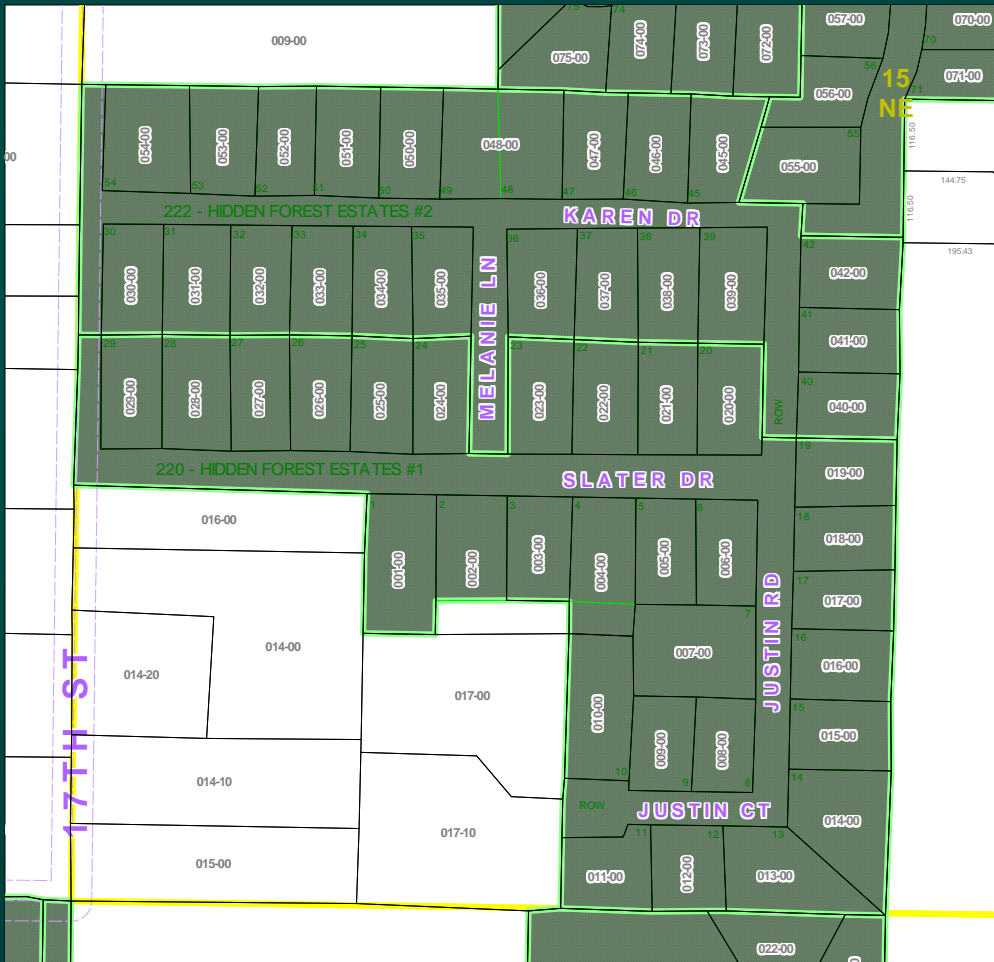


# County GIS Applications

## What is the potential scope of County GIS?

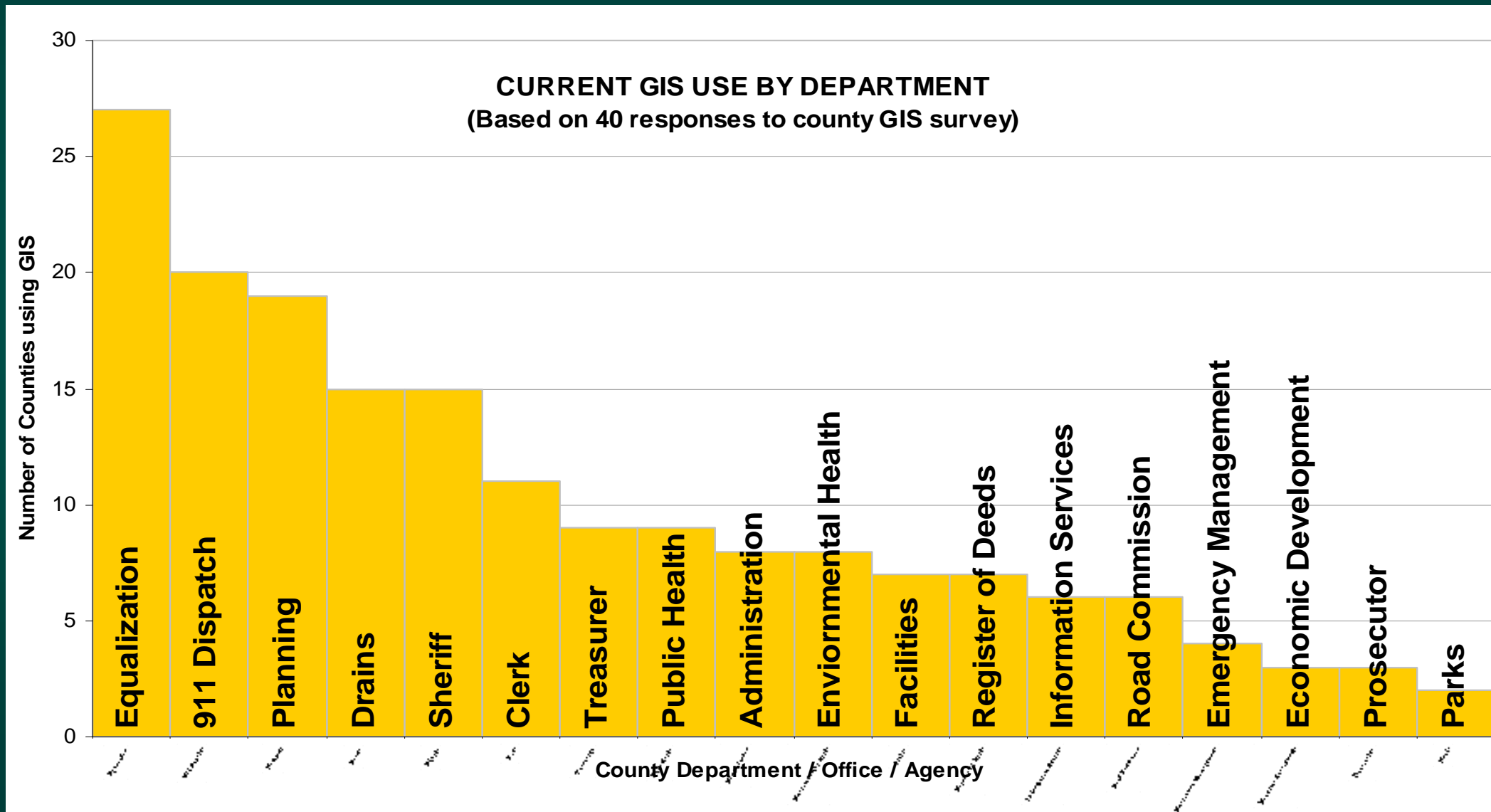


**Valdis Kalnins and  
Larry Sullivan**

**Michigan Counties Association  
of Mapping Professionals  
Boyne Highlands, Michigan  
September 11th - 12th, 2003**

# County Departments using GIS

**CURRENT GIS USE BY DEPARTMENT**  
 (Based on 40 responses to county GIS survey)



# GIS Application Categories - Core

- **Create, view and print maps**
- **Point and click information retrieval from a map.**
  - What is the tax assessment on this parcel?
  - How far is it from the street to this house?
- **Select features based on a set of criteria**
  - Which owners live within 500 feet of this zoning change?
  - Which wells have been tested in the last year?
- **Distribution mapping**
  - What is the distribution of parcels in this years sales study?
  - What areas of the county are hot-spots for crime?
- **Site investigation**
  - Which sites are suitable for a waste water treatment plant?
  - Which part of this parcel is suitable for development?

# GIS Application Categories - Advanced

- **Linking databases using geographic location**
  - What is the parcel number for this address?
  - Who should be dispatched to the location of a cell phone call?
- **Facilitate communication and decision making**
  - Is this zoning change compatible with surrounding land use?
  - Where should road-blocks and detours be set-up?
- **Resource tracking, management and status display.**
  - Where are all of the on-duty police cars?
  - Which roads have been plowed?
- **Navigation and routing**
  - What is the best way to get to this location?
  - What area can a fire truck reach in five minutes?

# Worksheet Format - Complete the Sentence:

**A county can use GIS in the  
(Insert Department)  
To...**

- **General Activity #1**
  - **Specific Case #1**  
Notes
  - **Specific Case #2**
- **General Activity #2**
  - **Etc.**

**Note: In many cases a listed activity may occur in one of several departments. In the interest of brevity, each activity has only been listed once in the department most likely to engage in it.**

# Equalization Department

- **Maintain Tax Maps**
  - **Map splits and maintain annotation (dimensions, lot #s, etc.)**
- **Ensure Quality Control of Tax Database**
  - **Verify school district coding**
    - Compare coded school district in tax database to digitized school boundaries.
  - **Parcel acreage verification**
    - Compare parcel acreage in tax database with GIS calculated acreage.
  - **Verify property class coding**
    - Ex. Subdivision lots classified as AG parcels.
- **Conduct Sales Studies**
  - **Thematically map or stratify sales by class, amount, type, etc.**
  - **Facilitate picking sales for equalization studies**
  - **Estimate average land values**
  - **Neighborhood analysis**

# Equalization Department

- **Assist in Property Appraising**

- **Create site maps for field work**

- Overlay aerials with parcels, dimensions, soils, wetlands, topography, etc. to help calculate economic condition factors.

- **Minimize Tax Evasion**

- **Check homestead exemption claims**

- Sign on by Oct. 1st.

- **Check for new construction without permit**

- Compare aerials from multiple dates to look for changes in buildings.

- **Document Retrieval and Organization**

- **Click on or select from a map rather than using a text interface to access documents and information**

# Equalization Department

- **Facilitate Tax Reporting**
  - Calculate land values of tax exempt parcels
- **Maintain Other GIS Layers**
  - Use source documents to maintain layers other than parcels (ex. addresses, roads, school districts, plats, drainage easements, building footprints, etc.)
- **Generate Products for Sale**
  - Print tax maps with aerial and other overlays
  - Create a plat book for the county
  - Mailing Lists
- **Some Key Layers:**
  - Parcels, dimensions, lots, sections, section corners, right of ways, annotation



# 911 Dispatch

- **Locate Emergency Calls/Computer Aided Dispatch (CAD)**
  - **On-screen locating and mapping of incoming emergency calls**  
Extremely important for locating cell phone calls.
- **Locate and Dispatch Emergency Vehicles**
  - **On-screen tracking of emergency vehicles using GPS enabled Automated Vehicle Location (AVL) technology**  
Assists in selecting and dispatching nearest available resources - works in conjunction with CAD.
  - **Maintain optimal distribution of resources during emergencies**  
Temporarily reposition available emergency vehicles to fill gaps in service created by emergencies that cluster and occupy multiple units.
- **Assign and Verify Addresses and Road Names**
  - **Assign addresses that are based on distance**
  - **Verify that addresses and road names are unique**

# 911 Dispatch

- **Select Optimal Sites for Emergency Facilities**
  - **Communications tower site selection**

Quickly identify candidate sites based on acreage, soil type and geographic location. Determine crumple zones for towers. Conduct viewshed analysis to see if towers will be able to “see” each other and the terrain below.
  - **Calculate response times for existing and proposed facilities**

Attribute roads with length and speed, then conduct a network analysis to see how far vehicles can respond in a given time interval.
  - **Analyze supply and demand**

Determine if emergency facilities are correctly sited relative to the locations of incoming calls and population.
- **Track Locations of Individuals with Specific Needs**
  - **Medical, homebound, mentally disabled, on oxygen, etc.**
- **Create a Paper Road Map and Road Index for Emergency Vehicles**

# 911 Dispatch

- **Emergency Vehicle Routing**

- **Optimize routing of emergency vehicles in consideration of current road conditions**

Take into consideration construction zones, detours, collapsed bridges, plowed roads, flooded areas etc.

- **Obtain Data and Generate Maps for Reports**

- **Area of service district, miles of road, locations of calls, etc.**

- **Some Key Layers:**

- **Roads, addresses, aerials, recognized names, emergency service areas and facilities (ambulance, fire, police), emergency resources (hydrants, fire breaks), building plans, utilities, hazards**

Addresses can be stored either as address ranges tied to a road segment or as individual point locations.

# Planning Department

- **Manage Zoning Process**

- **Evaluate proposed zoning changes**

- Create paper maps or live presentations showing proposed changes in relation to surrounding areas. GIS allows for the easy assembly of all relevant information related to a site and ultimately leads to better decision making.

- **Create and distribute zoning change notices**

- Embed GIS generated map in notice and generate mailing list from an on-screen selection of mapped properties using buffers or proximity filters as needed.

- **Assist with Planning Studies**

- **Traffic Flow studies**

- **Build-out analysis**

- **Land use studies**

- **Natural features inventories**

- **Demographic studies**

- **Parking Needs Assessment**

# Planning Department

- **Comprehensive Growth Management Planning**
  - Conduct analysis and generate maps for county master plan
- **Document Retrieval and Organization**
  - Link zoning ordinances, documents and related information to map features to provide easier access to information
- **Some Key Layers:**
  - Parcels, zoning, master plan, soils, floodplains, topography, land use, census, infrastructure (utilities, all season roads), aerials

# Drain Commission

- **Assess Parcels in Drainage Districts**

- **Calculate parcel acreage**

Cut out parcels using watershed boundaries and calculate acreage for parcels in the drain district to be assessed. Calculate acreage of MDOT right of ways.

- **Calculate runoff coefficients for parcels**

Use land-use, soils, photos, slope and proximity to drain variables to factor assessments

- **Locate New Drains and Drainage Districts**

- **Create preliminary site plans for proposed drains**

Conduct flow modeling from a digital elevation model to determine the direction of flow for surface runoff. Use this information to site new drains.

- **Locate natural drainage boundaries for new drains**

Conduct a watershed analysis using a digital elevation model to determine locations of naturally occurring watershed boundaries.

# Drain Commission

- **Facilitate Communication with the Public**
  - **Resolve drainage disputes**

Show land owners how they are being assessed using the surface runoff model (topography) and watershed boundaries overlaid on a parcel layer.
  - **Create presentation maps for public hearings**

Show where work will be done and who will be impacted.
- **Track Locations and Status of Issued Permits**
  - **Soil erosion, pollution discharge, etc.**
- **Track Locations and Status of Point and Non-Point Source Pollution Discharge**
  - **Correlate information with water sampling and display in map format**

# Drain Commission

- **Record GPS'ed Locations of Underground Features**
  - Relocate tile drains, storm sewers, underground pipes, etc. quickly and easily
- **Establish and Monitor Drain Maintenance Tasks**
  - Identify drains that need to be inspected
  - Plan field work and prepare field maps
  - Record location, dates and types of maintenance activity
    - Identify in GIS drains that have been cleaned and dredged, culverts that have been replaced, etc.
- **Plan and Monitor Storm Water Retention Systems**
- **Some Key Layers:**
  - Drains, watershed boundaries, hydrology, topography, aerials surface flow, dams, floodplains, slope, soils, high-risk erosion areas



# Sheriff / Drug Enforcement

- **Reduce Traffic Accidents**

- **Track accidents by location and type**
- **Identify accident prone areas**

Dangerous intersections and curves, wildlife crossings, areas prone to speeding. These locations can be correlated to traffic counts to see if they are statistically significant or not.

- **Assess the effectiveness of remedial action**

- **Reduce Crime**

- **Track crime by location and type**
- **Identify crime hot-spots and crime patterns**

Clustered burglaries, marijuana growing, meth labs etc.

- **Assess the effectiveness of remedial actions**

DARE, neighborhood watch, increased speed enforcement, etc.

# Sheriff / Drug Enforcement

- **Coordinate Search, Rescue and Recovery Efforts**

- **Generate maps for planning and conducting searches and exercises**

Include military or other grid to make maps compatible with GPS coordinate readings. This will facilitate communication between all units involved (ground, air and marine).

- **Overlay GPS'ed paths of search crews to track areas searched.**

- **Provide Information for Investigations**

- **Support research and surveillance activities**

Provide aerials photos of site; topography to show infiltration routes and high spots for surveillance; property ownership; distance measurements; known area felons; historical crime activity (burglaries, marijuana growing, methamphetamine labs) etc.

- **Look-up parcel ownership records for search warrants.**

# Sheriff / Drug Enforcement

- **Provide Support for Tactical Response**
  - **Support rapid decision making and action planning**

Quickly view aerials, topography, building plans, infrastructure, photos, etc. during hostage situations, standoff's, building evacuations, bomb threats, etc.
- **Track locations of permit and license holders**
  - **Firearms, explosives, dogs, etc.**
- **Facilitate Drug Enforcement**
  - **Maintain historical spatial database with drug-related arrests, known dealers, marijuana growing locations, drug free zones around schools, etc.**

Use information to target drug abuse programs and enforcement activities.
- **Some Key Layers:**
  - **Roads, addresses, parcels, aerials, topography, schools, drug free zones, crime locations, accident locations, building schematics**

# Clerk

- **Facilitate Voter Registration**
  - **Submit new roads and road changes to the Michigan Center for Geographic Information**
- **Support Election Process**
  - **Generate election maps**
    - Voting locations, district and precinct boundaries, election results, etc.
  - **Estimate ballots needed**
    - Use district and precinct boundaries to query census data.
  - **Evaluate distribution of polling locations relative to voters**
- **Establish Voter Precincts**
  - **Tabulate population from census data to evaluate different precinct scenarios**

# Clerk

- **Evaluate Redistricting Proposals**
  - **Tabulate population and voter records to evaluate different redistricting scenarios**
- **Maintain Cemetery Records**
  - **Link database to map to locate plots**
  - **Generate cemetery maps showing plot availability**
- **Some Key Layers:**
  - **Roads, addresses, census tracts, political and municipal boundaries, precinct boundaries, school districts, polling locations**

# Treasury

- **Facilitate Tax Certification of Deeds**

- **Check for delinquent taxes on-screen**

- Link delinquent tax database with parcel layer to see which parcels of land have delinquent taxes.

- **Manage Tax Delinquent Properties**

- **Track and locate forfeitures and foreclosures**

- **Generate maps for foreclosed property tax sales**

- Show location, zoning, aerial, etc.

- **Send letters of notification to surrounding property owners**

- Select adjacent owners by buffering foreclosed property, embed or attach site map to letter.

- **Track down delinquent taxpayers**

# Treasury

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- **Tax Abatement**

- **Maintain locations and boundaries of special tax zones**

- Brownfields, downtown development authorities, commercial forests, industrial parks, enterprise zones, renaissance zones, PA 116's, annexations, etc.

- **Some Key Layers:**

- **Parcels, splits, roads, addresses, municipal boundaries, tax zone boundaries**

# Administration

- **Generate a County Report Card**
  - **Compile data and maps from a wide variety of sources to track the health of the county.**
    - Include community surveys, crime, health, roads, census, etc.
- **Support Decision Making on County-wide Projects**
  - **Track locations and status of county facilities and assets**
  - **Evaluate new infrastructure development**
    - Preliminary site and impact studies for jails, buildings, roads, public water and sewer, landfills, etc.
- **Print Decorative Wall Maps for Offices and Corridors**
- **Generate Promotional Material**
- **Generate Maps for the Public Media**



# Public / Environmental Health

- **Track and Monitor Wells**
  - Record location of new wells with GPS and link to well log data
  - Create maps showing sampling results, well depths, well types
  - Generate groundwater flow models
  - Administer wellhead protection program
- **Track and Monitor Sites of Concern**
  - Track location, extent and status of hazardous waste storage facilities, contaminated soils, underground storage tanks, polluted water, manure lagoons, etc.
  - Plan and evaluate remediation action
  - Identify populations, wells and surface water in close proximity to these sites that could be at risk.

# Public / Environmental Health

- **Aid in Septic Permitting**

- **Create site maps showing soils to assist in locating and recording soil percolation testing sites and results**
- **Flag pending / proposed splits that do not meet minimum acreage requirements for septic systems**

- **Track, Schedule and Coordinate Inspections**

- **Restaurants, campgrounds, day care centers, etc.**

Use location maps to plan and improve efficiency of inspections.

- **Target Populations Needing Services**

- **Determine where health department clientele are coming from**
- **Identify optimal sites for providing health care services and conducting programs**

Vaccination clinics, blood drives, special health programs, education campaigns, mobile services, outreach, additional facilities, etc.

# Public / Environmental Health

- **Track the Outbreak and Spread of Diseases**
  - West Nile, swimmers itch, encephalitis, STD's, cancer, SARS, hepatitis, etc.
- **Plan and Respond to Bioterrorism**
  - Optimize locations of smallpox vaccination centers relative to population
  - Track outbreaks and monitor response
- **Assign School Districts**
  - Match addresses to school districts for program administration  
Ex. Baby Links
- **Some Key Layers:**
  - Parcels, addresses, wells, septic systems, school districts, hydrology, soils, aerials, wetlands

# Facilities / Public Works

- **Track and Manage Facilities and Infrastructure**
  - Map locations of sewer, water, cable, fiber, gas, power, communications and parking infrastructure.
  - Schedule and record routine and emergency maintenance
  - Calculate GPS coordinates for infrastructure to assist in relocation
- **Manage Waste Disposal**
  - Map extent of landfills and monitor volume with GPS
  - Optimize routes of waste collection vehicles
  - Find suitable sites for new landfills
- **Store and Retrieve Plans and Drawings**
  - Scan and register engineering and architectural drawings to aerials and building footprints
- **Generate Building Evacuation Wall Maps**

# Facilities / Public Works

- **Develop Preliminary Site and Infrastructure Plans**
  - Plan modifications to existing facilities and locations for new facilities and infrastructure
  - Delineate existing and proposed service areas to assist in cost benefit analysis
  - Easily compare and evaluate different development scenarios
- **Analyze and Predict Future Demand**
  - Evaluate population trends by location to anticipate future demand for facilities and infrastructure
- **Create Display Maps for Public Meetings**
- **Some Key Layers:**
  - Parcels, roads, facilities, utilities, addresses, contours, soils, census

# Road Commission

- **Manage Road Related Assets**

- **Map locations of roads, bridges, culverts right of ways and other infrastructure.**

Attribute road segments with functional classification; surface type; seasonal restrictions; weight limits, plowing priority, etc.

- **Schedule, manage and track road repairs, paving, grading etc.**

- **Optimize Snow Plowing**

- **Use GPS enable automated vehicle location (AVL) to track real-time snow plowing efforts and direct plows as needed**
- **Ensure that roads are plowed and kept clear in order of priority**
- **Quickly locate and dispatch assistance to stuck vehicles**
- **Link roads with historic snow-related traffic accidents to help establish order of priority**
- **Link roads with wetlands to establish no-salt zones**

# Road Commission

- **Provide Information to the Public via Internet**
  - Create website with map showing locations of current and proposed road projects with detours
  - Create website with map that allows public to locate and notify road commission of problems (potholes, fallen trees, road kill, etc.)
- **Store and Retrieve Plans and Drawings**
  - Scan and register engineering drawings to aerials and road segments
- **Create County Road Maps and Street Index**
- **Create Display Maps for Public Meetings**
- **Some Key Layers:**
  - Roads, road infrastructure, hydrology, topography, right of ways

# Register of Deeds

- **Document Retrieval and Organization**
  - Click on or select from a map rather than using a text interface to access documents and information
  - Create and manage a parcel tract index
- **Verify Legal Descriptions**
  - Check for errors and closure prior to recording
- **Review Site Condos and Subdivision Plats**
  - Check for uniqueness of names
  - Scan site plans and register to parcel layer
    - Provides an easy way to capture lot information, easement locations, utilities, roads, road names, lot numbers, etc.
- **Track Status of Remonumentation Program**
- **Some Key Layers:**
  - Parcels, subdivisions, tracts, municipal boundaries



# IT / IS

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- **Map Computer Network Infrastructure**
- **Enhance Public Access via Web Mapping**
  - **Facilitate search and retrieval of county data through interactive or static maps on the internet**
    - Ex. Address search; tax maps; zoning; parcel information; road conditions; school districts, etc.
- **Identify Infrastructure for Link Michigan**

# Emergency Management

- **Track Hazardous Sites**
  - **Track and monitor locations of chemical storage facilities (farm, commercial and industrial), fuel tanks, animal waste, tire piles, etc.**
- **Identify Locations of Critical Infrastructure**
  - **Bridges, dams, utilities, rail lines, highways, key facilities (government, schools, emergency service, power generation)**
- **Hazard Mitigation Planning**
  - **Evaluate multiple scenarios and develop mitigation plans based on probable sequences of events**
    - Assess the likely impact areas for population and structures. Determine optimal siting for road blocks, evacuation routes, decontamination centers, etc.
  - **Assemble portfolio for potential disaster areas**
    - Link aerials, site plans, building schematics, photos and other materials in GIS to allow for rapid retrieval during event.

# Emergency Management

- **Manage Disasters**

- **Identify area affected by a tornado, flood, fire, spill or leak**
- **Generate maps showing current and predicted spread and dispersion**
- **Rapidly prioritize response given adjacent population, structures and hazards identified in GIS**
  - Ex. During forest fire, identify near-by population clusters, buildings, storage tanks for flammable materials and utility infrastructure to plan evacuations, set-up road blocks and determine critical places to set up fire lines.
- **Generate field maps to aid field crews in hazard response**
- **Monitor status of various response measures**
  - Ex. Indicate when proposed road blocks, fire lines, decontamination centers become operational; show which homes have been evacuated; etc.

# Emergency Management

- **Assess and Report Damage**
  - Record damaged structures reported by field crews and tally assessed values.
  - Generate maps for final reports
- **Evaluate Response to Hazard Event**
  - Look at maps and timelines to see how effective a response was
- **Some Key Layers:**
  - Parcels, roads, addresses, aerials, hydrology, topography, soils, hazardous sites, critical infrastructure, utilities

# Economic Development

- **Create and Maintain a Portfolio of Available Sites**
  - **Compile aerial, parcel, tax, zoning, infrastructure and environmental information for site and surrounding area.**
  - **Include vacant, industrial, commercial and brownfields.**
  - **Make available with a search engine on the web.**
- **Provide Easy Access to Demographic Data**
  - **Provide census, demographic, labor and housing data and information for communities in map format.**
- **Assist with Infrastructure Development and Site Selection**
  - **Conduct preliminary studies for water and sewer projects.**
  - **Quickly find locations that meet certain criteria.**
    - Ex: Find parcel with the following characteristics: Zoned commercial, at least 40 acres in size, within 1 mile of water and sewer, less than 10 miles from nearest highway interchange, adjacent to all season road.

# Economic Development

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- **Create and Maintain Business Directory**
  - Track business type, employees, ownership, etc.
- **Some Key Layers:**
  - Census, parcels, roads, aerials, hydrology, topography, soils, infrastructure, utilities

# Prosecutor / Courts

- **Print Large Format Maps for Court Exhibits**
- **Maintain sex-offenders registry**
  - **Make maps available on the internet.**
- **Enforce Probation and House Arrest**
  - **Match offender's residence with with probation officers.**
  - **Monitor locations of offenders on GPS enabled tethers.**
- **Schedule Community Service**
  - **Match offender's residence with available community service locations and needs.**
- **Facilitate Jury Selection Process**
  - **Generate mailing addresses for Jury selection.**
  - **Evaluate distribution of jurors.**
- **Some Key Layers:**
  - **Addresses, school districts**

# Pest / Animal / Environmental Control

- **Monitor Distributions of Pests and Invasive Species**
  - **Map affected areas and locations.**
    - Ex: Gypsy moths, mosquitoes (West Nile Virus), Emerald Ash Borer, purple loosestrife, zebra mussels, water fowl, etc.
  - **Monitor changes in distribution and calculate rates of spread.**
- **Plan, Manage and Evaluate Abatement Programs**
  - **Identify aerial spray blocks, sites and targets for abatement.**
  - **Generate mailing lists to notify property owners in targeted areas.**
  - **Identify sites and properties for special consideration.**
    - Ex: environmentally sensitive areas, no-spray zones, objectors, schools, etc.
  - **Identify parcels in application area for special tax assessment.**
  - **Provide maps and coordinates to applicators and field workers.**



# Pest / Animal / Environmental Control

- **Track Owners of Exotic Species**
  - **Keep registry of exotic species ownership**  
Ex: Game farms, mountain lions, alligators, snakes, wild boars, etc.
- **Facilitate Dog Census**
- **Some Key Layers:**
  - **Addresses, parcels, tall structures, environmentally sensitive areas, schools**

# Parks and Recreation

- **Create and Maintain Parks and Recreation Maps**
  - Create maps and brochures for individual parks showing campsites, trails, public access, etc.
  - Create county-wide map showing campgrounds, golf courses, trails, public access sites and other recreational facilities.
- **Manage Campground Reservations**
  - Link maps with reservations database and post on the internet.
  - Keep track of nuisance campers.
- **Track Parks and Recreation Facility Use**
  - Summarize information on facility use in map format.
  - Find out who is using parks.
    - Link use permit information / surveys with zip code map.
  - Find out which campsites are most popular.

# Parks and Recreation

- **Track Maintenance and Improvement Tasks**
  - Track work orders and improve coordination of maintenance.
- **Improve Parks and Recreation Opportunities**
  - Maintain map showing all public lands, utility corridors, rail corridors, conservancy owned properties.
  - Identify candidate parcels and corridors for acquisition to improve parks and recreation network.
  - Conduct preliminary site analysis for development.
- **Create Concept Maps for New Facilities**
  - Produce maps for grant applications to create new parks, trails and other facilities.
  - Produce maps for public meetings and workshops.
- **Some Key Layers:**
  - Parcels, trails, roads, campsites, land use, zoning, population