Lower Coast Fork Willamette River
Oregon
Watershed Assessment

Chapter 2 Historical Climate and Geology

2.1 Introduction

Fifty million years ago the Pacific Northwest was tropical. At that time the Willamette Valley was completely submerged under the Pacific Ocean, which lapped against the foothills of the Cascade Mountains. Fossilized marine mollusks, crabs, and sharks from this time period indicate warm, tropical seas (Orr et al. 1992). Data from ice cores and other sources indicate that global climate was on a cooling trajectory, a trend that has been highlighted over the past few million years by a series of ice ages (Crowley 1996).

Between 40 and 25 million years ago the Pacific Ocean began to withdraw from the newly forming Willamette Valley as the Coast Range "lifted" from the ocean floor. Over time, this lifting caused portions of continental shelf that were one to two thousand feet below the Pacific Ocean to rise two or three thousand feet above the ocean. During this period the valley was a broad semi-tropical coastal plain, dotted with lakes that were formed in shallow depressions. Studies of fossilized pollen indicate the presence of both conifers and broadleaf plants, although most of these species are extinct today (Orr et al. 1992).

Volcanic activity also shaped the landscape over time. Around 15 million years ago "lava from fissures and vents in northeastern Oregon poured through the Columbia gorge and into the Willamette Valley where they reached as far south as Salem (Orr et al, 1992)". A lava flow that solidified at the northern end of the Willamette Valley created the falls at Oregon City. These falls created a seasonal barrier to upstream fish passage and maintained a broad, relatively flat floodplain in the upper portion of the Willamette Valley (Atkins 1993).

Beginning two to three million years ago a series of ice ages descended on the region, at times creating continental ice sheets that spread from the Arctic to the northern edge of the Pacific Northwest. These ice ages were punctuated with interglacial periods characterized by warmer temperatures and higher sea levels (Crowley 1996). During this time the advance and retreat of glaciers from the northern part of the continent and Cascade Range left its mark on the Willamette Valley. Rivers laden with glacial meltwater deposited large quantities of silt and debris (Orr et al. 1992).

Since the last ice age, which spanned approximately 100,000 to 10,000 years ago, the global climate has become considerably warmer and dryer, the Willamette Valley being no exception. Yet even within this relatively warm period, average global temperatures

are thought to have fluctuated between 14° to 16° C, the warmest interval of which was between 9,000 to 7,000 years ago (Thompson et al. 1993). More recently, a "Little Ice Age" took place between the mid-1400s until the late 1800s (average temperatures estimated to be 0.5º - 1º C colder than present, a time when European explorers and immigrants were discovering North America (Crowley 1996). This latest event may have the greatest significance to us now because the lore of early explorers and settlers, to an extent, has shaped our perceptions of the landscape and climate. Yet, because we are coming out of a cooler period and have no true record of what it was like to live here before the "Little Ice Age" it is difficult for us to anticipate how this gradual (or not so gradual) warming trend will affect us.

Also, during the last 10,000 years the major plant communities that we see in the watershed today began developing. Marshlands and lakes receded in places, allowing the expansion of grasslands and oak. Douglas fir and western hemlock became established in the higher elevations of the Valley and grand fir and ponderosa pine along the foothills. In turn, this diversity of plant communities supported a variety of insects, frogs, reptiles, birds and mammals (Aikens 1993, Hansen 1942, Heusser 1960).

Ultimately, the geologic and climatic events of the last 50 million years have determined how humans utilized the landscape. The flat, broad valley and adjacent hills shaped by the uplift of the Coast Range, layers of volcanic basalt and sediment deposited by eons of flooding created a diverse environment.

2.2 Early Human Inhabitants

Between 15,000 to 23,000 years ago, during the last ice age, sea levels lowered sufficiently enough that early humans were able to cross the Bering Strait (between present day Siberia and Alaska) and begin populating North and South America (Crowley 1996). Evidence of human inhabitants in the southern end of the Willamette Valley begins approximately 10,000 years ago. At the time of early exploration and European settlement the Kalapuya were the main tribe that inhabited the middle to southern end of the Willamette Valley. However, it is not known whether this tribe lived in the area over the entire period, or if other tribes existed here in the past.

Plant foods available in some quantity would have included camas bulbs, acorns, hazelnuts, tarweed seeds, sunflower seeds, cattail rhizomes, and a variety of berries. Large animals of the area were elk, deer, black bear, and grizzly bear. Smaller creatures included raccoons, rabbits, squirrels, beavers, and other rodents. Marsh birds included ducks, geese, and other water-loving species, as well as grouse, quail, and wild pigeons. Trout, suckers, freshwater mussels, and crayfish were available in the streams. Grasshoppers, yellow jacket larvae and caterpillars were also endemic. These species were characteristic foods of the Kalapuyan people who occupied the Willamette Valley during the early 19th century (Aikens 1993).

Excavations revealed various tools used for hunting and processing animals, including arrowheads, scrapers and knives. The remnants of tools used for grinding and pounding plant material were also found, as well as roasting ovens used to cook camas bulbs,

acorns and other roots gathered from nearby prairie and marshes. "Hammerstones, anvils, cores, flaked stone debris, choppers, drills, spokeshaves, and gravers indicate the working of stone, bone and wood (Aikens 1993)."

Reports from early explorers and settlers suggest that the Kalapuya set regular fires in the lower portions of the watershed. David Douglas, a British botanist traveling with an expedition from Ft. Vancouver, frequently complained in his journal of traveling for miles without finding adequate forage for their horses because the vegetation was completely burned. He also described what he had learned about the reasons for the prairie burning: "Some of the natives tell me that it is done for the purpose of urging the deer to frequent certain parts to feed, which they leave unburned, and of course they are easily killed. Others say that it is done in order that they might the better find wild honey and grasshoppers, which both serve as articles of winter food (Douglas 1959, 214)." Charles Wilkes also speculated on the reason the Kalapuya set fires: "They are generally lighted in September for the purpose of drying the seeds of the [tarweed] which is then gathered and forms a large portion of their food (Quoted in Boyd 1986, 71)."

Since then, many anthropologists have discovered or suggested additional reasons for Kalapuya burning. For example, the ground under oak trees was burned to facilitate the collection of acorns the following year, and perhaps the Kalapuuya understood that by preventing the growth of understory trees and shrubs the oaks would produce larger acorn crops. Fire also promoted the growth of hazelnut, berries and bulbs like camas and wild onion, which were important staples in the Kalapuya diet (Boyd 1986).

During the last quarter of the 18th century, the maximum Kalapuya population in the Valley is believed to have been roughly 13,500. By 1841, Wilkes estimated that only 600 Kalapuya lived in the Valley. The main reason for this staggering loss was disease introduced by European explorers. Before 1806 two small pox epidemics had killed at least one third of the native population. Venereal disease also spread inland from the Columbia in the 1790s, after the first explorers' ships arrived. Then, beginning in the 1830s there were annual outbreaks of malaria, against which the Kalapuya had no immunity (Boyd 1986). Despite the deadly effectiveness of these introduced diseases, there were still a handful of Kalapuya when the first settlers arrived in the mid-1800s. Shortly thereafter, these people were forced onto the Grande Ronde reservation in Northeastern Oregon, their presence and practices being viewed as a threat and an infringement on the rights of new settlers.

2.3 Pre-settlement: Early 1800s

Europeans and Americans began to leave their mark on the watershed before the first Euro-American settler arrived in 1847. By transmitting disease to the Kalapuya they may have indirectly reduced fire in the Valley, at least the fire which appeared to be intentionally started by the Kalapuya. Wilkes comments, "Since the country has been in the possession of the whites it is found that the wood is growing up rapidly, a stop having been put to the fires so extensively lighted throughout the country every year by the Indians (quoted in Boyd 1986, 71)."

European trappers also had an impact on the landscape by depleting or extinguishing some species of wildlife, most notably beaver (Johnson & Chance 1974).

Landscape and Vegetation
Many early explorers commented on the extent and beauty of the prairies, which they speculated, would provide excellent forage for cattle and sheep. Native grasses of the time included tufted hairgrass, sloughgrass, Roemer's fescue, june grass, slender wheatgrass, California oatgrass and meadow barley (Christy et al. 1998).

Although the expanse and beauty of the prairie was frequently written about, there was also a diversity of other plant communities. Savanna, containing oak and sometimes a scattering of ponderosa pine and Douglas fir, covered higher ground that didn't flood in the winter. Along the larger streams riparian forests containing ash, poplar and willow flourished. On the surrounding hills grew Douglas fir, grand fir, ponderosa pine and incense cedar, and in moist, cool areas western hemlock and western red cedar. Also on the foothills were hardwood trees like bigleaf maple, Oregon white oak and golden chinquapin. Shrubs included hazelnut ocean spray and snowberry (Christy et al. 1998).

Most of the prairie and oak savanna that covered the watershed in the early 1800s has been altered by the encroachment of trees, reduction in flooding or conversion to farmland. Some researchers believe that regular fire set by the Kalapuya maintained the prairie and savanna and prevented forests from encroaching on these habitats (Johannessen et al. 1971, Towle 1974, Boyd 1986). As evidence, they cite the many descriptions by early explorers of the natives setting fire, the infrequency of lightning that would ignite fires naturally and the encroachment of shrubs and trees onto former prairie since the disappearance of the Kalapuya (Boyd 1986). However, it is also possible that grazing by deer and elk and flooding may have maintained the prairie in some places. In more recent times, the draining of wet prairie and the conversion of prairie and savanna to farm fields or urban development have also decreased these habitat types.

2.4 Settlement Period: 1847 – early 1900s

A combination of factors led to the settlement of the LCFW watershed. In 1850, The Donation Land Law passed. This law granted every white settler who was 18 years of age or older and a citizen, and who was a resident of the Territory before December 1, 1850, one half section of land (320 acres) if a single man. He was granted one section of land (640 acres) if married before December 1, 1851. The land was a free gift granted on the condition that it be lived upon and cultivated for four years. Settlers arriving between 1850 and 1855 received only half as much land. Within five years over 2.5 million acres had been granted, most of which was in the Willamette Valley (Dicken & Dicken 1979). In 1853, Oregon Country was divided, and Washington Territory was formed of the north half.

In 1847 Richard Robinson staked his claim, one corner of it straddling the Coast Fork River, three miles north of present Cottage Grove. He was the farthest settler south in the Willamette Valley.

Euro-American settlement began to change the watershed's environment in many ways. The relationship between humans and the land changed. The Kalapuya had led a subsistence lifestyle, moving with the seasons to harvest wild plants and hunt animals. Aside from deliberately setting fires, which seems to have had a significant effect on certain kinds of vegetation, it does not appear that they altered their environment in any other way. Their lifestyle and population had probably remained relatively stable, or at least, changed relatively slowly during their occupation of the watershed. In contrast, the new settlers had a different way of working with the land. The introduction of agriculture was a significant event, and many farmers brought seeds, plants and animals from across the country. The settlers also possessed relatively sophisticated technology, which eventually evolved into tools that could significantly alter the environment. Finally, the surge in population encouraged by the Donation Land Claim Act placed new demands on the landscape.

Agriculture

Many homesteads consisted of "… one room log houses with vegetable gardens and a few acres planted in wheat. With little hard currency available, wheat was the primary medium of exchange (Oregon Archives 1990)."

For the first few decades settlers tried growing wheat and corn, since many were from the Midwest. Despite the relatively cool, wet climate, wheat became the most successful crop during the late 1800s and early 1900s; it was used for local consumption and later as an export crop. Corn, however, was not suited to the cool summers and did not become an important cash crop. New technology also allowed vegetable canning, which meant that more food could be grown and preserved for distant consumers. Cattle, sheep and pigs were an important part of many early homesteads. Cattle were first brought to the Willamette Valley in 1837 and sheep in 1843. Grazing was generally limited to higher ground and, based on the reports of early explorers, was quite nutritious and abundant given the wide expanse of prairie and savanna. Pigs, which were traditionally fed on corn in the Midwest, were fed acorn mash that came from the prolific oaks (Evans 1985).

Although the introduction of agriculture provided significant advantages to local residents, it had several notable impacts on the local ecology. For instance, in areas that were farmed, non-native crops replaced native prairie species. Domesticated animals grazed on the native grasses, which sometimes damaged them enough to be out competed by more resilient, weedy species or non-native plants.

Flooding

Annual flooding was a constant struggle for early settlers in the watershed. The area that flooded historically for the Willamette Valley encompassed an extremely large area. This area extended throughout the valley north to Coburg Hills and south to areas of Cottage Grove. Photographs taken in 1890 show water, "all the way from Skinners Butte to Coburg", and "rowboats at Eighth and Willamette." Therefore, the flood history of Creswell and Goshen ranges over many years (Reg. Guard Dec. 15, 1946).

The development of the railroad in 1872, impacted the decision of many Cloverdale residents to move toward the tracks, and this is where the city of Creswell is today. However, the residents of Creswell and the surrounding areas had to battle the Willamette and the ever present reality that floods could occur at least, "Two years out of every three!" Also, historical accounts (some unofficial) site records of river readings before 1897 that the Willamette in excess of 22 feet in 1861, 1881, and 1890. It was reported during the "super-flood" of 1861 that the river was 23 feet high. Official readings began in 1897… and records show that only nine times in a 49-year period has the Willamette not topped the 10-foot mark, dangerously near the flood stage (Register Guard Dec. 15, 1946). In 1861, "Eugene City" was flooded throughout the entire upper valley all the way from the hills near Coburg to the mountains near Noti and it resembled a "vast lake… "(The Register-Guard, November 27, 1994). As Creswell developed and pioneers endured the flood of 1861, they began looking at ways to monitor and control the floods that were a serious threat to their homes, livestock, agriculture, and vested interests.

Logging

Dense forests covered the hills on the western and eastern portions of the watershed and settlers wasted little time capitalizing on this resource. Many small mills were scattered throughout the area. Because there were few roads in the late 1800s, many mills were, by necessity, small and mobile. Transporting logs off the site and to the mill was a challenge. Before steam power was introduced felled logs were dragged across the ground on skids by horse or oxen to a nearby stream or hand built flume. Steam donkeys, which became available around the turn of the century, were a tremendous boon to the industry.

> The donkey would consist of a steam boiler and steam engine connected to a winch all mounted on a 'sled' called a 'donkey sled'. The donkeys were moved by simply 'dragging themselves' with the winch line. The process evolved rapidly, but donkeys were used for both yarding (moving the logs from where the tree was cut to an assembly point) and also 'skidding' (dragging the log down the skid trail to the river). Thus the loggers soon had 'yarders' and 'road donkeys', the latter being the name applied to donkeys strategically located along the skid road to drag the logs from point to point toward the river (VanNatta 1999).

After enough logs were accumulated the men drove them downstream to the miss, a job that occasionally cost someone their life. "Small streams were made usable by constructing a splash dam, forming a pond into which the logs were dumped. The dam was then knocked out, allowing the logs to move with the flood to a larger stream (Dicken & Dicken 1979, 128)."

Like agriculture, timber was an essential resource in the newly settled territory and would soon become the number one industry in Oregon. Lumber was valuable for building local infrastructure (e.g. homes, schools, railways) and was also a highly lucrative export crop, which infused capital and money into the economy.

Transportation

Early explorers and settlers arrived on foot, horseback and horse drawn wagons. This mode of transportation made the delivery of agricultural and timber products to outside markets slow and sometimes difficult compared to later transportation. Nonetheless, goods were hauled overland via the Oregon-California trail and shipped down the Willamette, Columbia and finally to the Coast where they were barged south. The goldrushes in California (circa 1848) and Southern Oregon (circa 1851) fueled this transport and jumpstarted the Willamette Valley Economy (Dicken & Dicken 1979).

In 1864 President Lincoln and Congress passed legislation, which granted public lands to the Northern Pacific Railroad Company in exchange for building a railroad from Lake Superior to the Pacific Ocean. The public lands were given for a railroad right-of-way and for Northern Pacific to sell to prospective settlers in order to raise the capital needed to build and maintain the railroad (Osborn 1995). In order to enhance the value of surrounding public lands, the land that was granted was distributed in alternating square miles, resembling a checkerboard. After several failed attempts and extended deadlines, the Northern Pacific line to Tacoma, Washington via Vancouver was finally completed in 1883. Similarly, in 1869 2.5 million acres of land in Oregon and California were granted in order to build a rail line between Portland and California. The main Southern Pacific line from Portland arrived in Eugene in 1871, and in Roseburg in 1872 (Dicken & Dicken 1979). This greatly facilitated the transport of timber and agricultural products and increased access which encouraged more people to move to the area.

2.5 The Modern Era: early 1900's – Present

Technology and population growth were the major themes that shaped the watershed's environment during the 20th century. The creation of gasoline-powered equipment increased the extraction rate of natural resources and gave people the ability to travel long distances in a short time, which meant they could live farther out of town. New technology gave rise to commercial fertilizers and pesticides, industrial and household chemicals, antibiotics, electronics and the silicon chip, among other things. All of these events contributed to population expansion, and resource consumption. Future population growth will certainly have significant impact on natural resources in the watershed.

Agriculture

Several discoveries in the first half of the 1900s dramatically changed the nature of farming in the Watershed: the success of grass seed farming, the replacement of horse drawn ploughs with tractors, and the development of commercial fertilizers and pesticides. The cultivation of grass seed began in the early 1900s and dominated the landscape by the 1940s. Clover, vetch and oats, and cheat were the principal hay and seed crops in the 1920s. In addition, "(a)nnual ryegrass began to be sown for seed around 1920 and was followed by perennial ryegrass in the mid-1930s. It is the ryegrass on which the development of the grass seed landscape of the southern Willamette Valley was based (Reynolds 1977, 88)." The success of grass seed growing was due to its ability to grow on Dayton soils and thrive in the hot, dry summers.

The replacement of horses for tractors meant that a "substantial amount of land once used for pasture, hay and feed grain could be cropped… Many farmers were reluctant to replace their horses, because they felt tractors would ruin the soil through compaction (Reynolds 1977, 90)". Despite this, the advantages of using tractors outweighed the potential side effects, and "…tractors and heavier machinery had largely replaced horses by the late 1920's (Evans 1985, 3)." The combination of tractors and grass seed production led to larger, less diverse farms. Livestock, which were once a part of most small farms, became concentrated on feedlots and pastures as land became more valuable for growing grass seed.

Until the early 1900's, farms tended to be small scale, diversified operations on which a variety of farm products were produced (Evans 1985). The resulting farmscape tended to support a mix of habitats, reflecting different agricultural management intensities. In addition to intensively managed croplands, pasturelands were also maintained to support livestock, and woodlots were maintained for building material and fuel.

As grass seed farming became more prevalent so did draining of fields with ditches and tiles and the use of fertilizers. Commercial fertilizers were introduced in the late 1930s. The boost in crop yield promoted the grass seed industry even more, and between 1950 and 1970 the amount of fertilizer that was being used in the area doubled (Reynolds 1977).

Logging

"Prior to 1900 the lumber industry of Oregon rated a poor third to that of Washington and California. The main reason was inaccessibility of most of the Oregon forests to the kinds of transportation available at that time, as compared to Puget Sound with its hundreds of miles of shore (Dicken & Dicken 1979, 128)." After the turn of the century, new rail lines, roadways and logging equipment enabled Oregon timber barons to vastly increase production.

Other factors contributing to Oregon's logging boom included a dwindling supply of timber in the upper Mid-west and large lumber companies moving to the West Coast, bringing capital and new techniques with them. Several of these timber barons purchased millions of acres of railroad grant lands. A great deal of money was made logging these lands and selling off parcels to other companies. In the 1900s the federal government revested some of these lands due to illegal actions on the part of the railroad companies (Osborn 1995). In the CFW watershed these lands are referred to as the O & C lands (Oregon & California Revested Lands) and are managed by the Bureau of Land Management.

Log driving on streams within the watershed phased out in the 1920s as the rail and road system expanded. The cessation of log driving certainly benefited these streams, although, from an ecological perspective the tradeoff was the development of numerous logging roads. A significant potential impact of logging roads is the delivery of sediment to adjacent streams from either surface erosion or by causing slope failures. New

requirements for the construction of forest roads decrease this potential, however many old roads still exist on public and private timberland.

After World War II gasoline-powered yarders replaced steam donkeys. In addition, a variety of new management practices were employed including the burning of logging slash, the use of herbicides on clear cuts and aerial fertilization. Burning slash is still common, new practices have been implemented that are less impacting. Logging companies still use herbicides and fertilizers.

In 1973 the Oregon Forest Practices Act began to change timber practices and to encourage sustained yield on private lands. In addition, in 1994, the Northwest Forest Plan has reduced cutting on federal lands, which has increased cutting on private lands to meet market demands. A 1989 Oregon State University Study reported that the logging rate on federal lands was well below the long-term sustainable yield estimates, whereas the rate on private lands was slightly below the long-term sustainable baseline harvest (Oregon Forest Resources Institute 1999).

Urbanization and Population Growth

Urban and rural residential development came on the heals of transportation advances. An expanding population led to the creation of more roads and buildings, and some residents moved out into the country where they converted farmland to large rural estates or hobby farms. In the cities, impervious surfaces like sidewalks, paved roadways, parking lots and roofs were created and expanded, which accelerated the transport of surface waters to local streams and prevented water from soaking into the ground.

Concentrations of city dwellers, commercial businesses and industry began having an impact on water quality as well. The U.S. Secretary of War wrote in 1938 "A serious pollution problem has developed on the lower Willamette River, as a result of the discharge into the river in an untreated state of domestic sewage and industrial wastes (Johnson 1938, 9)." However, the situation did not improve until a decade later when primary treatment became mandatory. In 1949 Junction City installed a primary sewage treatment plant, followed by Eugene in 1952. In addition to requiring sewage treatment plants, industrial sites that discharged into streams were also regulated.

As a result of sewage and industrial wastewater treatment, water quality in the Willamette River improved dramatically. Dissolved oxygen levels, which had been zero in Portland Harbor in 1950, returned to normal and noxious blooms of algae diminished. However, inevitable declines in water quality began to occur a few decades later. This time the problem was "non-point" sources, a term referring to the fact that the source of pollution is diffuse and widespread in nature. Examples of non-point source pollution are surface runoff from agricultural land, rural residential land, highways and cities. These sources continue to be a challenge to regulate and mitigate because they are not easily monitored like discharge from a pipe. In response to declining water quality, the Oregon Department of Environmental Quality (under requirement of the Clean Water Act of 1970) has developed a list, which is updated biennially, of rivers and streams in the state that are considered "water quality limited". Local governments, state agencies and local

residents are being encouraged, and in some cases required, to identify and remedy the sources that are causing the degradation of listed streams in their watershed.

Figure 7 displays the most current data regarding population density for the assessment area.

Stream Channelization and Cottage Grove and Dorena Reservoirs

The construction of the Cottage Grove and Dorena dams and reservoirs during the 1940's marked the beginning of large-scale structural changes to stream channels that had a significant effect on the LCFW Watershed. The Army Corps of Engineers built the dams to control flooding in the area and to provide irrigation for farmlands below the reservoirs. There have been several significant environmental consequences as a result of the construction of these structures. First, fish passage was blocked between the Lower Coast Fork Willamette River and the tributaries above the reservoirs. Second, stream flow patterns have been altered below the dams. Historically, the Coast Fork Willamette River had low summertime flows and intermittent high flows, which often overtopped the banks, in the fall, winter and spring. Currently streamflow is higher in the summer to provide downstream irrigation and unusually high during the reservoir draw down period in the fall. The latter event may prematurely trigger upstream migration by fluvial cutthroat trout at a time when water quality is still poor (high water temperature and low dissolved oxygen). Third, extensive swamps and wetlands are now covered by the reservoirs. Finally, conditions within the reservoir have at times affected downstream water quality, especially temperature, dissolved oxygen and sediment levels (Lane Council of Governments 1983).

Channelization of the Coast Fork Willamette River occurred in the 1950s. Modifications included levees, rip-rap at weak points and culverts to drain adjacent fields. In the early 1960s a diversion channel for flood control was constructed on Hill Creek. The Creswell Ponds (currently the Garden Lake Park area) was the by-product of quarry pits created during the construction of Interstate 5 during the late 1950s and early 1960s.

The result of these projects has been decreased flooding in portions of the watershed adjacent to the Coast Fork Willamette River and its tributaries. In turn, a significant number of new buildings and homes have been constructed within the floodplain.

2.6 Conclusions

Examining historical events and change in the LCFW Watershed Basin illustrates the complexity and magnitude of human impacts to the watershed's environment. As early as 10,000 years ago humans began utilizing the landscape. Manipulation of the environment probably began with Kalapuya burning and has accelerated over the past century. The arrival of settlers began a population boom in the area and at the same time intensive agriculture and logging began, which led to significant changes in terrestrial and aquatic habitat. Several decades later, transportation and urban development also started to have an impact on streams, wetlands and upland areas. Rapid environmental

change and population growth are hallmarks of this era, and have economic, cultural and ecological implications. For example, development within floodplains has occurred so quickly that there has not been sufficient time for it to reflect 100-year flood events.

From a cultural perspective, we are beginning to lose a historical landscape that attracted many settlers in the first place as rural areas are becoming increasingly dissected by new development and highways. Our relationship to the land has also changed. Both the Kalapuya and early settlers were self-sustaining; they grew and hunted for their food and lived within the limits of their local environment. As new technology has arisen we have moved away from this regional sustainability and shifted to an export/import economy.

From an ecological perspective, changes introduced by settlers and the current population have altered most habitats to some degree. Because the change has been so rapid many native plants and animals have not evolved or adapted fast enough to survive these new conditions. In particular, wet prairie and other wetland types used to cover a large portion of the Valley floor. Today it is estimated that over 99% of historic wet prairies in the Willamette Valley are gone (Daggett et al. 1998). Many species of plants and animals rely on wet prairie and other wetlands for all or part of their life cycle; hence the loss of wetlands has caused a decrease in populations and local extinction.

Although we cannot completely turn the tide of history or progress, we can reflect on our path. Are we heading in the direction we want to? How have living conditions changed for ourselves and other species? Are there certain trends or developments that we would like to change, slow down or mitigate in order to protect habitat and water quality? Certainly we all would give different answers to these questions. Nonetheless, a shared awareness of both past conditions and the current types and rate of environmental change is essential if we are to make informed, collaborative decisions about our future.

Based on the information provided in this chapter the Watershed Council may wish to consider the following recommendations:

- Provide educational opportunities for students and Council members regarding historic conditions, habitats and ecological functions.
- Use knowledge of historic habitats and ecological functions to prioritize landscape/habitat restoration and conservation efforts sponsored by the Council.
- Use knowledge of a site's historic vegetation and ecological functioning to guide restoration and conservation activities.