A HYDROLOGIC STUDY OF THE COAST FORK/MIDDLE FORK WILLAMETTE RIVER CONFLUENCE AREA

by

Valerie M. Rogers

A REASEARCH PAPER

Submitted to

THE GEOSCIENCES DEPARTMENT

in partial fulfillment of the
requirements for the degree of

MASTER OF SCIENCE

GEOGRAPHY PROGRAM

November 2000

Directed by

Dr. C. L. Rosenfeld

A Hydrologic Study
of the
Coast Fork/Middle Fork Willamette River
Confluence Area

Acknowledgements

I would like to thank all my professors at Oregon State University for their continuing commitment to providing an interesting and relevant educational experience to students. I am especially indebted to Geosciences department chair Dr. Gordon Matzke for encouraging me to pursue graduate work, and to Forest Engineering professor Dr. Bob Beschta for helping to obtain funding for this project.

I would particularly like to thank my major professor, Dr. Charles Rosenfeld, for helping to shepherd this project through to its conclusion. During the course of the study, Charlie Bruce of the Oregon Department of Fish and Wildlife also provided much appreciated guidance. I thank Todd/Liberty and Associates for permission to reprint maps from their atlas. I would also like to thank my good buddy Stephen Shaw for making the fieldwork much more fun. Finally, I thank my parents for their unconditional support and love.

Valerie Rogers

TABLE OF CONTENTS

PROJECT DESCRIPTION

Context

This study is part of a larger effort by the Bonneville Power Administration to assess the mitigation potential of numerous locations in the Willamette Basin for habitat losses due to dam construction. This larger program is known as the BPA Willamette Basin Wildlife Mitigation Project. Earlier reports identified riparian habitat as a significant component of the overall mitigation and enhancement plan for the Willamette Basin (BPA 1987). Areas along the Willamette Greenway were given priority for further study of their mitigation potential (BPA 1987). The BPA program requires a hydrologic study of each site proposed for habitat mitigation. The following hydrologic study of the Coast Fork/ Middle Fork Willamette River Confluence Area is intended to meet those requirements. This report was delivered to the Oregon Department of Fish and Wildlife in April 1997.

Purpose

The main purpose of this project is to describe the hydrologic characteristics, with and without regulation by dams, of the Coast and Middle Forks of the Willamette River, including the floodplain, from the confluence to approximately eight miles upstream. The research is intended to assess the future potential of the site in part by determining its past and current condition. Specifically, the study focuses on the surface flow regime, general groundwater hydrology, geology and soil characteristics, and water quality of the confluence area.

Results of the study will be used by the Oregon Department of Fish and Wildlife in conjunction with a habitat evaluation process to develop several alternatives containing specific actions to enhance wildlife habitat and facilitate compatible public recreation. This study will provide information on the hydrologic component of habitat units to be evaluated and may help predict some of the hydrologic effects of different alternatives.

SUMMARY OF FINDINGS

Geology and Soils

- A high water table occurs winter through spring in 5 soil types.
- Approximately 21 million cubic yards of aggregate material is under Wildish ownership.
- Most soils in the bottomlands have high value as prime farmland.

Groundwater

- The water table is about 7 - 19 feet below surface in bottomlands spring through fall.
- Groundwater discharges into rivers year round.

Flood Frequency and Floodplains

- Flood frequency has been reduced by a factor of 10 on the Coast Fork and a factor of 50 on the Middle Fork.
- The 100 year regulated floodplain of the Middle Fork was formerly inundated once out of every 2 years.
- The 100 year regulated floodplain of the Coast Fork was formerly inundated once out of every 10 years.
- Field-monitored ponds and sloughs on the Coast Fork are presently within the regulated 10 year floodplain.

Revetments

- Revetments were installed after regulation on the Coast Fork and before regulation on the Middle Fork.
- Several revetments are currently non-functional and may be appropriate to remove.
- Trees on revetments near Seavy Bridge are violating maintenance agreements and may be removed in the future.

Mean Monthly Flow

- Mean discharge in winter/spring has been reduced more on the Middle Fork than the Coast Fork.
- Mean discharge in summer has been increased more on the Coast Fork than the Middle Fork.
- Maximum flow augmentation occurs in September and increases river stage an average of 2 feet in the Middle Fork and 1.2 feet in the Coast Fork.

Withdrawals

- There are 286 individual water rights in two townships encompassing the study area.
- Withdrawals on the Coast Fork in summer sometimes produce a net decrease in flow between the dams and the gaging station.

Ponds and Sloughs

- Maximum depth measured in ponds ranged from 3.9 to 11.6 feet.
- Water levels in selected ponds and sloughs on the Coast Fork are controlled primarily by seasonal groundwater fluctuations.

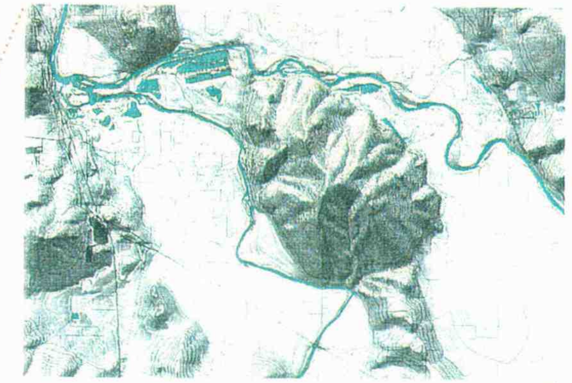
Hydraulic Connectivity

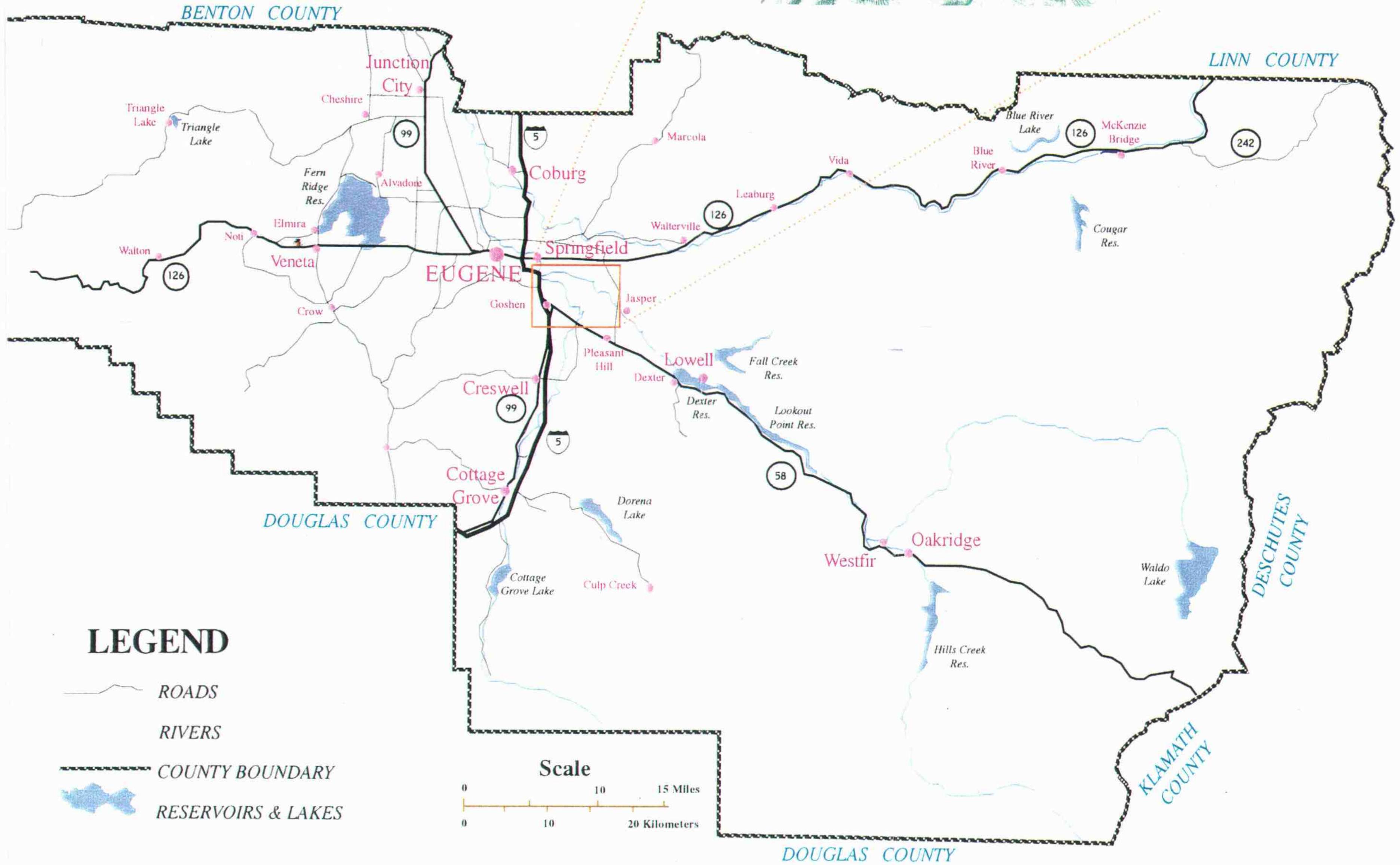
- The surface water features of the study area exhibit varying degrees of hydraulic connectivity to the mainstems depending on proximity and storm events. In general, features are connected only indirectly through groundwater.

Water Quality

- Water quality is good in the Middle Fork but is somewhat impaired in the Coast Fork.
- The overall health of the rivers in the study area is better than in most of the mainstem of the Willamette River downstream of the confluence.
- Water quality varies significantly among the sampled ponds, and dramatically within each pond from the surface to the bottom.

Lane County Context Map





from The Coast Fork/Middle Fork Willamette River Confluence Area: An Atlas by Todd/Liberty Associates

STUDY AREA

The study area is located in Lane County, just southeast of Eugene/Springfield (see Lane County Context Map on opposite page). The central feature of the area is a small butte known as Mt. Pisgah, which is surrounded by the Coast and Middle Forks of the Willamette River. The Middle Fork is on the north side, the Coast Fork is on the south side, and the confluence is just west of Mt. Pisgah. The rivers have formed broad floodplains, which occupy most of the remainder of the study area.

GEOLOGY AND SOILS

Sources and Methods – Geology and Soils

Information on the geology of the study area was compiled from published reports and maps, specifically, Columbia Basin Framework Study Appendix IV (PNW River Basins Commission, 1970), The Geologic Map of Oregon (USGS, 1991), and the Soil Survey of Lane County Area, Oregon (USDA, 1987).

All information on soil characteristics was obtained from the Soil Survey of Lane County Area, Oregon (USDA 1987). The soils map included in this hydrologic study is from "The Coast Fork/Middle Fork Willamette River Confluence Area: An Atlas" by Todd/Liberty & Associates and is reproduced with permission. The original data source for this map is the Lane County Soil Survey.

An estimate of remaining aggregate resources in the study area was made in order to help determine the value of surrounding lands, which may become available for purchase. Data on aggregate deposits by soil type and land ownership is the result of a GIS analysis produced by Todd/Liberty & Associates specifically for this report. The analysis defined three soil types as "aggregate bearing" based on their descriptions and recommended uses in the soil survey. Geologists at the US Geological Survey and the Oregon Dept. of Geology and Mineral Industries were consulted to estimate the average thickness of commercially valuable material (Wiley, 1996) and (O'Connor, 1997). The value of 30 ft. was used as a best estimate. The area of each soil type, excluding excavated pits, was then multiplied by 30 ft. to provide an estimated volume of aggregate by ownership.

Results – Geology and Soils

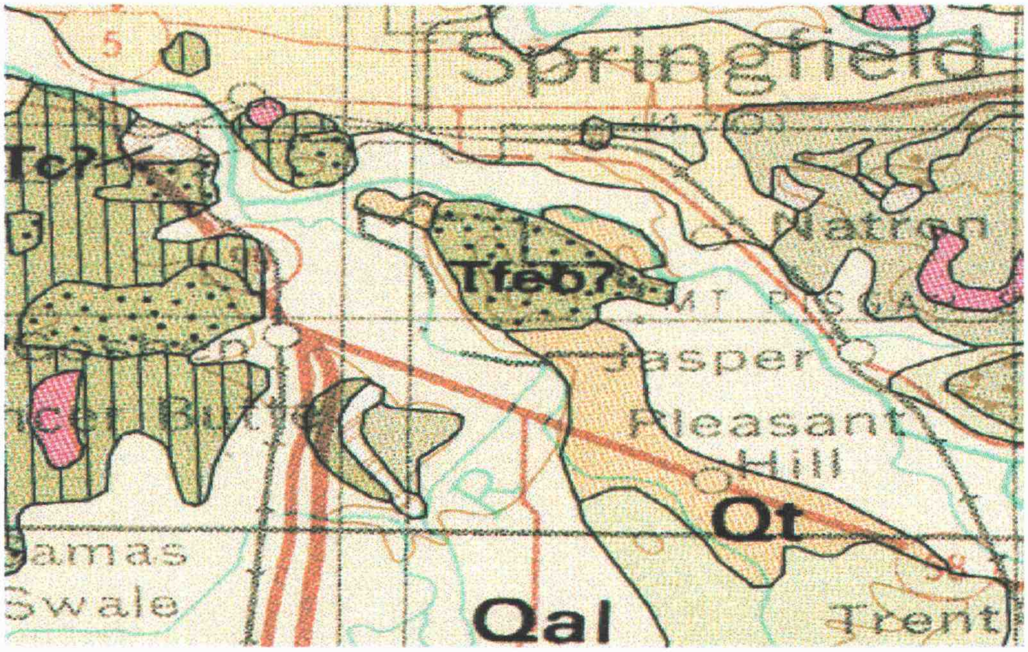
Surface Geology

The geology of the study area is composed of two basic types: alluvial deposits and volcanic rock. The most recent alluvial deposits consist of sand, gravel, and silt forming the floodplains and channels of the Coast and Middle Forks of the Willamette. These deposits were formed during the current geologic time period, the Holocene, and are less than about 15,000 years old. A slightly older set of deposits, formed during the Pleistocene period (15,000 to 1.5 million years ago) is found on glacial outwash terraces between Mt. Pisgah and the rivers. These consist of unconsolidated deposits of gravel, cobbles, and boulders, intermixed with clay, silt, and sand.

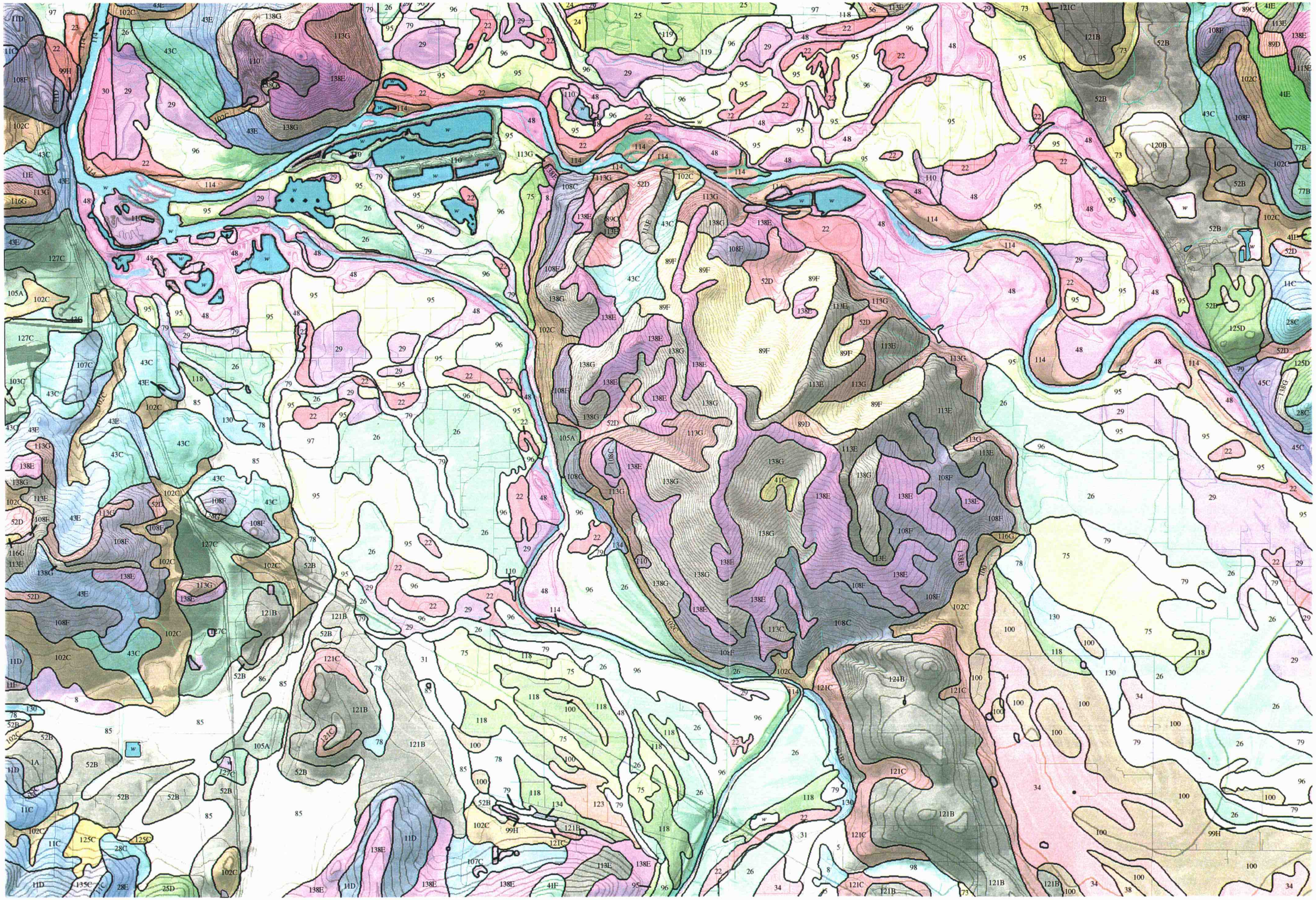
Volcanic rock forms Mt. Pisgah and the small butte just north of the confluence of the rivers. This rock is thought to be part of the Fisher Formation, which is a mix of andesitic tuff, breccia, and ash with basalt flows and intrusions. Basalt flows in this formation have been dated as old as 40 million years.

Figure 1, below, is scanned from the Geologic Map of Oregon and displays the geology of the study area (USGS 1991)

.**Figure 1. Study Area Geology.**



Qal - quaternary alluvium **Qt** - Quaternary Terrace
Tfeb? - Basaltic Rock, probably Fisher Formation



Soils

BPA Wildlife Mitigation Project • Coast Fork / Middle Fork Willamette Confluence Area

Soil Survey of Lane County Area, Oregon 1981, U.S. Natural Resources Conservation Service (USNRCS)

Produced for ODFW by David L. Liberty • Todd/Liberty & Associates Environmental Consulting • August 1996

■ ≈ 2.47 acres
1 Hectare

0 feet .25 .5 .75 1 2 Miles

0 meters .5 1 2 3 Kilometers

SCALE 1"=2200 feet or 670.56 meter

N E S W

Soils

Seventy-one soil types occur in the study area. The soils map from the confluence atlas on the opposite page displays the spatial arrangement of soil types in the study area. This discussion is limited to the most common types found on floodplains and terraces near the rivers and on Mt. Pisgah. The soils in each of these three locations have formed in different geologic parent material, occupy different geomorphic surfaces of the landscape, and experience different soil-forming processes. Thus, for this discussion, their characteristics are grouped into the broad categories of floodplain, terrace and foothill soils.

Floodplain Soils

Floodplain soils have formed in recent alluvium, are five or more feet deep, well to excessively drained, with a texture ranging from silty to gravelly.

Fluvents (48) and riverwash (114) occupy the actively developing floodplains of both rivers and occur along the main channels as well as in overflow channels, oxbows, and sloughs. Vegetation in these soils ranges from scattered grasses and willows on the freshest gravel deposits to large trees including cottonwood, fir, maple, alder, ash, and oak where soils are more well developed. The water table in these units is directly influenced by river levels. Most of the aggregate mining in the study area has occurred in these soil types.

The Camas (22) soil type occurs in locations generally contiguous with fluvents and riverwash and it is in the same hydrologic group (A). It is very gravelly, does not retain moisture well and has a shallow rooting depth. Cottonwood, maple and ash are able to grow in these conditions. This unit is also potentially a good source of aggregate material.

One other soil type, McBee (79), is a minor component overall, but is notable in that it outlines large parts of Berkshire and Oxley sloughs of the Coast Fork as well as Thompson slough on the Middle Forks near the confluence. A higher percentage of clay in this soil accounts for differences in hydrologic characteristics between it and the other three types. This soil also has a relatively shallow rooting depth due, not to a coarse substratum, but to a seasonally high water table. Native vegetation includes cottonwood, willow and Douglas-fir, but if protected from flooding this soil type can be very productive for agriculture.

Three additional floodplain soil types, Chehalis (26), Cloquato (29), and Newberg (95, 96) occur in a mosaic pattern in the river bottomlands. They are all in hydrologic group B and are considered prime farmland.

Terrace Soils

Terrace soils have formed in older stratified alluvial and glacial outwash deposits, are about five feet deep, well to poorly drained, with various textures ranging from gravelly sand to silty clay.

Five soil types predominate on the older alluvial and glacial outwash terraces to the south of Mt. Pisgah. Courtney (34) is a hydric soil found in depressional areas on terraces. A dense clay layer and a seasonally elevated water table limit the rooting depth to about 18 inches. The only native tree species typical of this soil is Oregon ash. The Oxley (100) soil is intermixed with Courtney in the southwest part of the study area. This type also has a seasonally elevated water table. A gravelly substratum results in a somewhat restricted rooting depth and can create droughtiness in summer. Oregon ash and Oregon white oak are the native tree species common in this soil. The other three major terrace soil types Malabon (75), Salem (118), and Salkum (121B, C) are all prime farmland and support a wide variety of native vegetation.

Foothill Soils

Foothill soils have formed from weathered volcanic bedrock, are from one to three and a half feet thick, moderately well drained, with a predominately clayey texture often with silt or cobbles.

Relatively shallow Philomath (108) and Witzel (138) soils occupy the west and south sides of Mt. Pisgah. The shallowness of these soils results in high runoff during storms which places these soils in hydrologic group D. It also restricts rooting depth, resulting in a native vegetation cover of primarily shrubs and grasses with scattered oak or fir. The north and east sides of the mountain are covered by soils about twice as deep as those on the opposite side. The Nekia (89) and Ritner (113) soils are both in hydrologic group C and support dense mixed stands of fir, maple, and oak. Hazelair (52) soil tends to occur in small drainageways on Mt. Pisgah. This unit has a seasonally high water table and is in hydrologic group D. The elevated water table does restrict rooting depth but the slope position of this unit allows the soil to be moderately well drained. Native vegetation includes oak, fir, pine and ash. The Panther (102) soil type occurs as a thin discontinuous ring along the base of Mt. Pisgah except on the northeast side. This unit is a hydric soil with a high clay content. It also has a seasonally elevated water table due in part to its position at the base of the high-runoff soils on the west and south slopes of Mt. Pisgah.

Table 1, below, summarizes selected characteristics by soil type.

Table 1. Selected soil characteristics. See footnotes for definitions and abbreviations.

General				Hydrologic Aspects			High Water		Agriculture
Location	**Name & Number**	**Soil Depth**	**Rooting Depth**	**Hydro Group**	**Perme-ability**	**Water Capacity**	**Depth to**	**Month**	**Capability Subclass**
floodplain	Camas-22	60"	8 - 14"	A	MR-VR	L	> 6'		IVw
floodplain	Chehalis-26	70"	> 60"	B	M	H - VH	> 6'		IIw, prime
floodplain	Cloquato-29	60"	40 - 60"	B	M	H - VH	>6'		IIw, prime
floodplain	Fluvents-48	> 60"	20 - 60"	A	M - VR	varies	na		VIIw
floodplain	McBee-79	62"	24 - 36"	B	M	H - VH	2 - 3'	11 - 4	IIw, prime
floodplain	Newberg-95, 96	65"	> 60"	B	M	VH	> 6'		IIw, prime
floodplain	Riverwash-114	> 60"	10 - 40"	A	VR	VL	na		VIIIw
terraces	Courtney-34	60"	15 - 18"	D	MS	H	0 - 1.5'	12 - 5	IVw
terraces	Malabon-75	60"	> 60"	C	M	H	> 6'		I, prime
terraces	Oxley-100	60"	25 - 50"	C	MS - M	VL - H	.5 - 1.5'	11 - 5	IIIw
terraces	Salem-118	60"	15 - 40"	B	M - VR	VL - H	> 6'		IIs, prime
terraces	Salkum-121B,C	> 60"	> 60"	C	S - M	H - VH	> 6'		B-IIe, prime. C-IIIe
foothills	Hazelair-52D	36"	12 - 24"	D	MS - M	M - H	1 - 2'	12 - 4	IVe
foothills	Nekia-89F	35"	20 - 40"	C	MS - M	L - VH	> 6'		VIe
foothills	Panther-102C	42"	20 - 40"	D	VS - MS	M - VH	0 - 1.0'	12 - 4	VIw
foothills	Philomath-108C, F	14"	12 - 20"	D	VS - M	M - H	> 6'		VIe
foothills	Ritner-113E, G	32"	20 - 40"	C	MS - M	M - H	> 6'		VIs & VIIs
foothills	Witzel-138E, G	17"	12 - 20"	D	S - M	L - M	> 6'		VIs

Notes to Soil Characteristics Table

Hydrologic Soil Groups: Groups soils according to their runoff-producing characteristics based chiefly on inherent infiltration capacity of bare wet soil.

Group A: Soils with high infiltration/low runoff potential
Group B: Soils with moderate infiltration/moderate runoff potential
Group C: Soils with slow infiltration/moderately high runoff potential usually due to fine texture and/or a restricting layer
Group D: Soils with very slow infiltration/high runoff potential usually due to a high water table, shallow soil over impervious material, soil with a clay layer near the surface or consisting of clays which swell when wet

Infiltration: Downward entry of water into the immediate surface of the soil.

Permeability: Transmission of water through the saturated soil profile. Rate measured in inches per hour.

VS: very slow = < .06
S: slow = .06 to 0.2
MS: moderately slow = 0.2 to 0.6
M: moderate = 0.6 to 2
MR: moderately rapid = 2 to 6
R: rapid = 6 to 20
VR: very rapid = > 20

Drainage: Refers to the removal of water from the soil profile.

Water Capacity: Refers to the quantity of water stored in the soil and available for use by plants. Ratings based on inches water per inch of soil.

VL: very low = < .05
L: low = .05 to 0.1
M: moderate = 0.1 to 0.15
H: high = 0.15 to 0.2
VH: very high = > 0.2

Capability Class: Refers to the suitability of soils for most kinds of field crops.

Class I: few limitations restricting use
Class II: moderate limitations, moderate conservation
Class III: severe limitations, special conservation
Class VI: generally unsuitable
Class V: severe limitations, little use
Class IV: very severe limitations, very careful management
Class VII: unsuitable
Class VIII: impossible
Subclasses: e - erosion risk, w - wetness limitation, s - shallow, droughty or stoney

Prime farmland: Produces highest sustained yields with lowest inputs of energy and other resources.

Aggregate Deposits

Results of the GIS analysis indicate the largest volume of aggregate material under a single ownership occurs on Wildish property, with a total of approximately 21.2 million cubic yards remaining in all three soil types. An even larger amount, 48.3 million cubic yards, occurs on land under the combined ownership of numerous other private individuals. A significant amount, approximately 11 million cubic yards, occurs on land owned by Lane County or the State of Oregon.

Table 2. Estimated Aggregate Deposits by Ownership – cubic yards

	ESTIMATED AGGREGATE VOLUME IN CUBIC YARDS			
OWNERSHIP	Fluvents	Riverwash	Camas	Total (cu. yds)
Wildish	16,025,526	3,604,899	1,614,897	21,245,321
Pacific Power and Light	677,282	0	0	677,282
BPA	0	0	0	0
State of Oregon	5,172,272	1,614,000	971,987	7,758,259
City of Springfield	1,191,072	447,138	2,263,784	3,901,994
Lane County	2,953,002	256,148	663,234	3,872,404
Private Individuals	26,220,037	5,653,483	16,535,430	48,298,950

Study Area

BPA Wildlife Mitigation Project • Coast Fork / Middle Fork Willamette Confluence Area

Property boundaries approximate • Produced for ODFW by David L. Liberty • Todd/Liberty & Associates Environmental Consulting • August 1996

HYDROLOGY

Hydrologic Features

The Basemap from the confluence atlas on the opposite page displays hydrologic features of the study area, including the mainstem rivers, creeks and sloughs, and ponds in excavated gravel pits. Locations of wells and permitted water withdrawals are shown on separate maps. These maps are referred to throughout the Hydrology section of the report.

GROUNDWATER

Sources and Methods - Groundwater

Information on groundwater characteristics of the study area has been compiled from several published reports, specifically: Willamette Basin Report (OWRD 1992), Columbia Basin Framework Study Appendix V (PNW River Basins Commission 1970), Groundwater Report No. 14 (State of Oregon 1970), Water Well Reports, and conversations with groundwater geologists at Oregon Water Resource Department and the USGS.

Results - Groundwater

Seasonal Groundwater Levels and Direction of Subsurface Flow

Groundwater levels in the study area vary by season and location. Levels are at their highest throughout the study area during the late winter and spring after rainfall has fully recharged the aquifers. Levels are at their lowest in the late summer and fall as aquifers are discharged through seepage to underlying strata and the rivers and through well pumping.

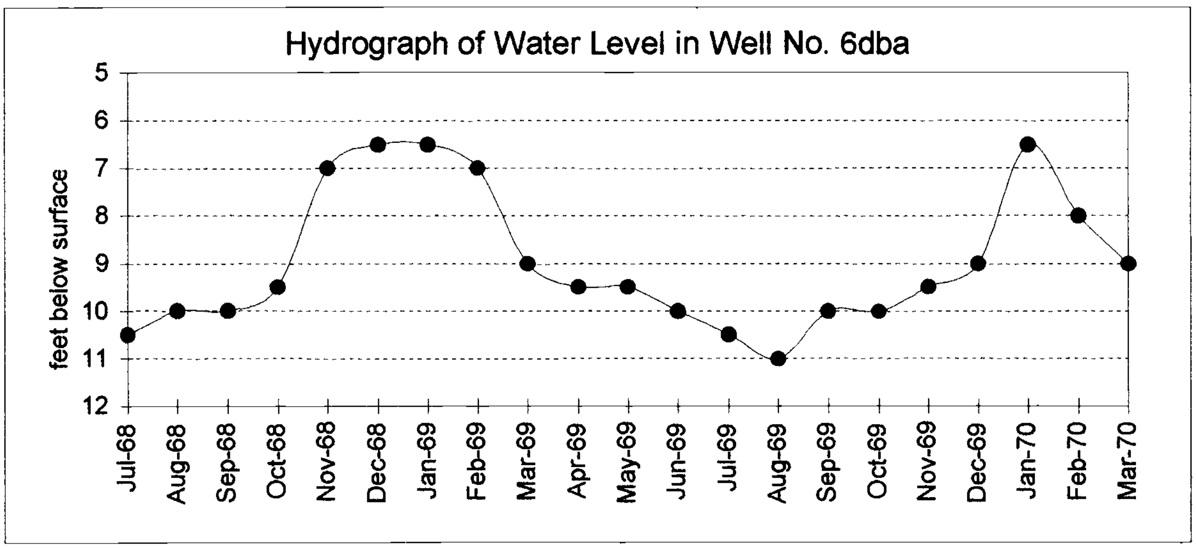
Although soil characteristics can influence the water table considerably at specific locations, the highest water table elevations (relative to the ground surface) are generally found in the gravelly alluvium near the rivers. The lowest levels would be expected to occur in the summer on Mt. Pisgah and similar foothills as water percolates down into deeper layers of rock.

The direction of groundwater discharge is generally expected to be toward the rivers throughout the year. Pumping from wells in floodplain areas may at times cause local lowering of the water table and induce discharge from the rivers into the groundwater. (PNW Framework Commission, 1970).

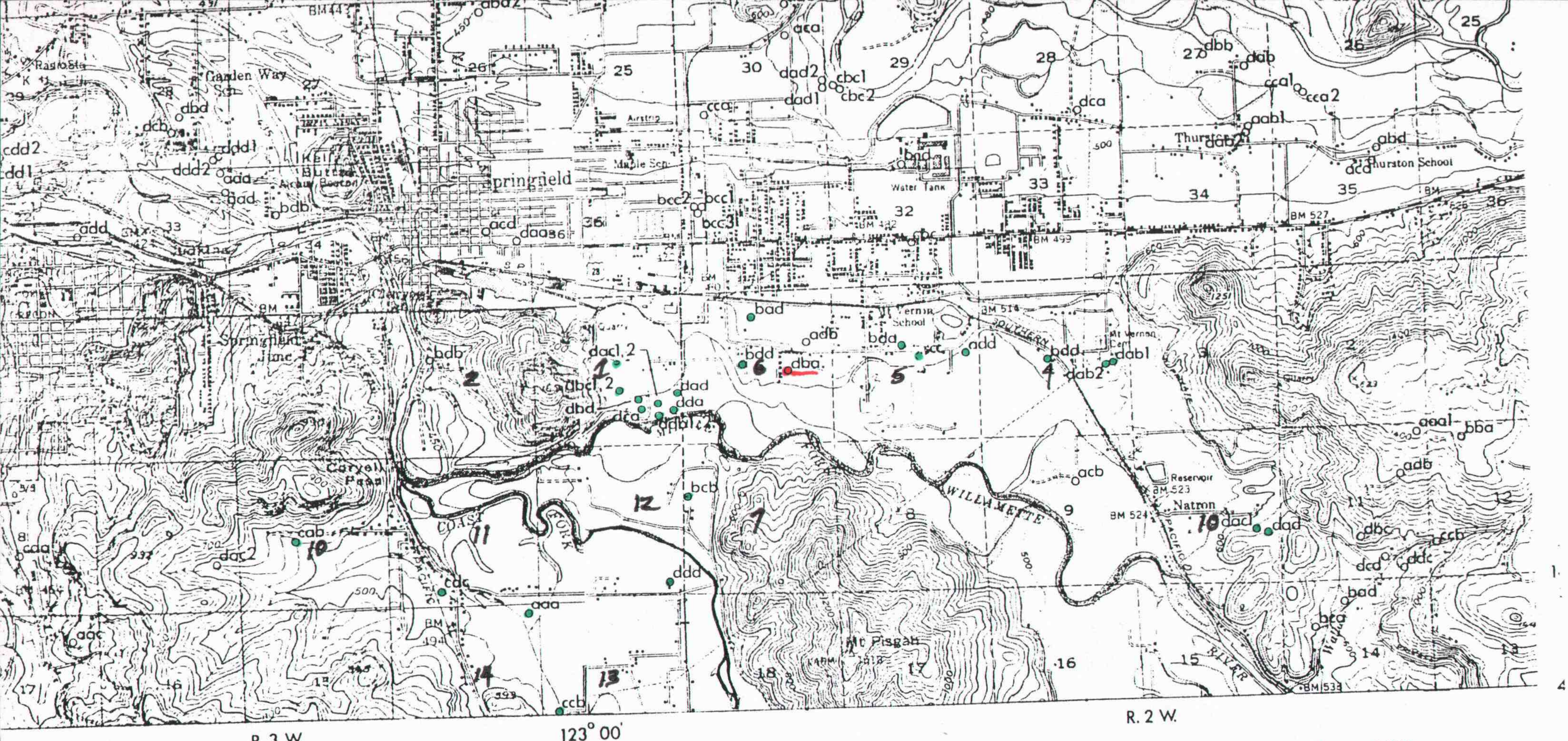
In addition, alternation of surface and subsurface flow also occurs regularly through the hyporheic zone. Typically this zone is conceptualized as part of the river rather than the groundwater system and includes unconsolidated material in the riverbed, point bars, and side channels. The boundaries of this zone of hydrologic exchange are not well defined but water levels in wells near the rivers are known to fluctuate with river stage. Several wells near mile 2 of the Middle Fork, between the river and Gory Creek are probably located in this zone (McKee, 1996).

Figure 2, below, displays seasonal groundwater fluctuations for several months in one well near the Middle Fork. See the Well Locations map on the following page for location.

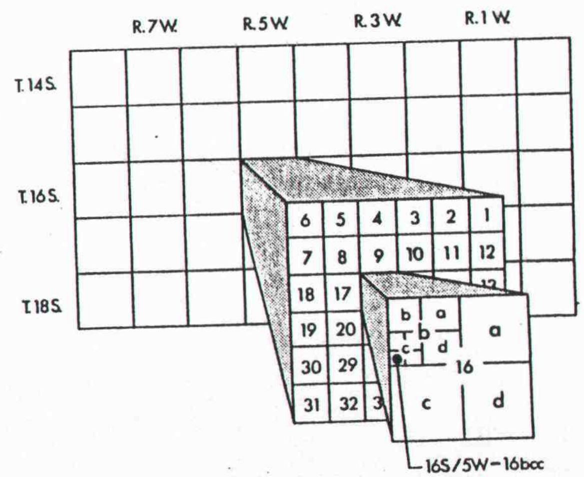
Figure 2. Seasonal Groundwater Fluctuations



The graph indicates the water table at this location ranged from about 6.5 feet below the surface in winter to 10 - 11 feet below the surface in summer. This well was the only site within the study area for which monthly water level data was available. It is assumed to be fairly representative of the general seasonal fluctuation of the water table in alluvial material within about a mile of each river. The seasonal fluctuation of approximately 5 feet at this well is relatively slight. The fluctuation would be expected to increase with increasing distance from the rivers.



Well Locations of Water Level Measurements



As a general indicator of spatial variability in water table elevations, table 3, below, presents data from well drilling logs published as Groundwater Report No. 14 (State of Oregon, 1970). Well locations are indicated by the identification number on the map on the opposite page.

Table 3. Groundwater levels in the study area.

Location	Well ID #	Material	Altitude	Water Level	Date
T18S R2W S4	4bdd	na	500	12	6-4-56
T18S R2W S4	4dab1	sandstone	570	48	7-30-68
T18S R2W S4	4dab2	na	575	23.7	7-30-68
T18S R2W S5	5acc	sand & gravel	490	12	3-27-67
T18S R2W S5	5add	na	490	19.4	7-30-68
T18S R2W S5	5dba	sand & gravel	490	15	5-18-66
T18S R2W S6	6bad	sand & gravel	480	9	6-26-62
T18S R2W S6	6bdd	sand & gravel	475	10.5	7-30-68
T18S R2W S6	6dba	sand & gravel	470	10.4	7-30-68
T18S R2W S7	7bcb	sand & gravel	465	10	9-30-59
T18S R2W S10	10dac1	na	720	90	10-25-56
T18S R2W S10	10dad	na	720	70	10-10-63
T18S R3W S1	1dac1	sand & gravel	465	9	4-3-58
T18S R3W S1	1dac2	sand & gravel	458	9	7-24-56
T18S R3W S1	1dad	sand & gravel	465	12	4-28-64
T18S R3W S1	1dbc1	sand & gravel	458	7	4-23-65
T18S R3W S1	1dbc2	gravel & sand	458	11.5	6-4-65
T18S R3W S1	1dbd	gravel & sand	458	11	5-9-58
T18S R3W S1	1dca	gravel & sand	458	10.5	4-2-65
T18S R3W S1	1dda	gravel & sand	465	9	7-30-56
T18S R3W S1	1ddb1	gravel & sand	465	10	5-60
T18S R3W S1	1ddb2	gravel & sand	458	8	3-61
T18S R3W S10	10cab	sandstone	560	92	8-6-63
T18S R3W S11	11cdc	na	490	20	5-10-67
T18S R3W S12	12ddd	sand & gravel	469	13.3	3-28-69
T18S R3W S13	13ccb	sandstone	470	19	1-27-68
T18S R3W S14	14aaa	sand & gravel	460	18	5-26-24

From this data it appears that the water table in alluvium generally ranges from about 7 to 19 feet below the surface from spring through fall. From the few wells listed as drilled in sandstone, the water table appears to be from about 20 to 90 feet below the surface in any season in this material.

SURFACE WATER

Sources and Methods – Surface Water

Flood Frequency

Flood frequency refers to how often a certain flood stage or discharge may be expected to occur. For example, a flood with a 20-year frequency could be expected to occur, on average, 5 times in 100 years and thus would have an average recurrence interval of 20 years. There may not, however, necessarily be 20 years between floods of that magnitude as they may occur at various intervals, even in consecutive years. Flood frequency data used by the Corps of Engineers, has been developed from observed maximum annual peak discharges at representative stations and from basin wide flood regulation and routing models. Thus flood frequencies are relative rather than absolute and are subject to change as the period of record increases.

Frequency curves for the peak flow analysis were obtained from the US Army Corps of Engineers Portland District. These curves show the natural and regulated maximum annual discharges for selected recurrence intervals at the two gaging stations in the study area. The curves are redrawn below with data points for additional recurrence intervals interpolated from the original graph. The original graph and additional tabular data can be found in the appendix. The flood frequency curves, generated in 1982, were the most recent data available at the time of this report. However, the flood occurrences of the past 14 years may have altered the shape of the curves somewhat. A new set of frequency curves should be available in the near future.

Flood Profiles

Additional data on flood frequencies and profiles was obtained from a 1982 Flood Insurance Study for Lane County done by the Federal Emergency Management Agency (FEMA). This study produced slightly lower estimates of regulated discharges for the 10, 50, and 100 year average recurrence intervals than the Corps of Engineers frequency curves. However, the difference is minimal, given the margin of error typical in this type of hydrologic calculation. The flood profiles in this report were redrawn from graphs included in the FEMA study.

Floodplain Boundaries

Additional floodplain boundaries for the Coast Fork have been added to a copy of the floodplain map from the Confluence Atlas. These boundaries are based on the FEMA flood profile data for the Coast Fork and Berkshire and Oxley Sloughs. Corps of Engineers flood profiles and maps from 1966 were also consulted to verify interpolations of floodplain boundaries.

Revetments

Information about revetments on both rivers was obtained the Corps of Engineers Portland District database.

Mean Monthly Discharge

Mean monthly flows for the gaging stations on both rivers were analyzed with and without regulation for the period 1966 - 1986. All dams affecting flows at the gaging stations were operational during this period. Reservoir inflows and outflows were obtained from the Corps of Engineers. The difference in discharge between the dam outlets and the gaging station was added to the reservoir inflows to compute discharge without regulation at the gaging stations.

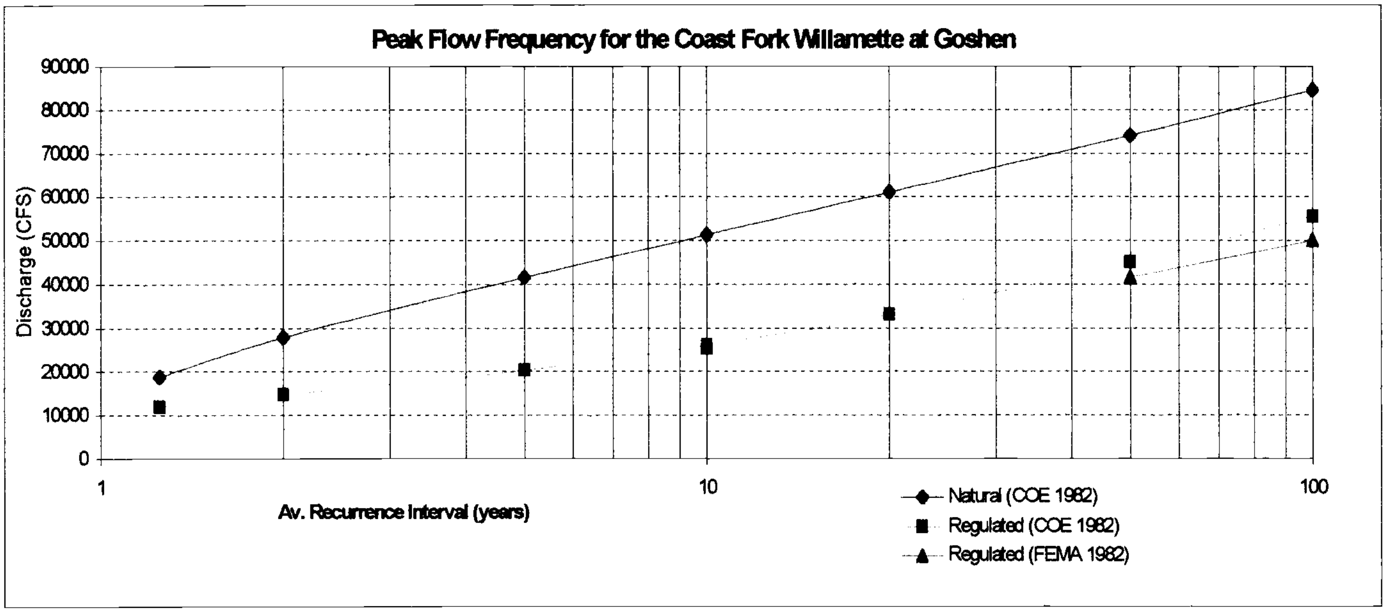
Results – Surface Water

Flood Frequency

Regulation by dams has of course altered the recurrence interval of discharges of a given magnitude at the gaging stations of both rivers. As shown in figures 3 and 4 below, there is a large difference between the magnitude of the change caused by regulation of the Coast Fork and that of the Middle Fork.

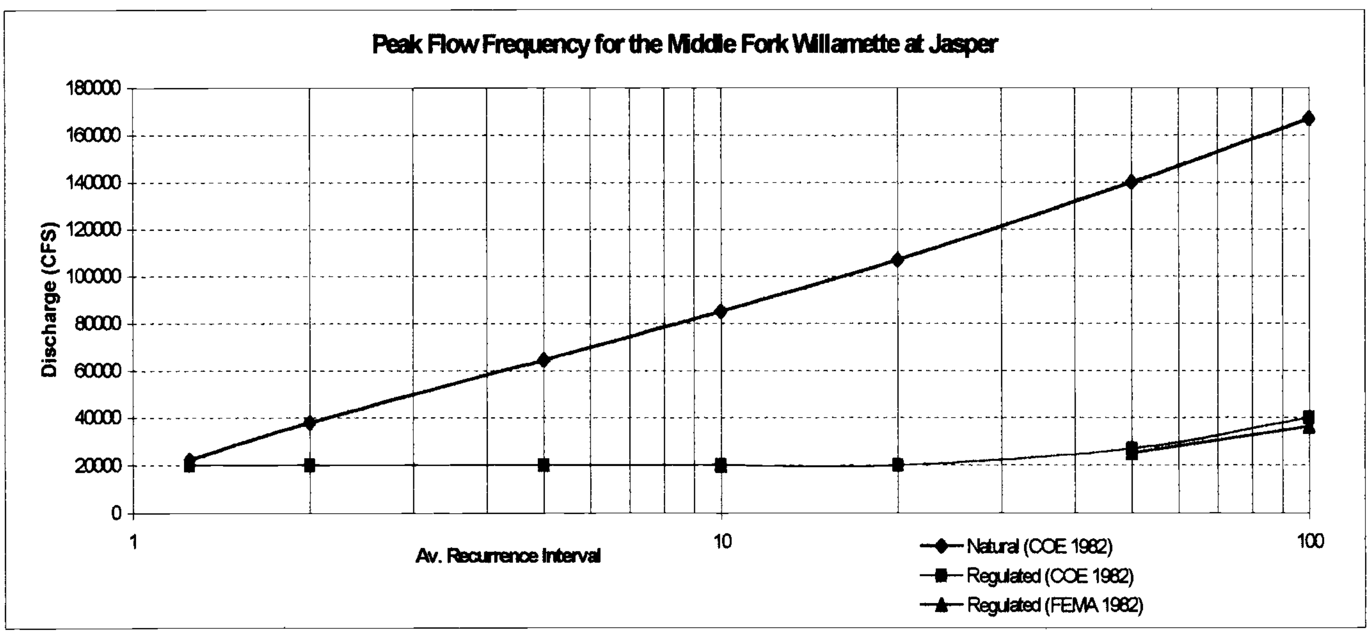
In the Coast Fork, the average frequency of floods of a given magnitude has been changed by nearly a factor of 10. Thus, the discharge which naturally occurred on average one out of ten years, is now expected to occur only once every 100 years if floods continue to be regulated as predicted. Similarly, the discharge which formerly occurred about one out of 5 years is expected to occur only about once every 50 years, and the discharge which naturally occurred about one out of two years, will occur about once every 10 years with regulation.

Figure 3. Peak Flow Frequency for the Coast Fork.



Greater reservoir storage capacity has produced greater alteration of flood frequencies in the Middle Fork. The frequency of floods of a given magnitude has been altered by roughly a factor of 50. The discharge that formerly occurred on average one year out of two is now predicted to occur on average only once in 100 years. And the discharge which formerly occurred nearly annually is predicted to occur 2 times in 100 years.

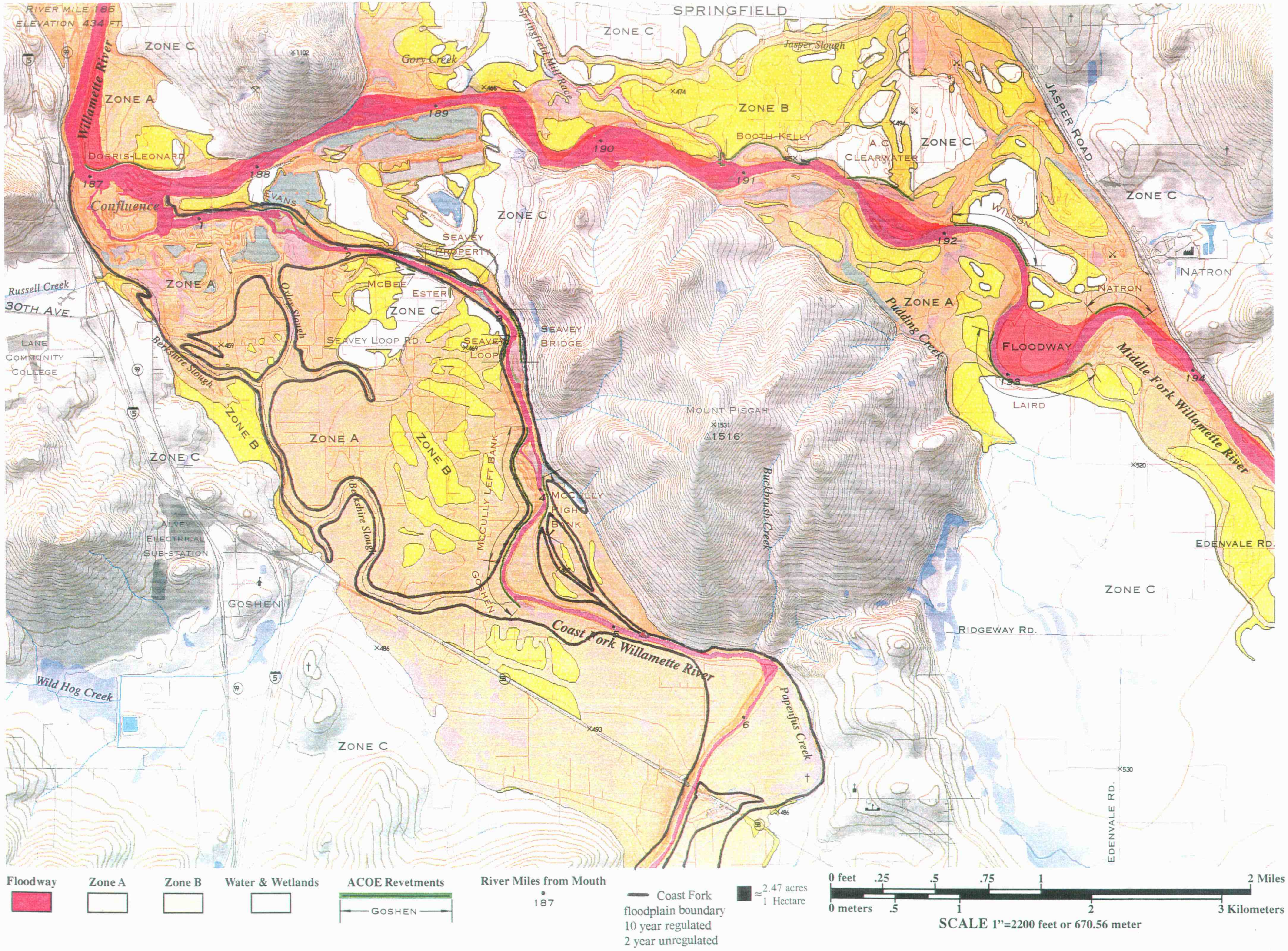
Figure 4. Peak Flow Frequency for the Middle Fork.



Flood Hazards, Wetlands, and ACOE Revetments

BPA Wildlife Mitigation Project • Coast Fork / Middle Fork Willamette Confluence Area

Produced for ODFW by David L. Liberty • Todd/Liberty & Associates Environmental Consulting • August 1996



This change in river flow regime means that large areas of the floodplains of both rivers which were formerly inundated bi-annually on average are now likely to be flooded only once in ten years for the Coast Fork or only once in 100 years for the Middle Fork.

Flood Profiles

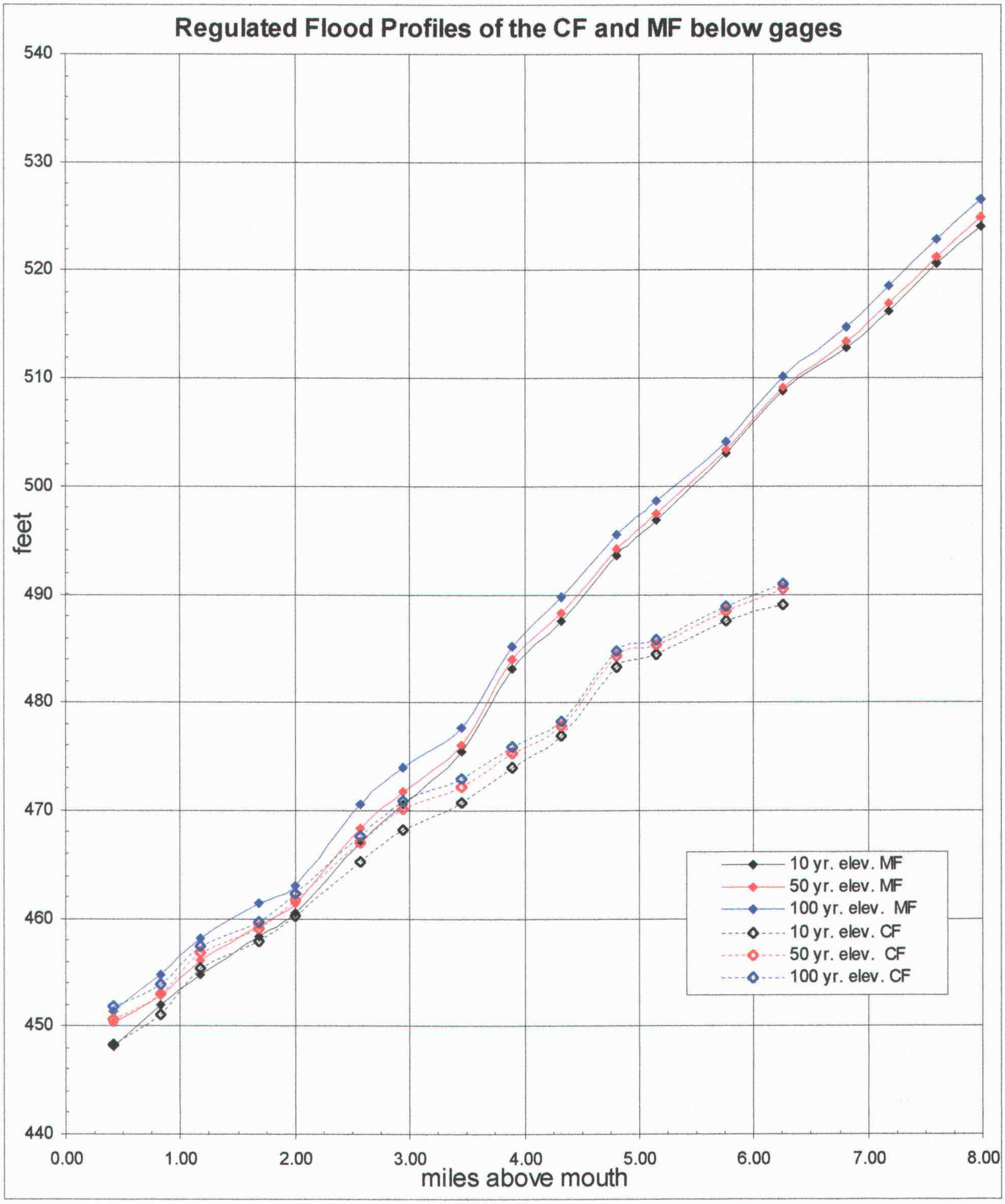
Elevation profiles of selected regulated flood discharges for the Coast and Middle Forks from near their confluence to the gaging stations are presented in figure 5 below. The slightly steeper slope of the Middle Fork past mile 2 is evident in comparison. The Middle Fork shows the greatest difference in elevation between the 50 and 100 year floods while the greatest difference in the Coast Fork occurs between the 10 and 50 year floods.

By projecting the elevations which are predicted to occur in the river channel horizontally out over the floodplain at the corresponding locations, one can estimate areas which would be flooded at that discharge. Since the rating curve which relates discharge to elevation at the gaging stations has not changed significantly over the period of record, these profiles also indicate the approximate elevations of similar size discharges which occurred in these rivers much more frequently prior to regulation. Thus the profile of the 100 year flood in the Middle Fork essentially represents the profile of a discharge which formerly occurred about every other year. And the 100 year profile on the Coast Fork represents the profile of the former 10 year flood.

The Flood Hazards map from the confluence atlas on the opposite page shows the 100 year floodplains of both rivers with regulation by upstream dams. These same boundaries basically define the 2 year floodplain of the Middle Fork and the 10 year floodplain of the Coast Fork without regulation. To aid visual comparison, the 2 year floodplain of the Coast Fork has been drawn in by hand on the map, using the elevations of the regulated 10 year flood.

The total area formerly subject to frequent flooding is smaller for the Coast Fork than for the Middle Fork, reflecting its smaller size and drainage area. Sloughs and other low-lying areas, notably near the bend in the river on the south side of Mt. Pisgah and the area of several gravel ponds near the confluence, were formerly in the bi-annual floodplain of the Coast Fork.

Figure 5. Regulated Flood Profiles



Revetment Data

The location and names of ACOE revetments are also shown on the Flood Hazards map. Table 4, below, lists information about each revetment obtained from the ACOE database. Copies of original data are included in the appendix .

Table 4. ACOE Revetments. See notes below for category definitions.

River	Name	Mile	Bank	Length	Material	Year	Category	Comments
MF	Dorris-Leonard	187.0	R	2250'	stone	51	3D, 1B	none
MF	Booth-Kelly	190.8	R	2570'	stone	50	4D	none
MF	A. C. Clearwater	191.4	R	1980'	stone	49	4D	none
MF	Wilson	192.0	R	3503'	stone	54	3C	sponsor disbanded
MF	Laird	192.7	L	3689'	stone	54	3B	sponsor disbanded
MF	Natron	193.5	R	950'	stone & wood bar.	48	3D	none
CF	Evans	1.3	R	1225'	stone	49	4D, 1C	none
CF	McBee	2.3	L	52'	plug	52	N/A	inactive
CF	Seavey Property	2.4	R	1107'	stone	57	3D	sponsor deficient
CF	Estep	2.5	L	85'	plug	52	N/A	inactive
CF	Seavy Bridge	3.0	R	1300'	stone	50	1D	none
CF	Seavy Loop	3.1	L	765'	stone	56	1D	sponsor deficient
CF	Mikesell	3.2	L	143'	plug	52	N/A	inactive
CF	McCully	3.6	B	3655'	stone	50	3C	none
CF	Goshen	4.2	L	1030'	stone & gravel apron	44	3D	no maint. authorized

Notes for Revetments

Maintenance Category:

1 - High value, high risk
2 - High value, low risk
3 - Low value - low risk
4 - Low value - no risk

A - Cleared revetment or grass cover only
B - Combined grass, shrub and brush cover
C - Shrub and tree cover
D - Predominantly tree cover

Most of the Coast Fork revetments were installed after both upstream dams became operational. The Goshen revetment is the earliest and was constructed after Cottage Grove Dam and before Dorena Dam became operational. Most of the revetments on the Middle Fork were constructed before the earliest of the three upstream dams, Lookout Point, became operational in 1953.

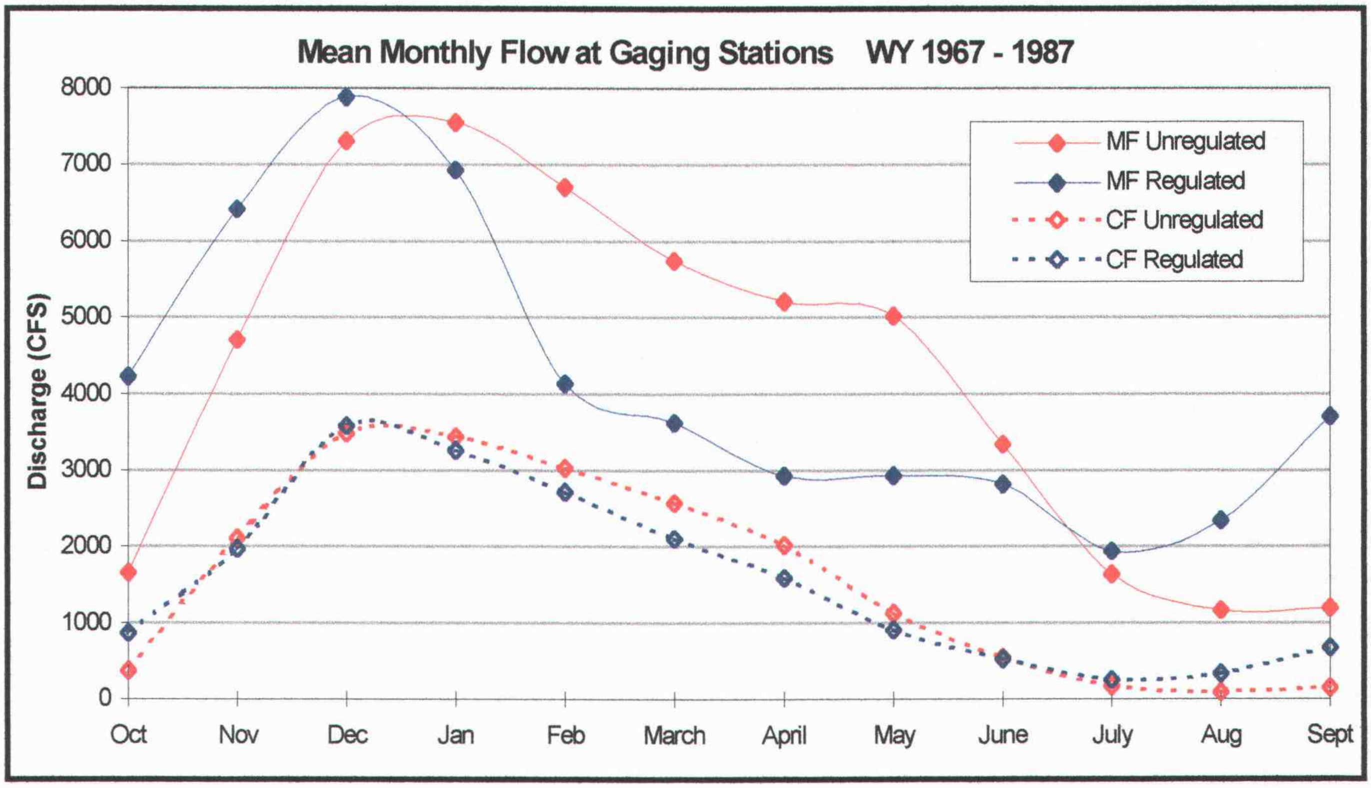
Two installations on the Middle Fork, "Booth-Kelly" and "Clearwater" fall into category 4D, low value - no risk. Maintenance notes included with the original data also state "revetment not under attack from river due to channel change or gravel bar formation". Since flood control reduces the frequency of discharges large enough to produce major channel adjustment, revetments, such as these may no longer be needed. Their removal would presumably increase habitat available to bank-dwelling species such as beaver and kingfisher.

In contrast, two installations on the Coast Fork, "Seavy Bridge" and "Seavy Loop" are in category 1D, high value - high risk. The proximity to Seavy Loop Bridge accounts for this rating. Additional maintenance notes indicate only grasses, herbaceous plants and low shrubs are permitted on the face and crown of the revetment, yet the sites are currently classified with predominantly tree cover. If maintenance is performed as originally planned, the vegetation condition at this site may change in the future.

Mean Monthly Flows

The primary effect of river regulation is to redistribute annual runoff. Essentially less flow is released during times of normally high runoff in winter and spring, and more flow is released during times of normally low runoff in summer and fall. This change is displayed in figure 6 below. The mean daily discharge for each month of the year is averaged for the period 1967 - 1987, and regulated and unregulated flows are compared for both rivers. Although the two rivers obviously have different discharges, it is primarily the change in flow regime from unregulated to regulated that is the main comparison between the rivers for this discussion. The months of the year are listed in the conventional order for water years, that is October through September. Data used to generate the graph is included in the appendix .

Figure 6. Mean Monthly Flows



Although both rivers show the same basic seasonal pattern of flow alteration, there are differences between the two rivers in the magnitude of the change. As with the change in flood frequency, regulation has produced a greater decrease in mean monthly flows on the Middle Fork compared to the Coast Fork. From February through May, regulation reduces mean monthly discharge by approximately 40% on the Middle Fork as compared to approximately 18% on the Coast Fork. In the dry season, however, augmentation of flow is greater in the Coast Fork than in the Middle Fork. Regulated flows in the Coast Fork are more than tripled in August and more than quadrupled in September compared to unregulated flows. On the Middle Fork, August flows are doubled and September flows are tripled.

The main purposes of low flow augmentation are to provide water for irrigation and to improve water quality. See the Water Withdrawals and Water Quality sections of this report for further discussion.

One other effect of augmenting flow is that the water level or "stage" is higher on average in the main channels than it would be without the augmented flow. From the rating tables for each gaging station, it appears that the regulated water level averages about 2 feet higher in the Middle Fork and about 1.2 feet higher in the Coast Fork in September. These elevated water levels likely reduce the rate of groundwater discharge to the main channels during the dry season and help retain water in sloughs near the main channels.

Water Withdrawals

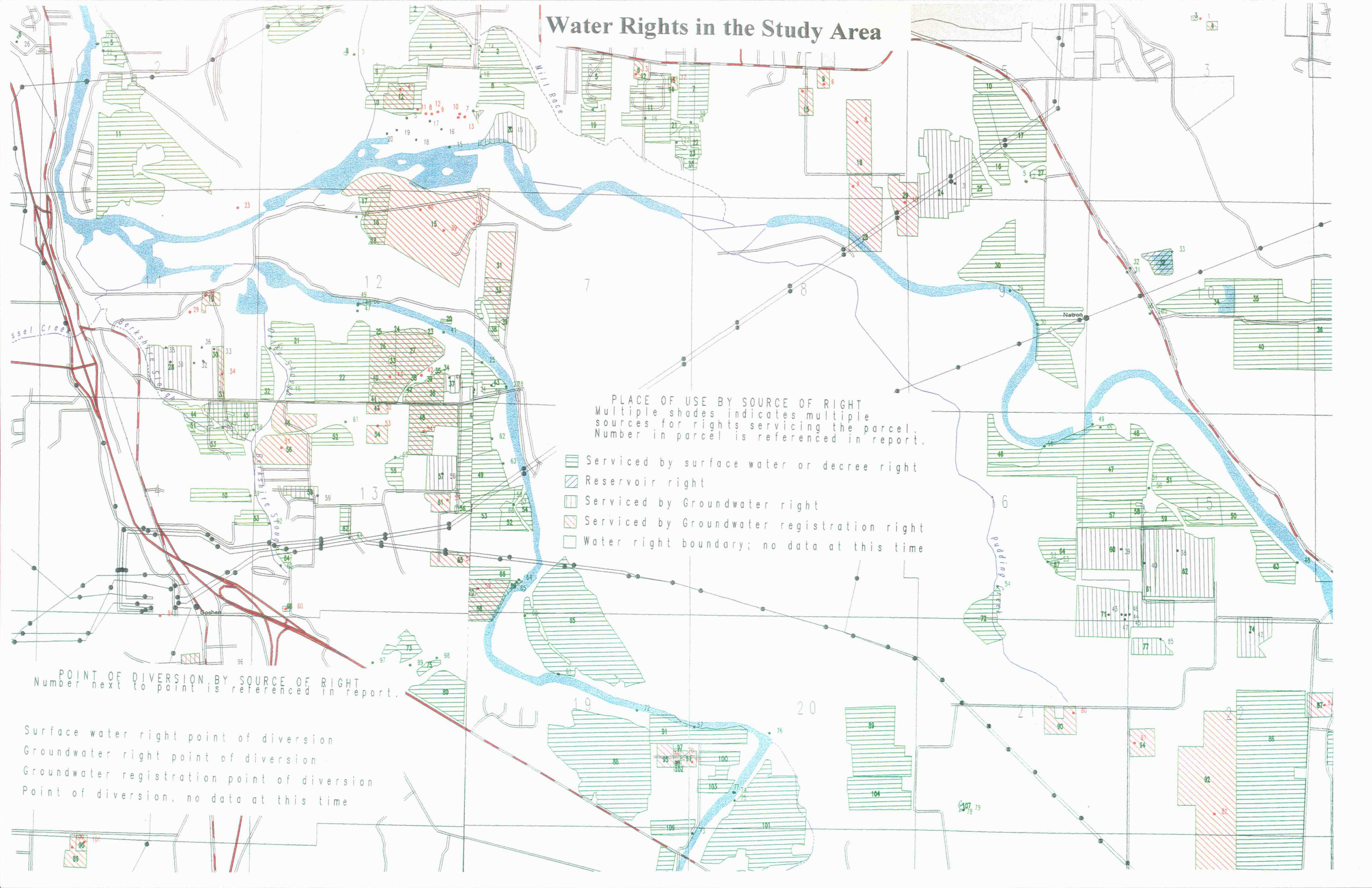
Since the study area is near the outlet of two watersheds, the amount of water used throughout the basins upstream can affect the quantity of water available to the site at the confluence. Table 5, below, lists total permitted rights in the Coast Fork and Middle Fork watershed (OWRD 1992).

Table 5. Permitted Water Rights in the Coast Fork and Middle Fork Watersheds.

		Surface	**Water**	**Rights**	**(CFS)**		
Watershed	Agriculture	Industrial	Municipal	Domestic	Recreation	Misc.	**Total**
Coast Fk.	93.05	43.51	61.70	1.00	0.16	0.92	**170.34**
Middle Fk.	35.73	26.26	22.56	6.56	0.06	92.06	**186.23**
		Ground	**Water**	**Rights**	**(CFS)**		
Coast Fk.	18.27	1.91	6.68	0.57	0.00	0.08	**27.52**
Middle Fk.	18.82	0.03	27.86	0.16	0.00	0.00	**46.86**

It is important to remember that most water uses are not entirely consumptive and a certain amount of water returns to the system as irrigation runoff, treated discharge, etc. However if use is heavy enough, there can be a net decrease in flow in the downstream direction, a reversal of the natural trend. This has occurred several times in July, August, or September on the Coast Fork between 1966 - 1986. The reductions range from very slight (~1cfs) to over 41cfs. (See data in the appendix for specific incidents).

Total surface rights allocated for the Coast Fork are less than the regulated mean daily flow at the Goshen gage in summer for the period of record computed above. However, the total amount is greater than the mean monthly discharge for summer months in some individual years


Water Rights in the Study Area
PLACE OF USE BY SOURCE OF RIGHT
Multiple shades indicates multiple sources for rights servicing the parcel.
Number in parcel is referenced in report.
Serviced by surface water or decree right
Reservoir right
Serviced by Groundwater right
Serviced by Groundwater registration right
Water right boundary; no data at this time
POINT OF DIVERSION BY SOURCE OF RIGHT
Number next to point is referenced in report.
Surface water right point of diversion
Groundwater right point of diversion
Groundwater registration point of diversion
Point of diversion, no data at this time
Mill Race
Natron
Goshen
Berkshire Slough
Pudding Creek

and is well above unregulated summer flow. (Data in appendix). Surface water rights on the Middle Fork are considerably less than minimum summer flows in all years.

Individual records of permitted water rights were obtained from OWRD for the two townships encompassing the study area. Table 6, below, lists the number of surface and groundwater rights in each township.

Table 6. Water Rights in the Study Area

Township	Total Number	Surface Rights	Groundwater Rights	Major Use
18S R2W	168	106	62	irrigation
18S R3W	118	69	49	irrigation
Both	286	175	111	irrigation

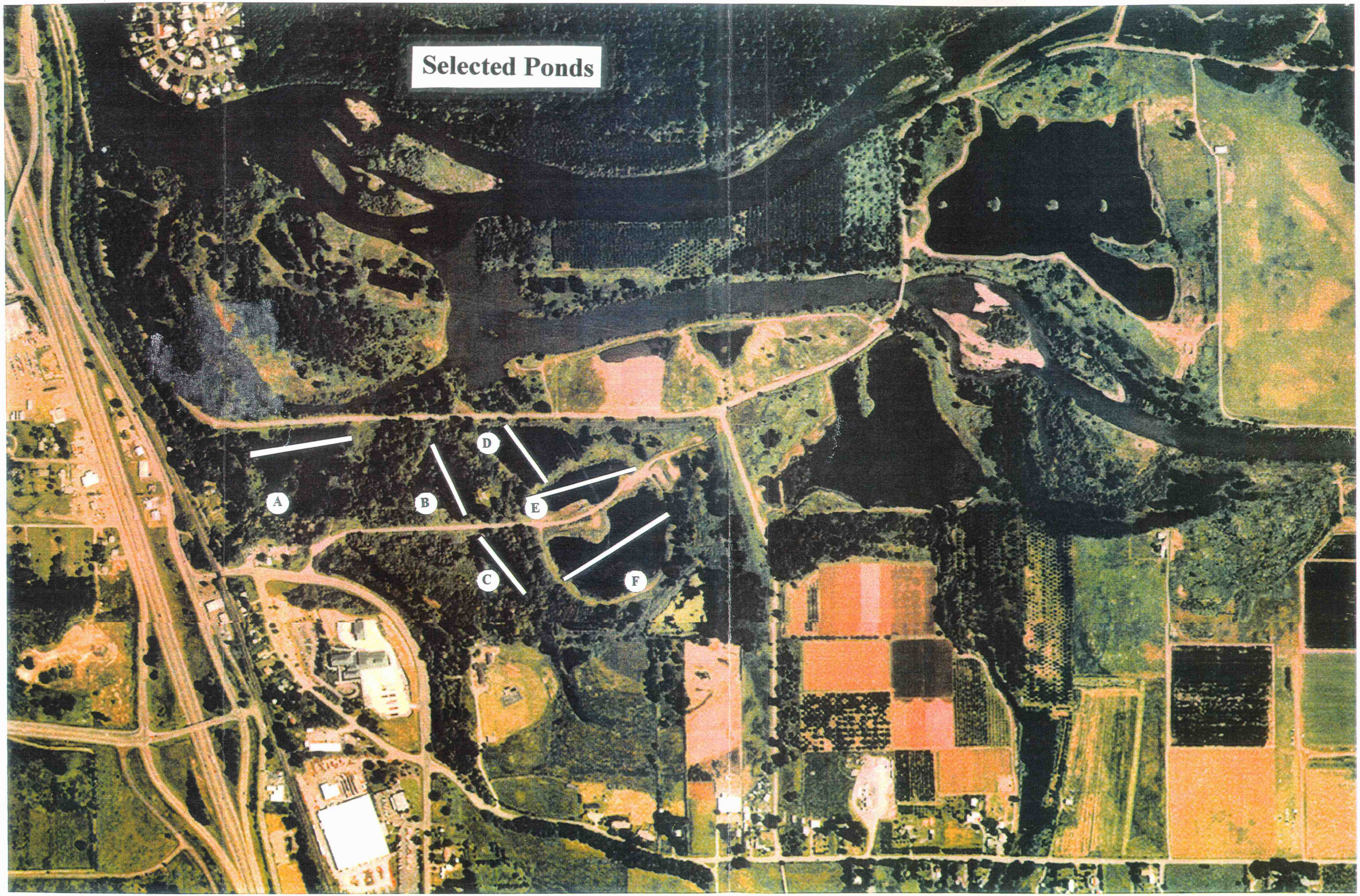
The Water Rights map on the opposite page indicates the location of points of diversion and places of use for the permitted water rights in the study area. Numbers on the map correspond to the ID numbers in the Point of Diversion report and the Place of Use Report found in the appendix. The Permit and Certificate numbers can be used to cross reference individual water rights from those two reports (and the map) to the Discharge Report, also in the appendix.

For example, from the map there appear to be 22 surface water points of diversion on the Coast Fork between the confluence and the gaging station. Their ID numbers are listed in upstream order in table 7 with associated discharges from the Discharge Report. Additional points of diversion from the Middle Fork, Oxley and Berkshire sloughs, and Pudding Creek are also tabulated in upstream order.

Table 7. Discharges of Selected Surface Water Rights

Coast Fork		Middle Fork		Berkshire		Oxley		Pudding	
ID #	CFS	ID #	CFS	ID #	CFS	ID #	CFS	ID #	CFS
49	.73	15	20.0	37	.24	45	.57	54	.25
48	.73	29	1.09	69	.13	46	.57		
47	.63	30	1.09	62	.08	68	.51		
66	.32	56	.5	63	.12				
41	.1	49	1.51						
25	.12	55	.5						
28	.19	48	.2						
27	.16								
62	.2								
63	.29								
58	.02.								
57	1.0								
64	.09								
65	.23								
61	**1.44**								
72	1.31								
67	.35								
76	.57								
77	.07								
74	.13								
75	1.10								
73	.06								

It may be of interest to note that the largest single surface water right on the Coast Fork is near a pasture for which cattle grazing is no longer planned. This point of diversion is also in the proximity of active sloughs used by a population of Western Pond Turtles. There may be an opportunity to utilize this water right for habitat enhancement.



Coast Fork/Middle Fork Willamette River Confluence • 1993 Aerial Photo

Bonneville Power Administration Wildlife Mitigation Project

Produced for Oregon Department of Fish & Wildlife by Friends of Buford Park & Mt. Pisgah • December 1996

0 250' 500'
Scale: 1" = 500'

N

SELECTED PONDS AND SLOUGHS

Sources and Methods – Selected Ponds and Sloughs

Six ponds in former gravel extraction pits were measured to determine depth, water quality, and other general characteristics. See water quality section for water quality results. The ponds are labeled A through F and the location of transects for depth profiles is drawn on the enlarged color photo of Selected Ponds on the opposite page. Historic airphotos were consulted to assess the approximate age of these ponds.

Rebar staff gages were installed at six additional field sites to monitor the decline in surface water level during early summer. These sites are numbered 1 - 6 on the enlarged color-infrared photograph titled "Hydrologic Diversity and Monitoring Sites" on the following page.

Interpretation of the color IR photo, along with soils, groundwater, and surface water information was the primary means of assessing the hydraulic connection between ponds, the other monitoring sites, and the mainstem rivers.

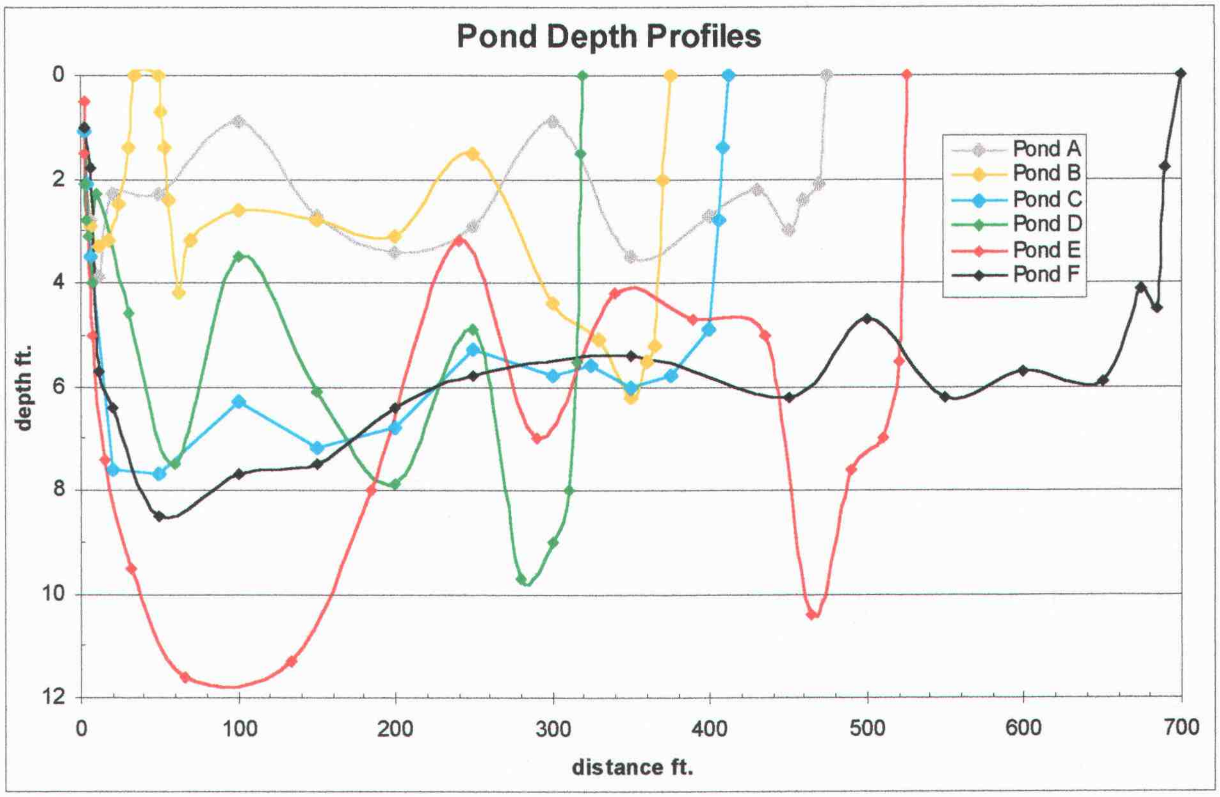
Results

Pond Characteristics

From the available photos, it appears that all ponds except E had been excavated well before 1967. At that time, active mining seemed to be occurring primarily on the large round island just north of pond A. Excavation of pond E apparently began between 1979 and 1981.

The depth measurements were taken in early September when water levels would be near the seasonal low, thus these values generally represent the minimum depth in each pond. From the high water mark visible around the edges, depth could be expected to be 20 to 30 inches greater in the winter. Figure 7, below, displays the pond depth profiles.

Figure 7. Pond Profiles



The maximum recorded depth ranged from only 3.9 feet in pond A to 11.6 feet in pond E. Ponds A, B, D, and E have relatively variable depths, and ponds C and F have relatively consistent depth. Banks are almost uniformly steep with one exception in pond D where a depth of 7.5 feet is reached at a distance of 60 feet. The steep banks limit the amount of edgewater habitat available, especially in the deeper ponds.

The riparian vegetation of the deeper ponds D, E, F is almost exclusively blackberry, while that of the shallower ponds A, B, C is a more varied mix of grasses, shrubs, and trees, with some blackberry. Pond C has the most "natural" appearance, with several mature cottonwoods, some snags and woody debris around the perimeter. Reed canary grass was observed around the edge of pond A, but apparently has not yet spread to the other ponds.

A dead beaver was observed floating in pond D. This pond had large amounts of aquatic plants growing throughout the pond. Where there were holes in the plant mass, many fish 5 - 8" were seen swimming around. In contrast, pond C had little vegetation growing in the water and the water was distinctly brown in color. This unique color difference in the water of pond C is evident even on the 1967 photos. The only fish seen were 1 - 3" near the bank though fishing line and bait containers littered the shore. A minklike animal was seen darting around the shore of this pond.

Water level monitoring

Results of the staff gage monitoring are presented in table 8, below. See photo on following page for site locations.

Table 8. Staff Gage Readings at Sloughs and Other Monitoring Sites

	Site Number					
Date	1- slough	2 - river	3 - trib	4 - slough	5 - slough	6 - Oxley
5/16/96	staff	gages	installed	at	each	site
	Drop in water level from previous date					
6/15/96	25"	48"	13" - dry	33"	32"	2"
7/14/96	16"	10"	unknown	5"	~8" - dry	0"
	Total drop in water level over two months					
5/15 - 7/14	41"	58"	> 13"	38"	~40"	2"

The greatest decline in water level (48")occurred in the mainstem of the Coast Fork between May and June. In contrast, the site on Oxley slough showed a decline of only 2" during the same period. Water levels in the other sloughs dropped 2 to 3 feet during this period. Between June and July, water levels declined further at all sites except Oxley, but at an apparently slower rate.

The data, though limited, seems to indicate that river stage is not exerting a direct influence on summer water levels at the other monitored sites in sloughs. It is more likely that water levels are controlled primarily by groundwater discharge especially at this time of year. The rate of groundwater discharge however is probably affected indirectly by river stage. Thus the smaller drop in water level in the Coast Fork between June and July corresponds to smaller declines at other sites (except #1) during the same period. The sustained water level in Oxley slough may be due in part to the soil type (McBee) which has a perched water table through April.

Monitoring Sites and Hydrologic Diversity

photo date
3/14/86

Hydraulic Connectivity

The color infrared photo on the opposite page was taken on March 14, 1986. At this time of year groundwater levels are still fairly high. The daily mean discharge in both the Coast Fork and the Middle Fork on this date was well above the regulated daily mean discharge in March for the period 1966 - 1986. The flow in the Middle Fork was more characteristic of the unregulated daily mean flow in March, while the flow in the Coast Fork was about 50% greater than the unregulated daily mean flow in March. So this photo displays hydrologic conditions in the study area that would be fairly typical of average flows (non-storm) in late winter without regulation. Discharges are presented in table 9 below for comparison. This photo is also a good general indicator of portions of the study area which are inundated by water at least part of the year.

Table 9. Mean Daily Flow in Both Rivers on Photo Date 3/14/86

River	Daily Mean - Photo	Daily Mean - Reg	Daily Mean - Unreg
Coast Fork	3814 cfs	2106 cfs	2572 cfs
Middle Fork	5630 cfs	3623 cfs	5744 cfs

The different colors of the surface waters visible on the photo reveal the diversity of hydrologic conditions in the study area. Clear calm water absorbs infrared radiation and so appears black. The various shades of blue indicate different degrees of reflectivity of blue light due to particles in the water. The color in effect is a visual tracer of water from different sources with corresponding reflective properties.

In the long narrow ponds on MF, there are gradations of color from light to dark in a direction perpendicular to the river indicating a gradient of decreasing hydraulic connectivity with the river. There is also a distinct contrast in color between the Mill Race with a direct intake near mile 191 on the Middle Fork and Jasper slough to the north.

On the Coast Fork, the small ponds on the central confluence island all appear to be directly connected to the mainstem under the flow conditions at the time of the photo. One other pond just north of the six sampled ponds also appears to be directly connected through a thin dike to the mainstem. This excavation site was formerly in the active channel of the mainstem as evidenced on the 1967 photos. The six sampled ponds all appear quite dark in color compared to the Coast Fork, indicating relatively little hydraulic connectivity with the mainstem. Pond E is somewhat lighter in color than the others but this is likely due to the recent excavation of that pond. Pond C is also a slightly different color but that has been a unique characteristic of Pond C observed on other photos and in the field.

The water of Berkshire/Oxley sloughs has a greyish green color on the photo. Apparently the Goshen revetment minimizes a direct surface connection with the Coast Fork. These sloughs and the large pond between Oxley and the Coast Fork seem to reflect a mixed connection with both groundwater and the mainstem. The other sloughs with water level monitoring sites all are distinctly dark in color indicating the primary hydraulic connection is to groundwater even at this relatively high river stage. In contrast, Pappenfus Creek appears to be inundated with water from the Coast Fork for some distance up the creek.

Although there is relatively little direct hydraulic connection between the rivers and the other hydrologic features at normal winter high flows, even less at summer low flows, occasional floods do periodically create surface connections. Based on the flood profiles and frequency analysis, all the field sites monitored in the study area are within the 10 year regulated floodplain of the Coast Fork. Photos taken in November 1996 illustrate this type of flow condition. See figures 8 and 9 on the following page.

Figure 8. Selected Ponds during a flood, November 1996.

Figure 9. Sloughs and pasture between Coast Fork and Mt. Pisgah, November 1996.

WATER QUALITY

Sources and Methods – Water Quality

A detailed investigation of all aspects related to the water quality of the study area is beyond the scope of this report. Descriptions of specific water quality standards and information on compliance in the Coast and Middle Forks was obtained from the Oregon Department of Environmental Quality (DEQ 1996).

Information on the overall health of the upper Willamette River, including the Coast and Middle Forks was obtained from the Willamette River Basin Water Quality Study - Summary and Synthesis of Findings (Tetra Tech, 1995).

In addition, field data was collected for several water quality parameters in the mainstem rivers and in six gravel ponds. Water temperature was recorded continuously for 3 to 5 days at each sample location. A Hydrolab multi-probe sensor was also used to record values for temperature, pH, dissolved oxygen, specific conductance, redox, total dissolved solids, and turbidity at one site in each river and at the bottom and surface along a sample transect for each pond.

Determination of Water Quality Status

In order to protect the beneficial uses of the waters of the state, the Oregon DEQ has established statewide criteria for 15 parameters affecting water quality. Waterbodies for which data indicates the criteria are not met are designated as "water quality limited". The designation identifies a specific beneficial use which is limited by the condition of a specific water quality parameter. A list of water quality limited waterbodies is compiled and published bi-annually (the 303d list). An explanation of the data requirements and decision process for making listing determinations is included with the list and will not be repeated in this report.

A management plan designed to bring the waterbody into compliance is required for those listed as water quality limited. The DEQ is required to establish Total Maximum Daily Loads (TMDL's) for the highest priority waterbodies. Developing TMDL's increases the DEQ's regulatory authority and enables it to closely monitor all sources of pollution affecting a waterbody. The Willamette River is currently number 2 on the DEQ priority list for establishing TMDL's by 1998. Waterbodies with TMDL's are considered water quality limited until the relevant standard is met but are tracked separately from the 303d list.

In addition to the recurring process of evaluating water quality status in terms of the parameters on the 303d list, there are other ongoing studies of water quality in the Willamette River. To rate the overall health of the river, the Tetra Tech study assigned a score to river segments based on an index of 10 health indicators. Of the 10 indicators, 4 were specific water quality parameters, 4 were biological indicators, plus one habitat indicator and a metric representing non-point source pollution load.

Results – Water Quality

Water Quality Limited Status

Table 10, below, summarizes the water quality status of the Coast and Middle Forks of the Willamette from the confluence to the first dam on each river. Parameters which exceed water quality standards are discussed in more detail below.

The Middle Fork meets all water quality standards except temperature in the summer. Data for the Middle Fork from a USGS site near Dexter indicates the 7 day moving average of daily maximum temperature has exceeded the standard of 64 degrees Fahrenheit in 1992/93/94 for 72/12/53 days respectively. The highest recorded value was 68.6 in 1992.

Table 10. Mainstem Water Quality Status

Parameter	Coast Fork	Middle Fork
Aquatic Weeds or Algae	(periphyton) TMDL - phosphorus	ok
Bacteria (E. coli, fecal coliform)	303d - year-round	ok
Bacteria (fecal coliform - shellfish)	ok	ok
Biological Criteria	ok	ok
Chlorophyll a	ok	ok
Dissolved Oxygen	TMDL-ammonia & phosphorus	ok
Habitat Modification	ok	ok
Flow Modification	concern	ok
Nutrients	TMDL - phosphorus	ok
pH	TMDL - phosphorus (summer)	ok
Sedimentation	concern	ok
Temperature	303d - summer	303d - summer
Total Dissolved Gas	ok	ok
Toxics	TMDL - ammonia	ok

The Coast Fork currently does not meet water quality standards for seven parameters. Summer temperatures at a DEQ site near river mile 3 have exceeded the standard each year between 1986 - 1995, with maximum recorded value of 84.5 during this 10 year period. Exceedances of other water quality parameters are related to primarily to discharge from the Cottage Grove sewage treatment plant, and runoff from livestock operations.

The fecal coliform standard for water contact recreation is no more than 10% of samples in a 30 day period may exceed 400 organisms per 100 ml. Data from DEQ sites from river mile 3 to 24 indicated between 13 and 63 percent of samples exceeded the standard with a maximum value of 2400 recorded during the period 1986 - 1995.

Ammonia has been found to be present in amounts toxic to aquatic life and a TMDL for this substance has been approved and is being implemented. Similarly, phosphorus is being regulated as a nutrient by implementing a TMDL. The exact values of the TMDL's are not included in the 303d list but are available from the DEQ.

The Coast Fork also exceeds water quality standards for pH, dissolved oxygen, and algae primarily due to the amount of phosphorus and ammonia in the water.

The standard for pH to support aquatic life and water contact recreation is between 6.5 and 8.5. No more than 10% of samples should fall outside that range. At a site near river mile 3, 22% of samples have exceeded the standard with a maximum value of 9.4 recorded during the summer from 1987 - 1995. The pH values in other seasons met the standard.

The dissolved oxygen standard for the Coast Fork is the one applied to waters identified as supporting cold-water aquatic resources, that is, dissolved oxygen shall not be less than 8.0 mg/l or 90% saturation in 10% or less of samples. At the site near river mile 3, 12% of samples did not meet the standard with a minimum value of 6.7 mg/l (75% sat) recorded between 1986 - 1995.

The water quality standard for periphyton (attached algae) is simply documented evidence that the algae is causing other exceedences (of pH or dissolved oxygen), or is impairing a designated beneficial use. There is evidence that periphyton is affecting both pH and dissolved oxygen in the Coast Fork.

The exceedance of these three water quality parameters are also being addressed by the established TMDL's for phosphorus and ammonia.

Overall Health Rating

Despite exceedances of the above water quality standards, the overall health of the Upper Willamette River (above Corvallis, including the Coast and Middle Forks) was rated as good compared to the health of the remainder of the river which was rated as marginal (TetraTech 1995).

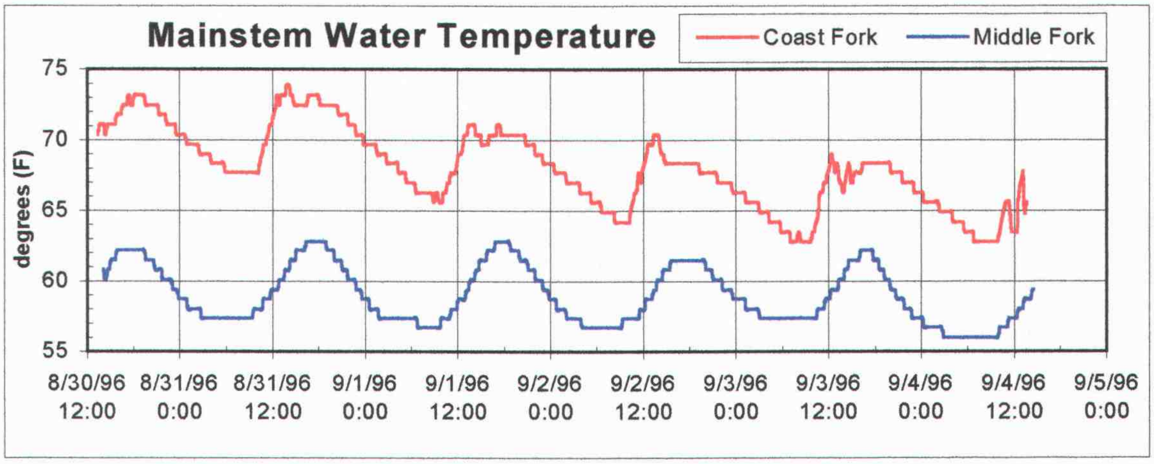
In terms of some of the specific components of the health rating, both the Coast and Middle Forks were considered to have relatively mild water quality problems related to non-point source pollution. Logging and agriculture were cited as land uses most affecting non-point source pollution. The report indicated that retention of sediment and nutrients (and perhaps toxics in the case of mercury on the Coast Fork) in the reservoirs was an important factor reducing overall non-point source pollution loads in these basins.

In addition, scores for the physical habitat metric, and the index of biotic integrity for fish and for benthic communities (bottom-dwelling aquatic insects) in the Middle Fork near river mile 3 were some of the highest obtained in the study indicating relatively little impairment to aquatic health.

Field Data - Mainstem

Water temperature was monitored continuously for five days at a site in each river near the confluence in late August/early September. Results are graphed in figure 10 below.

Figure 10. Mainstem Water Temperature



Temperatures in the Coast Fork generally were 8 - 10 degrees warmer than in the Middle Fork during the sample period. Temperatures in the Coast Fork also appear to increase more rapidly and decrease more slowly on a daily basis. A decline of about 5 degrees in the daily maxima was observed in the Coast Fork whereas the daily maxima were more constant in the Middle Fork.

One grab sample of multiple water quality parameters was taken at the same location in the mainstems. Results are presented in table 11 below.

Table 11. Mainstem Water Quality Parameters

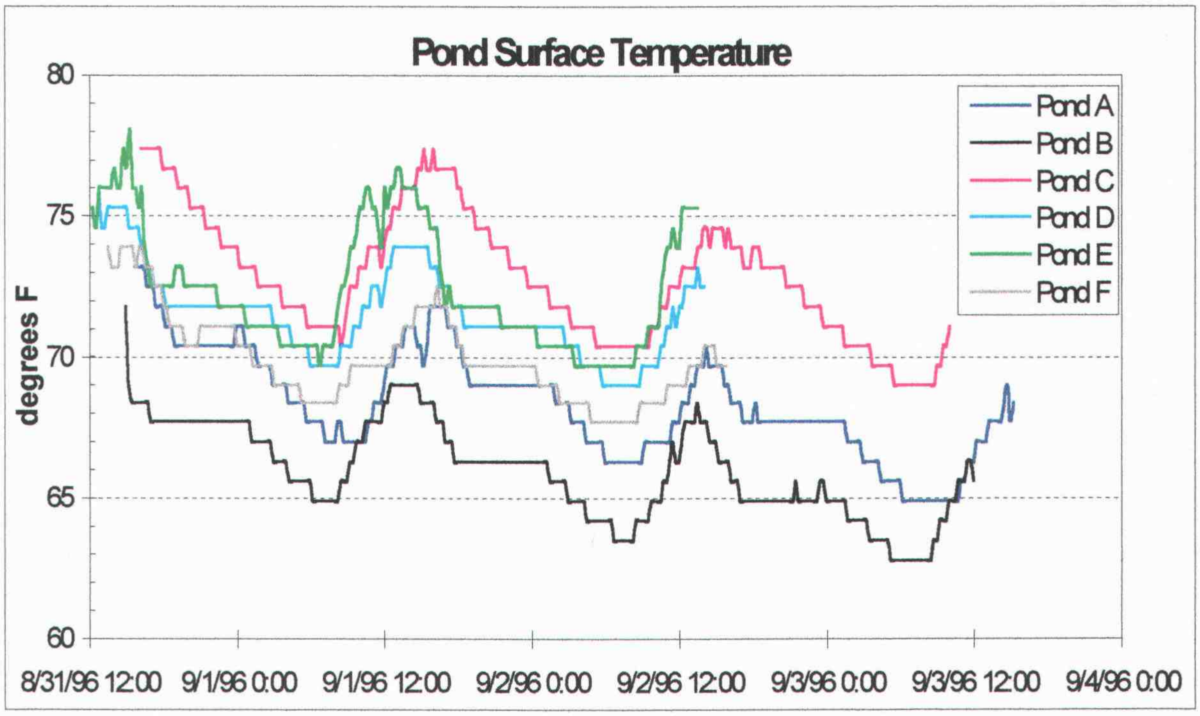
Coast Fork										
Date	Time	Depth	Temp	pH	SpCond	TDS	DO	DO	Redox	Turb
MMDDYY	HHMMSS	feet	degF	units	uS/cm	Kmg/l	%Sat	mg/l	mV	NTU
90496	134515	0.2	64.6	8.1	57.1	0.0365	96.5	8.99	246	6.8
90496	135258	0.6	64.2	7.61	54.6	0.0349	104.8	9.8	296	0
90496	135107	5.9	64	7.71	54.8	0.035	102.1	9.58	286	1.9
Middle Fork										
90496	143630	0.1	59.7	7.79	38.1	0.0244	109.6	10.81	339	3.4
90496	143725	0.5	59.7	7.76	38.1	0.0244	109.1	10.76	341	2.1
90496	143804	0.7	59.7	7.69	38.1	0.0244	109.3	10.78	345	2.1

An attempt was made to take a sample near the surface and at depth in each river, but this effort was unsuccessful in the Middle Fork due to the swift current. The main difference between the rivers based on this single sample appears to be related to suspended sediment loads. Total dissolved solids, specific conductance, and turbidity are all related to sediment and are all higher in the Coast Fork. This difference is also visible as differences in water color between the two rivers on photos of the area.

Field Data – Ponds

Surface water temperature was also monitored continuously for approximately 3 days in 6 different ponds near the confluence of the rivers. See photo of Selected Ponds for specific locations of thermograph installations. Monitoring results are graphed in figure 11 below.

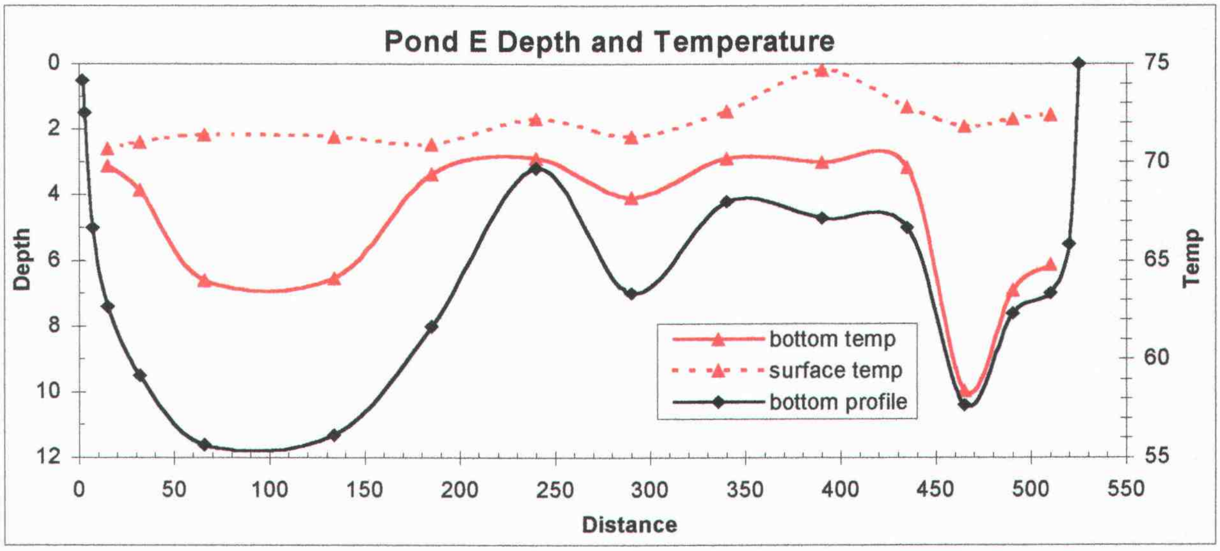
Figure 11. Surface Water Temperature in Ponds.

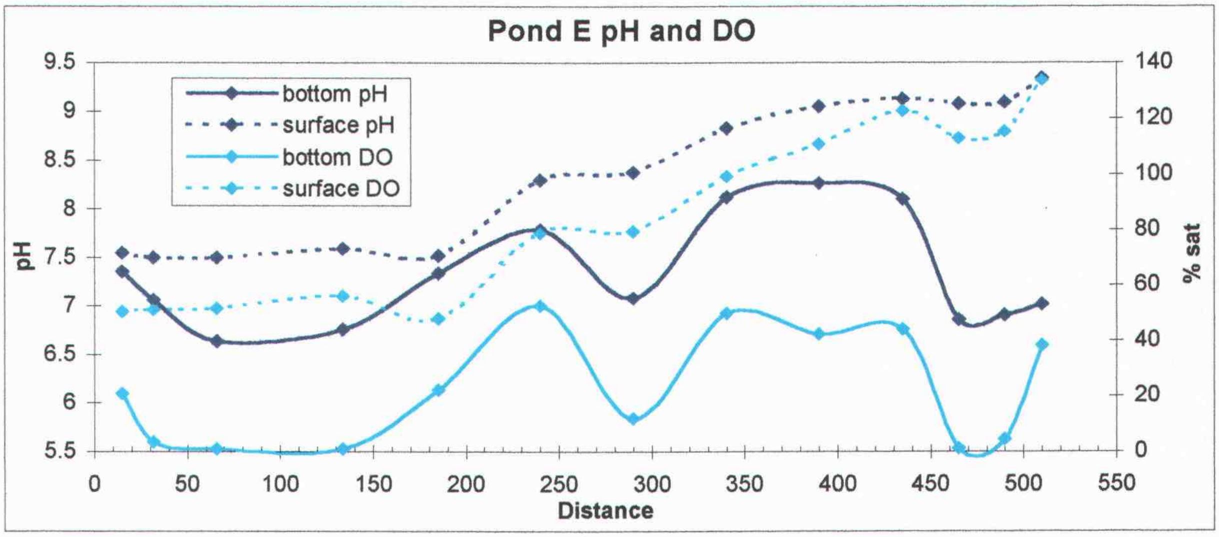


The warmest temperatures were recorded in ponds E & C and the coolest in pond B. The difference in temperature among all six ponds was approximately 5 to 8 degrees. In pond B, the presence of large amounts of aquatic vegetation had a noticeable effect on water temperature, even within the upper 12 inches. A cottonwood tree on the southern end of the pond also provided significant shading of the water surface.

Considerable spatial variability was observed for several parameters in each pond. Two plots of pond E are presented below as an example. Additional plots of the other ponds are included in the appendix.

Figure 12. Water Quality Variability in Pond E.





A 16 degree difference in temperature between the surface and the deepest point was measured in this pond. This was the largest difference observed of all the ponds. The pH and DO values also varied considerably between the surface and the bottom. Bottom values of dissolved oxygen ranged from 0 to 40% saturation, while surface values ranged from about 60 to 130% saturation. The trend of increasing DO saturation across the width of the surface was unique to this pond. This trend is also evident in the pH values which ranged from 7.5 to 9.3 across the surface of the pond, increasing at the same end of the pond as the DO saturation. There is no obvious explanation for this horizontal variability which was not observed in other ponds.

Table 12, below, presents the minimum and maximum values of water quality parameters observed in the six ponds for comparison.

Table 12. Min-max of water quality variables in selected ponds.

	Depth	Temp	pH	DO	DO	SpCond	Redox	TDS	Turb
Pond A	**feet**	**degF**	**units**	**mg/l**	**%Sat**	**uS/cm**	**mV**	**Kmg/l**	**NTU**
Min	0.8	64.7	6.8	0.22	2.4	155	113	0.099	0
Max	3.9	69	8.31	6.41	72.4	252	256	0.161	99.3
Pond B									
min	0	60.2	6.78	0.05	0.5	171	32	0.11	0
max	6.2	72	7.82	4.98	58	472	321	0.302	528
Pond C									
min	0.7	64.3	6.51	0.19	2.1	144.4	76	0.0924	0
max	7.7	71.2	7.67	7.66	88.5	480	316	0.307	130
Pond D									
min	0.7	55.9	6.64	0.14	1.5	138.7	92	0.0888	0
max	9.7	72.8	8.87	10.05	117.1	360	308	0.231	399
Pond E									
min	0.5	58.4	6.64	0.08	0.9	130.2	68	0.0833	6.3
max	11.6	74.7	9.34	11.43	133.8	753	414	0.482	482
Pond F									
min	0.7	62.5	6.49	0.07	0.8	117.3	97	0.075	11.7
max	8.5	72.8	9.26	9.04	105.4	494	323	0.316	981

DISCUSSION

Floodplains of large rivers are one of the most dynamic portions of the landscape. Floods initiate numerous processes which together produce the many characteristic features of a floodplain, and the wildlife habitat associated with them. Reducing the frequency of floods essentially reduces the rate of landscape change via erosion, deposition, channel migration, and vegetation disturbance and succession processes.

The long term landscape-level expression of this alteration of fundamental processes is not yet observable in the study area. One of the major unknowns, important to habitat modeling, is the long-term effects on vegetation communities. For species that use sloughs and other backwater areas, one relevant question is: Will the reduced flood frequency be sufficient to create new sloughs through channel shifting at a similar rate as present sloughs fill with sediment and eventually dry up?

One of the compounding factors in attempting to answer either question is the effect of increased summer flows in the rivers. This probably increases soil moisture for some distance away from the main channels, favoring some plants but not others. And the increased soil moisture probably reduces the rate of groundwater discharge from sloughs and ponds which sustains that particular habitat type more fully in the dry season.

It would seem that one of the advantages of this area for habitat mitigation is the diversity of hydrologic features and conditions. Establishing new surface water connections between features would have some disadvantages. Diversity would be reduced, and dispersal pathways for invasive species, such as reed canary grass or non-native fish species, would be created which may not be desirable. Also, the permit application for such an action would be closely scrutinized by the DEQ especially on the Coast Fork which currently is water quality limited for seven parameters. Finally, as demonstrated by the floods of 1996, natural processes do periodically renew surface connections among hydrologic features of the floodplain.

REFERENCES

1. Bonneville Power Administration. 1987. *A Wildlife Habitat Protection, Mitigation, and Enhancement Plan for Eight Federal Hydroelectric Facilities in the Willamette River Basin.* BPA Division of Fish and Wildlife, Portland, OR
2. Federal Emergency Management Agency. 1994. *Flood Insurance Study. Lane County, Oregon. Vols 1 & 2.*
3. Frank, J. F. and Johnson, N. A. 1970. *Selected Groundwater Data in the Eugene-Springfield Area, Southern Willamette Valley, Oregon.* Groundwater Report No. 14. State of Oregon.
4. Walker, G. W. and MacLeod, N. S. 1991. *Geologic Map of Oregon.* U. S. Department of the Interior. U.S. Geological Survey.
5. McKee, B. 1996. personal communication. Springfield Utility Board
6. O'Connor, Jim. 1997. personal communication. USGS Portland, OR.
7. Oregon Department of Environmental Quality. 1996. *DEQ's 1994/1995 List of Water Quality Limited Waterbodies.*
8. Oregon Water Resources Department. 1992. *Willamette Basin Report.* Salem, OR.
9. Pacific Northwest River Basins Commission. 1970. *Land and Mineral Resources.* Appendix IV, vol. 2 in *Columbia-North Pacific Region Comprehensive Framework Study of Water and Related Lands.* Vancouver, WA.
10. Pacific Northwest River Basins Commission. 1970. *Water Resources.* Appendix V, vol. 2 in *Columbia-North Pacific Region Comprehensive Framework Study of Water and Related Lands.* Vancouver, WA.
11. Tetra Tech. 1995. *Willamette River Basin Water Quality Study. Summary and Synthesis of Findings.* Redmond, WA.
12. Todd/Liberty & Associates. 1996. *The Coast Fork/Middle Fork Willamette River Confluence Area: An Atlas.* Eugene, OR.
13. USDA Soil Conservation Service. 1987. *Soil Survey of Lane County Area, Oregon.*
14. Water Well Reports. multiple years. Reports are filed at the Lane County Watermasters Office.
15. Wiley, T. 1996. Personal communication. Department of Geology and Mineral Industries

APPENDIX

Flood Hazards, Wetlands, and ACOE Revetments

This composite image attempts to show the projected location of flooding, known jurisdictional wetlands, and the position of the Army Corps of Engineers (ACOE) revetments (rock levees built along the river to prevent bank erosion and reduce flooding in adjacent lands).

Flood Hazards

The Federal Emergency Management Agency (FEMA), in conjunction with Lane Council of Governments (L-COG), is revising its Floodway data for areas south of the Willamette's Middle Fork. Data for that area was not available in digital form. For areas north of the Willamette's Middle Fork, floodway and flood hazard data was obtained in digital form from L-COG's ARC/INFO database. For the rest of the study area, flood hazard zones were encoded from Flood Insurance Rate Maps (FIRM) obtained from FEMA. No Floodway data was available for the Coast Fork. Flood zones are classified as follows;

Floodway (red) — A Floodplain is composed of two parts: the Floodway and the Floodway Fringe. The Floodway is the channel of a stream, plus any adjacent floodplain areas, that must be kept free of encroachment so that the 100-year flood can be carried without substantial increases in flood heights. Minimum federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced.

Zone A (orange) — Areas of 100-year floodplain, beyond the Floodway, refered to as Floodway Fringe; base flood elevations and flood hazards are not determined here. This area is represented here as a shade of orange.

Zone B (yellow) — Areas between limits of the 100-year flood and the 500-year flood; or certain areas of the 100-year flood subject to 100-year flooding with average depths of less than 1 foot or where contributing drainage area is less than 1 square mile; or protected by levees from the base flood. Represented here as yellow.

Zone C — Areas of minimal flooding. No color

ACOE Revetments

Revetments were encoded over the 1993 Aerial PICT. Their placement and names were derived from ACOE aerial photos, taken in March 1986, which highlighted revetment locations.

Wetlands and Water Features

The Water & Wetlands by type map is a generalized version of the National Wetlands Inventory (NWI) layer. Rather than assign unique polygon identifiers to each wetland, all polygons of the same wetland type are displayed with a single color. Classes are consistent with Classification of Wetlands and Deep Water Habitats of the United States (an operational draft) by Cowardin et al. 1977. (Refer to the MacGIS NWI layer to find the unique identifier and classification of individual wetland polygons).

The National Wetlands Inventory's digital coverage for the study area was incomplete. There was no digital data available for the Cottage Grove NE and Jasper quads. A background PICT of the scanned mylar was used to fill in the missing data. Once the layer was complete, it was error checked against the 1993 Aerial photo, and several significant revisions were made, mostly due to the increased resolution of the background PICT. The final image appears to be an improvement over the coarser base data. An attempt was made to retain the same values for individual polygons that existed in the exported ARC/INFO coverage. A list of all jurisdictional wetland types found in this area are shown in the table to the right.

Note: The NWI contains only known wetlands; many additional acres of wetlands have yet to be delineated or classified. Many of the ephemeral and intermittent streams on Mt. Pisgah, most without names, are not classified as wetlands. These streams are included in the macGIS datalayer (values 45 through 96), though there is insufficient space to list them in the table below.

Wetlands by Type: Classifications and area calculations

Value	Hectares	Acres	% of Total	Label	
1	120.62	297.93	1.8418%	R2UBH	"Riverine, lower perennial, unconsolidated bottom, permanently flooded"
2	0.35	0.86	0.0053%	R2OWZ	"Riverine, lower perennial, open water (unknown bottom), intermittently exposed/permanent"
3	17.51	43.25	0.2674%	R2USA	"Riverine, lower perennial, unconsolidated shore, temporarily flooded"
4	2.94	7.26	0.0449%	R2UBHx	"Riverine, lower perennial, unconsolidated bottom, permanently flooded, excavated"
5	12.74	31.47	0.1945%	R2USC	"Riverine, lower perennial, unconsolidated shore, seasonally flooded"
6	1.41	3.48	0.0215%	PUSCx	"Palustrian, unconsolidated shore, seasonally flooded, excavated"
7	35.38	87.39	0.5402%	PUBHx	"Palustrian, unconsolidated bottom, permanently flooded, excavated"
8	0.37	0.91	0.0056%	PUBH	"Palustrian, unconsolidated bottom, permanently flooded"
9	5.28	13.04	0.0806%	PUBFx	"Palustrian, unconsolidated bottom, semipermanently flooded, excavated"
10	0.55	1.36	0.0084%	PUBFh	"Palustrian, unconsolidated bottom, semipermanently flooded, diked/impounded"
11	3.38	8.35	0.0516%	PUBF	"Palustrian, unconsolidated bottom, semipermanently flooded"
12	0.10	0.25	0.0015%	PSS1Y	"Palustrian, scrub-shrub (broad leaf deciduous), saturated / semipermanent / seasonal"
13	21.72	53.65	0.3317%	PSS1W/PEM2W	"{Palustrian, scrub-shrub (broad leaf deciduous), intermittently flooded / temporary} + {Palustrian, emergent (persistent), intermittently flooded / temporary}"
14	2.23	5.51	0.0341%	PSS1W	"Palustrian, scrub-shrub (broad leaf deciduous), intermittently flooded / temporary"
15	5.97	14.75	0.0912%	PSSF	"Palustrian, scrub-shrub, semipermanently flooded"
16	38.33	94.68	0.5853%	PSSC	"Palustrian, scrub-shrub, seasonally flooded"
17	0.46	1.14	0.0070%	PSSB	"Palustrian, scrub-shrub, saturated"
18	6.30	15.56	0.0962%	PSSA	"Palustrian, scrub-shrub, temporarily flooded"
19	1.25	3.09	0.0191%	POWZx	"Palustrian, open water (unknown bottom), intermittently exposed / permanent, excavated"
20	0.50	1.24	0.0076%	PFOCx	"Palustrian, forested, seasonally flooded, excavated"
21	27.58	68.12	0.4211%	PFOC	"Palustrian, forested, seasonally flooded"
22	1.16	2.87	0.0177%	PFOB	"Palustrian, forested, saturated"
23	50.06	123.65	0.7644%	PFOA	"Palustrian, forested, temporarily flooded"
24	0.44	1.09	0.0067%	PFOYx	"Palustrian, forested, saturated / semipermanent / seasonal, excavated"
25	4.41	10.89	0.0673%	PEMY	"Palustrian, emergent, saturated / semipermanent / seasonal"
26	0.10	0.25	0.0015%	PEM2Y	"Palustrian, emergent (persistent), saturated / semipermanent / seasonal"
27	0.24	0.59	0.0037%	PEM1Y	"Palustrian, emergent (nonpersistent), saturated / semipermanent / seasonal"
28	1.10	2.72	0.0168%	PEMFx	"Palustrian, emergent, semipermanently flooded, excavated"
29	0.20	0.49	0.0031%	PEMF	"Palustrian, emergent, semipermanently flooded"
30	1.36	3.36	0.0208%	PEMCx	"Palustrian, emergent, seasonally flooded, excavated"
31	2.97	7.34	0.0454%	PEMCd	"Palustrian, emergent, seasonally flooded, partially drained ditched"
32	56.02	138.37	0.8554%	PEMC	"Palustrian, emergent, seasonally flooded"
33	2.54	6.27	0.0388%	PEMB	"Palustrian, emergent, saturated"
34	0.09	0.22	0.0014%	PEMAx	"Palustrian, emergent, temporarily flooded, excavated"
35	2.80	6.92	0.0428%	PEMAd	"Palustrian, emergent, temporarily flooded,partially drained ditched"
36	15.77	38.95	0.2408%	PEMA	"Palustrian, emergent, temporarily flooded"
37	0.28	0.69	0.0043%	PEM2Wx	"Palustrian, emergent (persistent), intermittently flooded / temporary, excavated"
38	12.35	30.50	0.1886%	PABHx	"Palustrian, aquatic bed, permanently flooded, excavated"
39	4.65	11.49	0.0710%	PABH	"Palustrian, aquatic bed, permanently flooded"
40	1.08	2.67	0.0165%	PABFx	"Palustrian, aquatic bed, semipermanently flooded, excavated"
41	2.00	4.94	0.0305%	PABF	"Palustrian, aquatic bed, semipermanently flooded"
42	24.34	60.12	0.3717%	L1UBHx	"Lacustrian (limnetic), unconsolidated bottom, permanently flooded, excavated"
43	1.49	3.68	0.0228%	POWUx	"Palustrian, open water (unknown bottom), unknown, excavated"
44	1.28	3.16	0.0195%	POWU	"Palustrian, open water (unknown bottom), unknown"
100	6043.63	14927.77	92.2838%	u	"Upland,:also Unclassified or Unknown"
Total	6548.96	16175.93	100.0000%		
*	505.34	1248.19	7.7163%		

* refers to Wetlands totals only

14-157500 Coast Fork Willamette River near Goshen

1. Period of record 1924-1976 (53 years); period 1924-1950 based on drainage area correlation with Coast Fork Willamette River at Saginaw (D.A. = 529 Sq Mi); period 1951-1976 based on change of content of Cottage Grove and Dorena Reservoirs.

2. Drainage Area = 642 Square Miles

3. Data obtained from USGS Water Supply Papers and Project Operation Book.

4. Natural curve developed in accordance with WRC Guidelines using expected probability.

5. This station is regulated by: Cottage Grove Dam
Dorena Dam

6. Regulated curve based on basin wide flood routing study (HEC-5).

NOTES:

Coast River Basin

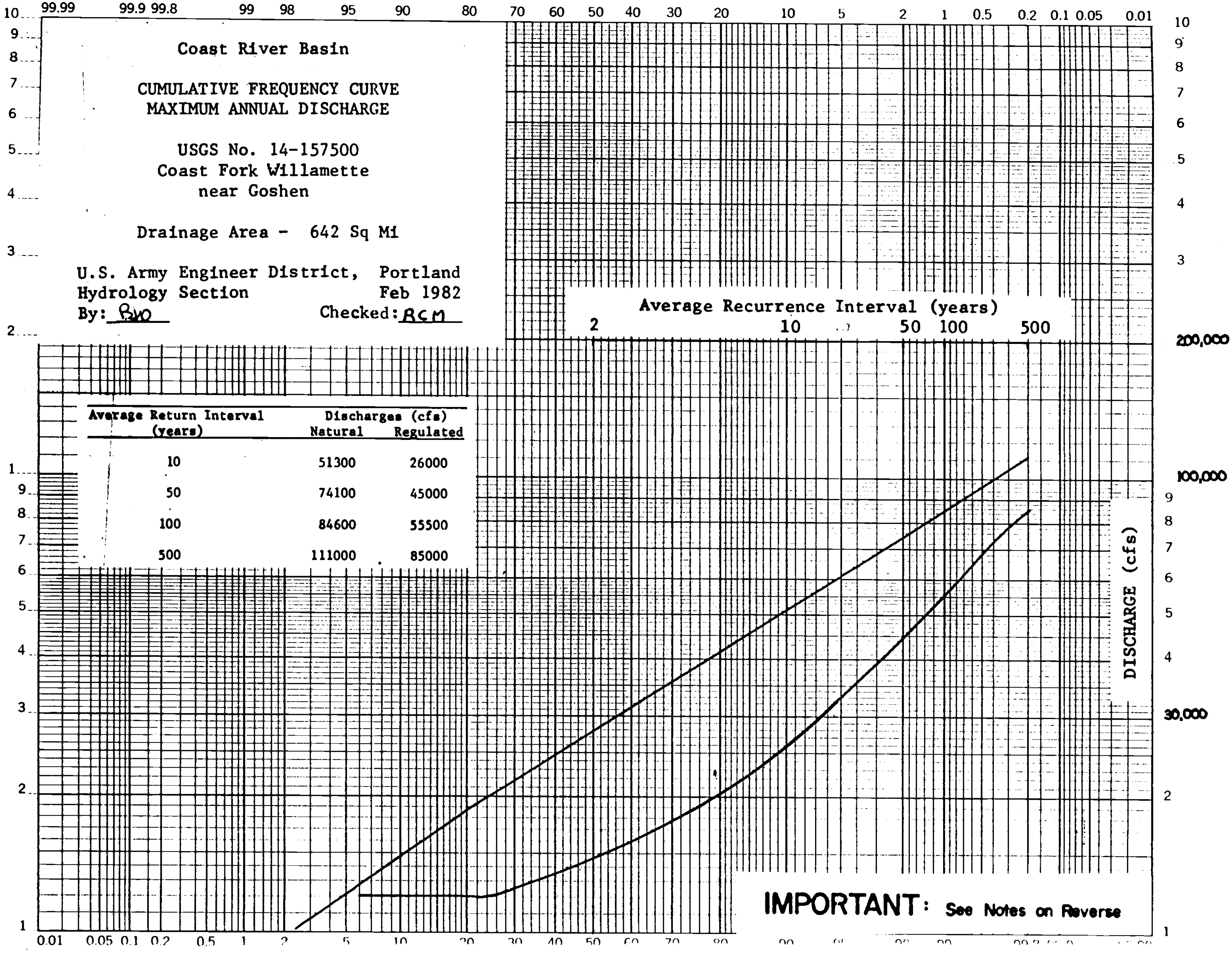
CUMULATIVE FREQUENCY CURVE
MAXIMUM ANNUAL DISCHARGE

USGS No. 14-157500
Coast Fork Willamette
near Goshen

Drainage Area - 642 Sq Mi

U.S. Army Engineer District, Portland
Hydrology Section Feb 1982
By: BWO Checked: RCM

Average Return Interval (years)	Discharges (cfs) Natural	Regulated
10	51300	26000
50	74100	45000
100	84600	55500
500	111000	85000



14-152000 Middle Fork Willamette River near Jasper

1. Period of record 1906-1912, 1914-1916, 1924-1976 (63 years); period 1906-1916 from observed flows; period 1924-1950 based on drainage area correlation with Middle Fork Willamette River at Eula (D.A. = 941 Sq Mi); period 1951-1963 based on drainage area correlation with Middle Fork Willamette River near Oakridge (D.A. = 924 Sq Mi); period 1964-1976 based on change of content and reduction of reservoirs upstream.

2. Drainage Area = 1340 Square Miles

3. Data obtained from USGS Water Supply Papers and Project Operation Books.

4. Natural curve developed in accordance with WRC Guidelines using expected probability.

5. This station is regulated by: Hills Creek Dam
Lookout Point Dam
Dexter Dam
Fall Creek Dam

6. Regulated curve based on basin wide flood routing study (HEC-5).

NOTES:

Middle Fork Willamette
River Basin

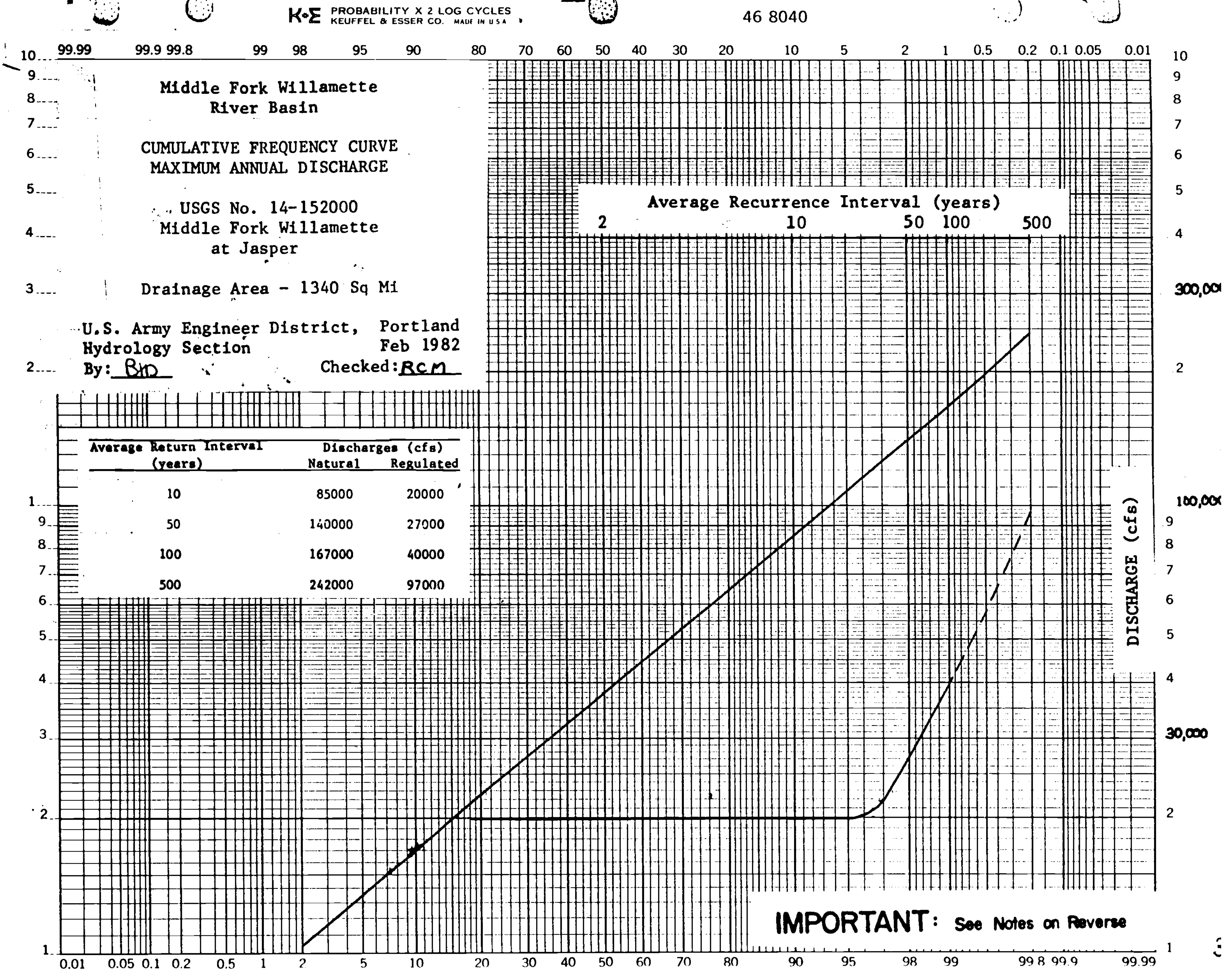
CUMULATIVE FREQUENCY CURVE
MAXIMUM ANNUAL DISCHARGE

USGS No. 14-152000
Middle Fork Willamette
at Jasper

Drainage Area - 1340 Sq Mi

U.S. Army Engineer District, Portland
Hydrology Section
Feb 1982
By: BHD
Checked: RCM

Average Return Interval (years)	Discharges (cfs) Natural	Regulated
10	85000	20000
50	140000	27000
100	167000	40000
500	242000	97000



WILLAMETTE RIVER VEGETATION MAINTENANCE DEMONSTRATION PROJECT

Categories and Criteria for EXISTING Revetments Revetment Maintenance

This issue of the Willamette River aerial photo mosaics shows vegetation maintenance categories for revetments under study in the Willamette River Vegetation Maintenance Project. This study is being conducted by the U. S. Army Corps of Engineers, Portland District in cooperation with the Willamette River Coordinating Committee. The study's objective is to establish guidelines for managing vegetation on revetments. The guidelines are presented below in four categories; each category being defined by three criteria. The criteria are based upon the value of the feature protected by the revetment and the risk of damage or destruction of the feature if the revetment were to fail.

Category I* — shown on listing as 1A-1D
(High Value - High Risk)

Area Protected: Critical public and private structures (bridges, improved roads, buildings, aggregations of private structures)

Environmental Setting: Revetment is still under attack from the river. Structure is set too close (0' -75') to river for emergency repairs to save structure if revetment fails.

Vegetative Restrictions: No vegetation that would hinder inspection or have a reasonable chance of impacting the structural integrity of the revetment will be permitted.

Sod cover of grasses and herbaceous plants and individual low-growing shrubs (eg. snowberry) permitted on the face and crown of revetment.

Revetment Encroachment: No permanent structural encroachment allowed without District Engineer approval.

Category II* — shown as 2A-2D
(High Value - Low Risk)

Area Protected: Economically significant, structural improvements

Environmental Setting: Revetment is still under attack from the river. Structures are set back 150 feet or more from crown of revetment, thus allowing sufficient time for emergency repairs to be affected if the revetment fails.

Vegetative Restrictions: No vegetation that would prohibit aerial inspection will be permitted.

Sod cover of grasses and herbaceous plants, scattered clumps of low-growing (less than 3 feet high) shrubs and individual trees (DBH less than 6 inches and 25' in heighth) will be permitted on the face of the revetment. No restrictions will be placed on the kinds, size, or density of trees and shrubs behind the crown of the revetment.

Clumps of shrubs are defined as aggregations of shrubs having a collective ground cover areas of less than 10' in diameter and more than 50' apart. Trees can be no closer than 100' apart.

Revetment Encroachment Standards**: No permanent structural encroachment permitted. Applicant will be encouraged to allow trees to grow behind the crown of the revetment to form a debris barrier.

Category III* — 3A-3D
(Low Value - Low Risk)

Area Protected: Agricultural lands, parks, and other natural areas

Environmental Setting: Revetment still under attack from river.

Vegetative Restrictions: No vegetation that would prohibit ground inspection would be permitted.

Sod cover of grasses and herbaceous plants and scattered clumps of shrubs and trees (DBH of less than 10" and 40' tall) on the face of the revetment will be permitted.

No restrictions will be placed on the size, kinds, or density of vegetation permitted behind the crown of the revetment.

Clumps of shrubs and trees are defined as aggregations of shrubs, trees, or shrubs and trees whose collective ground coverage is greater than 25' in diameter and closer than 25' apart.

Revetment Encroachment Standards**: No permanent structural encroachment permitted. Applicant will be encouraged to allow trees to grow behind crown of the revetment to form a debris barrier.

Category IV* — 4A-4D
(Low Value - No Risk)

Area Protected: Not applicable.

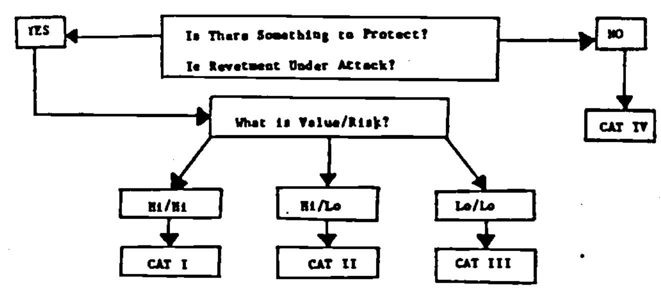
Environmental Setting: Revetment not under attack from river due to channel change or gravel bar formation.

Vegetative Restrictions: None, vegetation will be allowed to develop.

Revetment Encroachment Standards: No permanent structural encroachment permitted without approval of District Engineer.

VEGETATION MAINTENANCE CATEGORY SELECTION DIAGRAM

The maintenance category selection diagram below is provided as a guide in periodically revetment categories. As of this writing it is intended to update revetment maintenance caregories at least once a year. It is planned to distribute a list of revisions to users of this book immediately after the periodic revetment inspection tour, and coordination with the Willamette River Coordination Committee.



VEGETATION COVER CLASSES

In order to better define vegetation conditions on the revetments and to assist the reader in using the classification system, four vegetation cover classes are shown on the revetment photos. These classes appear with the vegetation maintenance catagories as lower case letters.

Class A - Cleared revetment or grass cover only
Class B - Combined grass, shrub and brush cover
Class C - Shrub and tree cover
Class D - Predominantly tree cover

Maintenance Agreement

Y - Yes
N - No

Maintenance Category (see attached sheet for further explanation)

1 - High Value-High Risk (structure 0'-75' to river)
2 - High Value-Low Risk (structure >75' to river)
3 - Low Value-Low Risk (revetment under attack)
4 - Low Value-No Risk

A - Cleared revetment or grass cover only
B - Combined grass, shrub and brush cover
C - Shrub and tree cover
D - Predominantly tree cover

Maintenance Deficient

Y - Yes
N - No
N/A - Not Applicable

WILLAMETTE RIVER BASIN BANK PROTECTION
DATA BASE DESCRIPTION

River

WR - Willamette River
MF - Middle Fork Willamette River
CF - Coast Fork Willamette River
CR - Clackamas River
SR - Santiam River
NS - North Santiam River
SS - South Santiam River
ML - Molalla River
MR - McKenzie River
CA - Calapooia River
RR - Row River

Construction Authority

FCA (S) - Flood Control Acts (Sponsored projects)
FCA (U) - Flood Control Acts (Unsponsored projects)
R&H - River and Harbor Acts
Emergency - Emergency Bank Protection Projects

Sponsor

1.
Corps of Engineers

2.
Rivers and Harbors Acts

3.
Emergency Projects

4.
Yamhill County District Improvement Company No. 1
~~Guy Freshour, Chairman~~ John Heiser, Chairman
~~1961 Keizer Road,~~ NE 20945 Grand Island Loop
~~Salem, OR 97303~~ Dayton 97114

5.
Eldriedge Bar District Improvement Company
Larry Pearman, Chairman
2251 Matheny Road, NE
Gervais, OR 97026

47.
North Lebanon Improvement District
Jack Scott, President
33763 Tennessee Road
Lebanon, OR 97355

48.
South Lebanon Improvement District
Charles J. Bennett, President
37813 River Drive
Lebanon, OR 97355

49.
Liberty District Improvement Company
Ray Ewing, Secretary-Treasurer
40494 Piper Lane
Sweet Home, OR 97386

50.
Santiam Forks Improvement Company
Howard Schelske, President
17711 Weddle Road
Jefferson, OR 97352

51.
Santiam Water Control District
Michael Weinberg, Secretary-Treasurer
11871 Dieckman Lane SE
Aumsville, OR 97325

52.
City of Brownsville
Tony Gorsline, Mayor
Brownsville, OR 97327

53.
McKenzie River Improvement District No. 2 (Disbanded)

54.
Willamette-Alder Creek Improvement District

55.
City of Oakridge

56.
Lower Clackamas Water Control District

57.
Dorena Reservoir

#	River	Site Name	RM	Bank	Length	Type	Yr Const.	Authority	Sponsor	Maint Agreement	Category	Maint. Deficient	Comments
59	WR	BASS LOCATION PHS II	135.7	R	2024	8 GROINS	83	FCA (S)	12	Y	3A	N	NONE
60	WR	CANNON	136.8	R	2450	CLASS III	84	FCA (S)	14	Y	3A	N	NONE
61	WR	JACOBS BEND U/S EXT	145.1	R	1925	CLASS III	59	FCA (S)	16	Y	3C	Y	SPONSOR ON DEFICIENT LISTING
62	WR	SAM DAWS BEND	145.7	L	2753	STONE	62	FCA (S)	17	Y	3B	N	NONE
63	WR	TRENHOLM	148.1	L	962	CLASS III	63	FCA (S)	17	Y	3A	N	NONE
64	WR	LOWER BEND D/S EXT	151.5	L	1936	CLASS III & ST. BAR.	63	FCA (S)	18	Y	3C	Y	SPONSOR ON DEFICIENT LISTING
65	WR	LOWER BEND	151.8	L	3506	STONE	49	FCA (U)	1	N	3C	N/A	NONE
66	WR	IRISH BEND	153.7	L	2530	STONE & WOOD BARR.	38	FCA (U)	1	N	3C	N/A	NONE
67	WR	FAWVER ISLAND	154.1	L	2371	STONE	55	FCA (S)	13	Y	3C	Y	REVETMENT DEFICIENT
68	WR	INGRAM ISLAND	156.3	L	2433	STONE	39	FCA (U)	1	N	3D, 1D	N/A	NONE
69	WR	FOSTER	156.8	L	4005	STONE	58	FCA (S)	19	Y	3D	Y	SPONSOR ON DEFICIENT LISTING
70	WR	ALFORD	157.4	R	1916	STONE	48	FCA (U)	1	N	3C	N/A	NONE
71	WR	FOSTER U/S EXT.	157.5	L	1726	CLASS III	71	FCA (S)	19	Y	3C	Y	SPONSOR ON DEFICIENT LISTING
72	WR	MORGAN BEND	159.2	L	1380	STONE	47	FCA (U)	1	N	4D	N/A	NONE
73	WR	CITY OF HARRISBURG	160.9	R	1694	STONE	48	FCA (U)	1	N	1A	N/A	NONE
74	WR	BOGGS	161.4	L	816	CLASS III	67	FCA (S)	42	Y	3C	Y	SPONSOR HAS DISBANDED
75	WR	GAVETTE	161.5	L	2249	STONE & STEEL BARR.	58	FCA (S)	42	Y	3D	Y	SPONSOR HAS DISBANDED
76	WR	GAVETTE U/S EXT.	161.8	L	435	CLASS III	65	FCA (S)	42	Y	3D	Y	SPONSOR HAS DISBANDED
77	WR	FORGAY	162.3	R	930	CLASS III	63	FCA (S)	20	Y	3C	N	NONE
78	WR	HARRISBURG BEND	162.7	R	2218	STONE & ASPHALT	37	EMERGENCY	3	N	4D	N/A	MAINTENANCE NOT AUTHORIZED
79	WR	HARRISBURG RR BR APP	162.8	L	972	STONE	48	FCA (U)	1	N	1C	N/A	NONE
80	WR	HARRISBURG RR BR U/S	163.0	L	1354	CLASS III	64	FCA (S)	21	Y	3C	N	NONE
81	WR	HARPER BEND	163.6	L	2601	STONE & ASPHALT	47	FCA (U)	1	N	3C	N/A	NONE
82	WR	HARPER BEND U/S EXT	164.1	L	2594	STONE	58	FCA (S)	21	Y	3B	N	NONE
83	WR	MORSE	164.2	R	2474	CLASS III & W. BARR.	62	FCA (S)	20	Y	3B	N	NONE
84	WR	SAWER	164.8	R	1526	CLASS III	70	FCA (S)	20	Y	3B	N	NONE
85	WR	JUNCTION CITY	165.2	L	451	CLASS III	65	FCA (S)	21	Y	3D	N	NONE
86	WR	KOON	166.3	L	1322	CLASS III	64	FCA (S)	21	Y	3D	N	NONE
87	WR	KOON U/S EXT.	166.5	L	1021	CLASS III & W. BARR.	73	FCA (S)	21	Y	3C	N	NONE
88	WR	LOCATION NO. 9	167.0	L	2615	STONE	39	FCA (U)	1	N	3C,3D	N/A	NONE
89	WR	LOC. NO. 9 U/S EXT.	167.5	L	2155	STONE	52	FCA (U)	1	N	4C	N/A	NONE
90	WR	LOC. 8A D/S EXT.	167.7	R	938	CLASS III & W. BARR.	65	FCA (S)	20	Y	3C,3B	N	NONE
91	WR	LOCATION 8A	168.0	R	3880	STONE	38	FCA (U)	1	N	4D,3C	N/A	NONE
92	WR	MARSHALL ISLAND	168.8	L	4218	CLASS III & IV	63	FCA (S)	21	Y	3D	N	NONE
93	WR	FERTILE DIST.(LOC 8)	169.5	R	4000	STONE	39	FCA (U)	1	N	4D, 1B	N/A	NONE
94	WR	LOCATION 7A	170.4	L	3650	CLASS III	38	FCA (U)	1	N	4D, 3B	N/A	NONE
95	WR	KELSO	172.0	L	2108	CLASS III & W. BARR.	60	FCA (S)	21	Y	3D	N	NONE
96	WR	LASSEN	172.0	L	1717	CLASS III & W. BARR.	74	FCA (S)	21	Y	3C	N	NONE
97	WR	LOCATION 7 D/S EXT	173.6	L	2428	STONE & WOOD. BARR.	55	FCA (S)	21	Y	3D,3B	N	NONE
98	WR	LOCATION 7	174.0	L	1055	STONE	44	EMERGENCY	3	N	3D	N/A	MAINTENANCE NOT AUTHORIZED
99	WR	ROGERS BEND	174.1	L	682	STONE	46	EMERGENCY	3	N	2B	N/A	MAINTENANCE NOT AUTHORIZED
100	WR	LOCATION 6	175.0	L	2179	STONE	44	EMERGENCY	3	N	4D	N/A	MAINTENANCE NOT AUTHORIZED
101	WR	MACLAY PLACE D/S EXT	176.0	L	923	CLASS III	68	FCA (S)	22	Y	2B,3C	N	NONE
102	WR	MACLAY PLACE	176.3	L	1720	ST. & ASPH & W. BARR	47	FCA (U)	1	N	4C	N/A	NONE
103	WR	LOWER GOODPASTURE	178.0	R	3400	STONE	38	FCA (U)	1	N	1C, 1B	N/A	NONE
104	WR	WILBUR BEND	178.3	L	1350	STONE & ASPHALT	47	FCA (U)	1	N	3B	N/A	NONE
105	WR	UPPER GOODPASTURE	179.4	R	3850	STONE & WOOD. BARR.	39	FCA (U)	1	N	1C	N/A	NONE
106	WR	BAUER LANE D/S EXT	179.7	L	1005	STONE & ASPHALT	47	? ~~FCA (U)~~	1	N	~~1C~~	N/A	~~NONE~~ stet
107	WR	BAUER LANE	180.1	L	2130	STONE	44	? ~~EMERGENCY~~	3 ?	N	~~3D~~	N/A	~~MAINTENANCE NOT AUTHORIZED~~
108	WR	FERRY ST. BR. D/S EX	182.0	R	385	STONE	48	EMERGENCY	3	N	1C	N/A	NONE
109	WR	FERRY STREET BRIDGE	182.1	R	1170	STONE & ASPHALT	47	FCA (U)	1	N	1C	N/A	NONE
110	WR	TANNER RAPIDS	182.6	R	1950	STONE	35	EMERGENCY	3	N	3D	N/A	MAINTENANCE NOT AUTHORIZED
111	MF	DORRIS-LEONARD	187.0	R	2250	STONE	51	FCA (U)	1	N	3D, 1B	N/A	NONE
112	MF	BOOTH-KELLY	190.8	R	2570	STONE	50	FCA (U)	1	N	4D	N/A	NONE
113	MF	A. C. CLEARWATER	191.4	R	1980	STONE	49	FCA (U)	1	N	4D	N/A	NONE
114	MF	WILSON	192.0	R	3503	STONE	54	FCA (S)	23	Y	3C	N	SPONSOR HAS DISBANDED
115	MF	LAIRD	192.7	L	3689	STONE	54	FCA (S)	23	Y	3B	N	SPONSOR HAS DISBANDED
116	MF	NATRON	193.5	R	950	STONE & WOOD. BARR.	48	FCA (U)	1	N	3D	N/A	NONE
117	MF	FISHER	195.5	B	7900	STONE & LEVEES	58	FCA (S)	54	Y	3C,4B,4D	N	LEVEE ON BOTH BANKS
118	MF	SALMON CREEK	229.4	B	6300	STONE & LEVEES	59	FCA (S)	55	Y	N/A	N	NONE

119	CA	HENSHAW	32.0	R	1622	STONE	53	FCA (S)	52	Y	N/A	Y	REVETMENT DESTROY
120	CA	BROWNSVILL NO. 3	32.5	L	1988	CLASS III	65	FCA (S)	52	Y	3D	Y	SPONSOR ON DEFICIENT LISTING
121	CA	BROWNSVILLE NO. 2	33.2	R	875	STONE	51	FCA (U)	1	N	2D	N/A	NONE
122	CA	BROWNSVILLE NO. 1	33.5	R	1120	STONE	51	FCA (S)	52	Y	2D	Y	SPONSOR ON DEFICIENT LISTING
→ 123	CF	BENTER (DORENA RES.)	11.6	L	2000	STONE	51	FCA (U)	57	N	3C	N/A	NONE
124	CF	LOWER BENTER	11.4	R	1254	STONE	52	FCA (U)	1	N	3C	N/A	NONE
125	CF	RINEHART(DORENA RES)	12.1	R	2400	STONE	51	FCA (U)	57	N	4C	N/A	NONE
126	RR	VEATCH (DORENA RES)	0.2	R	986	STONE	52	FCA (U)	57	N	3D	N/A	NONE
127	RR	HEMENWAY(DORENA RES)	0.5	L	1275	STONE	52	FCA (U)	57	N	1C	N/A	NONE
128	CR	PARK PLACE	1.5	L	630	STONE	54	FCA (S)	26	Y	1B	N	NONE
129	CR	DIXON FARM	6.3	L	4505	STONE & LEVEE	51	FCA (S)	56	Y	4C	N	NONE
130	CR	SEMPLE	9.5	R	1515	CLASS III	62	FCA (S)	27	Y	1A	N	NONE
131	CR	SEMPLE ROAD U/S EXT	9.9	R	581	CLASS III	70	FCA (S)	27	Y	2C	N	NONE
132	CR	UPPER SEMPLE ROAD	10.3	R	1810	CLASS III	72	FCA (S)	28	Y	1A	N	NONE
133	CR	LOCATION NO. 12A	11.4	L	1240	STONE	38	FCA (U)	1	N	N/A	N/A	REVEMENT DESTROYED 64 FLOOD
134	CR	LOCATION NO. 13	12.7	L	520	STONE	38	FCA (U)	1	N	4D	N/A	NONE
135	CR	LOCATION NO. 14	12.8	R	1222	STONE	38	FCA (U)	1	N	N/A	N/A	REVEMENT DESTROYED
136	CR	LOWER PARADISE PARK	19.0	R	2050	STONE	66	FCA (S)	29	Y	1A	N	NONE
137	CR	PARADISE PARK	19.9	R	1156	STONE	38	FCA (U)	1	N	3C	N/A	NONE
138	CR	TWIN ISLAND	20.1	R	990	CLASS III	77	FCA (S)	29	Y	1A	N	NONE
139	CR	BOAT RAMP	13.6	R	690	CLASS III	83	FCA (S)	26	Y	3A	N	NONE
140	NS	EISENMANN	13.5	L	2391	CLASS III	70	FCA (S)	46	Y	4C,3B	N	NONE
141	NS	SIDNEY DITCH	19.5	R	851	CLASS III	64	FCA (S)	50	Y	3C	N	NONE
142	NS	PRITCHARD	24.4	R	2660	CLASS III & IV	65	FCA (S)	51	Y	3C,3B	N	NONE
143	NS	LAFKY	26.2	R	1498	CLASS III	65	FCA (S)	51	Y	3B	N	NONE
144	NS	LOCATION 40	28.4	L	4370	LEVEE	46	EMERGENCY	3	N	3D	N/A	NONE
145	NS	STAYTON	28.5	R	1290	CLASS III	62	FCA (S)	43	Y	3B	N	NONE
146	NS	HOLT	12.5	R	2635	CLASS III	82	LCA (S)	50	Y	3A,3B	N	NONE
147	NS	STAYTON ISLAND	30.0	R	1375	CLASS III	83	LCA (S)	8	Y	2A	N	NONE
148	MO	LOCATION NO. 1	2.9	L	1875	STONE	38	FCA (U)	1	N	3C	N/A	NONE
149	MO	LOCATION NO. 2	4.8	L	1858	STONE	38	FCA (U)	1	N	4C,3C	N/A	NONE
150	MO	WILKE	5.1	L	1233	CLASS III	75	FCA (S)	24	Y	3C	Y	SPONSOR ON DEFICIENT LISTING
151	MO	ISLAND PARK	5.4	R	1916	CLASS III	67	FCA (S)	24	Y	2C	Y	SPONSOR ON DEFICIENT LISTING
152	MO	GOODS BRIDGE	6.0	L	1698	CLASS III	81	FCA (S)	24	Y	3B	N	SPONSOR ON DEFICIENT LISTING
153	MO	LOCATION NO. 4	7.0	L	1980	STONE	38	FCA (U)	1	N	4D	N/A	NONE
154	MO	LOCATION NO. 5	8.2	L	810	STONE	38	FCA (U)	1	N	4D	N/A	NONE
155	MO	LOCATION NO. 6	8.5	L	1087	STONE	38	FCA (U)	1	N	4D	N/A	NONE
156	MO	LOCATION NO. 7	9.0	L	710	STONE	38	FCA (U)	1	N	4D	N/A	NONE
157	MO	LOCATION NO. 8	9.5	L	1915	STONE	38	FCA (U)	1	N	4D,3A	N/A	NONE
158	MO	MILK CREEK	10.0	R	4387	STONE & LEVEE	55	FCA (S)	24	Y	4C	Y N	SPONSOR ON DEFICIENT LISTING
159	MO	LOCATION NO. 10	10.4	L	1793	STONE	38	FCA (U)	1	N	1D	N/A	NONE
160	MO	LOCATION NO. 11	11.3	L	1131	STONE	38	FCA (U)	1	N	2C	N/A	NONE
161	MO	LOCATION NO. 12	12.3	L	500	STONE	38	FCA (U)	1	N	N/A	N/A	REVEMENT DESTROYED
162	MO	OFFICER DLC	13.9	L	2468	CLASS III	70	FCA (S)	24	Y	3D,3A	Y	SPONSOR ON DEFICIENT LISTING
163	MO	RESSEL LOCATION	14.4	L	3079	STONE & LEVEE	51	FCA (S)	24	Y	3D,4D	Y	SPONSOR ON DEFICIENT LISTING
164	MO	SHADY DELL	20.2	L	1346	CLASS III	73	FCA (S)	30	Y	1A	N	NONE
165	MO	SERRES MAY	7.4	L	1360	CLASS III	82	FCA (S)	24	Y	3A	N	SPONSOR ON DEFICIENT LISTING
→ 166	CF	EVANS	1.3	R	1225	STONE	49	FCA (U)	1	N	4D,1C	N/A	NONE
167	CF	MCBEE (DORENA RES.)	2.3	L	52	PLUG	52	FCA (U)	57	N	N/A	N/A	INACTIVE
168	CF	SEAVEY PROPERTY	2.4	R	1107	STONE	57	FCA (S)	~~16~~ 25	Y	3D	Y	SPONSOR ON DEFICIENT LISTING
169	CF	ESTEP (DORENA RES.)	2.5	L	85	PLUG	52	FCA (U)	57	N	N/A	N/A	INACTIVE
170	CF	SEAVEY BRIDGE	3.0	R	1300	STONE	50	FCA (U)	1	N	1D	N/A	NONE
171	CF	SEAVEY LOOP	3.1	L	765	STONE	56	FCA (S)	~~16~~ 25	Y	1D	Y	SPONSOR ON DEFICIENT LISTING
172	CF	MIKESELL(DORENA RES)	3.2	L	143	PLUG	52	FCA (U)	57	N	N/A	N/A	INACTIVE
173	CF	MCCULLY	3.6	B	3655	STONE	50	FCA (U)	1	N	3C	N/A	NONE
174	CF	GOSHEN	4.2	L	1030	STONE & GRAVEL APRON	44	EMERGENCY	3	N	3D	N/A	MAINTENANCE NOT AUTHORIZED
175	CF	LWR MELTON (DORENA)	9.0	L	1046	STONE	52	FCA (U)	57	N	3C	N/A	NONE
176	CF	MELTON (DORENA RES)	9.2	R	2350	STONE	51	FCA (U)	57	N	4D	N/A	NONE
177	CF	JENKINS (DORENA RES)	9.6	L	2692	STONE	51	FCA (U)	57	N	4D,3C	N/A	NONE
178	CF	HASKINS (DORENA RES)	10.1	R	2020	STONE	51	FCA (U)	57	N	4C	N/A	2 SITES, 1380 LF & 640 LF

PLACE OF USE REPORT 18 S 3 W
SECTION(S)

TWP/RNG	POU-ID	POD-ID	APPLICATION		PERMIT		CERTIFICATE	PRIORITY DATE	USE
17.00S 3.00W	237		GR	114	GR	105	0	5/31/1933	IR
17.00S 3.00W	238		S	21240	S	16647	17309	10/20/1945	IM
17.00S 3.00W	239		G	2225	G	2097	32114	5/ 3/1962	AH
17.00S 3.00W	240		GR	3775	GR	3433	0	8/30/1949	IM
18.00S 2.00W	2		S	55484	S	42511	0	3/15/1977	IR
18.00S 2.00W	8		S	37447	S	27940	34658	3/ 5/1962	IR
18.00S 2.00W	20		G	2721	G	2523	35752	10/16/1963	IR
18.00S 2.00W	31		GR	3122	GR	2929	0	3/31/1945	IR
18.00S 2.00W	33		GR	3122	GR	2929	0	3/31/1945	IR
18.00S 2.00W	33		S	34841	S	27351	34780	4/21/1961	IR
18.00S 2.00W	38		S	34841	S	27351	34780	4/21/1961	IR
18.00S 2.00W	39		GR	3122	GR	2929	0	3/31/1945	IR
18.00S 2.00W	41		S	31172	S	24566	28091	10/22/1956	IR
18.00S 2.00W	42		G	1133	G	914	31788	7/31/1958	IR
18.00S 2.00W	43		G	8003	G	7442	50609	4/ 7/1977	IM
18.00S 2.00W	44		S	34639	S	27209	31601	2/17/1961	IR
18.00S 2.00W	45		S	32280	S	25543	28095	8/15/1958	IR
18.00S 2.00W	49		S	30460	S	23992	28089	12/ 2/1955	IR
18.00S 2.00W	52		S	68177	S	49398	0	9/11/1984	IR
18.00S 2.00W	53		S	58388	S	44000	52787	3/ 9/1979	IR
18.00S 2.00W	53		S	68177	S	49398	0	9/11/1984	FR
18.00S 2.00W	54		S	68177	S	49398	0	9/11/1984	IR
18.00S 2.00W	56		S	68177	S	49398	0	9/11/1984	IR
18.00S 2.00W	65		S	26336	S	20664	21316	8/20/1951	IR
18.00S 2.00W	66		S	42697	S	31589	38144	8/24/1966	IR
18.00S 2.00W	68		GR	4277	GR	4129	0	6/30/1945	IR
18.00S 2.00W	68		S	44648	S	33400	42508	3/29/1968	IS
18.00S 2.00W	69		GR	4277	GR	4129	0	6/30/1945	IR
18.00S 2.00W	70		GR	4277	GR	4129	0	6/30/1945	IR
18.00S 2.00W	88		S	38204	S	28467	35159	10/30/1962	IR
18.00S 2.00W	137		S	47469	S	35558	45519	8/25/1970	IR
18.00S 2.00W	145		S	44677	S	33119	37740	4/ 8/1968	IR
18.00S 2.00W	145		S	54174	S	40921	50834	10/19/1976	IR
18.00S 2.00W	148		S	46562	S	34412	46204	12/ 1/1969	IR
18.00S 2.00W	156		S	46562	S	34412	46204	12/ 1/1969	IR
18.00S 2.00W	157		S	30163	S	23565	44197	7/27/1955	IR
18.00S 2.00W	157		S	46562	S	34412	46204	12/ 1/1969	IS
18.00S 2.00W	164		S	46562	S	34412	46204	12/ 1/1969	IR
18.00S 2.00W	168		S	30163	S	23565	44197	7/27/1955	IR
18.00S 2.00W	168		S	46562	S	34412	46204	12/ 1/1969	IS
18.00S 2.00W	176		S	46562	S	34412	46204	12/ 1/1969	IR
18.00S 2.00W	189		S	46562	S	34412	46204	12/ 1/1969	IR
18.00S 3.00W	1		S	39170	S	29217	35753	10/16/1963	IR
18.00S 3.00W	2		S	39169	S	29136	34661	10/16/1963	IR
18.00S 3.00W	3		S	39170	S	29217	35753	10/16/1963	IM
18.00S 3.00W	4		S	39169	S	29136	34661	10/16/1963	IR
18.00S 3.00W	5		S	27460	S	21617	23655	7/18/1952	IR
18.00S 3.00W	6		G	3572	G	3366	35974	7/12/1966	IM

PLACE OF USE REPORT 18 S 3 W
SECTION(S)

TWP/RNG	POU-ID	POD-ID	APPLICATION		PERMIT		CERTIFICATE	PRIORITY DATE	USE
18.00S 3.00W	7		S	46122	S	34458	41701	6/ 1/1969	IR
18.00S 3.00W	7		S	46122	S	34458	41701	6/24/1969	IR
18.00S 3.00W	8		S	14899	S	10859	10813	4/ 8/1933	LV
18.00S 3.00W	9		S	32075	S	25306	28883	1/22/1958	IR
18.00S 3.00W	10		S	32075	S	25306	28883	1/22/1958	IR
18.00S 3.00W	11		S	17327	S	13041	14181	3/14/1938	IR
18.00S 3.00W	12		GR	923	GR	896	0	5/31/1952	IR
18.00S 3.00W	12		S	32075	S	25306	28883	1/22/1958	IR
18.00S 3.00W	13		G	897	G	796	29630	3/20/1958	IR
18.00S 3.00W	14		S	48646	S	35513	41343	9/ 1/1971	IR
18.00S 3.00W	15		GR	1325	GR	1280	0	2/28/1953	IR
18.00S 3.00W	15		GR	1326	GR	1281	0	2/28/1953	IR
18.00S 3.00W	15		GR	1327	GR	1282	0	2/28/1953	IR
18.00S 3.00W	16		GR	1326	GR	1281	0	2/28/1953	IR
18.00S 3.00W	16		GR	1327	GR	1282	0	2/28/1953	IR
18.00S 3.00W	16		S	32229	S	25477	29639	4/ 3/1958	IR
18.00S 3.00W	17		S	32229	S	25477	29639	4/ 3/1958	IR
18.00S 3.00W	18		GR	1325	GR	1280	0	2/28/1953	IR
18.00S 3.00W	18		GR	1326	GR	1281	0	2/28/1953	IR
18.00S 3.00W	18		GR	1327	GR	1282	0	2/28/1953	IR
18.00S 3.00W	18		S	32229	S	25477	29639	4/ 3/1958	IR
18.00S 3.00W	19		GR	3396	GR	4141	0	3/15/1952	IR
18.00S 3.00W	20		S	60483	S	46289	62157	8/11/1980	IM
18.00S 3.00W	21		S	31968	S	25215	29553	11/13/1957	IR
18.00S 3.00W	22		S	32826	S	25907	29384	12/30/1958	IR
18.00S 3.00W	23		GR	721	GR	697	0	6/30/1930	IR
18.00S 3.00W	24		GR	722	GR	698	0	6/30/1930	IR
18.00S 3.00W	25		S	37219	S	27736	56507	12/ 1/1961	IR
18.00S 3.00W	26		GR	722	GR	698	0	6/30/1930	IR
18.00S 3.00W	26		GR	1325	GR	1280	0	2/28/1953	IR
18.00S 3.00W	26		S	37219	S	27736	56507	12/ 1/1961	IS
18.00S 3.00W	27		GR	721	GR	697	0	6/30/1930	IR
18.00S 3.00W	27		S	37219	S	27736	56507	12/ 1/1961	IS
18.00S 3.00W	28		G	2399	G	2193	31595	5/21/1962	IR
18.00S 3.00W	28		G	8760	G	8127	50297	4/21/1978	IR
18.00S 3.00W	30		G	758	G	670	27812	5/28/1957	IR
18.00S 3.00W	31		GR	559	GR	529	0	12/31/1940	IR
18.00S 3.00W	32		S	31968	S	25215	29553	11/13/1957	IR
18.00S 3.00W	33		GR	722	GR	698	0	6/30/1930	IR
18.00S 3.00W	34		GR	721	GR	697	0	6/30/1930	IR
18.00S 3.00W	35		S	37219	S	27736	56507	12/ 1/1961	IS
18.00S 3.00W	36		GR	721	GR	697	0	6/30/1930	IR
18.00S 3.00W	36		S	37219	S	27736	56507	12/ 1/1961	IS
18.00S 3.00W	37		G	4708	G	4425	37733	12/ 3/1968	IR
18.00S 3.00W	38		GR	721	GR	697	0	6/30/1930	IR
18.00S 3.00W	39		GR	721	GR	697	0	6/30/1930	IR
18.00S 3.00W	40		GR	722	GR	698	0	6/30/1930	IR
18.00S 3.00W	41		GR	721	GR	697	0	6/30/1930	IR
18.00S 3.00W	42		S	37219	S	27736	56507	12/ 1/1961	IS
18.00S 3.00W	44		S	20593	S	16119	17047	12/ 6/1944	IR

PLACE OF USE REPORT 18 S 3 W
SECTION(S)

TWP/RNG	POU-ID	POD-ID	APPLICATION		PERMIT		CERTIFICATE	PRIORITY DATE	USE
18.00S 3.00W	45		G	2399	G	2193	31595	5/21/1962	IR
18.00S 3.00W	45		S	20593	S	16119	17047	12/ 6/1944	IR
18.00S 3.00W	46		GR	3565	GR	3274	0	12/31/1953	IR
18.00S 3.00W	47		GR	839	GR	811	0	8/30/1954	IR
18.00S 3.00W	48		GR	836	GR	808	0	10/31/1944	IR
18.00S 3.00W	48		GR	837	GR	809	0	10/31/1944	IR
18.00S 3.00W	48		S	43242	S	32328	35874	2/ 1/1967	IS
18.00S 3.00W	51		S	20593	S	16119	17047	12/ 6/1944	IR
18.00S 3.00W	52		S	33323	S	26545	31881	8/24/1959	IR
18.00S 3.00W	53		S	20593	S	16119	17047	12/ 6/1944	IR
18.00S 3.00W	54		GR	838	GR	810	0	10/31/1954	IR
18.00S 3.00W	56		GR	4113	GR	4000	0	4/30/1953	IR
18.00S 3.00W	57		G	1311	G	1171	29537	11/14/1958	IR
18.00S 3.00W	58		S	31999	S	25246	27833	11/27/1957	IR
18.00S 3.00W	59		G	2498	G	2310	34481	12/12/1962	GD
18.00S 3.00W	60		S	29205	S	24777	29549	5/26/1954	IR
18.00S 3.00W	61		GR	745	GR	722	0	5/15/1946	IR
18.00S 3.00W	62		S	29156	S	24948	27831	5/ 5/1954	IR
18.00S 3.00W	63		S	52352	S	39391	56850	8/26/1974	IR
18.00S 3.00W	64		S	33043	S	26185	29386	4/20/1959	IR
18.00S 3.00W	65		GR	2817	GR	2658	0	12/31/1948	IR
18.00S 3.00W	66		GR	4035	GR	3638	0	10/31/1952	IR
18.00S 3.00W	67		GR	2501	GR	2368	0	12/31/1953	IR
18.00S 3.00W	67		GR	2502	GR	2369	0	6/30/1954	IR
18.00S 3.00W	68		R	46132	R	5493	44635	12/ 3/1969	ST
18.00S 3.00W	68		S	46566	S	34592	44679	12/ 3/1969	ST
18.00S 3.00W	69		GR	1560	GR	3789	0	9/30/1953	GD
18.00S 3.00W	69		S	21604	S	16973	27986	5/ 3/1946	GD
18.00S 3.00W	70		S	69504	S	50251	0	11/27/1987	IR
18.00S 3.00W	71		S	69504	S	50251	0	11/27/1987	FI
18.00S 3.00W	72		GR	3938	GR	3662	0	12/31/1953	IR
18.00S 3.00W	73		S	25940	S	21242	24019	5/15/1951	IR
18.00S 3.00W	74		G	3270	G	3168	35870	5/23/1966	IM
18.00S 3.00W	74		GR	4077	GR	3673	0	8/30/1948	IM
18.00S 3.00W	74		GR	4078	GR	3674	0	8/30/1948	IM
18.00S 3.00W	74		GR	4079	GR	3675	0	8/30/1948	IM
18.00S 3.00W	75		S	26884	S	21107	24742	2/13/1952	IR
18.00S 3.00W	76		G	5324	G	4939	44092	9/28/1970	IR
18.00S 3.00W	77		S	33262	S	26298	30290	7/30/1959	DI
18.00S 3.00W	78		G	5324	G	4939	44092	9/28/1970	IS
18.00S 3.00W	78		S	47582	S	35624	44094	9/28/1970	IR
18.00S 3.00W	80		S	26884	S	21107	24742	2/13/1952	IR
18.00S 3.00W	81		S	17720	S	13390	13753	12/28/1938	IR
18.00S 3.00W	82		S	47582	S	35624	44094	9/28/1970	IR
18.00S 3.00W	83		S	17215	S	12936	12430	1/24/1938	IR
18.00S 3.00W	84		S	17215	S	12936	12430	1/24/1938	IR
18.00S 3.00W	85		S	23474	S	18517	23992	10/ 8/1948	DI
18.00S 3.00W	86		S	53851	S	40109	61685	1/14/1976	DI
18.00S 3.00W	87		S	47710	S	35741	44757	11/10/1970	FP
18.00S 3.00W	87		S	47710	S	35741	44757	11/10/1970	IM

PLACE OF USE REPORT 18 S 3 W
SECTION(S)

TWP/RNG	POU-ID	POD-ID	APPLICATION		PERMIT		CERTIFICATE	PRIORITY DATE	USE
18.00S 3.00W	88		R	47709	R	5761	44758	11/10/1970	ST
18.00S 3.00W	89		GR	3629	GR	3323	0	6/22/1954	IR
18.00S 3.00W	90		GR	3630	GR	3324	0	7/10/1955	IR
18.00S 3.00W	91		S	31424	S	25138	30286	9/10/1957	DI
18.00S 3.00W	92		S	31424	S	25138	30286	9/10/1957	DI
18.00S 3.00W	93		S	40153	S	29932	33078	8/10/1964	IR
18.00S 3.00W	95		R	23798	R	973	20954	5/23/1949	ST
18.00S 3.00W	95		S	23799	S	18771	20955	5/23/1949	FI
18.00S 3.00W	96		S	21718	S	17101	21058	6/13/1946	DO
18.00S 3.00W	97		G	2170	G	2001	33382	11/29/1961	IS
18.00S 3.00W	97		S	34648	S	27251	33381	2/24/1961	IR
18.00S 3.00W	98		G	2170	G	2001	33382	11/29/1961	IS
18.00S 3.00W	98		S	34648	S	27251	33381	2/24/1961	IR
18.00S 3.00W	99		S	40393	S	30111	34181	10/28/1964	DO
18.00S 3.00W	101		S	70007	S	50871	66696	7/27/1989	IR
18.00S 3.00W	102		G	2170	G	2001	33382	11/29/1961	IS
18.00S 3.00W	102		S	34648	S	27251	33381	2/24/1961	IR
18.00S 3.00W	103		R	34647	R	2592	33380	2/24/1961	ST
18.00S 3.00W	104		S	21718	S	17101	21058	6/13/1946	DO
18.00S 3.00W	105		S	21718	S	17101	21058	6/13/1946	DO
18.00S 3.00W	106		S	21718	S	17101	21058	6/13/1946	LV
18.00S 3.00W	107		R	51370	R	6232	45671	11/ 5/1973	ST
18.00S 3.00W	107		S	51371	S	38821	45672	11/ 5/1973	LV
18.00S 3.00W	108		S	29268	S	22959	28337	6/17/1954	IR
19.00S 2.00W	7		S	52023	S	38199	57310	6/ 4/1974	IR
19.00S 3.00W	1		S	37975	S	28317	36521	8/21/1962	IR
19.00S 4.00W	1		R	59429	R	8205	58367	11/26/1980	ST
19.00S 4.00W	1		S	59945	S	45345	58368	11/26/1980	AQ

PLACE OF USE REPORT 18 S 2 W
SECTION(S)

TWP/RNG	POU-ID	POD-ID	APPLICATION		PERMIT		CERTIFICATE	PRIORITY DATE	USE
17.00S 2.00W	172		S	24261	S	19043	21092	11/ 7/1949	D1
17.00S 2.00W	173		S	24261	S	19043	21092	11/ 7/1949	D1
17.00S 2.00W	174		S	24261	S	19043	21092	11/ 7/1949	D1
17.00S 2.00W	175		S	34629	S	27203	32118	2/14/1961	D1
17.00S 2.00W	175		S	44945	S	33592	38151	5/20/1968	D1
17.00S 2.00W	176		S	34629	S	27203	32118	2/14/1961	D1
17.00S 2.00W	176		S	44945	S	33592	38151	5/20/1968	D1
17.00S 3.00W	240		GR	3775	GR	3433	0	8/30/1949	IM
18.00S 1.00W	4		S	33505	S	26502	51470	12/23/1959	IR
18.00S 1.00W	5		S	32542	S	25776	28224	8/ 1/1958	IR
18.00S 1.00W	14		S	33505	S	26502	51470	12/23/1959	IR
18.00S 1.00W	14		S	55574	S	48427	66485	5/ 2/1984	IR
18.00S 1.00W	15		S	55574	S	48427	66485	5/ 2/1984	IR
18.00S 1.00W	26		S	55574	S	48427	66485	5/ 2/1984	IR
18.00S 2.00W	1		GR	3970	GR	4071	0	12/31/1952	IR
18.00S 2.00W	2		S	55484	S	42511	0	3/15/1977	IR
18.00S 2.00W	3		GR	3557	GR	3344	0	12/31/1950	IR
18.00S 2.00W	4		GR	3557	GR	3344	0	12/31/1950	IR
18.00S 2.00W	5		S	30932	S	24344	28090	7/13/1956	IR
18.00S 2.00W	6		GR	1385	GR	1342	0	6/30/1943	IR
18.00S 2.00W	7		S	42958	S	32093	37934	10/24/1966	IR
18.00S 2.00W	8		S	37447	S	27940	34658	3/ 5/1962	IR
18.00S 2.00W	9		GR	3580	GR	3289	0	12/31/1948	IR
18.00S 2.00W	10		S	28885	S	22712	23795	11/ 2/1953	IR
18.00S 2.00W	11		S	31924	S	25172	29736	10/ 4/1957	IR
18.00S 2.00W	12		GR	1385	GR	1342	0	6/30/1943	IR
18.00S 2.00W	12		S	31924	S	25172	29736	10/ 4/1957	IR
18.00S 2.00W	13		GR	1175	GR	1136	0	5/31/1947	IR
18.00S 2.00W	13		S	31924	S	25172	29736	10/ 4/1957	IR
18.00S 2.00W	14		GR	1175	GR	1136	0	5/31/1947	IR
18.00S 2.00W	15		GR	4039	GR	3640	0	12/31/1948	IR
18.00S 2.00W	16		S	32169	S	25380	31596	3/ 7/1958	IR
18.00S 2.00W	17		S	28691	S	22592	23793	8/ 7/1953	IR
18.00S 2.00W	18		GR	3585	GR	3977	0	12/31/1940	IR
18.00S 2.00W	19		S	30932	S	24344	28090	7/13/1956	IR
18.00S 2.00W	20		G	2721	G	2523	35752	10/16/1963	IR
18.00S 2.00W	21		S	32185	S	25389	28885	3/13/1958	IR
18.00S 2.00W	22		S	43471	S	32515	43362	4/12/1967	IR
18.00S 2.00W	23		S	32185	S	25389	28885	3/13/1958	IR
18.00S 2.00W	24		G	2163	G	1995	34256	11/17/1961	IR
18.00S 2.00W	25		S	32169	S	25380	31596	3/ 7/1958	IR
18.00S 2.00W	26		S	43471	S	32515	43362	4/12/1967	IR
18.00S 2.00W	27		S	32169	S	25380	31596	3/ 7/1958	IR
18.00S 2.00W	28		GR	3946	GR	3576	0	12/31/1938	IR
18.00S 2.00W	29		GR	2753	GR	2603	0	12/31/1941	IR
18.00S 2.00W	30		S	33222	S	26264	31466	7/10/1959	IR
18.00S 2.00W	31		GR	3122	GR	2929	0	3/31/1945	IR

PLACE OF USE REPORT 18 S 2 W
SECTION(S)

TWP/RNG	POU-ID	POD-ID	APPLICATION		PERMIT		CERTIFICATE	PRIORITY DATE	USE
18.00S 2.00W	32		R	22932	R	917	17248	12/ 3/1947	ST
18.00S 2.00W	32		S	22933	S	18077	17392	12/ 3/1947	IM
18.00S 2.00W	33		GR	3122	GR	2929	0	3/31/1945	IR
18.00S 2.00W	33		S	34841	S	27351	34780	4/21/1961	IR
18.00S 2.00W	34		S	32248	S	25439	32562	4/ 9/1958	IM
18.00S 2.00W	35		S	32248	S	25439	32562	4/ 9/1958	IR
18.00S 2.00W	36		S	32247	S	25438	30580	4/ 9/1958	IR
18.00S 2.00W	37		R	50943	R	6197	51677	7/24/1973	ST
18.00S 2.00W	37		S	62360	S	46517	51678	8/18/1981	LV
18.00S 2.00W	38		S	34841	S	27351	34780	4/21/1961	IR
18.00S 2.00W	39		GR	3122	GR	2929	0	3/31/1945	IR
18.00S 2.00W	40		S	32248	S	25439	32562	4/ 9/1958	IR
18.00S 2.00W	41		S	31172	S	24566	28091	10/22/1956	IR
18.00S 2.00W	42		G	1133	G	914	31788	7/31/1958	IR
18.00S 2.00W	43		G	8003	G	7442	50609	4/ 7/1977	IM
18.00S 2.00W	44		S	34639	S	27209	31601	2/17/1961	IR
18.00S 2.00W	45		S	32280	S	25543	28095	8/15/1958	IR
18.00S 2.00W	46		S	45923	S	34310	43468	4/10/1969	IR
18.00S 2.00W	47		S	33677	S	26679	35349	5/10/1960	IR
18.00S 2.00W	48		S	60888	S	45356	62066	10/ 9/1980	IR
18.00S 2.00W	49		S	30460	S	23992	28089	12/ 2/1955	IR
18.00S 2.00W	50		S	60888	S	45356	62066	10/ 9/1980	IR
18.00S 2.00W	51		S	33677	S	26679	35349	5/10/1960	IR
18.00S 2.00W	52		S	68177	S	49398	0	9/11/1984	IR
18.00S 2.00W	53		S	58388	S	44000	52787	3/ 9/1979	IR
18.00S 2.00W	53		S	68177	S	49398	0	9/11/1984	FR
18.00S 2.00W	54		S	68177	S	49398	0	9/11/1984	IR
18.00S 2.00W	56		S	68177	S	49398	0	9/11/1984	IR
18.00S 2.00W	57		S	45923	S	34310	43468	4/10/1969	IR
18.00S 2.00W	58		S	60888	S	45356	62066	10/ 9/1980	IR
18.00S 2.00W	59		S	33677	S	26679	35349	5/10/1960	IR
18.00S 2.00W	60		G	1766	G	1618	31460	6/15/1960	IR
18.00S 2.00W	61		G	1766	G	1618	31460	6/15/1960	IR
18.00S 2.00W	61		G	7935	G	7321	51680	3/17/1977	IS
18.00S 2.00W	62		G	1766	G	1618	31460	6/15/1960	IR
18.00S 2.00W	63		S	18697	S	14372	15730	5/ 3/1940	IR
18.00S 2.00W	64		S	31119	S	24678	27827	2/20/1957	IR
18.00S 2.00W	65		S	26336	S	20664	21316	8/20/1951	IR
18.00S 2.00W	66		S	42697	S	31589	38144	8/24/1966	IR
18.00S 2.00W	67		R	31118	R	1979	27828	2/20/1957	ST
18.00S 2.00W	68		GR	4277	GR	4129	0	6/30/1945	IR
18.00S 2.00W	68		S	44648	S	33400	42508	3/29/1968	IS
18.00S 2.00W	69		GR	4277	GR	4129	0	6/30/1945	IR
18.00S 2.00W	70		GR	4277	GR	4129	0	6/30/1945	IR
18.00S 2.00W	71		G	671	G	576	28084	5/29/1957	IR
18.00S 2.00W	72		S	31120	S	24679	27829	2/20/1957	IR
18.00S 2.00W	74		G	1719	G	1576	31459	4/15/1960	IR
18.00S 2.00W	76		S	11687	S	8129	9135	8/ 9/1927	IR
18.00S 2.00W	77		G	6417	G	5996	49860	1/30/1974	IR
18.00S 2.00W	80		S	55382	S	41805	56041	2/28/1977	IR

PLACE OF USE REPORT 18 S 2 W
SECTION(S)

TWP/RNG	POU-ID	POD-ID	APPLICATION		PERMIT		CERTIFICATE	PRIORITY DATE	USE
18.00S 2.00W	82		S	44674	S	33446	42410	4/ 8/1968	IR
18.00S 2.00W	84		S	44673	S	33445	46418	4/ 8/1968	IR
18.00S 2.00W	86		S	64845	S	47634	0	3/14/1983	IR
18.00S 2.00W	87		GR	2969	GR	2784	0	9/30/1948	IR
18.00S 2.00W	88		S	38204	S	28467	35159	10/30/1962	IR
18.00S 2.00W	89		S	29898	S	23410	27820	4/13/1955	IR
18.00S 2.00W	90		GR	1328	GR	1283	0	12/31/1953	IR
18.00S 2.00W	91		S	30984	S	24418	23636	7/30/1956	IR
18.00S 2.00W	92		GR	2462	GR	2332	0	6/ 1/1951	IR
18.00S 2.00W	93		S	11687	S	8129	9135	8/ 9/1927	IR
18.00S 2.00W	94		GR	3553	GR	3266	0	6/30/1945	IR
18.00S 2.00W	95		GR	2168	GR	2078	0	12/31/1946	IR
18.00S 2.00W	95		GR	2169	GR	2079	0	12/31/1950	IR
18.00S 2.00W	96		S	52191	S	37822	65265	7/16/1974	IR
18.00S 2.00W	97		GR	3555	GR	3268	0	12/31/1952	IR
18.00S 2.00W	98		GR	2168	GR	2078	0	12/31/1946	IR
18.00S 2.00W	98		GR	2169	GR	2079	0	12/31/1950	IR
18.00S 2.00W	98		GR	3555	GR	3268	0	12/31/1952	IR
18.00S 2.00W	99		GR	2168	GR	2078	0	12/31/1946	IR
18.00S 2.00W	99		GR	2169	GR	2079	0	12/31/1950	IR
18.00S 2.00W	100		S	44893	S	33566	42090	3/ 9/1968	IR
18.00S 2.00W	101		S	39867	S	29499	37591	5/19/1964	IR
18.00S 2.00W	102		GR	3555	GR	3268	0	12/31/1952	IR
18.00S 2.00W	103		S	28233	S	22207	35910	3/20/1953	IR
18.00S 2.00W	104		S	29898	S	23410	27820	4/13/1955	IR
18.00S 2.00W	105		S	68435	S	49584	65397	7/10/1985	IR
18.00S 2.00W	106		S	41656	S	31085	37135	2/23/1966	IR
18.00S 2.00W	107		R	52462	R	6321	46582	9/27/1974	ST
18.00S 2.00W	107		S	52667	S	39460	46583	12/26/1974	RC
18.00S 2.00W	108		S	32823	S	25906	29383	12/24/1958	IR
18.00S 2.00W	109		S	30383	S	23881	28338	10/26/1955	IR
18.00S 2.00W	110		S	50128	S	36791	50033	3/ 8/1973	IR
18.00S 2.00W	111		S	51154	S	38663	47413	8/27/1973	IR
18.00S 2.00W	112		S	51154	S	38663	47413	8/27/1973	IR
18.00S 2.00W	113		S	30169	S	23794	27824	7/28/1955	IR
18.00S 2.00W	114		S	32830	S	25910	39600	1/ 5/1959	IR
18.00S 2.00W	116		S	52149	S	39275	46210	7/ 3/1974	IR
18.00S 2.00W	117		GR	4087	GR	3680	0	9/30/1952	IR
18.00S 2.00W	118		S	31667	S	25028	29372	6/27/1957	IR
18.00S 2.00W	119		S	52149	S	39275	46210	7/ 3/1974	IR
18.00S 2.00W	120		S	31668	S	25029	29373	6/27/1953	IR
18.00S 2.00W	121		S	27455	S	21491	28212	7/17/1952	IR
18.00S 2.00W	122		GR	3146	GR	3855	0	8/30/1953	IR
18.00S 2.00W	123		G	7978	G	7671	51205	3/31/1977	IR
18.00S 2.00W	124		S	47469	S	35558	45519	8/25/1970	IR
18.00S 2.00W	125		S	26246	S	20452	21116	7/25/1951	IR
18.00S 2.00W	126		S	21260	S	16913	21160	11/ 2/1945	IR
18.00S 2.00W	127		GR	103	GR	133	0	11/30/1954	IR
18.00S 2.00W	128		S	55589	S	41658	50034	3/30/1977	IR
18.00S 2.00W	129		S	37038	S	27599	32313	8/28/1961	IR

03/22/96

PLACE OF USE REPORT 18 S 2 W
SECTION(S)

TWP/RNG	POU-ID	POD-ID	APPLICATION		PERMIT		CERTIFICATE	PRIORITY DATE	USE
18.00S 2.00W	130		S	31323	S	24665	28879	1/25/1957	IR
18.00S 2.00W	131		S	31323	S	24665	28879	1/25/1957	IR
18.00S 2.00W	132		R	31322	R	1975	28878	1/25/1957	ST
18.00S 2.00W	133		S	28209	S	22196	23912	3/16/1953	IR
18.00S 2.00W	134		S	22570	S	17764	21382	5/26/1947	IR
18.00S 2.00W	135		S	51278	S	38724	49983	9/28/1973	IR
18.00S 2.00W	136		S	22570	S	17764	21382	5/26/1947	IR
18.00S 2.00W	137		S	47469	S	35558	45519	8/25/1970	IR
18.00S 2.00W	138		GR	3192	GR	2973	0	12/31/1941	IR
18.00S 2.00W	139		S	39946	S	30043	35875	1/22/1965	IR
18.00S 2.00W	140		R	60537	R	8183	54864	8/20/1980	ST
18.00S 2.00W	140		S	60388	S	45194	54865	7/23/1980	LV
18.00S 2.00W	141		S	62819	S	46596	55182	9/22/1981	IR
18.00S 2.00W	142		S	39946	S	30043	35875	1/22/1965	IR
18.00S 2.00W	143		S	25241	S	19829	24521	9/ 8/1950	IR
18.00S 2.00W	144		S	22782	S	17943	24520	8/22/1947	IR
18.00S 2.00W	145		S	44677	S	33119	37740	4/ 8/1968	IR
18.00S 2.00W	145		S	54174	S	40921	50834	10/19/1976	IR
18.00S 2.00W	145		S	44677	S	33119	37740	4/ 8/1968	IR
18.00S 2.00W	145		S	54174	S	40921	50834	10/19/1976	IR
18.00S 2.00W	146		S	30163	S	23565	44197	7/27/1955	IR
18.00S 2.00W	148		S	46562	S	34412	46204	12/ 1/1969	IR
18.00S 2.00W	149		S	30163	S	23565	44197	7/27/1955	IR
18.00S 2.00W	149		S	46562	S	34412	46204	12/ 1/1969	IS
18.00S 2.00W	150		S	35117	S	27488	34903	7/12/1961	IR
18.00S 2.00W	151		R	35116	R	2643	34902	7/12/1961	ST
18.00S 2.00W	152		S	25241	S	19829	24521	9/ 8/1950	IR
18.00S 2.00W	152		S	31147	S	24549	27390	10/ 1/1956	IR
18.00S 2.00W	153		S	31147	S	24549	27390	10/ 1/1956	IR
18.00S 2.00W	154		S	57341	S	43137	0	4/25/1978	IR
18.00S 2.00W	155		S	30163	S	23565	44197	7/27/1955	IR
18.00S 2.00W	155		S	46562	S	34412	46204	12/ 1/1969	IS
18.00S 2.00W	156		S	46562	S	34412	46204	12/ 1/1969	IR
18.00S 2.00W	157		S	30163	S	23565	44197	7/27/1955	IR
18.00S 2.00W	157		S	46562	S	34412	46204	12/ 1/1969	IS
18.00S 2.00W	158		S	46562	S	34412	46204	12/ 1/1969	IR
18.00S 2.00W	159		S	55139	S	41338	49990	1/21/1977	IR
18.00S 2.00W	160		S	31401	S	24793	29550	3/ 1/1957	IR
18.00S 2.00W	161		S	31401	S	24793	29550	3/ 1/1957	IR
18.00S 2.00W	162		S	30163	S	23565	44197	7/27/1955	IR
18.00S 2.00W	162		S	46562	S	34412	46204	12/ 1/1969	IS
18.00S 2.00W	163		S	61021	S	45702	59103	11/25/1980	IR
18.00S 2.00W	164		S	46562	S	34412	46204	12/ 1/1969	IR
18.00S 2.00W	166		S	61021	S	45702	59103	11/25/1980	IR
18.00S 2.00W	167		S	46562	S	34412	46204	12/ 1/1969	IR
18.00S 2.00W	168		S	30163	S	23565	44197	7/27/1955	IR
18.00S 2.00W	168		S	46562	S	34412	46204	12/ 1/1969	IS
18.00S 2.00W	169		G	7042	G	6529	51143	7/ 8/1975	IR
18.00S 2.00W	170		S	43196	S	31864	37739	2/ 8/1967	IR
18.00S 2.00W	171		S	26009	S	20374	21303	6/ 7/1951	IR

PLACE OF USE REPORT 18 S 2 W
SECTION(S)

TWP/RNG	POU-ID	POD-ID	APPLICATION		PERMIT		CERTIFICATE	PRIORITY DATE	USE
18.00S 2.00W	172		G	7042	G	6529	51143	7/ 8/1975	IR
18.00S 2.00W	173		G	7042	G	6529	51143	7/ 8/1975	SC
18.00S 2.00W	174		S	21336	S	16729	19509	12/24/1945	IR
18.00S 2.00W	175		G	7042	G	6529	51143	7/ 8/1975	SC
18.00S 2.00W	176		S	46562	S	34412	46204	12/ 1/1969	IR
18.00S 2.00W	177		G	7042	G	6529	51143	7/ 8/1975	SC
18.00S 2.00W	178		G	7042	G	6529	51143	7/ 8/1975	SC
18.00S 2.00W	179		G	7042	G	6529	51143	7/ 8/1975	SC
18.00S 2.00W	180		R	45499	R	5380	43375	10/30/1968	ST
18.00S 2.00W	180		S	45688	S	33997	43376	1/ 7/1969	FI
18.00S 2.00W	180		S	45688	S	33997	43376	1/ 7/1969	RC
18.00S 2.00W	181		G	7042	G	6529	51143	7/ 8/1975	SC
18.00S 2.00W	182		G	7042	G	6529	51143	7/ 8/1975	IR
18.00S 2.00W	183		G	7042	G	6529	51143	7/ 8/1975	SC
18.00S 2.00W	184		G	7042	G	6529	51143	7/ 8/1975	SC
18.00S 2.00W	185		G	7042	G	6529	51143	7/ 8/1975	IR
18.00S 2.00W	186		S	25850	S	20302	28691	6/12/1951	IR
18.00S 2.00W	187		G	7042	G	6529	51143	7/ 8/1975	SC
18.00S 2.00W	188		G	7042	G	6529	51143	7/ 8/1975	SC
18.00S 2.00W	189		S	46562	S	34412	46204	12/ 1/1969	IR
18.00S 2.00W	190		GR	2601	GR	2468	0	12/31/1946	IR
18.00S 2.00W	191		GR	2601	GR	2468	0	12/31/1946	IR
18.00S 2.00W	191		S	21336	S	16729	19509	12/24/1945	IR
18.00S 2.00W	192		S	33356	S	26373	29389	9/10/1959	IR
18.00S 2.00W	193		S	33356	S	26373	29389	9/10/1959	IR
18.00S 2.00W	194		S	25850	S	20302	28691	6/12/1951	IR
18.00S 2.00W	200		R	32921	R	2220	30981	2/18/1959	ST
18.00S 2.00W	201	167	R	32921	R	2220	30981	2/18/1959	ST
18.00S 3.00W	2		S	39169	S	29136	34661	10/16/1963	IR
18.00S 3.00W	4		S	39169	S	29136	34661	10/16/1963	IR
18.00S 3.00W	9		S	32075	S	25306	28883	1/22/1958	IR
18.00S 3.00W	10		S	32075	S	25306	28883	1/22/1958	IR
18.00S 3.00W	12		GR	923	GR	896	0	5/31/1952	IR
18.00S 3.00W	12		S	32075	S	25306	28883	1/22/1958	IR
18.00S 3.00W	13		G	897	G	796	29630	3/20/1958	IR
18.00S 3.00W	15		GR	1325	GR	1280	0	2/28/1953	IR
18.00S 3.00W	15		GR	1326	GR	1281	0	2/28/1953	IR
18.00S 3.00W	15		GR	1327	GR	1282	0	2/28/1953	IR
18.00S 3.00W	16		GR	1326	GR	1281	0	2/28/1953	IR
18.00S 3.00W	16		GR	1327	GR	1282	0	2/28/1953	IR
18.00S 3.00W	16		S	32229	S	25477	29639	4/ 3/1958	IR
18.00S 3.00W	20		S	60483	S	46289	62157	8/11/1980	IM
18.00S 3.00W	23		GR	721	GR	697	0	6/30/1930	IR
18.00S 3.00W	24		GR	722	GR	698	0	6/30/1930	IR
18.00S 3.00W	25		S	37219	S	27736	56507	12/ 1/1961	IR
18.00S 3.00W	26		GR	722	GR	698	0	6/30/1930	IR
18.00S 3.00W	26		GR	1325	GR	1280	0	2/28/1953	IR
18.00S 3.00W	26		S	37219	S	27736	56507	12/ 1/1961	IS
18.00S 3.00W	27		GR	721	GR	697	0	6/30/1930	IR

PLACE OF USE REPORT 18 S 2 W
SECTION(S)

TWP/RNG	POU-ID	POD-ID	APPLICATION		PERMIT		CERTIFICATE	PRIORITY DATE	USE
18.00S 3.00W	27		S	37219	S	27736	56507	12/ 1/1961	IS
18.00S 3.00W	33		GR	722	GR	698	0	6/30/1930	IR
18.00S 3.00W	34		GR	721	GR	697	0	6/30/1930	IR
18.00S 3.00W	35		S	37219	S	27736	56507	12/ 1/1961	IS
18.00S 3.00W	36		GR	721	GR	697	0	6/30/1930	IR
18.00S 3.00W	36		S	37219	S	27736	56507	12/ 1/1961	IS
18.00S 3.00W	37		G	4708	G	4425	37733	12/ 3/1968	IR
18.00S 3.00W	38		GR	721	GR	697	0	6/30/1930	IR
18.00S 3.00W	39		GR	721	GR	697	0	6/30/1930	IR
18.00S 3.00W	40		GR	722	GR	698	0	6/30/1930	IR
18.00S 3.00W	41		GR	721	GR	697	0	6/30/1930	IR
18.00S 3.00W	42		S	37219	S	27736	56507	12/ 1/1961	IS
18.00S 3.00W	47		GR	839	GR	811	0	8/30/1954	IR
18.00S 3.00W	48		GR	836	GR	808	0	10/31/1944	IR
18.00S 3.00W	48		GR	837	GR	809	0	10/31/1944	IR
18.00S 3.00W	48		S	43242	S	32328	35874	2/ 1/1967	IS
18.00S 3.00W	54		GR	838	GR	810	0	10/31/1954	IR
18.00S 3.00W	57		G	1311	G	1171	29537	11/14/1958	IR
18.00S 3.00W	58		S	31999	S	25246	27833	11/27/1957	IR
18.00S 3.00W	61		GR	745	GR	722	0	5/15/1946	IR
18.00S 3.00W	65		GR	2817	GR	2658	0	12/31/1948	IR
18.00S 3.00W	73		S	25940	S	21242	24019	5/15/1951	IR
18.00S 3.00W	75		S	26884	S	21107	24742	2/13/1952	IR
18.00S 3.00W	80		S	26884	S	21107	24742	2/13/1952	IR
19.00S 1.00W	1		S	32583	S	25780	28697	11/ 7/1958	IR
19.00S 1.00W	2		GR	344	GR	329	0	4/30/1953	IR
19.00S 1.00W	5		GR	344	GR	329	0	4/30/1953	IR
19.00S 1.00W	5		S	32583	S	25780	28697	11/ 7/1958	IR
19.00S 1.00W	6		S	32583	S	25780	28697	11/ 7/1958	IR
19.00S 1.00W	7		S	31313	S	24659	29547	1/21/1957	IR
19.00S 1.00W	8		G	6597	G	6183	56978	12/ 6/1974	IR
19.00S 2.00W	1		S	52023	S	38199	57310	6/ 4/1974	IR
19.00S 2.00W	4		S	52023	S	38199	57310	6/ 4/1974	IR
19.00S 2.00W	5		GR	3758	GR	3420	0	9/30/1947	IR
19.00S 2.00W	6		S	52023	S	38199	57310	6/ 4/1974	IR
19.00S 2.00W	7		S	52023	S	38199	57310	6/ 4/1974	IR
19.00S 3.00W	1		S	37975	S	28317	36521	8/21/1962	IR
19.00S 3.00W	2		S	41565	S	31006	36205	11/ 1/1965	IR

POINT OF DIVERSION REPORT 18 S 3 W
SECTION(S)

TWP/RNG	POD-ID	APPLICATION		PERMIT		CERTIFICATE
17.00S 3.00W	175	G	2225	G	2097	32114
17.00S 3.00W	185	S	31913	S	25234	29375
17.00S 3.00W	189	GR	114	GR	105	0
17.00S 3.00W	190	GR	114	GR	105	0
17.00S 3.00W	191	GR	114	GR	105	0
17.00S 3.00W	192	S	21240	S	16647	17309
17.00S 3.00W	193	GR	3775	GR	3433	0
18.00S 2.00W	14	S	55484	S	42511	0
18.00S 2.00W	15	G	2721	G	2523	35752
18.00S 2.00W	18	S	37447	S	27940	34658
18.00S 2.00W	23					
18.00S 2.00W	24	G	1133	G	914	31788
18.00S 2.00W	25	S	34841	S	27351	34780
18.00S 2.00W	26	G	8003	G	7442	50609
18.00S 2.00W	27	S	34639	S	27209	31601
18.00S 2.00W	28	S	31172	S	24566	28091
18.00S 2.00W	57	S	68177	S	49398	0
18.00S 2.00W	58	S	68177	S	49398	0
18.00S 2.00W	59	GR	4277	GR	4129	0
18.00S 2.00W	60	S	26336	S	20664	21316
18.00S 2.00W	62	S	32280	S	25543	28095
18.00S 2.00W	63	S	30460	S	23992	28089
18.00S 2.00W	64	S	42697	S	31589	38144
18.00S 2.00W	65	S	44648	S	33400	42508
18.00S 2.00W	66	S	58388	S	44000	52787
18.00S 2.00W	124	S	54174	S	40921	50834
18.00S 2.00W	127					
18.00S 2.00W	130	S	46562	S	34412	46204
18.00S 2.00W	133	S	46562	S	34412	46204
18.00S 3.00W	1	S	39170	S	29217	35753
18.00S 3.00W	2	G	11978	G	10970	0
18.00S 3.00W	2	S	39170	S	29217	35753
18.00S 3.00W	3	S	14899	S	10859	10813
18.00S 3.00W	4	GR	923	GR	896	0
18.00S 3.00W	5	S	32075	S	25306	28883
18.00S 3.00W	6	S	39169	S	29136	34661
18.00S 3.00W	7	GR	3175	GR	3134	0
18.00S 3.00W	8	GR	3176	GR	3135	0
18.00S 3.00W	9	GR	3177	GR	3136	0
18.00S 3.00W	10	GR	3178	GR	3137	0
18.00S 3.00W	11	GR	3179	GR	3138	0
18.00S 3.00W	12	GR	3180	GR	3139	0
18.00S 3.00W	13	GR	3181	GR	3140	0
18.00S 3.00W	14					
18.00S 3.00W	15	S	28213	S	22200	0
18.00S 3.00W	16	G	397	G	266	27979
18.00S 3.00W	17	G	3212	G	3027	35650
18.00S 3.00W	18	G	3298	G	3075	35754

POINT OF DIVERSION REPORT 18 S 3 W
SECTION(S)

TWP/RNG		POD-ID	APPLICATION		PERMIT		CERTIFICATE
18.00S	3.00W	19	G	3297	G	3074	35651
18.00S	3.00W	20	G	3296	G	3073	52375
18.00S	3.00W	21	G	897	G	796	29630
18.00S	3.00W	22	S	27460	S	21617	23655
18.00S	3.00W	23	GR	3122	GR	2929	0
18.00S	3.00W	23	S	17327	S	13041	14181
18.00S	3.00W	24	S	46122	S	34458	41701
18.00S	3.00W	25	S	46122	S	34458	41701
18.00S	3.00W	26	G	3572	G	3366	35974
18.00S	3.00W	27	S	48646	S	35513	41343
18.00S	3.00W	28	GR	3396	GR	4141	0
18.00S	3.00W	29	GR	3397	GR	4140	0
18.00S	3.00W	30	G	11978	G	10970	0
18.00S	3.00W	31					
18.00S	3.00W	32	G	117978	G	10970	0
18.00S	3.00W	33	G	758	G	670	27812
18.00S	3.00W	34	GR	559	GR	529	0
18.00S	3.00W	35	G	2399	G	2193	31595
18.00S	3.00W	36	G	8760	G	8127	50297
18.00S	3.00W	37	S	32229	S	25477	29639
18.00S	3.00W	38	GR	1325	GR	1280	0
18.00S	3.00W	39	GR	1326	GR	1281	0
18.00S	3.00W	40	GR	1327	GR	1282	0
18.00S	3.00W	41	S	60483	S	46289	62157
18.00S	3.00W	42	GR	721	GR	697	0
18.00S	3.00W	43	GR	722	GR	698	0
18.00S	3.00W	44	G	4708	G	4425	37733
18.00S	3.00W	45	S	31968	S	25215	29553
18.00S	3.00W	46	S	31968	S	25215	29553
18.00S	3.00W	47	S	32826	S	25907	29384
18.00S	3.00W	48	S	37219	S	27736	56507
18.00S	3.00W	49	S	37219	S	27736	56507
18.00S	3.00W	50					
18.00S	3.00W	51	GR	4113	GR	4000	0
18.00S	3.00W	52	GR	839	GR	811	0
18.00S	3.00W	53	GR	838	GR	810	0
18.00S	3.00W	54	GR	837	GR	809	0
18.00S	3.00W	55					
18.00S	3.00W	56	G	1311	G	1171	29537
18.00S	3.00W	57	GR	745	GR	722	0
18.00S	3.00W	58	GR	2817	GR	2658	0
18.00S	3.00W	59	G	2498	G	2310	34481
18.00S	3.00W	60	GR	4035	GR	3638	0
18.00S	3.00W	61	S	33323	S	26545	31881
18.00S	3.00W	62	S	52352	S	39391	56850
18.00S	3.00W	63	S	33043	S	26185	29386
18.00S	3.00W	64	S	29156	S	24948	27831
18.00S	3.00W	65	S	31999	S	25246	27833
18.00S	3.00W	66	S	43242	S	32328	35874
18.00S	3.00W	67	S	20593	S	16119	17047

POINT OF DIVERSION REPORT 18 S 3 W
SECTION(S)

TWP/RNG		POD-ID	APPLICATION		PERMIT		CERTIFICATE
18.00S 3.00W		68	S	20593	S	16119	17047
18.00S 3.00W		69	S	29205	S	24777	29549
18.00S 3.00W		70	R	46132	R	5493	44635
18.00S 3.00W		71	S	46566	S	34592	44679
18.00S 3.00W		72	S	69504	S	50251	0
18.00S 3.00W		73	S	69504	S	50251	0
18.00S 3.00W		74	GR	1560	GR	3789	0
18.00S 3.00W		75	S	21604	S	16973	27986
18.00S 3.00W		76	GR	3938	GR	3662	0
18.00S 3.00W		77	GR	2501	GR	2368	0
18.00S 3.00W		78	GR	2502	GR	2369	0
18.00S 3.00W		79	S	17215	S	12936	12430
18.00S 3.00W		80	S	17215	S	12936	12430
18.00S 3.00W		81	S	53851	S	40109	61685
18.00S 3.00W		82	S	33262	S	26298	30290
18.00S 3.00W		83	S	23474	S	18517	23992
18.00S 3.00W		84	GR	4165	GR	3730	0
18.00S 3.00W		85	G	3270	G	3168	35870
18.00S 3.00W		86	GR	4077	GR	3673	0
18.00S 3.00W		87	GR	4078	GR	3674	0
18.00S 3.00W		88	GR	4079	GR	3675	0
18.00S 3.00W		89	R	47709	R	5761	44758
18.00S 3.00W		90	S	47710	S	35741	44757
18.00S 3.00W		91	G	5324	G	4939	44092
18.00S 3.00W		92	G	5324	G	4939	44092
18.00S 3.00W		93	S	47582	S	35624	44094
18.00S 3.00W		94	S	47710	S	35741	44757
18.00S 3.00W		95	G	5324	G	4939	44092
18.00S 3.00W		96	G	5325	G	4939	44092
18.00S 3.00W		97	S	17720	S	13390	13753
18.00S 3.00W		98	S	26884	S	21107	24742
18.00S 3.00W		99	S	25940	S	21242	24019
18.00S 3.00W		100	GR	3629	GR	3323	0
18.00S 3.00W		101	GR	3630	GR	3324	0
18.00S 3.00W		102	S	40393	S	30111	34181
18.00S 3.00W		103	R	34647	R	2592	33380
18.00S 3.00W		104	S	34648	S	27251	33381
18.00S 3.00W		105	G	2170	G	2001	33382
18.00S 3.00W		106	S	70007	S	50871	66696
18.00S 3.00W		107	S	31424	S	25138	30286
18.00S 3.00W		108	S	31424	S	25138	30286
18.00S 3.00W		109	S	21718	S	17101	21058
18.00S 3.00W		110	S	21718	S	17101	21058
18.00S 3.00W		111	S	40153	S	29932	33078
18.00S 3.00W		112	R	23798	R	973	20954
18.00S 3.00W		113	S	23799	S	18771	20955
18.00S 3.00W		114	S	21718	S	17101	21058
18.00S 3.00W		115	S	21718	S	17101	21058
18.00S 3.00W		116	R	51370	R	6232	45671
18.00S 3.00W		117	S	51371	S	38821	45672

POINT OF DIVERSION REPORT 18 S 3 W
SECTION(S)

TWP/RNG	POD-ID	APPLICATION	PERMIT	CERTIFICATE
18.00S 3.00W	118 S	29268	S 22959	28337
19.00S 3.00W	3 S	37975	S 28317	36521
19.00S 3.00W	4 S	37975	S 28317	36521
19.00S 4.00W	1 R	59429	R 8205	58367
19.00S 4.00W	2 S	59945	S 45345	58368

POINT OF DIVERSION REPORT 18 S 2 W
SECTION(S)

TWP/RNG	POD-ID	APPLICATION		PERMIT		CERTIFICATE
17.00S 2.00W	140					
17.00S 2.00W	142	S	61273	S	46734	0
17.00S 2.00W	142	S	31938	S	25182	30383
17.00S 2.00W	143					
17.00S 3.00W	193	GR	3775	GR	3433	0
18.00S 1.00W	5	S	33505	S	26502	51470
18.00S 1.00W	11	S	55574	S	48427	66485
18.00S 1.00W	12	S	55574	S	48427	66485
18.00S 2.00W	1	GR	3557	GR	3344	0
18.00S 2.00W	2	S	28885	S	22712	23795
18.00S 2.00W	3	G	2163	G	1995	34256
18.00S 2.00W	4	S	28691	S	22592	23793
18.00S 2.00W	5	S	32169	S	25380	31596
18.00S 2.00W	6	GR	3850	GR	3289	0
18.00S 2.00W	7	GR	4039	GR	3640	0
18.00S 2.00W	8	GR	3585	GR	3977	0
18.00S 2.00W	9	GR	3946	GR	3576	0
18.00S 2.00W	10	GR	2753	GR	2603	0
18.00S 2.00W	11	GR	3970	GR	4071	0
18.00S 2.00W	12	GR	1175	GR	1136	0
18.00S 2.00W	13	GR	1385	GR	1342	0
18.00S 2.00W	14	S	55484	S	42511	0
18.00S 2.00W	15	G	2721	G	2523	35752
18.00S 2.00W	16	S	31924	S	25172	29736
18.00S 2.00W	17	S	30932	S	24344	28090
18.00S 2.00W	18	S	37447	S	27940	34658
18.00S 2.00W	19	S	42958	S	32093	37934
18.00S 2.00W	20	S	43471	S	32515	43362
18.00S 2.00W	21	S	32185	S	25389	28885
18.00S 2.00W	22	S	32185	S	25389	28885
18.00S 2.00W	23					
18.00S 2.00W	24	G	1133	G	914	31788
18.00S 2.00W	25	S	34841	S	27351	34780
18.00S 2.00W	26	G	8003	G	7442	50609
18.00S 2.00W	27	S	34639	S	27209	31601
18.00S 2.00W	28	S	31172	S	24566	28091
18.00S 2.00W	29	S	33222	S	26264	31466
18.00S 2.00W	30	S	33222	S	26264	31466
18.00S 2.00W	31	R	22932	R	917	17248
18.00S 2.00W	32	R	22932	R	917	17248
18.00S 2.00W	33	S	22933	S	18077	17392
18.00S 2.00W	34	S	32248	S	25439	32562
18.00S 2.00W	35	S	32248	S	25439	32562
18.00S 2.00W	36	S	32247	S	25438	30580
18.00S 2.00W	37	R	50943	R	6197	51677
18.00S 2.00W	38	G	1766	G	1618	31460
18.00S 2.00W	39	G	1766	G	1618	31460

POINT OF DIVERSION REPORT 18 S 2 W
SECTION(S)

TWP/RNG	POD-ID		APPLICATION	PERMIT		CERTIFICATE
18.00S 2.00W	40	G	7935	G	7321	51680
18.00S 2.00W	41	S	62360	S	46517	51678
18.00S 2.00W	42	G	1719	G	1576	31459
18.00S 2.00W	43	G	671	G	576	28084
18.00S 2.00W	44	G	671	G	576	28084
18.00S 2.00W	45	G	671	G	576	28084
18.00S 2.00W	46	G	671	G	576	28084
18.00S 2.00W	47	G	671	G	576	28084
18.00S 2.00W	48	S	18697	S	14372	15730
18.00S 2.00W	49	S	33677	S	26679	35349
18.00S 2.00W	50	S	33677	S	26679	35349
18.00S 2.00W	51	S	60888	S	45356	62066
18.00S 2.00W	52	R	31118	R	1979	27828
18.00S 2.00W	53	S	31119	S	24678	27827
18.00S 2.00W	54	S	31120	S	24679	27829
18.00S 2.00W	55	S	45923	S	34310	43468
18.00S 2.00W	56	S	45923	S	34310	43468
18.00S 2.00W	57	S	68177	S	49398	0
18.00S 2.00W	58	S	68177	S	49398	0
18.00S 2.00W	59	GR	4277	GR	4129	0
18.00S 2.00W	60	S	26336	S	20664	21316
18.00S 2.00W	61	S	26336	S	20664	21316
18.00S 2.00W	62	S	32280	S	25543	28095
18.00S 2.00W	63	S	30460	S	23992	28089
18.00S 2.00W	64	S	42697	S	31589	38144
18.00S 2.00W	65	S	44648	S	33400	42508
18.00S 2.00W	66	S	58388	S	44000	52787
18.00S 2.00W	67	S	30984	S	24418	23636
18.00S 2.00W	68	GR	2168	GR	2078	0
18.00S 2.00W	69	GR	2169	GR	2079	0
18.00S 2.00W	70	GR	3555	GR	3268	0
18.00S 2.00W	71					
18.00S 2.00W	72	S	38204	S	28467	35159
18.00S 2.00W	73	S	30383	S	23881	28338
18.00S 2.00W	74	S	44893	S	33566	42090
18.00S 2.00W	75	S	39867	S	29499	37591
18.00S 2.00W	76	S	29898	S	23410	27820
18.00S 2.00W	77	S	28233	S	22207	35910
18.00S 2.00W	78	R	52462	R	6321	46582
18.00S 2.00W	79	S	52667	S	39460	46583
18.00S 2.00W	80	GR	1328	GR	1283	0
18.00S 2.00W	81	GR	3553	GR	3266	0
18.00S 2.00W	82	GR	2462	GR	2332	0
18.00S 2.00W	83	GR	2969	GR	2784	0
18.00S 2.00W	84	S	64845	S	47634	0
18.00S 2.00W	85	G	6417	G	5996	49860
18.00S 2.00W	86	S	11687	S	8129	9135
18.00S 2.00W	87	S	52191	S	37822	65265
18.00S 2.00W	88	S	68435	S	49584	65397
18.00S 2.00W	89	S	50128	S	36791	50033

POINT OF DIVERSION REPORT 18 S 2 W
SECTION(S)

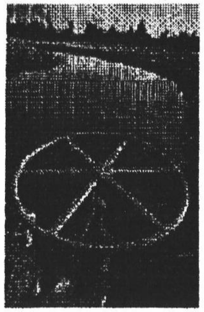
TWP/RNG	POD-ID	APPLICATION		PERMIT		CERTIFICATE
18.00S 2.00W	90	S	55382	S	41805	56041
18.00S 2.00W	91	S	51154	S	38663	47413
18.00S 2.00W	92	S	44674	S	33446	42410
18.00S 2.00W	93	S	41656	S	31085	37135
18.00S 2.00W	94	S	44673	S	33445	46418
18.00S 2.00W	94	S	44673	S	33445	46418
18.00S 2.00W	95	S	32823	S	25906	29383
18.00S 2.00W	96	S	51278	S	38724	49983
18.00S 2.00W	97	S	37038	S	27599	32313
18.00S 2.00W	98	S	62819	S	46596	55182
18.00S 2.00W	99	S	25241	S	19829	24521
18.00S 2.00W	100	S	22782	S	17943	24520
18.00S 2.00W	101	S	22570	S	17764	21382
18.00S 2.00W	102	S	21260	S	16913	21160
18.00S 2.00W	103	GR	3146	GR	3855	0
18.00S 2.00W	104	S	32830	S	25910	39600
18.00S 2.00W	105	S	44677	S	33119	37740
18.00S 2.00W	106	S	55589	S	41658	50034
18.00S 2.00W	107	GR	3192	GR	2973	0
18.00S 2.00W	108	GR	4087	GR	3680	0
18.00S 2.00W	109	R	31322	R	1975	28878
18.00S 2.00W	110	S	31323	S	24665	28879
18.00S 2.00W	111	G	7978	G	7671	51205
18.00S 2.00W	112	GR	103	GR	133	0
18.00S 2.00W	113	R	60537	R	8183	54864
18.00S 2.00W	114	S	60388	S	45194	54865
18.00S 2.00W	115	S	31667	S	25028	29372
18.00S 2.00W	116	S	31668	S	25029	29373
18.00S 2.00W	117	S	27455	S	21491	28212
18.00S 2.00W	118	S	28209	S	22196	23912
18.00S 2.00W	119	S	30169	S	23794	27824
18.00S 2.00W	120	S	26246	S	20452	21116
18.00S 2.00W	121	S	39946	S	30043	35875
18.00S 2.00W	122	S	47469	S	35558	45519
18.00S 2.00W	123	S	52149	S	39275	46210
18.00S 2.00W	124	S	54174	S	40921	50834
18.00S 2.00W	126					
18.00S 2.00W	127					
18.00S 2.00W	129	S	46562	S	34412	46204
18.00S 2.00W	130	S	46562	S	34412	46204
18.00S 2.00W	132	S	46562	S	34412	46204
18.00S 2.00W	133	S	46562	S	34412	46204
18.00S 2.00W	134	R	35116	R	2643	34902
18.00S 2.00W	135	R	35116	R	2643	34902
18.00S 2.00W	136	S	35117	S	27488	34903
18.00S 2.00W	137	S	35117	S	27488	34903
18.00S 2.00W	138	R	45499	R	5380	43375
18.00S 2.00W	139	S	45688	S	33997	43376
18.00S 2.00W	140	S	24261	S	19043	21092
18.00S 2.00W	140	S	45688	S	33997	43376

POINT OF DIVERSION REPORT 18 S 2 W
SECTION(S)

TWP/RNG	POD-ID	APPLICATION		PERMIT		CERTIFICATE
18.00S 2.00W	141	G	7042	G	6529	51143
18.00S 2.00W	142	S	34629	S	27203	32118
18.00S 2.00W	142	G	7042	G	6529	51143
18.00S 2.00W	143	S	44945	S	33592	38151
18.00S 2.00W	143	G	7042	G	6529	51143
18.00S 2.00W	144	G	7042	G	6529	51143
18.00S 2.00W	145	G	7042	G	6529	51143
18.00S 2.00W	146	G	7042	G	6529	51143
18.00S 2.00W	147	G	7042	G	6529	51143
18.00S 2.00W	148	G	7042	G	6529	51143
18.00S 2.00W	149	G	7042	G	6529	51143
18.00S 2.00W	150	G	7042	G	6529	51143
18.00S 2.00W	151	S	31147	S	24549	27390
18.00S 2.00W	152	S	57341	S	43137	0
18.00S 2.00W	153	GR	2601	GR	2468	0
18.00S 2.00W	154	S	31401	S	24793	29550
18.00S 2.00W	155	S	33356	S	26373	29389
18.00S 2.00W	156	S	25850	S	20302	28691
18.00S 2.00W	157	S	25850	S	20302	28691
18.00S 2.00W	158	S	25850	S	20302	28691
18.00S 2.00W	159	S	43196	S	31864	37739
18.00S 2.00W	160	S	26009	S	20374	21303
18.00S 2.00W	161	S	55139	S	41338	49990
18.00S 2.00W	162	S	61021	S	45702	59103
18.00S 2.00W	163	S	21336	S	16729	19509
18.00S 2.00W	164	S	21336	S	16729	19509
18.00S 2.00W	165	S	21336	S	16729	19509
18.00S 2.00W	166	S	21336	S	16729	19509
18.00S 2.00W	167					
18.00S 2.00W	168	S	32922	S	25983	30982
18.00S 3.00W	4	GR	923	GR	896	0
18.00S 3.00W	5	S	32075	S	25306	28883
18.00S 3.00W	6	S	39169	S	29136	34661
18.00S 3.00W	7	GR	3175	GR	3134	0
18.00S 3.00W	8	GR	3176	GR	3135	0
18.00S 3.00W	9	GR	3177	GR	3136	0
18.00S 3.00W	10	GR	3178	GR	3137	0
18.00S 3.00W	11	GR	3179	GR	3138	0
18.00S 3.00W	12	GR	3180	GR	3139	0
18.00S 3.00W	13	GR	3181	GR	3140	0
18.00S 3.00W	14					
18.00S 3.00W	15	S	28213	S	22200	0
18.00S 3.00W	16	G	397	G	266	27979
18.00S 3.00W	17	G	3212	G	3027	35650
18.00S 3.00W	18	G	3298	G	3075	35754
18.00S 3.00W	19	G	3297	G	3074	35651
18.00S 3.00W	20	G	3296	G	3073	52375
18.00S 3.00W	21	G	897	G	796	29630
18.00S 3.00W	38	GR	1325	GR	1280	0

POINT OF DIVERSION REPORT 18 S 2 W
SECTION(S)

TWP/RNG	POD-ID	APPLICATION		PERMIT		CERTIFICATE
18.00S 3.00W	39	GR	1326	GR	1281	0
18.00S 3.00W	40	GR	1327	GR	1282	0
18.00S 3.00W	41	S	60483	S	46289	62157
18.00S 3.00W	42	GR	721	GR	697	0
18.00S 3.00W	43	GR	722	GR	698	0
18.00S 3.00W	44	G	4708	G	4425	37733
18.00S 3.00W	52	GR	839	GR	811	0
18.00S 3.00W	53	GR	838	GR	810	0
18.00S 3.00W	54	GR	837	GR	809	0
18.00S 3.00W	55					
18.00S 3.00W	56	G	1311	G	1171	29537
18.00S 3.00W	57	GR	745	GR	722	0
18.00S 3.00W	58	GR	2817	GR	2658	0
18.00S 3.00W	65	S	31999	S	25246	27833
18.00S 3.00W	98	S	26884	S	21107	24742
18.00S 3.00W	99	S	25940	S	21242	24019
18.00S 3.00W	118	S	29268	S	22959	28337
19.00S 1.00W	17	GR	344	GR	329	0
19.00S 1.00W	20					
19.00S 1.00W	21	S	31313	S	24659	29547
19.00S 1.00W	23	G	6597	G	6183	56978
19.00S 2.00W	1	GR	3758	GR	3420	0
19.00S 2.00W	6	S	52023	S	38199	57310
19.00S 3.00W	2	S	41565	S	31006	36205
19.00S 3.00W	3	S	37975	S	28317	36521
19.00S 3.00W	4	S	37975	S	28317	36521



WATER RIGHTS WRIS CODES

Oregon Water Resources Department

Water Right Database User's Guide

W.R.I.S. CODE EXPANSIONS

AGRICULTURE (1)

AG - Agriculture

CH - Cranberry harvest

CF - Flood harvesting

CR - All cranberry uses

TC - Temperature control

DB - Dairy barn

FR - Frost protection

GH - Greenhouse

MS - Mint still

NU - Nursery use

INDUSTRIAL (4)

GT - Geothermal

DOMESTIC (2)

DO - Domestic

DI - /Inc lawn and garden

DN - /Inc non-commercial

DS - /Stock

GD - Group domestic

RR - Rest room

SC - School

RECREATION (5)

CS - Campground

RC - Recreation

SW - Swimming

IRRIGATION (3)

IC - Primary&Supplemental

IR - Irrigation

IS - Supplemental

CI - Cranberries

I* - Irr.,domestic & stock

ID -Irrigation&domestic

IL - Irrigation & stock

MISCELLANEOUS (M)

AH - Air conditioning

AS - Aesthetic

FM - Forest management

FP - Fire protection

IM - /Manufacturing

SM - Sawmill

SH - Shop

LD - Log deck

CM - Commercial

LA - Laboratory

POWER (6)

PW - Power

RM - Ram

GR - Groundwater recharge

PA - Pollution abatement

RW - Road construction

ST - Storage

FISH (7)

AQ - Aquaculture

FI - Fish

FW - /Wildlife

LIVESTOCK (8)

LV - Livestock

LW - /Wildlife

WILDLIFE (W)

WI - Wildlife

MUNICIPAL (9)

MU - Municipal

QM - Quasi-municipal

MINING (0)

MI - Mining

STATUS CODES

C - canceled

M - misfiled

P- part canceled

R - rejected

V - non-canceled

W - withdrawn

DLC - Donation Land Claim

SOURCE TYPE

DR - drain

L - lake

RS - reservoir

SE - sewage effluent

SP - spring

ST - stream

SU - sump

PERMIT/APPLICATION CHARACTERS

E - enlargement

DN - decree, no certificate

G - groundwater

GR - groundwater registration

IS - instream water right

MF - converted minimum flow

R - reservoir

LOT - Government Lot	WE - well	S - surface
	WR - winter runoff	T - transfer
	WW - waste water	U - underground

P/A/S/C	**CERTIFICATE TYPES**	**PENDING TRANSFER RIGHTS**
A - alternate	CF - confirming	CD - confirming decreed right
C - primary and supplemental	CR - correcting	CG - confirming groundwater
P - primary	OR - original	CS - confirming surface water
S - supplemental	RR - remaining	CR - confirming reservoir
	RG - remaining groundwater	RD - remaining decreed
		RS - remaining surface water
		RR - remaining reservoir

Martha O. Pagel, Director
Oregon Water Resources Department • 158 12th ST. NE • Salem, OR 97310 • Phone: (503)378-8455 • Fax: (503)378-2496

(1)

Application		Permit	Certificate	Rate		Use	Twp		Range		Sec	Quarter Quarter
46562	S	34412	46204	1.9400	C	IR	18.00	S	2.00	W		NWNE
	S	19043	21092	0.0400	C	DI	18.00	S	2.00	W	1	NWNW
	S	27203	32118	0.0100	C	DI	18.00	S	2.00	W	1	NENW
	S	33592	38151	0.0100	C	DI	18.00	S	2.00	W	1	NENW
	S	16729	19509	0.1300	C	IR	18.00	S	2.00	W	3	NESE
	GR	3344	0	80.0000	G	IR	18.00	S	2.00	W	4	NENW
	S	42193	0	75.2500	A	IS	18.00	S	2.00	W	4	SESW
	S	22592	23793	0.5000	C	IR	18.00	S	2.00	W	4	SWSE
	S	22712	23795	0.1300	C	IR	18.00	S	2.00	W	4	SWSE
	S	25380	31596	0.4700	C	IR	18.00	S	2.00	W	4	SWSE
	G	1995	34256	0.3100	C	IR	18.00	S	2.00	W	4	SWSW
	G	5613	0	0.1800	C	IR	18.00	S	2.00	W	5	SENW
	G	5613	0	0.2000	C	IR	18.00	S	2.00	W	5	NESW
	GR	3289	0	1000.0000	G	IR	18.00	S	2.00	W	5	NWSE
	GR	3576	0	450.0000	G	IR	18.00	S	2.00	W	5	SESE
	GR	3640	0	800.0000	G	IR	18.00	S	2.00	W	5	NWSE
	GR	3977	0	176.0000	G	IR	18.00	S	2.00	W	5	SESE
	G	2643	0	1.0000	C	QM	18.00	S	2.00	W	6	SESE
	G	2643	0	1.0000	C	QM	18.00	S	2.00	W	6	SESE
	GR	1136	0	70.0000	G	IR	18.00	S	2.00	W	6	SENE
	GR	1342	0	350.0000	G	IR	18.00	S	2.00	W	6	SWNE
	GR	4071	0	150.0000	G	IR	18.00	S	2.00	W	6	NENE
	S	42511	0	0.2600	C	IR	18.00	S	2.00	W	6	SWNW
	S	[illegible]518	0	0.1100	C	IR	18.00	S	2.00	W	6	SWNW
	S	[illegible]344	28090	0.3800	C	IR	18.00	S	2.00	W	6	NWSE
	S	25389	28885	0.1000	C	IR	18.00	S	2.00	W	6	NESE
	S	25172	29736	0.3600	C	IR	18.00	S	2.00	W	6	NESE
	S	27940	34658	0.3000	C	IR	18.00	S	2.00	W	6	SWNW
	G	2523	35752	0.3000	C	IR	18.00	S	2.00	W	6	NWSW
	S	32093	37934	0.1250	C	IR	18.00	S	2.00	W	6	NESE
	S	32515	43362	0.1000	C	IR	18.00	S	2.00	W	6	NESE
	S	34412	46204	1.9400	C	IR	18.00	S	2.00	W	6	NENW
	S	34412	46204	1.9400	C	IR	18.00	S	2.00	W	6	NESW
	S	24566	28091	0.1900	C	IR	18.00	S	2.00	W	7	SWSW
	S	27209	31601	0.1600	C	IR	18.00	S	2.00	W	7	SWSW
	G	914	31788	0.0300	C	IR	18.00	S	2.00	W	7	SWSW
	S	27351	34780	0.1200	C	IR	18.00	S	2.00	W	7	SWSW
8003	G	7442	50609	0.0400	C	IM	18.00	S	2.00	W	7	SWSW
	GR	2603	0	200.0000	G	IR	18.00	S	2.00	W	8	NENE
	S	29218	34571	0.8900	C	IM	18.00	S	2.00	W	8	NWNW
	S	29217	35753	0.4300	C	IR	18.00	S	2.00	W	8	NWNW
	S	29217	35753	1.3000	C	IM	18.00	S	2.00	W	8	NWNW
	S	26264	31466	1.0900	C	IR	18.00	S	2.00	W	9	NWSE
	S	26264	31466	1.0900	C	IR	18.00	S	2.00	W	9	SENW
	R	917	17248	46.0000	A	IM	18.00	S	2.00	W	10	NWNW
	R	917	17248	46.0000	A	IM	18.00	S	2.00	W	10	NWNW
	S	18077	17392	0.5000	C	IM	18.00	S	2.00	W	10	SWNW
	S	18077	17392	0.5000	C	IM	18.00	S	2.00	W	10	SWNW
	S	25438	30580	0.7400	C	IR	18.00	S	2.00	W	10	NWSW
	S	25439	32562	0.7900	C	IR	18.00	S	2.00	W	10	NWSW
	S	25439	32562	0.0400	C	IM	18.00	S	2.00	W	10	NWSW
50943	R	6197	51677	1.0000	A	LV	18.00	S	2.00	W	12	SENE
50943	R	6197	51677	1.0000	A	LV	18.00	S	2.00	W	12	SENE
62360	S	46517	51678	0.0050	C	LV	18.00	S	2.00	W	12	SENE
	S	14372	15730	0.2000	C	IR	18.00	S	2.00	W	15	NESE
	G	576	28084	0.6500	C	IR	18.00	S	2.00	W	15	SWSW
	G	1618	31460	0.4300	C	IR	18.00	S	2.00	W	15	NWSW
	G	1618	31460	0.[illegible]00	C	IR	18.00	S	2.00	W	15	NESW
	S	26679	35349	1.5100	C	IR	18.00	S	2.00	W	15	SWNW
7935	G	7321	51680	0.1600	C	IS	18.00	S	2.00	W	15	NWSW

S	60888	S	45356	62066	0.3500	C	IR	18.00	S	2.00	W	15	SWNW
S	60888	S	45356	62066	0.3500	C	IR	18.00	S	2.00	W	15	SENW
		S	24678	27827	0.2000	C	IR	18.00	S	2.00	W	16	NWSE
		R	1979	27828	1.0000	A	IR	18.00	S	2.00	W	16	NWSE
		S	24679	27829	0.2500	C	IR	18.00	S	2.00	W	16	SESW
		G	576	28084	0.6500	C	IR	18.00	S	2.00	W	16	SESE
		S	26679	35349	1.5100	C	IR	18.00	S	2.00	W	16	NENE
		S	34310	43468	0.5000	C	IR	18.00	S	2.00	W	16	NENE
		S	34310	43468	0.5000	C	IR	18.00	S	2.00	W	16	NWNE
		GR	1392	0	160.0000	G	IR	18.00	S	2.00	W	18	SWNW
		GR	4089	0	200.0000	G	IR	18.00	S	2.00	W	18	SWSW
		GR	4129	0	150.0000	G	IR	18.00	S	2.00	W	18	SWSW
		S	51078	0	65.0000	A	IS	18.00	S	2.00	W	18	SWNW
		S	51078	0	65.0000	A	IS	18.00	S	2.00	W	18	SWNW
		S	20664	21316	1.4400	C	IR	18.00	S	2.00	W	18	SWSW
		S	23992	28089	0.2900	C	IR	18.00	S	2.00	W	18	SWNW
		S	25543	28095	0.2000	C	IR	18.00	S	2.00	W	18	NWNW
		S	31589	38144	0.0900	C	IR	18.00	S	2.00	W	18	SWSW
		S	33400	42508	0.2300	C	IS	18.00	S	2.00	W	18	SWSW
		S	44000	52787	0.2000	C	IR	18.00	S	2.00	W	18	SWNW
	0	S	44000	64912	0.2000	C	IR	18.00	S	2.00	W	18	SWNW
S	68177	S	49398	67766	0.0200	C	IR	18.00	S	2.00	W	18	SWNW
S	68177	S	49398	67766	1.0000	C	FR	18.00	S	2.00	W	18	SWNW
		GR	2079	0	50.0000	G	IR	18.00	S	2.00	W	19	NESE
		GR	3268	0	60.0000	G	IR	18.00	S	2.00	W	19	NESE
		S	20664	21316	1.4400	C	IR	18.00	S	2.00	W	19	NENW
		S	21109	23766	0.8700	C	IR	18.00	S	2.00	W	19	SWNW
		S	28467	35159	1.3100	C	IR	18.00	S	2.00	W	19	SENE
		GR	2078	0	50.0000	G	IR	18.00	S	2.00	W	20	NWSW
		S	8741	8534	0.0100	C	IR	18.00	S	2.00	W	20	SWSE
		S	24418	23636	0.3500	C	IR	18.00	S	2.00	W	20	SWNW
		S	22207	23913	0.0700	C	IR	18.00	S	2.00	W	20	SWSW
		S	23410	27820	0.5700	C	IR	18.00	S	2.00	W	20	NESW
		S	23881	28338	0.0600	C	IR	18.00	S	2.00	W	20	SWSW
		S	22207	35910	0.0700	C	IR	18.00	S	2.00	W	20	SWSW
		S	29499	37591	1.1000	C	IR	18.00	S	2.00	W	20	SWSW
		S	33566	42090	0.1300	C	IR	18.00	S	2.00	W	20	SWSW
R	71324	R	100245	69030	4.0000	A	IR	18.00	S	2.00	W	20	SWSE
		GR	1283	0	165.0000	G	IR	18.00	S	2.00	W	21	SENE
		R	6321	46582	3.0000	A	RC	18.00	S	2.00	W	21	SESW
		S	39460	46583	0.0300	C	RC	18.00	S	2.00	W	21	SESW
		GR	2332	0	500.0000	G	IR	18.00	S	2.00	W	22	SESW
		GR	2784	0	30.0000	G	IR	18.00	S	2.00	W	22	SENE
		GR	3266	0	70.0000	G	IR	18.00	S	2.00	W	22	NWSW
		G	1576	31459	0.2200	C	IR	18.00	S	2.00	W	22	NWNE
		G	5996	49860	0.2000	C	IR	18.00	S	2.00	W	22	NWNW
		R	11940	0	13.2200	A	WI	18.00	S	2.00	W	23	SENE
		R	11940	0	25.7100	A	WI	18.00	S	2.00	W	23	SWNE
		R	11940	0	0.8300	A	WI	18.00	S	2.00	W	23	SWNE
		S	47634	0	0.0130	C	IR	18.00	S	2.00	W	23	SWNW
		S	47634	0	1.9870	C	IR	18.00	S	2.00	W	23	SWNW
		S	52016	0	0.0560	C	WI	18.00	S	2.00	W	23	SWNE
		S	9129	9135	0.2500	C	IR	18.00	S	2.00	W	23	
		S	25906	29383	0.0300	C	IR	18.00	S	2.00	W	23	SWSW
		S	31085	37135	0.1490	C	IR	18.00	S	2.00	W	23	SESW
		S	33446	42410	0.0200	C	IR	18.00	S	2.00	W	23	NWNW
		S	33445	46418	0.0200	C	IR	18.00	S	2.00	W	23	NWNW
		S	41305	56041	0.0220	C	IR	18.00	S	2.00	W	23	NENE
		S	37822	65265	0.0200	C	IR	18.00	S	2.00	W	23	NWSW
		S	49584	65397	0.0500	C	IR	18.00	S	2.00	W	23	NWSW

3

	S	35907	0	0.0200	C	IR	18.00	S	2.00	W	25	NWSE
	S	17764	21382	0.0950	C	IR	18.00	S	2.00	W	25	NESW
	S	19829	24521	0.3800	C	IR	18.00	S	2.00	W	25	SWSE
	S	27599	32313	0.1600	C	IR	18.00	S	2.00	W	25	NWSW
	S	38724	49983	0.0100	C	IR	18.00	S	2.00	W	25	NESW
	S	46596	55182	0.0200	C	IR	18.00	S	2.00	W	25	SESW
	GR	2973	0	30.0000	G	IR	18.00	S	2.00	W	26	SWSE
	GR	3855	0	8.0000	G	IR	18.00	S	2.00	W	26	SENW
	S	37889	0	0.2900	C	IR	18.00	S	2.00	W	26	NWSW
	S	37889	0	0.2900	C	IR	18.00	S	2.00	W	26	SWNW
	S	16913	21160	0.3750	C	IR	18.00	S	2.00	W	26	NESE
	S	25910	28098	0.3600	C	IR	18.00	S	2.00	W	26	NWNE
	S	33119	37740	0.0125	C	IR	18.00	S	2.00	W	26	SWNE
	S	33119	37740	0.3255	C	IR	18.00	S	2.00	W	26	SWNE
	S	25910	39600	0.1000	C	IR	18.00	S	2.00	W	26	NWNE
	S	38663	47413	0.2500	C	IR	18.00	S	2.00	W	26	NENW
	S	36791	50033	0.3400	C	IR	18.00	S	2.00	W	26	NWNE
	S	41658	50034	0.0650	C	IR	18.00	S	2.00	W	26	SWNE
	GR	3680	0	120.0000	G	IR	18.00	S	2.00	W	27	SENW
	S	42837	0	0.7000	C	IR	18.00	S	2.00	W	27	NWSE
	R	1975	28878	4.9000	A	IR	18.00	S	2.00	W	28	NWSE
	S	24665	28879	0.3700	C	IR	18.00	S	2.00	W	28	NWSE
	S	24665	28879	0.3700	C	IR	18.00	S	2.00	W	28	NWSE
	G	7671	51205	0.0500	C	IR	18.00	S	2.00	W	28	SWNW
	G	11672	0	15.0000	G	NU	18.00	S	2.00	W	29	NWSE
	G	11672	0	52.0000	G	NU	18.00	S	2.00	W	29	NWSE
	GR	133	0	30.0000	G	IR	18.00	S	2.00	W	29	NESE
	S	8741	8534	0.0100	C	IR	18.00	S	2.00	W	29	NWNE
	S	21491	28212	0.0200	C	IR	18.00	S	2.00	W	29	SENE
	P	8183	54864	0.2000	A	LV	18.00	S	2.00	W	29	SWSE
	S	45194	54865	0.1736	G	LV	18.00	S	2.00	W	29	SWSE
	S	20452	21116	0.2840	C	IR	18.00	S	2.00	W	30	NWSE
	S	22196	23912	0.6000	C	IR	18.00	S	2.00	W	30	SWSE
	S	23794	27924	0.0900	C	IR	18.00	S	2.00	W	30	NENE
	S	25028	29372	0.2700	C	IR	18.00	S	2.00	W	30	SENE
	S	25029	29373	0.1800	C	IR	18.00	S	2.00	W	30	SENE
	S	35558	45519	0.1800	C	IR	18.00	S	2.00	W	30	SWSE
	S	39275	46210	0.1100	C	IR	18.00	S	2.00	W	30	SENE
	S	25983	30982	0.5000	C	FI	18.00	S	2.00	W	31	SWSW
	S	25983	30982	0.0500	C	IR	18.00	S	2.00	W	31	SWSW
	S	30043	35875	0.3800	C	IR	18.00	S	2.00	W	31	NENW
	S	40921	50834	0.2300	C	IR	18.00	S	2.00	W	31	NENW
77097	P	102114	70903	2.5000	A	FW	18.00	S	2.00	W	31	SESE
77097	R	102114	70903	2.5000	A	IL	18.00	S	2.00	W	31	SESE
	R	2643	34902	1.0000	A	IR	18.00	S	2.00	W	34	NWNW
	S	27498	34903	0.0300	C	IR	18.00	S	2.00	W	34	NWNW
	S	27488	34903	0.0300	C	IR	18.00	S	2.00	W	34	NWNW
	S	27488	34903	0.0300	C	IR	18.00	S	2.00	W	34	NWNW
	R	5380	43375	1.2000	A	RC	18.00	S	2.00	W	34	NWSW
	R	5380	43375	1.2000	A	FI	18.00	S	2.00	W	34	NWSW
	S	33997	43376	0.0100	C	FI	18.00	S	2.00	W	34	NWSW
	S	33997	43376	0.0100	C	RC	18.00	S	2.00	W	34	NWSW
	S	33997	43376	0.0100	C	FI	18.00	S	2.00	W	34	NWSW
	G	6529	51143	0.2600	C	IR	18.00	S	2.00	W	34	NWSE
	G	6529	51143	0.0400	C	DO	18.00	S	2.00	W	34	NWSE
	G	6529	51143	0.0400	C	DO	18.00	S	2.00	W	34	NWSE
	G	6529	51143	0.2600	C	IR	18.00	S	2.00	W	34	NWSE
	G	6529	51143	0.2600	C	IR	18.00	S	2.00	W	34	NWSE
	G	6529	51143	0.0400	C	DO	18.00	S	2.00	W	34	NWSE
	G	6529	51143	0.0400	C	DO	18.00	S	2.00	W	34	NWSE

G	6529	51143	0.2600	C	IR	18.00	S	2.00	W	34	NWSE
G	6529	51143	0.0400	C	DO	18.00	S	2.00	W	34	SENW
G	6529	51143	0.2600	C	IR	18.00	S	2.00	W	34	SENW
G	5839	0	0.0250	C	IR	18.00	S	2.00	W	35	SESW
GR	2468	0	100.0000	G	IR	18.00	S	2.00	W	36	SWSE
S	40983	0	0.3100	C	IR	18.00	S	2.00	W	36	SWNE
S	43137	0	0.1500	C	IR	18.00	S	2.00	W	36	NWNE
S	16729	19509	0.1400	C	IR	18.00	S	2.00	W	36	SESE
S	16729	19509	0.1400	C	IR	18.00	S	2.00	W	36	SWSE
S	20374	21303	0.3200	C	IR	18.00	S	2.00	W	36	NESE
S	17943	24520	0.1400	C	IR	18.00	S	2.00	W	36	NENW
S	24549	27390	0.0600	C	IR	18.00	S	2.00	W	36	NWNE
S	20302	28691	0.0800	C	IR	18.00	S	2.00	W	36	NWSE
S	26373	29389	0.2000	C	IR	18.00	S	2.00	W	36	NWSE
S	24793	29550	0.1500	C	IR	18.00	S	2.00	W	36	SWNE
S	31864	37739	0.0450	C	IR	18.00	S	2.00	W	36	SWNE
S	41338	49990	0.0600	C	IR	18.00	S	2.00	W	36	SENW
S	45702	59103	0.3000	C	IR	18.00	S	2.00	W	36	SWNE
G	11558	0	0.7200	C	MU	18.00	S	3.00	W	1	NWSE
G	11558	0	0.7200	C	MU	18.00	S	3.00	W	1	SWSE
G	12792	0	0.3340	C	IM	18.00	S	3.00	W	1	NENE
GR	896	0	160.0000	G	IR	18.00	S	3.00	W	1	NWSE
GR	3134	0	900.0000	G	MU	18.00	S	3.00	W	1	NESE
GR	3135	0	1250.0000	G	MU	18.00	S	3.00	W	1	NESE
GR	3136	0	1250.0000	G	MU	18.00	S	3.00	W	1	NESE
GR	3137	0	1250.0000	G	MU	18.00	S	3.00	W	1	NESE
GR	3138	0	1250.0000	G	MU	18.00	S	3.00	W	1	NWSE
GR	3139	0	600.0000	G	MU	18.00	S	3.00	W	1	NESE
GR	3140	0	1250.0000	G	MU	18.00	S	3.00	W	1	NESE
S	22200	0	20.0000	C	MU	18.00	S	3.00	W	1	
S	42519	0	0.1300	C	IR	18.00	S	3.00	W	1	NWSE
S	10859	10813	0.1000	C	LV	18.00	S	3.00	W	1	SENW
G	268	27979	2.0000	C	MU	18.00	S	3.00	W	1	NESE
S	25306	28383	0.4000	C	IR	18.00	S	3.00	W	1	NWSE
G	796	29630	0.4700	C	IR	18.00	S	3.00	W	1	SENE
S	29136	34661	0.0400	C	IR	18.00	S	3.00	W	1	NESE
G	3027	35650	400.0000	G	MU	18.00	S	3.00	W	1	NESE
G	3074	35651	3.3000	C	MU	18.00	S	3.00	W	1	NWSE
S	29217	35753	1.3000	C	IM	18.00	S	3.00	W	1	NENW
S	29217	35753	0.4300	C	IR	18.00	S	3.00	W	1	NENW
G	3075	35754	2.4000	C	MU	18.00	S	3.00	W	1	SWSE
G	3073	52375	2.2200	C	MU	18.00	S	3.00	W	1	NWSE
S	21617	23655	0.0600	C	IR	18.00	S	3.00	W	2	SWNW
S	34458	41701	0.0400	C	IR	18.00	S	3.00	W	2	SWNW
S	34458	41701	0.0100	C	IR	18.00	S	3.00	W	2	SWNW
G	3366	35974	0.0400	C	IM	18.00	S	3.00	W	3	SENE
S	35513	41343	0.0130	C	IR	18.00	S	3.00	W	5	SESE
G	10970	0	4.0000	C	GM	18.00	S	3.00	W	11	SWNE
G	10970	0	4.0000	C	GM	18.00	S	3.00	W	11	SWNE
G	10970	0	4.0000	C	CM	18.00	S	3.00	W	11	SWNE
GR	529	0	200.0000	G	IR	18.00	S	3.00	W	11	SWSE
GR	4140	0	449.0000	G	IM	18.00	S	3.00	W	11	NWSE
GR	4141	0	250.0000	G	IR	18.00	S	3.00	W	11	NWSE
S	13041	14181	0.0100	C	LV	18.00	S	3.00	W	11	NENE
S	13041	14181	1.2500	C	IR	18.00	S	3.00	W	11	NENE
G	670	27812	0.0600	C	IR	18.00	S	3.00	W	11	SESE
G	2193	31595	0.3500	C	IR	18.00	S	3.00	W	11	SWSE
G	8127	50297	0.1200	C	IR	18.00	S	3.00	W	11	NWSE
GR	697	0	300.0000	G	IR	18.00	S	3.00	W	12	SWSE
GR	698	0	192.0000	G	IR	18.00	S	3.00	W	12	SWSE

(5)

	GR	1280	0	400.0000	G	IR	18.00	S	3.00	W	12	NENE
	GR	1281	0	400.0000	G	IR	18.00	S	3.00	W	12	NENE
	GR	1282	0	400.0000	G	IR	18.00	S	3.00	W	12	NWNE
	GR	1430	0	40.0000	G	IR	18.00	S	3.00	W	12	SESE
	GR	1538	0	300.0000	G	IR	18.00	S	3.00	W	12	NENW
	GR	2929	0	200.0000	G	IR	18.00	S	3.00	W	12	SENE
	S	51570	0	0.3300	G	IR	18.00	S	3.00	W	12	SWSW
	S	25907	29384	0.6300	C	IR	18.00	S	3.00	W	12	NESW
	S	25215	29553	0.5700	C	IR	18.00	S	3.00	W	12	SWSW
	S	25477	29639	0.2400	C	IR	18.00	S	3.00	W	12	NENW
	S	27736	35873	0.7300	C	IS	18.00	S	3.00	W	12	NESW
	S	27736	35873	0.0400	C	IR	18.00	S	3.00	W	12	NESW
	S	32328	35874	0.3200	C	IS	18.00	S	3.00	W	12	NESW
	G	4425	37733	0.0500	C	IR	18.00	S	3.00	W	12	SESE
	S	27736	56507	0.3000	C	IR	18.00	S	3.00	W	12	NESW
	S	46289	62157	0.1000	C	IM	18.00	S	3.00	W	12	NESE
	S	27736	67299	0.4700	C	IR	18.00	S	3.00	W	12	NESW
	S	27736	67299	0.4700	C	IR	18.00	S	3.00	W	12	NESE
	GR	722	0	54.0000	G	IR	18.00	S	3.00	W	13	SENE
	GR	808	0	156.0000	G	IR	18.00	S	3.00	W	13	NENE
	GR	809	0	156.0000	G	IR	18.00	S	3.00	W	13	NENE
	GR	810	0	60.0000	G	IR	18.00	S	3.00	W	13	NWNE
	GR	811	0	45.0000	G	IR	18.00	S	3.00	W	13	NWNE
	GR	2658	0	80.0000	G	IR	18.00	S	3.00	W	13	NESE
	GR	3274	0	140.0000	G	IR	18.00	S	3.00	W	13	NWNW
	GR	3638	0	15.0000	G	IR	18.00	S	3.00	W	13	NWSE
	GR	4000	0	140.0000	G	IR	18.00	S	3.00	W	13	NWNW
	S	24948	27831	0.0500	C	IR	18.00	S	3.00	W	13	NESW
	S	25246	27833	0.0900	C	IR	18.00	S	3.00	W	13	SWNE
	S	26185	29386	0.0300	C	IR	18.00	S	3.00	W	13	SWSW
	G	1171	29537	0.1800	C	IR	18.00	S	3.00	W	13	SENE
	S	26545	31881	0.1200	C	IR	18.00	S	3.00	W	13	NENW
	G	2310	34481	0.1200	C	DO	18.00	S	3.00	W	13	SENW
	S	39391	56850	0.0800	C	IR	18.00	S	3.00	W	13	NWSW
	S	16119	17047	0.5150	C	IR	18.00	S	3.00	W	14	NENE
	S	24777	29549	0.1300	C	IR	18.00	S	3.00	W	14	SENE
	R	5493	44635	0.5200	A	ST	18.00	S	3.00	W	15	SWNE
	S	34592	44679	0.5200	A	ST	18.00	S	3.00	W	15	SWNE
	GR	3662	0	3.0000	G	IR	18.00	S	3.00	W	16	NWSW
	GR	3789	0	15.0000	G	MU	18.00	S	3.00	W	16	NWSW
	S	50251	0	2.0000	G	FI	18.00	S	3.00	W	16	NWSW
	S	50251	0	4.0000	G	IR	18.00	S	3.00	W	16	NWSW
	S	51524	0	0.0360	C	FI	18.00	S	3.00	W	16	NWSW
	S	52007	0	0.0053	C	IR	18.00	S	3.00	W	16	NWSW
	S	52007	0	0.0089	C	FI	18.00	S	3.00	W	16	NWSW
	S	16973	27986	0.0600	C	DO	18.00	S	3.00	W	16	NWSW
69504	S	50251	72142	2.2000	G	IR	18.00	S	3.00	W	16	NWSW
69504	S	50251	72142	2.0000	G	FI	18.00	S	3.00	W	16	NWSW
	GR	2368	0	20.0000	G	IR	18.00	S	3.00	W	18	SWNE
	GR	2369	0	17.0000	G	IR	18.00	S	3.00	W	18	SWNE
	S	35834	0	0.0100	C	DI	18.00	S	3.00	W	19	SESW
	S	12936	12430	0.0125	C	IR	18.00	S	3.00	W	19	NESW
	S	26298	30290	0.0100	C	DI	18.00	S	3.00	W	19	SENE
	S	40109	61685	0.0100	C	DI	18.00	S	3.00	W	19	SESW
	S	18517	23992	0.0100	C	ID	18.00	S	3.00	W	20	NWSW
	R	11844	0	1.0000	A	FP	18.00	S	3.00	W	21	NWSE
	R	11844	0	1.0000	A	WI	18.00	S	3.00	W	21	NWSE
	R	11844	0	1.0000	A	RC	18.00	S	3.00	W	21	NWSE
	R	11846	0	2.0000	A	FP	18.00	S	3.00	W	21	NWSE
	R	11846	0	2.0000	A	RC	18.00	S	3.00	W	21	NWSE

R	11846	0	2.0000	A	WI	18.00	S	3.00	W	21	NWSE
S	42766	0	0.0100	C	FP	18.00	S	3.00	W	21	SESE
GR	3673	0	40.0000	G	IM	18.00	S	3.00	W	23	SWNE
GR	3674	0	25.0000	G	IM	18.00	S	3.00	W	23	NWNE
GR	3675	0	25.0000	G	IM	18.00	S	3.00	W	23	SWNE
GR	3730	0	135.0000	G	DO	18.00	S	3.00	W	23	NWNE 6
GR	3730	0	135.0000	G	IM	18.00	S	3.00	W	23	NWNE
G	3168	35870	0.2800	C	IM	18.00	S	3.00	W	23	SWNE
G	4939	44092	0.0900	C	IR	18.00	S	3.00	W	23	SENE
G	4939	44092	0.0160	C	IR	18.00	S	3.00	W	23	SENE
S	35741	44757	0.2500	C	IM	18.00	S	3.00	W	23	NESW
S	35741	44757	0.2500	C	IM	18.00	S	3.00	W	23	NESW
S	35741	44757	0.1000	C	FP	18.00	S	3.00	W	23	NESW
S	35741	44757	0.1000	C	FP	18.00	S	3.00	W	23	NESW
R	5761	44758	18.0000	A	FP	18.00	S	3.00	W	23	SESW
R	5761	44758	6.0000	A	IM	18.00	S	3.00	W	23	SESW
S	13390	13753	0.3400	C	IR	18.00	S	3.00	W	24	NWNE
S	21242	24019	0.1300	C	IR	18.00	S	3.00	W	24	NWNE
S	21107	24742	0.3000	C	IR	18.00	S	3.00	W	24	NENE
S	35624	44094	0.1400	C	IR	18.00	S	3.00	W	24	SWNW
GR	3323	0	35.0000	G	IR	18.00	S	3.00	W	26	NWNW
GR	3324	0	25.0000	G	IR	18.00	S	3.00	W	26	NWNW
R	2592	33380	1.7000	A	IR	18.00	S	3.00	W	27	SWSE
S	27251	33381	0.1000	C	IR	18.00	S	3.00	W	27	SWSE
G	2001	33382	0.0900	C	IS	18.00	S	3.00	W	27	SWSE
S	30111	34181	0.0030	C	DO	18.00	S	3.00	W	28	SWSE
S	50871	66696	0.0290	C	IR	18.00	S	3.00	W	28	SWSE
S	17101	21058	0.0200	C	LV	18.00	S	3.00	W	29	SWNW
S	17101	21058	0.0300	C	DO	18.00	S	3.00	W	29	SWNW
S	25138	30286	0.0100	C	DI	18.00	S	3.00	W	29	NWNW
R	973	20954	16.0000	A	FI	18.00	S	3.00	W	30	SWNE
[illegible]	19771	20955	0.2500	C	FI	18.00	S	3.00	W	30	SWNE
S	20932	33078	0.0050	C	IR	18.00	S	3.00	W	30	SENE
R	6232	45671	0.1000	A	LV	18.00	S	3.00	W	31	NENW
S	50821	45672	2.0000	G	LV	18.00	S	3.00	W	31	NENW
G	11496	0	0.1110	C	IR	18.00	S	3.00	W	34	SENE
S	22959	28337	2.6800	C	IR	18.00	S	3.00	W	36	SESE
S	22959	28337	2.6800	C	IR	18.00	S	3.00	W	36	SESE
S	28517	36521	0.9000	C	IR	18.00	S	3.00	W	36	SESE

Table 1.--Records of wells in the Eugene-Springfield area--Continued

Well number	Owner	Type of well	Year completed	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Finish	Water-bearing zone(s)			Altitude (feet)	Water level		Specific conductance of water	Type of pump and hp	Well performance		Use	Remarks
								Depth to top (feet)	Thickness (feet)	Character of material		Feet below datum	Date			Yield (gpm)	Drawdown (feet)		
T. 17 S., R. 6 W.--Continued																			
2dd	Robert Hoffman	Dr	1966	155	6	42	B	--	--	Sandstone	720	132.27	5-21-69	280	S, 1	8	30	D	B 1 hr; does not have adequate water supply to irrigate garden.
12bda	Ken Johnson	Dr	1967	103	6	43	B	40	--	do.	650	40.48	5-16-69	270	J, 1	12	50	D	B 1 hr, L.
12ddc	M. Greenleaf	Dr	--	124	6	40	B	--	--	do.	450	--	--	979	J, 1	--	--	D	Ca.
13aad	Darrell Smith	Dr	1965	85	6	22	B	--	--	do.	470	22	5-19-65	580	S, 2/3	40	36	D	B 1 hr, L.
13cca	J. E. Bown	Dr	1968	50	5	26	B	42	2	Shale	500	11.54	5-15-69	175	S, 2/3	28	9	D	Do.
13dba	H. L. Jacobson	Dr	1967	100	6	42	B	--	--	Sandstone	550	18.02	5-15-69	170	S, 1	10	70	D	Do.
14ada	A. E. McPheeters	Dr	1966	60	6	39	B	37	--	do.	520	17.29	5-15-69	240	S, 2/3	10	35	D	Do.
14dac	J. E. Bown	Dr	1959	208	6	--	B	--	--	do.	540	41.02	5-15-69	260	S, 2/3	20	120	D	Do.
23ada	Walter Jenkins	Dr	1963	53	6	53	B	40	13	Sand and gravel	465	23.99	5-14-69	120	S, 1/3	50	3	D	P 1 hr, L.
23dcb	R. A. Stone	Dr	1960	76	6	76	B	38	30	do.	455	22.35	5-14-69	220	J, 1/2	40	33	D	B 2 hr, L.
24ada	Graydon Bachman	Dr	1965	48	6	48	B	--	--	--	375	6.17	5-15-69	125	S, 1	--	--	D	
24bac	J. H. McClenner	Dr	1964	82	6	--	--	--	--	--	460	27.20	5-15-69	165	S, 1	--	--	D	
24dcb	Elmira High School	Dr	1963	120	10	111	B	113	7	Sand and gravel	380	10.24	5-14-69	145	S, 5	102	43	PS	P 8 hr, L.
24ddc	Elmira Grade School	Dr	--	233	8	--	--	--	--	--	390	29.62	5-14-69	1,249	S, 2	--	--	PS	Ca.
25aaa	Elmira Junior High School	Dr	1958	100	8	78	P, 48-78	5	75	Sand, gravel, and boulders	375	15.84	5-13-69	145	S, 1½	100	70	PS	B 1/2 hr, L.
25acb	Edward Utter	Dr	1963	59	6	59	B	45	14	Sand and gravel	375	5	4-22-63	140	S	30	45	D	B 1 hr, L.
25cab	Darrel Kau	Dr	1967	153	6	51	B	50	2	do.	400	13.79	5-13-69	--	--	4	40	D	B 1½ hr, L; water comes from contact between sand and bedrock.
36adc	Gladys Jorgensen	Dr	1966	82	6	82	B	60	22	do.	400	50	8-17-66	170	S, 1/2	20	10	Ir	B 2 hr, L.
36cdd	Waldo Hunter	Dr	1964	351	6	50	B	344	7	Sedimentary rock	500	45.16	5-13-69	--	N	8	290	N	B 1½ hr, L.
36dca	O. E. Williams	Dr	1959	91	6	90	P, 68-86	55	36	Shale	440	53.93	5-12-69	160	S, 5	22	0	Ir	B 1 hr, L. H (fig. 4).
T. 18 S., R. 2 W.																			
4bdd	W. W. Dow	Dr	1956	239	6	84	B	--	--	--	500	12	6- 4-56	--	J, 3/4	8	78	D	P 2 hr, L.
4dab1	Hugh Hassell	Dr	1960	128	6	31.5	B	125	3	Sandstone	570	48.03	7-30-68	150	J, 1	18	80	D	B 1 hr, L.
4dab2	C. C. Crone	Dr	1963	110	6	48	B	--	--	--	575	23.67	7-30-68	--	N	20	45	N	B 1 hr, L.
5acc	O. S. Headlee	Dr	1967	65	6	46	B	20	45	Sand and gravel	490	12	3-27-67	--	S, 1	15	40	D	B 1 hr.

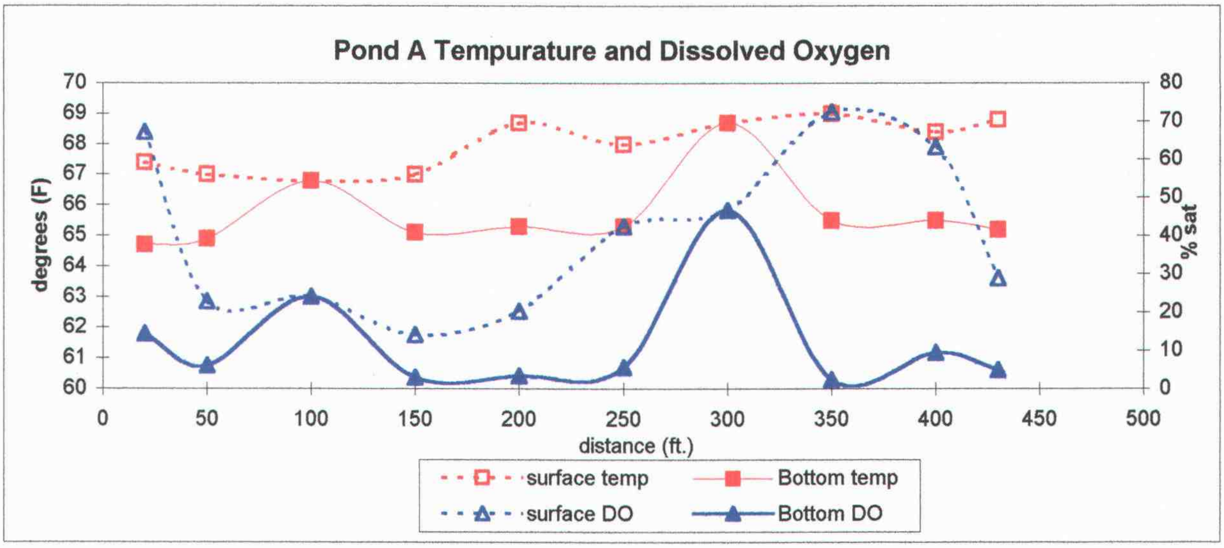
Table 1.--Records of wells in the Eugene-Springfield area--Continued

Well number	Owner	Type of well	Year completed	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Finish	Water-bearing zone(s): Depth to top (feet)	Thickness (feet)	Character of material	Altitude (feet)	Water level: Feet below datum	Date	Specific conductance of water	Type of pump and hp	Well performance: Yield (gpm)	Drawdown (feet)	Use	Remarks
										T. 18 S., R. 2 W.--Continued									
5add	C. A. Keever	Dr	1968	80	6	35	B	--	--	--	490	19.38	7-30-68	118	J, 1½	20	0	D	P 24 hr, L.
5bda	L. L. Patrick	Dr	1966	55	6	55	B	14	28	Sand and gravel	490	15	5-18-66	--	S	16	55	D	B 1 hr, L.
6adb	D. G. Healey	Dr	1967	265	6	21	B	--	--	--	482	--	--	--	N	--	--	N	L; inadequate water supply; well abandoned.
6bad	R. L. Chadburn	Dr	1962	55	6	55	B	15	50	Sand and gravel	480	9	6-26-62	--	S, 1	20	25	D	B 1 hr, L.
6bdd	Bob Behm	Dr	1961	43	6	43	B	14	29	do.	475	10.46	7-30-68	--	J, 1	14	25	D	B 1/2 hr.
6dbs	Howard Jenkins	Dr	1962	38	6	39	B	12	26	do.	470	10.40	7-30-68	220	S, 1/2	30	2	D	B 3 hr, L. H (fig. 5).
7bcb	Warren Holden	Dr	1959	38	6	38	P	12	16	do.	465	10	9-30-59	--	N	50	12	N	B 2 hr.
9acb	Don Hendricks	Dr	--	80	6	--	--	--	--	--	505	--	--	--	J, 1	--	--	D,S	
10dac1	Gordon Tripp	Dr	1956	216	6	15	B	--	--	--	720	90	10-25-56	--	S, 1	6	190	D	B 2 hr, L.
10dad	D. K. Mitchel	Dr	1963	152	6	42	B	--	--	--	720	70	10-10-63	--	S	16	52	D	Do.
11aaa1	Norman Hutchinson	Dr	1965	145	6	63	B	--	--	Sandstone	1,420	14.43	7-31-68	105	S, 1/2	5	140	Ir	B 1 hr; used to irrigate lawn and garden; a 126-ft well is used for the house.
11adb	Robert Barrett	Dr	1965	380	6	21	B	--	--	--	1,170	95	10-11-65	--	N	4	365	N	B 1 hr, L.
11dbc	R. G. Reynolds	Dr	1964	505	6	20	B	--	--	Sandstone	870	240	9- 2-64	750	S, 1½	6	260	D	B 1 hr, L, Ca.
11dcd	Lyle Schulz	Dr	1967	400	6	80	P, 40-80	--	--	--	700	82	8-18-67	500	S, 3/4	4	--	D	B 1 hr; well was deepened from original depth of 125 ft.
11ddc	Howard Hart	Dr	1964	170	6	20	--	--	--	--	780	80	7-31-68	210	S, 1	7	60	D	B 2 hr, L; inadequate water supply for both house and lawn. Has another auxiliary well 195 ft deep.
12bba	F. R. Baker	Dr	1967	225	6	21	B	--	--	--	1,450	45	9-29-67	160	S, 1/2	3	180	D	B 1 hr.
12ccb	Arthur Davisson	Dr	1967	210	6	36	B	--	--	Sandstone	820	--	--	280	S, 1	30	--	--	B, L.
14bad	L. L. Davis	Dv	--	31.5	4	31	--	--	--	--	620	21.64	7-31-68	--	C, 1/2	--	--	N	
14bca	R. J. Frisendahl	Dr	1966	150	6	21	B	--	--	Claystone	620	100	8- 8-66	--	S, 1/2	7	40	D	B 2 hr, L.

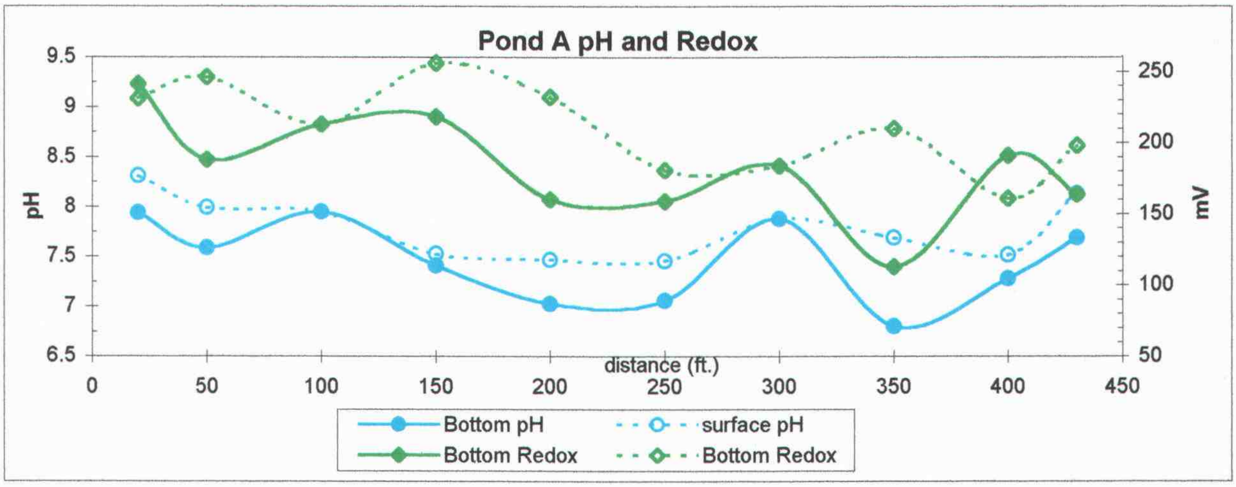
Table 1.--Records of wells in the Eugene-Springfield area--Continued

Well number	Owner	Type of well	Year completed	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Finish	Water-bearing zone(s): Depth to top (feet)	Thickness (feet)	Character of material	Altitude (feet)	Water level: Feet below datum	Date	Specific conductance of water	Type of pump and hp	Well performance: Yield (gpm)	Drawdown (feet)	Use	Remarks
T. 18 S., R. 3 W.																			
1dac1	Pacific Power & Light Co.	Dr	1957	44	16	44	P, 22-42	10	34	Sand and gravel	465	9	4- 3-58	--	T, 25	750	22	PS	P 72 hr.
1dac2	do.	Dr	1956	44	16	44	P, 19-44	10	34	do.	458	9	7-24-56	--	T, 25	756	40	PS	P 72 hr.
1dad	do.	Dr	1964	50	12	50	P, 18-48	10	50	do.	465	12	4-28-64	--	T, 60	320	23	PS	P 9 hr.
1dbc1	do.	Dr	1965	55	16	55	P, 22-47	10	45	do.	458	7	4-23-65	--	T, 100	1,700	9½	PS	P 30 hr, L.
1dbc2	do.	Dr	1965	56	16	56	P, 22-47	14	42	Gravel and sand	458	11.5	6- 4-65	--	T, 50	750	10	PS	P 30 hr.
1dbd	do.	Dr	1958	56	16	56	P, 22-54	14	42	do.	458	11	5- 9-58	--	T, 75	1,250	14	PS	P 24 hr.
1dca	do.	Dr	1965	55	16	55	P, 22-47	12	43	do.	458	10.5	4- 2-65	--	T, 100	1,200	10	PS	P 30 hr, L.
1dda	do.	Dr	1956	30	12	30	P, 12-30	12	18	do.	465	9	7-30-56	--	T, 25	--	--	--	L; used for recharging.
1ddb1	do.	Dr	1960	49	16	49	P, 24-49	12	37	do.	465	10	5- -60	--	T, 75	1,300	14	PS	P 22 hr.
1ddb2	do.	Dr	1961	50	16	50	P, 25-50	12	38	do.	458	8	3- -61	--	T, 75	1,250	13	PS	P 24 hr.
2bdb	S. W. Alexander	Dr	1952	87	4	22	B	--	--	--	500	18	1952	--	--	6	--	D	B 2 hr, L.
6aca	Pauline Olson	Dr	1965	160	6	20	B	--	--	--	480	75	6- 4-65	--	S, 1/2	2	40	Ir	P 2 hr, L; used to irrigate lawn.
7bca	H. T. Eaton	Dr	1957	124	6	--	--	--	--	--	660	80	5-22-57	--	S, 1-3/4	--	--	Ir	Used to irrigate lawn.
7bdb	W. L. Morse	Dr	1956	230	6	139	B	--	--	Sandstone	665	46.77	3-26-69	525	S, 2	25	90	Ir	B, L.
8caa	Carl Goddard	Dr	1967	200	6	27	B	--	--	do.	465	18	8-29-67	--	S, 1	7	180	Ir	B 1 hr, L; used to irrigate lawn.
9dac2	Vern Warnock	Dr	1965	250	6	84	B	--	--	do.	640	42	3-24-65	--	J, 1	2	206	N	B 1 hr, L.
10cab	D. R. Chamberlain	Dr	1963	102	6	20	B	62	--	do.	560	92	8- 6-63	--	J, 3/4	8	92	D	Do.
11cdc	Mobil Oil Co.	Dr	1967	175	6 5	42 175	P, 28-175	--	--	--	490	20	5-10-67	--	N	12	145	N	Do.
12ddd	Harold Estep	Dr	1967	65	6	65	P, 18-48	18	47	Sand and gravel	469	13.26	3-28-69	--	S, 2	40	30	Ir	Do.
13ccb	Oak Mobile Trailer Park	Dr	1968	120	6	20	B	19	--	Sandstone	470	19	1-27-68	305	S, 1	25	120	D	Do.
14aaa	R. S. Willoughby	Dr	1964	57	6	57	P, 20-25	19	34	Sand and gravel	460	18	5-26-64	--	J, 1	15	30	D	B 2 hr, L.
17aac	G. W. Shafer	Dr	1959	268	6	37	B	--	--	Sandstone	725	240	5- 1-59	--	N	16	--	N	B 2 hr, L; well abandoned.
T. 18 S., R. 4 W.																			
1cbb	Mrs. C. R. Knorr	Dr	1955	48	6	15	B	--	--	--	570	20	8-20-55	--	N	3	40	N	B, L.
3bcd	J. P. Bergman	Dr	1957	74	6	22	B	72	2	Sand, coarse	425	7	4-11-57	--	J, 1	15	50	D	B.

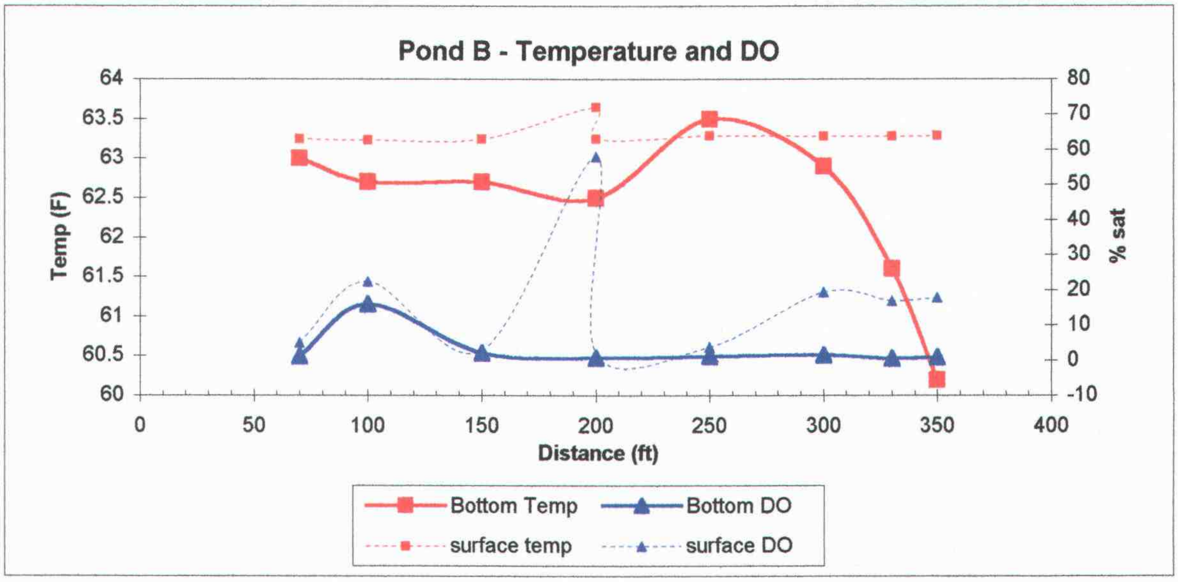
Pond_a.xl



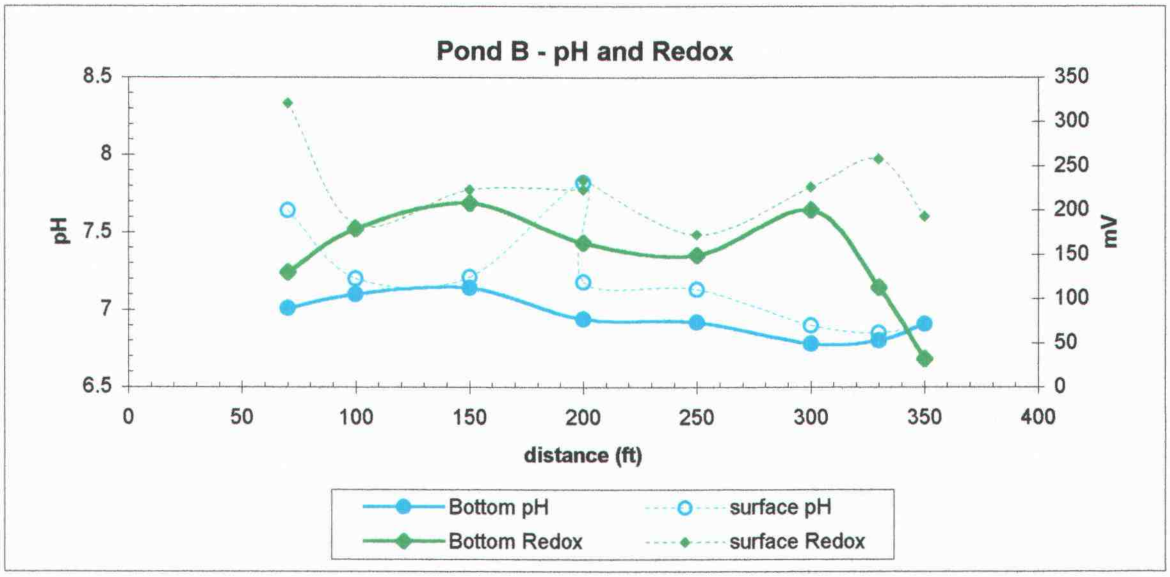
Pond A Tempurature and Dissolved Oxygen
degrees (F)
% sat
distance (ft.)
surface temp
Bottom temp
surface DO
Bottom DO



Pond A pH and Redox
pH
mV
distance (ft.)
Bottom pH
surface pH
Bottom Redox
Bottom Redox

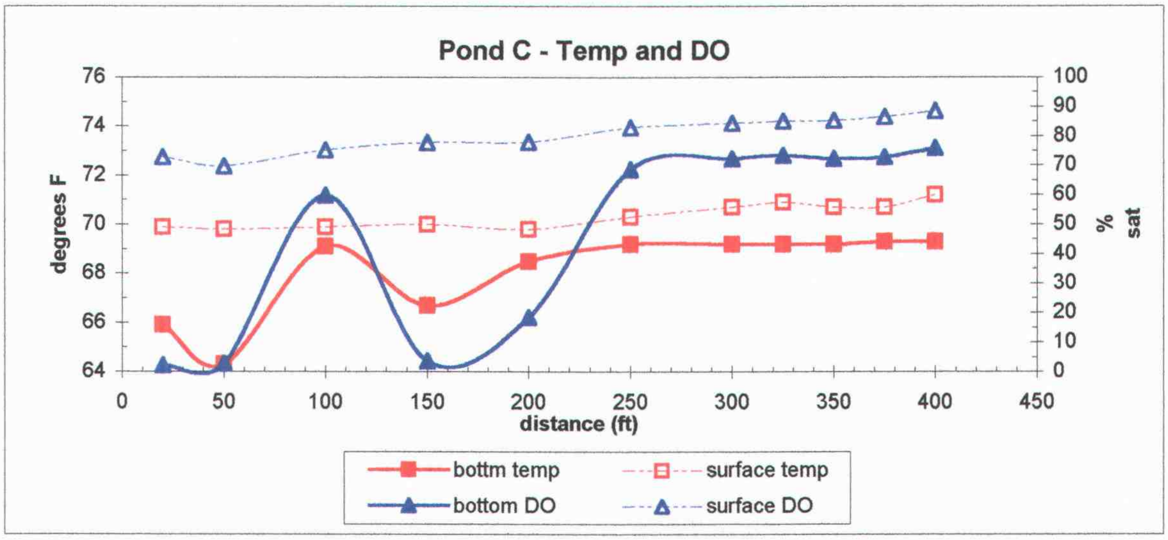


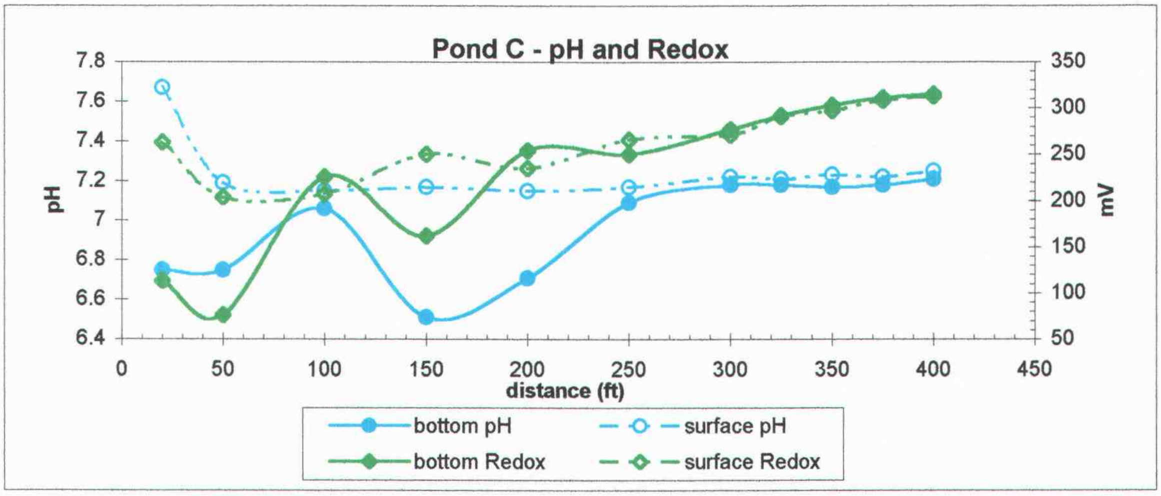
Pond B - Temperature and DO
Temp (F)
% sat
Distance (ft)
64
63.5
63
62.5
62
61.5
61
60.5
60
80
70
60
50
40
30
20
10
0
-10
0
50
100
150
200
250
300
350
400
Bottom Temp
Bottom DO
surface temp
surface DO

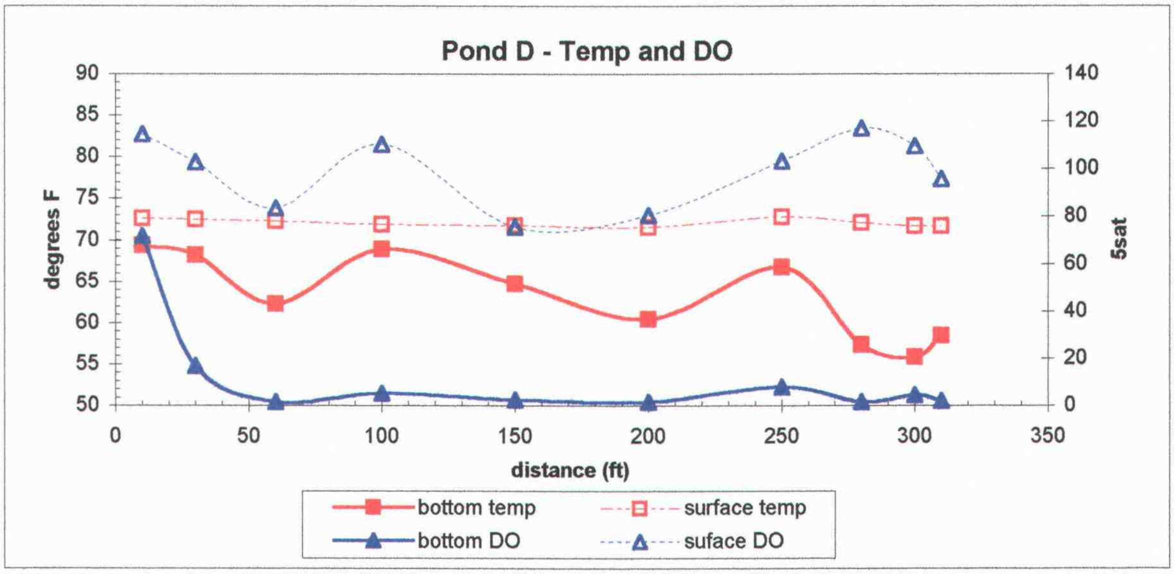


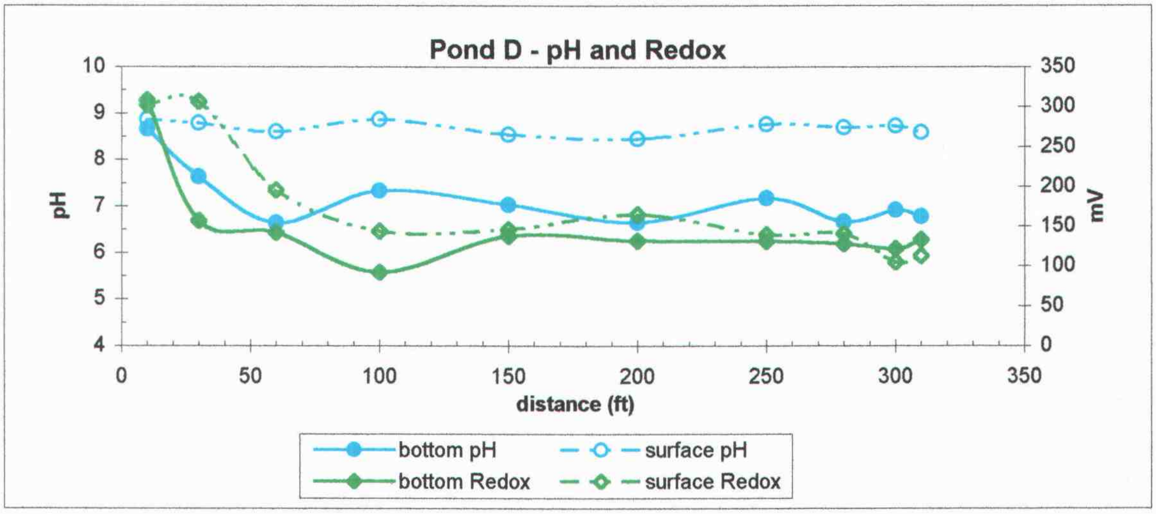
Pond B - pH and Redox
pH
mV
distance (ft)
8.5
8
7.5
7
6.5
350
300
250
200
150
100
50
0
0
50
100
150
200
250
300
350
400
Bottom pH
surface pH
Bottom Redox
surface Redox

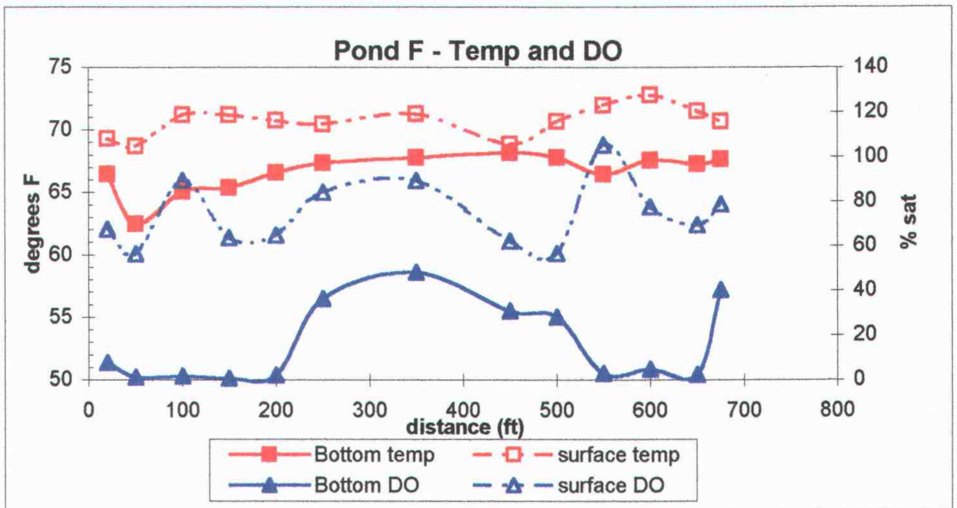
Pond_c.xl


Pond C - Temp and DO
degrees F
% sat
distance (ft)
bottm temp
surface temp
bottom DO
surface DO

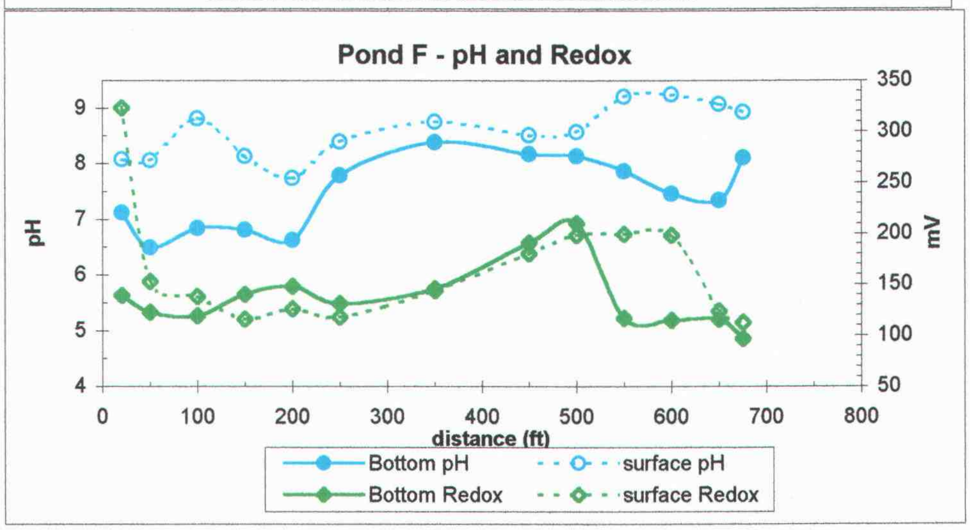

Pond C - pH and Redox
pH
mV
distance (ft)
bottom pH
surface pH
bottom Redox
surface Redox


Pond D - Temp and DO
degrees F
90
85
80
75
70
65
60
55
50
140
120
100
80
60
40
20
0
5sat
0
50
100
150
200
250
300
350
distance (ft)
bottom temp
surface temp
bottom DO
suface DO


Pond D - pH and Redox
pH
10
9
8
7
6
5
4
350
300
250
200
150
100
50
0
mV
0
50
100
150
200
250
300
350
distance (ft)
bottom pH
surface pH
bottom Redox
surface Redox



Pond F - Temp and DO
degrees F
% sat
distance (ft)
75
70
65
60
55
50
140
120
100
80
60
40
20
0
0
100
200
300
400
500
600
700
800
Bottom temp
surface temp
Bottom DO
surface DO



Pond F - pH and Redox
pH
mV
distance (ft)
9
8
7
6
5
4
350
300
250
200
150
100
50
0
100
200
300
400
500
600
700
800
Bottom pH
surface pH
Bottom Redox
surface Redox