

**Proposal**  
**Maine Applied GIS Institute (MAGI)**  
**University of Maine System**

The 21<sup>st</sup> century has been declared the Information and Communications Technology (ICT) Age. Geospatial and mapping technologies form a subset of this broader landscape. What we now consider routine applications such as Google Maps to find addresses or Global Positioning Systems (GPS) to navigate street networks, involve the use of complex, interlinked theories, concepts and technologies related to geography, mapping, aerial imaging, surveying, and database design. These coalesce within a geographic information systems (GIS), which provides us the ability to capture, store, edit, analyze, and display data with a spatial or geographic component (DeMers 2008).

GIS technology is used routinely in fields as diverse as urban and regional planning, emergency management, environmental planning, business and marketing, epidemiology, forestry and natural resources management, landscape architecture, engineering, and utilities management. Both the public and private sectors employ GIS professionals and a recent report suggests that the GIS marketplace is a multi-billion dollar industry set to rapidly expand as more of this technology is adopted for use in myriad everyday applications (DOL 2015; Gewin 2004). The Department of Labor has designated geospatial technology as a “high growth” industry sector with recent reports suggesting that worldwide the industry will grow from \$4.4 billion in 2010 to \$10.6 billion by 2015 (DOL 2015).

Maine has a significant geospatial technology sector with industry leaders such as J. W. Sewall Company and Delorme, as well as a strongly expanding sector of small and medium-sized businesses such as Blue Marble Geographics, PenBay Solutions, among myriad others. Moreover, a wide range of industries in Maine are increasingly recognizing the power and efficiency offered by GIS mapping and analysis. So, workers with GIS skills are more valuable in marketing, healthcare, transportation, municipal and county government, environmental services, utilities and many others fields. Studies over the past several years have shown that Maine workers need expanded training opportunities in GIS (Weaver and Duffy 2006; Sutton 2006; Johnson and Bampton 2007; and Maine GeoLibrary 2009). Also, a 2010 study showed Maine’s geospatial workforce is aging with an average age in the late 40s. This means we will see a large number of workers retiring in the coming decade (Johnson, Colgan, and Bampton 2010). Also in the 2010 study, some employers in focus group interviews noted instances where highly-paid analysts were doing entry-level technician tasks because of a dearth of qualified entry-level workers.

A 2010 summit brought together representatives of Maine’s geospatial industry with faculty from Maine’s colleges and universities. The group reviewed and discussed the workforce studies, and in breakout groups and follow-up discussions, made several key recommendations for Maine higher education, including:

- *Provide GIS education in a greater variety of formats, incl. continuing education, hybrid, and distance*
- *Provide opportunities for curriculum in discipline-specific applications of GIS*
- *Provide more options for applied GIS at the master's level*
- *Bring smaller schools together and increase efficiency with distance education*
- *“Grease the skids” between K12, community colleges, four-year college and graduate levels with articulation*
- *Provide a one-stop “marketplace” for GIS education*

- *Reach out to high school seniors and provide early college opportunities*
- *Promote geographic and spatial literacy in K12*

(Johnson, Colgan, and Bampton 2010)

The Maine GeoLibrary Board's current strategic plan, which also engaged employers and educators from across the state, echoes many of the recommendations from the workforce summit (Maine GeoLibrary 2009).

All UMS institutions have been working to address the recommendations in these reports, building on long-standing collaborations across the system. However, while we've made great strides in expanding access to GIS education, we have come to understand that it will require closer collaboration and coordination among the state's geospatial programs to fully address the recommendations. Representing geospatial faculty from all UMS institutions, we propose a systemwide institute--the Maine Applied GIS Institute (MAGI) to address identified priorities and achieve greater efficiencies, broader educational opportunities and access, and a more strategic approach to meeting the growing and changing needs of the geospatial workforce.

#### Guiding Principles:

- Maine's geospatial workforce needs an increasing number of workers at all levels with skills in applied geospatial technology, especially as the geospatial workforce ages and use of the technology expands with newer web-based and mobile computing applications.
- UMS must do more to increase access to geospatial training for Maine's workforce.
- UMS institutions already provide geospatial training and can and must do a better job of recruiting in- and out of state-students, both traditional and non-traditional age, into the geospatial field.
- Maine needs a coordinated effort to engage youth in geospatial technology to prepare them to pursue GIS in college and beyond.
- All UMS institutions need to have the capacity to offer on-campus introductory GIS courses that support a wide array of programs on their respective campuses and serve traditional students who tend to be more successful in on-campus courses.
- Campus-based GIS laboratories and associated faculty provide needed support to courses, research, community partners, student projects. Therefore, each institution needs a GIS laboratory and expert faculty to support it.
- GIS courses in online and hybrid formats can increase access to courses and programs, raise enrollment, increase efficiency, and increase collaboration, especially for advanced and specialized courses.
- To better serve students and the workforce, we need the seamless transfer of a wider array of course choices for electives in applied GIS available across the UMS system.
- GIS instruction and research are highly dependent on system or campus IT support that is skilled, responsive and committed to preventing downtime related to hardware, operating systems, productivity and ancillary software.
- GIS instruction and research are also highly dependent on skilled geospatial professionals for support of the software and domain-specific hardware, and a statewide institute must include arrangements to provide such support services.
- Already, shared licensing is a cost-effective approach to providing software across the system, and further efficiencies can be achieved through additional shared resources.

- There are faculty at every UMS campus with varied disciplinary and geospatial expertise, experience and resources to offer to a shared GIS education and research program.
- Collaborative research is more robust, easier to fund, more efficient and more enjoyable than research in silos.

### MAGI Functions

The proposed Maine Applied GIS Institute (MAGI) will act as a shared systemwide entity to serve the following functions among all UMS institutions:

- A shared introductory GIS sequence coordinated between campuses, aligned with nationally-recognized standards and workforce needs, directly transferable between institutions, and offered consistently and in multiple formats with dual-listed graduate and undergraduate options
- Coordinated elective offerings leveraging the range of expertise available across the state, addressing workforce and student needs and interests, and offered via online or hybrid formats with dual-listed graduate and undergraduate options
- Shared undergraduate and graduate certificate programs building on the shared introductory sequence and incorporating elective options from across the system (Undergraduate certificates will be administered by each campus, and graduate certificates will be administered by the graduate schools. Enrollment data for the programs will be determined in aggregate across the system.)
- Strategically develop and implement a plan to promote GIS courses and programs, including links to the ABCD program, outreach to veterans with military mapping experience, incumbent workers need to additional training, and others.
- Work with the Maine GeoLibrary Board and major employers to develop a workforce education program keyed to workforce needs, potentially including modular and non-credit offerings.
- Over the long term, planning and building a shared one-year Professional Master's in Applied GIS program located at USM and articulated with key undergraduate programs on all UMS campuses will provide students and professionals an accelerated pathway to a graduate degree.
- Building on a proven record of research in the geospatial technology field within the state of Maine, MAGI will foster and promote collaborative research in the geospatial technology field, including opportunities for undergraduate and graduate research
- In coordination with UMS IT Services, administering and support of site licenses, data and cloud computing subscriptions, and as appropriate, server infrastructure and other relevant IT services
- Coordination and planning for IT support of GIS facilities statewide
- Providing technical and curriculum design support for GIS across all UMS campuses
- Professional development opportunities for students and faculty, including the annual Maine GIS Educators Conference, now in its eighth year
- Providing internship and career services for GIS students
- Coordinating and collaborating with the GeoLibrary Board, Maine Office of GIS, Maine Department of Education's MLTI Program, and other relevant state and federal agencies, as appropriate

- Coordinating with relevant professional associations
- Convening UMS GIS faculty and other UMS stakeholders for planning and coordination

### MAGI Administrative Structure

The leadership of MAGI will include a permanent, salaried director and an elected rotating chief scientist with a two-year term and a term limit of three consecutive terms.

The director will have primary responsibility for all MAGI administrative functions, in consultation with faculty, including managing site licenses, coordinating and convening member faculty, coordinating support functions in collaboration with IT services, coordinating MAGI events, overseeing website and promotional activities, and generally making sure education and research activities are running smoothly. The director, **a two-thirds or full-time, salaried position**, will have other functions at their home institution. ***The consortium has elected Dr. Vinton Valentine of USM to be MAGI's first director.*** Dr. Valentine already serves many of these functions for the consortium and will be able to seamlessly assume the responsibilities of the director.

The chief scientist will be elected from among the tenure-track MAGI faculty. In consultation with faculty, the chief scientist will facilitate curriculum decisions and scheduling, oversee coordination with the GeoLibrary Board and other relevant bodies, maintain communication with UMS and campus administrators, facilitate development and pursuit of a collaborative research agenda, and facilitate engagement with the larger GIS education and research communities.

Faculty will meet via video conference at least twice per semester and in person at least once per year in a central location. All tenure-track faculty will vote on key MAGI decisions. With facilitation and support from the director and chief scientist, the faculty will develop policies and strategic goals and objectives, make curriculum decisions, discuss MAGI business, elect chief scientists, participate in peer review processes, and appoint representatives to committees, as needed.

MAGI faculty will, with relevant administrators, develop mechanisms for contributing to evaluation, promotion and tenure processes for participating faculty on their home campuses. This will ensure that participating faculty receive credit for collaboration and service to the shared programs, as well as ensuring input from colleagues with compatible expertise.

MAGI's physical functions will be housed on whichever campuses the director and chief scientist reside. Dr. Valentine is based currently in Gorham. It's likely the first chief scientist will be from another campus.

### Educational Programs

MAGI will offer a wide range of educational options to serve the diverse needs of students and the workforce. The programs will be designed to...

- Serve traditional and non-traditional students, as well as incumbent workers, professionals, and full-time students, including non-completers, veterans and other relevant groups.
- Emphasize GIS applications in key fields that are important in Maine or emerging nationally, including myriad natural resources, public health, land use planning, sustainable communities, municipal and regional government, emergency response and management, recreation and tourism, K12 education, and business and economic development.
- Offer multiple "on-ramps" throughout the educational pathway and multiple formats to ensure students can access GIS education at crucial times in their careers

- Combine hands-on, applied learning rooted in real-world problems supported by strong fundamentals

Educational Programs will include...

Courses available as service courses for other majors, for students who require only a basic introduction, and those who need to expand their skills.

- Introductory courses available on every campus, aligned with nationally-recognized standards and workforce needs, offered in both traditional on-campus format and online or hybrid format
- Elective courses in online or hybrid format, dual listed graduate and undergraduate wherever appropriate. Electives may include remote sensing, web GIS, spatial analysis, application development for mobile devices, cartography/ design, municipal applications, spatial law, database systems, CAD, surveying with lidar, GIS in public health, GIS in K12 education, GIS in Public Safety, scenario building, and more.

Certificate Programs (Near-Term/ Current)

- A shared undergraduate certificate program adopted by (ideally) all UMS campuses, including the introductory sequence and a wide array of electives available from across the system.

The following structure for the certificate was developed by the MAGI partners:

GIS I (4cr/ 3cr for grads at USM)

GIS II (4cr 3cr for grads at USM)

GPS course or demonstrated competency (0 to 3cr)

Two electives (6 to 8cr, 300 level or above, except as approved by the faculty in the shared programs)

Total Undergraduate 14 to 19 credits/ Total Graduate at USM 12 to 17 credits

Implementation of this model will depend upon the approval of the program on individual campuses.

- A shared graduate certificate adopted by the graduate schools

Professional Master’s Program with Accelerated Admissions (Future)

- A one-year professional Master’s in Applied GIS Program, which will attract new students from across the region, professionals wishing to enhance their skills or engage in re-training, and retain existing undergraduate students to complete graduate studies
- Students enrolled in specific four-year undergraduate programs on each UMS campus who incorporate specific courses into their studies (typically the introductory sequence) will gain accelerated admission to the professional master’s program.

### Longer Term

MAGI will explore the viability of a shared four-year program in the future. It is difficult and time consuming to develop a bachelor's program, it would require significant market research, and it would be important to design such a program very carefully to be attractive to students and serve workforce needs. So, we feel it is best addressed over the long term. Recent market research in Maine shows a significant and growing need for skills in applying GIS in allied fields and fewer jobs for those who have GIS as their sole focus. For example, a student with an undergraduate degree in environmental science and a certificate or master's in GIS will be more employable in Maine than someone with only a bachelor's in GIS. The proposed MAGI educational programs are designed to meet these specific needs in the short term.

<b>Estimated Enrollment per year upon Full Implementation (1 to 3 years)</b>								
<b>Program</b>	<b>UMA</b>	<b>UMF</b>	<b>UMFK</b>	<b>UMM</b>	<b>UMO</b>	<b>UMPI</b>	<b>USM</b>	<b>TOTAL</b>
Individual Courses (incumbent workers, non-degree/ non-cert)	10	10	5	15	20	5	30	<b>95</b>
Individual Courses (matriculated in other majors)	5	20	30	20	100	15	30	<b>220</b>
Undergraduate Certificate	5	15	5	20	20	15	40	<b>120</b>
Graduate Certificate	0	0	0	0	15	0	25	<b>40</b>
Master's (non-accelerated admission)	0	0	0	0	10	0	10	<b>20</b>
Master's (accelerated admission)	2	2	2	2	10	2	15	<b>35</b>
Master's in Public Policy & Management (GST Track)	0	0	0	0	0	0	15	<b>15</b>

### Time Line of Implementation

#### Tasks Completed to Date

- Align and redesign introductory sequence for use across system campuses, including evaluation mechanisms
- Convene all interested faculty and establish list serve
- Create standard certificate program framework, and begin to develop proposals for individual campuses

#### Spring 2015

- Communicate proposal to individual CAOs
- Present proposal to all CAOs
- Meet with Dick Thompson regarding coordination with UMS IT services
- Director assumes MAGI responsibilities
- First official MAGI meetings and finalizing administrative details
- Elect senior scientist
- Develop a coordinated plan for electives for AY 2015/16

- Seek approval from each campus for new certificates, changes to existing certificates, and changes to courses, as required to implement the coordinated programs.

#### Summer 2015

- Begin redesign of the gis.maine.edu website
- Develop and distribute promotional materials across the state and New England
- Current and pending collaborative research continues; coordinate additional collaborations, including new grant submissions
- Coordinate with UMS IT to devise a framework for the relationship between MAGI and UMS IT
- Revise software site licenses and related administrative arrangements, as needed to accommodate new structure
- Develop a plan for funding proposals with at least three proposals submitted by the end of 2015
- On-going communication with UMS administration and provosts

#### Fall 2015

- Strategic planning process begins
- MAGI meetings continue (likely more needed this year as we implement the plan)
- Implement redesigned introductory courses
- Implement shared certificate programs on all campuses
- Develop proposals for accelerated admission to graduate programs for at least one pilot program on each of the campuses
- Offer electives on coordinated schedule
- Sponsor with Maine GIS User Group the Ninth Annual Maine GIS Educators Conference
- Finalize web and promotional materials
- Begin promoting MAGI and certificate programs when they are approved.
- On-going collaborative research
- Build on existing networks and work with local businesses to offer a variety of internship opportunities
- On-going communication with UMS administration and provosts

#### Spring 2016

- Continue MAGI meetings
- Continue coordinated offerings of electives and intro sequence
- Continue promotional activities and populating website with material
- On-going communication with UMS administration and provosts
- Seek approval for accelerated admission to graduate programs for at least one pilot program on each of the campuses

#### Summer and Fall 2016

- Evaluation and revision of intro sequence, as needed
- Develop proposal for one-year Professional Master's in Applied GIS
- Continue expanding opportunities for accelerated admission to master's programs
- Begin developing internship and career resources

- On-going collaborative research
- On-going promotional activities

### Estimated Funding Requirements

<b>MAGI Funding Requirements</b>						
<b>June 2015- May 2016</b>	<b>Time Frame</b>	<b>Number</b>	<b>Units</b>	<b>Rate</b>	<b>Total</b>	<b>Comments</b>
Director's Salary	On-going	9	Months	\$6,238	\$56,142	
Travel and basic expenses for director	On-going				\$500	
Course Release for Chief Scientist	On-going	1	Month	\$6,500	\$6,500	estimated, depends on faculty elected
Summer funding for faculty to participate in planning and for travel and meeting expenses	Only for summer 2015 and 2016	9	Stipends plus travel	\$250	\$2,250	Estimate: two people each from Orono and USM, one each from the other five campuses
Funding for in-person meetings of faculty, one summer & one fall	On-going	15	people	\$250	\$3,750	
Web design	One-time		Consultant		\$2,000	
Web hosting	On-going	12	Months	\$20	\$240	
Promotional materials	One-time		Consultant		\$1,500	
Advertising	On-going		Fees		\$1,200	
Shared server charge	On-going	12	Months	\$220	\$2,640	
Miscellaneous (printing, phone, materials, etc.)	On-going				\$500	
				<b>Total</b>	<b>\$77,222</b>	

### Unanswered Questions for CAOs

- What should we call the proposed entity? Is "institute" an appropriate designator?
- How will the director and chief scientist be supervised? Can the MAGI faculty serve in a primary oversight capacity? Will the director and chief scientist answer to a specific provost?
- How will faculty be compensated for participating, and how will they receive credit in tenure and promotion decisions for their collaboration?



- Can the system pay for the GIS site licenses? The current model is unsustainable and inefficient with USM administering the license without compensation and other campuses paying for shares of each license?
- How will we manage tuition and shared courses among campuses? How will we manage credit for enrollment and program completion?
- What is the best way to manage grant funds for collaborative research? We don't mind having a single institution as the fiscal agent, and we have had many collaborative grants managed that way. However, sharing funding is currently difficult and time consuming. We need a better way. Should grants come through the UMS or can we streamline sharing through MAGI? If so, can indirects benefit, at least in part, MAGI programs?
- There are currently some expenses that specific campuses are shouldering, especially the cost to USM of administering the site licenses and providing technical support and other services to the partners in the current consortium. It's important that the plan for a systemwide program incorporate a director position to address these functions. How will we sustain this position in the future?

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