Topos for Teachers

A Map Literacy Project of the Arizona Geological Survey

Tucson, Arizona

Topographic maps are an indispensible tool for examining landforms – mountains, massifs, river valleys, basins, plateaus, mesas, and more. The Arizona Geological Survey recently surplused 1000s of out-of-date topographic maps. Rather than recycle them, we want to put them in the hands of teachers for instructing their students. Each teacher can receive up to 30 maps. Classroom sets of 30 are rare and you may end up with a number of different titles.

To collect your free topographic map set visit our Arizona Experience Store at 416 W. Congress, adjacent to the State Complex Building, one block east of I-10. Our hours are 8:00 a.m. to 5:00 p.m., Monday through Friday. Call 520.770.3500 for further information. Find additional teacher resources at www.ArizonaExperience.org

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What can you do with a topographic map in the classroom?

Start with the basics – "Just the Facts" approach for instructing students on topographic maps.

- Topographic maps (topos) model the Earth's surface. Using contour lines, topos convey landform shape and elevation information – the z (elevation) component to complement the x (longitude) and y (latitude) components.
- The United States Geological Survey is the primary source for topographic maps in the United States. For free digital maps visit the US Geological Survey Store at http://store.usgs.gov.
- Topos come in a variety of scales. The most common topo is the 7.5' quadrangle. A 7.5' topo covers 7.5' of latitude and 7.5' of longitude at a fractional scale of 1:24,000; 1 inch on the map is equal to 24,000 inches on the ground surface (or 1" = 2000 ft).
- At the bottom center of the map scale is expressed fractionally (1:24,000) and via three bar scales – in miles, feet, and meters. Adjacent to the scale is a north arrow and arrow showing magnetic north.
- At the bottom left is information regarding map parameters, e.g., map projection and related information. At the bottom right is the map name, e.g., Mt Baldy, Arizona, and vintage, e.g., 1998.
- Each topo is accompanied by a map collar along which coordinates are expressed. For the western U.S., USGS topos include three coordinate systems: latitude and longitude, Township and Range (T&R-Public Land Survey System PLSS) – sections are the basic unit of T&R and are one-mile on each side – and Universal Transverse Mercator (UTM), the latter is expressed in meters.

Some contour line facts

- A contour line represents a line of equal elevation. Thus, a contour line denoted 2,500 feet is precisely 2,500 feet above sea level everywhere along that line.
- Contour interval – elevation change between successive contour lines; commonly 20 feet, 40 feet, or 80 feet. (In the Midwest, contour intervals are often 5 ft. – perfectly suitable for flat-lying lands.)
- The closer the contours the steeper the slope. Conversely, contours on level ground are far apart.
- Contours never cross – how could they? They represent different elevations; they never split and they always close. Of course, they may appear to be open at the edges of the map, but they close on adjacent maps.
- In crossing stream valleys, contour lines point in the upstream direction – that reflects the downstream gradient.

Some useful classroom exercises

Because topographic maps model an infinitely variable surface, there are a number of things that one can do with students in the classroom. Here are some suggestions.

- Measure from point A to point B. Use the bar scales to express distance in feet, miles and meters. (For our purposes let's imagine that A and B are 1,250 ft apart.)
- Evaluate the relief from point A to point B. Relief is simply a measure of elevation change. Point A is at 2,450 ft, Point B at 2,700 ft, the difference in elevation, or relief, is simply the difference: 250 ft.
- Calculate the slope. Remember slope is simply rise (relief) over run (distance). In our case, 250 ft / 1,250 ft for a slope of 0.2. Of course, the larger the number, the steeper the slope. To express the slope as a percentage, simply multiply by 100. In our case the result is a slope of 20%. FYI, the angle of repose of unconsolidated materials is about 33% – above that material will start moving downslope, it may take a push to get started, but once started, off it goes.
- Identify landforms – mountains, volcanoes, river valleys, basin floors, mesas, plateaus, bluffs, cliffs, buttes…
- In rugged terrain, pencil out the route you would take to avoid steep slopes.

There are any number of other things that you can do. For more ideas, visit DLESE (Digital Library for Earth Science Education) and query their database of more than 13,000 objects.

Got questions? Give me a call. You can reach me at 520.209.4146 or e-mail:
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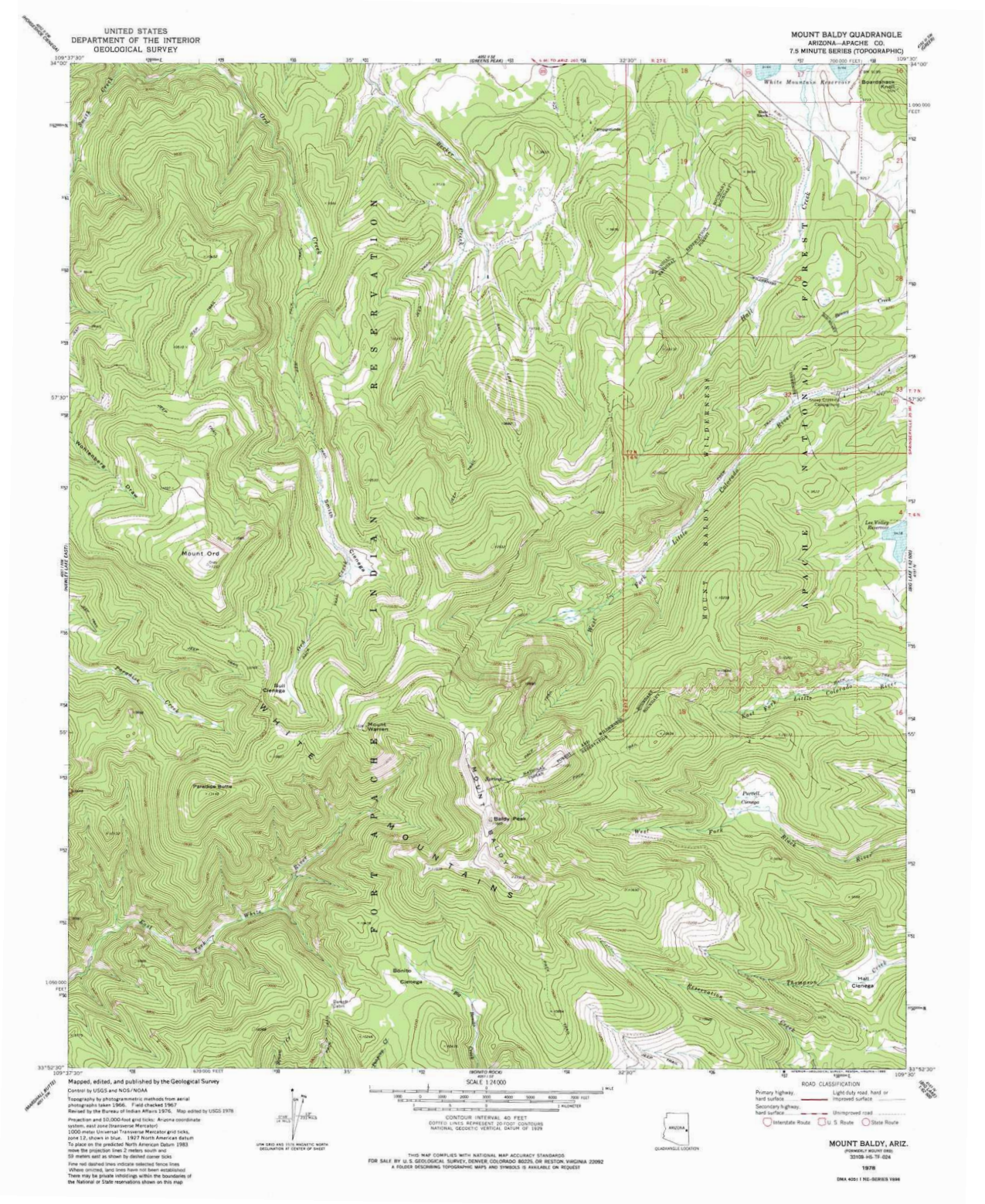
Topographic map example – Mount Baldy Quadrangle, Apache County, Arizona



Mount Baldy, Arizona 7.5” topographic map. A 7.5” quadrangle covers 7.5” of latitude and 7.5” of longitude. Actual paper dimensions are 27” x 21”.

Arizona Geological Survey

Additional Online & Digital Resources Workshop for Teachers

Introduction

Web resources for teaching Earth science or geography abound. The challenge is identifying the resource best suited for you and your students. Fortunately, several excellent educational digital libraries exist to help teachers find just the right tool. Chief among them is the Digital Library for Earth Science Education (DLESE) and the National Science Digital Library (NSDG).

Listed below are a few my favorite sites for Earth science information. They all contain solid information, they are interactive, and they are updated frequently with new information and web tools.

Digital Education Libraries – *Science education at your fingertips*

- **DLESE** – Digital Library Earth Science Education
  http://www.dlese.org/library/index.jsp

- **National Science Digital Library** - Clearinghouse for science education online resources: Earth science, life sciences, physics, astronomy, math, chemistry, computer sciences… http://nsdl.org
  Browse Science Refreshers – Steps 1 & Steps 2.

- **Science Education Research Center SERC** - Teach the Earth / K-12 Science
  http://serc.carleton.edu/index.html
  Browse K-12 Portal – Improve Teaching and Learning – Educator's Toolbox – Teaching with Visualizations

Select Web Resources

- **Landsat** – ChangeMatters http://changematters.esri.com/compare
- **Dynamic Planet** http://nhb-arcims.si.edu/ThisDynamicPlanet/index.html
- **Arizona Geographic Alliance** - Maps of Arizona: AZ Mining Towns, AZ Biomes, and more http://geoalliance.asu.edu/azga_site
- **US Geological Survey** – all things geologic, rich in geologic hazard materials – earthquakes, volcanoes, landslides, tsunami… http://www.usgs.gov
- **Worldwide Telescope** – Point your eye to the sky http://www.worldwidetelescope.org/ExperienceIt/ExperienceIt.aspx
- **Climate Hot Map** – Union of Concerned Scientists http://www.climatehotmap.org Examine map – select impact sites
- **Arizona Geological Survey** – Field Notes and Arizona Geology newsletters since 1971 http://azgeology.azgs.az.gov/archived-issues
- **Arizona Experience** – Online virtual museum celebrating 100 years of statehood http://arizonaexperience.org

Building a Google Earth flyover

in 5-minutes

First Steps

Install – Open Google Earth

- Review tool bar and navigation
  View Moon – Mars
- Review layers – gallery, global view

Building a tour

Recommended settings – Review *"Tools"* *Options*

1. Creating a path
   Select "Add path" icon (New Path text box opens)
   Edit path must be open to add vertices
   Using cross-hairs cursor add vertices
   Hit ok – closes "Add Path" box
   NOTE – to reopen "Add Path" select Trial 1 and go to properties

2. Recording a Tour
   Select "Record a Tour" icon
   Reload Trial path and select Record
   Save the Tour recording

Contact Information

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