THE WATER RESOURCES ATLAS OF FLORIDA:

INSPIRATION, ORGANIZATION, PRODUCTION

Elizabeth Purdum

The Water Resources Atlas of Florida (Fernald and Patton 1984), published by the Institute of Science and Public Affairs, Florida State University, was the culmination of three years of work by staff members of the Florida Resources and Environmental Analysis Center within the Institute and experts on fresh water from throughout the state. Edited by Edward A. Fernald and Donald J. Patton, the atlas cost an estimated $450,000 to produce and was funded by a state appropriation through the Florida Department of Environmental Regulation and from sales of the Atlas of Florida (Fernald 1981). The project assumed it to be valid and desirable for a public organization---in this case a university---to present the vast amount of information that government agencies collect and to return it to the public in an accessible and attractive way.

Inspiration and Purpose

Several events conspired to make the Water Resources Atlas of Florida a reality. In 1981 the Florida Resources and Environmental Analysis Center had completed the Atlas of Florida under the editorship of Edward A. Fernald and was thus geared up in terms of people, equipment, and experience to begin another atlas. The editors and cartographers were also inspired by the artistically striking and tremendously successful California Water Atlas (Karhl 1978). But most importantly the editors sensed the time was right for a Florida water atlas. Many issues related to fresh water---notably contamination of water by hazardous waste, protection of wetlands and ground water, and restoration of natural water systems---came to the forefront of legislative and citizen concerns in Florida in the early 1980s.

The major purpose of the water atlas was to compile in a single volume discussions of fresh water in Florida from the perspectives of various disciplines. Included were descriptions of the physical nature of water and the importance of water for ecosystem maintenance. The atlas was intended to be a basic reference for legislators, businessmen, state officials, planners, and non-professionals---and a useful reference for students and planners in other states who face similar problems.

The atlas was conceived as more than a technical document containing facts and figures. These are important, but the editors believed that technical details are best understood when they are placed in their historical, economic, social, political, and legal contexts. The atlas should help, for example, water resource lawyers better understand the physical properties of water, or geologists appreciate the legal and regulatory constraints on water use. Therefore, each chapter was written to be understood by people who are not experts, while at the same time providing useful information to those who are.

Management and Organization

Production of any type of atlas requires the cooperation of people with different talents and different points of view. They must be carefully selected and organized, or project members may find themselves spending much time dividing the labor and becoming involved in needless conflicts. The editors' greatest management problems were with authors who were scattered throughout the state and who found it difficult to translate ideas into atlas chapters. The editors requested that authors gather data for graphics first, and then write text---the typical sequence for atlas production. Many found this request to be peculiar. They were accustomed to developing ideas, writing text, and then thinking of illustrations.

Barbara Petchenik (1977), cartographic director for the Atlas of Early American History (Cappon 1976), encountered a similar problem. She had assumed a division of labor would arise between the cartographers and the researchers and writers---in this case historians. She originally thought historians would "do research" and cartographers would then compile maps from the historians' notes, but the historians, like some of our authors, had little concept of cartographic requirements. Map data has to meet different and more rigorous standards than data described in text. One can generalize in text, even if some of the data are missing,but on a map "nothing can be left ambiguous, vague or undecided" (Petchenik 1977, p. 22).

Other conflicts arose because of differences between cartographic production and research and writing. Cartographers are accustomed to scheduling their work in a predictable fashion---one can estimate relatively accurately how long it will take to produce a map, but frequently one cannot reliably estimate the time needed to find data for a map or to develop an idea or to write a chapter. Such differences are particularly difficult for cartographers who find themselves and other members of their production team waiting for work.

The problems between cartographers and authors can only be overcome if all participants in an atlas project learn patience and appreciation for the variety of skills needed to create the book. Cartographers and contributors need to work closely from the beginning, although researchers and writers need to start their work well in advance of the cartographic staff. Contributors, often working part-time for no pay in various locations, need staff people to assist them.

Data Collection and Display

The first step in data gathering for a water atlas is to identify specific organizations and agencies that are responsible for collecting and maintaining data related to water. Federal, state, and local agencies collect a great deal of such data, but a surprising amount of this information is inaccurate, incomplete, or inconsistent. There may be substantial disagreement among agencies on methods of reporting, means of calculation, and even names of places or facilities. For the Water Resources Atlas of Florida we relied heavily on data from the U.S. Geological Survey. USGS is responsible for basic research on water quantity and quality (both for surface and ground water) and disseminates this information through its many publications. Data on weather and climate were obtained from the National Oceanographic and Atmospheric Administration. The U.S. Census contains a wealth of information on water, although this information is not always collected in a compatible form from decade to decade. The Census of Agriculture contains information by state and county on number of acres irrigated, acre feet of water used, acres of drained land used for agriculture, and crop production on irrigated land. The Census of Housing provides information on source and type of household water, and the Census of Manufacturing contains information on industrial water use.

Clyde Conover, a retired USGS geologist, served as technical reviewer for the atlas and was enormously helpful in detecting errors in data and in picking up inconsistencies in data from chapter to chapter. One of the greatest difficulties was maintaining consistency in data and data presentation among the chapters written by the state's five water management districts. Each district was initially given the flexibility to develop its chapter independent of other districts. With flexibility unfortunately came inconsistency. The atlas would have been more internally coherent if there had been uniformity in the order of topics, level of detail, and method of presentation of data among the district chapters.

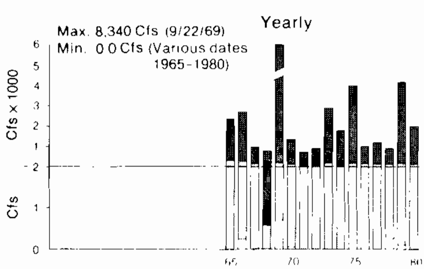

Fig. 1. New River Stream Flow Variation-Yearly Discharge, Maximum, Mean, Minimum (Fernald and Patton 1984, p. 205).

Another difficulty was how to depict a wide range of values in a single graphic. In many cases there was a difference of several thousands between the smallest and largest values. This problem is common in any mapping project, large or small. Water atlas cartographers used four techniques to show wide value ranges within a graphic: breaking the scale, converting a linear comparison to a logarithmic scale, converting a linear to a volumetric comparison, and bending the scale.

The break-in-scale solution is illustrated in Figure 1, the graphic of the yearly flow of the New River. Values range from 0.0 cubic feet per second (CFS) to 8,340 CFS. The break in scale was necessary to accommodate the large number of values between 0.0 CFS and 1.0 CFS. The set of data for the New River also contained one extreme value (8,340 CFS), which was accommodated by breaking the bar.

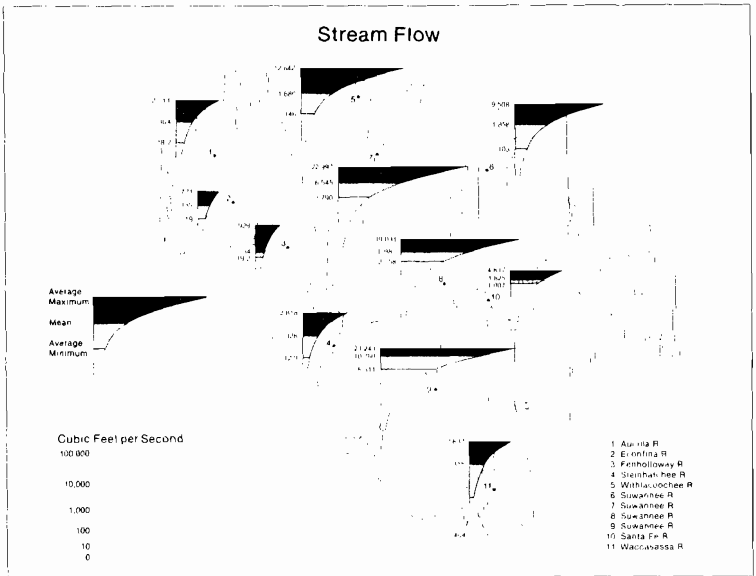

Fig. 2. Stream Flow---Suwannee River Water Management District (Fernald and Patton 1984, p. 225).

Logarithmic scales were used for stream flow maps of each of the state's five water management districts. Figure 2 is the stream flow map for the Suwannee River Water Management District. Logarithmic scales are useful, and necessary for depiction of certain types of data, but they do remove distinctions at the upper end of the scale. To alert the reader that the scale used in these maps is not an arithmetic scale, a horizontal component was added. The length of the horizontal component does not represent a direct measure but an implied value.

Space may be saved and interest may also be added by converting a linear comparison to a volumetric comparison. This technique was used for the graphic comparing Florida rivers and major world rivers (Fig. 3). In this instance the data range in value from 6,000 CFS for the St. Johns River to 6,200,000 CFS for the Amazon.

To fit a linear scale in a short space without breaking the scale or using a logarithmic scale, the scale may be bent, as was done in Figure 4. Bending the scale also adds interest to the graphic

Order of Production

Establishing a reasonable and workable order for the required tasks is crucial. Atlas production is different from production of other types of books. Most books are processed by the chapter, with text taking precedence over illustrations. Atlases are typically processed by the page, with illustrations taking precedence over text. Typically in an atlas each page is allotted a topic before any work is begun. Once work is begun, one should not then decide that there is not enough data for a particular topic or that a topic is ill-conceived or that the associated text is poorly written.

Below is one logical order for tasks that must be completed for an atlas, assuming decisions on staffing, facilities, and equipment have already been made. **We did not follow all these steps,** but I believe if we had we would have **been able to avoid some of the problems** we encountered at the production stage.

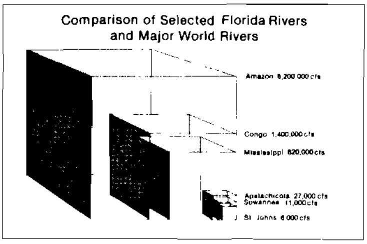

Fig. 3. Comparison of Selected Florida Rivers and Major World Rivers (Fernald and Patton 1984, p. 59).

1. Initial Planning - Decide what topics are to be included. Formlate a tentative table of contents.

2. Research - Determine whether data are available on the chosen topics. If not, develop alternative topics for which data are available.

3. Staff and Advisory Committee Meetings - Make the final decisions on what topics are to be included and in what order.

4. Data Collection - Obtain the necessary data for text and maps.

5. Production of Page Drafts - Construct drafts, either by hand or with the aid of a computer. As much detail as possible should be shown on these drafts, including placement of maps, map titles, legends, and text blocks. As much as possible, maps should look like the envisioned final product. Cartographers should resist temptations to abandon this step. The time saved by not producing drafts in the first place will be lost by the time needed to correct and adjust finished graphics.

6. Reviewing Page Drafts and Writing Text - Review the maps and the map text. This will be done by major staff members as well as by authors or contributors. Text contributors should be given, in addition to draft graphics, the exact number of words of text needed to fill allotted space.

7. Production of Final Graphics and Text Editing - In some cases the production of graphics will be first, in others the text will come first. It may not be possible to perform these tasks in the same order for every chapter. For some chapters whose subjects do not easily lend themselves to graphical display it may be necessary to write and edit the text before proceeding with the graphics.

For production of the Water Resources Atlas of Florida, we developed several means of increasing productivity and reducing errors which we had not had for the Atlas of Florida. First, we wrote a detailed style guide and used style sheets for maps and chapter text. We also developed a means of interfacing the word processor and typesetter, which meant that text no longer had to be typed twice. A "spell-check" program on the word processor was used to help reduce typographical errors, although it did not obviate the need for careful editing and proofreading.

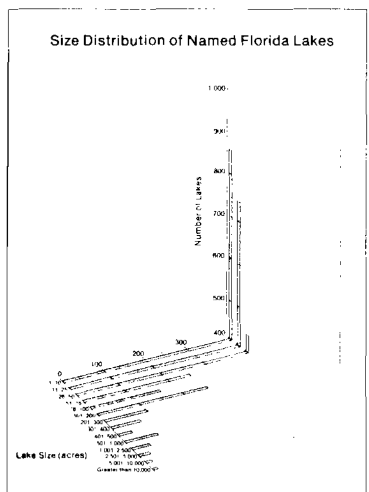

Fig. 4. (Fernald and Patton 1984, p. 61).

The descriptions given here on the inspiration and purpose of the *Water Resources Atlas of Florida*, and on its production, indicate the many complexities inherent in a project of this scope. Some of the lessons we learned working on the atlas will apply, we hope, to other major cartography projects.

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(Continued from p. 10)

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