
SCALE 1:1,000,000
1 inch equals approximately 16 miles

10 0 10 20 30 40 MILES
10 0 10 20 30 40 KILOMETERS

Lambert conformal conic projection
Standard parallels 33° and 45°

PHOTOMOSAIC IMAGE OF WILLAMETTE RIVER BASIN, OREGON PREPARED BY USDA—SOIL CONSERVATION SERVICE FROM ERTS-1 SATELLITE, JULY 23 TO OCTOBER 31, 1972


## PHOTOMOSAIC BASE MAP OF THE WILLAMETTE RIVER BASIN, OREGON: A TOOL FOR LAND AND WATER-RESOURCE PLANNING

### BASIN DESCRIPTION

The Willamette River basin occupies an area of 11,463 square miles in northwestern Oregon, between the crests of the Cascade and Coast Ranges. (See 1:1,000,000 scale index map of Oregon on sheet 1 for an overview.) Within the basin are the State's three largest cities—Portland, Salem, and Eugene—and approximately 1.4 million people (1970) representing 70 percent of the State's population. The basin supports an important timber, agricultural, industrial, and recreational economy and also extensive fish and wildlife habitats.

The basin is roughly rectangular, with a north-south dimension of about 150 miles and an east-west width averaging 75 miles. It is bounded on the west by the Coast Range, on the south by the Calapooya Mountains, and on the east by the Cascade Range. The northern boundary is formed by the Columbia River in the western sector, and by the Sandy Basin in the eastern sector. Elevations in the Willamette River basin range from less than 10 feet near the mouth of the Willamette River, to 450 feet on the valley floor near Eugene, and to more than 10,000 feet in the Cascades. The Coast Range varies in average elevation from 1,000 to 2,000 feet but includes peaks higher than 4,000 feet. The Willamette Valley floor lies below an elevation of 500 feet, is nearly 30 miles wide, and covers an area of about 3,500 square miles.

The main stem Willamette River forms at the confluence of its Coast and Middle Forks near Springfield. The river then flows northward through the valley floor for 187 miles to the Columbia River at Portland. The first 135 miles of the river are characterized by a meandering alluvial channel. Through most of the remaining 52 miles, the Willamette flows within well-defined banks, unhindered by falls or rapids except for the basalt bedrock at Oregon City which creates the Willamette Falls. The 26-mile reach below the falls is subject to nonsaline tidal effects, transmitted from the Pacific via the Columbia River.

### WHAT DOES THE PHOTOMOSAIC MAP SHOW?

The photomosaic map forms a present-day image of the Willamette River basin as perceived by a high-altitude camera. The image portrays a speckled, blotchy, and complex landscape. The view is synoptic and attests to pervasive human activities on the land surface. Clearcut patches by the hundreds speckle the forest mantle on the western flank of the Cascade Range and on the eastern slope of the Coast Range. Rectangular patterns of agricultural fields cover the broad valley floor and the nonforested foothills.

Cities and suburbs appear as brown, fine textured areas that interrupt the mosaic of agricultural fields. Upon close inspection, the intricate and varied patterns of urbanization become apparent. Most urbanization patterns appear at the intersections of major roads or flank the Willamette River at points along its course.

Interspersed throughout the image are the broad, irregular surfaces of lakes and reservoirs, the lineaments of roads and powerline networks, and the curvy traces of streams and rivers. Mountaintop snowfields cap the high Cascades.

The significance of the image is that it portrays land processes and surface alterations at a scale previously unavailable to the resource analyst. For example, hydrologic effects of clearcut logging have been studied and partly understood for basins having areas up to a few square miles. However, the collective effects of hundreds of partly clearcut basins on the hydrology of a major river system have been infrequently considered and poorly perceived. But today, through use of the synoptic view, the analyst can begin to perceive and consider the impacts of interactive basinwide processes.

### WHY WAS THE PHOTOMOSAIC MAP PRODUCED?

The purpose of the photomosaic map is to present a recent regional-scale overview of the major physical featuresnatural and manmadeof the Willamette River basin. The photomosaic map is also being used as a work base for interpretive reports on basinwide erosional processes and related land and water problems. Existing (1976) maps are unsuitable for these purposes because they lack up-to-date cultural information and none is presented at a scale suited for synoptic, yet detailed, examination of the entire basin.

### HOW WAS THE PHOTOMOSAIC MAP PRODUCED?

The photomosaic map was produced from photography taken at 65,000 feet (21,000 meters) from a U–2 aircraft during July 1973. The National Aeronautics and Space Administration (NASA), Moffett Field, California, took the photographs upon request of the Environmental Remote Sensing Applications Laboratory (ERSAL) at Oregon State University and the Willamette Intensive River Quality Assessment Study (WIRQAS), U.S. Geological Survey. ERSAL and the North Pacific Division, U.S. Army Corps of Engineers, provided financial assistance.

One hundred and fifty photographic prints were used in producing the mosaic. The individual prints had sufficient overlap to provide the assembler (Antonio Jurado, U.S. Geological Survey, Miami, Florida) a good choice of areas suitable for matching purposes. For control, the prints were hand laid on a rigid masonite sheet using photo-reduced U.S. Geological Survey 7½ (1:24,000) and 15 minute (1:62,500) topographic maps (see "Index to Topographic Maps of Oregon," U.S. Geological Survey, 1975). The resultant image can thus be designated a semicontrolled photomosaic.

Cultural and hydrologic features were accentuated with lines, symbols, and color on overlays and photographically composited with the photomosaic. The resulting photomosaic base was photographed in four parts for final publication and reproduced on four sheets having ample space for explanatory text and user notes.

### WHY WAS THE PHOTOGRAPHY TAKEN DURING THE SUMMER?

In the Willamette River basin, June through September is the only period when cloud-free conditions can be reasonably expected. The NASA overflight mission was scheduled for this period to obtain cloud-free imagery of the entire basin. A secondary reason for the summer overflight was that the Cascade snow fields often obscure large areas of land until June or July. Also, river-channel morphology can be best studied from photographs taken during low-flow conditions and such conditions are common in the Willamette River basin during July.

### WHAT ARE THE PHOTOMOSAIC MAP'S ASSETS?

The principal assets of the photomosaic base map are its enormous informational content and resolution (or detail). These assets are highly attractive considering that the photomosaic affords a summary image of all land within the basin at a rather detailed scale (1:130,000).

The format of the photomosaic, including hydrologic and cultural enhancement, was largely designed through suggestions and comments made by potential users (City, State, and Federal resource and planning agencies). This approach hopefully provides the built-in asset of user convenience.

### WHAT ARE THE PHOTOMOSAIC MAP'S LIMITATIONS?

The fixed altitude from which the photography was taken and the method of mosaicking cause minor distortion in the photomosaic image, particularly in the mountainous areas. The mosaic is suitable for estimation of approximate distances but not for precise engineering scaling.

The distortion precluded exact matching of all prints, and along some matchlines, caused a loss of small parts of the image. Under close examination, users will find small offsets and other inaccuracies. These image inaccuracies do not hinder the intended uses of the mosaic which are provision of a basinwide synoptic overview and a regional interpretive base.

The photographic characteristics of the base are considered adequate for making general comparisons and recognitions among land uses, landforms, vegetation, and other physical features. However, minor inconsistencies, both in the quality of individual photographs and in their overall processing, preclude definitive analysis of all land surfaces solely on the basis of tone, contrast, texture, and pattern. More intensive photographic interpretation in conjunction with field checking is necessary for definitive land-use analysis of any specific area.

### WHAT ARE THE PHOTOMOSAIC MAP'S USES?

The photomosaic base map has many potential uses for resource planners and managers, governmental officials, scientists, and the general public. The uses evolve because the photomosaic provides: (a) an overall perspective of the relation of the basin's drainage system to regional landforms and land use, (b) synoptic resource information for immediate use and for future comparative work, and (c) a work base (directly compatible with concurrently produced and available stereoscopic, color IR imagery) for future planning, management, and scientific studies. Potential uses of the photomosaic include:

1. *A base for monitoring regional land-surface change.* For example, at intervals of time, additional photography could be compiled to examine the changing status of regional forestry practices or to document the conversion of agricultural land into urbanized land.
2. *A key for site investigations.* Resolution of the photomosaic is sufficient to allow recognition of critical resource areas that may be worthy of detailed study. (For example, the photomosaic identifies the location and general extent of clear cuts in Bull Run Watershed.
3. *A tool for logical collation of studies from widely separated areas.* A variety of land- and water-resource studies have been completed or are currently in progress in various parts of the Willamette River basin. Although many of these studies are of a similar nature (for example, the evaluation of the environmental impacts associated with different timbering practices), their results are difficult to compare without a concurrent analysis of pertinent environmental factors from each study area. The photomosaic enhances the ability to compare individual studies by providing a basinwide synoptic view of surficial features.
4. *A base for compositing overlay information.* The photomosaic provides a base for compositing multiple transparent overlays of regional resource information. For example, soil permeability and depth-to-water overlays at the 1:130,000 scale could provide an initial screening device for assessing site suitability for sanitary landfills.

### PUBLIC INTEREST

All photography used in the mosaic is available for public viewing at ERSAL, Oregon State University, Corvallis. In addition, the photography can be purchased through the U.S. Geological Survey's EROS Data Center at Sioux Falls, South Dakota.

The photomosaic is an evolutionary product in a study devoted to developing resource information for public use. Comments and suggestions are invited and can be sent to the following addresses:

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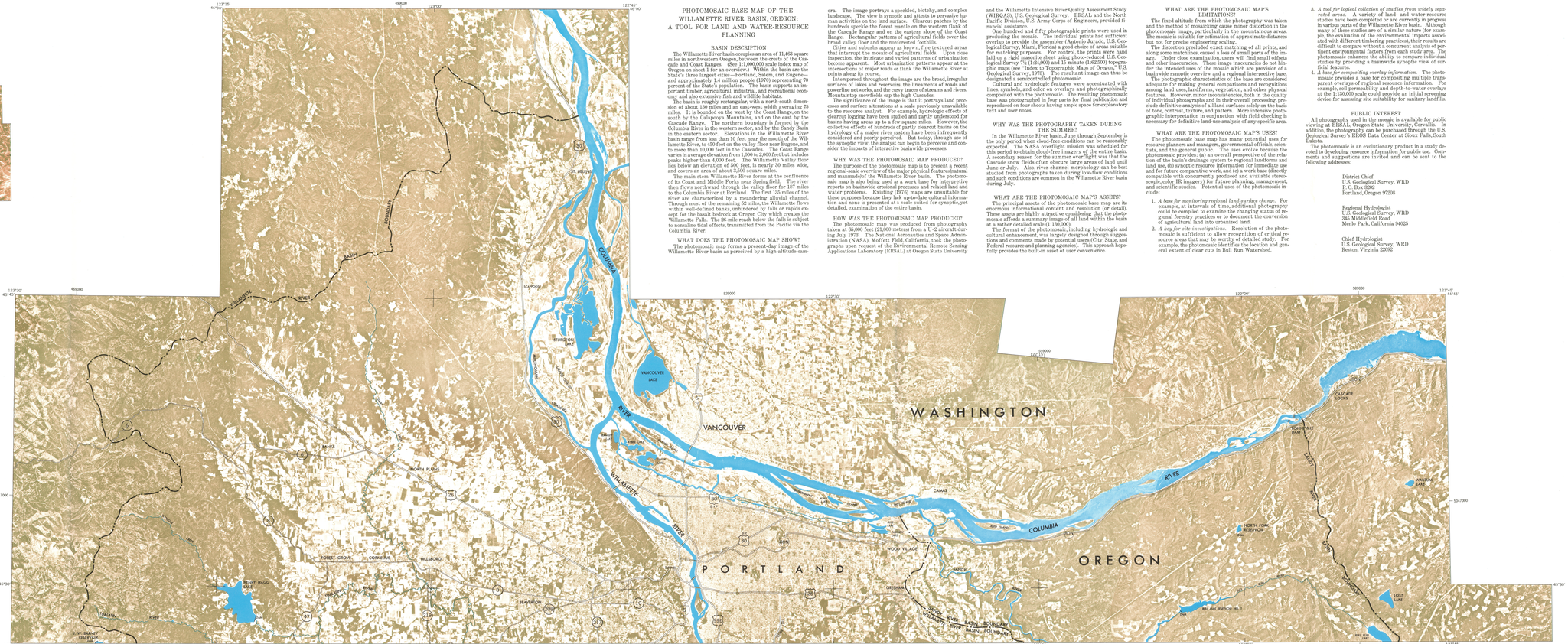
345 Middlefield Road
Menlo Park, California 94025

Chief Hydrologist
U.S. Geological Survey, WRD
Reston, Virginia 22092




Semicontrolled photomosaic base prepared from photographs (1973) furnished by National Aeronautics and Space Administration, Ames Research Center, Moffett Field, California

APPROXIMATE SCALE 1:130 000

1 ½ 0 1 2 3 4 5 6 7 8 9 10 MILES
1.5 0 1 2 3 4 5 6 7 8 9 10 KILOMETERS

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1976

Interior—Geological Survey, Reston, Virginia—1976—W75134