Lab 7: Mapping an MSL Curiosity Landing Site

The final four proposed landing sites for the Mars Science Laboratory Curiosity rover were:

Name	Location	Elevation (relative to Mars datum)	Notes
Eberswalde Crater Delta	23.86°S 326.73°E	−1,450 m	Ancient river delta
Holden Crater Fan	26.37°S 325.10°E	−1,940 m	Dry lake bed
Gale Crater	4.49°S 137.42°E	−4,451 m	Features 5 km (3.1 mi) tall mountain of layered material near center.
Mawrth Vallis	24.01°N 341.03°E	−2,246 m	Channel carved by catastrophic floods

If you don't have the data files already you'll need to come and get them from me as they are too big to put on Collab. There are four folders, one for each proposed landing site. In each folder there are 2 ArcGIS files (.mxd extension), one for Arc 9 and one for Arc 10 (you'll probably be using Arc10). All maps are projected using an equidistant cylindrical projection (this is the de facto standard for most NASA datasets).

When you open the files, you will notice that there are a number of layers:

Ellipse: the proposed landing area

Footprints: Markers indicating there is additional data. You can easily access these files by clicking on them using the hyperlink tool:  . This is useful because we can access large files (HiRISE's are typically ~1gb) online rather than having them stored locally. The MOLA footprint is the track of the Mars Global Surveyor (MGS) spacecraft as it orbited Mars.

CRISM IR: CRISM infrared

FRT: Full Resolution Targeted 18m/pixel

HRS: Half Resolution Short targeted, 36m/pixel

HRL: Half Resolution Long targeted 36 m/pixel, larger size than HRS

CRISM VNIR: CRISM Visible and Near-Infrared.

Shaded Relief: Topographic (elevation) data

HRSC: topography derided from stereo pair HRSC images from the Mars Express spacecraft (~70m/pixel)

MOLA: Mars Orbital Laser Altimeter on MGS. Global topographic data at ~460 meters/pixel resolution

THEMIS: There are 4 THEMIS layers: daytime visible, daytime infrared, nighttime infrared, and thermal inertia (difference between day and night infrared)

Your assignment is to pick and map one of these proposed landing sites using what you learned about GIS and photogeologic mapping last week. Rover missions are expensive and relatively rare, so picking a landing site is typically a 5+ year debate between the many possible locations to send a rover (the first Mars 2020 rover landing meeting is in May of this year).

You should use the THEMIS (visual) data as your base map, but use the topographic and CRISM data for your interpretations of the area. You don't need to look up what the different colors in each of the CRISM files mean. I'd also suggest using the linked CTX and HiRISE images.

How many features you map is up to you. You will build a **stratigraphic column** and write **a geologic history** of the region. You can also age date the difference surfaces in your area using crater counts (make a polygon Shapefile, use 'calculate geometry' and 'field calculator' to determine diameters).

Then write up a **justification** as to why you think NASA should have (or should not have) sent the rover to whatever site you mapped. When justifying your landing site, be sure to mention how what you mapped will be useful for MSL's main science objectives: http://mars.jpl.nasa.gov/msl/mission/science/objectives/. You don't need to individually reference each of these, just use it as a guideline.

So you will turn in:

1) Map, highlighting different geologic features, craters, etc. Include scale bar, title, legend, etc 2) Stratigraphic column

3) Geologic history
4) Justification as to why MSL should land here