

7. Vector Approach



CNSI and its subcontractors adopted a vector approach for its GIS-based site selection process. When the process began in 1990, far less geographic data was available in digital form than it is today. Most of the necessary data was available only as paper maps, which had to be converted to digital form. In one of its interim reports, CNSI described two digitizing procedures used, "digitizing" and "scanning." Here's how it described "digitizing:"

In the digitizing process, a GIS operator uses a hand-held device, known as a cursor, to trace the boundaries of selected disqualifying features while the source map is attached to a digitizing table. The digitizing table contains a fine grid of sensitive wire imbedded within the table top. This grid allows the attached computer to detect the position of the cursor so that the system can build an electronic map during the tracing. In this project, source maps and GIS-produced maps were compared to ensure that the information was transferred accurately. (Chem Nuclear Systems, 1993, p. 8).

One aspect overlooked in the CNSI description is that operators must encode the attributes of features as well as their locations. Some of you know all too well that tablet digitizing (illustrated at left in Figure 9.8.1, below) is an extraordinarily tedious task, so onerous that even student interns resent it. One wag here at Penn State suggested that the acronym "GIS" actually stands for "Getting it (the data) In Stinks." You can substitute your own "S" word if you wish.

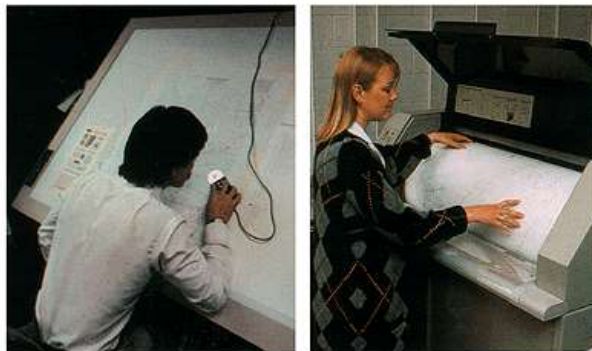


Figure 9.8.1 Vector digitizing with a tablet (left); raster digitizing with a drum scanner (right).

Credit: USGS

Compared to the drudgery of tablet digitizing, electronically scanning paper maps seems simple and efficient. Here's how CNSI describes it:

The Nature of Geographic Information

Chapters

- ▶ Chapter 1: Data and Information
- ▶ Chapter 2: Scales and Transformations
- ▶ Chapter 3: Census Data and Thematic Maps
- ▶ Chapter 4: TIGER, Topology and Geocoding
- ▶ Chapter 5: Land Surveying and GPS
- ▶ Chapter 6: National Spatial Data Infrastructure I
- ▶ Chapter 7: National Spatial Data Infrastructure II
- ▶ Chapter 8: Remotely Sensed Image Data
- ▼ Chapter 9: Integrating Geographic Data
 - 1. Overview
 - 2. Context
 - 3. Low Level Radioactive Waste
 - 4. Siting LLRW Storage Facilities
 - 5. Map Overlay Concept
 - 6. Pennsylvania Case Study
 - **7. Vector Approach**
 - 8. Stage One: Statewide Screening

The scanning process is more automated than the digitizing process. Scanning is similar to photocopying, but instead of making a paper copy, the scanning device creates an electronic copy of the source map and stores the information in a computer record. This computer record contains a complete electronic picture (image) of the map and includes shading, symbols, boundary lines, and text. A GIS operator can select the appropriate feature boundaries from such a record. Scanning is useful when maps have very complex boundaries lines that can not be easily traced. (Chem Nuclear Systems, Inc., 1993, p. 8)

I hope you noticed that CNSI's description glosses over the distinction between raster and vector data. If scanning is really as easy as they suggest, why would anyone ever tablet-digitize anything? In fact, it is not quite so simple to "select the appropriate feature boundaries" from a raster file, which is analogous to a remotely sensed image. The scanned maps had to be transformed from pixels to vector features using a semi-automated procedure called **raster to vector conversion**, otherwise known as "vectorization." Time-consuming manual editing is required to eliminate unwanted features (like vectorized text), correct digital features that were erroneously attached or combined, and to identify the features by encoding their attributes in a database.

In either the vector or raster case, if the coordinate system, projection, and datums of the original paper map were not well defined, the content of the map first had to be redrawn, by hand, onto another map whose characteristics are known.

- 9. Stage Two: Regional Screening
- 10. Stage Three: Local Disqualification
- 11. Buffering
- 12. New York Case Study
- 13. Outcomes
- 14. Conclusion
- 15. Bibliography

Navigation

- [login](#)
- [Search](#)

[◀ 6. Pennsylvania Case Study](#)

[up](#)

[8. Stage One: Statewide Screening ▶](#)

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- [Resources](#)
- [Services](#)
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