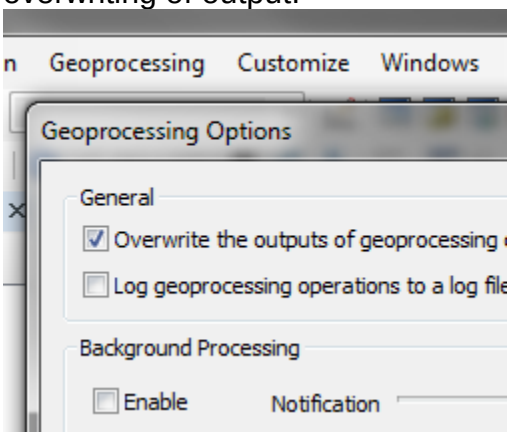
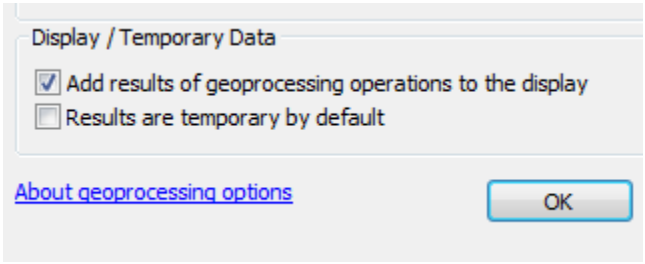
Lab#4: GIS Feature Formats

In this lab, you will work with GIS features (points, lines, polygons) data that are in several formats: Coverages, Shapefiles, and Geodatabases.

For this lab, set your geoprocessing environment for no background geoprocessing and allow overwriting of output:





ArcInfo Coverages

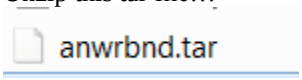
Arc/Info coverage is how GIS points, lines, and polygons were stored in the 1980s-1990s. Some websites still offer their data in this format as arc/info interchange files that have an extension .e00. For example, download and extract ***the boundary*** of the Arctic National Wildlife Refuge from:
http://agdc.usgs.gov/data/projects/anwr/webhtml/bnd_index.html

Arctic National Wildlife Refuge (ANWR)
Earth and Biological Science-Data Website

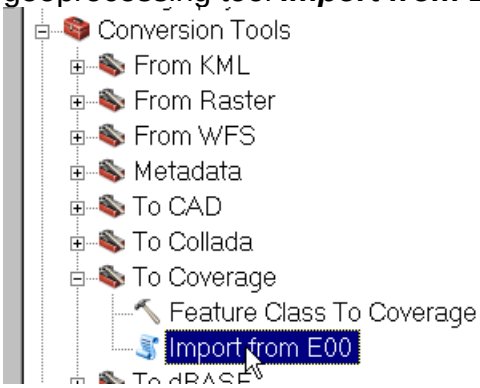
Political Boundaries and Coastlines

Theme
North Slope Coastline
Arctic Refuge Coastline
Arctic Refuge Boundary
1002 Area Boundary

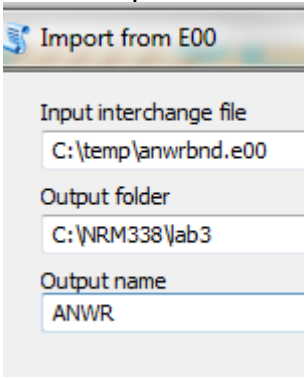
Unzip this tar file…



In Arcmap, you can use import from the e00 file to an arc/info coverage using the geoprocessing tool ***Import from E00***

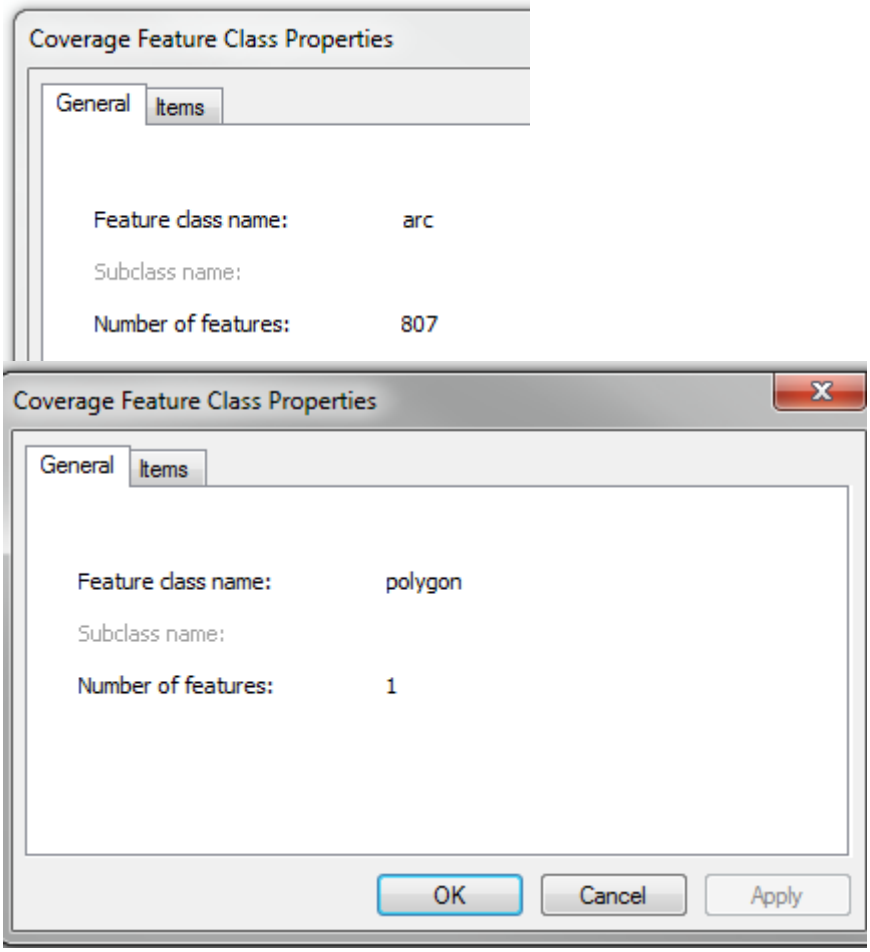


Since coverages are an old format, they do have a restriction in names. Coverage names cannot start with a number, and they must be 13 characters or less, and names can not contain spaces. Name your output coverage ANWR

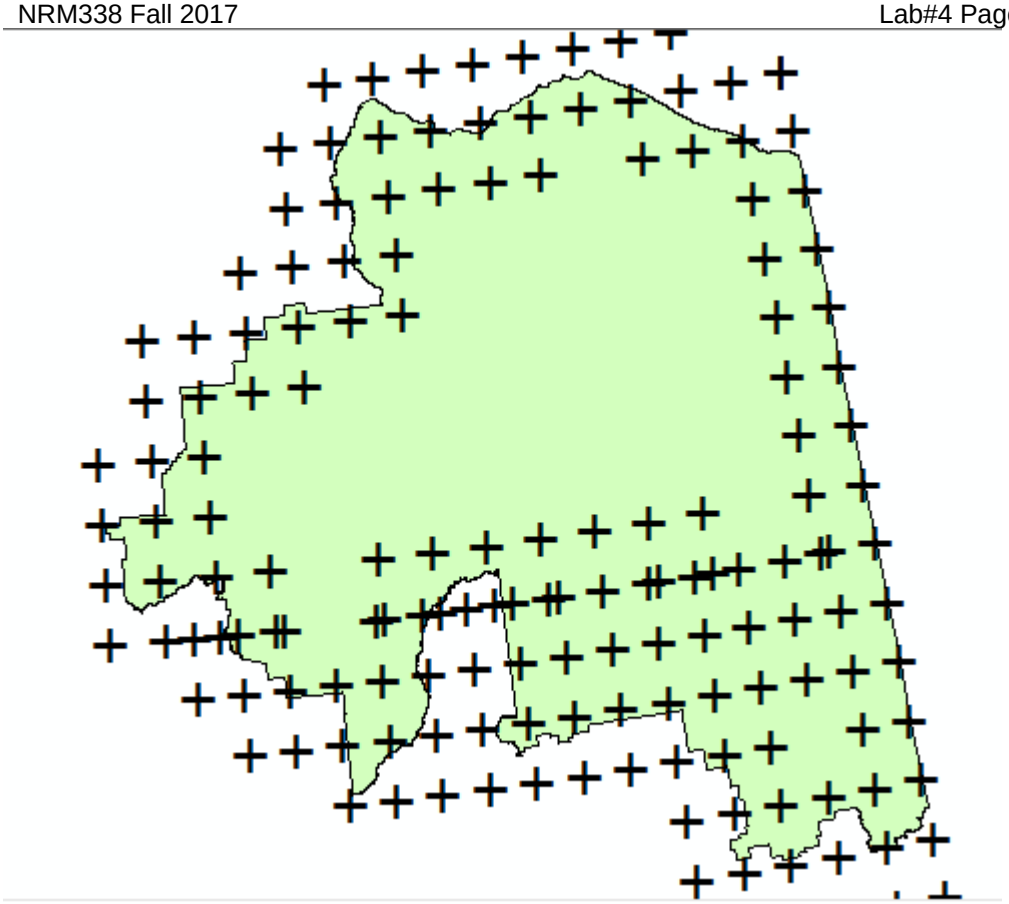


Use the Catalog window to look at the Refuge coverage.

Right mouse click to see the properties of the Coverage components:



The Tics are control points, typically the corners of USGS quad maps…



And add the Coverage components to your data frame.

What is the coordinate system of your coverage? Alaska Albers, but based on an ancient Geographic Coordinate System using the Clarke 1866 spheroid…

Data Source

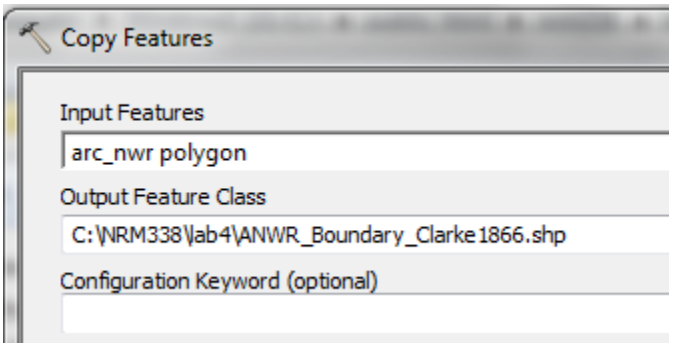
False_Northing:	0.00000000
Central_Meridian:	-154.00000000
Standard_Parallel_1:	55.00000000
Standard_Parallel_2:	65.00000000
Latitude_Of_Origin:	50.00000000
Linear Unit:	Meter
Geographic Coordinate System:	GCS_Clarke_1866
Datum:	D_Clarke_1866
Prime Meridian:	Greenwich

anwr polygon

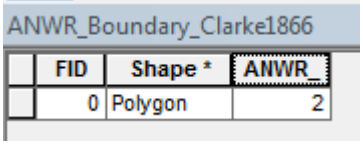
	FID	Shape	AREA	PERIMETER	ANWR#	ANWR-ID
	2	Polygon	80326620000	1863321	2	1

You will not be able to delete any coverage fields….

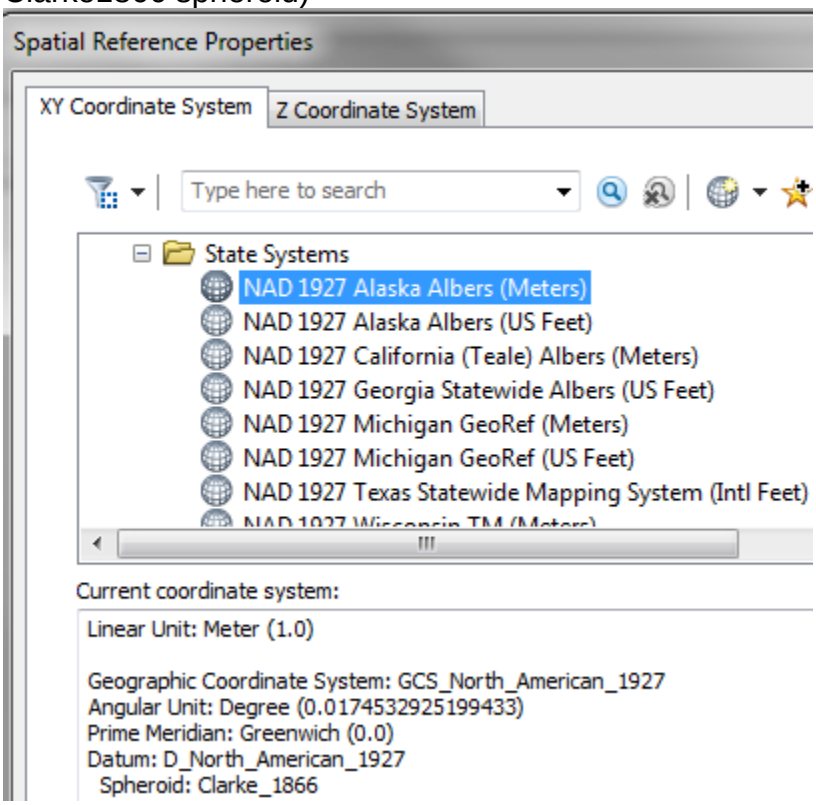
Use the ***Copy Features*** geoprocessing tool to copy your coverage polygon to a polygon shapefile.



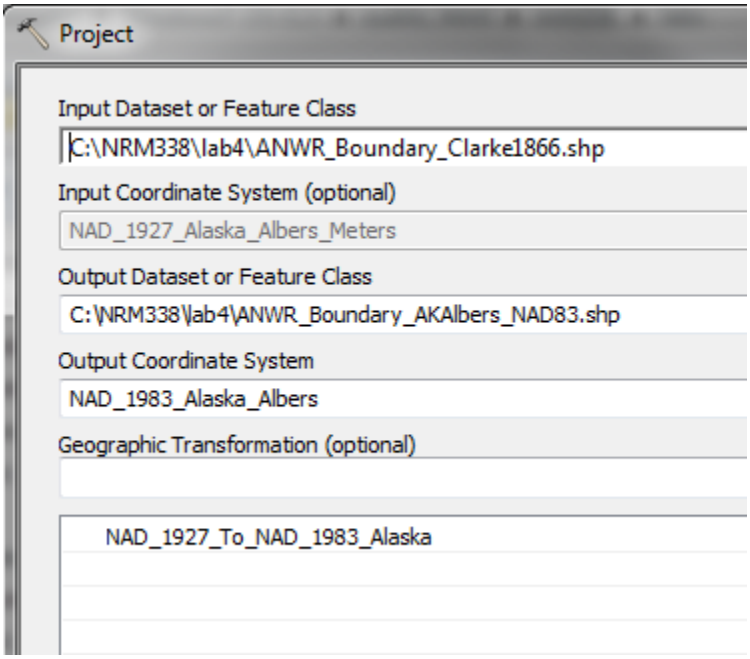
Then delete your fields…you must have one field besides feature ID and Shape…



use the ***Define Projection*** geoprocessing tool to define the datum as NAD27 (which uses the Clarke1866 spheroid)



Project the polygon representing the refuge boundary to Alaska Albers NAD83 as a polygon shapefile.



Compute the refuge area in Hectares and in Acres

Refuge_HA	ACRES
8,032,588.2	19,848,957.7

Download and unzip the ***Major Drainage Basins*** and ***Towns*** Arc/Info coverages from: http://agdc.usgs.gov/data/usgs/water/yukon.html

Digital Elevation Model (DEM)	Metadata	Download Files (1.08 M)
Carbon	Metadata	Download Files (1.33M)
Ecoregions	Metadata	Download Files (218 KB)
Glaciers	Metadata	Download Files (142 KB)
Lakes	Metadata	Download Files (1.15 M)
Landcover	Metadata	Download Files (112 KB)
Major Drainage Basins	Metadata	Download Files (662 KB)
Permafrost	Metadata	Download Files (109 KB)
Physiography	Metadata	Download Files (93 KB)
Precipitation	Metadata	Download Files (118 KB)
Roads	Metadata	Download Files (29KB)
Soils	Metadata	Download Files (1.37M)
Towns	Metadata	Download Files (8 KB)
Watershed Boundary	Metadata	Download Files (491 KB)
Wetlands	Metadata	Download Files (433 KB)

We want a table of towns listed by sub basin. Use the ***Intersect*** geoprocessing tool to transfer the sub-basin information to each town point. Then use the ***Sort*** geoprocessing tool to sort your point attribute table by SubBasin and town Name.

OBJECTID *	Shape *	SUBBASIN	NAME
1	Point	Chandalar River	Arctic Village
2	Point	Chandalar River	Venetie
3	Point	East Central Yukon	Beaver
4	Point	East Central Yukon	Birch Creek
5	Point	East Central Yukon	Central
6	Point	East Central Yukon	Circle
7	Point	East Central Yukon	Circle Hot Springs
8	Point	East Central Yukon	Eagle
9	Point	East Central Yukon	Eagle Village
10	Point	East Central Yukon	Fort Yukon
11	Point	East Central Yukon	Stevens Village
12	Point	Koyukuk River	Alatna
13	Point	Koyukuk River	Allakaket
14	Point	Koyukuk River	Bettles
15	Point	Koyukuk River	Evansville

Shapefiles

In the early 1990s, Arcview GIS used the shapefile format as a format for simple GIS themes. A shapefile theme can contain either point, polyline, or polygon shapes. A shapefile theme is composed of several companion files. A shapefile always has at least three companion files (***.shp, shx, .dbf***) that contain spatial and attribute data.

One companion file (***.shp***) contains the X,Y coordinates of each feature in the theme. Another companion file (.***shx***) contains an index for rapid access to this information. You also have a (***.prj*** file) that contains map projection and coordinate information about your shapefile theme. The attribute data are stored in a dBase file with a ***dbf*** extension. Metadata about your theme are stored in a file with an **xml** extension.

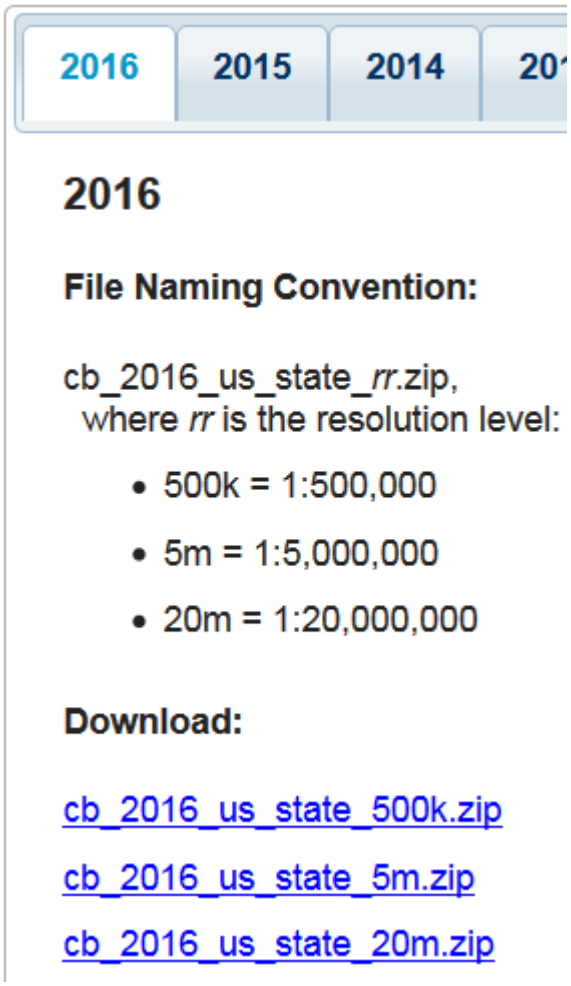
Download and unzip the 2011 Forest Insect & Disease survey from the following website http://agdc.usgs.gov/data/projects/fhm/#L

- **Yearly Coverages.**
  - **Year 2011.** [Shape] [1.67MB ZIP]
  - **Year 2010.** [Metadata] [Shape] (2.97Mb). [JPG]
  - **Year 2009.** [Metadata] [Shape] (1.85Mb). [JPG]
  - **Year 2008.** [Metadata] [Shape] (1.6Mb). [JPG]
  - **Year 2007.** [Metadata] [Shape] (1.7Mb). [JPG]
  - **Year 2006.** [Metadata] [Shape] (1.5Mb). [JPG]
  - **Year 2005.** [Metadata] [Shape] (1.2Mb). [JPG]
  - **Year 2004.** [Metadata] [ARCExport] (1.02Mb). [Shape] (589KB). [JPG]
  - **Year 2003.** [Metadata] [ARCExport] (457Kb). [Shape] (883Kb). [JPG]
  - **Year 2002.** [Metadata] [ARCExport] (295Kb). [Shape] (334Kb). [JPG]
  - **Year 2001.** [Metadata] [ARCExport] (1.1Mb). [Shape] (754Kb). [JPG]
  - **Year 2000.** [Metadata] [ARCExport] (1.3Mb). [Shape] (930Kb). [JPG]
  - **Year 1999.** [Metadata] [ARCExport] (2.5Mb). [Shape] (1.4Mb). [GIF]
  - **Year 1998.** [Metadata] [ARCExport] (881Kb). [Shape] (570Kb). [GIF]
  - **Year 1997.** [Metadata] [ARCExport] (1.9Mb). [Shape] (1.3Mb). [GIF]
  - **Year 1996.** [Metadata] [ARCExport] (1.7Mb). [Shape] (1.2Mb). [GIF]
  - **Year 1995.** [Metadata] [ARCExport] (450Kb). [Shape] (261Kb). [GIF]
  - **Year 1994.** [Metadata] [ARCExport] (1.1Mb). [Shape] (763Kb). [GIF]
  - **Year 1993.** [Metadata] [ARCExport] (845Kb). [Shape] (566Kb). [GIF]
  - **Year 1992.** [Metadata] [ARCExport] (635Kb). [Shape] (423Kb). [GIF]
  - **Year 1991.** [Metadata] [ARCExport] (585Kb). [Shape] (371Kb). [GIF]
  - **Year 1990.** [Metadata] [ARCExport] (396Kb). [Shape] (236Kb). [GIF]
  - **Year 1989.** [Metadata] [ARCExport] (259Kb). [Shape] (162Kb). [GIF]

Unzip the 2011 file into your own folder.
Create a table of the top ten Code1 insect/disease classes by hectares.

Code1	FREQUENCY	SUM_Hectares
ALM	1396	56,341.4
ADD	773	52,751.1
ALD	193	30,229.4
SPB	392	19,770.2
WLM	490	17,875.3
BID	143	11,554.4
CDL	632	10,847.1
BND	52	9,342.8
CWD	107	5,700.0
ADC	99	4,716.3

Download the 1:20 million scale of state boundaries from:
https://www.census.gov/geo/maps-data/data/cbf/cbf_state.html



What is the area of the state of Alaska in Alaska Albers NAD83?

KM2
1,560,668.9

ArcGIS Geodatabases

A geodatabase is a container of geographic information inside a relational database. A ***personal geodatabase*** is stored in Microsoft Access format. A **file geodatabase** is stored in an ArcGIS format and can be used on non-windows platforms and takes less disk space compared to the personal geodatabase.

The geodatabase model has many advantages over traditional coverage or shapefile data models including:

1) More accurate data entry. Attribute values can be constrained and validated. For example, you may limit a tree species name from a list of only six species that the data entry person would choose from.

2) Subtypes. Instead of generic points, lines and polygons, the user can work with certain subtypes of points, lines, or polygons. For example, instead of salmon points, you can have subtypes sockeye salmon, king salmon.

3) Topological association. You can define the spatial relationships among objects. For example, if a lake shoreline is moved, the associated vegetation is also moved.

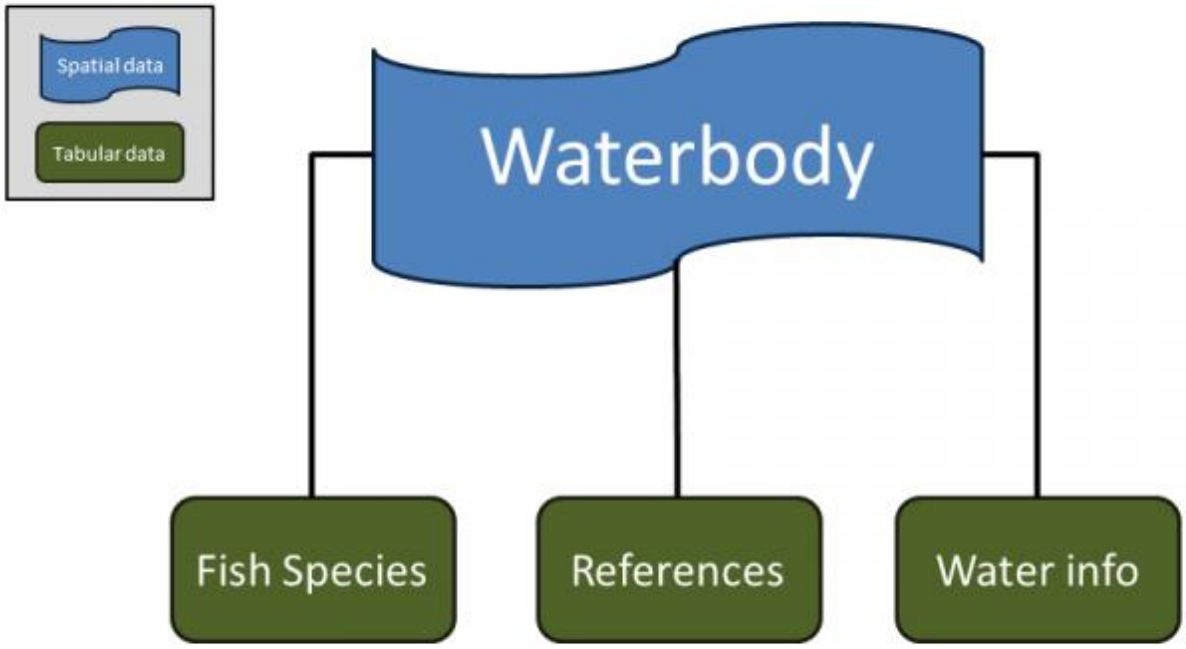
4) Shape properties such as length and area are correctly updated after using any tool in Arctoolbox. (such as the Clip tool)

Download and unzip the file geodatabase from
http://arcticlcc.org/products/spatial-data/show/aquabase-geodatabase

From your geodatabase container, add the water body polygons and Fish_species table to a new data frame.

- AquaBase.gdb
  - Fish_species
  - Reference
  - Water_Info
  - Waterbody
  - Waterbody_Fish_species
  - Waterbody_Reference
  - Waterbody_Water_Info

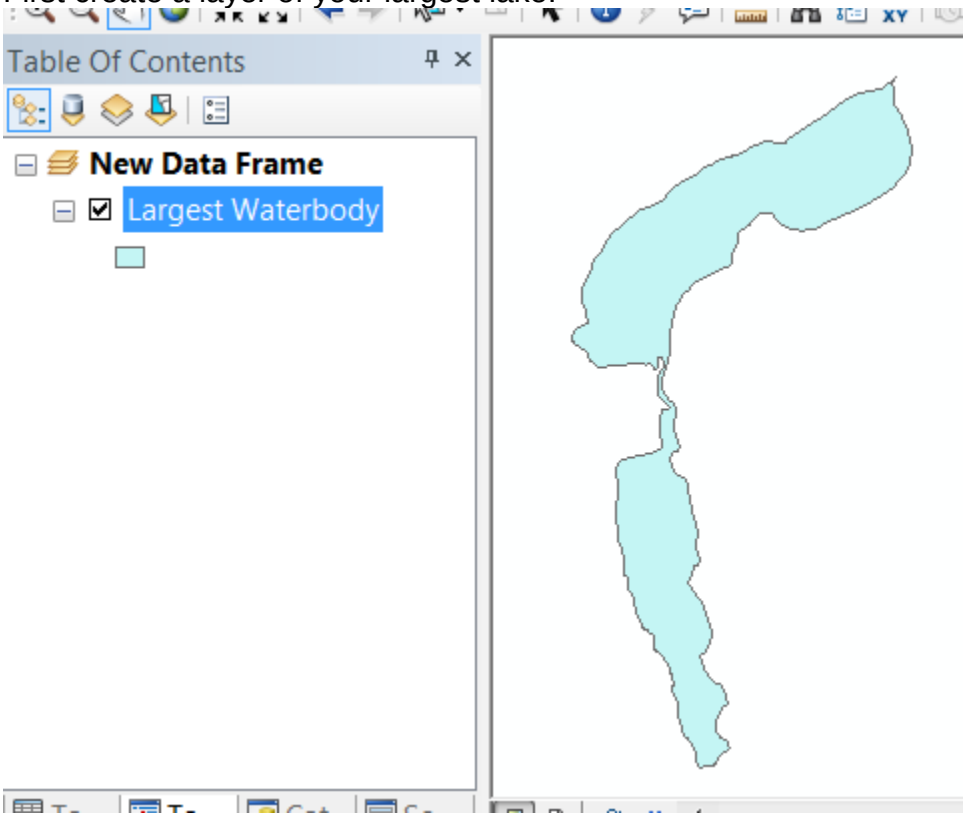
Simplified Schema for the Aquabase Geodatabase



Each waterbody (i.e., lake, pond, river, lagoon, or spring) is assigned an ID that is then used to link fish species, references, and water quality/quantify information to it.

What coordinate system is your Waterbody layer in?

There are 23,072 water body polygons.
For the largest lake polygon, create a table of fish species.
First create a layer of your largest lake.



Do definition query for this water body:

NAME_Species	Fry	Juvenile	Adult	Anadromous	Resident
Arctic char	Y	Y	Y	N	Y
Arctic grayling	Y	Y	Y	N	Y
lake trout	Y	Y	Y	N	Y