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COMMENTARY

Tribal Implementation of GIS: A Case Study of Planning Applications with the Colville Confederated Tribes¹

MICHAEL E. MARCHAND AND RICHARD WINCHELL

Geographic Information Systems (GIS) are computer systems that link large sets of data with spatial representation in maps. Much of the data utilized in governmental decision making has a spatial component, and the ability to map data and organize information spatially can be extremely valuable in governmental decision making. The application of GIS within tribal governments is an important process that can help empower tribes, particularly with regard to natural resources management and land and water rights litigation.²

Recognizing this potential, the Bureau of Indian Affairs in 1983 established a Geographic Information System (GIS) officially titled the Indian Integrated Resource Information Program (IIRIP).³ This project grew to offer a training program in 1986 and provided a demonstration project for ten tribes across the nation to create American Indian applications of Geographic Information Sys-

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tems.⁴ A national office, here called the National Center, was established in Golden, Colorado, to staff and support the development of a GIS database using ARC/INFO for each of the ten tribes and to promote the effective development and application of GIS management within each of the tribal governments. ARC/INFO is a specific software package capable of sophisticated mapping and analysis of spatial information and is recognized as "state of the art" GIS technology.

The National Center has successfully developed databases and limited GIS applications with the ten tribes, emphasizing timber and natural resource management, but implementation of integrated GIS applications within tribes has been difficult. Although the GIS effort has proven effective for resource management and development, particularly for forestry on the Colville Reservation, the expanded use of the system for land use records, planning, and other local government applications has been slow. An overreliance on the National Center GIS technical staff and Bureau of Indian Affairs resources has slowed the development of local agency staff capability.

This paper presents a case study of critical issues in the use of GIS within the tribal government of the Colville Confederated Tribes, one of the ten national demonstration projects selected by the Bureau of Indian Affairs. Research for this project was carried out as the planning department of the Colville Confederated Tribes worked with the tribal planning program at Eastern Washington University to conduct a land use assessment for a portion of the reservation, and to utilize the resources of the GIS demonstration project. Three important issues were identified during these efforts to conduct a land use feasibility study: (1) There was a need to create a coordinated, tribally based program in which local tribal members gained full access and control of GIS data and applications processes, with technical assistance to achieve this end provided by the Bureau of Indian Affairs; (2) such a system required additional staffing, hardware, and extensive education at a wide range of technical skill levels within the tribe; and (3) there are important concerns about sensitive cultural and community data which can be mapped but which tribal members do not wish to become public. This last issue creates a management problem in tribal control and use of the data. Sensitivity to traditional uses and values of the land should play a part in tribal GIS applications, integrating such data into maps, where possible, but recognizing the need for tribal controls and security of the data,

which has value even if not mapped. GIS applications within such contexts hold much potential for improved decision making within tribal governments, but the use of the technology and the implementation of effective GIS management systems will require major tribal efforts in conjunction with the utilization of federal resources.

THE NEED FOR TRIBALLY CONTROLLED GIS APPLICATIONS

The need for a coordinated, tribally based and tribally controlled GIS is evident in the existing policies between Indian communities and the Bureau of Indian Affairs to promote self-determination. The Indian Self-Determination and Education Act of 1975 identified the failure of the federal government to effectively create and support tribal governance and empowerment, including a failure to train tribal members for responsible roles in local tribal government. This act was furthered by formal policy statements regarding tribal government by both the Reagan and Bush administrations but has commonly met resistance in its application and implementation in the field.

Unfortunately, the Bureau of Indian Affairs did not fully embrace the principles of the act in establishing the National Center's GIS system, which should have included working actively to train local tribal governments for full takeover and administration of the program. Instead, a "neutral" position that supported either BIA or tribal control of the GIS applications was adopted. In many cases, the key application—forestry management—was controlled by National Center staff and local BIA officials instead of directly by the tribes, so the GIS applications became a federal function, instead of a new locally controlled resource. The BIA's neutral position did not restrict tribes that wanted control of GIS applications; however, because of the complexity of the GIS resource itself, including hardware, software, centralized data access, training, and technical assistance, tribes that may have desired more control of the GIS applications often allowed local BIA officials to dominate the applications process.

Additional problems were inherited because the GIS programs began in the pioneering stages of GIS technology, but this technology has evolved at a rapid pace. Five years ago, the expense and unwieldiness of hardware platforms led to the centralized "Na-

tional Center" philosophy. Since that time, however, hardware technology has skyrocketed and prices have plummeted. Software has likewise evolved. The Colville database, for example, was initially created with the public domain "Moss" software. The BIA decided to convert to ARC/INFO, but the initial systems that were created are themselves obsolete at this time. The idea of a centralized database repository for all tribes is also no longer necessary with new workstations, and a decentralized, more extensive, and active application by tribes can be developed.

The sheer distance between National Center staff and end-users at the reservation level has also increased problems. The National Center staff, well-versed in computer technology, have very limited knowledge of tribal operational needs. There is a broad range in data quality. There is also considerable variation in the regional and local geographic situation of each tribe, which must be understood in creating appropriate GIS applications.

THE COLVILLE CONFEDERATED TRIBES' GIS APPLICATIONS

The Colville Confederated Tribes, with a land base approximately the size of Connecticut, has extensive timber resources and operates its own timber mill, which generates gross receipts of more than \$60 million annually and employs more than 160 tribal members. The tribe's timber resource is managed for sustained yield; application of GIS technology to that management process is simply the latest application of "state of the art" forestry management techniques. Within the Colville Confederated Tribes, the GIS applications were created primarily by National Center staff. This provided the framework for initial applications, utilizing an intact database created with special support and application to timber resources management.

Unfortunately, this application of GIS to timber management limited the scope of the applications within tribal government and created limitations for expansion of GIS applications to other offices and agencies, including planning and natural resources divisions of the tribal government. It was so time-consuming to utilize the system in resource management that it was difficult to expand to other applications run by tribal members directly under the tribal business council.

In addition, there was a huge gap between the database creators

at the National Center and the end-users at the reservation level. Local users did not know how to access the data, which was stored in Colorado. The access to this data for the Colville Confederated Tribes, for example, was through local BIA staff responsible for timber management. Other applications by the tribe were often limited to the time these staff members could take off from their regular assignments to assist in new applications. Although the system and data were in place, there was inadequate support staff to provide effective access beyond the initial application to forest management. In addition, National Center staff were not able to identify or assess problems in the quality of the data, which was generally poor. Maps were produced that indicated land uses or vegetation types that were not the same as what was actually on the ground. Recognition of these problems and correction requires working with the database over time in local field applications.

Two processes were begun in 1989 to expand the application of GIS throughout tribal government. First, an interdepartmental committee was established to inform all offices within the tribe about possible use of GIS and to coordinate such applications. Regional BIA staff, along with representatives of the Golden, Colorado, National Center made presentations and assisted the tribe to understand the varied opportunities for expanded GIS applications through presentations to this committee. The tribe, however, lacked the staff and the funding to implement the expanded program. Over time, the issue of control remained important, since the BIA was responsible for forest management and land titles and records, and seemed unwilling to relinquish control of some information to the tribe. On the other hand, some tribal members were concerned that tribal maps of archaeological sites and other cultural use areas might be used to disrupt sites. Both legitimate and political concerns guided the committee, but ultimately the tribe's Physical Resources Department was identified as the control point for GIS. The process remained dependent upon access, support, and technical assistance from the BIA through funding for a new GIS manager and continued support by local BIA forestry staff.

The second process to expand tribal GIS applications was a contract between the tribal planning department and Eastern Washington University to demonstrate a GIS application in a land use analysis of the impact of a proposed ski resort and recreation area on tribal lands. This project was funded by the tribe but was dependent upon the BIA to provide base maps generated by the

GIS program, along with digitized files of soils and environmental information for the site.

Initial meetings and presentations by the local BIA forestry officials were very promising, and the project was designed around assumptions of file access and some technical support from the BIA staff. As the project evolved, technical assistance was provided to develop the base maps, but the priorities of the BIA staff, combined with technical difficulties in downloading files, dragged out the time processes. Ultimately, although the project used a computer-generated soils base map for analysis, the analysis maps were generated by hand.

Self-determination—that is, the operation and control of programs and decisions by trained tribal members within local tribal government—is a difficult goal to achieve, but the delivery of GIS within tribes offers an excellent opportunity to further this effort. Unfortunately, applications of GIS in Indian tribal governments often have maintained too close relations with or been directly controlled by the National Center instead of tribal departments and staff. Current GIS delivery could and should be modified to fully promote self-determination. This can be done through expanded efforts to train tribal members to understand and operate GIS applications, and through development of long-term support for tribes so that their governments can take over the GIS applications.

COMPLEX ORGANIZATION AND TRAINING NEEDS

The second concern in tribal GIS applications lies not with the control of GIS but with the needs for additional staffing and with the complex and diverse training necessary to develop fully integrated GIS applications within local government. These issues are common to any governmental application and are based on diverse data needs and uses in government offices. Tribal governments are relatively new institutions in their present form, many formed under the Indian Reorganization Act of 1934 and most remaining extremely small until the late 1970s. The Colville Confederated Tribes, for example, employed only thirteen staff persons in 1972 and had a very limited role in governance. By 1991, the tribe employed over one thousand tribal members, with operating budgets of tribal and federal programs at over \$100 million.

The new and rapidly expanding government of the Colville

Confederated Tribes suffers from a lack of long-term definition of roles and responsibilities of various tribal agencies and offices but also has the potential to create new frameworks for effective governance. GIS applications therefore can serve as a catalyst to improved government within tribes, if adequate technical support and coordination to identify its full potential can be established. This is underway with considerable success within the Colville tribal government, and a combination of tribal resources and BIA local and national support seem to be leading to broader use and applications of GIS within the tribe.

The new tribal GIS manager has been on the job less than a year, so the actual linkage of different data sources and applications is still being developed. So far, most departments in the tribe and the BIA have been supportive of the effort, but under the current economic recession, funding any new program has been difficult. The ability of the tribe to integrate GIS effectively into its operations will continue to depend on an expanded training and education effort, which has been underway under the direction of the tribal steering committee. Improved access to the system by different departments, along with training and support for their staff in utilizing the system, will be a key for expanded applications. GIS technology is not suitable for part-time operators. Proficiency with the computer systems requires full-time systems analysts and programmers.

CULTURAL INFORMATION WITHIN GIS

An important concern of tribal governments is the generation and use of sensitive data in GIS. Tribal governments are more than just local governments. Their mission includes preservation of culture, language, and traditions—responsibilities that extend far beyond the “provision of services” goals of most other local governments. To meet these responsibilities, many tribes have cultural offices that help preserve and promote tribal cultures and also assure the protection of cultural resources. What is unique about these resources and this information is that it can sometimes be mapped, yet, through mapping, the information loses the informal controls of tribal elders and enters the domain of “just another set of data.” The appropriate mapping, interpretation, and use of such information are critical functions of the tribe to meet its obligation to its tribal member. Control of such informa-

tion by the tribal government and by tribal elders is essential not only to the preservation of tribal culture but also to effective GIS management.

The Colville Confederated Tribes has a cultural resources board, which oversees all possible development. In this regard, the board does utilize maps of archaeological sites, historic sites, cultural resource areas, including hunting and gathering areas used by traditional peoples today, and spiritually significant sites. This information is clearly not public and is not even for use by tribal government staff. The integration of such information as part of tribal GIS applications is important but difficult. Again, tribal control of the system, and especially of culturally significant mapped data, is essential.

As part of the Moses Mountain ski resort land use analysis, students conducted extensive interviews with traditional community members. These interviews led to mapping of cultural resources, including berry-picking areas and medicinal plant areas within the study region. The maps were used as critical elements of an impact assessment in the project.

CONCLUSIONS

The implementation of an integrated GIS effort within tribal governments holds great potential as a contribution to increased effectiveness of local government. The Bureau of Indian Affairs has established GIS demonstration projects in ten Indian communities around the nation and has successfully created a national tribal GIS center in Golden, Colorado, linked to these ten tribal governments. Key issues of tribal control, along with training and technical support for tribal members to assume that control, still need to be resolved. In addition, special sensitivity to cultural resources must be achieved before effective implementation of GIS takes place.

The Colville database was initially created to serve very limited objectives under the National Center in Golden, Colorado. Future applications and potential data end-users were not considered in the initial systems setup. The existing GIS database is inadequate, and the centralizing demands of large mainframe computer hardware no longer is necessary. GIS technology's potential, however, does look promising, and the Colville Confederated Tribes has made a commitment to revamp the entire GIS system. At this time,

the tribe has started to acquire its own GIS staff and is initiating its own needs assessment and systems planning processes. Through these tribally controlled efforts, linked to decentralized National Center resources, GIS offers an important technology which can expedite positive governmental decision making and tribal development.

NOTES

1. An initial version of this paper was presented by the authors in October 1991 at the annual meeting of the Applied Geography Conference, Toledo, Ohio.
2. Bryan A. Marozas, "The Role of Geographic Information Systems in American Indian Land and Water Rights Litigation," *American Indian Culture and Research Journal* 15:3 (1991): 77-93.
3. Don Hall, "GIS Provides New Management Tool for Tribal Natural Resource Managers," *Native American Fish and Wildlife Society* (Spring 1991), 3.
4. The ten demonstration tribes in the initial implementation of GIS include the Colville Confederated Tribes and the Yakima Indian Nation from the state of Washington. Persons wishing further information may contact the National Center by writing to the Geographic Data Services Center, 730 Simms Street, Room 101, Golden, Colorado 80401 or calling (303) 231-5100.