

A GEOLOGICAL SURVEY PERSPECTIVE ON  
DIGITAL CARTOGRAPHY

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In the late 60's and very early 70's, our perception of what the National Topographic Program should be was largely a matter of concentrating on getting the quadrangle mapping done. I have to make the goals that we had at that time look simple-minded so that I can point out to you, as this story unfolds, how good it looks now, under enlightened management. But at that time, we thought that the way to use our skills and resources best was to map the country at the 1:24,000 scale -- except for Alaska, which we concluded would be just right at a scale of one mile to the inch. By 1972 we had about 70 percent of the lower 48 states done at 1:24,000 scale and almost 80 percent of Alaska at a mile to the inch. I would rather not even discuss how many of those maps were up to date.

About that time the Federal Mapping Task Force reviewed civilian mapping. I won't go through a whole long story about what the Federal Mapping Task Force did. The Task Force effort took a year of rather intense study and some important findings were made. I will only comment on those that relate to the change of attitude and the change in environment in the cartographic work being done at the Geological Survey.

At that time, the time it took to produce an average project of 7.5 minute quadrangle maps, was an average of about 5 years. You'd have to assume that any good

idea that takes 5 years to hatch may not look like as good an idea at the end of that time, as it did when the map data was first needed. That was a pretty serious problem which we, for the time at least, had permitted to exist. Actually, the whole range of cycles was from  $3\frac{1}{2}$  to  $5\frac{1}{2}$  years and if you really went at a project in dead earnest, you could finish it in  $2\frac{1}{2}$  years or so. As mentioned though, the average was much longer.

At that same time, the Geological Survey wasn't doing any intermediate scale mapping. So, although we were quite good at what we were doing (modesty aside), we quickly recognized that some of the things the Task Force was pointing out were correct and needed fixing quickly. They said, "You need to do more; those are good maps and people want them, but they want them now, they don't want them someday - so see if you can find a way to get that good data to the user, faster". They said, "You really should be doing intermediate scale mapping". It was noticed that the Park Service was having to do it because we didn't; the Soil Conservation Service was doing it, because we didn't, and so on. Clearly, land management agencies needed maps at the intermediate scale. So there's another whole story there; I'll only suggest to you that we've done something about that, and we're now doing a lot of intermediate scale mapping, at the 1:100,000 scale primarily, and some at 1:50,000 scale.

The Task Force was somewhat aware of the need for automation, the point that Ted Sudia just made so eloquently in his speech. (I was reminded in Ted's talk that he has given us still another reason to look forward to automated cartography; it gives the user a way to spend his planning money faster.) But the Task Force was concerned about the shortfalls - the whole civilian mapping community of the Federal Government spending a lot of money and doing a lot of good mapping and still not getting all the requirements met. So the individuals on the Task Force came to the conclusion that automated cartography was a right and proper future for the whole effort. If you've read that Task Force report, you'll know, however, that it was not as sharp a recommendation as it should have been, and certainly not as sharp a recommendation as it would be now. So what has happened since. From this point on I'll be talking mostly about what we've done at Geological

Survey, but because this is a National Mapping Program that is conducted at Geological Survey, naturally other agencies are affected, sometimes favorably, sometimes not so favorably. (I probably won't comment much on the latter.)

We did establish a new mission statement for the National Mapping Program, and have clearly stated in a Departmental Manual Chapter, that our new mission was to make available not only a family of maps, but cartographic data for multiple use. This is a fairly simple statement, but it is a recognition that the nature of our job was changing. In 1976 there was conducted at the U.S.G.S. a joint project with the International Geographical Union, under the leadership of Dr. Roger Tomlinson, which was a study of spatial data handling, involving the whole Geological Survey. I'd have to conclude that spatial data handling at Geological Survey at that time was not well coordinated. It's better coordinated now, but it still needs more. We were able to improve the situation as much as we have, as a result of the kind of light and heat generated by the IGU study. Our eyes were opened to the importance of spatial data handling. Our eyes were particularly opened to our need for our education in the state of the science. And we might need a study of those every 3 or 4 years because it's easy to get smug about small successes.

Also, in 1976, in the Topographic Division, we formed the Digital Applications Team, under the leadership of Dr. Bob McEwen, who'll be talking to you tomorrow. That Digital Applications Team moved fast - identifying the problems of moving into the digital domain. We had many of the right ideas about what to do, but the whole effort needs more support and more resources. However, things continued to evolve and progress, and in 1978 we began a 5 year modernization plan which was funded successfully at \$6 million a year, and the basic content of the modernization plan was equipment and software for the digital activity. In 1979, we were budgeted for the first time for digital data production, to the tune of \$2 million, a modest start, but a start nevertheless. And it was the first recognition in the budget process that digital cartography was going on here. Now we are hopeful that the future budget process will provide for digital production and for the development of a national digital cartographic data base.

Also going on this year, and of great importance to the subject at hand, is our hope of receiving news from the Department, almost momentarily, that they have approved a proposal to reorganize the mapping functions within the Geological Survey that would combine the Topographic Division, the Geography Program with its land-use, land-cover mapping and analysis activity, and most of Publications Division. We would call that new **division** the National Mapping Division. It's important that the new organization is coming at this time, and at the same time we are carefully re-evaluating our approach to the formation of a digital cartographic mentality in the mapping function at the Geological Survey. We are setting some rather stern new goals, giving credence to the fact that a more aggressive effort is required. Also, of course, as we work with other agencies, we understand better what they need.

In connection with the new digital initiative we have taken certain steps. We've set up a steering committee which consists of people from all the elements of the new Division-to-be. Several work groups have been established and they're at work right now. The work groups are on Organization and Management, Systems Management, Production and Management, Requirements and Program Planning, and Applications and User Services. Each one of those work groups has been charged to identify all the tasks that must be undertaken, and the resources necessary to do them, without fear or favor. And then, after they report early in the new calendar year, we'll prioritize what we can do with the resources we have. Those priorities will be set in concert with our many partners in the digital activity.

I mentioned that we were working with other agencies. We've been working with Defense Mapping Agency, and must continue to. We're working with the National Ocean Survey, with Forest Service, and with Soil Conservation Service; within the Department of the Interior we're working with Fish and Wildlife Service, with the National Park Service, with the Bureau of Reclamation, with the Bureau of Land Management, Bureau of Mines, and especially with other Geological Survey Divisions. This is not an easy task for us to spend the time necessary, or for them to find the time to spend with us. It is, however, essential for us to understand their problems, and what we might be able to do to help them solve those problems.

I need to give you one further point which is a very important aspect to us. There is strong Departmental interest and the Secretary himself is supporting the digital mapping activity. I'll read only part of a memo he recently wrote to all Assistant Secretaries and Bureau Chiefs:

"Geological Survey will soon begin its detailed planning for the digital program for fiscal year 1980 and 1981. I expect this program to be a Department-wide effort and encompassing the necessary study of cost-saving alternatives, information sharing and possible transfer of funds from the Geological Survey to other bureaus for adaptation and support of existing software technologies, which might serve other bureaus in the Department. I therefore request that you support this Departmental effort through cooperation and staff participation in the planning and study efforts of the Geological Survey."

That's rapport of the best kind for this important effort. We must continue to work with the bureaus in the Department to make those words have any meaning. We recognize that, and so do the other bureaus.

I'll read the major objectives of our new digital mapping effort to give you the flavor and texture of what we're planning to do. There is no intended priority by the statement of these four objectives; they're all in first place:

- (1) Create a national digital cartographic data base by the mid-1990's. That's at the data level of, at least, 1:24,000 scale topographic maps.
- (2) Provide a digital data service, and user service to support the requirements of other Federal agencies.
- (3) Establish the Geological Survey as a principal source for digital cartographic data, for the Federal Government, and,
- (4) Provide the capability to produce graphic products from digital cartographic data.

These are ambitious objectives. One of our advisors has categorized the cartographic impact of that as being cartographically equivalent to the decision to put a man on the moon. It's very clear that our future is digital. It's also clear that a strong new initiative must be supported to move aggressively towards digitizing the base data categories that constitute the maps covering the U.S. The base data categories we're talking about are terrain, hydrography, transportation, boundaries, surface cover, land use, and many more. These data will be structured in separate data files, and merged in such a way to optimize utility of those data bases to the many users of these data who now exist and some who don't exist but will develop. In addition to the data base, the mapping process itself must become more automated. Only in these ways can the National Mapping Program respond to the most important needs for mapping and cartographic data in this country.