

# The Iowa Geospatial Infrastructure Return on Investment Studies 2007-2012

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# Thanks!!

- Federal Geographic Data Committee for funding 2 ROI studies in 2007 and 2010
- USGS State Geospatial Liaison Office for funding Flood ROI study in 2008
- Our ROI contractors/mentors GITA and Mary Ann Stewart

# What is the Iowa Geospatial Infrastructure (IGI)?

- Iowa Geospatial Infrastructure (IGI) is Iowa's contribution to the [National Spatial Data Infrastructure \(NSDI\)](#)
- IGI's central focus is on the 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***
- IGI will follow NSDI practices for [metadata and data standards](#), and use Iowa's [spatial data clearinghouse](#) for data discovery
- IGI includes [people, technology and agreements](#) to make this happen

# Components of IGI

- Nine framework layers and resources to maintain them
- Centralized GIS service bureau functions for technical assistance
- Coordination and oversight functions at the state and county levels
- Infrastructure for data discovery and sharing

# IGI Framework Layers

1. Geodetic control: county GPS control monuments and NGS benchmarks – counties and federal
2. Ortho imagery: BW, color and CIR orthorectified aerial imagery – counties, state and federal
3. Administrative boundaries: city, county and state boundaries – cities and counties
4. Cadastral data: public land survey section corners, section lines and parcel boundaries - counties
5. Transportation: road centerlines, railroads, trails, airports, waterways – cities, counties and state
6. Elevation: digital elevation models and contours – state and federal
7. Hydrography: rivers and streams, water bodies, watershed boundaries - state
8. Address points – cities, counties and state
9. Structures: 2D building footprints, bridges, towers – cities, counties and state

# Why are we doing this?

*The purpose of the NSDI (IGI) is:*

- To encourage the development, processing, archiving, and distribution of geospatial data using common standards and systems and to support the use of geospatial data for decision making (NSDI, 1994)
- To provide a national system of geospatial data for use in decision making, safety and security of our citizens (NSDI, 1994)



# IGI ROI Study

- 2007 CAP Grant – develop a business plan for the Iowa Geospatial Infrastructure using GITA return on investment methodology
  - Framework Data – 9 layers, files and services
  - 2 GIS Service Bureaus – county and state
  - Included federal support from Imagery for the Nation (IFTN) – new imagery every 3 years
  - Includes lidar update every 10 years
  - 20 year ROI calculation

# Example:

## ROI benefits to counties who participate in IGI

- Besides county government we also collected ROI measures from state, federal, business, academic users of geospatial data – numerous interviews, a wealth of information



# IGI ROI: Benefits to Counties with GIS Participating in IGI

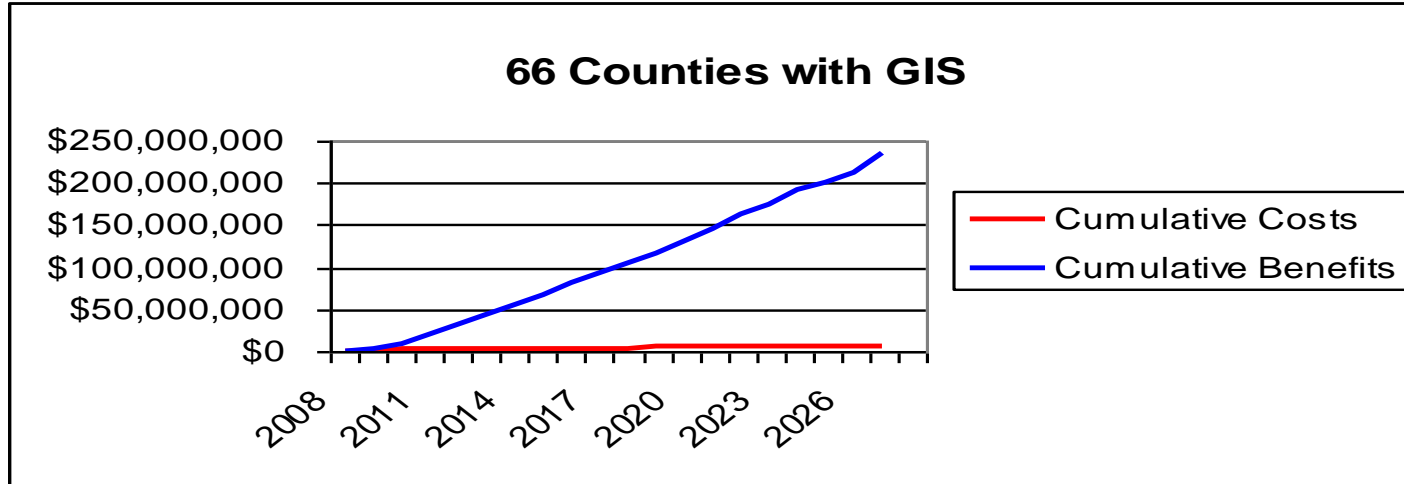
- Using lidar in **county engineer office** for road maintenance, surveying and design **\$10k-90k/yr**
- Using lidar in **county planning and zoning office** for floodplains, wind farms and other zoning applications **\$10k-50k/yr**
- Cost avoidance for web mapping server **\$10k/yr**
- Cost avoidance for aerial photography **\$20k/yr** through participation in Imagery For The Nation (IFTN)

***From \$50k to \$150k in benefits per county per year***

# Costs to Participate in IGI

- GIS Coordinator – providing framework data costs a few hours of staff time
  - County Staff – learning to use lidar elevation, other data layers – costs staff time
  - Participate in Imagery for the Nation (IFTN)  
~\$5,000 per year (provides 1' color imagery every 3 years)
- ~ \$5k-6k in real costs per county per year to participate in IGI***

# Counties WITH GIS participating in IGI



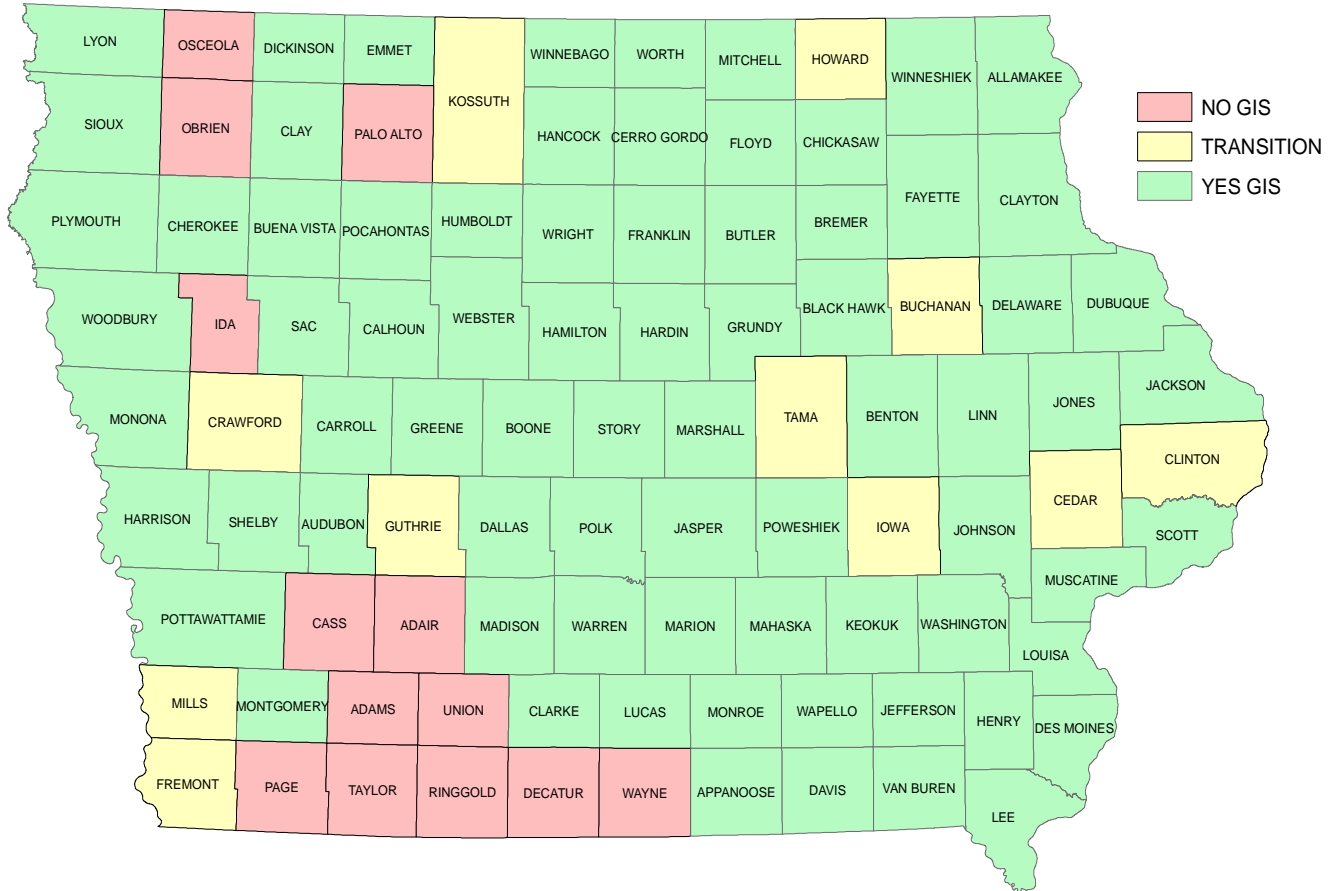
<b>Breakeven Year:</b>	2009
<b>Payback Period (in Years):</b>	1
<b>Net Present Value:</b>	\$218,563,418
<b>Present Value of Costs:</b>	\$5,808,835
<b>Return on Investment:</b>	188.13% <i>(Annualized)</i>

# *But what about counties WITHOUT GIS??*

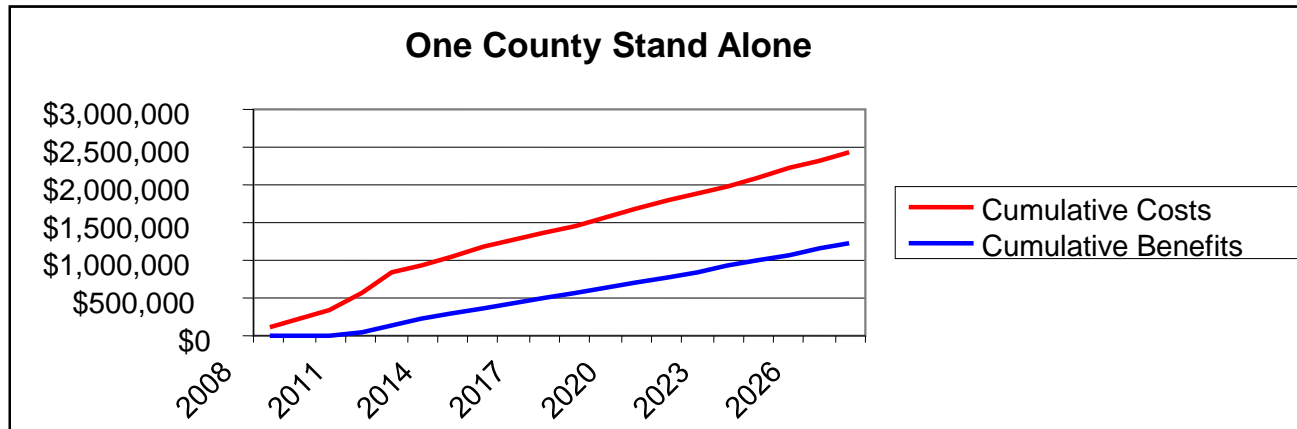
- Typical approach for counties wanting to adopt GIS:
  - Initial outlay of \$200k to \$500k for GPS control, orthos, centerlines and parcel conversion project
  - GIS staff: coordinator and half-time tech
  - 2 or more copies of desktop GIS software; GIS hardware, servers, plotter
  - Web mapping server
  - OR all above services provided by a vendor
- Many of the remaining counties can't afford startup or maintenance costs of GIS

# Status of County GIS Programs

## County GIS Programs - August 2008



# Counties adopting GIS: minimal GIS usage only



<b>Breakeven Year:</b>	Does Not Break Even
<b>Payback Period (in Years):</b>	No Payback Anticipated
<b>Net Present Value:</b>	<b>(\$1,384,577)</b>
<b>Present Value of Costs:</b>	\$2,423,193
<b>Return on Investment:</b>	-2.86% Annualized

# Problems

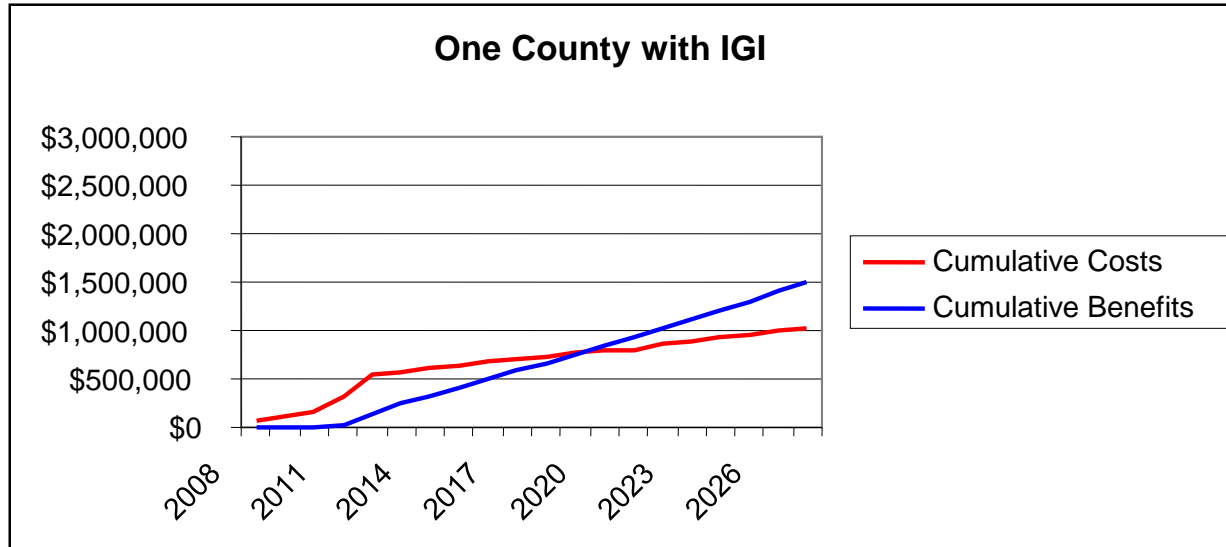
- “Standard” GIS approach is not cost effective for smaller counties if parcel maintenance and tax assessment are the only applications of GIS
- Many counties WITH GIS are not getting all the possible benefits of their GIS if all they do is parcel maintenance and tax assessment
- ***May feel compelled to sell data to recoup costs***
- IGI (and therefore NSDI) won't happen ***without major assistance*** to local data producers to lower their ongoing costs, and expand their overall benefits of having a GIS

# Helping counties without GIS get started

- IGI can help with regional approach to start a GIS
  - Sets up agreement to share a GIS person among 3 counties
  - Assists with contracting for GIS data conversion among 3 or more counties; parcel maintenance outsourcing
  - Data hosting and web application by service bureau
- Includes benefits of access to state IGI data (lidar contours, etc).
- Ortho-imagery partnerships



# County Adopting GIS with IGI Assistance – sharing maintenance costs with 2 other counties, plus lidar and IFTN benefits



<b>Breakeven Year:</b>	2018
<b>Payback Period (in Years):</b>	10
<b>Net Present Value:</b>	\$590,491
<b>Present Value of Costs:</b>	\$905,393
<b>Return on Investment:</b>	3.26%

# The BIG IGI ROI Calculation – 20 year cost scenario

- 20 **counties w/o GIS** will build county GIS programs, phased into GIS/IGI over 10 years
- 79 **counties w/ GIS**, will participate in IGI, phased in over 10 years
- **State and federal agencies** will provide funding GIS service bureaus and IFTN
- Costs of participating were phased in over first 10 years, then full cost of maintaining for next 10 years

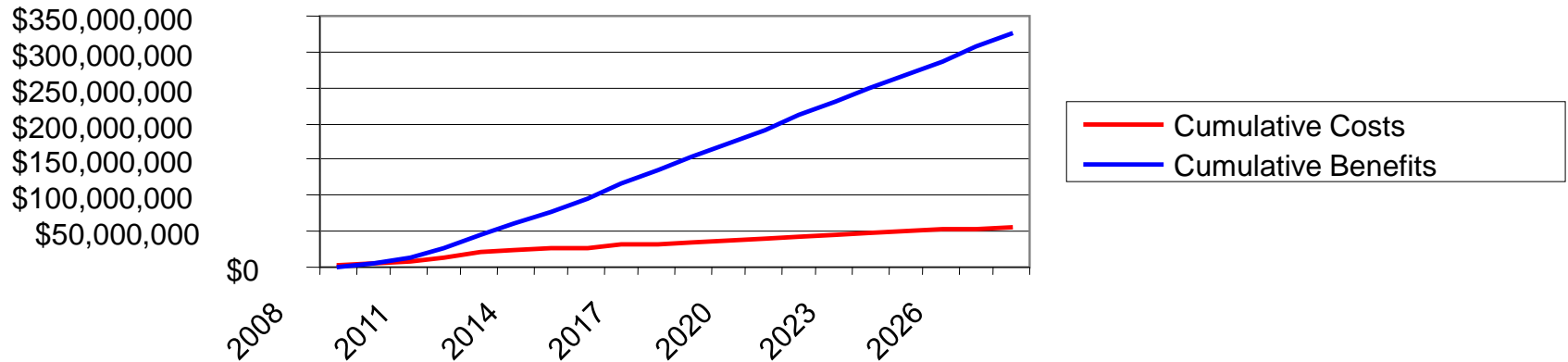
# Summary of IGI Costs

- \$385k/yr state service bureau
- \$600k/yr new orthos and lidar
- \$385k/yr county service bureau
- \$300k/yr county data projects
- \$2M one time data projects (hydro, structures, address points)
- 1M/yr county data costs (new and existing)
- (1M/yr federal contribution to IFTN –not counted in analysis)

***Total of about \$3M/yr average cost over 20 years (2M state, 1M county)***

# Multi-agency IGI Study

**Multiagency Cumulative Costs and Benefits**



<b>Breakeven Year:</b>	2010
<b>Payback Period (in Years):</b>	2
<b>Net Present Value:</b>	\$271,103,423
<b>Present Value of Costs:</b>	\$55,983,503
<b>Return on Investment:</b>	24.21% annualized

# Major Findings – ROI Spreadsheets

- The 20 year analysis shows Net Present Value of **\$271M** and Return on Investment of **24.21%**. Present value of total 20 yr **costs** is **\$56M** (about \$3M a year).
- Sensitivity analysis shows that delayed adoption of GIS, with counties phasing in GIS capabilities over 20 years instead of the desired 10 year span, does not result in extreme detriment to the project. NPV is reduced from **\$271M to \$230M** and ROI is reduced from **24% to 22%**.

# County Benefits

- Counties (or state agencies) with GIS: participating in IGI is a good deal – access to data, training, and technical services
- Counties without GIS: IGI may be a way to help you get started in GIS – technical advice, some data, coordination with potential partners, funding application assistance

# Other things we've learned

- Single use county GIS projects are hard to justify based on benefits to single agency
- Selling data has no positive impact on bottom line of GIS program
- Wide use of GIS by all departments creates very positive ROI
- Cooperation and coordination with others (local, state and federal) spreads costs, allowing increased benefits of ROI
- ROI studies help move things along, even without direct support – all but 6 counties have GIS now, due in part to our talking points

# A word about Lidar ROI

- From ROI study we estimated lidar benefits at \$5M/yr, did not include DOT
- Recent actual documented benefits \$2.5M/yr from DOT and some private
- Lots of benefits we will never be able to calculate, but hopefully will translate into future political support (John Deere & Co for example).



In 2008, this happened...



*100-500 yr flood - \$10B in damages*

# ROI #2: GIS and the Great Flood (2008 - not 1993)

- Lots of GIS uses before, during and after the 2008 Flood – documented by GITA and MAS
- Apply GIS lessons learned over 20 years, results in additional \$500,000 in benefits
- 69 interviews with 36 agencies

# 2008 Flood ROI Study

## Summary of tangible benefits from interviews

- staff time saved during emergency response
- staff time saved doing routine emergency preparedness work
- citizen time saved
- citizen cost for surveying saved
- mileage saved
- additional damage reimbursements provided
- materials saved (sandbags)
- building damage avoided
- ability to bill private entities for unneeded prevention (sandbagging)
- cost avoidance of unnecessary relocation activity

# Weather Risk Methodology

- Needed to extend GIS benefits experienced during 2008 floods to other parts of the state over 20 year ROI model
- Used 2008 Johnson County GIS actual benefit figures and statewide FEMA 500-year HAZUS model damage results to develop scaling factor to calculate GIS benefits statewide over 20 years
- Call Mary Ann Stewart for details

# ROI #3: IGI and Economic Development

- What is the value of GIS to economic development? (primarily new business development at local, regional and state levels)
- Do we expand framework layers to include more infrastructure (pipelines, electric lines, etc) needed for new biz development?
- Potential impact of “smart grid” technology
- GIS benefits = what % value of new development

# Benefits of GIS to Economic Development

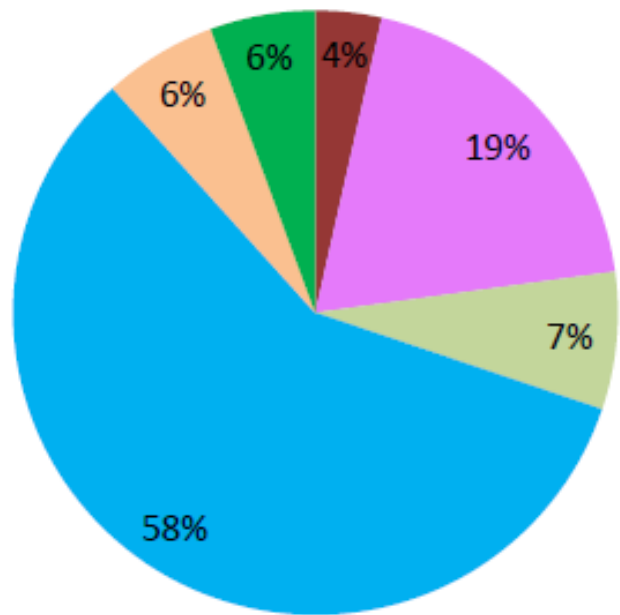
- Began with anecdotal evidence that said GIS can benefit new business development activities from 5-50% the value of the new development activity
- Interviews said this time and again, but few could actually document it

# GIS and Economic Development Metrics

- ED division of Cedar Rapids Chamber of Commerce was able to provide metrics on new jobs and earnings resulting from their activities, which are highly influenced by GIS. 5% value to them seemed very reasonable
- Used Census Bureau metrics for new job and earning by county to extend ED activity to rest of state
- Assigned metrics to the states economic development regions and ranked the regions by GIS use (1-5%)
- Current GIS impact calculated at \$2.46 M/yr
- Additional economic impact of moving to increased GIS use was \$2.33 M, or \$37.4 M over 20 year ROI study

# Recalculated IGI Benefits from all three ROI studies

## Net Benefits of IGI - \$605 M total



- State and Federal Agencies - \$24 M
- County Agencies - \$128 M
- Private Sector - \$49 M
- Flood Management - \$387 M
- Cities adopting GIS - \$40 M
- Regional Economic Development - \$37 M



# IGI ROI Final Results

- Total net benefits of IGI \$605M over 20 years
- Recalculated costs of IGI \$88 M over 20 years – added in more state/local costs to replace IFTN federal contribution
- Economic Development benefits of GIS were good, but not super huge like we hoped
- Public/private partnership with utilities did not pan out – inability to share data, even with password protected sites
- Emergency management still the biggest benefits of IGI and using GIS – key to future

So what have we done with this knowledge?



# Good News, Bad News and Really Bad News

- 2007 Great Recession
- 2008 Great Flood (Eastern IA)
- 2010 Big Flood (Central IA)
- 2011 New guys run the state
- 2011 Great Missouri Flood
- 2012 Big Drought (ongoing...)
- Bottom line = no money for new spending

# IGI Activities – FGDC CAP Grant Funding

- 2007-2008 IGI Return on Investment Study of original Iowa Geospatial Infrastructure concept - \$50k completed
- 2008-2009 Stewardship of Structures and Transportation layers – \$50k completed
- 2010 – 2011 IGI Return on Investment Study of Iowa One Map/economic development – \$50k completed
- 2011 – 2012 Iowa Metadata Outreach Project – \$25k 4 workshops, metadata training assistant position, new hardware and software for Iowa Geospatial Data Clearinghouse - completed
- 2012-2013 CAP 3+4: GIS Inventory \$15k and Framework Business Plans (statewide parcels, addresses and orthos) \$40k in progress

# IGI Activities – Funding from USGS

## State Geospatial Liaison Office

- 2007 NW Iowa 2' 4-band Orthos – \$195k funding from USGS for 17 counties, completed
- 2007 Hydrography Pilot Project – 27 HUC12s with \$50k, completed
- 2008 GIS Flood ROI Study - \$15k completed
- 2010 The National Map/USTOPO product completed for state of Iowa
- 2010 Geographic Names Information System (GNIS) and National Map structures for 10 counties - \$50k ongoing
- 2012 Local NHD Funding for 3 HUC 8s - \$45k ongoing

# IGI Activities – Other Federal Funding

- 2009 Geospatial Interns – ARRA Americorps funding for 4 volunteers to do local gov't GIS needs – Marshall, Hardin, Winneshiek Counties and City of Des Moines

# IGI Activities – State Pooled Technology Funding

- 2009 2' 4-band Orthos for 41 counties in Western Iowa - \$650k, completed
- 2010 2' 4-band Orthos for 41 counties in Eastern Iowa - \$650k, completed
- 2009 – 2011 Statewide Geocoding Project – \$650k address points and rooftop structure points for 50 counties in western Iowa – completed (\$ for eastern Iowa cut)
- 2011 State Agency GIS Service Bureau – \$300k for two ISU contract staff persons for 18 months to work with state agencies starting GIS

# IGI Activities – Funding from Partnerships

- 2008 NAIP - \$175k from state, local and private partners for RGB NAIP summer ortho-imagery
- 2010 NAIP - \$91k from state, local and private partners for 4-band NAIP summer ortho-imagery
- 2007 – 2010 Statewide Lidar Project – \$4.3M in funding from NRCS, IDALS, IDOT and IDNR – completed!!!!



# IGI Related Activities

- IDOT web services of transportation basemap layers
- Local resolution stream centerlines extracted from lidar for new floodplain maps – future hydro-enforced DEMs
- Historical orthophotos – 1930s, 1950s, 1960s, 1970s, 1980s BW county mosaics done – web services
- High resolution 1 meter land cover – in progress

# IGI Framework Layers Progress 2012

1. Geodetic control: some data collection, no new progress
2. Ortho imagery: 2' ortho program completed 2010, no further progress; ongoing uncoordinated county activity
3. Administrative boundaries: some IGI progress on school and voting boundaries
4. Cadastral data: ongoing uncoordinated county maintenance – no IGI progress
5. Transportation: state and county separately maintained road centerlines, DOT web services
6. Elevation: statewide digital elevation models and contours
7. Hydrography: local resolution rivers and streams in progress, conversion to NHD in progress
8. Address points – 50% of counties complete, no maintenance program, funding cut for remainder
9. Structures: 50% of counties complete, no maintenance program, funding cut for remainder

# IGI issues

- No central coordinator (though there is informal coordination happening)
- No governance structure or long term agreement to maintain IGI (though many informal relationships are building between sectors)
- No data standards (moving forward with “best available” for now)
- No ongoing funding, just project funds which are getting much harder to find

**FGDC funding is critical to our  
coordination efforts – THANKS!**

# IGI Current Status...

City

Federal

State

County



# Thanks for listening!

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Iowa IGI ROI Documents:

<http://www.iowagic.org/projects/iowa-geospatial-infrastructure/documents/>