The Historical Tualatin River Basin

Oregon Water Resources Research Institute
Oregon State University

October 1993
TUALATIN RIVER BASIN SPECIAL REPORTS

The Tualatin River Basin in Washington County, Oregon, is a complex area with highly developed agricultural, forestry, industrial, commercial, and residential activities. Population has grown in the past thirty years from fifty to over 270 thousand. Accompanying this population growth have been the associated increases in transportation, construction, and recreational activities. Major improvements have occurred in treatment of wastewater discharges from communities and industries in the area. A surface water runoff management plan is in operation. Agricultural and forestry operations have adopted practices designed to reduce water quality impacts. In spite of efforts to-date, the standards required to protect appropriate beneficial uses of water have not been met in the slow-moving river.

The Oregon Department of Environmental Quality awarded a grant in 1992 to the Oregon Water Resources Research Institute (WRRI) at Oregon State University to review existing information on the Tualatin, organize that information so that it can be readily evaluated, develop a method to examine effectiveness, costs and benefits of alternative pollution abatement strategies, and allow for the evaluation of various scenarios proposed for water management in the Tualatin Basin. Faculty members from eight departments at Oregon State University and Portland State University are contributing to the project. Many local interests groups, industry, state and federal agencies are contributing to the understanding of water quality issues in the basin. This WRRI project is based on all these research, planning and management studies.

This publication is one in a series designed to make the results of this project available to interested persons and to promote useful discussions on issues and solutions. You are invited to share your insights and comments on these publications and on the process in which we are engaged. This will aid us in moving towards a better understanding of the complex relationships between people’s needs, the natural environment in which they and their children will live, and the decisions that will be made on resource management.
The Historical Tualatin River Basin

by

Penny L. Cass
Scientific and Technical Communication
J. Ronald Miner, Ph.D.
Department of Bioresource Engineering
Oregon State University

The Tualatin River Basin studies are being done under a grant from the Oregon Department of Environmental Quality to the Oregon Water Resources Research Institute at Oregon State University.

Published by the Water Resources Research Institute.

Tualatin River Basin Water Resources Management
Report Number 7
When it is springtime in Tualatin Valley
And Nature is at its best
I thrill as I gaze on the landscape —
Most beautiful in the West

Chehelem Mountain in horseshoe shape,
Surrounds the village called Scholls,
Where the grass is like the emerald, green
And the river Tualatin rolls

And off to the east, like a sentinel
Stands our own majestic Mt. Hood
I will not attempt to describe it
I could not, if I would

The walnut orchards are leafing out,
Fruit blossoms and flowers gay,
Seems to be telling a story —
The beauty of Nature's way

With friends, old and new, and hearts so true,
Their friendship will never fail,
Let me live in the little village of Scholls
At the end of the Oregon Trail

Ina Rowell Sutherland (Hesse, 1976)
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>1</td>
</tr>
<tr>
<td>Geography</td>
<td>3</td>
</tr>
<tr>
<td>Indigenous Tualatins</td>
<td>7</td>
</tr>
<tr>
<td>Trappers and Settlers</td>
<td>14</td>
</tr>
<tr>
<td>Trappers</td>
<td>14</td>
</tr>
<tr>
<td>Settlement Life</td>
<td>20</td>
</tr>
<tr>
<td>Agriculture</td>
<td>25</td>
</tr>
<tr>
<td>Logging</td>
<td>29</td>
</tr>
<tr>
<td>Navigation, Drainage, and Channel Modifications</td>
<td>37</td>
</tr>
<tr>
<td>Urbanization</td>
<td>45</td>
</tr>
<tr>
<td>Floodplain</td>
<td>46</td>
</tr>
<tr>
<td>Water Rights</td>
<td>48</td>
</tr>
<tr>
<td>Water Quality</td>
<td>50</td>
</tr>
<tr>
<td>Conclusion</td>
<td>55</td>
</tr>
<tr>
<td>References Cited</td>
<td>57</td>
</tr>
</tbody>
</table>
# LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Figure 1</td>
<td>Various Spellings of the Kalapuya tribe</td>
<td>8</td>
</tr>
<tr>
<td>Figure 2</td>
<td>Location of Twality villages</td>
<td>10</td>
</tr>
<tr>
<td>Figure 3</td>
<td>Land Donation Settlement Claims</td>
<td>18</td>
</tr>
<tr>
<td>Figure 4</td>
<td>Map of 1855 Settlement Claims</td>
<td>19</td>
</tr>
<tr>
<td>Figure 5</td>
<td>Scholls Grange Advertising Tract</td>
<td>27</td>
</tr>
<tr>
<td>Figure 6</td>
<td>Douglas Fir Harvest, Washington County</td>
<td>34</td>
</tr>
<tr>
<td>Figure 7</td>
<td>Washington County Population</td>
<td>45</td>
</tr>
<tr>
<td>Figure 8</td>
<td>Water Rights in Metropolitan Areas</td>
<td>49</td>
</tr>
</tbody>
</table>
INTRODUCTION

Dionysius said that history is philosophy learned from examples. As one of the original four counties of the Territory of Oregon, the Tualatin River Basin is rich in history. While still a prime agricultural region, the Tualatin Valley is one of the state’s fastest developing areas. The slow accumulation of landscape changes within the basin have their origin in the historical needs and lives of the people within the valley.

The isolation of the Tualatin River from its floodplain, the draining of wetlands, and the increased urbanization are intertwined with the dreams and efforts of the valley’s residents for the last 150 years. The landscape changes, accumulating over time, have had unforeseen consequences. The Tualatin River, once respected for its floods and tortuous channels, was declared "water quality limited" in 1987.

Turning back the pages of history, a picture of the pre-contact Tualatin River Basin can provide a point of reference for evaluating the current hydrology of the river. Further, the historical account provides insight into the needs that fueled the landscape changes. No one set out to create a river too rich in phosphorus and too subject to algal blooms. The philosophy of the original settlers differs little from that of present day inhabitants, only today we understand more about the consequences of the slow accretion of small, individual changes.
The Tualatin River Basin has been called "a bowl-shaped hollow" (Benson, 1978), "roughly oval" (USACE, 1970), a "saucer-shaped syncline" (Hart & Newcomb, 1956), and "roughly triangular in shape" (USBR, 1962). Each image is attempting to portray a floodplain valley that is surrounded on all sides by a rim of mountains and adjoining hills. The Tualatin Mountains, a spur of the Coast Range rising up to 1000 feet, walls in the valley on the north and east. The southern rim is formed by the Chehelem and Parrott Mountains (1630 and 1240 feet maximum elevation, respectively). The rugged Coast Range mountains finish the enclosure on the west and are the home of the Tualatin River headwaters. The enclosed basin is 712 square miles, 40 miles long and 25 miles wide.

There are only four low notches in the wall around the Tualatin River Basin. The Tualatin River drains into the Willamette River through the low spot at Lake Oswego. The other notches are found at Wapato Lake, Fields Bridge, and at Tonquin. All four low spots have been used by prehistoric floods to fill the Tualatin River Basin with water to approximately 500 feet. Scabland channels from these floods can still be seen at Tonquin. (Benson, 1975; 1978)

During the Wisconsin stage of the last ice age, 12,800 to 15,000 years ago, an ice dam across the Upper Columbia River gave way. The Missoula or Bretz floods filled the Willamette Valley which became Lake Allison to geologists when it was inundated with muddy water. These catastrophic floods punched their way into the Tualatin River Basin and left a landscape dominated by swamps and prairies (Benson, 1975; 1978; Zyback, 1990; Beckham et al., 1981). The old alluvial soils in the Tualatin Valley were probably carried during these floods because "the absence of marine-type water indicates that fresh water was the most likely environment of this valley..."
fill" (Hart & Newcomb, 1956). Newer alluvial soils are found near the Tualatin River placed by the much smaller floods of the river itself (USBR, 1962).

The Tualatin River is the most northern, and one of the largest, tributaries to the Willamette River. The upper reaches of the Tualatin River are in the Coast Range below the crest of Grindstone Ridge at an elevation of 2,800 feet. The main stem of the Tualatin River has three large elevation drops at Haines Falls, Lee Falls, and Little Lee Falls before it enters the Tualatin Valley plain at an elevation of 120 feet. An 1895 survey report states, "the river flows in a tortuous channel throughout its length ... and varies in width from 20 to 60 feet." The report says that across the plains on the way to the mouth "the width increases to 200 feet" (USHR, 1895).

As the river travels leisurely and sinuously across the valley floor for 45 miles it only drops 20 feet in elevation. The last six miles are constrained and underlain with bedrock causing whitewater and rapids, and dropping 30 feet in elevation during the last mile to the mouth (Benson, 1978).

The Tualatin River has eight large tributaries: the Wapato, Scoggins, and Gales creeks which drain part of the Coast Range; the Dairy and Rock Creeks which drain the Tualatin Mountains; the McFee and Chicken Creeks which drain the northeast slopes of the Chehelem Mountains; and Fanno Creek which drains the valley floor and Portland Hills. Many of these creeks have deeply dissected their slopes providing "a situation of maximum relief and runoff" (Hart & Newcomb, 1956). These characteristics give the secondary streams a strong tendency to flood their low reaches near the Tualatin River.

The flooding of the Tualatin River Basin is one of the motivational forces of subsequent human-induced landscape changes. There are several reasons that the basin is subject to inundation and slow drainage. The primary source of flooding is the weather. Benson (1975) reports that
From October to June, disturbances move in from the vast Pacific in a steady succession of varieties of bad weather. Storms that are funneled inland by the gorge of the Nestucca, driven by southwest gales, are called "Nestuckers." ...A nestucker can dump an inch of rain in an hour, and have been known to bring four inches of rain in a day. Gentler disturbances that move in from the west, up the valleys of the Wilson and Trask, are known as "Traskers." ...About four times per decade, a combination of melting snow and severe, lashing Nestucker rainstorms build up a burden of water beyond what the soil can absorb.

Natural catchments for holding excess water were lakes such as the Wapato, and various other smaller marsh lakes due largely to dams built by beavers (Benson, 1975). The water table is high under much of the valley floor and is underlain by Columbia River basalt or lava-rock. The aquifers are refilled each year during the first rainfalls and subsequent recharge is rejected and drains away as runoff or stands in marshy ponds. The largest marshy area is near the east fork of Dairy Creek. Other marshy areas were found along Wapato Creek and in the embayment of the valley plain (Hart & Newcomb, 1956).

As flood waters overflowed banks of tributaries and then rushed into the Tualatin River, the slow moving waters of the river, with little drop in elevation and clogged with sediment, fallen trees, and vegetation, overran its banks and spread out over the valley floor as marshlands which were very slow to drain off. Early trapper reports note the wet condition of the valley floor, and one such trapper, Peter Ogden, described the Tualatin Valley as "mostly water connected by swamps" (Sedell & Luchessa, 1982).

These swamps were probably the reason early settlers wrote they were "severely persecuted by mosquitoes day and night" (Carey, 1922). Aside from mosquitoes, the "humid, transition life zone" (Decker, 1976) of the Tualatin River Basin provided a woodland habitat for Douglas fir, western hemlock, western red cedar, and understory vegetation of vine maple, hazel, dogwood, sallal, and Oregon grape. The grass-covered prairies and the wooded hills
were home for the cougar, Columbia blacktailed deer, brown mountain beaver, Douglas squirrel, silver gray squirrel, Oregon brush rabbit, raccoon, Townsend chipmunk, muskrat, fox, beaver, and coyote. Birds in the area included the sooty grouse, Oregon ruffed grouse, mallards, snow geese, and swan, quail, western crow, and long-tailed jays (Decker & Davis, 1976; Hesse, 1976). Trout, steelhead, and possibly salmon were found in the Tualatin River. Species long gone from the valley included elephants, camels, and the giant beaver (Zybach, 1990)
INDIGENOUS TUALATINS

The Trickster, Coyote, created the world, the Willamette Falls, sickness, and the art of fishing for salmon, according to the Kalapuya who lived in the Tualatin River Basin (Beckham et al., 1981).

Although some evidence seems to indicate there may have been inhabitants in the Willamette Valley before the Kalapuya, as long ago as 60,000 years (Zybach, 1990), the earliest direct evidence suggests humans arrived near the end of the last ice age (Beckham et al., 1983). This indicates humans may have contributed to the extinction of large ice age mammals but were not here long enough to be affected by the Missoula floods. The beginnings of winter village complexes, which characterize the Kalapuya, dates back 6,000 years (Beckham et al., 1983), and the presence of three distantly related Penutian languages used by the Kalapuya suggest these natives had been in the region several millennia (Beckham et al., 1981).

The Kalapuya, descended from natives in the Columbia River plateau, occupied most of the Willamette Valley but formed distinct groups with separate languages. The Kalapuya within the Tualatin River Basin were related to the Yamhill River Basin Kalapuya but spoke a distinct dialect. The emphasis on river basins is important as Beckham, et al. (1981) report:

Each "tribe" or "band" elsewhere documented to have probably been a dialectical-ethnic entity seems to occupy its own valley or basin formed by one of the larger tributaries of the Willamette River; each such major valley offered a range of riverine, lowland, and upland types of habitat.

Within river basins, "the basic organizational unit of the Kalapuya was the autonomous winter village" (Beckham et al., 1981). Each village consisted of related males and their wives and children. Marriage partners were found outside the village and wives moved to their husband’s camp.

The most northern Kalapuya lived within the Tualatin River Basin and were called the Twality, Tualatins, Atfalati, Quality, Faladin, or Nefalatine.
(Goodall, 1958). Their name, Twality, was used for one of the four original counties in Oregon. Although some historians have suggested that "Tualatin" meant "slow and lazy," more recent historians dispute this and have suggested it meant either "without trees" or possibly "those who live near forked mountains" (Benson, 1975).

There were between 22 and 24 winter villages within the Tualatin River Basin. Figure 1 lists the various spellings of the Kalapuya tribe. Figure 2 shows the location of the Twality villages.

![Figure 1. Various spellings of Kalapuya. (Beckham, 1981)](image)

The term "Kalapuya" is derived from the Chinookan term for the Willamette Valley people, *it-galapu-ywi-yu-ks.*

<table>
<thead>
<tr>
<th>Spellings</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cal-lar-po-e-wah</td>
<td>Calapoosas</td>
</tr>
<tr>
<td>Cath-la-poo-qaas</td>
<td>Calapuaya</td>
</tr>
<tr>
<td>Kallapooya</td>
<td>Calapuyas</td>
</tr>
<tr>
<td>Calapooias</td>
<td>Calipoa</td>
</tr>
<tr>
<td>Kalapu-yua</td>
<td>Calipooias</td>
</tr>
<tr>
<td>Kalapuyuks</td>
<td>Calipoyas</td>
</tr>
<tr>
<td>ka-lapu-ya</td>
<td>Calipuyowes</td>
</tr>
<tr>
<td>Calapooya</td>
<td>Cal-lah-po-e-ouah</td>
</tr>
<tr>
<td>Kalapooiah</td>
<td>Callapipas</td>
</tr>
</tbody>
</table>

The Twality were distinct from southern Kalapuya because they traded with coastal Tillamook who caught fish and gathered shellfish and carried them over the Coast Range to trade with the Twality for Wapato roots which the Tillamook dug for themselves at Wapato Lake (Beckham et al., 1981). The other distinction was that field burning appears to have been less important for the Twality. Kalapuya burned valley floors to maintain them in oak-savannah, to make harvesting seeds easier, and to concentrate game animals in unburned areas. Seed and acorn processing seems to have been more important further south, while the Twality engaged in more large game hunting (Beckham et al., 1981). Whether the Tualatin valley floor was maintained as marsh grassland
through field burning or by periodic floods has not been definitively decided in
the literature, though some burning may have occurred in the cultivation of
tarweed.

(1981) report the Twality spent:

six or more months of the year in temporary open camps. ...
Vegetable resources were harvested throughout the drier half of
the year, from about March (when the first shoots of camas
began appearing) at least well into October.

The Twality used a number of techniques for game hunting, including
deer’s head disguises, noose snares, pitfalls, and communal drives. They also
dried and ate a number of berries and edible plants, such as the now-rare
riceroot. The Twality fished for trout and suckers, eels, crawfish, and freshwater mollusks. Fishing was done with rock dams and willow baskets, with
spears, and with hooks, willow bark line, and grasshopper-baited lures. The
Twality used cedar canoes if only for carrying water.

The Kalapuyan subsistence base seems to have been diverse,
requiring access to a variety of riverine and upland and lowland
habitats... Thus, winter-village groups were perhaps relatively
small, with each necessarily having access to a comparatively
large territory. Therefore, the loose organization of Kalapuyan
local groups into larger dialectical-ethnic units (the specific
organizational structure of which is, of course, unknown) could
have had an adaptational significance: such a form of
organization would have provided a territory large and diverse
enough to offer each local group sufficient access to an adequate
range of subsistence resources, but at the same time would have
kept the population suitably dispersed by preserving the separate
existence of small local groups (Beckham et al., 1981).

The Willamette Falls were the trading center for all the Kalapuya and
for the Clackamas tribes that lived below the falls. A simplified trade
language, Chinook Jargon, was used by all Oregon natives (Benson, 1975).
Trading often involved slavery, as the Twality frequently captured Kalapuya
<table>
<thead>
<tr>
<th>Place Name</th>
<th>Location Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chachambitmanchal</td>
<td>3½ miles N. of Forest Grove</td>
</tr>
<tr>
<td>Chachamewa</td>
<td>At Forest Grove, 6 miles from Wapato Lake</td>
</tr>
<tr>
<td>Chachanim</td>
<td>On Wapato Lake prairie</td>
</tr>
<tr>
<td>Chachif</td>
<td>On Wapato Lake</td>
</tr>
<tr>
<td>Chachimahiyuk River</td>
<td>Between Wapato Lake and Willamette</td>
</tr>
<tr>
<td>Chachimewa</td>
<td>On or near Wapato Lake (Yamhill County)*</td>
</tr>
<tr>
<td>Chachokwith Grove</td>
<td>At a place of the same name N. of Forest Grove</td>
</tr>
<tr>
<td>Chagindueftei</td>
<td>Between Hillsboro and Sauvie Island</td>
</tr>
<tr>
<td>Chahelim</td>
<td>In Chehalem Valley, 5 miles S. of (Yamhill County)*</td>
</tr>
<tr>
<td>Wapato Lake</td>
<td>About 10 miles W. of Oregon City</td>
</tr>
<tr>
<td>Chakeipi</td>
<td>Northeast of Hillsboro</td>
</tr>
<tr>
<td>Chakutpalai</td>
<td>Near the outlet of Wapato Lake</td>
</tr>
<tr>
<td>Chalal</td>
<td>Southeast of Wapato Lake</td>
</tr>
<tr>
<td>Chalawai</td>
<td>On Wapato Creek at the E. end of Wapato Lake</td>
</tr>
<tr>
<td>Chamampit</td>
<td>North of Hillsboro</td>
</tr>
<tr>
<td>Cahpanaghtin</td>
<td>4 miles W. of Wapato Lake</td>
</tr>
<tr>
<td>Chapokele</td>
<td>At Forest Grove</td>
</tr>
<tr>
<td>Chapungathpi</td>
<td>At the upper end of Wapato Lake</td>
</tr>
<tr>
<td>Chataghil</td>
<td>In Washington County</td>
</tr>
<tr>
<td>Chatagshish</td>
<td>7 miles N. of Hillsboro</td>
</tr>
<tr>
<td>Chatakuin</td>
<td>10 miles N. of Wapato Lake</td>
</tr>
<tr>
<td>Chatamnei</td>
<td>5 miles W. of Wapato Lake (Yamhill County)*</td>
</tr>
<tr>
<td>Chatilkuei</td>
<td>W. of Forest Grove</td>
</tr>
</tbody>
</table>

Chapokele may have been the Twality name for Patton Valley where "Wishram Water Devil" petroglyphs are located.

*Unless otherwise noted, locations are in Washington County

Figure 2. Twality Winter Villages. (Decker, 1976)

from further south. According to Beckham, et al. (1981), life as a slave among the Twality was not as harsh as in other tribes further north:

Among the Atfalati (Twality) slaves were allowed to marry fellow slaves, even free persons [sic] when horses were paid to their owner for the permission.
The main reason for traveling to the Willamette Falls was to fish for salmon. Although the literature is undecided whether or not salmon were able to leap the Willamette Falls, it seems that any salmon in the Tualatin River were insufficient because yearly treks were made to the Falls, to the annoyance of the Clackamas tribe who considered the Falls private territory (Benson, 1975).

Because of their inland location, the Kalapuya were not visited by the Lewis and Clark expedition in 1805 and 1806. The first meeting of Kalapuya and whites was in 1812 when fur traders, led by Donald McKenzie, visited the valley. Many diaries describe how the settlers viewed the Twality. Harvey Starkweather wrote:

The Indian village nearest Oswego was across the river where Jennings Lodge is located. As I recollect this particular Indian camp, it was a vile smelling place. Each hut of one room served as shelter for a large family and in it living, cooking, sleeping and the curing of fish and meats were carried on in more or less indiscriminate manner. ...I distinctly remember on the occasion of one of my visits that the ceiling beams of the hut were covered with eels for the purpose of drying. The condition of the interior at this time can be better imagined than described. I recollect many interesting features, [sic] as a tame beaver and a fawn which were evidence of the Indian's fondness for pets. I remember the immense sturgeon and salmon which the Indians caught. A medium-sized salmon, say up to 15 or 20 pounds, would sell for 25 cents. A larger fish, up to perhaps 35 or 40 pounds, could be bought for 50 cents. The Indian delivering it a mile or more, carrying it upon his back (Goodall, 1958).

Such descriptions depict the remnants of the Twality after historic contact, when their traditional winter village organization had been destroyed. Rampant epidemics swept through the Kalapuya after first contact with the fur trappers and the diseases were especially virulent between 1829 and 1835 (Decker & Davis, 1976). Early accounts suggest there were originally 10,000 Kalapuya (Beckham et al., 1981). Parker's count in 1840 totaled 8,780. Between 5,000 and 6,000 Kalapuya died of fever in 1829 and Slaucum
estimated there were only 1,200 survivors (Decker & Davis, 1976). Wilkes stated there were 600 Kalapuya in the 1830’s (Beckham et al., 1981). British Royal Marines surveying in 1845 reported 300 Kalapuya. Governor Lane reported 60 "Tualatene" in 1849, and 65 men, women, and children were included in the treaty negotiated with the Twality on April 17, 1851 (Decker & Davis, 1976). An 1870 census showed 60 Atfalati (Twality) living on the Grand Ronde reservation; the 1910 census counted 44. In 1914, only one Twality survivor was found, living on the Yakima reservation in the state of Washington (Ruby & Brown, 1986).

Such drastic decline in population and lifestyle explains why Lee and Frost wrote in 1844:

Now the fact is this: there never was but one tribe of Calapooyas, and of that tribe there are only a few most miserable remnants left, (which is the condition of all the Indians in the lower country,) and these remnants, consisting of but a few families each, are scattered over the most part of the Walamet Valley, and will not number more than 500 to 800.

The philosophy of the settlers with regard to the natives is perhaps best described by Charles Nicolay, writing in 1846:

Stripped, however, of all fictitious ornaments, savage life, though it has natural beauties, yet the darker shadows of its vices overcome the lustre of its virtues; and though we may regret individual loss, we cannot but rejoice in the universal advantage and progress. The mill and the factory of the white man may be less picturesque than the deer-skin lodge of the red; the smoky steamer, as, panting and rattling, she cuts through the lakes or rivers, less in harmony with their features than the undulations of the buoyant canoe — the blackened clearing less grateful to the eye than the woodland glade, the dusty road than the forest trail — but the perfection to which they lead, the bright day of peace and love, of which they are the harbingers — though but faintly discernible in the long perspective of years to come — is too pregnant with the happiness of the human race, and the glory of the Deity, to leave any serious pain, from the means by which it is of necessity to be obtained, upon the
mind which looks forward to it.

The rapidity of the advance of civilization to the west has, in the rapid development of its vices, obscured the poetry of its savage life, insomuch that the very knowledge of the existence of the tribes inhabiting it was coupled with that of their demoralization and degradation.

This pioneer attitude justified settling in lands that were the ancestral home of the Twality, including dividing the land around Wapato Lake that had been reserved for the Twality by treaty. In 1851, Indian Superintendent Palmer urged the remaining Twality to move to the reservation at Grand Ronde and stated:

Settlers have taken and now occupy within this reserve all the lands susceptible of cultivation, without regard to the occupancy of the indians who in several instances have been driven from their huts, their fences thrown down and property destroyed. …The Wapato, Kammas and other nutritious roots once produced abundantly in the marshes and lowlands around their principle residences, and constituting their principle means of subsistence, have, since the increase of swine, gradually diminished in quantity and must soon fail. The wild game, formerly abundant, is also becoming scarce (Carey, 1922).

Today, no one speaks Kalapuyan and the only remnants are the names of rivers and towns, some petroglyphs, and the highways that cross the Tualatin River in the same spot as the old Indian trails.
Trappers

The British Pacific Fur Company started the first Anglo-American base in the Pacific Northwest at Astoria in 1811. Their plan was "to tap the fur wealth of the interior of the North Pacific Coast and ship the pelts directly to the Orient for trade goods it could then sell to the larger world market" (Beckham et al., 1981). In May of 1811, the trappers had sent explorers to the mouth of the Willamette River and reported:

Our guide informed us that up this river about a day’s journey there was a large waterfall and beyond it the country abounded in beaver, otter, deer, and other wild animals. Here, where we were, the rows of oaks and poplars lining both banks of the river, the green and flower-covered prairies glimpsed through the trees, and the mountains seen in the distance presented a smiling and enchanting prospect to the observer who loved the beauties of simple nature (Beckham et al., 1981).

By December of 1811, Robert Stuart led the first exploration up the Willamette River. Donald McKenzie, who was part of the competing Northwest Fur Company, out of Montreal, led the second exploration in 1812 as far as the McKenzie River. The November, 1812 expedition of Wallace and Halsey built a post near present Salem because Fort Astoria was being ravaged by scurvy. When they returned to Astoria in May 1813, they brought 17 packs of furs and 32 bales of dried venison (Beckham et al., 1981).

For the next eight years, both fur companies trapped and traded in the Willamette Valley. In 1821, the Northwest Fur Company merged with the Hudson Bay Company, who soon moved its headquarters to Fort Vancouver. Dr. McLoughlin, who ran Fort Vancouver, kept a tight grip on all activities in the Willamette Valley by being the only source of supplies.

In 1828, McLoughlin was approached by the first "Yankees" to enter the Willamette Valley. Jedediah Smith of the Rocky Mountain Fur Company had been trapping in California and had moved North. Smith described the
Willamette Valley to McLoughlin:
I judge it to be two hundred miles long, Doctor. There are meadows and natural prairies. I've never seen such game and wild fruit and belly-deep grass (Case, 1949).

Eventually, politics between Britain and the United States increased the number of Americans moving into the valley, and decreased the supplies McLoughlin was willing to give Americans.

The Hudson Bay Company fur traders named Dairy Creek in the Tualatin River Basin after a dairy they ran there. They apparently used the valley as a backyard for the cattle needed to supply Fort Vancouver (McArthur, 1943). But by 1837, Americans not associated with the fur trade had begun to enter the Willamette Valley. Ewing Young decided it was time to break the Hudson Bay Company monopoly on cattle. Young's Willamette Cattle Company drive of 630 head from California to Champoeg was a heroic effort through territory only surveyed by Jedediah Smith. The early settlers saw the cattle as a "literal symbol of freedom" (Case, 1949; Beckham et al., 1981).

The first settlers in the Tualatin River Basin were retired mountain men, fur trappers from the various companies. Benson (1975) estimates there were seven trappers and their Nez Perce wives in Twality before 1840. Peter Barnett, who came to Oregon in 1843, described these settlers:

When we arrived in Oregon, we found there a number of Rocky Mountain hunters and trappers, who were settled in the Willamette Valley, most of them in the Tualatin Plains. The invention of the silk hat had rendered the trapping of beaver less profitable. ...Having been so accustomed to the idle life of the Rocky Mountains, they were not at first pleased with the hard work and drudgery of farming. Meek told me that soon after their arrival in Oregon, they applied to Dr. McLoughlin for purchase of supplies on credit. This application the doctor refused. They still urged their request most persistently and finally asked the doctor what they should do. He replied in a loud voice: *Go to work! Go to work! Go to work!* Meek said that was the thing they did not wish to do. (Carey, 1922)
Meek complained a great deal about the Tualatin Valley, living in a tent during rainstorms, enduring moccasins filled with mud, running out of food, and having to live on boiled wheat (Case, 1949). Meek was not the only one who complained, Edward Lenox, who arrived in the Tualatin plains in 1843 recalled:

The fields were not fenced at all, and so father and I went to work at once, making rails and fencing the fields. In the spring, through the kindness of Dr. McLoughlin of Fort Vancouver, we got an order on one of our neighbors, a Mr. Buxton, for such wheat as we needed to sow and mill, the loan to be repaid when we delivered our crops on the river. The mill where our grain was ground, belonged to Gale, and was about ten miles from where we lived. We had gone hardly more than half the distance, when the wagon was so mired, that our two yoke of weakened oxen were not able to draw it out and we were compelled to carry the grain a sack at a time, and so empty the wagon in order to get out...

Our family lived to a great extent on boiled peas, boiled wheat, with parched wheat and parched peas for coffee. This was our coffee for fifteen years (Beckham, 1975).

Outside of the Oregon Territory, however, it was the glowing reports, such as those of Wilkes’ (in five volumes) that encouraged more settlers to come to the valley:

O’Neill came to the valley with only a shirt to his back, as he expressed it: he began by working part of this farm, and obtained the loan of cattle and other articles from Dr. M’Laughlin [sic], all of which he has, from the natural increase of his stock and, out of his crops, since repaid. He has bought the farm, has 200 head of stock, horses to ride on, and a good suit of clothes, all earned by his own industry; and he says it is only necessary for him to work one month in the year to make a living; the rest of the time he may amuse himself. (Beckham et al., 1981)

Before Wilkes’ glowing descriptions brought more emigrants to Oregon, the second group of settlers were selecting homesteads in the Tualatin River Basin. Benson (1975) states that at least four missionaries were settled
in Twality prior to 1840. Many missionaries took to farming as the indigenous population dwindled. Rev. Griffin became pastor of the First Church of the Tualatin Plains in 1842. The British supporters were not happy with the settlements organized by the missionaries as they brought more Americans into the Oregon Territory. Nicolay, a British sympathizer, wrote in 1846:

No satisfactory account of Oregon could be given without some notice of the Willamette Settlement.

He then goes on to say that the American Missionaries in the settlement, "...sink into political agents and would-be legislators."

The next group of settlers in the Tualatin River Basin were the 14 Red River men, a group of Canadians, mostly Scots, who became discouraged farming the Puget Sound for the Hudson Bay Company and drifted away to Twality (Benson, 1975).

The decline of beaver trapping, patriotism, and religious work brought the early settlers to Twality. Conditions in the rest of the United States, including slavery and economic downturns, and the glowing reports of previous settlers brought the next tide of emigrants to the Tualatin River Basin. Figure 3 shows Benson's (1975) report of the number of settlement claims in Twality between 1841 and 1855, the last year of the free land offered under the Donation Lands Claim Act. Figure 4 is a map of 1855 settlement claims estimated by Benson (1978) and includes tributaries, historical sites, and highways on the Tualatin River as described in Benson’s article "The Tualatin River, Mile By Mile."

Oregon was granted official territory status in 1848. Nicolay (1846) reports that by this time there were 3,000 people living in the Willamette Valley, producing "at least 1,000 bushels of wheat, 70 head of cattle, 5 horses, and 900 hogs [as the] tangible results of the settlers from a few years work."
Life for the settlers was neither as glowing as Wilkes reported, nor as
doomed as Meek feared. The activities of the settlers to carve a meaningful
existence for themselves, however, continued the landscape changes that had
begun with the "trapping out" of the beaver. Nicolay reports that by 1846:

Every new settler, every fresh location, reduces, if but a little,
the number of fur-bearers. ...all animals inhabiting the
more fertile districts must soon become extinct. That this is the
inevitable consequence of the occupation and cultivation, the
constant occurrence of deserted beaver dams and entire absence
of the animal itself from the eastern shores of the continent,
sufficiently prove, and it therefore becomes probable that at no
distant period the fur trade in Oregon will be carried on in small
animals only.

He then goes on to exonerate the Hudson Bay Company by showing how they
relinquish any post that shows danger of exhausting an area, and recommends
commencing trade in the "swarms [of] amphibious animals of the seal kind,
known by the vulgar names of sea-lion, sea elephant, and sea cow."

<table>
<thead>
<tr>
<th>Donation Land Claims in the Tualatin River Basin</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Counts include only men, not wives or children)</td>
</tr>
<tr>
<td>Prior to 1840</td>
</tr>
<tr>
<td>1841</td>
</tr>
<tr>
<td>1842</td>
</tr>
<tr>
<td>1843</td>
</tr>
<tr>
<td>1844</td>
</tr>
<tr>
<td>1845</td>
</tr>
<tr>
<td>1846</td>
</tr>
<tr>
<td>1847</td>
</tr>
</tbody>
</table>

Figure 3. Settlers in the Tualatin River Basin between 1841 and 1855.
(Benson 1975)
Historical Tualatin River Basin

Figure 4. Land Donation Claims and Historical Locations. (Benson, 1978).
Settlement Life

The earliest settlers selected properties with open meadows where they could run their horses and small herds of cattle. Nicolay (1846) describes the benefit of these pasture lands:

The cattle thrive on natural hay; for the grass, which in the beginning of the summer grows rapidly, is afterwards converted by the heat and drouth into hay; it is very nutritious, all its juices being preserved. ...The cattle require no shelter, though they are penned for protection against the wolves, and to manure the land.

Lawrence Bamford, Wilkes’ nephew recalls:

Some of my early memories are about Uncle Billy. When he and his boys had their hay shocked they would always go swimming before they would haul it in (Moore, 1978).

Later arrivals had to either buy existing homesteads or face the rigors of chopping, burning, or wresting farms out of the woodlands. Established homesteads rose rapidly in value. Wilkes purchased his land for $20 per acre, and sold it four years later, in 1889, to Milton Markham for $25 per acre. When Markham sold the farm in 1908, he received $70 per acre (Moore, 1978), a land value increase of 350 percent in 23 years!

Most settlers, however, had to carve out new homesteads. Hesse (1976) states:

The landowners had a surplus of timber. As clearing progressed, many trees were felled, allowed to dry, and then burned. The air, especially in autumn, was often filled with dense smoke.

Settlers taking up new sites had to become self-sufficient rapidly.

Martinazzi writes:

Tualatin’s early residents were almost entirely dependent on wild game for food, since the denseness of the trees prevented the growth of pasture grass sufficient to support even a family milk cow. Trapping fur animals, a chore usually relegated to the younger boys in the family, provided an income for staples which were brought from Oregon City. To get them the settlers
followed an Indian trail... crossing the Tualatin River by rowboat and the Willamette at Oregon City on the McLaughlin ferry (Moore, 1976).

Many activities had to be engaged in rapidly to provide a living for the settlers. Cabins had to be built, which meant cutting and hauling timber with oxen, and the wood was better suited for use if a nearby saw mill had been constructed. Orchards had to be planted. Wheat needed to be ground, and routes to trading centers needed to be established. Mail needed to get through, products needed to be sold to purchase necessary items, wells dug, and schools built.

While each homestead developed some sufficiency ("Every family had an orchard of about one acre of a good variety of fruit of which apples were an important part"(Moore, 1978)), other activities such as mills and mail required partnerships. For this reason, little settlements began to grow up along the Tualatin River around low spots, which allowed crossing, or around the site of a saw or grist mill. Thus Scholls was built at the ferry landing site for travelers following the old Indian trail to French Prairie and Salem, and Dilley was built around a flour mill.

The Tualatin River Basin presented some unique problems for the settlers. When William and Butler Ives conducted the first surveys of the basin (Township 2, Range 1 West) in 1852, they found many acres of swamps or sloughs that were repeatedly filled during the winter freshets, when muddy floodwaters rushed out of the Coast Range and backed up on the valley floor.

One of the first industries in the Tualatin River Basin was the manufacturing of tiles to help drain off the fields (Hesse, 1976). Martinazzi describes the swamps on the Thompson homestead near the town of Tualatin:

At that time the beaver dam, which later became rich onion producing land, was a bottomless swamp and until it was drained presented a hazard to livestock. Quicksand along the edges sucked many cattle into the bog and the jawbone of a
huge animal pulled from the swamp when it was ditched, was identified by the Smithsonian Institute as part of a prehistoric creature (Moore, 1976).

Residents of the Tualatin River Basin also had to worry about floods. Martinazzi described the flooding in the early settlement of Tualatin:

Flooding of the town was an annual menace. ...Streams were inundated and boats were the only means of travel. Asa Mack was born January 13, 1894, when the river was at flood tide, and water had entered the lower floor of the house before the delivery was completed (Moore, 1976).

These unique circumstances of swamps and floods led the settlers to build canals, drainage ditches, dikes, and dams quite soon after they arrived. In 1895, James Post, the Chief of Engineers, reported to the U.S. War Department on the state of the Tualatin River. He noted that Wapato Lake:

was formerly a shallow lake of considerable area. Half a mile below the lake a canal of 1½ miles long has been opened by the property owners in the vicinity which straightens the river and drains the bed of the lake for agricultural purposes (USHR, 1895).

Later, the report notes the existence of two private dams:

The first of the dams, 14 feet in height, is located at Dilley, 2 miles below the canal, and was built by a flour mill company for milling purposes. The second dam, 4 feet in height, was built by the Oswego Iron and Steel Company.

James Post’s report also notes that 14 bridges were already crossing the Tualatin River, and that 6,000 tons of valley produce were taken annually to Portland, with a return commerce of 9,000 tons.

The noted trade with Portland is of particular interest, because in the early years of the Tualatin River Basin settlements, both Portland and Oregon City vied for the business and produce of the valley. A race between the cities to establish the first road or river route to Tualatin ensued. How Portland became victor is described by Maddeux (1952):
For access to Tualatin Plains, it was necessary to cut a road through the mountains back of the city. This developed into the Canyon Road, which began where Jefferson Street left off. Construction commenced in 1847, but the forest was so thick that progress was slow. The road became so muddy during the rainy season that a wagon could make but nine miles a day. It was the end of 1849 before the Canyon Road was opened to through traffic. The farmers of the Tualatin Valley could now bring their produce down to Portland, which gave it an advantage as a shipping point over rival cities along the river. It was much more convenient for Tualatin Valley farmers to come to Portland than to Oregon City.

The difference this road made for Portland can be understood from diary and letter extracts of 1848 before the road, and those of 1850 after the road was completed. In 1848, Portland was described as having:

- two white houses and one brick and three wood colored frame houses and a few cabins...
- We traveled four or five miles through the thickest woods I ever saw, all from two to six feet through, with now and then a scattered cedar; and intolerably bad road...
- These woods are infested with wild cats, panthers, bears, and wolves. (Carey, 1971)

Two years later, in November 1850, an observer wrote:

- You will perhaps be astonished when I tell you that Portland has become the principle town of Oregon...
- There are now under way not less than 150 new houses and there have been built over 100 dwellings during the last summer and fall, eighteen stores, six publick boarding houses, two large churches, fifteen smaller stores.
- We have cut a road through to Tuality Plains (Carey, 1971).

The transition between an area of a few somewhat idle retired trappers and an area of political significance occurred rapidly within ten years. The change was dependent on agriculture, forestry, and transportation. Each played their part in the landscape changes that are of present concern, and each deserves a section of their own.
AGRICULTURE

The first trappers and settlers to the Tualatin River Basin consistently sent back reports and letters identifying the valley as a prime agricultural area. In 1850, Charles Stevens wrote:

West of this ridge on the opposite side of the river is what they call the Quality (Twality) Plains, and it is said to be a most delightful country, and all settled up. We are told there is a large quantity of wheat on the ground in these parts, and looks the very best...

Wilkes, of course, wrote the most glowing reports. His comments on agriculture include:

The wheat of this valley yields 35 to 40 bushels for one sowing, or from 20 to 30 to the acre. Its quality is superior to that grown in the United States and its weight nearly four pounds to the bushel heavier. The above is the yield of the new land, but it is believed it will greatly exceed this after the third crop, when the land has been broken up and well tilled (Nicolay, 1846).

Mrs. John McConnel near Sherwood disagrees with Wilkes on that last point:

The ground was always best the first few crops. My uncle who lived on Parrott Mountain grubbed out some land, and the first crops of wheat which he put in turned out 60 bushels to the acre. One must remember also that this grain was flailed on the threshing floor and then winnowed, so much grain was lost that would be saved by modern threshing methods (Moore, 1976).

Each settler who brought agricultural diversity into the valley was appreciated, the first sheep, potato starts, a knowledge of onion culture. Ewing Cummings brought his New York knowledge of onions to Tualatin and is believed to have started the onion farms on the Cipole beaver dam, mentioned earlier as the site of quicksand. William Jurgens is thought to be the first to grow potatoes for the commercial market his brother set up in San Francisco. In the Patton Valley region of the basin, farmers were planting
less-watered hillsides in prunes and raising hops (Moore, 1976; Beckham, 1975)

Predominantly, however, the settlers drained their land to grow wheat. By the late 1840’s, the Tualatin agricultural economy was firmly established. Oregonians were the first to be aware of the California gold strike, in 1848, so several Tualatin Valley residents beat the 1849 gold rush (Case, 1949). Some did fairly well, but so did the settlers who remained behind. Tualatin Valley residents were able to sell flour at $50 a bushel to those working the gold fields. The incoming gold brought hard currency into the valley and enabled the building of roads, schools, and stores.

Farmers traded home-raised products for staples at their local markets. Ledgers from the Scholls Ferry store in 1890 show farmers brought in cider, vinegar, cherries, honey, pears and plums, beeswax, wine, calf, tallow, apples, oats, wheat, potatoes, hide, roosters, eggs, lard, and butter (Hesse, 1976). Christopher Hesse’s records also show the prices he sold products for in 1890:

<table>
<thead>
<tr>
<th>Item</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 gal. wine</td>
<td>$ .35</td>
</tr>
<tr>
<td>14½ lb. bacon @ .09</td>
<td>1.21</td>
</tr>
<tr>
<td>27 lb. pork @ .07</td>
<td>1.89</td>
</tr>
<tr>
<td>45 lb. beef @ .05</td>
<td>2.25</td>
</tr>
<tr>
<td>12 bu. wheat @ .82</td>
<td>9.84</td>
</tr>
<tr>
<td>85 lb. cherries @ .02</td>
<td>1.70</td>
</tr>
<tr>
<td>3 doz. eggs @ .10</td>
<td>0.30</td>
</tr>
<tr>
<td>2 bu. peach plums @ .25</td>
<td>0.50</td>
</tr>
<tr>
<td>1 gal. vinegar</td>
<td>0.25</td>
</tr>
<tr>
<td>1 cow</td>
<td>26.50</td>
</tr>
</tbody>
</table>

After the initial push to develop farms and markets, agriculture in the valley remained relatively unchanged until well after the turn of the century. The Scholls Grange advertising tract in 1922, sounds very similar to earlier recommendations of the valley. Figure 5 shows excerpts from that tract.

In 1956, Hart and Newcomb conducted a survey of groundwater resources in the Tualatin River Basin. They found that:
The Garden Spot of the Most Productive County in Oregon

Scholls boasts an up-to the minute, diversified farming community and a population unique in their hearty co-operation in all community work...

Dairying is one of the most important industries of Scholls... Three truck loads of milk leave this community each morning, one for Portland and two for Hillsboro, besides some cream that is sent as sour cream and the milk fed to hogs.

Scholls also has one of the two (4-H) Calf Clubs in the County, and a Pig Club.

No section of Oregon is better suited for potatoes, berries, nuts and fruits than the hills lying to the south and west of Scholls...

Scholls is famed for its walnut industry, as much as anything...

Approximately 100 cases of eggs are sent from this community per week during the spring months.

Black caps are grown much more extensively than logan berries, but there is a large acreage of both in and surrounding Scholls...

Scholls prunes, tart and sweet
An appetizer, a food complete
When cooked by a correct receipt.

The large number of driers nestled all round in the hills is the best evidence of the great out-put of dried prunes in this section...

(Excerpted from Scholls Grange 1922 tract by Hesse 1976)

Figure 5. Excerpts from 1922 grange hall tract in the Tualatin River Basin

Most of the water is used to irrigate dairy pasture and other field crops, but the irrigation of vegetables and berries for fresh market produce and the frozen-food-processing plants is coming into major importance.

Hart and Newcomb also found that in 1953, 1,125 acres of the Tualatin Valley
were irrigated with groundwater and that row crops watered with 18 inches per growing season doubled the yields. For comparison, they reviewed 1952 surface water use and found 8,640 acres were under irrigation by diversion, mostly by sprinkler.

In 1956, consideration was given to storing water on Scoggins Creek to irrigate an additional 31,000 acres and to provide 4,500 acre-feet of water to nearby towns and industry. Reviewing the report, it was decided that more water was needed for non-agricultural uses. A plan was developed in 1963 to provide 17,000 additional irrigated acres and 14,000 acre-feet of municipal and industry water (USBR, 1983).

The study for this dam site described the economy of the area as based on agriculture, particularly hay and pasture crops, dairy products, small grains, and specialty crops. Just as in the days of the Hudson Bay Company, dairying was still the major source of income in the valley (USBR, 1962).

The report suggested that a stable water supply for irrigation during the summer months would allow farmers to diversify into crops for canning and freezing, such as peas, sweet corn, asparagus, beans, and tomatoes. The additional water was projected to benefit 232 private farm owners, as well as the towns and businesses (USBR, 1962).

Construction on the Scoggins Dam began in 1972 and the project was completed in 1978. The entire Tualatin Project contains the dam, Henry Hagg Lake, Patton Valley pumping plant, Spring Hill pumping plant, 20 booster pumping plants, 65 miles of asbestos-cement pipe, and 17.5 miles of reinforced concrete pipe (USBR, 1983).
LOGGING

The first lumbering activity in the Pacific Northwest began with Captain John Meares in the late 1700's. After exploring the coast, he wrote in his journal:

We also took on board a considerable quantity of fine spars, fit for topmasts, for the Chinese market, where they are very much wanted and of course proportionally dear. Indeed, the woods of this part of America are capable of supplying with these valuable materials all the navies of Europe (Carey, 1922).

Timber harvesting in the Tualatin River Basin did not begin for another 100 years. Early settlers were the first loggers as they cut the trees to clear land and build homes. The manufacture of lumber coincided with the milling and shipping of wheat. In his official report of 1846, Lieutenant Neil M. Houison, U.S.N. wrote:

Oregon cannot yet boast of her towns and cities. Even in these, however, her improvement has been great and rapid, and population comes into the capital (Oregon City) faster than the gigantic fir trees which have lately been its sole occupants, can be made to disappear (Carey, 1922).

From 1840 to 1870, timber use was predominantly local. Because settlers were anxious to move out of log cabins and into houses constructed of milled timber (Beckham, 1981), several timber mills sprung up along the creeks in the Tualatin River Basin. Timber was also an important source of energy for the early settlers. Lepschat (Moore, 1975) states that in 1908 the Forest Grove Light Plant generated electricity using four foot cordwood. Mooberry (Moore, 1975) recalls that the blacksmith in Glencoe used homemade charcoal when shoeing the horses used for railroad grading.

One of the first sawmills was built on Baker Creek in 1860 near the Scholls Ferry crossing. A dam was built in 1878 to form a millpond that extended back up the creek. The dam was also used to power a grist mill in the traditional "flouring, chopping and lumbering business." In 1903, the
Groner Rowell Company bought the mills and operated them in conjunction with their tile and brick plants. The company soon added another sawmill, described by Hesse (1976):

A flume was built across the bottom land behind McFee Creek to get logs through the meandering creek to the Tualatin River and to the new mill. Logs were cut and stacked in the hills until the water in the creeks was high enough to bring them down. Mill hands and neighbors helped drive the logs and raft them to the mill.

Baker Creek was also home to a tie mill in the late 1920s, which produced railroad ties, hop posts, lumber and cordwood.

The town of Cedar Mill was the site of the Jones Lumber Company mill built in 1855. The Mill Creek waterfall, with its 32 foot drop, furnished power and water for the log pond. Though it changed hands several times, the mill was still operating in 1892, "until the timber supply was exhausted" (Moore, 1978). John Labbe (Moore, 1978) described how the Cedar Mill worked:

They would close the gate on the dam and back up the water and then they would fill the pond with cedar logs which they cut in the gully up there. When the pond was full, they would open the gate and that provided water for the water wheel.

Hazel Young (Moore, 1978) described how the river's seasonal flow affected the mill:

When water was plentiful the mill was kept busy cutting lumber, mostly cedar and occasionally cut logs hauled in from other areas, such as oak from Bethany area and also from the northeast area of Portland. ...When water was low, activity was more or less confined to cutting and hauling logs from nearby timber and placing it in the pond awaiting more water power for operating the saw. ...Also in the slack periods, the mill hands were kept busy cutting shingles.

The town of Durham was named in honor of Albert Durham who built a lumber and flour mill on Fanno Creek in 1869. Durham also operated a
shipping business to take Oregon lumber to the California, Hawaii, and China markets (Goodall, 1958).

The community of Cherry Grove was platted by August Lovengren, a Swedish lumberman, in 1911. Lovengren began building what was to be a 200 foot dam across the mouth of the Tualatin River canyon above Cherry Grove. The site had seen two previous dams: the Patton Mill dam built in 1862 to power a mill, removed by the fish commission of Oregon at the turn of the century; and the Haines Falls dam built in 1901 to generate electricity. By the fall of 1912, the Lovengren mill was sawing logs from the forest on the south side of the Tualatin River. In 1913, water behind the Lovengren dam began to fill and become a 70 acre lake, with a boom across the backwater to catch debris. Beckham (1975) describes what happened:

In January 1914, a freshet swept through the Tualatin Canyon. Drift piled against the boom and spread across the top of the dam. Within minutes a wild flood of water, logs, and debris went surging into Patton Valley.

When the Lovengren dam burst, Beckham (1975) says, "other firms moved into the heavily timbered upper reaches of the South Fork of the Tualatin and between 1918 and 1958 logged those mountain sides."

The Oregon Iron and Steel Company, which operated the dam at the mouth of the Tualatin River, also operated a logging business. When they sold much of their Tualatin Valley land in 1923, they kept their logging tract. Goodall (1958) reports on the timber area the O.I.& S. harvested:

For their logging operations, the company had reserved five feet from the high water line of the Tualatin, so a narrow ribbon of land stretched for many miles.

Log driving was the earliest method of transporting timber to the mills. Log drives down the Scoggins, Dairy, and Beaver creeks, and on the mainstem of the Tualatin River continued from 1879 to 1913 (Farnell, 1978). To facilitate drives and keep water in the main creek channel, sloughs, swamps, and low meadows were blocked off with log cribs. Obstructions such
as boulders, leaning trees, woody debris, and jams were removed from the water channels (Shively, 1993).

Splash dams were used to increase water pressure. Logs were floated downstream by releasing large quantities of water trapped behind the impoundments. Sedell and Luchessa (1982) have identified nine splash dams that operated in the Tualatin Basin for more than a single season. Scoggins Creek had four splash dams; Gales Creek and the Tualatin River above Roaring Creek each had two; the West Fork of Dairy Creek had the other known splash dam.

The construction of railroad tracks, between 1905 and 1911, dramatically altered timber harvest practices in the Tualatin River Basin. Carl Meyer (Moore, 1978) reported on the change:

With the new railways, the larger companies and corporations from the East were able to invest their capital in timberlands and saw mills in the wooded areas of the Coast range. Local men set up their own small business enterprises. Other men flocked to the forests in search of employment. The Southern Pacific had opened the door for the growth of the industry.

Timber companies built their own rail lines from forest sites to the mainstem of the Southern Pacific railroad. Logging camps were built throughout the upper reaches of the Tualatin River hills. Aagard Logging Company and the Consolidated Timber Camp were located in the Glenwood area. Sunset Logging Camp was located on the right side of what is now the Sunset Highway. Logging towns of a thousand loggers and their families grew up around the railroad stops at Timber and Cochran.

Forest Grove became one of the weekend towns where loggers blew off steam at the dance halls and taverns. Meyer (Moore, 1978) reports the story of woodsman Ralph Raines, regarding the weekend life in Forest Grove:

Shadyside was built right on the side of Scoggins Creek. ...But anyhow, this door on the side of the building was always nailed shut. The loggers all got in a fight one night and they picked
up one guy and threw him right through the door! He went out the
door and went right over the bank and right into the creek.

Timber camps, loggers, and sawmills moved around throughout the
Tualatin River Basin hills. Hesse (1976) described the movement of sawmills:

During the heavy lumbering era in Scholls, many portable
sawmills were situated in the timbered hills. Much of the
timber was located in inaccessible regions and it was easier to
take a mill to the timber. The mill would stay in one location
for a year or so until most of the surrounding timber was logged
and then move to another area.

Meyer (Moore, 1978) reports from oral histories on the movement of the
loggers:

Many of the woodsmen thought of themselves as tramps. They
traveled from one logging operation to another. ...A lot of the
times, these outfits might finish logging where they was.
Now, that happened to me in lots of cases. They just ran out of
timber, so you automatically ran out of a job. Then you went
someplace else.

Finally, Meyer (Moore, 1978) reports on the movements of logging camps and
timber harvest sites:

Most camps only stayed in one particular area for just a few
short years. Once the area was stripped of its trees, the camp
and the loggers would move on.

How much forest cover originally existed in the Tualatin River Basin,
how much timber was harvested, and how much harvested timber land was
converted to agriculture is unclear. A tentative picture of the change in forest
cover can be created by various reports spanning the century.

Allan Elkins (Moore, 1976) estimates that originally 80 percent of the
land in Washington County was covered by forests, or approximately 350,000
acres of wooded land. Scott (1993) reports that in 1979 there was an
estimated 234,000 acres of commercial forest in Washington County, and that
today there is an estimated 200,000 forested acres. Approximately 42% of the
Tualatin River Basin is now forested. If estimates are accurate and reflect the
same land area, forests in the Basin have shrunk 150,000 acres, a 38 percent loss.

Whether such an assessment is accurate or not, we do have some reports on timber production. Timber output for Washington County in 1903 was estimated by the News of Forest Grove to be 20 million board feet (Farnell, 1978). Figure 6 reports the Douglas fir harvest in Washington County between 1925 and 1954.

<table>
<thead>
<tr>
<th>Year</th>
<th>Thousand Board Feet</th>
<th>Year</th>
<th>Thousand Board Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>1925</td>
<td>90,195</td>
<td>1940</td>
<td>129,860</td>
</tr>
<tr>
<td>1926</td>
<td>162,595</td>
<td>1941</td>
<td>142,238</td>
</tr>
<tr>
<td>1927</td>
<td>170,436</td>
<td>1942</td>
<td>146,713</td>
</tr>
<tr>
<td>1928</td>
<td>170,436</td>
<td>1943</td>
<td>126,622</td>
</tr>
<tr>
<td>1929</td>
<td>135,730</td>
<td>1944</td>
<td>122,968</td>
</tr>
<tr>
<td>1930</td>
<td>71,493</td>
<td>1945</td>
<td>122,968</td>
</tr>
<tr>
<td>1931</td>
<td>40,359</td>
<td>1946</td>
<td>117,561</td>
</tr>
<tr>
<td>1932</td>
<td>17,297</td>
<td>1947</td>
<td>124,402</td>
</tr>
<tr>
<td>1933</td>
<td>50,417</td>
<td>1948</td>
<td>154,193</td>
</tr>
<tr>
<td>1934</td>
<td>75,941</td>
<td>1949</td>
<td>124,843</td>
</tr>
<tr>
<td>1935</td>
<td>80,404</td>
<td>1950</td>
<td>162,768</td>
</tr>
<tr>
<td>1936</td>
<td>107,561</td>
<td>1951</td>
<td>173,429</td>
</tr>
<tr>
<td>1937</td>
<td>111,218</td>
<td>1952</td>
<td>154,394</td>
</tr>
<tr>
<td>1938</td>
<td>87,391</td>
<td>1953</td>
<td>168,026</td>
</tr>
<tr>
<td>1939</td>
<td>117,146</td>
<td>1954</td>
<td>133,035</td>
</tr>
</tbody>
</table>

Figure 6. Lumber Production of Douglas fir in Washington County 1925-1954 (Moore, 1978)

In 1956, Hart and Newcomb, investigating groundwater resources in the Tualatin River Basin, reported on the extent of forest cover:
Originally, the plain was largely open prairie and the forests were mostly confined to the margins and to the surrounding slopes and mountains. Now, the forests have been logged off until only the steeper of the surrounding hill slopes are forested. Lumbering and processing of forest products are now secondary industries, generally located adjacent to the timber stands in the Coast Range.

Six years after that report, officials surveying the upper reaches of the Tualatin River for the dam of the Tualatin Project reported on the forested area of the slopes. The Bureau of Reclamation (1962) found that:

Vegetative cover on the small timber tracts and lands adjacent to the project consist primarily of Douglas fir, bigleaf maple, oak, dogwood, vine maple, snowberry, blackberry, and various grasses and forbes. Streamside cover is typified by oceanspray, rose, willow, alder, cottonwood, bigleaf maple, oak and Douglas fir. The ditchbanks and fence rows support heavy growth of rose, blackberry, willow, oceanspray, vine maple, and various grasses and forbes.

In the same report (USBR, 1962), the U.S. Department of Health, Education, and Welfare reported:

The upper elevations of the Tualatin Basin, about a third of the area, support a forest cover in which Douglas-fir is the dominant species. Associated species include western hemlock and western red cedar. Practically all of the old growth forest has been cut and most of the forest area now supports vigorous stands of young second-growth Douglas-fir. However, there are scattered patches of hardwood brush here and there where for one reason or another regeneration of the conifers has not been successful.

Timber harvest can impact Tualatin River water quality by two primary methods. One of the effects is increased water yield due to less adsorption and diversion by the vegetation. Farnell (1978) in a navigability study, explained this effect:

The heavy logging activities led to amplification of the seasonal changes in streamflow because of lessened upriver storage capacity in the surrounding hills.
The other effect associated with logging is increased sediment production from such harvesting practices as roadbuilding, skidding, and slash burning. These sediments can carry phosphorus from the surrounding hill soils into the basin stream. Wolf (1992) explains how this erosion can accumulate:

It is estimated that typical erosion rates for the approximately 1,650 forested acres harvested annually in the Dairy-McKay watershed are 50 tons/acre the first harvest year. The average erosion from reestablishment period of five years is 15 tons/acre or 137,000 tons annual erosion associated with harvest activities.
NAVIGATION, DRAINAGE, AND CHANNEL MODIFICATIONS

The Tualatin River Basin, as a land of marshes, swamps, and floods, surrounded by mountains, presented a unique challenge for the early settlers. The agricultural produce of the valley and the timber from the hills were in high demand in both Portland and Oregon City. The difficulty arose in finding an adequate method for transporting the commodities.

Early attempts at road building were not very successful. Hesse (1976) describes the situation:

During the summer the roads were rough. One can imagine the huge clouds of dust billowing from around the horse’s feet and the wagon’s wheels. The roads were almost impassible in winter. During the long rainy season, the mud was hub deep and travel was limited to 8 or 10 miles a day with a loaded wagon. A complaint from Hillsboro describes the road situation: "Hauling can only be done during the dry weather in summer and light loads can be taken at best." The farmers were compelled to resort to the river to transport produce.

Ferry boats were the first traffic on the Tualatin River. Dr. Brown’s ferry at Tualatin operated until 1867. Peter Scholl’s ferry at Scholls operated from 1850 until it was replaced by a toll bridge in 1870. The Harris ferry crossed the Tualatin River at Bridgeport, and Abraham Sulger ran a ferry south of Hillsboro where he was a postmaster and grocer. The Taylor ferry and the Boone’s ferry also crossed the Tualatin River (Farnell, 1978; Carey, 1971; Moore, 1978).

The license fee to operate a ferry, which in the case of the Scholls ferry was described as a "raft on cedar logs ...operated by manpower" (Farnell, 1978), was two hundred dollars (Moore, 1978). The county court set the transport and passenger prices as follows (Moore, 1978):
<table>
<thead>
<tr>
<th>Traveler Type</th>
<th>Fee</th>
</tr>
</thead>
<tbody>
<tr>
<td>For a passenger</td>
<td>25 cents</td>
</tr>
<tr>
<td>Each man and horse</td>
<td>37½ cents</td>
</tr>
<tr>
<td>Each wagon and yoke of oxen or a span of horses and teamster</td>
<td>1.00 dollar</td>
</tr>
<tr>
<td>Each additional yoke of oxen or span of horses</td>
<td>25 cents</td>
</tr>
<tr>
<td>Each head of cattle or loose oxen</td>
<td>12½ cents</td>
</tr>
<tr>
<td>Each hog or sheep</td>
<td>6¼ cents</td>
</tr>
</tbody>
</table>

The ferry boats and roads were inadequate for transport of produce, however, as evidenced by the September 27, 1856 *Oregon Argus* article published in Oregon City. Referring to Tualatin Valley farmer’s plight, the article said:

Some had grain in their barns that should have been marketed three years previously.

The settlers from eastern United States were used to boats, barges, and steamers. The problem with introducing these boats was as Hesse (1976) stated:

The mouth of the Tualatin was so choked with rocks and boulders that boats could not pass through it, and it was necessary to make a portage on the south side.

Nevertheless, plans were made to initiate riverboat traffic on the mainstem of the Tualatin River. The *Oregon Spectator* began its campaign to establish steamboat traffic in late May, 1851. At that time, it published a reassuring description of the river by M. R. Barnum:

Myself, together with four others, started from Rice’s Mill (river mile 2.5) to go up the river for the purpose of making an examination in regard to timber and land along its banks, and the feasibility of its being navigable. I was highly pleased with the results. We started out from the mill in the morning in a skiff and got to Brown’s ferry, which is about four miles, in about an hour and a half. We had to cut one tree out of the way which took half an hour. The water to Brown’s is very sluggish, hardly a perceptible current, and very deep, and the river was not very crooked.

We proceeded on up the river about ten miles further, and found it about the same as below Brown’s, deep and sluggish, very little drift wood in it. ...I have been told that the river is equally free from obstruction some distance above Hillsboro.
This carefree journey stopped approximately 0.8 miles from the serpentine bends that were infamous for their log jams.

In the winter of 1856, the Legislature chartered the Tualatin River Transportation and Navigation Company. The company proposed to "improve the Tualatin as far upstream as possible" (Moore, 1976) and plans were discussed to connect the Tualatin and the Willamette rivers by canal, rail, road, or locks. John Moore attempted to finance the Tualatin River Navigation Project by soliciting farmers in the Valley, and successfully raised $9,000 (Moore, 1976).

On June 1, 1856, the *Oregonian* reported the completion of a 1-3/4 mile railroad:

which forms a portage from the Willamette River to the Tualatin River at the head of Sucker Lake (Lake Oswego). On that day logs from the Tualatin were taken over it for the mill of Mr. Trulliger of Oswego, sawed on the day following and are delivered to Silver and Fain, of this city, in the shape of sidewalk lumber.

Mr. Trulliger operated the People's Transportation Company which included a 71 foot steam scow, *Minnehaha*, plying Lake Oswego. His vessel towed or carried logs and produce from the little railroad. The railroad was actually a five-foot gauge, horse-drawn tram which ran along the north bank of the Tualatin to the head of Lake Oswego (Goodall, 1958).

With a rude portage system in place, two steamboat companies began to operate on the Tualatin River. Captain Cris Sweitzer and Captain George H. Pease placed the steamer, *Hoosier*, in the river in 1858. Hesse (1976) describes the route of this steamboat:

The Hoosier loaded a short distance from the mouth on the north side. Several trips were made as far as Harris Bridge at Farmington. Because of drifts and jams above the bridge, the steamer could not go any farther upstream.

Sweitzer and Pease took a $1,500 contract from the Tualatin River Company to clear logs and drifts so the river would be navigable to Forest Grove. The
captains were to receive $500 when the steamer blew its whistle at Hillsboro. In December 1858, they sounded the whistle at Hillsboro, but receiving no money, they quit. The Hoosier was placed in service on the Willamette River.

The best description of the Tualatin River Boat Line, run by Captain Kellogg comes from a letter by T. S. Wilkes, published in the July 9, 1925 Hillsboro Argus. An excerpt of that letter states:

It may be that I can add a little of value to the story of the early navigation on the Tualatin River as recalled by Mrs. Jack. My grandfather, Hyer Jackson, owned the Jackson Bottom south of Hillsboro in those days and I can well remember the time when the Kelloggs ran the "Yamhill," a side wheeler, on the river. It ran up as far as the Sol. Emrick place south of where Cornelius now is, and it was intended to run up Dairy Creek to the old Centerville bridge, but I am not sure that it ever did. ...I saw a crew of men at work clearing out the drifts in Dairy Creek, but as I remember it there was no draw in the old bridge west of Hillsboro, so it is doubtful if the boat ever ran up to Centerville.

...As to the name of the boat Mrs. Jack rode on, it was either the "Yamhill," a side-wheeler of about 50 tons capacity, or the "Onward," a stern-wheeler which the Kelloggs built at Oswego. The "Onward" was too long for the tortuous channel and the crew spent more time cutting trees away than in running the boat. She was kept on the river about four years, I think, and then hauled up out of the lake at Oswego and slid down on ways into the Willamette, where she saw many years of service on the Cowlitz River run from Portland, and it is about 1883 that I last saw her towing a raft of logs past Columbia City. It must have been some time around 1865 when Joseph Kellogg started the Tualatin River Boat Line, and one of the red letter days of my boyhood was when I stood on the bank at the Jackson warehouse and watched the column of steam and smoke curling up among the tree-tops as the Onward wound in and out of the bends between Minter and the Jackson bridges.

...I was a frequent passenger on the boat and had a few talks with Captain Kellogg about the old times. He said that if he could have had the Tualatin River declared a public waterway and a little help in the way of dredging and locks, he could have made it a success, and that as it was he didn't lose money, but could not hold on after the railroad was built. The shoal at the point where the Willamette Meridian crosses the
Tualatin was the worst obstacle and that should have been dredged, but he never could get a government dredge and snagboat on the river and was not able to build one himself. He had the dam built and cut the canal into Sucker Lake, and a small and comparatively inexpensive set of locks at Oswego would have done away with the portage and delay which compelled him finally to give up the fight.

The river not being considered worthy of government aid, he had no power to condemn the land where it was necessary to cut through the bends, and so the Onward often landed its passengers on the narrow neck and made the long trip around while they picked blackberries enough to supply the table with the delicious fruit. This habit they carried with them to the lower river, and many amusing stories I have heard of the Indian who had 23 fish and wanted them to wait until he got another bite, or of the woman who lacked one egg of having so many dozen and they waited for her to run to the barn to see if the hens had laid another.

...I was a witness for the plaintiffs in the case of McDougall, Saffron et al. vs. the Oregon Iron and Steel Company in the late nineties, when the defendants were compelled to stop putting up the flash boards because of the flooding of the lower parts of the bottom. For a comparatively small expenditure the rapids I mentioned could have been removed and the channel made deep enough so that there would have been no need of raising the dam to afford enough water for such a boat as the Onward to have ascended at any time, and in fact with such a boat as Captain U. B. Scott built for the Eugene run I doubt if the rapids were ever too shallow.

It was a matter of considerable regret to Captain Kellogg when Olaf Pihl, a Norwegian engineer who was sent out to examine and report on the river along in the eighties, turned it down as unworthy of government aid, and I think it was a mistake. ...Some of these days when we get over our 'speed Mania' we will turn our attention to these obviously more economical means of transportation of our perishable products. Our highways cannot last always, our fuel supply is steadily diminishing, and we must turn away from these wasteful ways more and more if we are to make the most of our resources. (The above article was signed T. S. Wilkes, former county engineer)
The *Onward* not only had to navigate the tortuous turns of the Tualatin River, and keep the channel clear of obstructions, it also had to cease runs occasionally due to low water. The *Oregonian* printed such a notice on July 22, 1869. The steamboat was able to resume on November 10.

The canal which Wilkes describes was begun on July 18, 1871. The Tualatin River Canal Company hired Chinese laborers to excavate between the Tualatin River and Lake Oswego to a depth of two to twelve feet. The canal raised the lake level, in conjunction with the 20 foot dam, and increased the length of Lake Oswego from 2-3/4 miles to 3-1/2 miles. The canal was completed on January 21, 1873, and the *Onward* was the first boat through, delivering 2,000 bushels of wheat.

The canal went through a period of neglect after steamboat travel ceased and "became cluttered with grasses and willows" (Goodall, 1958). Beginning in 1939, the canal was widened to 40 feet; work was completed after World War II, in 1948. The canal was widened to enhance lake side property values, rather than to aid river navigation.

Steamboat travel on the Tualatin River began to die when the Oregon-California Narrow Gauge Railroad began running through the area in 1887 (Goodall, 1958). The final death knell for the boats was the government engineering report by James C. Post. The following comments are excerpted from this 1895 engineering report made to the Secretary of War:

...The channel is obstructed by snags and log jams, which were found in many places, two private dams, and rapids which extend from the second of these dams (Oregon Iron and Steel) to the mouth of the river, a distance of 1½ miles.

...Between Hillsboro and this dam, 38 miles, the channel is nowhere less than 3 feet in depth at low water, and in this portion of the river three small steamers, the largest being 60 feet long and 15 feet wide, with a draft of 2 feet, are operated by the steel company and used for towing logs, carrying freight, etc. In higher stages of water and when the river has been cleared of log jams the steamers have extended their trips to Cornelius, 8 miles above Hillsboro. Below the second dam the fall in the river at the rapids is about 30 feet to the Willamette
River. These rapids are impassible for steamers, and any project contemplating the improvement of this river must include the construction of a canal and locks for passing them, if a navigable connection is to be made between the two rivers. The river is further obstructed by fourteen bridges which cross it at various points with single spans at heights varying from 10 feet to 30 feet above low water.

...On account of the large expenditure required to improve this river, and the relatively small amount of commerce to be benefited, I do not deem this river worthy of improvement by the General Government (USHR, 1895).

Channel modification and hydrology changes were also made in conjunction with agriculture. Much of the farmland used tiles by the Scholls Tile Company or the Groner Rowell Company to drain the marshy land. By 1895, the Wapato Lake had been drained by canal. An 1887 drainage district report by Jone A. Peterson contains the following comments:

Commenced work in Dairy Creek September 20th, cleared out said creek to channel of the Lousignont lake, cleared said channel to the southwest boundary of said drainage district on T. M. Hines place and also north fork of said channel on John Shorb’s place (Moore, 1978).

The author comments further on the clearing of Drainage District No. 4 (Moore, 1978):

It was about 1920 that the district cleared the channel or canal from the Reiner Wirtz place and the second channel from the Nabus place through the Lousignont Lake to Dairy Creek. This made a great number of acres available for cultivation. It has been said a lake starts to die the day it is born, and the canal in 1920 was a bad blow to Lousignont Lake.

Shively (1993) reports that the only estimate of wetland loss within the Tualatin River Basin was a M.S. thesis that estimated 61 percent lost wetlands in elevations below 600 feet.

Modification in the channel, removal of log jams, and the drainage of wetlands may constitute part of the reason that river depths, which never fell below three feet in 1895, now have significantly lower summertime flows.
The Hart and Newcomb report in 1956 states:

During the 21-year period July 1928 to September 1949, the Tualatin River (including diversion to Lake Oswego) discharged an average volume of 1,376 cfs of water. In the 12 year period 1940 to 1950, the flow at the town of Willamette ranged from an average winter-time maximum of about 7,330 cfs to almost no water during the late summer of most years.
URBANIZATION

Grassy prairie land suitable for agriculture and abundant timber resources on nearby hills lured many early settlers to the Tualatin River Basin. By 1850, rural populations began to develop around the ferry boat crossings and the saw and grist mills, making the "Tuality Valley" one of the most populated areas in Western Oregon (Shively, 1993).

The lack of adequate transportation and the agricultural nature of the area meant the valley population lagged behind that of the rest of the state until 1920. With better transportation and an influx of loggers, the Tualatin Valley population began to expand rapidly. Between 1920 and 1990, Washington County’s rate of population growth exceeded that of Oregon’s as a whole during every census (Shively, 1993).

Figure 7 shows the population expansion in Washington County and its incorporated cities between 1850 and 1990. The growth in urban area affects water runoff primarily through the larger amount of impervious surface — rooftops and pavements. Natural watersheds slow water movement with vegetation, overland flow, and infiltration, but urban areas have to manage rapid water runoff of a greater volume with pipes, channels, and sewers (Huber, 1993).

<table>
<thead>
<tr>
<th>Date</th>
<th>Washington County</th>
<th>Banks</th>
<th>Beaverton</th>
<th>Cornelius</th>
<th>Forest Grove</th>
<th>Gaston</th>
<th>Hillsboro</th>
<th>Sherwood</th>
<th>Tualatin</th>
</tr>
</thead>
<tbody>
<tr>
<td>1850</td>
<td>2,652</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1860</td>
<td>2,801</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1870</td>
<td>4,261</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1880</td>
<td>7,028</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1890</td>
<td>11,972</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1890</td>
<td>11,972</td>
<td>668</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1900</td>
<td>14,467</td>
<td>882</td>
<td>249</td>
<td>246</td>
<td>1,096</td>
<td>699</td>
<td>980</td>
<td>111</td>
<td></td>
</tr>
<tr>
<td>1910</td>
<td>21,522</td>
<td>1,261</td>
<td>386</td>
<td>459</td>
<td>1,772</td>
<td>924</td>
<td>2,016</td>
<td>115</td>
<td></td>
</tr>
<tr>
<td>1920</td>
<td>26,376</td>
<td>1,440</td>
<td>580</td>
<td>494</td>
<td>1,915</td>
<td>221</td>
<td>2,468</td>
<td>320</td>
<td>234</td>
</tr>
<tr>
<td>1930</td>
<td>30,725</td>
<td>209</td>
<td>1,138</td>
<td>487</td>
<td>1,859</td>
<td>227</td>
<td>3,039</td>
<td>382</td>
<td>193</td>
</tr>
<tr>
<td>Date</td>
<td>Washington County</td>
<td>Banks</td>
<td>Beaverton</td>
<td>Cornelius</td>
<td>Forest Grove</td>
<td>Gaston</td>
<td>Hillsboro</td>
<td>Sherwood</td>
<td>Tualatin</td>
</tr>
<tr>
<td>------</td>
<td>-------------------</td>
<td>--------</td>
<td>-----------</td>
<td>-----------</td>
<td>-------------</td>
<td>---------</td>
<td>-----------</td>
<td>----------</td>
<td>---------</td>
</tr>
<tr>
<td>1850</td>
<td>2,652</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1940</td>
<td>39,194</td>
<td>247</td>
<td>1,052</td>
<td>637</td>
<td>2,449</td>
<td>333</td>
<td>3,747</td>
<td>447</td>
<td>180</td>
</tr>
<tr>
<td>1950</td>
<td>61,269</td>
<td>376</td>
<td>2,512</td>
<td>998</td>
<td>4,343</td>
<td>368</td>
<td>5,142</td>
<td>575</td>
<td>248</td>
</tr>
<tr>
<td>1960</td>
<td>92,237</td>
<td>347</td>
<td>5,937</td>
<td>1,146</td>
<td>5,628</td>
<td>320</td>
<td>8,232</td>
<td>680</td>
<td>359</td>
</tr>
<tr>
<td>1970</td>
<td>157,920</td>
<td>439</td>
<td>17,976</td>
<td>1,831</td>
<td>8,203</td>
<td>422</td>
<td>14,469</td>
<td>1,358</td>
<td>741</td>
</tr>
<tr>
<td>1980</td>
<td>245,808</td>
<td>489</td>
<td>31,926</td>
<td>4,462</td>
<td>11,499</td>
<td>471</td>
<td>27,664</td>
<td>2,386</td>
<td>7,483</td>
</tr>
<tr>
<td>1990</td>
<td>311,554</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 7. Population of Washington County and Incorporated Cities, 1850 to 1990. Oregon Blue Book

*Banks population was combined with Dairy during early years. Gaston, originally Wapato, became a city in 1914 and no longer counted outlying populations.

The urban area of the Tualatin River Basin accounts for 21 percent of the land area. Cities are primarily clustered in the southeastern corner of the watershed (Scott, 1993). Concern over increasing urbanization of the Tualatin River Basin is not new. A Tualatin Valley Flood Plain study in 1964 stated:

There is a considerable fear in many urban areas that so much land will be committed to intensive urban uses — homes, streets, shopping centers, parking lots, schools, and industrial areas — that little open space will be preserved for recreation, visual enjoyment, buffers between divergent land uses and the like (MPC, 1964).

While maintaining a rural character in the face of increased population pressure may have been a primary concern, most reports on urbanization within the Tualatin River Basin focused on three issues: building in the floodplain, water rights, and water quality.

**Floodplain**

The Tualatin River and its tributaries have all been subject to flooding. The largest flood this century occurred in December 1933 after about 10 inches of rain fell during a 6-day period and when December rain total
exceeded 14.46 inches. The flood inundated 30,000 acres and caused $75,000 damage to roads and bridges, with four bridges completely destroyed. A flood in 1890 is estimated to have exceeded the 1933 flood (USACE, 1969).

The extent of flooding throughout the Tualatin River Basin is primarily a concern when urban areas begin to encroach on the floodplain. In 1953, the Army Corps of Engineers expressed this concern:

In the past development within the floodplain has been limited because of frequent flooding. However, recent surveys and observations indicate that the population influx is leading to further subdivision of floodplain lands, with additional buildings, more intensive cropping practices, and increased land values. The floodplain is being utilized to a greater extent than formerly for residential housing and recreational, industrial, and commercial developments. It is believed, therefore, that future developments within the floodplain may be expected to equal or exceed that elsewhere in the basin and that immediate flood damages, without flood control improvements, would increase proportionally (MPC, 1964).

In 1964, the Metropolitan Planning Commission estimated there were 326 dwelling units in the floodplain "including all 123 of those in the City of Tualatin." In 1969, the Army Corps of Engineers were concerned about large housing developments next to creeks, and stated that population pressure from Portland was increasing development on the floodplain (USACE, 1969).

The Army Corp of Engineers (1969) was particularly concerned about "rank vegetation" which made the Tualatin and its tributaries more susceptible to flooding. They stated:

The channel capacities of Tualatin River and its downstream tributaries have been reduced as much as 40 percent by the congestion that exists due to bridge obstructions, inadequate channel cross sections, and the choking effect of the trees, brush, and structures. There are also numerous natural dams located near the downstream end of the valley.

The concern over the combination of flooding and urbanization is perhaps best summarized by the Metropolitan Planning Commission (1964):
Will all these additional families mean an irresistible pressure to develop subdivisions, perhaps even cities and towns, on the floodplain? Will that in turn mean a hue and cry for public provision of expensive protective works, such as channel straightening, bank protection, levees, and storage dams?

**Water Rights**

Though originally slated primarily for irrigation, a large portion of the Tualatin Project water was allocated for urban use due to increased demand. Historically, the supply of water within the Tualatin River Basin was always adequate, but with increased population water rights have become an increasing concern.

In 1956, Hart and Newcomb found that rural domestic water was primarily supplied by wells. Their 1952 estimate of domestic withdrawal was 211 million gallons or 17 percent of groundwater usage within the Tualatin River Basin. Industrial water use, at that time, was relatively small. Sayers, Inc., a camera manufacturer, used 27 million gallons from a well, and 2 million gallons went to Pacific Gas and Coke for cooling of two gas stations, two slaughterhouses, two sawmills, a horseradish processing plant, and several greenhouses and refrigerated storage units. Total industrial use in 1952 was 50 million gallons (Hart & Newcomb, 1956).

Surface water, in 1956, was used primarily for irrigation and to supply water to the two largest towns in the Tualatin Valley — Hillsboro and Forest Grove. Hart & Newcomb (1956) found that municipal water supplies were "taxed to the limit and other sources may be needed in the near future."

In 1952, Hillsboro and Forest Grove used 656 million gallons of surface water (Hart and Newcomb, 1956). By 1960, the same two towns were using 991 million gallons (USBR, 1962), a 34 percent increase. By 1952, Beaverton was pumping more water from its two wells than was being recharged. The water level in a nearby well declined 20 feet in the three years between 1948 and 1951. The other area of drawdown, in 1956, was the
Farmington area, where a well was lowered two feet in three years (Hart & Newcomb, 1956).

By 1960, the four largest cities in the valley — Forest Grove, Hillsboro, Beaverton, and Tigard were using 1,453 million gallons of water (USBR, 1963). Figure 8 shows the water rights and water use of the major municipalities in 1960.

The Oregon Iron and Steel Company has a 1906 water right to 57.5 cfs from the Tualatin River. This water is used to freshen water in Lake Oswego. By 1960, there was not enough water to supply this right during periods of low runoff.

Currently, there are 400 water rights on the Tualatin River, with 80 percent designated for irrigation. The stored water at Hagg Lake is insufficient to supply all rights to stored water.

<table>
<thead>
<tr>
<th>City</th>
<th>Water Source</th>
<th># of Water Rights</th>
<th>Date of Water Right</th>
<th>Amount Entitled</th>
<th>Amount Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forest Grove</td>
<td>Clear Creek Gales Creek</td>
<td>3 1</td>
<td>1917 1947</td>
<td>9.8 cfs</td>
<td>362 million gallons/yr</td>
</tr>
<tr>
<td>Hillsboro</td>
<td>Tualatin River Seine Creek</td>
<td>1 2</td>
<td>1912 1930</td>
<td>14.0 cfs</td>
<td>629 million gallons/yr</td>
</tr>
<tr>
<td>Beaverton</td>
<td>2 wells</td>
<td></td>
<td>5.08 acre feet/day</td>
<td>combined capacity</td>
<td></td>
</tr>
<tr>
<td>Tigard</td>
<td>3 wells</td>
<td></td>
<td>4.09 acre feet/day</td>
<td>combined capacity</td>
<td></td>
</tr>
<tr>
<td>Outlying Towns</td>
<td>wells</td>
<td>3</td>
<td>1957 1959</td>
<td>4.34 cfs</td>
<td></td>
</tr>
</tbody>
</table>

Figure 8. Water rights and 1960 usage of the major urban areas (USBR, 1962).

Total withdrawals from the Tualatin River between river mile 0.1 and river mile 60 is 359 cfs, with 30 percent withdrawn for the Tualatin Valley Irrigation District (Scott, 1993). Scott (1993) describes the current surface
Applications for new water rights have been submitted recently, but water is available only from November 1 to April 30. Junior water rights certified within the past few years are assured water only during the first two months of spring runoff. Water use was curtailed on the Tualatin in 1992. On the upper one-third of the river, those holding water rights dated after 1930 were no longer permitted to withdraw water. On the middle third, withdrawal was curtailed for those holding water rights after 1945. On the lowest segment of the river, the withdrawal cutoff date was 1950.

**Water Quality**

Water quality is affected by many land use activities. Concern about urban effects on water quality relate to both point source pollutants such as sewage disposal and to non-point sources. Urban runoff can pick up a large load of pollutants as it moves through a city environment. Oil and grease from parking lots and roads, leaves, dust fall from industry, zinc from automobile tires, fertilizers from lawns and gardens, sediment from construction sites, and particulates from many sources are carried by storm waters and may affect receiving water quality. Urban areas can contribute significant amounts of phosphorus, particularly from leaching by organic trash (Wolf, 1993).

Sewage treatment plants in urban areas are a major contributor of point source pollutants. Wolf (1993) states that of the total phosphorus entering the Tualatin River, it is estimated that before 1992 "85 percent is from point sources such as sewage treatment plants."

Shively (1993) has described the effect urbanization has had on the hydrology of the Tualatin River Basin:

The rural land conversion and effect of urban sprawl have almost certainly had a negative impact on the basin's remaining wetlands, riparian, and even upland areas; a problem that is of increasing concern to land managers and scientists alike. Changes in basin hydrology occur with the increase in
impervious surfaces associated with transportation features such as roads and highways, and the roofs of residential and commercial structures. This loss of permeability undoubtedly has had a negative effect on groundwater recharge and the important storage functions of the basin’s aquifers and floodplain deposits.

Water quality is not a new concern in the Tualatin River Basin. A 1962 report prepared by the U.S. Public Health Service described the wastes produced within the Tualatin River Basin as domestic sewage, and wastes from canneries, slaughtering and meat packing plants, paperboard plants, tannery works, milk products manufacturers, and miscellaneous wastes such as those from potato chip and dog food processing companies.

At the time of the 1962 study, a variety of water treatment methods and disposal practices existed in the Tualatin River Basin. Conventional waste treatment facilities designed for the removal of solids and the reduction of biochemical oxygen demand (BOD) and other waste constituents were in place in localities where sanitary sewers existed. Throughout the basin, it was estimated that waste treatment and other disposal practices removed 75 percent of the BOD.

Yet, water quality in the Tualatin River Basin continued to deteriorate. In response to water quality issues, the voters of Washington County, in 1970, established the Unified Sewage Agency (USA). After twenty-one years, the USA collection system serves a population of 325,500 with about 600 miles of sewer lines. The agency provides treatment to an average daily flow of 48 million gallons. Sewage collection is provided for the cities of Banks, Beaverton, Cornelius, Durham, Forest Grove, Gaston, Hillsboro, King City, North Plains, Sherwood, Tigard, Tualatin, and Lake Oswego. USA uses no combined sewer overflow systems where stormwater and sewage are combined in the same pipes.

In 1975, L. M. Carter published a study designed to relate water use and water quality. The study suggested that construction of Scoggins Dam,
which began in 1972 and was completed in 1978, might create more environmental quality problems by increasing residential development and agricultural intensity. Carter's study found a maximum ammonia-N concentration of 12 mg/l and a maximum phosphate concentration of 19 mg/l in Rock Creek above the Hillsboro Rock Creek sewage treatment plant and four other spots below the plant. This data indicates that severe water quality problems existed.

In August 1979, USA and the Department of Environmental Quality began a cooperative stream monitoring project. That sampling program confirmed that the upper reaches of the stream had water of fair to excellent quality, while water in the lower reaches ranged from good to poor. The project also found numerous water quality violations.

In 1986, the Northwest Environmental Defense Center filed a lawsuit against the EPA claiming that appropriate limits for effluent discharge for the Tualatin River had not been set within the required 180 days. The primary water quality concerns were low dissolved oxygen and high phosphorus. The result of the lawsuit was a Federal District Court consent decree issued in June 1987. The decree required the adoption of Total Maximum Daily Loads (TMDL) for ammonia nitrogen and phosphorus. Phosphorus concentrations were set at 70 micrograms per liter. The TMDL process requires apportioning the capacity of the Tualatin River to absorb pollutants between the various point and non-point sources. The plan includes all known contributors, including urban areas, agriculture and forestry.

In February 1991, a regional ban was placed on phosphorus in detergents. In addition, a pilot project was begun to remove phosphorus from the effluent of the Rock Creek Sewage Treatment Plant. The pilot program was found to be highly effective, reducing phosphorus to an average discharge of 5 pounds per day. The addition of a nitrification-denitrification process at the Rock Creek Plant has had similar results in reducing ammonia concentration. In 1992, similar tertiary treatment programs were placed in
operation at the Durham Plant. The total cost of upgrading the two plants has been $42 million; the full cost of point source reduction was set at $351 million paid for by users over twenty years (Hummel and App, 1993).
CONCLUSION

Turning back the pages of history allows us to view the slow accumulation of landscape changes in the Tualatin River and its floodplain, to glimpse the river of old, to understand why the individual changes were made.

Every activity in the Tualatin River Basin contributed minutely to the vastly different river we see today - the original floods, the Kalapuya field burning and animal drives, the beaver trapping, the draining of swamps, the introduction of cattle, sheep, and pigs, the conversion of belly-high grass to agriculture, the use of fertilizers and pesticides, the digging of wells and diversion of stream water, the felling of forests and the loss of understory brush, the straightening of channels and the removal of log jams and obstructions, the building of dams, the increased population living on the floodplain, the production and treatment of sewage, the water used for industry or to accept industrial wastes - each had a role in the conversion of the Tualatin River.

Today, the water quality of the Tualatin River has deteriorated from what it once was. Today, the summer low flows are not three feet deep in the lower reaches, but even with dams regulating output, become the merest trickle. Today, algae grows in quiet spots, in the canal, in Lake Oswego. The rotting vegetation tastes bad in drinking water, results in foul smells. Eutrophic waters, areas of algal blooms and low oxygen, become unsuitable for boating, fishing, swimming, drinking or even irrigation.

At one time, the tall grasses, taller trees and the marshes and swamps stored the winter "trasker" rains, the vegetation held the water and the soils in place. Harsh "nestucker" rains made the rivers swell and when the rushing waters hit log jams, boulders, and beaver dams, they flowed over their banks, spreading out over the floodplain. Again the vegetation trapped and held the waters, and took from the river the soils and sediments it carried.
Winter water, trapped by the trees, grasses, and marshes, slowly infiltrated the ground, was stored, and was released back to the river traveling underground to augment the summer low flows.

Today, the river rarely floods its banks. Today the "nestucker" rains las the soil where trees or crops have been harvested. The water picks up the sediments, and fertilizers, travels through impervious urban areas and picks up more pollutants, rushes into the unobstructed river channel and washes away to the Willamette River, all within the winter. Little water is stored in the soils awaiting summer.
References Cited


Farnell, James. 1978. Tualatin River Navigability Study. (Salem, OR: Division of State Lands).


Hesse, Margaret P. 1976. Scholls Ferry Tales. (Scholls, OR: Groner Women's Club).

Ives, William and Butler. 1852. Township Field Notes: T1S R3W T1S R2W, Willamette Meridian. (Oregon City: Surveyor General’s Office).


Zyback, Bob. 1990. Historic Soap Creek Valley (Corvallis, OR: OSU Book Stores, Inc.).