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Water-Quality Assessment of the Central Columbia Plateau in Washington and Idaho--Analysis of Available Nutrient and Pesticide Data for Ground Water, 1942-92

By Joseph L. Jones and Richard J. Wagner

U.S. GEOLOGICAL SURVEY

Water-Resources Investigations Report 94-4258

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FOREWORD

The mission of the U.S. Geological Survey (USGS) is to assess the quantity and quality of the earth resources of the Nation and to provide information that will assist resource managers and policymakers at Federal, State, and local levels in making sound decisions. Assessment of water-quality conditions and trends is an important part of this overall mission.

One of the greatest challenges faced by water-resources scientists is acquiring reliable information that will guide the use and protection of the Nation's water resources. That challenge is being addressed by Federal, State, interstate, and local water-resource agencies and by many academic institutions. These organizations are collecting water-quality data for a host of purposes that include: compliance with permits and water-supply standards; development of remediation plans for a specific contamination problem; operational decisions on industrial, wastewater, or water-supply facilities; and research on factors that affect water quality. An additional need for water-quality information is to provide a basis on which regional and national-level policy decisions can be based. Wise decisions must be based on sound information. As a society we need to know whether certain types of water-quality problems are isolated or ubiquitous, whether there are significant differences in conditions among regions, whether the conditions are changing over time, and why these conditions change from place to place and over time. The information can be used to help determine the efficacy of existing water-quality policies and to help analysts determine the need for and likely consequences of new policies.

To address these needs, the Congress appropriated funds in 1986 for the USGS to begin a pilot program in seven project areas to develop and refine the National Water-Quality Assessment (NAWQA) Program. In 1991, the USGS began full implementation of the program. The NAWQA Program builds upon an existing base of water-quality studies of the USGS, as well as those of other Federal, State, and local agencies. The objectives of the NAWQA Program are to:

•Describe current water-quality conditions for a large part of the Nation's freshwater streams, rivers, and aquifers.

•Describe how water quality is changing over time.

•Improve understanding of the primary natural and human factors that affect water-quality conditions.

This information will help support the development and evaluation of management, regulatory, and monitoring decisions by other Federal, State, and local agencies to protect, use, and enhance water resources.

The goals of the NAWQA Program are being achieved through ongoing and proposed investigations of 60 of the Nation's most important river basins and aquifer systems, which are referred to as study units. These study units are distributed throughout the Nation and cover a diversity of hydrogeologic settings. More than two-thirds of the Nation's freshwater use occurs within the 60 study units and more than two-thirds of the people served by public water-supply systems live within their boundaries.

National synthesis of data analysis, based on aggregation of comparable information obtained from the study units, is a major component of the program. This effort focuses on selected water-quality topics using nationally consistent information. Comparative studies will explain differences and similarities in observed water-quality conditions among study areas and will identify changes and trends and their causes. The first topics addressed by the national synthesis are pesticides, nutrients, volatile organic compounds, and aquatic biology. Discussions on these and other water-quality topics will be published in periodic summaries of the quality of the Nation's ground and surface water as the information becomes available.

This report is an element of the comprehensive body of information developed as part of the NAWQA Program. The program depends heavily on the advice, cooperation, and information from many Federal, State, interstate, Tribal, and local agencies and the public. The assistance and suggestions of all are greatly appreciated.

Robert M. Hirsch

Chief Hydrologist

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CONVERSION FACTORS AND VERTICAL DATUM

Multiply	By	To obtain
inch (in.)	25.4	millimeter
foot (ft)	0.3048	meter
mile (mi)	1.609	kilometer
acre	4,047	square meter
square mile (mi^2)	2.590	square kilometer
gallon (gal)	3.785	liter
acre-foot (acre-ft)	1,233	cubic meter
gallon per minute (gal/min)	0.06308	liter per second
pound	0.4536	kilogram
ton	0.9072	megagram
degree Fahrenheit (°F)	°C = 5/9 x (°F-32)	degree Celsius

Sea level: In this report "sea level" refers to the National Geodetic Vertical Datum of 1929 (NGVD of 1929)--a geodetic datum derived from a general adjustment of the first-order level nets of both the United States and Canada, formerly called Sea Level Datum of 1929.

Water-Quality Assessment of the Central Columbia Plateau in Washington and Idaho--Analysis of Available Nutrient and Pesticide Data for Ground Water, 1942-92

By Joseph L. Jones and Richard J. Wagner

ABSTRACT

Analysis of available nutrient and pesticide data from more than a thousand wells shows that shallow ground water (less than 300 feet) in the Central Columbia Plateau has been contaminated with nitrate, particularly in the southwest. Water samples collected from one-fifth of public-supply wells in the southwest, and one-tenth elsewhere, have nitrate concentrations that exceed the maximum contaminant levels for nitrate in drinking water. Eleven pesticides also have been detected, and one of them (EDB) was detected in 10 wells at concentrations above the maximum contaminant level for drinking water.

Nitrate concentrations in ground water are influenced most by agricultural use of fertilizers and by recharge rates and sources. Concentrations are higher where fertilizers are most heavily applied and are higher in shallow ground water than in deeper aquifers. Trends observed in wells with long periods of record show increases in nitrate concentration beginning in the early 1950's, after the use of nitrogen compounds as fertilizers became widespread. Ground-water recharge affects nitrate concentrations in two ways: it transports nitrate into the ground-water system, raising nitrate concentrations in ground water; and it lowers concentrations by dilution when fresh water recharges in sufficient quantities. Dilution is especially evident near canals where fresh irrigation water enters the ground-water system.

More data would be needed to investigate possible relations between phosphate or pesticide concenrations and land use or depth. Phosphate concentrations in ground water are low--the median in the study unit is 0.02 milligram per liter as phosphorous. Detection of pesticides in ground water correlates with the solubility of the compounds in water and other related physico-chemical properties. Compounds that were detected have higher solubilities than compounds that were not detected.

INTRODUCTION

The Central Columbia Plateau, in eastern Washington and western Idaho, is an arid to semiarid, sparsely populated region characterized by few perennial streams and extensive agriculture. A vast irrigation system supplied mainly by the Columbia River supports much of the agriculture. The Central Columbia Plateau is 1 of 20 major hydrologic basins in the Nation in which the quality of ground- and surface-water resources is being assessed as part of the National Water-Quality Assessment (NAWQA) Program. The NAWQA program is a nationwide program designed by the U.S. Geological Survey (USGS) to describe the status and trends in the quality of the Nation's ground- and surface-water resources and to link the status and trends with an understanding of the natural and anthropogenic factors that affect the quality of these resources (Leahy and others, 1990). The program integrates information about water quality at a wide range of spatial scales, from local to national, and focuses on water-quality conditions that affect large areas of the Nation or that occur frequently within numerous small areas.

This report completes one of the initial activities undertaken as part of the Central Columbia Plateau study-unit investigation--to compile, review, and analyze existing water-quality data. For each study unit, retrospective analysis of existing water-quality data provides an historical perspective on the water quality in the study unit, knowledge of strengths and weaknesses of available information, and indications of what the water-quality issues are. The analyses assist in refining the design of both study-unit and national scale investigations.

The report focuses on available nutrient (nitrate and phosphate) and pesticide (insecticides, herbicides, fungicides, fumigants, and some volatile organic compounds) data for ground water. A companion report by Karen E. Greene and others, "Nutrients, Suspended Sediment, and Pesticides in Streams and Irrigation Systems in the Central Columbia Plateau in Washington and Idaho, 1959-1991," documents the analysis of available surface-water-quality data.

Purpose and Scope of the Report

The primary purpose of this report is to describe the distribution of nutrients and pesticides in ground water across the Central Columbia Plateau NAWQA study unit based on available data and to develop a set of hypotheses (conceptual model) about the natural and anthropogenic factors that affect the movement and fate of nutrients and pesticides. Subdivisions of the study unit, referred to as subunits, are defined to aid in understanding and describing ground-water-quality conditions in the overall study unit. The sources and general characteristics of available data are described. Also included are the implications of the current assessment for future data collection and analysis plans.

The analysis is based on readily available nitrate, orthophosphate (nutrient), and pesticide data for ground water from March 1958 through July 1992, primarily from the U.S. Geological Survey National Water Information System (NWIS). Trend plots are supplemented with data extending back to December 1942.

Previous Investigations

The structure of basalts underlying the Columbia Plateau was described by Drost and Whiteman (1986). Water levels, pumpage from, and recharge to aquifers in these basalts were described in a series of Regional Aquifer System Analysis Program (RASA) reports by Bauer and Vaccaro (1990), by Lane and Whiteman (1989), and by Cline and Knadle (1990). Water-quality characteristics were described by Turney (1986), by Bortleson and Cox (1986), by Erickson and Norton (1990), by Larson and Erickson (1993), and in a RASA series contribution by Steinkampf (1989). Water use was reported by Dion and Lum (1977). The character and geochemical evolution of ground water in the study unit was described by Hearn and others (1985). Drost, Ebbert, and Cox (1993) recently reported on the relation between nitrate concentrations and land use.

DESCRIPTION OF THE STUDY UNIT

The Central Columbia Plateau study unit covers 13,100 mi^2 located in eastern Washington and part of western Idaho (fig. 1). The boundaries of the study unit are the Snake River to the south, the Columbia River from the confluence with the Snake River upstream to the confluence with the Spokane River to the west and north, and the drainage basin boundaries for Hawk Creek, Crab Creek, the Palouse River, and the lower Snake River to the east. The Columbia and Snake Rivers are not included in the project area. The study unit includes all of Adams, Douglas, Franklin, and Grant Counties; most of Lincoln and Whitman Counties; about one-third of Spokane County in Washington; and about half of Latah County and parts of Benewah and Nez Perce Counties in Idaho.

Physiography and Hydrography

Altitudes in the study unit range from about 300 ft at the confluence of the Snake and Columbia Rivers to almost 5,000 ft in the mountains northeast of Moscow, Idaho. The western part of the study unit is composed mainly of gently sloping alluvial basins but includes some mountainous areas in southern Douglas and western Grant Counties. The dominant physiographic feature of the central part of the study unit is a region called the Channeled Scablands. The character of this rugged basalt terrain is the result of cataclysmic flooding from ancient Lake Missoula, caused by glacial ice dam breaches on the Clark Fork River about 16,000 to 12,000 years ago. The flood waters covered most of the central part of the study unit, washing away any unconsolidated materials that were present and carving channels in the fractured basalts that underlie the area. Altitudes in the eastern part of the study unit range from about 1,500 ft to almost 5,000 ft, and the terrain is characterized by rolling hills with some mountainous basalt prominences. The extreme eastern part of the study unit comprises the foothills of mountain ranges in northern Idaho, including the Palouse Range.

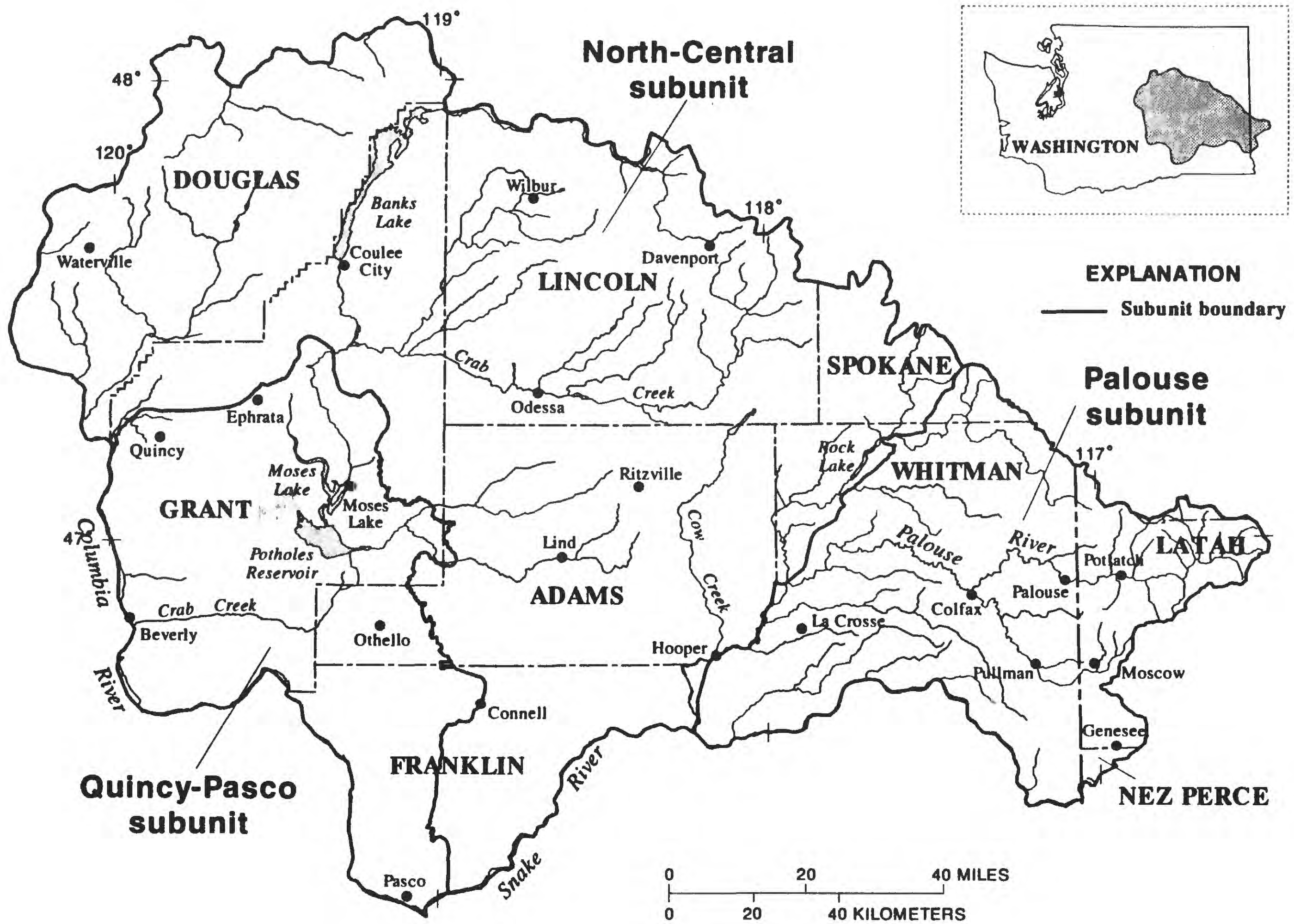


Figure 1. Location of the Central Columbia Plateau National Water-Quality Assessment study unit.

Surface water in the study unit drains to the Columbia or Snake Rivers (fig. 2). The major hydrologic features of the arid western part of the study unit are lower Crab Creek and the numerous large reservoirs and more than 5,000 mi of canals, drains, and wasteways that serve the Columbia Basin Irrigation Project (CBIP). The irrigation system was constructed and is maintained by the U.S. Bureau of Reclamation. Franklin D. Roosevelt Lake, which forms part of the northern border of the study unit, is the source of water for the CBIP. In the Channeled Scablands, upper Crab Creek is the only major perennial stream, despite the presence of numerous small natural lakes. The Palouse River drains the relatively wet eastern region of the study unit and is fed by many tributaries.

Climate

Most of the study area has a semiarid climate, receiving between 10 and 20 in. of precipitation per year, but a large area in the southwestern part of the study unit receives less than 10 in/yr (fig. 3; Bauer and Vaccaro, 1990). Precipitation generally increases from west to east, with the headwater areas of the Palouse River receiving more than 25 in/yr. Most of the precipitation (85 percent) occurs from October through May, and 40 percent occurs from November through January. Mean monthly temperatures at Othello range from 28°F in winter to 72°F in summer.

Population and Water Use

The population of about 200,000 people in the study unit has stabilized since the dramatic increases that accompanied the development of irrigated agriculture in the area during the 1940's and 1950's. Population centers include Pasco, Moses Lake, Pullman, and East Wenatchee, Washington, and Moscow, Idaho (fig. 4). The balance of the population resides in rural areas and small towns.

Consumptive water use is approximately 3.4 million acre-feet of water per year in the study unit (Bortleson, 1991). Irrigation of agricultural land is by far the largest consumptive use of water (about 99 percent). The irrigated areas are in the dry southwestern part of the study unit--mostly in Grant, Franklin, and Adams Counties (fig. 5). About 80 percent of water used for irrigation is surface water delivered to the CBIP between April and mid-October. The CBIP is irrigated almost exclusively with surface water and includes most of the agricultural lands in the study unit that are irrigated with surface water. About 3 million acre-feet/yr of surface water is delivered to the CBIP, and since 1970 about 2 million acre-feet/yr is delivered to farms (fig. 6). The remaining million acre-feet is lost from the system by seepage and evaporation or mixed with return-flow water and returned to the Columbia River.

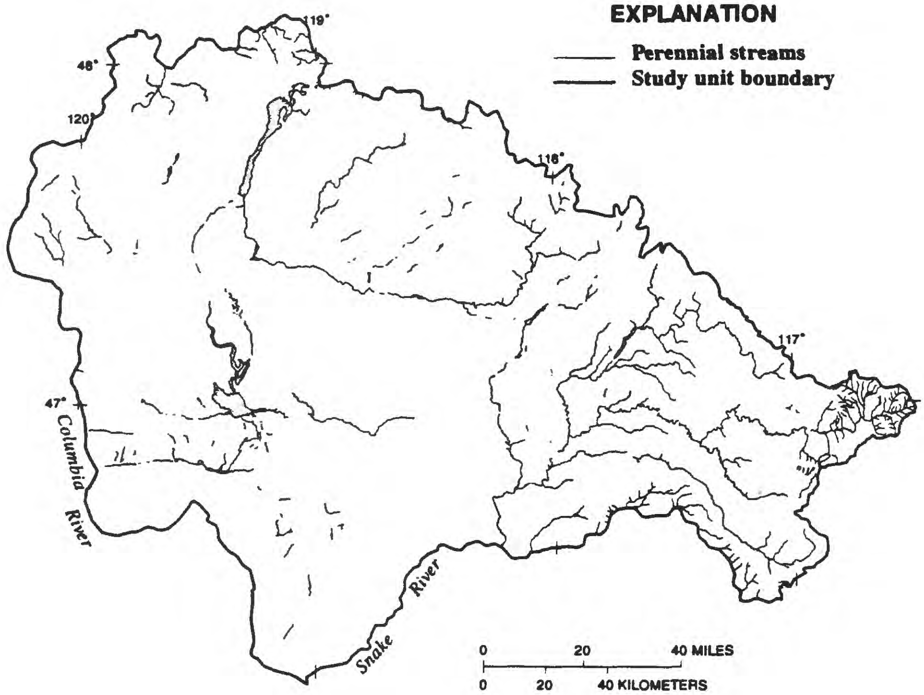
Ground-water sources make up the remaining 20 percent of water used for irrigation. In 1984, about one-half million acre-feet of ground water was used for irrigation in central Grant and western Adams Counties (table 1) and in smaller areas scattered through Douglas, Franklin, and Lincoln Counties. The largest non-consumptive uses of water in the study unit are for habitat for fish and wildlife and for recreation. Domestic water use is a small quantity of total consumptive water use (about 1 percent), and, excluding the Pasco area, is derived almost exclusively from ground water. Pasco is situated along the Columbia River and gets around 60 percent of its municipal water supply from the river. Public water systems generally derive their water from deep wells in basalt aquifers.

Land Use and Land Cover

Land use in the study unit is primarily agricultural (about 8,000 mi^2 or 61 percent). About 31 percent (more than 4,000 m^2) of the study unit is sparsely vegetated, almost barren range land, which is mostly in the central part of the study unit where the arid to semiarid climate and the lack of substantial soils combine to make agriculture and other land uses impractical. A small part of the study unit is forested (about 4 percent), mostly located in the headwaters of the Palouse River system in the extreme eastern part of the study unit and in spots along the northeastern boundary. These areas are at higher altitude than most of the study unit and receive the largest quantities of precipitation. The remaining 4 percent of the study unit is used for urban, industrial, military, wildlife, and recreation purposes.

Agricultural Practices

Almost 8,000 mi^2 of the 13,000 mi^2 of land in the study unit is used for agriculture. In the arid western part of the study unit about 1,300 mi^2 of agricultural land is irrigated; more than 800 mi^2 of this area is irrigated with surface water from the CBIP. The surface-water irrigated crops grown in the largest acreages in the CBIP are alfalfa (about 30 percent of the area), wheat and other small grains (19 percent), corn (11 percent), potatoes (10 percent), beans (8 percent), orchards (6 percent), and a wide variety of specialty crops (asparagus, mint, peas, seed



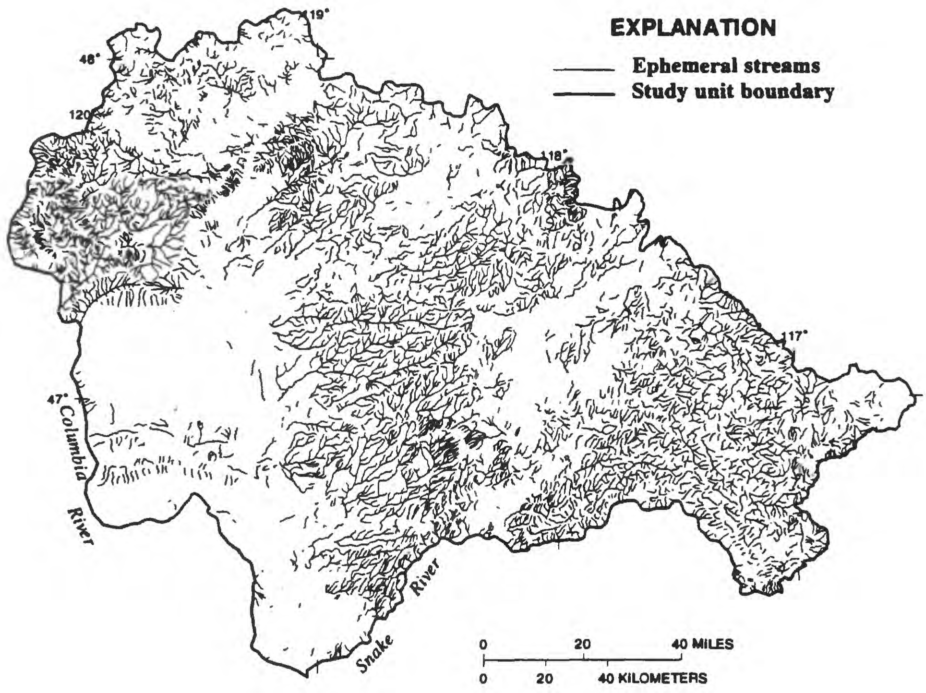


Figure 2. Lakes, perennial streams, and ephemeral streams in the Central Columbia Plateau study unit.

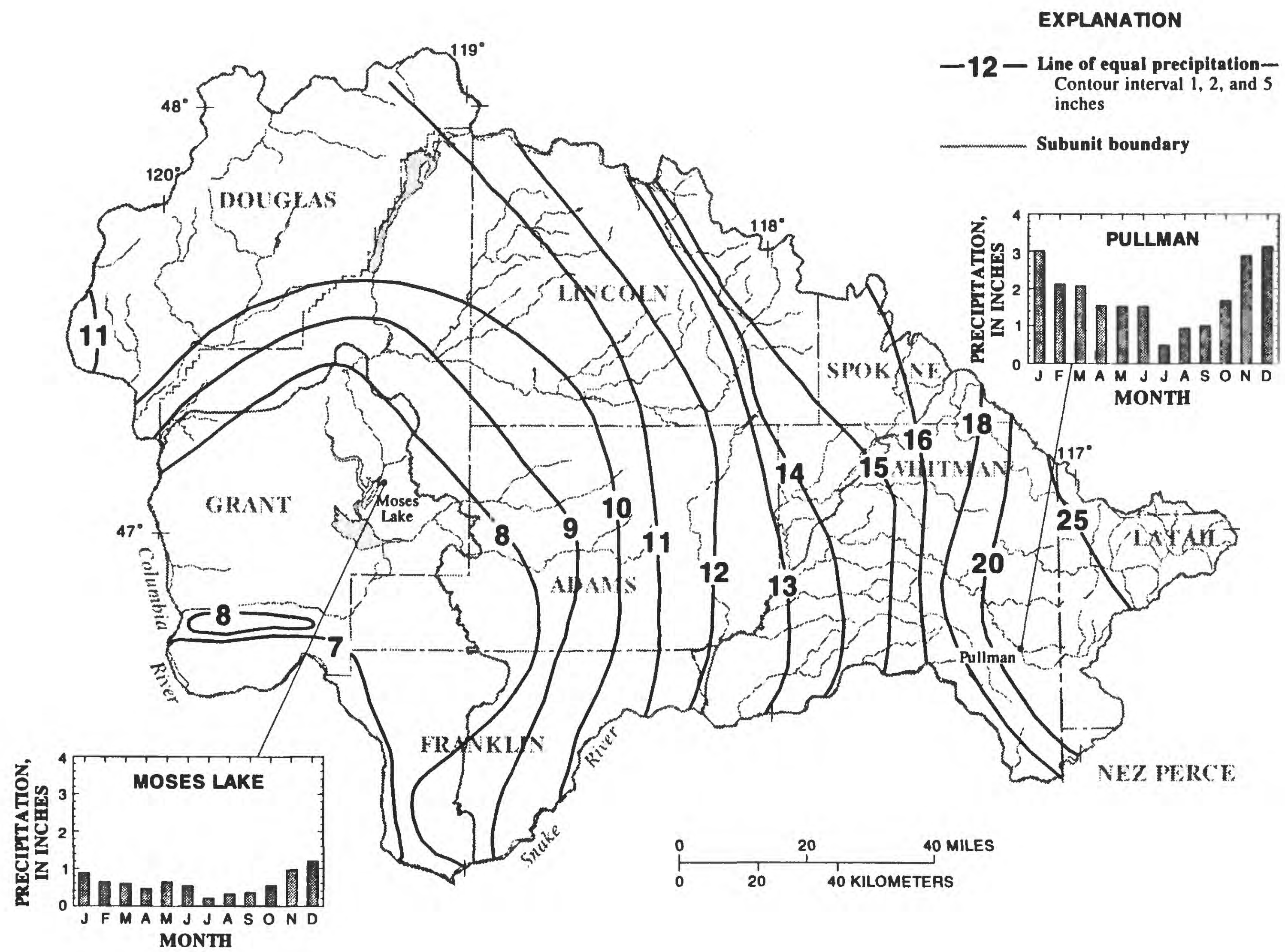


Figure 3. Mean annual precipitation in the Central Columbia Plateau study unit and mean monthly precipitation at Moses Lake, Wash., and Pullman, Wash. (Modified from Nelson, 1991.)

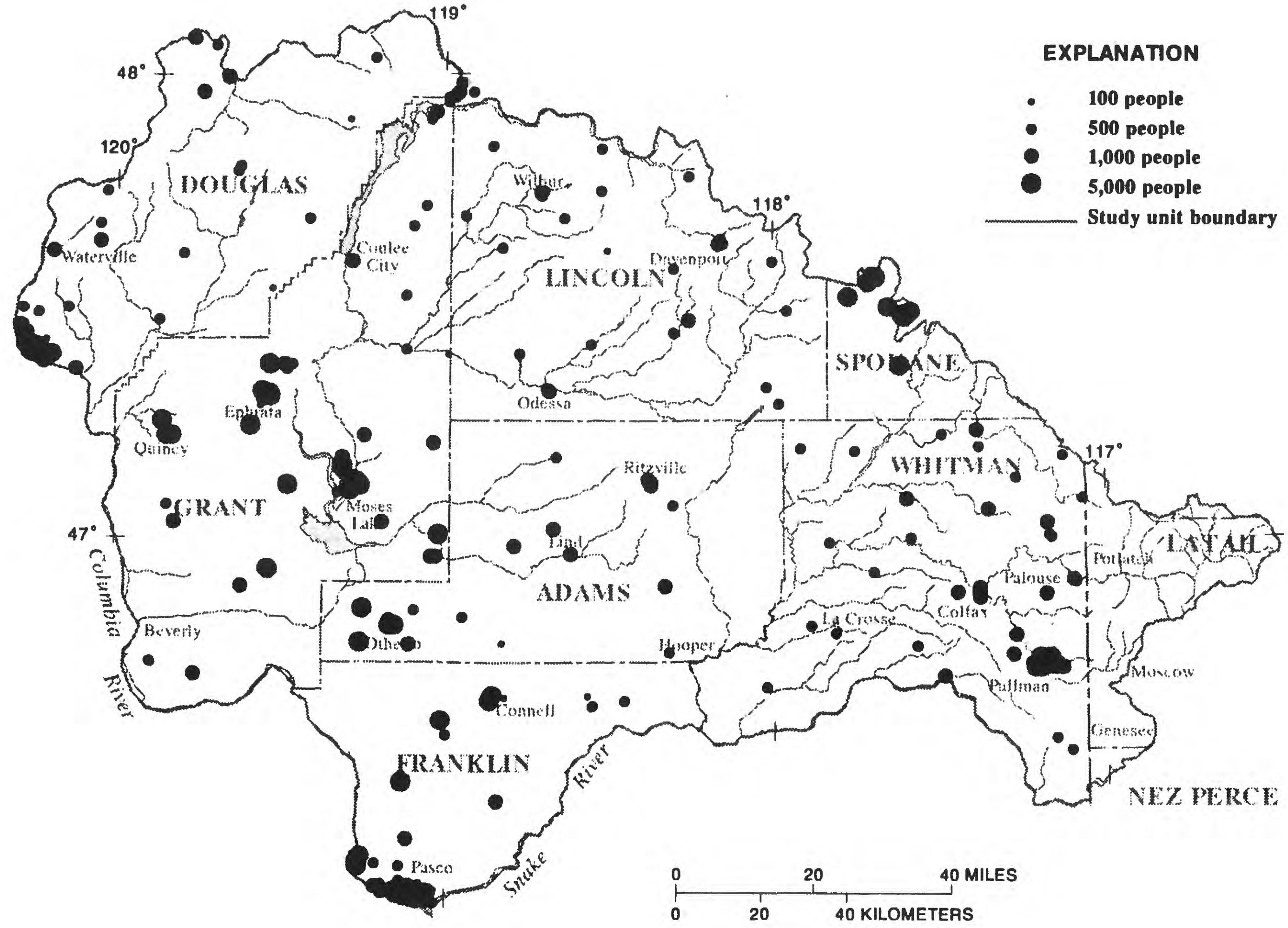


Figure 4. Population in the Central Columbia Plateau study unit. Data are from the 1985 Census (U.S. Department of Commerce, 1985).

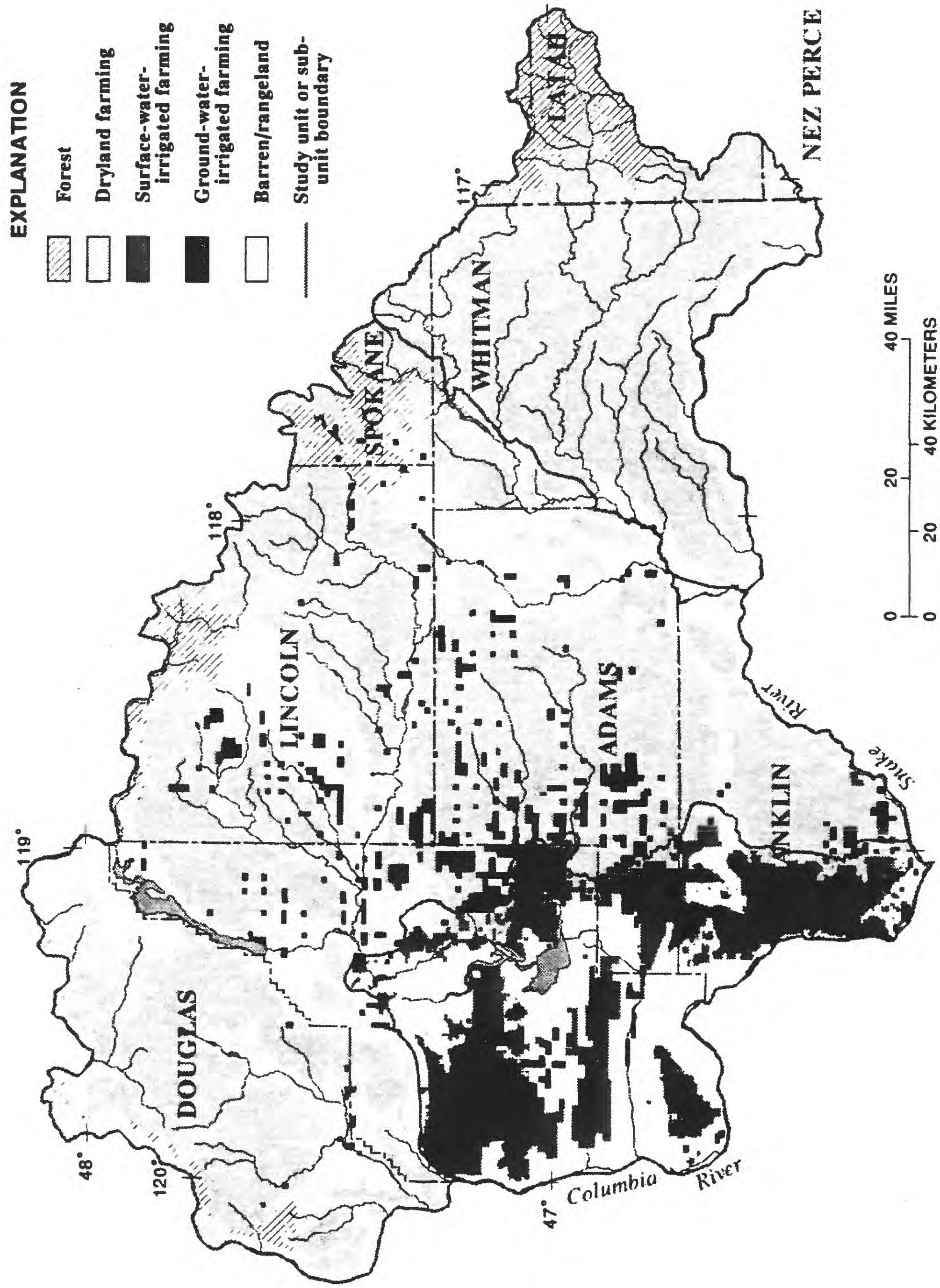


Figure 5. Land uses in the Central Columbia Plateau study unit.

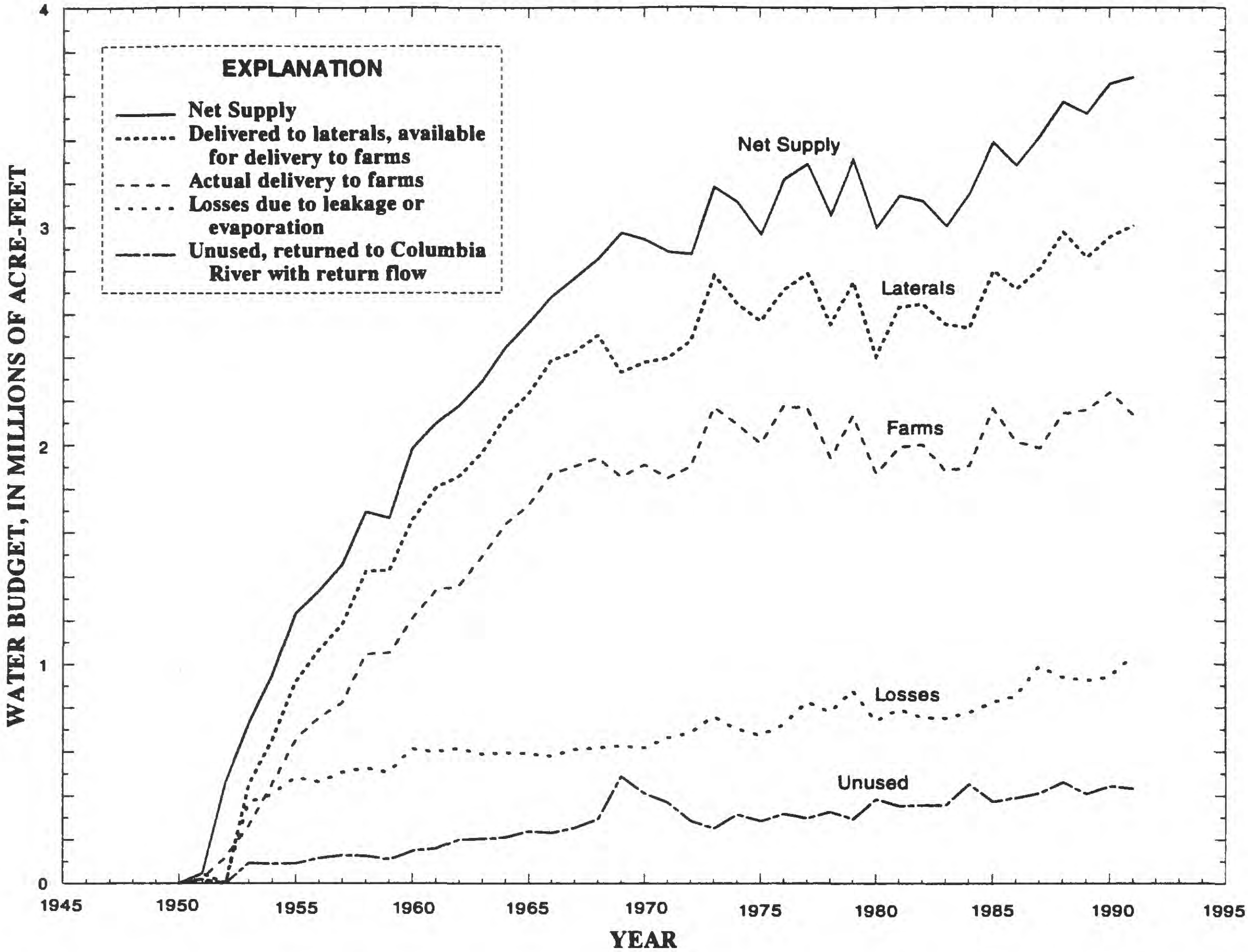


Figure 6. Surface-water budget for the Columbia Basin Irrigation Project, 1950–1990.

Table 1.--*Ground-water pumpage in the Central Columbia Plateau study unit, 1984*

		Pumpage, in acre-feet				
		Basalt units			Surficial unit	
County	State	Grande Ronde	Wanapum	Saddle Mountains	Overburden	Total
Adams	WA	81,050	51,700	100	0	132,850
Douglas	WA	2,840	0	0	0	2,840
Franklin	WA	5,810	22,940	3,800	62,950	95,500
Grant	WA	50,610	100,360	0	74,940	225,910
Lincoln	WA	33,470	16,230	0	0	49,700
Whitman	WA	6,550	730	0	0	7,280
Spokane	WA	2,000	2,175	0	0	4,175
Latah	ID	2,990	100	0	0	3,000
Total		185,320	194,235	3,900	137,890	521,255

crops) grown in small amounts on the remaining 14 percent (table 2). Approximately 500 additional square miles in the central and western parts of the study unit are irrigated by ground water, mostly to grow wheat (63 percent of ground-water irrigated acres) but also to grow some of the same crops--though fewer specialty crops--as those grown in the surface-water irrigated areas (table 2).

Dryland (non-irrigated) farming covers the remaining agricultural lands--nearly all of the Palouse River Basin and large parts of the central and northern areas of the study unit. Crops are not as diverse as they are on the irrigated lands. Wheat, peas, lentils (beans), barley, and some grasses are planted on a rotating schedule in the Palouse Basin, and wheat is predominant in the central and northern areas.

Wheat and grains are the largest crop in each county (fig. 7, table 3). In Grant and Franklin Counties, which include most of the CBIP, the second largest crop is alfalfa, and several other crops are grown in significant acreages. In Whitman County, peas and lentils (labeled field crops in fig. 7) are the only crops in addition to wheat and barley grown in significant acreages. In the remaining counties, wheat is by far the dominant crop.

Nitrogen and phosphorus compounds commonly are applied to agricultural lands. The highest annual applications of nitrogen and phosphorous fertilizers are in Grant, Franklin, and Whitman Counties (fig. 8, table 4). These estimates are based on fertilizer-expenditure figures from the 1987 Census of Agriculture (Jerald Fletcher, West Virginia University, written commun., 1991).

Pesticides, including herbicides, insecticides, and fungicides, also are applied to control the growth of unwanted plants and to kill crop-injuring fungi and invertebrates above and below ground. Herbicides and fungicides are applied to crops and to a much smaller extent along transportation rights-of-way and in and along canals. Insecticides are applied on crops and in agricultural soils. A wide variety of chemicals are currently being used (Karen Greene, U.S. Geological Survey,

Table 2.--*Summary of crops grown by ground- and surface-water irrigation and dryland farming in the Central Columbia Plateau study unit (Jerald Fletcher, West Virginia University, written commun., 1993; Van Metre and Seevers 1991)*

[--, not available]

	Ground-water irrigation		Surface-water irrigation		Dryland farming		Crop total	
Crop	Acreage	Percent	Acreage	Percent	Acreage	Percent	Acreage	Percent
Alfalfa	26,700	8.5	170,056	29.8	--	--	196,756	5.4
Asparagus	--	--	15,080	2.6	--	--	15,080	0.414
Beans	--	--	48,024	8.4	269,700	9.773	317,720	8.716
Corn	57,300	18.2	63,220	11.1	--	--	120,520	3.306
Mint	300	0.1	11,948	2.1	--	--	12,248	0.336
Orchard/ Vineyard	--	--	34,614	6.1	--	--	34,614	0.950
Other crop	4,000	1.3	30,508	5.3	--	--	34,508	0.947
Pasture		--	16,008	2.8	--	--	16,008	0.439
Peas	5,700	1.8	16,820	2.9	31,400	1.136	53,880	1.478
Potatoes	24,300	7.7	57,420	10.1	--	--	81,720	2.242
Wheat/ other grains	197,000	62.5	106,604	18.7	2,458,600	89.091	2,762,228	75.775
Total	315,300	100.1	570,302	99.9	2,759,700	100.000	3,645,282	100.000

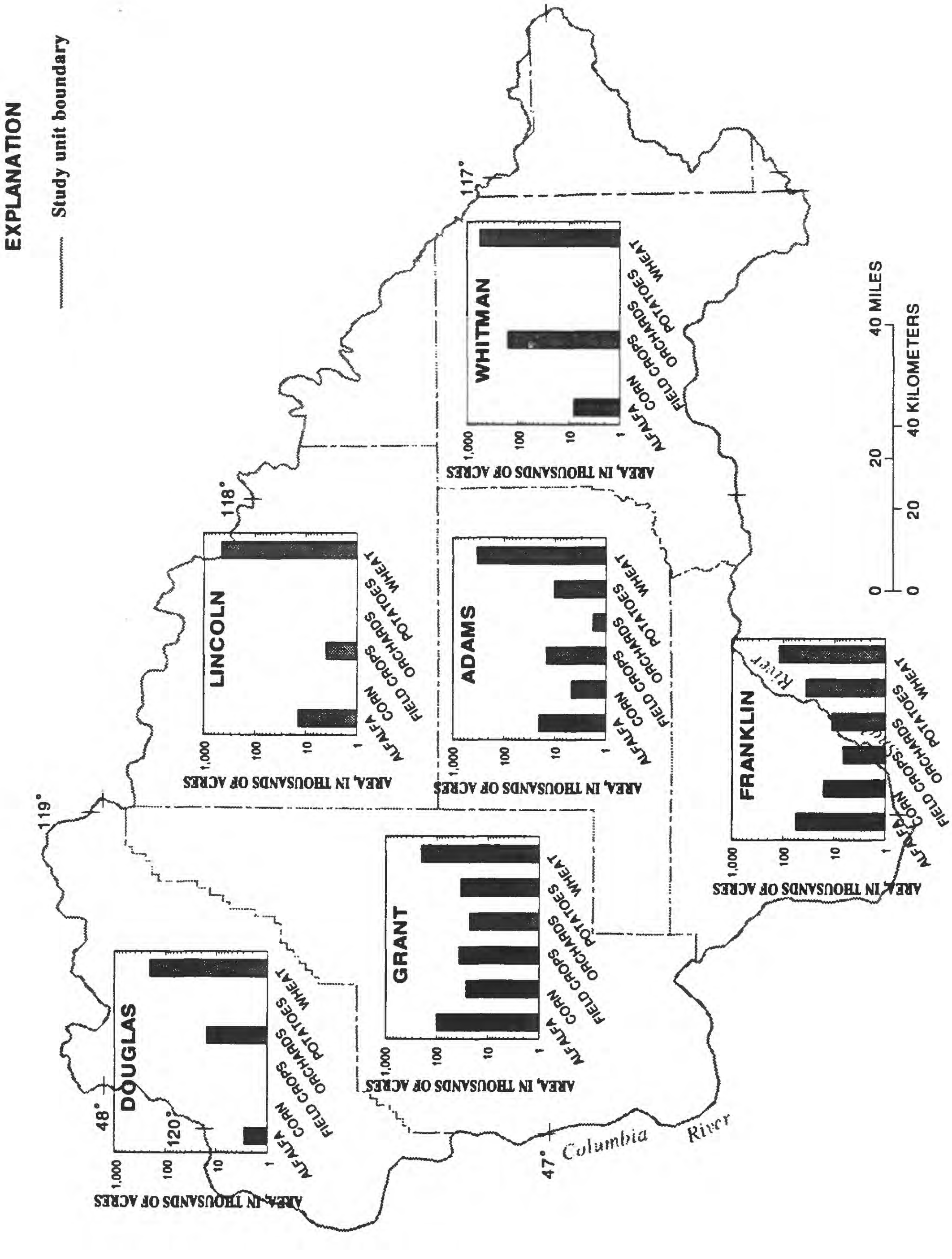


Figure 7. Predominant crop types, by county, in the Central Columbia Plateau study unit.

Table 3.--*Summary of acreages, by county, of crop categories and individual crops in the Central Columbia Plateau study unit (Jerald Fletcher, West Virginia University, written commun., 1993)*
[Values are in acres]

Crop category	Crop	Quincy-Pasco Franklin	Quincy-Pasco Grant	North-Central Adams*	North-Central Douglas	North-Central Lincoln	Palouse Whitman	Total
Alfalfa	Alfalfa	57,169	102,247	20,754	2,822	14,285	7,091	204,368
Corn	Corn	16,500	27,910	4,871	0	0	0	49,281
Field Crops	Dry beans	0	19,872	4,420	0	525	62,943	87,760
	Dry peas	1,953	7,195	5,324	0	1,135	71,733	87,340
	Mint	0	2,896	0	0	0	0	2,896
	Seed crops	4,939	7,936	5,182	0	2,373	3,449	23,879
	Field Crop Total	6,892	37,899	14,926	0	4,033	138,125	210,875
Potatoes	Potatoes	36,096	33,003	10,658	0	0	0	79,757
Other Hay	Other Hay	2,959	7,460	2,604	2,867	11,193	5,906	32,989
Orchard	Apples	5,763	18,306	1,749	12,569	0	73	38,460
	Cherries	1,351	1,319	38	1,074	0	0	3,782
	Grapes	3,722	1,047	0	0	0	0	4,769
	Peaches	242	264	15	230	0	0	751
	Pears	187	676	0	918	0	11	1,792
	Plums	70	71	0	25	0	3	169
	Orchard Total	11,335	21,683	1,802	14,816	0	87	49,723
Vegetables	Asparagus	10,225	1,953	306	0	0	0	12,484
	Carrots	1,554	1,184	0	0	0	0	2,738
	Green Beans	2,905	63	0	0	0	0	2,968
	Onions	127	2,434	619	0	0	0	3,180
	Peas	224	1,486	310	0	0	6,728	8,748
	Squash	0	8	0	0	0	0	8
	Sweet Corn	5,617	15,368	0	0	0	0	20,985
	Vegetable Total	20,652	22,496	1,235	0	0	6,728	51,111
Wheat	Barley	11,119	23,279	37,942	12,124	129,675	182,135	396,274
	Oats	291	2,356	1,892	3,907	1,619	1,020	11,085
	Wheat	112,290	175,845	303,379	185,258	316,350	389,317	1,482,439
	Wheat Total	123,700	201,480	343,213	201,289	447,644	572,472	1,889,798
	Total Cropland	275,303	454,178	400,063	221,794	477,155	730,409	2,558,902
Pasture + range land		210,700	561,900	340,300	427,100	448,100	267,900	1,483,400

* Part of Adams County is in the Quincy-Pasco Subunit, but it is included in the North-Central Subunit for comparison.

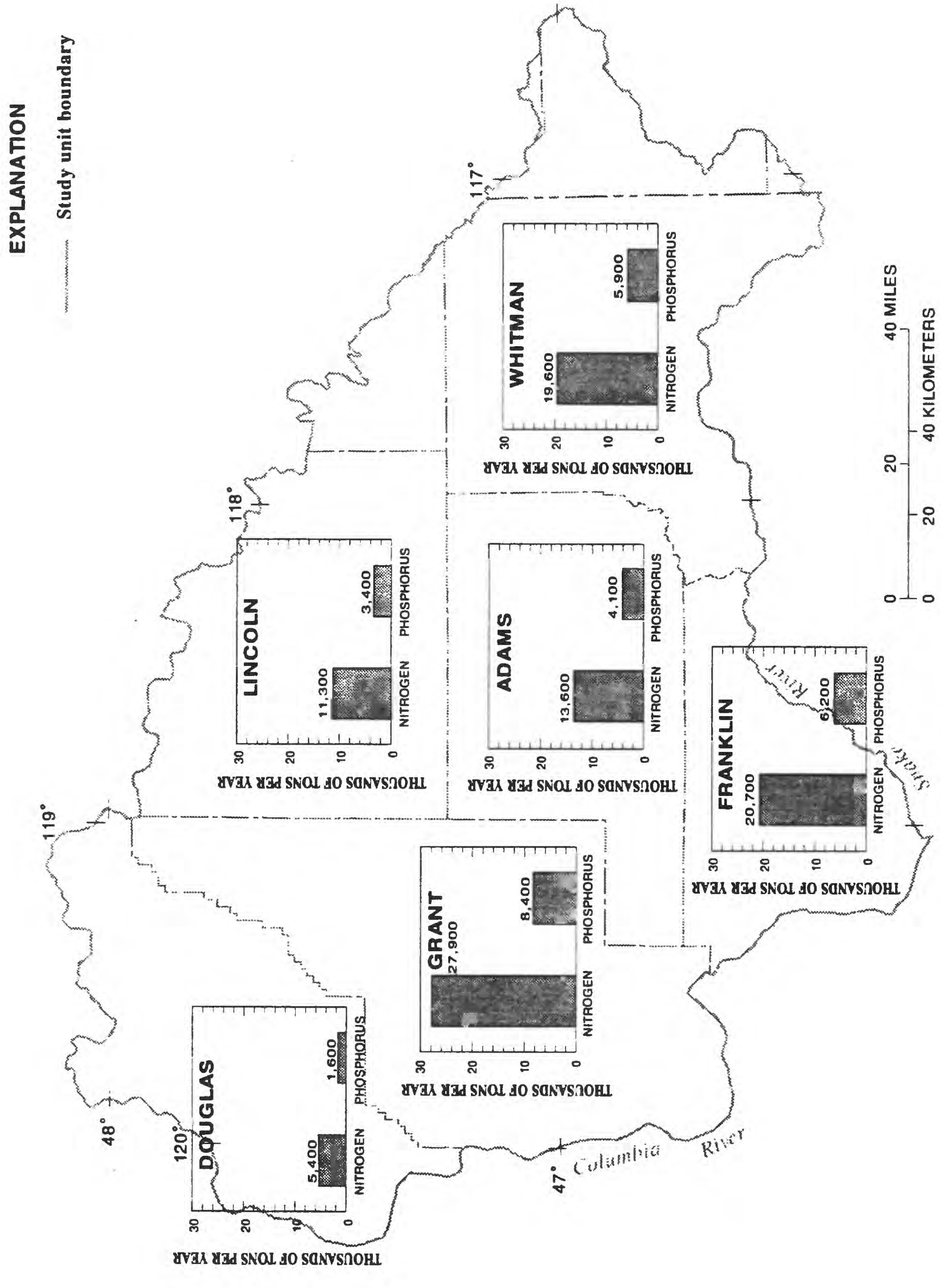


Figure 8. Rate of nutrient application, by county, in the Central Columbia Plateau study unit.

Table 4.--*Total nitrogen and phosphorus purchased and estimated applications as fertilizer in the Central Columbia Plateau study unit (Jerald Fletcher, West Virginia University, written commun., 1991)*
[N, nitrogen; P, phosphorus; lb/acre, pounds per acre]

Subunit	County[1]	Crop land acreage	Total nitrogen (tons as N)	Applied nitrogen (lb/acre)[2]	Total phosphorus (tons as P)	Applied phosphorus (lb/acre)[2]
Quincy-Pasco	Franklin	275,000	20,700	151	2,700	20
	Grant	464,000	27,900	120	3,700	16
(subunit)		739,000	48,600	132	6,400	17
North-Central	Adams	400,000	13,600	68	1,800	9
	Douglas	222,000	5,400	49	700	6
	Lincoln	477,000	11,300	47	1,500	6
(subunit)		1,099,000	30,300	55	4,000	7
Palouse	Whitman	732,000	19,600	54	2,600	7
(subunit)		732,000	19,600	54	2,600	7
Study unit		2,570,000	98,500	77	13,000	10

[1] Part of Adams County is in the Quincy-Pasco subunit.
[2] Fertilizers purchased in any county might be applied outside of that county.

written commun., 1993; table 5), and many more are no longer in use but may remain in the soil and ground water as residuals.

The herbicides currently used in the largest quantities are EPTC, 2,4-D, and 2,4-DB (table 5). EPTC is applied to potatoes (more than 110,000 lbs/yr, table 5), alfalfa (more than 60,000 lbs/yr), corn (more than 50,000 lbs/yr), vegetables (more than 20,000 lbs/yr), and other field crops (almost 80,000 lbs/yr). The herbicide 2,4-D is applied to wheat (more than 240,000 lbs/yr) and, to a much smaller extent, pasture (almost 60,000 lbs/yr), corn, vegetables, other field crops, alfalfa, and orchards (all between 2,000 and 6,000 lbs/yr). The highest rates (as opposed to total amounts) of herbicide application are to corn and potatoes (table 6). Application rates are based on estimated crop acreages from the 1987 Census of Agriculture and on regional estimates of herbicide applications for each crop type from the National Agricultural Statistics Service, a part of the U.S. Department of Agriculture (Gianessi and Puffer, 1991).

The insecticides used in the largest quantities are disulfoton, azinphos-methyl, chlorpyrifos, ethoprop, methamidophos, and phorate (Karen Greene, U.S. Geological Survey, written commun., 1993; table 5). Disulfoton is applied primarily to potatoes (more than 80,000 lbs/yr, table 5), and wheat (more than 50,000 lbs/yr). Azinphos-methyl and chlorpyrifos are applied primarily to orchards (almost 90,000 and almost 60,000 lbs/yr, respectively), and ethoprop, methamidophos, and phorate are applied exclusively to potatoes (around 80,000 lbs/yr each). Insecticides are applied at the highest rates to orchards. Application estimates for insecticides and fungicides are prorated from State usage rates (Mike Majewski, U.S. Geological Survey, written commun., 1992).

The fungicides used in the largest quantities are sulfur, thiabendazole, benomyl, mancozeb, ziram, and iprodione (Karen Greene, U.S. Geological Survey, written commun., 1993; table 5). Sulfur is applied primarily to orchards (almost 90,000 lbs/yr), thiabendazole and benomyl to wheat (both around 70,000 lbs/yr), mancozeb to potatoes (more than 40,000 lbs/yr), ziram to orchards

Table 5.--*Total usage of six common herbicides, insecticides, and fungicides on selected crops in the Central Columbia Plateau study unit*

[--, not available; values are in pounds of active ingredient per year]

			HERBICIDES			
Crop	EPTC	2,4-D	2,4-DB	Terbutryn	Triallate	Bromoxynil
Wheat	--	241,968	144,907	88,945	71,329	79,763
Alfalfa	61,310	3,300	--	--	--	2,044
Field crops	78,982	4,178	2,839	--	10,918	36
Potatoes	113,702	--	--	--	--	--
Vegetables	20,608	4,269	372	--	--	344
Orchard	--	2,195	--	--	--	--
Corn	50,267	5,913	--	--	--	--
Pasture	--	56,403	--	--	--	--

			INSECTICIDES			
Crop	Disolfoton	Azinphos-methyl	Chlorpyrifos	Ethoprop	Methami-dophos	Phorate
Wheat	53,746	--	--	--	--	--
Alfalfa	--	--	6,130	--	--	--
Field crops	--	--	2,854	--	--	--
Potatoes	81,097	3,190	--	82,947	77,165	76,471
Vegetables	--	477	19,330	--	--	--
Orchard	382	88,732	59,332	--	--	--
Corn	--	--	4,066	--	--	--
Pasture	--	--	--	--	--	--

			FUNGICIDES			
Crop	Sulfur	Thiabendazole	Benomyl	Mancozeb	Ziram	Iprodione
Wheat	--	73,381	66,710	--	--	--
Alfalfa	--	--	--	--	--	--
Field crops	--	--	--	--	--	--
Potatoes	21,247	--	--	46,227	--	22,396
Vegetables	--	--	596	5,134	--	1,618
Orchard	88,800	--	--	9,343	44,713	3,971
Corn	--	--	--	--	--	--
Pasture	--	--	--	--	--	--

Table 6.--*Quantities of pesticides applied to crops in the Central Columbia Plateau study unit (Gianessi and Puffer, 1991, 1992a, and 1992b)*
[lb/acre/yr, pounds per acre per year; lb/yr, pounds per year]

Crop category	Acres of crop land	Fungicides (lb/acre/yr)	Fungicides (lb/yr)	Herbicides (lb/acre/yr)	Herbicides (lb/yr)	Insecticides (lb/acre/yr)	Insecticides (lb/yr)	All pesticides (lb/acre/yr)	All pesticides (lb/yr)
Orchards	50,000	3.7	186,900	1.1	53,800	6.0	29,500	11	540,200
Potatoes	80,000	1.7	138,100	2.2	178,700	4.7	374,000	8.6	690,800
Vegetables	51,000	0.2	9,700	2.0	103,000	1.2	62,300	3.4	175,000
Field corn	49,000	0	0	2.6	127,400	0.1	4,600	2.7	132,000
Other field crops	213,000	0.0005	100	1.3	278,000	0.3	68,600	1.6	346,700
Alafalfa	204,000	0	0	1.1	221,500	0.2	36,300	1.3	257,800
Wheat and grains	1,890,000	0.1	157,900	0.4	787,100	0.05	87,200	0.5	1,032,200

(more than 40,000 lbs/yr), and iprodione to potatoes (more than 20,000 lbs/yr). Fungicides are applied at the highest rates to orchards.

Geohydrologic Setting

The Central Columbia Plateau study unit is part of the extensive Columbia Plateau, which covers parts of Washington, Oregon, and Idaho and was formed by the extrusion of basaltic lava from 17.5 to 6 million years ago (Walters and Grolier, 1960, and Drost and Whiteman, 1986). The area is underlain by massive basalt flows with a composite thickness of about 16,000 ft near Pasco, Wash. Sedimentary deposits overlie the basalt over large areas (fig. 9). Tanaka and others (1974) list four major geologic events that influenced the lithology and structure in the study unit: extrusion of basaltic lavas during the Miocene and early Pliocene Epochs; tectonic deformation of the basalt flows during the Pliocene and early Pleistocene Epochs; lacustrine, fluviatile, and eolian deposition during the early Pleistocene Epoch; and glaciofluvial erosion and deposition during the late Pleistocene Epoch.

During and after the basalt extrusion, the plateau region warped into a broad basin. Several subbasins were formed locally by steep folding and faulting. Deposits of clay, silt, sand, and gravel accumulated in these subbasins by glaciofluvial action during the Pleistocene Epoch. The silt and sand deposits have been extensively reworked and continue to be reworked and shifted by wind action (Walters and Grolier, 1960). During the Pleistocene glaciation, Lake Missoula floodwaters stripped away the overlying sediments as well as some basalt, leaving behind deep canyons and coulees (Weis and Newman, 1973). Erosion is now considered to be the dominant geologic process affecting the area.

The basalts in the study unit have been named the Columbia River Basalt Group (CRBG). The youngest subgroup of these basalts is the Yakima Basalt Subgroup, which contains the aquifers that provide most of the ground water in the study unit. The Yakima Basalt Subgroup comprises (in ascending order) the Grand Ronde Basalt, The Wanapum Basalt, and the Saddle Mountains Basalt. Overlying the basalts are two areas of unconsolidated deposits: a complex layering of glaciofluvial deposits in the western and central areas--primarily in the Quincy and Pasco Basins, and loess in the Palouse drainage (fig. 9). The overburden in the Quincy and Pasco Basins is composed of alternating layers of coarse- and fine-grained deposits that make up four geologic units--the Pasco Gravels, the Touchet Beds, the Ringold Formation, and undifferentiated glaciofluvial deposits (Brian W. Drost, U.S. Geological Survey, oral commun., 1993). The Pasco gravels occur in significant thickness only in the Pasco Basin, and the Touchet Beds are not known to occur in significant thicknesses in the study unit. The Ringold Formation, discussed in detail below, is overlain by glaciofluvial deposits in the Quincy Basin.

Aquifers in the Study Unit

The three aquifer systems identified for this study unit are the Yakima aquifer system, comprising the Yakima Basalt Subgroup; the Ringold aquifer, comprising

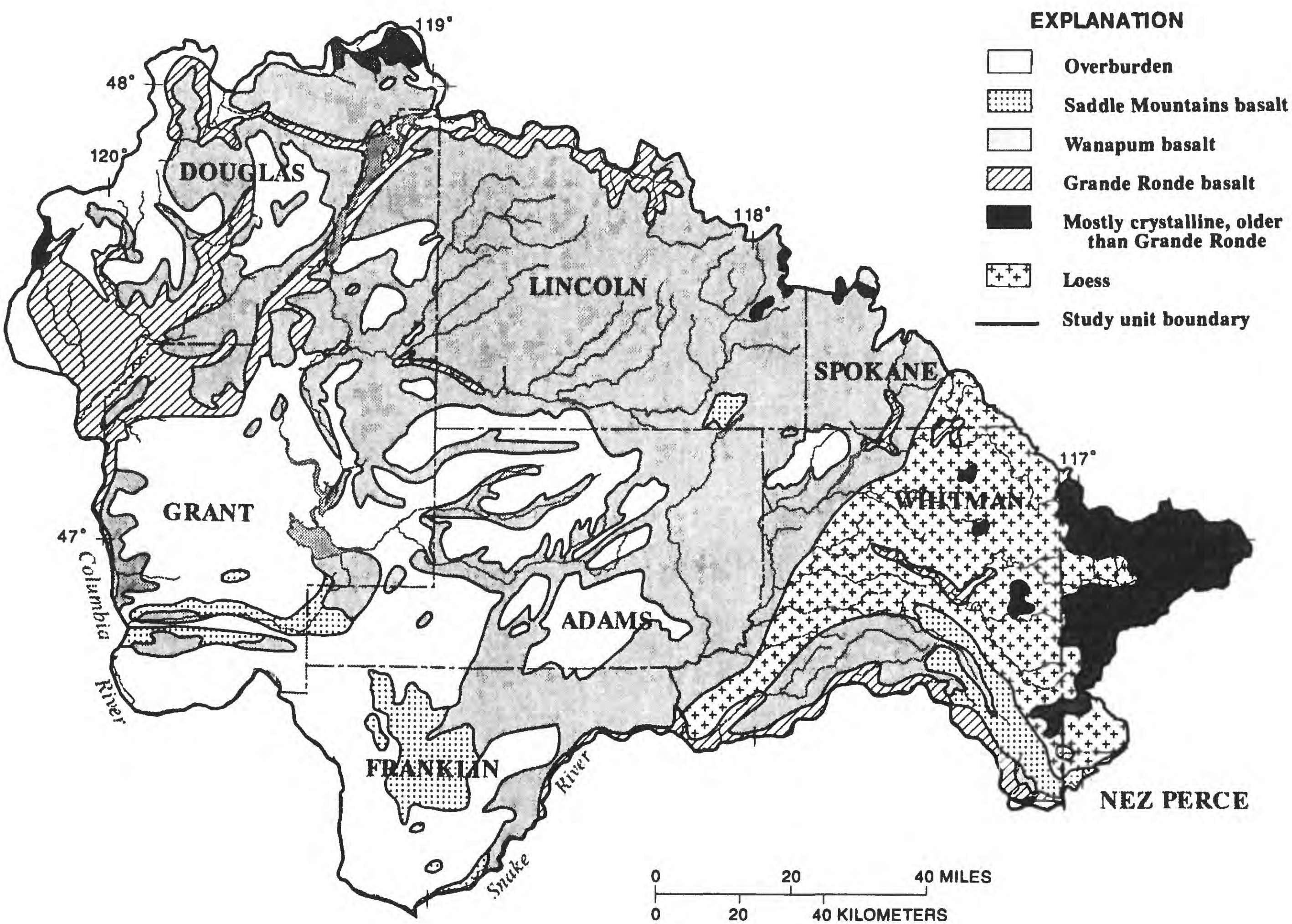


Figure 9. Surficial geology of the Central Columbia Plateau study unit. (Modified from Drost and Whiteman, 1986)

the overburden of the Quincy and Pasco Basins; and the loess aquifer, comprising the overburden of the Palouse Basin. The Yakima aquifer system, the primary source of ground water in the study unit, has the largest saturated thickness of the three and is the most extensive. The Ringold aquifer is the least extensive of the three but is a significant source of ground water. The loess aquifer is more extensive areally than the Ringold aquifer but has a relatively small saturated thickness and is not widely used as a ground-water source.

Yakima Basalt Aquifer System

Tanaka and others (1974) describe the CRBG, including the Yakima Basalt Subgroup, as a thick sequence of generally permeable basalt flows, which under favorable conditions are capable of yielding large quantities of water (usually greater than 75 gallons per minute) to wells. The generally permeable conditions in the top parts of the basaltic flows are attributed to the presence of cinders and rubble and to the existence of vesicular cavities connected by joints and cracks. The lower parts of the basalt flows are permeable in areas where irregular openings are present and in places where the lava was deposited in water, forming a characteristic pillow-like broken zone (Tanaka and others, 1974). Together, the permeable top of an underlying basalt layer and the permeable base of an overlying one form an interflow zone, which is where most of the horizontal ground-water flow takes place. The basalt between interflow zones is much less permeable, and the movement of water is mainly restricted to vertical flow through joints and cracks formed as the mass shrank during cooling processes.

Ringold Aquifer

The Ringold Formation occurs in the western and central parts of the study unit and pinches out eastward in the Palouse River and upper Crab Creek Basins. It comprises layers of sand and silt, laminated clay and silt, and conglomerate. The sand-and-silt bed is most common in the southwest and is usually interbedded with the other Ringold Formation beds. The permeability of the sand-and-silt unit is relatively low. The laminated-clay-and-silt beds, deposited by lakes, are largely confined to the deepest parts of the structural basins near Quincy and Pasco and make up most of the material overlying the basalt beneath the Royal Slope, which extends from near Othello west to the Columbia River. The permeability of the clay-and-silt layers is low. The conglomerate facies, formed by stream deposition, occur as lenses in the clay-and-silt and is limited to a small area near Pasco. It is more than 180 ft thick in an area about 10 mi north of Pasco, and thins out toward the east. During the late Pleistocene Epoch, large volumes of glacial meltwater from the north and east deposited well-sorted gravel and sand on top of the Ringold Formation in lower Crab Creek valley. The saturated thickness of these undifferentiated glacial deposits is greatest near Quincy, in lower Crab Creek valley, and in areas north and east of Pasco.

The Ringold aquifer receives large quantities of recharge from canal seepage and percolation of applied irrigation water (Drost and others, 1993). The water table is typically within 20 ft of land surface in the CBIP.

Loess Aquifer

Loess, a wind-blown deposit of generally unstratified silt-sized particles, was deposited by prevailing southwest winds over the study unit to depths ranging from about 20 in. to several hundred feet (Bain, 1985). These deposits are thickest in the eastern and central parts of the study unit, but they also occur in several places along the Columbia River near Quincy and in a few areas in the central part of the CBIP area (Bain, 1985; Tanaka and others, 1974). Although the loess aquifer is not a major producing aquifer, sufficient water is available for some livestock and domestic supplies.

In the Palouse region, public-supply wells, which are sampled as required by drinking water regulations, withdraw water from the basalt units underlying the loess. Some domestic wells are finished in the loess. Little is known about the quality of water in the loess and the effect that recharge through the loess may have on the quality of water in the underlying basalt units, because most of the wells finished in the loess are used for domestic purposes. Although public-supply wells are required to be sampled for compliance with drinking water regulations, domestic wells are not.

Ground-Water Flow Systems

In the regional flow system, ground water flows from the northeastern boundary of the study unit to the Columbia and Snake Rivers (figs. 10 and 11; Hearn and others, 1985). The regional flow paths reflect the regional hydraulic potential that is highest (more than 2,000 ft) along the northeastern boundary of the study unit and lowest (less than 500 ft) near the confluence of the Columbia and Snake Rivers (Lane and Whiteman, 1989). There is

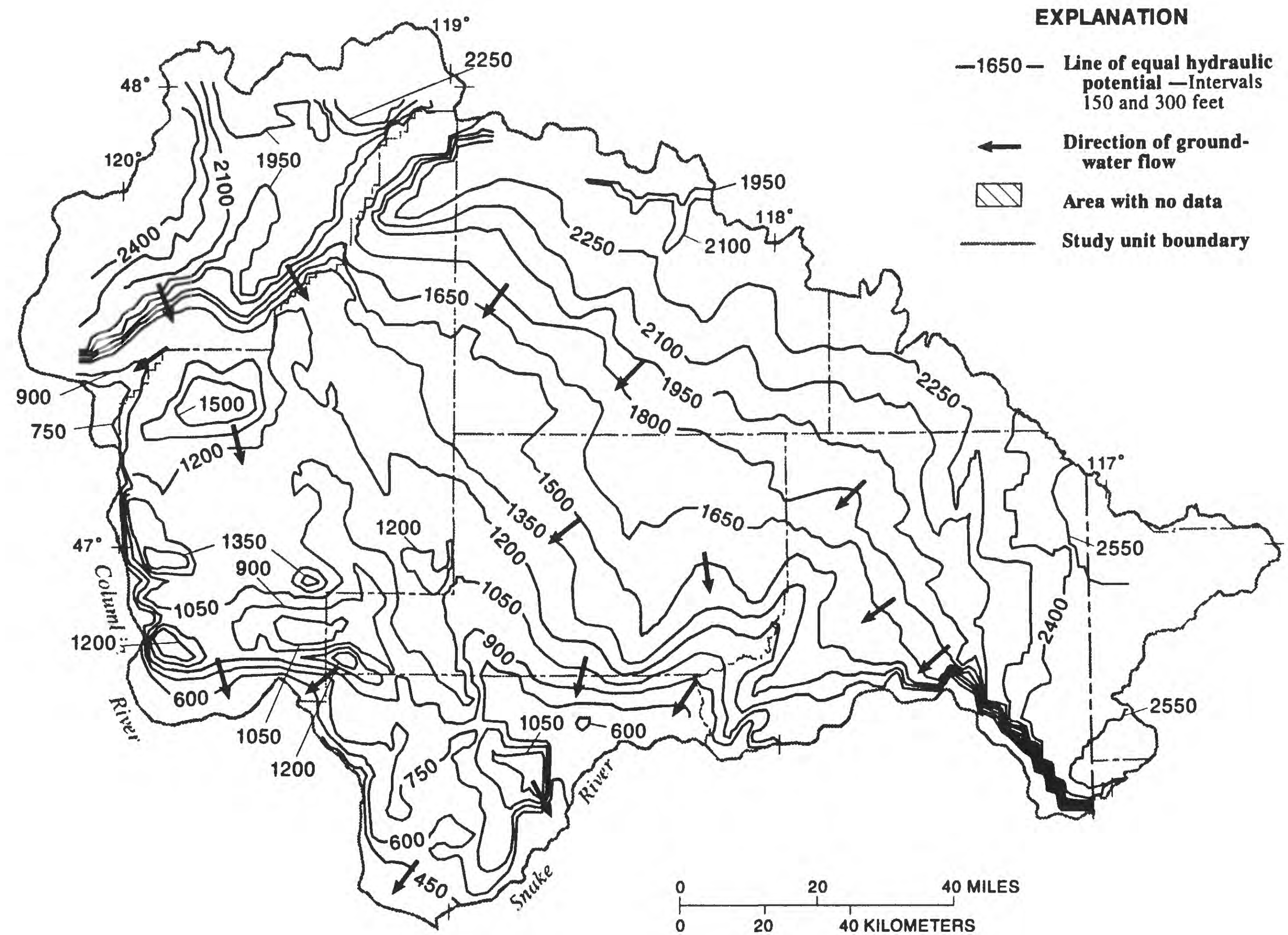


Figure 10. Generalized ground-water flow direction and regional hydraulic potential in the Central Columbia Plateau study unit, 1985.

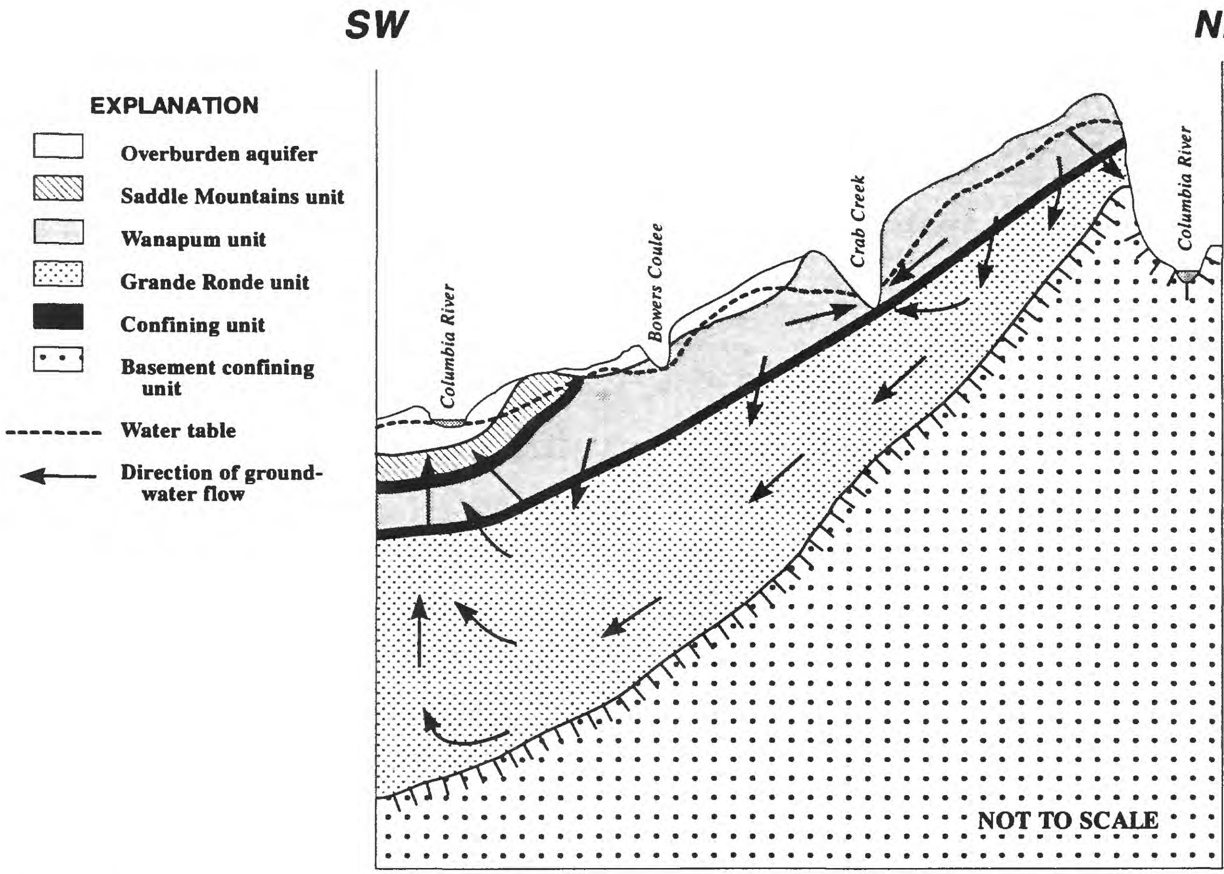


Figure 11. Generalized cross-sectional ground-water flow pattern for the aquifer system in the Central Columbia Plateau study unit.

also a notably high hydraulic potential along the northwestern extreme of Douglas County; this results from the higher elevations there and the increased precipitation that occurs at higher elevations. Because regional flow paths may extend to depths of hundreds or thousands of feet, and because the residence time of water travelling along them may reach tens of thousands of years, the quality of water along these flow paths is less likely to be affected by land use than by geochemical processes. Therefore, the water quality in these regional flow systems is not of primary interest when evaluating the effects of land use on ground-water quality. In addition, relatively few wells penetrate the deep regional system.

Intermediate-scale, or subregional, flow systems receive recharge at smaller scale highs in the regional hydraulic potential, such as that in northern Grant County, and discharge their water at smaller scale lows such as the lower Palouse River (fig. 10). Flow paths in these systems are shorter (tens of miles) and shallower (hundreds of feet) than those in regional systems and convey more water. Subregional systems are of interest because they provide the base flow for the larger perennial streams in the study unit. Additionally, many public-supply wells and irrigation wells withdraw water from ground-water flow systems of this scale, and domestic wells drilled near discharge areas also may intercept these flow paths. The water in these flow systems is therefore of particular interest in an assessment of ground-water quality.

Small-scale, or local, flow systems result from differences in hydraulic potential (which, in small-scale systems, are equivalent to differences in water-table altitude) that are not large enough to be shown in figure 10. Flow paths in these systems typically originate at ridges and hills and discharge a short distance away at creeks such as Crab Creek, Palouse River tributaries, and numerous valleys and coulees that occur throughout the central parts of the study unit. Flow paths in these systems are comparatively shallow (tens of feet) and short (thousands of feet), and residence times are on the order of tens of years. Because these systems are shallow, they are more easily affected by land-use changes; because they are short, changes are more quickly observed throughout the system. Thus, local systems best reveal the relations between land use and ground-water quality and will be the subject of subsequent investigations by the study team.

Recharge

Ground water in the study unit is recharged from precipitation and irrigation. Bauer and Vaccaro (1990) estimated recharge to vary across the study unit from less than 0.1 to more than 10 in. per year (fig. 12; Bauer and Vaccaro, 1990). Recharge estimates shown in figure 12 are average yearly amounts based on daily recharge values averaged over the period 1956-1977 (Bauer and Vaccaro, 1990); annual recharge from precipitation occurs in larger quantities some years and smaller quantities most years. The largest recharge is in the western part of the study unit because of the importation of irrigation water by the CBIP. The smallest recharge is due to low precipitation in the arid central part of the study unit where irrigation is minimal. Natural recharge quantities generally increase from west to east, primarily reflecting changes in precipitation and average temperature.

Recharging precipitation and irrigation water transport nutrients and pesticides applied to fields through the soil and unsaturated zone to an aquifer. In irrigated areas, dilution of such constituents in the shallow ground-water system can occur because of the seepage of relatively dilute waters in irrigation canals into the ground-water system. Recharge from canal seepage is significant--about 46 percent of the total recharge in the irrigated parts of Franklin County (Drost and others, 1993).

Depth to Water Table

Depth to water below land surface affects the development of local flow systems, recharge quantities, and in some cases, land use. Large depths to water over wide areas eliminate the possibility of a local flow system developing, simply because there must be a local discharge point where the water table intersects the land surface. Recharge is affected by evaporation as water percolates through varying thicknesses of unsaturated material. Deep ground water may be prohibitively expensive to withdraw for use in dry areas, and shallow ground water may result in swamps or bogs; in both cases, land uses may be limited. In addition, the large unsaturated zones existing above deep water tables may affect the chemical and biological processes affecting water quality.

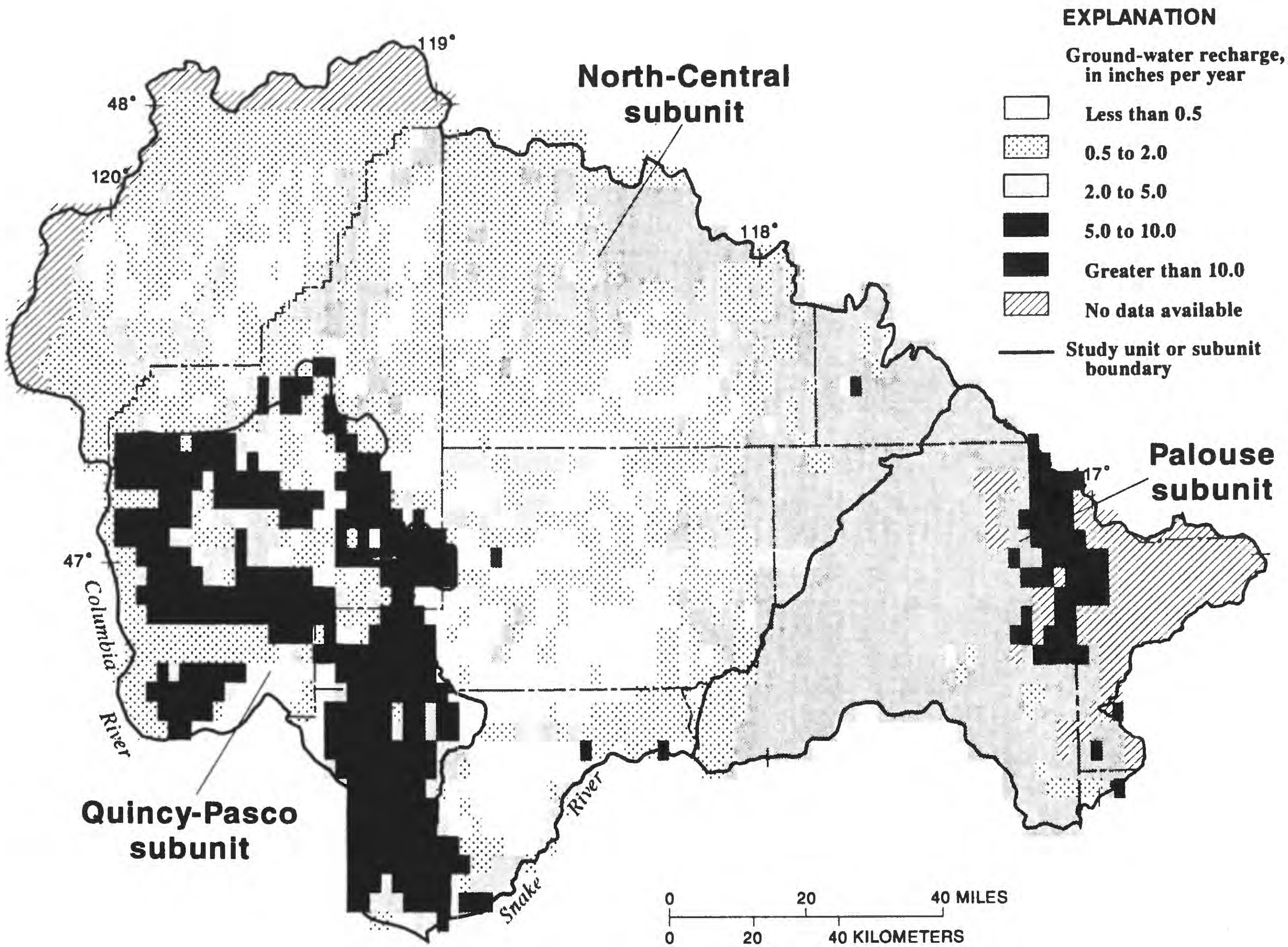


Figure 12. Mean annual regional ground-water recharge in the Central Columbia Plateau study unit, 1956–77.

In the Quincy and Pasco Basins, depth to water is generally less than 150 ft (fig. 13) and is less than 30 ft over large areas due to the large quantities of applied water in those areas. By contrast, depth to water is generally greater than 300 ft in Adams and Douglas Counties. In the rest of the study unit, depths to water vary locally.

The use of water for irrigated agriculture in the study unit has caused water levels to rise in areas where surface water has been imported for irrigation and to fall where ground water is being withdrawn for irrigation. In the Quincy and Pasco Basins, where CBIP water is applied in great quantities, water levels have increased by 150 ft in large areas (fig. 13) and up to several hundreds of feet in some localized areas. Water levels have risen to near land surface in some of these areas. Where the permeability of the underlying unconsolidated deposits is poor, large water application rates and low percolation rates result in water-logged soils. In many of these areas in the CBIP, subsurface drains have been installed 8 to 10 ft below ground to carry away this accumulated water (fig. 14). Along the Columbia River west of the Pasco Basin, the higher water table has resulted in the creation of numerous springs, some large. In this same area, landslides have been associated with the higher water-table elevation. Where large quantities of ground water are pumped for irrigation, particularly just east of the CBIP, ground-water levels have declined more than 100 ft in areas (fig. 13).

Study Unit Subunits

The Central Columbia Plateau study unit has been subdivided into the three subunits--the Quincy-Pasco subunit, the North-Central subunit, and the Palouse subunit--in order to aid in the analysis of the relation between observed ground-water quality and possible causative factors (fig. 5). This division into subunits facilitates the forming and testing of hypotheses about the processes that affect water quality. Furthermore, the use of subunits provides the opportunity to make comparisons on a national scale by allowing future investigators to study the results from similar subunits in different parts of the country.

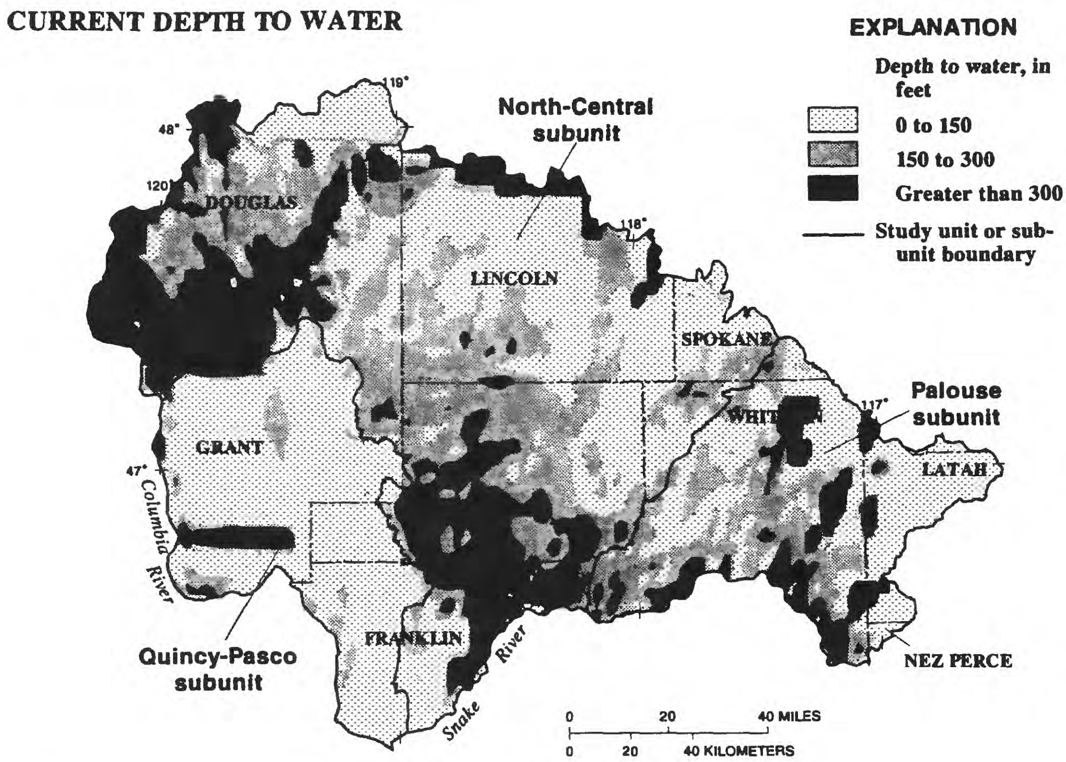
Each subunit has unique characteristics of climate, geology, hydrology, geohydrology, land use, and land cover. These characteristics are integrally related and may change only gradually across the study unit, thereby making it difficult to identify the key characteristics of each subunit. The interdependence of the characteristics is especially true for land use and land cover, which often relate directly to the type of soils present and the quantity of water available. In Lincoln County, for example, agriculture is impractical where soils have been scoured from the basalt bedrock and where there is little precipitation.

Quincy-Pasco Subunit

The Quincy-Pasco subunit is in the arid southwestern part of the study unit. Intensive agricultural development is the most visible characteristic of the subunit. Because the desert climate and northerly latitude provide long growing seasons with long days and the CBIP provides plentiful quantities of water for irrigation, a wide variety of crops are grown there. The subunit is underlain by thousands of feet of basalt with an overburden of unconsolidated materials ranging from coarse glaciofluvial deposits from the catastrophic Lake Missoula flooding to fine-grained lacustrine deposits. These deposits range in thickness from a few tens of feet up to several hundred feet. Few natural perennial streams exist in the subunit; of these, lower Crab Creek is the most notable. Depth to ground water is shallow--generally less than a few tens of feet. The topography is flat or gently rolling, but some prominent channels are cut into the basalt and unconsolidated materials.

Palouse Subunit

The Palouse subunit is located in the relatively wet eastern part of the study unit, including the entire Palouse River Basin except for the Cow Creek drainage. The area is mantled by loess and is noted for its rolling hills, which typically have less than 100 ft of relief. The subunit is farmed intensively, but not irrigated; the crops grown there are limited almost exclusively to winter and spring wheat, barley, peas, and lentils. The loess is a fine-grained unconsolidated deposit of material that was probably carried in by the prevailing westerly winds from old lacustrine deposits in the Quincy-Pasco subunit. The loess is as much as a few hundred feet thick, but is missing where some of the larger perennial streams have scoured it away. Basalt underlies the loess, except at the eastern extreme of the subunit where older granites occur. The depth to ground water ranges from zero near perennial streams to 50 to 100 ft. There are many perennial streams in the subunit, most of them in the Palouse River Basin and the rest draining small areas along the Snake River. The extreme eastern part of this subunit receives the most precipitation in the study unit, has thin or missing unconsolidated deposits over granitic bedrock, and is primarily forested rather than farmed.



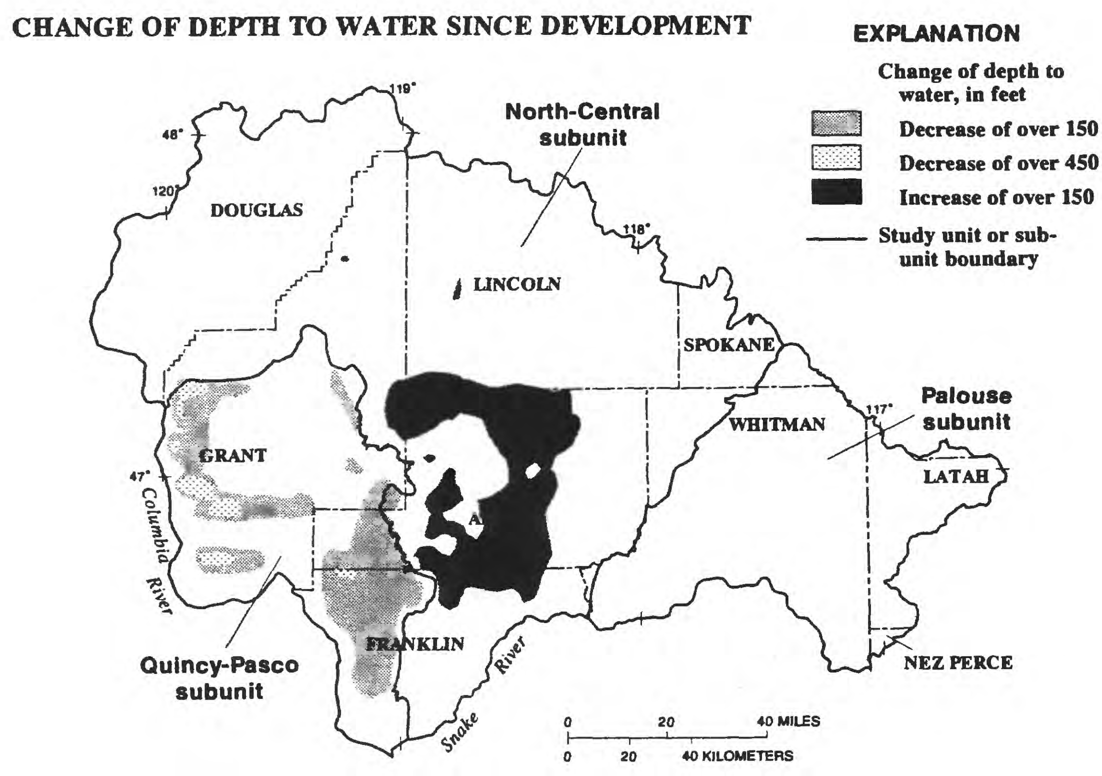


Figure 13. Water-table characteristics in the Central Columbia Plateau study unit.

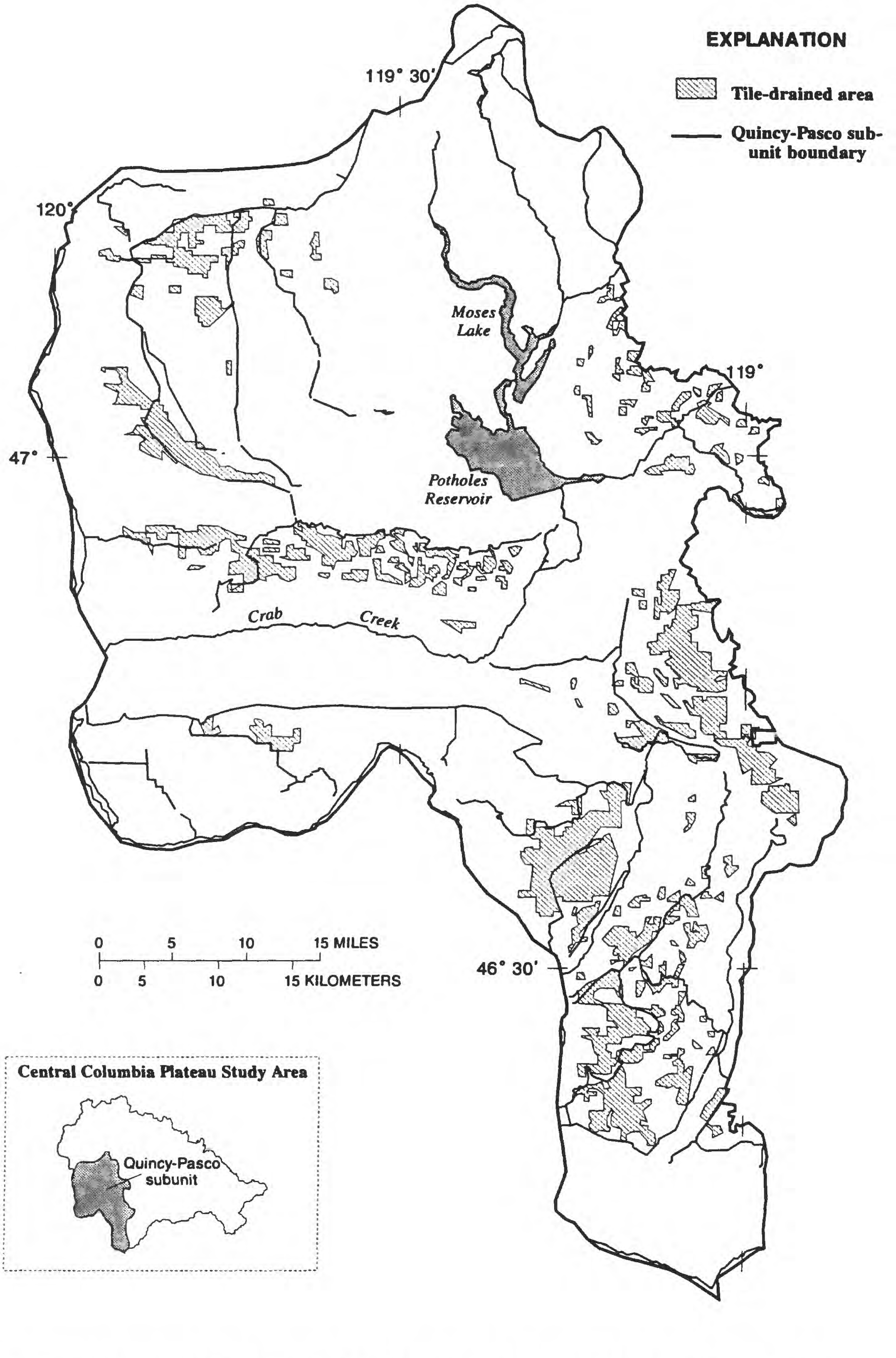


Figure 14. Tile-drained areas of the Columbia Basin Irrigation Project area in the Quincy-Pasco subunit. Data are from the U.S. Bureau of Reclamation.

North-Central Subunit

The North-Central subunit is best described by its lack of a uniform, unconsolidated surficial deposit. In this subunit, unconsolidated deposits have been scoured by wind and ancient floods so that basalt is at or near the surface in large areas. In the western part of the subunit, unconsolidated deposits are present but are thinner than similar deposits in the Quincy-Pasco subunit; in the eastern part, the unconsolidated deposits are thin or missing over large areas, but where they exist they are similar to those in the Palouse subunit. In the northern part of the subunit, unconsolidated deposits are typically thin or missing and support little agriculture.

The topography is more varied in this subunit than in the others. Douglas County has mountainous areas and scablands, Lincoln County is dominated by the Channeled Scablands, and Adams County has both scablands and rolling hills of loess. Depth to ground water varies more in this subunit than in the other two subunits. In southern Douglas, central Adams, and eastern Franklin Counties, depth to ground water is several hundred feet. In contrast, in the northern parts of Douglas, Grant, and Lincoln Counties the water table is at land surface in places, as demonstrated by the many ground-water fed lakes and springs that occur in these areas. However, the North-Central subunit is almost completely devoid of perennial streams; upper Crab Creek and a few small creeks that drain the higher elevations of Douglas County are the only perennial streams.

In the central and southern parts of the subunit, there is a significant amount of ground-water irrigated agriculture; corn and alfalfa are the predominant crops. Where there are sufficient thicknesses of loess in the central and eastern parts of the subunit, dryland agriculture is practiced, and wheat is the dominant crop. However, in the central part of the subunit, there is not sufficient precipitation to sustain yearly harvests; consequently, fields are left fallow for 1 or 2 years to allow soil moisture to return to acceptable levels. An additional effect of the low precipitation is that peas and lentils are not common in this subunit as they are in the Palouse subunit.

SOURCES AND GENERAL CHARACTERISTICS OF WATER-QUALITY DATA

Retrospective investigations are intended to aid in the planning of each NAWQA assessment by analyzing readily available ground-water-quality data in order to develop conceptual models of water-quality processes in the study unit and to identify significant gaps in data and understanding. This section describes the sources of nutrient and pesticide data that were considered, the reasons some data were not used, and the comparisons made between analysis methods. It also outlines the quality-assurance procedures that were used for the collection and analysis of water-quality samples.

Data Sources

Computerized data bases with remote access capability and documented, standardized data formats offer the most readily available data, and two were queried: the U.S. Geological Survey National Water Information System (NWIS), and the U.S. Environmental Protection Agency (USEPA) Storage and Retrieval (STORET) data base. Fifty-two ground-water sites were retrieved from the STORET data base, 45 of which had water-quality data but were not included in the final data analysis because there was no well-construction information. Data from 8,120 ground-water sites were retrieved from the NWIS data base, 858 of which had water-quality data, table 13, located at the end of the report). These sites constitute the primary data set for the study.

Data were also obtained from the data bases of two State agencies: the State of Washington Department of Ecology (Ecology) and the State of Washington Department of Health (WDOH). The Ecology data include 56 sites with pesticide data. Two sets of data were available from the WDOH: a nitrate data base and a volatile organic chemical (VOC) data base. Neither of the WDOH data sets included information on well construction or location.

Because of the large size of the nitrate data set (approximately 1,600 measurements of nitrate concentration from 647 sites), these data were analyzed despite the lack of well-construction and location information; however, they were analyzed separately as a qualitative check on the results derived from the NWIS data set. The WDOH VOC data set, with samples from 309 public-supply wells, was subject to the same limitations as the nitrate data set. Only four of the VOCs analyzed by WDOH are known to be used as pesticides in the study unit; however, others may be used as adjuvants in pesticide mixtures. The WDOH data for VOCs are discussed with the Ecology and USGS pesticide data presented later in this report, but only those considered pesticides are included.

Data Screening

Screening procedures were used to verify the integrity of the data. The data were reviewed for completeness of well-construction and location information. All data were reviewed for errors that may have been made during data processing, such as incorrectly recording concentration units or values. Unusually high values were checked against the original analytical report.

Data Comparability

In many cases, the processing and analysis of a ground-water-quality sample by different studies differed in fairly minor ways. For example, analysis of nitrate plus nitrite by one study may have been made on a filtered sample, and in another study analyzed on unfiltered samples. Because nitrate and nitrite have traditionally been analyzed using the same techniques for "total" and "dissolved" constituents, there should be little difference between concentrations in filtered and unfiltered samples (Charles Patton, U.S. Geological Survey, written commun., 1994). In order to maximize the amount of data available for analysis, comparisons were made between similar water-quality data by selecting samples that had both filtered and unfiltered samples and plotting them together. Comparisons were made for nitrate plus nitrite (filtered) and nitrate plus nitrite (unfiltered); phosphorous (unfiltered) and orthophosphate (unfiltered); and phosphorous (unfiltered) and orthophosphate (filtered). The comparisons indicated that only filtered and unfiltered nitrate plus nitrite types of determinations were comparable. Values from filtered samples were more numerous, and in cases where both types of values were available, the one from the filtered sample was used for analysis.

Data Quality-Assurance

Quality-assurance (QA) plans are developed to ensure that the analytical methods yield accurate results and that sample collection and processing procedures do not contaminate samples in the field or laboratory. Laboratory QA plans consist of quality-control procedures such as calibrating instruments, analyzing solutions that are free of analyte(s) (blanks), and analyzing solutions containing known concentrations of analytes (spikes). Prior to October 1, 1978, nutrient samples were analyzed at the USGS District laboratory in Tacoma, Wash., and after that date they were analyzed at the USGS National Water Quality Laboratory in Arvada, Colo. Further details on changes in USGS laboratory procedures are documented in a companion report by Karen E. Greene and others, "Nutrients, Suspended Sediment, and Pesticides in Streams and Irrigation Systems in the Central Columbia Plateau in Washington and Idaho, 1959-1991."

Field quality-assurance techniques for most of the samples include: sampling as near to the well head as possible, filtering in the field, and chilling nutrient samples. USGS ground-water samples were generally collected using these techniques. Beginning October 1, 1980, the technique for preserving USGS nutrient samples was expanded to include treatment with mercuric chloride. Adding mercuric chloride to a chilled sample improves the stability of nitrate and prevents the biological conversion to other forms of nitrogen. Prior to the use of preservatives (1980), samples were chilled and generally analyzed within 7 days. Reported nitrate concentrations for these samples could be lower than concentrations present in ground water due to biological action. Field QA plans for the USGS recently have been expanded to provide checks on the collection and processing of samples in the field. These plans include submitting standards, blanks, and replicate samples to the laboratory in order to identify possible contamination of samples in the field and to provide a second check on the performance of the laboratory. Laboratory and field QA plans were in effect for most of the nutrient samples and all of the pesticide samples reported on in this assessment.

Distribution of Data

Distribution of data for an analyte--by subunit, depth of sample, water use, and time--is important because gaps may interfere with the detection and description of water-quality patterns. Good distribution by location may reveal areal patterns. Good distribution by depth may reveal changes in water quality that have resulted from changes in land use. Good distribution through time may reveal trends. Finally, it is important for there to be good distribution of data by other variables, such as water-use type, which would allow a survey of drinking water quality. This section describes the distributions of nitrate, orthophosphate, and pesticide data with respect to these variables.

There are more wells with water-quality data in the Quincy-Pasco subunit than in the North-Central subunit, or the Palouse subunit (table 7). This results from the fact that water-quality sampling programs are usually designed to focus on a particular locale, and it reflects to some degree the level of concern about water quality and the quantity of ground water used in each of these areas.

Most of the wells with water-quality information had open boreholes (no casing) or no information stored about types of openings (more than 350 wells in each case). About 100 wells had screens, perforations, or similar openings. The range of the openings, which is the distance from the top of the first opening to the bottom of the last opening, is different for the three well types. Wells with no opening information are not classified by range. About 100 open-hole wells have a range of 0-100 ft, and progressively fewer for longer open intervals. This simply reflects the tendency for wells finished in basalt to be open wells; the deeper they are drilled, the greater the length of open interval, and consequently the range of the open interval. The range of openings for screened wells is predominantly less than 100 ft. This situation is best for estimating the sample depth of the water being sampled but is uncommon in the study unit.

The 573 wells in the study unit with analyses for nitrate plus nitrite (hereafter referred to as nitrate) concentrations are distributed similarly to those wells with any water-quality data (table 7). Few (21) have 5 or more measurements, and 322 have more than 1 measurement. A higher proportion of wells with sample depth estimates of less than 100 ft occurs in the Quincy-Pasco subunit (66 percent) and the Palouse subunit (64 percent; fig. 15). The North-Central subunit has a more even distribution of depths. These biases are caused by the differences in depth to water in the subunits. The median sample depth for wells with nitrate analyses is 58 ft for the Quincy-Pasco subunit, 140 ft for the North-Central subunit, and 79 ft for the Palouse subunit.

The nitrate data used in this analysis cover the period 1958 to 1991 (fig. 16); trend plots were supplemented with data extending back to 1942. The samples are clustered in time because they are collected for investigations that each last only a few years. Most of the samples were collected in the 1980's. WDOH nitrate data were collected from 1977 through 1992; typically, two or three samples were collected per well.

The dominant water-use type for wells with nitrate analyses in the Quincy-Pasco subunit and the Palouse subunit is domestic and was calculated to be about 51 percent each (table 7). In the North-Central subunit, domestic (35 percent) and irrigation (46 percent) are the dominant uses of water from wells with nitrate data.

Most of the 81 wells with orthophosphate (phosphate) analyses (12 with 2 measurements and 1 with 34 measurements) are in the Quincy-Pasco subunit (39) and the North-Central subunit (35), with only 7 in the Palouse subunit (table 7). Distribution of estimated sample depths among these wells is fair considering the small number of wells with analyses (fig. 15). Orthophosphate samples were collected from 1958 to 1984; most were collected in the early 1960's and 1980's (fig. 16). Domestic and public supply are the dominant classifications for wells with orthophosphate analyses in the Quincy-Pasco subunit. Analyses are fairly well distributed among the common water-use types in the North-Central subunit. And in the Palouse subunit, the seven analyses are mostly in the public supply and unknown water-use categories (table 7).

Sampling for pesticides in ground water is expensive because of the variety of pesticides, the variety of methods and dates of applications, and low concentrations of pesticides in the applied mixtures. Thus, the amount of information available on the presence of pesticides in the environment is limited. Data on pesticides in ground water in the study unit is limited to three sampling programs, two coordinated by Ecology and one by the USGS. Ecology collected and analyzed samples from 27 wells in Franklin County (fig. 17 and table 14, located at the end of the report) in September 1988 (Erickson and Norton, 1990) and from 27 wells and 2 subsurface field drains near Quincy in April 1991 and February 1992 (Larson and Erickson, 1993). The USGS collected and analyzed samples from 14 wells and 4 subsurface field drains in Franklin County during 1988 (fig. 17 and table 14). The WDOH VOC samples were collected at public-supply wells between 1988 and 1992 and are distributed much more widely than the other samples (fig. 17 and table 15, located at the end of the report). Only four of the compounds in the VOC data base are known to be applied as pesticides; however, because many may be used as adjutants in pesticide mixtures, all of the VOC data are presented in table 15.

Table 7.--*Numbers of wells in the Central Columbia Plateau study unit with water-quality data, by subunit and water-use type*

[PWS, public water supply; IRR, irrigation; DOM, domestic; MON, monitoring; VOC, volatile organic compound]

Available	Study unit					Quincy-Pasco Subunit					North-Central Subunit					Palouse Subunit				
types of data	Total	PWS	IRR	DOM	MON	Total	PWS	IRR	DOM	MON	Total	PWS	IRR	DOM	MON	Total	PWS	IRR	DOM	MON
Any water-quality data	858	24	159	369	0	474	0	44	234	0	295	24	111	98	0	89	0	4	37	0
Any water-quality data and depth	729	88	155	339	0	389	50	42	222	0	261	23	109	81	0	79	15	4	36	0
Nitrate	573	42	119	259	0	298	20	19	151	0	207	12	96	73	0	68	10	4	35	0
Nitrate and depth	474	41	116	238	0	228	20	18	147	0	185	11	94	57	0	61	10	4	34	0
Phosphate	81	18	13	26	0	39	9	2	19	0	35	6	11	7	0	7	3	0	0	0
Phosphate and depth	70	18	13	24	0	37	9	2	18	0	29	6	11	6	0	4	3	0	0	0
Pesticide	67	0	0	51	16	67	0	0	51	16	0	0	0	0	0	0	0	0	0	0
Pesticide and depth	67	0	0	51	16	67	0	0	51	16	0	0	0	0	0	0	0	0	0	0
VOC	309	309	0	0	0	143	143	0	0	0	126	126	0	0	0	40	40	0	0	0
VOC and depth	309	309	0	0	0	143	143	0	0	0	126	126	0	0	0	40	40	0	0	0

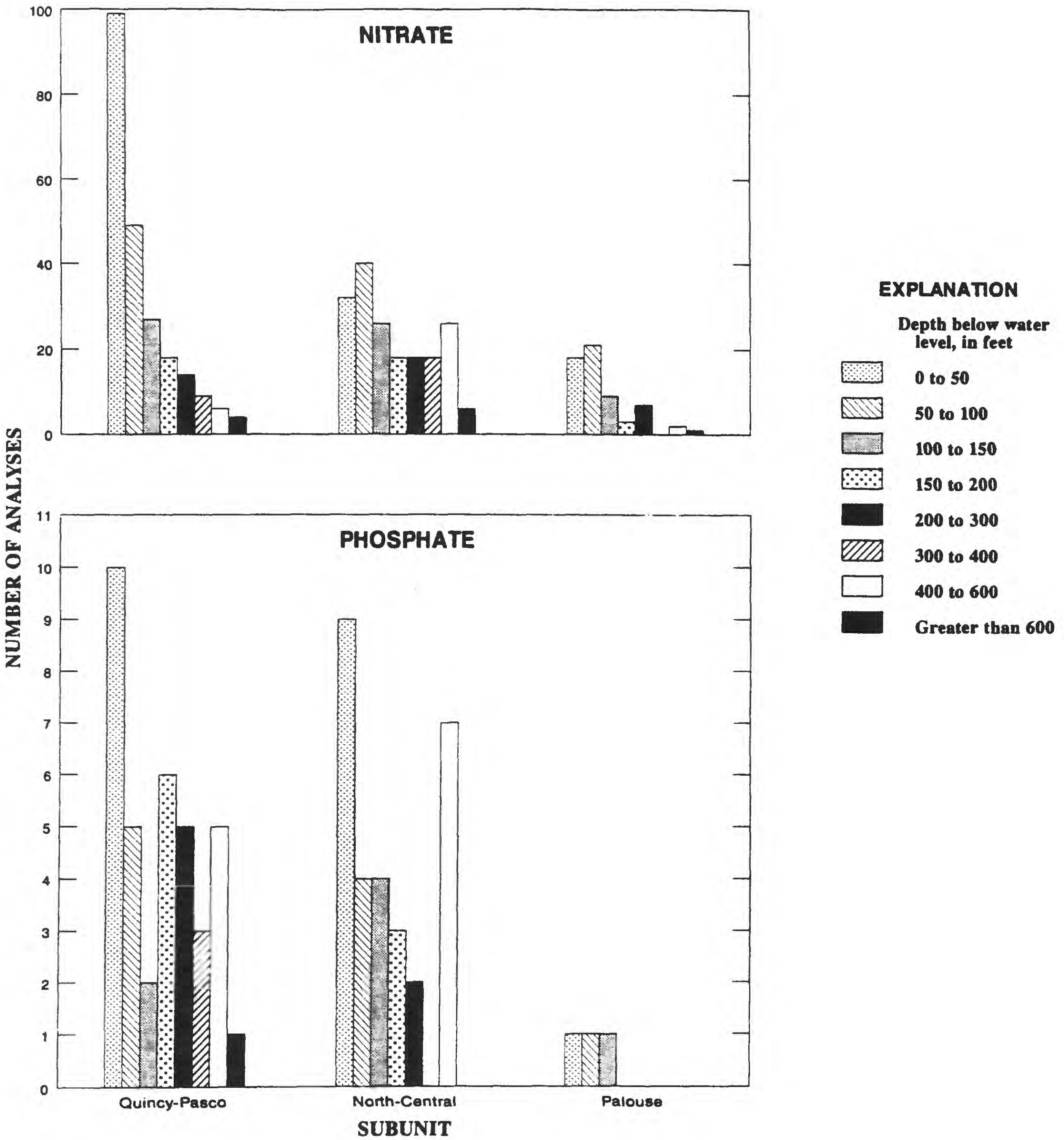


Figure 15. Number of nitrate and phosphate analyses for wells in the Central Columbia Plateau study unit, by depth categories and by subunit.

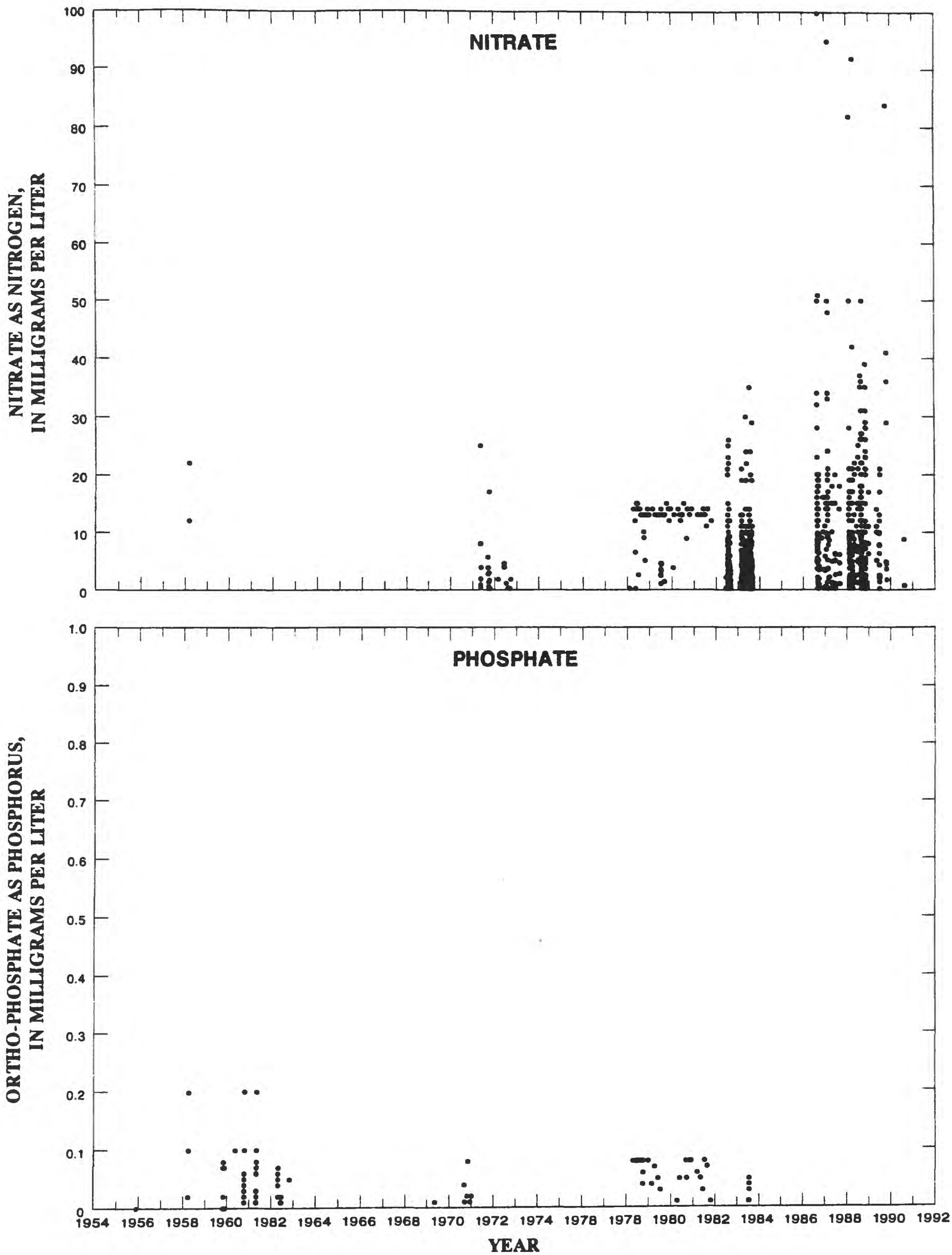


Figure 16. Nitrate and phosphate concentrations in ground water in the Central Columbia Plateau study unit, 1955–92.

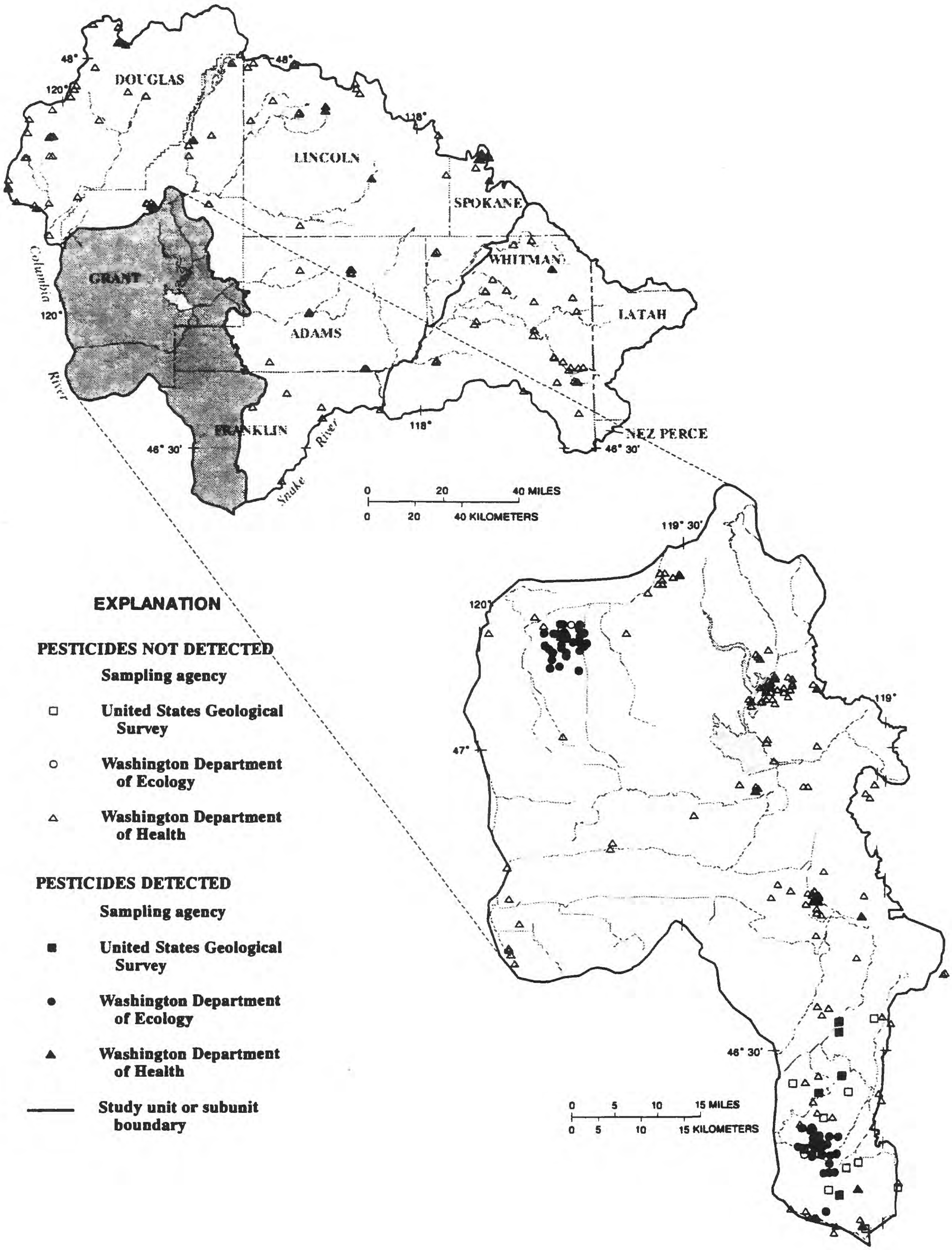


Figure 17. Sampling locations for pesticides in the Central Columbia Plateau study unit.

Most of the wells sampled for pesticides are shallow wells used for irrigation purposes or domestic water supply and range in depth from 22 to 340 ft with a median depth of 78 ft. Eleven of the sampled wells are shallow observation wells used to monitor changes in water levels caused by irrigation. Three of the sampled wells are deeper and range in depth from 295 to 340 ft. Most of the wells sampled for VOCs are deep wells used for public water supply, ranging in depth from the surface (flowing wells) to 2,134 ft with a median depth of 278 ft.

ANALYSIS OF NUTRIENTS AND PESTICIDES IN GROUND WATER

Relations between nitrate concentration and depth, subunit, land use, irrigation, and time are presented in this section. Orthophosphate concentration data are summarized only, because they are too few to establish such relations. Similarly, pesticide concentration data are from too few wells to develop these types of relations; however, because concentrations were determined for a number of different pesticides, an hypothesis is presented about the relation between physico-chemical properties of pesticides and the likelihood that they will be detected in ground water.

Nitrate

The median nitrate concentration for all samples from all wells in the data set is 3.4 mg/L as N; the maximum is 100 mg/L, and 213 samples have concentrations below the detection limit of 0.1 mg/L. For the remainder of this report, references to the nitrate concentration of individual wells will be the mean of all nitrate determinations for that well. The median nitrate concentration for all wells is 3.1 mg/L; the maximum is 89 mg/L, and 100 wells have nitrate concentrations at or below the detection limit. Nitrate concentrations in 107 wells (19 percent) exceed the USEPA's maximum contaminant level (MCL, USEPA, 1988) of 10 mg/L, with most occurring in the southwestern part of the study unit (fig. 18). Domestic and public-supply wells exceed the nitrate MCL with a similar frequency (21 percent) and distribution (fig. 19).

Variation With Depth

Nitrate concentrations in the study unit generally decrease with depth (fig. 20) because the primary source of nitrogen is fertilizer applied to the land. Additional factors include biodegradation of nitrate as it moves toward and through the ground-water system, and dispersion as the water enters deep regional ground-water systems conveying water that recharged long before agriculture could have affected it. Factors complicating the relation are local-scale flow systems moving nitrate laterally to local discharge areas, open well bores that allow nitrate to move rapidly downward, and regional discharge areas that are conveying old ground water upward to the surface.

Nitrate concentrations exceeding the MCL of 10 mg/L are generally found at sample depths less than 300 feet (92 percent of all values over 10 mg/L, table 8). Concentrations at these depths also cover the greatest range (fig. 21); 51 percent are less than 5 mg/L and 24 percent are more than 10 mg/L (table 8). Low nitrate concentrations occur at a much wider range of depths; of all values less than 5 mg/L, 55 percent are below 300 feet and 45 percent greater. Deeper than 300 feet, 91 percent of nitrate concentrations are less than 5 mg/L.

The inverse relation between nitrate concentration and depth is evident when dislayed graphically (fig. 20); however, because of the broad range of concentrations at shallow depths, non-parametric correlation coefficients between nitrate concentration and depth indicate weak relations (table 9). Two other measures of depth were investigated for relations with nitrate concentration: sample depth below estimated water table and depth to estimated water table. For the study unit as a whole, sample depth correlated the best with nitrate concentration. Differences in the correlations among the subunits may be explained by characteristics of the ground-water systems in each of the subunits and may also be used to make inferences about the relative importance of these characteristics and about the effects of others.

Regional Variations Among Subunits

The magnitude of nitrate concentrations and the degree of (inverse) correlation between depth and nitrate concentration vary among subunits because of differences in the quantities of nitrogen applied, the quantities of ground water recharged, and the characteristics of local and regional flow systems. Related to these differences are other characteristics such as irrigation practices, crop types, surficial geology (thickness, topography, and hydraulic properties), depth to water, and quantity of surface runoff. High rates of nitrogen application (fertilizer) and high recharge rates result in the movement of nitrate into the shallow ground-water system. Local ground-water flow systems may move much of the shallow ground

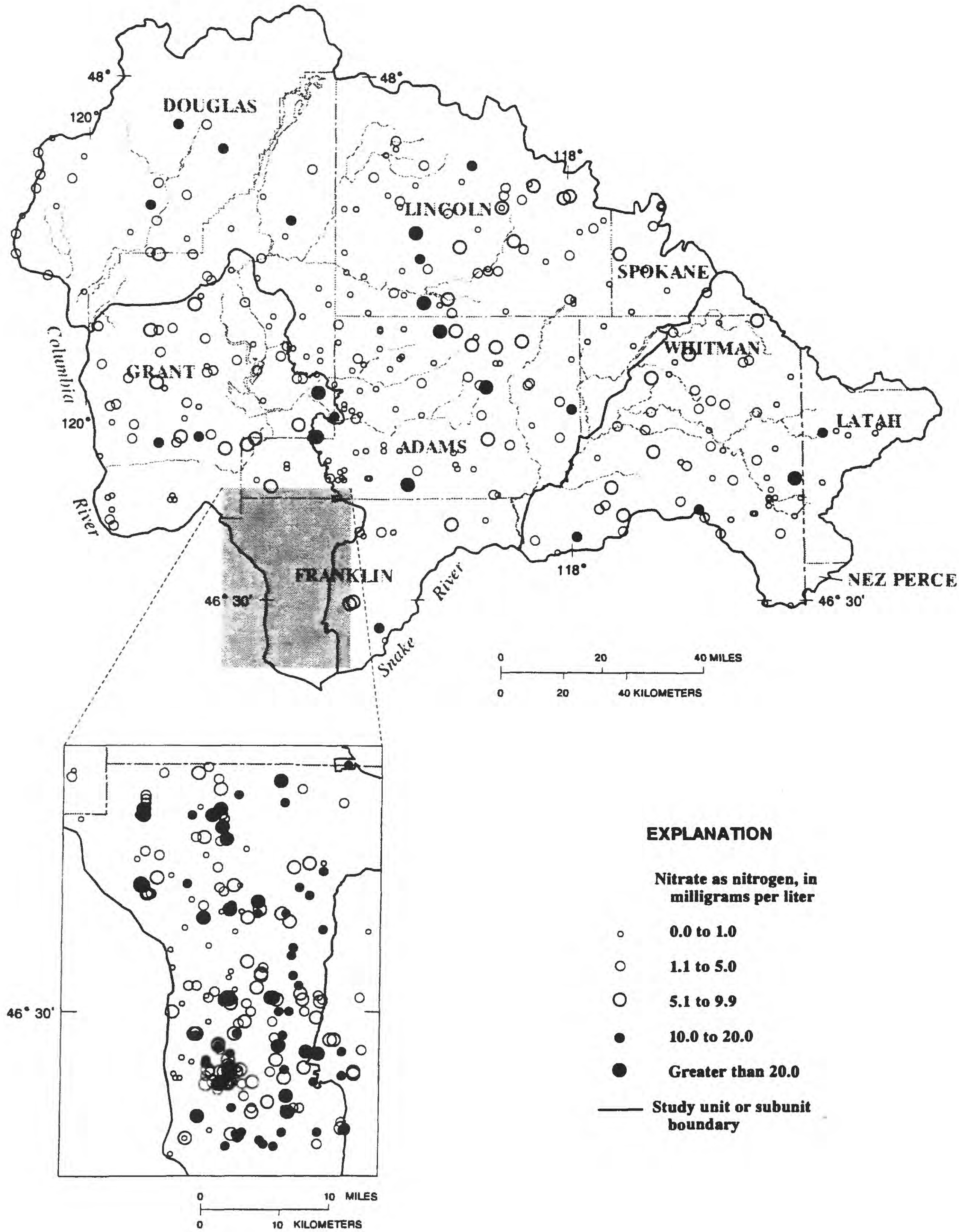


Figure 18. Nitrate concentrations in ground water in the Central Columbia Plateau study unit.

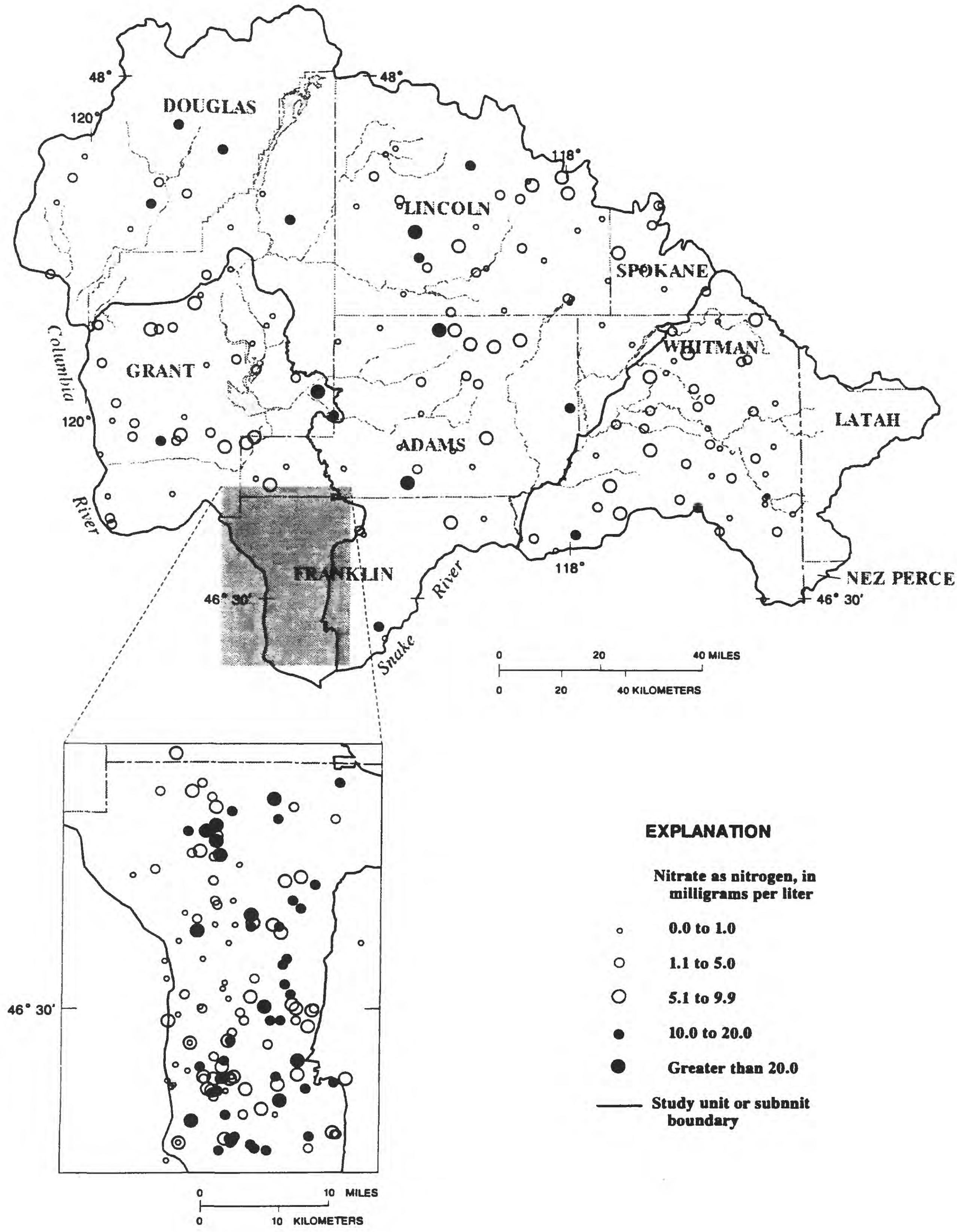


Figure 19. Nitrate concentrations in ground water from domestic and public supply wells in the Central Columbia Plateau study unit.

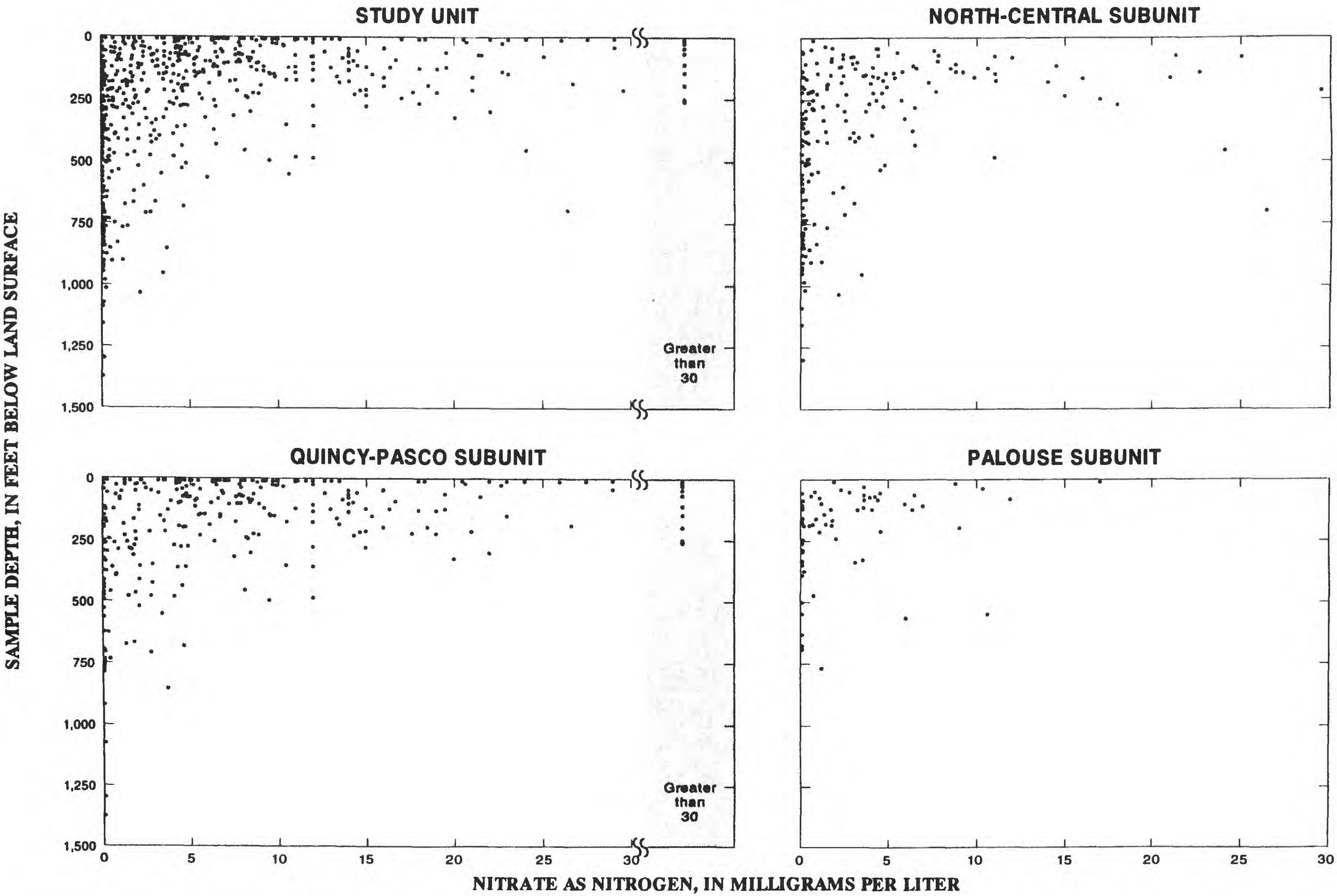


Figure 20. Relation between nitrate concentration and sample depth for the Central Columbia Plateau study unit and subunits.

Table 8.--*Percentage of samples in depth and nitrate-concentration ranges for wells in the Central Columbia Plateau study unit*

[mg/L, milligrams per liter; <, less than; >, greater than; some values in bold for emphasis]

	All samples	Samples <300 feet deep	Samples >300 feet deep
Percent of samples with nitrate <5 mg/L	64	51	**91**
Percent of samples with nitrate 5 to 10 mg/L	17	25	4
Percent of samples with nitrate >10 mg/L	19	24	5
	100 percent	100 percent	100 percent

Depth range	Samples with nitrate <5 mg/L	Samples with nitrate >10 mg/L
Percent of samples less than 300 feet deep	55	**92**
Percent of samples more than 300 feet deep	45	8
	100 percent	100 percent

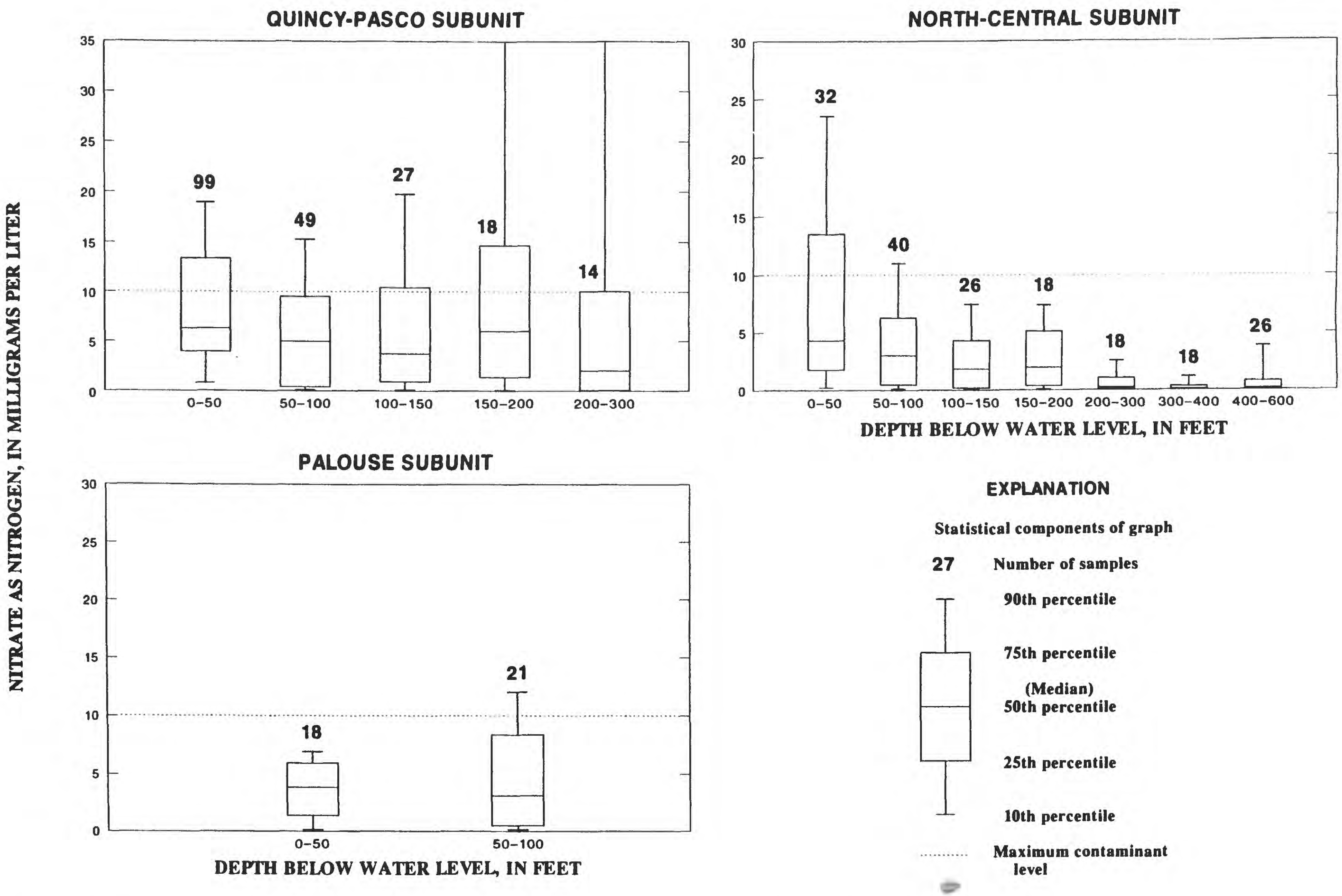


Figure 21. Distribution of nitrate concentrations for depth ranges, by subunit in the Central Columbia Plateau study unit.

Table 9.--*Spearman correlation coefficients for combinations of nitrate concentration and depth estimates for wells in the Central Columbia Plateau study unit and subunits*

Correlation	Study unit	Quincy-Pasco subunit	North-Central subunit	Palouse subunit
Sample depth and nitrate concentration	-0.53	-0.40	-0.53	-0.44
Sample depth below water table and nitrate concentration	-0.44	-0.25	-0.53	-0.49
Depth to water table and nitrate concentration	-0.42	-0.38	-0.44	-0.29
Sample depth below water table and depth to water table	+0.38	+0.38	+0.40	+0.24

water to local discharge areas, where it is then carried away in the surface-water system or evapotranspired; this is especially true in regional discharge areas. Where depth to water is large, local flow systems cannot develop and most recharge enters the regional system.

The subunit with the highest median concentration of nitrate is the Quincy-Pasco subunit (5.4 mg/L, table 10, fig. 22), which is significantly higher (with 99 percent confidence by a Kruskal-Wallis test) than the medians for either of the other subunits. The Quincy-Pasco subunit had the highest percentage of wells (28 percent) exceeding 10 mg/L, the MCL (table 10). The medians and percent exceedances for the North-Central and the Palouse subunits are not statistically different.

The Quincy-Pasco subunit has the highest median nitrate concentration as a result of having the largest nitrogen applications (132 pounds/acre, table 4) and the highest recharge rates in the study unit (more than 10 in/yr over large areas of the subunit, fig. 12). Twenty-eight percent of wells in this subunit have nitrate present at more than 10 mg/L (table 10) and 94 percent of these wells have sample depths of less than 300 feet. Of wells with sample depths over 300 feet deep, 85 percent have nitrate concentrations less than 5 mg/L. Despite this, the statistical correlation between nitrate concentration and sample depth is weak; this subunit has the poorest correlation of the three subunits (table 9) for several reasons. The water table in the area has risen several hundreds of feet in some areas since irrigation began, and all of this water is associated with the irrigation project. Consequently, pre-irrigation ground water (which has low nitrate concentrations) is deep in these areas, whereas at regional discharge areas

Table 10.--*Median nitrate concentrations and percentage of samples exceeding 10 mg/L in well water in the Central Columbia Plateau study unit and subunits*

[mg/L, milligrams per liter]

	Median nitrate concentration (mg/L)	Percentage of samples exceeding 10 mg/L
Study unit	3.1	21
Quincy-Pasco Subunit	5.4	28
North-Central Subunit	0.9	9
Palouse Subunit	1.2	6

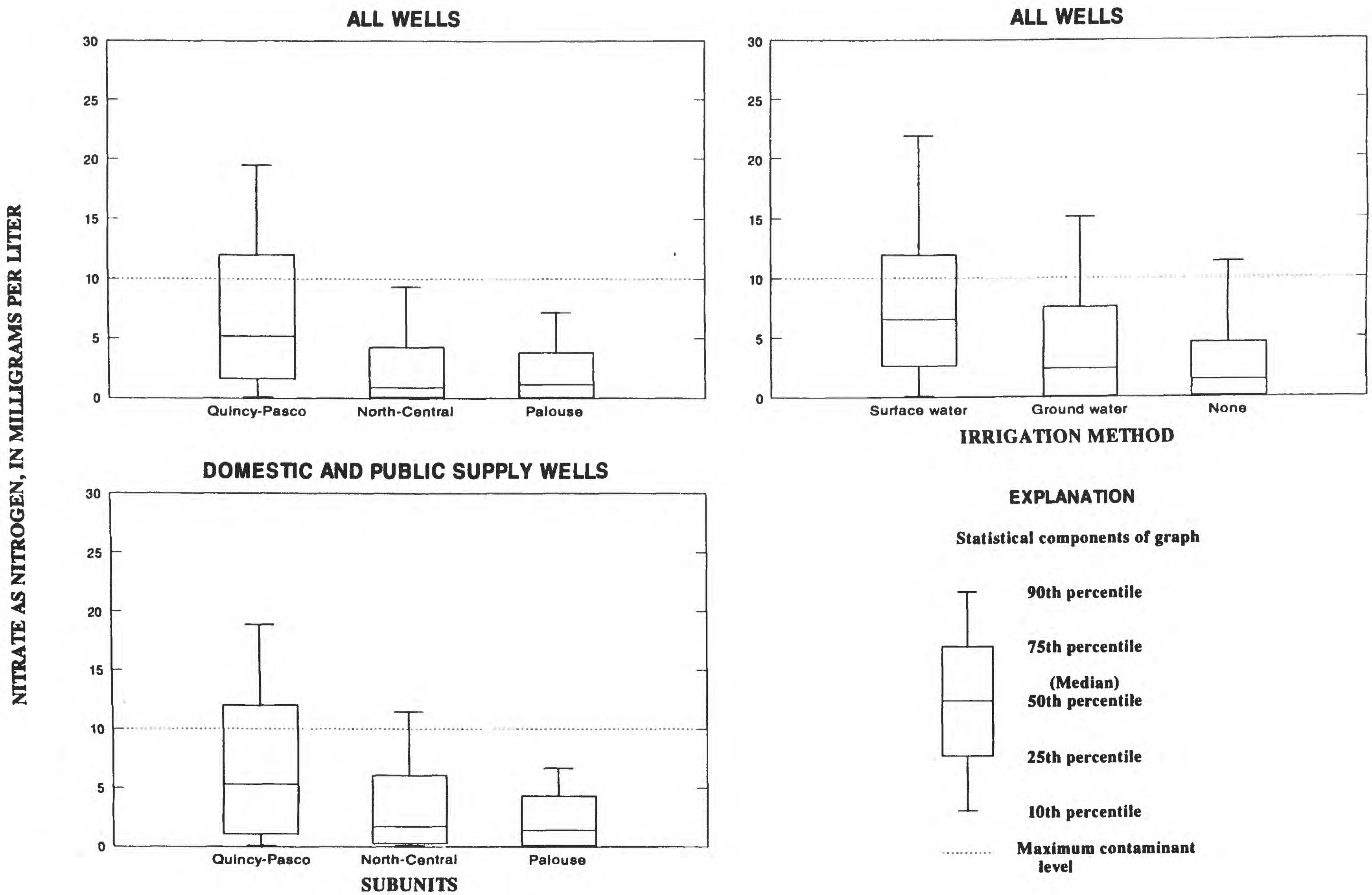


Figure 22. Distribution of nitrate concentrations by subunit and by irrigation method for wells in the Central Columbia Plateau study unit.

along the Columbia River, pre-irrigation water is discharging. The resulting broad range of concentrations in shallow ground water (figs. 20 and 21) is related to the weak correlation with sample depth.

In the Quincy-Pasco subunit, the weak correlation between sample depth below the water table (table 9) and nitrate concentration also indicates the effects of the ground-water mounding and the regional discharge areas. The complexity of the flow system in the area and the presence of many local discharge areas are additional factors weakening this correlation. Finally, approximately half of the recharge in the subunit is low-nitrate water seeping from canals. This results in large differences in nitrate concentration between ground water near canals and ground water elsewhere. This effect and the presence of regional discharge areas is reflected by the percentage of wells with low nitrate concentrations in the shallow ground water (62 percent).

In contrast, the North-Central subunit has the lowest median nitrate concentration (0.9 mg/L, table 10, fig. 22), low nitrogen application rates (55 lbs/acre/yr, table 4), and the lowest recharge rates. Nine percent of the wells in the subunit have nitrate concentrations more than 10 mg/L, and 84 percent of these wells had sample depths less than 300 feet. Of wells with sample depths more than 300 feet, 94 percent have nitrate concentrations less than 5 mg/L.

In the North Central subunit, the statistical correlation of nitrate concentration and sample depth is the best of the subunits (table 9, fig. 21) because most of the subunit is a regional recharge area; the water table is deep, regional discharge areas do not exist, and few local flow systems develop. Agricultural land uses are limited in the subunit by the paucity of soils and precipitation, though some ground-water irrigation occurs, particularly in western Adams and Lincoln Counties (fig. 5). These agricultural areas probably have similar effects on the quality of shallow ground water as the surface-water irrigated areas do in the Quincy-Pasco subunit, but because the agricultural activities are more spread out the effect is diluted (fig. 22). Generally, greater depths to water may also influence the degree to which agriculture affects shallow ground-water quality. The overall effect of the sparse agriculture in the subunit is to increase the magnitude of the higher concentrations without affecting the median value significantly.

The median nitrate concentration in the Palouse subunit (1.2 mg/L) and the percentage of wells exceeding the 10 mg/L concentration (6 percent) are comparable to the values for the North-Central subunit. Application rates of nitrogen fertilizer are similar as well (54 lbs/acre/yr), but recharge is higher at 2 to 5 in/yr. The distribution of concentrations greater than 10 mg/L and less than 5 mg/L are surprisingly even between shallow and deep ground water. It must be noted, however, that the number of wells in this subunit is small, and these distributions may be misleading. Other factors that contribute to the low nitrate concentrations in the subunit are the presence of many local flow systems and regional discharge areas (where the Palouse River has incised into the basalts). The hilly topography of the area encourages erosion, which may keep nitrate out of the ground-water system as well.

In the Palouse subunit, the statistical correlation between sample depth and nitrate concentration is between the values for the other subunits. The correlation between depth to water and nitrate concentration is notably weak; this is because ground water is found at similar depths throughout the subunit, making it unlikely to correlate well with anything.

Variation Over Time

Temporal trends in nitrate concentrations were assessed in a small number of wells that have multiple measurements. Wells located in the Quincy-Pasco subunit demonstrate the most pronounced trends and reflect the effects of the agricultural development that has taken place in that subunit over the last four decades (fig. 23). Because of the complexity of the ground-water flow system, some wells with multiple measurements have a wide range of nitrate concentrations with no apparent trend. Differences in trends between wells that are near each other result from (1) the proximity of some wells to canals or regional ground-water discharge areas, (2) the effects of local flow systems, (3) low-permeability layers that inhibit vertical ground-water movement, and (4) fractures in the basalts that allow faster vertical ground-water movement in some areas. Most wells outside of the Quincy-Pasco subunit show no clear trends; however, this is probably because none of the wells in these areas have samples from the early 1950's--when fertilizer usage was increasing dramatically--or from periods spanning more than a few years.

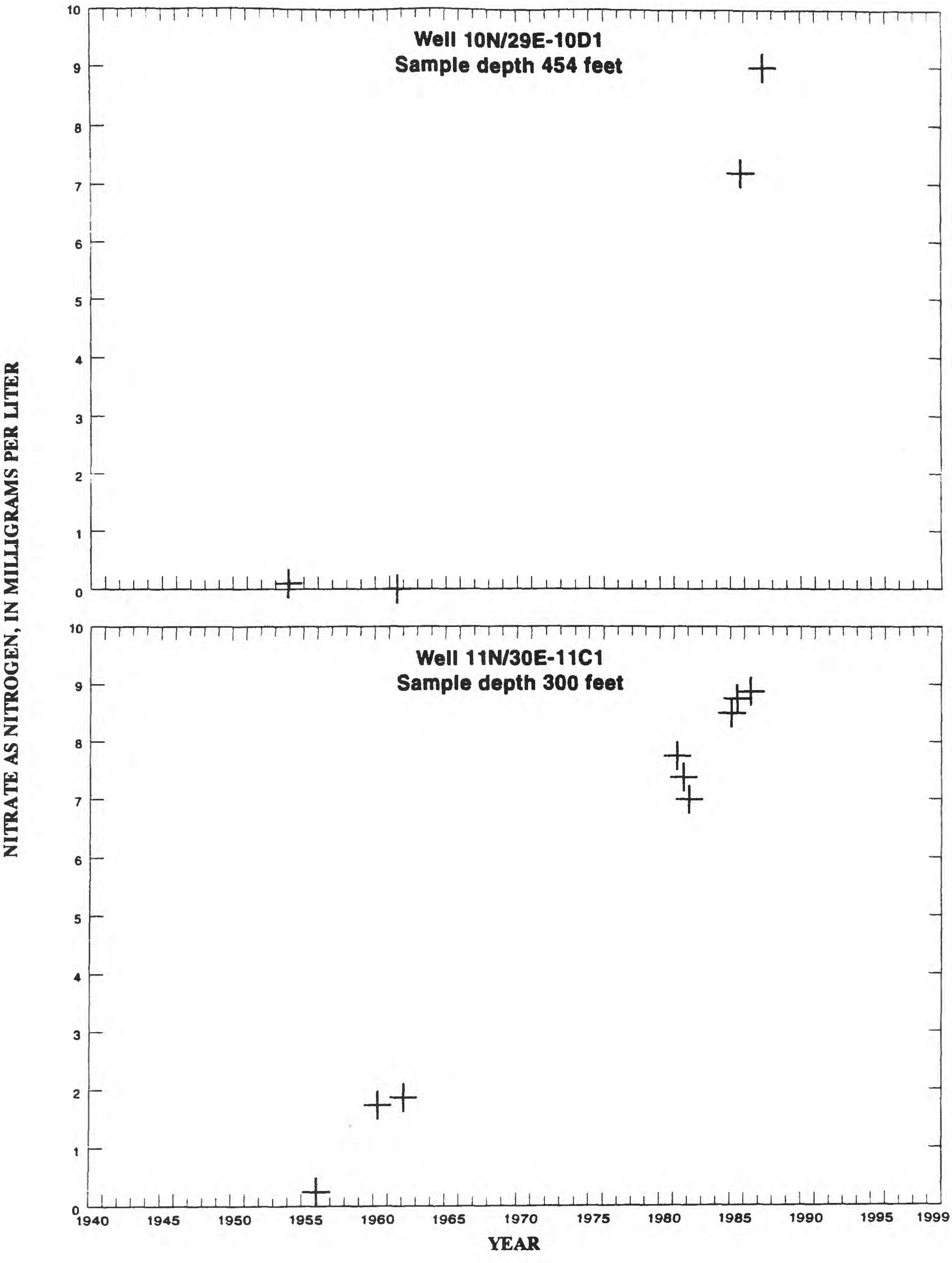


Figure 23. Relation between nitrate concentration and time for selected wells in the Central Columbia Plateau study unit.

Assessment of Additional Nitrate Data for Public-Supply Wells

Nitrate concentration data obtained from the WDOH for public-supply wells were reviewed separately and were not included in the above analysis because of limitations in the well construction and location information and possible bias resulting from using data clustered around population centers to represent ground water in the entire study unit (fig. 24). The median concentration for this data set is 3.5 mg/L, slightly higher than the median for the data set used for the preceding analysis, but the percentage of wells exceeding 10 mg/L is lower (12 percent, table 11, as compared to 19 percent, table 8). Although the percentage of wells with nitrate concentrations below 5 mg/L is similar between the two data sets (63 percent compared to 64 percent), the relation between depth and nitrate concentration observed in the primary data set is either much weaker or does not appear in the WDOH data set.

The differences between depth-nitrate concentration relations for the two data sets are perhaps best illustrated by comparing tables 8 and 11. Of WDOH wells more than 300 feet deep, only 77 percent have nitrate concentrations below 5 mg/L (as compared to 91 percent in the primary data set), and of wells less than 300 feet deep only 14 percent have nitrate concentrations above 10 mg/L (as compared to 24 percent). Of wells with nitrate concentrations greater than 10 mg/L, the WDOH data set has a higher percentage deeper than 300 feet, and of wells with nitrate concentrations lower than 5 mg/L, a higher percentage are from wells less than 300 feet. The lack of a relation between nitrate concentration and depth is also seen in figure 25; although there appears to be an inverse correlation between nitrate concentration and depth in wells 150 to 600 feet deep, it is statistically weak (Spearman rH0=-0.28) and it is clearly much weaker than the relation seen in the previous analysis (fig. 20a).

The lack of a relation between nitrate concentration and depth in the WDOH data is somewhat of a surprise because public-supply wells generally are assumed to be deeper and more carefully constructed than other wells to guard against contamination from activities at the surface; the fact that a lower percentage of these wells exceeds the standards for nitrate concentration supports this notion. There are two possible explanations for the differences in the data sets: (1) there are inaccuracies or biases in the data, and (2) there are differences in the ground-water systems the wells are drawing from.

With respect to the first possibility, the purpose of the WDOH data set is to monitor drinking water supplies, not to analyze variation in nitrate concentration with depth or location. Well depth was not determined with any type of analysis in mind; location information was not even provided as such--it was inferred for this analysis from the well identification code (based on the Pubic Land Survey System). With respect to the second possibility, the clustering of wells around population centers may have introduced a geographical bias not present in the primary data set. Additionally, the cumulative pumping from clusters of these wells may be sufficient to draw shallow, high-nitrate water to greater depths more quickly. This clustering could also explain why irrigation wells (which are about 20 percent of the primary data set) do not have the same effect on the depth-nitrate relation observed in the previous analysis despite the fact that they also tend to be deep wells with large pumping rates.

The WDOH data include more wells with multiple measurements taken over time because regular monitoring of drinking water quality is required by law. Data from wells in the Quincy-Pasco subunit show trends similar to those observed in the primary data set, including increasing nitrate concentrations (fig. 26A, B) and relatively constant concentrations (fig. 26C, D). Large variation over short periods of time is well illustrated by one well in this subunit (fig. 26E). WDOH data for a few wells in the Palouse subunit show increases in nitrate concentration over time (fig. 26F); however, data from most wells show little change in nitrate concentrations (fig. 26G). No trends were observed in data from wells in the North-Central subunit (fig. 26H, I).

Orthophosphate

The median orthophosphate concentration of 127 samples is 0.03 mg/L as phosphorous; 33 concentrations are at or below the detection limit of 0.01 mg/L, and the maximum concentration of all analyses is 0.2 mg/L. The median orthophosphate concentrations for the 81 wells with samples (using the mean for wells with multiple measurements) is 0.02 mg/L. Wells with concentrations above an arbitrary value of 0.1 mg/L (approximately the highest 5 percent of values) are randomly distributed across the study unit (fig. 27). There is no correlation between orthophosphate concentration and depth (fig. 28) or nitrate concentration.

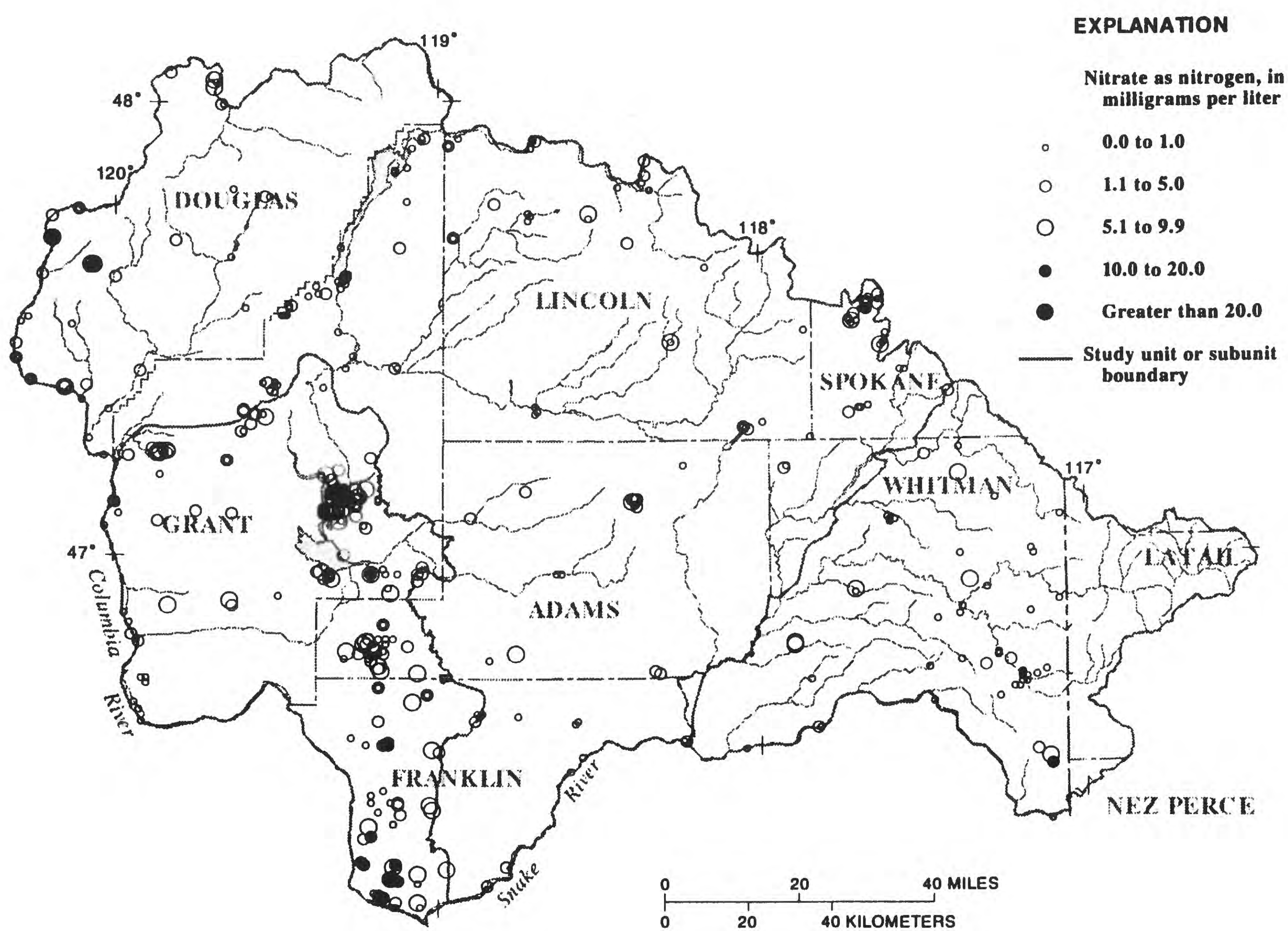


Figure 24. Mean nitrate concentrations in wells sampled by the Washington Department of Health in the Central Columbia Plateau study unit.

Table 11.--*Percentage of wells sampled by the Washington Department of Health in depth and nitrate-concentration ranges for wells in the Central Columbia Plateau study unit*

[mg/L, milligrams per liter; <, less than; >, greater than]

	All wells	Wells <300 feet deep	Wells >300 feet deep
Percentage of wells with nitrate <5 mg/L	63	57	77
Percentage of wells with nitrate 5 to 10 mg/L	25	29	15
Percentage of wells with nitrate >10 mg/L	12	14	8
	100 percent	100 percent	100 percent

Depth range	Wells with nitrate <5 mg/L	Wells with nitrate >10 mg/L
Percentage of wells less than 300 feet deep	65	82
Percentage of wells more than 300 feet deep	34	17
	99 percent (rounding error)	99 percent (rounding error)

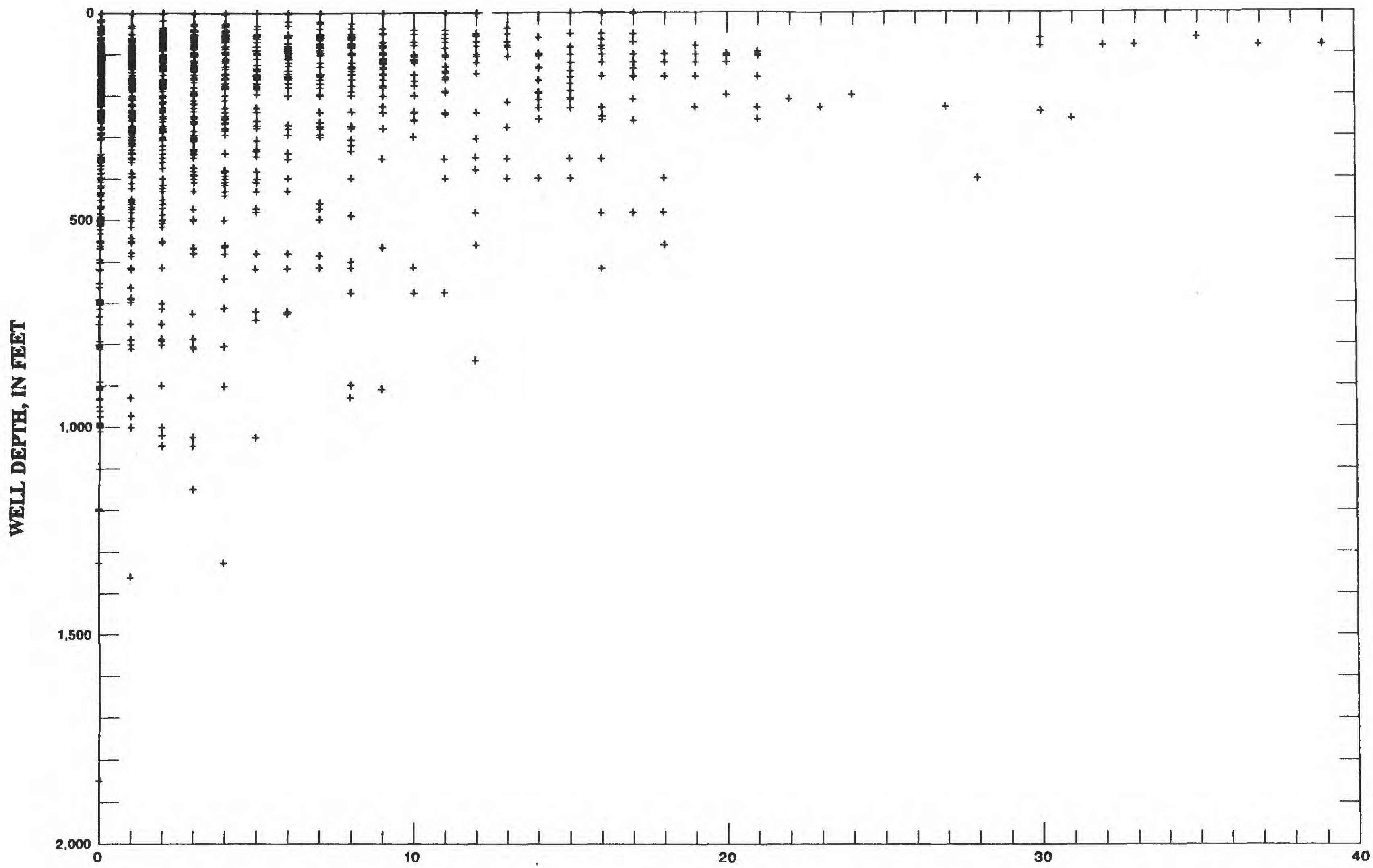


Figure 25. Relation between nitrate concentration and depth for wells sampled by the Washington Department of Health in the Central Columbia Plateau study unit.

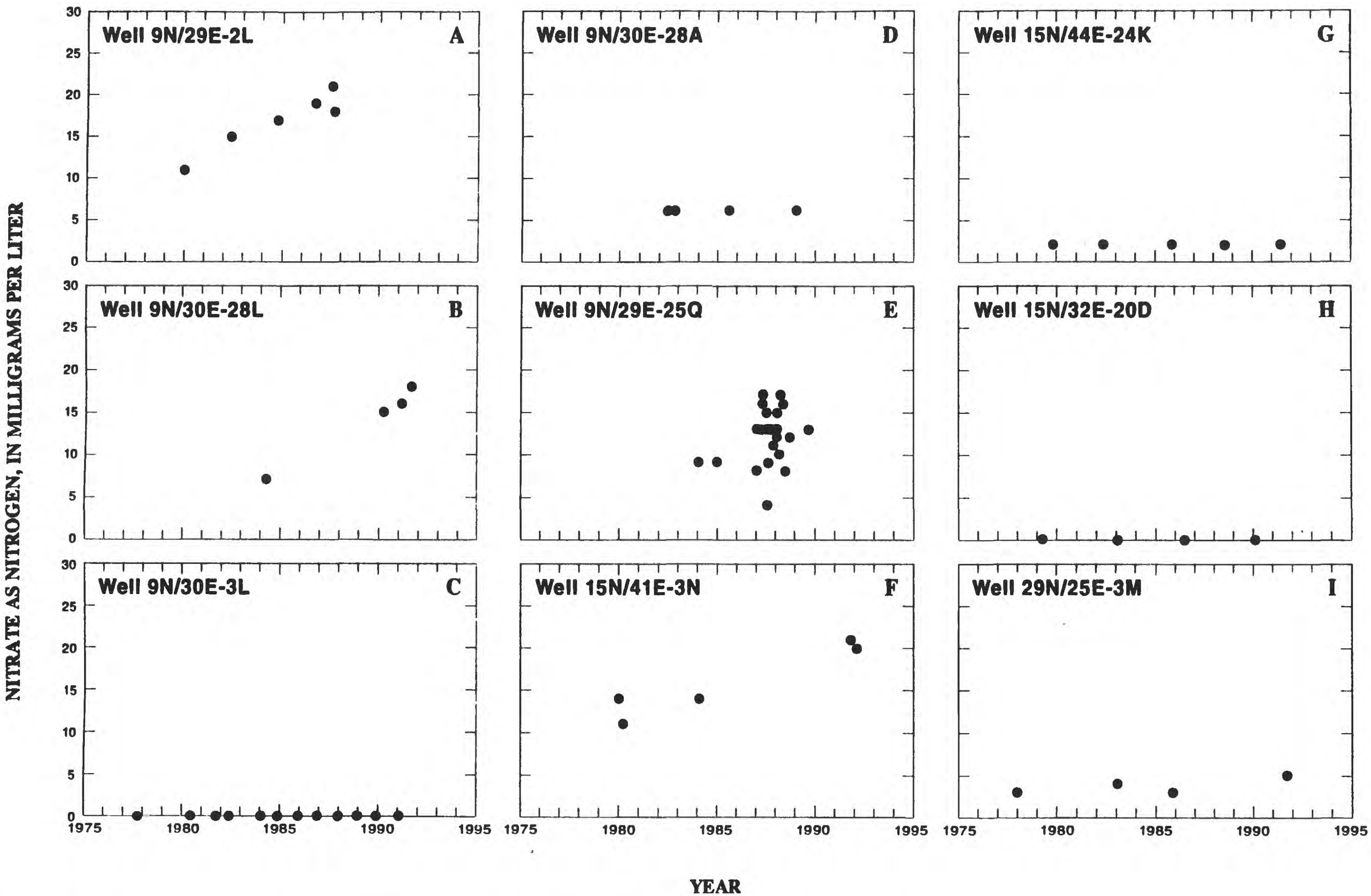


Figure 26. Relation between nitrate concentration and time for selected wells sampled by the Washington Department of Health in the Central Columbia Plateau study unit.

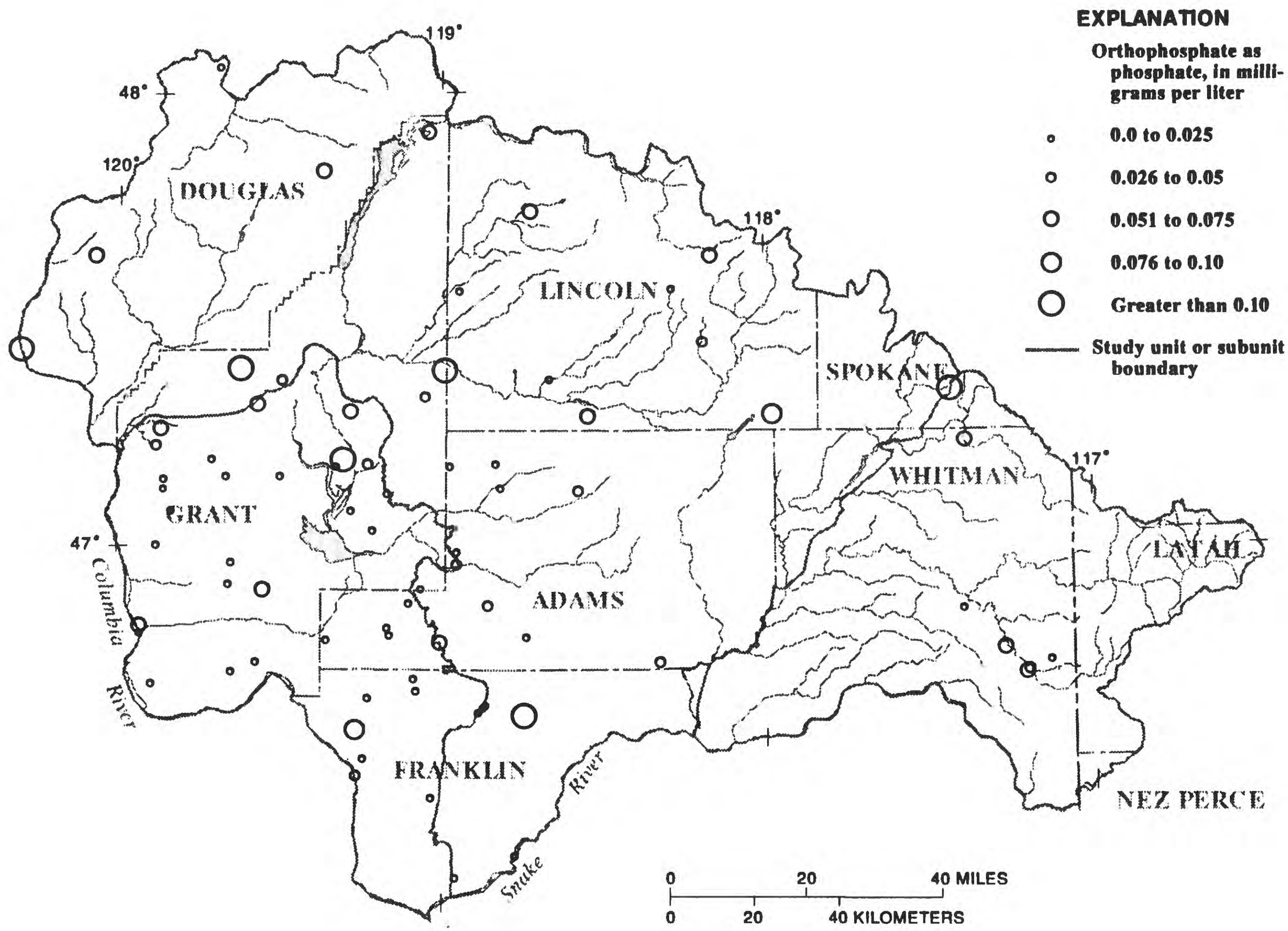


Figure 27. Orthophosphate concentrations in wells in the Central Columbia Plateau study unit.

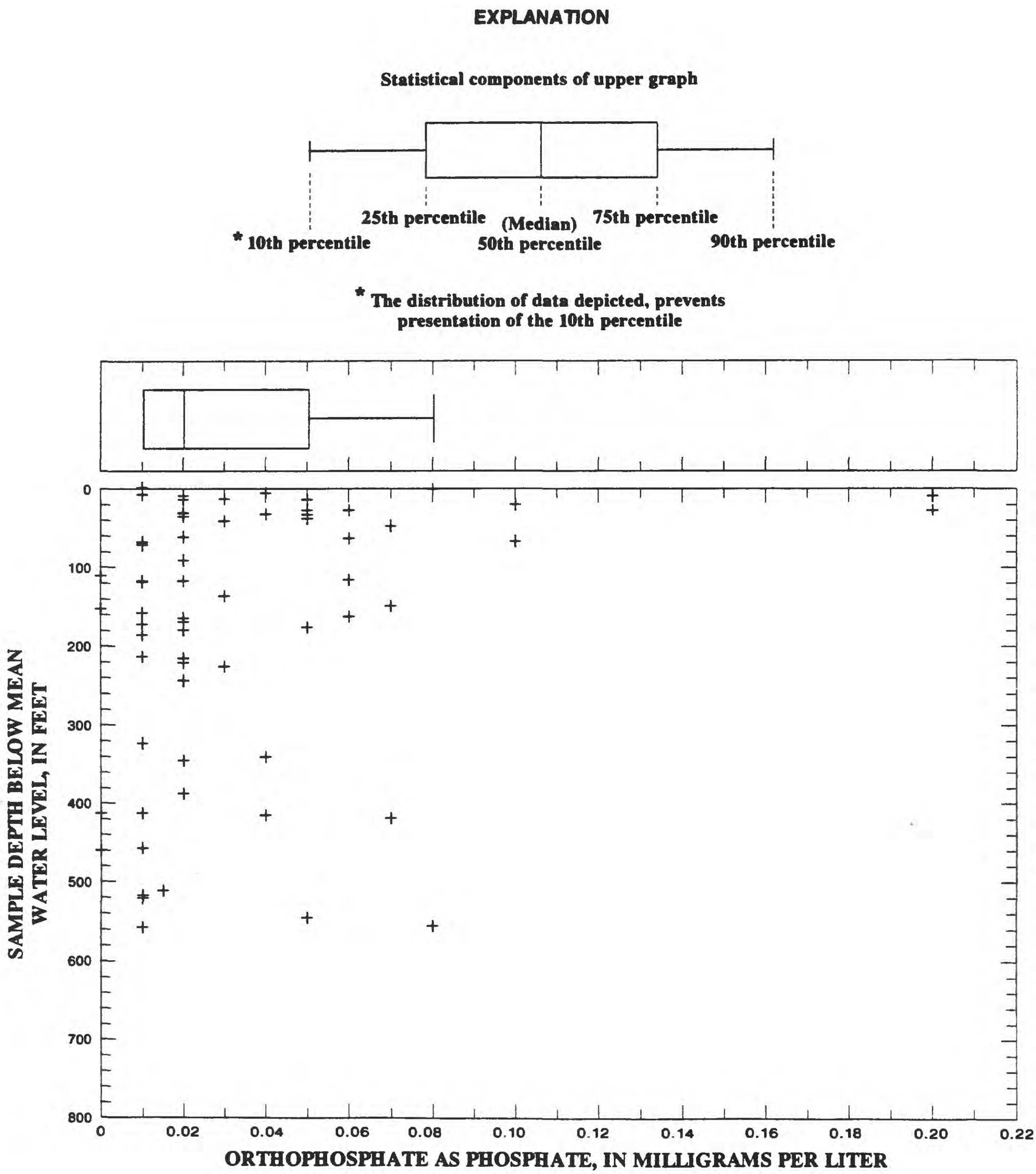


Figure 28. Relation between orthophosphate concentration and sample depth below water level for wells in the Central Columbia Plateau study unit.

Pesticides

Samples collected from 67 wells and 6 subsurface drains in Franklin County and near Quincy in Grant County were analyzed for various suites of pesticides, including chlorophenoxy acid herbicides, triazine herbicides, other miscellaneous herbicides, carbamate insecticides, organophosphate insecticides, fungicides, and fumigants (table 14, located at the end of the report). One or more of 11 pesticides were detected in samples from 40 wells and all of the subsurface drains (figs. 17 and 29; table 16, located at the end of the report). The soil fumigant and insecticide 1,2-dibromoethane (EDB) was detected at concentrations exceeding the MCL of 0.05 µg/L in 10 out of the 90 samples analyzed for that compound. Other fumigants detected also include 1,2-dichloropropane; *trans*-1,3-dichloropropene; and the nematicide aldicarb sulfone. Aldicarb sulfoxide, a degradation product of the insecticide aldicarb, was detected in one sample. The herbicides DCPA (Dacthal), dicamba, atrazine, picloram, bromacil, and metribuzin were detected.

The herbicide DCPA was found at concentrations ranging from 0.014 to 8.3 µg/L in samples from 23 wells and 1 drain. Dicamba was found in ground-water samples from two wells and three drains at or near the detection level of 0.10 µg/L. Samples from one well, 10N/29E-03R02 (table 16, located at the end of the report), were analyzed for pesticides by both Ecology and the USGS. Dicamba was found in the sample collected by the USGS at the level of detection; however, dicamba was not detected in the Ecology sample because Ecology used different detection limits. Atrazine was found in samples from three wells and one drain in concentrations ranging from the detection level of 0.10 µg/L to 0.28 µg/L. Picloram was found in the sample from one well at a concentration of 0.03 µg/L, bromacil was found in the sample from one well at a concentration of 14.9 µg/L, and metribuzin was found in the sample from one drain at a concentration of 1.2 µg/L.

The soil fumigant 1,2-dichloropropane was detected in samples from 19 wells and 2 drains at concentrations ranging from 0.04 to 1.0 µg/L. Detectable concentrations of 1,2-dibromoethane (EDB), a soil fumigant and insecticide, were found in 17 wells and 1 drain. Values of EDB concentrations ranged from 0.01 to 0.4 µg/L. The nematicide and soil fumigant *trans*-1,3-dichloropropene was found in samples from three wells at or near the detection limit of 0.10 µg/L. The nematicide aldicarb sulfone (also a degradation product of aldicarb) was detected in one well and one drain at concentrations of 0.09 and 0.23 µg/L, and aldicarb sulfoxide (a degradation product of aldicarb) was found in one drain at a concentration of 0.21 µg/L.

Ten of the wells in Franklin County that had detectable levels of pesticides were resampled in 1989 to verify previous results, and the same pesticides were again detected in these wells. All but one of the wells and both drains near Quincy were resampled for the analysis of pesticides in February 1992. DCPA, atrazine, and *trans*-1,3-dichloropropene were not detected above the reporting levels in these follow-up samples. The fumigant 1,2-dichloropropane was identified in samples from 14 wells and 1 drain. Values ranged from 0.10 to 0.72 µg/L. Detectable concentrations of EDB were found in samples from nine wells and one drain in February 1992, ranging in value from 0.01 to 0.34 µg/L, with a mean concentration of 0.10 µg/L.

The WDOH samples VOCs as part of its Organic [Chemical] Monitoring Program. This program is not designed to detect pesticides--the majority of VOCs are not used as such. However, several of the VOCs that were analyzed in samples collected by WDOH from public water supply wells are used as fumigants in the study area (table 14, located at the end of the report), compound class VOL) and some of the VOCs are used in pesticide applications as an adjuvant to aid the operation or improve the effectiveness of the pesticide. The fumigant 1,2-dichloropropane was detected in samples from three wells at concentrations that ranged from 0.9 µg/L to 7.2 µg/L.

Nine of the 11 compounds detected (all but DCPA and atrazine) have physico-chemical characteristics that make them more likely to be dissolved in water than the 6 compounds that are more abundantly used in the study unit and that were analyzed for but not detected (table 12). DCPA and atrazine are excluded from the following discussion because, for unknown reasons, the thermodynamic properties currently reported for them do not fit the patterns shown by the other compounds. These compounds are included in table 12 and figure 30 for comparison, however.

The solubility of a compound in water, as well as the equilibrium partitioning coefficients of compounds between octanol and water (K_{ow}) and between organic carbon in soil and water (K_{oc}), correlate well with detections of pesticides in ground-water samples. For the detected compounds, solubilities in water range from 430 to 330,000 mg/L as compared to the range of 0.3 to 620 mg/L for the more abundantly used but undetected compounds (fig. 30). The logarithm of the octanol-water

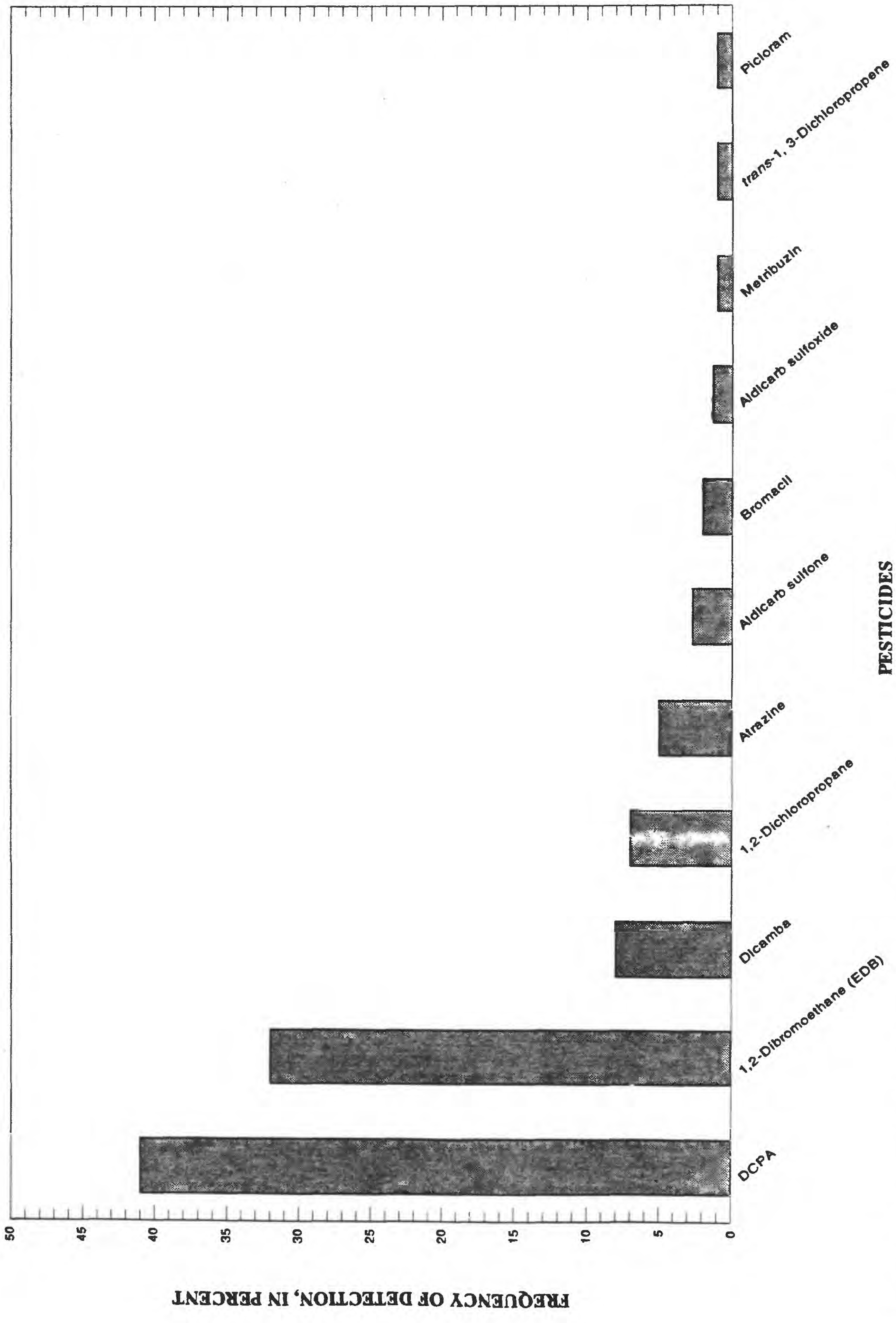


Figure 29. Frequency of detection of pesticides in wells in the Central Columbia Plateau study unit.

Table 12.--*Physico-chemical properties of pesticides and their metabolites used or detected in wells in the Central Columbia Plateau study unit*

[Pesticide types: H, herbicide; I, insecticide; F, fungicide; FU, fumigant; M, metabolites. URAC, uracid; MISA, miscellaneous acid; MISC, miscellaneous; TRI, triazine; CB, carbamate; IO, inorganic; TCB, thiocarbamate; NC, nitrogen-containing; VOL, volatile; OP, organophosphate; OC, organochlorine; CP, chlorinated phenoxy acid; mg/L, milligrams per liter; log K_{ow}, logarithm of octanol-water partitioning coefficient; log K_{oc}, logarithm of organic carbon partitioning coefficient; --, not available; Y, yes; N, no]

Compound	Pesticide type	Chemical class	Solubility (mg/L)	log K_{ow}	log K_{oc}	Analyzed for	Detected
			Predominantly Used Herbicides				
EPTC	H	TCB	375	--	2.4	Y	N
2,4-D	H	CP	620	1.6	1.3	Y	N
2,4-DB	H	CP	375	--	2.4	Y	N
Terbutryn	H	TRI	25	--	--	Y	N
Triallate	H	TCB	4	3	2.4	N	--
Bromoxynil	H	MISC	130	--	--	N	--
			Predominantly Used Insecticides				
Disulfoton	I	OP	25	2.4	3.3	N	--
Azinophosmethyl	I	OP	33	2.7	3	N	--
Chlorpyrifos	I	OP	0.3	5	4.1	Y	N
Ethoprop	I	OP	1.1	5.1	4.2	Y	N
Methamidophos	I	OP	--	--	2.9	N	--
Phorate	I	OP	50	3.8	3.5	N	--
			Predominantly Used Fungicides				
Sulfur	F	IO	--	--	--	N	--
Thiabendazole	F	--	--	--	--	N	--
Benomyl	F	CB	4	--	--	N	--
Mancozeb	F	TCB	0.5	--	3.3	N	--
Ziram	F	--	--	--	--	N	--
Iprodione	F	NC	13	--	2.7	N	--
			Detected Pesticides and Metabolites				
DCPA	H	OC	0.5	6	3.7	Y	Y
Atrazine	H	TRI	30	2.7	2.2	Y	Y
Bromacil	H	URAC	710	2	1.9	Y	Y
Dicamba	H	MISA	5,600	0.5	0.3	Y	Y
Picloram	H	MISA	430	0.3	1.2	Y	Y
Metribuzin	H	TRI	1,200	-5	2	Y	Y
1,2-Dibromoethane (EDB)	I,FU	VOL	4,300	--	1.6	Y	Y
1,2-Dichloropropane	FU	VOL	2,700	--	--	Y	Y
trans-1,3-Dichloropropene	I,FU	VOL	2,800	--	--	Y	Y
Aldicarb sulfone	I,M	CB	8,000	0.1	1.0	Y	Y
Aldicarb sulfoxide	M	CB	330,000	-0.2	--	Y	Y

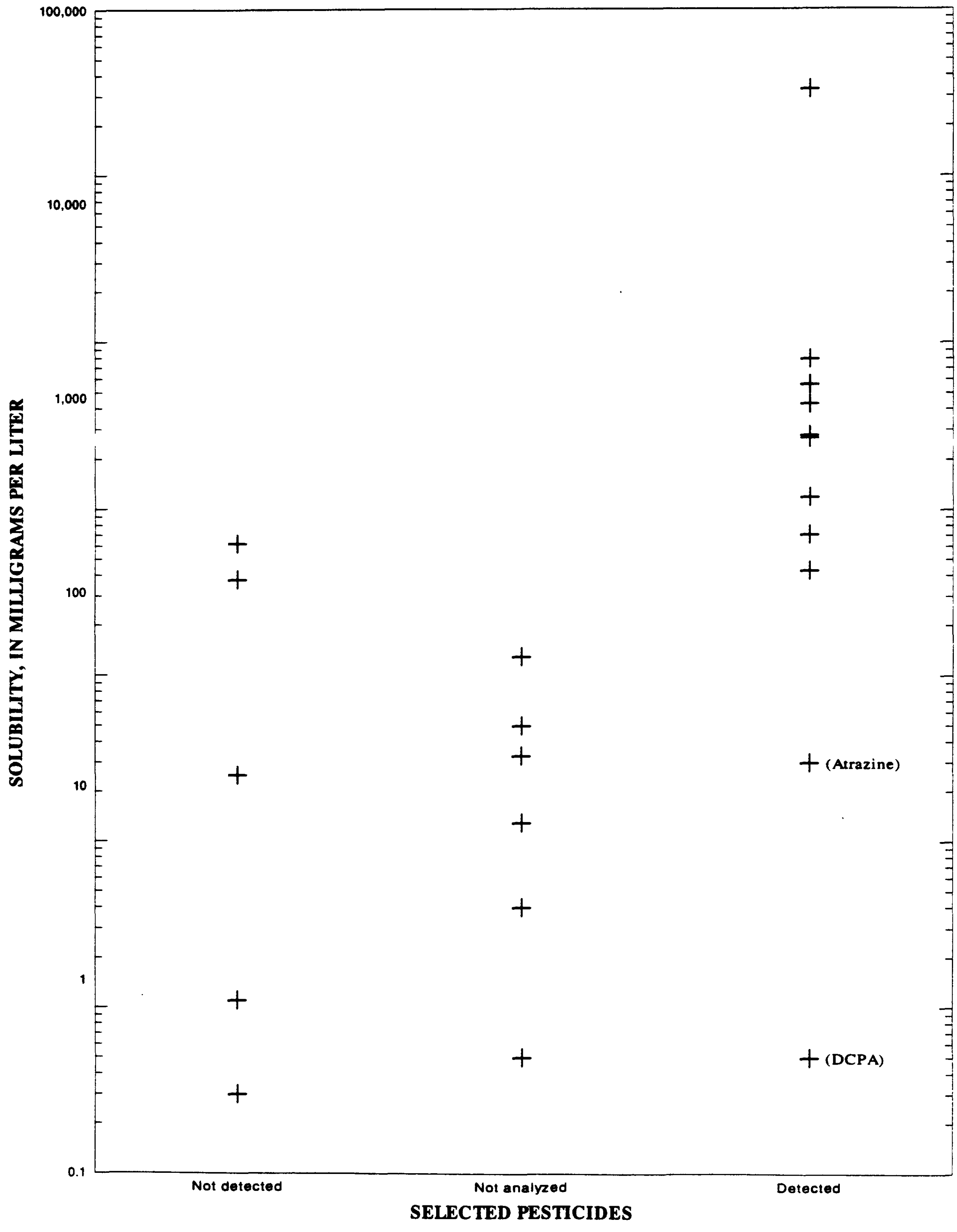


Figure 30. Solubilities in water of selected pesticides. Atrazine and DCPA are labeled because their solubilities are lower than the solubilities of most detected compounds.

partitioning coefficient, $\log K_{ow}$, is a measure of the equilibrium distribution of a compound between octanol, an organic solvent, and water, an inorganic solvent. High values of $\log K_{ow}$ suggest that the compound is less likely to be found in water. The logarithm of the soil/sediment adsorption coefficient, $\log K_{oc}$, is an estimate of the equilibrium distribution of the compound between organic solids in soils and water. High values of $\log K_{oc}$ suggest that the compound is less likely to be found in water. $\text{Log}K_{ow}$ ranges from -5.0 to 2.0 for the detected compounds, and 1.6 to 5.1 for the compounds not detected. $\text{Log}K_{oc}$ ranges from 0.3 to 2.0 and 1.3 to 4.2, respectively.

These observations have been used to develop a conceptual model of the movement of pesticides in the study unit, but there is insufficient information on some important factors. The largest limitation is the limited distribution of sampling sites and poor knowledge about the areal distribution of the use of individual compounds. All of the samples (except those for VOC analysis only) are from the Quincy-Pasco subunit, whereas information on the usage of individual compounds is for the entire study unit. For example, the compounds 2,4-D, 2,4-DB, and terbutryn are used primarily on wheat (terbutryn exclusively on wheat, table 6), which is the predominant crop in the Palouse subunit, so detection of it in the Quincy-Pasco subunit is not as likely as one might expect based on application rates for the entire study unit. Similarly, ethoprop is used exclusively on potatoes and chlorpyrifos is mainly used on orchards, so if samples were not taken near these crops, it is not likely they would be detected.

Implications for Future Sampling

An objective of the retrospective analysis is to use knowledge gained from analyzing existing data to improve the data-collection plans for the assessment of ground-water quality in the study unit. The goals of the assessment are to:

(1) Describe current water-quality conditions;

(2) Identify trends (if any) in water quality; and

(3) Explain factors that affect water-quality conditions and trends.

Ground-water data-collection (sampling) plans designed to help accomplish these general goals will focus on three specific objectives:

(1) to assess the quality of the ground-water source or sources that provide most of the water for public consumption;

(2) to investigate the effects of widely practiced or otherwise significant land uses on the quality of shallow ground water; and

(3) to investigate the processes occurring on a local scale that move or inhibit the movement of contaminants through the ground-water system.

The results of this report affect the data-collection designs for three types of investigations differently.

The retrospective analysis resulted in significant progress toward addressing objective #1, to assess the quality of water used for public water supply, because of the recent acquisition of data from WDOH on water quality in public-supply wells. The review of the WDOH data, though not as thorough as the analysis of the USGS data set, indicates that the concentrations of nitrates in public-supply wells are similar to those observed in the wells in the USGS data set; however, the inverse correlation with depth does not occur. Consequently, there may not be a need for the NAWQA project to collect more data on nutrient concentrations with respect to water quality in public-supply wells. However, there is a need for data on pesticide concentrations in these wells--particularly pesticides that have been used extensively and pesticides with solubilities (in water) greater than about 500 mg/L.

Analyses made for this report have also had a large influence on sampling design for objective #2, the investigation of the effects of land use on water quality. Because land use and recharge, specifically the rates of agrichemical usage and recharge, appear to control the distribution of nitrogen in the ground-water system, more detailed information on land use will be collected and used to help select sampling locations. The relation between nitrate concentration and depth identified in this report emphasizes the importance of well depth to the selection of wells to be sampled for land-use effects studies. Sampling will include both shallow domestic wells and water-table wells drilled by the project staff. Data from the two types of wells will be compared to further assess the relation between depth and water quality and to address the effects of land use on water quality both at the water table where contaminants should appear first and at the depths more commonly tapped for domestic use. The comparison will also allow an evaluation of the relative strengths of the two types of wells for future ground-water sampling programs. The analysis of the WDOH data suggests that the WDOH wells should not be included in sampling for this objective because they are geographically biased toward populated areas.

The complexities of the relations between depth, ground-water residence time, and nitrate concentrations that have become apparent during this retrospective analysis also affect the design of the land-use studies. The study unit is simply too large to attempt to account for the effects of local scale ground-water flow systems, differences between regional recharge and discharge areas, and variations in the thickness and composition of unsaturated materials above the water table. These factors prevent a sampling design that would identify 'typical' small areas representing large parts of the study unit. If such a design were attempted, the areas chosen as 'typical' probably would not be representative in all ways. However, the comparisons of concentrations by subunit and land use show that there are regional correlations in land use and water quality that can provide a basis for subdividing the study unit into representative land-use areas. This approach is referred to as a stratified random sampling, where stratified refers to the process of subsetting land-use areas and identifying the characteristics of the wells to be sampled. The use of random selection of wells within each land-use area requires a statistical approach to the analysis of each of the land-use areas.

Local-scale, or "flow path", studies (objective #3) will focus on the movement of contaminants in local ground-water flow systems, including discharge to streams. This retrospective analysis was not detailed enough to affect the design of these studies; however, it does show that local systems probably play an important role in the transport of contaminants. Local systems should be studied in greater detail in order to understand the occurrence and movement of solutes in the ground-water system and the large variations in nutrient and pesticide concentrations that result.

SUMMARY

This report is a retrospective analysis of ground-water quality data from 1942-92 from the Central Columbia Plateau--one of the major hydrologic basins in the Nation currently being studied as part of the National Water-Quality Assesment (NAWQA) Program. The goals of the NAWQA program are to describe the status and trends in the quality of a representative part of the Nation's water resources.

Irrigated and nonirrigated agriculture are the dominant land uses in the study unit, which is in an arid to semiarid region underlain by the Columbia River Basalt Group. To aid in the development of a conceptual model and to facilitate comparisons of water quality on a national scale, the study unit was divided into three subunits on the basis of factors that could influence ground-water quality, including recharge, geology, geohydrology, hydrology/topography, and land use. The Quincy-Pasco subunit in the south-western part of the study unit has the most recharge, a thick unconsolidated surficial deposit with variable composition, shallow ground-water table, generally flat topography with few perennial streams, and intensive irrigated agriculture with a great variety of crops. The North-Central subunit has the least recharge, a thin or missing unconsolidated unit of highly variable composition, a wide range of depth to ground water, rough topography, few perennial streams, and dryland agriculture (mostly wheat) that requires leaving land fallow for 1 or 2 years between crops. The Palouse subunit in the eastern part of the study unit has moderate recharge, a 10 to 200 ft thickness of fine-grained unconsolidated surficial deposits, shallow water table, hilly topography with many perennial streams, and dryland agriculture, mostly wheat.

The primary source of data is from the U.S. Geological Survey's National Water Information System. Nitrate and pesticide data from the State of Washington Department of Health and pesticide data from the State of Washington Department of Ecology are also analyzed.

Nineteen percent of the mean nitrate concentrations for individual wells in the study unit exceed the U.S. Environmental Protection Agency's Maximum Contaminant Level (MCL) for nitrates (10 mg/L as nitrogen), and 21 percent of drinking water wells exceed the MCL. The median nitrate concentration for all wells is 3.1 mg/L, and the maximum is 89 mg/L. Ten of 90 samples analyzed for the pesticide dibromoethane (EDB) exceeded the MCL.

Nitrate concentration is inversely correlated with depth. Most nitrate concentrations exceeding 10 mg/L (92 percent) are from depths less than 300 ft, and most samples collected from more than 300 ft (91 percent) have nitrate concentrations lower than 5 mg/L. The inverse correlation of nitrate concentration with depth suggests that land use, specifically the use of nitrogen fertilizers, is the source of nitrate in ground water. This relation is supported by wells with trends of increasing nitrate concentrations; these wells generally show the increases beginning in the early 1950's, after the use of nitrogen compounds as fertilizers became widespread. Relations between nitrate concentration and depth are complicated by variations in

vertical ground-water flow direction and by the effects of local-scale ground-water flow systems. Additional factors that may influence the movement and concentration of nitrate are thickness and composition of the unsaturated zone, storm runoff (that carries nitrate to the surface-water system), and denitrification.

Nitrate concentrations are influenced most by land use and recharge rates. Comparison of nitrate concentrations among the subunits shows that nitrate concentrations in ground water are higher where nitrogen fertilizers are applied at the highest rates; the Quincy-Pasco subunit has the highest median nitrate concentration (5.4 mg/L) and the highest rate of nitrogen application (132 lbs/acre). Recharge rates also affect nitrate concentrations; in irrigated areas, recharge transports nitrate into the ground-water system, as in the Quincy-Pasco subunit and the ground-water irrigated areas in the North-Central subunit. Because the North-Central subunit has higher fertilizer application rates and recharge quantities in the irrigated areas, more wells in that subunit have elevated nitrate concentrations than in the Palouse subunit, which has overall higher fertilizer usage and recharge. In the Quincy-Pasco subunit, recharge of fresh irrigation water from canals lowers nitrate concentrations in ground water near the canals.

There are insufficient phosphate and pesticide data to establish relations between concentrations and land use or depth. Phosphate concentrations in ground water are low--the median in the study unit is 0.02 mg/L as phosphorous.

Eleven pesticide compounds were detected: the herbicides DCPA, dicamba, atrazine, picloram, bromacil, and metribuzin; the fumigants 1,2-dichloro-propane, 1,2-dibromoethane (EDB), *trans*-1,3-dichloropropene; the insecticide aldicarb sulfone (also a degradation product of the insecticide aldicarb); and aldicarb sulfoxide (a degradation product of aldicarb). Detection of pesticides in ground water appears to be strongly correlated with the solubility of the compounds in water and with other related physico-chemical properties. Compounds that were detected, with the exceptions of DCPA and atrazine, have solubilities that range from 430 to 330,000 mg/L and compounds that were not detected have solubilities that range from 0.3 to 620 mg/L. Equilibrium partitioning coefficients of the compounds also show that the compounds that were not detected are more strongly attracted to organic solvents and organic substances in soil than compounds that were detected in water.

The relations between nitrate concentrations and depth, age of ground water, land use, and recharge will be considered in the design of subsequent studies of ground-water quality in the Central Columbia Plateau NAWQA study unit. One such study will be an investigation of the effects of selected land uses on shallow ground-water quality. Another will be a study of the change in quality of ground water and the processes that cause the changes as the water flows from the recharge area to the discharge area of a local-scale flow system. Additionally, the results presented in this report are part of an initial assessment of regional and national ground-water quality to be conducted by NAWQA project staff in Reston, Va., and Menlo Park, Calif.

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Table 13.--*Location and well construction data for ground-water-quality sites in the Central Columbia Plateau study unit. Ground-water-quality sites are located on the map on page 101*

[Depth in feet below land surface and altitude in feet above sea level; ID, identification; in, inches;Primary use of site codes: B, withdrawl; Z, destroyed; U, unused; O, observation; H, domestic; T, test; D, drain; E, standby or emergency supply; Use-of-water codes: H, domestic; U, unused; I, irrigation; A, public supply; G, stock; N, industrial; R, recreational; C, commercial; J, industrial cooling; Y, other; Type of openings: P, perforated or slotted; X, open hole; S, screen; mg/L, milligrams per liter;--, no data]

Site number on plate 1	Local well number	Latitude[1]	Longitude	Date of construction (year, month, and day)	Diameter of casing (in)	Primary use of site	Primary use of water	Aquifer code[2]	Type of openings	Depth of well (feet)	Estimated depth of sample (feet)	Sample depth below mean water level (feet)	Depth to mean water level (feet)	Range of open interval: Top of first interval (feet)	Range of open interval: Bottom of last interval (feet)	Number of nitrate samples	Mean nitrate concentration as N (mg/L)
	QUINCY-PASCO SUBUNIT																
1	09N/28E-12P01	461621	1191510	19780710	--	B	H	121RGLDL	P	130	120	88	32	114	126	1	0.10
2	09N/29E-02A01	461759	1190808	19780516	--	B	H	112PSCO	P	128	123	23	100	118	128	2	20
3	09N/29E-02A02	461749	1190823	19771025	--	B	H	112PSCO	S	132	130	13	117	127	132	1	19
4	09N/29E-02C04	461757	1190855	19770103	--	B	H	112PSCO	X	134	132	22	110	130	134	1	14
5	09N/29E-02D03	461757	1190916	19770515	--	B	H	112PSCO	S	160	145	30	115	130	160	3	5.9
6	09N/29E-02G02	461742	1190836	19790501	8	Z	U	122SDLM	P	470	465	350	116	460	470	1	0.11
7	09N/29E-02G02D1	461742	1190836	19860401	--	U	U	--	P	493	493	--	--	--	--	1	0.11
8	09N/29E-02G03	461739	1190836	19760101	--	B	H	122SDLM	X	118	84	34	50	23.5	118	3	14
9	09N/29E-02G04	461742	1190836	19750311	--	B	--	112PSCO	--	145	124	22	102	--	--	3	16
10	09N/29E-02G06	461737	1190831	19810126	--	B	H	112PSCO	S	133	128	23	105	123	133	1	18
11	09N/29E-06F01	461740	1191351	19840920	--	B	H	--	--	160	145	15	130	--	--	1	5.6
12	09N/29E-06G01	461736	1191349	19780430	--	B	H	121RGLDB	--	230	178	52	126	--	--	3	0.27
13	09N/29E-10B01	461703	1190948	19790805	--	B	H	112PSCO	--	200	184	16	167	--	--	2	14
14	09N/30E-02R01	461712	1190041	19620123	6	B	H	122SDLM	X	211	194	80	114	177	211	5	4.4
15	09N/30E-06L01	461727	1190630	19800916	--	B	H	--	--	93	48	46	2	--	--	1	16
16	09N/30E-06Q01D1	461711	1190608	19770606	--	B	H	121RGLDM	S	154	152	70	81	149	154	3	15
17	09N/30E-08B02D1	461703	1190457	19850101	--	B	H	121RGLDM	--	135	135	--	--	--	--	3	14

Table 13.--*Location and well construction data for ground-water-quality sites in the Central Columbia Plateau study unit--Continued*

Site number on plate 1	Local well number	Latitude[1]	Longitude	Date of construction (year, month, and day)	Diameter of casing (in)	Primary use of site	Primary use of water	Aquifer code[2]	Type of openings	Depth of well (feet)	Estimated depth of sample (feet)	Sample depth below mean water level (feet)	Depth to mean water level (feet)	Range of open interval: Top of first interval (feet)	Range of open interval: Bottom of last interval (feet)	Number of nitrate samples	Mean nitrate concentration as N (mg/L)
18	10N/28E-12F01	462210	1191508	19751109	6	B	H	121RGLD	P	196	192	55	137	188	196	10	0.10
19	10N/28E-12J01	462152	1191435	19780826	--	B	H	121RGLDM	--	179	149	30	118	--	--	1	0.10
20	10N/28E-12K01	462150	1191451	19781219	--	B	H	--	--	192	171	21	150	--	--	1	0.10
21	10N/29E-02Q01	462227	1190837	--	--	B	H	--	--	386	254	132	122	--	--	1	0.10
22	10N/29E-02Q02	462231	1190825	19770722	--	B	H	121RGLDU	S	66	64	52	12	61	66	1	8.7
23	10N/29E-03P01	462225	1191006	19630201	6	B	H	121RGLDU	P	75	67	56	11	62	72	3	0.77
24	10N/29E-03R01	462225	1190934	19770722	--	B	H	121RGLDU	X	95	93	79	14	90	--	3	17
25	10N/29E-03R02	462233	1190926	19840313	--	B	H	--	S	110	64	46	19	--	--	1	14
26	10N/29E-04N01	462225	1191133	19590601	6	B	H	121RGLDU	P	110	99	76	23	88	110	1	8.4
27	10N/29E-06H01	462256	1191312	19810705	--	B	H	122SDLM	--	466	414	52	363	--	--	2	0.10
28	10N/29E-08R01	462130	1191150	19540728	--	O	U	--	P	50	25	8	17	0	50	1	9.7
29	10N/29E-09Q01	462136	1191102	19830713	--	B	H	121RGLDM	--	147	114	33	80	--	--	2	5.4
30	10N/29E-09R01	462133	1191041	19581121	6	B	H	--	X	388	327	61	266	250	388	1	0.10
31	10N/29E-10B01	462218	1190951	19770317	--	B	H	121RGLDU	S	55.5	45	33	12	35	55.5	1	16
32	10N/29E-10C01	462218	1191007	19550701	6	B	H	--	X	397	364	34	330	--	--	1	4.4
33	10N/29E-10D01	462218	1191025	19531217	12	B	H	122SDLM	X	618	455	300	155	291	618	2	8.1
34	10N/29E-10N01	462138	1191017	19880623	--	O	U	121RGLDU	P	45	44	24	19	42	45	3	2.6
35	10N/29E-10N02	462137	1191017	19880624	--	O	U	112PSCO	P	29	28	8	19	26	29	3	5.2
36	10N/29E-10N03	462136	1191017	19880623	--	O	U	112PSCO	P	22.5	21	2	19	19.5	22.5	3	21
37	10N/29E-10Q02	462132	1190957	--	--	B	H	--	--	168	133	35	99	--	--	3	12
38	10N/29E-11C01	462220	1190855	19630901	--	B	H	121RGLDU	S	57	52	37	15	47	57	1	6.9
39	10N/29E-11N01	462135	1190909	19540803	--	O	U	--	P	50	25	16	9	0	50	1	2.5

Table 13.--*Location and well construction data for ground-water-quality sites in the Central Columbia Plateau study unit--Continued*

Site number on plate 1	Local well number	Latitude[1]	Longitude	Date of construction (year, month, and day)	Diameter of casing (in)	Primary use of site	Primary use of water	Aquifer code[2]	Type of openings	Depth of well (feet)	Estimated depth of sample (feet)	Sample depth below mean water level (feet)	Depth to mean water level (feet)	Range of open interval: Top of first interval (feet)	Range of open interval: Bottom of last interval (feet)	Number of nitrate samples	Mean nitrate concentration as N (mg/L)
40	10N/29E-12Q01	462134	1190718	19800804	--	B	H	121RGLDM	--	126	88	38	49	--	--	1	8.6
41	10N/29E-14D01	462126	1190909	19570101	8	B	H	121RGLDU	--	48	29	19	10	--	--	2	0.81
42	10N/29E-14R01	462038	1190805	19540804	--	Z	U	--	P	50	25	15	10	0	50	1	2.1
43	10N/29E-15D01	462128	1191033	--	--	O	U	121RGLDU	--	40	26	14	12	--	--	1	1.3
44	10N/29E-15M01	462102	1191031	19581124	6	B	H	122SDLM	X	350	273	146	126	195	350	3	1.9
45	10N/29E-16A01	462127	1191037	19831013	--	B	H	121RGLDM	--	144	104	40	64	--	--	1	7.2
46	10N/29E-16A02	462121	1191038	19840207	--	B	H	121RGLDM	--	102	76	26	51	--	--	1	14
47	10N/29E-25B01	461944	1190718	19801001	--	B	H	112PSCO	--	90	63	27	36	--	--	1	4.9
48	10N/29E-25G01	461929	1190714	19720208	6	B	N	121RGLDM	S	81	67	44	23	53	81	3	7.9
49	10N/29E-26D01	461943	1190918	19780602	6	B	H	122SDLM	X	274	213	65	147	151	274	1	15
50	10N/29E-29L01	461913	1191241	19780915	--	B	H	121RGLDM	S	218	214	54	160	210	218	2	21
51	10N/29E-33P01	461806	1191129	19830201	--	H	I	122SDLM	X	325	296	127	169	267	325	1	0.10
52	10N/30E-03J01	462238	1190159	19651221	6	B	H	122SDLM	X	230	150	111	39	70	230	5	9.8
53	10N/30E-04N01	462227	1190403	19771129	--	B	H	122SDLM	X	121	101	56	45	81	121	1	14
54	10N/30E-05B01	462314	1190449	19690326	--	O	--	110DUNE	P	27	16	4	12	5	27	1	6.4
55	10N/30E-05N01	462221	1190526	19540805	--	O	--	--	P	49.5	10	--	--	--	--	1	4.2
56	10N/30E-09M01	462155	1190401	19790509	--	B	H	122SDLM	X	180	145	98	47	110	180	1	9.6
57	10N/30E-11Q01	462139	1190058	--	--	B	H	122SDLM	X	286	225	133	92	163	286	3	19
58	10N/30E-16P01D1	462041	1190347	19850129	--	B	H	--	P	111	111	--	--	--	--	1	31
59	10N/30E-19J01	462008	1190534	19880115	--	B	H	121RGLDM	S	122	120	51	69	117	122	1	9.2
60	10N/30E-21N01	461945	1190408	--	--	B	H	122SDLM	X	366	289	126	163	212	366	10	0.92
61	10N/30E-21R01	461946	1190300	19660414	--	O	U	121RGLDU	P	50	28	20	8	5	50	1	1.9

Table 13.--*Location and well construction data for ground-water-quality sites in the Central Columbia Plateau study unit--Continued*

Site number on plate 1	Local well number	Latitude[1]	Longitude	Date of construction (year, month, and day)	Diameter of casing (in)	Primary use of site	Primary use of water	Aquifer code[2]	Type of openings	Depth of well (feet)	Estimated depth of sample (feet)	Sample depth below mean water level (feet)	Depth to mean water level (feet)	Range of open interval: Top of first interval (feet)	Range of open interval: Bottom of last interval (feet)	Number of nitrate samples	Mean nitrate concentration as N (mg/L)
62	10N/30E-22N01	461952	1190249	19880726	--	O	--	--	--	16	10	--	--	--	--	1	3.6
63	10N/30E-27C01	461946	1190230	19880809	--	O	U	112PSCO	--	13.3	11	2	9	--	--	1	4.5
64	10N/30E-28G01	461925	1190335	19880802	--	O	U	112PSCO	--	12	8	4	3	--	--	1	24
65	10N/30E-33N04	461801	1190414	19770509	--	B	I	121RGLDM	S	228	223	34	189	218	228	11	18
66	10N/30E-35R01	461807	1190036	19750109	6	B	H	112GLCV	S	127	125	32	93	122	127	1	13
67	10N/31E-32D01D1	461844	1185813	19760708	--	--	--	122SDLM	--	275	153	123	30	--	--	1	3.3
68	10N/31E-32M01	461822	1185812	19790417	--	B	H	122SDLM	P	165	150	76	74	135	165	2	9.6
69	10N/31E-32M02	461815	1185803	19790321	--	B	H	--	X	400	233	153	80	186	280	2	1.3
70	10N/31E-32N03	461811	1185801	19790418	--	U	U	122SDLM	X	295	279	194	85	262	295	2	15
71	11N/28E-13C01	462640	1191510	19760726	--	B	H	121RGLDM	--	140	100	40	60	--	--	1	6.2
72	11N/28E-13C02	462639	1191510	19760729	--	B	H	121RGLDM	--	105	83	23	60	--	--	9	6.6
73	11N/29E-01A01	462822	1190650	19590201	--	B	H	121RGLDU	P	40	38	29	9	36	40	1	8.0
74	11N/29E-03H01	462813	1190908	19791116	6	B	H	122SDLM	X	552	476	76	400	395	552	4	0.10
75	11N/29E-05D01	462830	1191254	19530721	--	O	U	121RGLDU	P	50	25	10	15	0	50	1	4.2
76	11N/29E-05R01	462740	1191150	19580501	8	B	A	122SDLM	X	1,000	788	264	524	575	1,000	1	0.10
77	11N/29E-05R02	462736	1191142	19811208	--	B	A	121RGLDU	X	105	76	56	20	47	105	1	5.1
78	11N/29E-06C01	462832	1191337	19670902	--	B	H	121RGLDU	Z	66	62	40	22	57	66	1	3.3
79	11N/29E-07M01	462704	1191413	19851019	--	B	H	121RGLDM	P	590	565	27	538	540	590	1	0.10
80	11N/29E-10C01	462734	1190945	19880627	--	O	U	121RGLDU	P	46	45	36	9	43	46	3	4.6
81	11N/29E-10C02	462735	1190945	19880628	--	O	U	121RGLDU	P	27	26	17	9	24	27	3	23
82	11N/29E-10C03	462733	1190945	19880628	--	O	U	121RGLDU	P	14	13	4	9	11	14	3	26
83	11N/29E-10C04	462736	1190945	19880628	--	O	U	121RGLDU	P	10	9	0	9	8	10	1	29

Table 13.--*Location and well construction data for ground-water-quality sites in the Central Columbia Plateau study unit--Continued*

Site number on plate 1	Local well number	Latitude[1]	Longitude	Date of construction (year, month, and day)	Diameter of casing (in)	Primary use of site	Primary use of water	Aquifer code[2]	Type of openings	Depth of well (feet)	Estimated depth of sample (feet)	Sample depth below mean water level (feet)	Depth to mean water level (feet)	Range of open interval: Top of first interval (feet)	Range of open interval: Bottom of last interval (feet)	Number of nitrate samples	Mean nitrate concentration as N (mg/L)
84	11N/29E-12E01	462712	1190752	19621001	--	B	H	121RGLDU	P	105	75	41	34	65	85	1	4.6
85	11N/29E-13C01	462639	1190728	19590401	--	B	H	121RGLDU	--	30	24	6	17	--	--	2	1.3
86	11N/29E-14R01	462552	1190758	19540724	--	O	U	121RGLDU	P	50	25	4	21	0	50	1	7.9
87	11N/29E-16N01	462551	1191142	19530724	--	O	U	121RGLDU	P	50	25	0	31	0	50	1	0.10
88	11N/29E-19R01	462500	1191302	19530723	--	O	U	121RGLDU	P	50	25	17	8	0	50	1	12
89	11N/29E-20N01	462501	1191251	19551207	8	B	A	122SDLM	X	936	774	217	557	612	936	1	0.10
90	11N/29E-20N02	462502	1191252	19770711	--	B	A	121RGLDU	S	75	63	47	16	50	75	1	7.0
91	11N/29E-23C01	462550	1190836	19581201	8	B	H	122SDLM	X	519	479	40	439	330	519	1	1.6
92	11N/29E-23N01	462507	1190857	19861103	--	B	H	121RGLDM	S	327	325	53	271	322	327	1	20
93	11N/29E-23N02	462507	1190901	19871028	--	B	H	121RGLDU	S	97.5	91	37	54	84.5	97.5	1	5.4
94	11N/29E-28R01	462414	1191040	19570101	--	U	U	121RGLDU	--	87	58	29	29	--	--	2	15
95	11N/29E-31N01	462321	1191415	19750901	6	B	H	122SDLM	P	746	736	251	485	726	746	4	0.13
96	11N/29E-32R01	462315	1191151	19770420	8	B	H	--	S	363	358	21	337	352	363	1	12
97	11N/29E-34D02	462359	1191028	19770101	--	B	H	121RGLDU	--	78	55	23	31	--	--	1	1.2
98	11N/29E-34J02	462339	1190920	19751219	8	B	H	121RGLDM	--	211	174	37	136	--	--	2	11
99	11N/29E-34R02	462316	1190937	19840331	--	B	H	121RGLDU	X	160	155	138	17	150	160	1	6.7
100	11N/30E-02R01	462747	1190040	19680726	6	B	I	112PSCO	--	124	101	23	79	--	--	--	--
101	11N/30E-03L01	462754	1190233	19590101	6	B	H	122SDLM	X	105	75	33	42	45	105	1	7.6
102	11N/30E-05N02	462737	1190524	19761123	--	B	H	122SDLM	X	79.5	67	55	12	54.5	79.5	3	50
103	11N/30E-08C01	462734	1190454	19770614	--	B	N	122SDLM	X	52	38	29	9	23.70	52	1	9.1
104	11N/30E-10B01	462734	1190208	19580901	6	B	H	122SDLM	X	115	85	30	55	20	115	1	5.5
105	11N/30E-11A01	462727	1190029	19810601	--	B	H	122SDLM	X	290	226	64	161	20	290	1	8.7

Table 13.--*Location and well construction data for ground-water-quality sites in the Central Columbia Plateau study unit--Continued*

Site number on plate 1	Local well number	Latitude[1]	Longitude	Date of construction (year, month, and day)	Diameter of casing (in)	Primary use of site	Primary use of water	Aquifer code[2]	Type of openings	Depth of well (feet)	Estimated depth of sample (feet)	Sample depth below mean water level (feet)	Depth to mean water level (feet)	Range of open interval: Top of first interval (feet)	Range of open interval: Bottom of last interval (feet)	Number of nitrate samples	Mean nitrate concentration as N (mg/L)
106	11N/30E-11C01	462735	1190119	19510917	12	--	--	--	X	614	485	130	355	40	614	--	--
107	11N/30E-12D01	462731	1190015	19790320	8	B	H	122WNPM	X	410	313	98	215	18.5	410	4	1.8
108	11N/30E-14K01	462615	1190054	19820211	--	B	H	122SDLM	X	265	245	168	77	225	265	1	8.4
109	11N/30E-15B01	462643	1190202	19580101	6	B	H	112PSCO	--	163	130	33	98	--	--	1	2.1
110	11N/30E-16C01	462642	1190343	19570101	6	B	H	122SDLM	--	320	198	122	76	--	--	1	16
111	11N/30E-17B01	462643	1190440	19600101	6	B	H	122SDLM	X	100	63	44	19	26	100	2	20
112	11N/30E-29C01	462450	1190501	19620801	--	B	H	121RGLDM	--	220	220	--	--	--	--	2	1.9
113	11N/30E-34H01	462345	1190151	19821012	--	B	H	122SDLM	X	105	73	32	41	20	105	2	22
114	12N/28E-12H01	463234	1191411	19070301	7	B	H	122SDLM	X	450	375	195	180	300	450	2	0.10
115	12N/28E-23H01D1	463100	1191535	19800801	6	B	H	122SDLM	X	413	328	306	22	242	413	4	0.10
116	12N/28E-24N01	463023	1191528	19211001	12	B	H	--	--	755	387	368	19	--	--	--	--
117	12N/28E-25M01	462943	1191522	19781221	--	B	H	121RGLDM	--	95	60	35	25	--	--	1	0.31
118	12N/29E-01A01	463337	1190645	19630801	6	B	H	122SDLM	X	313	231	82	148	128	313	9	14
119	12N/29E-01E01	463319	1190750	19550818	--	O	U	121RGLDU	P	50.3	28	21	6	5.3	50.3	1	6.6
120	12N/29E-03F01	463320	1190952	19070101	6	B	H	121CBRV	X	401	351	51	300	20	401	--	--
121	12N/29E-04N01	463258	1191138	19731210	6	B	H	--	X	170	146	24	122	--	--	1	50
122	12N/29E-11M01	463222	1190905	19570801	6	B	H	122SDLM	X	212	200	23	177	188	212	3	0.10
123	12N/29E-17K01	463124	1191203	19751124	6	B	H	--	X	478	447	58	389	416	478	1	0.10
124	12N/29E-25D01	463016	1190749	19560821	--	O	U	121RGLDU	P	50.5	28	1	27	5.5	50.5	1	9.9
125	12N/29E-28F01	462955	1191110	19521002	10	U	A	122SDLM	X	700	599	101	497	455	700	--	--
126	12N/29E-34B01	462924	1190933	19570501	8	B	A	122SDLM	X	555	490	66	424	390	555	--	--
127	12N/29E-34B01D1	462924	1190933	19621027	6	B	A	--	P	997	530	68	462	525	535	1	0.10

Table 13.--*Location and well construction data for ground-water-quality sites in the Central Columbia Plateau study unit--Continued*

Site number on plate 1	Local well number	Latitude[1]	Longitude	Date of construction (year, month, and day)	Diameter of casing (in)	Primary use of site	Primary use of water	Aquifer code[2]	Type of openings	Depth of well (feet)	Estimated depth of sample (feet)	Sample depth below mean water level (feet)	Depth to mean water level (feet)	Range of open interval: Top of first interval (feet)	Range of open interval: Bottom of last interval (feet)	Number of nitrate samples	Mean nitrate concentration as N (mg/L)
128	12N/29E-34K01	462859	1190943	19580125	8	B	H	--	X	971	746	226	520	417	971	1	0.10
129	12N/30E-04D01	463338	1190357	19591101	6	B	H	122SDLM	X	290	177	126	50	63	290	2	12
130	12N/30E-04L01	463308	1190343	19830517	--	B	H	122SDLM	X	250	175	75	101	60.90	250	1	7.6
131	12N/30E-05B01	463341	1190428	19551126	12	B	H	122SDLM	X	457	302	186	116	146	457	6	8.5
132	12N/30E-12E01	463231	1190015	--	6	B	G	122SDLM	X	121	121	19	102	120	121	1	15
133	12N/30E-16Q01	463117	1190315	19580101	6	B	H	122SDLM	X	56.9	48	9	39	11.5	56.9	1	14
134	12N/30E-21G01	463044	1190330	19600401	6	B	H	122SDLM	X	211	121	91	30	17	211	1	11
135	12N/30E-30L01	462946	1190616	--	--	B	H	122SDLM	X	219	197	--	--	175	219	3	4.8
136	12N/30E-33B01	462916	1190319	19580101	6	B	H	122SDLM	X	374	215	159	57	20	374	3	15
137	12N/30E-34N01	462832	1190241	19570601	6	B	H	122SDLM	--	328	196	132	65	--	--	2	19
138	13N/28E-03N01	463805	1191804	--	--	O	U	--	--	51	51	--	--	--	--	1	2.8
139	13N/28E-09L01	463729	1191852	19861218	--	B	H	122SDLM	--	810	698	113	585	--	--	1	0.10
140	13N/28E-11E01	463751	1191636	196307	--	B	H	--	--	727	669	59	610	--	--	1	1.8
141	13N/28E-13N01	463621	1191536	19540503	12	B	--	122WNPM	X	1,120	1,075	600	475	1,030	1,120	3	0.14
142	13N/28E-21J01	463543	1191822	--	--	O	--	--	--	46	46	--	--	--	--	1	39
143	13N/28E-21J02	463544	1191822	--	--	O	--	--	--	17	17	--	--	--	--	3	8.9
144	13N/28E-21J03	463545	1191822	--	--	O	--	--	--	27	27	--	--	--	--	3	35
145	13N/28E-21J04	463542	1191822	--	--	O	--	--	--	9	9	--	--	--	--	1	9.4
146	13N/29E-03C01	463858	1191006	19620701	6	B	H	--	X	260	260	105	154	259	260	3	31
147	13N/29E-04A01	463850	1191044	19631101	6	B	H	--	--	294	277	17	260	--	--	2	4.9
148	13N/29E-08H01	463747	1191202	19640711	10	B	R	122SDLM	X	453	433	51	381	412	453	5	0.10
149	13N/29E-12L01	463810	1190805	19830804	--	B	H	--	--	225	118	108	10	--	--	2	0.16

Table 13.--*Location and well construction data for ground-water-quality sites in the Central Columbia Plateau study unit--Continued*

Site number on plate 1	Local well number	Latitude[1]	Longitude	Date of construction (year, month, and day)	Diameter of casing (in)	Primary use of site	Primary use of water	Aquifer code[2]	Type of openings	Depth of well (feet)	Estimated depth of sample (feet)	Sample depth below mean water level (feet)	Depth to mean water level (feet)	Range of open interval: Top of first interval (feet)	Range of open interval: Bottom of last interval (feet)	Number of nitrate samples	Mean nitrate concentration as N (mg/L)
150	13N/29E-16H01	463658	1191049	19860524	--	B	H	--	X	104	75	30	45	--	--	1	4.7
151	13N/29E-23M01	463544	1190910	19600801	8	B	T	122SDLM	P	310	230	174	56	149	310	1	8.9
152	13N/29E-23P01	463538	1190843	19751023	16	B	A	--	X	703	389	314	75	22	703	1	0.81
153	13N/29E-26B01	463526	1190834	19541110	10	B	H	122SDLM	X	175	158	18	140	27	175	--	--
154	13N/29E-27D01	463518	1191019	19790425	--	B	H	122SDLM	X	75	50	31	19	25	75	2	4.3
155	13N/29E-28A01	463528	1191038	19590701	7	B	H	112PSCO	--	25	22	3	18	--	--	2	4.3
156	13N/29E-32G01	463411	1191215	19580101	--	B	H	122SDLM	X	264	216	110	106	168	264	2	3.6
157	13N/29E-32M01	463357	1191254	19620101	6	B	H	--	--	463	338	23	315	--	--	1	0.21
158	13N/29E-34N01	463345	1191024	19620401	6	B	H	122SDLM	X	182	169	13	156	124	182	2	0.10
159	13N/29E-35Q01	463347	1190826	19571201	6	B	H	122SDLM	X	330	264	66	198	191	330	2	0.21
160	13N/29E-36A01D1	463435	1190654	19840306	--	B	H	122SDLM	--	340	189	151	38	--	--	3	27
161	13N/30E-10R01	463718	1190137	19600101	6	B	H	122SDLM	X	137	104	33	71	47	137	1	8.9
162	13N/30E-12N01	463715	1190014	19760112	--	B	N	122SDLM	X	280	262	18	243	21	280	2	0.70
163	13N/30E-13M01D1	463641	1190010	19640101	--	B	H	122SDLM	--	196	160	36	125	--	--	4	13
164	13N/30E-16G01D2	463656	1190318	19600101	--	B	H	122SDLM	--	160	102	58	44	--	--	11	7.9
165	13N/30E-22N01	463529	1190236	19540101	6	B	H	122SDLM	X	154	107	72	35	60	154	1	12
166	13N/30E-27J01	463458	1190140	19590901	6	B	H	122SDLM	--	56	32	24	8	--	--	2	10
167	13N/30E-29C01	463525	1190455	--	6	B	H	--	--	272	264	9	255	--	--	--	--
168	13N/30E-31N01	463356	1190641	19750724	6	B	H	122SDLM	X	235	188	47	141	135	235	5	6.2
169	14N/23E-13D01	464217	1195322	19790301	14	B	I	122WNPM	X	970	765	495	270	560	970	2	0.10
170	14N/23E-26A01D1	464039	1195350	19811201	--	B	H	122SDLM	--	410	285	127	158	--	--	3	1.6
171	14N/23E-36L02	463926	1195314	19571123	10	B	A	122WNPM	P	236	186	84	102	135	236	3	1.3

Table 13.--*Location and well construction data for ground-water-quality sites in the Central Columbia Plateau study unit--Continued*

Site number on plate 1	Local well number	Latitude[1]	Longitude	Date of construction (year, month, and day)	Diameter of casing (in)	Primary use of site	Primary use of water	Aquifer code[2]	Type of openings	Depth of well (feet)	Estimated depth of sample (feet)	Sample depth below mean water level (feet)	Depth to mean water level (feet)	Range of open interval: Top of first interval (feet)	Range of open interval: Bottom of last interval (feet)	Number of nitrate samples	Mean nitrate concentration as N (mg/L)
172	14N/25E-01D01	464406	1193818	19520510	16	U	U	--	P	938	776	602	173	613	938	1	0.10
173	14N/25E-02C01	464407	1193918	19731222	6	U	U	122SDLM	X	445	395	127	268	345	445	3	0.77
174	14N/25E-21B01	464137	1194136	19530430	20	B	A	--	P	522	394	159	235	270	518	--	--
175	14N/25E-31M01	463922	1194433	19521113	16	U	U	--	P	699	554	183	370	429	678	--	--
176	14N/27E-03L01	464344	1192525	19881116	--	O	--	112TCHT	--	8.1	8	--	--	--	--	1	0.10
177	14N/27E-03P01D1	464327	1192526	19800311	--	O	--	--	P	85	10	--	--	--	--	1	2.3
178	14N/27E-24C01	464135	1192245	19531110	16	B	A	122WNPM	P	1,400	1,380	995	385	1,370	1,390	--	--
179	14N/27E-26E01	464025	1192434	19600204	--	O	U	--	P	79.5	80	--	--	--	--	1	1.1
180	14N/28E-15E01	464204	1191809	19850701	--	O	U	--	P	9.6	11	3	7	1	20	1	1.7
181	14N/28E-15N01	464136	1191808	19850702	--	O	U	--	P	12.6	11	3	8	1	20	1	3.6
182	14N/28E-16R01	464147	1191810	--	--	O	--	--	P	20.8	21	--	--	--	--	1	4.5
183	14N/28E-21J01	464108	1191810	19850703	--	O	U	112TCHT	P	35.5	18	0	23	1	35.5	1	36
184	14N/28E-28A01	464042	1191810	--	--	O	--	--	P	43	43	--	--	--	--	1	29
185	14N/28E-28C01	464042	1191847	19850708	--	O	U	--	--	20	13	7	6	--	--	1	11
186	14N/28E-29B01	464344	1191613	19580101	6	B	H	--	X	666	552	114	438	--	--	1	3.5
187	14N/29E-05A01	464412	1191157	19780301	6	B	H	122SDLM	X	305	280	25	255	165	305	5	4.6
188	14N/29E-05M01	464342	1191258	19810922	6	B	H	122WNPM	X	550	495	214	281	440	550	1	9.6
189	14N/29E-09A01	464321	1191048	19500617	10	B	A	121CBRV	X	863	714	150	564	218	863	--	--
190	14N/29E-09B02	464316	1191052	19710710	8	B	H	122WNPM	S	725	710	354	356	695	725	8	2.8
191	14N/29E-09R01	464231	1191035	19800328	--	B	H	--	X	360	240	120	120	95	360	1	8.2
192	14N/29E-14C01	464210	1190854	--	8	O	H	--	X	350	278	73	205	90	350	1	12
193	14N/29E-19Q01	464043	1191322	19790914	6	B	H	122SDLM	X	420	352	129	223	284	420	5	10

Table 13.--*Location and well construction data for ground-water-quality sites in the Central Columbia Plateau study unit--Continued*

Site number on plate 1	Local well number	Latitude[1]	Longitude	Date of construction (year, month, and day)	Diameter of casing (in)	Primary use of site	Primary use of water	Aquifer code[2]	Type of openings	Depth of well (feet)	Estimated depth of sample (feet)	Sample depth below mean water level (feet)	Depth to mean water level (feet)	Range of open interval: Top of first interval (feet)	Range of open interval: Bottom of last interval (feet)	Number of nitrate samples	Mean nitrate concentration as N (mg/L)
194	14N/29E-20M02D1	464113	1191249	19770107	--	B	I	--	X	920	920	--	--	--	--	1	0.10
195	14N/29E-21J01	464108	1191038	19620101	6	B	H	122SDLM	X	260	196	184	12	132	260	3	47
196	14N/29E-27E01	464025	1191014	19580115	8	B	A	122WNPM	X	498	467	364	103	435	498	1	1.9
197	14N/29E-27N01	463955	1191025	19630901	6	B	H	122SDLM	X	273	251	184	67	229	273	3	36
198	14N/29E-28A01	464044	1191033	19591222	1.5	O	U	121RGLDU	--	51	34	17	17	--	--	1	4.9
199	14N/29E-28C01	464041	1191125	19620701	6	B	H	122SDLM	X	343	252	222	30	161	343	6	89
200	14N/29E-32N01	463904	1191300	19640501	6	B	H	--	P	592	521	71	450	--	--	2	2.2
201	14N/29E-32Q01	463910	1191209	19620101	6	B	H	--	X	330	318	158	160	306	330	1	7.6
202	14N/30E-02J01	464339	1190018	--	6	B	H	121CBRV	--	400	325	75	250	--	--	--	--
203	14N/30E-08G01	464304	1190438	19520715	10	B	H	122WNPM	P	371	301	264	37	231	371	1	22
204	14N/30E-10P01	464234	1190227	19520317	12	B	A	122WNPM	X	433	259	174	85	30	433	4	1.5
205	14N/30E-20A01	464136	1190409	19511108	12	B	A	122WNPM	X	717	486	232	254	157	717	1	12
206	14N/30E-27J01	464010	1190146	19530916	6	B	H	122WNPM	P	381	331	136	195	301	361	--	--
207	14N/30E-30K01	464015	1190555	--	6	B	H	121CBRV	--	360	305	55	250	--	--	--	--
208	14N/31E-19B01	464135	1185812	19731003	6	B	H	122WNPM	X	320	250	70	180	153	320	3	2.0
209	14N/31E-36B01	463946	1185150	19390301	12	B	A	121CBRV	X	643	531	113	418	8.5	643	--	--
210	14N/31E-36B02	463946	1185200	1919	12	B	A	--	X	276	192	84	108	16	276	--	--
211	15N/23E-03H01	464914	1195518	1958	12	B	H	--	P	84	78	--	--	72	83	--	--
212	15N/23E-35J01	464431	1195344	19771128	8	B	T	122SDLM	P	424	378	50	328	332	424	3	--
213	15N/23E-35P01	464422	1195423	19810407	12	B	A	122WNPM	X	993	760	483	277	526	993	3	--
214	15N/25E-35H01	464440	1193832	19750124	6	B	H	122SDLM	X	420	361	59	302	260	420	3	--
215	15N/26E-28Q01	464518	1193350	19530901	16H	U	U	--	P	892	865	559	306	860	870	--	--

Table 13.--*Location and well construction data for ground-water-quality sites in the Central Columbia Plateau study unit--Continued*

Site number on plate 1	Local well number	Latitude[1]	Longitude	Date of construction (year, month, and day)	Diameter of casing (in)	Primary use of site	Primary use of water	Aquifer code[2]	Type of openings	Depth of well (feet)	Estimated depth of sample (feet)	Sample depth below mean water level (feet)	Depth to mean water level (feet)	Range of open interval: Top of first interval (feet)	Range of open interval: Bottom of last interval (feet)	Number of nitrate samples	Mean nitrate concentration as N (mg/L)
217	15N/27E-32E01	464448	1192814	19530512	16	U	U	--	P	1,120	1,046	784	262	982	1,110	--	--
218	15N/27E-34L02	464427	1192535	19520120	16	U	U	122SDLM	X	636	495	207	287	353	636	--	--
219	15N/28E-08E01	464812	1192039	19370901	6	B	H	--	X	415	340	100	240	265	415	--	--
220	15N/28E-15D01	464737	1191807	19511113	15	B	A	--	X	865	626	251	375	386	865	1	0.10
221	15N/28E-24G01	464633	1191439	19520328	12	B	H	121CBRV	X	237	231	82	149	225	237	1	5.6
222	15N/28E-24L01	464620	1191514	19511230	10	B	H	122SDLM	X	382	362	20	342	290	382	--	--
223	15N/28E-35P01	464422	1191620	19560724	12	U	U	121CBRV	X	840	558	282	276	25	840	--	--
224	15N/29E-03C01	464934	1191007	19400401	10	B	A	122WNPM	X	697	526	172	354	212	697	--	--
225	15N/29E-03J01	464905	1190914	19650130	20	B	A	122WNPM	P	905	728	374	354	550	905	--	--
226	15N/29E-04A01	464929	1191030	1908	8	B	A	122WNPM	X	561	383	178	205	120	561	--	--
227	15N/29E-04A02	464928	1191030	19771001	20	B	A	122CBRV	X	1,210	735	475	260	212	1,210	3	0.44
228	15N/29E-04H01	464920	1191030	1908	--	B	N	121CBRV	--	538	409	129	280	--	--	--	--
229	15N/29E-08G01	464828	1191219	--	6	B	H	121CBRV	--	265	265	--	--	--	--	--	--
230	15N/29E-08K01	464807	1191220	--	6	B	H	121CBRV	--	480	330	150	180	--	--	--	--
231	15N/29E-27R01	464515	1190933	19520502	10	B	A	121CBRV	X	550	394	157	237	102	550	--	--
232	15N/30E-23A01	464638	1190019	--	6	B	H	--	--	500	300	200	100	--	--	--	--
233	15N/30E-36A01	464504	1185909	19560217	12	B	H	121CBRV	X	492	456	36	420	--	--	--	--
234	16N/23E-21J01	465139	1195633	19650708	12	B	A	122WNPM	X	173	167	214	46	160	173	3	0.21
235	16N/23E-34C01	465016	1195551	1929	6	--	--	--	--	85	74	11	64	--	--	--	--
236	16N/23E-34F02	465000	1195543	19560901	8	B	A	--	P	141	138	43	95	136	140	--	--
237	16N/24E-01G01	465425	1194515	1960	20	U	U	121CBRV	X	800	760	40	720	410	800	--	--

Table 13.--*Location and well construction data for ground-water-quality sites in the Central Columbia Plateau study unit--Continued*

Site number on plate 1	Local well number	Latitude[1]	Longitude	Date of construction (year, month, and day)	Diameter of casing (in)	Primary use of site	Primary use of water	Aquifer code[2]	Type of openings	Depth of well (feet)	Estimated depth of sample (feet)	Sample depth below mean water level (feet)	Depth to mean water level (feet)	Range of open interval: Top of first interval (feet)	Range of open interval: Bottom of last interval (feet)	Number of nitrate samples	Mean nitrate concentration as N (mg/L)
238	16N/24E-01G02	465428	1194517	19591201	--	B	A	--	--	915	809	107	702	--	--	--	--
239	16N/24E-04H01	465432	1194840	19661018	8	B	H	122CBRV	X	811	683	128	556	10	811	3	4.7
240	16N/25E-01Q01	465358	1193738	19560503	12	B	A	122YKIM	X	907	677	231	446	43	907	3	1.4
241	16N/25E-04N01	465407	1194203	19740329	6	B	H	122SDLM	X	70	60	47	13	50	70	3	13
242	16N/25E-06M01	465419	1194443	19490323	12.5	U	U	122WNPM	X	850	786	64	722	170	850	--	--
243	16N/25E-26Q01	465031	1193845	1925	60	B	I	--	--	16	13	3	10	--	--	--	--
244	16N/25E-26R03	465027	1193838	1927	6	B	I	--	--	16	13	3	10	--	--	--	--
245	16N/26E-29E01	465050	1193559	19540727	48	B	I	--	--	19	14	6	8	--	--	--	--
246	16N/26E-30H01	465100	1193837	--	--	B	I	--	--	20	13	7	6	--	--	--	--
247	16N/26E-34H01	465006	1193219	19510401	72	B	I	110ALVM	--	25	19	6	13	--	--	--	--
248	16N/27E-10N01	465300	1192546	19760111	6	B	H	--	X	250	146	123	23	42	250	3	6.7
249	16N/27E-19D01	465200	1192938	1962	6	B	H	--	X	252	152	100	52	48	252	--	--
250	16N/28E-04B01	465444	1191837	19591001	6	B	H	122SDLM	X	179	103	77	26	7	179	3	7.7
251	16N/28E-05N01	465352	1192033	19580601	7	B	H	122WNPM	X	290	255	35	220	69	290	2	6.5
252	16N/28E-08P01	465304	1192009	--	7	B	H	--	--	304	239	66	173	--	--	--	--
253	16N/29E-06M02	464903	1191409	1919	6	B	I	--	--	12	10	2	8	--	--	--	--
254	16N/29E-06P01	464845	1191347	--	36	B	I	--	--	16.5	15	2	13	--	--	--	--
255	16N/29E-34D01	465024	1191024	19630201	12	B	N	122WNPM	X	1,040	707	501	206	374	1,040	2	0.16
256	16N/29E-34R01	464947	1190926	19560901	16	B	A	122WNPM	X	900	666	234	432	197	900	--	--
257	16N/30E-18A01	465258	1190527	19550623	10	B	H	--	X	392	208	184	24	--	--	--	--
258	16N/30E-35Q01	464931	1190111	19570416	10	B	H	121CBRV	X	231	143	88	55	--	--	--	--
259	17N/23E-02B01	465957	1195413	19760305	12	B	I	122WNPM	X	364	289	88	201	214	364	3	1.7

Table 13.--*Location and well construction data for ground-water-quality sites in the Central Columbia Plateau study unit--Continued*

Site number on plate 1	Local well number	Latitude[1]	Longitude	Date of construction (year, month, and day)	Diameter of casing (in)	Primary use of site	Primary use of water	Aquifer code[2]	Type of openings	Depth of well (feet)	Estimated depth of sample (feet)	Sample depth below mean water level (feet)	Depth to mean water level (feet)	Range of open interval: Top of first interval (feet)	Range of open interval: Bottom of last interval (feet)	Number of nitrate samples	Mean nitrate concentration as N (mg/L)
260	17N/23E-23A01D1	465725	1195356	19751129	--	B	H	--	--	905	753	153	600	--	--	3	0.10
261	17N/24E-04J01	465932	1194847	--	6	U	U	121CBRV	X	320	270	50	220	22	320	--	--
262	17N/24E-22L01	465657	1194819	19741101	6	B	H	122WNPM	X	280	273	122	151	265	280	3	4.1
263	17N/25E-11H01	465833	1193835	19510519	10	B	H	--	X	285	256	179	77	227	285	--	--
264	17N/25E-23K01	465835	1193855	19570208	12	T	U	--	X	957	792	166	626	80	957	--	--
265	17N/25E-31N01	465455	1194449	19620201	6	B	H	121CBRV	X	110	72	38	34	--	--	1	8.0
266	17N/26E-18H01	465803	1193600	19610712	8	B	H	122WNPM	X	310	265	189	76	220	310	1	0.10
267	17N/26E-28Q01	465545	1193353	--	6	B	H	--	--	404	342	62	280	--	--	--	--
268	17N/26E-33D01	465540	1193842	19601101	6	B	A	--	--	340	265	75	190	--	--	--	--
269	17N/27E-10M01	465835	1192533	--	8	B	I	--	--	40	40	--	--	--	--	--	--
270	17N/27E-31D01	465533	1192920	19510125	18	B	A	122CBRV	X	810	479	392	87	148	810	4	2.8
271	17N/28E-12D01	465900	1191520	19510319	8	B	H	--	--	270	214	57	157	--	--	--	--
272	17N/28E-16E01	465756	1191912	19540701	6	B	A	--	--	96	71	25	45	--	--	--	--
273	17N/29E-24A01	465717	1190640	1917	4	B	H	--	--	475	475	--	--	--	--	--	--
274	17N/29E-24C01	465717	1190723	19761206	8	B	I	122WNPM	X	210	149	61	88	20	210	1	5.6
275	17N/31E-07E01	465840	1185848	1960	7	B	H	122WNPM	X	126	96	30	66	15.3	126	3	14
276	17N/31E-08R01	465818	1185632	19531031	8	B	H	--	X	155	109	46	63	62	155	--	--
277	18N/23E-01C01	470513	1195315	1910	2	--	--	121CBRV	--	185	105	80	25	--	--	--	--
278	18N/23E-14B01	470327	1195412	--	10	B	I	121CBRV	--	542	381	161	220	--	--	--	--
279	18N/23E-36H01	470030	1195236	19500426	16	B	H	122GDRD	X	669	482	188	294	237	669	1	4.1
280	18N/24E-04D02	470506	1194942	19770215	16	B	I	122WNPM	X	280	200	172	28	120	280	3	4.7
281	18N/24E-06H01	470458	1195122	19540616	8	B	H	--	X	330	256	228	27	181	330	--	--

Table 13.--*Location and well construction data for ground-water-quality sites in the Central Columbia Plateau study unit--Continued*

Site number on plate 1	Local well number	Latitude[1]	Longitude	Date of construction (year, month, and day)	Diameter of casing (in)	Primary use of site	Primary use of water	Aquifer code[2]	Type of openings	Depth of well (feet)	Estimated depth of sample (feet)	Sample depth below mean water level (feet)	Depth to mean water level (feet)	Range of open interval: Top of first interval (feet)	Range of open interval: Bottom of last interval (feet)	Number of nitrate samples	Mean nitrate concentration as N (mg/L)
282	18N/24E-17P01	470247	1195048	19550201	6	B	H	--	--	140	99	41	58	--	--	--	--
283	18N/24E-32N02	470009	1195109	19510818	8	B	I	--	X	425	371	54	317	143	425	--	--
284	18N/24E-33R01	470008	1194856	1955	8	B	H	--	--	60	56	4	52	--	--	--	--
285	18N/25E-04A01	470457	1194132	--	--	U	U	--	--	126	113	13	100	--	--	--	--
286	18N/25E-08B01	470420	1194253	--	--	--	--	--	--	134	134	--	--	--	--	--	--
287	18N/25E-08C01	470418	1194305	19730404	16	B	I	112GLCV	P	120	84	67	17	47	120	1	8.4
288	18N/25E-15E01D1	470308	1194058	19780111	10	T	U	122GDRD	X	1,610	1,298	914	384	986	1,610	1	0.10
289	18N/26E-28F01	470130	1193410	--	--	--	--	--	--	--	10	--	--	--	--	--	--
290	18N/26E-32C01	470049	1193521	19751115	16	B	I	122WNPM	X	450	350	302	48	250	450	3	2.9
291	18N/26E-34K01	470018	1193235	19750904	16	B	I	112GLCV	P	66	46	21	25	36	56	1	0.10
292	18N/27E-04R01	470436	1192540	--	--	Z	--	--	--	18	18	--	--	--	--	--	--
293	18N/28E-03A01	470513	1191619	1946	8	B	--	--	P	126	113	17	96	105	120	--	--
294	18N/28E-24N01	470146	1191517	19481111	18	B	I	121CBRV	X	590	394	307	87	198	590	--	--
295	18N/28E-26F01	470120	1191619	1945	12	B	I	122CBRV	P	801	626	552	74	596	656	3	0.34
296	18N/28E-34H01	470030	1191520	--	6	B	H	121CBRV	--	164	135	29	106	--	--	--	--
297	18N/28E-34R01	470004	1191649	1947	8	B	A	--	--	268	187	81	106	--	--	--	--
298	18N/28E-36D01	470046	1191522	19520201	6	O	U	--	--	218	146	72	73	--	--	--	--
299	18N/29E-01A02	470508	1190627	1950	10	B	I	122CBRV	--	510	357	153	204	--	--	2	2.2
300	18N/29E-02A01	470510	1190752	19521220	6	B	H	122WNPM	--	270	218	53	165	--	--	3	2.7
301	18N/29E-07R01	470340	1191305	19481216	12	B	I	121CBRV	X	521	353	168	185	120	521	--	--
302	18N/29E-08B01	470417	1191203	1900	6	B	H	--	--	230	188	42	146	--	--	--	--
303	18N/29E-17P01	470237	1191219	19520104	8	B	H	121CBRV	--	342	266	76	190	--	--	--	--

Table 13.--*Location and well construction data for ground-water-quality sites in the Central Columbia Plateau study unit--Continued*

Site number on plate 1	Local well number	Latitude[1]	Longitude	Date of construction (year, month, and day)	Diameter of casing (in)	Primary use of site	Primary use of water	Aquifer code[2]	Type of openings	Depth of well (feet)	Estimated depth of sample (feet)	Sample depth below mean water level (feet)	Depth to mean water level (feet)	Range of open interval: Top of first interval (feet)	Range of open interval: Bottom of last interval (feet)	Number of nitrate samples	Mean nitrate concentration as N (mg/L)
304	18N/30E-04P01	470420	1190333	--	6	B	H	--	--	140	115	25	90	--	--	--	--
305	18N/30E-16R01	470234	1190242	19531118	6	B	H	122WNPM	X	185	149	108	41	113	185	3	23
306	19N/23E-12R01	470851	1195228	--	6	B	H	--	--	135	89	47	42	--	--	--	--
307	19N/23E-22M01	470722	1195608	19660509	8	B	A	122WNPM	X	111	98	13	85	64	111	3	4.5
308	19N/24E-03C01	471031	1194813	1955	6	B	H	121CBRV	--	60	35	25	9	--	--	--	--
309	19N/24E-04A01	471032	1194840	1956	6	B	H	--	--	66	48	18	30	--	--	--	--
310	19N/24E-05B01	471030	1195015	1943	8	B	I	121CBRV	X	350	258	93	165	35	350	--	--
311	19N/24E-07J01	470913	1195117	1912	10	B	H	--	--	502	268	234	34	--	--	--	--
312	19N/24E-11A01	470938	1194608	1956	6	B	H	121CBRV	--	80	80	--	--	--	--	--	--
313	19N/24E-11M01	470912	1194715	19470701	--	Z	--	121CBRV	--	191	111	80	32	--	--	--	--
314	19N/24E-19A01	470755	1195112	19540	--	B	H	--	--	112	72	40	32	--	--	--	--
315	19N/24E-28N01	470619	1194944	1945	6	B	H	--	--	210	200	10	190	--	--	--	--
316	19N/24E-36K01	470514	1194541	--	--	--	--	--	--	164	164	--	--	--	--	--	--
317	19N/25E-02M01	471008	1193932	1911	6	B	H	--	--	100	59	41	17	--	--	--	--
318	19N/25E-02N02	470946	1193937	--	8	U	U	--	--	184	131	53	78	--	--	--	--
319	19N/25E-08A01	470930	1194212	19740305	18	B	I	122CBRV	X	722	439	394	45	155	722	2	4.6
320	19N/25E-10A01	470943	1193940	1911	--	B	H	--	--	160	125	35	90	--	--	--	--
321	19N/26E-01R01	470949	1192935	19560402	10	U	U	--	X	459	440	240	200	421	459	--	--
322	19N/26E-04Q01	470947	1193351	19551114	10	U	U	--	X	436	424	303	121	418	430	--	--
323	19N/26E-05D01	471039	1193541	19530810	6	B	H	--	--	130	119	12	107	--	--	--	--
324	19N/26E-06A01	471037	1193541	19100919	6	U	U	--	--	135	127	9	118	--	--	--	--
325	19N/26E-25D01	470704	1193042	19750216	6	B	H	112GLCV	X	140	128	68	60	115	140	1	0.21

Table 13.--*Location and well construction data for ground-water-quality sites in the Central Columbia Plateau study unit--Continued*

Site number on plate 1	Local well number	Latitude[1]	Longitude	Date of construction (year, month, and day)	Diameter of casing (in)	Primary use of site	Primary use of water	Aquifer code[2]	Type of openings	Depth of well (feet)	Estimated depth of sample (feet)	Sample depth below mean water level (feet)	Depth to mean water level (feet)	Range of open interval: Top of first interval (feet)	Range of open interval: Bottom of last interval (feet)	Number of nitrate samples	Mean nitrate concentration as N (mg/L)
326	19N/26E-36E01	470559	1193026	19760529	16	B	I	122WNPM	X	515	413	165	248	311	515	2	2.2
327	19N/27E-07A01	470936	1192818	19521101	12	B	I	121CBRV	X	570	406	310	96	242	570	--	--
328	19N/27E-17L01	470816	1192735	1914	10	B	I	--	X	211	156	88	68	100	211	--	--
329	19N/27E-21C01	470750	1192625	19161019	--	B	I	--	--	70	68	2	66	--	--	--	--
330	19N/27E-23R01	470705	1192315	19160912	--	B	I	--	--	77.5	75	2	73	--	--	--	--
331	19N/27E-24H02	470813	1192300	--	6	B	H	--	--	96	78	18	60	--	--	1	5.0
332	19N/27E-24K01	470720	1192210	--	72	B	I	--	--	27	17	10	7	--	--	--	--
333	19N/27E-25A03	470700	1192147	1939	48	B	H	--	--	34	31	4	27	--	--	--	--
334	19N/27E-30N01	470622	1192911	19750810	12	B	I	122WNPM	X	460	360	207	153	260	460	2	4.8
335	19N/28E-01C01	471025	1191500	19520414	--	B	H	--	--	57	38	19	19	--	--	--	--
336	19N/28E-04L01	470956	1191843	1961	20	B	A	121CBRV	X	750	504	366	138	258	750	--	--
337	19N/28E-10E01	470920	1191743	19490401	6	B	H	--	--	80.5	77	4	73	--	--	--	--
338	19N/28E-10F01	470920	1191725	--	--	B	H	--	--	76	70	6	64	--	--	--	--
339	19N/28E-13R01	470805	1191405	19470516	20	B	I	--	X	568	357	212	145	108	568	--	--
340	19N/28E-15M02	470812	1191749	--	--	B	H	--	--	62	62	--	--	--	--	--	--
341	19N/28E-15Q01	470803	1191705	1950	20	B	A	--	X	909	521	498	23	132	909	--	--
342	19N/28E-16P02	470754	1191842	--	7	B	I	--	--	9	7	2	6	--	--	--	--
343	19N/28E-22B01	470751	1191724	1940	12	B	A	121CBRV	X	543	330	315	15	116	543	--	--
344	19N/28E-22B02	470751	1191725	19470520	16	B	A	121CBRV	X	763	453	418	35	143	763	--	--
345	19N/28E-22G02	470731	1191701	--	48	B	I	--	--	37	34	3	32	--	--	--	--
346	19N/28E-22P02	470706	1192221	19530801	8	B	H	121CBRV	--	100	56	44	11	--	--	--	--
347	19N/28E-23D06	470720	1191618	--	6	B	I	--	--	24	19	5	15	--	--	--	--

Table 13.--*Location and well construction data for ground-water-quality sites in the Central Columbia Plateau study unit--Continued*

Site number on plate 1	Local well number	Latitude[1]	Longitude	Date of construction (year, month, and day)	Diameter of casing (in)	Primary use of site	Primary use of water	Aquifer code[2]	Type of openings	Depth of well (feet)	Estimated depth of sample (feet)	Sample depth below mean water level (feet)	Depth to mean water level (feet)	Range of open interval: Top of first interval (feet)	Range of open interval: Bottom of last interval (feet)	Number of nitrate samples	Mean nitrate concentration as N (mg/L)
348	19N/28E-23D08	470750	1191633	19570425	--	B	A	--	--	920	473	447	26	--	--	--	--
349	19N/28E-24P01	470725	1191456	19490701	8	B	I	121CBRV	--	440	295	145	150	--	--	--	--
350	19N/28E-27M01	470625	1191750	--	48	B	H	121CBRV	--	91.5	54	38	17	--	--	--	--
351	19N/28E-28K04	470627	1191815	1953	12	B	A	121CBRV	X	1,000	855	822	33	710	1,000	1	3.8
352	19N/28E-33M03	470634	1191842	1949	48	B	H	--	--	33.3	20	13	6	--	--	--	--
353	19N/28E-33P02	470521	1191846	19530407	6	B	A	121CBRV	--	115	77	38	39	--	--	--	--
354	19N/29E-08L01	470857	1191218	19670419	12	B	I	122WNPM	X	273	165	108	57	37	273	3	1.8
355	19N/29E-09L01	470601	1191403	19530501	8	B	H	121CBRV	--	85	68	18	50	--	--	--	--
356	19N/29E-19B01	470742	1191321	1940	6	B	H	--	--	157	134	24	110	--	--	--	--
357	19N/29E-22C01	470741	1190950	19511201	8	B	H	--	--	352	284	68	216	--	--	--	--
358	19N/29E-32R01	470517	1191144	1947	6	B	H	--	--	32	31	1	30	--	--	--	--
359	19N/29E-34D02	470603	1191014	1949	8	B	H	--	--	285	157	128	29	--	--	--	--
360	19N/30E-33B01	470553	1190303	--	--	T	--	122WNPM	--	245	245	--	--	--	--	1	0.41
361	20N/23E-01Q01	471721	1195255	19460812	10	B	H	121CBRV	--	505	327	178	149	--	--	--	--
362	20N/23E-16D01	471358	1195718	19680718	8	B	H	122WNPM	X	238	174	64	110	63.7	238	3	3.6
363	20N/23E-23J01	471237	1195346	1912	8	B	H	121CBRV	X	445	280	168	112	22	447	--	--
364	20N/23E-24H01	471340	1195245	19550901	6	B	H	--	--	75	59	16	43	--	--	--	--
365	20N/23E-25E01	471149	1195344	1943	8	B	H	121CBRV	--	480	417	64	353	--	--	--	--
366	20N/23E-27A01	471207	1195501	--	5	B	H	121CBRV	--	278	259	19	240	--	--	--	--
367	20N/23E-28J01	471142	1195630	1953	6	B	H	121CBRV	--	446	262	184	78	--	--	--	--
368	20N/23E-34J01	471050	1195500	--	--	B	H	121CBRV	--	405	225	180	44	--	--	--	--
369	20N/23E-36A01	471020	1195230	1952	6	B	H	121CBRV	--	232	139	93	47	--	--	--	--

Table 13.--*Location and well construction data for ground-water-quality sites in the Central Columbia Plateau study unit--Continued*

Site number on plate 1	Local well number	Latitude[1]	Longitude	Date of construction (year, month, and day)	Diameter of casing (in)	Primary use of site	Primary use of water	Aquifer code[2]	Type of openings	Depth of well (feet)	Estimated depth of sample (feet)	Sample depth below mean water level (feet)	Depth to mean water level (feet)	Range of open interval: Top of first interval (feet)	Range of open interval: Bottom of last interval (feet)	Number of nitrate samples	Mean nitrate concentration as N (mg/L)
370	20N/24E-01H01	471535	1194448	1913	10	B	H	121CBRV	--	400	265	136	129	--	--	--	--
371	20N/24E-07R01	471412	1195124	19370701	12	B	A	--	X	431	353	78	275	80	431	--	--
372	20N/24E-07R02	471414	1195122	--	8	U	U	--	--	376	301	76	225	--	--	--	--
373	20N/24E-09D01	471452	1194937	19140810	15	U	U	--	--	424	327	98	229	--	--	--	--
374	20N/24E-09E02	471440	1194940	19230401	16	B	I	--	X	345	285	60	225	60	345	--	--
375	20N/24E-09P01	471405	1194818	1905	6	B	H	121CBRV	--	362	276	86	190	--	--	--	--
376	20N/24E-16H01	471339	1194838	1948	8	B	H	121CBRV	--	176	172	4	168	--	--	--	--
377	20N/24E-20B01	471307	1195015	--	5	B	H	121CBRV	--	314	314	--	--	--	--	--	--
378	20N/24E-28J01	471142	1194839	--	--	U	U	121CBRV	--	196	196	--	--	--	--	--	--
379	20N/24E-29Q01	471133	1195026	19460501	6	B	H	--	--	230	215	15	200	--	--	--	--
380	20N/24E-31C01	471123	1195150	--	5	B	H	121CBRV	--	226	214	13	201	--	--	--	--
381	20N/25E-03R01	471503	1193944	19530206	6	B	H	121CBRV	--	168	146	23	123	--	--	--	--
382	20N/25E-04M01	471519	1194207	19500329	10	B	A	--	X	674	465	209	256	65	674	--	--
383	20N/25E-05P01	471503	1194256	--	10	B	H	--	--	450	324	127	197	--	--	--	--
384	20N/25E-13Q01	471318	1193735	19160928	10	U	U	--	--	278	218	60	158	--	--	--	--
385	20N/25E-14K01	471329	1193855	19751229	6	B	H	112GLCV	--	59	52	7	45	--	--	1	1.9
386	20N/25E-17Q01	471321	1194232	19810114	8	B	H	122WNPM	X	158	128	125	3	98	158	3	3.8
387	20N/25E-19D01	471312	1194426	1954	6	B	H	121CBRV	--	132	73	59	14	--	--	1	8.1
388	20N/25E-21A02	471258	1194108	1947	12	U	U	--	X	652	425	401	24	198	652	--	--
389	20N/25E-29H01	471202	1194224	19501124	8	B	--	--	--	175	164	12	152	--	--	--	--
390	20N/25E-36B01	471128	1193738	19510108	8	B	H	--	--	250	189	62	127	--	--	--	--
391	20N/26E-21A01	471314	1193312	19560301	10	B	H	--	--	489	289	200	89	--	--	--	--

Table 13.--*Location and well construction data for ground-water-quality sites in the Central Columbia Plateau study unit--Continued*

Site number on plate 1	Local well number	Latitude[1]	Longitude	Date of construction (year, month, and day)	Diameter of casing (in)	Primary use of site	Primary use of water	Aquifer code[2]	Type of openings	Depth of well (feet)	Estimated depth of sample (feet)	Sample depth below mean water level (feet)	Depth to mean water level (feet)	Range of open interval: Top of first interval (feet)	Range of open interval: Bottom of last interval (feet)	Number of nitrate samples	Mean nitrate concentration as N (mg/L)
392	20N/26E-26J01	471147	1193053	19770220	16	B	I	122CBRV	P	527	427	261	166	326	527	2	2.9
393	20N/26E-31C01	471225	1193625	1952	6	B	H	--	--	185	163	22	141	--	--	--	--
394	20N/28E-01M01	471520	1191510	19520301	6	B	H	121CBRV	--	138	91	48	43	--	--	--	--
395	20N/28E-11R01	471404	1191521	19731214	6	B	H	122WNPM	X	110	86	24	62	59	110	1	1.1
396	20N/28E-17Q01	471313	1191930	19580531	12	B	N	121CBRV	--	212	138	74	64	--	--	--	--
397	20N/28E-17Q02	471313	1191954	1959	--	B	H	121CBRV	--	350	350	--	--	--	--	--	--
398	20N/28E-27E01	471159	1191751	19550201	18	B	N	--	--	134	102	32	70	--	--	--	--
399	20N/28E-29E01	471157	1192015	1955	15	B	H	121CBRV	--	165	143	22	121	--	--	--	--
400	20N/28E-31C01	471120	1192112	1955	6	B	A	--	--	75	46	29	17	--	--	--	--
401	20N/28E-32C01	471123	1191950	19430604	20	B	A	--	X	725	467	328	139	208	725	--	--
402	20N/28E-32H01	471101	1191911	1943	18	B	A	122CBRV	X	712	460	351	109	207	712	3	0.47
403	20N/28E-33E01	471100	1191906	19531215	20	B	A	121CBRV	X	790	506	410	96	222	790	--	--
404	20N/28E-36N01	471034	1192250	--	8	B	I	121CBRV	--	114	69	45	24	--	--	--	--
405	20N/29E-18A01	471300	1191351	1952	--	B	H	--	--	180	130	50	80	--	--	--	--
406	20N/29E-18J01	471124	1191313	19530401	6	B	H	--	--	85	78	8	70	--	--	--	--
407	20N/29E-28C01	471105	1191209	19510129	8	O	--	--	--	416	306	111	195	--	--	--	--
408	20N/29E-29P01	471126	1191224	1953	6	B	H	121CBRV	--	62	62	--	--	--	--	--	--
409	20N/29E-33R01	471033	1191028	--	--	T	--	122WNPM	--	112	112	--	--	--	--	1	2.1
410	21N/24E-31L01	471607	1195200	19521110	--	B	H	--	--	407	338	70	268	--	--	--	--
411	21N/26E-02M01	472043	1193145	--	6	B	H	--	--	203	149	54	95	--	--	--	--
412	21N/26E-15E01	471903	1193302	19491129	10	B	N	--	X	347	266	171	95	185	347	--	--
413	21N/26E-15H01	471907	1193209	19770330	20	B	A	122GDRD	X	1,850	1,375	1	1,117	258	900	1,850	3

Table 13.--*Location and well construction data for ground-water-quality sites in the Central Columbia Plateau study unit--Continued*

Site number on plate 1	Local well number	Latitude[1]	Longitude	Date of construction (year, month, and day)	Diameter of casing (in)	Primary use of site	Primary use of water	Aquifer code[2]	Type of openings	Depth of well (feet)	Estimated depth of sample (feet)	Sample depth below mean water level (feet)	Depth to mean water level (feet)	Range of open interval: Top of first interval (feet)	Range of open interval: Bottom of last interval (feet)	Number of nitrate samples	Mean nitrate concentration as N (mg/L)
414	21N/26E-16B03	471923	1193338	19410430	12	B	A	--	P	260	200	177	24	180	220	--	--
415	21N/26E-21E01	471819	1193420	19521231	20	B	A	--	X	618	401	217	184	106	618	--	--
416	21N/26E-22E02	471823	1193300	1912	8	B	H	--	--	295	188	108	80	--	--	--	--
417	21N/26E-28A01	471745	1193323	19740520	8	B	H	--	--	65	45	20	25	--	--	1	5.6
418	21N/28E-19F02	471817	1192105	19820511	8	B	I	122WNPM	X	115	93	22	71	62	115	1	4.0
419	21N/28E-23D01	471827	1191623	19510313	8	B	H	--	--	150	119	31	88	--	--	--	--
420	21N/28E-36R01	471553	1191402	1971	8	B	H	122WNPM	X	138	124	60	64	110	138	3	0.64
421	22N/26E-12B03	472535	1192447	19520301	--	Z	U	--	--	40	20	20	0	--	--	--	--
422	22N/26E-12F01	472005	1193010	--	--	--	--	--	--	17	17	--	--	--	--	--	--
423	22N/27E-22H01	472330	1192433	19741217	6	B	--	122GDRD	X	345	298	136	161	250	345	3	0.31
424	22N/27E-23R01	472302	1192259	1963	48	B	H	--	--	258	159	99	61	--	--	--	--
425	D15-112P-3471	462735	1190944	--	--	D	--	--	--	--	10	--	--	--	--	5	24
426	D15-112P1-0+00	462735	1190948	--	--	D	--	--	--	--	10	--	--	--	--	3	18
428	D15-65-2F-4148	462711	1190931	--	--	D	--	--	--	--	10	--	--	--	--	2	9.8
429	D15-65-2F-700	462735	1190909	--	--	D	--	--	--	--	10	--	--	--	--	1	4.6
430	D15-65-2H0+00	462734	1191004	--	--	D	--	--	--	--	10	--	--	--	--	1	22
431	D16-133A1412	462452	1190420	--	--	D	--	--	--	--	10	--	--	--	--	1	12
432	D16-147N30+00	462502	1191302	--	--	D	--	--	--	--	10	--	--	--	--	4	9.2
433	D16-174-22525	462252	1191147	--	--	D	--	--	--	--	10	--	--	--	--	1	4.6
434	D16-174A-2AA0+00	462252	1191147	--	--	D	--	--	--	--	10	--	--	--	--	1	18
435	D16-174L2-0+00	462421	1191033	--	--	D	--	--	--	--	10	--	--	--	--	4	6.4

Table 13.--*Location and well construction data for ground-water-quality sites in the Central Columbia Plateau study unit--Continued*

Site number on plate 1	Local well number	Latitude[1]	Longitude	Date of construction (year, month, and day)	Diameter of casing (in)	Primary use of site	Primary use of water	Aquifer code[2]	Type of openings	Depth of well (feet)	Estimated depth of sample (feet)	Sample depth below mean water level (feet)	Depth to mean water level (feet)	Range of open interval: Top of first interval (feet)	Range of open interval: Bottom of last interval (feet)	Number of nitrate samples	Mean nitrate concentration as N (mg/L)
435	D16-179E-0+00	462238	1190927	--	--	D	--	--	--	--	10	--	--	--	--	1	6.6
437	D16-179F-0+00	462238	1190927	--	--	D	--	--	--	10	--	--	--	--	--	1	12
438	D16-179H-0+00	462244	1190933	--	--	D	--	--	--	--	10	--	--	--	--	6	8.6
439	D16-179J-0+00	462244	1190933	--	--	D	--	--	--	--	10	--	--	--	--	6	11
440	D16-179K-0+00	462244	1190933	--	--	D	--	--	--	--	10	--	--	--	--	4	12
441	D16-198P1-NORTH	462221	1190916	--	--	D	--	--	--	--	10	--	--	--	--	1	18
442	D16-198S-0+00	462220	1190932	--	-	D	--	--	--	--	10	--	--	--	--	1	9.2
443	D16-198T-0+00	462220	1190932	--	--	D	--	--	--	--	10	--	--	--	--	1	10
444	D16-199	462221	1190916	--	--	D	--	--	--	--	10	--	--	--	--	6	13
445	D16-205F-2316	462220	1190958	--	--	D	--	--	--	--	10	--	--	--	--	1	6.7
446	D16-207-3581	462131	1191020	--	--	D	--	--	--	--	10	--	--	--	--	1	5.1
447	D16-207-6097	462131	1190937	--	--	D	--	--	--	--	10	--	--	--	--	1	4.7
448	D16-207-8598	462155	1190946	--	--	D	--	--	--	--	10	--	--	--	--	1	5.1
449	D16-207-9321	462150	1190955	--	--	D	--	--	--	--	10	--	--	--	--	2	14
450	D16-207G-0+00	462131	1191020	--	--	D	--	--	--	--	10	--	--	--	--	4	5.5
450	D16-207G-0+00	462131	1191020	--	--	D	--	--	--	--	10	--	--	--	--	4	5.5
451	D16-207H-0+00	462131	1190937	--	--	D	--	--	--	--	10	--	--	--	--	3	6.3
452	D16-208D-0+00	462202	1191147	--	--	D	--	--	--	--	10	--	--	--	--	1	4.2
453	D16-266-1195	462923	1190626	--	--	D	--	--	--	--	10	--	--	--	--	1	6.7
454	D16-266A-0+00	462916	1190626	--	--	D	--	--	--	--	10	--	--	--	--	4	7.0
455	D16-266C-0+00	462923	1190626	--	--	D	--	--	--	--	10	--	--	--	--	1	5.1
456	D16-267-8071	462131	1190821	--	--	D	--	--	--	--	10	--	--	--	--	3	1.6

Table 13.--*Location and well construction data for ground-water-quality sites in the Central Columbia Plateau study unit--Continued*

Site number on plate 1	Local well number	Latitude[1]	Longitude	Date of construction (year, month, and day)	Diameter of casing (in)	Primary use of site	Primary use of water	Aquifer code[2]	Type of openings	Depth of well (feet)	Estimated depth of sample (feet)	Sample depth below mean water level (feet)	Depth to mean water level (feet)	Range of open interval: Top of first interval (feet)	Range of open interval: Bottom of last interval (feet)	Number of nitrate samples	Mean nitrate concentration as N (mg/L)
457	D16-330-2F-0+00	462555	1190517	--	--	D	--	--	--	--	10	--	--	--	--	2	2.3
458	D16-330-8444	462555	1190517	--	--	D	--	--	--	--	10	--	--	--	--	1	1.3
459	D16-65A-196	462737	1190517	--	--	D	--	--	--	--	10	--	--	--	--	1	7.2
460	D161-14M-611	462408	1190436	--	--	D	--	--	--	--	10	--	--	--	--	2	21
461	D19-183-0+00	463418	1190922	--	--	D	--	--	--	--	10	--	--	--	--	1	12
462	D19-33-0+00	463358	1190935	--	--	D	--	--	--	--	10	--	--	--	--	1	23
463	D20-114Q9-0+00	463547	1191352	--	--	D	--	--	--	--	10	--	--	--	--	1	11
464	D23-37D-0+00	463616	1191648	--	--	D	--	--	--	--	10	--	--	--	--	1	8.0
465	D23-39-0+00	463542	1191821	--	--	D	--	--	--	--	10	--	--	--	--	1	31
466	D23-39H-0+00	463549	1191821	--	--	D	--	--	--	--	10	--	--	--	--	1	0.31
467	D23-43B-0+00	463504	1191722	--	--	D	--	--	--	--	10	--	--	--	--	1	3.6
468	D23-44-1469	463501	1191749	--	--	D	--	--	--	--	10	--	--	--	--	1	3.6
469	D23-44J-0+00	463501	1191749	--	--	D	--	--	--	--	10	--	--	--	--	1	8.2
470	D23-44K-0+00	463501	1191749	--	--	D	--	--	--	--	10	--	--	--	--	2	9.3
471	DRAIN D16-147R	462411	1191033	--	--	B	--	--	--	--	10	10	--	--	--	9.9	1
472	DRAIN D16+174R	462502	1191300	--	--	D	U	--	--	--	10	--	--	--	--	1	7.1
473	DRAIN NR ROYAL CAMP	465453	1193230	--	--	B	Y	--	--	--	10	--	--	--		57	13
474	DRAIN PUMP BLOCK 15	462802	1191100	--	--	B	U	--	--	--	10			--	--	1	3.3

Table 13.--*Location and well construction data for ground-water-quality sites in the Central Columbia Plateau study unit--Continued*

Site number on plate 1	Local well number	Latitude[1]	Longitude	Date of construction (year, month, and day)	Diameter of casing (in)	Primary use of site	Primary use of water	Aquifer code[2]	Type of openings	Depth of well (feet)	Estimated depth of sample (feet)	Sample depth below mean water level (feet)	Depth to mean water level (feet)	Range of open interval: Top of first interval (feet)	Range of open interval: Bottom of last interval (feet)	Number of nitrate samples	Mean nitrate concentration as N (mg/L)
	NORTH-CENTRAL SUBUNIT																
475	09N/31E-04N01	461705	1185700	--	6.25	B	H	122SDLM	--	343	308	35	273	--	--	--	--
476	10N/31E-08A02	462209	1185705	19760426	--	B	I	112PSCO	S	147	136	53	83	125	147	1	8.9
477	10N/31E-08E01	462201	1185815	--	--	U	H	122SDLM	--	400	234	166	69	--	--	2	15
478	10N/31E-09D01	462219	1185701	19590401	8	B	H	122WNPM	X	310	217	149	68	160	274	2	7.8
479	10N/31E-32L02	461815	1185750	19790404	6.62	B	H	122SDLM	P	350	330	181	149	310	350	6	2.6
480	10N/31E-32L03	461824	1185747	19790406	--	B	U	122SDLM	X	290	275	184	91	260	290	1	4.7
481	10N/32E-03R01	462217	1184715	19750318	6	--	H	122WNPM	X	540	482	58	423	36	540	1	11
482	10N/32E-23J01	462000	1184559	19770219	6	B	H	122WNPM	X	300	225	75	150	20	300	3	0.94
483	11N/30E-25H01	462435	1185926	19830314	16	B	I	--	S	133	123	29	94	113	133	1	8.6
484	11N/30E-35J02	462341	1190031	19770824	--	B	--	122SDLM	X	205	163	43	120	40	205	1	21
485	11N/30E-36M01	462336	1190024	19771202	6	B	I	122SDLM	--	237	179	59	120	--	--	3	14
486	11N/31E-04P01	462737	1185625	19810222	16	B	I	122WNPM	X	1,310	955	535	420	600	1,310	4	3.5
487	11N/31E-14B01	462631	1185336	--	12	B	I	--	X	621	431	191	240	125	621	1	6.6
488	11N/31E-15G01	462621	1185449	19830316	8	B	U	--	X	450	325	100	225	93	425	1	6.0
489	11N/31E-30E01	462438	1185900	19780428	18	B	I	122SDLM	X	410	280	196	84	150	410	1	6.6
490	11N/31E-31H01	462343	1185817	19840104	--	B	I	112PSCO	S	122	115	36	78	107	122	2	15
491	11N/31E-33B01D1	462357	1185617	19830329	16	B	I	--	P	700	510	342	168	320	700	1	4.9
492	11N/32E-20A01	462537	1184933	1953	--	B	H	--	--	156	138	18	120	--	--	--	--
493	12N/31E-10M01	463222	1185534	1912	6	B	H	122WNPM	X	961	831	131	700	118	961	1	0.90
494	12N/32E-28B01	463003	1184841	1952	8	B	H	122WNPM	X	792	642	150	492	300	792	--	--
495	13N/31E-01E01	463835	1185224	19780131	20	B	A	122GDRD	P	1,320	1,035	563	472	750	1,320	3	2.2

Table 13.--*Location and well construction data for ground-water-quality sites in the Central Columbia Plateau study unit--Continued*

Site number on plate 1	Local well number	Latitude[1]	Longitude	Date of construction (year, month, and day)	Diameter of casing (in)	Primary use of site	Primary use of water	Aquifer code[2]	Type of openings	Depth of well (feet)	Estimated depth of sample (feet)	Sample depth below mean water level (feet)	Depth to mean water level (feet)	Range of open interval: Top of first interval (feet)	Range of open interval: Bottom of last interval (feet)	Number of nitrate samples	Mean nitrate concentration as N (mg/L)
496	13N/31E-24R01	463529	1185132	1919	6	B	H	--	X	537	497	40	457	100	537	--	--
497	13N/32E-01J01	463822	1184404	19540501	12	B	N	--	X	220	147	73	73	53	220	--	--
498	13N/32E-02B01	463850	1184530	--	--	B	I	122WNPM	--	126	104	22	83	--	--	--	--
499	13N/32E-03C01	463846	1184702	19760316	16	--	I	122WNPM	X	300	221	79	141	134	300	3	4.7
500	13N/32E-07E02	463749	1185114	19690221	8	--	H	122WNPM	X	652	537	115	422	64	652	3	1.1
501	13N/33E-06M01D1	463828	1184346	--	--	B	N	--	--	380	380	--	--	--	--	2	0.31
502	13N/34E-33R01	463347	1183243	--	--	B	--	--	--	117	117	--	--	--	--	--	--
503	14N/31E-36J01	463915	1185130	--	--	B	--	--	--	1,100	1,100	--	--	--	--	--	--
504	14N/32E-31D01	463943	1185110	19541029	12	B	A	122CBRV	X	502	374	128	246	96	502	--	--
505	14N/32E-33Q01	463900	1184753	19520611	12	B	I	121CBRV	X	281	194	87	107	51	281	--	--
506	14N/33E-18B01	464220	1184256	19530415	8	B	H	121CBRV	X	542	513	29	484	70	542	--	--
507	14N/34E-25P01D1	463953	1182939	19750826	8	B	H	--	X	220	123	--	--	25	220	3	6.7
508	14N/36E-19N01	464046	1182110	19760326	6	B	H	122CBRV	X	940	488	--	--	35	940	3	0.41
509	15N/30E-12L01	464758	1185938	19751226	16	B	I	122CBRV	X	1,380	903	589	313	425	1,380	2	1.2
510	15N/31E-05L01	464850	1185707	19750809	20	B	I	122CBRV	X	1,330	879	452	427	20	1,330	2	0.31
511	15N/31E-08J01D1	464807	1185641	19820223	14	B	I	--	X	1,210	847	364	483	86	1,210	1	0.10
512	15N/31E-08N01	464746	1185739	19750320	14	B	I	122CBRV	X	1,030	709	321	389	66	1,030	3	0.10
513	15N/31E-16D01	464737	1185616	19751104	16	B	I	122CBRV	X	1,410	925	486	439	80	1,410	1	0.10
514	15N/31E-31R01	464415	1185753	19790906	6	B	H	122WNPM	X	304	175	--	--	45	304	3	11
515	15N/32E-01R01	464841	1184345	19550203	12	B	I	--	X	353	274	79	195	19	353	--	--
516	15N/32E-07J01	464752	1185008	19760515	16	B	I	122GDRD	X	1,900	1,301	706	595	701	1,900	2	0.16
517	15N/32E-08E01	464803	1184953	19770327	20	B	I	122GDRD	S	1,980	732	83	649	642	822	1	0.26

Table 13.--*Location and well construction data for ground-water-quality sites in the Central Columbia Plateau study unit--Continued*

Site number on plate 1	Local well number	Latitude[1]	Longitude	Date of construction (year, month, and day)	Diameter of casing (in)	Primary use of site	Primary use of water	Aquifer code[2]	Type of openings	Depth of well (feet)	Estimated depth of sample (feet)	Sample depth below mean water level (feet)	Depth to mean water level (feet)	Range of open interval: Top of first interval (feet)	Range of open interval: Bottom of last interval (feet)	Number of nitrate samples	Mean nitrate concentration as N (mg/L)
518	15N/33E-02A01	464924	1183745	19720518	8	B	H	122CBRV	X	830	765	65	700	46	830	1	1.6
519	15N/33E-02A01D1	464924	1183745	--	8	B	H	122CBRV	X	1,200	623	--	--	46	1,200	2	1.9
520	15N/33E-15N02	464650	1184016	19760408	6	B	H	122WNPM	X	480	456	25	431	20	480	3	24
521	15N/35E-02D01	464924	1182345	19780117	6	B	H	--	X	342	286	56	230	57	342	3	0.74
522	15N/36E-28N01	464512	1181848	19530414	8	B	I	122CBRV	X	144	108	37	71	66.2	144	--	--
523	15N/36E-28N01D1	464512	1181848	1980	10	B	I	--	--	380	380	--	--	--	--	3	3.0
524	15N/36E-33A02	464507	1181755	19791217	16	B	I	122GDRD	X	510	358	302	56	206	510	3	0.10
525	16N/30E-26A02D1	465108	1190016	19750501	--	B	I	--	--	1,060	713	347	365	--	--	3	0.17
526	16N/31E-14K01	465225	1185313	19751020	20	B	I	122CBRV	X	1,340	854	486	368	26	1,340	2	0.51
527	16N/31E-33P01	464925	1185600	19731218	6	B	H	122WNPM	X	540	484	56	427	52.5	540	3	0.47
528	16N/32E-11D01D1	465346	1184608	19750330	16	B	I	--	X	1,410	905	505	400	62	1,410	3	0.61
529	16N/32E-14D01	465243	1184611	19750327	20	B	I	122GDRD	X	1,310	846	464	382	44	1,310	1	0.21
530	16N/32E-18G01D2	465239	1185032	19750403	20	B	I	--	X	1,540	1,091	449	642	189	1,540	2	0.10
531	16N/33E-17B02	465251	1184207	19751120	6	B	H	122WNPM	X	600	503	97	406	95	600	3	0.47
532	16N/34E-13R02	465212	1182857	19740722	6	B	H	122WNPM	X	400	320	80	240	135	400	3	0.31
533	16N/35E-31B01	465022	1182817	19740801	20	B	I	122CBRV	X	620	412	208	204	68	620	3	0.97
534	16N/35E-32N01D1	464940	1182742	--	16	B	I	--	X	1,100	750	350	400	89	1,100	2	0.76
535	16N/36E-06B02	465444	1182030	19751001	6	B	H	122CBRV	X	560	374	186	187	29	560	3	6.4
536	16N/36E-11H01D1	465337	1181446	19760810	--	B	I	--	--	200	149	51	98	--	--	3	3.7
537	16N/38E-04B01D1	465452	1180224	19690401	--	B	G	--	--	300	197	103	93	--	--	2	4.9
538	17N/30E-10N01	465813	1190230	--	10	B	C	--	--	499	350	150	200	--	--	--	--
539	17N/30E-33K01	465501	1190314	19590930	24	B	N	122CBRV	X	1,000	700	553	147	400	1,000	3	26

Table 13.--*Location and well construction data for ground-water-quality sites in the Central Columbia Plateau study unit--Continued*

Site number on plate 1	Local well number	Latitude[1]	Longitude	Date of construction (year, month, and day)	Diameter of casing (in)	Primary use of site	Primary use of water	Aquifer code[2]	Type of openings	Depth of well (feet)	Estimated depth of sample (feet)	Sample depth below mean water level (feet)	Depth to mean water level (feet)	Range of open interval: Top of first interval (feet)	Range of open interval: Bottom of last interval (feet)	Number of nitrate samples	Mean nitrate concentration as N (mg/L)
540	17N/30E-33K02	465501	1190311	19600113	--	B	H	121CBRV	P	981	808	507	301	635	981	--	--
541	17N/30E-34B01	465531	1190156	--	6	B	H	121CBRV	--	282	241	42	199	--	--	--	--
542	17N/30E-34C01	465530	1190215	--	6	B	H	121CBRV	--	263	194	69	125	--	--	--	--
543	17N/31E-03B01	465944	1185421	19750617	16	B	I	122CBRV	X	1,360	845	515	330	48	1,360	1	0.10
544	17N/31E-11Q01	465820	1185306	19760730	16	B	I	122CBRV	P	1,130	712	560	152	293	1,130	2	2.6
545	17N/31E-12D01	465900	1185226	19760616	20	B	I	122GDRD	X	1,950	1,595	1,439	156	1,240	1,950	3	0.14
546	17N/31E-30C01	465616	1185818	1911	6	B	H	--	--	337	292	45	247	--	--	--	--
547	17N/32E-06B01	465959	1185034	--	6	B	I	--	--	588	437	151	286	--	--	--	--
548	17N/33E-06D03	465947	1184332	19741008	16	B	I	122CBRV	X	1,200	983	217	766	90	1,200	2	0.21
549	17N/33E-12F01	465850	1183646	19590303	16	B	A	--	--	567	495	72	423	--	--	1	0.10
550	17N/33E-12F02	465853	1183651	19800812	16	B	A	122GDRD	X	1,020	768	304	464	515	1,020	3	0.27
551	17N/35E-11H01D2	465852	1182154	19700301	--	B	I	--	X	349	275	212	63	200	350	3	1.3
552	17N/37E-21G01	465712	1180926	19760220	20	B	I	122CBRV	X	755	421	334	86	50	755	2	0.46
553	17N/38E-02K01	465933	1175922	19770606	8	B	H	122WNPM	X	140	74	66	8	7	140	3	11
554	18N/25E-05F01	475951	1194304	19700122	16	B	I	121CBRV	S	193	137	114	23	80	--	--	--
555	18N/31E-07E01D1	470356	1185844	19820227	16	B	I	--	X	1,170	738	433	305	45	1,170	3	0.10
556	18N/31E-13E01	470301	1185225	19670518	18	B	I	122CBRV	X	982	652	330	321	38	982	2	0.10
557	18N/31E-23A01	470229	1185231	19480928	6.25	B	I	--	X	355	335	30	305	315	355	--	--
558	18N/31E-32R01	470001	1185624	19750616	16	B	I	--	X	1,260	813	447	366	51	1,260	3	0.14
559	18N/31E-33D01	470046	1185616	19760624	16	B	I	122GDRD	X	2,400	1,885	1,605	280	1,370	2,400	2	0.10
560	18N/32E-16C02	470324	1184808	19761020	6	B	I	122WNPM	X	280	218	63	155	23	280	3	0.10
561	18N/33E-12C02	470422	1183648	19760227	6	B	H	122WNPM	X	500	391	109	282	87	500	3	4.1

Table 13.--*Location and well construction data for ground-water-quality sites in the Central Columbia Plateau study unit--Continued*

Site number on plate 1	Local well number	Latitude[1]	Longitude	Date of construction (year, month, and day)	Diameter of casing (in)	Primary use of site	Primary use of water	Aquifer code[2]	Type of openings	Depth of well (feet)	Estimated depth of sample (feet)	Sample depth below mean water level (feet)	Depth to mean water level (feet)	Range of open interval: Top of first interval (feet)	Range of open interval: Bottom of last interval (feet)	Number of nitrate samples	Mean nitrate concentration as N (mg/L)
562	18N/35E-04B01	470515	1182504	19770224	6	B	H	122WNPM	X	180	124	56	68	20	180	3	3.2
563	18N/35E-11K01	470359	1182227	19681025	6	B	H	122CBRV	X	747	666	81	585	140	747	3	3.1
564	18N/35E-12Q01	470336	1182058	19651203	8	--	G	122WNPM	X	256	216	41	175	21	256	2	30
565	18N/37E-08J01	470402	1181029	19560201	12	B	I	121CBRV	--	527	401	126	275	--	--	1	2.8
566	18N/37E-09C02	470423	1180956	19670803	16	B	I	122WNPM	X	294	226	68	158	15	294	1	2.6
567	18N/38E-28N02	470102	1180239	19771004	6	B	--	122WNPM	X	155	117	38	80	28	155	1	2.3
568	19N/29E-03B01	471024	1190922	19750329	20	B	I	122CBRV	X	1,200	748	452	297	21	1,200	3	0.10
569	19N/29E-09H01	470912	1191022	19500710	10	B	I	121CBRV	X	637	444	194	250	52	637	--	--
570	19N/30E-03E01	471000	1190218	19751124	16	B	I	122CBRV	X	1,100	734	366	368	19	1,100	2	0.16
571	19N/30E-07L01	470902	1190549	19750227	14	B	I	122CBRV	X	930	617	313	304	46	930	2	0.10
572	19N/30E-15L01	470814	1190201	19741124	20	B	I	122CBRV	X	1,180	789	391	399	26	1,180	2	0.10
573	19N/30E-32N01	470518	1190505	19510124	8	B	H	--	X	351	227	124	104	37	351	--	--
574	19N/31E-14H02	470827	1185229	19670603	12	B	I	122CBRV	X	630	415	215	199	19	630	1	3.1
575	19N/31E-24H01	470722	1185121	19750618	20	B	I	122CBRV	X	1,060	650	410	240	20	1,060	2	0.31
576	19N/31E-26D01	470653	1185330	--	6	B	H	--	--	365	335	31	304	--	--	--	--
577	19N/31E-27G01D1	470630	1185416	19760827	16	B	I	--	X	1,410	933	477	457	70	1,410	1	0.10
578	19N/32E-04H02	471006	1184723	19680411	12	B	I	122CBRV	P	710	575	315	260	440	710	2	0.46
579	19N/32E-16M01	470814	1184834	19500410	8	B	H	--	--	101	66	36	30	--	--	--	--
580	19N/32E-24K01	470710	1184410	19690908	--	B	I	121CBRV	X	807	664	170	495	521	807	--	--
581	19N/32E-24N01	470657	1184436	19750612	20	B	I	122GDRD	X	2,240	1,945	1,228	717	1,650	2,240	2	0.10
582	19N/33E-07R01	470844	1184227	19760401	16	B	I	122GDRD	X	1,720	1,160	633	527	600	1,720	2	0.10
583	19N/33E-08Q02	470849	1184130	19750110	20	B	I	122GDRD	X	2,430	1,990	1,373	617	1,550	2,430	3	0.10

Table 13.--*Location and well construction data for ground-water-quality sites in the Central Columbia Plateau study unit--Continued*

Site number on plate 1	Local well number	Latitude[1]	Longitude	Date of construction (year, month, and day)	Diameter of casing (in)	Primary use of site	Primary use of water	Aquifer code[2]	Type of openings	Depth of well (feet)	Estimated depth of sample (feet)	Sample depth below mean water level (feet)	Depth to mean water level (feet)	Range of open interval: Top of first interval (feet)	Range of open interval: Bottom of last interval (feet)	Number of nitrate samples	Mean nitrate concentration as N (mg/L)
584	19N/33E-30C01	470650	1184312	1910	6	B	H	--	--	433	355	78	277	--	--	--	--
585	19N/34E-20B02	470754	1183351	19750628	20	B	I	122CBRV	X	1,120	875	245	630	82	1,120	3	0.10
586	19N/35E-23E01	470751	1182302	19400	12	B	A	121CBRV	--	457	291	166	125	--	--	--	--
587	19N/36E-05B01	471028	1181819	19740808	6	B	H	122WNPM	X	155	106	49	57	21	155	3	8.9
588	19N/36E-20H01D1	470746	1181818	19750413	--	B	I	122CBRV	--	1,030	830	200	630	--	--	3	0.14
589	19N/36E-21C01D1	470746	1181726	19750116	--	U	I	122CBRV	--	1,280	950	330	620	--	--	1	0.10
590	19N/38E-14K02	470828	1175911	1953	10	B	I	122WNPM	X	200	10	0	15	15	200	1	0.70
591	19N/40E-02B01	471039	1174359	19790502	6	B	H	122CBRV	X	421	357	57	300	149	414	3	0.10
592	20N/23E-10P01	471909	1195554	19530729	10	B	U	--	P	351	318	110	208	285	351	--	--
593	20N/23E-18C01	471354	1195935	1950	6	B	H	121CBRV	--	400	310	90	220	--	--	--	--
594	20N/29E-01A01	471540	1190632	19750511	20	B	I	122CBRV	X	1,360	799	561	238	36	1,360	2	0.10
595	20N/29E-11A01	471255	1190943	--	6	B	H	--	--	165	143	22	120	--	--	--	--
596	20N/30E-19D01	471256	1190738	1900	6	B	H	121CBRV	--	314	252	62	190	--	--	--	--
597	20N/31E-07H02	471418	1185732	19800513	16	B	I	122CBRV	X	800	600	200	400	39	800	1	2.5
598	20N/31E-31A03	471112	1185747	19771221	8	B	H	--	X	620	508	113	395	13	620	3	0.27
599	20N/31E-31B01	471115	1185750	--	--	B	H	--	--	270	270	--	--	--	--	--	--
600	20N/32E-15D02	471348	1184718	19740724	6	--	H	122WNPM	X	220	144	77	67	18	220	3	0.97
601	20N/32E-15L01D2	471320	1184712	--	16	T	I	--	X	1,040	741	299	442	40	1,040	2	0.21
602	20N/32E-32B01	471117	1184913	19590705	20	T	A	--	P	502	412	205	207	334	490	--	--
603	20N/32E-32B02	471117	1184912	19591203	30	T	--	--	P	510	406	202	204	302	510	--	--
604	20N/33E-16E03	471347	1184101	19710401	1.25	B	U	122WNPM	X	310	290	152	138	270	310	1	0.31
605	20N/33E-16E05	471347	1184101	19710401	1.25	B	U	122GDRD	X	616	586	367	219	555	616	1	0.10

Table 13.--*Location and well construction data for ground-water-quality sites in the Central Columbia Plateau study unit--Continued*

Site number on plate 1	Local well number	Latitude[1]	Longitude	Date of construction (year, month, and day)	Diameter of casing (in)	Primary use of site	Primary use of water	Aquifer code[2]	Type of openings	Depth of well (feet)	Estimated depth of sample (feet)	Sample depth below mean water level (feet)	Depth to mean water level (feet)	Range of open interval: Top of first interval (feet)	Range of open interval: Bottom of last interval (feet)	Number of nitrate samples	Mean nitrate concentration as N (mg/L)
606	20N/33E-16E06	471347	1184101	19710401	1.25	B	U	122GDRD	X	704	682	322	360	660	704	1	0.10
607	20N/34E-13R01	471314	1182818	19751208	6	B	H	122WNPM	X	340	250	90	159	35	340	3	5.8
608	20N/34E-22D01	471309	1183156	1904	6	B	H	121CBRV	X	95	79	16	64	20	--	1	25
609	20N/35E-27A01	471219	1182309	19750916	20	B	I	122CBRV	X	1,260	1,018	242	776	56	1,260	3	0.27
610	20N/35E-34M02	471058	1182422	19751125	6	B	H	122WNPM	X	320	180	140	39	22	320	2	7.3
611	20N/37E-32D01	471126	1181130	19770518	6	--	H	122WNPM	X	180	136	46	90	91	180	3	5.8
612	20N/39E-12N02	471413	1175105	19571001	10	--	H	122WNPM	X	284	220	64	156	78	284	3	0.44
613	20N/39E-32A01D1	471122	1175517	19771116	12	B	I	--	X	363	194	169	25	18	363	2	0.10
614	21N/30E-03E01	472031	1190229	--	--	B	--	--	--	651	651	--	--	--	--	--	--
615	21N/32E-08L01	471920	1184902	--	--	B	--	121CBRV	--	550	550	--	--	--	--	--	--
616	21N/22E-12G01D1	471946	1200049	19780829	--	B	I	--	--	767	510	257	253	--	--	1	0.31
617	21N/26E-08M01	471948	1193536	19520510	20	B	A	--	X	1,000	571	436	135	141	1,000	--	--
618	21N/26E-08N01	471935	1193530	19530226	26	O	A	--	X	450	260	204	56	70	450	--	--
619	21N/30E-03E02	472032	1190225	19790517	16	B	I	122GDRD	X	1,340	906	448	458	472	1,340	3	0.14
620	21N/30E-23J01D1	471745	1185959	19761230	16	B	I	--	X	1,330	931	400	531	29	1,330	3	0.10
621	21N/31E-10M02	471936	1185444	19720928	1.25	B	U	--	X	735	505	230	274	98	735	3	0.41
622	21N/32E-12B01	471959	1184349	1900	90	B	I	--	P	41	41	5	36	41	--	1	1.8
623	21N/32E-12H01D1	471947	1184332	19760601	6	B	I	122CBRV	X	225	180	45	134	19	225	3	2.4
624	21N/32E-31C01	471627	1185024	19640123	16	B	I	122CBRV	X	744	607	137	469	86	744	2	0.16
625	21N/33E-08K01	471924	1184120	19651201	16	B	A	122CBRV	X	595	466	129	337	250	595	3	0.10
626	21N/33E-24B01	471809	1183608	1905	6	B	I	122WNPM	X	120	73	48	25	12	120	3	21
627	21N/34E-14M01	471840	1183010	19630201	8	B	G	122WNPM	X	150	95	75	20	40	150	1	7.9

Table 13.--*Location and well construction data for ground-water-quality sites in the Central Columbia Plateau study unit--Continued*

Site number on plate 1	Local well number	Latitude[1]	Longitude	Date of construction (year, month, and day)	Diameter of casing (in)	Primary use of site	Primary use of water	Aquifer code[2]	Type of openings	Depth of well (feet)	Estimated depth of sample (feet)	Sample depth below mean water level (feet)	Depth to mean water level (feet)	Range of open interval: Top of first interval (feet)	Range of open interval: Bottom of last interval (feet)	Number of nitrate samples	Mean nitrate concentration as N (mg/L)
628	21N/34E-21K01	471737	1183219	19650701	16	B	I	122CBRV	X	737	546	191	355	150	737	3	0.64
629	21N/34E-35A01	471630	1182922	19621011	8	B	H	122WNPM	X	337	222	116	106	79.2	337	3	4.2
630	21N/36E-27P02	471644	1181545	19740123	6	B	H	--	X	200	157	43	114	22	200	3	0.21
631	21N/38E-14E01	471847	1175934	1958	8	B	H	122WNPM	X	353	265	88	178	74	353	1	4.0
632	21N/38E-14J01	471835	1175828	19671011	8	U	H	122WNPM	X	178	156	22	134	23.5	178	3	0.21
633	21N/38E-23L01	471749	1175852	19800804	12	U	A	122GDRD	X	502	360	241	119	218	502	3	0.17
634	21N/38E-24H01	471755	1175728	1950	--	B	I	121CBRV	--	18	16	2	14	--	--	--	--
635	21N/39E-09C01	471958	1175406	19590803	8	B	U	121CBRV	P	381	351	281	70	320	381	--	--
636	21N/39E-09C02	471958	1175406	19590909	8	B	U	--	P	368	337	267	70	306	368	--	--
637	21N/40E-27R01	471631	1174415	19790607	16	B	I	122CBRV	X	400	322	78	244	220	400	1	0.10
638	21N/41E-02Q01	472004	1173523	19790223	6	B	H	122CBRV	X	450	301	149	153	19	450	1	0.10
639	22N/21E-26B01	472228	1200948	19750707	6	B	H	112GLCV	P	82	70	6	64	67	72	1	4.5
640	22N/25E-05A01	472611	1194230	19510507	10	--	I	121CBRV	P	200	113	88	25	25	200	1	6.5
641	22N/25E-13J02	472414	1193710	--	--	--	H	--	--	118	95	24	71	--	--	--	--
642	22N/26E-04C02	472627	1193402	19660906	6	O	I	122WNPM	X	105	75	30	45	21	105	3	3.1
643	22N/26E-12B01	472536	1192947	19510802	--	--	--	--	--	78	78	--	--	--	--	--	--
644	22N/26E-12B02	472534	1192946	19520723	6	--	--	--	--	40	31	10	21	--	--	--	--
645	22N/26E-12C01	472530	1193013	19520225	--	U	--	--	--	49	40	10	30	--	--	--	--
646	22N/26E-12C02	472532	1193010	19530420	--	B	--	--	--	187	108	79	29	--	--	--	--
647	22N/26E-12F02	472518	1193011	--	6	D	--	--	--	43	22	21	1	--	--	--	--
648	22N/26E-13M01	472412	1193025	19510523	8	B	U	--	--	330	312	19	293	--	--	--	--
649	22N/26E-23M01	472322	1193139	19520402	10	B	A	121CBRV	X	448	377	67	310	12	443	--	--

Table 13.--*Location and well construction data for ground-water-quality sites in the Central Columbia Plateau study unit--Continued*

Site number on plate 1	Local well number	Latitude[1]	Longitude	Date of construction (year, month, and day)	Diameter of casing (in)	Primary use of site	Primary use of water	Aquifer code[2]	Type of openings	Depth of well (feet)	Estimated depth of sample (feet)	Sample depth below mean water level (feet)	Depth to mean water level (feet)	Range of open interval: Top of first interval (feet)	Range of open interval: Bottom of last interval (feet)	Number of nitrate samples	Mean nitrate concentration as N (mg/L)
650	22N/26E-24Q06	472302	1192944	--	12	B	--	--	--	123	111	12	100	--	--	--	--
651	22N/26E-25M01	472230	1193031	19470401	12	B	A	--	X	355	295	175	120	235	355	1	3.8
652	22N/26E-36B01	472156	1192947	1979	16	B	I	--	X	451	376	291	84	300	451	3	1.5
653	22N/26E-36E01	472147	1193024	--	--	B	A	--	--	190	101	90	11	--	--	--	--
654	22N/27E-19N01	472318	1192903	1940	8	B	A	--	--	466	237	229	8	--	--	--	--
655	22N/27E-30P03	472226	1192911	19510801	6	B	H	121CBRV	--	120	83	38	45	--	--	--	--
656	22N/28E-03K01	472540	1191700	19680816	12	B	I	--	P	170	150	20	130	130	--	1	1.8
657	22N/28E-03R02	472536	1191641	1946	6	B	H	--	--	110	98	13	85	--	--	--	--
658	22N/28E-09D04	472528	1191900	19680308	10	B	I	--	--	192	175	18	157	--	--	--	--
659	22N/28E-10A03	472523	1191638	1930	8	B	H	121CBRV	--	260	185	75	110	--	--	--	--
660	22N/28E-28Q01	472208	1191820	19640613	12	B	I	121CBRV	X	552	376	176	200	70	552	1	0.41
661	22N/30E-13H01	472402	1185857	1954	--	B	I	--	--	42.5	31	12	19	--	--	--	--
662	22N/31E-21F01	472318	1185537	19730818	8	B	I	122GDRD	X	100	57	--	--	14	100	3	0.14
663	22N/32E-30D01	472228	1185057	19770425	18	B	I	122CBRV	X	505	430	75	355	30	505	2	0.10
664	22N/33E-02K01	472540	1183716	1964	8	B	H	122WNPM	X	165	124	41	82	26	165	3	11
665	22N/33E-17N01	472347	1184141	19750715	10	B	I	122CBRV	X	615	408	208	200	125	615	2	0.10
666	22N/33E-27E01	472228	1183905	19521202	12	--	I	121CBRV	--	300	172	128	44	--	--	--	--
667	22N/34E-18M01	472349	1183517	19770720	6	--	H	122WNPM	X	45	34	20	13	22	45	3	1.5
668	22N/34E-26D01	472226	1183011	19670809	16	B	I	--	X	515	344	171	173	21	515	--	--
669	22N/34E-26J01	472208	1182922	19590728	8	B	--	--	P	267	234	39	195	200	267	--	--
670	22N/34E-26J02	472208	1182923	19590825	8	B	--	--	P	268	234	38	196	200	268	--	--
671	22N/35E-13H01	472400	1182012	19711020	8	B	H	--	X	67	47	39	8	27	67	3	0.61

Table 13.--*Location and well construction data for ground-water-quality sites in the Central Columbia Plateau study unit--Continued*

Site number on plate 1	Local well number	Latitude[1]	Longitude	Date of construction (year, month, and day)	Diameter of casing (in)	Primary use of site	Primary use of water	Aquifer code[2]	Type of openings	Depth of well (feet)	Estimated depth of sample (feet)	Sample depth below mean water level (feet)	Depth to mean water level (feet)	Range of open interval: Top of first interval (feet)	Range of open interval: Bottom of last interval (feet)	Number of nitrate samples	Mean nitrate concentration as N (mg/L)
672	22N/35E-23E01D1	472308	1182239	19680417	12	B	H	122CBRV	X	346	203	148	55	19	350	3	1.6
673	22N/36E-18N02D1	472336	1182002	1966	--	B	I	--	--	212	154	58	96	--	--	3	4.2
674	22N/36E-20A01	472324	1181744	19620930	10	B	I	122CBRV	X	400	268	132	137	120	400	1	2.1
675	22N/37E-12C02D1	472516	1180533	--	8	B	H	--	X	510	263	--	--	15	510	3	0.47
676	22N/38E-02D01D1	472605	1175925	1979	8	--	I	--	--	300	171	129	42	--	--	1	4.7
677	22N/39E-36H01	472128	1174926	19740628	6	B	H	122CBRV	X	154	106	48	57	18	154	3	0.27
678	22N/41E-18Q01D1	472337	1174040	19810325	--	B	H	122WNPM	X	196	156	136	20	116	196	2	0.10
679	23N/20E-34R01	472616	1201813	--	--	B	--	110ALVM	--	60	60	--	--	--	--	--	--
680	23N/20E-10R01	472938	1201808	19750712	8	--	I	112GLCV	--	95	66	30	36	--	--	1	2.5
681	23N/20E-35N01	472609	1201800	19770316	8	B	I	110ALVM	P	50	43	8	35	36	50	1	4.5
682	23N/24E-09E01	473015	1194941	19760412	6	O	H	122GDRD	X	625	323	--	--	20	625	3	0.31
683	23N/24E-31E02	472649	1195226	19580801	6	B	--	--	--	182	166	16	150	--	--	--	--
684	23N/25E-31M01	472641	1194440	1975	16	B	I	--	X	500	294	207	87	48	500	1	2.6
685	23N/26E-20D03	472857	1193548	19820928	1.25	--	U	122GDRD	--	940	924	407	517	856	992	1	0.10
686	23N/27E-10B01	473045	1192438	--	8	B	H	122CBRV	X	830	794	37	757	63	830	3	0.14
687	23N/28E-27R01	472720	1191640	1936	26	B	H	--	--	45	40	5	36	--	--	--	--
688	23N/28E-36E01	472650	1191514	--	--	B	--	--	--	187	166	21	145	--	--	--	--
689	23N/29E-16E01	472927	1191123	19770831	16	B	I	122GDRD	X	935	583	373	210	231	935	1	0.10
690	23N/29E-25N01	472730	1190730	--	--	B	H	121CBRV	--	120	110	10	100	--	--	--	--
691	23N/31E-33E01	472638	1185601	19790627	14	B	I	122GDRD	X	685	548	137	412	355	685	3	0.10
692	23N/33E-10A01	473018	1183814	--	6	B	H	122WNPM	X	146	141	6	135	12	146	3	23
693	23N/35E-03H01D1	473100	1182240	19811105	--	B	H	--	--	445	340	105	235	--	--	3	0.17

Table 13.--*Location and well construction data for ground-water-quality sites in the Central Columbia Plateau study unit--Continued*

Site number on plate 1	Local well number	Latitude[1]	Longitude	Date of construction (year, month, and day)	Diameter of casing (in)	Primary use of site	Primary use of water	Aquifer code[2]	Type of openings	Depth of well (feet)	Estimated depth of sample (feet)	Sample depth below mean water level (feet)	Depth to mean water level (feet)	Range of open interval: Top of first interval (feet)	Range of open interval: Bottom of last interval (feet)	Number of nitrate samples	Mean nitrate concentration as N (mg/L)
694	23N/35E-30F01	472735	1182712	19730324	6	B	H	122WNPM	X	240	160	80	81	20	240	3	9.9
695	23N/36E-13N01	472846	1181338	19601125	12	B	I	122WNPM	X	247	138	109	29	19	247	2	9.2
696	23N/37E-29F01	472728	1181045	19440530	8	B	H	122WNPM	X	213	152	148	3	90	213	3	2.5
697	23N/38E-12A01	473020	1175708	19390126	12	B	A	122WNPM	X	100	53	--	--	6	100	3	0.10
698	23N/39E-04B01	473107	1175333	19730712	6	--	I	122CBRV	X	300	159	157	2	18	300	1	4.5
699	23N/40E-32R01D1	472617	1174652	19771208	--	--	H	122WNPM	--	160	160	--	--	--	--	3	5.4
700	23N/41E-04C01	473109	1173824	19740429	6	B	H	122WNPM	X	100	81	49	32	61	100	3	1.8
701	24N/25E-32C01	473212	1194307	--	--	B	--	--	--	191	191	--	--	--	--	1	1.6
702	24N/20E-35J01	473240	1201640	19680222	--	B	--	112GLCV	--	260	157	104	53	--	--	1	0.10
703	24N/21E-13A03	473433	1200807	19790814	6	B	H	122GDRD	X	475	283	203	80	90	475	2	0.66
704	24N/25E-18E01	473449	1194444	19741004	6	B	H	122CBRV	X	515	268	--	--	20	515	3	18
705	24N/26E-06H01	473630	1193552	19741011	6	B	H	122WNPM	X	205	143	--	--	80	205	3	4.9
706	24N/28E-03B01	473632	1191652	19810605	12	O	A	--	X	550	414	145	269	278	550	3	0.31
707	24N/29E-27P01	473224	1190930	19750324	6	B	H	--	X	242	165	77	88	20	242	2	16
708	24N/31E-14E01	473431	1185319	19740309	6	B	H	122WNPM	X	250	134	--	--	18	250	3	0.10
709	24N/31E-16E01	473432	1185603	19710210	10	B	U	121CBRV	X	317	249	68	181	60	317	1	0.70
710	24N/33E-06Q01	473549	1184215	--	--	B	H	--	--	185	185	--	--	--	--	2	1.6
711	24N/33E-18H01	473436	1184200	1974	8	O	H	122WNPM	X	350	215	135	80	20	350	1	0.61
712	24N/34E-23L01	473329	1182949	19730301	15	O	I	122CBRV	X	596	418	178	241	32	596	1	1.6
713	24N/36E-03D01	473644	1181608	19750215	6	O	H	122WNPM	X	125	78	--	--	30	125	3	2.9
714	24N/36E-16A02	473441	1181627	19710908	1.25	O	U	122WNPM	X	160	142	104	37	123	160	1	5.4
715	24N/36E-16A03	473441	1181627	19710908	1.25	O	U	122GDRD	X	224	216	179	37	208	224	1	0.61

Table 13.--*Location and well construction data for ground-water-quality sites in the Central Columbia Plateau study unit--Continued*

Site number on plate 1	Local well number	Latitude[1]	Longitude	Date of construction (year, month, and day)	Diameter of casing (in)	Primary use of site	Primary use of water	Aquifer code[2]	Type of openings	Depth of well (feet)	Estimated depth of sample (feet)	Sample depth below mean water level (feet)	Depth to mean water level (feet)	Range of open interval: Top of first interval (feet)	Range of open interval: Bottom of last interval (feet)	Number of nitrate samples	Mean nitrate concentration as N (mg/L)
716	24N/36E-16A04	473441	1181627	19710908	1.25	O	U	122WNPM	X	261	252	214	38	242	261	1	0.10
717	24N/36E-16A05	473441	1181627	19710908	1.25	B	U	122WNPM	X	365	340	299	41	315	365	1	0.10
718	24N/36E-16A07	473441	1181627	19710908	1.25	B	U	122GDRD	X	635	613	419	193	590	635	1	0.10
719	24N/36E-16A08	473441	1181627	19710908	1.25	B	U	122GDRD	X	750	739	546	193	728	750	2	0.21
720	24N/37E-06Q01	473558	1181133	19741014	6	B	H	122WNPM	X	165	94	72	22	20	165	3	1.8
721	24N/37E-21N01	473317	1180942	1959	8	B	H	--	--	400	244	157	87	--	--	--	--
722	24N/37E-21N02	473317	1180942	1959	8	--	H	--	--	400	244	157	87	--	--	--	--
723	24N/38E-02D01	473641	1175930	19731008	6	--	H	122WNPM	X	85	52	44	8	19	85	1	7.6
724	24N/39E-26K01	473224	1175057	19750814	6	--	H	122WNPM	X	100	60	57	3	20	100	3	0.14
725	24N/40E-22L01	473320	1174459	--	--	--	--	122CBRV	--	345	345	--	--	--	--	--	--
726	24N/41E-03N01	473542	1173739	--	16	B	--	122CBRV	X	402	206	197	9	4	402	--	--
727	24N/41E-03N02	473119	1173739	1944	--	B	--	122CBRV	--	410	410	--	--	--	--	--	--
728	24N/41E-11N01	473453	1173617	--	--	--	--	122CBRV	--	274	274	--	--	--	--	--	--
729	24N/41E-14D01	473435	1173622	19771012	8	--	A	122GDRD	P	775	548	494	54	320	775	3	0.10
730	24N/41E-15A02	473442	1173630	19731025	6	B	H	122CBRV	--	148	97	51	46	--	--	1	3.3
731	25N/21E-16K01	473944	1201225	19590320	10	B	--	112GLCV	--	115	115	--	--	--	--	1	2.3
732	25N/21E-32L01	473735	1201318	19590519	8	B	--	112GLCV	--	97	83	15	68	--	--	1	2.5
733	25N/22E-21H01	473904	1200423	19531101	20	B	A	--	P	600	487	453	34	445	529	--	--
734	25N/22E-21H01D1	473904	1200423	--	20	E	A	--	P	615	530	503	27	445	615	2	4.6
735	25N/25E-20Q01	473842	1194255	19770530	6	B	H	122GDRD	X	640	330	--	--	20	640	1	1.3
736	25N/30E-05L01	474118	1190421	1967	6	B	I	122WNPM	X	220	119	111	8	18	220	1	4.1
737	25N/32E-17K01	473946	1184841	19770513	6	B	H	122WNPM	X	300	250	50	200	20	300	1	4.4

Table 13.--*Location and well construction data for ground-water-quality sites in the Central Columbia Plateau study unit--Continued*

Site number on plate 1	Local well number	Latitude[1]	Longitude	Date of construction (year, month, and day)	Diameter of casing (in)	Primary use of site	Primary use of water	Aquifer code[2]	Type of openings	Depth of well (feet)	Estimated depth of sample (feet)	Sample depth below mean water level (feet)	Depth to mean water level (feet)	Range of open interval: Top of first interval (feet)	Range of open interval: Bottom of last interval (feet)	Number of nitrate samples	Mean nitrate concentration as N (mg/L)
738	25N/32E-35P01	473648	1184519	19800610	16	B	I	122GDRD	X	1,140	784	525	259	428	1,140	3	0.14
739	25N/33E-01B01	474154	1183605	19480701	6	B	I	122WNPM	X	60	42	38	4	24	60	3	4.4
740	25N/33E-27A01	473829	1183819	19690526	16	B	I	122CBRV	X	850	565	285	281	21	850	1	0.10
741	25N/35E-03E01D1	474142	1182355	19760928	6	B	H	--	X	200	146	99	47	91	200	3	11
742	25N/35E-20D01	473915	1182620	19640106	16	B	I	122CBRV	X	410	213	197	15	5	410	1	0.70
743	25N/36E-27Q01	473754	1181520	19650924	12	B	I	122WNPM	X	324	184	140	45	37	324	2	4.1
744	25N/37E-21L01	473904	1180913	1913	12	B	A	121CBRV	--	503	341	162	179	--	--	--	--
745	25N/37E-21L04	473848	1180919	19750508	18	--	A	122GDRD	X	975	710	466	244	445	975	3	0.10
746	25N/37E-27E01	473819	1180818	19740611	8	B	H	122WNPM	X	100	59	--	--	18	100	3	5.6
747	25N/38E-15N01	473935	1180038	1940	6	B	H	122WNPM	X	121	71	57	14	20	121	3	7.9
748	26N/33E-18L01	474458	1184239	--	--	B	--	--	--	900	900	--	--	--	--	--	--
749	26N/21E-11H02	474600	1200928	19630330	18	B	I	112GLCV	--	164	99	65	35	--	--	1	0.90
750	26N/21E-21N02	474347	1201249	19590714	16	B	I	112GLCV	P	159	153	18	135	147	158	2	3.6
751	26N/22E-25N01	474259	1200132	19810118	8	B	H	122GDRD	X	325	203	184	19	80	325	3	0.24
752	26N/27E-17R01	474436	1192652	1953	--	B	H	--	--	80	80	--	--	--	--	1	12
753	26N/31E-32A01	474245	1185621	1937	10	--	A	--	X	208	134	121	13	60	208	--	--
754	26N/32E-26D01	474336	1184542	19621031	8	--	H	122WNPM	--	166	166	--	--	--	--	3	0.37
755	26N/33E-07E01	474557	1184308	19640427	12	B	I	122WNPM	X	154	103	94	9	51	154	3	3.0
756	26N/33E-12M01	474550	1183638	19590806	8	--	--	--	P	294	282	106	176	269	294	--	--
757	26N/33E-12M02	474550	1183638	19590915	8	B	--	--	P	292	279	99	180	266	291	--	--
758	26N/33E-19D01	474435	1184254	19591201	12	T	H	122CBRV	X	233	137	160	-22	40	233	2	0.10
759	27N/27E-13A01	475037	1192144	--	--	--	--	--	--	100	100	--	--	--	--	--	--

Table 13.--*Location and well construction data for ground-water-quality sites in the Central Columbia Plateau study unit--Continued*

Site number on plate 1	Local well number	Latitude[1]	Longitude	Date of construction (year, month, and day)	Diameter of casing (in)	Primary use of site	Primary use of water	Aquifer code[2]	Type of openings	Depth of well (feet)	Estimated depth of sample (feet)	Sample depth below mean water level (feet)	Depth to mean water level (feet)	Range of open interval: Top of first interval (feet)	Range of open interval: Bottom of last interval (feet)	Number of nitrate samples	Mean nitrate concentration as N (mg/L)
760	27N/25E-25C01	474847	1193804	19681101	8	--	A	--	X	265	247	18	230	160	265	1	17
761	27N/26E-25D06	474854	1193038	19720301	10	T	U	--	P	760	399	72	327	38	760	3	3.4
762	27N/36E-24E01	474938	1181323	19590807	8	B	--	--	X	357	352	140	212	347	357	--	--
763	27N/36E-24E02	474935	1181318	19590830	8	B	--	--	--	327	264	64	200	--	--	--	--
764	27N/36E-30C03	474904	1181930	19670830	4	T	U	--	--	43.8	23	21	2	--	--	--	--
765	28N/30E-15E01	475542	1190211	19521219	--	B	I	--	--	165	149	17	132	--	--	--	--
766	28N/31E-08R01	475601	1185618	19651230	8	--	A	--	--	173	102	72	30	--	--	--	--
767	28N/33E-17F02	475533	1184123	19670831	4	B	U	--	--	55.5	35	21	14	--	--	--	--
768	28N/36E-20L01	474935	1181815	19550804	8	B	T	--	--	202	125	77	47	--	--	--	--
769	30N/25E-28H01	480415	1194125	19590711	36	B	--	--	--	40	31	10	21	--	--	--	--
	PALOUSE SUBUNIT																
770	11N/45E-17E01	462607	1171215	19790514	8	B	H	122IMNH	X	225	172	53	119	28	225	3	0.10
771	11N/46E-19D01	462525	1170554	19770915	14	B	N	122GDRD	X	530	473	437	35	415	530	3	0.74
772	13N/37E-15A01	463700	1180849	1912	6	B	H	122GDRD	--	850	769	81	689	--	--	2	1.3
773	13N/38E-28K01	463455	1180301	19690815	6	B	H	122GDRD	X	165	159	103	56	152	165	3	0.87
774	13N/39E-07E01	463742	1175823	19790711	6	B	H	122CBRV	X	630	550	80	469	109	630	3	11
775	13N/40E-03E01	463837	1174707	19760401	8	B	I	122GDRD	X	279	185	106	79	92	278	3	1.8
776	13N/43E-02M01	463815	1172232	19761022	14	B	H	122GDRD	X	250	164	86	79	21	250	3	1.9
777	13N/45E-03P01	463804	1170806	19690729	8	B	H	122WNPM	X	120	83	60	23	45	120	3	4.5
778	14N/39E-12G01	464300	1175128	19580201	12	B	I	122CBRV	X	604	337	267	70	66	604	2	3.2

Table 13.--*Location and well construction data for ground-water-quality sites in the Central Columbia Plateau study unit--Continued*

Site number on plate 1	Local well number	Latitude[1]	Longitude	Date of construction (year, month, and day)	Diameter of casing (in)	Primary use of site	Primary use of water	Aquifer code[2]	Type of openings	Depth of well (feet)	Estimated depth of sample (feet)	Sample depth below mean water level (feet)	Depth to mean water level (feet)	Range of open interval: Top of first interval (feet)	Range of open interval: Bottom of last interval (feet)	Number of nitrate samples	Mean nitrate concentration as N (mg/L)
779	14N/39E-14B01	464221	1175242	19440523	6	B	H	122WNPM	X	92	69	23	46	28	92	3	4.3
780	14N/40E-22D02	464128	1174704	19751229	8	--	H	--	X	610	565	45	520	53.5	610	2	6.1
781	14N/42E-04F01	464346	1173217	1934	6	--	H	122WNPM	--	60	41	19	23	--	--	3	2.3
782	14N/42E-13B01	464210	1172807	19520228	6	B	A	122GDRD	X	90	80	68	12	70	90	3	12
783	14N/42E-13B02	464211	1172807	--	--	B	--	--	--	209	146	63	83	--	--	--	--
784	14N/43E-19J01	464051	1172644	1972	8	B	--	--	X	176	121	85	36	65	--	1	1.8
785	14N/43E-24R01	464035	1172016	1952	6	B	H	122CBRV	X	162	85	77	7	7	162	3	0.14
786	14N/44E-14P01	464133	1171427	19581126	8	B	G	122CBRV	X	600	500	219	281	400	600	1	0.10
787	14N/44E-14P02	464132	1171425	19800911	8	B	T	122CBRV	P	432	390	102	288	350	430	1	0.10
788	14N/45E-04D01	464402	1170925	19750709	16	Z	T	122GDRD	X	702	547	283	264	392	702	3	0.10
789	14N/45E-05D01	464355	1171047	1913	10	Z	A	121CBRV	--	164	109	56	53	--	--	--	--
790	14N/45E-05D03	464355	1171049	19460427	16	B	A	122CBRV	X	167	114	53	61	40	167	1	0.10
791	14N/45E-05D04	464356	1171041	--	--	B	U	121CBRV	--	166	88	78	10	--	--	--	--
792	14N/45E-05E01	464346	1171037	1926	6	B	U	121CBRV	--	91	55	36	19	--	--	--	--
793	14N/45E-05F02	464348	1171011	--	--	B	A	121CBRV	--	237	139	98	41	--	--	--	--
794	14N/45E-05F03	464348	1171012	19460817	16	B	T	121CBRV	X	230	131	100	31	27	230	--	--
795	14N/45E-05G01	464346	1171008	1937	10	B	A	121CBRV	--	213	119	94	25	--	--	--	--
796	14N/45E-08E01	464247	1171052	19690521	18	--	A	122GDRD	X	712	692	532	160	672	712	1	0.10
797	14N/46E-05B01	464353	1170238	19770112	8.75	B	N	122GDRD	X	338	294	44	249	195	338	3	0.10
798	14N/46E-19M01	464055	1170418	1951	6	B	H	122WNPM	X	80	55	43	12	30	80	1	0.10
799	15N/45E-32N02	464409	1171032	--	--	B	--	121CBRV	--	954	954	--	--	--	--	--	--
800	15N/40E-19K01	464615	1174949	19760423	8	B	H	122WNPM	X	250	195	88	107	140	250	3	9.1

Table 13.--*Location and well construction data for ground-water-quality sites in the Central Columbia Plateau study unit--Continued*

Site number on plate 1	Local well number	Latitude[1]	Longitude	Date of construction (year, month, and day)	Diameter of casing (in)	Primary use of site	Primary use of water	Aquifer code[2]	Type of openings	Depth of well (feet)	Estimated depth of sample (feet)	Sample depth below mean water level (feet)	Depth to mean water level (feet)	Range of open interval: Top of first interval (feet)	Range of open interval: Bottom of last interval (feet)	Number of nitrate samples	Mean nitrate concentration as N (mg/L)
801	15N/43E-09P01	464751	1172422	19750225	8	B	H	122GDRD	P	207	104	--	157	89	119	3	0.10
802	15N/43E-13H01	464724	1171940	1947	6	U	H	122SDLM	--	112	64	49	15	--	--	2	3.7
803	15N/44E-15A02	464706	1171452	19541101	10	B	A	--	--	78	47	31	16	--	--	--	--
804	15N/45E-07R03	464743	1171049	1970	7	B	H	122ELBG	X	242	187	107	80	132	242	1	0.21
805	15N/45E-26K01	464522	1170615	1953	6	B	U	121CBRV	--	302	302	0	303	--	--	--	--
806	15N/45E-29G02	464532	1171003	1963	8	B	N	121CBRV	X	247	217	61	156	187	--	--	--
807	15N/45E-29G03	464533	1171003	19780623	8	O	N	122CBRV	X	400	286	115	171	118	400	1	0.10
808	15N/45E-32N01	464409	1171032	19460312	15	O	A	121CBRV	--	231	145	86	59	--	--	--	--
809	15N/45E-32N02	464409	1171033	19560802	16	O	A	122GDRD	X	954	677	601	75	399	954	3	0.10
810	15N/46E-07P01P1	464742	1170404	--	--	O	--	--	--	--	10	--	--	--	--	1	1.9
811	15N/46E-07P02P3	464739	1170401	--	--	O	--	--	--	31.2	31	--	--	--	--	1	3.6
812	15N/46E-07P02P4	464739	1170401	--	--	B	--	--	--	49.2	49	--	--	--	--	1	0.81
813	15N/46E-07P03P1	464736	1170401	--	--	--	--	--	--	--	10	--	--	--	--	1	17
814	15N/46E-07P03P2	464736	1170401	--	--	B	--	--	--	16.4	16	--	--	--	--	1	8.9
815	15N/46E-20P01	464603	1170246	--	--	B	H	--	--	250	176	74	102	--	--	--	--
816	16N/43E-14N02	465218	1172213	--	--	B	--	--	--	750	750	--	--	--	--	--	--
817	16N/39E-22J01	465133	1175310	19740716	8	B	H	122WNPM	X	400	244	156	88	23	400	3	0.14
818	16N/41E-16K01	465227	1173925	19780609	6	B	H	122WNPM	X	90	64	26	37	18	90	2	6.6
819	16N/42E-28M01	465042	1173219	19790212	12.70	B	I	122GDRD	X	185	159	140	19	133	185	2	0.10
820	16N/42E-34L01	464949	1173055	19740623	6	B	H	--	X	141	114	51	63	87	141	3	3.6
821	16N/43E-07K01	465324	1172638	19620908	8	B	H	--	--	190	101	89	12	--	--	--	--
822	16N/43E-14N02	465220	1172204	19550622	16	B	A	122GDRD	P	750	630	290	340	510	750	3	0.10

Table 13.--*Location and well construction data for ground-water-quality sites in the Central Columbia Plateau study unit--Continued*

Site number on plate 1	Local well number	Latitude[1]	Longitude	Date of construction (year, month, and day)	Diameter of casing (in)	Primary use of site	Primary use of water	Aquifer code[2]	Type of openings	Depth of well (feet)	Estimated depth of sample (feet)	Sample depth below mean water level (feet)	Depth to mean water level (feet)	Range of open interval: Top of first interval (feet)	Range of open interval: Bottom of last interval (feet)	Number of nitrate samples	Mean nitrate concentration as N (mg/L)
823	16N/43E-17A01	465303	1172450	19790815	6	B	H	122WNPM	X	120	97	69	28	74	120	3	1.2
824	16N/44E-26J01	465040	1171337	1944	6	B	H	122WNPM	--	125	83	43	40	--	--	1	3.6
825	16N/45E-16F01	465235	1170854	19600624	8	B	A	122WNPM	X	170	155	96	59	140	170	1	0.10
826	17N/40E-08H01	465837	1174724	19550401	8	B	G	--	--	102	74	29	45	--	--	--	--
827	17N/40E-20K01	465658	1174751	19771215	6	B	H	--	X	60	51	15	36	42	60	3	2.8
828	17N/41E-09E01	465908	1173918	19800418	6	B	H	122GDRD	X	95	72	48	24	49	95	3	4.0
829	17N/41E-30R01	465559	1174105	19450703	8	B	A	122WNPM	X	175	121	54	67	55	175	3	4.1
830	17N/42E-01F01	465953	1172743	19531001	8	B	H	122WNPM	--	199	123	76	46	--	--	3	3.3
831	17N/43E-29N01	465601	1172517	19790331	6	B	H	122GDRD	X	207	185	22	164	68	207	3	0.51
832	17N/44E-11L01	465850	1171328	19741122	8	B	H	122GDRD	X	88	74	14	60	20	88	3	1.1
833	17N/45E-04C01	470017	1170823	19480520	10	B	A	--	X	380	331	213	118	282	380	3	0.10
834	18N/41E-04E01	470504	1173935	19791217	5	B	H	122WNPM	X	119	100	29	71	80	119	3	6.0
835	18N/42E-23B01	470244	1172841	19750916	6	B	H	--	X	225	180	45	134	56	225	3	1.5
836	18N/43E-32B01	470103	1172447	19790601	6	B	H	122WNPM	P	85	55	39	16	25	85	3	4.6
837	18N/43E-35P03	470024	1172108	19810710	8	B	J	122CBRV	X	425	328	273	55	230	425	3	3.6
838	18N/45E-01L02	470508	1170439	19660721	10	B	I	--	X	419	373	144	229	327	419	1	0.21
839	19N/41E-36Q02D1	470533	1173512	19760503	10	B	A	122CBRV	X	480	288	192	96	20	480	3	0.14
840	19N/42E-15B01	470901	1173001	19740627	6	B	H	122WNPM	X	185	107	78	29	28	185	3	7.0
841	19N/42E-19H01	470753	1173322	19791211	--	B	H	122CBRV	X	500	390	110	280	38	500	3	0.10
842	19N/44E-21M01	470735	1171637	19760219	6	B	H	122CBRV	X	325	241	84	157	64	325	1	2.1
843	19N/44E-22F01	470755	1171500	19800415	6	B	H	122WNPM	X	280	213	154	59	145	280	3	1.1
844	20N/42E-19J01	471300	1173340	1956	8	B	H	122GDRD	--	241	210	32	178	--	--	3	4.6

Table 13.--*Location and well construction data for ground-water-quality sites in the Central Columbia Plateau study unit--Continued*

Site number on plate 1	Local well number	Latitude[1]	Longitude	Date of construction (year, month, and day)	Diameter of casing (in)	Primary use of site	Primary use of water	Aquifer code[2]	Type of openings	Depth of well (feet)	Estimated depth of sample (feet)	Sample depth below mean water level (feet)	Depth to mean water level (feet)	Range of open interval: Top of first interval (feet)	Range of open interval: Bottom of last interval (feet)	Number of nitrate samples	Mean nitrate concentration as N (mg/L)
845	20N/43E-10R01	471429	1172206	19520522	12	--	A	--	X	308	181	127	55	30	308	3	0.70
846	20N/44E-12M01	471442	1171248	1980	8	B	H	122WNPM	X	145	123	23	100	45	145	3	6.4
847	21N/43E-07G01	471935	1172509	19741014	6	B	H	122WNPM	X	225	141	85	56	43	225	3	1.4
848	22N/43E-32L01	472111	1172416	--	--	B	--	--	--	115	115	--	--	--	--	--	--
850	39N05W06ABB1	464532	1165303	--	8	B	--	--	X	200	115	85	30	27	200	--	--
851	39N05W08ABD1	464426	1165908	1948	24	B	--	--	X	373	268	105	163	144	373	--	--
852	39N05W14DCA1	464309	1165521	19710510	6	B	--	--	X	140	120	106	13	99	140	--	--
853	40N05W27CBA1	464645	1165715	19711016	8	B	--	--	X	99	67	56	11	34	99	1	0.61
854	41N03W03BCB1	465553	1164236	19710505	8	B	--	--	X	98	85	59	25	71	98	1	0.10
855	41N03W09BBD1	465505	1164343	--	--	B	--	--	--	170	119	51	68	--	--	1	0.10
856	41N04W06BAD1	465543	1165315	19710306	10	B	--	--	X	513	347	205	142	180	513	1	0.10
857	41N04W09BAD1	465455	1165043	19621016	6	B	--	--	X	261	259	--	--	257	261	1	0.10
858	41N05W03DBC1	465515	1165650	19720922	8	B	--	--	X	41	38	15	23	34	41	2	10

[1] Latitude and Longitude given in degrees, minutes, and seconds.

[2] Abbreviations used to represent geohydrologic units in the study unit [Abbreviation codes consist of three parts. The first part contains three numeric characters which represent the Era, System, and Series of the rock unit. The second part, or next four characters of the code is an alpha code which represents the rock-stratigraphic unit. The third part of the code is a single character and denotes a qualifying term such as Upper, Middle, or Lower].

Aquifer codes	Description of rock-stratigraphic unit
110ALVM	Quaternary Alluvium
110DUNE	Quaternary dune sand
112GLCV	Pleistocene glaciofluviatile
112PSCO	Pasco gravels of the Hanford formation (informal name), of Pleistocene age
112TCHT	Touchet beds of the Hanford formation (informal name), of Pleistocene age
121CBRV	Columbia River Basalt Group of the Pliocene age
121RGLD	Undifferentiated Ringold Formation of Pliocene age
121RGLDB	Basal part of the Ringold Formation of Pliocene age
121RGLDL	Lower unit of the Ringold Formation of Pliocene age
121RGLDM	Middle unit of the Ringold Formation of Pliocene age
121RGLDU	Upper unit of the Ringold Formation of Pliocene age
122ELBG	Ellensburg Formation of Miocene age
122GDRD	Grand Ronde Basalt of Yakima Basalt subgroup of Columbia River Basalt Group, of Miocene age
122IMNH	Imnaha Basalt of Columbia River Basalt Group of Miocene age
122SDLM	Saddle Mountains Basalt of Yakima, subgroup of Columbia River Basalt Group, of Miocene age
122WNPM	Wanapum Basalt of Yakima Basalt, subgroup of Columbia River Basalt Group, of Miocene age
122YKIM	Yakima Basalt subgroup of Columbia River Basalt Group, of Miocene age

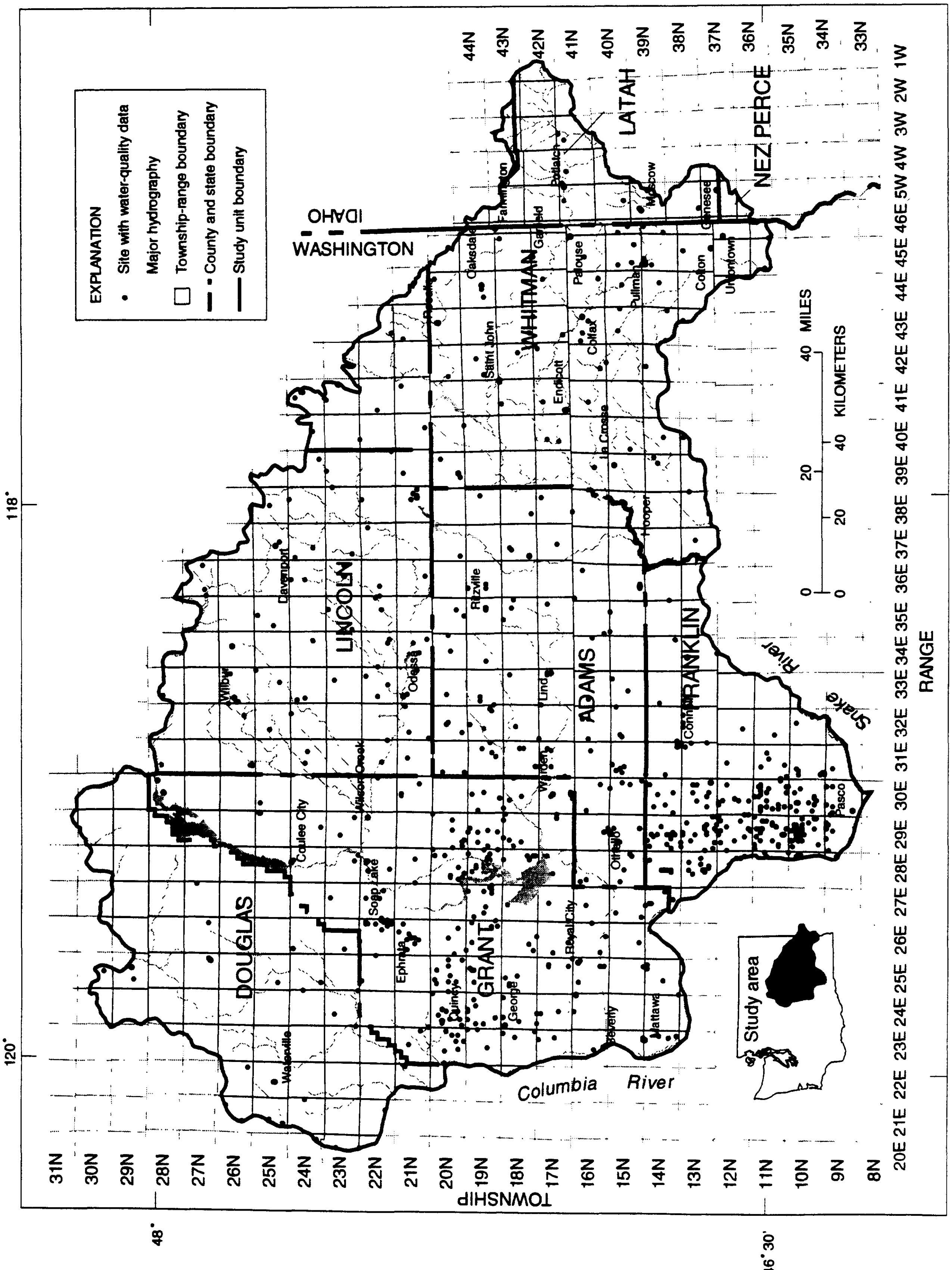
EXPLANATION
Site with water-quality data
Major hydrography
Township-range boundary
County and state boundary
Study unit boundary
WASHINGTON
IDAHO
DOUGLAS
GRANT
LINCOLN
ADAMS
WHITMAN
FRANKLIN
LATAH
NEZ PERCE
Columbia River
Snake River
Study area
MILES
KILOMETERS
TOWNSHIP
RANGE
118°
120°
48°
46°30'

Table 14.--*Pesticides sampled in ground water in the Central Columbia Plateau study unit*

[USGS, U.S. Geological Survey; WDOE, Washington Department of Ecology; WDOH, Washington Department of Health; MISA, miscellaneous acid; CLPH, chlorophenoxy acid herbicides; AMID, amide; TRI, triazine; MISC, miscellaneous; NC, nitrogen-containing; URAC, uracid; TCB, thiocarbamate insecticide; CB, carbamate; OC, organochlorine; OP, organophosphate; UREA, urea; MISN, miscellaneous; TP, thiophosphate; ACE, acetanilids; VOL, volatile; --, not analyzed]

Chemical name	Compound class	Chemical abstract number	Number of sites with detections/number of sites (detection limit, µg/L)		
			USGS	WDOE	WDOH
		HERBICIDES			
2,4,5-T	CLPH	93-76-5	0 / 17 (0.01)	0 / 56 (0.2)	--
2,4,5-Tp (Silvex)	CLPH	93-72-1	0 / 17 (0.01)	0 / 56 (0.2)	--
2,4-D	CLPH	1702-17-6	0 / 17 (0.01)	0 / 56 (0.5)	--
2,4-DB	CLPH	94-82-6	--	0 / 56 (2)	--
Acifluorfen	MISA	62476-59-9	--	0 / 56 (0.2)	--
Alachlor	AMID	15972-60-8	0 / 17 (0.1)	0 / 56 (1)	--
Ametryn	TRI	834-12-8	0 / 17 (0.1)	0 / 56 (0.3)	--
Atratone	MISC	1610-17-9	--	0 / 29 (0.3)	--
Atrazine	TRI	1912-24-9	0 / 17 (0.1)	4 / 56 (0.2)	--
Bentazon	NC	25057-89-0	--	0 / 56 (0.5)	--
Bromacil	URAC	314-40-9	--	1 / 56 (2.2)	--
Butachlor	AMID	23184-66-9	--	0 / 29 (1.5)	--
Butylate	TCB	2008-41-5	--	0 / 29 (5.0)	--
Chloramben	MISA	1954-81-4	--	0 / 27 (0.5)	--
Chlorpropham	CB	101-21-3	--	0 / 29 (0.7)	--
Cyanazine	TRI	21725-46-2	0 / 17 (0.1)	0 / 56 (0.8)	--
Cycloate	TCB	1134-23-2	--	0 / 27 (0.4)	--
DCPA	OC	1861-32-1	--	23 / 56 (0.2)	--
Dalapon	MISA	75-99-0	--	0 / 56 (5)	--
Dicamba	MISA	1918-00-9	5 / 17 (0.01)	0 / 56 (0.2)	--
Dichlorprop (2,4-DP)	CLPH	120-36-5	0 / 17 (0.01)	0 / 56 (0.5)	--
Dinoseb	NC	2794-72-9	--	0 / 56 (2.5)	--
Diphenamide	AMID	957-51-7	--	0 / 56 (0.4)	--
Diuron	UREA	94-75-7	--	0 / 26 (0.5)	--
EPTC	TCB	759-94-4	--	0 / 29 (0.3)	--
Fluridone	MISN	59756-60-4	--	0 / 29 (0.8)	--
Hexazinone	TRI	51235-04-2	--	0 / 56 (0.3)	--
IPC (Propham)	CB	122-42-9	--	--	--
Merphos	TP	150-50-5	--	0 / 29 (0.4)	--
Metolachlor	ACE	51218-45-2	0 / 17 (0.1)	0 / 56 (1.5)	--
Metribuzin	TRI	21087-64-9	1 / 17 (0.1)	0 / 56 (0.4)	--
Molinate	TCB	2212-67-1	--	0 / 29 (0.4)	--

Table 14.--*Pesticides sampled in ground water in the Central Columbia Plateau study unit--Continued*

Chemical name	Compound class	Chemical abstract number	Number of sites with detections/number of sites (detection limit, µg/L)		
			USGS	WDOE	WDOH
		HERBICIDES--Continued			
Napropamide	AMID	15299-99-7	--	0 / 29 (0.4)	--
Norflurazon	NC	27314-13-2	--	0 / 29 (0.4)	--
Pebulate	TCB	1114-71-2	--	0 / 29 (0.4)	--
Picloram	MISA	1918-02-1	0 / 17 (0.01)	1 / 56 (1.0)	--
Prometon	TRI	1610-18-0	0 / 17 (0.1)	0 / 56 (0.3)	--
Prometryn	TRI	7287-19-6	--	0 / 56 (0.2)	--
Propazine	TRI	139-40-2	0 / 17 (0.1)	0 / 56 (0.2)	--
Simazine	TRI	122-34-9	0 / 17 (0.1)	0 / 56 (0.8)	--
Simetryn	TRI	1014-70-6	--	--	--
Tebuthiuron	UREA	34014-18-1	--	0 / 56 (0.4)	--
Terbacil	URAC	5902-51-2	--	0 / 56 (3.5)	--
Terbutryn	TRI	886-50-0	--	0 / 29 (0.3)	--
Tribufos	OP	78-48-8	0 / 17 (0.01)	--	--
Trifluralin	NC	1582-09-8	0 / 17 (0.1)	--	--
Vernolate	TCB	1929-77-7	--	0 / 29 (0.4)	--
		INSECTICIDES			
1,2-Dibromoethane (EDB)	VOL	106-93-4	--	18 / 56 (--)	--
Aldicarb	CB	116-06-3	0 / 18 (0.05)	0 / 56 (1.5)	--
Carbaryl	CB	63-25-2	0 / 19 (0.05)	0 / 29 (5)	--
Carbofuran	CB	1563-66-2	0 / 17 (0.05)	0 / 56 (0.5)	--
Carbophenothion	OP	786-19-6	0 / 18 (0.01)	--	--
Chlorpyrifos	OP	2921-88-2	0 / 18 (0.01)	--	--
Diazinon	OP	7600-50-2	0 / 18 (0.01)	0 / 29 (0.1)	--
DDVP	OP	58727-55-8	--	0 / 29 (0.2)	--
Disulfoton	OP	298-04-4	--	0 / 29 (0.3)	--
Ethion	OP	563-12-2	0 / 18 (0.01)	--	--
Ethoprop	OP	13194-48-4	--	0 / 29 (0.1)	--
Fenamiphos	OP	22224-92-6	--	0 / 56 (0.3)	--
Fonofos	OP	944-22-9	0 / 18 (0.01)	--	
MGK- 264	MISN	113-48-4	--	0 / 29 (2)	--
Malathion	OP	121-75-5	0 / 18 (0.01)	--	--
Methiocarb	CB	2032-65-7	--	0 / 29 (5)	--
Methomyl	CB	16752-77-5	0 / 19 (0.05)	0 / 55 (0.5)	--
Methyl paraoxon	NA	950-35-6	--	0 / 29 (0.3)	--

Table 14.--*Pesticides sampled in ground water in the Central Columbia Plateau study unit--Continued*

Chemical name	Compound class	Chemical abstract number	Number of sites with detections/number of sites (detection limit, µg/L)		
			USGS	WDOE	WDOH
		INSECTICIDES--Continued			
Methyl parathion	OP	298-00-0	0 / 18 (0.1)	--	--
Methyl trithion	NA	786-19-6	0 / 18 (0.1)	--	--
Mevinphos	OP	7786-34-7	--	0 / 29 (0.3)	--
Oxamyl	CB	2135-22-0	0 / 17 (0.5)	0 / 56 (0.6)	--
Parathion	OP	56-38-2	0 / 18 (0.1)	--	--
Phorate	OP	298-02-2	0 / 18 (0.1)	--	--
Propoxur	CB	114-26-1	--	0 / 56 (1.1)	--
Tetrachlorvinphos	OP	22248-79-9	--	0 / 29 (0.4)	--
		FUNGICIDES AND FUMIGANTS			
1,2-Dibromo-3-Chloropropane (DBCP)	VOL	96-12-8	--	0 / 29 (--)	--
1,2-Dichloroethane	VOL	107-06-2	--	--	1 / 309
1,2-Dichloropropane	VOL	62-73-7	--	21 / 56 (0.2)	3 / 309
Carboxin	MISC	5234-68-4	--	0 / 56 (1)	--
cis-1,3-Dichloropropene	VOL	10061-01-5	--	29 / (0.2)	0 / 309
trans-1,3-Dichloropropene	VOL	10061-02-6	--	3 / 29 (0.2)	0 / 309
Fenarimol	MISN	60168-88-9	--	0 / 29 (0.4)	--
Methyl bromide	VOL	74-83-9	--	--	0 / 309
Pentachlorophenol	OC	131-52-2	--	0 / 56 (0.2)	--
Triadimefon	NC	66841-25-6	--	0 / 29 (0.3)	--
Tricyclazole	MISN	64470-88-8	--	0 / 29 (1.2)	--
		PESTICIDE METABOLITES			
1-Naphthol	NC	90-15-3	0 / 18 (0.5)	--	--
3-Hydroxycarbofuran	CB	1563-66-2	0 / 18 (0.5)	--	--
3,5-Dichlorobenzoic acid	MISA	120-36-5	--	0 / 56 (0.6)	--
4-Nitrophenol	NC	100-07-7	--	0 / 56 (5)	--
5-Hydroxydicamba	MISA	7600-50-2	--	0 / 56 (0.2)	--
Aldicarb Sulfone (Aldoxycarb)	CB	1646-88-4	2 / 18 (0.5)	0 / 56 (1)	--
Aldicarb Sulfoxide	CB	1646-87-3	1 / 17 (0.5)	0 / 56 (1)	--

Table 14.--*Pesticides sampled in ground water in the Central Columbia Plateau study unit--Continued*

Chemical name	Compound class	Chemical abstract number	Number of sites with detections/number of sites (detection limit, µg/L)		
			USGS	WDOE	WDOH
		VOLATILES			
1,1-Dichloroethane	VOL	75-34-3	--	--	2 / 309
1,1-Dichloroethylene	VOL	25323-30-2	--	--	0 / 309
cis-1,2-Dichloroethylene	VOL	156-59-2	--	--	2 / 309
trans-1,2-Dichloroethylene	VOL	156-60-5	--	--	1 / 309
1,3-Dichloropropane	VOL	142-28-9	--	--	0 / 309
2,2-Dichloropropane	VOL	594-20-7	--	--	0 / 309
1,1-Dichloropropene	VOL	563-58-6	--	--	0 / 309
1,1,1-Trichloroethane	VOL	71-55-6	--	--	1 / 309
1,1,2-Trichloroethane	VOL	79-00-5	--	--	2 / 309
1,1,1,2-Tetrachloroethane	VOL	630-20-6	--	--	0 / 309
1,1,2,2-Tetrachloroethane	VOL	79-34-5	--	--	0 / 309
1,2,3-Trichlorobenzene	VOL	87-61-6	--	--	0 / 309
1,2,3-Trichloropropane	VOL	96-18-4	--	--	1 / 309
1,2,4-Trichlorobenzene	VOL	120-82-1	--	--	1 / 309
1,2,4-Trimethylbenzene	VOL	95-63-6	--	--	1 / 309
1,3,5-Trimethylbenzene	VOL	108-67-8	--	--	1 / 309
Benzene	VOL	71-43-2	--	--	1 / 309
Bromobenzene	VOL	108-86-1	--	--	0 / 309
Bromochloromethane	VOL	74-97-5	--	--	0 / 309
n-Butylbenzene	VOL	104-51-8	--	--	0 / 309
sec-Butylbenzene	VOL	135-98-8	--	--	0 / 309
tert-Butylbenzene	VOL	98-06-6	--	--	0 / 309
Carbon tetrachloride	VOL	56-23-5	--	--	5 / 309
Chlorobenzene	VOL	108-90-7	--	--	0 / 309
Chloroethane	VOL	75-00-3	--	--	0 / 309
Chloromethane	VOL	74-87-3	--	--	0 / 309
o-Chlorotoluene	VOL	95-49-8	--	--	0 / 309
p-Chlorotoluene	VOL	106-43-4	--	--	0 / 309
Dibromomethane	VOL	74-95-3	--	--	0 / 309
m-Dichlorobenzene	VOL	541-73-1	--	--	0 / 309
o-Dichlorobenzene	VOL	95-50-1	--	--	0 / 309
p-Dichlorobenzene	VOL	106-46-7	--	--	0 / 309
Dichlorodifluoromethane	VOL	75-71-8	--	--	0 / 309
Ethylbenzene	VOL	100-41-4	--	--	1 / 309
Hexachlorobutadiene	VOL	87-68-3	--	--	0 / 309
Isopropylbenzene	VOL	98-82-8	--	--	1 / 309

Table 14.--*Pesticides sampled in ground water in the Central Columbia Plateau study unit--Continued*

Chemical name	Compound class	Chemical abstract number	Number of sites with detections/number of sites (detection limit, µg/L) USGS	WDOE	WDOH
		VOLATILES--Continued			
p-Isopropyltoluene	VOL	99-87-6	--	--	0 / 309
Methylene chloride	VOL	75-09-2	--	--	3 / 309
Naphthalene	VOL	91-20-3	--	--	1 / 309
n-Propylbenzene	VOL	103-65-1	--	--	1 / 309
Styrene	VOL	100-42-5	--	--	0 / 309
Tetrachloroethylene	VOL	127-18-4	--	--	3 / 309
Toluene	VOL	108-88-3	--	--	1 / 309
Trichloroethylene	VOL	79-01-6	--	--	7 / 309
Trichlorofluoromethane	VOL	75-69-4	--	--	0 / 309
Vinyl Chloride	VOL	75-01-4	--	--	0 / 309
m/p-Xylenes	VOL	108-38-3	--	--	1 / 309
o-Xylene	VOL	95-47-6	--	--	2 / 309

[1] Number of sites with detections/number of sites (detection limit).

Table 15.--*Concentrations of volatile organic compounds (VOCs) detected at wells in the Central Columbia Plateau study unit*
[All concentrations in micrograms per liter; ND, no concentration above analytical reporting limits; --, no data]

Local well number	Well depth (feet)	Date	1,1-Di-chloro-ethane	1,2-Di-chloro-ethane	1,1-Di-chloro-ethylene	*cis*-1,2-Di-chloro-ethylene	*trans*-1,2-Dichloro-ethylene	1,2-Di-chloro-propane	1,3-Di-chloro-propane	*cis*-1,3-Di-chloro-propene
26N/34E-10G	370	03/27/91	ND	ND	ND	ND	ND	ND	ND	ND
26N/34E-15K	383	03/27/91	ND	ND	ND	ND	ND	ND	ND	ND
25N/22E-22M	675	12/11/89	ND	ND	ND	ND	ND	ND	ND	ND
25N/28E-26G	246	07/27/92	ND	ND	ND	ND	ND	ND	ND	ND
23N/36E-15F	200	08/28/91	ND	ND	ND	ND	ND	ND	ND	ND
23N/36E-15F	300	01/03/91	ND	ND	ND	ND	ND	ND	ND	ND
22N/26E-25E	353	09/24/90	ND	ND	ND	ND	ND	7.2	ND	ND
22N/26E-25G	473	09/24/90	ND	ND	ND	ND	ND	0.9	ND	ND
22N/21E-25L	107	05/12/92	ND	ND	ND	ND	ND	ND	ND	ND
21N/26E-14G	1,025	03/05/90	ND	ND	ND	ND	ND	ND	ND	ND
19N/44E-22M	360	01/23/91	ND	ND	ND	ND	ND	ND	ND	ND
19N/28E-09B	--	05/28/91	ND	ND	ND	ND	ND	ND	ND	ND
19N/28E-09E	137	10/01/91	ND	ND	ND	ND	ND	ND	ND	ND
19N/28E-09E	78	10/15/91	ND	ND	ND	ND	ND	ND	ND	ND
19N/29E-16R	494	04//29/92	ND	ND	ND	ND	ND	ND	ND	ND
19N/28E-09L	230	10/30/89	ND	ND	ND	ND	ND	ND	ND	ND
17N/33E-12P	754	04/28/92	ND	ND	ND	ND	ND	ND	ND	ND
17N/33E-13D	382	08/13/91	ND	ND	ND	ND	ND	ND	ND	ND
17N/28E-17J	62	03/13/91	ND	ND	ND	ND	ND	ND	ND	ND
17N/28E-17J	62	03/13/91	ND	ND	ND	ND	ND	ND	ND	ND
15N/30E-28P	476	05/05/92	ND	ND	ND	ND	ND	1.3	ND	ND
14N/45E-05D	160	03/05/90	ND	ND	ND	ND	ND	ND	ND	ND
10N/30E-33P	25	08/24/92	6.6	0.7	ND	7.6	0.7	ND	ND	ND
09N/30E-28A	120	08/15/92	0.8	ND	ND	1.1	ND	ND	ND	ND

Table 15.--*Concentrations of volatile organic compounds (VOCs) detected at wells in the Central Columbia Plateau study unit--Continued*

Local well number	Well depth (feet)	Date	*trans-* 1,3-Di-chloro-propene	2,2-Di-chloro-propane	1,1-Di-chloro-propene	1,1,1-Tri-chloro-ethane	1,1,2-Tri-chloro-ethane	1,1,1,2-Tetra-chloro-ethane	1,1,2,2-Tetra-chloro-ethane	1,2,3-Tri-chloro-benzene
26N/34E-10G	370	03/27/91	ND	ND	ND	ND	ND	ND	ND	ND
26N/34E-15K	383	03/27/91	ND	ND	ND	ND	ND	ND	ND	ND
25N/22E-22M	675	12/11/89	ND	ND	ND	ND	ND	ND	ND	ND
25N/28E-26G	246	07/27/92	ND	ND	ND	ND	ND	ND	ND	ND
23N/36E-15F	200	08/28/91	ND	ND	ND	ND	ND	ND	ND	ND
23N/36E-15F	300	01/03/91	ND	ND	ND	ND	ND	ND	ND	ND
22N/26E-25E	353	09/24/90	ND	ND	ND	ND	ND	ND	ND	ND
22N/26E-25G	473	09/24/90	ND	ND	ND	ND	ND	ND	ND	ND
22N/21E-25L	107	05/12/92	ND	ND	ND	ND	ND	ND	ND	ND
21N/26E-14G	1,025	03/05/90	ND	ND	ND	ND	ND	ND	ND	ND
19N/44E-22M	360	01/23/91	ND	ND	ND	ND	ND	ND	ND	ND
19N/28E-09B	--	05/28/91	ND	ND	ND	ND	ND	ND	ND	ND
19N/28E-09E	137	10/01/91	ND	ND	ND	ND	ND	ND	ND	ND
19N/28E-09E	78	10/15/91	ND	ND	ND	ND	ND	ND	ND	ND
19N/29E-16R	494	04//29/92	ND	ND	ND	ND	ND	ND	ND	ND
19N/28E-09L	230	10/30/89	ND	ND	ND	ND	ND	ND	ND	ND
17N/33E-12P	754	04/28/92	ND	ND	ND	ND	ND	ND	ND	ND
17N/33E-13D	382	08/13/91	ND	ND	ND	ND	ND	ND	ND	ND
17N/28E-17J	62	03/13/91	ND	ND	ND	ND	0.5	ND	ND	ND
17N/28E-17J	62	03/13/91	ND	ND	ND	ND	0.5	ND	ND	ND
15N/30E-28P	476	05/05/92	ND	ND	ND	ND	ND	ND	ND	ND
14N/45E-05D	160	03/05/90	ND	ND	ND	ND	ND	ND	ND	ND
10N/30E-33P	25	08/24/92	ND	ND	ND	9.4	ND	ND	ND	ND
09N/30E-28A	120	08/15/92	ND	ND	ND	ND	ND	ND	ND	ND

Table 15.--*Concentrations of volatile organic compounds (VOCs) detected at wells in the Central Columbia Plateau study unit--Continued*

Local well number	Well depth (feet)	Date	1,2,3-Tri-chloro-propane	1,2,4-Tri-chloro-benzene	1,2,4-Tri-methyl-benzene	1,3,5-Tri-methyl-benzene	Benzene	Bromo-benzene	Bromo-chloro-methane	*n*-Buytl-benzene
26N/34E-10G	370	03/27/91	ND	ND	ND	ND	ND	ND	ND	ND
26N/34E-15K	383	03/27/91	ND	ND	ND	ND	ND	ND	ND	ND
25N/22E-22M	675	12/11/89	ND	ND	ND	ND	ND	ND	ND	ND
25N/28E-26G	246	07/27/92	ND	ND	ND	ND	ND	ND	ND	ND
23N/36E-15F	200	08/28/91	ND	ND	ND	ND	ND	ND	ND	ND
23N/36E-15F	300	01/03/91	ND	ND	ND	ND	ND	ND	ND	ND
22N/26E-25E	353	09/24/90	0.8	ND	ND	ND	ND	ND	ND	ND
22N/26E-25G	473	09/24/90	ND	ND	ND	ND	ND	ND	ND	ND
22N/21E-25L	107	05/12/92	ND	ND	1.6	ND	ND	ND	ND	ND
21N/26E-14G	1,025	03/05/90	ND	ND	ND	ND	ND	ND	ND	ND
19N/44E-22M	360	01/23/91	ND	16	ND	4.6	38	ND	ND	ND
19N/28E-09B	--	05/28/91	ND	ND	ND	ND	ND	ND	ND	ND
19N/28E-09E	137	10/01/91	ND	ND	ND	ND	ND	ND	ND	ND
19N/28E-09E	78	10/15/91	ND	ND	ND	ND	ND	ND	ND	ND
19N/29E-16R	494	04//29/92	ND	ND	ND	ND	ND	ND	ND	ND
19N/28E-09L	230	10/30/89	ND	ND	ND	ND	ND	ND	ND	ND
17N/33E-12P	754	04/28/92	ND	ND	ND	ND	ND	ND	ND	ND
17N/33E-13D	382	08/13/91	ND	ND	ND	ND	ND	ND	ND	ND
17N/28E-17J	62	03/13/91	ND	ND	ND	ND	ND	ND	ND	ND
17N/28E-17J	62	03/13/91	ND	ND	ND	ND	ND	ND	ND	ND
15N/30E-28P	476	05/05/92	ND	ND	ND	ND	ND	ND	ND	ND
14N/45E-05D	160	03/05/90	ND	ND	ND	ND	ND	ND	ND	ND
10N/30E-33P	25	08/24/92	ND	ND	ND	ND	ND	ND	ND	ND
09N/30E-28A	120	08/15/92	ND	ND	ND	ND	ND	ND	ND	ND

Table 15.--*Concentrations of volatile organic compounds (VOCs) detected at wells in the Central Columbia Plateau study unit--Continued*

Local well number	Well depth (feet)	Date	*sec-* Butyl-benzene	*tert-* Butyl-benzene	Carbon tetra-chloride	Chloro-benzene	Chloro-ethane	Chloro-methane	*o-* chloro-toluene	*p-* chloro-toluene
26N/34E-10G	370	03/27/91	ND	ND	ND	ND	ND	ND	ND	ND
26N/34E-15K	383	03/27/91	ND	ND	ND	ND	ND	ND	ND	ND
25N/22E-22M	675	12/11/89	ND	ND	4.7	ND	ND	ND	ND	ND
25N/28E-26G	246	07/27/92	ND	ND	ND	ND	ND	ND	ND	ND
23N/36E-15F	200	08/28/91	ND	ND	2.6	ND	ND	ND	ND	ND
23N/36E-15F	300	01/03/91	ND	ND	2.2	ND	ND	ND	ND	ND
22N/26E-25E	353	09/24/90	ND	ND	ND	ND	ND	ND	ND	ND
22N/26E-25G	473	09/24/90	ND	ND	ND	ND	ND	ND	ND	ND
22N/21E-25L	107	05/12/92	ND	ND	ND	ND	ND	ND	ND	ND
21N/26E-14G	1,025	03/05/90	ND	ND	ND	ND	ND	ND	ND	ND
19N/44E-22M	360	01/23/91	ND	ND	ND	ND	ND	ND	ND	ND
19N/28E-09B	--	05/28/91	ND	ND	ND	ND	ND	ND	ND	ND
19N/28E-09E	137	10/01/91	ND	ND	ND	ND	ND	ND	ND	ND
19N/28E-09E	78	10/15/91	ND	ND	ND	ND	ND	ND	ND	ND
19N/29E-16R	494	04//29/92	ND	ND	ND	ND	ND	ND	ND	ND
19N/28E-09L	230	10/30/89	ND	ND	ND	ND	ND	ND	ND	ND
17N/33E-12P	754	04/28/92	ND	ND	1.3	ND	ND	ND	ND	ND
17N/33E-13D	382	08/13/91	ND	ND	4.8	ND	ND	ND	ND	ND
17N/28E-17J	62	03/13/91	ND	ND	ND	ND	ND	ND	ND	ND
17N/28E-17J	62	03/13/91	ND	ND	ND	ND	ND	ND	ND	ND
15N/30E-28P	476	05/05/92	ND	ND	ND	ND	ND	ND	ND	ND
14N/45E-05D	160	03/05/90	ND	ND	ND	ND	ND	ND	ND	ND
10N/30E-33P	25	08/24/92	ND	ND	ND	ND	ND	ND	ND	ND
09N/30E-28A	120	08/15/92	ND	ND	ND	ND	ND	ND	ND	ND

Table 15.--*Concentrations of volatile organic compounds (VOCs) detected at wells in the Central Columbia Plateau study unit--Continued*

Local well number	Well depth (feet)	Date	Di-bromo-methane	*m*-Di-chloro-benzene	*o*-Di-chloro-benzene	*p*-Di-chloro-benzene	Dichloro-difluoro-methane	Ethyl-benzene	Hexa-chloro-buta-diene	Iso-propyl-benzene
26N/34E-10G	370	03/27/91	ND	ND	ND	ND	ND	ND	ND	ND
26N/34E-15K	383	03/27/91	ND	ND	ND	ND	ND	ND	ND	ND
25N/22E-22M	675	12/11/89	ND	ND	ND	ND	ND	ND	ND	ND
25N/28E-26G	246	07/27/92	ND	ND	ND	ND	ND	ND	ND	ND
23N/36E-15F	200	08/28/91	ND	ND	ND	ND	ND	ND	ND	ND
23N/36E-15F	300	01/03/91	ND	ND	ND	ND	ND	ND	ND	ND
22N/26E-25E	353	09/24/90	ND	ND	ND	ND	ND	ND	ND	ND
22N/26E-25G	473	09/24/90	ND	ND	ND	ND	ND	ND	ND	ND
22N/21E-25L	107	05/12/92	ND	ND	ND	ND	ND	ND	ND	ND
21N/26E-14G	1,025	03/05/90	ND	ND	ND	ND	ND	ND	ND	ND
19N/44E-22M	360	01/23/91	ND	ND	ND	ND	ND	12	ND	ND
19N/28E-09B	--	05/28/91	ND	ND	ND	ND	ND	ND	ND	ND
19N/28E-09E	137	10/01/91	ND	ND	ND	ND	ND	ND	ND	ND
19N/28E-09E	78	10/15/91	ND	ND	ND	ND	ND	ND	ND	ND
19N/29E-16R	494	04/29/92	ND	ND	ND	ND	ND	ND	ND	0.8
19N/28E-09L	230	10/30/89	ND	ND	ND	ND	ND	ND	ND	ND
17N/33E-12P	754	04/28/92	ND	ND	ND	ND	ND	ND	ND	ND
17N/33E-13D	382	08/13/91	ND	ND	ND	ND	ND	ND	ND	ND
17N/28E-17J	62	03/13/91	ND	ND	ND	ND	ND	ND	ND	ND
17N/28E-17J	62	03/13/91	ND	ND	ND	ND	ND	ND	ND	ND
15N/30E-28P	476	05/05/92	ND	ND	ND	ND	ND	ND	ND	ND
14N/45E-05D	160	03/05/90	ND	ND	ND	ND	ND	ND	ND	ND
10N/30E-33P	25	08/24/92	ND	ND	ND	ND	ND	ND	ND	ND
09N/30E-28A	120	08/15/92	ND	ND	ND	ND	ND	ND	ND	ND

Table 15.--*Concentrations of volatile organic compounds (VOCs) detected at wells in the Central Columbia Plateau study unit--Continued*

Local well number	Well depth (feet)	Date	*p*-Iso-propyl-toluene	Methyl-bromide	Methylene chloride	Naph-thalene	*n*-Propyl-benzene	Styrene	Tetra-chloro-ethylene	Toluene
26N/34E-10G	370	03/27/91	ND	ND	0.6	ND	ND	ND	ND	ND
26N/34E-15K	383	03/27/91	ND	ND	1.0	ND	ND	ND	ND	ND
25N/22E-22M	675	12/11/89	ND	ND	ND	ND	ND	ND	ND	ND
25N/28E-26G	246	07/27/92	ND	ND	0.5	ND	ND	ND	ND	ND
23N/36E-15F	200	08/28/91	ND	ND	ND	ND	ND	ND	ND	ND
23N/36E-15F	300	01/03/91	ND	ND	ND	ND	ND	ND	ND	ND
22N/26E-25E	353	09/24/90	ND	ND	ND	ND	ND	ND	ND	ND
22N/26E-25G	473	09/24/90	ND	ND	ND	ND	ND	ND	ND	ND
22N/21E-25L	107	05/12/92	ND	ND	ND	ND	ND	ND	ND	ND
21N/26E-14G	1,025	03/05/90	ND	ND	ND	ND	ND	ND	0.6	ND
19N/44E-22M	360	01/23/91	ND	ND	ND	3.1	1.4	ND	ND	128
19N/28E-09B	ND	05/28/91	ND	ND	ND	ND	ND	ND	ND	ND
19N/28E-09E	137	10/01/91	ND	ND	ND	ND	ND	ND	ND	ND
19N/28E-09E	78	10/15/91	ND	ND	ND	ND	ND	ND	ND	ND
19N/29E-16R	494	04//29/92	ND	ND	ND	ND	ND	ND	ND	ND
19N/28E-09L	230	10/30/89	ND	ND	ND	ND	ND	ND	ND	ND
17N/33E-12P	754	04/28/92	ND	ND	ND	ND	ND	ND	ND	ND
17N/33E-13D	382	08/13/91	ND	ND	ND	ND	ND	ND	ND	ND
17N/28E-17J	62	03/13/91	ND	ND	ND	ND	ND	ND	ND	ND
17N/28E-17J	62	03/13/91	ND	ND	ND	ND	ND	ND	ND	ND
15N/30E-28P	476	05/05/92	ND	ND	ND	ND	ND	ND	ND	ND
14N/45E-05D	160	03/05/90	ND	ND	ND	ND	ND	ND	ND	ND
10N/30E-33P	25	08/24/92	ND	ND	ND	ND	ND	ND	1.5	ND
09N/30E-28A	120	08/15/92	ND	ND	ND	ND	ND	ND	1.7	ND

Table 15.--*Concentrations of volatile organic compounds (VOCs) detected at wells in the Central Columbia Plateau study unit--Continued*

Local well number	Well depth (feet)	Date	Tri-chloro-ethylene	Tri-chloro-fluoro-methane	Vinyl chloride	*m/p*-Xylenes	*o*-Xylene
26N/34E-10G	370	03/27/91	ND	ND	ND	ND	ND
26N/34E-15K	383	03/27/91	ND	ND	ND	ND	ND
25N/22E-22M	675	12/11/89	ND	ND	ND	ND	ND
25N/28E-26G	246	07/27/92	ND	ND	ND	ND	ND
23N/36E-15F	200	08/28/91	ND	ND	ND	ND	ND
23N/36E-15F	300	01/03/91	ND	ND	ND	ND	ND
22N/26E-25E	353	09/24/90	ND	ND	ND	ND	ND
22N/26E-25G	473	09/24/90	ND	ND	ND	ND	ND
22N/21E-25L	107	05/12/92	ND	ND	ND	ND	0.6
21N/26E-14G	1,025	03/05/90	ND	ND	ND	ND	ND
19N/44E-22M	360	01/23/91	ND	ND	ND	61	27
19N/28E-09B	--	05/28/91	5.8	ND	ND	ND	ND
19N/28E-09E	137	10/01/91	0.9	ND	ND	ND	ND
19N/28E-09E	78	10/15/91	0.8	ND	ND	ND	ND
19N/29E-16R	494	04//29/92	ND	ND	ND	ND	ND
19N/28E-09L	230	10/30/89	6.5	ND	ND	ND	ND
17N/33E-12P	754	04/28/92	ND	ND	ND	ND	ND
17N/33E-13D	382	08/13/91	ND	ND	ND	ND	ND
17N/28E-17J	62	03/13/91	ND	ND	ND	ND	ND
17N/28E-17J	62	03/13/91	ND	ND	ND	ND	ND
15N/30E-28P	476	05/05/92	ND	ND	ND	ND	ND
14N/45E-05D	160	03/05/90	0.6	ND	ND	ND	ND
10N/30E-33P	25	08/24/92	13.1	ND	ND	ND	ND
09N/30E-28A	120	08/15/92	0.9	ND	ND	ND	ND

Table 16.--*Concentrations and drinking water Maximum Contaminant Levels of pesticides detected at ground-water sites in the Central Columbia Plateau study unit*

[All concentrations in micrograms per liter; MCL, Maximum Contaminate Levels; HA, Health Advisory level; ND, no concentration above analytical reporting limits; e, positively identified but an estimated value; a, concentration is an average value of 2 or more replicate samples; --, not analyzed; na, not established]

Site number on plate 1	Well name	Date		1,2-Di-bromo-ethane (EDB)	1,2-Di-chloro-propane	*trans*-1,3-Di-chloro-propene	Aldi-carb sul-fone	Aldi-carb sulf-oxide	Atra-zine	Brom-acil	DCPA	Di-camba	Met-ribu-zin	Pi-clo-ram
			MCL	0.05	5	na	2	4	3	na	na	na	na	na
			HA	10 to 40	na	na	10	na	500	200	na	3	na	200
2	09N/29E-02A01	05/24/88		--	--	--	ND	ND	ND	--	--	ND	ND	ND
15	09N/30E-06L01	09/07/88		--	--	--	ND	ND	ND	--	--	0.01	ND	0.03
--	10N/29E-01A01	09/21/88		ND	ND	--	--	--	ND	14.9	ND	ND	ND	ND
		05/30/89		ND	--	--	--	--	ND	11	--	ND	ND	ND
		05/30/89		ND	--	--	--	--	ND	12	--	ND	ND	ND
		05/30/89		ND	--	--	--	--	ND	12	--	ND	ND	ND
22	10N/29E-02Q02	09/06/88		ND	ND	--	--	--	ND	ND	0.28e	ND	ND	ND
		05/31/89		ND	ND	--	--	--	ND	ND	0.2	ND	ND	ND
23	10N/29E-03P01	09/06/88		ND	ND	--	--	--	ND	ND	1.08	ND	ND	ND
		05/31/89		ND	ND	--	--	--	ND	ND	0.9	ND	ND	ND
		05/31/89		ND	ND	--	--	--	ND	ND	1	ND	ND	ND
		05/31/89		ND	ND	--	--	--	ND	ND	0.9	ND	ND	ND
24	10N/29E-03R01	02/22/88		--	--	--	ND	ND	ND	--	--	ND	ND	ND
25	10N/29E-03R02	09/14/88		--	--	--	ND	ND	ND	--	--	0.01	ND	ND
		09/06/88		ND	ND	--	--	--	ND	ND	ND	ND	ND	ND
26	10N/29E-04N01	09/20/88		ND	ND	--	--	--	ND	ND	ND	ND	ND	ND
--	10N/29E-08C01	09/20/88		ND	ND	--	--	--	ND	ND	0.26	ND	ND	ND
		05/31/89		ND	ND	--	--	--	ND	ND	0.4	ND	ND	ND

Table 16.--*Concentrations and drinking water Maximum Contaminant Levels of pesticides detected at ground-water sites in the Central Columbia Plateau study unit--Continued*

Site number on plate 1	Well name	Date		1,2-Dibromoethane (EDB)	1,2-Dichloropropane	*trans*-1,3-Dichloropropene	Aldicarb sulfone	Aldicarb sulfoxide	Atrazine	Bromacil	DCPA	Dicamba	Metribuzin	Picloram
			MCL	0.05	5	na	2	4	3	na	na	na	na	na
			HA	10 to 40	na	na	10	na	500	200	na	3	na	200
28	10N/29E-08R01	09/07/88		ND	ND	--	--	--	ND	ND	ND	ND	ND	ND
--	10N/29E-09R02	09/07/88		ND	ND	--	--	--	ND	ND	ND	ND	ND	ND
31	10N/29E-10B01[a]	09/06/88		ND	ND	--	--	--	ND	ND	ND	ND	ND	ND
		09/21/88		ND	ND	--	--	--	ND	ND	ND	ND	ND	ND
		09/21/88		ND	ND	--	--	--	ND	ND	ND	ND	ND	ND
36	10E/29N-10N03	09/10/88		--	--	--	ND	ND	ND	--	--	ND	ND	ND
37	10N/29E-10Q02	09/07/88		ND	0.8	--	--	--	ND	ND	ND	ND	ND	ND
		05/31/89		--	0.9	--	--	--	--	--	--	--	--	--
		05/31/89		--	1.0	--	--	--	--	--	--	--	--	--
--	10N/29E-11N02	09/21/88		ND	ND	--	--	--	ND	ND	ND	ND	ND	ND
40	10N/29E-12Q01	09/06/88		ND	ND	--	--	--	ND	ND	ND	ND	ND	ND
--	10N/29E-13D01	09/22/88		ND	ND	--	--	--	ND	ND	ND	ND	ND	ND
--	10N/29E-14B01	09/08/88		ND	ND	--	--	--	ND	ND	ND	ND	ND	ND
41	10N/29E-14D01	09/07/88		ND	ND	--	--	--	ND	ND	1.04	ND	ND	ND
		05/31/89		ND	ND	--	--	--	ND	ND	0.9	ND	ND	ND
42	10N/29E-14R01	09/08/88		ND	ND	--	--	--	ND	ND	ND	ND	ND	ND
46	10N/29E-16A02	09/07/88		ND	ND	--	--	--	ND	ND	ND	ND	ND	ND
		09/07/88		ND	ND	--	--	--	ND	ND	ND	ND	ND	ND
--	10N/29E-26A01	09/21/88		ND	ND	--	--	--	ND	ND	ND	ND	ND	ND
49	10N/29E-26D01	09/07/88		ND	ND	--	--	--	ND	ND	ND	ND	ND	ND
47	10N/29E-25B01	09/08/88		ND	0.4	--	--	--	ND	ND	ND	ND	ND	ND

Table 16.--*Concentrations and drinking water Maximum Contaminant Levels of pesticides detected at ground-water sites in the Central Columbia Plateau study unit--Continued*

Site number on plate 1	Well name	Date		1,2-Dibromoethane (EDB)	1,2-Dichloropropane	*trans*-1,3-Dichloropropene	Aldicarb sulfone	Aldicarb sulfoxide	Atrazine	Bromacil	DCPA	Dicamba	Metribuzin	Picloram
			MCL	0.05	5	na	2	4	3	na	na	na	na	na
			HA	10 to 40	na	na	10	na	500	200	na	3	na	200
		05/31/89		ND	0.3e	--	--	--	ND	ND	ND	ND	ND	ND
58	10N/30E-16P01D1	09/08/88		--	--	--	ND	ND	ND	--	--	ND	ND	ND
59	10N/30E-19J01	05/24/88		--	--	--	ND	ND	ND	--	--	ND	ND	ND
70	10N/31E-32N03	09/10/88		--	--	--	ND	ND	ND	--	--	ND	ND	ND
78	11N/29E-06C01	09/09/88		--	--	--	ND	ND	ND	--	--	ND	ND	ND
93	11N/29E-23N02	09/09/88		--	--	--	ND	ND	ND	--	--	ND	ND	ND
--	11N/29E-28R02	09/22/88		ND	ND	--	--	--	ND	ND	ND	ND	ND	ND
--	11N/29E-32B01	09/22/88		ND	ND	--	--	--	ND	ND	0.65	ND	ND	ND
		05/31/89		ND	ND	--	--	--	ND	ND	0.7	ND	ND	ND
--	11N/29E-33G01	09/20/88		ND	ND	--	--	--	ND	ND	ND	ND	ND	ND
97	11N/29E-34D02	09/06/88		ND	ND	--	--	--	ND	ND	1.08	ND	ND	ND
		05/31/89		ND	ND	--	--	--	ND	ND	0.7	ND	ND	ND
--	11N/29E-34Q01	09/20/88		ND	ND	--	--	--	ND	ND	ND	ND	ND	ND
--	11N/29E-34R01	09/22/88		ND	ND	--	--	--	ND	ND	ND	ND	ND	ND
--	11N/29E-35R01	09/22/88		ND	ND	--	--	--	ND	ND	0.46	ND	ND	ND
		05/31/89		ND	ND	--	--	--	ND	ND	0.5	ND	ND	ND
102	11N/30E-05N02	02/18/88		--	--	--	ND	ND	ND	--	--	ND	ND	ND
118	12N/29E-01A01	09/12/88		--	--	--	ND	ND	0.1	--	--	ND	ND	ND
160	13N/29E-36A01D1	05/24/88		--	--	--	0.09	ND	0.1	--	--	ND	ND	ND
166	13N/30E-27J01	02/25/88		--	--	--	ND	ND	ND	--	--	ND	ND	ND
--	19N/24E-04Q01	04/30/91		0.05	0.32a	0.11	--	--	ND	ND	0.4a	ND	ND	ND

Table 16.--*Concentrations and drinking water Maximum Contaminant Levels of pesticides detected at ground-water sites in the Central Columbia Plateau study unit--Continued*

Site number on plate 1	Well name	Date		1,2-Dibromoethane (EDB)	1,2-Dichloropropane	*trans*-1,3-Dichloropropene	Aldicarb sulfone	Aldicarb sulfoxide	Atrazine	Bromacil	DCPA	Dicamba	Metribuzin	Picloram
			MCL	0.05	5	na	2	4	3	na	na	na	na	na
			HA	10 to 40	na	na	10	na	500	200	na	3	na	200
		02/24/92		ND	0.1e	ND	--	--	--	--	ND	--	--	--
--	19N/24E-05A01	04/29/91		0.4	0.48	ND	--	--	ND	ND	ND	ND	ND	ND
		02/24/92		ND	0.3e	ND	--	--	--	--	--	--	--	--
--	19N/24E-05Q01	04/29/91		0.2	0.2	ND	--	--	ND	ND	8.3	ND	ND	ND
		02/25/92		ND	0.1e	ND	--	--	--	--	ND	--	--	--
--	20N/24E-09Q01	05/02/91		ND	ND	ND	--	--	ND	ND	0.82	ND	ND	ND
		02/27/92		--	--	--	--	--	--	--	ND	--	--	--
--	20N/24E-10N01	05/02/91		ND	ND	ND	--	--	ND	ND	0.4	ND	ND	ND
		02/27/92		--	--	--	--	--	--	--	ND	--	--	--
--	20N/24E-12D02	04/30/91		0.05	0.35	ND	--	--	ND	ND	ND	ND	ND	ND
		02/26/92		ND	0.2e	ND	--	--	ND	ND	--	ND	ND	ND
--	20N/24E-12N02	05/02/91		ND	ND	ND	--	--	ND	ND	0.3	ND	ND	ND
		02/27/92		--	--	--	--	--	--	--	ND	--	--	--
--	20N/24E-13Q01	05/01/91		ND	ND	ND	--	--	ND	ND	0.53	ND	ND	ND
--	20N/24E-14D01	05/02/91		ND	ND	ND	--	--	ND	ND	ND	ND	ND	ND
--	20N/24E-16J01	05/02/91		ND	ND	ND	--	--	ND	ND	2.1	ND	ND	ND
		02/27/92		--	ND	--	--	--	--	--	--	--	--	--
--	20N/24E-18R01	05/02/91		0.1	ND	ND	--	--	ND	ND	0.32	ND	ND	ND
		02/27/92		0.099	--	--	--	--	--	--	ND	--	--	--
--	20N/24E-21D01	05/02/91		0.06	0.17	ND	--	--	ND	ND	0.8	ND	ND	ND
		02/27/92		0.059	ND	--	--	--	--	--	ND	--	--	--

Table 16.--*Concentrations and drinking water Maximum Contaminant Levels of pesticides detected at ground-water sites in the Central Columbia Plateau study unit--Continued*

Site number on plate 1	Well name	Date		1,2-Dibromoethane (EDB)	1,2-Dichloropropane	*trans*-1,3-Dichloropropene	Aldicarb sulfone	Aldicarb sulfoxide	Atrazine	Bromacil	DCPA	Dicamba	Metribuzin	Picloram
			MCL	0.05	5	na	2	4	3	na	na	na	na	na
			HA	10 to 40	na	na	10	na	500	200	na	3	na	200
--	20N/24E-22G01	04/30/91		ND	ND	0.11	--	--	0.28	ND	ND	ND	ND	ND
		02/26/92		--	ND	ND	--	--	ND	--	--	--	--	--
--	20N/24E-22K01	04/30/91		0.21	0.48	0.1	--	--	ND	ND	ND	ND	ND	ND
		02/26/92		0.34	0.3e	--	--	--	--	--	--	--	--	--
--	20N/24E-24E02[b]	05/01/91		0.05	ND	ND	--	--	ND	ND	0.48	ND	ND	ND
		02/26/92		0.067	--	--	--	--	--	--	ND	--	--	--
--	20N/24E-25A01	05/01/91		0.01	ND	ND	--	--	ND	ND	ND	ND	ND	ND
		02/26/92		0.013	--	--	--	--	--	--	--	--	--	--
--	20N/24E-25D01	05/01/91		0.04	0.72	ND	--	--	ND	ND	ND	ND	ND	ND
		02/26/92		ND	0.5e	--	--	--	--	--	--	--	--	--
--	20N/24E-25G02	05/01/91		0.04	0.18	ND	--	--	ND	ND	ND	ND	ND	ND
		02/26/92		0.014	0.2e	--	--	--	--	--	--	--	--	--
--	20N/24E-25N01	05/01/91		ND	0.23	ND	--	--	ND	ND	ND	ND	ND	ND
		02/26/92		--	0.1e	--	--	--	--	--	--	--	--	--
--	20N/24E-26C01	05/01/91		0.03	0.52	ND	--	--	ND	ND	ND	ND	ND	ND
		02/26/92		--	0.4e	--	--	--	--	--	--	--	--	--
--	20N/24E-28H01	04/30/91		0.25	0.37a	ND	--	--	ND	ND	0.33a	ND	ND	ND
		02/25/92		0.32	0.2e	ND	--	--	--	--	0.014e	--	--	--
--	20N/24E-28J02[c]	04/30/91		ND	0.15	ND	--	--	ND	ND	ND	ND	ND	ND
		02/25/92		--	0.04e	ND	--	--	--	--	--	--	--	--
--	20N/24E-29E01	05/01/91		0.01	0.12	ND	--	--	ND	ND	1.1	ND	ND	ND

Table 16.--*Concentrations and drinking water Maximum Contaminant Levels of pesticides detected at ground-water sites in the Central Columbia Plateau study unit--Continued*

Site number on plate 1	Well name	Date	1,2-Dibromoethane (EDB)	1,2-Dichloropropane	*trans*-1,3-Dichloropropene	Aldicarb sulfone	Aldicarb sulfoxide	Atrazine	Bromacil	DCPA	Dicamba	Metribuzin	Picloram
		MCL	0.05	5	na	2	4	3	na	na	na	na	na
		HA	10 to 40	na	na	10	na	500	200	na	3	na	200
		02/25/92	0.01	ND	ND	--	--	--	--	0.06	--	--	--
--	20N/24E-29Q02[d]	04/29/91	ND	0.25	ND	--	--	ND	ND	0.9	ND	ND	ND
		02/25/92	--	ND	ND	--	--	--	--	ND	--	--	--
--	20N/24E-32H01	04/29/91	0.07	0.53	ND	--	--	ND	ND	1.1	ND	ND	ND
		02/25/92	0.096	0.4e	ND	--	--	--	--	ND	--	--	--
--	20N/24E-34B01	04/30/91	0.13	0.37	ND	--	--	ND	ND	1.1	ND	ND	ND
		02/25/92	ND	0.2e	ND	--	--	--	--	ND	--	--	--
--	20N/24E-34K01	04/30/91	0.01	0.19	ND	--	--	ND	ND	ND	ND	ND	ND
		02/25/92	ND	0.06e	ND	--	--	--	--	--	--	--	--
425	D15-112P-3471	09/16/88	--	--	--	ND	ND	0.1	--	--	0.01	1.2	ND
444	D16-198P1-West	09/16/88	--	--	--	ND	ND	ND	--	--	0.01	ND	ND
452	D16-208D-0+00	08/25/88	--	--	--	0.23	0.21	ND	--	--	ND	ND	ND
454	D16-266A-0+00	08/26/88	--	--	--	ND	ND	ND	--	--	0.01	ND	ND
--	QNDRAIN1	05/03/91	ND	0.18	ND	--	--	ND	ND	5.7	ND	ND	ND
		02/26/92	--	ND	ND	--	--	--	--	ND	--	--	--
--	QNDRAIN2	05/03/91	0.06	0.72	ND	--	--	ND	ND	ND	ND	ND	ND
		02/26/92	0.01	0.4e	ND	--	--	--	--	--	--	--	--

[a] Identified by Ecology as 10N/29E-10A01.
[b] Identified by Ecology as 20N/24E-24E1.
[c] Identified by Ecology as 20N/24E-28J1.
[d] Identified by Ecology as 20N/24E-29Q01.