Projecting Census Shapefiles

Problem: Boundary files downloaded from the US Census Bureau come unprojected and with an unlabeled coordinate system.
http://www.census.gov/geo/www/cob/bdy_files.html
Solution: Assign a coordinate system to the file and then project it.
Software: ESRI's ArcCatalog; boundary files in shapefile (.shp) format.

You can examine the coordinate and projection information of shapefiles within ArcCatalog by highlighting the shapefile in the left-hand (file system) pane, then selecting the "Metadata" tab in the right-hand pane, and clicking the "Spatial" tab within the metadata itself. A shapefile with the coordinate system defined will have the item "Geographic Coordinate System Name" and some value next to it, ie "GCS_North_American_1983." A projected shapefile will have the item "Projected coordinate system name" followed by the name of a projection, ie, "NAD_1983_StatePlane_California_III_FIPS_0403_Feet." A shapefile that is ready to use will both have a defined coordinate system *and* be projected.

When you examine a boundary shapefile from the census bureau, the coordinate system is labeled "Unknown" and there is no projection. The coordinate system is actually a geographic coordinate system, based on latitude and longitude, and is called "GCS Assumed Geographic 1."

To assign this coordinate system to a shapefile with "Unknown" as its coordinate system:

1. Close all maps that use the shapefile.
2. Open up ArcToolbox > Data Management Tools > Projections and Transformations and double click on Define Projection.
3. In the first field, choose the shapefile whose coordinate system you want to define.
4. In the second field, choose the coordinate system or projection; it should be called "**GCS_Assumed_Geographic_1.prj**"
5. Click OK.

It can be more practical to assign a coordinate system and project an unprojected census bureau shapefile with an unknown coordinate system at the same time:

1. Close all maps that use the shapefile.
2. Open up ArcToolbox > Data Management Tools > Projections and Transformations > Feature and double click on Project.
3. In the first field, choose the shapefile to project.
4. If the shapefile's coordinate system hasn't been set, choose it in the second field (as in step 4 above).
5. In the third field, choose where to save and what to name the new projected shapefile.
6. In the fourth field, choose the projection; we use one called "NAD 1983 StatePlane California III FIPS 0403 (Feet).prj"; it is part of the data set that came with the ArcMap suite, and is in the "Coordinate Systems" folder ("GIS Data\Coordinate Systems\Projected Coordinate Systems\State Plane\NAD 1983 (Feet)\ NAD 1983 StatePlane California III FIPS 0403 (Feet).prj" on our system.)
7. Click OK.