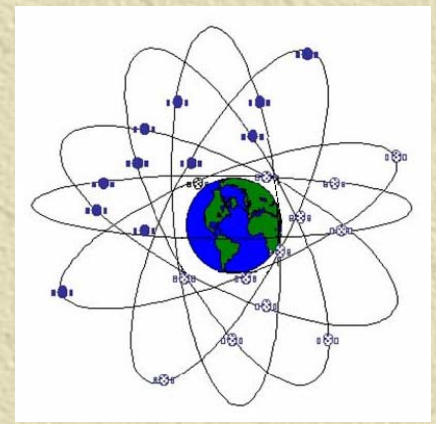
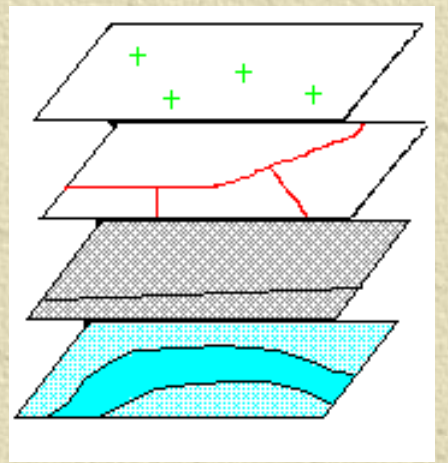
GPS Resource Mapping For GIS
Session III-5

PSLS Surveyors

Conference

2006





David Nichter

Outline

1. Project Plan
2. Resource Inventory (paper maps, database)
3. Scope
4. Data Dictionary
5. GPS Mission Planning (daily)
6. Field work (collect it!)
7. Data Download
8. QA/QC for Completeness
9. Differential Correction
10. QA/QC Spatial Error
11. Export to GIS
12. Metadata
13. Use the data.
14. Review data / process

Definitions

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GPS - Global Positioning System

Code GPS or Mapping Grade or Sub-meter

not Survey Grade, not Recreational

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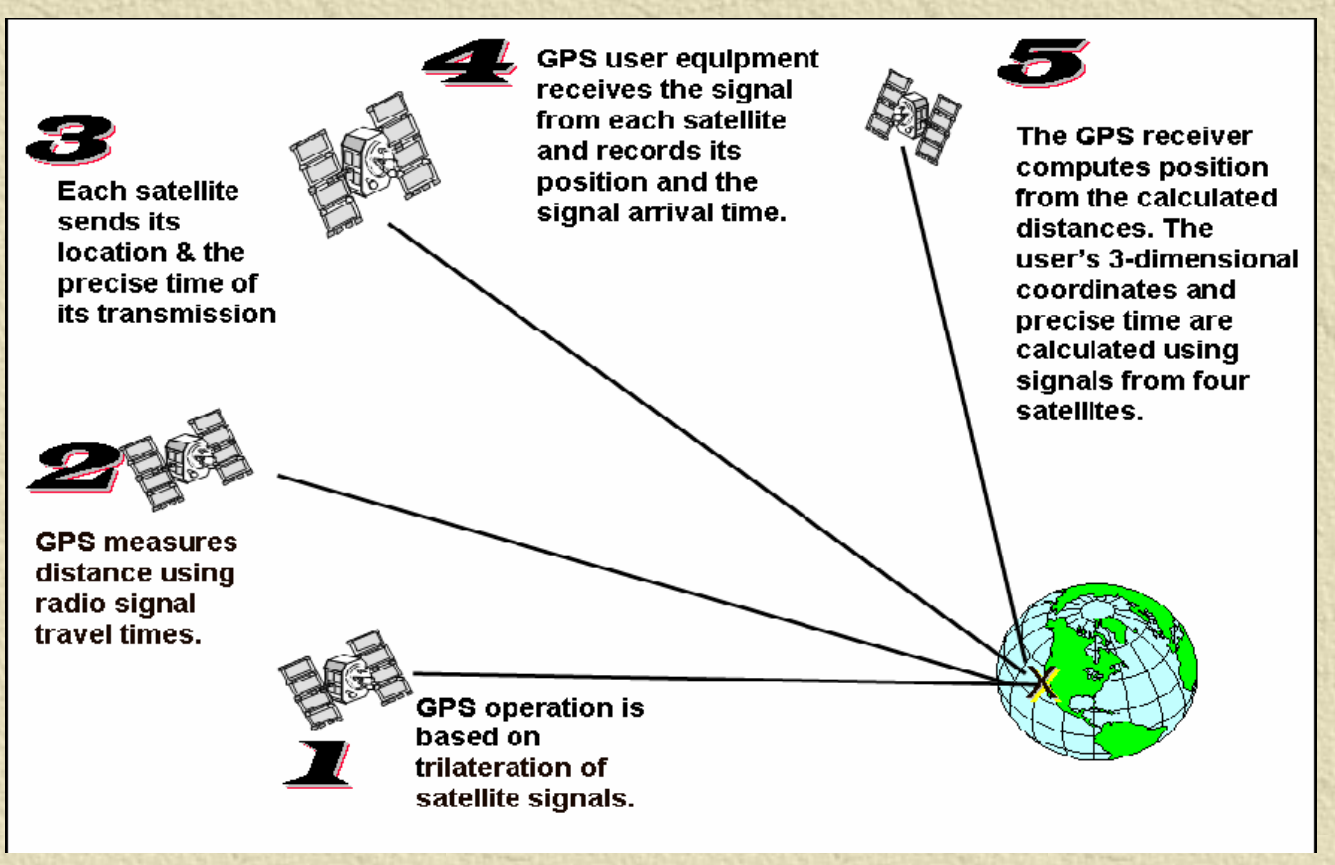


Definitions

GPS - Global Positioning System

Code GPS or Mapping Grade or Sub-meter

not Survey Grade, not Recreational

GIS - Geographic Information System

Spatial Data Management or Intelligent Maps

not CADD, not AM/FM

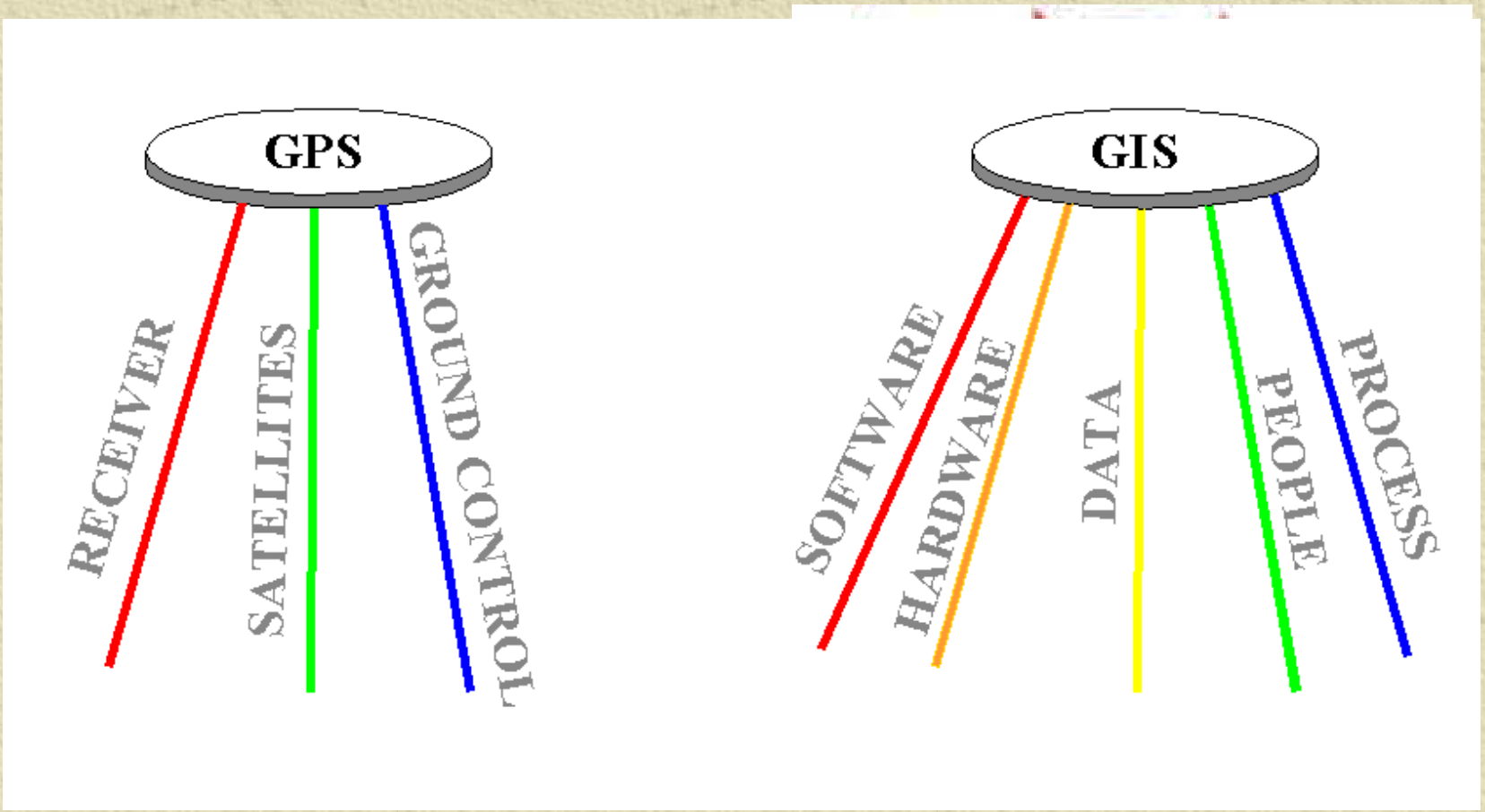
Definitions

Definitions

GIS –A computer system capable of capturing, storing, analyzing, and displaying geographically referenced information; that is, data identified according to location.

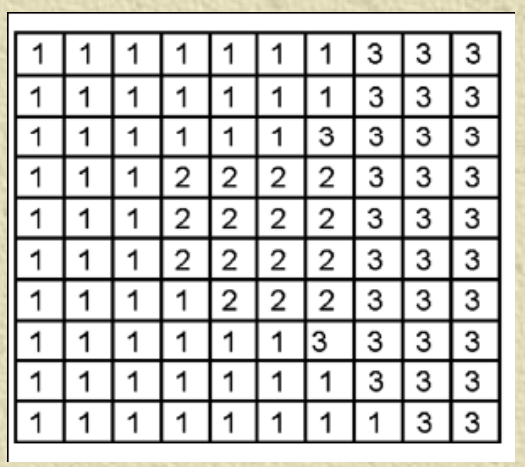
(USGS definition)

Definitions



Definitions (Continued)

Raster vs. Vector



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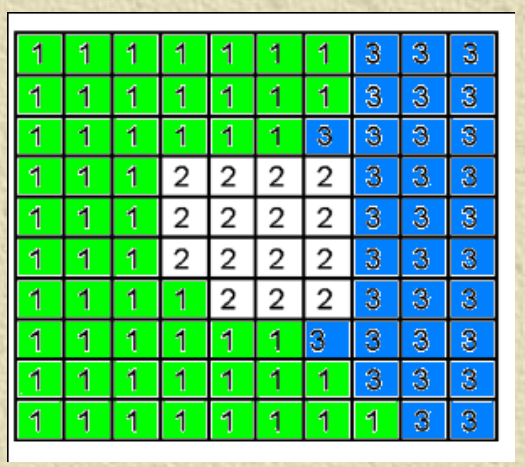

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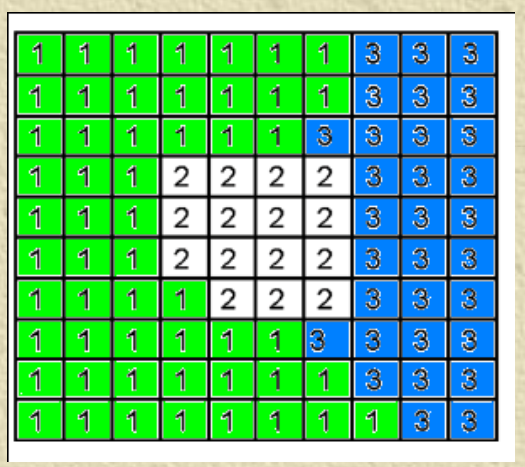

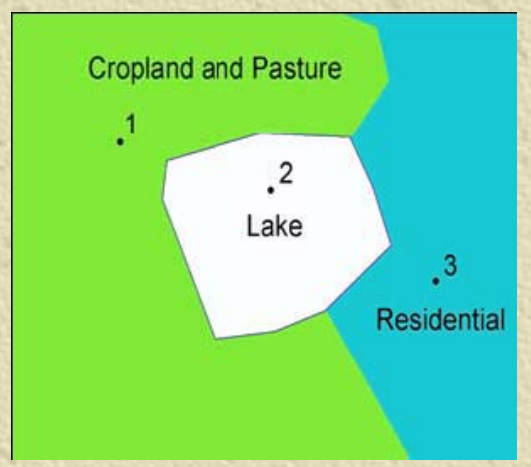

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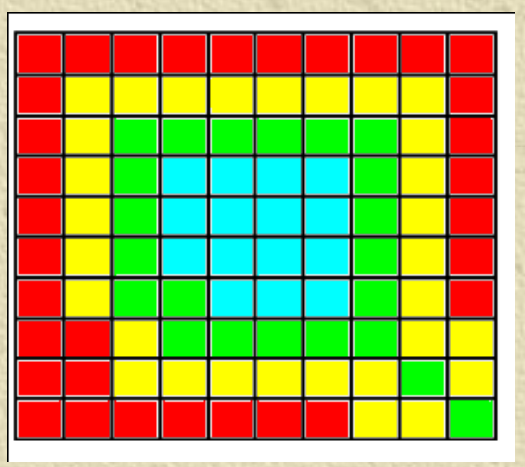

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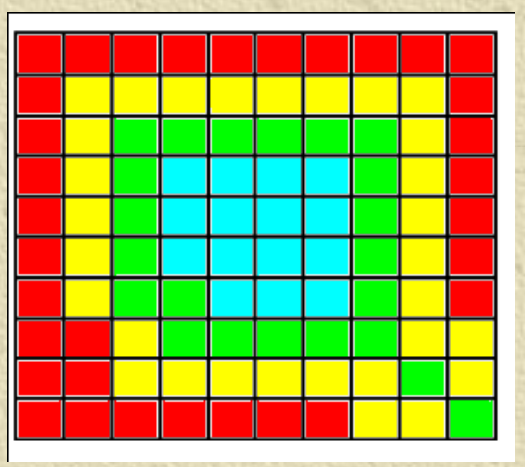

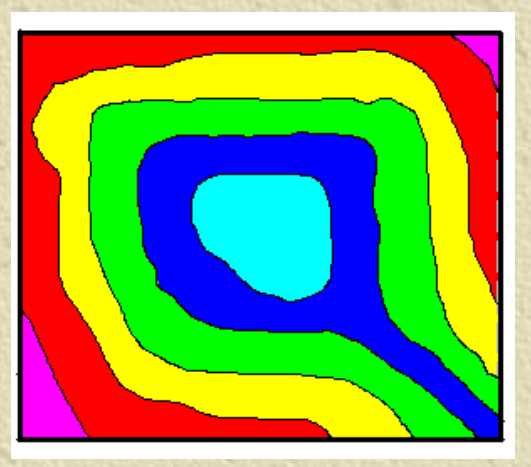

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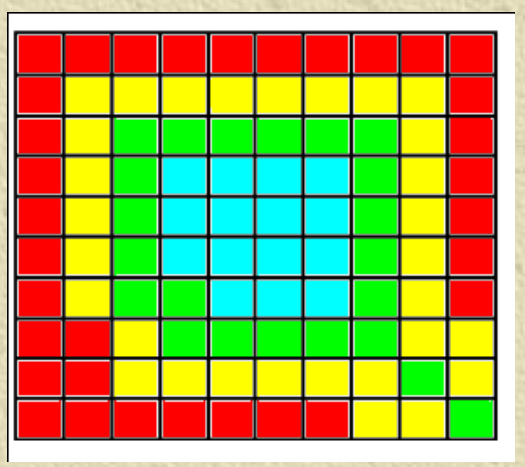

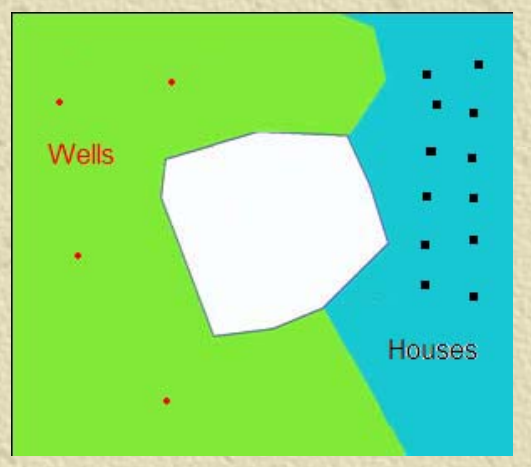

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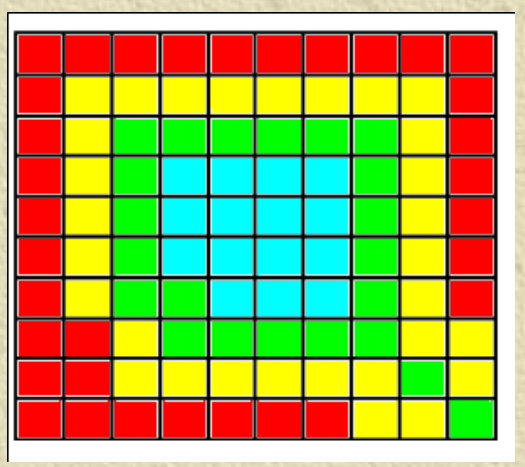

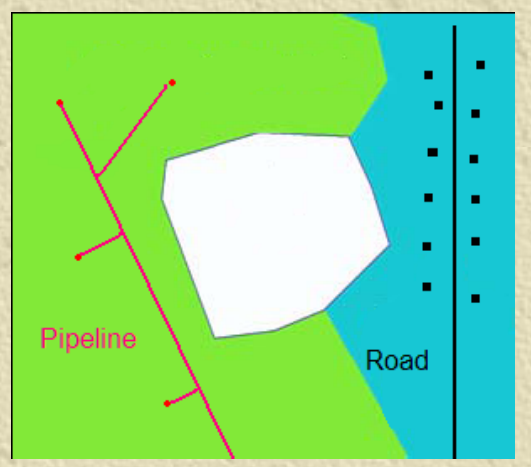

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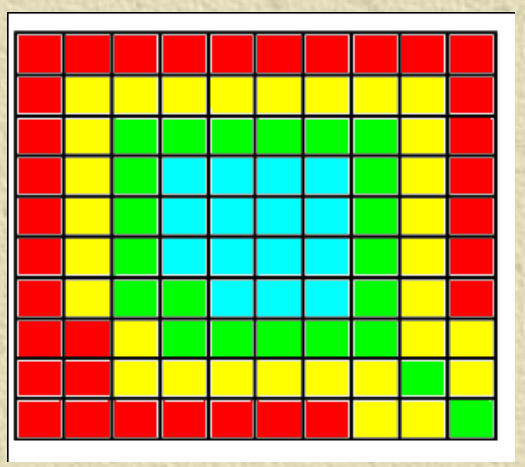

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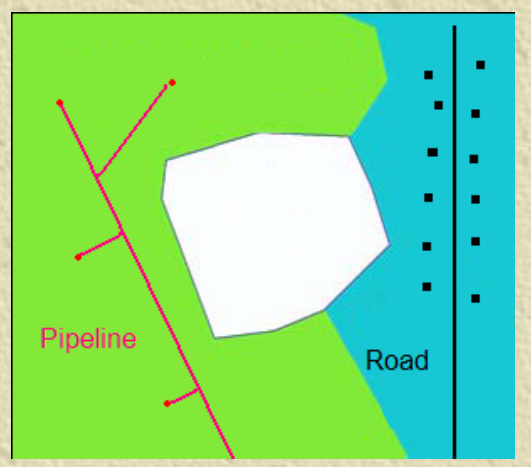

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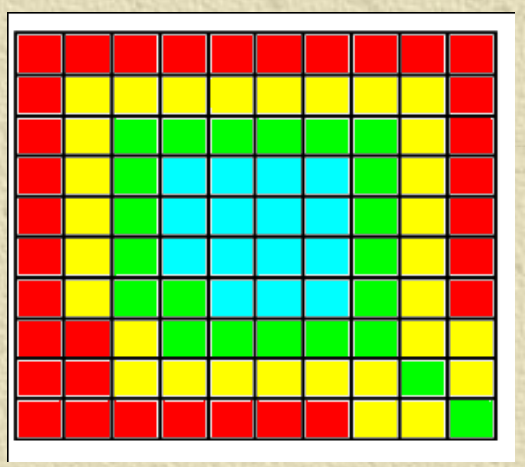

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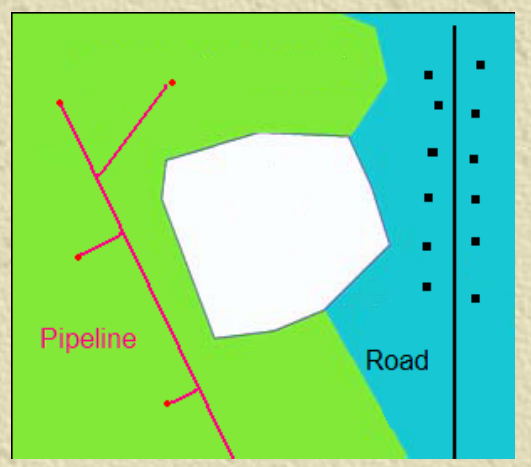

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Definitions (Continued)

Facility or Business Data

Data and attributes specific to the organization

vs.

Base Data

Generic data used for analysis, location or reference

One organization's Facility data is another's Base Data…

GIS Technician

Electric utility is in search of a GIS Technician to **maintain an accurate map** of our distribution system and **associated databases** in the current mapping software. The successful candidate will have knowledge of current digital mapping systems and techniques found in the Utility industry, particular **ESRI Arc GIS software,** AutoCAD 2000 **and Trimble GPS units**. An Associate degree in surveying, geology, or related field is preferred, but GIS certificates and/or the equivalent experience will be considered. Competitive salary and benefit package included. Interested candidates should send or email a resume a salary requirements, if any, by December 30, 2005 to: Director of Human Resources, Central Electric Cooperative, Inc., 716 Route 368, P O Box 329, Parker, PA 16049. Email: jmarron@central.coop An EOE

1. Project Plan

- What is the Strategic Purpose?

  What is the objective?
- What is your organization responsible for?
- What are its functions?
- What does the organization produce?

2. Resource Inventory

- Review existing data resources… Hardcopy/Digital, Tabular/Spatial
- Identify what features need to be GPSed
- Determine what attributes need to be collected for each feature

2. Needs Assessment

- Review existing processes …

  manual or automated
- Identify what processes could benefit from GPS data and GIS techniques
- Determine the priority for re-engineering the existing processes
- Create GPS process to collect data for GIS

1. Project Plan (revisited)

- Navigation w/ Realtime DGPS
- Digital Photos?
- Use base data?
  - Orthophotos
  - Raster quads
  - Vector

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Coast Guard Beacons

Space Based Systems-SBAS

WAAS

OmniStar
Landstar

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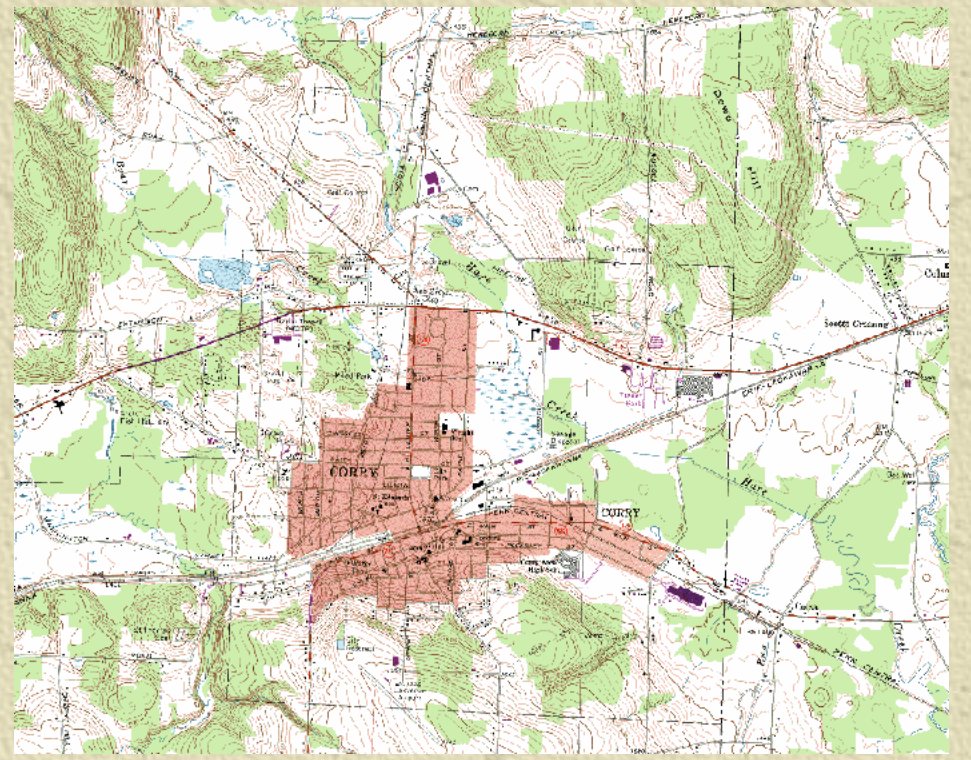

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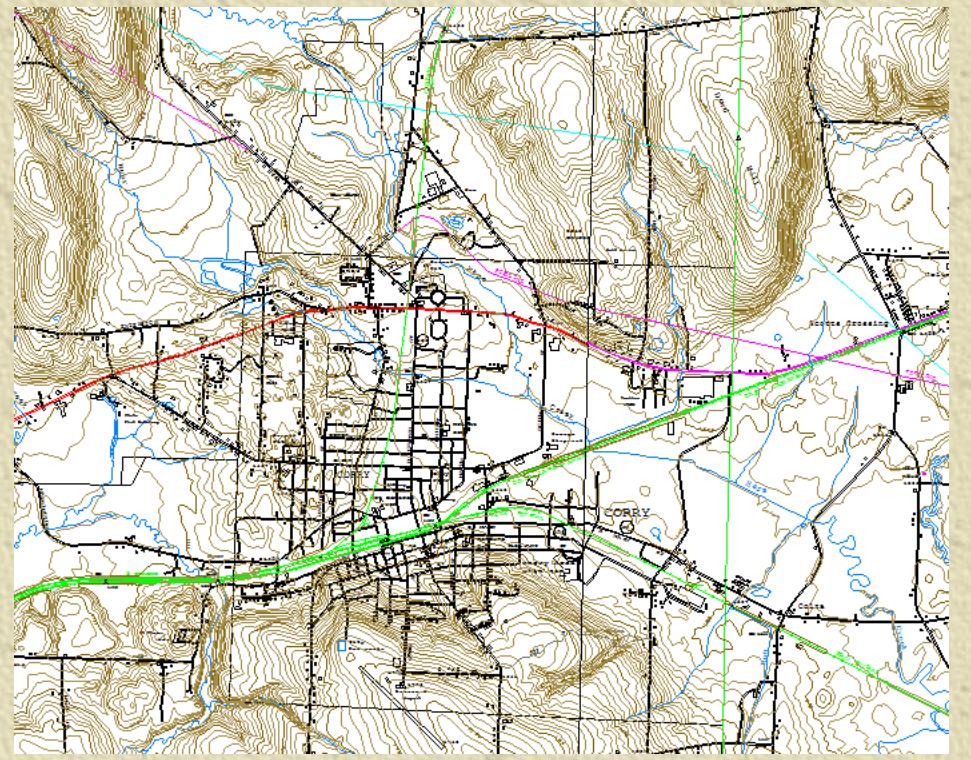

3. Scope

- Who
  - GIS / GPS Staff / Other Dept / Client
- What
  - Features GPSed, Attributes collected
  - Number and distribution of features
  - Locate new or Update existing digital data
  - Deliverables – data formatting, compilation

3. Scope (Continued)

- When
  - How much Time to complete project
- Where
  - Urban, Suburban, Rural, Remote
  - Located together or widely separated
- How
  - Data handling process, Tools…

3. Scope (Continued)

- Right tools for the right job

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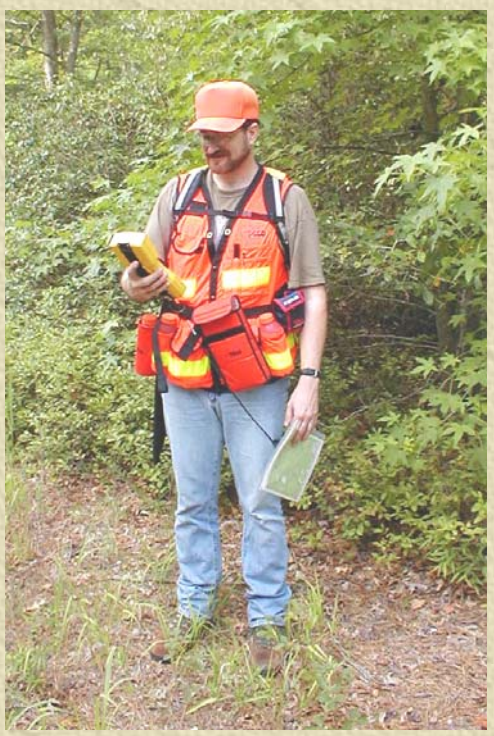
- Right tools for the right job



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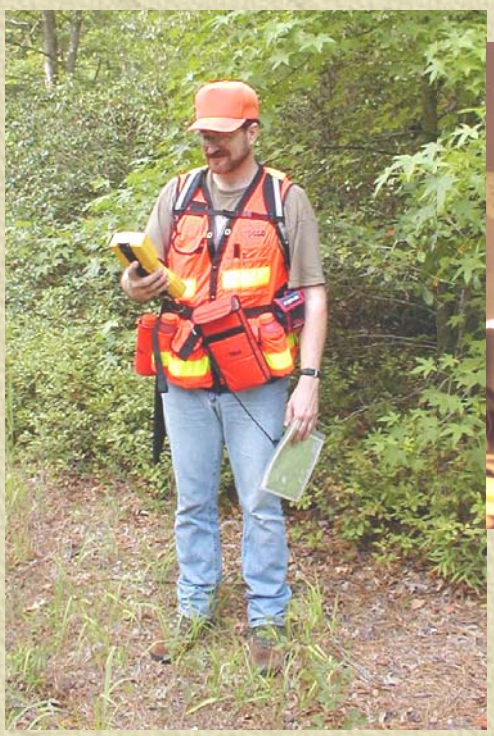

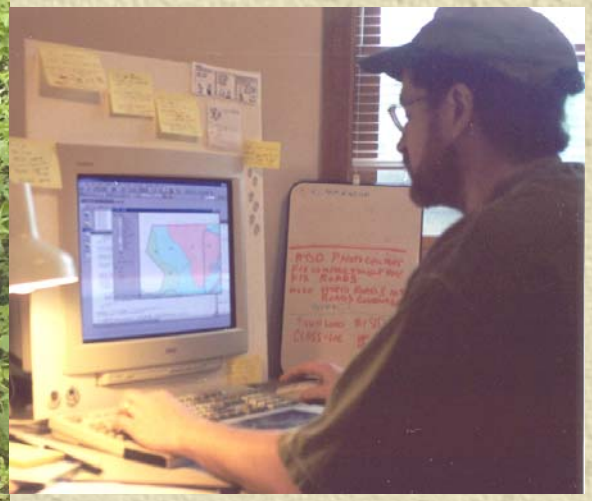

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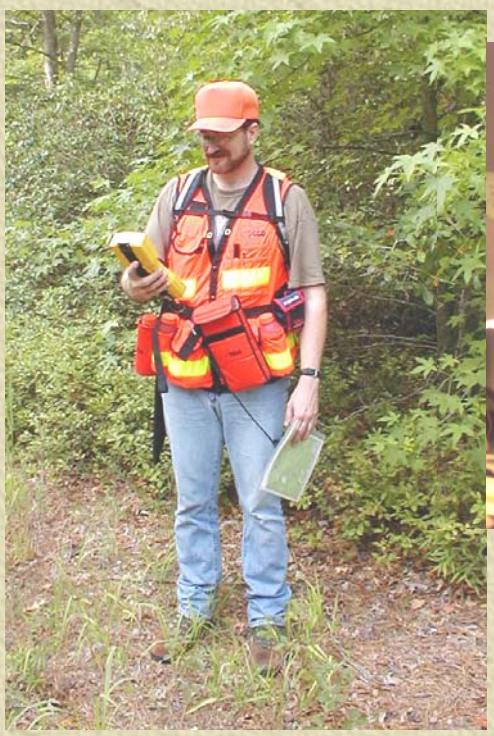
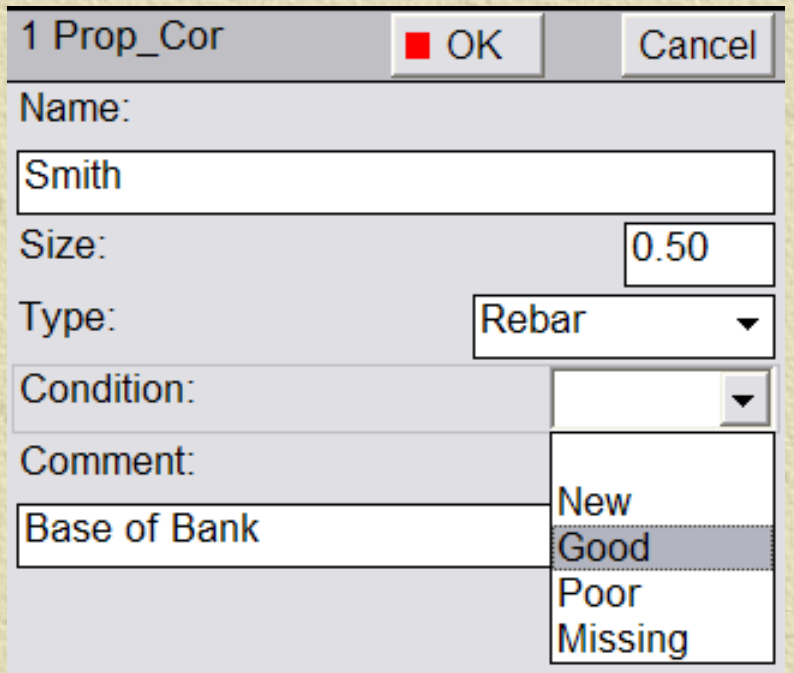


4. Data Dictionary

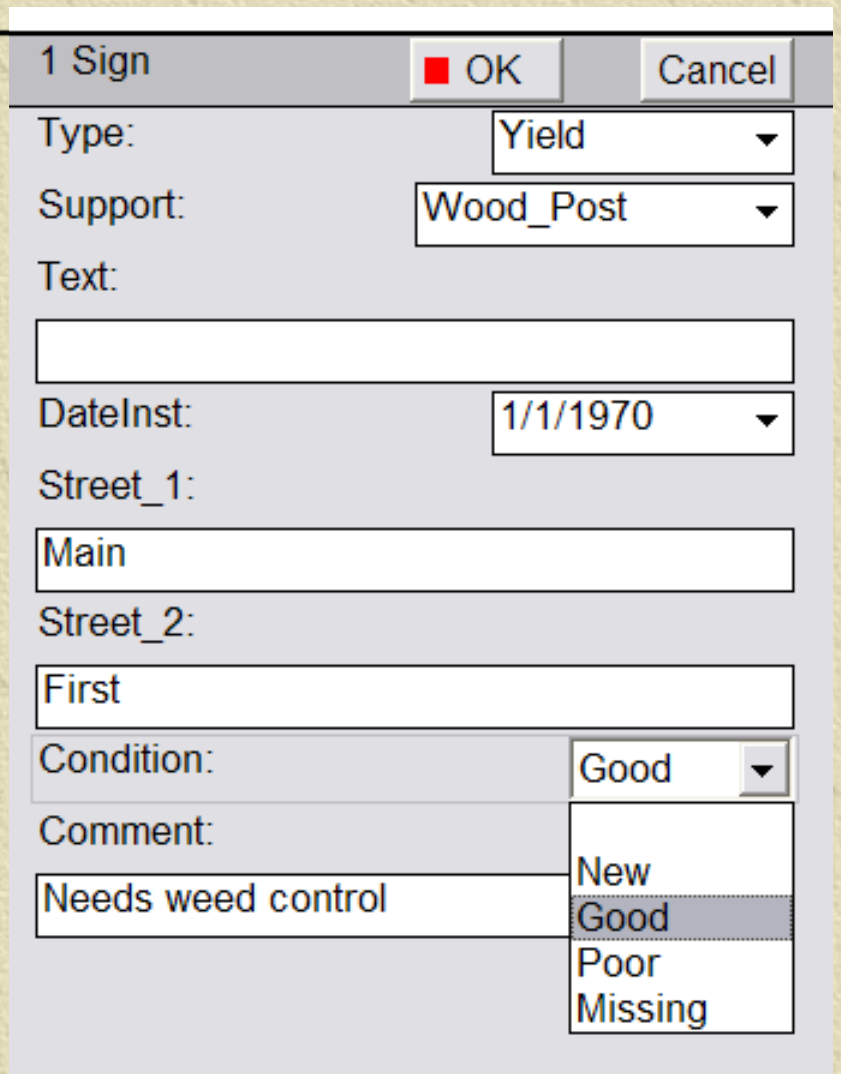
- Create DDF for each job type, but not too specific
  include common features for flexibility
- Consistent look
- Standard attribute names
  - Name
  - Number
  - Type
  - Condition
  - Comments



4. Data Dictionary (Continued)

- Menus
  - speed up data entry
  - help ensure quality
  - simplify training

Reduce the number of features with types



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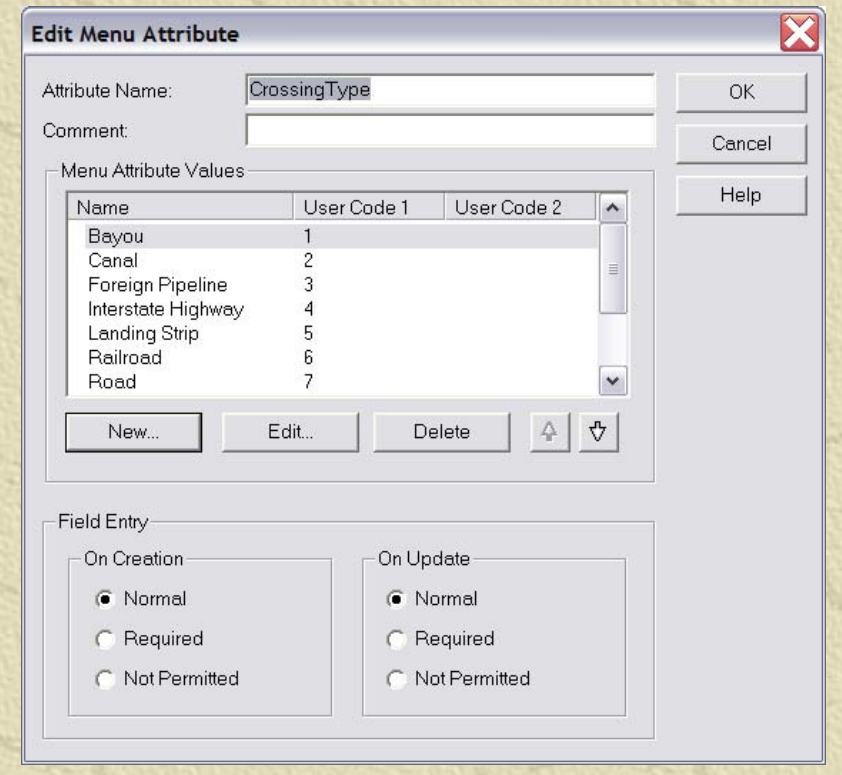
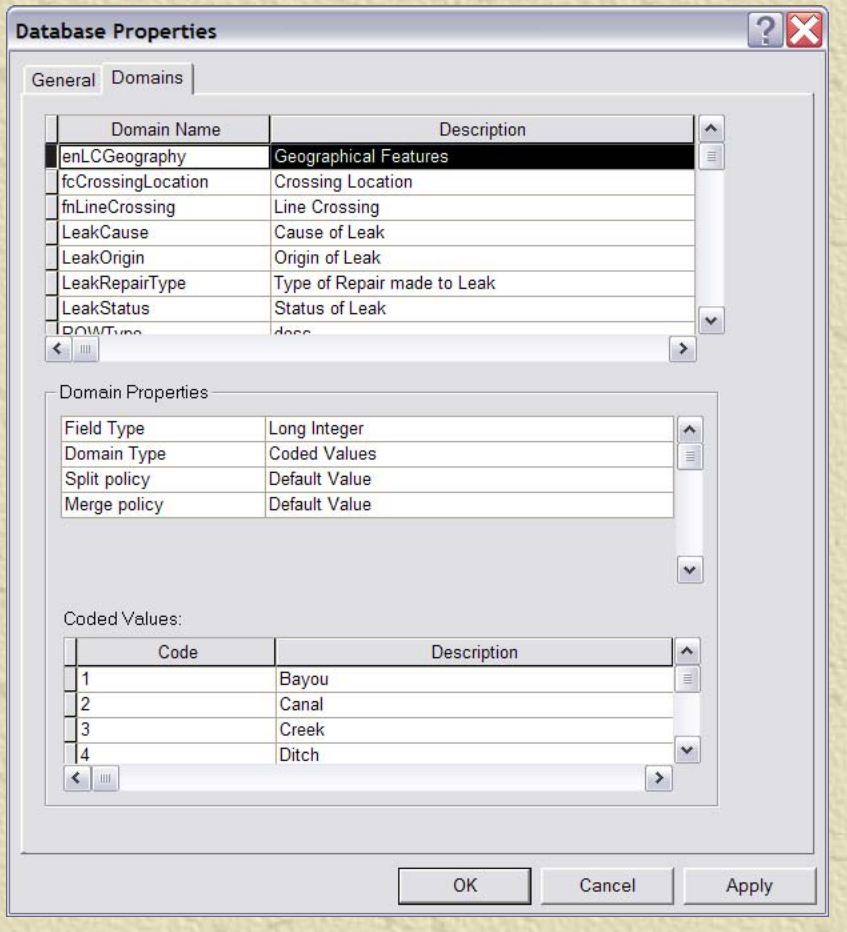
- Menus…





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- Sort features
  - alphabetical
  - feature type
  - functional groups
- Eliminates need for
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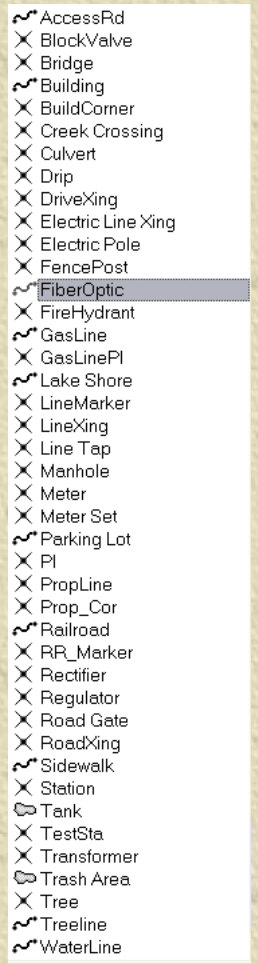

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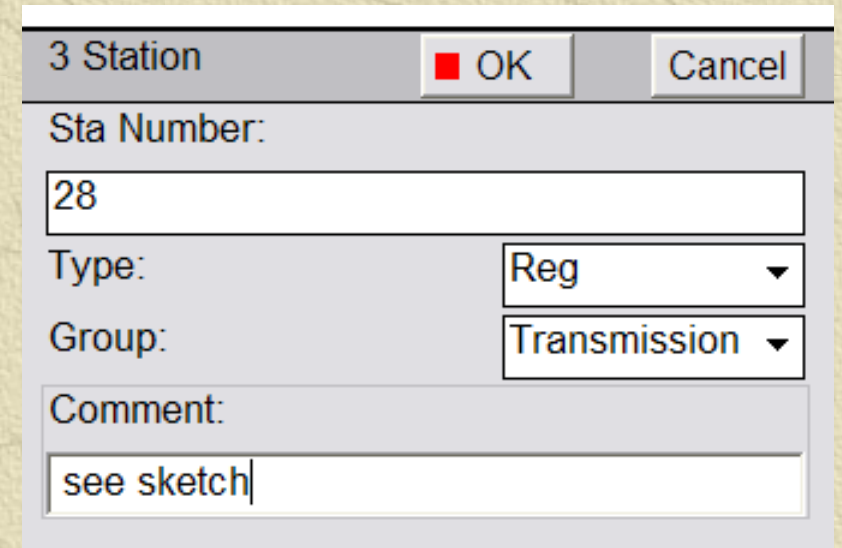

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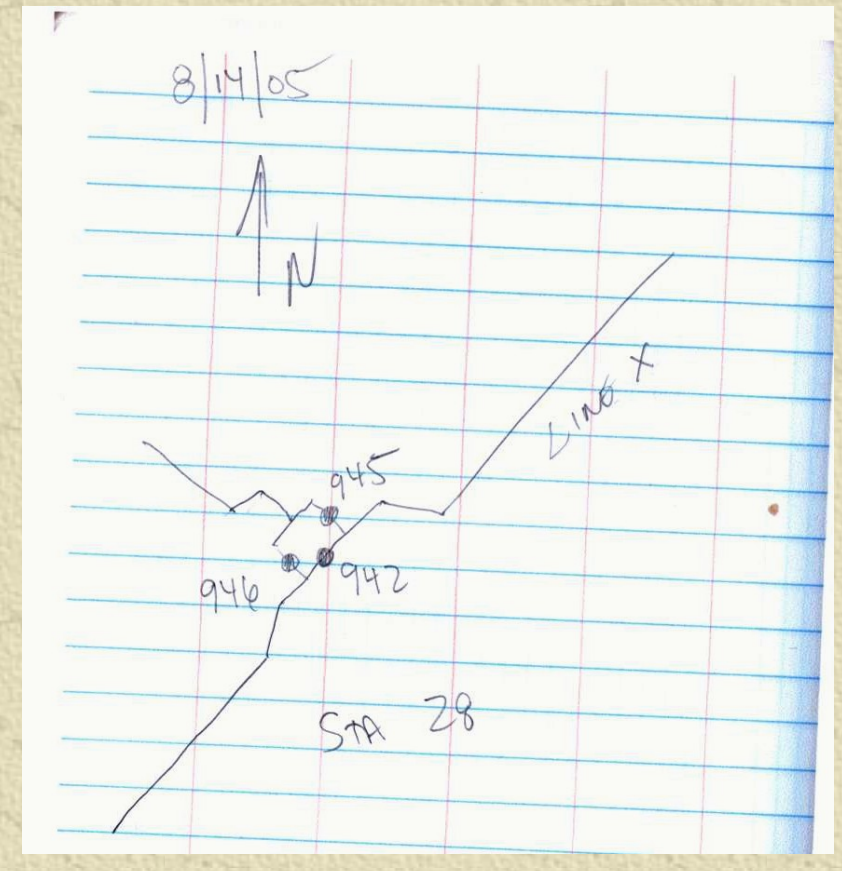

5. GPS Mission Planning (daily)

Identify time of low PDOP and high N-sat

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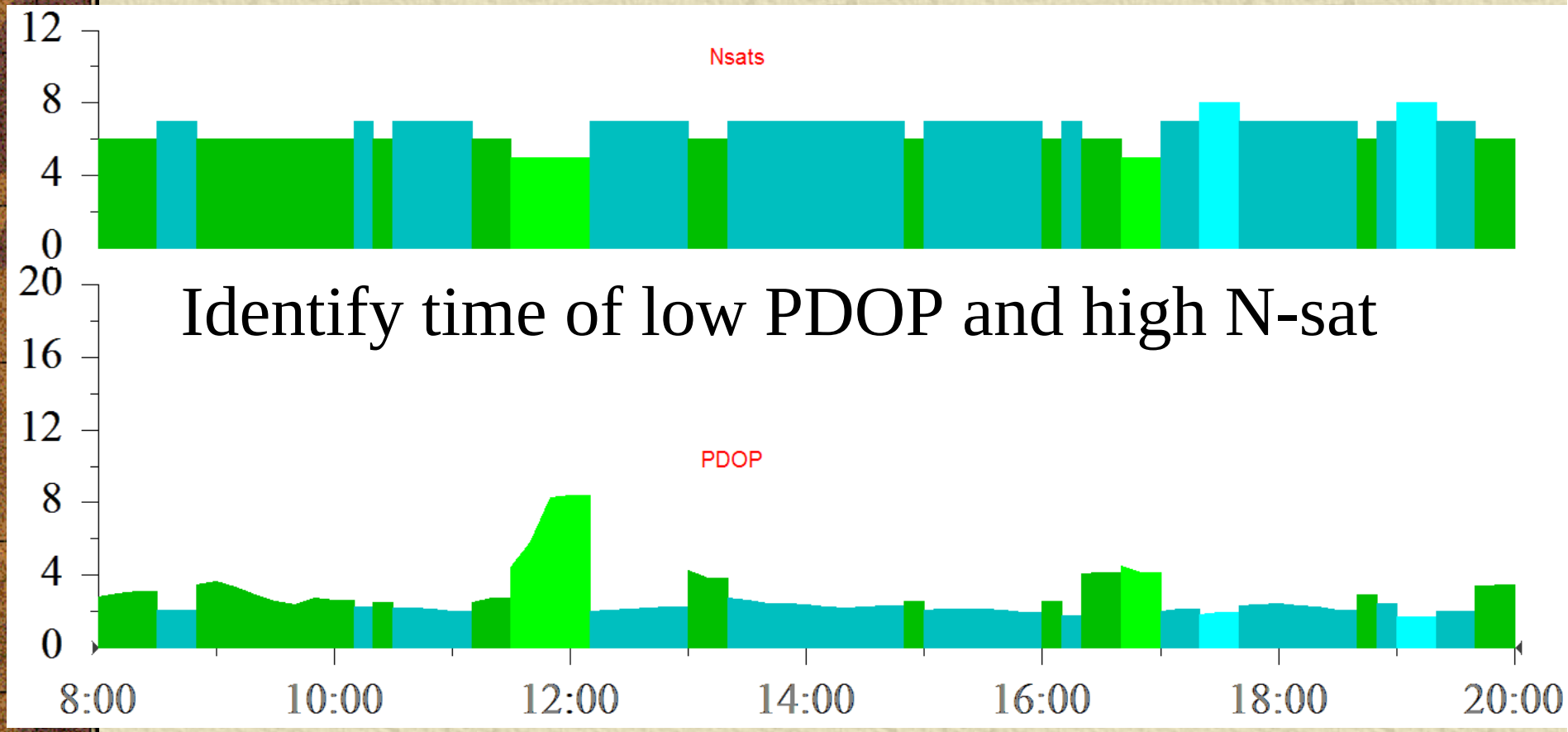

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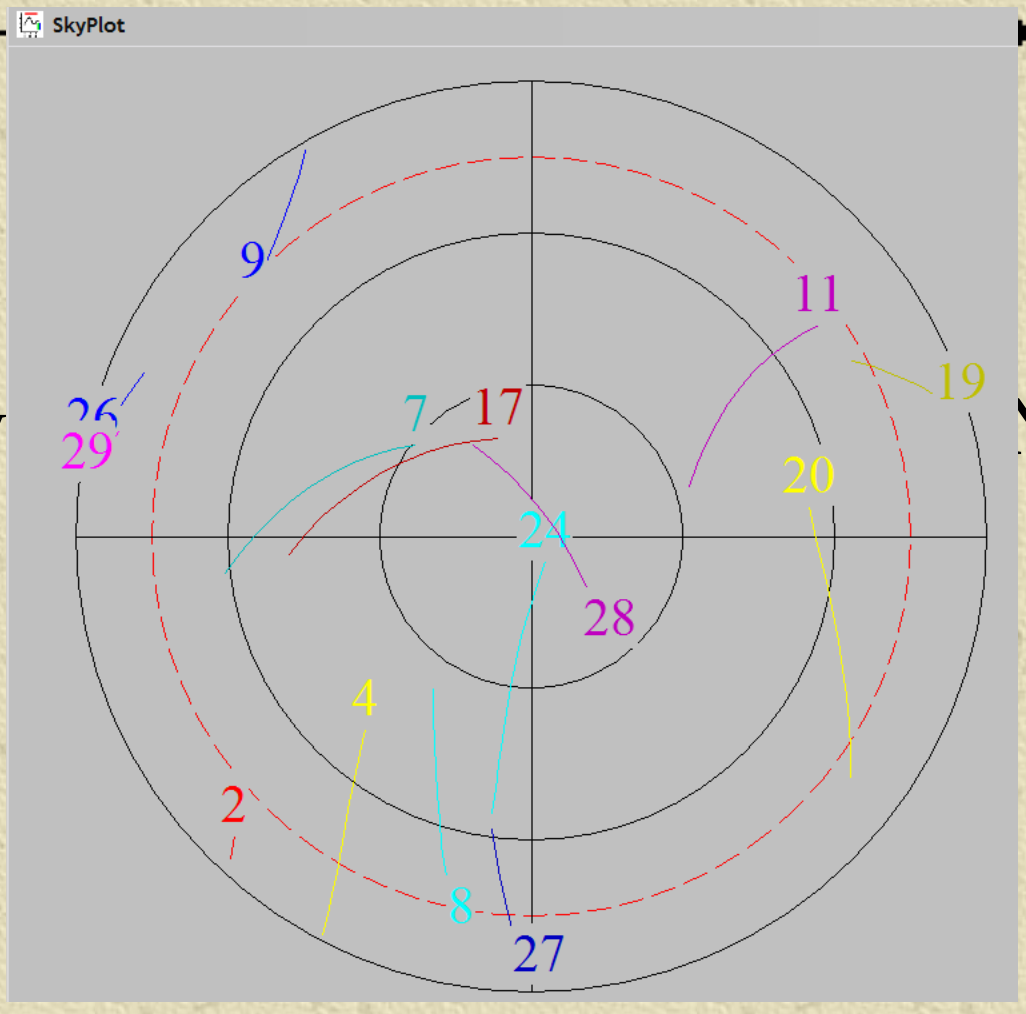
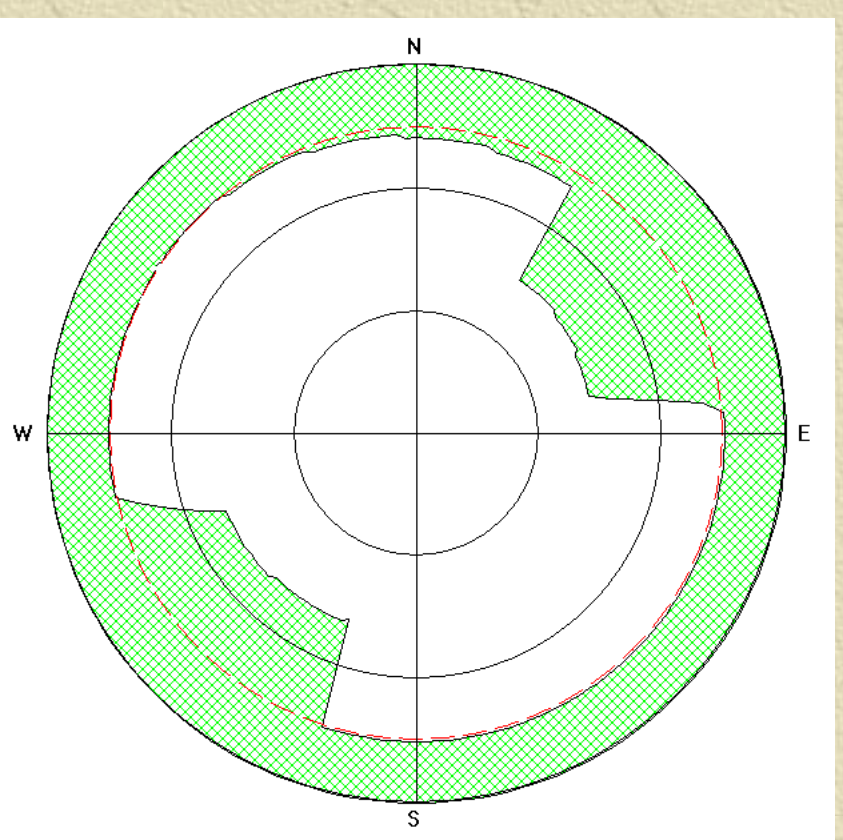
Identify



N-sat

5. Mission Planning (Continued)

- Horizon Mask
- Point Specific
- Obstruction diagram



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- Export data from GIS to use in GPS

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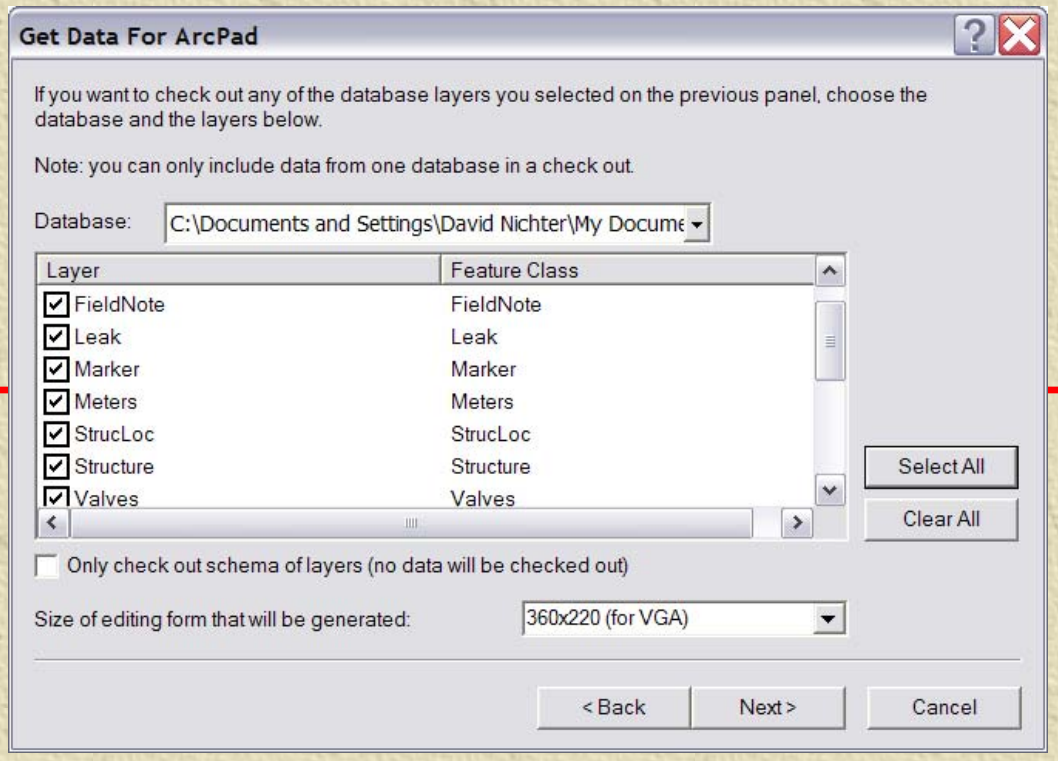

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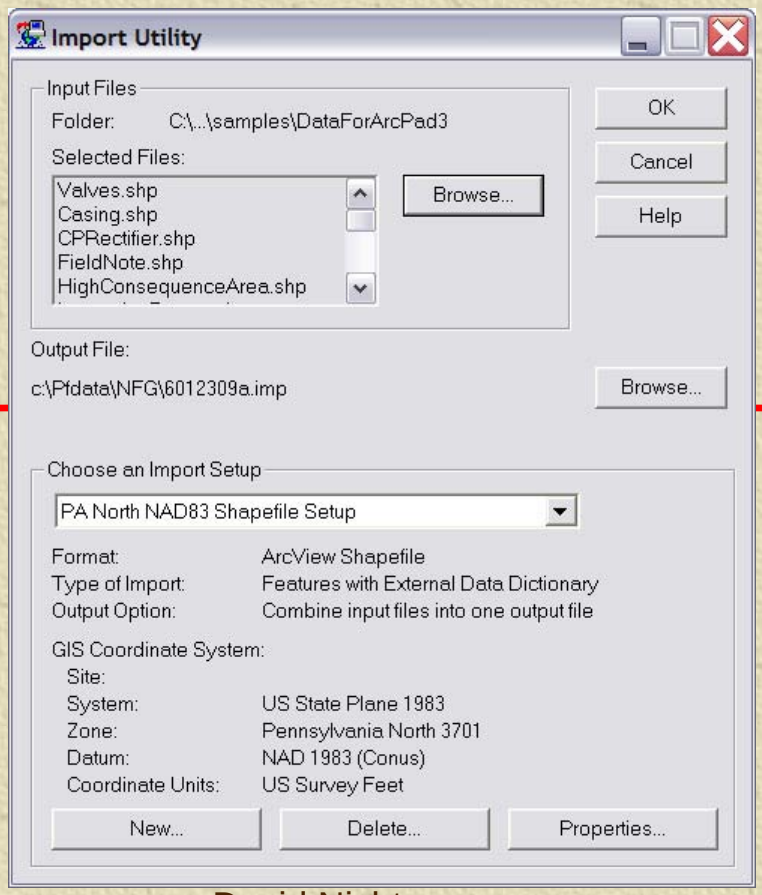

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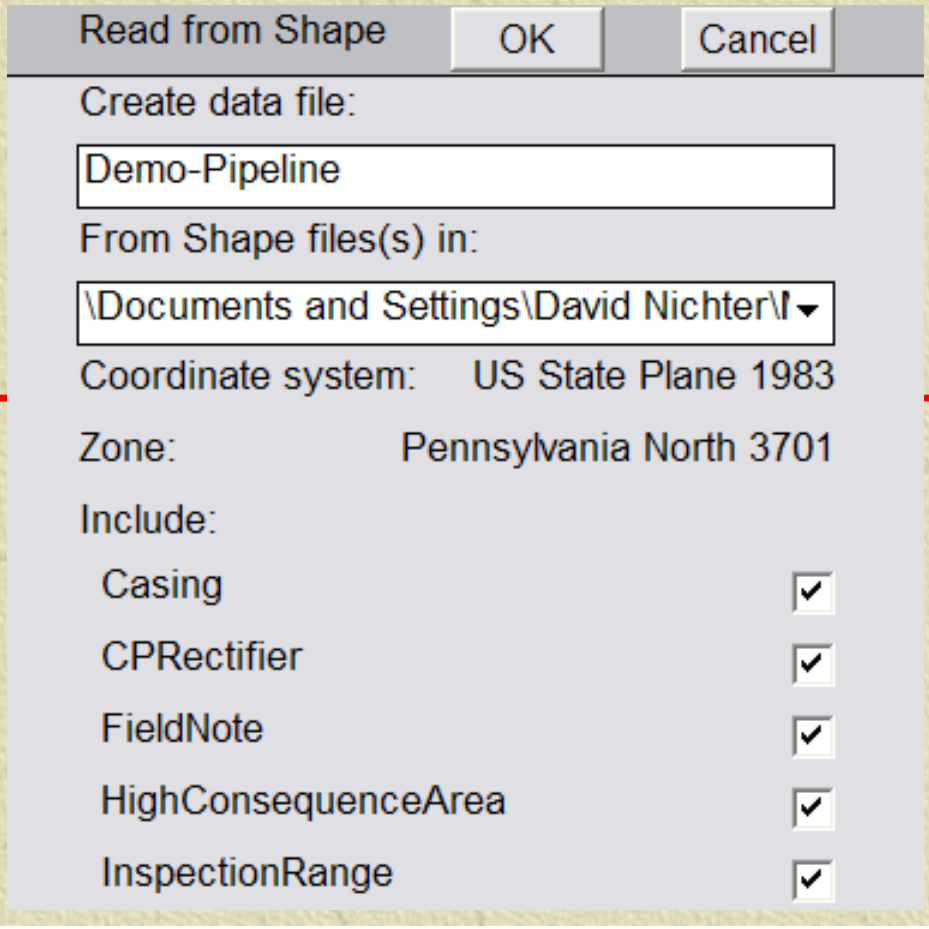

5. Mission Planning (Continued)

- Prepare hardcopy resources (lists, maps)

  Configure and load data in field Computer
- Prepare equipment

  functional and clean

  configuration, avail. memory

  batteries - receiver and field computer

6. Field work

- Go out and collect data under good conditions
  - satellite geometry
  - weather conditions
- Collect new features
  - work with staff of client or other staffers
  - work from hardcopy resources
- Navigate to and update existing features
  - Use the existing data as ‘starting point’

7. Data Download

- Return to office
- Connect up the field computer
  - Cable  
  - BlueTooth
  - Active Sync
  - Cell Phone
- Down load your field data

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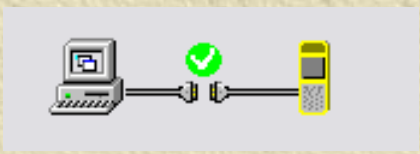
- Down load your field data 

8. QA/QC for Completeness

- Verify the data includes positions for all the features you intended to collect
- Check that features are generally where you expected
- Ensure you have no duplicate features
- Ensure all features are attributed properly

9. Differential Correction

- Download base data (base station or CORS)

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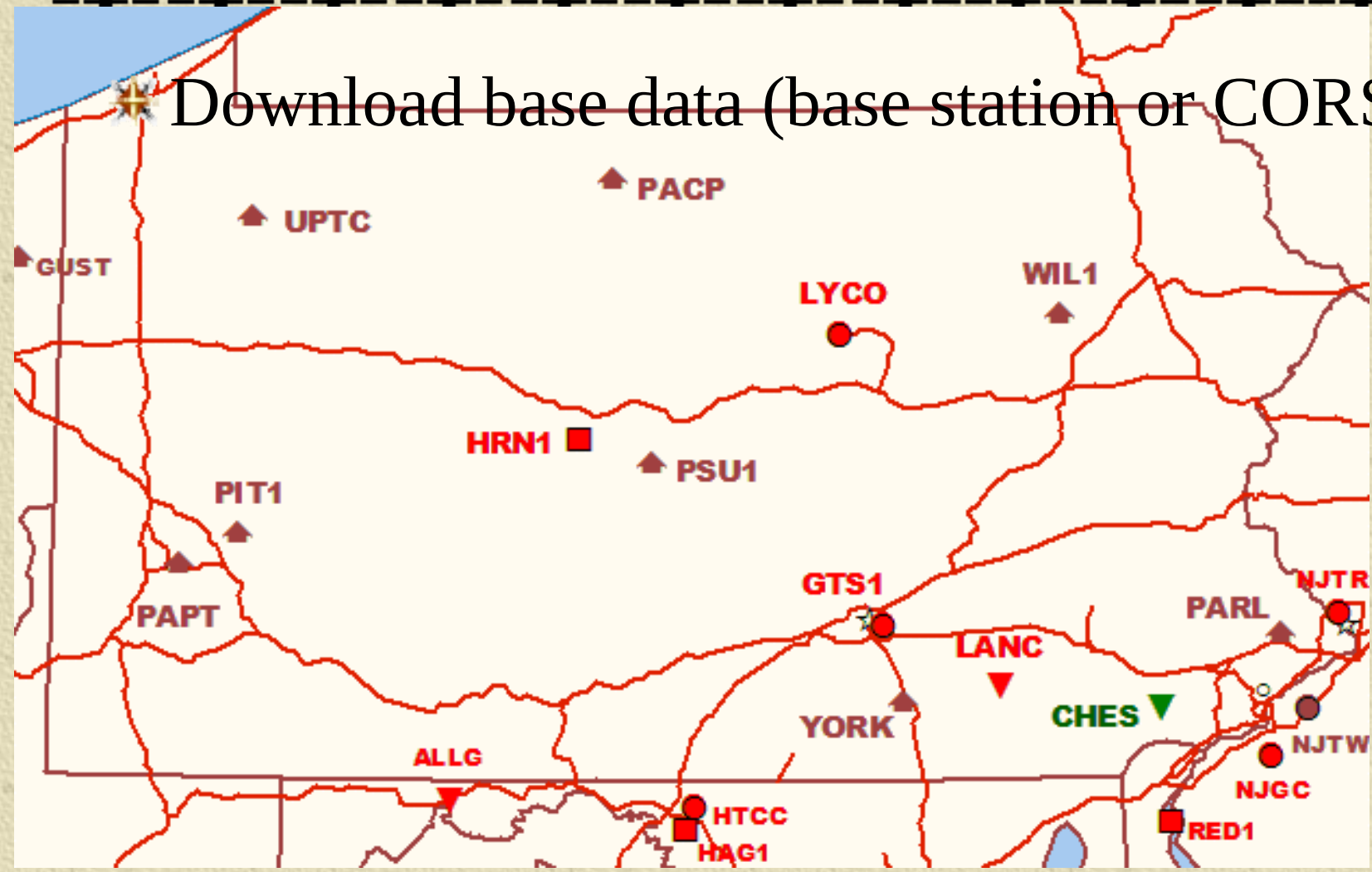

9. Differential Correction

- Download base data (base station or CORS)

- Perform differential correction of field data

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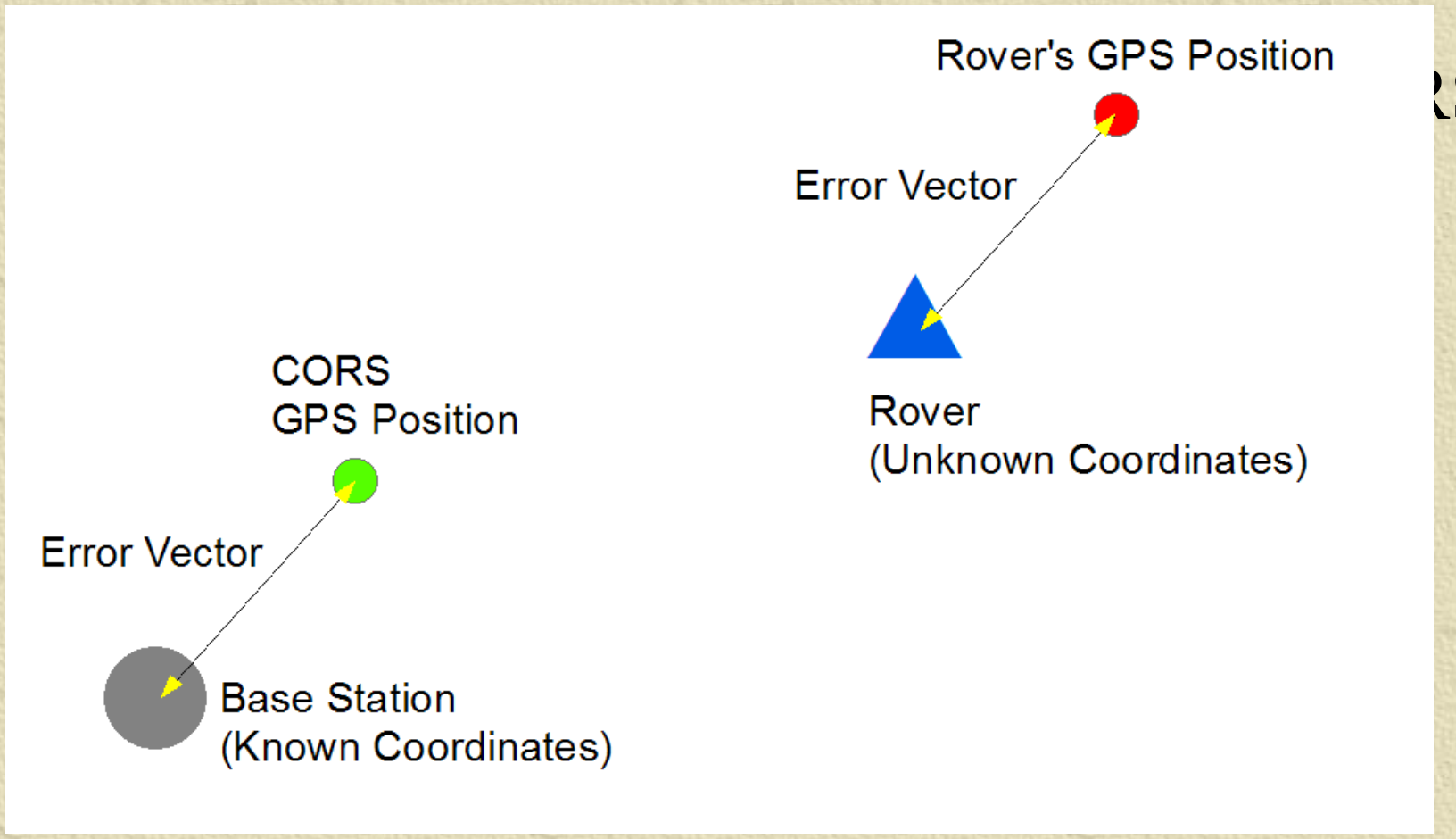

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- Download base data (base station or CORS)

- Perform differential correction of field data

- Did all positions get corrected?

9. Differential Correction

- Download base data (base station or CORS)

- Perform differential correction of field data

- Did all positions get corrected?
- Do all features have sufficient positions?

10. QA-QC Spatial Error

- Check spatial accuracy of corrected data

  RMS errors

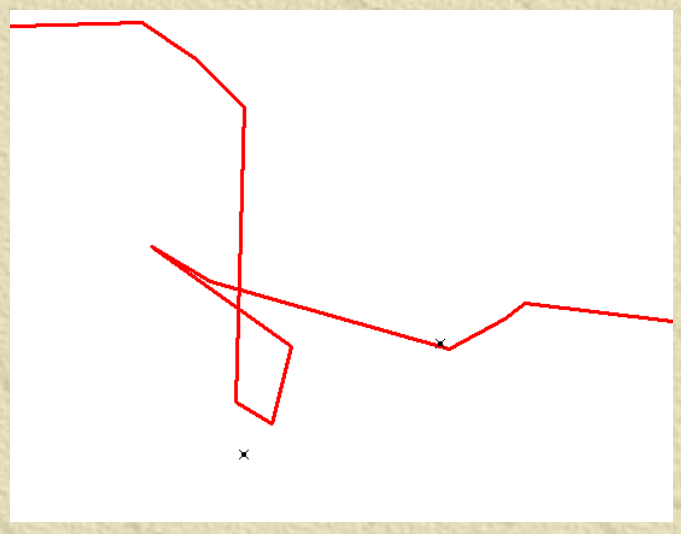
- Data clean up
  - Knots or "Bow-ties“
  - Jogs
  - Missed Vertices
  - Gaps in satellite coverage
  - Gaps in features

10. QA-QC Spatial Error

- Check spatial accuracy of corrected data

  RMS errors

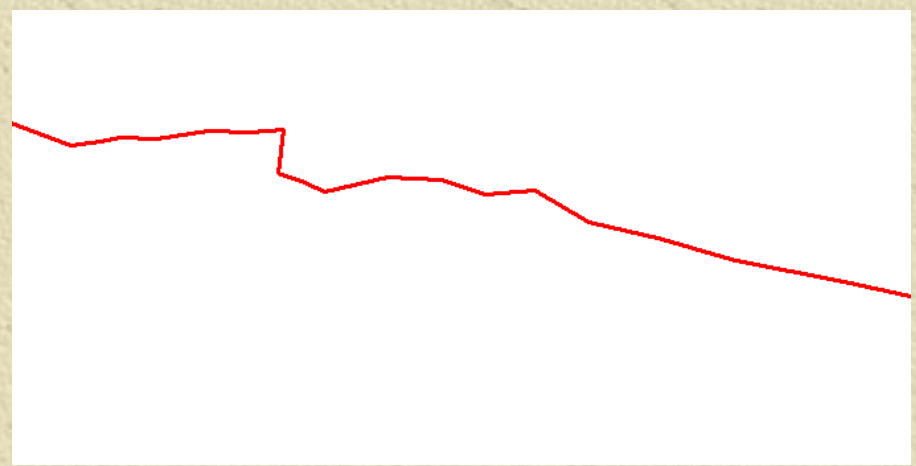
- Data clean up
  - Knots or "Bow-ties“
  - Jogs
  - Missed Vertices
  - Gaps in satellite coverage
  - Gaps in features



10. QA-QC Spatial Error

- Check spatial accuracy of corrected data

  RMS errors



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  - Knots or "Bow-ties“
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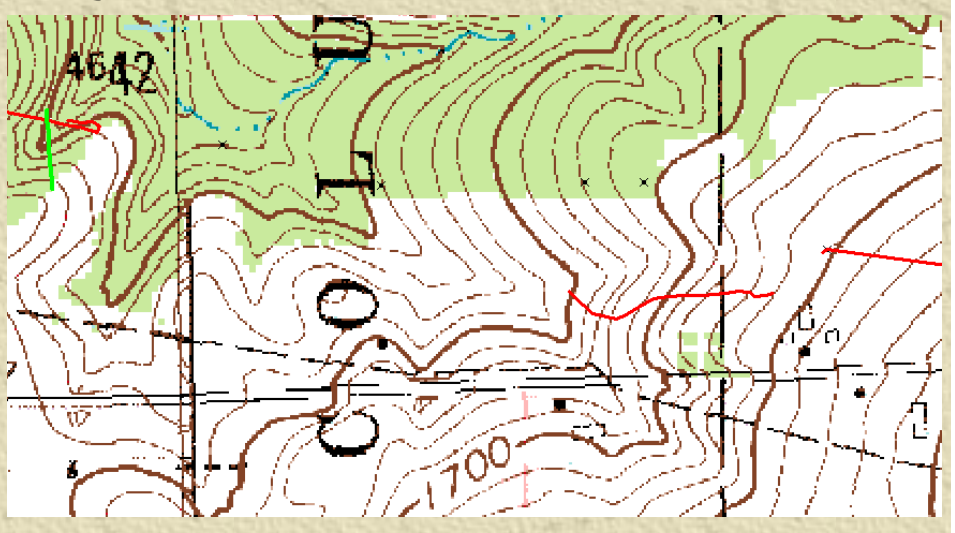
  RMS errors



- Data clean up
  - Knots or "Bow-ties“
  - Jogs
  - Missed Vertices
  - Gaps in satellite coverage
  - Gaps in features

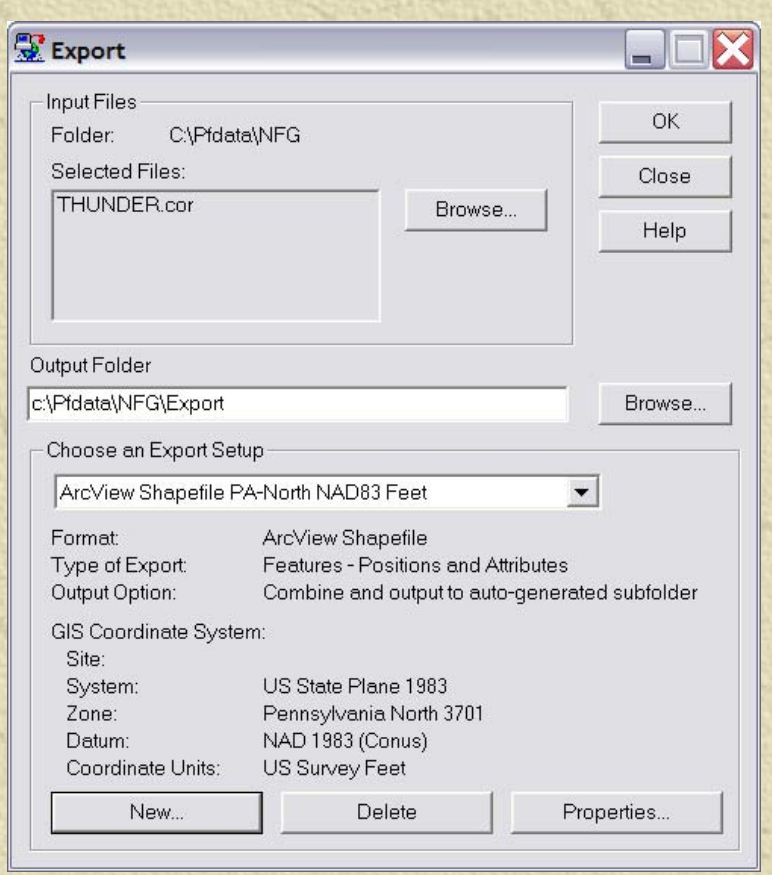
10. Quality (Continued)

- Did anything get missed?
- Were features collected in-accurately?

- Identify missing feature / attribute
- Identify source of error / omission
- Communicate with data collectors

11. Export to GIS

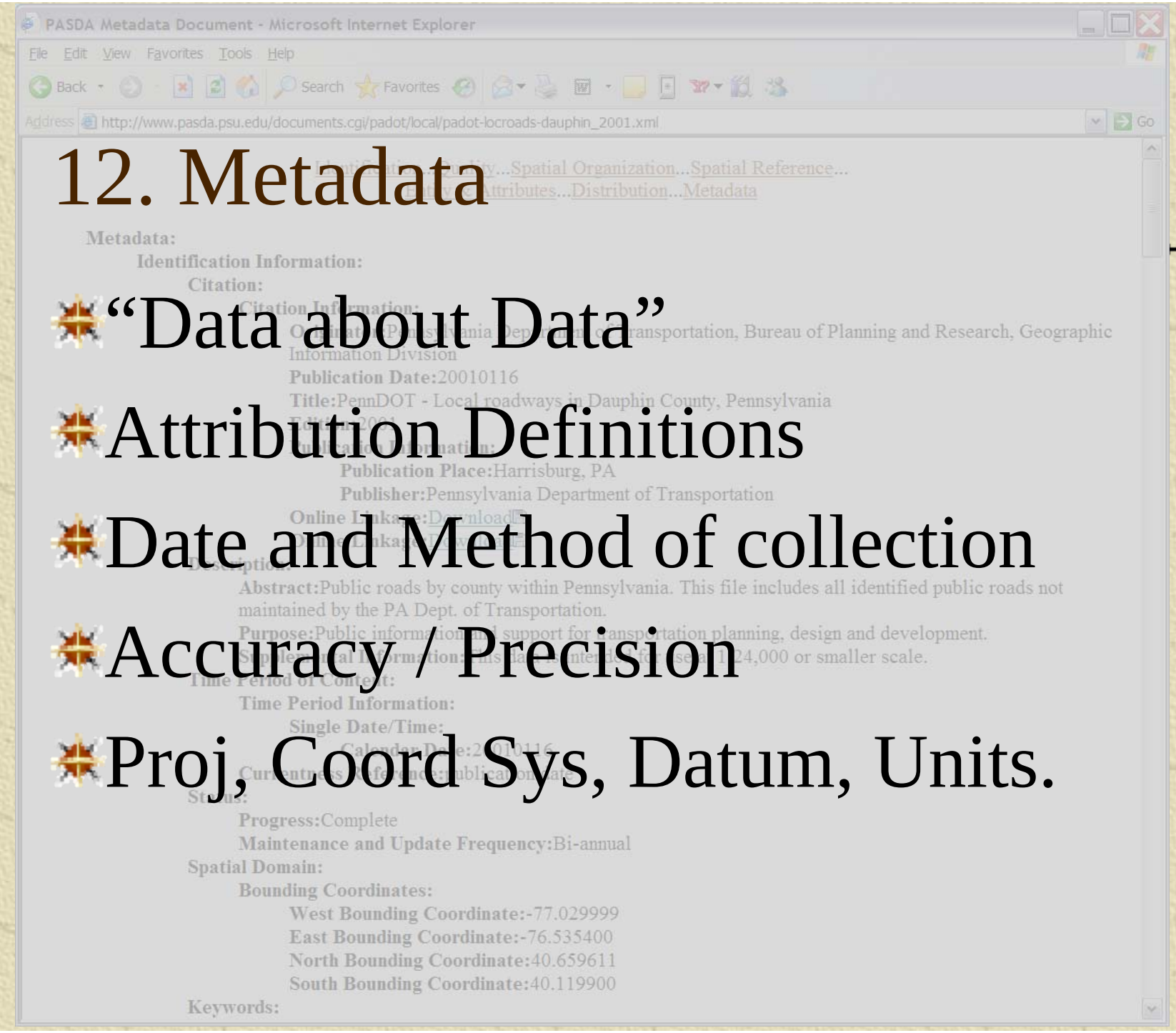
- Define export specs
- Format
- Attributes
- Update Status
- Spatial reference
  - Projection, Datum
  - Coordinate System
  - Units (on both tabs)



11. Export to GIS (Continued)

- Create Projection file (.prj)

PROJCS["NAD_1983_StatePlane_Pennsylvania_North_FIPS_3701_Feet"
,GEOGCS["GCS_North_American_1983",DATUM["D_North_American
_1983",SPHEROID["GRS_1980",6378137.0,298.257222101]],PRIMEM[
"Greenwich",0.0],UNIT["Degree",0.0174532925199433]],PROJECTION[
"Lambert_Conformal_Conic"],PARAMETER["False_Easting",1968500.0]
,PARAMETER["False_Northing",0.0],PARAMETER["Central_Meridian"
,-
77.75],PARAMETER["Standard_Parallel_1",40.8833333333333],PARA
METER["Standard_Parallel_2",41.95],PARAMETER["Latitude_Of_Origi
n",40.1666666666666],UNIT["Foot_US",0.3048006096012192]]

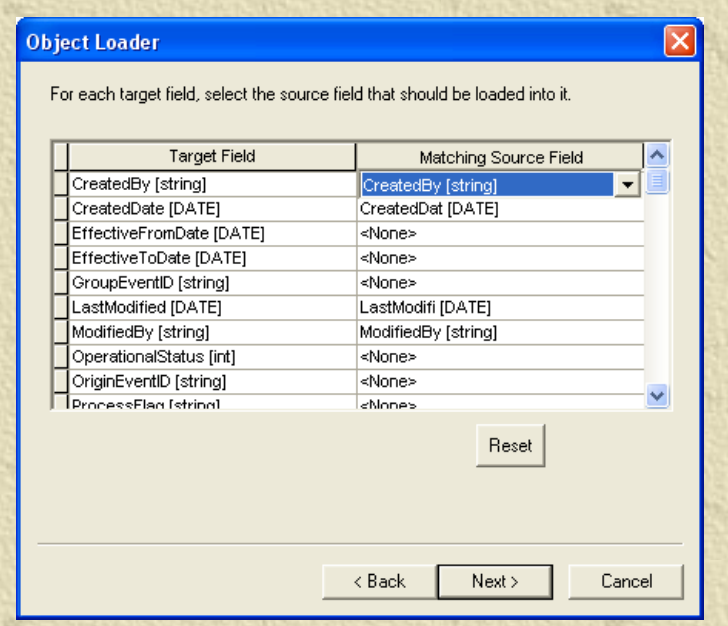


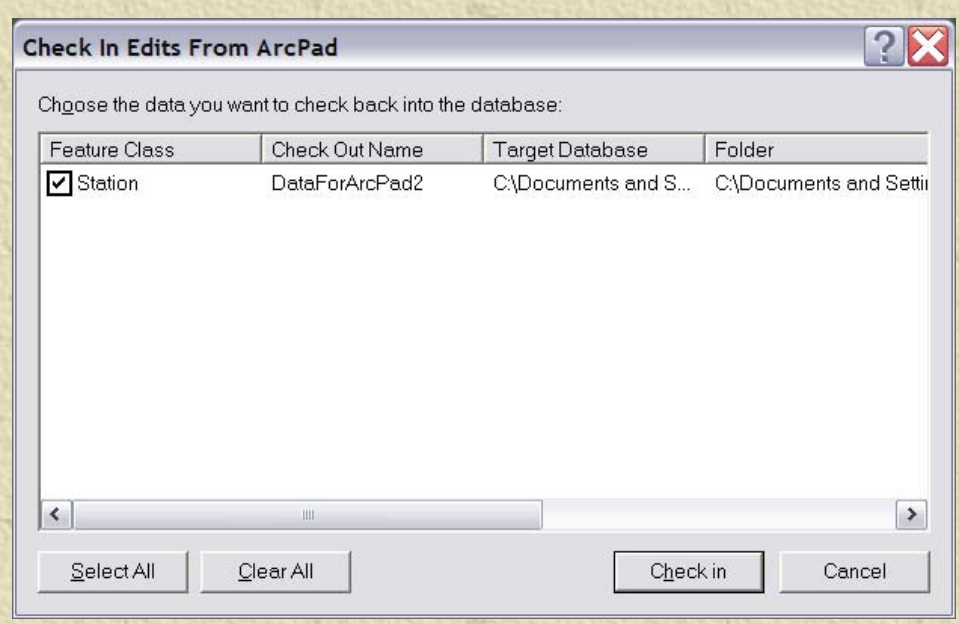
12. Metadata

- "Data about Data"
- Attribution Definitions
- Date and Method of collection
- Accuracy / Precision
- Proj, Coord Sys, Datum, Units.

13. Use the Data

- Load or Integrate GPS data with existing data

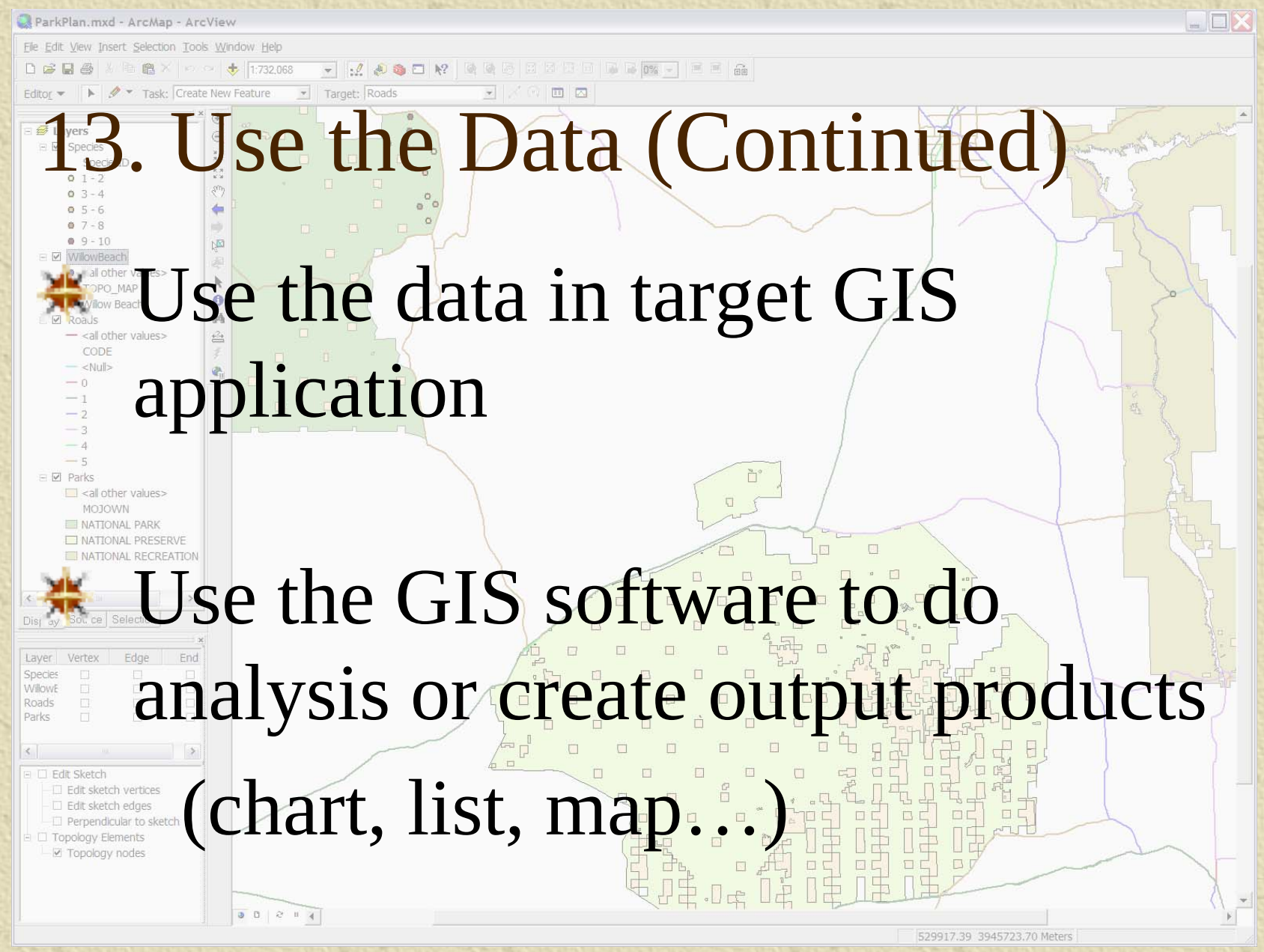




13. Use the Data (Continued)

- Use the data in target GIS application
- Use the GIS software to do analysis or create output products (chart, list, map…)

13. Use the Data (Continued)

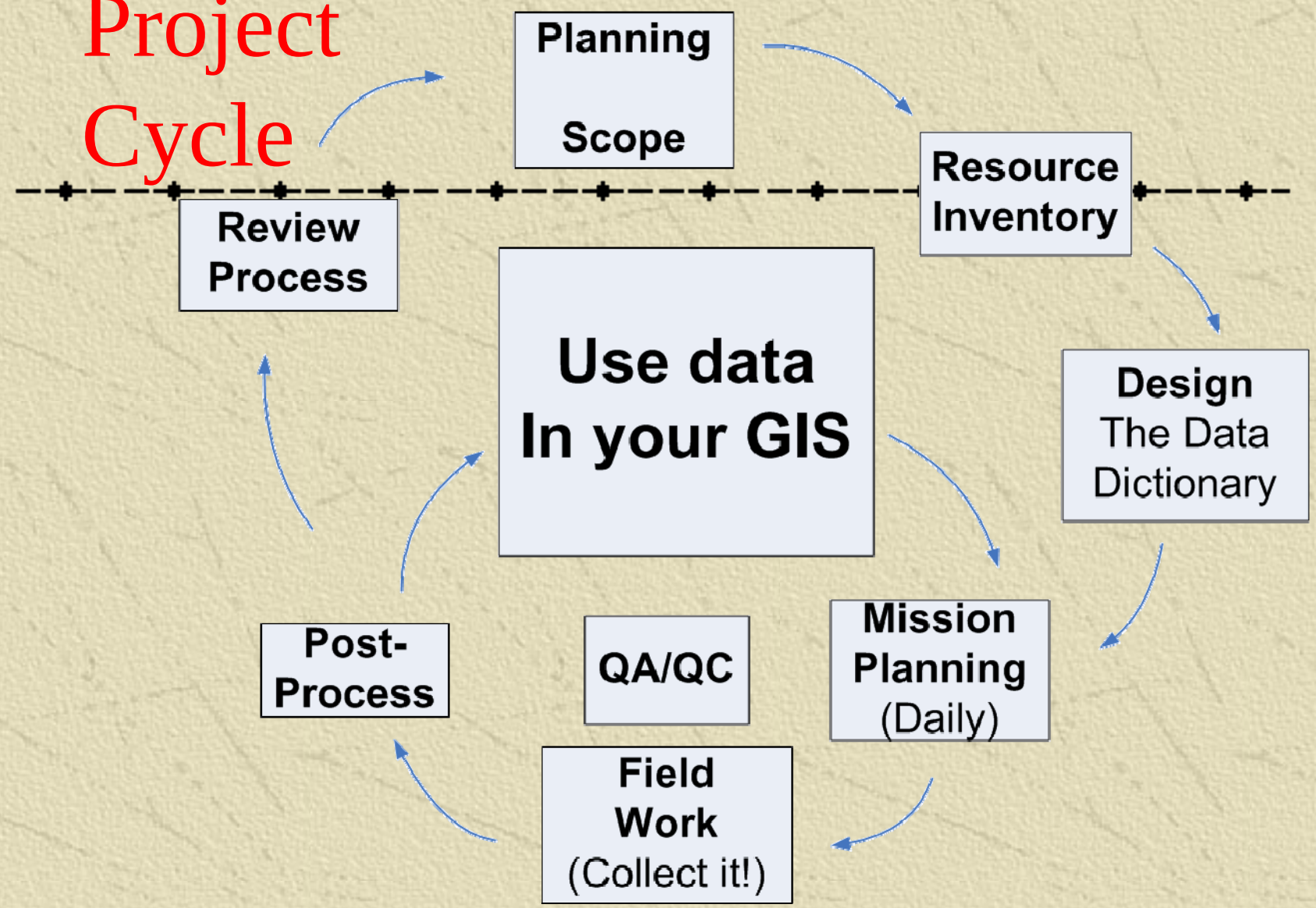


- Use the data in target GIS application
- Use the GIS software to do analysis or create output products (chart, list, map…)

14. Review Data and Process

- Learn from your GPS data to make you a better field collector in the future
- Do you need to change
  - process / methodology / training?
- This leads to a continuous cycle…

Project Cycle



Thanks for Attending

Questions / Comments ?

WWW Resources

- GPS
  - http://trimble.com/mgis.shtml
  - http://www.leica-geosystems.com
  - http://www.sokkia.com
  - http://ThalesNavigation.com/
  - http://www.TopConGPS.com
- GIS
  - http://www.esri.com
  - http://www.autodesk.com/gis
  - http://www.bentley.com/
  - http://www.mapinfo.com
  - http://www.intergraph.com/

WWW Resources (Data)

http://www.pasda.psu.edu/

http://www.dcnr.state.pa.us/topogeo

http://www.nysgis.state.ny.us/

http://cugir.mannlib.cornell.edu/

http://erie-gis.co.erie.ny.us/website/erie_help/

http://www.erie.gov/maps/

http://www.maptech.com/

http://www.ngs.noaa.gov/

http://seamless.usgs.gov/

http://er.usgs.gov

WWW Resources (Community)

http://www.GISuser.com/

http://www.GeoPlace.com

http://www.GisCafe.com

http://www.PAmagic.org/

http://www.GisDevelopment.net

http://www.DirectionsMag.com

http://www.GeoCaching.com

WWW Resources (Careers)

http://careers.geocomm.com/

http://www.gisjobs.com/

http://www.gjc.org

http://www.GeoJobSource.com/

http://www.GisPortal.com/gis3d.thm

http://www.GisLounge.com

Bio

Mr. Nichter has worked with GPS and GIS Technology for over 9 years. In that time he has worked on a variety of GIS projects for public utilities, municipalities, timber management and engineering firms. These projects include: GIS parcel mapping for Right of way, vegetation mapping along electrical transmission lines, GPS mapping of natural gas transmission lines and forestry management GIS development. His areas of responsibility have included: field data collection, data editing, feature digitizing, database and application design, GIS analysis, data QA/QC, GIS consulting and client training.

He graduated with a Bachelor's degree in Forest Biology and Resource Management from State University of New York - College of Environmental Science and Forestry in Syracuse, NY. While at ESF he studied raster and vector GIS techniques as well as field survey and GPS for data collection. He is a veteran of the US Army. Mr. Nichter has 9 years of experience with a number of firms involving GPS data collection, GIS analysis and mapping, CADD mapping and field surveying.