

**GEOGRAPHIC INFORMATION SYSTEM EMPLOYEES
IN THE NATIONAL PARK SERVICE:**

EARLY SIGNS OF A BRAIN DRAIN

Some concerns and recommendations

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INTRODUCTION

Use of Geographic Information Systems (GIS) technology has grown rapidly in the National Park Service from the late 1980's to the present time. It has aided in better serving the public through improved management, effective planning, and enhanced interpretation. GIS is a complex interaction between four primary elements. They are, in order of importance: (1) the institution and its users, i. e. the "people" component, (2) data, (3) software, and (4) hardware (Frank, et. al., 1991). It is a new emerging profession, which is highly technical, and requires considerable training.

During the past two years, a number of Park Service employees working in the areas of Geographic Information Systems (GIS) and related areas, such as remote sensing/image processing (RS), have left the agency for employment elsewhere. The reasons have been varied, but a common thread among most who have left is higher pay and/or improved career development.

The purpose of this paper is to review several case histories of individuals who have left the agency, including a look at what the NPS invested in training these individuals, how they improved professionally, and what types of positions they moved into after leaving the NPS. It should also be noted that when an employee leaves the agency, much institutional knowledge is lost, which has taken years for the employee to develop.

It is hoped that these case histories will underscore the importance of the NPS recognizing the "market value" of personnel working in the area of GIS, and put itself in a better position to retain its training investments and institutional knowledge gained by employees over the years.

CASE HISTORIES

The following case histories are intended to document four specific instances of former employees of the National Park Service who received substantial formal as well as on-the-job training in GIS and related sciences. These employees will be referred to as A, B, C and D.

Employee A: This person worked in a large eastern park for five years preparing a comprehensive GIS data base, and addressing many resource management issues in the park through the use of GIS analyses. This employee began as a GS-7 temporary Forestry Technician, with no previous GIS experience. Formal training provided by the NPS included SAGIS (1 week) introduction to GRASS (1 week), and introduction to UNIX (1 day). Much additional training was obtained informally, including two visits to the GIS Division facilities in Denver. Informal training included SAGIS and GRASS analysis techniques, UNIX system administration, and hardware setup and operation. After four years of working as a temporary employee, the NPS provided a permanent GS-8 position, commensurate with the increase in duties and experience. One year later the position was upgraded to a GS-9, and a year afterward to a GS-11. This employee took a GIS position with a county agency, for personal/family reasons. Although the training and experience received at the NPS more than qualified this employee for the county position, the salary was about \$2,000.00 less than the GS-11 position at the park would have paid. The employee left the NPS just before the position was upgraded to a GS-11.

Employee B: This employee began working on GIS projects as a GS-7 permanent position in the NPS Washington office as a historian with no previous GIS experience.. He received one week of intensive informal training in UNIX, UNIX system administration, and GRASS training from the GIS Division. He had formal training in Advanced GRASS (1 day), and UNIX system administration (1 week). He received ongoing informal on-the job training in both system administration and GRASS applications for a period of two years. The employee took a position at a U.S. Army base as chief of their GIS operations with responsibility for a \$1,000,000.00 budget at a GS 11/12 grade level, and is likely be promoted to a GS 12 in 1 year. Army documentation on his personnel action stated that this employee was "vastly underpaid". The increase in annual salary, from a GS 7/4 to a GS 11 that was realized by this employee from this transfer is \$13,000.00.

Employee C: This employee began as a temporary GS 7 park tech at a large park in the Western Region. She received two weeks of intensive informal training in UNIX, UNIX system administration, and GRASS from the GIS Division, and 2 weeks of formal training in GRASS. She worked at the park for about two years in GIS, and received a GS 7 permanent position. The employee went to work for the U.S. Forest Service in a GS 9/11 GIS position. Although there were personal reasons for relocating, there was a \$5,000.00 gain in annual salary, plus promotion potential to a GS 11.

Employee D: This employee began as an airphoto interpreter at a large park in the Southeast Region, as a temporary GS 7. He worked for the NPS for 8 months, and took a position with a state agency at the equivalent of a GS 10/2. This amounts to an annual salary increase of \$8,000.00. He received 8 months of informal training in UNIX, GRASS, ELAS, and general GIS database construction and analysis techniques. He also received formal training in ELAS (1 week), PC ARC-INFO (1 week), Auto-CAD (1 week), fire mapping (1 week), and GPS (3 days).

DISCUSSION

During the past two years about 10 percent of the professional GIS workforce within the NPS has left the agency for permanent and/or better paying positions, or for other personal reasons. This may be an early indication that the NPS is vulnerable to a "brain drain" of GIS technical personnel. It is possible that this may be part of a much larger trend occurring within the Federal workforce. It should also be noted that many NPS employees are taking positions with other Federal agencies. In fact, one major Federal land managing agency has openly stated that they view the NPS as a fertile training ground for recruitment of professional GIS employees.

During the past few years the NPS has invested millions of dollars in GIS technology, training personnel in the use of GIS, and developing institutional knowledge in these employees. These expenditures came largely from existing funding sources (i.e. at the cost of other programs), as there was no specific GIS line item in the NPS budget in years past. In short, the NPS has made a substantial investment in its professional GIS personnel, which is lost every time an individual leaves the agency.

In the case studies cited, it is interesting to note that three of the four employees leaving the NPS had little or no formal education or training in GIS before working in that capacity in the NPS. The training and experience gained while working for the NPS provided these employees with sufficient qualifications and experience to successfully compete for GIS positions at other Federal, state, and county government agencies. In three out of four cases, transferring to a new position resulted in both substantial financial gain to the employees, and a career ladder for continued future advancement. This clearly indicates how much the training and experience received at the NPS increased their marketability.

It would appear from the case study examples that the NPS is serving as a training ground or "stepping stone" for people working their way up the career ladder in the GIS field. Although there is much benefit to individuals who have worked for the NPS, the agency is getting a limited return for its investment. Furthermore, the NPS location where the employee had previously worked often experiences a void in GIS activity or capability until the vacated position is filled and the new individual becomes familiar enough with the new job to be productive. This process takes a full year at best, and in some instances has taken several years.

The obvious question at this point is how the NPS, faced with its current goal to implement GIS technology in field, can develop a strategy for retaining employees in the GIS profession once they are trained and experienced.

To effectively answer this question, there are several factors that should be considered.

1. There is a revolution of sorts occurring today in the science and technology relating to the handling of spatial data. GIS, remote sensing, image processing, and CAD have become professions increasingly in demand, and will continue to be in the foreseeable future.
2. GIS, remote sensing/image processing, and CAD are relatively new technical fields, especially to agencies of the Federal government. Consequently, most managers have limited experience in hiring these professionals. Efforts to inform managers and institutionalize GIS in the NPS have revealed several issues related to the classification and staffing of GIS and remote sensing positions. These issues can be characterized as:
 - (a) The need to establish visible career paths. Without classification series specific to GIS and RS, these positions are not visible throughout the Service (WASO, Regions and parks) therefore making it difficult for individuals to plan and aspire to career development and advancement.
 - (b) The improvement of the recruiting notices to reach qualified candidates. Without a "GIS/RS" position title, graduate and experienced professionals within and outside the government are likely to miss most recruiting notices.
 - (c) The establishment of consistency in classification actions among the NPS personnel offices that classify GIS and RS positions. Without a "GIS" and "RS" classification standard, it is likely that the personnel offices, throughout Federal agencies and within individual agencies, classify similar positions in different series and grades.

(d) The identification of qualifications for GIS and RS positions. Certification lists of eligible candidates lack qualified applicants.

3. The NPS has traditionally coupled most of its higher graded positions to management responsibilities. Although a few positions in the agency are graded by research accomplishments, there is no clear direction which permits employees to advance much over the GS-12 level based on technical skills. GIS and related professions are highly technical in nature, and command high salaries. According to a recent survey (Huxhold, 1991), employees in the role of managing a GIS program in the Federal government are at the GS-12/GS-13 level. Those in "analyst" positions range from GS-9 to GS-12, and "processor" positions are graded GS 9/11. level. On the lower end, a "digitizer" is graded at GS-4 to GS-5.

4. There has been a widespread practice within the NPS to hire temporary employees for GIS and related skills. These individuals are most likely to transfer to a permanent position at the first available opportunity. Hiring of temporary personnel also limits the amount of expertise that can be obtained. Most highly competent individuals in the GIS field have little trouble finding permanent positions.

5. There is an attitude prevalent within the NPS which assumes that many individuals will come to work for the agency for lesser pay because of the nobility of its mission. Although this has been true to some extent in the past, one has to question, with a field as competitive as GIS, if this assumption still holds.

RECOMMENDATIONS

The NPS should consider some actions to address the problems outlined above. Some of these actions are "formal" in nature; others are more informal and "creative".

1. Assemble a "blue ribbon panel" of appropriate persons from within and also outside the NPS to develop a set of benchmark position descriptions for all levels of GIS work. Grading should reflect graduated levels so that persons gaining experience will not be "stranded" or "topped-out" as they become more marketable in the GIS profession. Positions should be written in such a way as to recognize GIS as both a profession in its own standing, and also one which interacts with many other fields. Positions should be designed and/or inter-related to provide career ladders and upward mobility within the GIS profession. Requirements for education and experience should be kept flexible, as GIS interfaces with many other professions.

2. Develop classification standards which emphasize technical skills and graduated levels of experience as a basis for higher graded positions (GS-12 to GS-15 level) rather than management or research emphasis. Competition for highly advanced technical personnel in the GIS field will make it difficult for the NPS to hire and retain professionals of this calibre without an appropriate career ladder. These professionals are the agency's in-house

GIS consultants or "gurus", and receive salaries in the private sector equivalent to GS-13 to GS-15, according to Huxhold, 1991.

3. The NPS should be discouraged from attempting to hire temporary personnel for GIS work at higher technical levels such as manager, analyst, processor, or programmer. These individuals are highly marketable in the GIS field, and are likely to be seeking permanent positions. Hiring permanent employees for all but the most menial of GIS tasks such as digitizing, will require longer-range budget planning and forethought as parks, regions, and other offices develop their GIS plans. GIS plans in general should recognize the importance of the "people" aspect of GIS, factoring it in appropriately with all other GIS considerations, such as data, hardware, software, and overall planning strategy.

4. The NPS needs to break away from an attitude that professionals will work at lesser pay levels than other employers or accept temporary positions because of the "status" of the agency. Although this has been a factor in the past for many professionals, the recent exodus of many people in the GIS field suggests that it is not effective in retaining people in such a highly marketable discipline. Many technically oriented GIS types are drawn not so much by the overall mission of the NPS but by the interesting GIS applications afforded within the agency.

5. With the realization that there is ongoing competition for competent GIS professionals at virtually all levels, parks, regions, CPSU's, program offices, and WASO offices should make every effort to give GIS employees the message that they are needed, appreciated, and of great value to the agency. This can be done in many ways using existing mechanisms, some of which are suggested below:

- a. Anticipate and provide for career advancement as employees increase their knowledge base and experience.
- b. Give special consideration to incentive awards and step advances to well-performing employees.
- c. Provide ongoing support, encouragement, and appreciation to GIS employees. Commendations, even without money attached can go a long way.
- d. Encourage formal or informal training and/or career-broadening experiences that reinforce the employee's value and overall contribution to the agency.

CONCLUSIONS

The NPS is encouraged to build and retain a cadre of GIS professionals to develop and maintain this technical capability within the agency. This is likely to be accomplished only if the NPS takes a careful look at its current hiring/promotion practices recognizing the advent of a new profession. Rethinking of existing hiring/promotion practices and creativity in retaining employees working in this new highly competitive profession will be necessary to assure that the NPS is not merely a "stepping stone" to people advancing in this field.

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