Lessons Learned as the Result of 30 Years of GIS Development

Dr. Allen M. Brackley, Research Scientist

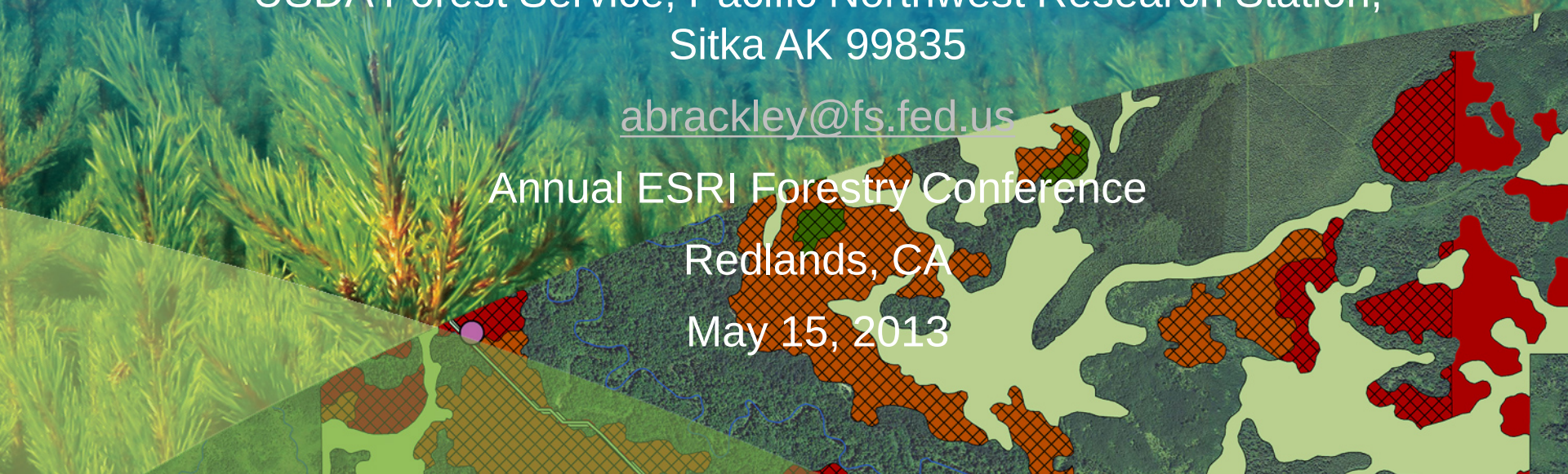
USDA Forest Service, Pacific Northwest Research Station, Sitka AK 99835

abrackley@fs.fed.us

Annual ESRI Forestry Conference

Redlands, CA

May 15, 2013



Enterprise Forest Management Systems

- Woods laborer and logger in family owned business
- BS in Forestry – MS Forest Products/Wood Technology
- 45 credit hours for PhD in Forest Business & Economics
- Land Agent responsible for all aspects (fiduciary and environmental) of operating 250,000 acres of forest land
- Registered Land Surveyor
- Registered Professional Forester
- Computer programming & database design
- Forest Inventory & Mapping Specialists
- Land & timber appraisal methods $$
- Experience with site selection and construction of facilities

Enterprise Forest Management Systems

My vision was not “GIS”, but rather “A comprehensive forest management and land information system for the planning and control of forestry operations!”

And yes, the data were spatially referenced!

Enterprise Forest Management Systems

My objective today:

Provide some guidelines to allow you to evaluate the quality of a spatial data system.

Enterprise Forest Management Systems

Back to 1983! Limited standards for development of spatially referenced data systems? The concept of a relational databases was new!

An early lesson learned. Use a broad definition of data! All of the classic forestry attributes are data, as well as the codes that define line widths, colours and patterns.

Enterprise Forest Management Systems

Back to 1983! No standards for development of spatially referenced data systems? The concept of a relational databases was new!

One source of ideas and rules about the new technology was work of E.F. Codd, the originator of the commandment-like “Codd’s Rules”

Enterprise Forest Management Systems

An example of a Codd rule: “All information in the database should be represented in one and only one way – as table values”

In the world of spatial data some tables contain strings of coordinate values.

Enterprise Forest Management Systems

Codd created rules relative to:

1. Physical Data Independence
2. Logical Data Independence

A derived rule: There must be independence of data and process. Changes to the data must not impair the programmed process.

Enterprise Forest Management Systems

If changes to data in your system make it necessary to reprogram you have violated the Codd rules relative to data independence!

Enterprise Forest Management Systems

Codd: The database description is represented at the logical level in the same way as ordinary data, so authorized users can apply the same relational language to interrogation as they apply to the data.

Extensions from experience: Any code that exists in a table must be defined in the data dictionary. All codes in a table must be entered from the data dictionary!

Enterprise Forest Management Systems

Data Dictionaries – A powerful tool.

The kiss of death – Free format data entry systems!

In a computer “y” is not the same as “Y” nor is “n” = “N” unless a table of synonyms equates the two values!

Enterprise Forest Management Systems

What about rules for graphic components?

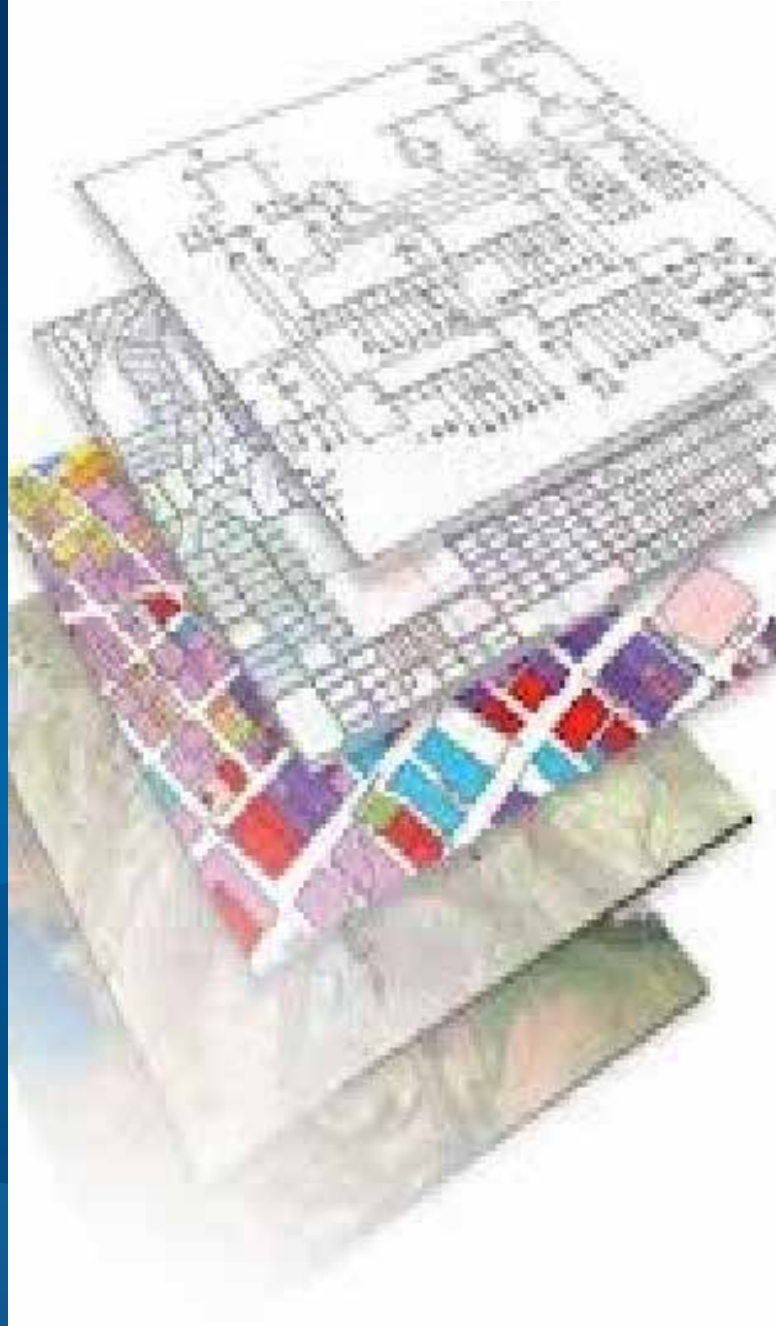
Codd addressed database issues.

Special rules must be applied to the graphic components.

Most of the graphic base rules are learned “The Hard Way!

Some comments about the graphic component

Dr. Allen M. Brackley



Enterprise Forest Management Systems

We are all familiar with the picture that presents a GIS graphic database as a series of layers.

It conveys the disastrous impression that a GIS database should be maintained as series of layers. I reject this concept!

Enterprise Forest Management Systems

Allen's suggested rules for graphics

Rule 1 – Maps are linked to the earth by ground control systems and corrected to plane surfaces by projection methods. The best source maps for the development of GIS databases are generally available base maps. The control system and well defined points are critical to system integrity.

Enterprise Forest Management Systems

Allen’s suggested rules for graphics

Rule 2 – The template method that defines feature representations that will be promulgated to all maps is critical to the processes of adding themes and building any database.

Enterprise Forest Management Systems

Allen's suggested rules for graphics databases:

Rule 3 - For a given class of topology a line delineating features will exists once in the master database. The line will be created at the largest scale represented in the database. If the line has multiple features (i.e. shoreline, property line, land classification code, etc.) these features will be referenced to the line by tables and not duplication in layers.

Enterprise Forest Management Systems

Allen's suggested rules for graphics databases:

Rule 4 – The lines representing the same features, but in different classes of topology should be logically consistent when displayed simultaneously (i.e. the centerline of a highway in a network coverage should be located between the bounding lines of the highway in a polygon coverage).

Enterprise Forest Management Systems

Allen's suggested rules for graphics databases:

Rule 5 – At the corporate level the master database will be maintained as the union of all existing themes. 1. All polygons will be assigned a code, null values are not allowed. 2. Data will be distributed to subordinate units from the master database.

Enterprise Forest Management Systems

Allen's suggested rules for graphics databases:

Rule 5 – A note: In older computer systems the intersection or union of many layers was a time consuming project. The author remembers one project in 1987 that required two weeks of continuous computer time to process. In this situation a DISSOLVE command to eliminate lines was much faster than an INTERSECTION or UNION.

Enterprise Forest Management Systems

The time allotted to this talk is drawing to a close, as are my productive working years. I have had a wonderful run of over 50 years in the forest products industry from Maine, to New Brunswick, British Columbia and Alaska. Along the way I became acquainted with Jack Dangermond, a man of vision, and had the opportunity to use the product of his vision!

Understanding our world.