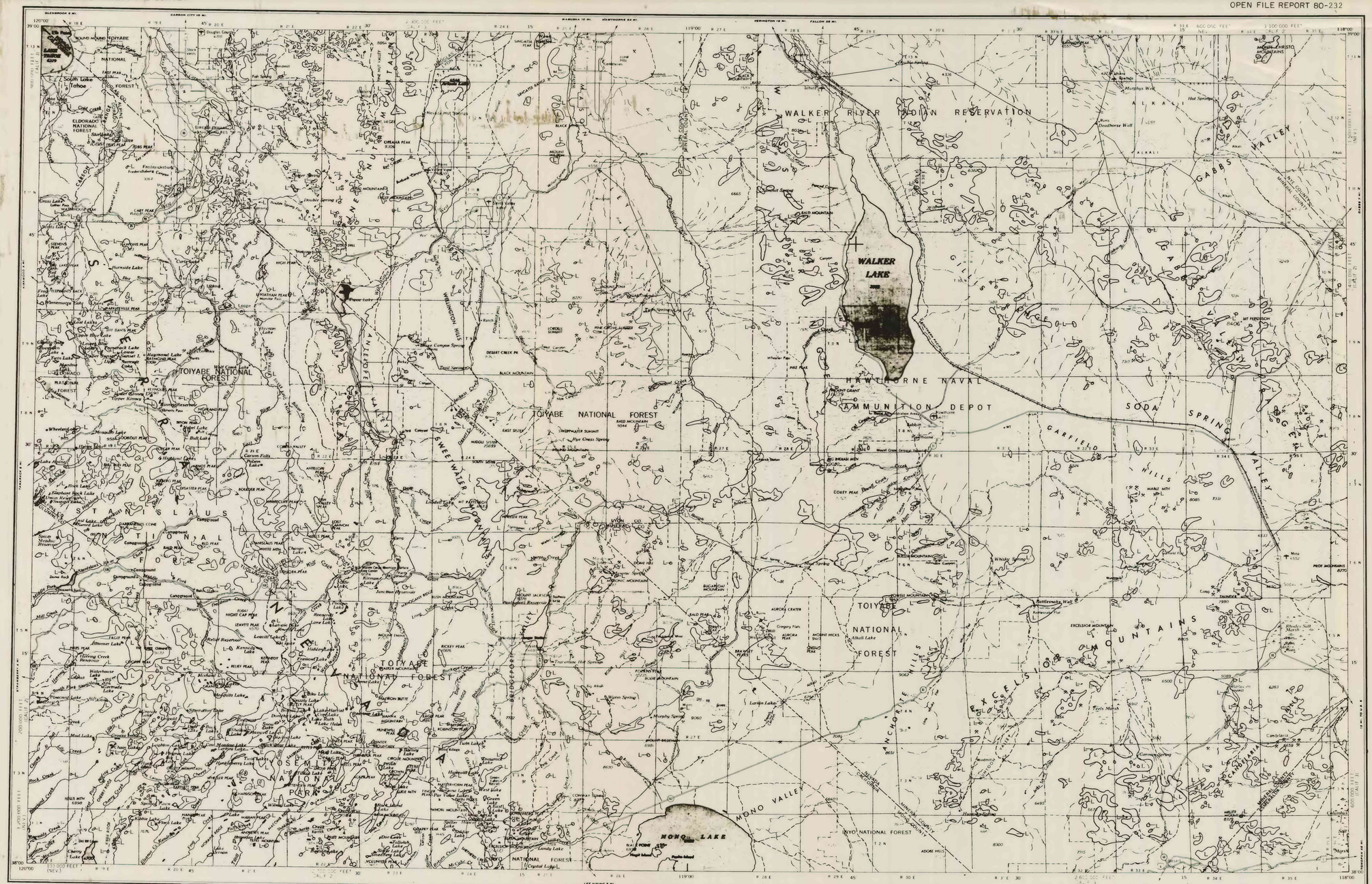
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

OPEN FILE REPORT 80-232



GENERALIZED MAP OF OCCURRENCES OF LIMONITIC ROCKS IN THE WALKER LAKE 1° BY 2° QUADRANGLE, NEVADA-CALIFORNIA

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1980

DISCUSSION

This map showing the distribution of limonitic bedrock was prepared using Landsat Multispectral Scanner (MSS) images (E1380-18111 and E2951-17300) processed to enhance the diagnostic spectral reflectance properties of iron-oxide and hydrous iron-oxide minerals, collectively referred to as limonite (Rowan and others, 1974; 1977). Briefly stated, the procedure used consists of ratioing spatially registered radiances, each of which represents a picture element of MSS bands; of contrast stretching the resulting ratio values that are then used to generate new black-and-white ratio images; and of color compositing these ratio images using diazo film. The resulting color-ratio composite (CRC) images show spectral radiance in color, brightness variation due to albedo and topographic slope having minimized by ratioing. In the following combination of ratio images and subtractive colors, limonitic rocks appear green: MSS $4/5$ as blue, MSS $4/6$ as yellow, MSS $6/7$ as magenta. No atmospheric corrections were made.

The green picture elements representing limonitic bedrock were extracted visually using an enlarger and were transferred to the base map at a scale of 1:250,000 by matching landmarks. Separation of bedrock and alluvial areas was accomplished using available geologic maps, Landsat MSS and Return Beam Vidicon (RBV) images, Skylab, and aerial color photographs. However, because of the small scale of the map and satellite images, some alluvial areas may be included on this map. Although most of the limonitic bedrock areas have anomalous amounts of limonite stain, some very bright areas have only moderate amounts of limonite. The high reflectance of these areas results in intense iron-absorption bands that account for some green picture elements in the CRC image.

This map provides a basis for compiling a regional map of the hydrothermally altered rocks, but several limitations necessitate extensive field checking: (1) vegetation cover exceeding about 35-40 percent obscures limonitic areas, (2) limonitic altered and limonitic unaltered rocks are not distinguishable, and (3) iron-poor altered rocks are not detectable in the MSS CRC images (Rowan and others, 1977; Rowan and Abrams, 1978).
Although the second and third problems should be resolved by analyzing images that include bandpasses centered near 2.2 μm and 1.6 μm (Rowan and others, 1977; Abrams and others, 1977), such satellite images will not become available until Landsat D is launched, currently estimated to occur in 1981.

REFERENCES CITED

Abrams, M.J., Ashley, R.P., Rowan, L.C., Goetz, A.F.H., and Kahle, A.B., 1977, Mapping of hydrothermal alteration in the Cuprite mining district, Nevada, using aircraft scanner images for the spectral region 0.46 to 2.36 um: Geology, v. 5, p. 713-718.

Rowan, L.C., Wetlaufer, P.H., Goetz, A.F.H., Billingsley, F.C., and Stewart, J.H., 1974, Discrimination of rock types and detection of hydrothermally altered areas in south-central Nevada: U.S. Geological Survey Professional Paper 883, 35 p.

Rowan, L.C., Goetz, A.F.H., and Ashley, R.P., 1977, Discrimination of hydrothermally altered and unaltered rocks in visible and near-infrared multispectral images: Geophysics, v. 42, no. 3, p. 522-535.

Rowan, L.C., and Abrams, M.J., 1978, Evaluation of Landsat Multispectral Scanner images for mapping altered rocks in the East Tintic Mountains, Utah: U.S. Geological Survey Open-File Report 78-736, 73 p.

EXPLANATION

Limonitic bedrock

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This report is preliminary and has not been edited for conformity with Geological Survey standards or nomenclature.