case. The report instead provides an overview of the watershed's earlier history, about which there is far less detailed information readily available to resource specialists.

B. Geographic Overview

The Little Applegate River originates on the highest slopes of the "Siskiyou Crest," in the eastern Siskiyou Mountains. The river flows generally northwestward for approximately twenty-five miles before joining the main Applegate River a short distance upstream from the community of Ruch. The entire watershed lies within Jackson County, Oregon, in the southwestern corner of the state. Beginning at the river's source, major tributaries include: McDonald Creek, Glade Creek, Yale Creek, Grouse Creek, and Sterling Creek. Beginning at its mouth and passing clockwise, the following peaks dominate the river's watershed divide: Woodrat Mountain (approx. 4,120' above sea level [a.s.l.]), Anderson Butte (5,200'), Bald Mountain (5,800'), Wagner Butte (7,140'), McDonald Peak (7,220'), Siskiyou Peak (6,860'), Red Mountain (7,000'), Dutchman Peak (7,400'), Little Red Mountain.
(6,660'), Deadman's Point (5,800'), and Cinnabar Peak (3,900').

The Siskiyou Mountains form a sub-range of the Klamath Mountain Geological Province. Rock-types making up the watershed include early Mesozoic sea-floor sediments and volcanics (metamorphosed into a variety of rocks, collectively termed by geologists as the "Applegate Group"), and later Mesozoic ultramafic deposits (e.g., the peridotite/serpentine of Red Mountain) and granitoid intrusions (e.g., the granitic batholith of Mt. Ashland/Wagner Butte). Originating as ocean-floor formations, the rocks of the Siskiyous were buckled and uplifted by plate-tectonic activity over eons of time. Later they were intruded with granitic-forming magma that further transformed their geological character. The eastern Siskiyous have experienced continued uplift, erosion, and mass wasting over the past sixty million years into the rugged slopes we see today.

Above 5,500 feet in elevation, the Little Applegate and its uppermost tributaries have relatively gentle gradients through the glacially carved forest/meadow mosaic of the Siskiyou Crest. The drainage becomes a high-gradient system as it passes through the steep-walled, densely forested canyons of the Siskiyous' mid-elevation slopes. The Little Applegate's final eight miles or so pass through a gently sloping valley, composed of extensive alluvial terraces (now mostly agricultural or residential property) and adjacent foothills. (This report arbitrarily divides the watershed into "lower," "mid-elevation," and "upper" drainage areas for purposes of general discussion. "Lower" refers to those areas from the river's mouth (approx. 1,500' a.s.l.) to about 2,500 feet in elevation; mid-elevation slopes, which make up by far the largest portion of the watershed's acreage, are those between 2,500 and 4,500 feet; the watershed's upper portion lies above 4,500 feet in elevation.)

C. Report Format

Including the Introduction, Part I, the report is divided into six parts. Part II gives an overview of the Little Applegate watershed's human history, presented in both chronological and topical format. Part III traces natural events, as documented in the historical record, that may have had significant effects on the local environment. Part IV, the key section of the report, explores results of various human/natural interactions on the watershed's hydrology, fish and wildlife, and vegetation cover. Part V interprets some specific aspects of vegetational change, based on historic descriptions, photographs, maps, and other evidence. Part VI is a selected bibliography that includes all references cited in the report as well as other sources.

D. Acknowledgments

Historical information on human-induced/-influenced environmental change prior to the 1950s in the Little Applegate watershed is relatively sparse in quantity and uneven in quality. Most of it is anecdotal; much of it is ambiguous. A historian's job is to assemble, organize, synthesize, and interpret historical evidence as best he or she can. The writer of this report, an archaeologist and historian, has no specialized professional knowledge of hydrology, zoology, botany, ecology, or other natural science fields. Specialists in those fields have been consulted and they have offered helpful comments on a draft of this report. Any errors of fact or interpretation, however, remain the writer's responsibility. John Fertig reformatted the February 1995 version of the report and incorporated the photographs into the text.

The writer is grateful to all the members of the Little Applegate Watershed Analysis Area pilot study team for their encouragement at the start of this project, as well as for their useful comments on the draft version of this report: Bob Bessey (B.L.M.), Don Boucher (U.S.F.S.), Matt Broyles (B.L.M.), Don Ferguson (B.L.M.), John Fertig (U.S.F.S.), Jerry Hellinga (U.S.F.S.), Dave Steinfeld (U.S.F.S.), Mike Zan (U.S.F.S.), and Larry Zowada (B.L.M.).

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* * *
II. HISTORIC OVERVIEW: Human Activity in the Little Applegate Watershed

The overview that follows is divided into two complementary sections. The first section of Part II is a chronological review of the Little Applegate River watershed's human history—beginning with long-term climatic and cultural changes of prehistory and continuing on to the major human events and trends recorded over the last two-hundred years. The latter portion of this chronological narrative uses decades as convenient time periods. The second section, which focuses exclusively on the past two centuries, is organized as a topical discussion of human activities (i.e., significant activity types such as trapping, mining, and so on); it concentrates on particular types of activities with less regard to the passage of time. Together, the two sections of Part II provide a brief narrative description of the area's history.

A. Chronological Overview

Geologic/Climatic Prehistory of the Holocene

Geologists and paleoclimatologists apply the term "Holocene Epoch" to the relatively recent period of the past 10,000 years. When its comparative brevity is compared to the Earth's overall geologic time, the Holocene is like the blink of an eye relative to an average human lifespan. The beginning of the Holocene time period probably witnessed the initial, sustained human occupation of southwestern Oregon. The Holocene may actually be but a brief interlude of generally temperate climatic conditions within the much longer Pleistocene Epoch, or "Ice Age" (which began about two-million years ago).

The Pleistocene involved a number of major glacial periods, and the latest of these (often referred to as the "Wisconsin") itself included several shorter sub-periods of glacial advance and retreat. During the closing millennia of the Ice Age, elevation of the permanent snowline along the Siskiyou Crest between Dutchman Peak and Mount Ashland may have been as low as 6,500 feet. Possibly as late as 10,000-9,000 years ago, near the end of the Ice Age, glaciers in the Klamath Mountain Province made a last, brief push down from the mountain summits before melting away with the onset of Holocene global climate change (Lee 1972:75).

As the Pleistocene came to a close in the Pacific Northwest roughly 12,000-9,000 years ago, the small Ice Age glaciers that had carved basins along the Siskiyou Crest in the Little Applegate's headwaters (e.g., near Dutchman Peak, Red Mountain, and McDonald Peak) rapidly disappeared. Climatic conditions during the Pleistocene/Holocene transition may have included a severe, 300-year-long drought beginning around 11,200 years before present (B.P.) (C. Vance Haynes, as cited by Ames 1993:B5). As a result, existing vegetation communities and fauna of southwestern Oregon would have experienced serious stress and undergone major changes in distribution during the earliest Holocene. The Pleistocene "megafauna" mammals (mammoth, mastodon, giant bison, etc.), for example, became extinct throughout the Western Hemisphere during this time.

Evidence from fossil pollen studies, macrofossils, and other sources in the Pacific Northwest (particularly the lower Columbia River drainage, the northern Great Basin, and the upper Sacramento River drainage) indicate that the climate of the Holocene in the Far West region underwent three periods of major change (see Heusser 1983, Grayson 1993:193-229; Connolly et al. 1994:16-17; West 1989, in: Basgall and Hildebrandt 1989:36-55, Barnosky 1985:263-271). Although comparatively little scientific study of the question has been accomplished to date in southwestern Oregon or adjacent sections of California, this three-part climatic sequence, discussed below, may apply—at least in a general sense—to the eastern Siskiyou Mountains area.

At first (i.e., immediately following the brief but intense Pleistocene/Holocene transitional drought), the Holocene climate from about 10,000 to 8,000-7,500 years ago was apparently significantly cooler and somewhat more moist than at present. However, the early Holocene (which is sometimes referred to as the Anathermal climatic period) was not sufficiently cold and wet so as to initiate another round of glacial advance. Vegetation communities changed and adapted to the new climatic regime:

2During the mid-nineteenth century, gold miners uncovered skeletal remains of late Pleistocene elephants from placer deposits along Sterling Creek, in the Little Applegate drainage, and on Missouri Gulch, on the main Applegate River (Oregon Sentinel 6/29/1867 and 7/6/1867).
Mixed-conifer stands (which probably contained many of the same species as present mixed-conifer stands in the Siskiyous) may have initially developed at lower-to-mid-elevations and then "migrated" upslope during succeeding centuries of the early Holocene.3

Some conifers present during the Pleistocene may have (like the megafauna) disappeared entirely, even as other resident Pleistocene (and now "endemic") plant species of the Klamath Mountain Province survived in southwestern Oregon/northwestern California and no place else.

The next Holocene climatic period, which lasted from about 8,000-7,500 to 4,500 years ago, was a time of generally hot, dry climate. However, this mid-Holocene "long drought" (called variously the Altithermal, Hypsithermal, Xerothermic, and Xeric Maximum) was almost certainly not simply a period of unrelieved searing heat and parched seasons. More likely it was a time of widely varying temperature and precipitation cycles during which the overall average was hotter and drier than present. Although creating desert conditions elsewhere (for example, the northern Great Basin), the mid-Holocene dry spell may actually have increased the faunal/human carrying capacity of the eastern Siskiyous. This could have occurred with the inferred spread of drought-adapted oak savanna and oak woodland/transition forest up to 1,500-2,000 feet in elevation higher than present, at the expense of mixed-conifer forest on many mountain slopes (see: Detling 1962, Axelrod 1981, Aikens: 1993:226-227). Some of the foothill grassy "balds" and higher elevation oak/pine openings of southwestern Oregon are relict communities from the mid-Holocene "drought" times; bulb plants may have become more common during the Xerothermic than they were before (T. Atzet 1994:p.c.).

The third and latest climatic period of the Holocene (the last 4,500 years, referred to in some of the scientific literature as the Medithermal) returned relatively cooler temperatures and increasing moisture to the region, gradually leading to the climatic regime of the present. Particularly cool and moist conditions evidently returned to the southern portions of the Klamath Mountain Province sometime between 3,000 and 1,500 years ago. As a result, small glaciers reappeared in the higher cirque basins left behind by Pleistocene glaciers (Lee 1972:75-79, Long 1982:iii and 11). During this late Holocene "chill," glaciers may have again accumulated on the north summits of Mt. Ashland and Red Mountain.4

Climatic fluctuations continued. Recent research in the southern Sierra Nevada Mountains suggests that two severe, relatively lengthy droughts occurred there during a global climatic sub-period often referred to as the "Little Climatic Optimum," from about A.D. 900 to 1110 and from around A.D. 1200 to 1350 (Stine 1994:546-549). Similar research has found evidence of lengthy, severe drought for the same periods in southern Argentina, suggesting that the droughts were part of a global phenomenon (of which the "Little Climatic Optimum" in western Europe was but a localized and "beneficial" result; see: Stine 1994:549). Intense drought might have characterized southwestern Oregon during this "Optimum" as well. On the heels of possible local drought came another global climatic sub-period, one we call the "Little Ice Age," an extended period of cool, moist weather (with a temperature mean about 0.5 degrees C below modern levels). It lasted from about A.D. 1350 through the mid-nineteenth century (Pielou 1991: 291-310). During the Little Ice Age, the cirque on the north summit of Mt. Ashland may have supported a perpetual snowbank or very small glacier.

The Little Ice Age had important consequences for some human populations. (For example, it apparently led to a southward extension of North Atlantic pack-ice that effectively isolated and doomed the Viking colonies of Greenland and North America--which had been founded during the preceding balmy period of the "Little Climatic Optimum," ca. A.D. 900-1300; of more widespread significance, the Little Ice Age lowered grain harvests during much of the period, resulting in periodic famines.) The Little Ice Age's severity and consequences on the non-agricultural human populations of the eastern Siskiyous are unknown.

By the onset of the late Holocene, small, relatively mobile populations of humans had already occupied the Siskiyou Mountains and adjacent valleys for several millennia. The colder climate of the late Holocene's Little Ice Age might have brought increased conifer cover at the expense of more xeric vegetation communities. However, some prehistorians

3The term "migrate" is used figuratively here: as climate changes, plant communities may change not only their elevational position but their species components as well, in effect becoming a new array of associated species (T. Atzet 1995: p.c.).

4Lee (1972), whose research took place in the headwaters of the Scott River, refers to this late-Holocene glacial advance as the "Marble Mountain" glaciation; Long (1982), probably documenting a contemporary event in the Preston Peak vicinity, terms it the "Preston" glaciation.
of the Sierran region (e.g., see: Woolfenden 1993:4-5) speculate that human inhabitants—hoping to preserve and even expand the extensive, food-rich, drought-tolerant oak groves of the mid-Holocene dry period—may have "held the fir forest at bay" through increased, intensive manipulation of the environment with fire. This same trend may have occurred for similar reasons elsewhere in the West, including southwestern Oregon.

Local climatic patterns of the "present"—the past 200-to-300 years—can be interpreted from meteorological data recorded since the late nineteenth century. Tree-ring growth rates obtained from the stumps and increment-borings of long-lived trees also provide some information about recent climate. Briefly, the "present", like the past, has probably been marked by "cycles within cycles" of relative drought and relative high moisture that have lasted varying periods; the range of "normal" weather for the area has apparently included decades-long hot, dry spells and substantial periods of temperate-to-cool weather. Initial observations of dendrochronological data (see Appendix) suggest that southwestern Oregon may have experienced a severe 30-to-40-year drought during the middle part of the eighteenth century.5

Human Prehistory of the Holocene

Broad temporal divisions of the human prehistory of the Pacific Northwest include four major cultural periods: "Paleo-Indian," "Early Archaic," "Middle Archaic," and "Late Archaic."

The earliest human presence within southwestern Oregon remains unknown. Based on limited evidence ("Clovis"-style projectile points found on the ground surface in the nearby southern Cascades), small populations of Paleo-Indian hunters probably had arrived in the Siskiyou Mountains vicinity by about 11,000 years ago. These people, who had originally arrived in North America via the Bering "Land Bridge" from northeastern Asia, came onto the scene during the Pleistocene/Holocene transition as small nomadic groups. They likely hunted big-game animals (e.g., mastodon and other rapidly disappearing megafauna), augmenting their subsistence with more generalized hunting and gathering. By about 9,000 B.P., the Paleo-Indian period had come to an end. (At present, no known archaeological sites or artifacts within the Little Applegate watershed or surrounding Siskiyous date to this period.)

The Early Archaic, a cultural period roughly contemporary with much of the early Holocene climatic period and encompassing all of the mid-Holocene "drought," lasted from about 9,000 to about 4,000 years B.P. This cultural period probably witnessed the development of "central-based wandering" subsistence patterns by resident groups. Several archaeological sites within the vicinity, including sites along the upper Applegate River, date to this period (Brauner and Nisbet 19883). Large, wide-stem projectile points (used as points for dartshafts thrown by an "atlatl") characteristic of the Early Archaic have been found at a number of locations in the Little Applegate watershed and nearby, and an atlatl weight has recently been reported for the lower Applegate Valley. Grinding tools such as bowl mortars and metate slabs, used for processing roots, bulbs, and nuts, came into wide use during this time: they too are found at various elevations in the eastern Siskiyous (perhaps indicating the richer edible-plant resources of the mid-Holocene). Salmon may have become an at-least occasionally used food source during the latter half of the Early Archaic.

The Middle Archaic (ca. 4,000-1,500 B.P.) probably witnessed steadily increasing intensity in resource use by growing human populations, with a concomitant reliance on relatively well-bounded ethnic territories. Pithouses, a house form that may have been used since Paleo-Indian times, provided winter shelter. At least one pithouse village site dating from this period has been documented for the Applegate River drainage (Brauner and Nisbet 1983). Improved gathering of edible plants (including heavy reliance on periodic burning to maintain certain vegetation types) and of anadromous fish may have played a key role in population growth. Hunting of deer, elk, and other game (as evidenced by numerous smaller, wide-stem dartpoints found in the Little Applegate watershed) continued to be important. By the end of the Middle Archaic, the atlatl-and-dart had been largely supplanted if not totally replaced by the bow-and-arrow as the major hunting weapon system.

Characteristic of the Late Archaic period (ca. 1,500-200 B.P.), therefore, are the small, narrow-necked, side- and corner-notched arrowpoints found at numerous places in the eastern Siskiyous. Basketry had probably flourished throughout much of local prehistory, but during the Late Archaic it became highly developed. About A.D. 1,000, crude ceramic

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5Droughts doubtless contributed to Holocene insect infestation cycles as well. However, tree density tends to be a more important factor in severe insect-caused tree mortality than drought. Assuming that prehistoric mid-elevation forests, at least since the mid-Holocene dry period, were significantly more open than they have become since twentieth-century fire suppression (i.e., today's forests are much denser than previously), prehistoric insect infestations were probably not so intense as those witnessed recently (D. Goheen 1995: p.c.).
to capture sea otters and/or trade with the native from Alaska during the early 1800s, made brief stops. Some of the sea-borne explorers, including Russians Gray in the 1790s, coasted along the rugged shoreline. Englishman George Vancouver and American Robert Spanish captain Bruno Heceta in 1775 and followed by Euro-Americans. Maritime explorers, beginning with the initial exploration of the region by Europeans and the natives of the region.

horses, and virulent new diseases soon arrived among southwestern Oregon. Metal, glass beads, guns, based fur trappers had arrived in the interior of groups took place; within another fifty years land- European maritime explorers with nearby Coastal Latgawa), and the Shasta. ("Applegate Athapascans"), Upland Taklema (or Applegate watershed included the Dakubetede in inhabited or seasonally used portions of the Little territories (Winthrop 1993). Ethnographic groups that subsistence strategy within relatively well-defined extended family bands that pursued a "collector" management tool. Food surpluses--of salmon, acorn meal, and camas bulbs--enabled populations to cluster into growing winter villages at lower elevations.

The Late Archaic is the best-represented prehistoric period in local archaeological sites, including several in the Applegate River drainage. Villages consisted of a collection of semi-subterranean pithouses; by the closing decades of the Late Archaic, these houses had probably changed from circular-floored, conical structures to rectangular-floored, vertical-plank and gable-roofed lodges. During the warm seasons, the village populations broke up into extended family bands that pursued a "collector" subsistence strategy within relatively well-defined territories (Winthrop 1993). Ethnographic groups that inhabited or seasonally used portions of the Little Applegate watershed included the Dakubetede ("Applegate Athapascans"), Upland Taklema (or Latgawa), and the Shasta.

By A.D. 1775, the first known contact of European maritime explorers with nearby Coastal groups took place; within another fifty years land-based fur trappers had arrived in the interior of southwestern Oregon. Metal, glass beads, guns, horses, and virulent new diseases soon arrived among the natives of the region.

1770s-1840s

This seventy-year period, the onset of recorded history in southwestern Oregon, saw the initial exploration of the region by Europeans and Euro-Americans. Maritime explorers, beginning with Spanish captain Bruno Heceta in 1775 and followed by Englishman George Vancouver and American Robert Gray in the 1790s, coasted along the rugged shoreline. Some of the sea-borne explorers, including Russians from Alaska during the early 1800s, made brief stops to capture sea otters and/or trade with the native inhabitants. The interior remained unknown to white explorers until 1827, when fur trappers under Peter Skene Ogden of the British Hudson's Bay Company traveled through the Rogue River drainage (including portions of the Applegate Valley).

Hudson's Bay Company trapping brigades continued to pass through the area, on their way to and from trapping expeditions to central California, through the early 1840s. American trappers also visited streams of the region during the 1830s-40s. The streams of the Little Applegate watershed would have been trapped for beaver during these years. In 1841, a party of U.S. Navy explorers and scientists (the "Wilkes Expedition") made a brief foray through the Rogue River Valley. And in 1846, in order to provide an alternative southern Oregon Trail route, Willamette Valley settlers laid out the Applegate Trail through the Rogue River Valley. (The trail was named for the pioneer Applegate brothers and did not pass through the Applegate Valley.)

1850s-1860s

With the discovery of gold on the west edge of the Rogue River Valley in 1851-52, hundreds of prospectors flocked to the eastern Siskiyou Mountains. Numerous placer claims were located along Poorman's Creek, Jackass Creek, and Forest Creek (immediately north of the Little Applegate watershed) by 1853. In 1854, James Sterling and Aaron Davis discovered gold on Sterling Creek, a tributary of the lower Little Applegate, and a sudden influx of miners into the Little Applegate watershed resulted. Small-capacity placer mining ditches were excavated almost immediately and the Little Applegate watershed's white population may have exceeded 700 by 1856. Mining during the 1850s-60s was labor intensive, most of it accomplished by small crews or "companies" of partners using hand tools. By the end of 1856, following the final "Rogue River Indian War," the remaining native inhabitants of the Little Applegate Valley were removed to a reservation on the north-central Oregon Coast.

During the early 1850s, farmers also arrived in southwestern Oregon, taking up land under the generous terms of the Oregon Donation Land Act of 1850. Gideon B. Davidson settled on a Donation Land Claim at the mouth of the Little Applegate, the only D.L.C. in the watershed. After 1855, increasing numbers of Chinese miners arrived in the region; some worked the placer gravels of Sterling Creek and elsewhere in the watershed during the 1850s-60s. Small-scale sawmilling and ranching in the Little Applegate Valley supported the needs of local miners during the 1850s-60s, which was a time of sudden and exponential population growth, most of it occurring
along Sterling Creek during the mid-to-late 1850s and tapering off during the 1860s. (See Haines 1964, LaLande 1981.)

1870s-1880s

Small, intermittent logging and family ranching operations continued during this period. The major development was the arrival of large-scale hydraulic mining in the Little Applegate watershed. The “Gin Lin” or “China” Ditch (built 1871), the Sterling Ditch (built 1877), and a number of other hand-dug delivery systems brought large quantities of water from the upper Little Applegate drainage to work the placer gravels of Sterling Creek and the lower Little Applegate.

Hydraulic mining created a second population boom in the lower portion of the watershed. For example, more than 400 men, many of them Chinese, worked on the Sterling Ditch in 1877 (Haines 1964:48-49). Ditch construction, purchases of land and mining equipment, and maintenance of work-camps represented heavy capital investment by a small number of relatively affluent entrepreneurs, who typically resided in Jacksonville, Portland, or elsewhere. Adapting to the seasonal nature of each activity, some local residents both mined and farmed.

1890s-1900s

During the turn-of-the-century period, extensive hydraulic mining continued intermittently at the Sterling Creek Mine but ended elsewhere in the watershed. Livestock farming, encouraged by irrigation ditches built earlier, became the dominant economic use of the area. Sheep and cattle grazed in the high country during the warm months; during the winter the herds subsisted on hay grown on irrigated pastures along the lower Little Applegate. A few family logging and milling operations produced small amounts of pine lumber for use by Little Applegate Valley and Jacksonville residents.

The Little Applegate Valley became tied to the county seat at nearby Jacksonville and to the railroad depots and growing urban markets of the Rogue River Valley by means of wagon roads along the lower river and Sterling Creek. The population of the watershed stabilized as a rural, agricultural community that probably consisted of approximately 100-150 permanent residents. The names of farming families prominent in the Little Applegate Valley during this and succeeding periods included: Cameron, Cantrall, Saltmarsh, Kleinhammer, Phillips, Hall, Gilson, Armstrong, Gallagher, Pursel, Crump, and Trask. (See: Black and Black 1990: passim.)

1910s-1920s

Rangers of the USDA Forest Service arrived in the vicinity by 1906 to administer the newly created Crater (now Rogue River) National Forest. Beginning about 1910 (following the severe fire season of that year), the Forest Service developed a network of trails, telephone lines, and mountain-top fire lookouts that linked the Little Applegate watershed to ranger stations at Star Gulch and elsewhere. Much of the upper watershed--former Oregon-and-California Railroad grant land--returned to government ownership in 1916, but these "checkerboard" sections of land did not become part of the National Forest until the 1930s (other former railroad-grant lands in the watershed came under the administration of the Bureau of Land Management in 1946).

This period probably witnessed the most intensive and uncontrolled phase of livestock grazing and irrigation diversion in the watershed's history. High market prices before and during World War One led to overstocked range. In addition, a number of “squatters” and “homesteaders” settled briefly in the forested mid-elevation watershed (Yale Creek and above), attempting to gain ownership to public land. The watershed's "permanent" population may have increased to about 200-250 people prior to World War One. A crude wagon/auto road extended up the Valley almost to Duncan Gap; from there a well-traveled pack-trail up Rush Creek and over Section Line Gap linked the upper watershed to the Rogue River Valley near Talent/Phoenix. (The route is now overlain or closely paralleled by Anderson Creek Road.)

1930s-1950s

The collapse of agricultural prices during the Great Depression eventually caused a severe contraction in livestock numbers during the 1930s. However, the relatively high price of gold stimulated a decade-long "gold rush" in the Siskiyous, one that brought renewed hydraulic (as well as dragline) operations to the streambanks of the lower Little Applegate watershed. Also, individuals and groups took up small-scale placer mining in the Sterling Creek area, with the 1930s mining population of the vicinity reportedly reaching about 100 people (Black and Black 1990:96). The Forest Service, using crews of Civilian Conservation Corps enrollees, built truck roads across the eastern-most Siskiyous that linked the Little Applegate Valley directly to Talent, Phoenix, and Medford.

These roads became important timber-haul routes during World War Two and the post-War lumber boom. The Bureau of Land Management took
over administration of non-National Forest federal timber lands within the watershed in the late 1940s. Powerlines brought electricity to most members of the rural community by the 1940s. With improved transportation, local schools consolidated and centralized outside of the Little Applegate Valley. During the 1950s, many Valley residents came to depend less upon agriculture and more upon work in the woods or jobs in Jacksonville/Medford.

1960s-1990s
The past four-and-a-half decades brought intensive timber harvest to the upper reaches of the watershed. Logging roads proliferated, reaching up into the upper forest stands. Tractor logging and skyline-cable logging harvested millions of board feet of Douglas-fir, ponderosa pine, sugar pine, white fir, incense-cedar, and Shasta red fir from public and private timberlands. Large clearcut and shelterwood harvests replaced the scattered, selective logging of the pre-War decades. Reforestation efforts attempted to keep up with the pace.

In the lower Valley, landowners subdivided former ranches into multi-acre residential properties. Many of these contained comparatively modest-sized homes during the 1960s-70s, but construction of larger, more expensive dwellings has characterized the past decade. The natural beauty and rural "lifestyle" continue to attract people to the Little Applegate Valley; however, few residents earn a livelihood from the land. (For more detailed discussion, see: Preister 1994.)

Human population trends during the historic period: The Little Applegate watershed, particularly the lower portion where most human settlement has been concentrated, experienced several waves of major population influx. The mid-to-late 1850s gold rush brought the first, and in some ways most dramatic, population boom. (It is important to remember that most mining was seasonal, and the population numbers associated with it were also largely seasonal.) Numbers apparently declined and stabilized somewhat during the 1860s, but then climbed again with the large ditch-digging crews and seasonal hydraulic mining camps of the 1870s-1880s.

Although the Sterling Mine continued to operate well into the twentieth century, the number of employees involved was probably far less than during the previous century. Instead, most of the Little Applegate watershed's population of about 100-200 people during 1890-1930 was involved in stock-raising and farming along the comparatively fertile bottomlands or in speculative "homesteading" ventures on marginal-quality federal land.

The Great Depression, with the renewed influx of placer miners and the increased number of federal work projects, resulted in another spurt in seasonal population. The number of people involved in local agriculture declined after World War Two. However, although some of the "old-time" ranching families dwindled, the number of permanent residents actually grew dramatically during the post-War boom and after. With improved roads and communication, the current permanent population of the Little Applegate watershed may actually be the largest, densest, and most widespread in its history. In addition to full-time residents, the number of regular visitors (delivery people, firewood cutters, hunters and other recreationists, government employees) within the watershed at any one time is a significant factor.

B. Topical Overview

Native Land Uses
Arbitrarily setting A.D. 1695 as the beginning of the "ethnographic present" in southwestern Oregon, native land-use practices that would have measurably affected the Little Applegate watershed's ecosystem included anadromous fishery harvest, small-scale horticulture, big-game drives, intensive gathering of certain valuable plants and widespread use of fire.

An Indian village (probably inhabited by Dakubetede) is reported for the mouth of the Little Applegate during the early 1850s, with a smaller occupation site reported for near the mouth of Sterling Creek (Port 1945:5, Haines 1964:23). These and other winter habitation sites were probably occupied off and on throughout the 1695-1855 period. Port (1945:5), relying on long-time residents' recollections, documents the importance of salmon to the villagers at the mouth of the river; fish-drying racks were prominent at this site when prospectors first visited the area in the 1850s. The natives probably took quantities of fish from both the main Applegate and the Little Applegate. The aboriginal use of fish weirs, although undocumented for the Applegate River, is known for other major streams in the wider vicinity; it is possible that weirs or other fish traps were used along the Little Applegate and the main river.

Native horticulture in southwestern Oregon was confined to the raising of tobacco. Individuals or families tended small plots of tobacco in the foothills near villages. Typically, less than two-acre-sized stands of Douglas-fir/ponderosa pine and brush would
be partially cleared by underburning, with the ash providing fertilizer for the *Nicotiana* plants. Some limited soil tillage by digging sticks may have prepared the seedbed, but little if any ongoing cultivation took place. (See: Harrington 1932).

Cooperative group drives for deer and elk probably took place at least semi-annually in the hills and mountains of the watershed. These drives necessitated construction of "brush fences," some of them several miles long (LaLande 1991:19). Brush cutting for these fences was not the only form of vegetation manipulation. Sugar pine--one of the natives' most valuable conifer species because of its use for lodge planks--was probably felled by means of long-burning basal fires. Ponderosa pine was also used. Gathering of edible bulbs (camas, for example) and roots (e.g., beargrass) involved use of mountain mahogany digging sticks; this practice may have aerated the soil and perhaps stimulated further root growth in certain intensively used locales, such as beargrass-gathering grounds (cf. Blackburn and Anderson 1993).6

Dead and down Oregon white oak was a preferred fuelwood, especially for sweatlodge fires (Dixon 1907:420). Certainly regular use of fire (for a variety of purposes, but particularly for creating and maintaining desired vegetation communities) took place throughout the period, especially concentrated throughout the lower-elevation savanna, oak woodland, and transition pine forest of the watershed, as well as at certain high-elevation meadows and other openings. Among the latter would have been the western, uppermost slopes of Wagner Butte (which the Upland Takelma knew as "Alketakh"); for the Upland Takelma (and doubtless other groups as well), this extensive open area was a favorite place for harvesting large quantities of beargrass, with its edible rhizomes and its long, fibrous leaves so useful in basketry (Harrington 1981). Although not mentioned in the ethnographic account, fires set regularly by Indians (typically by the women) probably played an important part in sustaining the desired vegetational character in this key upland gathering area.7

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6Camas is apparently not present in the Little Applegate River watershed at this time; however, poorly drained swales along the lower river could have supported camas prior to intensive agricultural/ grazing use.

7The literature regarding anthropogenic fire in North America is plentiful and growing (see Williams 1994). Although aboriginal fire undoubtedly played a major part in the ecosystem of the Rogue River drainage, the specifics of the practise are not well documented for the area in primary- source historical records. Members of the 1841 Wilkes Expedition observed an Indian woman in the act of setting a brushfire, near present-day Ashland (LaLande 1991:24).

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Trapping and Hunting

The Hudson's Bay Company had its Pacific Northwest headquarters at Fort Vancouver, on the lower Columbia River. H.B.C. Governor George Simpson initiated the Company's "fur desert" policy for the "Snake Country" in the mid-1820s.8 The Snake Country, which at the time included southwestern Oregon, was on the far fringes of the firm's territory; this "scorched-earth" strategy was meant to trap out the beaver streams of the region, thereby discouraging American trappers from penetrating into the rich center of the Oregon Country, north of the Columbia River.

Beginning in 1827 and continuing for most of the next fifteen years, H.B.C. brigades trapped heavily in the Rogue River drainage. Although river otter and even raccoon were taken, beaver pelts were the main prize. During some winters, parties of trappers spent extended periods in the Rogue River Valley; although no records of beaver-take are available, the Applegate River and its major tributaries doubtless were regularly visited by these men. Due to aggressive trapping (which included indiscriminate harvest of females during the reproductive season), the local beaver population—if not decimated—may have been seriously depleted.

During the later nineteenth and early twentieth centuries, local trappers concentrated on high-elevation furbearers such as fisher and marten. Hunting, beginning with the gold rush of the 1850s, took a serious toll on ungulates in the eastern Siskiyous. Because of high prices for beef, pork, and agricultural staples during the first half of the decade, deer were slaughtered in large numbers by hungry miners. Unrestricted recreational and commercial hunting of deer and elk, including the notorious "hide-hunters" of the 1870s-1880s, characterized game hunting in southwestern Oregon for most of the late nineteenth century. In a single day's hunting along Sterling Creek in 1885, for example, John B. Griffin reported bagging seven deer and three brown bear (Haines 1964:59). State game regulations, although passed by the legislature during these years, were not effectively enforced until after 1900. Hunting of predators (especially grizzly bear, wolf, and cougar) by local

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Subsequent anecdotal accounts are plentiful however (e.g., Riddle 1953:51, Walling 1884:334, Leiberg:1900:278). A newspaper account of the 1890s, for example, relates that "old settlers in Southern Oregon claim that the Indians kept the country looking neater than the whites do." The article goes on to comment on the lack of underbrush during the 1850s, as well as the plentiful open grasslands and deer, all attributed to the effects of Indian fire practices (Ashland Tidings 3/4/1892).

The term "fur desert" was Simpson's own, referring to his goal of a wide swath of trapped-out streams.

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stockmen accelerated during the nineteenth century, further altering the mammalian component of the watershed's ecosystem.

**Mining**

The earliest phase of gold mining in the Little Applegate watershed (ca. 1854-1870) involved excavation and washing of alluvial gravels in and immediately adjacent to streams. As with later placer mining in the area, winter was the main season of operation. Rocker-boxes, long-toms, sluice-boxes, and hand tools—supplemented by water from pumps and low-elevation, small-capacity ditches—processed an unknown but no doubt considerable volume of gravel. Placer mining, then and later, was restricted largely to the lower river (below the mouth of Yale Creek) and to much of the length of Sterling Creek.

The next phase of placer mining, the large-scale hydraulic mines of the 1870s and later, focused on the consolidated, hard-to-work gravels, some "high terrace" deposits of which were situated well back from the streambeds. Hydraulic miners relied on long, large-capacity ditches (e.g., the Sterling Ditch; almost 25 miles long, maximum projected capacity of 75 second-feet [2,000 miner's inches]) to bring water to and above the area to be mined. The water was fed into iron pipe and descended out the end of a "giant" nozzle as a high-pressure spray, capable of removing tons of overburden a day. Over the course of nearly two decades, Gin Lin's "Little Applegate diggings" were steadily extended downstream for nearly four miles along the south bank of the lower river (LaLande 1981:71-80). This activity, along with the Sterling Mine during the same period, poured hundreds of thousands of cubic yards of silt and rock into the river during the December-May mining seasons. In 1878, the Sterling Mine reported its two giants moved compacted deposits at the rate of 800 cubic yards a day (Haines 1964:49).

Large hydraulic operations and smaller-scale placer mining continued on into the twentieth century, particularly along Sterling Creek. The Sterling Mine, which by 1900 controlled about 1,200 acres of ground, purchased a huge, electrically-powered hydraulic pump in 1913 in a largely unsuccessful attempt to break up the "cemented gravels"; the company returned to dynamiting (Haines 1964:73-85). The Depression years of the 1930s brought renewed placer mining to the lower watershed, much of it using the old ditches and methods of the hydraulic operators. Among the major placer mines of the 1930s, in addition to continued work along Sterling Creek, were the Kleinhammer Mine (along the Little Applegate between Yale Creek and Sterling Creek), the Federal Mine (near the mouth of Sterling Creek), and the Merrick Mine (along lower Group Creek) (State of Oregon 1943:167 and 173).

Lode, or hard-rock, mining for gold ore has never been a major factor in the watershed's history. Around the turn of the century, a few small "quartz gold" lode mines (such as the Queen Anne Mine, in Sec. 3, T39S, R2W) operated in the upper Sterling Creek drainage, but their production was minimal. In the upper Little Applegate watershed, lode mining for cinnabar (mercury ore, important in the gold-recovery process) occurred intermittently from the 1870s through the 1930s at Cinnabar Gulch. The so-called Brickpile Mine involved a number of short adits, open cuts, and other small excavations. A retort, to render the cinnabar into liquid mercury, operated during the 1870s only. The only other hard-rock mining of record involved very limited open-pit removal of chromite from serpentine bedrock during World War One; less than 200 tons of chromite was mined and packed by mule-string over the mountains to the railroad at Talent. The Cass Ranch and Horsehoe chromite mines, both located in the upper watershed near the mouth of Glade Creek, may have seen renewed activity during World War Two due to the demand for chromium ore (important in making high-temper steel alloys). On the upper slopes of Red Mountain, chromite was mined from the early 1940s through the mid-1950s' "strategic minerals stockpiling program"; again, this involved very small, open-pit operations. (See: State of Oregon 1943: Passim. and Ramp 1961:88-94.)
The most environmentally significant mining impact within the watershed was the recurring sequence of large-scale placer operations of the late nineteenth and early twentieth centuries.

**Farming and Irrigation**

Euro-American agriculture began in the watershed near the mouth of the river, at Gideon Davidson's 1853 Donation Land Claim. This 320-acre parcel soon changed hands; after 1865 it remained under the ownership of the Robert Cameron family for many years. Other farm properties were located along the lower Little Applegate during the 1850s-80s; these included vegetable gardens raised by the Chinese miners (U.S. Forest Service homestead examination records 1910-1920). Very few people settled upstream from the mouth of Yale Creek until much later in the century (i.e., largely due to a final "land rush" created by the Forest Homestead Act of 1906). Small grainfields, fruit orchards, vegetable gardens, and stock pastures typified these early farms; later, pasture dominated the productive land of each farm or ranch. Fields were cleared of native oaks, pines, and other trees by cutting and by stump-pulling/root-burning. The low elevation "bottomlands," which had probably been forested in prehistoric times, became almost totally open. Farming and gardening brought exotic weeds to the disturbed soil, and some of these plants (along with probable post-1910 arrivals, such as starthistle, that came with open grazing) spread into the surrounding foothills.

By 1900 oats and alfalfa hay (two cuttings per year, averaging three-to-five tons per irrigated acre, at $5-6 per ton) were the major cash crops of the "thickly settled" lower part of the Little Applegate Valley (Crater N.F. 1910-1925 homestead examination files). Some farms also grew feed corn (averaging 30 bushels per acre), garden truck, and berries. Killing frosts made the scattered upper valley farms unfit for growing all but hardy hay (alfalfa, timothy, red clover) and potatoes or other root crops. Served by a store and post office at Buncom (near the mouth of Sterling Creek), early twentieth-century farmers could regularly travel a well-maintained county road to Jacksonville, 16 miles away. One Forest Service specialist described the Little Applegate Valley in 1915 as a "well populated...agricultural and stock-raising community."

He praised its people as "typical of an intelligent farming community"; further, the various property owners (whose ethnic composition, he felt called upon to stress, was "wholly white") were generally open to progressive, cooperative agricultural endeavors (Ringland 1916:6-7).

Irrigation was a necessity during the semi-arid growing seasons of southwestern Oregon. One of the first irrigation ditches of record in the Rogue River drainage was the "Wagner-Thornton Ditch" of 1852. This small ditch diverted water out of the upper Little Applegate and into the Wagner Creek drainage for the benefit of farmers near the present vicinity of Talent (Rivers 1963:23). Four of the earliest ditches in the lower watershed were the 1854 Davidson Ditch, the 1854 Farmers Ditch, the 1860 Gallagher Ditch, and the 1866 Lower Phillips Ditch.

The 1919 Rogue River water-rights decree (Circuit Court...for Jackson County 1919:30-31 and 70-71) provides information on virtually all of the then-active ditches in the Little Applegate drainage. In addition to the four mentioned above, the decade of construction (based on earliest water-right) for these are as follows: 1870s: Deming Ditch, Gin Lin (or China) Ditch, Gilson and Gleave Ditch, Goldsby Ditch, Greely Ditch, and Sterling Ditch; 1880s: Buck and Jones Ditch, Gallagher Ditch no.2, Garrison Ditch, Jennings Ditch, Kleinhammer Ditch, Mathes Ditch, Spicer Ditch, Trask Ditch and Upper Phillips Ditch; 1890s: Garrett Ditch, McCormick Gulch Ditch, Pursel Ditch, and Schmidt Ditch no.1; 1900s: Combest Ditch, Crump and Pursel Ditch, Gallatin Ditch, Pierce (or Pearce) Ditch, Reynolds Ditch, and Schmidt Ditch no.2. The trend in construction shows steadily increasing withdrawals of water from the Little Applegate throughout the sixty-year period. The ditches ranged from very small-capacity channels of less than one second-foot to sizable diversions such as the Sterling Ditch. The total combined water allocation from these ditches in 1919 was almost 75 cubic feet per second.

**Livestock**

Horses were probably the most vital livestock for the earliest miners and settlers of the eastern Siskiyou, but hogs became a critical source of meat during the sudden population influx of the 1850s. Pigs could largely fend for themselves in the foothills, eating acorns and roots, until slaughter time (e.g., see: Port 1945). Hog-raising evidently lessened in significance after 1870. Although other livestock dominated in the area during the later nineteenth century, pigs continued to range the country throughout the period. During the 1870s, the outskirts of Jacksonville supported a facility known as the "Hog Pits," where stray hogs were penned until retrieved by their owners (Black and Black 1990:19). Some of the wily animals became feral "razorbacks," the target of local sportmen. One herd of 50-60 wild hogs, with some boars reportedly weighing up to 300 pounds, roamed the mountains south of Jacksonville as late as
1908 (Ashland Tidings 3/16/1908). In 1911, a "huge porker...of the wild boar species" reportedly was "running amuck" in the streets of Talent; it was thought to be the scion of pigs owned by early settler Welborn Beeson that had gone wild in the Siskiyou foothills (Ashland Tidings 2/20/1911).

In addition to pigs, a few goats were released to graze the brushy hills of the eastern Siskiyou during the 1850s (Black and Black 1990:69). Later, by the 1890s, small herds of Angora goats were raised for their long, silky hair (Leiberg 1900:279). For example, Joseph Hall, who settled on a "stump ranch" along upper Yale Creek, raised goats for cash during 1908-10. Unfortunately, although Mr. Hall cut brush for feed, most of the younger animals starved to death or drowned in an irrigation ditch (U.S. Forest Service 1912: Pursel homestead examination file).

If goats were a minor form of livestock, sheep and cattle were not. By the late nineteenth century, large herds grazed the high-country range of the Little Applegate watershed. Sheep, raised for Oregon's expanding wool industry, entered the watershed via the Wagner Creek and Neil Creek/Cottonwood Creek drainages to the northeast and east. Most of these animals belonged to three major owners, each of whom resided in the Wagner Creek Valley/Talent vicinity: Herrin, Beeson, and Peterson. Although notorious among Forest Service grazing examiners for wandering beyond their permitted range, the sheep summered mostly along the Siskiyou Crest between Grouse Gap/McDonald Basin and Red Mountain/Jackson Gap. Forest Service estimates for 1917 put the annual number of sheep ranging in and immediately adjacent to the upper Little Applegate watershed at over 5,000 head; in addition, small herds of horses grazed the high country (Gribble 1916:3). The number of sheep declined significantly after World War One (to about 1,000 head in the early 1920s), but McDonald Basin and other locales apparently supported a dwindling number of sheep into the 1930s (Gribble 1916:3). Based on the Crater National Forest grazing atlas, this figure remained almost constant into the early 1920s (Ingram and Horton 1923).

Beef cattle came with the earliest white settlers to southwestern Oregon. By the 1860s, the Rogue River Valley had become the Pacific Northwest's prime cattle-raising area, and remained so until ranchers expanded to the steppelands east of the Cascades. Conflicts between sheepmen and cattlemen did occur within the Little Applegate watershed (see discussion in Part IV-C). The size of nineteenth-century herds is not well documented. Larkspur, wild parsnip, blackleg, predators, and rustlers thinned the numbers somewhat, but by 1916 so many cattle were crowded onto the eastern Siskiyou range that insufficient feed was available (Gribble 1916:2).

The period from 1914 through 1920 brought very high prices for local cattle, due to the war-time demand for beef and leather. In hopes of reaping high profits, Little Applegate Valley ranchers expanded their herds aggressively during the war years, often mortgaging "to the limit" their property to local banks (Johnson 1922:7). A few years later--overextended, selling their animals at a loss, and facing foreclosure during the post-war depression of 1920-22--local stockmen such as Arthur Kleinhammer then drastically reduced the size of their herds and attempted to upgrade them with Hereford and Shorthorn bulls (Johnson 1922:5-7, Rankin 1927:9. Black and Black 1990:104-106). Kleinhammer, the largest stockman on the Little Applegate during the early twentieth century, ranged up to 600-700 head of cattle on his upper Little Applegate allotment; the approximate total number of head grazed in and immediately adjacent to the upper watershed during the war-time boom was 2,000 (Gribble 1916:3). Based on the Crater National Forest grazing atlas, this figure remained almost constant into the early 1920s (Ingram and Horton 1923).

Forest Service personnel complained that the area's "small stockmen" were the "hardest to handle," due to their marginal financial situation and their tendency to act as short-term speculators. Consequently, overgrazing, improper salting, and disputes over grazing permits were ongoing. Subsequent to the early 1920s, cattle numbers apparently stabilized briefly and then declined again during the very poor market years of the Great Depression (Rankin 1927:9). Relative to sheep, however, cattle in the eastern Siskiyous became steadily more plentiful. During the 1940s-50s, the size of herds grew but—with more attention from federal land managers—the numbers never returned to the extremely over-crowded conditions of 1914-20.
Logging and Milling

Much white oak and madrone doubtless fell to the prospector's axe for firewood during the gold rush period. However, as with the native inhabitants before them, local miners and settlers found ponderosa and sugar pine to be the most valuable timber species of the lower watershed. Pine was cut for flume boards and sluice boxes as well as for roofing shakes and other lumber.

The earliest sawmill in the vicinity was built by Ashland-area settler Justus Wells about a mile upstream on the main river from its confluence with the Little Applegate. The so-called Wellsville mill burned during the Indian War of 1855-56; rebuilt soon after, the water-powered mill produced small quantities of lumber for Little Applegate miners and farmers throughout the 1860s (Port 1945:11, Black and Black 1990:57-58). Although perhaps not processed by the Wellsville mill, most of the mature pines along the south side of the lower Little Applegate were harvested to supply lumber to Gin Lin's hydraulic mine during the 1870s (Crater N.F. 1925 [Fisher homestead exam.]). Construction of the Sterling Ditch required much lumber for flumes and other purposes; the Irwin mill, set up on Sterling Creek especially for the project, cut pine at a then astonishing rate of 13,000 board feet per day (Haines 1964:48). The Wisdom-and-Snider mill and the Gilson mill operated in the Sterlingville vicinity during the 1870s-90s--as with many family-run sawmills, passing through several incarnations following periodic destruction by fire (Haines 1964:58-59).

The nineteenth century thus witnessed relatively heavy cutting of hardwoods for fuel and "high-grading" of accessible large conifers (especially pines) for commercial lumber, virtually all of it sold to local residents or mining operations. Based on newspaper accounts of the 1880s-1890s (Ashland Tidings, Democratic Times), commercial fuelwood cutters operated each summer in the hills of upper Wagner Creek, probably hauling Douglas-fir cordwood by sled and wagon down to the Talent railroad siding for winter sale in Medford or Ashland. Some of these firewood cutters may well have operated in adjacent portions of the upper Little Applegate drainage, near Wagner Gap.

Harvest of conifer timber during the early twentieth century, as with preceding years, remained very limited in scale. The small Pursel mill, cutting pine along lower Yale Creek, operated seasonally from about 1906 until World War One. In 1921, a Forest Service management plan noted that only two sawmills then operated within the entire Applegate River drainage, one on Thompson Creek and another about five miles west of Ruch (Crater N.F. 1921:29); within five years even these had closed (Rankin 1927:4). However, the Pursel family opened a second small-capacity sawmill on Yale Creek in 1929. Relying on a 24-horsepower diesel powerplant, the headrig and planer (which, having "cut out" one site, moved to a second Yale Creek location in 1935) produced pine lumber intermittently during the Depression, switching to Douglas-fir railroad ties during the high market demand of the Second World War. With most of its readily accessible timber cut, the Pursel mill closed permanently in 1947; a Mr. Sanderson purchased the small plant and moved it to the Butte Falls area to take part in the post-War housing lumber boom (Black and Black 1990:108-113).

Figure 6 Nelson Pursel with oxen team, hauling pine logs to Pursel sawmill on Yale Creek, ca. 1915. (S.O.H.S. #1219)

During the late 1940s and throughout the 1950s, small rural sawmills and "gyppo" logging outfits simply supplemented the huge production of the large wood-products plants situated in the Medford/Central Point/White City area. A mill at Ruch operated during the boom years, but it closed by the 1960s. Although milling capacity in the upper Applegate Valley area shrank and disappeared during the mid-twentieth century, logging steadily accelerated and expanded throughout the upper Little Applegate watershed. As the transportation system proliferated in the high country, log-truck loads composed of formerly inaccessible and relatively low-value species such as Shasta red fir, white fir, and incense-cedar came down the roads to Rogue Valley mills. The Forest Service steadily improved the quality of roads 20 and 22 during the 1970s-1980s to handle the increased traffic. By 1990, most substantial-sized stands of private, Bureau of Land Management, or National Forest timber within the watershed had been harvested by more than one logging entry. Only the highest elevation forest stands of Wagner Butte remain essentially uncut.
C. Section Summary

Various human activities, most of them associated with the exploitation and management of natural resources, have taken place within the Little Applegate River watershed. Prehistoric activities, with the notable exception of vegetational management by means of fire, generally had very limited and not readily visible impacts to the land. Historic period activities, beginning with the placer mining of the 1850s gold rush, have had widespread impacts within the watershed. Fire, set for a variety of reasons by Euro-American settlers, continued to be a major factor into the early twentieth century. Various forms of placer mining within the area were most intense during the 1850s, the 1870s-1880s, and the 1930s. Irrigation and grazing became significant uses during the 1890s through the 1920s. Timber harvest became dominant during and following World War Two.

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14
III. SIGNIFICANT NATURAL EVENTS of the PAST ONE-HUNDRED-AND-FIFTY YEARS

Part III summarizes what the historic record tells us about major geologic or climatic events in the eastern Siskiyou Mountains. It is drawn largely from contemporary newspaper accounts. Although not exhaustive, the summary documents the relative frequency of "natural catastrophes," from earthquakes to floods.

Based on historic testimony, many of these events definitely impacted the Little Applegate River watershed. Some of the other episodes discussed below are known only from eyewitness accounts dealing with the adjacent Bear Creek watershed, a more heavily settled area located immediately to the east. Although the limited historic documentation does not verify the fact, many of these same events almost certainly affected the Little Applegate watershed in a similar fashion. Quantitative data (e.g., water volume of floods) are not available for most of these occurrences, but the qualitative, anecdotal evidence provides a sense of their comparative severity.

A. Seismic Activity

Due to the rarity of perceptible seismic events in the area during the twentieth century, most people do not think of southwestern Oregon as an area that experiences earthquakes. However, readily noticeable earthquakes have occasionally rattled the eastern Siskiyou. (Many of them—as with the September 20, 1993 "Klamath Falls" earthquake [magnitude 6.0] that shook the area all the way to the Coast—probably had their epicenter east of the Cascade Range, in the upper Klamath Basin; others have probably been centered offshore.) None of the very few historically recorded temblors were severe west of the Cascades; property damage was light. Nevertheless, these seismic events may have triggered small slumps or other forms of mass-wasting on the steeper slopes of the eastern Siskiyou. More severe earthquakes in the prehistoric past very well could have contributed to large landslides or other geomorphic changes within the Little Applegate watershed; such events may happen again in the future.\(^\text{11}\)

One evening in May of 1867, a few residents of the southern Bear Creek Valley reported feeling "severe earthquake shock." The phenomenon apparently did not extend to the Jacksonville area, and the editor of that town's newspaper, having no record of previous earthquakes in the area, dismissed the Ashlanders' experience as due to "night-mare or indigestion" (Oregon Sentinel 5/18/1867).

The authenticity of the 1867 earthquake probably can not be verified. According to the Jacksonville Democratic Times of 1873, southwestern Oregon's genuine "first earthquake" occurred at about nine o'clock in the evening, on November 15 of that year. Although no damage was reported for Jacksonville, the quake extended from Linkville (Klamath Falls)—where "the earth was reported as having cracked"—to Crescent City, where cornices fell from the eaves of masonry buildings. In Grants Pass and other Josephine County communities, a number of brick chimneys partially tumbled. The earthquake reportedly was felt as far away as Portland and San Francisco. Jacksonville's Odd Fellows Lodge, in session at the time, adjourned because of the quake (Democratic Times 11/22/1873).

The second recorded "major" earthquake in southwestern Oregon rocked the Ashland vicinity on the evening of April 2, 1906. Described by the Ashland Tidings (4/5/1906) as a "light shock," it rattled windows and stovepipes but did no damage. The newspaper's editor added that there had been "slight tremors felt here in times past, but not for years." (This statement lends some credence to the authenticity of "The Siskiyou and southern Cascades no doubt have been subject to innumerable imperceptible quakes over the past 150 years. As recently as December 28, 1994 a minor (magnitude 2.9) temblor shook the Crater Lake area, but was apparently not felt beyond the National Park vicinity (Ashland Tidings 12/29/94)."

Evidence of large-scale tree mortality due to insect or disease is virtually absent from the nineteenth-century and early-twentieth-century newspaper record. No doubt forests of the Little Applegate watershed experienced cycles of insect/disease infestations during these years, especially in conjunction with drought cycles, but residents or editors apparently did not note these gradual events. White pine blister rust probably did not arrive in the eastern Siskiyou until around 1925-30. Early Forest Service observers commented on the presence of bark beetles and other insects, but Douglas-fir dwarf mistletoe received no mention until the 1940s; it may not have become particularly noticeable until the increasing tree density of recent decades.
the 1867 event.) The early April 1906 quake felt in Ashland previewed the severe earthquake that destroyed much of San Francisco later that month.

A third (and perhaps, at least until the 1993 tremblor, the last) documented major earthquake in the area occurred shortly after noon on March 15, 1913. The shock was quite noticeable in Medford: dishes rattled in cupboards and fell to the floor; elevator cages swayed in downtown buildings; and a ten-foot long hairline crack appeared in the pavement of East Main Street (Ashland Tidings 3/17/1913). Interestingly, the newspaper's current editor--evidently unfamiliar with previous episodes--noted that the quake was, "as far as we have been able to find, the "first shock in this valley."

B. Windstorms and Cloudbursts

The 1962 Columbus Day windstorm (Typhoon "Freida") that blew down millions of board feet of timber throughout the Pacific Northwest was not the first such recorded event to batter the forests of southwestern Oregon. Throughout the centuries, occasional catastrophic windstorms have doubtless brought down extensive stands of trees, creating openings similar to those caused by stand-replacement fires. Perhaps the first recorded windstorm in the area occurred in the Rogue River canyon near Rock Point in February 1867. It was apparently quite localized but tore "great trees up by the roots"; the winds also knocked flat many rail fences in the vicinity (Oregon Sentinel 2/23/1867).

In 1880, western Oregon experienced a severe and widespread windstorm (probably similar in origin and effect to the 1962 event). Another storm occurred in October 1900, reportedly leaving southwestern Oregon's "woods filled with downed timber." Travelers on the stage road from Ashland to Klamath Falls gave the Tidings' editor the impression that the southern Cascades, especially the Lake-of-the-Woods and Dead Indian Plateau areas, suffered the greatest damage (steady winds of over 70 miles per hour were reported; Ashland Tidings 10/22/1900), but this storm and the 1880 event probably affected the eastern Siskiyous as well, particularly in areas where the water table was close to the surface and the root systems consequently more susceptible to windthrow.

Because of the region's terrain and climatic regime, tornadoes are almost unknown for the Pacific Northwest. During the early twentieth century, however, one tornado was briefly seen in the Willamette Valley. A June 1905 "whirlwind" in the southern Bear Creek Valley, near Ashland, destroyed William Butler's cow barn, tossing some of the timbers "a distance of sixty feet." The whirlwind, probably an unusually powerful "dust devil," was visible to Mr. Butler, a prominent farmer and stockman, as it approached his property from the south.

Another summer season phenomenon, one that definitely affected the Little Applegate watershed with some regularity, was the "cloudburst." Often associated with an electrical storm, the cloudburst was a highly localized concentration of rain that could wreak havoc in the confined canyon bottoms of the eastern Siskiyous. For example, an August 1886 cloudburst "devastated" mining claims and farmland along lower Sterling Creek. The waters carried a great deal of tailing debris from the Sterling Mine downstream, depositing masses of it on the fields of the Saltmarsh ranch (Haines 1964:55).

In July 1889, a thunderstorm brought over two inches of rainfall in one hour to the Ashland/Talent vicinity. Large quantities of soil and gravel eroded out of usually "dry gulches"; fences were swept away--as was a milk cow, "badly hurt" from the experience; the water also carried a chickenshed down a swollen gully, drowning almost 100 of the hapless birds. In the Wagner Creek Valley, rain, wind, and hail caused extensive damage to crops and buildings (Ashland Tidings 7/12/1889). Although not reported in the press, it is possible that erosion was severe in the upper Little Applegate watershed as well.

The watershed definitely experienced a highly erosive cloudburst on July 11, 1904, when "a wall of water...twenty feet deep" reportedly swept down from near Wagner Gap. Harry and W. H. Hosler were camped on a bluff in the upper Little Applegate's canyon, not far from Wagner Gap, when they saw the torrent coming down a side canyon from the direction of Bald Mountain. The water "swept the Canyon clean for a distance of two miles...[l]ogs and rocks were driven down through the canyon with incredible force" (Ashland Tidings 7/18/1904). The Hoslers related that the "sight and experience" was one they would "remember for many days to come." This particular event, possibly a debris avalanche, may have resulted...
in substantial downcutting in the decomposed granitic soil of the Bald Mountain side canyon.¹³

In late May of 1905, Emil Britt, of Jacksonville, reported that a cloudburst—the "heaviest [non-winter] rainstorm that [had] fallen...in thirty years"—dropped considerable rain and hail in the headwaters of Daisy Creek and Sterling Creek. The hailstones, "as large as quail eggs," stripped trees of their branches, ruined about 500 tons of alfalfa in Jacksonville, and in some places lay "six inches deep." Bridges and fences were damaged as "small gulches [became] great torrents" (Southern Oregon Historical Society 1905 clipping).

Another July storm, this one in 1913, brought nearly three inches of rain in one hour to the Griffin Creek country. Adjacent portions of the Little Applegate watershed, on the southwest slope of Anderson Butte, probably experienced erosive high waters as well; this particular cloudburst overflowed the banks of Griffin Creek, destroying corn crops, drowning chickens, and "washing a large amount of dirt down the slope" (Ashland Tidings 7/24/1913).

The erosive power of summer storms at high elevations (e.g., the granitic soils of McDonald Basin) was no doubt substantial.

C. Winter Storms and Floods

In comparison to summer cloudbursts, winter storms have historically brought the most devastating floods to the streamcourses of southwestern Oregon. The most severe floods took place in 1853, 1861, 1890, 1927, 1948, 1955, 1964, and 1974.¹⁴ The typical flood episode goes something like this: unusually cold, wet weather during November-January results in a deep snowpack, particularly in the mountains but extending well down to lower elevations. Sometime between late December and early February, arrival of a warm "chinook" rainstorm rapidly melts the accumulated snow and adds further water to the already overburdened stream channels. During these "rain-on-snow" events, normally placid streams become raging rivers that erode channel banks, topple large trees, and leave behind logjams and soil-scraped boulder fields.

The Floods of 1853 and 1861; Freshets of the mid-1860s-1872

The first recorded flood in southwestern Oregon, that of January 1853, still ranks among the most intense. (The following description is based on the recollections of early-day Bear Creek Valley settlers William Hamilton, Orlando Coolidge, and Welborn Beeson, as given in the Ashland Tidings 1/17/1890, 7/22/1892, 1/12/1903.) During December 1852, snow fell in the Valley to the depth of two feet on lower Wagner Creek and almost three feet at Ashland. The snowpack in the mountains was almost certainly much deeper. With temperatures hovering around zero for much of the time, snow remained on the ground for over two weeks. Early January brought warming weather and a heavy rainstorm (one account relates that the snow had fallen over the course of 17 days, followed immediately by three days of warm rain). Most of the accumulated snow melted within a period of 48 hours. From south of Talent to the Phoenix area, the lower portions of the Bear Creek Valley became a single "great lake"; the few scattered farms were submerged for several days. One settler compared the scene to the Mississippi at flood stage. The Little Applegate Valley—as yet unsettled by Euro-Americans—likely experienced extensive erosion.

The great mid-December 1861 flood inundated the low-lying portions of Jacksonville along Jackson Creek. The Bear Creek Valley "was converted into numberless small islands and lakes." Lower Neil Creek, south of Ashland, became blocked by an immense logjam; when it gave way, the flood carried off all fencing and outbuildings in its path (Oregon Sentinel 12/14/1861). In the Little Applegate watershed, the 1861 flood swept away the flumes and sluice boxes of Sterling Creek; it also scoured and redeposited soil along the lower river, evidently "robbing" some farms of topsoil and "paying" others in return (Haines 1964:35).

¹³Well before reading the above account of the 1904 cloudburst, the present writer—during a 1980s archaeological survey in the Wagner Gap vicinity of the Little Applegate watershed—found an unusual geomorphic feature in Section 33 or 34, T39S, R1W, W.M. For much of its length, a south-draining draw on the mid-slope of Bald Mountain showed clear evidence of severe down-cutting that occurred within the relatively recent past. Based on the relatively uniform size of the older trees growing on the eroded granitic-soil walls of the "wash-out" channel, the event probably took place between seventy and one-hundred years ago. The feature appeared similar to some hydraulic-mining ditch wash-out channels found in the lower Little Applegate drainage. However, no ditch was found on the slopes above and the available historic records do not document placer mining of any kind for this high-elevation vicinity. It is quite possible, therefore, that the feature is evidence of the 1904 cloudburst witnessed by the Hoopers.

¹⁴The 1861 flood is believed to have been the largest on record prior to 1964, with an estimated discharge at the present site of Gold Ray Dam (well above the mouth of the Applegate River) of 131,000 cubic feet per second. The 1890 flood ranks second, at an estimated 120,000 c.f.s at Gold Ray Dam. The 1927 and 1955 floods discharged an estimated 110,000 c.f.s, while the great 1964 flood topped 131,000 c.f.s. (see: Atwood 1988, appendix).
Floods of somewhat lesser magnitude returned to the eastern Siskiyou in 1864, 1866, 1867, and 1872. In the fall of 1864, storms threatened the Sterling Creek mines, but the damage was far less than three years before (Haines 1964:37). The March 1866 waters nearly flooded Lindley's sawmill near Phoenix; it was moved to higher ground immediately after the waters receded. One man nearly drowned trying to cross a stream when his horses feet were "washed out from under him" (Oregon Sentinel 3/31/1866, 4/21/1866), and the Applegate River overtopped its banks (Democratic Times 3/16/1872). The January 1867 flood apparently caused its most serious damage in the vicinity of Phoenix (washing away parts of a tannery and a sawmill); the same storm probably dumped substantial rain into the upper Little Applegate watershed (Oregon Sentinel 1/26/1867). In March 1872, local residents reported that the Applegate River was "higher...than it had been for six years"; although little property damage was reported, the Jacksonville/Illinois Valley stagecoach was postponed until the waters lowered (Democratic Times 3/16/1872).

**Floods of the 1880s and the Flood of 1890**

The year 1880 brought local streams to flood stage twice. In early January, a "thaw" rapidly melted mountain snows and charged Ashland Creek and other streams "to the highest point they [had] attained for some time." Cold weather returned almost immediately and with it, more snow. The Jacksonville Democratic Times (2/20/1880) called it "the severest winter ever experienced in Southern Oregon." In mid-February almost a foot reportedly fell at Jacksonville within 24 hours; the snowfall turned into a steady rain, which kept "pouring down in copious amounts" for over five days. Structural damage was generally light, but streambank erosion was severe in the Ashland area (Ashland Tidings 2/5/1890); no reports on conditions in the Little Applegate watershed are available.

The next winter, that of early 1881, brought a repeat of the pattern. An early January downpour melted mountain snows in the Mt. Ashland/Wagner Butte area. Bridges across Bear Creek's upper tributaries were destroyed; one of the horses pulling the Linkville (Klamath Falls) stage drowned when the driver tried to cross Emigrant Creek (Ashland Tidings 1/14/1881). In 1883, over a foot of snow blanketed lower Sterling Creek, but the absence of a following chinook evidently allowed the eastern Siskiyou to avoid a major flood that year (Haines 1964:54).

Because of the increased agricultural and residential development of the area during the 1870s-1880s, the great flood of January 1890—although reportedly smaller in volume than that of 1861—did significantly more property damage. The 1890 flood remained the literal and figurative "highwater mark" in local residents' meteorological memory well into the twentieth century. The Democratic Times (1/30/1890) reported that between January 1 and January 24, just under forty inches of snow had fallen in Jacksonville.\(^5\)

Due to blockage of the Siskiyou Pass, south-bound railroad passengers were stranded in Ashland for a week (Ashland Tidings 1/24/1890). By early February, relentless rains liquified the snowpack, stripped away extensive acreages of the Valley's cropland soil, and tore out almost every bridge across Bear Creek (Ashland Tidings 2/6/1890). Railroad trestles and bridges to the north and south, undermined by the waters, had to be closed. Rail service halted for six weeks, isolating Jackson and Josephine counties during what came to be called "the Blockade of 1890" (Ashland Tidings 9/2/1919).

Flood damages in the Little Applegate area are fairly well documented for the 1890 storm. According to long-time residents, the main Applegate River near Ruch reached "five or six feet higher than it had ever been known since the settlement of the valley" (Ashland Tidings 2/12/1890). The undercutting of banks and removal of adjacent topsoil was extensive for miles along the main river. Four different farms along the five-mile Forest Creek/Humbug Creek stretch of the Applegate lost between 15 and 20 acres of bottomland soil each. Bridges, barns, haycrops, fences, and livestock disappeared into the swollen river. On the Little Applegate, Robert Cameron's alfalfa fields (located near the mouth of the river) were seriously damaged when the flood cut a new channel through the middle of his property. Further upstream, the Cantrall place sustained similar damages. In the lower Sterling Creek vicinity, where the January snowpack had reached 38 inches, erosion damage was compounded by deposition of tailings from the mines upstream. The Finley, Gilson, and Saltmarsh farms were either "washed away" or covered with so much debris that much of their land lost its value. The Sterling Mine suffered major damages: mining pipe and nozzles were buried beneath tons of mud; the reservoir washed out and the ditch filled with debris; and the large, expensive derrick (built to hoist boulders out of the mine) was smashed to pieces (Ashland Tidings 2/12/1890).

Subsequent freshets during January 1894, January 1903, and March 1907 again damaged farms

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\(^5\)The measurements were taken by the town's prominent photographer and amateur weather observer Peter Britt on a daily basis, from the north balcony of his photographic studio.
and sections of the railroad (Haines 1964:71, Ashland Tidings 1/15/1894, 1/15/1903, 3/25/1907). Although these three storms seem to have caused the most severe flooding in areas well north of the eastern Siskiyous, the 1903 flood in particular approached the 1890 storm in intensity. Again, croplands in the Bear Creek Valley suffered the most noteworthy damage, but doubtless Little Applegate ranchers had their share of losses as well (Ashland Tidings 1/29/1903).

**Floods of the Twentieth Century**

The relative frequency of major destructive floods in the main Rogue River/Bear Creek Valley seems to have lessened after 1910. The floods of 1927, 1948, 1955, (most especially) 1964, and 1974 are noteworthy. The apparent reduction in the number of destructive floods in the lower Bear Creek Valley may be due to channelization of Bear Creek tributaries such as Jackson Creek and Wagner Creek. In the Little Applegate watershed, although records may not be available to confirm the following supposition, severe erosive floods may have continued to occur with greater frequency than approximately once a decade.

The February 1927 flood carried off bridges in Ashland, swept away homes from the riverfront east of Grants Pass, damaged the railroad, and isolated the valley for several days (Ashland Tidings 2/21/1927, 2/23/1927). The effects in the Little Applegate watershed evidently are not documented. The early January flood of 1948 was less severe than that of 1927; however the Ashland town plaza was inundated and a new fire truck that plunged into Ashland Creek was "lost from sight" beneath the "raging waters" (Ashland Tidings 1/5/1948, 1/7/1948). Again, no description of the flood's effects in the Little Applegate drainage is readily available from newspaper accounts.

The 1955 flood, because of the activity of the U.S. Army Corps of Engineers and others associated with the proposed Rogue Basin Flood Control project, was the first local flood to be extensively measured and analyzed (Atwood 1988). The damage estimate exceeded $4,000,000. Although evidence regarding the actual effects in the Little Applegate watershed are not readily available for this report, Forest Service photographs document extensive road reconstruction work in 1955 at many places elsewhere within the upper Applegate River drainage. The Little Applegate watershed almost certainly experienced severe erosion in 1955.

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16Although no serious flood followed on its heels, the winter of 1901 brought "record-breaking" snows to the eastern Siskiyous; Ashland received over a foot of snow within a few days' time as the thermometer hovered near zero (Ashland Tidings 1/10/1901).

17The lack of road reconstruction photographs for the upper Little Applegate watershed probably does not indicate that the 1955 flood was not severe there; only a few, low-standard Forest Service roads were located in the area at that time.
The late December flood of 1964 caused the greatest property damage on record in southwestern Oregon. Highway bridges collapsed; towns along the Rogue River were evacuated as homes filled with water; and landslides blocked many mountain roads in the eastern Siskiyou (Ashland Tidings 12/21/1964). A similar pattern of destruction, albeit somewhat less widespread than in 1964, came with the more localized January 1974 flood. In both cases, the eastern Siskiyou experienced severe channel erosion, mass-wasting on slopes, and road damage. Localized heavy rainfall-on-snow in the Little Applegate's upper watershed during May 1983 saturated the porous, granitic soils of Wagner Butte, resulting in the nearly four-mile-long "Sheep Creek Slide," one of the largest mass-wasting events of its kind to occur in the Pacific Northwest during recorded history.

D. Droughts and Forest Fires

Long-term periods of "unusually" hot, dry weather were less noteworthy to local newspaper editors than were short-term floods or other dramatic events. Rainfall records, of course, provide the most accurate account of droughts, but regular precipitation and temperature records for Ashland (the earliest "weather station" in Jackson County) were not kept until 1879, and the earliest regular, official weather records for Jackson County date to 1911, at Medford. Using information from available climatological records, supplemented by anecdotal information from local newspapers (particularly articles alluding to unusually severe fire seasons in the eastern Siskiyou many summers in a row), we can infer a general chronology of drought periods that would have affected the Little Applegate River watershed over the past 150 years.

Prior to white settlement, evidence for drought is sparse and totally circumstantial. The winter of 1826-27, when Peter Ogden crossed Siskiyou Pass, seems to have been quite mild in the Rogue River Valley, and snow depth at the Pass was well under a foot in early February. Two winters later, however, H.B.C. fur trader Alexander McLeod encountered very deep snows in the Mt. Shasta and Siskiyou Pass areas during the same time of the year. Based on journals kept by members of the Wilkes Expedition—which contain plentiful eyewitness testimony of dry vegetation, vast forest fires, and dense smoke in the Rogue River Valley—the summer of 1841 was possibly only the latest in a series of annual droughts that may have begun several years previous (LaLande 1991:23-24).

Based on the unofficial Ashland records for the period, 1854-1859 saw lower than "normal" rainfall in the eastern Siskiyou. The earliest well-documented evidence for droughty conditions in the region comes from the Jacksonville newspaper in late summer of 1864:

Never, since white men trod the soil of Southern Oregon, has there been so much fire in the mountains as during the past few weeks. From north of the Canyon [Canyonville area] to the Siskiyou, the fire has been raging with increased fury. Much of the sickness among us at present is attributed to the heated state of the atmosphere, and the immense volume of smoke created by these vast fires (Oregon Sentinel 9/3/1864).

The mountain fires that summer were so widespread and intense that numerous bears were "driven...to the borders of the valley" to seek refuge (Oregon Sentinel 9/3/1864). Due to the severity of the 1864 fire season, it is possible that the early 1860s were a time of overall drought in the watershed.

Dense smoke was a near-annual affliction throughout the 1860s-1900s, but smoke-filled summer skies were especially newsworthy from 1869 through 1874, possibly indicating another dry cycle. In September 1874, the Democratic Times's editor (9/4/1874) remarked that it seemed "as though no year shall pass but what...the country [is] deluged with smoke...the fire [this year] is as bad as ever and the sun can hardly be seen for the smoke." The summers of 1883 and 1885 also saw widespread fires in the foothills of the eastern Siskiyou (Ashland Tidings 1869:23-24).

**Notes:**

18Peter Britt, Jacksonville's pioneer photographer, kept informal records of local temperature and general weather observations intermittently from 1861 through the 1880s, followed by his son, Emil, into the early 1900s; however, these are not particularly useful for this study (see: Britt n.d.). An "unofficial private record" of annual precipitation was kept for Ashland from the mid-1850s until 1865; official precipitation records for Ashland begin in 1879 (Merriam 1936:293).

19The use in this section of newspaper accounts of fire and smoke does not attempt to distinguish between natural or human-caused fire. That discussion is reserved for a later section of the report. (Amount/intensity of fire during any given season does not, of course, correlate directly with drought; high winds and other factors can drive fire intensity even during a relatively moist summer.)

20In contrast to the newspaper account, the unofficial Ashland records for 1864 show that year as having the highest precipitation (just under 30 inches) for the entire 1854-1865 period (Merriam 1936:293). This may indicate either the unreliability of either both sources, or it might be evidence of an extremely wet winter followed by an exceedingly dry summer.
3/7/1883, 8/14/1885). The smoke filling the Rogue River Valley in August 1883 was reportedly thick enough to cause "tourists...travelling through...[to] complain bitterly of the smoke, which prevents them from gaining any conception of the scenery" (Ashland Tidings 8/24/1883). The Ashland precipitation records confirm that 1882 through 1884 saw record low rainfall (Merriam 1936:293). The wheat harvests of 1889 and 1892 withered from drought and other weather-related causes, and the newspaper accounts from those summers indicate severe fire and persistent smoke. The Ashland Tidings editor remarked on September 27, 1889 that "fires are still burning in almost every direction in the high mountains." Again, the Ashland weather records show those two seasons as spikes of very low rainfall (Merriam 1936:293). (See Appendix A; dendrochronological data from the Applegate River drainage suggests a drought during the late 1880s/early 1890s.

Southwestern Oregon, and the Pacific Northwest in general, experienced a dry, fire-plagued summer in 1902, but the summer of 1910 exceeded all previous years in fire severity, possibly resulting in part from the cumulative effects of record low precipitation years, recorded at Ashland in 1905 and 1908 (Merriam 1936:293), and possibly from a sustained period of drought conditions in the forested mountains (see Appendix A for mention of tree growth-ring patterns that may reflect a drought during this period). From August through September 1910, large fires burned in the eastern Siskiyous at such places as Wagner Gap, lower Ashland Creek, and Anderson Creek. U.S. Army soldiers arrived in Ashland by special troop train to help fight the blazes (Ashland Tidings 9/25/1910). Because the above-mentioned places were nearer to heavily settled portions of Jackson County, fires in the adjacent Little Applegate River drainage did not earn as much attention from fire crews, but fires definitely burned at various places in the watershed. These included a "fire proposition" on Glade Creek that grew to newsworthy portions in September (Ashland Tidings 9/8/1910).21

After some relief during 1912 and 1913, large-sized fires returned to the eastern Siskiyou in 1914-1917. The Ashland Tidings for late August 1915 reported a number of fires in the dry foothills of the area, including one that "destroyed some 200 acres of good timber southeast of the Sterling Mine" (8/26/1915). Forest Service records indicate that over 10,000 acres burned within the foothill areas of the Applegate drainage above Ruch (which would include much of the Little Applegate watershed); the agency also reported that 1915 costs for fire suppression on the entire Crater National Forest was $17,000; of that amount, the Applegate Ranger District accounted for over $12,000 (Ringland 1916:7 and 30, Crater National Forest 1916). The summer of 1917 again brought scenery-obscuring smoke (and consequent complaints from tourists) to the Rogue River Valley (Ashland Tidings 8/27/1917). The severity of the drought caused Oregon Governor Withycombe to close the hunting season that year (Ashland Tidings 8/30/1917). As late as mid-October, large areas of the Sterling Creek/lower Little Applegate area were aflame (Ashland Tidings 10/11/1917). Ashland rainfall records (Merriam 1936:293) again confirm the 1914-1917 period as a time of unusually low precipitation.

As the Forest Service successfully implemented an aggressive fire-detection and fire-suppression regime during and after World War One, the number and size of fires in the eastern Siskiyous decreased, significantly lessening their potential usefulness as historical drought indicators. Ashland precipitation records, supplemented by Medford weather data (which commenced in 1911) indicate serious drought conditions from about 1928 through 1935, with the most severe occurring in 1929-31 (Rivers 1963:79). (As with 1905-1910, the 1928-1935 drought seems to be recorded in the growth-rings of trees in the eastern Siskiyou; see Appendix.) Later years of notably high summer temperatures and low annual rainfall in the eastern Siskiyou were 1946-47, 1949, 1959, and 1967-68 (National Oceanic and Atmospheric Administration 1975). The regional drought of the mid-1980s through the early 1990s is simply the latest in a series of drought cycles of varying severity.

E. Section Summary

Compared to the "slow, steady" forces of ongoing erosion, vegetational succession, and climatic change, sudden "natural disasters" such as earthquakes and windstorms—while not uncommon in the Little Applegate River watershed—have probably played a relatively minor part among the overall processes responsible for the area's condition over the past few centuries. One exception would be the erosive and depositional impacts of major flood events within the riparian zone of the Little Applegate River and its main tributaries.

21 Descriptions of the 1910 fires in the eastern Siskiyou indicate that they were, for the most part, light burns that consumed mainly grass, brush, and small trees. They seem not to have been stand-replacement events, pointing toward the probability of much more open forest than now characterizes the area (B. Rose 1995: p.c.).
IV. INTERACTIONS:
Human Activities and Their Effect on the Landscape

Part IV is the core of the report. Questions and interpretations regarding human/environmental interactions are grouped into five major topics: streams and the dependent fishery, terrestrial wildlife, soil and vegetation relative to the effects of grazing, soil and vegetation relative to the effects of logging, and soil and vegetation relative to the effects of anthropogenic fire. The temporal focus of the discussion extends from ca. 1800 until about 1950.

Sections IV-A, IV-C, and IV-E are probably most important for a historical understanding of the Little Applegate River watershed's current environment. However, the environmental effects of recent (i.e., post-1950) timber harvest and related activities such as road building—although doubtless extremely important within the eastern Siskiyous—are barely addressed in this report.

It is important to stress once more the scanty and ambiguous nature of much of the historical data. Much of what follows is conjectural, even speculative, in nature. It is offered in a spirit of inquiry and probable interpretation, not certainty, about the area's environmental history.

A. Streams and Fish Habitat

This section summarizes major hydrological interactions of past human activities. It includes water quality, water quantity, and fish populations.

Native Fishing

Prior to Euro-American settlement, most of the anadromous fish of the Applegate River probably were taken by the Dakubetede people who inhabited the lower drainage and used the upper drainage during the warmer seasons. Anthropologists have commented that the fishery management practices (including annual rituals) of the native groups of the lower Klamath River helped ensure adequate fish harvests to all groups along the river, including those living far upstream (Swezey and Heizer, in Blackburn and Anderson 1993: 299-327). This helped reduce inter-group conflict and perpetuated the return of the fish. For the much smaller and shorter Applegate River drainage, inter-group conflict may have played a much lesser role (i.e., the Taklema and Shasta people probably used the upper Applegate River drainage mainly during the warm seasons, for hunting and gathering, not fishing).

Due to the lack of upstream, fishery-dependent neighbors in the Applegate River drainage, Dakubetede fishermen likely would have had only self-imposed restraints on their take of salmon and steelhead. Whatever the actual situation among native groups of the area, based on Port's (1945) account about a sizable village with numerous "salmon-drying racks" at the mouth of the Little Applegate, fish seem to have been abundant in the Applegate River during "contact" times. In addition to Port's account about a sizable Indian village with numerous "salmon-drying racks" at the mouth of the Little Applegate in the early 1850s, local newspapers featured recollections by pioneers that "in the early days" (ca. 1850s-60s) southwestern Oregon rivers were "literally full of fish" during the spawning runs (Ashland Tidings 2/26/1906). Native people seem to have benefited from the Applegate River fishery without having an appreciable impact on the quantity of the resource.

It is likely that dip-nets, spears, and other fishing tools were used on the Applegate and the Little Applegate rivers, as they are known to have been used on the nearby Rogue River. Additionally, Rogue River Valley inhabitants took exhausted, dying spawners, probably in large quantities (LaLande 1991:20-21). As mentioned previously, it is unknown whether local native people used weirs or other "mass-take" methods of harvesting fish (as some of their northern California and southwestern Oregon neighbors are known to have done). Even if such methods were used, the apparently small number of people in the Applegate Valley probably would not have had a significant impact on fish populations, except possibly as a minor contributing factor during times of oceanic current fluctuation or other stress.

Beaver Trapping

The nearly annual trapping forays by the Hudson's Bay Company from the late 1820s through the early 1840s probably put heavy pressure on beaver populations of the drainage. The H.B.C.'s "fur desert" policy—as well as occasional incursions by American competitors—likely lowered beaver populations
A sudden absence of beaver throughout the upper watershed from the 1830s into subsequent decades, and the consequent down-cutting and in-filling of dammed ponds in headwater locales such as McDonald Basin and Monogram Lakes, would have resulted in various subtle hydrological changes. Some slight lessening of downstream water volume during the warmer seasons (due to loss of storage capacity in the upper watershed) may have occurred; this likely would have been localized along low-gradient reaches of tributaries such as McDonald Creek, Dog Fork, Bear Gulch, and Yale Creek (B. Bessey and M. Zan 1995: p.c.). Water temperatures might have risen somewhat above previous norms during these times as well. It may be that the resident, as opposed to anadromous, fish population, particularly that of the middle and upper sections of the Little Applegate watershed, were most seriously affected by the temporary disappearance of beaver. However, if beaver dams (as opposed to bank-dwelling beaver) were once common along the lower river (i.e., damming flows along side channels, not the main river channel), the resulting pools would have provided ideal habitat for juvenile coho salmon and, to a lesser extent, juvenile steelhead trout. Beaver eradication thus would have impacted the anadromous fishery as well.

The hydrological impacts of beaver trapping, together with cloudbursts and floods before 1850, could have begun a period of human-induced stress on the fishery that grew exponentially with the mining and irrigation activities of the late nineteenth century.

Mining

Early miners of the Applegate River drainage reportedly found salmon to be far more plentiful in their sluice boxes than gold. The fish would "pile up and fall into a sluice box in the river and men would pick them up in gunny sacks" for fresh fish dinner or for sale in Jacksonville (Port 1945:5).

Small-scale placer mining of the 1850s-60s definitely would have increased sediment in the Little Applegate River during both the chinook and the coho runs of fall, with the amount of sediment possibly increased above normal levels during these species' juvenile winter residence in the river system. However, the total turbidity and sedimentation attributable to numerous pick-and-shovel miners along lower Sterling Creek, for instance, may not have been significant when compared to that originating from natural winter causes (e.g., the floods of 1852 and the 1860s). Spring-spawning winter steelhead, particularly the fingerlings resident during the summer, would have been affected to a much lesser degree, due to the timing of most placer operations.

The 1870s and subsequent decades brought large-scale hydraulic mining to the lower Rogue River drainage, including much of the Applegate River watershed. Therefore, it is difficult to isolate the actual effects of the hydraulic mines located within the Little Applegate River drainage from those caused by mines elsewhere, both above and below the mouth of the Little Applegate. Nevertheless, in wintertime the Jacksonville newspapers commented regularly during the period that the Applegate River was "running brick red" in color from all the mining sediment (Democratic Times 1875-1882: passim, Rivers 1963:21). The Sterling and Gin Lin enterprises on the Little Applegate doubtless were among the major contributors (if not the major contributors) to the Applegate River's notable turbidity. During the mining seasons of the late 1870s through the 1880s, the two large Little Applegate mines possibly dumped a combined average load of over 1,500 cubic yards of sediment into the river each day. In addition, as occurred during 1890, tailings that had been dumped adjacent to the streamcourse could be "recaptured" by unusually high flood waters, with dramatic sedimentation results downstream (Haines 1964:54; see Part III-C above).

Hydraulic mining created seasonal turbidity during times of normally high water; therefore the adverse effects of mining on water quality and fish habitat were less than they would have been had mining taken place during the lower water levels of late spring and summer (warm season mining characterized some other sections of the western United States, but there the weather regime created the highest normal flows during that same period). However, the sifting of redds along the lower Little Applegate and on down the main Applegate River would have begun during the fall spawning season for chinook and coho/silver salmon. Further, the sediment load in these same stretches would have been most severe during the winter and early spring, the critical rearing times for juvenile chinook and coho.  

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22Rivers (1963:22) states without reservation that mining "was one of the first inimical factors contributing to the decline of the Rogue River fishery," and concludes that the fall chinook and silver runs suffered by far the greatest damage from mining. Rivers' report contains some errors regarding the timing of mining and settlement in the Rogue River drainage, but overall his account is historically accurate. He points out that studies commissioned by the Oregon State Department of Geology and Mineral Industries (e.g., Baldwin 1936) tended to be biased in favor of finding no adverse impact on fish from mining activity.
Figures 9 and 10 Two views of the Sterling Mine, ca. 1910. (The 4-digit numbers on the photos are original negative numbers, not years.) (SOHS #14943 and #14942)
It is likely that anadromous fish, especially coho salmon, that spawned and reared in the lower and middle Little Applegate and in lower Sterling Creek were most directly and severely affected by hydraulic mining. Most obviously, whatever spawning potential there might have been along those reaches would have been largely obliterated. High sediment deposition would have eliminated aquatic insects and reduced or eliminated rearing habitat for most small fish. However, much of the finer sediment load from the Little Applegate mines flowed into the main river, impacting the spawning grounds preferred by most chinook salmon as well; Rivers (1963:21) references early twentieth-century studies that found lower Applegate gravel bars, exposed at low summer levels, as "tightly sealed with layers of silt from one-eighth to one-quarter of an inch thick." The same writer (1963:81) cites another study that indicates that mining contributed to a decline in aquatic insect populations. Rivers (1963:21-22) also points out that, although early analyses of mining-sediment effects on fish were inconclusive at best, mining seems to have been the main cause of the fishery's decline. Rogue River fish-packing records from the mid-1870s through the 1880s—the period of most intense hydraulic mining—shows a decline in volume that "more closely parallels the years of hydraulic...mining than those of commercial fishing." In addition, the fall runs were apparently more severely affected than the spring spawning runs of the more hardy and adaptable steelhead.

Figure 11 Ca. 1900 view of confluence of turbid Sterling Creek (left) with Little Applegate River. Photographer's original caption states "showing clear and muddy water." (SOHS #14941)

Diversion of water from the upper Little Applegate into mining ditches normally took place during times of highest flow; hence, the immediate effect of lowered water quantity along the affected reaches probably was not severe. (A possible exception was the "Greely Ditch," built on Greely Gulch in 1875 by Horace Seibert [Whistler and Lewis 1916:50]; this diversion of one of the river's headwater streams may have caused substantial reduction in flows along an important reach used by resident trout.) Periodic late spring mining, however, may have resulted in abnormally low waters immediately below the intakes of the large-capacity Sterling and Gin Lin ditches, stressing the coho juveniles in those stretches. Further, the Sterling Mine's reservoir (built in 1885), which would have been allowed to fill from spring through early fall, may have caused unnaturally low water levels along lower Sterling Creek during the warm season, impacting not only coho juveniles of the lower Little Applegate but also resident trout (i.e., whatever cutthroat or rainbow trout that may have been able to survive the silty torrents of the mining seasons by wintering in the upper Little Applegate and its tributaries). A similar but smaller capacity reservoir at Gin Lin's Little Applegate's diggings impounded a small tributary of the lowermost reach of the river (Crater National Forest 1912 [Jinkson homestead claim exam.]:2) but its effect would have been quite minor.

Due both to the smaller size of the mines in the 1930s and to the required use of settling ponds, renewed placer mining of the Depression had less effect on water quantity, quality, and fish habitat than did earlier operations. Hard-rock mining in the Little Applegate watershed probably produced little or no impact to the streams or fishery. The question of possible mercury poisoning from the Brickpile cinnabar retort is a valid one, but the mercury production was apparently so small and short-lived that conclusions about toxic impacts are problematic. The hydraulic mines of the last quarter of the nineteenth century definitely left the mining industry's most dramatic environmental legacy to the area's water values.

Commercial and Recreational Fishing

Commercial exploitation of the Rogue River's anadromous fishery began on a small scale in the 1860s. In the late 1870s, Robert D. Hume established his large salmon cannery at the mouth of the Rogue and experimented with the river's first hatchery. Hume maintained a virtual monopoly of commercial fish take on the lower river during the late nineteenth and early twentieth centuries (Rivers 1963:36-38). Intense commercial fishing on the lowermost river—which included use of gillnets (both set and drift), beach seines, traps, and weirs—put very heavy pressure on salmon and steelhead populations from about 1885...
until complete commercial closure of the river in 1935. Various restrictions, beginning in 1913, had been enacted by the state but proved ineffective because of increased poaching and lack of law enforcement (Rivers 1963:43-46). Rivers (1963:36) ranks commercial fishing among the three major contributors to the fishery's decline (along with mining and irrigation diversions).

Although the lower Rogue's fish harvest definitely lessened the number of fish that reached the Applegate River drainage, commercial fishing was a much lesser factor within the drainage itself. Nineteenth-century Jacksonville newspaper articles make scattered reference to "fish wheels" operating on the Applegate, but these were probably very small affairs. The Ashland Tidings for February 26, 1906 mentions a large and productive set-net on the Illinois River, about twenty miles above its confluence with the Rogue, so it is possible that set-nets also operated on the lower Applegate during the early twentieth century. Within the Little Applegate watershed, William Cameron apparently indulged in the only documented commercial fishing on the river; his fish trap, situated at or near the mouth of the river, operated during the 1860s and supplied fresh salmon to hungry miners at 25 cents a fish (Black and Black 1989:59). (However, it is likely that throughout the late nineteenth at least some salmon and steelhead were snagged from local sluice boxes and irrigation ditches, with some of the fish sold commercially.)

Recreational fishing for steelhead on the Rogue River became popular soon after 1900; salmon fishing by recreational anglers grew after 1935. Very few sportsmen fished the Applegate for anadromous species however (Rivers 1963:51-53). Neither commercial harvest nor recreational take of anadromous fish within the upper Applegate/Little Applegate system seem to have had much affect on the population. Downstream fishing activity had by far the greatest impact on the local anadromous fishery.

The resident trout population of the Little Applegate probably experienced steady, if relatively low, pressure from anglers, primarily members of local ranching families. Extension of a rough auto road into the headwaters of the river during the 1930s probably increased the number of Jackson County anglers who fished this stretch. This supposed increase would have coincided with improved enforcement of catch limits by the newly formed Oregon State Police, and so the impact of angling upon the resident fishery of the Little Applegate was probably not adverse.

Irrigation Ditches and Dams

According to a Forest Service land appraisal report (Sproat 1927:3), early-twentieth-century state water records showed the lower Applegate River at Murphy (south of Grants Pass) as having a flow of almost 1,500 cubic feet per second in December, 240 c.f.s. in July, 40 c.f.s. in August, and just under 50 c.f.s in September. In contrast, lower Yale Creek, one of the Little Applegate's main tributaries, had an average summer flow of less than 10 second feet (Crater National Forest 1914 [Pursel homestead claim exam.]:2). The upper Little Applegate, near Wagner Gap, had a late summer flow of 4 second feet and lower Glade Creek a late summer flow of 3 second feet; winter maximums were estimated at 80 second feet and 20 second feet respectively (Whistler and Lewis 1916:51).

The irrigation diversions, large and small, that proliferated in the Applegate Valley as a whole during the late nineteenth and early twentieth centuries probably resulted in an over-allocation of water by about 1900 at the latest; many newer water rights could not be fulfilled during average summers and some water-rights owners were refused water in the 1920s as early as May (Sproat 1927:3). Compounding the more localized water-quantity problem caused by 1880s-1920s irrigation along the lower Little Applegate was the development of Talent Irrigation District's "McDonald Canal" in the 1920s. This large-capacity diversion, following a precedent set in 1897 when the Greely Ditch was extended to Wagner Gap (Whistler and Lewis 1916:50), carried water from the upper Little Applegate watershed and dumped it into the Wagner Creek drainage.23 Adding to the water-quantity problem of the critical low-flow summer period in the 1920s was the reopening of the Gin Lin Ditch for irrigation purposes (Crater National Forest 1925 [Fisher homestead claim exam.]:n.p.). Irrigation demands on the Little Applegate lessened its in-stream water volume in the summer months, with the most serious impact on juvenile steelhead, coho, and--in the upper reaches--on resident trout. Because of growing irrigation demands, the period from the 1890s through the 1920s probably saw a steady, human-caused decrease in flow levels along

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23 In their engineering feasibility study for the proposed McDonald Ditch, Whistler and Lewis (1918:54) estimate the mean monthly flows of the upper Little Applegate (measured at 4,200' a.s.l.) as: April=20 sec.ft., May=50 sec.ft., June=40 sec.ft., July=25 sec.ft., August=15 sec.ft., September=10 sec.ft.

The Talent Irrigation District's McDonald Ditch has water rights for up to 46 c.f.s, but it rarely carries more than 12 c.f.s. (M. Zan 1995: p.c.).
the entire river, with a concomitant effect on steelhead and resident trout populations. Irrigation withdrawals have continued to be a major limiting factor in the Little Applegate's anadromous fishery.

A second factor in local fish decline was the near-total absence of fish screens at ditch diversions until the mid-1940s. The large quantities of anadromous and (and doubtless some resident) fish--diverted with the water into ditches--dying and rotting in irrigated fields caught the notice of local newspaper editors by 1900 at the latest (Rivers 1963:25) and was probably a regular occurrence well before that. State efforts to require irrigators to screen ditch intakes were unsuccessful during the early twentieth century; development of the Oregon Rotary Fish Screen and transfer of screening responsibility to the state game commission finally remedied the situation by about 1947 (Rivers 1963:24-26). The 1910-1945 period evidently witnessed the highest fish mortality in the Little Applegate that was associated with irrigation.24

Irrigation dams, as well as ditches, acted as fish-killers. A 10-foot high log dam, built in 1899 on the lower Applegate near Wilderville, was without a fish ladder until about 1918 (Rivers 1963:31-32). This and other, smaller dams made fish passage difficult, particularly for spawning runs during low-water years.

Riparian Vegetation Change

The relative magnitude of logging's hydrological impacts compared to that from other activities is the subject of continuing controversy. However, the effects of timber harvest and associated activities on water quality, water quantity, and fish habitat in southwestern Oregon are generally agreed to have been substantial.

The character of the pre-1870s lower Little Applegate River is uncertain. The river may have been significantly wider and more meandering than it is today, but General Land Office survey plats suggest that its 1850s streamcourse (at least where crossed by section lines) was quite similar to the river's present course. Based on mid-nineteenth century accounts from elsewhere in western Oregon, the lower river (and tributaries such as Sterling Creek and Yale Creek) was probably lined by an open gallery of large conifers and hardwoods, which shaded the water and stabilized the stream banks.25 It was these same readily accessible, mature ponderosa pines and Douglas-firs growing within or adjacent to the riparian zone that would have been among the first cut down by miners and farmers, leading to increases in water temperature. Mining and winter grazing along the banks subsequently kept these species from reestablishing themselves in large numbers; instead the riparian zone tended to be revegetated by dense thickets of alder, willow, maple, and other deciduous trees. Livestock ranchers may have occasionally cleared willow from riparian areas in order to increase forage; this was a common practice in the southern Cascades (M. Mamone 1995: p.c.).

Periodic floods, the erosive effects of which were exacerbated by the loss of conifer root systems, ensured that few large conifers returned to the riparian zone. According to local old-timers, streams in the agricultural Bear Creek Valley suffered noticeably more severe bank erosion during the 1890 flood because of the removal of trees from the streamside than had been the case during earlier, pre-logging floods (Ashland Tidings 2/6/1890). The Little Applegate may have been similarly affected. Ironically, hydraulic mining may have widened the lower Little Applegate's channel, thereby reducing flood erosion in those stretches.

B. Wildlife

The terrestrial fauna of the eastern Siskiyou included herds of ungulates such as black-tailed deer, Roosevelt elk, and---along the highest sections of the Siskiyou Crest---small populations of bighorn sheep (Bailey 1936:65 and 69). Pronghorn antelope formerly inhabited the Rogue River Valley (Bailey 1936:71), and conceivably on occasion a few of these animals wandered into the upper Applegate Valley via the Jackson Creek/Poorman Creek divide. Large predators included bobcat, cougar, red fox, coyote, gray wolf, black bear, and grizzly bear. Various rodents, hares (jackrabbit), and mustelids were quite common. Numerous species of birds were native to or migrated through the area; band-tailed pigeons were among the first cut down by miners and farmers, as formerly shaded with large pines and without the dense thickets of alder, maple, and poplar present today.

24Rivers (1963:26) suggests that the loss of fish due to unscreened ditches "reached a peak in the late 1930s and early 1940s." This would have compounded the long-term loss from irrigation-caused lowered stream levels during the preceding three decades. He further identifies irrigation as the major historical culprit in the decline of the Rogue River fishery in comparison to mining and commercial fishing.

25This historic appearance is confirmed by information from the writer's personal interview with a long-time Applegate Valley resident, the late Hazel Swayne, who described sections of the Applegate River between Ruch and Star Gulch as formerly shaded with large pines and without the dense thickets of alder, maple, and poplar present today.
Native Subsistence

Dakubetede, Takelma, and Shasta hunters took a variety of mammals and birds for food and for other purposes (e.g., hide clothing, bone tools, feather adornments). Much deer hunting was done by cooperative groups, using dogs to help drive the game en masse, and in winter men on snowshoes would take advantage of the slowness of deer or elk when crossing deep, crusty snow, clubbing a number of them as the animals became exhausted from the chase (Dixon 1907:420). (Grizzly bear were also hunted, not for food but as an individual or group power-seeking quest.)

Occasionally, very large numbers of animals might be killed during a single drive, causing a localized and temporary population decline. However, animal numbers probably waxed and waned more significantly with climatic/vegetational change and disease cycles; predation by the relatively small human population was simply one of several lesser factors.

Commercial Hunting and Anti-Predator Hunting

Trapping led to the near extirpation of beaver in the eastern Siskiyous. Later trapping probably lowered significantly the population of other fur-bearers (especially high elevation mustelids such as marten, fisher, and wolverine) by the turn of the century. Commercial hunting of the Little Applegate watershed's ungulates (for food, hide, and other products) began in the 1850s. Bighorn sheep, never plentiful, evidently disappeared (likely due to both hunting and introduced disease) before 1860. The large mining population and lack/high cost of staple foods during much of that decade would have resulted in near-decline of the deer and elk herds in the lower watershed. Driven down to lower elevation hills and streams by winter snowpacks, the animals were welcomed by scores of hungry, well-armed miners. For example, William Hamilton, an early-day Bear Creek Valley settler, recalled that during the winter of 1852-53, when "game was [still] plentiful," he kept "the carcasses of from 20 to 25 deer hanging in front of [his] cabin" at all times; passersby were allowed to help themselves (Ashland Tidings 1/12/1903). Although the heavily hunted deer population ultimately survived and then rebounded, elk herds disappeared from the eastern Siskiyous by 1890-1910 (Bailey 1936:82), although a few of the animals remained as late as the 1920s (LaLande 1980:87).

Migratory waterfowl visiting the lower Little Applegate, vulnerable to the disturbance of hydraulic mining as well as hunting, may have declined rapidly during the late nineteenth century. It was a newsworthy event when Gin Lin's Little Applegate miners aimed a hydraulic giant at a flock of low-flying Canadian goose and knocked two of them out of the sky (Oregon Sentinel 12/4/1878).

As deer and elk numbers declined, the largest predators became unwanted competitors with human hunters. And as stockmen ranged herds of cattle and sheep in the uplands of the Little Applegate watershed, these same carnivores were targeted by extermination campaigns. Wolves were virtually extirpated from the eastern Siskiyous by 1890, although a handful remained in northeastern Jackson County as late as 1914 (Bailey 1936:273). A $2.50 bounty on coyotes during the 1890s put cash in the pockets of many rural residents (e.g., Ashland Tidings 2/19/1892), but--despite once-aggressive poison baiting--they have survived, even thrived, in the watershed. Cougars (called "panthers" by early settlers) were also aggressively hunted for bounty; by 1910 they were still "common" in the area, but over the next 25 years, a concerted campaign reduced their numbers throughout Oregon significantly (Bailey 1936:262). Forest Service grazing reports for 1916, a year of extremely high livestock numbers, indicate that predators were not a problem; none were killed on the Little Applegate range allotments (Crater N.F. 1916:2 and 4).

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27 Elk have recently returned to the upper Little Applegate watershed, evidently migrating north from the south side of the Klamath River canyon to the Siskiyou Crest.

28 Due to a number of factors, including increased feed from pastures, golf courses, and lawns throughout western Oregon, both migratory and year-round resident the Canada goose have greatly increased their numbers in the Applegate and Rogue River valleys in recent years. In about 1970, a rancher living in the Applegate Valley, near Provolt, began raising flocks of the Great Basin subspecies of Canada goose; the birds thrive and spread beyond the Applegate Valley. Many of the geese currently resident in the Rogue River Valley are thought to be descended from the Applegate flocks; others migrated from the upper Klamath basin, via the southern Cascade Range, in about 1975-80, after nests were provided at Howard Prairie and Hyatt Lake reservoirs (M. Wolfer, Oregon Dept. of Fish and Wildlife 1995: p.c.).
The most famous and dangerous of southwestern Oregon predators was the grizzly bear. Although shot at whenever encountered, grizzlies apparently remained plentiful throughout the 1850s. Newspaper accounts from the 1860s, however, indicate that the animals were becoming more scarce due to hunting. A young, 500-pound male bear was killed in the Applegate Valley in June 1860 (Oregon Sentinel 11/10/1860); in 1866 a grizzly made a newsworthy if unwelcome visit to a herd of cattle near the mouth of Sterling Creek; it escaped into the mountains unharmed (Oregon Sentinel 4/21/1866). By the 1870s accounts of grizzlies in the eastern Siskiyou faded from the local press. Instead, during the 1890s, the region's few remaining bears made their final stand in the High Cascades to the east; the long-sought "Old Reel-Foot" was killed near Pilot Rock in 1891 (LaLande 1980:134) and the "Cat Hill grizzly," another notorious cattle-slayer, was killed near Mt. McLoughlin in 1897 (Ashland Tidings 5/10/1897). Although a few of the animals apparently remained in remote sections of southwestern Oregon after 1900 (Bailey 1936:325), they would have been gone from the comparatively well-peopled eastern Siskiyou by 1870 or 1880 at the latest.

In summary, the progression of hunting pressure on large mammals within the Little Applegate watershed probably followed this pattern: 1850s-60s: a sharp and massive decline in ungulates, with elk eventually becoming locally extinct for nearly a century; 1870s-80s: local extirpation of wolves and grizzly bears accomplished, with a related, very gradual rebound in deer population; 1880s-1910s: extirpation of wolverine; marten and fisher become exceedingly rare; 1890s-1930s: ongoing predator control lessens cougar numbers, high elevation trapping reduces fur-bearers, implementation of game regulations leads to steady expansion of deer population.

Grizzlies bedeviled early explorers of the region, including Peter Ogden and the Wilkes Expedition. Both Bear Creek and Grizzly Peak were named for the ferocious bruins that inhabited the Rogue River Valley region. Bear Creek received its name in 1851 when packers killed three bears they found feasting on the carcass of an ox (Ashland Tidings 11/17/1913). Grizzly Peak was reportedly named in 1855 or 1856, when local settler Henry Chapman had a near-fatal encounter with a bear on the upper slopes of that mountain (Ashland Tidings 6/29/1926).

30By the late 1980s, a few elk, evidently descended from herds planted by California and/or Oregon authorities in areas to the southwest and east respectively, were reported for the uppermost elevations of the Applegate River drainage.

C. Soil and Vegetation Cover:  
The Effects of Ranching/Grazing

In addition to low-elevation agricultural activity during the nineteenth century (which encouraged the spread of Himalayan blackberry, teasel, mullein, and other exotic weeds in cultivated areas), livestock grazing began affecting the soil and vegetation of the Little Applegate watershed in the mid-1850s. Its most severe consequences (some of which remain visible today) occurred in the upper watershed during the 1890s-1920s.

Hogs

Herds of domestic (and later, feral) swine ranged throughout the drainage, but their activity probably concentrated within the lower elevations. Early-day southwestern Oregon pioneers (e.g., Riddle 1953) recalled that the settlers' mast-loving hogs depleted the annual acorn crops, contributing to the stress on native people by 1853-54. The animals also competed with local Indians for camas and other important edible bulbs, as well as with quail and other ground-feeding birds for manzanita berries. Hogs apparently grubbed up poison oak roots for food, and poison oak consequently became relatively less common in the interior valleys of southwestern Oregon during the days of free-ranging swine than it had been previously (or was to become in later decades, after hogs were no longer a significant factor) (Pfefferle 1977:111).

Overall, the major impact of hog grazing on the watershed's soil and vegetation would have been limited to oak woodland, transition pine forest, and moist or dry meadows. Most severely affected would have been the few moist (i.e., poorly drained) grassy areas along the lower Little Applegate; there the hogs may have consumed large quantities of bulbs, roots, and other vegetation (possibly causing major losses in plant populations) and their sharp hooves may have altered the soil profile significantly. On drier open slopes, brodiaea, fritillary, and other members of the Lily family would have been especially hard hit by rooting. Rooting for acorns and fungi would have resulted in substantial disturbance to the topsoil of the oak woodland and transition pine forest areas. With the decline of domestic swine and the "expulsion" of the few remaining feral animals into remote corners of brushy timberland (e.g., see: Ashland Tidings 3/16/1908), the lower areas most affected by hogs otherwise would have begun to recover--were it not for the fact that many of these same areas became fenced winter pasture for other livestock.
Goats and Sheep

The severe, long-term erosive consequences of overgrazing by goats and sheep in many hilly Mediterranean lands are well known to environmental historians. The effects occurred over many centuries, dating back to Hellenic times. These animals were present within the Little Applegate drainage for well under a century and their impact has been on a far smaller scale, although some slopes with sandy, decomposed-granitic soil continue to suffer serious erosion that evidently began with early twentieth-century sheep grazing.

Goats were a very minor component of the local livestock industry, apparently present (and in small numbers) only between about 1890 and 1920. Local goatherders occasionally burned or cut back brushfields in late summer in order to stimulate new growth in the spring (Leiberg 1900:279, Crater N.F. 1913 [Pursel homestead claim exam.]:2), and this may have actually improved forage for wild species as well. Goat grazing had little if any measurable impact within the watershed.

Sheep, however, were present in such numbers and were grazed in such an uncontrolled fashion from the 1880s through the 1920s that their effect on vegetation, particularly in high-elevation meadows, was substantial.

Figure 12. "Severe erosion" on granitic slope west of Siskiyou Peak, "looking north into Little Applegate, green fescue coming in foreground"; upper Bear Gulch, ca. 1950. (RRNF #V-5-12.5)

Further, although southwestern Oregon did not witness deadly "sheep wars" as occurred in central Oregon, local cattlemen resented and resisted incursions by sheep. In 1894, the VanDyke herd of 1,700 sheep ranged in the middle Little Applegate watershed, on the southwest slope of Anderson Butte; this had customarily been cattle range. VanDyke's sheepherder, W. D. Bain, was "burned out" of his camp; when he refused to abandon the area, his meat was surreptitiously poisoned with strychnine (Ashland Tidings 12/14/1894). VanDyke's friends laid the blame at the feet of unnamed cattlemen. Competition for range, although less violent, continued well into the 1910s, with cattlemen purposely salting their herds in such a way as to cause them to stray onto the designated sheep range (Crater N.F. 1916 [Grazing Report]:1). Huge herds of cattle did not graze in the eastern Siskiyou; the conflict is probably more indicative of a declining range resource around the turn of the century.

Sheep grazing concentrated in the headwater meadows of the Little Applegate watershed, including the southwest slope of Wagner Butte (south of Splitrock Creek), all of McDonald Basin, and along much of the entire Siskiyou Crest from Grouse Gap west to Jackson Gap. Forest Service grazing reports of the 1910s portray that area as a range that was in very poor and steadily declining condition (e.g., see: Crater N.F. 1916 [Grazing Report]:1-2, 1917 [Grazing Report]:3). The entire sheep range (i.e., the Siskiyou Crest east of Jackson Gap) was described by Ranger John Gribble as "badly overgrazed," with feed "exceedingly poor" and some areas "totally bare" of vegetation. The reports blame excess head and, by inference, an unwillingness to keep the sheep moving. Overgrazing by sheep caused denudation of the soil with consequent erosion; compaction of the soil by trampling accelerated the erosion, particularly rilling. The continuing erosion problems in the granitic soils of McDonald Basin, Siskiyou Gap, and elsewhere along this section of the Siskiyou Crest can be attributed in large part to the initial overgrazing by sheep between 1890 and 1920.

Figure 13. "Erosion" in McDonald Basin, view to north, Sept. 1963. (RRNF #V-5-13.1)
Sheep herds compacted the soil of meadows and caused the meadows to expand in area; they reduced the organic material in the meadows' soil profile, thereby lowering the soil's water infiltration and holding capacity. Overgrazing by sheep tended to favor the growth of bulbous and taprooted plants at the expense of grasses. These plants in turn are preferred food for pocket gophers, and the current heavy populations of gophers may thus be due, in part, to the effects of past grazing (Laurent 1994:1751-1752). Sheep may also be partially responsible for the current extremely rare occurrence of certain plant species along the Siskiyou Crest (e.g., Tauschia howellii, Saussurea americana [W. Rolle, p.c.]).

**Cattle**

Cattle have grazed in the eastern Siskiyous steadily since the 1860s. Although driven to high-elevation range all along the Crest to the west throughout the nineteenth and twentieth centuries (e.g., Silver Fork Basin, Grayback Mountain), within the Little Applegate watershed they seem to have been largely displaced by sheep at the highest meadows during the 1890s-1920s (excepting Glade Creek/Wrangle Gap/Monogram Lakes). During those years, the northwest slope of Wagner Butte, the south slopes of Anderson Butte and Woodrat Mountain, as well as much of the Yale Creek and Glade Creek drainages remained prime cattle grazing land.

In the lower elevation savannas, meadows, and open forestlands, early and continued disturbance by cattle probably was a major factor in the introduction and spread of exotic plant species such as yellow starthistle. In riverside areas fenced and converted to pasture, of course, the conversion to exotic species was nearly complete. By the onset of World War One, cattle faced seriously depleted range conditions in the mid-elevations of the Little Applegate watershed. The drought years of 1914-1917 were partially responsible, but the Forest Service identified overgrazing (caused in part by poor salting practices by ranchers) as the main culprit for the "very short, poor" feed and the consequent low weight of most animals (Crater N.F. 1916 [Grazing Report]:1).

The entire Little Applegate cattle range was described as "practically ruined by overstocking" (Crater N.F 1916 [Grazing Report]:2). The area between Section Line Gap and the south side of the Sterling Creek drainage were in such poor shape in 1916 that the same Forest Service report urged that cattle be kept off the area for two years or more (1916:2); this was in contrast to the higher elevation meadows of Silver Fork Basin and Wrangle Gap, which were said to be in somewhat better shape. The Anderson Gap vicinity in particular was almost bare of feed. Tarweed grew thickly "on the higher ridges, the "strong odor of which while in blossom permeated the air" (Crater N.F. 1916 [Grazing Report]:3).

Other ca. 1920 Forest Service records describe the south-aspect slopes of the Anderson Butte area as a "spring weed range" for cattle, suggesting that grasses that may have been present prior to heavy grazing were replaced by forbs (W. Rolle 1995:p.c.). Some of the higher meadows on Wagner Butte suffered from too-early grazing, before the grass was sufficiently mature. As cattle steadily replaced sheep along the entire Crest after 1930, their trampling, if not feeding, probably kept the sheep-reduced plant species from recovering. Additionally, desirable grasses, including green fescue (a favorite feed), probably continued to shrink in population between McDonald Peak and Jackson Gap because of intense grazing by cattle during the 1930s to the present. Conversely, false hellebore and unpalatable species increased during these recent decades, and exotic weeds invaded disturbed soil. Forest Service herbarium collections taken from the headwaters of the Little Applegate before 1920 indicate that European weeds had invaded the high meadows by at least 1910 (W. Rolle 1995:p.c.).

**D. Soil and Vegetation Cover: The Effects of Logging**

As discussed previously, native utilization of standing timber focused on sugar pine for lodge planks and other purposes. Other trees were important; for example, higher elevation Pacific yew was used for bows, but this rarely involved harvesting the tree and this species was probably never common within the Little Applegate watershed. Native "logging" would have had virtually no effect on the overall composition and condition of the watershed's forests.

Early commercial logging concentrated almost exclusively on sugar pine and ponderosa pine. Nineteenth-century logging rarely included slash disposal, and branches and other debris would have

31Ranger Gribble seems to credit, at least by implication, the abundance of tarweed (Madia spp.) in the Anderson Gap/upper Sterling Creek area to intensive grazing. However, tarweed was native to the grassy hills of this area, and the native people used to gather large quantities of seeds after scorched the sticky oil off the plants with quick-burning grass fires (Riddle 1953.65). It could be that the presence of tarweed was more a result of local settlers' habit of setting grass and brush fires each summer (see discussion in Part IV-E), thereby unconsciously maintaining previously native-managed gathering areas, than it was a result of overgrazing by cattle.
accumulated in pine stands—increasing the destructiveness of subsequent fires. By 1900 probably all or most easily accessible mature pine in the lower elevation woodlands had been cut. In certain localized portions of mid-elevation forests, such as in the vicinity of the Pursel mills on lower Yale Creek, most pine would have been cut out as well. Mature incense-cedar, split into fence-posts and fence-rails by local settlers, was "high-graded" from mid-elevation timber stands as well. The coveted sugar pines, typically found widely scattered and never in pure stands—had probably become relatively rare as mature trees by 1920. Federal forester John Leiberg (1900:443), describing the timber conditions of Township 39 South, Range 1 West (including the upper Little Applegate drainage near Bald Mountain and Wagner Gap) immediately before the turn of the century, remarked that lumbermen had "culled...and stripped" the forest of "its best timber" over the preceding decades. Oxen teams, assisted by peaveys and gravity, remained the main motive power into the twentieth century, enabling the skidding of large logs down from the more gentle slopes. Steam donkeys apparently did not operate within the watershed to any significant extent. Overall, logging impacts to the soil before the 1950s were very limited and minor.

Fuelwood cutting, which included oak and madrone at lower elevations and Douglas-fir near Section Line Gap and Wagner Gap, contributed to further changes in stand composition within localized areas; medium-diameter, immature Douglas-firs would have been mostly heavily harvested for fuel. Outside of selected sugar pines across a wide area and isolated patches of Douglas-fir near the watershed divide with the Bear Creek Valley, most of the Little Applegate watershed's vast mid-elevation mixed-conifer forest remained untouched by the axe. Within the watershed, a one half-section parcel of pine and fir near Wagner Gap was clearcut in about 1900 (cf. Cowlin 1947); the timber almost certainly was skidded to the Wixtrom sawmill on upper Wagner Creek for milling. A similar sized area on lower Yale Creek was cut out about the same time, probably for the Pursel mill (J.Hellinga 1995:p.c.). The area's highest elevation forests—composed of true firs and mountain hemlock—were totally unaffected by logging during this period. Logging prior to the 1940s had reduced the number of mature trees of the most valuable species, especially in certain locales of the watershed; a 1920s Forest Service land appraisal report (Sproat 1927:4) states that cutting of timber had occurred "only on small patches" in the Little Applegate's mixed-conifer zone. However, in some of these areas (the north side of the Little Applegate drainage near Anderson Butte, for example), "full reproduction [from previous fires and logging] had[d] not come back" and soil erosion was evident (Sproat 1927:6). Overall, the impacts of logging before World War Two were minor in comparison to the effects that came after the War.

Recent Decades: Intensive Timber Management

Production of light-weight chainsaws, construction of truck roads, and development of sophisticated cable-yarding systems for use on steep slopes revolutionized the logging industry of southwestern Oregon after World War Two. Virtually the entire Little Applegate River watershed, including the high-elevation true-fir forest, was opened to intensive timber harvest during the 1950s-70s.

The first clearcutting of National Forest timber within the Little Applegate drainage occurred in Section 15, T40s, R2W, on Yale Creek, in 1947. Clearcutting spread throughout timberlands within the watershed in the 1950s (J. Hellinga 1995: p.c. and Little Applegate timber-harvest history data on file). Selective logging ("high-grading") with tractors, which concentrated on harvesting large-diameter trees, occurred on many relatively steep slopes during the late 1960s and into the 1970s, including the highly erodible granitic terrain around Wagner Butte. Tractor skidding also caused soil compaction, lowering the site productivity of the affected land. Although on some soils within the eastern Siskiyous, post-logging germination of conifer seeds was plentiful along the route of tractor skid-trails, these seedling patches often proved short-lived or experienced a severe lack of growth in height and diameter after a few years (G. Badura, 1994: p.c.).

Clearcutting and, by the late 1970s, shelterwood harvest created a spreading patchwork of intensively managed timber units. After removal of commercial timber and burning of slash, harvest units were replanted (by the 1980s with genetically improved seedlings). Between the 1960s and the mid-1980s, many plantations were treated with herbicides to control the growth of competing brush species and thereby benefit the planted tree seedlings; seedlings also might be protected from drought by paper mulching and from hungry animals by "vexar" tubing (deer) or poison bait (pocket gophers).

Post-harvest "site preparation" (for replanting) and fuels management (e.g., terracing, machine piling, windrowing) often led to scalping of the topsoil down to mineral soil, with consequent loss of water-holding capacity, nutrient cycling, and increased erosion. Much of this activity, particularly that occurring on south slopes with shallow soils, was done with little
regard to a specific site's soil characteristics; in some cases, long-term loss of soil productivity resulted. "High-grade" logging, which tended to leave behind more disease-prone species and individuals, has been a major factor in the spread of tree diseases in the eastern Siskiyous, particularly root rots and dwarf mistletoe (D. Goheen 1995: p.c.).

As has occurred elsewhere in the Pacific Northwest and northern California, certain animal species dependent on large bodies of "old-growth" conifers were threatened with declining populations by the 1970s, eventually leading to the listing of the northern spotted owl as a threatened species (under the Endangered Species Act) and, in 1991, to a virtual halt to logging on federal land within the watershed.

Even-aged, intensively managed reforestation stands of nursery-raised ponderosa pine and Douglas-fir became a major legacy of the 1960s-80s. Furthermore, very few stands in the over-200-years-old age-class remain in the watershed and--due to both harvest practices and fire suppression--large areas that once contained large-diameter pine now support dense stands of trees (especially the less fire-tolerant Douglas-fir and the fire-intolerant white fir) that are less than 100 years in age (U.S.D.I. and U.S.D.A. 1994:20-21).

Approximately 440 miles of roads now wind through the Little Applegate River watershed (approx. density: over 3.0 miles per section). Many of them cross steep terrain, in places altering water drainage patterns. For example, the Rush Creek road, located on private and B.L.M. land, has poured substantial sediment into the river for many winters. As in other portions of southwestern Oregon, logging roads have increased peak flows, transferred runoff from one drainage to another, and blocked fish access to some sections of streams. Clearcut harvests and construction of access roads increased the amount and frequency of debris slides and surface erosion during storm events; as revegetation progresses, this trend will probably reverse. Exotic plants, such as mullein and thistles, have spread along the network of logging roads and harvest units. Exotic grasses seeded for soil stabilization and wildlife/livestock feed along logging roads and within timber harvest units have resulted in the spread of additional non-native species. Soil compaction, particularly in tractor-logged areas, lessened the site-potential of some areas for several decades.

E. Vegetation Cover and Air Quality: Effects of Human-Set Fire

When the greater percentage of fires in a given region may be attributed to human agencies, the problem then is not so much one of protection technique as one...of the social anatomy of the community--of the human element in its relation to the Forest.

(Arthur Ringland, Forest Service inspector, on the "fire problem" in the eastern Siskiyou Mountains, 1916)

For centuries, fire--whether natural or human-caused--has been a major factor, probably the major factor, in producing the eastern Siskiyous' mosaic of various vegetational communities and forest age-classes. As early as 1916, Forest Service specialists identified the eastern Siskiyous' grassy southwest slopes as "the result of repeated fires hundreds of years ago (Crater N.F. 1916 [fire history]:n.p.) Until recently, recognition by scientists and historians of the vast scale and key importance of prehistoric anthropogenic fire in shaping the forests and grasslands of North America was barely acknowledged. Over the past two decades this situation has changed dramatically (e.g., Lewis 1973, Barrett and Arno 1982, Pyne 1982, Boyd 1986, Teensma 1987, Agee 1990, Williams 1994, MacCleery 1994).32

The significant role of native peoples in creating or maintaining extensive "natural" landscapes across the continent is now widely and prominently credited in the professional and popular literature, so much so in fact that discussion of the subject may soon become something of a truism. It would be wise, therefore, to recognize the continuing ambiguity we face in ascribing prehistoric and early historic fire origins. In the current and long-overdue effort to recognize the importance of anthropogenic fire (whether set by prehistoric or historic-period populations), there may be discernible on the part of some commentators a resulting inclination, albeit perhaps an unintended one, to slight the importance of natural fire in the overall scheme (e.g., Zybach 1994:13). A tendency--possibly over-compensating for past sins of omission--to ascribe all or nearly all low-intensity/high-frequency fire to human origins, while leaving to lightning the credit for high-intensity

32Fire (through its influence on forest stand densities, structure [number of canopies], age-class, and species composition) has acted as a major determinant in insect and disease activity. Frequent fires, especially the low intensity fires that apparently characterized much of prehistory, fostered generally healthy forests in the American West (D Goheen 1995:p.c.).
stand-replacement conflagrations, would be simplistic.

Some, even many, human-set fires had perhaps unintended consequences in terms of the extensive size and high intensity of burn. Conversely, surely many of the "light burns" of prehistory now credited to conscious native design actually resulted from natural causes—for example, a lightning fire that burned long and slow through a dense mixed-conifer forest stand and eventually broke out into grassy woodland, mimicking the role of native-set fires in maintaining the "open, park-like" nature of such areas. The fire might appear as simply one more "low-intensity-burn" cat-face scar in the growth-ring count of a ponderosa pine.

In the eastern Siskiyou, as elsewhere, fire was definitely a key environmental player, no matter whether it originated from a native woman's burning torch or from one of Nature's lightning strikes. The following discussion focuses on anthropogenic fire while recognizing that natural fire may have been equally important, especially in the Little Applegate watershed's extensive mid-elevation, mixed-conifer forests.

Changing Patterns of Burning

Assuming that humans have fired the grasslands, brushfields, and forests of the eastern Siskiyou since at least the end of the "Xeric Maximum" of the mid-Holocene, their reasons for burning have been many.

Native-set fires had both short-term and long-term goals, with strategies ranging from preparing a tobacco plot for planting later that year to ensuring adequate acorn-bearing trees several decades after a fire was set. Fires were generally set either during the late spring or in late summer/early fall. Frequency within some given areas might have been as often as every three-to-five years, or even annually. Although allowing for occasional large burns, Leiberg (1900:278) characterizes most Indian-set fires of southwestern Oregon during 1750-1855 as "small and circumscribed" but of frequent occurrence.

Within the Little Applegate watershed, native people likely used fire for most if not all of the following purposes: warmth, cooking, and evening light; clearing underbrush from around village sites (a defensive measure); creating/maintaining oak savanna or oak woodland for production of desirable food plants; clearing the ground of the same areas so as to facilitate acorn-gathering; burning off the dry grass in late summer so that the autumn rains would stimulate growth of tender new grass (in effect creating natural "pastures" that attracted and concentrated deer for fall or winter hunting); creating/maintaining higher elevation openings for berry- or beargrass-gathering; scorching volatile oils from tarweed or other plants (in order to enhance seed gathering); driving and roasting edible insects; mass driving of deer and other big game; forcing bears out of their winter dens to be killed; preparing tobacco plots; stimulating new-growth sprouting of brush and other deer/elk browse; enhancing the open qualities of the forest to facilitate travel; "fireproofing" of habitation areas or other special sites; signaling to other groups (by means of the simple appearance of a smoke column, not by "smoke signals"); impeding pursuit by enemies.

Although virtually all elevations and vegetation types of the Little Applegate drainage would have been purposely set on fire at some time or another by native people, most of those ignitions may have been concentrated in the watershed's lower-elevation areas as well as in its highest-elevation meadow-forest mosaic, areas with higher concentrations of edible roots, bulbs, berries, and nuts. The watershed's great expanse of mixed-conifer forest doubtless experienced human-set fire, particularly on south and west slopes favorable to pine and at certain favored openings (e.g., those containing California black oak), but natural fire may have been an equal or greater overall force in creating these mid-elevation forest communities during prehistoric times.

During the historic period, humans continued to set the woods ablaze, with both similar and different goals in mind. Documented reasons (e.g., Leiberg 1900:278-279, Port 1945:11) for historic-era burning in southwestern Oregon included: clearing away brush and forest litter to enhance the visibility of the ground for gold prospecting or for easier travel/hunting; stimulating new-growth brush for big game (and for livestock herds); creating dense smoke where deer would congregate to escape the affliction of flies or gnats (thereby concentrating the animals for easier hunting); maintaining grassy areas for cattle and sheep grazing. Other causes included: accidental escape of clearing fires; leaving campfires untended; and setting fires simply for the enjoyment of seeing the woods burn.

Contrary to what some sources have concluded about the Western U.S. in general (e.g., MacCleery 1993:1, MacCleery 1994:12), at least in the eastern Siskiyou the "disintegration of native cultures" during the nineteenth century did not substantially reduce the amount of ecosystem fire. If anything, the extent of human-caused fire probably grew in the region between 1860 and 1920. Numerous accounts of human-set fires—some of them written to express...
approval and some written in complaint—that appear in the local newspapers during that period certainly indicate such a trend, climaxing around the turn of the century but continuing well afterward. In the mid-1870s, the Jacksonville Democratic Times (9/4/1874) commented that it seemed “no year shall pass but what the woods are set afire and the country deluged in smoke.” Twenty years later, the Ashland Tidings (8/15/1895) commented that fires in the Little Applegate continued to be extremely commonplace: One big conflagration on Anderson Butte was caused by a settler who tried to “burn out a hornet’s nest”; another large one in the same vicinity, which “caused no little damage to timber,” resulted from a rancher clearing brush. Forest Service records (discussed in more detail below) testify that the Little Applegate remained a “center of incendiarism” well into the twentieth century (Ringland 1916:7).

Unlike the two distinct (spring/late summer) fire seasons of the natives, newspaper accounts indicate that Euro-American settlers set blazes throughout the warmer period of the year, but with August through October predominating (Crater N.F. 1916 [fire history]:20). According to Forest Service specialists, Little Applegate Valley ranchers especially favored fall for range fires (Ringland 1916:20), and they burned some low-elevation grasslands and brushfields as often as every two years (Erickson 1915 memo, in: Ringland 1916:26). Leiberg (1900:279), whose personal knowledge of the situation was probably less than that of later local Forest Service staff, believed that ranchers burned the same tracts "every year."

The overall frequency of historic-period human-set fire within a given area, however, may have been much more sporadic and random than was the case with native fires—which were set by people who very closely and continuously observed the vigor of vegetation at particular gathering sites. Another change in pattern during the historic period may have been an increased portion of anthropogenic fire in the mid-elevation forests of the watershed, due to widespread prospecting and hunting in the 1850s-1890s. For instance, a Forest Service land appraisal report remarks that extensive, formerly timbered areas of the Little Applegate watershed (particularly the south-aspect mid-slopes between Sterling Creek and Wagner Gap) were lacking "full reproduction" in the mid-1920s and that evidence of post-fire erosion was quite apparent (Sprout 1927:6). This same source attests that many north-aspect slopes of the watershed had a good cover of young conifers (likely heavy to Douglas-fir), with most of these stands varying between twenty and sixty years old (i.e., the fires or other events that led to the establishment of these young stands occurred since white settlement began).

Changing Amounts of Burning

Based on evidence provided by early foresters, the historic period conceivably brought a steady increase in the average annual acreage burned in the eastern Siskiyous from the 1850s until around 1900-10. The relatively stable amounts of land ignited annually by native groups were replaced by greater numbers and sizes of fires in the late nineteenth century. Leiberg (1900:277), describing the southern Cascade Range, states that fires there were "more numerous and devastated much larger areas in the early days" of settlement than they did either before or later. But he implies that the size and number of human-set fires declined in the Cascades by 1890 or earlier, due in part to wanton destruction of deer and elk and the consequent decline in the number of hunting parties. Human-caused fires continued to rage in the eastern Siskiyous well after that however. The Ashland Tidings (8/20) complained in 1896 that "every year forest fires become more and more of a nuisance."

Differences in fire history between the Siskiyous and the nearby Cascades resulted from differences in their terrain, wind patterns, and so on—as well as the former’s higher intensity of historic-period use. But the human factor must be counted as a major factor in this difference. Whereas lightning-caused fires were the principal kind recorded in the southern Cascades in 1910-1916, incendiarism was the main cause of fire in the eastern Siskiyous (Crater N.F. 1916 [fire history]:20). In addition, the destructiveness of fires—whether natural or human in origin—was greater in the Siskiyous. Leiberg’s survey of townships in the southern Cascades (1900:passim.) proclaims emphatically the pervasive evidence of fire throughout the area (“99.9%” of the forested lands). A number of townships, particularly within the highest elevations of the Cascades, bore testimony of very destructive fires since about 1850. However, Leiberg’s data tables record that by far the largest portion of his “fire-scared” stands in the mid-elevation, mixed-conifer forested Cascade Range townships (e.g., T36S, R3E; T39S, R5E, W.M.) was actually composed of healthy, mature timber. Much of the past burning in this portion of the Cascade Range, therefore, was evidently of low intensity. The "badly burned" component of many southern Cascade townships was apparently substantially less than that found by Leiberg at corresponding elevations in the Little Applegate drainage.

Within the Little Applegate watershed, in several townships, he estimated "badly burned"
portions of forested areas at between one-quarter and one-third of the total. Due to "great havoc...wrought" by fires, many slopes of the Little Applegate drainage around Brickpile Ranch had been "transformed...into great brush heaps with thin lines of half-dead trees in their midst" (1900:443). As with later Forest Service timber reports, Leiberg comments on "small growth" stands as being most common. This was due not only (or even primarily) to fire, however, but also to previous "culling of dimension" timber (Leiberg 1900:442). Writing shortly after Leiberg, Harvey (1909:n.p.) describes the eastern Siskiyou's south-aspect, mid-elevation slopes as nearly "60%...burned over," and warns that "destructive insects are at work."33

Extensive incendiary fires in the Little Applegate drainage continued well after 1900; "particularly in 1915 large areas were burned over" (Crater N.F. 1916 [fire history];n.p.). Added to the traditional reasons for starting fires by this time was the new financial incentive offered by Forest Service fire-fighting employment. During the 1920s, according to a Forest Service policy statement (Rankin 1927:9), the Applegate Ranger District averaged 32 fires a year, of which an annual average of three grew to "Class C" (large) size; in this same report the Forest Supervisor complained that "little or no dependence can be placed on local residents as too many are still advocates of light burning." Not until the late 1920s-1930s did fire suppression become a dominant factor in changing the vegetational character of the eastern Siskiyou. Since then, as with other portions of the Pacific Northwest, the eastern Siskiyous have probably experienced reductions in both the total amount of area burned and a significant reduction in the amount of nonlethal understory fire (cf. Brown et al. 1994).

**Historic-Period Fire and Air Quality**

Vegetational effects of fire has been the central topic of the foregoing discussion; however, fire's impact on local air quality deserves some mention. Rather than belabor the point with numerous quotations from newspaper accounts, the situation can be summarized briefly: The "fire era" of the late-nineteenth and early-twentieth centuries resulted in substantial accumulations of smoke in the Rogue River/Bear Creek and Applegate valleys each summer. A few contemporary descriptions will suffice: Smoke from the surrounding forest fires was variously described as a "dense," "thick," "intense," "excessive," "unabating," and an "annual affliction." Smoke often obscured the nearest mountains and sometimes "even the sun" from view. Valleys were often "filled" with it, "deluged" by it, rendered "uncomfortable" and "unhealthful" by it. "Sick people pant[ed] for breath" because of it and tourists complained of it blocking the scenery from view. Summer rains not only carried moisture to thirsty crops, they brought welcome (if usually short-lived) respite from the smoke. As late as 1917, a local editor voiced hope that rain would fall "so that the beloved hills [near Ashland] will again become visible" (Ashland Tidings 8/27/1917).

Setting aside the question of automotive and industrial pollutants in the valleys, air quality of the eastern Siskiyou has improved significantly since the onset of effective fire suppression around 1930 and smoke-management of slash burning since the 1960s.

**Changing Attitudes toward Burning**

Anthropogenic fire's changing role in influencing the environmental history of the eastern Siskiyou Mountains has been determined in part by changing attitudes. Before closing this discussion of fire, a short review of those attitudes is in order.

For native cultures, fire had played a central role in subsistence activities for several millennia. In addition to vegetational and game management, fire-setting may have functioned as a cooperative and enjoyable social activity. For example, Australian aborigines (who continue to burn portions of the "Bush") have stated that, besides its key utilitarian

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33Leiberg's emphasis on the wide extent of pre-1900 fires in the southern Cascades may have lent itself to an over-emphasis on the supposed destructiveness of many of those fires. Countering-balancing the "Leiberg-influenced" image of the "sea of smoldering snags" seemingly suggested by some recent interpreters (e.g., Petersen 1994:3-4, Zybach 1993:10-47, Zybach 1994:11-13) are various photographs and written descriptions of late-nineteenth century forests for the same vicinity, depicting the "gloriously dense and majestic forest" spreading out from the western base of Mt. McLoughlin or the "interminable forest" of large-diameter sugar pine and other mature conifers along the upper Rogue River north of Prospect (Walling 1884:308 and 310). (On the other hand, recent Forest Service stand examinations indicate that some sizable areas of timber in the southern Cascades [e.g., portions of the southern Big Butte Creek drainage, Griffin Pass vicinity] probably originated after stand-replacing fires, ca. 1900.) For the southern Cascades at least, the truth of the matter is probably somewhere in between these two contrasting images.

Regarding broad interpretations that present-day forests are composed of "older and more densified" stands than previously (e.g., MacCleery 1994:15), one must be cautious when dealing with specific areas. There is little doubt about the greatly increased density of forests in the eastern Siskiyou. However, although stands may be older on average than a century ago, this is not the entire picture; it ignores the possibility that many stands of a century-and-a-half ago were much older yet. The once widespread, open, mature stands of pine in the region were harvested selectively but continuously after 1850, contributing to the "young stands" of the 1890s-1900s (see Leiberg 1900:442-452).
purpose, fire-setting provides "a good time; it's fun" (Henry Lewis 1989: p.c.). More importantly, from the native perspective periodic burning was critical to maintaining the health of the environment; in that sense it was in effect a conscious "duty" of good land stewardship (see: Blackburn and Anderson 1993, Martinez 1992, 1993).

Many of the initial white settlers of the Rogue River Valley, descended only one or two generations from the first trans-Appalachian pioneers, would have been personally familiar with the use of fire for clearing and maintaining certain vegetation communities. (And long before that, the Atlantic Seaboard was settled by Western European colonists who brought traditional burning practices with them across the Atlantic, and who supplemented these with practices learned from the local natives [Pyne 1982:50-52].) "Burning the woods" was nothing extraordinary to the new Euro-American arrivals in southwestern Oregon; it was part of traditional American rural culture.

Early on in Jackson County, however, a widening split in attitude about burning came to divide rural folk from their townsfolk brethren. (In this split we can perhaps see the initial divergence between the "commodity" interests of farmers or other land-based producers of southwestern Oregon and the "amenity" interests of local urban residents that continues today.) As early as the 1860s, Jacksonville's newspaper "doubted the propriety of burning great districts of timber, and filling the atmosphere with smoke" (Oregon Sentinel 8/3/1867). The following year, the same source, admitting that it was "very common for parties going into the mountains to set the whole country on fire," commented that such actions were "very wrong" because "summer diseases are greatly aggravated" by the smoke (Oregon Sentinel 8/8/1868).

Three decades later, the thriving railroad town of Ashland held anti-burning sentiments due not only to health concerns, but because it was a "terrible annoyance" to tourists and others seeking views of the mountains (Ashland Tidings 8/20/1896). And with the growing value of timber in the Ashland hills near the railroad, incendiary fire became a "wanton waste of wealth" and a "useless destruction of property" (Ashland Tidings 8/15/1895). "Something should be done to stop it," declared the outraged Ashland editor (Tidings 8/20/1896).

Occasionally, pro-burning attitudes appeared in the local press. The Medford Mail (9/16/1892)--at the time a Populist newspaper with a strong following in Jackson County's rural hinterland--described a large fire on Anderson Butte as "likely to make...better grazing ground for deer and other stock, [s]o there is not so much loss as gain anyhow." As late as 1915, even the Ashland Tidings (8/26/1915) could find a bit of silver lining with one cloud of smoke: a grass fire across the valley from town "really resulted in a great deal of good, for it destroyed...foxtail seed and burned off a lot of poison oak." However, forest burning became less tolerable to opinion-makers, merchants, and other town dwellers as the commercial value of local timber increased. As demonstrated below, when local anti-burning sentiment combined with the federal government's efforts in professionally managed forest conservation during the late 1890s and early 1900s, the days of human-set fires as an acceptable practice in southwestern Oregon were numbered.

Figure 14  Cattle round-up in the Siskiyou Mountains, ca. 1920. (SOHS #6341) Local ranchers typically "burned off" the range during late summer.
(Ashland Tidings 8/18/1898). During the searing Northwest fire year of 1910, when a number of fire-fighters burned to death in Idaho, the Tidings (8/15/1910, 8/25/1910) applauded the government's aggressive "campaign of education" to halt incendiarism, and spoke approvingly of Forest Service "scouts" sent into the remote forest to spy out arsonists.4

As a result of the 1910 holocaust in the Far West, the anti-burning values of "urban, amenity" spokesmen were fully joined with the scientific values of government foresters and other specialists. The catastrophic fire season, combined with the Forest Service's growing concern for protecting the long-term economic value of young forests, led to a massive assault against incendiarism in Western forests. Public education efforts, improved fire-detection and fire-suppression techniques, and government policy all worked to put traditional rural burning practices on the defensive. The 1910-1925 "light burning" controversy, particularly fierce in northern California, was almost equally intense in southwestern Oregon.5

Applegate Valley ranchers' long-standing reliance on "range-improving" fire made the eastern Siskiyous a hotbed of incendiarism in the Forest Service's Pacific Northwest Region. The agency went through an internal debate, struggling to come to terms with traditional burning: whether to allow it to continue, but with stringent controls, or to stamp out the practice entirely. Ultimately, the Forest Service took the latter course.

A year before 1910, Forest Service timber examiner Bartle T. Harvey's report on the Applegate River watershed reflected the agency's willingness to accept and even adopt local burning practices. Discussing "preservation of [the cattle] ranges," Harvey felt that "cutting and burning" of brush at the proper time "would hold the ranges open." He recommended light burning about "once in every five or ten years, depending on locality and conditions" (Harvey 1909:n.p.). Even after the big fire year, in 1915 Crater National Forest's Martin L. Erickson sought permission from a reluctant Regional Office for "authority to burn some of [the] brush areas" on the

Applegate Ranger District.6 Erickson, who had evidently established a working rapport with Applegate stockmen during his eight-year tenure as Forest Supervisor, saw the logic in periodically burning these large, long-term "brush patches" that contained "no forest reproduction" and "had no possibility of reproduction within the next...100 years" (Erickson 1915 memos, in: Ringland 1916:23-26). In addition to the expense involved in protecting young timber from nearby brush fires (see: Crater N.F. 1915 [reconnaissance report]:12), Acting District [Regional] Forester Charles H. Flory, worried about the "psychological effect of the Forest Service burning patches...upon the community" and the likelihood that some members of the "undiscerning public" would continue "burning brush patches that contain abundant natural reproduction," refused to grant Erickson the authority. Flory concluded that "the uncertain benefits of burning brush patches do not warrant unfavorable consequences that would surely result" (Flory 1915 memo, in: Ringland 1916:24-25)

The internal controversy continued into the next year, when special "Forest Inspector" Arthur C. Ringland conducted a special study of the light-burning situation on the Applegate Ranger District and the adjacent section of the Klamath National Forest to the south. Ringland, who was then serving as District [Regional] Forester of the Southwestern Region, had begun with the agency in 1900 as one of its first "student forester assistants" and soon worked closely with Gifford Pinchot; he later went on to help found the international relief agency, C.A.R.E. Ringland took a sociological approach to the Applegate problem. "Why," asked Ringland (1916:18) rhetorically, "does Rancher K. on the Little Applegate River, with modern plumbing in his house, a Literary Digest on the table, and a Ford under the shed" indulge in burning "the brush on the southwestern slope of Sterling Creek?"

"To secure more range," answered the District Ranger and Ringland. Instead of adapting to the local situation, the Forest Service, stated Ringland, "spent three or four months" each year "fighting windmills." "Next year there is another fire near K.'s ranch; the jitneys [U.S.F.S. crew trucks] rush out and the [firefighters'] time slips rush in" (Ringland 1916:17-18).

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4The danger that arson-set fires posed to government employees remained a strong concern. In 1917, the Tidings (8/30/1917) reported on Oregon Governor Withycombe's decision to proclaim a closing of the state's hunting season due to the extreme fire danger. National Guard troops, patrolling the forests to catch arsonists, reportedly were in particular danger of being mistaken for deer by eager hunters because of their khaki uniforms.

5For a detailed history of the "light burning" issue from a national perspective, see Pyne (1982:100-122).

6Timber cruisers of the General Land Office, surveying low-elevation, non-timbered public domain land in the Sardine Creek drainage, north of the Rogue River (about twenty miles north of the Little Applegate River), in 1916 made comments about local burning practices that paralleled those of Supervisor Erickson: "There are spots of of brush but generally the country is open [oak] woods. The Natives start fires all through the country along about this time of year; while it does a certin amount of damage, it does a wonderful sight of good" (Monry 1916).
"Emphatically the time has come when we must look inside the head of Rancher K. [and other local participants in light burning]," Ringland declared. "We scorn K.'s ideas," scolded Ringland, "--bawl him out for an undesirable citizen; distribute largesse money to the I.W.W.s; wire for an increase in [fire-fighting fund] allotment...and stick another colored pin in the chart" (1916:19). Ringland felt that local ranchers, after years of observation and practice of burning, deserved a better hearing. He recommended that the Regional Forester permit an experimental, cooperative program of agency-led light burning on the "brush patches" of the Applegate District. Rather than suppress all burning in the probably forlorn hope that "southern and western slopes will...reforest," Ringland concluded that, if the areas "will grow grass...[p]roducing a fat steer may be rendering higher public service than producing No. 3 common lumber" (1916:43).

After a thorough review in the Washington Office, Chief Forester Henry S. Graves agreed with Ringland's assessment. The Chief's memo to Pacific Northwest Regional Forester Cecil J. Buck (Graves 1916) endorsed the inspector's recommendations without making them mandatory. He suggested a one-year trial cooperative agreement with the Applegate Stockmen's Association, "[u]less there are very good reasons to the contrary." There is no record of the agreement having been implemented and the Forest Service's initial opportunity to experiment with prescribed fire in the eastern Siskiyous was foreclosed.

Very likely America's entry into World War One the following year was a principal cause of the proposal's apparent abandonment. The War not only significantly affected the National Forests' budget priorities, personnel, and administration, the "war hysteria" included fears in southwestern Oregon of "enemy sabotage" in the form of arson-caused forest fires. The War probably made light burning seem "unpatriotic," and by the early 1920s the agency's national policies had shifted away from experimenting with prescribed fire and toward aggressive suppression of all fires.

* * *

37 Ringland's use of the term "I.W.W.s" (or "Wobblies") refers to the "tramp" laborers who belonged to the radical Industrial Workers of the World union; some of them earned cash as itinerant wildfire-fighters.
V. TWENTIETH-CENTURY VEGETATIONAL CHANGE in the LITTLE APPLEGATE WATERSHED: Case-Studies Using Photographic and Cartographic Evidence

Using a variety of historical evidence--written, mapped, and photographic documentation of the area--we can obtain a sense of the degree of vegetational transformation of the Little Applegate River watershed since fire suppression became effective.

A. Macro-Scale View of the Landscape

Nineteenth and Early-Twentieth Centuries

The township survey notes compiled for the eastern Siskiyous by the General Land Office during the 1850s-1880s contain some of the earliest site-specific descriptions. However, the surveyors' comments on the vegetation they encountered along section lines in the Little Applegate watershed tend to be terse, often ambiguous, and extremely general. They are helpful in giving a very general impression of the vegetation's pre-1900 appearance.

The earliest G.L.O. surveys were accomplished in the low-elevation farm and adjacent range lands; surveys of the remote uplands came later. For the lowest elevation slopes of the watershed, near the mouth of the river (elev. approx. 1,500'-2,000' a.s.l.), the 1857 survey notes rarely provide more detail than "rolling, open, timber: pine and oak, undergrowth: manzanita and chaparral" (Truax 1857 [T39S/R3W]); the slopes between lower Yale Creek and Lick Gulch (elev. approx. 2,300'-2,800') were generally described as "open ridges...[with] good grazing" (Truax 1857 [T39S/R2W]).

Ascending in elevation to the watershed's mid-slopes, the 1883 survey of the Bull Pine Ridge vicinity, near the confluence of Glade Creek with the Little Applegate (elev. approx. 3,000'-3,800'), found much of the land "densely covered with forests of fir, yellow [ponderosa] pine, and cedar" (Moore 1883 [T39S/R3W]). A few areas along the line between Sections 30 and 31 contained "thick growth of chaparral and some little [young] growth of oak, fir, and pine." (The oak referred to would have been Oregon white oak [Quercus garryana], with perhaps some California black oak [Q. kelloggii] as well; such scattered openings may well have been remnants of native acorn-gathering areas.) Along the Sec. 29/30 section line, the surveyor recorded "thick undergrowth of pine and oak in addition to dense forests" In general, Township 39 South, Range 1 West was characterized by "dense forests of fir, yellow pine, cedar, and some oak timber," but it held numerous openings and patches of thick growth of young "fir, oak, pine, matherone [madrone], etc."--no doubt established after mid-nineteenth century fires.

The General Land Office survey notes portray the Little Applegate watershed as composed of: lower slopes that are largely bare of trees or that contain scattered mature pine timber; a complex mosaic at mid-to-upper elevations that consists of mature/"old-growth" pine and fir stands, remnant oak and cedar openings, brushfields, and numerous patches of young reproduction; at the highest elevations a more grass-dominated mosaic that supported true fir--most of it, while perhaps not "young," smaller in size than the mature timber on the mid-slopes.

Leiberg's report on the Little Applegate watershed echoes the G.L.O. descriptions. The generally lower-to-mid-elevation, southwest-aspect slopes of Township 39 South, Range 2 West had "chaparral thickets," "oak copses," and "but little timber" (Leiberg 1900:442). However, "good stands of yellow and sugar pine" characterized the drainage's mid-elevation forest, along with numerous reforesting tracts of "nearly pure growth of red [Douglas-] fir"
Early Forest Service timber surveys emphasize the "barren hillsides" of the Applegate Valley's lower foothills, in places "covered with dense brush and scanty [timber] reproduction" (Harvey 1909:n.p.). These "denuded areas...on south slopes," such as occurred along the lower Little Applegate, were "covered with a dense growth of...oak, manzanita, and laurel [madrone]" (Crater N.F. 1915 [reconnaissance report]:12). Higher, on the predominantly forested mid-elevation slopes, "openings such as glades, cliff outcrops, and mountain meadows occur[red] throughout" (Harvey 1909:n.p.). In general, the mixed-conifer forest was "more open" than that of the nearby southern Cascades (Crater N.F. 1921 [management plan]:28).

On north slopes, the mature mixed-conifer forest was described as three-quarters Douglas-fir, with the remainder sugar pine and sparse ponderosa pine and abundant reproduction; yields were estimated at 25,000-50,000 board-feet per acre. Maturely forested south slopes were heavy (80 percent) to ponderosa pine, with the remainder equally divided between sugar pine and Douglas-fir and with very little reproduction in evidence among the bushy undergrowth; yields from these much more open stands were between 5,000 and 10,000 board-feet an acre (Harvey 1909:n.p.).

Above the 4,000-foot contour, noble [Shasta red] fir made up more than half the mature timber, with white fir (and scattered "black [mountain] hemlock" and western white pine) the remainder; reproduction was "good" and yield per acre averaged 40,000-60,000 board-feet in this upper forest zone. The "alpine type" of forest, along the Siskiyou Crest, contained "little if any merchantable timber" and "scant reproduction"; fire suppression was recommended as a way to make these highest-elevation areas more productive of timber (Harvey 1909:n.p.).

Circa 1940

The next body of broad-scale vegetation description dates from the mid-1930s through the mid-1940s. It includes panoramic photographs taken from Forest Service fire lookouts, aerial photographs, and the 1947 Jackson County Forest-Type Map prepared as part of the U.S.F.S. "Forest Survey of the Douglas-Fir Region." These sources, dating from the period just as fire-suppression became effective and before the post-War timber boom had significantly altered the forests of the watershed, are especially valuable for determining macro-scale vegetational change. (Although rarely allowing for exact quantified data, historic photographs of forested landscapes have proven valuable in helping to document the amount and kind of twentieth-century vegetational change throughout the Western U.S. [see: MacCleery 1993].)

The 360-degree panoramic photograph taken in 1936 from Cinnabar Peak Lookout (on the west edge of the watershed, elev. approx. 3,900') presents distant views of the lower Little Applegate's south-aspect foothills and of the Siskiyou Crest area between Wagner Butte and Dutchman Peak (Rogue River N.F. 8/10/1936). The former, which include Woodrat Mountain and Anderson Butte, display extensive areas of open grassland and brushfield in 1936; the proportions between the two are roughly one-third or more grass and less than two-thirds brush. In the mid-1990s, the 1936 grassy areas remain open but are noticeably smaller in size. The amount of brush has grown to nearly four-fifths of the non-forested total; additionally, what were sparsely covered brushy areas in the 1930s have become dense brushfields sixty years later.

High-altitude Forest Service aerial photographs of the lowermost Little Applegate, taken in 1939, show virtually the identical situation on the southwest slopes as the 1936 view (Rogue River N.F. 9/14/1939). They also show the corresponding north-aspect slopes on the south side of the Little Applegate, which are not visible from Cinnabar Peak. Timber is present on most of these slopes, but it appears to be "patchy" and not very dense.

Along the west face of upper Wagner Butte, open meadows appear to account for over sixty percent of the area above 6,000 feet in elevation in 1936. In 1995, the amount is less than forty-five percent, with one formerly extensive, open area near Wagner Glade Gap now almost totally grown up to forest.

Occupying the foreground of the 1936 photograph are fewer than ten large-diameter ponderosa pines that surround the summit of Cinnabar Peak. Younger pines and Douglas-firs in the sapling/pole stages are visible immediately downslope, with some larger Douglas-firs in evidence as well. At the very summit (which appears to have been a small grassy opening before lookout and road construction) are four healthy-looking, mature California black oaks.

In the mid-1990s, these oaks--shaded out by the crowded stand of pole-sized/mature Douglas-fir that now rings the summit--appear to have been dead for at least 10-15 years. Three or four of the ten big pines remain, but most of them are gone and pine
reproduction is sparse except on the south and west aspects; a dense canopy of pole-sized/mature Douglas-fir extends downslope to the north and east.

The 1947 forest-type map (scale: 1"=1 mile) gives a more accurate image of the watershed's low- and high-elevation vegetation than an oblique photograph from a distant point. However, it should be considered a very general, reconnaissance-level map (Cowlin 1947). The bulk of the south- and west-aspect slopes below 3,500 feet are mapped as unforested (a category that probably allows for oak), with patches of young ponderosa pine in protected draws. On higher or somewhat cooler slopes, large areas support mature ponderosa pine stands (the largest, some ten sections or more in size, extends from the mid-elevations of Glade Creek east to lower McDonald Creek). On north-aspect mid-elevation slopes, "old-growth Douglas-fir" predominates, with "second-growth Douglas-fir" and "mixed stands" of young conifers present in smaller patches. In the upper watershed area shown on the 1947 map, McDonald Basin, the head of the Little Applegate, and upper Glade Creek support large areas of mature true fir stands; grassy meadows are interspersed. The broad picture that emerges from the 1947 map probably does not account for the actual variability in stand age-class and species mix in the mixed-conifer zone. However, it certainly suggests that, prior to the accelerated timber harvest of the 1950s-60s, the eastern Siskiyou contained abundant mature and old-growth stands. Overall, the "intensively managed" forest present in the 1990s is definitely not (as has been implied by MacCleery [1994]) "older" on average than it was a half-century or even a full century ago.

B. Micro-Scale View: Four Sample Parcels

This discussion focuses on four relatively small areas within the Little Applegate River watershed for which more detailed history of vegetational change can be traced. In addition to some of the sources referenced above, Forest Service homestead examination reports (ca. 1908-1925) for three of these parcels are used to obtain information on past vegetation.

Two of the parcels, Eagle Canyon and the Daly/Fisher parcel, are situated in the lowest elevations of the watershed. The other two, the Hall/Pursel parcel and the Reynolds parcel, are well within the mixed-conifer zone. Due to the lack of homestead claims above 4,000 feet, detailed information is insufficient to identify a sample parcel in the higher elevations.

Eagle Canyon

Eagle Canyon is a south-draining gulch that joins the Little Applegate about a mile downstream from Sterling Creek. It is located largely in Sections 12 and 13, T39S, R3W. Elevation varies from about 1,500 feet to 2,400 feet above sea level. The 1854 G.L.O. survey describes the canyon simply as composed of "prairie" and "open pine and oak timber" (Truax 1854 [T39S/R3W]).

A ca. 1880 view of the canyon, taken from the south side of the Little Applegate River by Jacksonville photographer Peter Britt, is more useful. It shows extensive areas of grass interspersed with patches of light brush. Some brushfields of chaparral and scrub Oregon white oak, particularly on the east side of the canyon and nearest the river, appear to be more dense. Very few conifers are visible anywhere in the canyon; less than a half-dozen mature pine are scattered here and there in the shaded draws and on east-aspect slopes.

The 1947 forest-type map shows Eagle Canyon as almost entirely land-type 37 (the unforested "non-restocked burn"; see fn.38), which is scrub oak/brush community. Aside from a few areas of "cultivated [cleared] pasture" at low elevations, the only other land-type shown is a natural "grass community" near the head of the canyon. This area is the same grassy "bald" shown in the Britt photograph.

In the 1990s, when viewed from the same vantage point as the Britt photograph, the vegetation of Eagle Canyon appears similar at first glance to that present in the 1880s. However, it becomes apparent with a few minutes of comparative study that the fields of buckbrush ceanothus (Ceanothus cuneatus) have encroached steadily on the grassland, particularly in the upper canyon. Formerly light brush has become dense brush. Small-diameter Oregon white oak has become more dense on the lower east-aspect slopes, and a "grove" of mature ponderosa pine now occupies the north-aspect of a lower side draw. Fire suppression has probably been the major factor in this change.
Daly/Fisher Parcel

The Daly/Fisher Parcel (named for the two individuals who entered overlapping homestead claims, in 1910 and 1925 respectively) is located in the Southeast 1/4 of Section 10, T39S, R3W, W.M. It is situated at an elevation of approx. 1,650 feet, on the south side of the Little Applegate River, less than a mile from its confluence with the main river. The parcel is bounded on the northeast by the hydraulic mining cut of Gin Lin's Little Applegate Diggings. During the 1870s-80s, the Chinese miners had their work camp at the north end of an open "glade" in the parcel; several deteriorated "old buildings" remained as late as 1910. Reference is made to a 10-acre garden within the glade having been cultivated by the miners, and the Chinese also harvested the few scattered mature pines that formerly grew on the land for flumes and other lumber (Crater N.F. 1910 [Daly homestead exam.]:2 and map, Crater N.F. 1925 [Fisher homestead exam.]:n.p.).

In 1910-1925, aside from the mined-out area and the open, nearly level glade (20 acres of which were being cultivated in 1925), the parcel consisted of the base of north-aspect foothills. These were covered with dense "oak and laurel [madrone]" and "scattering pine." Manzanita occurred in dense patches throughout, and in the southeastern-most corner of the parcel grew young pine and "some Douglas fir reproduction 25 or 30 years of age" (Crater N.F. 1925 [Fisher homestead exam.]:n.p.).

The 1947 forest-type map indicates that the area of Douglas-fir reproduction noted in 1925 had become 40-60 percent stocked with 40-year age-class trees. Poor growing conditions on the site may account for the "discrepancy" with the 25-30-year age of the stand over twenty years before; additionally, the site's easy access may have resulted in harvesting of the largest poles during World War Two. The remainder of the parcel is land-type 37, scrub oak/brush; the former open glade apparently had been invaded by brush.

In 1995, much of the open "glade" still remains, due largely to ongoing agricultural and residential use of that area. It contains clumps of Himalayan blackberry and poison oak and supports a very dense cover of star thistle. On the slope to the southwest, the former "oak and laurel...and scattering pine" now consists of two quite different vegetation types. On the lower, more shaded slopes, conifers are now quite dense. Many of the scattered mature ponderosa pines in this area are dead or dying.
evidently from stress of the 1980s-90s drought, and a dense pole-sized stand of Douglas-fir appears to be crowding out pine regeneration. On the upper part of the slope, which receives considerably more direct sunlight, the patchy scrub/brush of 1910 is currently a dense thicket of scrub white oak, all of a uniform small diameter and less than 15 feet tall. Little or no "laurel" (madrone) is now present.

**Figure 16** Headwall (right) of Gin Lin's Little Applegate Diggings; pine and Douglas-fir reforesting the floor of the mine, ca. 1980. (RRNF #V-2-25.18.4)

In 1913, surrounding the clearing and on the adjacent slopes of the claim, grew various age-class stands of mixed-conifer forest. About three-quarters Douglas-fir and one-quarter ponderosa pine (with much lesser amounts of incense-cedar and white fir), the trees ranged from "small saplings" to 300-350-year old trees. Conks and other defects afflicted one-third of the mature timber. Most of the area was "fully restocked" with young trees, which were growing so thickly that "much of the young growth will necessarily die out before reaching any size." A "yellow pine thicket" adjacent to the southeast side of the cleared area and an extensive patch of "manzanita chaparral" on the west side of Yale Creek probably indicate past fires or other replacement events.

The 1947 forest-type map indicates that the parcel had not been logged during World War Two. Most of the western and northern portion supported "old-growth Douglas-fir." In the southern portion, ponderosa pine poles (12"-22" d.b.h.) dominated the stand, and in the area along Yale Creek, small (6"-10" d.b.h.) Douglas-fir had begun to encroach on the former homestead clearing.

In 1995, the open field (which dates to ca. 1905) still remains but is significantly smaller. Ponderosa pine up to 10"-15" d.b.h. now grow at scattered locations within the clearing, especially the south end, and young pines and incense-cedars are plentiful within these trees' shade/drip zone. In addition to sapling/pole-sized pines, seedling/sapling-sized Douglas-firs are encroaching on the opening from the forested margins, especially in more moist sites. The former "yellow pine thicket" on the southeast side of the clearing now supports scattered mature pine, but a dense stand of sapling/pole-size Douglas-fir accounts for most of the reproduction. Along the terrace on the east side of Yale Creek, where in 1913 the mature timber had been "cut, partly cleared," a second-growth stand of Douglas-fir shades out most of the understory shrubs aside from oceanspray, snowberry, and Oregon-grape. Mistletoe is common in this stand. On the steep slopes rising from the west bank of Yale Creek, pole-sized and mature Douglas-fir appears to dominate; several hundred feet in elevation above the creek, clearcut harvest units and a logging road are visible.

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**Hall/Pursel Parcel**

The Hall/Pursel parcel (named for the two individuals who made homestead claim applications for the same land in 1903 and 1913 respectively) is located in the Northwest 1/4 of Section 10, T40S, R2W. Situated at an elevation of about 2,700 feet, at the base of the northeast-aspect slope of Yale Creek canyon, it is about a mile downstream from the mouth of Shump Gulch. The bottomland along Yale Creek was cleared by brothers George and Joe Hall shortly after the turn of the century; they planted a few acres to alfalfa and less than an acre to potatoes (Crater N.F. 1913 [Pursel homestead exam.]3-4, Crater N.F. ca. 1908 [Hall homestead exam.]:n.p.).

In 1995, the open field (which dates to ca. 1905) still remains but is significantly smaller. Ponderosa pine up to 10"-15" d.b.h. now grow at scattered locations within the clearing, especially the south end, and young pines and incense-cedars are plentiful within these trees' shade/drip zone. In addition to sapling/pole-sized pines, seedling/sapling-sized Douglas-firs are encroaching on the opening from the forested margins, especially in more moist sites. The former "yellow pine thicket" on the southeast side of the clearing now supports scattered mature pine, but a dense stand of sapling/pole-size Douglas-fir accounts for most of the reproduction. Along the terrace on the east side of Yale Creek, where in 1913 the mature timber had been "cut, partly cleared," a second-growth stand of Douglas-fir shades out most of the understory shrubs aside from oceanspray, snowberry, and Oregon-grape. Mistletoe is common in this stand. On the steep slopes rising from the west bank of Yale Creek, pole-sized and mature Douglas-fir appears to dominate; several hundred feet in elevation above the creek, clearcut harvest units and a logging road are visible.

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39This parcel is currently known as "Kenney Meadows" and is the location of a Bureau of Land Management recreation site. The land, much of which remains open and appears to have been grazed in recent decades, was conveyed to the U.S. government in 1969 by owner Christian J. Kenney.
The Reynolds parcel (named for the individual who first entered a homestead claim for the area in 1910) is located in the Southwest 1/4 of Section 30, T39S, R1W, W.M. It is situated along both sides of the Little Applegate River, at an elevation of about 3,000 feet (approx. one mile downstream from the mouth of Glade Creek). About 20-40 acres on the east side of the river were cleared and cultivated to hay and garden truck between 1905 and 1913. To the east of the river, on the adjacent west-aspect hills, 1913 vegetation cover was quite sparse, composed of "brush, scrub oak, and timber running 5,000 [bd.ft.] per acre" (Crater N.F. 1913 [Reynolds homestead exam.]:2). The west-side slopes, which ordinarily might be expected to have supported denser timber, may have experienced fire in the not too distant past. It was described as "very thick brush" with scattered Douglas-fir pole timber. Scattered patches of "young reproduction" (pine and fir saplings) were found over much of the parcel.

The 1947 forest-type map indicates that fire suppression may have proven especially effective in this area by an early date. The map shows the parcel contained a small cultivated portion and less than five acres classified as brush. The remainder is divided between well-stocked stands of mature ponderosa pine (22" d.b.h. and larger) on the west-aspect slopes and similar stands of Douglas-fir across the canyon on the east-aspect slopes. None of the parcel is shown as having been logged over since 1940. Other than the clearing done by Mr. Reynolds ca. 1905-1920, the timber remained unharvested until after 1947.

In 1995, much of the Reynolds parcel remains a working ranch; the amount of cleared area on the east side of the Little Applegate River has grown since 1910. The former "timber and brush" slopes to the east and west now support dense Douglas-fir stands, with some "red-top" mature pines and recent pine snags probably representing the young pines noted in the 1913 Forest Service report. The former "very thick brush" area in the southwestern corner of the property is now a copse of scrub white oak, uniformly of 4"-6" d.b.h. and between 10' and 15' tall. Along the river, cottonwood, willow, and dense alder (all of which appear to be less than 40 years old) line the banks in several places. Floods appear to have periodically swept above the west bank, between the road and the main river channel (which at this place, except during winter storms, is more appropriately described as a creek).

C. Summary of Vegetation Change Since Ca. 1910

Based on historical evidence, we can summarize the "natural" changes in vegetation cover since fire suppression began as follows:

Grasslands on low-elevation and/or southwest-aspect slopes have shrunk to smaller remnants of their former size. Encroachment by brush species, buckbrush ceanothus in particular, accounts for most of this change. Adjacent areas formerly supporting mixed grass/brush communities have become dense brushfields of ceanothus and manzanita. Groves of Oregon white oak have expanded in size somewhat and have become noticeably more dense with copes of "scrub"-sized trees. On the north side of the Little Applegate River, successful forestation to ponderosa pine and (in cooler locations) Douglas-fir occurs only on north- and east-aspect draws and other low-elevation terrain sheltered from diurnal summer heat. On the south side of the river, the volume and extent of Douglas-fir has increased significantly at lower elevations.

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40This discussion does not address the many vegetational changes due to recent intensive timber harvest or earlier logging.
In the uppermost portions of the watershed, true fir species have become more dense and have expanded at the expense of glades and meadows. In the lower sections of the true fir forest, fire-intolerant white fir has especially benefited from fire suppression.

The mid-elevation, mixed-conifer zone of the watershed has witnessed a retreat of brush and open pine stands with a concomitant advance of Douglas-fir. Areas formerly containing mature pine, incense-cedar, and California black oak have now become blanketed by dense stands of pole-sized Douglas-fir and, at slightly higher elevations, white fir. Competition for moisture between ponderosa pine and the dense stands of younger Douglas-fir has stressed the pines, making young pine thickets and more mature individuals susceptible to bark beetles and flatheaded woodborers. This phenomenon has resulted in the proliferation of "red-top" (dying-and-dead) pines throughout the eastern Siskiyous during the 1980s-90s drought. The "densification" of the mixed-conifer forest has probably also resulted in large-scale changes to the understory component, with a reduction in the cover of those herbaceous species that prefer an open canopy.

Overall, more of the Little Applegate River watershed is forested now (i.e., including post-1950s logged-over forest and young plantations in the total current amount of forested land) than was the case a century ago. And those areas that formerly were forested now tend to support a much more dense conifer cover than previously. Insect and disease infestations (e.g., dwarf mistletoe) are probably far more prevalent as a result of this high-density pattern. An exception to the conifer "densification" trend is the riparian zone of the lower and middle stretches of the river. Although some mature Douglas-fir, incense-cedar, and even ponderosa pine grow adjacent to the streambed, maple, alder, and cottonwood now dominate.

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Dendrochronology has proven a key tool in the study of past climates and cultures in the Southwest and other parts of the United States. In some portions of the Pacific Northwest, specialists have relied upon dendrochronology to help establish the periodicity of past fire regimes and historic droughts (e.g., Graumlich 1987). Climatic history of the southwestern Oregon region, however, has apparently been little studied by means of dendrochronology. Extrapolation from information gathered in other sections of the Pacific Northwest may not be useful due to possible wide variation in the occurrence of short drought cycles within the wider region.

What follows is a brief, preliminary attempt to summarize a very small amount of casually gathered dendrochronological information from the Rogue River National Forest, information that may suggest the historic occurrence of drought periods in southwestern Oregon.

The writer first examined the stumps of large-diameter, 300+-year-old trees at two locations in Jackson County, Oregon. (1) "Mammoth Sugar Pines," near Prospect; (2) Fish Lake trees, near Fish Lake Resort.
The original "Mammoth Sugar Pine," once a noted landmark tree along the road between the Rogue River Valley and Crater Lake, died sometime in the late 1950s-early 1960s (due in part to a bark beetle infestation) and was cut down in 1964. The tree had a diameter at breast height of seven feet, and had reached an age of approximately 400 years. The stump and the base log remain in place; although both are heavily deteriorated in places and butt rot has obliterated the growth-ring record earlier than 300 years B.P., the growth-rings can be easily observed and counted back to approximately AD 1680. For most of its post-1680 lifespan, the tree's growth-rings show little variation to the unaided eye. However, a band of comparatively thin rings is clustered around 1685-1695 and another band at about 1704-1714. A second large-diameter sugar pine, cut down in about 1987, is situated next to the Mammoth Sugar Pine; butt rot has destroyed the growth-ring record for the period before AD 1720. A younger tree than its larger companion, it displays more macro-variation in growth-ring thicknesses for the eighteenth century. A very noticeable band of thin growth-rings extends from about 1735 through the 1750s. A second band of thin rings is clustered at about 1847-1857.

Along the north shore of Fish Lake reservoir, about three-to-six feet beneath the full pool level, are a number of very well-preserved tree stumps, exposed during reservoir drawdowns. (The Fish Lake trees were allowed to stand for some years until cut down, possibly as late as the 1960s.) Ranging from two feet to over five feet in diameter, this former stand of ponderosa pine and Douglas-fir contains two large-diameter trees that were about 300 years old before inundation and mortality in about 1927; the stumps of these two particular trees were examined. Both revealed a thirty-to-forty-year-long sequence of very thin annual rings, dating (assuming the stumps date to ca. 1960) approximately 260 to 220 years ago (ca. AD 1735-1774).

This dendrochronological evidence from eastern Jackson County, although crudely measured and based on a very small sample, suggests the possibility of a major drought during the middle third of the eighteenth century.

Although no trees/stumps within the Little Applegate watershed were examined, two sites within the wider Applegate River drainage provide potentially useful information. The Valley View Vineyard site is about one mile north of the mouth of the Little Applegate; the Towhead Lake site is located approximately twelve miles west of the uppermost Little Applegate watershed, along the Siskiyou Crest.

**The "Valley View Vineyard" Tree:** A large-diameter Douglas-fir formerly grew on the west side of Upper Applegate Road, next to the south entrance to the Valley View Vineyard property. The tree, situated at an elevation of approx. 1,500 feet a.s.l., died sometime in the 1980s and was cut down in about 1987; the stump remained in relatively good condition in early 1995, with growth-rings visible to almost 290 years before the tree's death. Several bands or clusters of comparatively "thin rings" ("bracketed" by wide bands of comparatively thicker rings) were readily visible (the stump was grubbed out in mid 1995): ca. AD 1928-1937; ca. 1840-1860; ca. 1777-1787; and ca. 1768-1775.

**The "Towhead Lake" Trees:** Towhead Lake is located within Red Buttes Wilderness, Applegate Ranger District, Rogue River National Forest (Siskiyou County, California), in the headwaters of the Butte Fork of the Applegate River. Situated at an elevation of 6,400 feet a.s.l., Towhead Lake occupies less than a quarter-acre of a rugged, peridotite outcrop near the head of
Hello Canyon. The peridotite/serpentine rock supports scattered trees. Some of these trees
doubtless had root systems that acquired water from the nearby lake. However, the depth of
Towhead Lake fluctuates greatly during a single season and particularly during dry periods, and
prolonged periods of low moisture likely seriously lessened the availability of water from the lake.

In September 1987, during the "Rattlesnake Fire," about a dozen of the trees growing near
the small lake were cut down (the lake served as a fire-suppression water source for helicopter
bucketdrops, and the trees were deemed to present a safety hazard to the aircraft). As part of the fire
rehabilitation efforts (which eventually included "roughening"/blasting of the stumps), the stumps
were first re-cut (at heights varying between 12" and 24" above the base) to provide growth-ring
slabs for future dendrochronological study.

Slabs from a total of ten trees (6 western white pine, 2 Brewer's spruce, 1 Jeffrey pine, and 1
incense-cedar) were used in this study. They range in size from about seven inches in diameter to
over three feet in diameter, and in age from about 130 to 380 years. One western white pine slab,
over three-feet in diameter, was over 320 years old; in startling size contrast, an 8"-diameter
Brewer's spruce was 270 years old.

For several of the "over-mature" trees that evidently had reached the culmination of their
mean annual increment of growth, the twentieth-century growth-rings are so consistently "tight" that
little variation can be detected with the unaided eye. For virtually all of the other trees, however, a
distinctive series of thin growth rings is visible at about AD 1905-1910 and a decade-long band of
thin growth-rings is common at about AD 1926-1938. This is apparent evidence of the droughts
recorded for shortly after the turn of the century and for the late 1920s through the mid-1930s
respectively. The growth rings for the period from World War Two through most of the 1950s
(with the exception of three consecutive years in the early/mid-1950s) are relatively thicker,
indicating the greater annual moisture recorded locally during that time.

Proceeding back into the nineteenth century, the growth-ring patterns shown by the
Towhead Lake trees suggest the occurrence other historic droughts: ca. 1887-1893, ca. 1840-1855,
and ca. 1810-1825. Continuing backward in time, during the eighteenth and seventeenth centuries,
very thin growth-rings are clustered during the following periods: ca. 1735-1775 (i.e., similar to the
pattern observed on the five trees discussed previously), and ca. 1665-1695.

Conclusions: Careful analysis by dendrochronological specialists, using a larger sample
and standard scientific techniques, is necessary to explore the validity of the above observations.
Aside from drought, thin growth rings can occur from crown damage and other causes. However,
the growth-ring information discussed above certainly indicates the repetition of 5-10-year long dry
cycles regularly over the past two-hundred years. It also hints at the occurrence of a severe,
prolonged drought during the middle third of the eighteenth century.

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