Certification and Ethics in the GIS Profession

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An independent Geographic Information Systems Certification Institute (GISCI), governed by a wide range of stakeholder groups including the Urban and Regional Information Systems Association (URISA) and its allied associations, shortly will help define the GIS profession as it adopts a formal professional certification program and code of ethics. Both programs got their start at URISA after its GIS Certification Committee, composed of 38 seasoned GIS professionals and academics (see list), completed work on the Content of Certification Requirements and Ethical Conduct Standards late in 2002. At its meeting on October 26, 2002, the URISA Board of Directors voted to accept the proposed certification requirements for the purpose of conducting a 1-year test that will begin in January 2003.

Both the GIS Professional Certification Program and the GIS Professional Code of Ethics contain guidelines for GIS professionals to use when making professional career and ethical choices. The purpose of both programs is to provide professionals who work in the field of geographic information systems with a formal process that will allow them to be recognized by their colleagues and employers as having demonstrated professional competence and integrity in the field by maintaining high standards of professional practice and ethical conduct. In addition, the programs will provide a basis for judging the validity of allegations or complaints involving GIS practitioners. Finally, the programs will assist aspiring professionals in choosing GIS as a career by identifying appropriate professional and moral characteristics of members of the profession, and will encourage established GIS professionals to continue to hone their professional skills and ethical performance even as GIS technology changes.

In addition, the Code of Ethics should provide a basis by which GIS professionals can evaluate their work and the work of others from a moral point of view. By following this code, GIS professionals will help preserve and enhance public trust in the discipline. Those who violate this code will most likely be criticized by their professional colleagues, and, quite possibly, lose their certification credentials.

Professional Certification

The GIS Profession

In 1989, D.L. Pugh researched professionalism for the American Society for Public Administration and identified certain prerequisites for defining a profession within a field: the existence of a specialized body of knowledge, a formal professional organization, a common language, a particular culture and lore, and a code of ethics (Pugh 1989). While Obermeyer (1993) and Goodchild and Kemp (1992) disagree on how close the GIS profession is to being a profession as Pugh defined one, they agree that there is a need to develop a framework for defining the requirements for

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practicing GIS and ensuring quality of the results. Obermeyer (1993) further suggested that "Whether we like it or not, certification is an idea that is becoming a reality."

The URISA Board of Directors, by establishing a GIS Certification Committee, felt that, not only is there a GIS profession, but there also should be a formal means to evaluate the competency of professionals who design and use geographic information systems. That was the charge given to the Committee when it was created in 1998.

Evaluation of Competencies

Professional disciplines such as engineering, urban planning, and landscape architecture have established means for defining the requirements of their professions as well as evaluating the competency of individuals practicing the professions. Goodchild and Kemp (1992) define five models that can be generalized into two distinct methods, based upon what is evaluated: Accreditation – evaluating the educational programs from where they received their training and education, and Certification – directly evaluating the competency of the individual.

Accreditation of education and training programs assures that what should be taught, is taught, and is being taught well [Editor's note: See the article by DiBiase in this issue for more on accreditation]. Because GIS educational programs exist in a variety of different academic disciplines, many of which have their own accreditation requirements, no single authoritative body has established accepted criteria for evaluating the quality of GIS courses and programs. The University Consortium for Geographic Information Science (UCGIS) is now in the process of developing a model undergraduate GIS curriculum, but that is directed more toward geographic information scientists [Editor's note: See the report on the UCGIS project elsewhere in this issue]. No authoritative institution has provided guidelines on what GIS practitioners should be taught; therefore, it is impossible to assess the quality of GIS education and accredit programs that teach GIS at this time.

Professions use individual certification either in addition to or instead of accreditation. This is accomplished through an examination or other means to evaluate the specific competencies of an individual. Although accrediting academic programs could be more efficient than evaluating each individual in the profession, the lack of educational standards led the Committee to concentrate on individual GIS certification. (Note that certification programs and licensing or registration programs are used for different purposes. In general, certification of individuals is a means to establish professional and ethical standards, whereas the licensure or registration of professionals is meant to protect the public from any harm that an incompetent professional may cause. In addition, licensure and registration are administered by a governmental body (states, in the case of surveyors), while certification is usually administered by one's professional peers.)

While Wikle (1998) promoted professional GIS certification in his model for continuing education, he cautioned that "professional competency programmes must involve significant input from industry, academia, and professional associations. Furthermore, to be accepted by practitioners, such programmes must be carefully planned and continuously reviewed." (p. 504). Those words of caution were foremost in the minds of those who volunteered to be members of the URISA GIS Certification Committee. The charge given the Committee by the URISA Board of Directors was to explore GIS certification, determine its benefits, identify and review other efforts to evaluate skills of GIS professionals, and propose a program that can benefit the profession and society. In other words – plan certification carefully.

The GIS Certification Committee

On July 20, 1998, the Certification Committee held its first meeting with 19 members present. No volunteers were excluded from membership on the Committee, which was composed of a rich mixture of practitioners, academics, public sector employees, and private sector entrepreneurs and employees. This meeting preceded two panel sessions at the URISA 98 Annual Conference that addressed the topic of evaluating skills of the GIS professional. A total of 150 conference attendees participated in these two panel discussions – often invoking lively discussions.

Initial discussion focused on whether certification is necessary, and the consensus was that GIS certification was going to happen whether URISA was involved or not since a number of organizations were also beginning discussions on the topic. Indeed, the Committee felt that it was critical for URISA to take a leading role in the development of a certification program since the International Standards Organization (ISO) had already taken steps internationally to develop GIS certification standards (Somers 2000). URISA, known for its multidisciplinary membership, was the logical organization to take the lead.

Opinions were also expressed that it is difficult to evaluate the competency of all professionals using geographic information technology because the professionals have different levels of responsibility (user, analyst, programmer, manager, etc.) and because they come from so many different disciplines. There was consensus, however, on the fact that there are "core" skills that all GIS professionals needed to perform adequately. Gaining consensus on exactly what those core skills are became one of the goals of the Committee. Although this was not accomplished, the Committee did compile a list of 23 disciplines that use GIS.

Later that year, the Committee participated in the Education Summit sponsored by UCGIS at the GIS/LIS 98 Conference in Fort Worth to discuss topics associated with assessing skills in the GIS profession and to hear from other associations on those topics. Representatives from The American Society for Photogrammetry and Remote Sensing (ASPRS) and The American Congress on Surveying and Mapping (ACSM) also were in attendance at this meeting.

By 1999, the Committee had grown to 30 members and had developed a web presence on the certification issue, providing status reports, white papers, and links to other associations and university GIS educational programs. A feedback mechanism was implemented at the site, and by July 1999, comments from 23 GIS professionals had been recorded. To gather more input from GIS professionals, a survey soliciting opinions was sent to 3000 URISA members and 5000 other GIS professionals. A total of 180 responded. The survey queried the GIS professionals on whether certification should be studied (63% – Yes); what mixture of education and experience should certification require (92% – Combination); whether there should be a single certification or discipline-specific certification (56% – Discipline-specific); and whether or not re-certification should be required (37% – Yes).

The 1999 and 2000 Annual Conferences continued to focus on certification issues with panel sessions, luncheon seminars, and committee meetings – all well attended. After the 2000 Conference, the Committee issued the "Report on Assuring the Qualifications of GIS Professionals," a summary of its research and decisions regarding certification.

Justification for Evaluating GIS Competency

The 2000 Committee Report first addressed the justification for GIS certification. After extensive research on certification and licensing programs in other professions (both nationally and internationally) and many meetings and Internet discussions, the Committee identified a number of important reasons why GIS certification is needed:

- to provide a means for attaining recognition by one's colleagues and peers that the GIS professional has demonstrated professional competence and integrity in the field;
- to encourage long-term professional development that will help existing professionals maintain currency in GIS technology and methods;
- to ensure ethical behavior by members of the profession and provide a basis for judging the validity of allegations or complaints against GIS practitioners;
- to assist prospective employers to assess and hire GIS professionals;
- to ensure that those who produce geographic information have a core competency of knowledge;
- to define and protect professional bodies of knowledge;
- to assist aspiring GIS professionals and professionals outside the GIS profession choose their educational opportunities wisely;
- to contribute to the development of geographic information science;
- develop standard GIS job descriptions; and
- to establish and maintain links to GIS education bodies.

However, the primary beneficiary of professional certification is the public: Given that the public sector is the largest employment sector using GIS technology today, it was felt that taxpayers deserve assurance that competent and ethical GIS professionals are being hired with their tax dollars. Also, citizens are possibly the largest group of people that can be affected by the use of GIS in the operations of government, so it is anticipated that GIS certification can assure the appropriate application of GIS technology to improve the quality of their lives. Finally, young people can be made aware of the GIS career and what it takes to become a GIS professional through the formal definition of the profession that certification provides.

Guiding Principles for Setting Competency Standards for GIS Professionals

The report also defined five guiding principles that were to be used to drive the development of competency standards. These principles were needed in order to gain consensus on how the standards could be defined:

Any initiative must be voluntary and open to all qualified individuals. Creating barriers to the entry and continued employment of qualified and ethical GIS professionals is not a goal of the program.

Any initiative must be flexible. The desire to identify more than one way to demonstrate competency directed the Committee away from a test-based system of evaluating competency. Rather, the Committee was directed toward a model more similar to the United Kingdom's Association for Geographic Information (AGI) certification scheme ("Continuing Professional Development"). Rapidly changing technology and the inability to agree on the "core competencies" were also important reasons for not adopting a test-based system.

Any initiative should incorporate existing GIS educational infrastructure.

The well-developed infrastructure of community colleges, universities, GIS consultants and software vendors, and other organizations and professional associations who offer GIS education and training should be included to encourage cooperation within the GIS community, stay on the cutting edge of the technology, and provide an alternative to testing.

Any initiative should be collaborative. The multi-disciplinary use of geographic information technology requires that many different disciplines be involved in the development of GIS competency standards. Developing a system that includes organizations and professionals outside URISA will avoid giving privilege to members of some professions or disciplines while marginalizing others.

Any initiative must include a code of ethics. Professional practice includes two complementary components: competence and ethics. These two elements are of equal importance because the competent professional who engages in unethical behavior can do as much harm to an organization as an incompetent professional.

The Proposed Certification Program for GIS Professionals

The Certification Committee, at its meeting at the 2001 URISA Annual Conference, voted unanimously to recommend the proposed Certification Program for GIS professionals. After presenting the proposal to the URISA Board of Directors on October 25, 2001, the Committee received approval to develop the details of a GIS Certification Program. The initial version was published on the URISA web site in November 2001.

Thus began public debate over the contents of the Certification Program: more than 250 detailed comments were posted by GIS professionals at the public web site (Guestbook) and several Certification Committee members and URISA staff presented the proposed program at dozens of GIS meetings and conferences across the nation to receive feedback.

Concerns that the proposal was biased toward academics and that too many academicians were on the Committee resulted in the establishment of three subcommittees (triads) to address specific comments in each of the three categories: educational achievement, professional experience, and professional contributions. A non-academic practitioner chaired each triad. A fourth triad was established to investigate the need for level designations (Beginner, Master, Expert, etc.).

The "Level Triad" found that having no levels separates certification clearly from career development. A potential problem with the multi-level program is that many may incorrectly interpret the levels as a path toward career development – however, GIS career paths should be developed with more information and thought about an individual's specific situation. Another possible concern with the multi-level program is that Human Resource officials and other non-GIS professionals involved in hiring decisions may use levels to shortcut the hiring process by avoiding detailed examination of job applicants who do not have a specific level designation. The multi-level model also presents potential operational complications that could result in delays in issuing certification and re-certification if many professionals resubmit for a higher level after they gain additional points.

A second version of the proposed program, modified by the Committee after studying the public feedback, was published in April 2002. Five more months of public feedback followed and again was reviewed by the Committee. The Committee approved the final pilot version (as shown in this printing) in October 2002. Throughout the process, the Committee met via conference calls 10 times to refine the proposals.

Overview of the Program

The proposed GIS Certification Program is a voluntary program that is intended to acknowledge the professional achievements of those whose primary job responsibility involves the use of geospatial data technology. It is not a program for general users of GIS technology. The program is a point-based system that is selfdocumented and calculated by the individual seeking certification. This means that applicants must document points in the following three categories: educational achievement, professional experience, and professional contributions. Acceptance of the GIS Professional Code of Ethics and periodic re-certification are required.

The program does not include an examination because general agreement on the skills needed for the GIS profession has not yet been achieved, given that there are so many different professions that use GIS technology. Designing a single examination that can equitably evaluate the basic skills needed is very difficult and is likely to be highly contentious. Unfortunately, graduation from an accredited education program is not yet an option for evaluating qualifications.* Therefore, professional experience weighs the most in determining qualification for certification.

* While there has been a dramatic increase in the number, variety, and quality of educational programs offering GIS certificates, as noted above there is no authoritative body to evaluate their quality. Since there is no such accreditation of GIS educational programs, it is impossible to determine which, if any, provide the skills needed in the profession. While UCGIS is addressing GIS education curriculum guidelines, no accreditation process is in place (or planned) to assure compliance or evaluate quality. URISA has accredited its own GIS workshops, but they are only a small offering among the many courses and workshops that are currently available.

While experience is the most important factor in being able to apply skills to real world problems, education does play a very important role in providing the knowledge and intellectual maturity required to approach problems and communicate solutions effectively. Additionally, it is important for professionals to help maintain the fundamental health of the profession and to contribute to its advancement by donating their time and skills in related efforts not leading directly to individual compensation. Thus, applicants must document points in three categories: educational achievement, professional experience, and professional contributions.

The minimum number of points required in each category is as follows:

Educational Achievement:	30 points
Professional Experience:	60 points
Professional Contributions:	8 points

As a benchmark, these minimums could be achieved by a person who has a Bachelor's degree with some GIS courses taken either in the degree program or as professional development courses (20 points for the degree plus 10 more for the courses); four years of experience in GIS application or data development (4 years x 15 points per year = 60 points); and a membership (1 point per year x 4 years = 4 points) and modest participation in the activities of some local, regional, or national group of GIS professionals (one newsletter article or GISrelated volunteer effort per year = 4 points).

Recognizing that there are many professionals who should qualify for certification but do not have a formal educational background, and that there are other professionals who do not have institutional support to contribute back to the profession, flexibility in the distribution of points is built into the program. That is the reason that a minimum in the total number of points required has been established.

To be certified, the applicant must have a minimum of 150 points. This means that, in addition to the minimum points in each category listed above, an additional 52 points are required in any one of the categories or in a combination of the three. Thus, whatever a person is lacking in, for example, education, can be made up for in experience – as long as that person meets the minimum in each category.

The full text of the final proposal for the pilot program follows as Appendix A.

In order to retain certification, a Certified GIS Professional must remain active in the profession. Once every 5 years, a certification renewal application must be submitted, identifying additional points in each of the three achievement categories since initial certification or previous renewal. Any Certified GIS Professional who fails to earn the minimum renewal points during that 5-year period is no longer considered a member of the GISCI nor is that person professionally certified.

Next Steps for Certification

During 2003, a pilot project will be conducted using members of the Georgia Chapter of URISA and other related GIS professionals (e.g., members of ACSM, ASPRS, and The Geospatial Information and Technology Association (GITA)) in the State of Georgia to test the certification criteria and evaluation process. If the results are positive, whatever necessary modifications identified during the pilot will be made, and the full Certification Program will commence, possibly by the end of 2003 or the beginning of 2004.

The GIS Certification Institute (GISCI), a 501(c)(6) organization that is a separate entity from URISA, will be responsible for conducting the pilot project and making whatever any needed modifications to the program. The GISCI has its own board of directors, and its members will consist of professional organizations whose primary interest is spatial information and technology. At present, URISA is the only member; however, over the next year (and also in future years), URISA's "sister" organizations will be invited to join by the GISCI Board of Directors. Its mission is to provide the GIS community with a mechanism and process for attaining professional certification.

Application fees paid by individuals seeking GIS certification from the GISCI will support a staff that will run the certification process. Standing volunteer committees of GIS professionals will be organized to assist the Board of Directors and the staff in carrying out the mission of the Institute. The current vision of the GISCI includes two such volunteer committees: a review committee of five members who will review submitted portfolios and make final decisions about individual applications, and an "oversight" (policy) committee of five members who will study and recommend changes in the process as it evolves.

Code of Ethics

In 1986, keynote presenter, Marshall Kaplan pressed the audience at the URISA Annual Conference to think about the impacts of their work. He reminded those in attendance that every policy decision has impact on different parts of the community and that the GIS professional should know the implications of policies based on their work and make those impacts known to policymakers. These thoughts formed the origin of the recognition that a GIS professional code of ethics was needed.

Codes of ethics typically speak of relationships between professionals and different parts of the community – the obligations that professionals have to these special groups. The groups identified typically include: society, employer, colleagues and the profession, and individual citizens, and those obligations are based on treating them with respect and never merely as a means to an end. Kant, who taught philosophy and geography at the University of Königsberg, originated the moral philosophy called deontology. The URISA GIS Code of Ethics adopts it.

According to the literature (Frankel 1989), however, a professional code of ethics serves many additional purposes. A code of ethics:

- aids with professional socialization
- enhances a profession's reputation
- serves as an enabling document
- acts as a source for public evaluation
- preserves entrenched professional biases
- deters unethical behavior
- provides a support system for members
- acts as a basis for adjudicating disputes

While all of these purposes have some merit, the Committee tried to focus on the more altruistic ones. Preserving entrenched professional biases would allow codification of traditional practices, but some of the biases are likely more self-serving than morally correct. It is unfortunate that Frankel's list does not address principles and guidelines to help professionals think ethically and make tough decisions.

Background of the Code

In 1993, Will Craig contacted* more than 100 professional organizations asking for copies of their codes. The professions included those related to GIS professionals: planning, social sciences, natural sciences, environment, public affairs, and geographic sciences. Nearly half responded, with two-thirds of the respondents sending a copy of their code and one-third saying they did not have one. Many of the organizations without codes were in the process of developing one. The results were presented at the 1993 URISA and GIS/LIS conferences and were also published in the URISA Journal (Craig 1993).

* Such research would be much easier today. The Center for the Study of Ethics (CSEP) in the Professions at the Illinois Institute of Technology has a wonderful web site, with many resources including a collection of codes from many societies and some analysis of them. See http://www.iit.edu/departments/csep. While The Center has been around since 1976, the information they have collected has not been readily accessible until it appeared on the web. In addition to finding the common reference to obligations that professionals have to special groups, Craig found that sanctions are addressed in some codes and include penalties ranging from admonition to termination of membership. Enforcing sanctions, however, runs the risk of legal battles based on restricting the ability of an individual to earn a living – a lesson sorely learned by other societies. The codes of societies that do include sanctions usually have quite detailed criteria for proper conduct – in the GIS context, this might include such things as a requirement to use a scale bar instead of a ratio on maps because the ratio can get distorted during photocopying. The list of rules of conduct could be endless.

When the URISA Board of Directors established the GIS Certification Committee in 1998, it also placed the responsibility for developing a Code of Ethics on the Committee. In response, the Committee developed a proposed Code of Ethics and published it on the URISA web site in 2002. The current version of this code follows in Appendix B.

Overview of the Code

A positive tone is taken throughout the GIS Professional Code of Ethics. The Code requires GIS professionals to commit themselves to doing the right thing, as opposed to admonishing them to avoid illegal or inappropriate acts. The problem with listing acts to be avoided is that there are usually reasonable exceptions to any avoidance rule and there is implicit approval of any act not on the list. By taking a positive tone, the code attempts to foster an attitude of respect for others.

As with most of the codes studied, the GIS Professional Code of Ethics addresses the obligations that GIS professionals have to the different parts of the community. Accordingly, it is divided into four parts:

- Obligations to society
- Obligations to employers and funders
- Obligations to colleagues and the profession
- Obligations to individuals in society

A small group of people were involved in drafting the initial version of the code, which was then released for public comment, review, and revision at URISA's web site. Input from private-sector representatives, for example, affected wording about sharing data and about respecting individual privacy. Statements were kept as short as possible and expanded where necessary for our profession.

Next Steps for the Code of Ethics

The proposed Code of Ethics was available for public review at URISA's web site until November 15, 2002. After that date, the URISA GIS Certification Committee is reviewing all comments and the code will be revised one additional time, then passed to the URISA Board of Directors for approval and acceptance. It is expected that the newly formed GIS Certification Institute will then assume responsibility for the Code and its maintenance because it is expected that agreeing to abide by the Code of Ethics will be a requirement for certification. As it will provide ethical guidance for anyone, certified or not, it is also anticipated that other GIS-related institutions will adopt the GIS Professional Code of Ethics.

Once finalized, a shorter version of the Code will be created and widely distributed. That version will highlight the first two levels in the Code (e.g., do the best work possible) but will exclude details such as making full use of education and skills. That is referred to this as the "refrigerator magnet" version of the code in hopes that it might become well known, even memorized by professionals. The worst fate for a code of ethics is obscurity.

The last steps planned include adding resources to assist the GIS professional with ethical dilemmas. The code is a starting point, but links to on-line resources such as Center for the Study of Ethics in the Professions (CSEP) and the Poynter Center at the University of Indiana (http://www.indiana.edu/~poynter/) are needed. The Committee plans to develop and link to a wide variety of case studies that present dilemmas faced by the GIS professional. Most ethicists agree that the best way to build ethical muscle is to take on tough problems, weigh them, and then see how others have responded. Existing resources provide many case studies, but few deal with GIS-related issues. The Committee will be looking widely for help in building this library of case studies over the foreseeable future.

Conclusion

The implementation of professional certification and adoption of a code of ethics for GIS professionals finally establish professional and ethical standards for our industry. The proposals documented in this article provide a detailed and comprehensive plan for defining and evaluating GIS professional practice and conduct. They are profession-based in that they have been developed and will be enforced by members of our own profession and not a government agency. They are characterized by the following: multiple evaluators of the skills and conduct of people in our profession: educators who provide the skills and test our understanding of them; employers and clients who provide the work and evaluate our performance; and peers who provide feedback to our professional activities and products.

For the first time since the 1960s, when geospatial information technology was first being developed and used, professionals have a formal means to identify what they do. For the first time, the GIS profession can be identified.

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Appendix A: The Certification Program for GIS Professionals

(Draft 12/04/02) This Draft is Subject to Change

Summary

The GIS Certification Program for GIS professionals is a voluntary program that is intended to acknowledge the professional achievements of those people whose primary job responsibility involves the use of geospatial data technology. It is not a program for general users of GIS technology.

The GIS Certification Institute (www.gisci.org) administers the program by reviewing all applications and either accepting or rejecting them. The GISCI, then, is the certifying body for all GIS professionals whose applications have been accepted.

The program is a <u>point-based system that is self-documented</u> and calculated by the individual seeking certification. **It does not include an examination.**

Applicants must document points in three categories that record the individual's educational and professional accomplishments. The categories in which points may be earned consist of *educational achievement, professional experience, and professional contributions.*

The minimum amounts of points required in each are as follows:

Educational Achievement:	30 points
Professional Experience:	60 points
Professional Contributions:	8 points

An additional 52 points are required in any of the categories or in a combination of the three. Thus, **the minimum amount of points that an applicant must have in order to be certified is 150 points.**

Certification Renewal

In order to retain certification, the Certified GIS Professional must maintain currency with the profession and document those activities periodically. He or she must earn *additional points in each of the three achievement categories* within five years of initially being certified or previously renewed to remain certified. If the Certified GIS Professional fails to earn the minimum renewal points during that period, then he or she is no longer considered professionally certified by the GIS Certification Institute.

Minimum Required Points for Initial Certification

Experience is the most important factor in applying skills to real world problems, and education plays a very important role in providing the knowledge and intellectual maturity required to approach problems and communicate solutions effectively. In addition, professionals must contribute to the advancement of the profession by donating their skills in professional efforts not designed for individual compensation, but rather to maintain the fundamental health of the Profession.

This forms the basis for the minimum number of points required in each category. The minimums are based upon a model GIS Professional who possess the following characteristics: a baccalaureate degree in any field supplemented with a number of courses, workshops, seminars, conferences, and other documented educational activities whose subject matter relates directly to GIS and geospatial data technologies; at least four years of experience in a position that involves spatial data compilation, teaching, etc. (fewer years if in GIS analysis, design, or programming; and more years if in a GIS user position); and a modest record of participating in GIS conferences, publications, or GIS-related events (such as GIS-Day).

Flexibility is important, of course. GISCI recognizes that there are many professionals who should qualify but do not have the formal background that is currently available to those who are now at the beginning of their careers, and that there are other professionals who have not yet built a record or do not have institutional support to contribute back to the profession. As a result, points for a variety of different activities within the three categories of Education, Experience, and Contributions allow those non-typical professionals to qualify with different points that add up to equivalent levels. With this in mind, the minimum number of points needed to become a certified GIS Professional as detailed in the three point schedules given below is 150 points. Thus, all applicants are expected to document achievements valued at a minimum of 150 points. To ensure that applicants have a broad foundation, specific minimums in each of the three achievement categories must be met or exceeded. These minimums are as follows:

Education:	30 points
Experience:	60 points
Contributions:	8 points

The additional 52 points can be counted from any of the three categories. The applicant has complete flexibility in deciding how to make up this difference. In other words, the 52 points can be made up from any combination of points from any one (or more) of the categories. Schedules for how to accumulate points are given below.

Education Points

While formal educational experiences may not contribute as much as experience to a GIS professional's qualifications, they certainly do have the potential to be valuable means of acquiring the knowledge, skills, and dispositions that individuals need to be successful in any profession. These guidelines are meant to encourage practitioners to seek out continuing education opportunities while providing incentives to education providers to build substantive GIS programs with quality courses. The GISCI is not an accrediting body, and therefore will not attempt to evaluate the quality of educational institutions or programs. Instead, it will ensure that individuals who seek certification have successfully participated in a minimum of relevant, formal educational experiences.

Minimum educational achievement: The minimum qualification for initial certification is the equivalent of a baccalaureate degree in any field, supplemented by formal GIS-related courses or workshops completed as part of, or in addition to, a formal degree or GIS certificate program. Practitioners without a formal degree credential can fulfill education point requirements through an equivalent combination of credit and non-credit courses and workshops.

Rationale: With or without a concentration in GIS-related studies, baccalaureate degrees do not guarantee that individuals possess the knowledge and skills required to be effective GIS practitioners. What a four-year college education does provide, however, is the opportunity for individuals to develop the intellectual maturity required to approach complex problems systematically and critically, as well as the communication skills needed to articulate not only the capabilities and benefits of GIS technology, but also its limitations. Society deserves GIS professionals who are broadly educated. On the other hand, all GIS professionals (as well as their employers and clients) are likely to benefit from the professional's participation in at least a few formal educational experiences focused on GIS science, technology, and/or applications.

The **Education Point Schedule** outlined in the table below consists of two parts:

- *Credential Points:* points earned through successful completion of a formal degree or certificate program offered by accredited¹ educational institutions; and
- Course Points: points earned through successful completion of individual courses, workshops, and other formal, documented educational activities whose subject matter relates directly to GIS science, technology, and/or applications.²

Applicants may claim a total number of Education points equal to the sum of Credential Points plus Course Points. The minimum number of Education points required for certification is 30 points. The maximum number of Education points that may be claimed is 82 (the 30 point minimum plus the additional 52 points beyond the minimums for Education, Experience, and Contributions needed to reach 150 points total).

Credential Points: Applicants may claim credential points equal to the value of the highest degree or certificate earned. For example:

- a) An applicant who has earned a Masters degree or a Doctorate degree may claim 25 points (the value of a "Masters degree or higher").
- b) An applicant who has earned an Associate degree and a Bachelors degree may claim 20 points (the value of a Bachelors degree).
- c) An applicant who has earned no formal degrees, but who has earned a GIS Certificate³, may claim 5 points.
- d) An Applicant who has earned degrees from non-U.S. institutions may claim points associated with the most comparable degree (justification required).

Degrees in any field of study awarded by accredited institutions may be counted. Certificates must be specific to GIS. Applicants who claim credential points are expected to document their achievements with photocopies of their highest degree, or an original transcript that states degrees earned.

Course Points: In addition to Credential Points, applicants may claim Course Points for any GIS-related course, workshop, or other formal, documented educational activity. The number of points earned per course or workshop is proportional to the number of Student Activity Hours (the time that a student spends both inside and outside the classroom completing reading or homework assignments, studying, or other preparations) that each course entails. Student Activity Hours (SAH) for credit courses offered by colleges and universities are calculated by multiplying the number of credits for an individual course times three (a standard estimate for student activity per credit hour) and then multiplying the result by the duration of the course in weeks. One Course Point is awarded for every 40 documented Student Activity Hours. For example:

- a) A three-credit college or university course in GIS conducted over a fifteen-week semester earns 3.375 points (3 credits × 3 activity hours per credit × 15 weeks, ÷ 40 activity hours per point);
- b) A non-credit college or university course involving ten hours of effort per week over a ten-week quarter earns 2.5 points (10 hours per week × 10 weeks, ÷ 40 activity hours per point);
- c) A non-credit course offered by a private company that involves 20 hours of effort earns 0.5 points (20 hours ÷ 40 activity hours per point);
- A professional conference at which an applicant attended educational sessions for eight hours over two days earns 0.4 points (16 hours ÷ 40 activity hours per point); and
- e) A pre-conference workshop lasting four hours earns 0.1 points (4 hours ÷ 40 activity hours per point).

Only formal courses and workshops that focus specifically upon GIS science, technology, and/or applications are eligible for Course Points. Applicants who claim Course Points are expected to provide evidence of their achievements with photocopies of official transcripts, receipts, or comparable official documents. Relevant courses may be counted even if they were completed as part of a degree or certificate program for which the applicant has also claimed Credential Points.

Experience Achievement Points

Job experience is the most important factor contributing to an individual's qualifications because performing in a job gives one opportunities to become skilled at the application of GIS technology to real world problems. Failures as well as successes in these contexts provide valuable learning experiences that, in turn, allow growth and expansion of skill sets. In addition, the professional working environment, where one is often working with other GIS professionals who have different skill sets and different experiences, provides opportunities to gain knowledge from one's peers. Successes, failures, and access to mentors all form skill development opportunities in the working experience, and the longer one is exposed to these opportunities, the more one is qualified to address new problems. Therefore, four years of experience be the minimum number of years required for GIS Certification.

The closer one's job is to GIS analysis and design, the more credit should be given for those experiences. Data compilation, teaching, and similar responsibilities are jobs that do not require as broad an application of the technology or are jobs that professionals hold towards the beginning of their careers, offering fewer successes, failures, and exposure to mentors, so a lesser amount of credit should apply to time in those positions. (More experiences are necessary to gain the needed skills.) Finally, an individual in a position that is considered a "User" of GIS software requires even more time to gain exposure to the number of experiences that provide skill development opportunities.

The draft worksheet shown in the EXPERIENCE POINT SCHEDULE table contains differing point values for these three experience classifications and a fourth for any experience in a supervisory or management GIS-related position. Personnel supervision and project management experiences offer additional skill development opportunities that are valuable in a professional's qualifications. Therefore, points are awarded for the number of years in a supervisory and/or management position in addition to the years spent in more technical positions.

Points in all four categories should be added together to determine the total number of Experience Points one has attained, because during the course of one's career, it is possible that one has had all of these experiences.

Contribution Points

The GIS Certification Program is an opportunity to define the profession of GIS. The However, the program should not be used as a personal yardstick for career development. As such, it must be recognized that professional contributions in the form

1. Credential Points

- a) Enter degree title, institution, year earned, and points associated with highest credential earned (attach documentation)
 - Masters degree or higher = 25 points
 - Bachelors degree = 20 points
 - Associates degree = 10 points
 - GIS Certificate ³ = 5 points
- b) Enter degree title, Institution, and associated point value of highest credential earned below

Degree or GIS Certificate Name	Institution	Year Earned	Credential Points

2. Course Points (see accompanying Course Points Guidelines for sample calculations)

- a) List relevant² course titles, institutions, credits or CEUs (if any; attach documentation)
- b) List Student Activity Hours per credit, CEU, or course⁴
- c) Calculate subtotal of Student Activity Hours per course
- d) Divide subtotal by forty hours per point. Result is number of course points per course.
- e) Calculate Total Course Points.

		0		0		
Course title	Institution	Credit	× Student activity hrs	× Course duration	= Subtotal	÷ 40 hrs/pt = Course points
Total Course Points						
3. Total Education Points (Credential Points + Course Points; maximum 82)						

of conference planning, publications, committee/board participation, outreach, and other related efforts are fundamental to the health of any profession.

This perspective is strongly supported by the allied ASPRS professional certification program objective to 'encourage persons not yet fully qualified to work towards certification as a goal of professional achievement' and 'encourage certified persons, through the re-certification process, to continue their professional achievements.' The ASPRS certification process requires the documentation of professional and technical contributions; and the renewal process requires the documentation of participation.

The ability to contribute can be limited by lack of administrative support and resources; however, the program and the GIS community must not lower expectations to the lowest common denominator. Instead, a case should be made for the value of participation. In this way, GIS staff members can use Certification to convince their management that participation contributes to the education and personal well being of their staff.

In general, it is expected that an active professional is capable of attaining a minimum of two Contributions points per year, but initial certification is expected to be weighted lighter and renewal heavier. This places greater pressure for contributions upon established professionals, and reduces the pressure on young professionals just beginning their careers to participate in such extramural activities. (Contribution Points are defined in the "CONTRIBUTION POINT SCHEDULE").

In order to give everyone a large variety of choices in how they may contribute to their profession, we expanded the original list of Contributions to include many local, state, and regional activities. Many of these opportunities would not require extensive management support, including local community activities and "virtual" opportunities.

It must be emphasized, however, that work-related publications and sales presentations are elements of work experience. Contributions are intended to recognize documents and activities that relay lessons learned and techniques developed at work beyond the client and beyond the employer: to the profession as a whole.

Theses and dissertations are included in the Education section under coursework credit and no additional credit will be given. EXPERIENCE POINT SCHEDULE (initial as well as renewal)

Points for years in a GIS position of data analysis, system design, programming, or similar GIS position	Points for years in a GIS position of data compilation, teaching, or similar position.	Points for years in a GIS user position	*Bonus points for years in a GIS supervisory or mgmt. position	
			(*points are additive to the other three positions)	
years	years	years	years	
times 25 points/yr	times 15 points/yr	times 10 points/yr	times 10 points/yr	
= points	= points	= points	= points	
TOTAL EXPERIENCE POINTS (Sum of the four above) = points				

Contributions Glossary

GIS Publication

Any GIS-related book, editorial board, refereed paper, article, conference paper, atlas, or map. This includes GIS-related papers and articles published in non-GIS publications. This does not include professional writing, nor the publication of academic theses and dissertations.

GIS Professional Association Involvement

Participation in any national, federal, state, regional, local GIS-related organization or board. This includes GIS software user groups.

GIS Conference Participation

Participation in any national, federal, state, regional, local GIS-related conference. This includes GIS software conferences. NOTE: credit is accrued for both a conference presentation and publication of same in the conference proceeding (see Item 1. GIS Publication)

GIS Awards

Receipt of any performance award that is a direct reflection of your work as a GIS professional or contributions to the GIS profession.

Other Contributions

Other Contributions to the GIS profession in the form of event organization and/or participation such as GIS Day activities, Career Day presentations about GIS as a profession, GIS outreach and education of legislators, and GIS-related workshop instructions. Community contributions may include active GIS-related listserver participation (1 pt / yr), GIS tech support to non-profits (1 pt / 8 hr), and GIS listserver/website management (3 pt / yr.). Other forms of contributions will be considered as submitted.

Footnotes

- 1 No accreditation program currently exists specifically for GIS-related education programs. Most higher educational institutions in the U.S. are accredited, however, by one of the regional accrediting organizations associated with the Council for Higher Education Association (http://www.chea.org).
- 2 "GIS-related courses" are defined as those whose subject matter is subsumed by one or more of the eleven "knowledge areas" identified in the University Consortium on Geographic Information Sciences' Model Curricula. Examples of relevant courses are outlined in a supplementary "Course Points Guidelines" document. It is the responsibility of the applicant to justify the applicability of particular courses to the satisfaction of the GISCI Review Board.
- 3 Many higher education institutions confer GIS Certificates to students who complete a prescribed number of credit or non-credit courses. Requirements vary widely. Only certificates that involve a minimum of 400 hours of student activity qualify for Credential points. Certificates earned in conjunction with or in addition to a formal degree may be credited through the Course Points schedule.
- 4 Student Activity Hours (SAH) are calculated as follows for credit courses:

 $SAH = C \times 3 \times W$

where C is the number of credits per course,

3 is the standard number of activity hours per credit, and W is the duration of the course in weeks

Continuing Education Units (CEUs) are typically allotted at one CEU per every ten hours of student activity. For other non-credit courses and workshops, Student Activity Hours is simply the time spent both inside and outside the classroom completing reading or homework assignments, studying, or other preparations

CONTRIBUTIONS POINT SCHEDULE (initial as well as renewal)

GIS Publications:					
Publication Type:	Formula	Points Earned	*Document Provided?		
Book author/editor	# of books times 15 pts per book =]			
Published atlas (as author)	# of atlases times 15 pts per atlas =]			
Refereed paper	# of papers times 5 pts per paper =]			
Published map (as author)	# of maps times 5 pts per map =				
Editorial Board	# of years times 3 pt per year =				
Article	# of articles times 3 pts per article =]			
Paper in conference Proceedings	# of papers times 2 pts per paper =				
Newsletter Article	# of articles times 1pt per article =				
Note: Professional writing is credited as E	xperience. Publication of theses and disser	tations is credited as E	ducation.		
GIS Professional Association Involvemen	nt:				
Level of Involvement	Formula	Points Earned	Document Provided?		
Presidency	# of terms times 5 pts per term =				
Board membership	# of terms times 4 pts per term =				
Committee chairmanship	# of terms times 3 pts per term =				
Committee participation	# of terms times 2 pts per term =				
Association membership	# of terms times 1 pt per term =				
GIS Conference Participation:		1			
Level of Involvement	Formula	Points Earned	Document Provided ?		
Conference chair	# of conferences times 4 pts per =				
Conference Committee Member	# of conferences times 2 pts per =				
Presentation/poster	#of presentations times 1 pt per =				
Note: Credit is accrued for both a conference presentation and publication of same in the conference proceedings (see item 1. GIS Publication).					
GIS Awards Received:	1				
Award Type	Formula	Points Earned	Document Provided?		
Employment award	# of awards times 1 pt per award =				
Local/regional/state award	# of awards times 2 pts per award =				
National award	# of awards times 3 pts per award =				
Other GIS Contributions:					
Туре:	Formula	Points Earned	Document Provided?		
Event organization (1)	# of events times 2 pts =	1			
Event participation (1)	# of events times 1 pt =	1			
Related community Contributions (2)	# of events times 1-3 pts (variable) =]			
TOTAL CONTRIBUTIONS POINTS (Sum the above points) = points					

Examples: GIS Day, Career Day, K-12 Event, legislative initiative, workshop instruction
Examples: Active listserver participation (1 yr/1 pt), tech support to non-profit (8 hr/1 pt), listserver/website management (1 yr/3 pts)
Documentation of included points needs to be included whenever possible. If documentation is provided the applicant should write Yes (Y) in the space provided. If documentation is not included the applicant should write No (N). Documents need to be included in the same order in the portfolio as they are listed on the above schedule. The existing benchmark is that the candidate needs to provide adequate documentation for at least 50% of the claims made.

Appendix B: A GIS Code of Ethics¹

(Draft 11/19/02) This Draft is Subject to Change

This Code of Ethics is intended to provide guidelines for GIS (geographic information system) professionals. It should help professionals make appropriate and ethical choices. It should provide a basis for evaluating their work and the work of others from a moral point of view. Individuals violating this code will be criticized by their professional colleagues. By following this code, GIS professionals will help to preserve and enhance public trust in the discipline.

This code is based on the ethical principle of always treating others with respect and never merely as means to an end. It requires us to consider the impact of our actions on other persons and to modify our actions to reflect the respect and concern we have for them. It emphasizes our obligations to other persons, to our colleagues and the profession, to our employers, and to society as a whole. Those obligations provide the organizing structure for these guidelines.

This code draws on the work of many professional societies. It is not surprising that many codes of ethics provide similar guidelines to professionals, because they are based upon similar conceptions of morality. A few of the guidelines that are of particular interest to the GIS profession include the encouragement to make data and findings widely available, to document data and products, to be actively involved in data retention and security, to show respect for copyrights and other intellectual property rights, and to display concern for the data about individuals created through geospatial or data-base manipulations.

A positive tone is taken throughout the text of this code. GIS professionals commit themselves to ethical behavior rather than merely seeking to avoid specific acts. The problems with listing acts to be avoided are: 1) there are usually reasonable exceptions to any avoidance rule and 2) there is implicit approval of any act not on the list. Certainly the positive actions listed here are not exhaustive, but they do provide a good framework for dealing with most issues. By taking a positive tone, this code attempts to encourage an attitude focused on respect for others.

One final note: sometimes a GIS professional may become stuck in a dilemma where two right actions are in conflict with each other or any course of action violates some aspect of this code. Some help might come from consulting works such as *How Good People Make Tough Choices* (Kidder 1995), which offers a decision guide. Ultimately, a professional must reflect carefully on a situation before making tough decisions. Contemplating various ethical approaches² may be useful in reaching a decision:

- View persons who exemplify morality as your own guide (Virtue Ethics)
- Attempt to maximize the happiness of everyone affected (Utilitarianism)
- Only follow maxims of conduct that everyone else could adopt (Kantianism)
- Always treat other persons as ends, never merely as means (Deontology)

I. Obligations to Society

The GIS professional recognizes the impact of his or her work on society as a whole, subgroups of society including geographic or demographic minorities, on future generations, and inclusive of social, economic, environmental, or technical fields of endeavor. Obligations to society shall be paramount when there is conflict with other obligations. Therefore, the GIS professional will:

- 1. Do the Best Work Possible
 - a. Be objective, use due care, and make full use of education and skills.
 - b. Practice integrity and not be swayed by the demands of others.
 - c. Provide full, clear, and accurate information.
 - d. Strive to do what is right, not just what is legal.
 - e. Do no harm.
- 2. Contribute to the Community to the Extent Possible, Feasible, and Advisable
 - a. Make data and findings widely available.
 - b. Strive for broad citizen involvement in problem definition, data identification, analysis, and decision-making.
 - c. Donate services to community organizations.
- 3. Speak Out About Issues
 - a. Call attention to emerging public issues and identify appropriate responses based on personal expertise.
 - b. Call attention to unprofessional work of others. First take concerns to those persons; if satisfaction is not gained and the problems warrant, additional people and organizations should be notified.
 - c. Admit when a mistake has been made and make corrections where possible.

II. Obligations to Employers and Funding Bodies

The GIS professional recognizes that he or she has been hired to deliver needed products and services. The employer (or funding body) expects quality work and professional conduct. Therefore the GIS professional will:

- 1. Deliver Quality Work
 - a. Be qualified for the tasks accepted.
 - b. Keep current in the field through readings and professional development.
 - c. Identify risks and the potential means to reduce them.
 - d. Define alternative strategies to reach employer/funder goals, if possible, and the implications of each.
 - e. Document work so that it can be used by others. This includes metadata and program documentation.
- 2. Have a Professional Relationship
 - a. Hold information confidential unless authorized to release it.
 - b. Avoid all conflicts of interest with clients and employers if possible, but when they are unavoidable, disclose any conflict of interest.

- c. Avoid soliciting, accepting, or offering any gratuity or inappropriate benefit connected to a potential or existing business or working relationship.
- d. Accept work reviews as a means to improve performance.
- e. Honor contracts and assigned responsibilities.
- f. Accept decisions of employers and clients, unless they are illegal or unethical.
- g. Help develop security, backup, retention, and disposal rules.
- h. Acknowledge and accept rules about the personal use of employer resources. This includes computers, data, telecommunication equipment, and other resources.
- 3. Be Honest in Representations
 - a. State professional qualifications truthfully.
 - b. Make honest proposals that allow the work to be completed for the resources requested.
 - c. Deliver an hour's work for an hour's pay.
 - d. Describe products fully.
 - e. Be forthcoming about any limitations of data, software, assumptions, models used, methods, and analysis.

III.Obligations to Colleagues and the Profession

The GIS professional recognizes the value of being part of a community of other professionals. Together, we support each other and add to the stature of the field. Therefore, the GIS professional will:

- 1. Respect the Work of Others.
 - a. Cite the work of others whenever possible and appropriate.
 - b. Honor the intellectual property rights of others. This includes their rights in software and data.
 - c. Accept and provide fair critical comments on professional work.
 - d. Recognize the limitations one's own knowledge and skills and recognize and use the skills of other professionals as needed. This includes both those in other disciplines and GIS professionals with deeper skills in critical subareas of the field.
 - e. Work respectfully and capably with others in GIS and other disciplines.
 - f. Respect working relationships and avoid interfering in employer/employee and client/contractor relationships.
 - g. Deal honestly and fairly with prospective employees, contractors, and vendors.
- 2. Contribute to the Discipline
 - a. Publish results so others can learn about them.
 - b. Volunteer time to professional educational and organizational efforts: local or national.
 - c. Support individual colleagues in their professional development. Special attention should be given to underrepresented groups whose diverse backgrounds will add to the strength of the profession.

IV. Obligations to Individuals in Society

The GIS professional recognizes the impact of his or her work on individual people and will strive to avoid harm to them. Therefore, the GIS professional will:

- 1. Respect Privacy
 - a. Protect individual privacy, especially about sensitive information.
 - b. Be especially careful with new information created about an individual through GIS-based manipulations (such as geocoding) or the combination of two or more databases.
- 2. Respect Individuals
 - a. Encourage individual autonomy. Examples of autonomy that might be encouraged include allowing individuals to: withhold consent about being added to a database, correct information about themselves in a database, or remove themselves from a database.
 - b. Avoid undue intrusions into the lives of individuals.
 - c. Be truthful when disclosing information about an individual.
 - d. Treat all individuals equally, without regard to race, gender, or other personal characteristic not related to the task at hand.

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