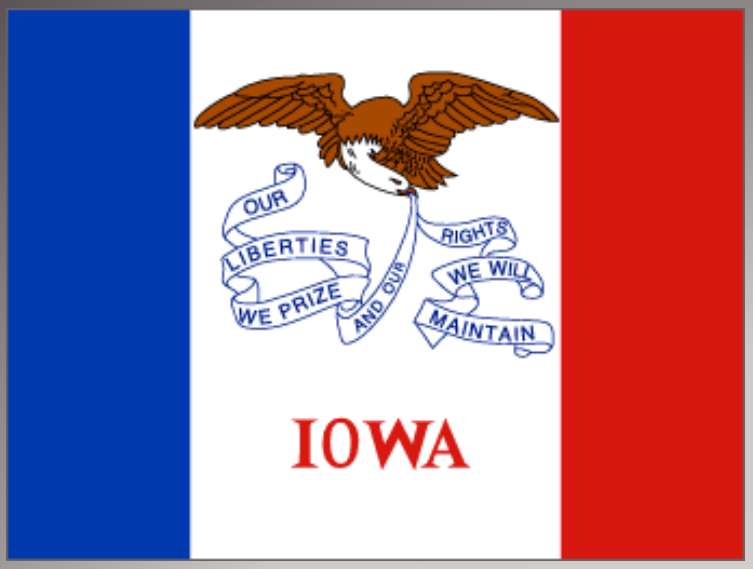

A Business Plan for Iowa Geospatial Infrastructure Framework Layers for Emergency Management Applications

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2012 NSDI CAP Category 4: Fifty State Initiative: Business Plan Development and Implementation

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IOWA geographic information council

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Executive Summary

Framework GIS data layers are critical needs for local, state, and federal agencies to respond to disasters, as well as for pre-planning and recovery phases. Emergency managers need data layers that are accurate, current, and consistent enough to make good operational decisions during disaster events, as well as serve as base maps for pre-disaster and post-disaster planning. Accuracy, currency, and consistency are all balanced against real world limitations on funding for data creation and maintenance, and institutional relationships to share and standardize common data themes. Iowa has an interesting and fruitful history of cooperatively creating and sharing GIS data, mostly without centralized coordination or institutional agreements. Realistically, centralized coordination led by the state, or state directed mandates with legislative appropriations are not going to guide or influence GIS development for the foreseeable future. Nor will federal resources likely become available in the needed amounts any time soon. Therefore it will be up to all of the individual agencies within Iowa, working within their own business needs and workflows, to choose to cooperatively develop and share data increasingly needed for emergency management applications.

The Iowa Geographic Information Council wishes to recommend that all geospatial partners within the State of Iowa, including emergency management operations stakeholders, develop a cooperative program to create and maintain shared GIS framework data layers which includes statewide high resolution orthoimagery, address points, and parcel datasets. This document outlines a business plan for those framework layers and provides recommendations for some of the various paths to meeting needs.

Several options are presented for each layer, but it is recommended that over the long run, the best solution is a cooperative program between state and local government partners. The vision of this program is for the state to provide local governments with a modest amount of financial support, technical and administrative assistance. County GIS groups, state agencies and their contractors, will collect and aggregate data files, provide quality assurance, and build web services and data portals for users for address points, parcels, and orthoimagery. These aggregated statewide layers will be distributed through the Iowa Geospatial Infrastructure (IGI), Iowa's contribution to the National Spatial Data Infrastructure (NSDI).

A regular statewide collection of orthoimagery has always presented several difficulties, not limited to the high cost of such products. A recent survey of county governments shows that all but six of Iowa's 99 counties have acquired high resolution (1' or less) imagery relatively recently (since 2007), with over 80 counties getting imagery in 2012, 2013 or 2014. This business plan suggests that the state partners negotiate for the existing imagery for a relatively modest amount of cash and assistance, and develop a new imagery program in cooperation with local governments that helps to financially support the next acquisition over the next four years. We believe this option will only cost about half of the amount needed for a state-only program collecting 1' across the state over 3 or 4 years.

The address points layer is a necessary component for the Next Generation 911 GIS data sets (NG911), which are currently being assessed and evaluated by a contractor for the Iowa Homeland Security and Emergency Management Department. A separate business plan for statewide NG911 GIS data, including address points will be forthcoming by Jan. 1, 2015. Funding for the development of NG911 GIS data layers is currently available from NG911 cell phone user fees, which are generated quarterly. The outlook for completion of this data layer is very good.

The outlook for a statewide parcel layer is also very good because almost every county has a GIS and parcel layer, or is working on one. IGIC recommends a county led effort to collect and aggregate county data into a statewide layer, using their data repository and a traveling technical team approach to getting counties onboard. Alternatively, or in conjunction with the county led effort, the Iowa Department of Revenue is deeply involved

with property tax issues in the state and recognizes that parcels and real estate data are needed across the state to assure fairness and monitor progress. The IDR has already developed a local government data exchange portal that has the potential to be equipped to handle GIS data as well.

This plan outlines a vision for complete coverage of the state by 2020. Costs for creating and maintaining the address point layers are due in January 2015, and therefore not developed further here. Costs for a cooperative program for parcels and orthoimagery run about $3 million over five years, resulting in statewide parcels and three statewide imagery acquisitions.

Program Goals

Background – Emergency Management is Everyone's Business

Iowa has experienced 55 presidentially-declared disasters since 1953. Starting in 2007, there have been multiple disasters declared almost every year; three in both 2007 and 2014, and four in 2010, 2011 and 2014 (see Figure 1). The drought year of 2012 was the only exception, with no declarations. Iowa's lead hazards are those associated with severe weather, including heavy rains and flooding, tornadoes and high winds, ice storms,

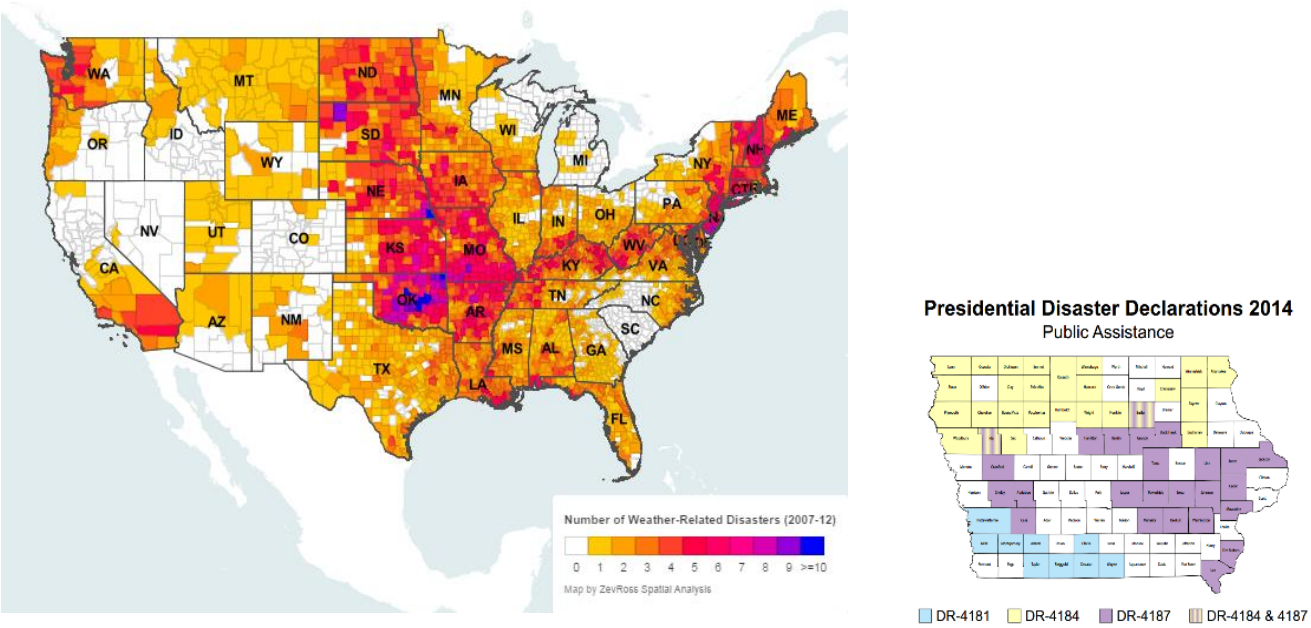


Figure 1: Map of Federal Disaster Declarations 2007-2012 for US (Left), Current Map of Presidential Disasters for 2014 from the Iowa HSEM Dept. (Lower Right). Source of past data http://www.environmentamerica.org/page/ame/map-recent-weather-related-disasters-iowa

blizzards, and heavy snow. Federal, state, and local emergency management personnel have been kept very busy these past eight years. Communities like Cedar Rapids and Iowa City remain deep in the rebuilding phase after the damages caused by the 2008 flooding of the Cedar and Iowa Rivers. Since the Great Midwest Flood of 1993, geospatial technology has come to play an increasingly critical role during all types of disasters. The Iowa Geographic Information Council, its members and federal partners, have participated in several of these events by directly supporting responders during emergencies, preparing disaster response or mitigation plans, or providing data and moral support.

During and after the great Midwest flood of 1993, GIS was used extensively by state and federal agencies to assess the causes and impacts of the flood. Before this, GIS was not often used in operations by emergency

services, especially at the local level. During the flood, federal agencies began asking state agencies for any and all GIS data. In Iowa, the Iowa Department of Natural Resources (Iowa DNR) Natural Resource GIS Library (NRGIS Library) was made available for the first time through the Internet using FTP protocols. This worked so well that in 1994, it was decided to make the NRGIS Library available to the public for free. It was one of the first open access statewide GIS data sites in the nation.

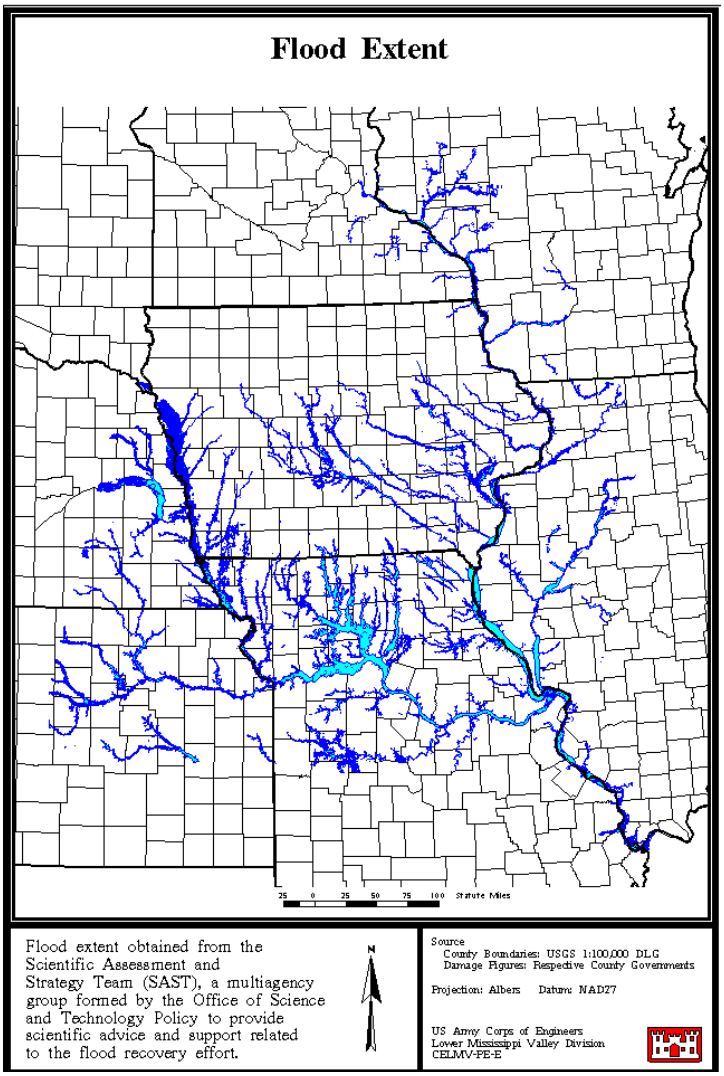


Figure 2: Flood of 1993. GIS used extensively for first time by US Army COE, USGS, and Iowa DNR for flood activities.
http://el.erdc.usace.army.mil/flood/maps/floodext.gif

As a result of the flood, funding became available to create large GIS data layers. Partnerships, particularly between the US Army COE Rock Island District and the Iowa DNR, were formed to rectify the Iowa Soil Survey polygons into a statewide GIS ready format, in a standardized map projection. This occurred several years before the advent of the NRCS SSURGO products.

USGS Water Resources Office in Iowa used GIS and Landsat remote sensing data to map the extent of the 1993 flood. Impacts from the 1993 flood project included the creation of new large scale statewide and regional GIS data layers, new models for distributing GIS data to other agencies and the public, new agency GIS capabilities for creating data and analysis, and new partnerships between state and federal scientific, land, and water management agencies.

During the flood of 2008, GIS was used extensively for emergency management operations. Using funding from the USGS Geospatial Liaison Office (Bob Lemen), IGIC contracted with the Geospatial Information and Technology Association (GITA) and consultant Mary Ann Stewart, for an ROI assessment of GIS use during the 2008 floods. Interviews with 69 individuals in 39 agencies revealed the considerable use of GIS during the emergency itself, particularly at the local level in Emergency Operation Centers (EOCs). Emergency managers began to see the power of mapping to plan evacuations, sandbagging of critical buildings and utilities, and communicate road and bridge closures to the public. Real time inundation mapping (with HAZUS models) was used to plan sandbagging operations around critical county buildings, including the EOC, jail, and county admin buildings. Inundation modeling also showed areas that did not need sandbags, helping to console worried citizens and businesses. Other modeling was used by FEMA to identify pipelines potentially damaged by erosion and scouring from fast moving streams. The results from the pipeline erosion models were used to plan inspections, thereby saving time and money on unnecessary surveys and prioritizing critical pipelines more likely to be damaged and leaking.

Several agencies learned the hard way that GIS servers and data required backups safe from flooding. Linn County and Johnson County GIS offices were both threatened by flooding. The Iowa Geological Survey, home of

the NRGIS Library, was closed to staff for several days by building closings on the University of Iowa campus due to the Iowa River flooding.

The Iowa Homeland Security and Emergency Management Division, the main agency in Iowa tasked with emergency preparedness and response, had difficulty obtaining GIS data from a few local governments during the emergency. Even during the height of the flood, some local agencies required signing of data agreements and payment take place before parcels and other data were delivered. Other local agencies took several days to weeks to deliver data to HSEMD. The Iowa Counties Information Technology group (ICIT) had available a very usable data repository (https://iowagisdata.org/), though only a small portion of the counties used it to backup and distribute data at the time.

In 2008, there was a limited availability of updated GIS framework layers for emergency management tasks, covering a wide area of the state. Statewide imagery was available from a 2002 statewide one meter CIR flight, and National Aerial Imagery Program (NAIP) flights from 2004-2007, however, the quality was poor. NAIP wasn't scheduled to be flown over Iowa in 2008, but the USDA offered to fly states who could provide funds towards a flight. Iowa partners, through the IGIC, the Iowa DNR, and Iowa DOT were able to assemble $176,000 in local matching funds by late 2007, enough to guarantee a summer 2008 flight. Fortuitously, this flight captured a record of the extensive damages from the flooding around the state. NAIP flights have continued over Iowa in 2009, 2010, 2011, 2013 and 2014. In 2010, the state contributed $91,000 in matching funds to buy up to 4 band imagery. While Iowa has benefited greatly by a generous NAIP schedule (better than the typical 3-yr. cycle), there is no guarantee that this will continue. There needs to be an established program to ensure the state is captured on a regular basis.

Parcel GIS layers were available for most of the counties affected by the floods of 2008. Most were readily made available to responding agencies, but there were notable exceptions as previously mentioned. No address points or building footprints data layers were available except in major urban counties.

The problem at hand is how to build and maintain basic GIS layers before they are needed during emergencies and disasters. These geospatial resources must be readily in place and accessible to a large number of users with a wide range of skills.

Iowa Geographic Information Council's Strategic Plan

Discussion: IGIC's strategic plan was last updated in 2012 (see info box below). Goal 2, *lead coordination activities between all sectors* has led to many useful statewide projects. As such, it is used here as the justification for creating this business plan. While individual agencies or groups administratively lead projects like statewide orthoimagery and LiDAR, the whole group participates in some form of developing new products, training, or providing feedback. The challenge here is to find a way to move beyond this ad hoc approach to projects, while retaining a spirit of cooperation. A few states are thriving with state-led IT centric approaches to GIS, whereas others appear to have lost focus, momentum, or backing over time. Our state needs to formalize coordination activities in order to build important geospatial layers and the partnerships required to maintain them.

IGIC Mission – To foster an efficient GIS environment through the cooperation and coordination with public and private entities that access, collect, provide, and share, data, metadata, applications, and educational opportunities.

IGIC Vision - Geospatial technologies are being used to effectively deliver services and address many issues of importance to Iowa's citizens. Once developed, common data layers and applications are maintained and shared so that all users can fully benefit. Government, academic, private and non-profit organizations within Iowa's geospatial community all share responsibility to contribute to the development and support of geospatial resources, work together cooperatively, and continue to promote GIS into the future.

Goal 1 - Increase the knowledge of GIS technologies by users and the public

1. Maintain the IGIC website
2. Continue support for the ESRI educational license
3. Develop outreach to users of GIS technology

Goal 2 - Lead coordination of GIS efforts between government agencies, organizations and private sector, to improve the efficiency and effectiveness of programs and services to the Iowa public

1. Establish executive level framework for statewide coordination, policy development and formal agreements between agencies
2. Support and maintain the Iowa Geospatial Data Clearinghouse
3. Promote data standards for all GIS layers
4. Promote data sharing
5. Develop and maintain IGI framework layers
6. Establish and support a GIS Service Bureau
7. Establish sustainable GIS funding for coordination efforts and projects
8. Develop other important GIS data layers as needed

Goal 3 - Build the community of GIS professionals in Iowa

1. Continue to improve and expand the biennial IGIC conference
2. Encourage professional development for all members of IGIC and the GIS community
3. Establish an Iowa GIS Corps to help during emergencies and other worthwhile efforts

Goal 4 - Maintain the Iowa Geographic Information Council as a vibrant and relevant organization

1. Update IGIC by-laws and committees on a regular basis
2. Encourage new people to join the organization and participate in IGIC activities
3. Encourage attendance and full participation at IGIC quarterly board meetings, committee meetings, and work groups
4. Develop an organizational strategic plan for the Iowa Geographic Information Council and review it every 2 years

IGIC's Vision for a Statewide Geospatial infrastructure

Using Federal Geographic Data Committee CAP grant funding starting in 2006 through the present, the IGIC and others devised a signature concept for a cooperative geospatial infrastructure for Iowa. The Iowa Geospatial Infrastructure or IGI, is our contribution to the National Spatial Data Infrastructure (NSDI). We define the IGI as having a central focus on a collection of consistent, common, integrated, standardized local, state, federal and other GIS data layers ("framework" data layers in NSDI terminology) that are readily available through the Internet. Free for anyone to use, for any purpose. IGI tries to follow NSDI practices for metadata and data

standards, and uses Iowa's spatial data clearinghouse for data discovery. IGI includes people, technology and agreements to make all of this happen. The status of framework layers follows:

IGI Framework Layer	*Description and Status*
Geodetic Control	*Iowa county GPS control monuments and National Geodetic Survey benchmarks. Status – most counties have monumented control network information available from the county engineer's office.*
Orthoimagery	*Ortho rectified aerial imagery, generally with resolution less than or equal to one meter. Status - Iowa completed a statewide 2-foot resolution, 4-band leaf-off spring flights over three years in 2007 (NW), 2009 (SW), 2010 (East). NAIP photography has also been flown for Iowa every year from 2004 to 2014, except 2012. Iowa also has a unique archive of georectified historical photography from the 1930s, 1950s, 1960s, 1970s, 1980s, 1990s, and 2002.*
Administrative Boundaries	*Statewide administrative boundaries for city, county, and state levels.*
Cadastral	*Public land survey section corners, section lines, and parcels boundaries. Status - of Iowa's 99 counties, approximately 94 counties have their parcels in a digital format. About thirty, are available to the public through the Iowa Counties Information Technology group's (ICIT) Data Repository.*
Transportation	*Road centerlines, railroads, trails, airports, and waterways layers. Iowa DOT has these layers available and maintained statewide.*
Elevation	*Digital elevation models, 2-foot contours, and shaded relief (hillshades). Status – Iowa completed a statewide LiDAR project in 2008-2011 with 1.4 meter postings, 18 cm vertical accuracy and 1 meter horizontal accuracy. All LAS point files available; county based GIS data includes 3 meter DEMs, 1 meter hillshades and 2' contours.*
Hydrography	*Rivers, streams, water bodies, and watershed boundaries (HUC 8, 10 12). Status – Iowa DNR and partners are in the process of creating LiDAR-derived stream centerlines. These will be used to develop new hydro-enforced and flattened DEMs, which in turn will be used to create new watershed boundary files. The result will be a complete set of streams, watersheds, and DEMs that all match.*
Address Points	*Road centerline address ranges and address points. Status – DOT centerlines at present do not have address ranges. State sponsored project created address points (911 and rooftop) for 61/99 counties.*
Structures	*Building points and footprints, bridges, towers, and all other structures. Status – State sponsored project created building rooftop points for 61/99 counties, with USGS best management land use classification. Some counties and cities with planimetric building footprints, with some available on ICIT Data Repository.*

Iowa Open Record Laws and GIS

The full Iowa Code section on open records is here:

http://coolice.legis.iowa.gov/cool-ice/default.asp?category=billinfo&service=iowacode&ga=83&input=22

The section of Iowa Code specific to GIS data is displayed below (Table 1). It is ambiguous, giving the impression that government bodies can create their own terms and conditions to access GIS data. This leads some local entities to charge thousands of dollars for parcels and other GIS data, or to not distribute GIS data at all. Nevertheless, others in the state Office of Ombudsman and County Government Assessor's association have

developed best practices for open records (see attachment A). These practices state that county assessors should only charge the cost of reproduction for public records (time and materials), they should make records available to everyone (cannot ask what the request is for), and should reply to requests within a reasonable amount of time (10 business days). While not all local governments are using this best practice approach, the trend is towards more consideration of GIS data as open records, charging the cost of reproduction at most, and ensuring general availability to all users. Under this business plan, any framework data layers created and managed in cooperation between the local, state, and federal governments will become considered open records and will therefore be made available under these best practices.

Table 1: Section of Iowa Code pertaining to Open Records Rules in GIS

22.2 Right to examine public records — exceptions.

1. Every person shall have the right to examine and copy a public record and to publish or otherwise disseminate a public record or the information contained in a public record. Unless otherwise provided for by law, the right to examine a public record shall include the right to examine a public record without charge while the public record is in the physical possession of the custodian of the public record. The right to copy a public record shall include the right to make photographs or photographic copies while the public record is in the possession of the custodian of the public record. All rights under this section are in addition to the right to obtain a certified copy of a public record under section 622.46.

2. A government body shall not prevent the examination or copying of a public record by contracting with a nongovernment body to perform any of its duties or functions.

3. However, notwithstanding subsections 1 and 2, a government body is not required to permit access to or use of the following:

a. A geographic computer database by any person except upon terms and conditions acceptable to the governing body. The governing body shall establish reasonable rates and procedures for the retrieval of specified records, which are not confidential records, stored in the database upon the request of any person.

b. Data processing software developed by the government body, as provided in section 22.3A.

Benefits and Justification

IGIC's Return on Investment Studies of the Iowa Geospatial Infrastructure

From 2007 to 2010, the Iowa Geographic Information Council (IGIC) led three multi-agency Return on Investment (ROI) case studies for the Iowa Geospatial Infrastructure (IGI), which is Iowa's contribution to the National Spatial Data Infrastructure (NSDI) (http://www.iowagic.org/projects/iowa-geospatial-infrastructure/). These studies assessed the needs and interests of several groups of stakeholders that produce and consume IGI framework geospatial data, especially data needed for government programs, emergency management, economic development activities, and related decision making. These ROI projects were made possible with CAP funding from the Federal Geographic Data Committee (FGDC) and the USGS state geospatial liaison's office for Iowa. IGIC was assisted by the Geospatial Information Technology Association (GITA), who participated in all three of the ROI studies of the IGI.

The third and final report combined and summarized findings from all three studies. The 20-year financial analysis of the IGI indicates that development of the IGI (including creation, maintenance, and sharing of nine framework data layers and a GIS service bureau to lead framework coordination, train users, and develop web services) will cost a total of $88 million, while providing benefits back to the state on the order of $694 million. The analysis shows a Net Present Value of $605 million with an annualized Return on Investment of 34.21%, and a payback in the first year. Of this, the benefits to flood management are $389 million, by far the largest of any

application category studied. From the original study, county, state, and federal agencies received a total of $152 million in benefits from improvements to effectiveness and efficiency of their business operations. The private sector also had substantial efficiency gains on the order of $49 million. From the research carried out in the third study on the economic development impacts of IGI, we showed benefits on the order of $37 million, using metrics based on the improved effectiveness of regional entities assisting in new business development activities. Also from the third study, benefits to smaller cities adopting GIS were included, adding $40 million through educational programs run by the state GIS service bureau. The total 20 year cost of the IGI was calculated to be $88 million, up from the first study which assumed a substantial amount of federal funding for orthoimagery (Imagery for the Nation), which may not materialize in the current federal fiscal environment. The annualized Return on Investment for IGI is 34.21%, with payback the first year.

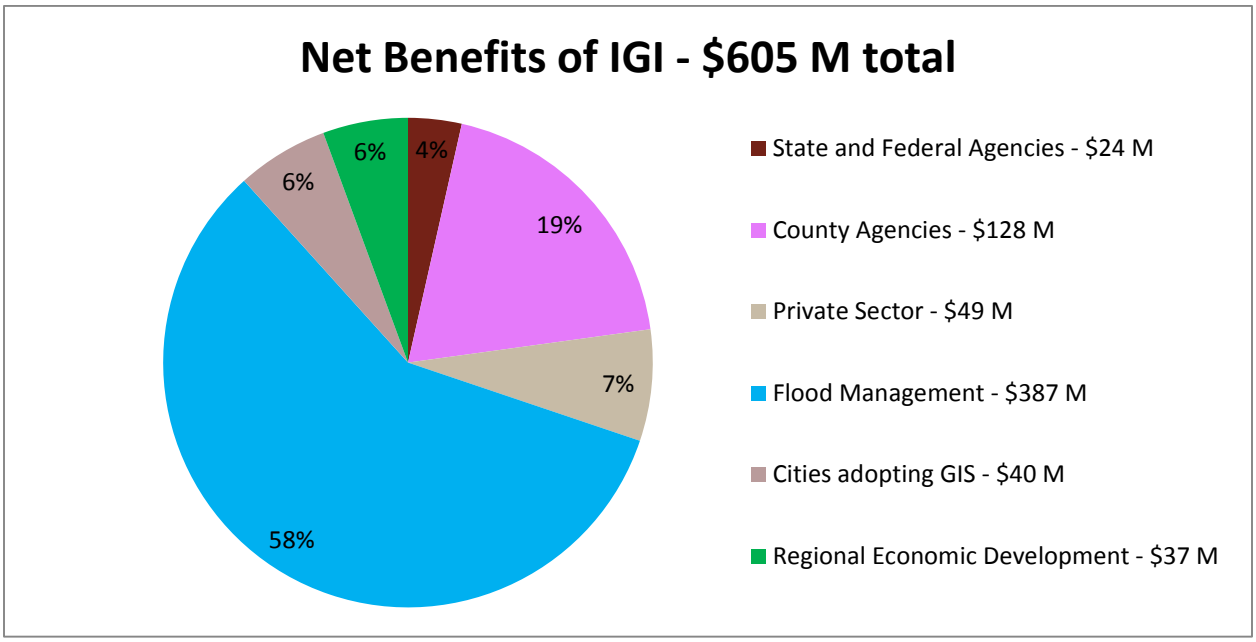


Figure 3: Net Benefits of Iowa Geospatial Infrastructure

Requirements and Costs

Orthoimagery

Orthoimagery is an important resource to the State of Iowa, especially for emergency management applications where it is used for base maps before, during, and after disasters. Requirements for emergency management applications include: high resolution (1' or better), fairly current (yearly in large urban areas, at least three years in rural settings), leaf-off (best visibility of ground features), and available in both image file format (for modeling and classification) and as a web service (online maps and field data collection apps). Medium resolution (1 meter or better) 4-band imagery is also useful for classification and image processing tasks that result in derived land cover products needed for hydrologic and other modeling. Users were surveyed for orthoimagery needs in 2013. Results are summarized in attachment B.

State-led programs: The last state-led statewide aerial program covered the state in three areas over a four year period: Northwest Iowa (17 counties in 2007 with USGS funding), Southwest Iowa (41 counties in 2009 with state funding), and Eastern Iowa (41 counties in 2010 with state funding). The imagery consisted of spring time, leaf-off, and 2' pixels with 4-bands (RGB plus infrared). This was primarily flown as an orthoimagery companion to the statewide LiDAR program being flown at the same time, though in separate areas. Besides its uses as a

visual base map used in GIS and web applications, it was processed together with NAIP 2009 leaf-on imagery and LiDAR height data to produce a high-resolution land cover product – one of the first of its type to cover an entire state.

The State of Iowa has also produced a one-of-a-kind historical aerial photography collection that includes decadal statewide sets from the 1930s, 1950s, 1960s, 1970, 1980s and 1990s. It is freely available to the public for both viewing and download on the ISU Ortho Server (http://ortho.gis.iastate.edu/).

As the State of Iowa is an agricultural state, in 2004 it began to receive additional imagery through the US Department of Agriculture's National Agriculture Imagery Program (NAIP). This has continued through 2014, with the exception of 2012. This imagery is flown to help monitor changes in agricultural conditions. The NAIP is flown at 1 meter pixel resolution during the summer to document the "leaf-on" crop conditions. Iowa has participated twice in NAIP "buy-ups", first in 2008 as an incentive for the USDA to fly Iowa on an off-cycle year and again in 2010 to buy-up to 4-bands, now the standard product.

Currently, there is no regularly scheduled flight or funding stream that allows GIS users in Iowa to anticipate when the state's orthoimagery will next be updated. For this business plan, we surveyed users' needs and received 100 responses (see attachment B). The general consensus revealed that 6", color, leaf-off imagery on a three year cycle would meet most needs. No one was able to provide ideas for new sources of adequate funding.

County-led programs: Many counties purchased a high resolution (2' rural, 1' or better urban) imagery data set when they began their forays into GIS development, needing a good visual base layer to compile parcels, roads, and other features. Since that time, tax assessment and law enforcement offices have requested and acquired newer sets of imagery on a periodic basis, usually at higher resolutions (6" or better, countywide), but occasionally geo-registered "oblique" imagery in order to see the sides of building and underneath trees. County acquired imagery is always leaf-off, taken either in early spring or late fall.

The map below shows the current status of county orthoimagery programs. What is striking about this map is the large number of counties flown in 2012, 2013, and 2014 – nearly 80% of the state. Three counties have not had the resources to fly high-resolution imagery and therefore use recent NAIP imagery for their base maps. Sixteen counties have older high-resolution imagery, from 2007 to 2011.

Commercial Orthoimagery web services: Several companies offer web services (APIs, WMS) for the US with a three year repeat cycle of mixed leaf-off and leaf-on high-resolution 6", with CIR capability. Currently, we don't have adequate cost information on these services, yet one from last year was identified to be at least half the cost of a statewide 6" program (estimated at $4 million using other state and regional programs). While the imagery samples are very good visually, they have significant leaf-on areas which eliminate their use by local governments and applications requiring visibility under trees, like emergency management. Additionally, they are licensed products, limiting who can use the image files directly. At present, commercial services have not been studied extensively in this plan, thus require further investigation before deciding if they are a viable option for a state-led orthoimagery program.

We have determined that the main requirement for emergency management operations is a leaf-off color product, with a resolution between 1' and 6". It will primarily be used for high resolution base maps and web services to locate man-made features on the ground during emergencies. A secondary requirement is a one meter to .5 meter four-band, leaf-off product for use in combination with other products like NAIP for image processing, land cover classification and modeling (HAZUS, hydrographic and hydraulic modeling, etc.).

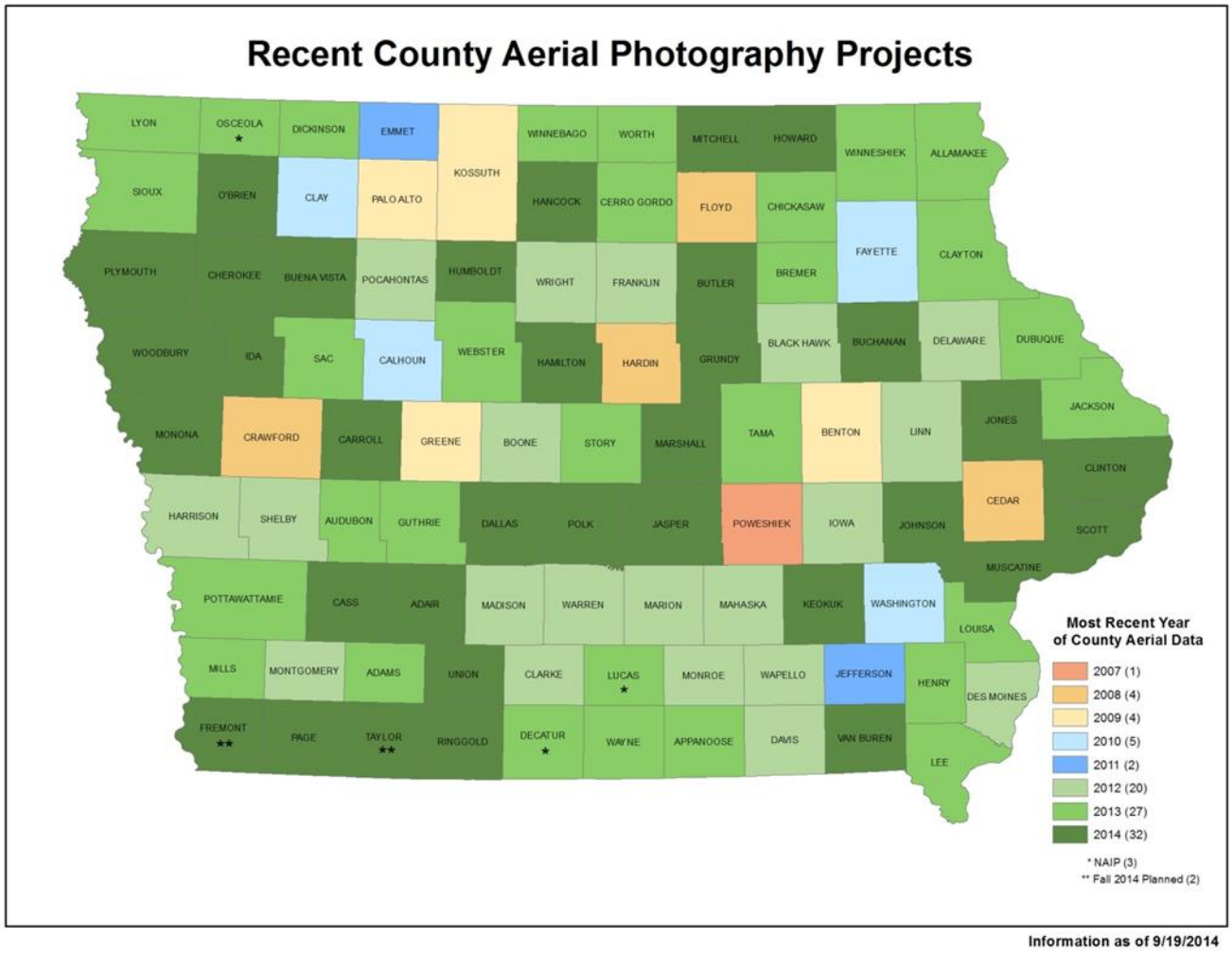


Figure 4: Map of recently completed orthoimagery projects in Iowa.

Cost Options:

We collected costs from several state orthoimagery programs over the last three years, as well as county orthoimagery RFPs (attachment E), and picked reasonable costs per square mile for 1', 6" and 3" orthos at standard flying heights and accuracy. We also visited with USDA NAIP program managers for statewide costs of one meter and half meter four-band imagery.

Table 2: Cost Estimates for Ortho-imagery

Ground Resolution	Cost per square mile	Cost per state (56272 sq. miles)	Cost per typical county
1 meter (NAIP cost)	$11	$619,000	$6,252
.5 meter (from NAIP buy-up)	$16	$900,352	$9,095
1' flown at 9600'	$39	$2,194,608	$22,167
6" flown at 4800'	$71	$3,995,312	$40,357
3" flown at 2400'	$208	$11,704,576	$118,228

Option 1: State-led Orthoimagery program for emergency management applications (base maps and web services) 6", leaf-off; divide the state into thirds or fourths and do one section each year. This option would require local contributions of 50 percent, splitting the $4 million cost equally. However, as 100 percent local contribution is unlikely, the state would end up picking up the full cost of some counties. Other states have done the 50-50 split, but were unable to get around the "free rider" problem. Buy-ups to higher resolution are possible but the state portion cannot be applied to local buy-ups, resulting in some areas being flown twice. This is what happened with our 2009/2010 2' project with local buy-ups to higher resolution. Total cost to state was between $2 million and $4 million depending on the final number of participating local partners. We like the 2014 Scott County RFP as a template for a state contract (attachment E).

Option 2: State-led Orthoimagery program for emergency management applications (base maps and web services) – 1', leaf-off; divide state into thirds or fourths and do one section each year. No local contributions required (1' doesn't meet local needs). Total cost about $2 million at $39 per square mile.

Option 3: County-led Orthoimagery program. Counties may either choose their own contractor or pick from a state contractor for a 6" or better product. The State of Iowa pays each county $10,000 towards their orthoimagery project in exchange for a copy of image files. Counties must complete their project within the program window, 2015 to 2019. Total cost to state would be a $990,000 maximum. Some counties may not participate. To increase the incentive process, decrease the amount after the third year to $5,000, and $2,500 the fourth and fifth years. The county doesn't have to do the project the same year as their commitment, so they may receive the higher incentive amount. With any amount remaining from nonparticipating counties, the state could do 1' county specific projects. This may increase the cost slightly because of smaller project areas, approximately $44 per square mile. Alternatively, the remaining amount could be used to support counties that need to fly more than once during the project period, especially larger urban counties.

Option 4: State-led four-band spring project to match NAIP cycle. The next NAIP project year for Iowa should be 2017, but the USDA seems to fly NAIP in Iowa more often than every three years. A combined spring/summer product is useful for land cover classifications, which can be used in watershed models for floodplain inundation mapping, locating cropped areas for the Iowa Department of Revenue's agriculture property tax adjustment process, or for monitoring nutrient reduction practices installed by farmers. NAIP one-meter projects cost around $620,000 for one meter, four-band, State of Iowa projects. A second option would be for a half meter buy-up to the summer NAIP for $319,000, and a state-led half meter, four-band spring project for $907,000. The total for a spring/summer half meter project would be $1,216,000.

Option 5: Buying a copy of existing county high resolution imagery (see map above). With about 79 counties having flown high resolution projects in the last three years (6" or 3" countywide, or 4" urban/9" rural), a tremendous opportunity is presented to acquire a great deal of quality imagery covering a recent time frame. Other counties have slightly older imagery, while just a few don't have anything recent and use NAIP for their base maps. As an incentive to participate, the state should pay to acquire copies of the imagery for $2,000 per county, in 2015. The incentive will continue at that amount in 2016, but decrease to $1000 in 2017. The state and ICIT will make web services out of the collected imagery. Not every county will elect to participate, but by educating decision makers at ISAC and ICIT meetings the incentives should become well known. If all counties participate, the maximum state cost will be $198,000, plus any costs to collect imagery and build web services.

Recommendations for high-resolution orthoimagery:

We recommend that the best course of action is for the state agencies to form a cooperative orthoimagery program with the counties (option 3). The benefits of this approach are reduced costs for both the state and counties by doing high resolution imagery at least once within the four year period 2016 to 2019. The strategic benefit is creating a program where state and county agencies work together, to move beyond the current status quo (limited access to high quality county data, no state support). It is illogical to complete a separate state project duplicating county efforts, even if it is easier to work with a single contractor over 99 government entities. It is also recommended that Option 5 should be done as a warm up to the larger cooperative program. For little over half the cost of a state 1' project, two imagery sets will be created at a much higher resolution.

The main drawbacks to this approach is the patchwork nature of county led programs will continue for the foreseeable future, but eventually after gaining some mutual trust, further improvements in cost reduction through shared contracting and larger regional projects will ensue.

IGIC strongly urges the partners to consider the addition of option 4 (one meter spring flight) to coincide with the next NAIP cycle. While the high-resolution (6" or better leaf off imagery) projects meet the needs for emergency management applications, the one meter spring/NAIP option adds further capabilities for land cover mapping and modeling for disasters.

Address Points and Structures

Most smaller, rural county GIS systems in Iowa do not have an address point layer and most county E911 dispatch systems do not use address points to locate incoming calls, relying instead on road centerlines with address ranges on each road segment. In the first ICIT ROI study of the Iowa Geospatial Infrastructure, address points were identified as a critical framework data layer. It was noted that geocoding was an important tool for many state programs including public health, human services, education, and floodplain management. Geocoding using road centerlines was not extremely accurate, especially in rural settings and can be up to 300' off the true location. IDOT road centerlines had no address ranges at that time, and US Census Tiger roads had poor address ranges, particularly in smaller counties away from urban areas. Based on this need, the Iowa DNR used state of Iowa IT technology funding to lead an effort to create an address point layer for the state beginning in 2007. Two layers were created: an E911 driveway point, and a rooftop structure point (with USGS land use code), both with the same standardized postal service address. In 2013, funding dried up with only 61 of 99 counties completed. A few counties have updated these initial data files.

As part of this business plan, we surveyed potential users and producers in November 2013 (see attachment C). Similar to findings in the ROI study, address points were identified as important, though not many users had access to them. Those needing geocoding either used Census TIGER data or commercial services. E911 and Next Generation 911 were seen as the top uses.

Currently, the Iowa Homeland Security and Emergency Management Department is developing a plan for Next Generation 911 in Iowa. GIS plays a crucial role in the routing of emergency calls to the proper Public Service Answering Point (PSAP) by employing coordinates of addresses or cell phone GPS to determine which emergency service zone the call is located in. Address points have been designated a critical data layer for NG911, and HSEM's contractor is in the process of inventorying GIS data that may be used in the new NG911 system. Many of the DNR address point files will be identified, updated, and used in this process. The NG911 program is well funded by new, additional cell phone 911 fees. It is safe to say that the NG911 GIS process will result in complete state coverage desired by the initial DNR led project, within a few years of project initiation.

Since this process is ongoing (the inventory is supposed to be done by Jan. 2015), this business plan will not include further options or recommendations for address point data layers.

Structures are another matter entirely, as NG911 does not designate structures or building footprints as a critical GIS layer. Building footprints are difficult to derive from orthoimagery where building layover has not been removed. Thus they must be directly observed and digitized. As one option, government real assessment websites occasionally include simple scale drawings of building footprints which could be georeferenced, though heads-up digitizing may be faster. However, an issue arises over the ownership of the drawings, as they may actually belong to the real estate assessment contractor.

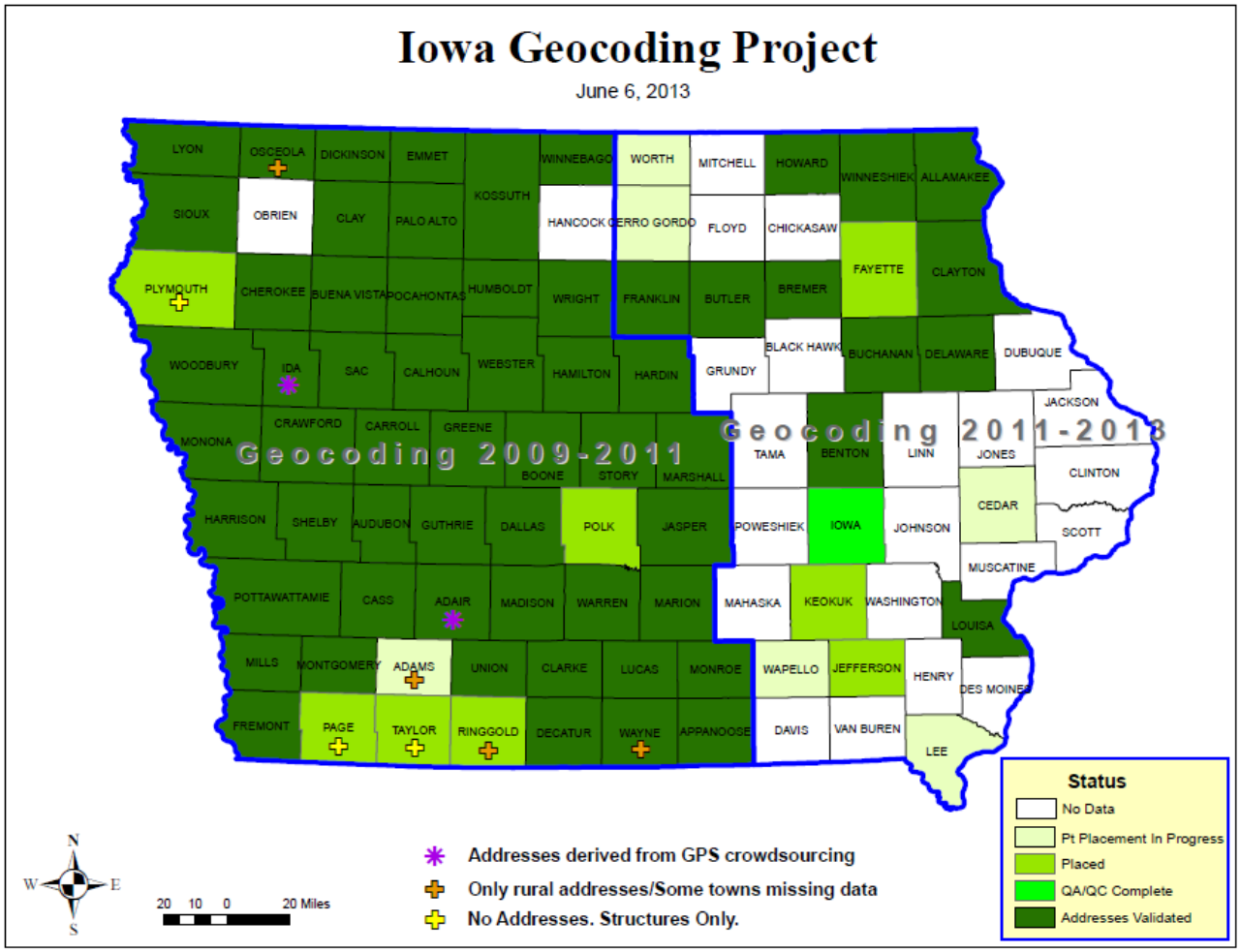


Figure 5: Map of completed and partially completed address and structure point data layers by county.

If the state Homeland Security and Emergency Management Department decided the need for some type of GIS layer for structures, either as points or polygons to go with the address point layer, a simple layer could be derived from DNR's recent compilation of land cover using one meter NAIP, spring orthoimages and LiDAR height information. This high-resolution land cover data set (one meter pixels) identifies buildings as a separate class, though land use (residential, commercial, industrial) is not part of the database. Land use would have to be derived from the parcel layer's zoning attribute, direct photo-interpretation, or data from the Assessor's office. All three methods were used to derive the land use category of building points in DNR geocoding project.

Recommendation for acquiring statewide address points and structure layers

IGIC recommends that the state continue the NG911 planning that includes the creation and maintenance of a statewide address point layer, in cooperation with local addressing authorities and local GIS staff. Maintenance of the layer with new addresses should be handled locally, but this may not be possible in all counties, without additional resources. These issues will be addressed in the contractor's inventory report due in January 2015.

Parcels

Parcels, or graphic representations of land ownership, are strictly a county government led function in Iowa. There is very little public land in comparison to other western states. The first county to use GIS to map parcels was Pocahontas County in 1987. Since then, nearly every county in Iowa has invested several hundred thousand dollars to either contract out the compilation of a parcel layer, or has done it in-house. Add to that cost the installation of control monuments, repeated orthoimagery flights, software, and training or hiring staff to run the GIS. We estimate there were over $50 million in investments to build county GIS programs in Iowa, followed by an additional $45 million used for their maintenance over the past two decades.

With such a steep investment in a new technology, it is understandable that many counties are reluctant to give away or share data with other government agencies or private businesses. Many counties feel compelled to charge thousands of dollars in order to recoup some of the costs of creating and maintaining their GIS. In IGIC's first ROI study, we were able to show that the county's initial and ongoing investment is never repaid if the GIS is used only for a few functions like tax assessment and parcel maintenance, even with a robust data selling program. The best way to break even, is to work with state and federal agencies which hold responsibilities within the county, sharing data back and forth, and expanding the uses of GIS to other county departments such as engineering, parks, public health, law enforcement, and emergency management. Indeed, when GIS is used by road departments and during disasters, the county return on investment really takes off. Of course, this requires more GIS software, more data, and more trained users. Educating county decision makers is critical to unleashing this power, which many counties in Iowa have been fortunate enough to discover. Pressure to follow Iowa's Open Record Laws is also changing ideas about data fees and agreements.

Making private businesses pay for GIS data, or pay more for GIS data, is also of dubious benefit. GIS data is frequently used by companies seeking to expand into new areas, or look for suitable building sites. If the GIS data isn't free and easily available, counties will be automatically eliminated from consideration. Agricultural producers living and working in the county, as well as their agricultural service providers, benefit greatly from easy access to GIS data. Limiting access to GIS data reduces overall economic activity in the area, making data sales less economically beneficial overall.

Figure 6 shows the status of GIS in Iowa as of 2014. Most counties have GIS and use them for parcel maintenance and property tax assessment. One county has only rural, agricultural, parcels in their system. Six more are in the process of finishing their parcel layer, some just starting the process while others nearing completion of in-house projects. All should be complete in the next 4-5 years. There are no state-only or commercial options for a statewide parcel layer without the complete cooperation of each county's agency that is responsible for their GIS and parcel maintenance. During the DNR's address geocoding project two years ago, every county contacted, with only a few exceptions, was able to provide a parcel layer at no cost. This shows a willingness to cooperate when the end result has tangible benefits for the individual county. This is the key to a successful cooperative program involving parcels.

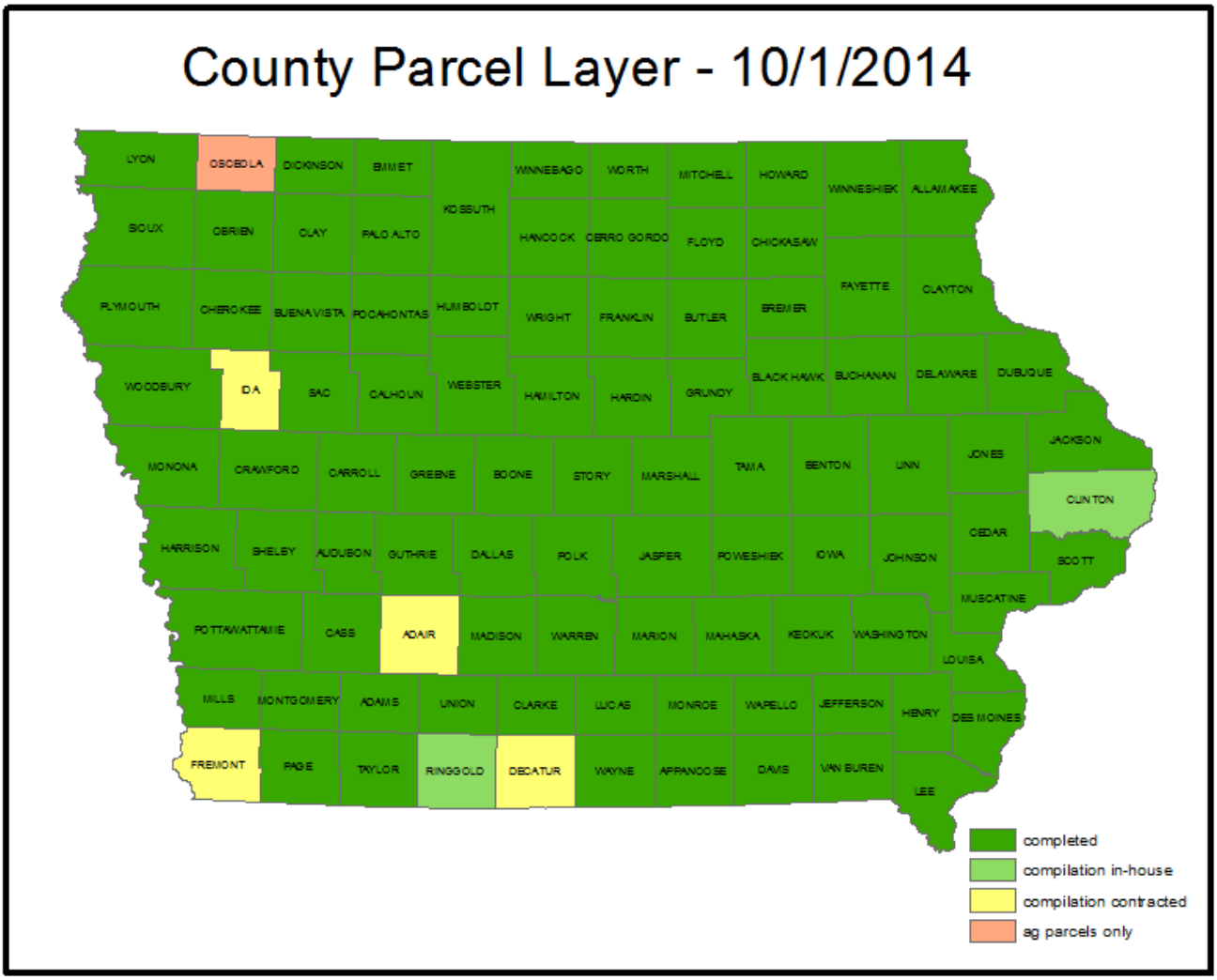


Figure 6: Map of county parcel layer status in Iowa. Information as of 9/30/2014.

Most users (65%) surveyed in 2013 needed parcels and thought a statewide layer would improve access (see attachment D). Emergency management was listed as a top use (see attachment D).

Option 1: County-led statewide parcel layer. In this scenario, the State of Iowa signs an agreement with the Iowa County Information Technology (ICIT) group to collect parcels through the ICIT Data Repository site. An ICIT technical team will install backup/upload software on a county designated computer or network for periodic backups of the county GIS files. This solution protects the county data from natural or man-made disasters that could wipe out the data. The Data Repository site itself is backed up elsewhere as well. Each county is given a one-time $2000 incentive grant to join the program in 2015 or 2016, which drops to $1000 in subsequent years. ICIT also provides training to use the backup system and operate one of the web services sites (which is probably with one of the larger county GIS systems). ICIT also is responsible for developing and maintaining the statewide parcel layer, which are aggregated and standardized from the individual county files uploaded to the data repository. The maximum cost to the state is $198,000 for incentive grants. Other ongoing costs will include the web services and aggregation technical support.

Option 2: State-led statewide parcel layer. The main alternative to this process is a state data portal, similar to the Local Government Exchange Web Portal operated by the Iowa Department of Revenue to retrieve and send data files back and forth to county assessors for the business tax credit program and property tax reform efforts. Internal costs for this option are unknown but are probably of a similar magnitude as the ICIT data repository. While the first year of experience with the tax portal shows that this system can work, its use is mandatory and directed by the IDR, though with input from the counties. This option offers the best chance of success if a county led parcel layer effort doesn't materialize, or have strong participation. There would still need to be a technical function to process, standardize, and update the individual layers.

Option 3: Commercial statewide parcel layer. There are a few companies offering nationwide, standardized parcel layers for sale or under license. These are based on purchases of county data, and in some cases if no county data exists, the companies create parcel-like substitutes. Costs are unknown at this point. Public access to licensed data is most likely limited or not permitted. The best commercial option would be companies in Iowa who provide parcel mapping services. Many have ongoing service contracts for updating the parcel layer, especially for the smaller counties without GIS staff. Many counties have online maps served by these companies, so current copies of the data are in just a few places. Contracts with the companies to aggregate their county parcel data could be developed. Permission to use the county data would need to be arranged with each county. Incentive grants could be used in this option as well to increase county participation. Some counties are wary of this option because it takes control of county data out of their hands.

Recommendation for acquiring county parcels for a statewide layer

IGIC recommends that the best long term solution would be for the state to develop a cooperative program with the counties through ICIT (Option 1). ICIT has a good technical team approach to helping counties with IT and GIS issues and this approach, supported by the state, would foster an environment of coordination and cooperation needed for long term success. Coupled with the cooperative orthoimagery program, we believe both programs would have high participation and user satisfaction. Option 2, mandatory participation through the Local Government Data Portal would have quicker implementation and higher participation in the short run, but again, counties would feel less in control of their own data, unless some services could be provided back in exchange for their participation. This would include the backup service of all their GIS data to the ICIT Data Repository, training to use the repository, and new, useful data layers and web services derived from the combined parcel layers. Besides the likely benefit to state emergency management activities in their county, perhaps economic development applications for cities and towns could be part of the overall benefit package.

Program Implementation

Strategic Goal

State, local and federal geospatial partners will develop a cooperative program to create and maintain statewide GIS layers for address points, parcels, and orthoimagery for emergency management, as well as other applications. The goal is to achieve 100% availability and access by 2020. Statewide address layers and parcels will be updated at least yearly, with some areas updated more frequently. County-based imagery will be less than four years old.

Guiding Principles

1) State and federal partners will work cooperatively with local government programs to develop these statewide products rather than dictating requirements. Resist emphasizing one sector over another.
2) Local governments remain the stewards of the primary data sets. Local governments and the state work cooperatively as data custodians of the aggregated statewide data layers.
3) Move toward standardization over time. Develop methods and workflows to aggregate existing products and projects initially, then work with data producers to evolve products that are more easily uploaded and merged.
4) Apply resources judiciously. By partnering with local governments on their current GIS and orthoimagery projects, the state can likely save both groups significant money through direct support, training and shared contracting of services.
5) Statewide products developed under this effort will be considered open records under Iowa Code, Section 22.2. As such, all other entities outside the partnership cannot be denied access to these products for other applications.
6) Working with local governments and state agencies under this project is a good opportunity to develop data backup procedures for each office that manages data and GIS services.
7) Emergency management activities touch all jurisdictions in Iowa, all agencies, all citizens. For a number of reasons, it's a good umbrella to stand under, and move everyone forward.

Programmatic Objectives

This business plan provides a broad outline for the creation and implementation of complete and accurate statewide GIS layers for address points, parcels, and orthoimagery.

1) Develop a program coordination team that meets regularly with data producers, stakeholders and policy makers to generally guide and measure progress towards the other programmatic objectives. Meet at least monthly during the crucial first year.
2) Create an Iowa GIS Development Fund – a virtual resource tracking system to keep general accounts of agency commitments of actual spending on program related activities, as well as in-kind staff and volunteer time.
3) Develop a program administrative team to handle collection and disbursements from the Iowa GIS Development Fund, as well as tracking agency in-kind contributions, staff and volunteer time.
4) Develop a program communication team to develop a program message and meet with local decision makers, individually and together at Fall ISAC 2015, 2016 and 2017.
5) Develop a traveling technical team, modeled after the award-winning ICIT IT team to aid local government data providers with scripts to upload backups, collect current and historic aerial imagery collections, and install connections to web services developed by the project. Other training as needed. Assess local unmet needs and report.

6) Develop an infrastructure technical team to set up and manage data collection and distribution nodes. Includes web services as well as data download functions. Assess options available through the ICIT Data Repository, DNR NRGIS Library, DOT web services, ISU Ortho Server, Revenue Property Tax Data Portal (for parcels) and NG911 data portal (for address points).
7) Develop an HSEM/ICIT regional demo project by end of 2015 using existing GIS data and workflows, data repositories and web services. Demonstrate to local decision makers emergency management applications using cooperative approach to data collection and distribution.
8) Decide between three imagery options: a) image services, b) state-led orthoimagery project, and c) county-led orthoimagery project with state support. Develop specifications for RFP as needed.
9) Continue collecting existing data in 2016. Continue backups to ICIT and state data repositories, and develop web services for imagery and GIS data.
10) If cooperative county-led imagery program with state incentives is selected, begin collecting new imagery in 2016. Continuing through 2019.
11) Assess options for parcel data collection, aggregation, and distribution.
12) Assess options for address point creation, collection, aggregation, and distribution.
13) Demonstrate progress at ISAC, ICIT, IGIC and state emergency management conferences using the Iowa Geospatial Infrastructure Status Dashboard (see Measures).

Recommended Tasks and Timeline for 2015-2020

1) Begin coordination meetings by Nov. 1, 2014, and meet at least monthly. Assign roles. Assess resources.
2) Develop an online spreadsheet for the GIS development fund tracking system by Jan. 2015.
3) Develop RFI for imagery services and 1', 6" and 3" orthoimagery products, Jan. 2015.
4) Select an ICIT/HSEM region for a demo project in Dec. 2014. Assign roles for communication with local governments, data collection and backup at ICIT data repository, ISU Ortho Server/DOT web services for imagery, and ICIT/state GIS web services (parcels and addresses).
5) Begin collecting existing orthoimagery, parcel and address point data sets Jan. 2015 for ICIT/HSEM regional demo.
6) Assess current orthoimagery, parcel and address point products and workflows by May 1, 2015.
7) Develop individual product specifications, workflows and timelines for each of the three aggregated statewide data sets by July 1, 2015.
8) If state led orthoimagery option is selected, develop an orthoimagery RFP for 1' (statewide 4-band) to begin in 2016. Release RFP before Dec 1. 2015.
9) If county led orthoimagery option is selected, develop state contract for 6" or 3" county imagery to begin in 2016. Release RFP in August 2015 so local governments can plan project budgets for 2016 and beyond.
10) If necessary, develop and administer vendor contracts for GIS and orthoimagery services in 2015.
11) Create at least two sites in different cities with servers for complete data backups and web services that are available during emergencies or disasters. Demo both sites in 2015-2016.
12) Begin collection of two additional HSEM/ICIT regions in 2016 assuming volunteer labor. More regions sooner if agency staff or contractors can be hired.

Budget Estimates

Using the recommended strategies for creating and maintaining statewide orthoimagery and parcels, the following budget summary is presented. Because address points are still being assessed by a separate state led process for NG911, no cost estimates are offered here.

The budget model assumes that incentive payments will reach 100% of the counties but not all at once. The first line item is for the orthoimagery currently held by county programs (see figure 4). The incentive starts with $2,000 the first two years, then drops to $1000 the third year. There are no incentives past the third year. So a county delivers its old imagery in either of the first two years, gets one $2000 payment. If it waits to the third year it only gets $1000, and then it is assumed it will be not participating. In the budget model we estimate 25 will elect to participate in 2015, 50 more in 2016 and the rest in 2017, for a total of $174,000 out of $198,000 budgeted.

The second line item covers state support for any new imagery. To incentivize new imagery sooner than later, the amount again goes down through time. Because budgets take time to confirm, if a county commits within the first two years to a new flight, they will receive $10,000 towards their project, even if it is flown later in the period. So the incentive is to at least commit early in the process. It goes down to $5,000 the 2nd and 3rd years, and $2,500 in years 4 and 5. We assume a participation of 10 committed counties in 2015, 40 commits in 2016, 20 in 2017 and 2018 and the last 10 in 2019. Hopefully by then we'll know if this approach works and the second cycle can begin. Total for this line is $675,000 out of $990,000 budgeted.

Third line is for the parcel incentive. It assumes a similar participation rate to the old orthoimagery. Likely the two payments can be packaged together for a total incentive of $4,000.

The fourth budget line is for parcel aggregation. This is an ongoing cost for about one half FTE GIS analyst, which may be optimistic for the first year or two, as the process evolves. Position could be with a state agency or ICIT. This may be true for the next item, an ongoing half GIS DBA FTE to set up and run the web services, split between a state agency and ICIT.

The sixth line item is for communications and training, a half FTE plus funding for travel for the technical team (volunteers).

The seventh line item covers a half FTE for coordination and administration, mostly likely in one of the state agencies. This is not a state GIO position but more like a coordinator for the IGI.

The final line item is for the optional statewide one meter spring leaf-off orthoimagery project to coincide with the next NAIP cycle image collection in 2017. As we've mentioned, NAIP coverage of Iowa is generous, so 2017 may not be the next NAIP pass.

A final budget recommendation is for the state partners to investigate using the State Revolving Loan Fund (SRF), as was done during the statewide LiDAR project by DNR. This smoothed out the cash flow so budgets weren't overly stressed by needing varying amounts over the course of the project.

While the costs for NG911 GIS data (including addresses) are as yet unknown, parcels and orthos are related needs, should be considered as part of a package. It will remain to be seen how much of the $3 million outlined here can be covered by other agency funds vs. NG911 funds. We recommend that the state look at NG911 needs and this plan for parcels and orthoimagery, adopting a holistic approach to funding, creating the cooperative framework for all the layers, not just the ones deemed critical for NG911. DOT, DNR and Revenue can all participate in the technical and coordination parts of the program. ICIT needs to be a foundational member. Others like ISU Extension can play a role in the training and specialty data development tasks. Volunteer time needs to be planned for and accounted for as well.

1	budget area	funding recpient	one time cost incentive per year	budgeted amount 2015-2019 with full participation	2015	2016	2017	2018	2019	total	comments
2	*old orthos one time incentive*	each county participating	2k, 2k, 1k	198000	50000	100000	24000			174000	assumes 25, 50 and 24 counties over three years
3	*new orthos support*	each county	10k, 10k, 5k, 2.5k, 2.5k	990000	100000	400000	100000	50000	25000	675000	assumes 10 counties first year, 40 2nd, 20, 20 and 10
4	*parcels one time incentive*	each county	2k, 2k, 1k	198000	50000	100000	24000			174000	assumes 25, 50 and 24 counties over three years
5	*parcel aggregation*	ICIT or state agency		250000	50000	50000	50000	50000	50000	250000	
6	*web services maintenance (2 sites)*	DOT and ICIT		250000	50000	50000	50000	50000	50000	250000	
7	*communication and training (traveling technical team)*	ICIT and ISU		375000	75000	75000	75000	75000	75000	375000	
8	*project administration and coordination*	DNR, DOT, Revenue or HSEMD		500000	100000	100000	100000	100000	100000	500000	
9	*Spring one meter 4 band ortho*	ortho contractor		619000			619000			619000	Assumes 2017 is next NAIP cycle year
10	*Yearly Totals*			3380000	475000	875000	1042000	325000	300000	**$3,017,000**	

Measuring Success

Risks and Opportunities

The major risk to this program to create statewide framework data layers for parcels, orthoimagery and address points is a poor working relationship between local government data stewards who create and update the primary data sources, and the state agencies who need to have access to the aggregated framework data layers in the IGI. Many county government staff, rightly or wrongly view the state's desire for their GIS as intrusive, somewhat dictatorial and less than supportive when data is requested with nothing obviously gained in return. Experience with the county data request for the DNR's geocoding project has shown it is possible to get good cooperation when the goals of a project are well communicated and a tangible benefit to the county is created. Forming good relationships is difficult and requires ongoing communication, but it is not impossible. High participation is possible when the results benefit all parties. This of course applies to building the National Spatial Data Infrastructure, which mirrors the state/local relationship at the federal/state level, so federal readers take note.

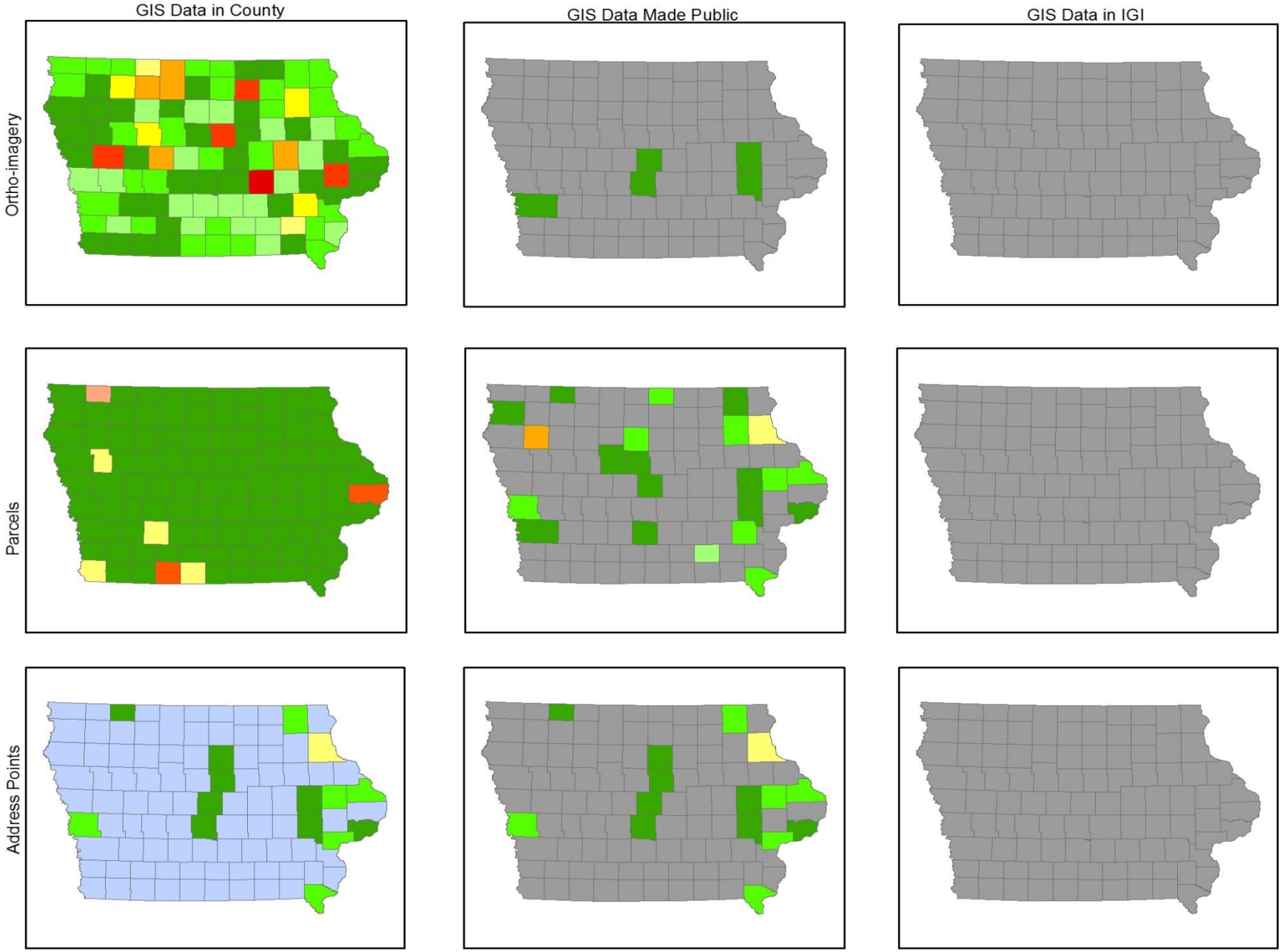
The big opportunities over the next five years are the need to develop GIS data layers for a statewide NG911 system, which comes with significant resources from cell phone fees, and changes in property and business taxes administration. NG911 is generally viewed as a good thing for everyone involved so motivating partners should be fairly easy. Tax reforms are more complex with perceived winners and losers. Another opportunity may come into play during the 2015-2020 timeframe with a stepped up effort at nutrient reduction (farmland fertilizer going to waterways), so additional resources may come available from the agriculture and environmental sources.

Measures

As the program works toward 100% coverage by 2020, IGIC will maintain an IGI status dashboard on its web site to track progress on each framework data layer. Three categories of product status will be tracked:

1) Availability of GIS layer from the data steward. Does the layer exist somewhere, in the state, a county or commercial source? What is its currency?
2) Access of GIS layer from the data steward. Is the primary data layer accessible to others either as a data file download, or through web services?
3) Availability of the aggregated statewide data layer from the IGI distribution sites (file download and web services).

A mockup of the dashboard might look like the figure below. Each data layer is a row on the chart. Each column is a status indicator, starting with primary data availability on the left, public access to primary data in the middle, and public access to aggregated IGI data layer on the right. Colors could indicate currency (year of flight or update) or status (no data, in-progress or complete). The status dashboard would be updated at least yearly with each major update or addition through 2020.


GIS Data in County
GIS Data Made Public
GIS Data in IGI
Ortho-imagery
Parcels
Address Points

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Joel Rohne – Worth County
Matt Boeck – Story County
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Alice Welch - IDOT
Gregg Hadish - USDA/NRCS
Rick Havel - Johnson County GIS

List of Attachments

A – Iowa Assessors Open Records Best Practices

B – Ortho-imagery Survey Summary

C – Address Points Survey Summary

D – Parcel Survey Summary

E – Scott County Ortho-imagery RFP