UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

Landsat Multispectral Scanner and Landsat Thematic Mapper Images and Interpretations of Hannapah and the Royston Hills, Nevada

By

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Part A-- Description

This Open-File Report consists of twenty-one 35-mm slides showing material that was presented at the Fourth Thematic Conference on Remote Sensing of the Environment held in San Francisco, California on April 1-4, 1985 (Purdy and others, 1985). The work was carried out in conjunction with the U.S. Geological Survey's Conterminous U.S. Mineral Appraisal Program for the Tonopah, Nevada 1° by 2° quadrangle (fig. 1). The slides show Landsat Multispectral Scanner (MSS) images, Landsat Thematic Mapper (TM) images, and geologic interpretations made from these data.

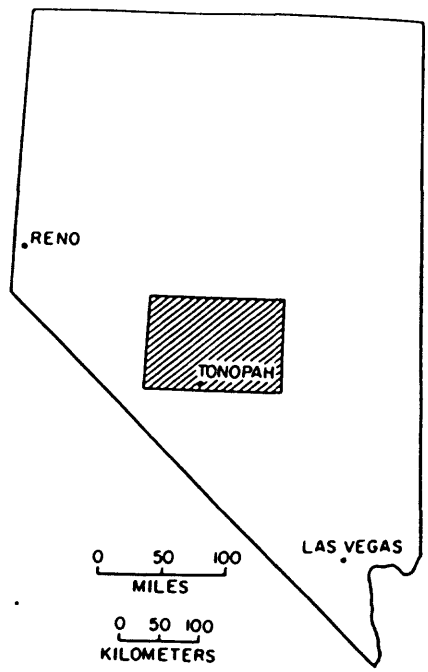

Figure 1-- Index map showing the location of the Tonopah, Nevada 1° by 2° quadrangle.

The 35-mm slides in Part B of this Open-File Report are:

1. Limonite map of the Tonopah quadrangle derived from MSS images that where digitally processed to enhance the diagnostic spectral characteristics of hydrous and anhydrous ferric-oxide minerals (referred to as limonite). Limonitic areas are shown in red. Areas where only scattered pixels are indicated as being limonitic in the MSS images are shown in yellow. Locations of the Hannapah and Royston Hills subscenes are indicated by the black outlines; Hannapah is to the east and Royston Hills is to the west.

2. MSS color-ratio composite image of the Hannapah area in which ratios 4/5, 5/6, and 6/7 are displayed as red, blue, and green, respectively. Limonitic areas appear green in the image.

3. Limonite map produced through the interpretation of the MSS false-color composite image (slide 2) of the Hannapah area.

4. TM false-color composite image of the Hannapah area in which bands 2, 3, and 4 are displayed as blue, green, and red, repectively.

5. TM color-ratio composite image of the Hannapah area in which ratios 3/1, 5/7, and 2/5 are displayed as red, green, and blue, respectively. The limonitic areas appear in reds, the areas with hydroxyl-bearing minerals appear in greens, and the areas with both limonite and hydroxyl-bearing minerals appear in yellows.

6. Interpretation of TM color-ratio composite image (slide 5) indicating areas which contain limonite and/or hydroxyl-bearing minerals.

7. Density sliced image of the TM 5/7 ratio for the Hannapah area. A low pass spatial filter (5 pixels by 5 pixels) was applied to the data. A numerical cutoff was chosen such that approximately 10 percent of the data occurs above the cutoff. The pixels with the highest values above the cutoff are displayed in red, those with median values in yellow, and those with the lowest values in blue. The pixels with values below the numerical cutoff are displayed in gray tones. High values in the TM 5/7 ratio are indicative of hydroxyl-bearing minerals and vegetation.

8. Density sliced image of the TM 3/1 ratio for the Hannapah area. A low pass spatial filter (5 pixels by 5 pixels) was applied to the data. A numerical cutoff was chosen such that approximately 10 percent of the data occurs above the cutoff. The pixels with the highest values above the cutoff are displayed in red, those with median values in yellow, and those with the lowest values in blue. The pixels with values below the numerical cutoff are displayed in gray tones. High values in the TM 3/1 ratio are indicative of limonite.

9. TM principal component image (using all seven TM bands) of the Hannapah area in which principal component channels 2, 1, and 5 are displayed as red, green, and blue, respectively.

10. Geologic interpretation for the Hannapah area made from TM false-color composite (slide 4), TM color-ratio composite (slide 5), and TM principal component (slide 9) images.

11. Legend for geologic interpretation (slide 10) of the Hannapah area.

12. MSS color-ratio composite image of the Royston Hills area in which the ratios 4/5, 4/6, and 6/7 are displayed as red, blue, and green, respectively. Limonitic areas appear green.

13. Limonite map produced through the interpretation of the MSS color-ratio composite image (slide 12) of the Royston Hills area.

14. TM false-color composite image of the Royston Hills area in which bands 2, 3, and 4 are displayed as blue, green, and red, respectively.

15. TM color-ratio composite image of the Royston Hills area in which ratios 5/7, 3/1, and 2/5 are displayed as red, green, and blue, respectively. Limonitic areas appear as greens, areas with hydroxyl-bearing minerals appear as reds, and areas with both hydroxyl-bearing and limonite minerals appear as yellows.

16. Interpretation of the TM color-ratio composite image (slide 15) indicating areas containing limonite and/or hydroxyl-bearing minerals.

17. Density sliced image of the TM 5/7 ratio for the Royston Hills area. A low pass spatial filter (5 pixels by 5 pixels) was applied to the data. A numerical cutoff was chosen such that approximately 10 percent of the data occurs above the cutoff. The pixels with the highest values above the cutoff are displayed in red, those with median values in yellow, and those with the lowest values in blue. The pixels with values below the numerical cutoff are displayed in gray tones. High values in the TM 5/7 ratio are indicative of both hydroxyl-bearing minerals and vegetation.

18. Density sliced image of the TM 3/1 ratio for the Royston Hills area. A low pass spatial filter (5 pixels by 5 pixels) was applied to the data. A numerical cutoff was chosen such that approximately 10 percent of the data occurs above the cutoff. The pixels with the highest values above the cutoff are displayed in red, those with median values in yellow, and those with the lowest values in blue. The pixels with values below the numerical cutoff are displayed in gray tones. High values in the TM 3/1 ratio are indicative of limonite.

19. TM principal component image (using all seven TM bands) of the Royston Hills area in which principal component channels 2, 1, and 4 are displayed as red, green, and blue, respectively.

20. Geologic interpretation of the Royston Hills area based on TM false-color composite (slide 14), TM color-ratio composite (slide 15), and TM principal component (slide 19) images.

21. Legend for geologic interpretation (slide 20) of the Royston Hills area.

Reference

Purdy, T.L., Bailey, G.B., and Dwyer, J.L., 1985, Use of thematic mapper data for alteration and geologic mapping in south-central Nevada: International Symposium on Remote Sensing of the Environment, Fourth Thematic Conference, Summaries, Environmental Institute of Michigan, San Francisco, California, April 1-4, 1985, p. 10-11.