U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

PREPARED IN COOPERATION WITH THE
IDAHO DEPARTMENT OF HEALTH AND WELFARE, DIVISION OF ENVIRONMENTAL QUALITY

WATER-RESOURCES INVESTIGATIONS REPORT 94–4087
Depth to Water, 1991, Northern and East-Central Idaho—SHEET 1
Berenbrock, Charles, and others, 1995, Depth to water, 1991, in the Rathdrum Prairie, Idaho; Spokane River Valley, Washington; Moscow-Lewiston-Grangeville area, Idaho; and selected intermontane valleys, east-central Idaho

INTRODUCTION

The Idaho Department of Health and Welfare, Division of Environmental Quality (IDHW/DEQ), began a project in 1988 to address concerns about ground-water vulnerability to pollution in Idaho. The objectives of the project were to develop methods to (1) assign priorities for the design of ground-water management and monitoring programs, (2) build support for and public awareness of the vulnerability of ground water to contamination, (3) assist in the design of regulatory programs, and (4) provide access to technical data through the use of a geographic information system (GIS) (C. Grantham, IDHW/DEQ, written commun., 1989). A modified version of the U.S. Environmental Protection Agency's DRASTIC system was used by IDHW/DEQ to evaluate the ground-water pollution potential of an area on the basis of a set of physical characteristics. Several agencies cooperated to provide information used to create GIS data layers for the project. The U.S. Soil Conservation Service provided information on soil characteristics; the Idaho Department of Water Resources provided estimates of ground-water recharge; and the U.S. Geological Survey (USGS) provided information on depth to water. Phase I of the Idaho ground-water vulnerability project included the western and eastern parts of the Snake River Plain and was finished in 1991 (Maupin, 1991, 1992). In 1991, as part of phase II of the ground-water vulnerability project, the USGS, in cooperation with the IDHW/DEQ, developed depth-to-water maps for Rathdrum Prairie in Idaho; part of the Spokane River Valley in eastern Washington; and intermontane valleys of the upper Big Wood, Big Lost, Pahsimeroi, Little Lost, and Lemhi Rivers and Birch Creek in Idaho.

This report presents the results of the USGS's effort to map depth to water in selected areas in Idaho and eastern Washington. Water levels measured in 1991 were used to define the depth-to-water zones. Depths to water shown in the Moscow-Lewiston-Grangeville area in Idaho are limited to point data at individual wells because most of the water levels measured were not representative of levels in the uppermost aquifer but of levels in deeper aquifers.

METHODS

Methods used to map the depth to water in areas included in Phase II differed from those used by Maupin (1991, 1992) for the Snake River Plain. Changes in methods were necessary because (1) the widths of the intermontane valleys are narrow compared with the lengths; and (2) wells and measured ground-water levels in these narrow valleys were sparse except near streams.

Digital elevation models (DEM's) and ground-water-level measurements were the primary sources of data used to define depth-to-water zones and to digitally generate depth-to-water maps. DEM's are records of land-surface altitude at regularly spaced horizontal intervals. The DEM's used to estimate land-surface altitudes in this study were digitized on a 3-arc-second spacing (about 220 feet longitudinally and about 300 feet latitudinally) from 1:250,000-scale Defense Mapping Agency Topographic Center maps. Digital land-surface data are available on floppy diskettes through the USGS Earth Science Information Centers. Ground-water levels measured in 1991 were used to draw water-table maps for the Rathdrum Prairie and Spokane River Valley and for each intermontane valley. Water-table altitude at each well was calculated from the DEM's by subtracting the estimated land-surface altitude from the measured depth to water. In intermontane valleys where measured water levels were sparse, estimates of depth to water were made on the basis of a conceptual hydrologic model in which increased depth to water was hypothesized with increasing distance from the main stream in each valley. Previous investigations of the Big Lost River Valley by Crosthwaite and others (1970), S.A. Goodell and others (USGS, written commun., 1987), and Bassick and Jones (1992) aided in the analysis of that area. Because ground-water conditions in the Big Lost River Valley are better defined than those in the other intermontane valleys, the Big Lost River Valley was used as a model for extending analysis into the intermontane valleys. In the intermontane valleys, some of the streams are hydraulically connected with the ground-water system. Where this hydraulic connection has been documented, the altitudes of the streambeds were used as control points to construct the water-table contours. The contours were converted to the same 3-arc-second spacing as the DEM's. Depth to water was calculated by subtracting water-table altitudes from DEM-derived land-surface altitudes and depth-to-water zones were defined. Previous investigations of the Rathdrum Prairie-Spokane River Valley by Drost and Seitz (1977) and Jehn (1988) aided in the analysis of that area.

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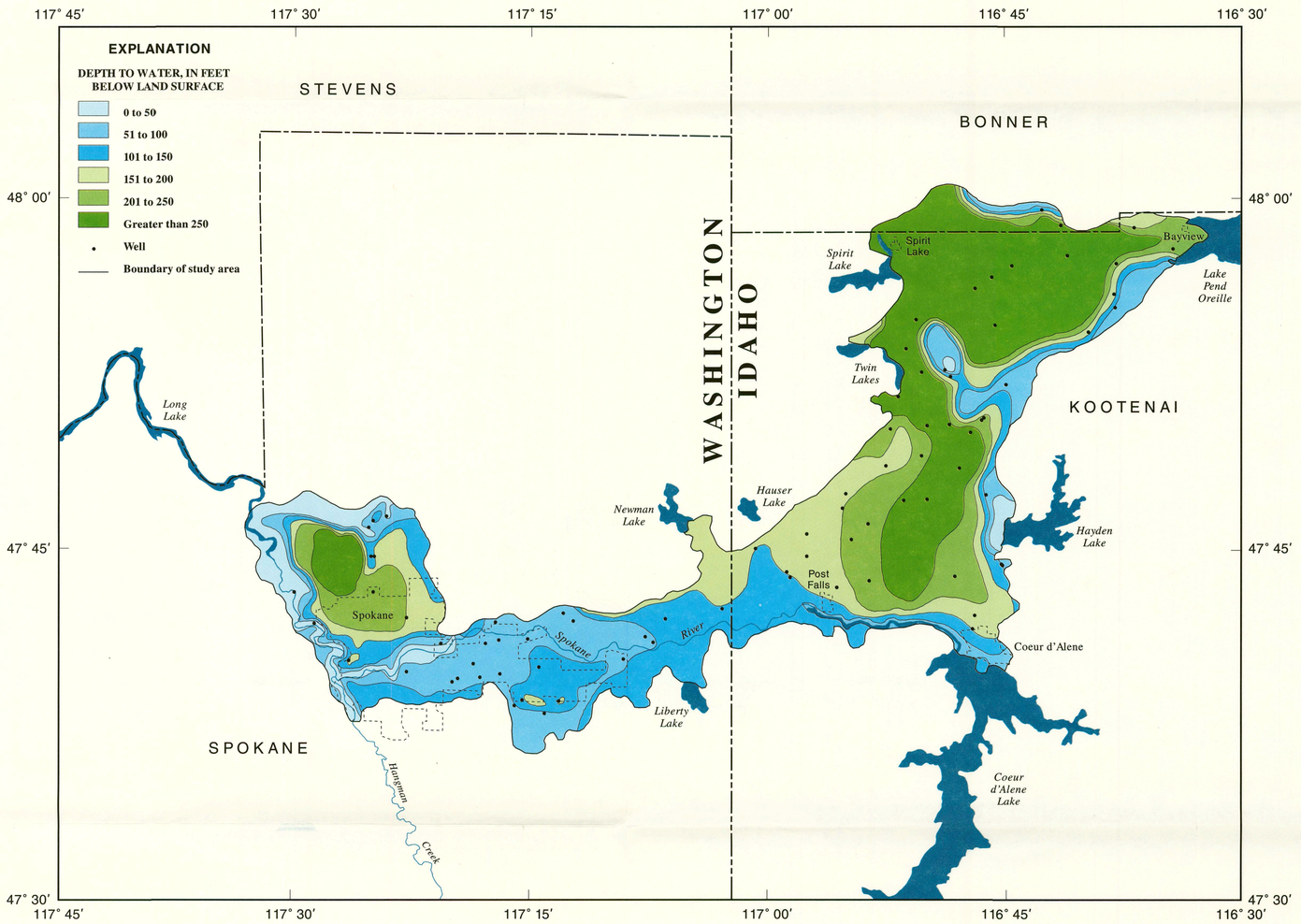
———1992, Depth to water in the eastern Snake River Plain and surrounding tributary valleys, southeastern Idaho, calculated using water levels from 1980 to 1988: U.S. Geological Survey Water-Resources Investigations Report 91–4193, 1 sheet, scale 1:750,000.



Base from U.S. Geological Survey
Spokane, 1:250,000, 1964 revised;
Lambert Conformal Conic projection
Standard parallels 33° and 45°,
central meridian, -114°;
latitude of projection origin, 42°

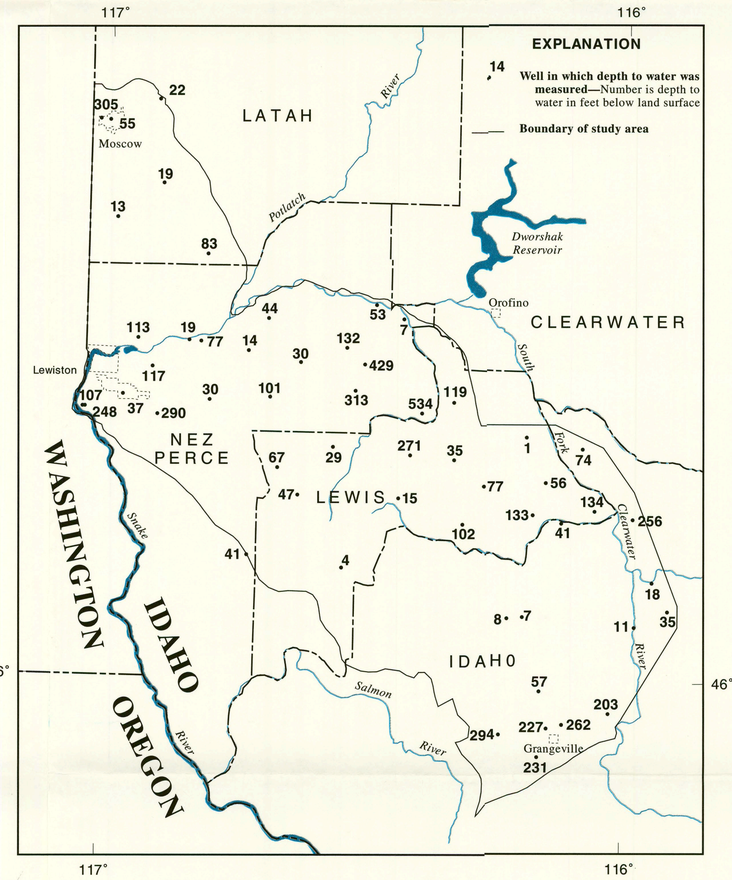
Scale 1:250,000
5 0 5 10 15 MILES
5 0 5 10 15 KILOMETERS

RATHDRUM PRAIRIE, IDAHO, AND SPOKANE RIVER VALLEY, WASHINGTON

The Rathdrum Prairie-Spokane River Valley is an outwash plain underlain by fine- to coarse-grained glaciofluvial deposits (Hammond, 1974; Jehn, 1988). Saturated glaciofluvial deposits are as much as 500 feet thick (Bolke and Vacarro, 1981) and contain large quantities of water under unconfined conditions. Transmissivity in parts of the aquifer is extremely large and ranges from several thousand to several million feet squared per day (R.L. Nace and others, USGS, written commun., 1970). Wells yield several hundred to several thousand gallons per minute in much of the area; one well in the Spokane area reportedly yields 15,000 gallons per minute.

Upstream from Post Falls, Idaho, the Spokane River is perched above the water table and loses water to the aquifer. Downstream from Post Falls to Spokane, Wash., the river alternately loses water to and gains water from the aquifer.

In the summer and fall of 1991, water levels were measured in 79 wells (46 in Idaho and 33 in Washington) in the Rathdrum Prairie-Spokane River Valley. Depth to water was 400 to 500 feet below land surface in the northern part of Rathdrum Prairie, 100 to 200 feet below land surface at the Idaho-Washington State line, and 0 to 250 feet below land surface in the Spokane area.



Base from U.S. Geological Survey
State base map, 1:500,000, 1976 revised;
Lambert Conformal Conic projection
Standard parallels 33° and 45°,
central meridian, -114°;
latitude of projection origin, 42°

Scale 1:500,000
10 0 10 20 MILES
10 0 10 20 KILOMETERS

MOSCOW-LEWISTON-GRANGEVILLE AREA

The primary aquifers in the Moscow-Lewiston-Grangeville area consist of permeable basalts with sedimentary rock interbeds (Lum and others, 1990, p. 11). Water in these zones is chiefly confined. Basalts commonly yield more than 1,000 gallons per minute to wells, and some wells in the Grande Ronde Basalt yield about 3,000 gallons per minute (Lum and others, 1990, p. 9). Overlying the permeable basalts is a discontinuous layer of predominantly unconsolidated, fine-grained sediments as much as 150 feet thick in which water is unconfined and which locally yields supplies adequate only for domestic and stock needs. Wells in these sediments yield less than 30 gallons per minute (Lum and others, 1990, p. 9). Along streams, moderate amounts of water are obtained from coarse-grained alluvium. The area is dissected by deeply entrenched valleys that separate uplands of rolling topography.

The Moscow-Lewiston-Grangeville area is geologically, hydrologically, and topographically different from intermontane valleys; therefore, analytical methods used to determine depth to first-encountered water in intermontane valleys were not applicable. In the summer of 1991, water levels were measured in 59 wells in the area. Some of the wells measured in river valleys were open to the shallowest aquifer; others in upland areas were not representative of levels in the uppermost aquifer but of levels in deeper aquifers. Thus, depth-to-water zones were not defined but the measured depth to water for each well is shown in the map above. Although depth-to-water zones could not be defined, the water-level data will be useful for future hydrologic studies.

DEPTH TO WATER, 1991, IN THE RATHDRUM PRAIRIE, IDAHO; SPOKANE RIVER VALLEY, WASHINGTON; MOSCOW-LEWISTON-GRANGEVILLE AREA, IDAHO; AND SELECTED INTERMONTANE VALLEYS, EAST-CENTRAL IDAHO

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1995

Copies of this map can be purchased from:

U.S. Geological Survey
Earth Science Information Center
Open-File Reports Section
Box 25286, MS 517
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