

DIGITAL MAPPING TECHNIQUES 2015

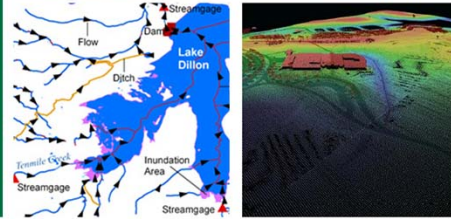
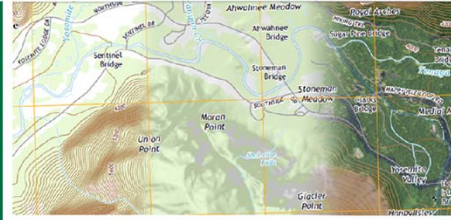
The following was presented at DMT'15
(May 17-20, 2015 - Utah Geological Survey,
Salt Lake City, UT)

The contents of this document are provisional

See Presentations and Proceedings
from the DMT Meetings (1997-2015)

<http://ngmdb.usgs.gov/info/dmt/>

GIS-Ready Templates
and Data for
US Topo Maps



Digital Mapping Techniques 2015 Workshop

19 May 2015

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+ Agenda

- Communities of Use: Objective
- Communities of Use: Pilot Projects
- Topo TNM Style Template: Delivery Plans
- Topo Combined Vector Product
- Content Differences from Published Maps
- TNM Derived Names for Topo Combined Vector Product
- Demo
- Continued Research
- Recap

+ Communities of Use: Objective

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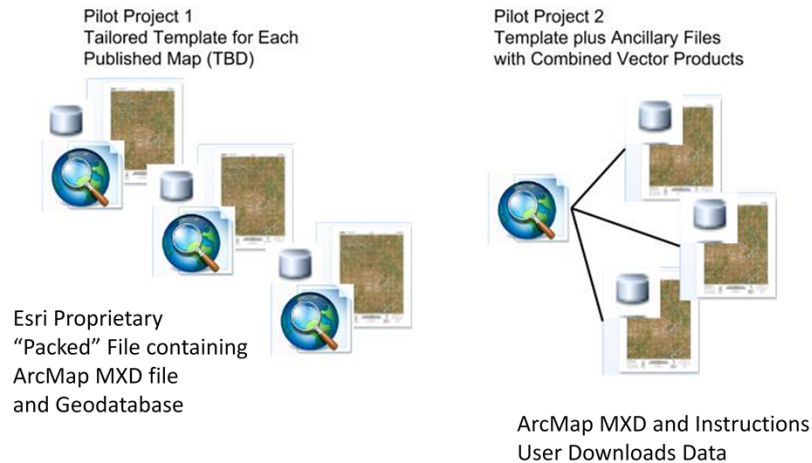
- Provide an efficient, 'one-stop shopping' approach to secure GIS-ready map data configured to US Topo layout and cartographic specifications
 - Originated with GeoCOU (2011 time frame); Applicable to
 - Geologic Mapping and Geologic Hazards (GMH) COU
 - Natural Resources Conservation (NRC) COU
 - USGS scientists
 - Private industry



The U.S. Geological Survey (USGS) National Geospatial Technical Operations Center (NGTOC) continues to evaluate methodologies to produce and deliver a map template product that is based upon US Topo Map specifications and can be easily used with data available for download from The National Map (TNM) (<http://nationalmap.gov/>). The requirement for this format was originally reported to the National Geospatial Program (NGP) by the Geologic Mapping and Geologic Hazards Communities of Use (COUs) in 2012. Since then, additional COUs and scientists within the USGS and in state and local organizations have shown interest as well. GIS-ready data layers provided in conjunction with a map template that uses the layout, symbology, and labeling specifications of the published US Topo Maps would be an invaluable tool for customers to create their own tailored maps.

+ Communities of Use: Pilot Projects

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In July through September of 2014, the NGTOC conducted a pilot activity with the Geologic Mapping Technical Committee using the Esri proprietary Map Packet format, which is an Esri formatted zip file (.mpk) containing an ArcMap template (.mxd) and file geodatabases. The NGTOC produced 25 sample Map Packets that were tailored to the equivalent 25 published US Topo Maps. Technical difficulties with the Map Packets led the NGTOC to pursue a second pilot in the last three months of 2014. For the second pilot, a single ArcMap template was provided along with data layers downloadable from TNM. Ancillary data and instructions were included for using the single template, which must be individually tailored (by the customer) to the desired US Topo Map 7.5-minute quadrangle.

+ Topo TNM Style Template: Delivery Plans

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- Delivered as a zip file via TNM Web Site
 - ArcMap MXD
 - US Topo cartographic specifications
 - Layout, labeling, and symbology
 - Service links for imagery and shaded relief layers
 - Ancillary Data and Files
 - Tailoring Instructions
 - Publicly available MGRS data for automatically tailoring US National Grid and Zone Designations in marginalia
 - NGTOC-produced table containing data for manually tailoring the map layout
 - Requires user to download data and/or services from TNM Viewer
 - Time Frame: Objective is July 2015



+ Topo Combined Vector Product

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- Single product containing all vector data themes
 - Hydrography
 - Transportation
 - TNM Derived Names
 - Structures
 - Boundaries
 - Elevation Contours
 - Woodland Polygons
 - 7.5-min Cells
- 7.5-min footprint
- Objective for full implementation: available via TNM Viewer (<http://viewer.nationalmap.gov/viewer/>) in 2015



Reference text:

<http://viewer.nationalmap.gov/help/9.0%20TNM%20Cart%20Tab.htm#stagedProducts>

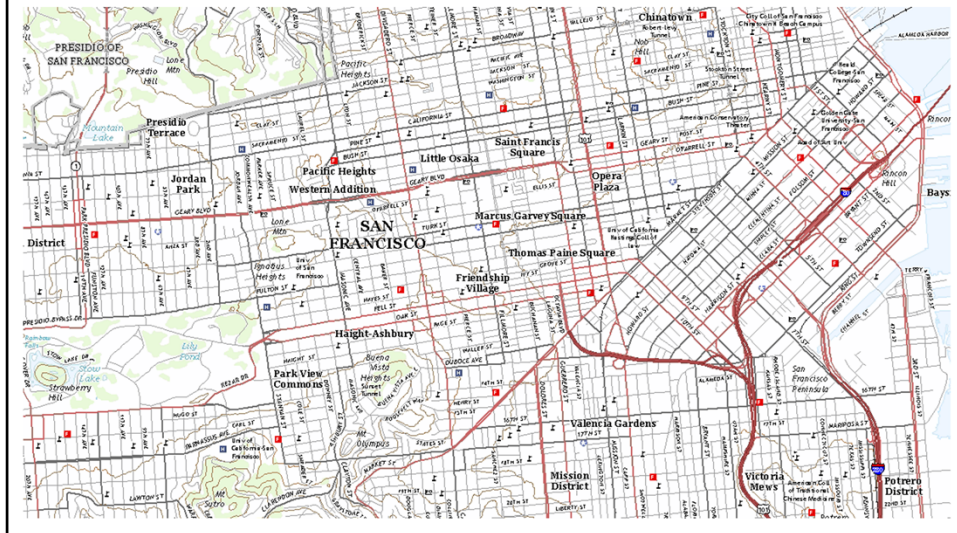
“In the past, products have been available for download via a dynamic clip-n-ship mechanism. While this offers users the flexibility of choosing and customizing the specific area of interest, it is a resource intensive process that no longer makes sense. Each dynamic order represents a custom package generated by backend services after the order is submitted. All orders were queued with other user requests and downloadable products were often not available until a day or more later.

In 2013 The National Map will be transitioning to completely pre-defined, staged products. Rather than wait for products to be generated, users will be presented with a list of pre-generated staged products matching the criteria they specify which are in turn immediately available for download. This is seen as a more cost-effective way to distribute products and will provide a more streamlined download capability for users.”

+ Content Differences from Published Maps

MXD from published map (differences from GNIS and Road data sources)

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To date, the published US Topo Maps use a commercial road data source. We anticipate converting to US Census Bureau roads for the maps that will be published beginning in late 2015. Symbology differences can be noted between commercial roads and Census roads between this slide and slide number 7. The NGTOC is currently evaluating the symbology for Census roads to account for the differences.

Another key difference between slides 6 and 7 are the Geographic Name labels. Note that in the current slide, names have a size hierarchy and are well placed. In slide number 7, note that the hierarchy does not exist and name placement is poor. This is for two reasons: 1) our published maps are edited for label placement; 2) we use a special filtered and enriched Geographic Names data set in the production of our maps that is not currently available for download. Slide number 7 uses the Geographic Names file that is available for download as a pipe-delimited text file. While the text file is extremely useful to many customers and can be easily converted to a point feature class or shape file for use in GIS software, it contains many more names than are represented on the published US Topo Maps and the text file does not contain population information that is used in the production process to create the hierarchical view. Because this hierarchy is a significant improvement to the use of the template, the NGTOC has plans to deliver the filtered and enriched data used in US Topo Map production along with the Topo Combined Vector Product.

+ Content Differences from Published Maps

Topo TNM Style Template and downloaded data (differences from GNIS and Road data sources)

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+ TNM Derived Names for Topo Combined Vector Product

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- Geographic Names Delivery Formats
 - Pipe-delimited text files (no change from current delivery)
 - State and national files
 - Standalone Staged Vector Product: TNM Gazetteer
 - Content: Complete content from Gazetteer multi-point (complex features) database
 - State and national footprints
 - **Topo Combined Vector Product: with TNM Derived Names**
 - Content: **Filtered and enriched** content extracted from Gazetteer multi-point database
 - 7.5-min footprint



As noted previously, the GNIS pipe-delimited text file and the complete (unfiltered) TNM Gazetteer multi-point dataset cannot be used to precisely emulate the annotation on published US Topo Maps without additional processing by the end user with special joins, filters, and enrichment with other data sets. The list below provides details on each.

1. Pipe-delimited text file.
 1. Must be converted to single point features.
 2. Cannot distinguish populated places (by importance or population size).
 3. Do not have multi-points to represent names of features that cross multiple quadrangles.
 4. Definition queries in template cannot match the filters inherent in TNM Derived Names.
2. Complete (unfiltered) TNM Gazetteer multi-point dataset.
 1. Does have multi-points to represent names of features that cross multiple quadrangles.
 2. Cannot distinguish populated places (by importance or population size) without complex joins.
 3. Definition queries in template cannot match the filters inherent in TNM Derived Names.

TNM Derived Names used in current US Topo Map operations was approved for

delivery with the Topo Combined Vector Product. Details on TNM Derived Names follow.

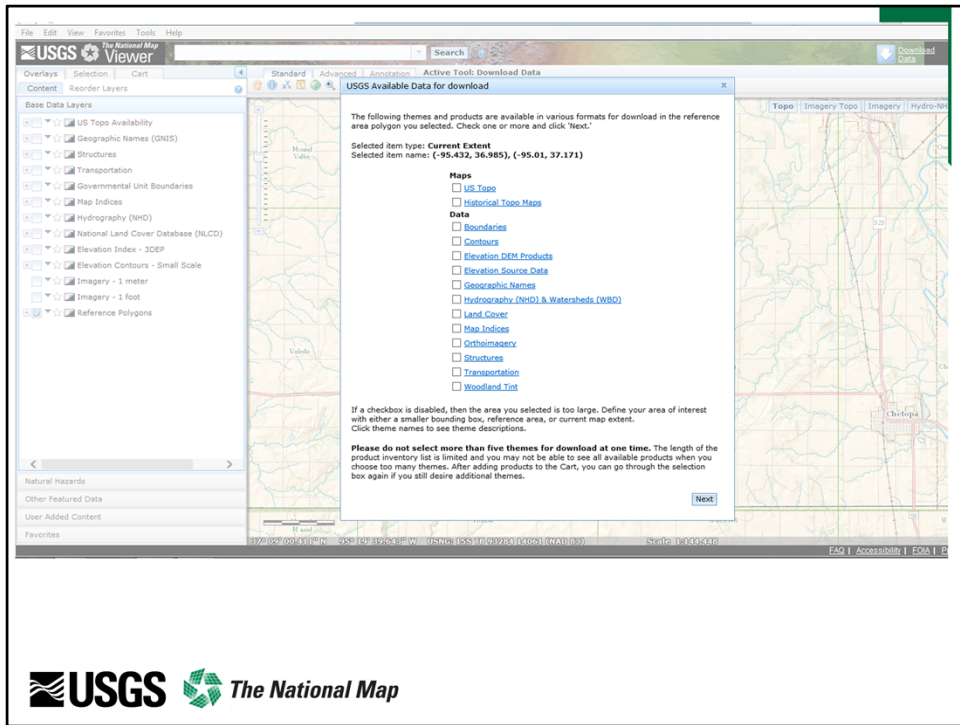
1. Joins Gazetteer points to population data from Incorporated/Unincorporated Governmental Unit features.
2. Joins Gazetteer points to Gazetteer tables.
 1. E.g.: For a specific subset of Gazetteer features, if the shortName attribute is equivalent to the quadrangle name, those features are included for labeling.
 2. Eliminates duplicates between the Census and Civil GeoName feature types.
 3. Filters out Gazetteer feature types that are not labeled on US Topo.
 4. For valley and arroyo features that cross multiple quadrangles, sequence number is evaluated to output a point available for labeling on each quadrangle.
3. Exports a multi-point TNM Derived Names feature class.

+ DEMO

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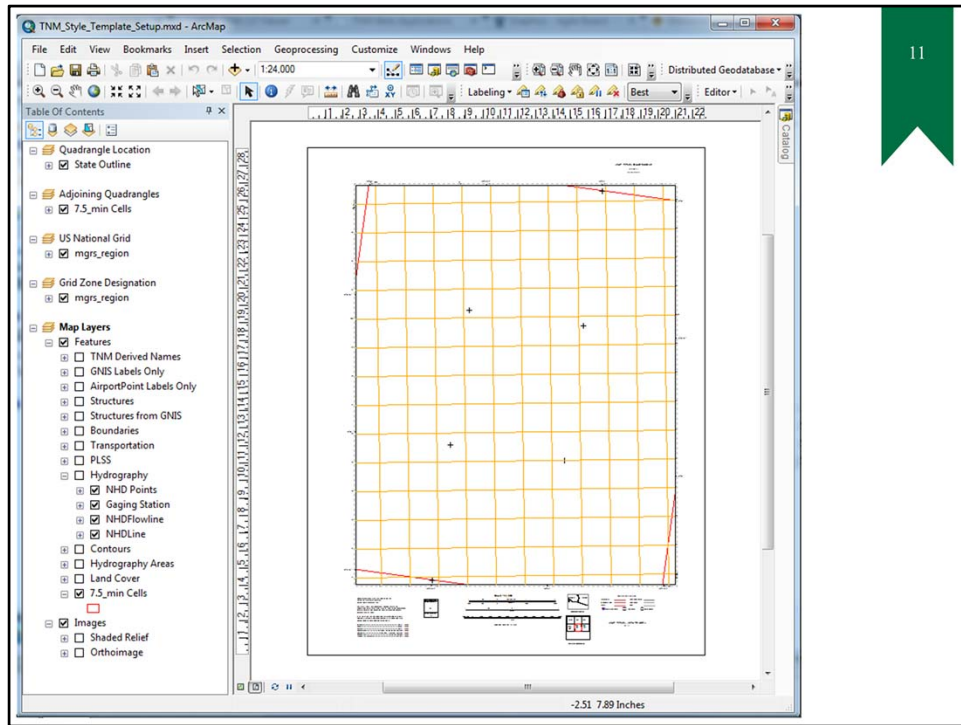
- Tailoring the Topo TNM Style Template

In lieu of a live demo, the following slides are provided as screenshots directly from ArcMap.



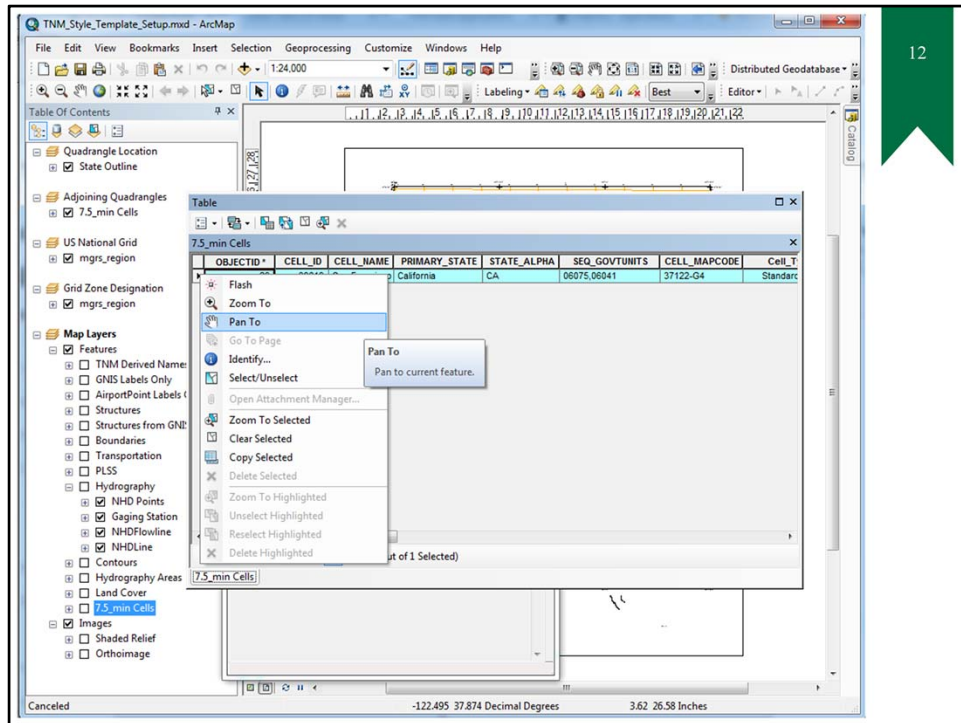
This slide shows TNM Viewer download capability. When the Topo TNM Style Template and the Topo Combined Vector Product become available, they will be listed along with the other products noted.



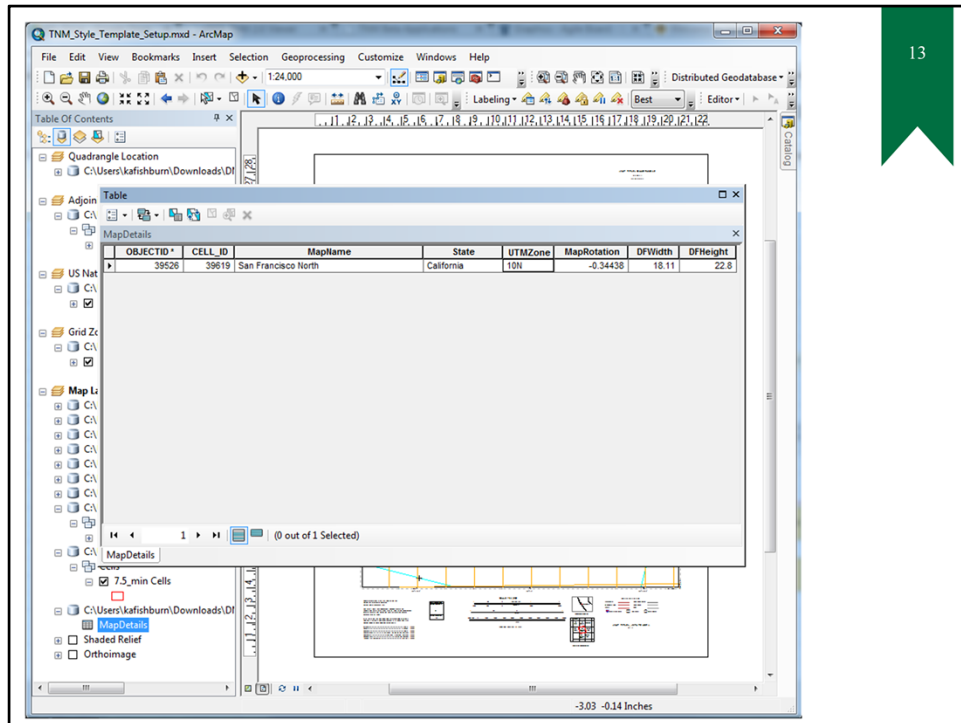


After downloading the template and the data, the user will begin with the following actions to tailor the template.

1. Open the template ArcMap .mxd file.
2. Verify all layers are pointed to the data layers in the file geodatabase that was downloaded along with the Style Template.
3. Note that the Image layers are actually pointed to services available from The National Map. Verify that these are active and display the shaded relief and the orthoimagery.



1. Next, pan to your 7.5-min cell.
 1. Open the attribute table for the 7.5_min Cells Layer.
 2. Select the cell for your area of interest.
 3. Right click and select the “pan To” option.



1. Identify the Projection, Map Rotation, and Data Frame properties.
 1. Click on DB Icon in TOC and scroll down until you see the Map Details table listed.
 2. Select the cell you are interested in, as you did for the 7.5-min cell layer.
 3. Open the table and note the UTM Zone, the MapRotation, and DFWidth/DFHeight for that cell. This information will be used in the following steps.

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UTMZone	MapRotation	DFWidth	DFHeight
10N	-0.34438	18.11	22.8

USGS The National Map

1. Set the Projection, Map Rotation, and Data Frame properties.
 1. Open the Properties of the Map Layers Data Frame and select the Coordinate System tab and navigate to the correct Projection. Click Apply.
 2. Note the selection box for the cell is now rotated, but doesn't yet fit the data frame.

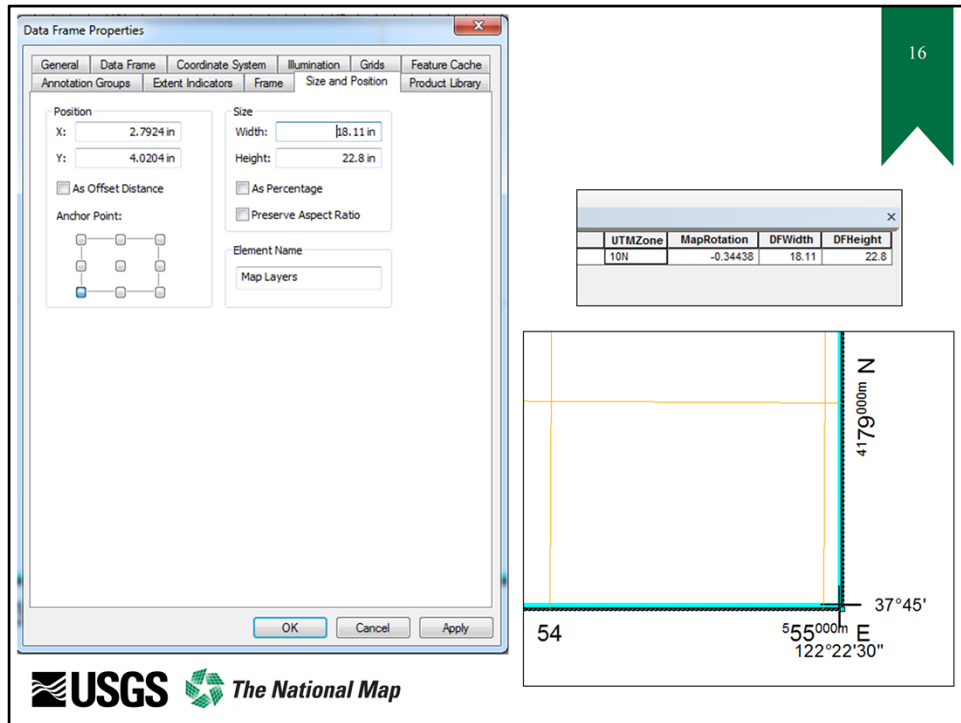
15

UTMZone **MapRotation** **DFWidth** **DFHeight**

10N	-0.34438	18.11	22.8
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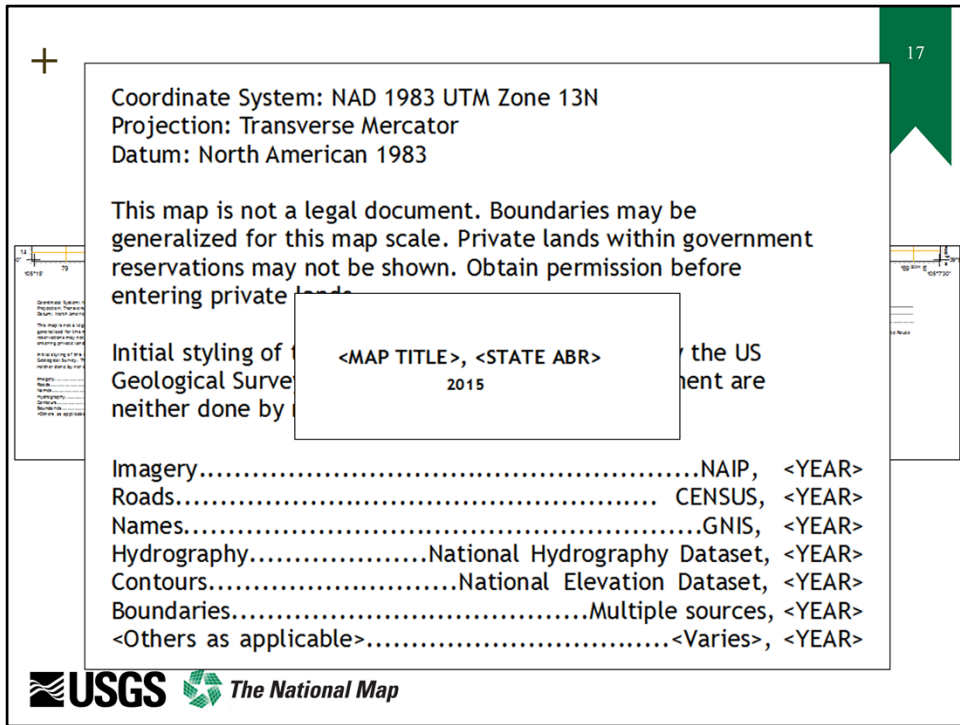
USGS **The National Map**

1. Set the Projection, Map Rotation, and Data Frame properties.
 1. Return to the Properties Menu and select the General Tab.
 2. Update the Rotation Angle per the properties found in the Map Details table and click on Apply.
 3. The Rotation is now correct, but the frame size is still incorrect.

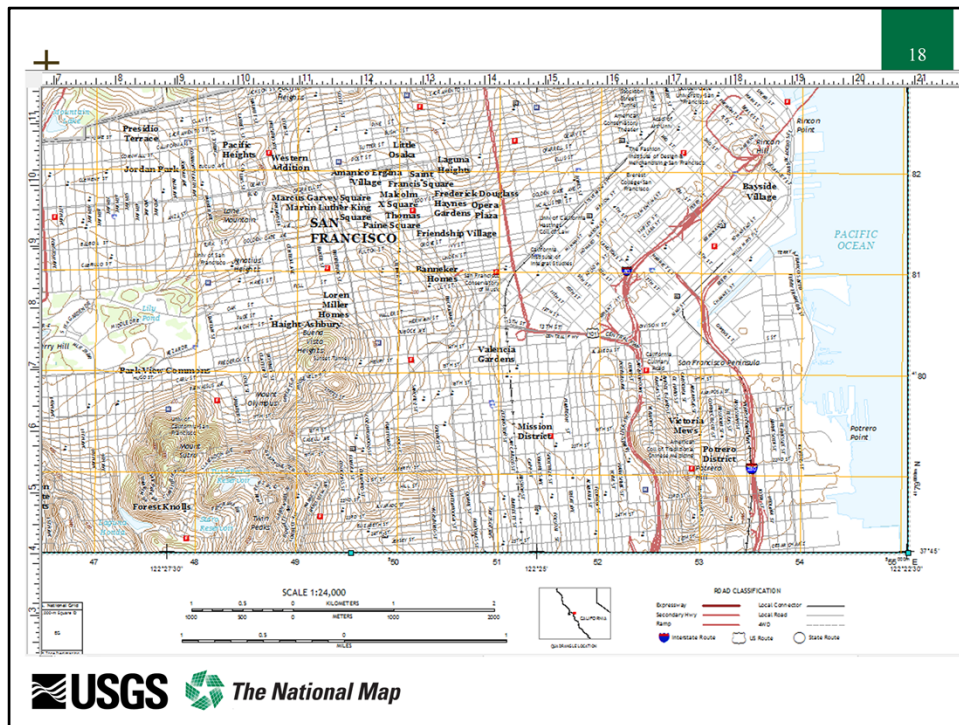


1. Set the Projection, Map Rotation, and Data Frame properties.
 1. Return to the Properties Menu and select the Size and Position Tab.
 2. Update the Data Frame Width and Height per the properties found in the Map Details table and click on Apply.
 3. The Cell now fits the Data Frame.

NOTE: the UTM Zone must also be set for the Quadrangle Location, the Adjoining Quadrangles, the US National Grid, and The Grid Zone Designation Layers in the Table of Contents.



1. Update the Marginalia.
 1. Some is done automatically (Coordinate System, U.S. National Grid box, Quad location, and Adjoining Quad diagrams).
 2. Some must be edited manually (Title boxes, and Dates on downloaded data – information used to add this data be found in metadata that accompanies the download).



1. You are now ready to use the template, add your own data layers, and create your own maps.
2. Tip: Lock labels after you get them drawn the first time. This will enhance the continued performance in zooming and panning around the map.

+ Continued Research

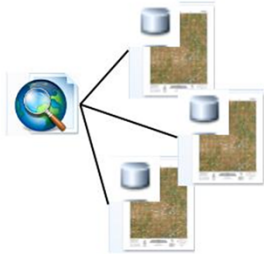
- Long Term Continued R&D (FY15-18)
 - Pennsylvania State University Research
 - Improve label placement and MXD performance
 - Evaluation of multi-scale data, generalization, and cartographic designs
 - Evaluate extension of current production system
 - Evaluation of Esri Product On Demand (POD) server technology to extend export of tailored products
 - Formats; Esri map packet and other formats (e.g. GeoTIFF)
 - Additional product scales and AOIs
 - Evaluate OGC GeoPackage



The USGS is continuing to evaluate the best methodologies for enhancing label placement. We also are continuing to evaluate the latest and greatest technologies available to support fully tailored GIS-Ready templates in the future through our internal Map on Demand (MOD) production system and/or the Esri Product On Demand (POD) system. We will be evaluating export of other map formats as well, such as GeoTIFF, and additional product scales (1:100k) and tailored map Area of Interest (AOI) outputs. The Open Geospatial Consortium (OGC) GeoPackage is also an important technology to explore given that not all of the USGS customers are Esri software consumers. Open source data and tools must be investigated to support all customers in the future.

+ Recap

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Short Term Solution:
TNM Style Template
TNM Integrated Vector Staged Product



Continued Research:
Fully Tailored Style Template
delivered with each published map

