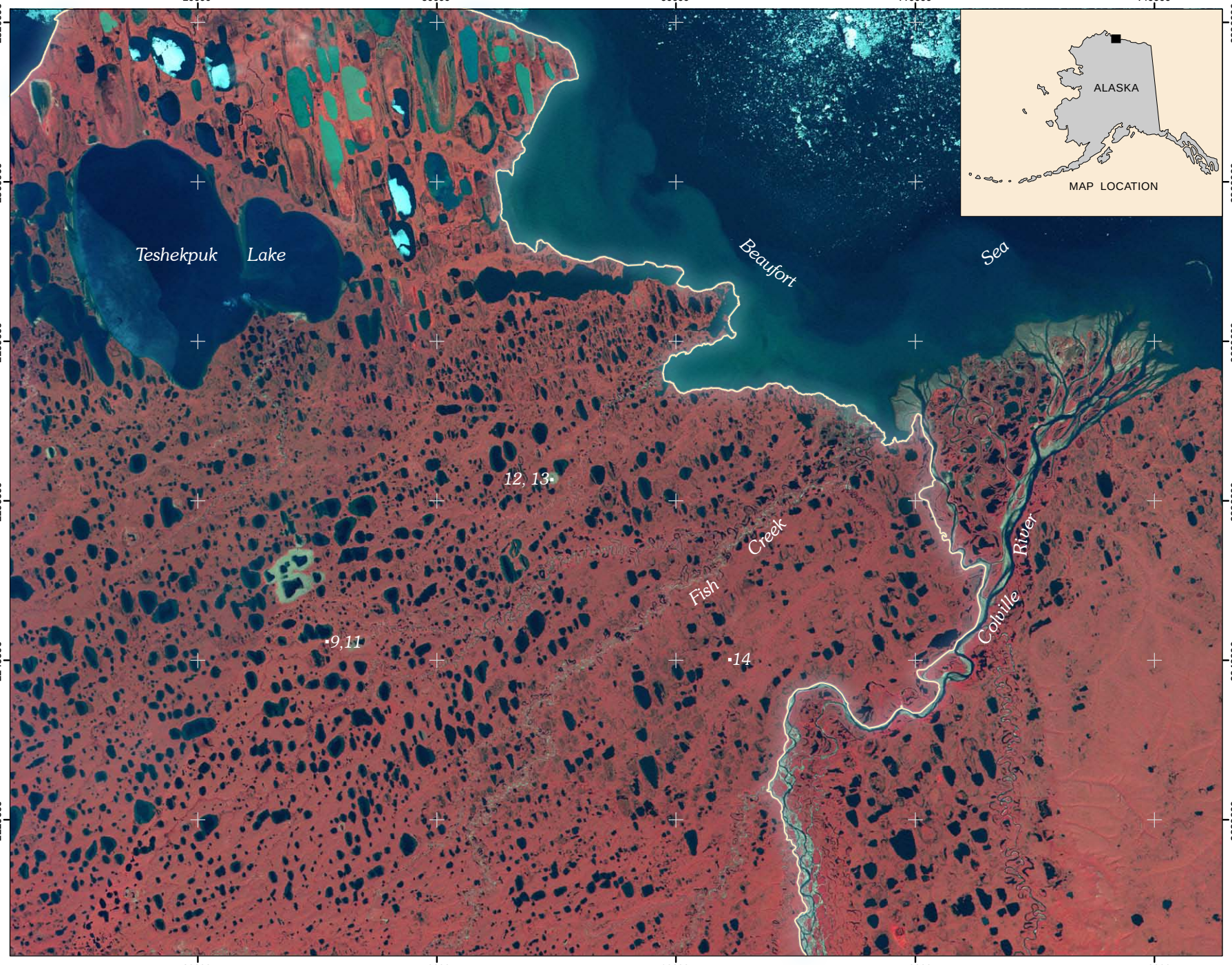


Figure 1. Lansat MSS false color composite image (Red=1, Green=2, Blue=4) of the Fish Creek study area, northeastern NPRA. Numbered points represent locations of field photos in figures 9,11,12,13, and 14. NPRA border is shown in white. Meter grid based on Alaska Albers Equal Area coordinate system.

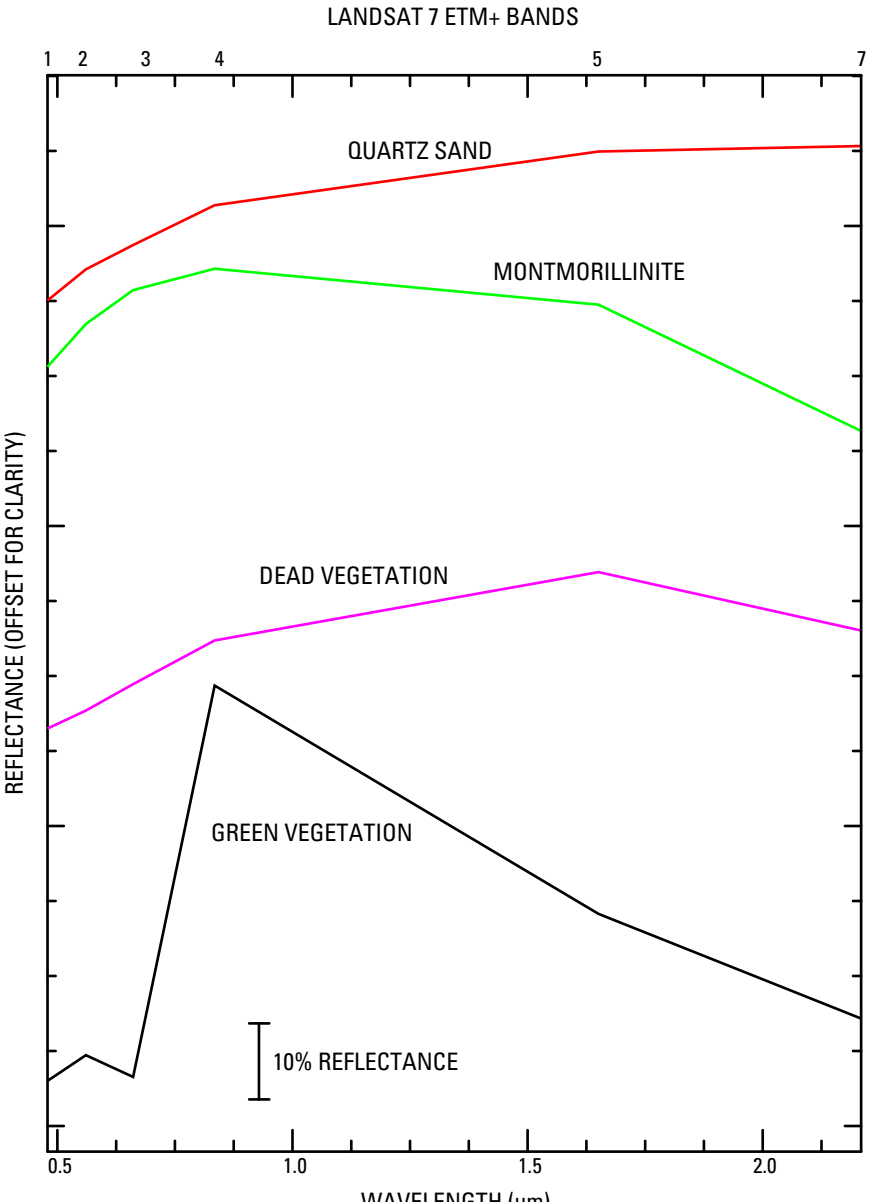


Figure 2. USGS library spectra (Clark and others, 2003) of green grass, dead vegetation, quartz sand, and montmorillonite, resampled to Landsat 7 ETM+ bandpasses.

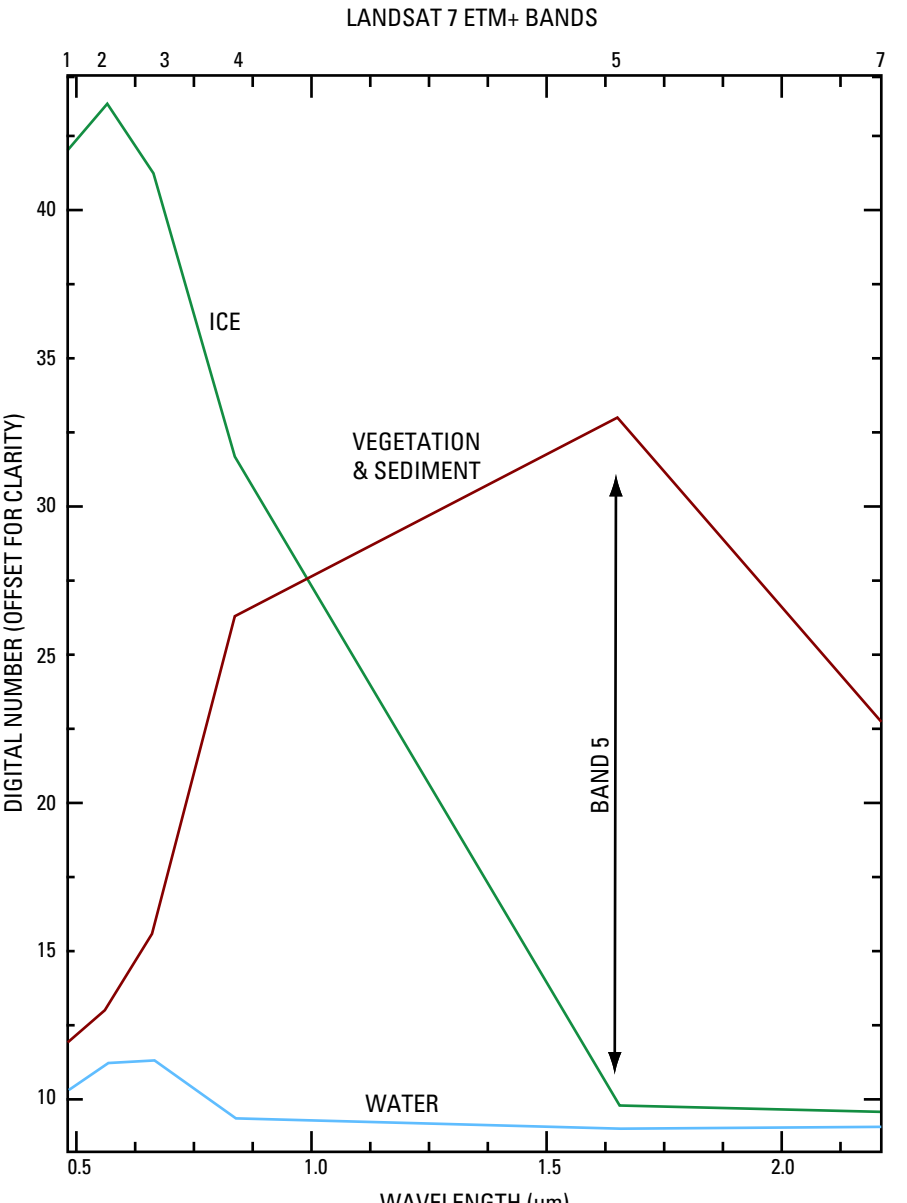


Figure 3. Landsat 7 ETM+ Image reflectance spectra from the NPRA study area of water, ice, and vegetation and sediment. Band 5 illustrates more spectral contrast between water and ice, and vegetation and sediment than all other Landsat ETM+ bands.

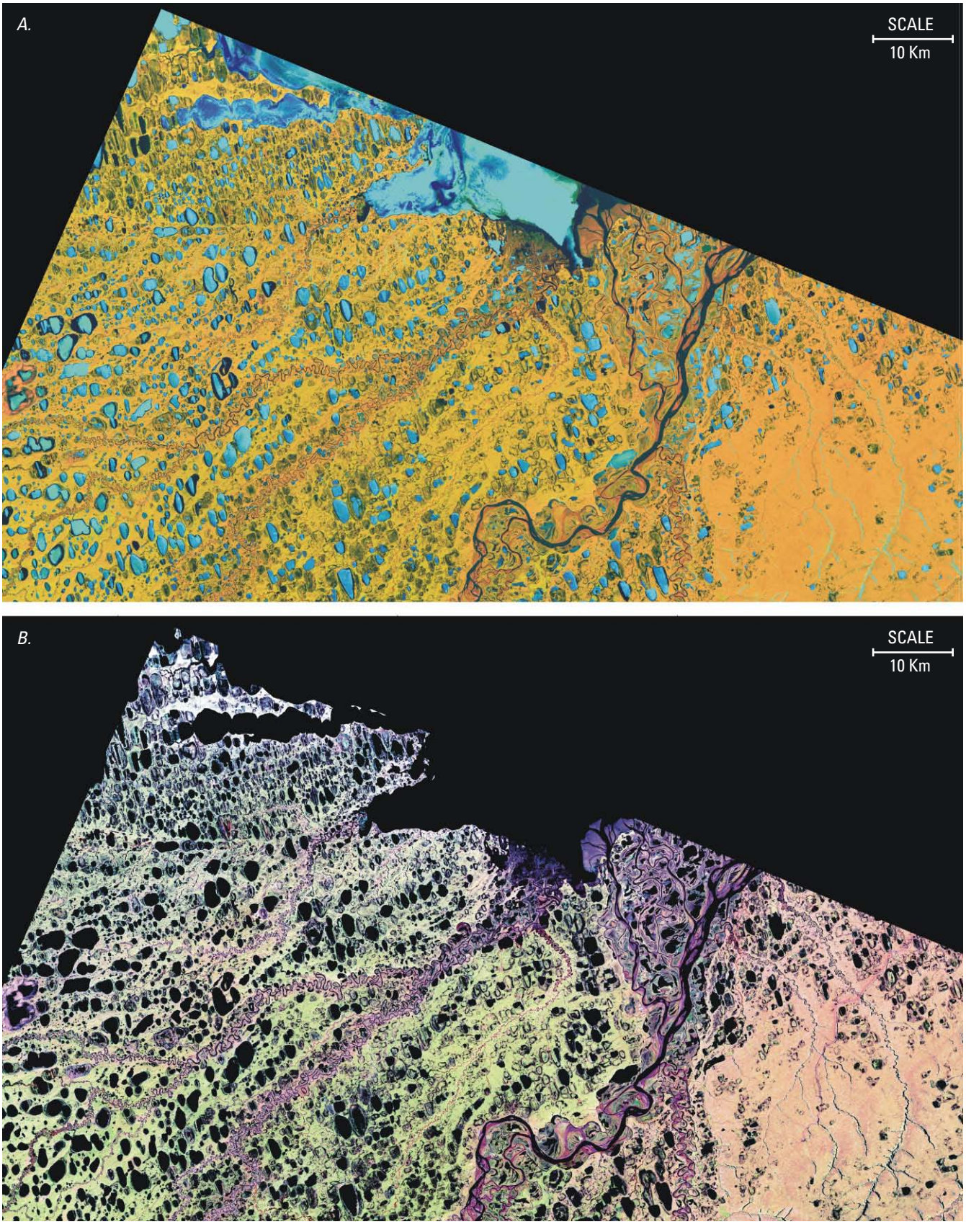


Figure 4. *A.* ETM+ 7=Red, 4=Green, 2=Blue false color composite image of the eastern part of NPRA. *B.* ETM+ 7=Red, 4=Green, 2=Blue false color composite image of the eastern part of NPRA with water and ice masked out using a band 5 threshold.

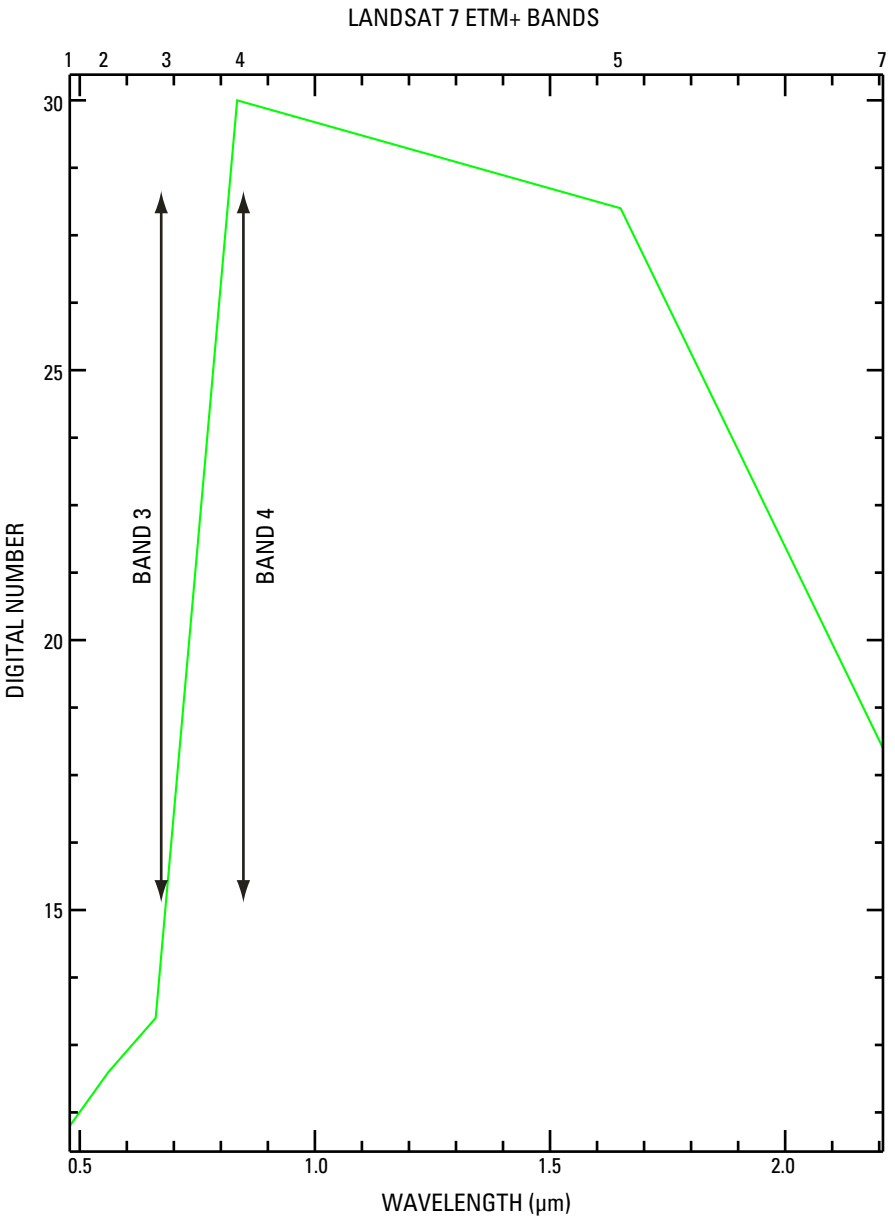
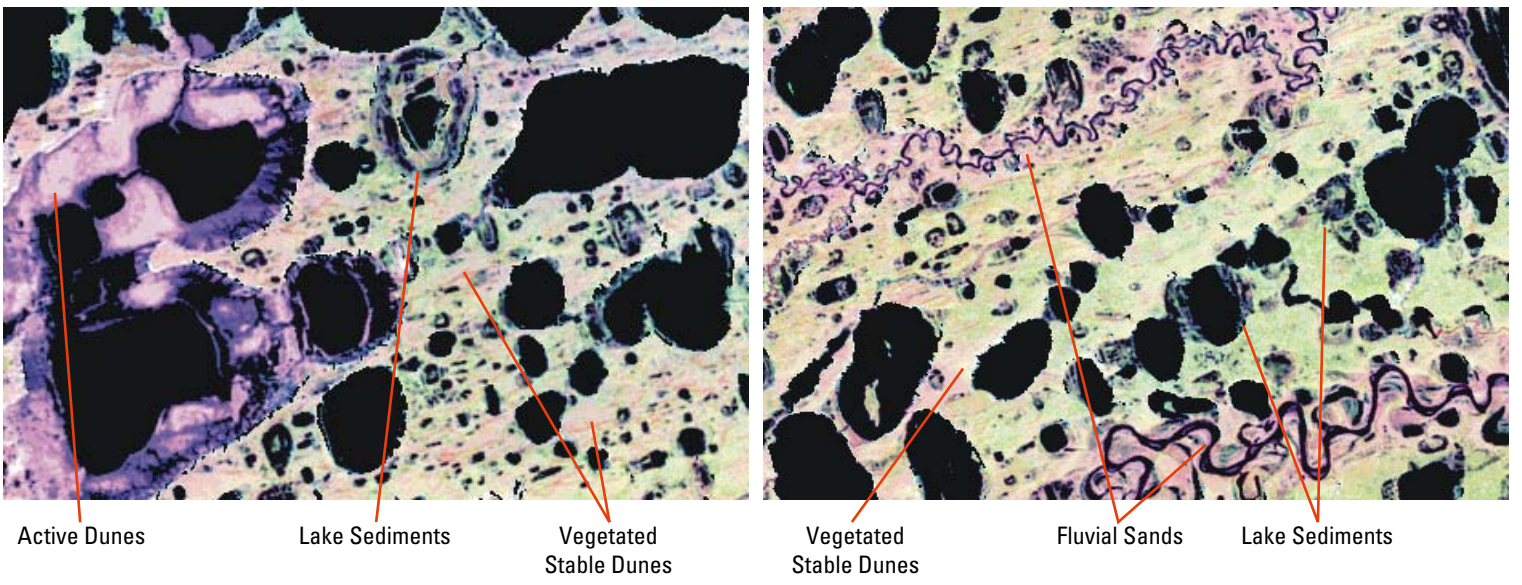


Figure 5. Landsat 7 ETM+ Image reflectance spectrum of green vegetation from NPRA illustrating the low DN value for band 3 (0.66 µm) and high DN value for band 4. The 0.66 µm absorption feature in caused by chlorophyll.



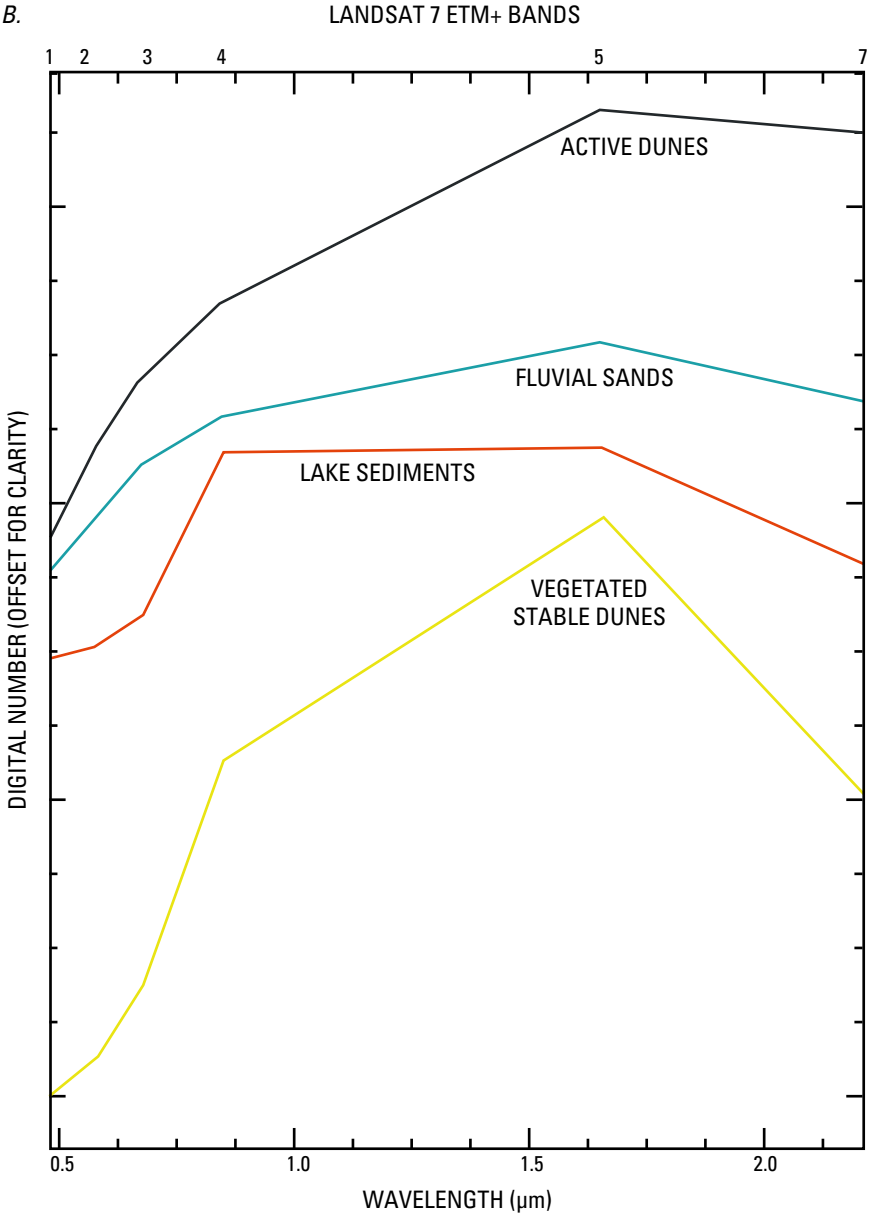


Figure 6. *A.* Water and ice-masked ETM+ 7,4,2 images used to identify landforms such as lakes, active and vegetated dunes, and fluvial systems. *B.* Image spectra selected from the identified landforms.

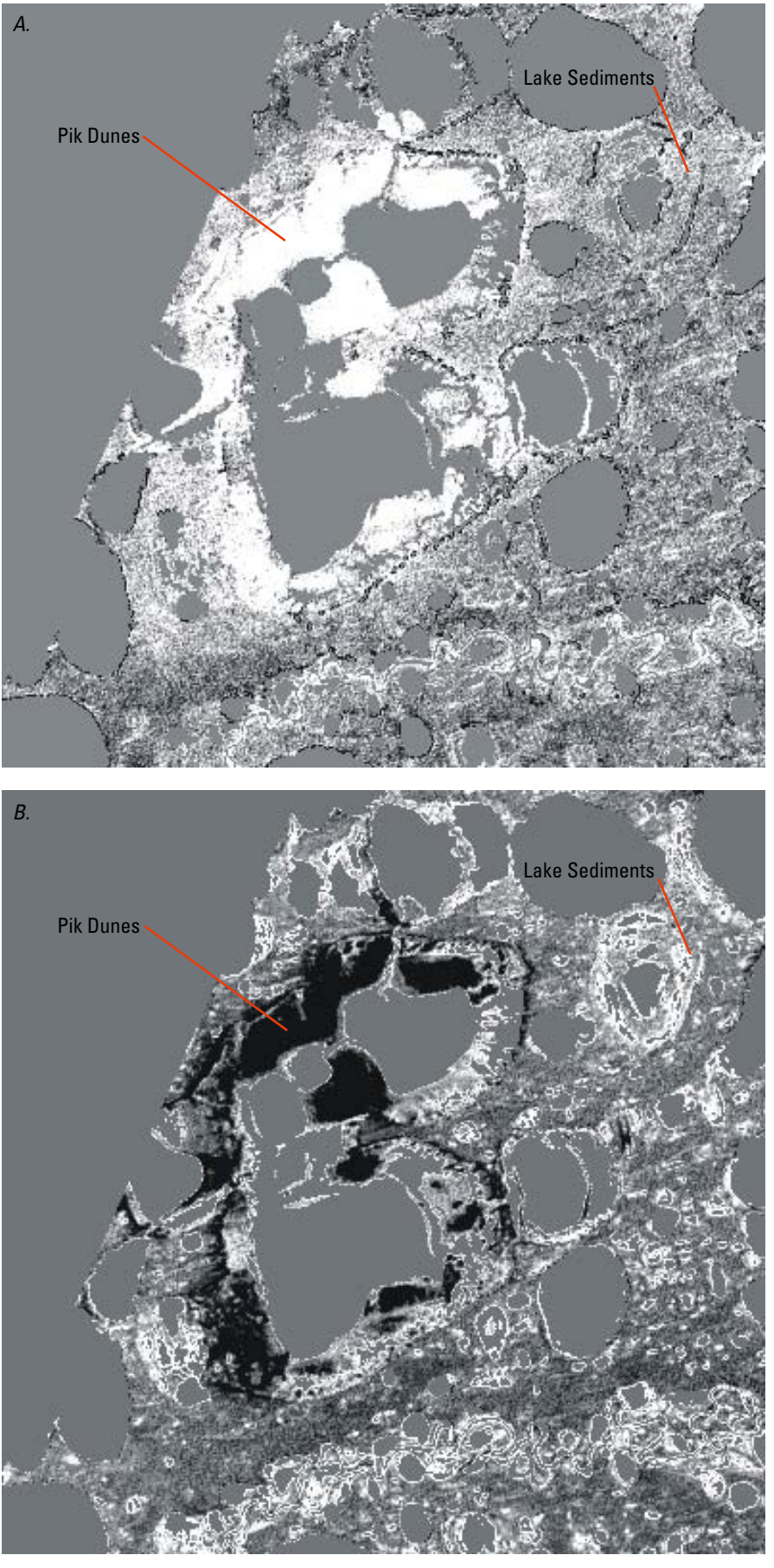


Figure 7. An example of matched filtering results on two lake sediment image spectra from NPRA. White pixels represent a good match of the input spectrum to image spectra and black pixels represent a poor match. *A.* Matched filter image has poor spatial coherence mapping lake sediments and has incorrectly mapped the Pik dunes. *B.* Matched filter image has correctly mapped the lakes sediments and has good spatial coherence.

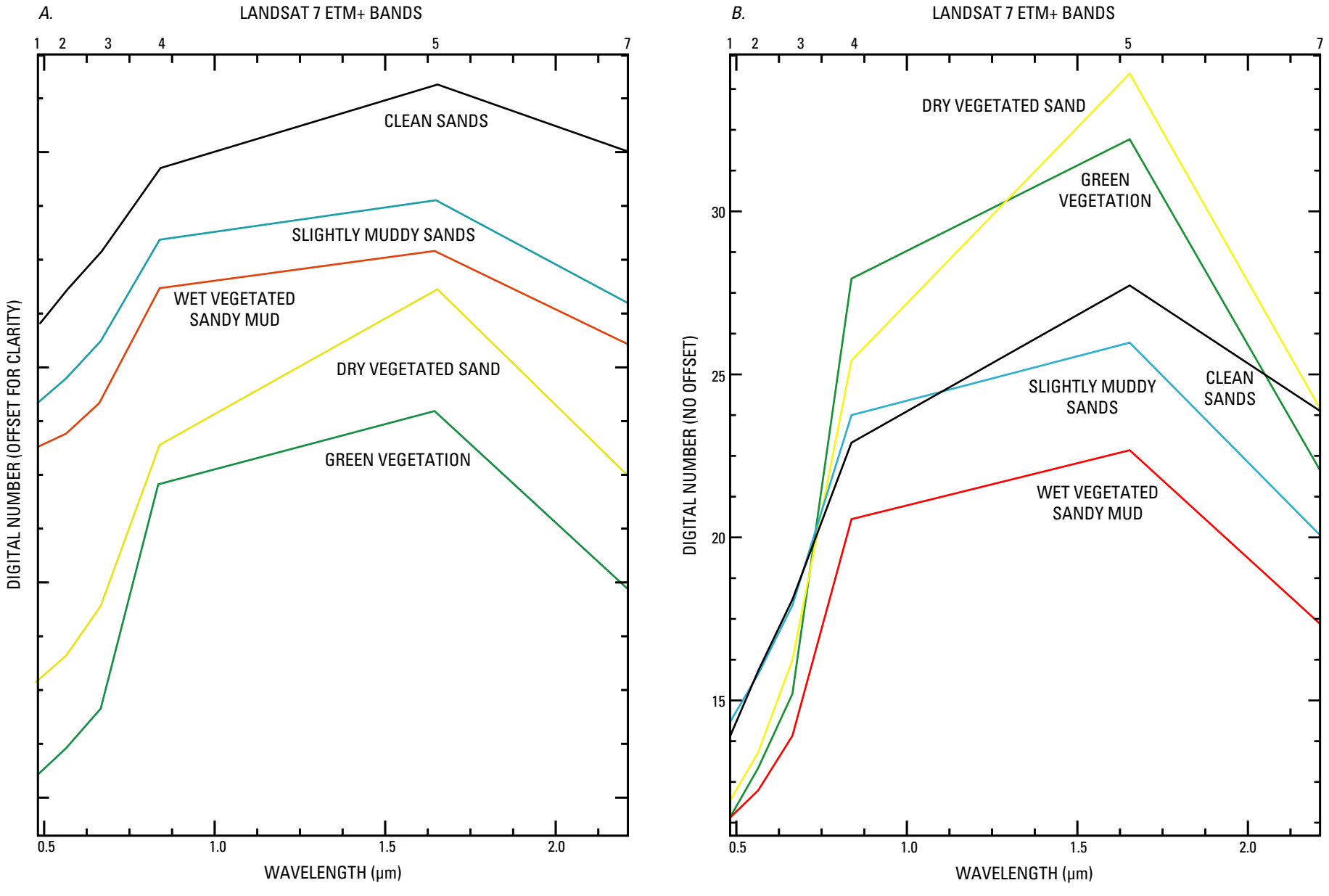


Figure 8. *A.* Averaged image spectra of spectral units from NPRA Landsat 7 ETM+ dataset, offset for comparison of spectral features. *B.* The same averaged image spectra of spectral units from NPRA Landsat 7 ETM+ dataset, not offset for albedo comparisons.

Figure 9. Photo of water, sandy mud, and dead and green grass that was mapped as wet, vegetated, sandy mud (red unit, Plates 2 and 3). Location of photo is on Fig. 1. Lens cap in lower left of photo is for scale.

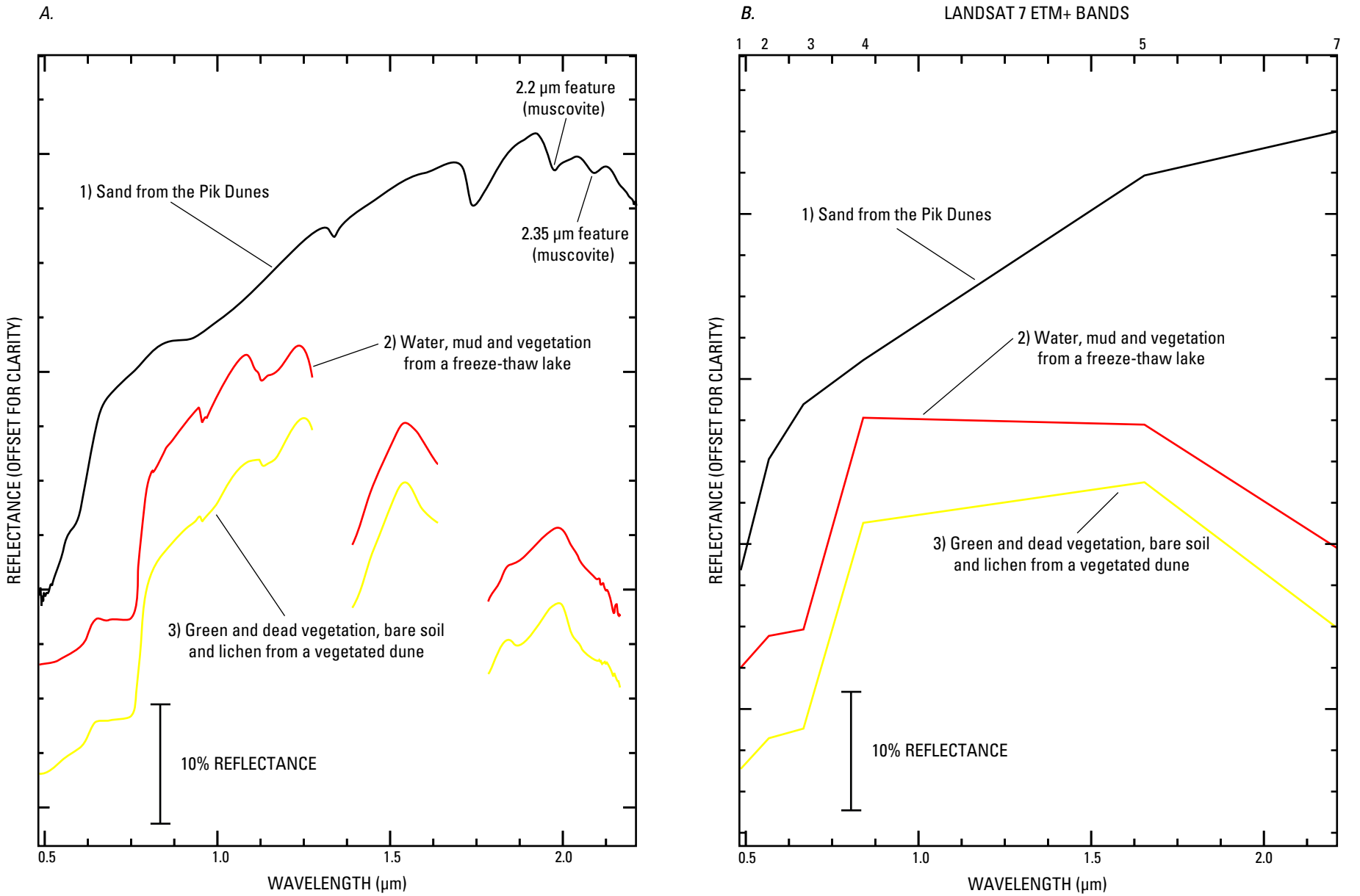
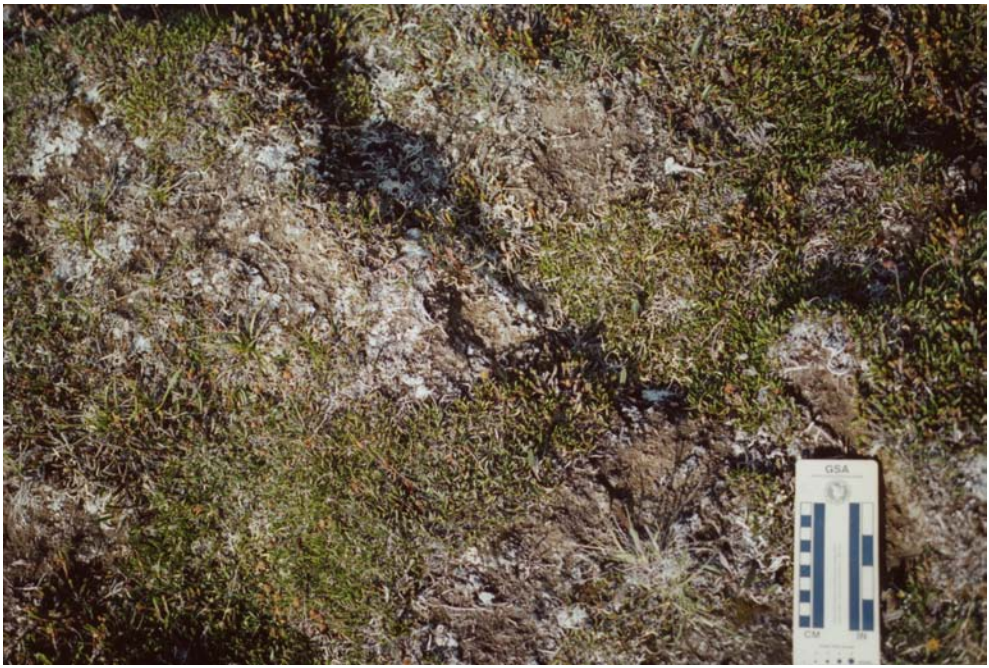


Figure 10. Laboratory and field spectra from NPRA. *A.* 1) Laboratory spectrum of sand from the Pik dunes, the 2.2 µm feature is caused by <5% muscovite 2) An averaged spectrum produced from 20 field spectra of lake vegetation, sediment and water (Red - wet sandy mud spectral unit), the 0.66 µm absorption feature is caused by chlorophyll and the 2.165 mm and 2.3 mm absorption features are caused by cellulose 3) An averaged spectrum using 10 field spectra collected from an eolian dune covered by green and dead vegetation, bare soil, and lichen (yellow – vegetated sand spectral unit), chlorophyll and cellulose absorption features are present in the spectra. *B.* Spectra resampled to Landsat 7 bandpasses.

Figure 13. Photo of muddy sand deposits (< 95 percent quartz sand) at a drained thaw lake and blowout feature in the western part of the NPRA study area (cyan unit, Plates 2 and 3). Notebook in lower left of photo is for scale. Location of photo is on Fig. 1.

Figure 12. Photo of a wind blowout feature in NPRA that consists of > 95 percent quartz sand. There are some 1 m high dunes with vegetation in the background. The area in the photo was classified as clean sand (white unit, Plates 2 and 3). Location of photo is on Fig. 1.

A.



B.

Figure 11. *A.* Photo of moss lichen and bare soil on the crest of a parabolic dune situated on top of a larger eolian dune in the western part of the NPRA study area. *B.* Photo of green and dead sedge on an eolian dune. Areas in photos A and B are classified as the vegetated sand spectral units (yellow unit, Plates 2 and 3). Lens cap inlower left of photo is for scale. Location of photos is on Fig. 1.

Figure 14. Photo of dead and green vegetation cover in a river valley in the eastern part of the NPRA study area. Most of the green vegetation is dwarf willow. The area was not classified in the surface classification map (black unit, Plates 2 and 3). Notebook in upper right of photo is for scale. Location of photo is on Fig. 1.