IOWA INFRASTRUCTURE

2015 REPORT CARD

A Call to Action for Iowa's Infrastructure

ASCE IOWA SECTION

Energy | Drinking Water | Aviation | Bridges | Levees

Roads | Solid Waste | Waste Water | Rails | Inland Waterways | Dams

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A Call to Action for Iowa's Infrastructure

ASCE AMERICAN SOCIETY OF CIVIL ENGINEERS

IOWA INFRASTRUCTURE
2015 REPORT CARD
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IOWA'S 2015 GRADE: C -

Why a 2015 Report Card for Iowa's Infrastructure?

The 2015 Report Card for Iowa's Infrastructure has been prepared to acquaint Iowans with the extent, condition and importance of the capital assets that support modern life. It is hoped that this information, along with the grades, will encourage awareness of and concern for these often under-appreciated facilities. Iowa's ASCE members hope that the grades will alert citizens, media agencies, business leaders, and elected officials to the needs of the infrastructure and induce a commitment to giving it proper care and upkeep. Lastly, the grades provide a benchmark for detecting, in the future, how things are trending.

The 2015 Report Card for Iowa's Infrastructure contains one grade B, seven Cs, and three Ds. Readers are invited to consider if this is good enough or if Iowa ought to strive for better scores. Our daily lives and economic activities depend on the safe, reliable, taken-for-granted presence of infrastructure. If we make the commitment to improve the grades, we'll experience benefits in both personal and business activities. If we let the facilities' adequacy decline, we'll face higher costs with less reliability. What sort of future do we want and what path should be taken to arrive there?

Aviation: C- Pages 1 - 4

Iowa's air transportation capacity, operations, and resilience are currently in good standing; however, the condition, funding, and innovation were found only to be average. Safety and future needs are concerning with the lack of a long-term funding strategy.

Section author: Rob Garber, Project Manager, CGA Associates, Marshalltown

Rail: C Pages 5 - 9

Iowa's freight rail system features good capacity, condition, operations, and maintenance for current traffic levels. The outlook is for fewer but larger shipping points with a smaller rail system as funding to maintain the full current network is inadequate in the long-term. Passenger rail languishes at a minimal service level.

Section author: Steve De Vries, Executive Director, Iowa County Engineers Association Service Bureau, Des Moines

Inland Waterways: D Pages 10 - 12

Iowa's two river inland waterway transportation system is safe, efficient, and sustainable. But with no long-term funding for maintenance or modernization its future serviceability and capacity will be constrained.

Section author: Andy McCoy, Project Manager, HDR, Inc., Des Moines

Roads: C- Pages 13 - 20

Traffic volumes have been increasing on Iowa roads but reduced purchasing power has left road agencies unable to prevent loss of condition. The system requires at least an additional $215 million per year to address its most critical needs. The road use tax funding mechanism is losing its efficacy so a search is on for methods more appropriate to the times.

Section author: Dave Mulholland, Transportation Engineer, Ames

Co-author: Mark Crawford, Project Manager, CGA Engineering, Marshalltown

Bridges: D+ Pages 21 - 25

One in every five bridges in Iowa is rated structurally deficient giving our state the third worst rating in the nation. Reducing the number of structurally deficient bridges is a priority of the IDOT, Counties and Cities. While there has been progress, the pace of repair and replacement must be quickened if the backlog is to be noticeably reduced. Road agencies are exploring accelerated construction techniques to as one way to speed things up.

Section author: Dave Mulholland, Transportation Engineer, Ames

Co-author: Mike Vander Wert, President, Calhoun-Burns & Associates, Inc., West Des Moines

Dams: D Pages 26 - 28

Iowa dams are struggling due to a lack of funding, not only for maintenance and repair, but for safety programs as well. With nearly 50% of the dams privately owned in the state, private property owners are faced with the reality of self-funding any needed dam maintenance or improvement projects as there are no state loan or grant programs for dam owners.

Section author: Gary Reed, Principal, CDA, Inc., Grimes

Levees: C- Pages 29 - 32

The majority of Iowa's levees are currently functioning adequately with typical stream flows, but issues frequently occur when design flows are experienced. There appears to be thorough oversight of the permitting process; however, there is no follow-up maintenance program at the state level for constructed levees.

Section author: Kari Sebern, Principal, Sebern Structural, Panora

Drinking Water: C+ Pages 33 - 36

Iowa's drinking water supply infrastructure is in relatively good condition, has adequate capacity, and a good safety record. Funding for system operation and maintenance is generally sufficient, but additional revenue is needed to enable water line replacement and treatment plant modernization. Water ultilities are adopting computerized control systems to improve quality and reliability. Nitrates in surface water require expensive additional treatment.

Section author: Steve De Vries, Executive Director, Iowa County Engineers Association Service Bureau, Des Moines
With special assistance from John Dunn, City of Ames

Wastewater: C- Pages 37 - 40

Iowa has an aging wastewater infrastructure which requires significant funding. In the long-term, the state must modernize and build new facilities in a targeted and strategic manner. By employing strategies to use every dollar resourcefully and by deploying creative solutions to infrastructure development, the state can implement the right projects in an efficient and economical manner.

Section author: David Claman, Chief Hydraulics Engineer, Ames

Electrical Energy: C Pages 41 - 44

Upgrading and expanding existing transmission and distribution infrastructure, along with a rational implementation of existing and new regulations, is vital to preserving the continued dependability of electrical power in Iowa and protecting grid stability and resilience. The need for a national energy plan is great.

Section author: Michael Shimkus, Staff Engineer, WHKS, Ames

Solid Waste: B+ Pages 45 - 48

Iowa is performing well in the area of solid waste; however, several new techniques and technologies provide an opportunity to further enhance solid waste management in the state. Continued waste reduction education and increased diversion opportunities would benefit the state as well.

Section author: Aaron Granquist, Project Manager, McClure Engineering, North Liberty

Co-author: Aaron Moniza, Lead Civil Engineer, Foth Infrastructure & Environment, LLC, Cedar Rapids

Co-author: Riley Quinn, Civil Engineer, Shive-Hattery, Inc., West Des Moines

The resulting grades should be evaluated as follows:

A All criteria are met; facilities are fully adequate both for both today and the future. Fully resilient and safe.

B Most criteria are met; facilities OK for today but not on a trajectory to meet all future needs. Some weaknesses.

C Marginally adequate for current use; needs additional investment just to remain marginal. Medium resilience.

D Falls short of fully meeting current needs; at risk of falling further behind in the future. Weak resilience.

F Inadequate for today; likely to fall seriously short in the future. Likely to fail when stressed.

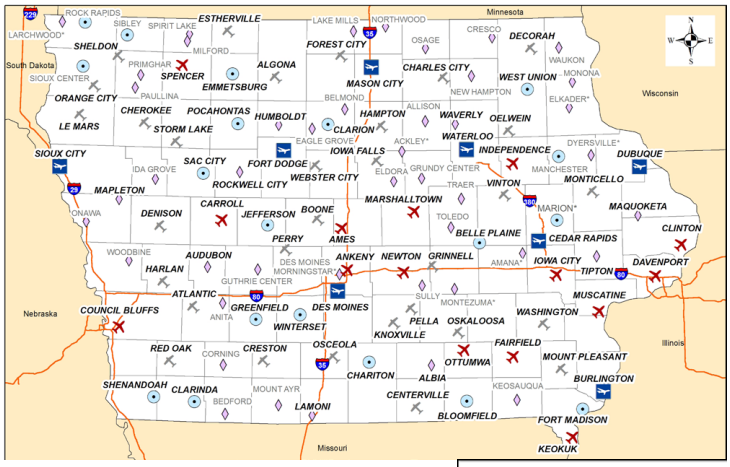
The grades presented in this report represent a professional assessment of seven criteria:

- **Capacity:** Do the facilities have enough capacity to serve today's needs and future demands?
- **Condition:** Are the assets being kept in good, reliable condition and will they remain that way?
- **Funding:** Is the category adequately funded and will future revenues suffice?
- **Operations and Maintenance:** Are the assets being actively maintained by people with the necessary skills, tools, action plans, and resources?
- **Public Safety:** Is the public being adequately protected from disease, injury, death, and/or loss of property through the design and function of the infrastructure?
- **Resilience:** Can the facilities continue in operation during or recover quickly after major disruptions, such as floods, storms, breakdowns, or accidents?
- **Innovation:** Are improved construction, process, and control technologies being deployed?

C - AVIATION

Summary

Iowa's air transportation capacity, operations, and resilience are currently in good standing; however, the condition, funding, and innovation were found only to be average. Safety and future needs are concerning with the lack of a long term funding strategy. Based on the information presented, Iowa Aviation receives a grade of C -.



Background

Aviation is an integral part of Iowa's economy and way of life. Air transportation provides needed connectivity and moves people and goods to their destinations quickly and efficiently. Support of flight operations can stimulate the need for a broad range of products and services that create jobs. Significant levels of economic activity occur in every category of aviation in Iowa including commercial, military, and general aviation.

Iowa has a long and varied aviation history. Early pioneers such as Clyde Cessna, the Wright Brothers, and Amelia Earhart lived in Iowa in their childhood years. Balloon and glider flights began in Iowa in the 1880s. In 1910, just seven years after the first powered flight by the Wright Brothers, the first powered flight took place in Iowa. The remainder of the 20th century witnessed the development of a mature air transportation system throughout Iowa and around the globe.

Currently, Iowa has eight commercial service and 100 general aviation airports that are publicly owned. Of Iowa's 108 publicly owned airports, 79 are listed in the Federal Aviation Administration (FAA) National Plan of Integrated Airport System (NPIAS). There are 2,514 aircraft based in Iowa making approximately 840,350 operations in 2014. Iowa's air transportation system contributes about $5.4 billion a year to Iowa's economy and supports an estimated 47,034 jobs.[1]

Capacity and Condition

Capacity is a measure of the maximum number of aircraft operations that can be accommodated on an airport in an hour with continuous demand. Nationally, the active general aviation fleet is projected to increase at an average annual rate of 0.5% between 2013 and 2033. The turboprop fleet is projected to grow by 2.8%, on average, per year with the jet fleet increasing by 3.5%. Piston powered aircraft are projected to decrease by an average annual rate of 0.2%. The 2014 FAA forecast calls for U.S. carrier passenger growth over the next 20 years to average 2.2% per year.[2] For Iowa, the fleet is expected to increase from 2,514 in 2014 to 2,954 aircraft by 2035. Total aircraft operations are projected to increase by 3.7% by 2030.[1] Capacity for Iowa's airports is currently above average; however, airports need to be ready to accommodate the anticipated long term growth.

Airports in Iowa serve varying types of users and levels of demand. Five roles were identified to classify airports based upon the function they serve as well as their capability of supporting general types of aircraft. Each role is defined by a set of criteria based upon the level of infrastructure and services provided at each airport. The five airport classifications are:

- Commercial Service – Scheduled commercial airline service.
- Enhanced Service – Airports with runways 5,000 feet or greater with facilities and services that can accommodate a full range of general aviation activity.
- General Service – Airports with runways 4,000 feet or greater with facilities and services that can accommodate most general aviation activity.
- Basic Service – Airports with runways 3,000 feet or greater with facilities and services customized to meet local aviation demands.
- Local Service – Airports supporting local aviation activity with little or no services; i.e. turf runways.

Facility and service targets were established to help airports, within a specific role, meet the needs of their users. Airports are encouraged to meet or exceed suggested targets for their role to satisfy local and aviation system needs. The targets are separated into two main categories: airside and landside facilities and services. Targets for each role vary based on the needs of aviation users for that role. The Enhanced Service airports, for example, will have more targets to meet the needs of business users. There are fewer targets for Local Service airports since they serve users with fewer requirements for operation. Targets required for inclusion in a role are highlighted in gray in the following facility and service table:

Table 1- Airport classifications

Target Description	Commercial/Enhanced Service Targets	General Service Targets	Basic Service Targets	Local Service Targets
Airside				
Airport Reference Code	C-II	B-II	B-I or below	A-I
Primary Runway Length	Minimum 5,000 ft	Minimum 4,000 ft	3,000 ft	Not an objective
Primary Runway Width	Minimum 100 ft	Minimum 75 ft	Minimum 60 ft	Minimum 50 ft
Type of Parallel Taxiway	Full parallel	Turnarounds meet standards (both ends)	Exits as needed	Not an objective
Type of Runway Approach	Vertical guidance	Non-precision	Visual	Visual
Runway Lighting	*MIRL	*MIRL	*LIRL	Not an objective
Taxiway Lighting	*MITL	*MITL	Not an objective	Not an objective
Visual Guidance Slope Indicator	Both runway ends (or *ILS)	Both runway ends	Not an objective	Not an objective
Runway End Identifier Lights - as required	Both runway ends (or *ILS)	Both runway ends	Not an objective	Not an objective
Rotating Beacon	Yes	Yes	Yes	Not an objective
Lighted Wind Indicator	Yes - multiple as needed	Yes	If open for night	If open for night
*RCO Facilities	Tower or *RCO	Not an objective	Not an objective	Not an objective
Wind coverage or crosswind runway	Crosswind runway or 95% wind coverage for *NPIAS facilities	Crosswind runway or 95% wind coverage for *NPIAS facilities	Not an objective	Not an objective
Landside				
Covered storage	100% of based aircraft	100% of based aircraft	100% of based aircraft	Not an objective
Overnight storage for business aircraft	Typical average aircraft/business user demand	Typical average aircraft/ business user demand	Not an objective	Not an objective
Aircraft apron	100% of average daily transients	100% of average daily transients	50% of average daily transients	Not an objective
Terminal/administration building	Yes	Yes	Waiting area	Not an objective
Paved entry/terminal parking	Yes	Yes	Not an objective	Not an objective

Only 61% of Iowa airports meet all the facility targets for their airport role. However, 70% of airports meet at least 75% of service targets for their role, and 78% of airports store all based aircraft in hangars.[1] Therefore, the conditions at Iowa Airports are considered average.

Operations and Maintenance

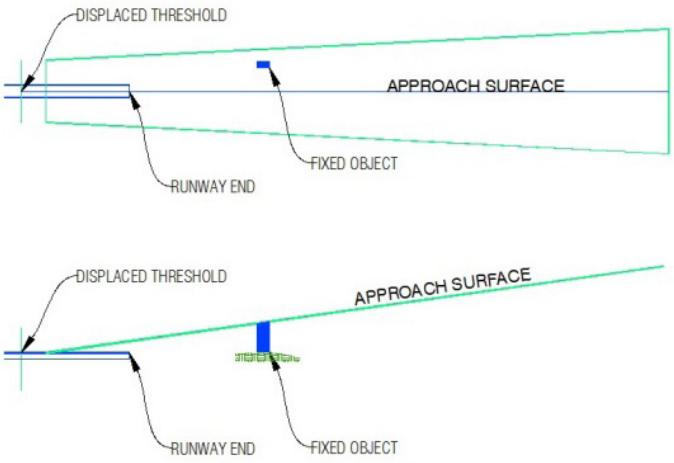
Airports must maintain their facilities, hangars, and most importantly, their runways. Iowa has regular Pavement Condition Index (PCI) inspections to determine the overall health of the pavement. The Iowa Department of Transportation (DOT) has set the Critical PCI at 65 for runways, 60 for taxiways, and 55 for aprons. In general terms, pavements with a PCI of 65 to 100 that are not exhibiting significant load related distress will benefit from preventive maintenance actions, such as crack sealing and surface treatments. Pavements with a PCI of 40 to 65 may require major rehabilitation, such as an overlay. Often, when the PCI is less than 40, reconstruction is the only viable alternative due to the substantial damage to the pavement structure. Eighty-nine percent (89%) of Iowa's primary runways have a

Pavement Condition Index (PCI) of 70 or greater.

Iowa airports are protecting their airspace and operational environment by having an Airport Land Use and Height Overlay Zoning Ordinance. The Ordinance regulates what, where, or if, a structure can be located near an airport. However, only 43% of airports have city or county comprehensive planning that address compatible land use around airports.[1]

Public Safety

Safety is very important to the aviation community in a variety of ways including maintenance, communication, and protocol. A key safety concern is an obstruction, which is any fixed object that penetrates the airport's approach surface. Typically, in Iowa, obstructions are trees, power poles, and barns. Eighty percent (80%) of Iowa's airports have height zoning ordinances.[1] This protects the public by not allowing homes, schools, or other gathering places too close to the airport. Also, wind turbines and cell towers located near an airport are an obvious concern. When an obstruction is identified it may or may not be determined to be a hazard and can be marked and lighted. If it is a hazard, the obstruction should be removed or the runway threshold will have to be relocated or displaced, losing landing and takeoff distances. Only 36% of airports have no obstructions to all runway ends.[1]



In addition, Iowa's airports should be establishing regular communications programs, pilot safety programs, and education.

Accessibility

Iowa's system of airports is adequately accessible from both the ground and the air. Most Iowans are within a 30-minute drive time to a Commercial Service or Enhanced Service airport and 78% of employment in Iowa is within a 30-minute drive time to a Commercial Service or Enhanced Service airport.[1]

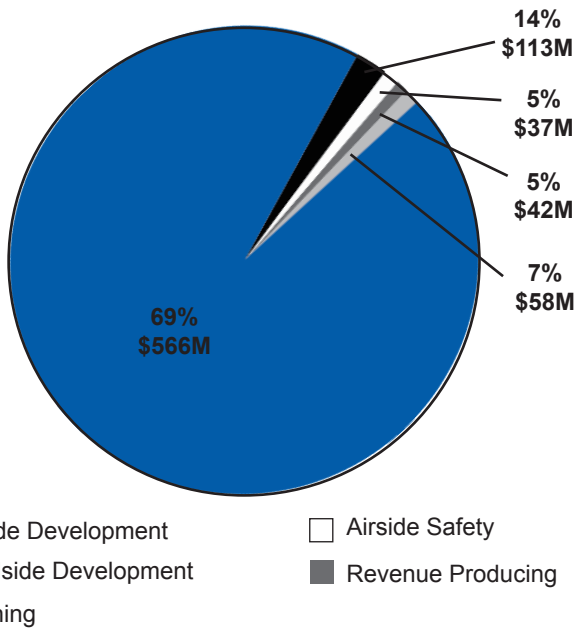
Funding and Future Need

As the economy recovers from the most serious economic downturn and slow recovery in recent history, aviation will continue to grow over the long run. Fundamentally, demand for aviation is driven by economic activity. As economic growth picks up, so will growth in aviation demand. It is for this reason Iowa should work toward meeting the infrastructure needs of the growth in aviation.

Significant funding has been invested into the existing infrastructure of Iowa airports. Between 2005 and 2010, $290 million has been invested through federal, state, and local sources to develop and maintain the aviation system.[1] In order to maintain the level of service at these airports and invest in appropriate future development, funding from the federal Airport Improvement Program (AIP), the state, and local communities continues to be necessary. Typically, the local share for federal grants is 10%, and for state grants, the local share is 15% to 30%. The local share is generally funded by municipal government or by public/private partnership. Iowa has 79 airports eligible for the federal program, which is funded exclusively with aviation user fees and administered by the FAA.

It is estimated that Iowa's airports will need $816 million over the next 20 years to meet needs.[1] This is spread over a number of project types such as runway construction, hangar development, planning studies, and obstruction removal.

Figure 1- System needs by category 2011-2030



Iowa Aviation System Plan 2010-2030 Executive Summary

Innovation

The NextGen system is the transformation of the National Airspace System (NAS) from a ground based system of air traffic control to a satellite based system of air traffic management. The evolution of the airport system is important to meet future user demand and to avoid gridlock in the air and on the ground. The NextGen system will support continued growth and increased safety of aircraft operations while reducing the environmental impact of aviation operations.

Several technologies will support the NextGen system including the Global Positioning System (GPS), advances in weather forecasting, data networking, and digital communications. When NextGen becomes fully operational for and available to the entire aviation community, it will allow a greater number of aircraft to safely fly closer together on more direct routes. This will result in reduced delays and benefits for the economy and environment through reduced carbon emissions and fuel consumption.

Conclusions

Iowa's 108 publically owned airports support 2,514 based aircraft which make around 840,000 operations per year. Eight airports support commercial air services providing nearly 4/5ths of all citizens with 30-minute access to air travel. While capacity is adequate today, substantial growth can be expected over the next 20 years. Only 61% of the State's airports meet all the requirements of their service level. Work remains to be done in the area of landing and takeoff corridors of potential flight obstructions, with only 43% of all airports protected by land use ordinances. Estimated needs over the next twenty years total $816 million, or about $41 million per year. Improved GPS based navigation controls will help boost airport capacities.

Recommendations

It is recommended to include the following for Iowa airports along with local/state/federal governments:

Airports should be engaged in local community planning efforts: Airports should be integrated in strategic community activities and provide perspective on their needs and protect against incompatible development.

Provide consistent funding for the national aviation program: The continuing resolution for Airport Improvement Program (AIP) funding is a concern. State and federal government should implement a six year funding program for development and maintenance of airports.

Continue approach obstruction mitigation to clear runway approaches.

Continue regular PCI inspections and pavement preservation. Increase passenger facility charges (PFCs) to aid funding for aviation infrastructure.

Removing the PFC cap would allow airports to raise necessary funds locally for improving the nation's aviation infrastructure.

Resources

[1]IOWA Aviation System Plan 2010-2030: http://www.iowadot.gov/aviation/studiesreports/systemplanreports.html

[2]Federal Aviation Administration Terminal Area Forecast, FY 2013 – 2040: http://www.faa.gov/about/office_org/headquarters_offices/apl/aviation_forecasts/taf_reports/media/TAF_Summary_Report_FY2013-2040.pdf

[3]National Plan of Integrated Airport Systems (NPIAS) 2015-2019: http://www.faa.gov/airports/planning_capacity/npias/reports/media/npias-2015-2019-report-narrative.pdf

*MIRL - Medium Intensity Runway Light
*RCO - Remote Communication Outlet
*ILS - Instrument Landing System
*LIRL - Low Intensity Runway Light
*MITL - Medium Intensity Taxiway Light
*NPIAS - National Plan of Integrated Airport Systems

Summary

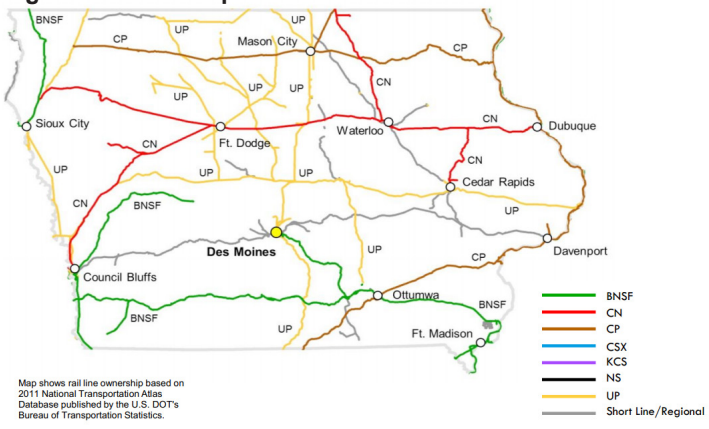
Iowa's rail system has dropped from about 10,000 miles in 1980 to 3,800 today with major private railroads owning 82% of the trackage. The share of freight movement moving by rail has declined from 43.5% in 1987 down to 37.5% in 2002, yet railroad traffic has physically doubled. Iowa's rail system features good capacity, condition, as well as operations and maintenance for current traffic levels. However, increasing congestion on key main lines, escalating costs, and rapid growth of oil, frack-sand, and agricultural commodity transport may test the rail industry's ability to deliver reliable service.

While safety statistics are trending better overall, new concerns regarding tank car trains have developed and are not yet fully addressed. Funding to maintain freight service, while currently acceptable for major Class I railroads, is inadequate in the long term for the full rail network. Existing and potential passenger services languish without public consensus on how to finance them. While it is estimated farmers save 10 cents a bushel due to the availability of the rail system, agriculture and rail need to work together to economically deliver an ever increasing grain harvest to world markets at a competitive price. This will require innovation in tracks, terminals, cars, locomotives, and operating practices. Some main lines have become so heavily used that service levels are hard to maintain and double or triple tracking may be needed. There will be fewer but larger shipping points in the future serviced with a still smaller rail system; abandonment of low use lines will be balanced by upgrades of others.

Background

Rail transportation is important to Iowa's economy. It helps deliver products of Iowa agriculture to world markets at competitive prices. It delivers the lion's share of thermal coal to utilities that generate electricity used in the state and transports Iowa produced motor fuels to external markets. It provides jobs for several thousand citizens, buys products and services from Iowa companies, and pays property taxes that support schools and local government.

Figure 1- Rail transportation



Map shows rail line ownership based on 2011 National Transportation Atlas Database published by the U.S. DOT's Bureau of Transportation Statistics.

Railroads have played an important role in Iowa's economy since the state was founded. While they originally served as general purpose carriers serving all citizens and businesses in nearly every community, they have since evolved into specialists who efficiently transport large quantities to and from high volume terminals.

At the peak of local service around 1913, 10,000 miles of rail lines crisscrossed Iowa and handled almost all freight movement plus a large volume of passengers. Due to competition from other modes of transportation, regulations, inefficient use of labor, and changes in the agricultural economy, many lines became uneconomical leading to a general decline of the rail system and service. Track and facility maintenance was deferred, track speeds slowed, and many railroad companies became at risk of bankruptcy. These trends culminated in the 1980s with the collapse of the Rock Island and Milwaukee railroads in the Midwest and a near shut-down of major eastern carriers.

In response, Congress deregulated the remaining railroads of many constraints that had prevented efficient operation and adequate revenue generation. Iowa's surviving railroads then aggressively right-sized their systems and adopted a focus on hauling large volumes of freight in unit trains. Rail line mileage fell drastically, to 3,800 miles, but operational factors, such as track and rolling stock utilization, improved substantially. Long deferred maintenance work was caught up and most remaining lines were actually improved with ribbon rail and revamped yards.

The rail industry, which had not only had too many miles of underused track but also too many small, weak corporations, consolidated. The top lines – including UP, BNSF, NS, CN and CP – took over Iowa lines of national importance. New regional and local carriers, like Iowa Interstate, Iowa Northern, and Burlington Junction Railway, sprang up to keep the remaining lines of state/local significance in service.

After all these changes, Iowa is today served by an efficient and reasonably profitable rail system. It links the state to distant markets, transports energy products in and out, and provides our agricultural sector with cost savings that help keep Iowa's harvest competitive in world markets.

All this change has not been without adverse effect. Many communities lost all access to rail service. Single carload shippers now find themselves at the back of the line as rail companies focus their resources on maximizing track and equipment utilization. Passenger service has dwindled to two pairs of long distance trains operating out of aged depots. These trains are often behind schedule and don't run through Iowa's population centers. While public interest in upgrading and expanding passenger service exists, the question of how

to fund both capital improvements and ongoing expenses has inhibited any action.

Capacity and Condition

Iowa's rail capacity and condition are reasonably good and still improving. Line utilization is considerably better than was the case in the 1980s and the number of possible further abandonments is much reduced. From 1985 to 2011, total ton miles carried per year has increased by 217%, even as the track mileage dropped 17%, down to 3,800 miles.

Seventy percent (70%) of the freight moving on Iowa rails is pass-through traffic that both originates and terminates out of state. However, Iowa itself originates 56.2 million tons (mostly agricultural, energy, and chemical products) per year and receives 42.9 million tons (mostly coal for electrical generation and chemicals).

Figure 2- Iowa originated carloads per year

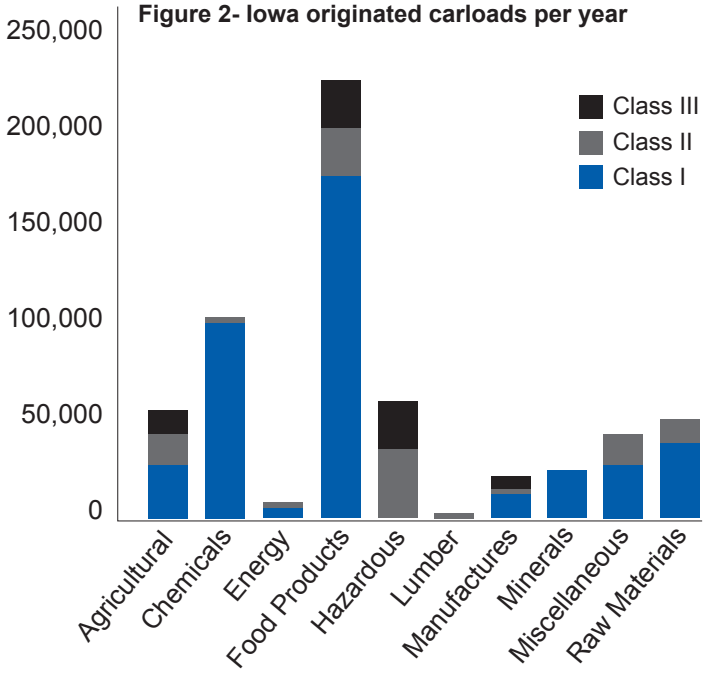
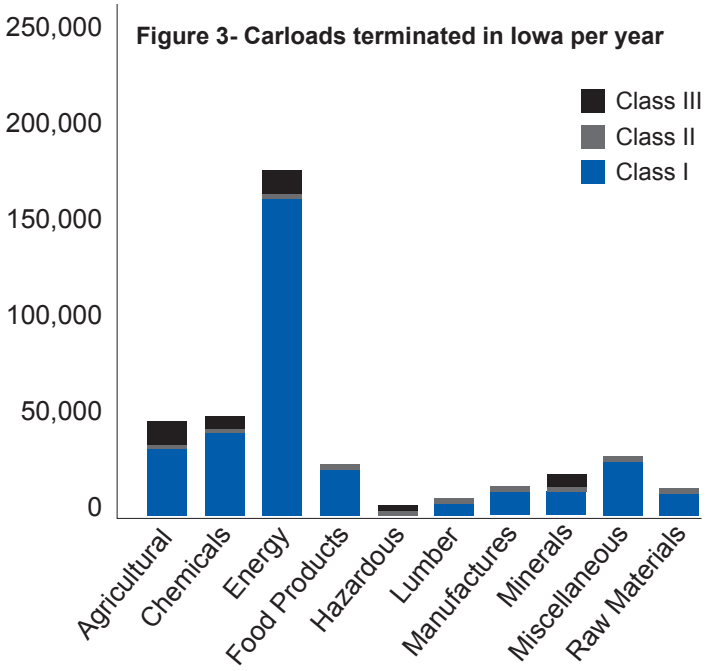


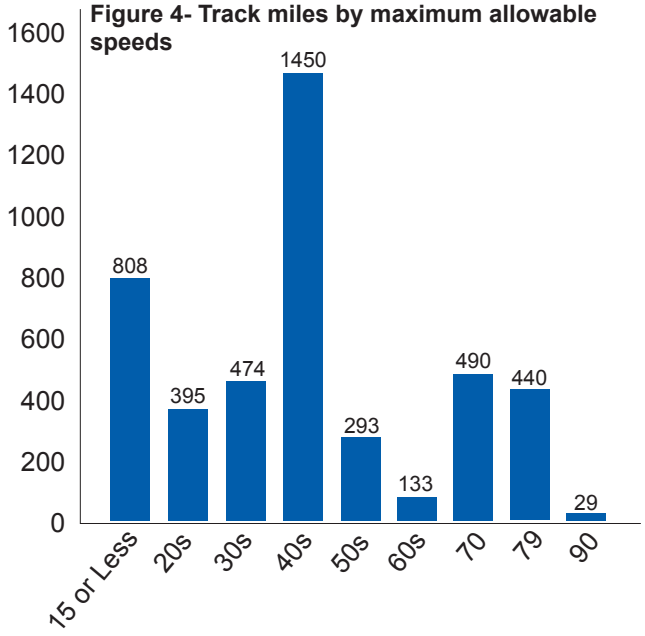
Photo 1- Rail

Figure 3- Carloads terminated in Iowa per year



Seventy percent (70%) of all tracks are rated at 40 mph or better, with key transcontinental routes on the UP and BNSF rated up to 79 mph – although freights usually travel at no more than 60 mph maximum. Most track is in acceptable to good condition for the traffic levels carried.

Figure 4- Track miles by maximum allowable speeds



Rolling stock usage is also much improved since the 1980s. Locomotive miles travelled per year have increased by 147%, cars per locomotive are up from 23 to 31, and car capacity is up by 18%. These gains have been achieved by concentrating service on fewer lines with a limited number of shipping points, which enable the railroads to reduce load/unload times and maximize car utilization.

However, only two long distance Amtrak lines run through Iowa, boarding about 60,000 passengers at six depots each year. Unfortunately, the lines cross through the state's less populated southern counties and the once per day schedules preclude using the service for business trips.

Operations and Maintenance

Six Class I (national scale), one Class II (regional), and 11 Class III (local) firms operate Iowa's rail network. The Class I firms hold 82% of the trackage and carry 97% of the rail ton-miles. Operations are not uniformly distributed. According to the Iowa DOT (2011 Iowa's Rail System Trends), "One-fourth of Iowa's rail miles carried a majority of the rail traffic in 2011. Only 1,066 miles (27%) carried 88% of the gross ton-miles hauled in the state in 2011. Conversely, the remaining 2,914 miles (73%) accounted for the other 12% of the gross ton-miles."

Per a 2012 report prepared by the Iowa Department of Transportation (DOT), "Iowa railroads spent an estimated $233.3 million or an average of about $60,000 per mile to maintain the Iowa rail system in 2011 (See Figure 15). This compares to an average of about $23,500 per mile spent in 1987. In addition, Iowa railroads spent an estimated $253.0 million in 2011 to upgrade their tracks, an increase of $216.2 million over 1987."

Amtrak operates two passenger train routes across Iowa. One daily route goes across southern Iowa to link Chicago and San Francisco. The other runs from Chicago, across the desert southwest, to Los Angeles. These trains usually have two coaches, two sleepers, a lounge car, and a dining car. The full length trips take about 36 hours. Westbound trains stop at Iowa stations in the evening; eastbound runs stop in the mornings.

Figure 5- Amtrack routes in Iowa

Public Safety

Railroad safety is at an all-time high, when measured in terms of mishaps per ton-miles hauled. Even with the tripling of total traffic in the last 30 years, the absolute number of accidents and derailments is down as well. Safety improvements at, and the reduction in number of, rail-highway grade crossings have reduced the number of train-vehicle accidents. Investments in better track maintenance have likewise made derailments much less frequent.

Yet new risks have arisen that are not yet fully dealt with. The mass transports of energy liquids, such as ethanol and crude oil, have brought about the potential for even a small accident to have disastrous consequences. Recent derailment/explosions (outside Iowa) have shown the need for safer tank cars and observation of special operating rules in moving such trains. The Federal Railroad Agency (FRA) and the rail industry are making a good effort to minimize these new risks, but the process is not yet complete.

On an industry wide basis, railroads are adopting and installing a system called Positive Train Control (PTC) to prevent train accidents. Once in place, PTC could eliminate over speed, train-on-train collision and other mishaps caused by train-crew error or equipment failure. This won't, however, eliminate vehicle-train crashes where the highway driver is at fault.

Resilience

The rail system's physical resilience appears good at this time. Most lines have been tested by flood events over the last decade and weaknesses revealed by the high waters have been addressed. Perhaps the most crucial infrastructure vulnerability for rail in this regard is bridges. Many lines are operating with bridges built nearly 100 years ago. The loss of a structure over a major river can substantially interrupt traffic for extended time periods. Class I railroads have been addressing this issue proactively, with new structures over the Missouri and Mississippi either planned or built. The UP rebuilt the Kate Shelly span across the Des Moines River Valley in 2009, clearing a major bottleneck in their east-west main line. Smaller Class II and III lines, however, remain at risk of disruption or shut down if key structures are ever lost.

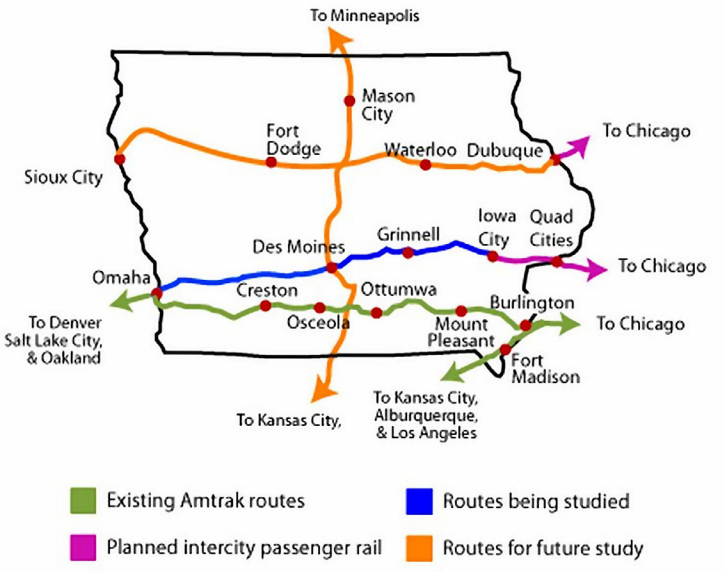
On the other hand, the system's operational resilience was found to be lacking during the winter of 2013-14 when extreme winter conditions slowed train movements and clogged terminals. Whether this was a one-time event or an indicator the system has only marginal amounts of surplus capacity available in times of stress or growth remains to be seen. It appears that future traffic increases will not be able to be accommodated just by enhancing the train capacity of existing track, it will become necessary to double or even triple track certain main line segments.

Funding

Rail traffic in and across Iowa generates $2 billion in transportation charges per year. After deducting operating costs, the remainder is available to pay for maintenance, upgrades, profit, and taxes. In recent years, all railroads have had low enough operating ratios (cost of train operations as a percentage of total revenue) to allow maintenance and upgrade of tracks, bridges, and signals. The operating ratios of Class I firms have been holding steady, but those of the Class II and III firms have been rising, putting their long term viability into question. Coupled with the fact that rail costs are rising faster than rail revenues, this creates mild concern about the future.

Passenger rail funding is inadequate to provide more than marginally acceptable continuance of existing service. Ticket sales alone are unlikely to be able to directly pay the full cost of capital and operating needs. Other funding sources such as the state, communities, and benefitting businesses may be necessary to help with initial capital improvements and on-going costs. Should the financial resources be found, in Iowa and surrounding states, it would be possible to expand routes and services.

Figure 6- Passenger Rail Service in Iowa



Future Need and Innovation

While now less intense, the trends that have driven railroading over the last 30 years can be expected to continue; the network will shrink further as the industry works to serve fewer but larger shipping terminals with more efficient train operations. Abandonment of lesser used lines will be balanced by upgrades to the ones that remain.

Ever increasing grain yields plus growing transcontinental traffic will test the rail transport system capacity. To meet the challenge, rail will need to upgrade many tracks to carry heavier cars, add spur tracks and participate in establishment of “shuttle train terminals,” where dedicated trains cycle in and out 15 to 20 times a year. These setups can save 9 to 12 cents per bushel when delivering grain to distant points.

The changes in how railroads do business have tended to work against smaller, less-than-trainload shippers, but that may change. Recently, in 2014, there has been discussion of creating a “rail-port” in Des Moines. If constructed, this facility would enable interchange of shipments between highway and rail and give low volume shippers access to rail service.

The largest cloud on rail’s horizon is main line capacity. This is an issue that affects both freight and passenger operations. When the railroads began their long recovery after the 1980s, it was easy to accept new business because all trackage was underutilized. Traffic increases could be absorbed simply by scheduling more trains. Today, however, some main line segments have reached nearly 100% of physical capacity. At that level of usage, even slight interruptions of the flow can quickly cascade into major service disruptions. Further signal and dispatch improvements may help, but, at some point, the only way to accommodate the traffic will be to double or triple track the line. This will make absorption of future traffic increases much more expensive than has been the case over the last 30 years. Freight charges will have to rise to permit the investment.

Photo 2- BNSF

Conclusion

Iowa’s rail infrastructure has been awarded a C grade. Current capacity, condition, and operations are adequate for existing traffic, but key main lines can quickly coagulate if adverse circumstances interrupt train movements or if the train count exceeds practical track capacity. Resilience and safety are up, but some oil transport accident potential and declining

operating ratios are concerns. Heavier cars will necessitate upgrades to branch lines – or induce their abandonment. Passenger service and funding is very limited and prospects for improvement are not imminent. The rail industry has aggressively worked to become more efficient, with great results, but will find itself challenged to accommodate future traffic growth without increased rates, which could induce calls for re-regulation.

Photo 3- Osceola Amtrak station

Recommendations

Because railroad infrastructure is primarily owned and operated by private sector businesses, Iowa must work with the railroads to address issues and influence outcomes. Iowa should support the industry's effort to obtain the capital needed to maintain and improve service. Rail crossing safety programs managed through the Iowa DOT should be continued, and Iowa's leaders should monitor the implementation of tank car safety rules and positive train control. State and local assistance for new spur lines and high volume terminals is encouraged, as rail companies often require shippers to pay for new connections. Iowans should seek to come to a consensus on passenger rail needs, identify where the support for those needs are, and then find ways to fund it.

Resources:

Iowa State Rail Plan, Iowa Department of Transportation, 2009, http://www.iowadot.gov/iowainmotion/rail.html

Iowa Rail Transport web site, Iowa Department of Transportation, 2014, http://www.iowadot.gov/iowarail/index.htm

Website, American Association of Railroads, 2014, https://www.aar.org/

Website, Federal Railroad Administration, US Department of Transportation, http://www.fra.dot.gov/Page/P0001

D INLAND WATERWAYS

Summary

Inland waterways are vital to the economy of the United States as they provide means for efficient movement of goods up and down the rivers, to and from coastal water bodies. Specific to Iowa, the Mississippi River connects Iowa products and exports to world-wide markets. Grain exports to Asia are expected to increase with the expansion of the Panama Canal and will help to stimulate and grow the U.S. economy into the future. Even though, compared to other modes of transportation, barge transport results in fewer accidents, loss of life, and greenhouse gas emissions, barge transport along Iowa's inland waterway system has decreased in recent years due to reliability and performance issues. Several studies have shown the lock and dam system on the Upper Mississippi River, including the facilities bordering Iowa, is operating long past design life. Facilities are undersized compared to the size of modern barges and unexpected repairs have been hindering the use of the lock and dam system, forcing shippers to use rail and truck transport for their goods. Despite the fact this mode of transport is safe, efficient, and sustainable, no long term funding source has been identified to fund the modernization of the inland waterway system that will help keep Iowa and the United States competitive in the global economy. Modernization of the inland waterway system is a very challenging and capital intensive task. Stakeholder organizations from across the Upper Midwest as well as the Iowa Department of Transportation (DOT) and the United States Army Corps of Engineers (USACE) have been diligently working to identify cost-effective, environmentally sensitive, and safe solutions for modernization of the U.S. inland waterway system.

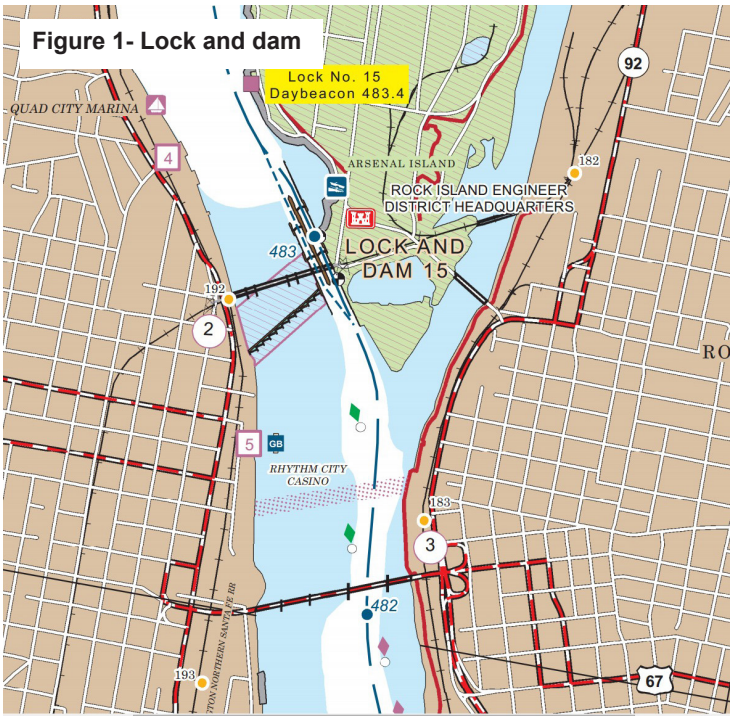


Figure 1- Lock and dam

Background

Iowa is in the unique position of being the only state bordered by two navigable waterways - the Mississippi and Missouri Rivers. Along the Iowa border on the Mississippi River, Lock and Dam 9 is the furthest upstream; Lock and Dam 19 is the furthest downstream. The total tonnage transported through Lock and Dam 19 on the Mississippi River, in 2011, was 20 million tons with an economic value of over $3 billion. Goods shipped included grain, coal, chemicals, and gravel among other commodities. The total value of commodities shipped on the Mississippi River has been falling in recent years, mainly due to system performance and reliability issues. Comparably, the economic value of the commodities shipped to and from Iowa on the Missouri River has fallen to zero. Between 1999 and 2006 the total tonnage of goods shipped to and from Iowa on the Missouri River was cumulatively 2.5 million tons and had actually fallen to zero by 2004. Though it is navigable, the Missouri River has not largely been involved in the transport of goods to and from Iowa in recent years, due to fluctuating water levels. However, due to above normal releases at the lower four dams on the Missouri River, increases in shipping north toward Sioux City are being seen for the first time in 11 years.

Based on macro economic trends, Iowa freight flows are expected to increase from 453 million tons in 2010 to 620 million tons in 2040, or an increase of nearly 37%. The share of Iowa's freight traveling on inland waterways is expected to increase from 6.9 million tons in 2010 to 9.7 million tons in 2040, an increase of nearly 41%.

International competitiveness depends on being able to ship goods at low cost. In 2011, shipping a metric ton of soybeans from Iowa to China was 18% of the total cost to the Chinese consumer compared to 32% of the total cost to the Chinese consumer of shipping from Brazil to China. As transportation costs increase, the competitive advantage will disappear.

Capacity and Condition

The major issue with the expected increase in goods transported by Iowa's inland waterways system is the current system is taxed beyond its capacity to effectively meet the current demand for shipping via barge. Without significant changes in capacity, it will be impractical to meet the increase in demand for Iowa products. With the exception of Lock and Dam 19, the lock and dams that make up the Iowa inland waterways system were designed and opened in 1940 and before. Lock and Dam 19 was opened in 1957. The entire system has exceeded its design life by an average of more than 20 years. All but one lock along Iowa border are undersized by half for today's barges. Of the 13 locks and dams along the Iowa border, only one, at Lock and Dam 19, is long enough to accommodate the modern tow length (1,200 ft). The other 12 are only 600 ft. long. This results in longer shipping times

as the cumulative impact of shipping delays along the Iowa border can be longer than five hours.

Grain comprises the highest commodity tonnage transported on Iowa's inland waterway system. However, from 2006 through 2010, the total grain export tonnage transported by barge decreased by 20% at a time when overall crop production was increasing. The average delay at locks along Iowa's border is 1.5 hours per barge leading to increased costs for shipping.

The average age of the lock and dams along the Iowa border is more than 70 years old. This is more than 20 years past the average design life. Between the years 2001 to 2010, unscheduled repairs to locks along the Iowa border accounted for more than 50% of total repairs resulting in major delays to the supply chain and increased costs to consumers.

On a per ton per mile basis, barge traffic has lower greenhouse gas emissions than rail or truck freight transportation

Operations and Maintenance

The US Army Corps of Engineers operates and maintains the fixed base that supports river transport: locks and dams, navigational markers, dredging, obstruction removal and regulates docks, landings, and terminals. Simultaneously, large sections of natural refuge are managed to preserve habitats for various species found along the river corridors.

Funding

Current national funding levels can support only $7 billion through 2020 and $16 billion through 2040. To maintain current levels of services and based on existing data trends, $13 billion will be required by 2020 and $28 billion by 2040. Federal funding levels for the inland waterway system have been decreasing since 2006 despite an increase in production of commodities that can be shipped via barge.

Public Safety

Due to unscheduled maintenance issues and decreased performance and reliability of the inland waterway system, barge tonnage has decreased while truck tonnage has increased. This leads to an increase in truck mileage. The cost of accidents per mile due to truck traffic is 327 times the cost of accidents per mile due to barge traffic. Fatalities per billion ton miles due to truck traffic are 254 times the fatalities per billion ton miles due to barge traffic.

Conclusions

Several key findings and recommended actions were outlined in the Iowa DOT report (Iowa DOT 2013) to address the funding gaps in the inland waterways system. The State of Iowa has a sincere interest in seeing the continued maintenance, operations, and modernization of our nations' inland waterway navigation system. However, it is clear that the existing, inland waterway navigation system is at a critical juncture for funding repairs, maintenance and system enhancements that will be required to remain economically competitive. As such, it was proposed the State of Iowa undertake activities that may help realize improvements to the inland waterway navigation system.

No increase in the current funding plan will result in loss of


Photo 1

economic benefits and a missed opportunity for Iowa to take economic advantage of the plans for expansion of the Panama Canal (i.e., opportunities to increase grain shipments).

Leveraging increased funding from traditional sources is the only practical option to deal with the funding issues in the short term.

Recommendations

The State of Iowa should encourage the U.S. Congress to ensure the existence of opportunities for pilot programs that would allow non-federal sponsors the ability to rehabilitate, improve, operate, and maintain federal projects. It is recommended that such opportunities be identified and presented to legislators for sponsorship.

Encourage Congress to ensure opportunities for alternative project delivery and funding mechanisms (user fees, private investments) for existing and proposed civil works and navigation projects. There has been continued dialog between Iowa DOT, USACE, and other states regarding ways to utilize 2014 Water Resources Reform and Development Act (WRRDA) provisions for P3 and pilot projects.

Pursue adequate funding for both ongoing and pilot USACE Civil Works and Navigation programs. There has been

continued dialog between Iowa DOT, USACE, and other states regarding ways to utilize 2014 WRRDA provisions for P3 and pilot projects.

Ask Congress to raise the excise tax on diesel fuel from $0.20 per gallon to $0.30 per gallon and index the tax for inflation, to provide more adequate funding for the Inland Waterway Trust Fund.

Authorize the USACE to study additional funding mechanisms (recreational fees, lockage fees, tonnage fees, etc.) to provide for more adequate funding for the inland waterway system.

Iowa should form a coalition of Upper Mississippi River states (Minnesota, Wisconsin, Iowa, Illinois, and Missouri) and inland waterway interest groups (agriculture producers/businesses, barge operators, shippers, environmental stakeholders) to drive a legislative agenda in Washington, DC, to address funding and legislative changes needed to modernize the Upper Mississippi River System. A TIGER grant application in 2013 was a recent example of cooperation by this coalition.

Photo 2

Resources:

American Society of Civil Engineers (2012). “Failure to Act: The Economic Impact of Current Investment

http://www.asce.org/uploadedFiles/Infrastructure/Failure_to Act/Failure To Act Ports Economic

Inland Rivers Ports and Terminals (2014). October 20th, 2014. http://www.irpt.net/missouri-river-booming/

Iowa Department of Transportation (2012). “Iowa in Motion – Planning Ahead 2040.”

Iowa Department of Transportation (2013). “ U.S. Inland Waterway Modernization Reconnaissance Study.”

Soy Transportation Coalition (2012). “Land of Two Rivers.” Moving Iowa forward Conference. April 24, 2012.

Texas Transportation Institute (2009), “A Modal Comparison of Domestic Freight Transportation Effects on the General Public.” Center for Ports and Waterways. (2009): 1-83 Available online at http://www.americanwaterways.com press_room/news_releases/NWFSTudy.pdf.

Trends in Airports, Inland Waterways, and Marine Ports (2012): 1-48. Web.

United States Government Accountability Office (2009). “Missouri River Navigation: Data on Commodity Shipments for Four States Served by the Missouri River and Two States Served by Both the Missouri and Mississippi Rivers.”

C - ROADS

Summary

A majority of Iowa's roadways were built 50 to 60 years ago and the design life of these streets and highways has been met or exceeded. Traffic volumes, most notably truck traffic, have increased by approximately 123% on primary roadways over the last 30 years, and pavement conditions are deteriorating across the system. About one quarter of Iowa's primary roadways fails to meet a sufficiency rating considered minimally acceptable. The rural Interstate system in Iowa was ranked 38th in the nation in 2010 which was a six point decline from its 32nd rating in 2006. On a positive note, the number of fatalities and major injuries on Iowa roadways has been decreasing over the last 10 years. The uncertainties in funding the state has experienced on the local, state, and federal level are not beneficial to a system that requires an additional $215 million per year to address its most critical needs and is facing a total annual shortfall of $1.6 billion for all roadway needs.

Background

Iowa's roadway system is the major means of travel and commerce for the state. Iowa's roadways include six lane interstates, four lane divided thoroughfares, multilane urban streets, paved secondary roads, gravel streets, and city streets. The public system includes more than 114,000 miles of roads, which places Iowa 13th in the nation in terms of total roadway miles. Based on the information presented in this report, the roadway system in the state of Iowa receives a grade of C -.

Three interstate highways cross this state in the heartland of America, connecting customers and suppliers throughout the United States. Interstate 80 is a coast-to-coast interstate connecting California to New York City. Interstate 35 is a vital north/south route from Minnesota to Texas. Interstate 29 connects the Kansas City, Missouri, metro area to the Canadian border. These transcontinental interstates make Iowa a major hub of goods and services movements in the U.S. In 2012, it is estimated that motor vehicles on the public roadway system traveled over 31 billion miles. Of the almost 8% of roadway mileage managed by the Iowa Department of Transportation (DOT), those roads carried almost 62% of all vehicular traffic in 2012.

The roadway system plays a major role in the state's economic competitiveness, and it is the primary means by which all transportation within the state is linked. Businesses locate near the highway system in order to efficiently move goods and people. The roadway system also enables the growth of the biofuels and wind energy industries which are crucial to Iowa's role in the alternative fuel/energy sector of the economy. Although the extent of the roadway system in Iowa has not increased considerably for several years, the amount of traffic has increased significantly. Truck traffic has increased 42% since 1990, and total travel on Iowa's roadways has increased 36% since 1990.

Photo 1

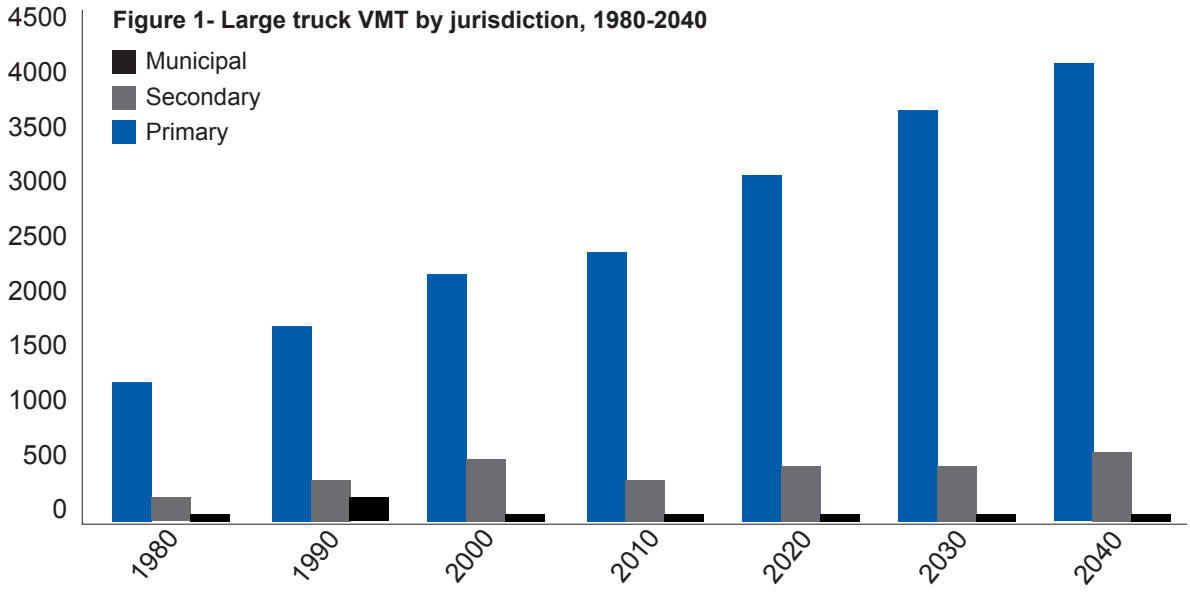
While traffic volumes have been increasing, the condition of the roads has been decreasing. A significant portion of the pavement condition of the primary system is below acceptable levels, and approximately one quarter of the primary system does not meet acceptable sufficiency ratings.

Capacity

Capacity is a measure of a roadway's ability to meet current and future vehicular travel demands. Capacity can be evaluated by several means including the volume/capacity ratio, travel time, traffic speed relative to posted speed, and costs from delays for excess gas consumption and unproductive time. In Iowa there are 9,400 miles of primary (interstate, U.S. routes, and state routes) roadway, 89,866 miles of secondary roadway, and 14,887 miles of municipal roadways.

A majority of the rural areas served by the roadway system do not have capacity deficiencies except during holiday periods on some of the primary routes. Most of the rural areas of Iowa are served by a roadway network that has roads spaced on a one mile grid.

The primary system makes up approximately 8% of the total roadway system, but it carries 62% of the total vehicle miles traveled (VMT) in the state. The primary system also carries approximately 92% of the total large truck VMT. Large truck traffic is projected to increase on Iowa's highways. Large truck traffic on the primary system has increased 123% over the last 30 years with the greatest truck traffic on Interstate 80 in eastern Iowa. Truck traffic on the secondary system has also increased substantially. Based on current trends, large truck traffic will increase about 66% between now and 2040 (see Figure 1). This increase in truck traffic will have a definite impact on Iowa's highways via increased congestion and pavement deterioration.



Condition

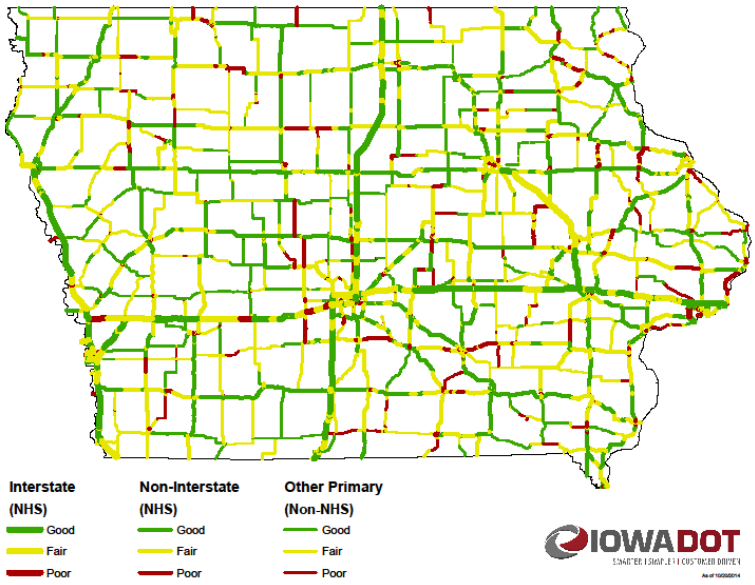
Condition is a measure of the physical soundness of the components of a roadway system. The components of a roadway system can include pavement, signage, drainage structures, bridges, erosion control measures, buildings, and vegetation. This section will focus on the roadway surface only since it is a major component of virtually all roadway systems. In Iowa, roadways are graded using two methods: the International Roughness Index (IRI) and the Pavement Condition Index (PCI).

The IRI is essentially an indicator of the smoothness of a pavement. The IRI can vary by season and in Iowa the roughness is generally greater in the winter than the other times of the year. The IRI is one of the most commonly used systems for evaluating pavement roughness in the world, and it is required by the Federal Highway Administration (FHWA) for pavement data submission. The IRI is obtained from measurements of the longitudinal profile of a roadway. In Iowa, the primary roadways have been classified as good, fair, and poor based on IRI data.

The PCI uses a scale of 0 to 100 to quantify the condition of a pavement. A rating of good, fair, or poor is then assigned to a pavement based on the scale value. A value greater than or equal to 80 receives a good grade, a value between 60 and 80 receives a fair rating, and values less than 60 receive a poor mark. Approximately 46.5% of primary roadways in Iowa receive a good rating. Figure 2 illustrates the combined IRI and PCI ratings for primary roadways in Iowa. A summary of the ratings is shown in Table 1.

The PCI rating of the primary road system has been decreasing, and a large portion of the system is below acceptable PCI ratings (see Figure 3).

Figure 2-
Pavement Condition on Iowa Primary Highways



Many of Iowa's roadways were constructed in the 1940s, 1950s, and 1960s. These roadway pavements are meeting or exceeding their design life spans and thus a large part of the system is in need of repair and replacement. A study published by the Reason Foundation compared the roadways of each state using data that was submitted to the FHWA. Table 2 lists Iowa's ranking in the nation in several measures (a ranking of 1 is best and 50 is worst).

The rural arterial condition improved somewhat between 2006 and 2008. Conditions in the other categories either remained the same or decreased with the exception of the urban interstate condition.

Table 1- Iowa highway pavement condition by system

Iowa Highway Pavement Condition by System Lane Miles of 2013 Primary Highways*							
				Pavement Condition**			Total
				Poor	Fair	Good	
Primary Highways	National Highway System	Interstate	Miles	100	1,451	1,788	3,339
			%	3.0%	43.5%	53.5%	
		Non-Interstate	Miles	1,132	5,135	6,006	12,273
			%	9.2%	41.8%	48.9%	
	Other Primary Routes		Miles	748	4,075	3,204	8,027
			%	9.3%	50.8%	39.9%	
Total			Miles	1,980	10,661	10,998	23,639
*Excludes Ramps			%	8.4%	45.1%	46.5%	
**Using the Iowa DOT PCI-2 Index							

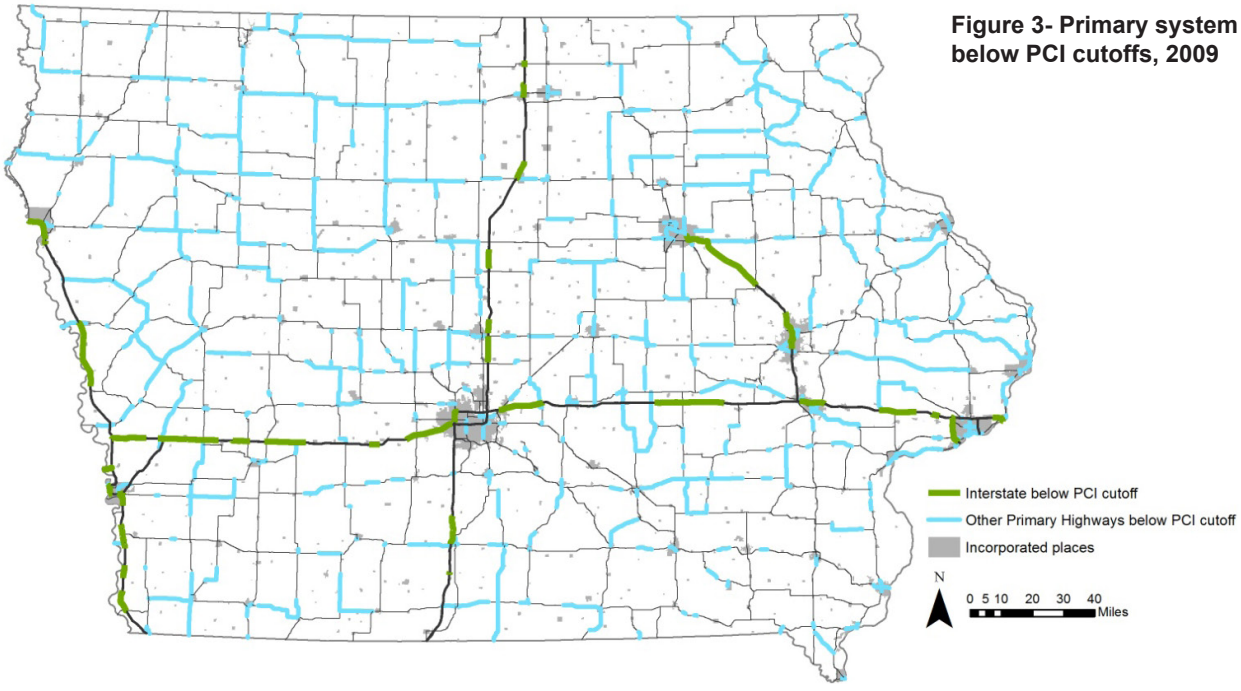


Figure 3- Primary system below PCI cutoffs, 2009

Table 2- Comparison of Iowa's roadway condition rankings from 2006 to 2010

Category	2006 Ranking	2008 Ranking	2010 Ranking	Change 2006-2008 (2008-2010)
Rural Interstate Condition	32	32	38	0 (-6)
Urban Interstate Condition	44	47	43	-3 (+4)
Rural Arterial Condition	45	43	46	+2 (-3)
Rural Arterial Condition	32	34	34	-2 (0)
Urban Interstate Congestion	19	20	19	-1 (+1)

Severe weather over the past several years has also impacted Iowa roadways. The unusually harsh winter of 2007-2008 had a significant impact on the roadway system. Calendar year 2008 ranks as the 4th snowiest and 2007 was the 9th snowiest in Iowa's record history as reported by the state climatologist. The heavy snowfall and repeated freeze thaw cycles have significantly affected pavement performance. Flooding events have also been damaging to Iowa's roadways. The 2008 floods resulted in $19 million in damage to the primary system, and an estimated $43 million to county roads across 92 counties. In 2011, the flooding that occurred along the Missouri River basin caused road closures of the primary and secondary system in western Iowa. The damage caused by the 2011 flooding is estimated to cost $46 million. These weather events caused not only short term damage but also long term damage that has a significant impact on the roadway system.

Public Safety

Protecting the welfare of those using Iowa's transportation system is one of the goals of the Iowa DOT's core business functions. As part of the state's Strategic Highway Safety Plan, Iowa is implementing a vision of Toward Zero Deaths. Although the trend-line is decreasing for the number of fatal and major injuries accidents on Iowa's roads, more attention is needed in both driver awareness and system condition. A graphical representation of these trends is shown in Figures 4 and 5. The decrease in fatal and major injuries can be attributed to many factors including advanced vehicle technology and increases in the integration of safety devices in highway and roadway design.

To address driver behavioral changes, the Iowa Governor's Traffic Safety Bureau (GTSB) has instituted programs associated with traffic enforcement, public education and awareness, media campaigns, and community involvement.

Figure 4- Fatalities on Iowa Roadways- 2004-2013

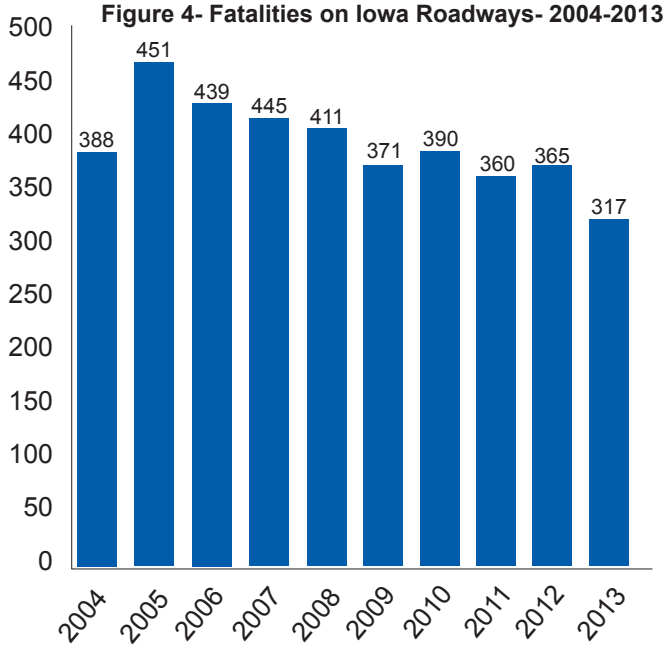
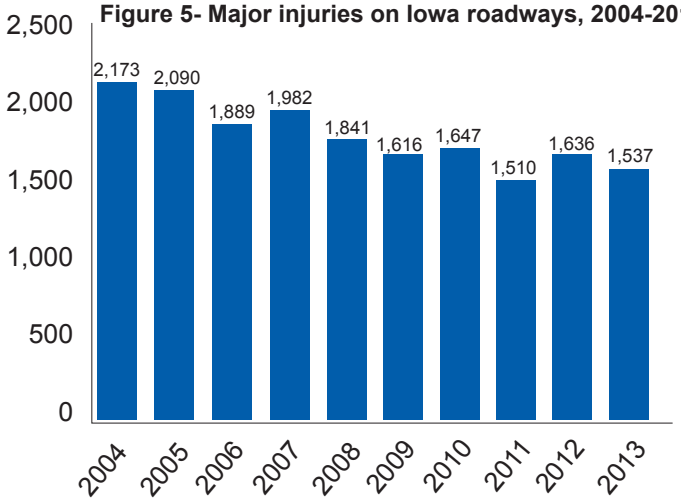


Figure 5- Major injuries on Iowa roadways, 2004-2013



One example of the strides these programs are making includes our safety belt usage. Iowa has a safety belt usage rate of 92% which is above the national average. This ranks Iowa in the top 10 of safety belt usage across the United States. Another example is The Safety Education Officers of the Iowa State Patrol. This group of law enforcement officials provides educational presentations in local churches, service clubs, schools, and businesses throughout the state. In 2013, over 5,400 presentations were made on vehicular safety related topics.

The Highway Safety Improvement Program (HSIP) is the core federal aid program that was continued when the current federal authorization bill, *Moving Ahead for Progress in the 21st Century (MAP-21)*, went into effect in 2012. The goal of the program is to significantly reduce fatal and major injury crashes on all public roads, both state and locally owned. As part of the HSIP, a statewide coordinated safety plan, titled Strategic Highway Safety Plan (SHSP), establishes statewide goals, objectives, and key emphasis areas. The plan includes:

- Consultation from a variety of stakeholders during the project development process.
- Analyzing and making effective use of crash data.
- Addressing the 4E's of management and operations (Engineering, Enforcement, Education, and Emergency Services).
- Considering the safety needs of all public roadways.
- Describing a program of projects that reduce or eliminate safety hazards.
- Solutions that can be implemented and evaluated.

By undertaking this process, Iowa has identified the most severe safety needs on the roadway network. Based on the analysis of fatal and major injury crashes between 2001 and 2009, Iowa's most urgent needs are related to crashes involving the following:

- Single vehicles running off road
- Vehicles crossing the centerline of two-lane highways
- Vehicles crossing the median on divided highways
- Horizontal curves
- Intersections
- Unbelted drivers and passengers
- Impaired drivers
- Speeding

Through Traffic Safety Funding, the Iowa DOT is implementing safety solutions that address these causes. One example is the installation of shoulder and centerline rumble strips. This solution is relatively low in cost, takes short time to implement, and has tried and proven effectiveness. Another solution is installing cable median barriers on multi-lane divided roadways, and roadways with narrow width medians. Although this solution has a slightly higher cost and longer timeframe to implement, its effectiveness has been proven to reduce head on vehicle collisions.

Funding

The Iowa DOT has developed a Transportation Improvement Program which outlines the projects planned over a five year period on the primary and interstate systems. The current program covers fiscal years 2015 through 2019.

A significant portion of funding comes from the federal government based on the current federal authorization bill, *MAP-21*, with funding coming from the federal Highway Trust Fund. The Trust Fund was nearly depleted in August 2014 when a legislation "patch" was passed to temporarily keep it solvent until May 2015. The authorized level of funding under this bill is approximately $11 billion. Based on current projections, the Trust Fund will again be insolvent by May 2015. Iowa, over a 10 year average, has received 59% of its state dollars from these federal sources.

The Iowa DOT has estimated $2.7 billion will be spent on highway right of way and construction in fiscal years 2015 to 2019. Approximately $1.2 billion is earmarked for modernization of Iowa's highways and for upgrading safety features between 2015 and 2019. Almost $2 billion per year is spent on city, county, and state road projects in Iowa. About $450 million per year is allocated from the federal government for these projects. The DOT has estimated an amount of $700 million will be spent on roadway projects in 2014. As stated above, the Highway Trust Fund contributes a major portion of the funding for these projects. In order to keep the Highway Trust Fund solvent, it is estimated there must be one full year in which no federal funding is disbursed to any roadway projects on a national level. In this case, the $450 million from the federal government would be lost which would mean a reduction of about $310 million to the Iowa DOT and about $140 million to local governments.

Funding for roadway improvements is also derived from state revenues. The Road Use Tax Fund (RUTF) and the *Transportation Investment Moves the Economy in the 21st Century (TIME-21)* fund are two means by which transportation projects are funded within the state. A study is conducted by the Iowa DOT regarding the RUTF every five years, and based on the most recent data (2011 study), the revenue to the RUTF and TIME-21 is obtained from the following sources as listed in Table 3.

The Iowa Constitution requires 95% of all revenue contributed

Table 3- Revenue sources for RUTF and TIME-21

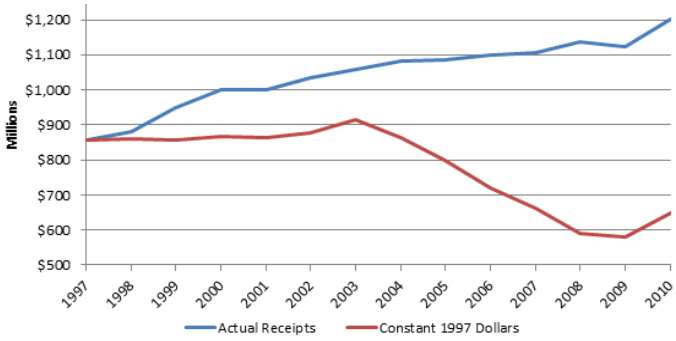
Funding Source	FY 2011 (estimated)	Percent of Total	State Constitution Requires Funds be Used Only for Roads
Fuel Tax	$430 million	36%	Yes
Annual Registration Fee	$470 million	39%	Yes
Fee for New Registration	$240 million	20%	Yes
Other*	$70 million	5%	No
Total	$1.21 billion		

***Driver's liscense fees, title fees, trailer registration fees and other miscellaneous fees**

to the RUTF and TIME-21 funds to be spent on public roadways, and diversion of these funds to other programs is prohibited.

The impact of inflation on these funds has been significant over the last 15 years. Since the year 2000, funding has remained essentially the same, and inflation has had a dramatic effect on the purchasing power of the funding. From 2004 to 2008, the construction cost index in Iowa grew by 67%, which is the largest five year increase in construction costs since 1986. Also, the buying power of fiscal year 2010 revenue is 24% less than the buying power of fiscal year 1997 revenue. These losses in buying power increase the challenges faced in providing the proper funds needed to keep up with the demand needed for roadway projects. Figure 6 is a graphical representation of the impact inflation has had on revenues.

Figure 6- Impact of inflation on revenues



The loss in buying power brought about by inflation is also compounded by the increase in more fuel efficient vehicles and the subsequent loss of tax revenues. State fuel taxes comprise about 36% of state road revenue, and federal fuel taxes comprise about 91% of federal road funds. Also, the federal government adopted increases in the Corporate Average Fuel Economy (CAFE) standards. As of model year 2010, the average fuel efficiency has increased to 29.2 miles per gallon (mpg). The CAFE standards require the fuel efficiency to grow to 35 mpg in 2016. Since vehicles are now using less gasoline, so the state and federal government is collecting less fuel tax revenue. These vehicles cause the same amount of wear and tear on roadways as gas only powered vehicles, but they are not paying an equal share since they do not use as much gasoline.

The state fuel tax has not been raised in Iowa since 1989, and the federal tax rate has not increased since 1993. Only three other states have had longer time periods since raising their gas tax rate than Iowa. Iowa initiated the gas tax in 1925 at which the rate was two cents per gallon. That is equivalent to 27.1 cents per gallon in 2014. The real cost of Iowa's gas tax has averaged 37.9 cents per gallon over the last 89 years after adjusting for inflation. The current tax rate is 19 cents per gallon; therefore, the actual impact to the consumer has been less than at any time in the history of the tax. The effect of the loss in tax revenue plays an extreme role in the financing of Iowa's roadway needs.

The RUTF study analyzed the 20 year needs to address the administration, maintenance, and construction costs for Iowa's public roadway system. Table 4 contains a summary of the needs analysis.

Table 4- 20 year needs analysis

	20 Year Total (in millions)	Average Annual (in millions)
Needs	$79,800	$3,990
Revenue	$47,300	$2,365
Shortfall	$32,500	$1,625

The 20 year shortfall is $32.5 billion, and the annual shortfall is $1.6 billion. This is the shortfall for Iowa's city, county, and state owned roadway systems. An additional analysis was done for the most critical pavement and bridge needs on the interstate system, commercial and industrial system, farm to market system, and major city streets. The critical needs also partially support the following areas of need: capacity improvements on high volume and commercial/industrial roads, reconstruction of high volume roads with poor pavement, repair/replacement of functionally obsolete bridges on high volume roads, repair/replacement of structurally deficient bridges on high volume roads, and resurfacing of low volume roads. The annual

shortfall in meeting Iowa's most critical needs is $215 million per year. Table 5 contains a summary of the critical funding shortfall needs.

Table 5- Critical needs analysis

	20 Year Total (in millions)	Average Annual (in millions)
Needs	$51,600	**$2,580**
Revenue	$47,300	**$2,365**
Shortfall	$4,300	**$215**

It should be noted that even if the critical needs are addressed there are still significant portions of the roadway system that are still under funded.

The economic impact of the roadway system on Iowa's financial viability is almost impossible to overstate. Each year, vehicles in Iowa travel over 31 billion miles on the state's roadways and almost $390 billion of freight is hauled. Without the roadway system, the economy would shut down.

The funding that is directed to the roadway system supports the economy through direct job creation via construction projects, indirect job support, and productivity gains. The FHWA stated in a 2007 study that for every $1 billion in highway investments about 27,800 jobs are created or supported. These jobs include full-time construction jobs, the support services for the construction jobs, and the jobs that are supported when construction wages are spent on goods and services. Also, productivity gains materialize via the reduced travel times, reduced crashes, and decreases in operating costs that result due to roadway investments. Studies by the FHWA show that every dollar increase in highway investments creates 30 cents of cost savings producer benefits annually. Also, the same study shows about 25% of the annual productivity growth in the United States is attributable to highway investments.

Photo 2

Photo Credit: "Game Day" CC image Courtesy of Carl Wycoff on www.flickr.com

Conclusions

Iowa has one of the densest road networks in the nation. The Interstate and Primary highway system handles the majority of intercity and truck traffic. City streets service urban residential, business, and commercial needs. The rural Secondary Roads support the Iowa's agricultural production by enabling efficient, rapid planting, tillage, and harvest operations. System capacities are mostly good today, but growth of Interstate traffic, especially trucks, will demand further investments in that part of the network. Condition of the roadways is an area of concern, as lack of adequate revenues have made it a challenge to meet current needs, let alone address future needs. Progress has been made regarding safety, with total fatalities significantly reduced, but more work must yet be done in this area.

Recommendations

Increase the state fuel tax rate to be able to repair all existing roadways and maintain Iowa's current system to remain economically competitive. A minimum of $215 million of revenue per year should be set as a target for Iowa's most critical roadway needs.

As an alternative to a flat tax increase, the state should consider a "hybrid" tax strategy in which the state tax rate is reduced to 16 cents per gallon and a 5% wholesale tax on motor fuels is implemented. This strategy is estimated to generate an additional $230 million annually. Also, the wholesale tax would provide a form of economic indexing so legislators won't have to repeatedly consider future increases to the tax.

Federal and state funding could benefit from being adjusted for inflation in a limited manner.

Electric and hybrid vehicles cause the same wear and tear on the roadway and bridge system, but they contribute less towards maintenance than gas and diesel fueled vehicles. As hybrid and electric vehicles become more common, an alternate means of funding, beyond the gas tax, must be created so such vehicles pay their fair share of the burden.

Focus on maintaining the existing roadway infrastructure rather than building new roadway infrastructure. Require the

registration fees for electric vehicles to be based on weight and value using the same method that applies to most passenger vehicles.

The state should consider the use of an infrastructure bank. Infrastructure banks are owned by government entities, and their purpose is to lend funds to agencies for infrastructure projects. The FHWA has estimated such banks could leverage $4 of private investment for every $1 of taxpayer investment.

Require the Road Use Tax Fund study to be completed once every two years instead of the current frequency of once every five years. A frequency of every two years would coincide with the legislature's biennial budget appropriations schedule, and a consideration every two years would allow the lawmakers a more timely response to changing conditions and needs in Iowa's roadways.

Resources

Iowa Department of Transportation, Iowa In Motion 2040, planning ahead, State Transportation Plan, May 8, 2012 (http://www.iowadot.gov/iowainmotion/state.html)

Des Moines Register, "Road Construction Running Out of Gas?", May 25, 2014 (The Register's Editorial: Road construction running out of gas?)

Des Moines Register, "$700M in road construction ahead", April 13, 2014 ($700 million in road construction ahead)

Des Moines Register, "Long-term road funding elusive", July 20, 2014

Des Moines Register, "Hybrid gas tax plan to be presented", March 23, 2014

Iowa Department of Transportation, 2011 Road Use Tax Fund (RUTF) Study, December 30, 2011 (http://www.iowadot.gov/pdf_files/RUTFStudy2011.pdf)

Federal Highway Administration, 2012 Urban Congestion Trends Operations: The Key to Reliable Travel, April 2013 (2012 Urban Congestion Trends: Operations – The Key to Reliable Travel - FHWA Office of Operations)

Iowa Department of Transportation, Performance and Technology Division

Federal Highway Administration, 2013 Status of the Nation's Highways, Bridges and Transit: Conditions and Performance (FHWA - 2013 Conditions and Performance: Table of Contents)

Iowa Department of Transportation, 2015-2019 Iowa Transportation Improvement Program, June 2014 (Office of Program Management - Iowa Department of Transportation)

Iowa Department of Transportation, Office of Program Management

Iowa Department of Transportation, Office of System Planning

American Society of Civil Engineers, Seattle Section, 2013 Report Card for Washington's Infrastructure (2013 Report Card for America's Infrastructure | Washington Overview)

Iowa Department of Transportation, Iowa Strategic Highway Safety Plan, July 1, 2013 to Dec 31, 2016 (http://www.iowadot.gov/traffic/shsp/pdf/SHSP.pdf)

Iowa Department of Transportation, 2010 5% Most Severe Safety Needs Report (http://www.iowadot.gov/crashanalysis/fivepercent/2010/iowa_5percent_consolidatedreport_2010_final.pdf)

National Highway Safety Administration, 2012 Seat Belt Usage Report, revised June 2014 (http://www-nrd.nhtsa.dot.gov/Pubs/811809.pdf)

Iowa Department of Safety, FY 2013 Annual Report (http://www.dps.state.ia.us/commis/pib/Annual_Report/2013AnnualReport-final.pdf)

Iowa Governor's Traffic Safety Bureau (http://www.dps.state.ia.us/commis/gtsb/psa.shtml)

Summary

Iowa ranks fifth in the nation in terms of the number of bridges with approximately 24,000 bridges in the state. The State of Iowa owns 4,115 bridges, counties have ownership of 18,688 bridges, and cities own 1,113 bridges. Bridges, along with the roadway system, significantly impact Iowa's economic competitiveness. One in every five bridges in Iowa is rated structurally deficient giving it the third worst rating in the nation. Reducing the number of structurally deficient bridges is a priority for the Iowa Department of Transportation (DOT), and while there is progress, there are always going to more bridges to fix today and in the future. Every five to 10 years, an additional 500 bridges in Iowa will reach their 50th birthday. Although bridges are not necessarily in bad condition because they are old, the useful life of a bridge is greatly diminished, and the costs to maintain it will rise.

Photo 1- I-235 arch bridge

State, county, and city transportation officials have performed extensive inspections of their bridges in order to maintain and correct deficiencies as they occur. Currently, the Iowa DOT allocates $104 million per year for replacement, rehabilitation, and repair of bridges on the primary highway system. In order to meet the goal of reducing the number of structurally deficient bridges and to address other bridge needs in the state, the funding level should increase to $152 million per year. Due to the number of structurally deficient structures and the shortfall in necessary funding, the bridge system in the State of Iowa receives a grade of D+.

Background

Inspection data on bridges is compiled by the Iowa DOT, and the information is submitted to the Federal Highway Administration (FHWA). The FHWA records this information in the National Bridge Inventory database. The FHWA requires data on all bridges that possess the following characteristics: those that are more than 20 feet in length, are located on a public road, and that carry vehicular traffic. Inspections on the bridges that meet the requirements are performed on a 24 month cycle or less. The data collected is used to determine the sufficiency rating for a particular structure. The sufficiency rating is a measure of a bridge's ability to serve its intended purpose. The sufficiency rating is comprised of the following: structural condition, serviceability, safety, functional obsolescence, importance to public use, and special conditions. A numerical value from 0 to 100 is assigned to each bridge; lower values indicate lower sufficiency ratings. For funding purposes a bridge with a value of 80 or less is eligible for repair, and a bridge with a value less than 50 is eligible for replacement. A bridge with a value between 50 and 80 is eligible for rehabilitation.

Capacity

Capacity is the ability of a bridge structure to convey vehicles and people without causing delays in the transportation system. The capacity of a bridge is primarily determined by its geometric constraints and structural adequacy. Bridges can act as bottlenecks in certain circumstances. Bottlenecks cause 40% of traffic congestion nationally, which can be time consuming and costly for the traveling public and freight traffic. Although congestion is not a major concern in Iowa, traffic volumes have been increasing. Truck traffic on Iowa roadways has increased 42% between 1990 through 2010, and total travel on Iowa roadways has increased by 36% in the same time period. If these trends continue, congestion will become more problematic without an increase in structure capacity.

Additionally, there are 3,927 bridges within the state that are posted and another 699 bridges that are restricted bridges. In most cases, posted structures are those that have a weight restriction. Restricted bridges are those that limit a certain number of vehicles on the structure at any one time.

Condition

The condition of a bridge is the physical ability of the structure to carry design loads. An evaluation based on the rating system by qualified personnel is required by the FHWA for bridges or culverts longer than 20 feet. These inspections are to be done at least once every two years on all publically owned structures. The Iowa DOT has created a Bridge Condition Index rating which takes into account the structural condition of the bridge, load carrying capacity, horizontal and vertical clearances, width, traffic levels, type of roadway the structure services, and the length of out of distance travel if the bridge is closed. All state owned and locally owned bridges in Iowa have been rated using this system. The bridge is rated good, fair, or poor. A good rating indicates the bridge is sufficient for current traffic and vehicle loads. A fair rating does not have a specific definition other than it does not fall under the extremes of good or poor. A poor rating means a bridge is

not necessarily unsafe, but it should be considered for repair, replacement, restriction posting, weight limits, or inspecting on a more frequent basis. Table 1 shows the number of good, fair, and poor bridges in Iowa organized by ownership.

Table 1- Good, fair, and poor bridges

	State Owned	County Owned	City Owned
Good	2,797 (68%)	7,817 (41%)	638 (57%)
Fair	1,278 (31%)	9,412 (49%)	379 (34%)
Poor	44 (1%)	1,888 (10%)	107 (9%)

***Figure 1 is a visual representation of this data**

Another measurement tool to define the condition of a bridge is a determination of whether it is structurally deficient. Bridges are considered structurally deficient if significant load carrying elements are found to be in poor or worse condition due to deterioration and/or damage, or the adequacy of the waterway opening provided by the bridge is determined to be extremely insufficient to the point of causing intolerable traffic interruptions. The fact that a bridge is "deficient" does not immediately imply that it is likely to collapse or that it is unsafe. With hands-on inspection, unsafe conditions may be identified, and if the bridge is determined to be unsafe, the structure must be closed. A "deficient" bridge, when left open to traffic, typically requires significant maintenance and repair to remain in service generally followed by eventual rehabilitation or replacement to address deficiencies. In order to remain in service, structurally deficient bridges are often posted with weight limits to restrict the gross weight of vehicles using the bridges to less than the maximum weight typically allowed by statute.

Structurally deficient bridges generally do not affect small vehicles, but they do affect larger vehicles such as trucks, school buses, fire engines, and farm equipment. In Iowa, 4,646 bridges (19%) are structurally deficient which places Iowa third in the nation in the number of structurally deficient structures. The average age of a structurally deficient bridge is Iowa is 69 years. In addition, there are 4,626 bridges that are posted and/or restricted in the state.

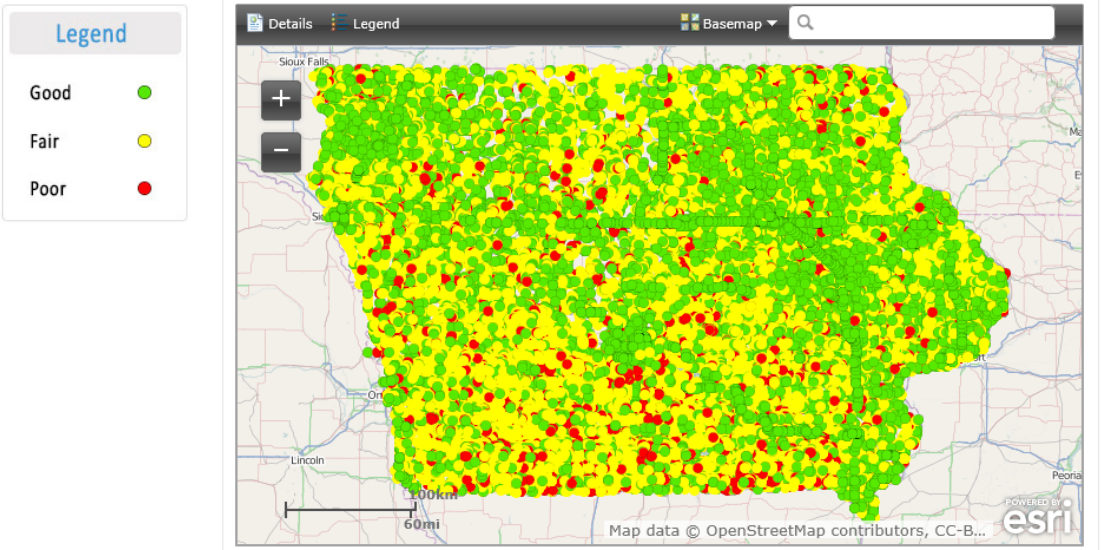
The number of structurally deficient structures in the state is an indication of the rapidly growing age of bridges in the state. Figure 2 shows the ages of all bridges within the state. The bridges built 50 to 60 years ago had design lifespans of 50 years while modern bridges have 75 year design lifespans. Approximately every five to 10 years another 500 bridges will reach an age of 50 years.

Public Safety

A bridge that has been deemed to be structurally deficient may be posted for weight limits so that the bridge may possibly remain in service. If a bridge is considered unsafe, it is closed to traffic. Currently, there are 4,626 bridges that are posted or restricted to a number of vehicles on the bridge at any one time. This represents approximately 19% of the total number of bridges in the state. Iowa is ranked third in the nation in terms of the number of structurally deficient bridges. Due to the posting system, these bridges do not pose an immediate threat to the public, but this data is an indication of an aging system in which safety must be addressed.

Many of the bridges in secondary/rural areas are undersized for the types of vehicles currently using them, which poses a definite safety hazard. Also, approximately 98% of the structurally deficient bridges and 97% of the posted/restricted

Figure 1- Good, fair, and poor bridges in Iowa



Displayed data: Includes bridges on all public roads in Iowa, regardless of jurisdiction – interstate, U.S., Iowa, county, municipal, etc.

bridges in the state are located on county and city systems. While not all of these deficient and posted bridges are an immediate threat to the traveling public, a failure of these structures can be detrimental as illustrated in the photo below.

Photo 2- Rural bridge failure

Iowa has many bridges that cross waterways. These structures are subject to a process known as scour. Scour is the erosion of streambed and bank material due to flowing water. The removal of this material near bridge abutments and piers can cause bridge failure. As material is removed, the bridge foundations become unstable and the bridge is categorized as scour critical. Scour is the primary cause of bridge failure in the nation. Iowa has 180 scour critical bridges on the state system, and there are additional bridges with unknown foundations that may be scour critical as well. In addition, there are 533 scour critical bridges in total within the city and county system. There are 12 bridges on the city and county system that are closed to traffic due to scour damage at the time of this report. Virtually all of the scour critical bridges on the state system have scour countermeasures installed to prevent scour from occurring or to lessen the impact on the bridge. Only three bridges in the state have been known to have failed due to scour within the last 20 years. Damage to a bridge abutment due to scour is shown in the photo below.

Photo 3- Bridge abutment damage due to scour

Studies have been conducted by the FHWA regarding safety improvements on the highway system. According to their findings for every $100 million spent on safety improvements approximately 145 fatalities can be prevented over a 10 year period. Also, for every dollar invested in the highway system approximately $5.40 in economic benefits is gained in improved safety, reduced vehicle costs, and reduced delays.

Funding

The Iowa DOT has developed a Transportation Improvement Program which outlines the projects planned over a five year period on the primary and interstate systems. The current program covers fiscal years 2015 through 2019.

A significant portion of bridge funding comes from the federal government based on the current federal authorization bill, *Moving Ahead for Progress in the 21st Century (MAP-21)*, with funding coming from the federal Highway Trust Fund. The Highway Trust Fund was nearly depleted in August 2014 when a legislation "patch" was passed to temporarily keep it solvent until May 2015. The authorized level of funding

Figure 2- Age of bridges

State and local bridges included
State=4,108
Local=19,951

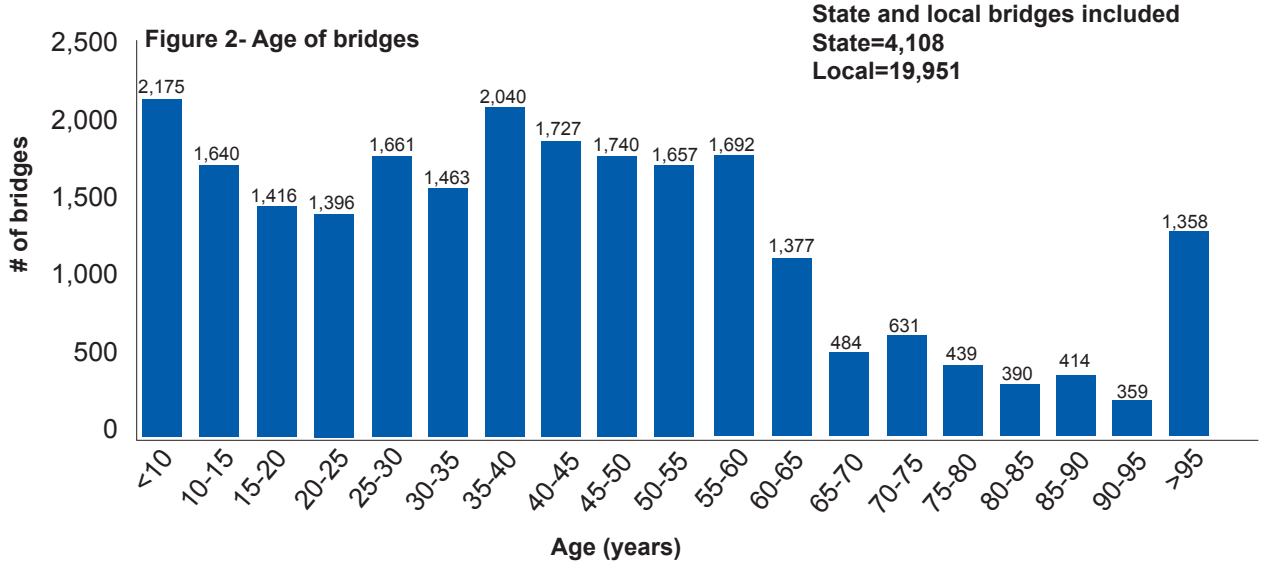


Table 2- Revenue sources for RUFT and TIME-21

Funding Source	FY 2011 (estimated)	Percent of Total	State Constitution Requires Funds be Used Only for Roads
Fuel Tax	$430 million	36%	Yes
Annual Registration Fee	$470 million	39%	Yes
Fee for New Registration	$240 million	20%	Yes
Other*	$70 million	5%	No
Total	$1.21 billion		

***Driver's liscense fees, title fees, trailer registration fees and other miscellaneous fees**
Source: Iowa DOT-offices of program management and systems planning

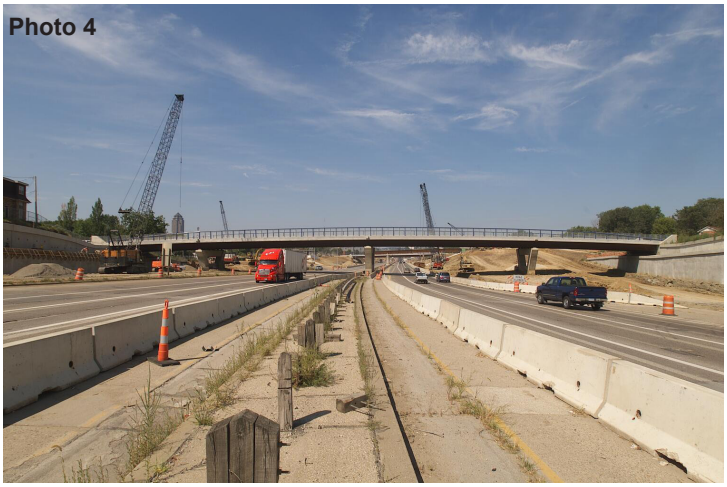
under this bill is approximately $11 billion. Based on current projections, the trust fund will again be insolvent by May 2015. Iowa, over a 10 year average, has received 59% of its state dollars from these federal sources.

The Iowa DOT estimates $900 million will be spent on Iowa's state owned bridges from 2015 to 2019. The Iowa DOT currently spends approximately $104 million per year on replacement, rehabilitation, and repair for the bridges on the primary system. An amount of $9 million per year is allocated for maintenance, $30 million is allocated for the bridges on the interstate system, and $40 million is allocated for the bridges on the primary system. The remainder, approximately $24 million per year, is allocated to specific corridor projects. The current funding percentages are 70% for replacements, 23% for rehabilitation, and 7% for repair.

A goal of reducing the number of structurally deficient bridges to 125 on the primary system by 2020 has been set by the Iowa DOT. This goal has been reached due to the influx of $50 million in stimulus money the state received to address structurally deficient bridges. Even though this goal has already been reached, the number of structurally deficient bridges will continue to increase if the funding level is not raised. The current funding rate of $104 million per year will not be adequate in Iowa's case as approximately every five to 10 years another 500 bridges will reach an age of 50 years. In order to address the number of bridges that will become structurally deficient within the near future, the funding level will need to increase to $152 million per year.

Funding for bridge and roadway improvements is also derived from state revenues. The Road Use Tax Fund (RUTF) and the *Transportation Investment Moves the Economy in the 21st Century (TIME-21)* fund are two means by which transportation projects are funded within the state. A study is conducted regarding the RUTF every five years and based on the most recent data (2011 study) the revenue to the RUTF

Photo 4



and TIME-21 is obtained from the following sources as listed in Table 2.

The Iowa Constitution requires 95% of all revenue that is contributed to the RUTF and TIME-21 funds are to be spent on public roadways, and diversion of these funds to other programs is prohibited.

The state fuel tax has not been raised in Iowa since 1989, and the federal tax rate has not increased since 1993. The effect of the loss in tax revenue places an extreme burden on the financing of Iowa's bridge needs. Also, the impact of inflation on these funds has been significant. For example, the impact of inflation can be illustrated by the fact that a loaf of bread costs nearly 50% more in the year 2013 than in the year 2000. The loss in buying power brought about by inflation is also compounded by the increase in more fuel efficient vehicles and the subsequent loss of tax revenues. Since vehicles are now using less gasoline, the state and federal government is collecting less fuel tax revenue. These vehicles cause the same amount of wear and tear on roadways as less fuel efficient vehicles, but they are not paying an equal share since they don't use as much gasoline.

Conclusions

Iowa is a bridge dependent state. The DOT owns 4,115 bridges, counties have 18,688, and cities own 1,113. Despite large increases in truck and agricultural commodity transport, about 20% of all structures are deficient and/or posted with weight restrictions. Increased funding will be necessary if the road agencies are to be able to reduce the number of structures that fall short of modern transport needs.

Recommendations

Increase the state fuel tax rate to be able to repair all structurally deficient bridges and maintain Iowa's current bridge inventory.

An alternative to a flat tax increase the state should consider is a "hybrid" tax strategy in which the state tax rate is reduce to 16 cents per gallon and a 5% wholesale tax on motor fuels is implemented. This strategy is estimated to generate an additional $230 million annually and would have the same impact as a flat increase of 10 cents per gallon. Also, the wholesale tax would provide a form of economic indexing so legislators won't have to repeatedly consider future increases to the tax. This increase would cover both roadway and bridge needs.

Maintain focus on repair and/or replacement of the worst structurally deficient bridges.

State funding should be required to adjust for inflation.

Electric and hybrid vehicles cause the same wear and tear on the roadway and bridge system, but they contribute less towards maintenance than gas and diesel fueled vehicles. As hybrid and electric vehicles become more common an alternate means of funding beyond the gas tax must be created so such vehicles pay their fair share of the burden.

Continued use of innovative technologies such as accelerated bridge construction, nondestructive testing, and structural health monitoring should be used to improve project delivery and better evaluate the condition of existing bridges.

New funding mechanisms for federal surface transportation legislation should be determined and dedicated to bridge repair, rehabilitation, and replacement by the U.S. Congress.

Federal funding should be required to adjust for inflation.

Resources

Iowa Department of Transportation, Iowa In Motion 2040, planning ahead, State Transportation Plan, May 8, 2012 (http://www.iowadot.gov/iowainmotion/state.html)

Des Moines Register, "Long-term road funding elusive", July 20, 2014

Des Moines Register, "Hybrid gas tax plan to be presented", March 23, 2014

Iowa Department of Transportation, 2011 Road Use Tax Fund (RUTF) Study, December 30, 2011 (http://www.iowadot.gov/pdf_files/RUTFStudy2011.pdf)

Iowa Department of Transportation, Iowa Strategic Highway Safety Plan, July 1, 2013-Dec.31, 2016 (http://www.iowadot.gov/traffic/shsp/pdf/SHSP.pdf)

Iowa Department of Transportation, Performance and Technology Division

Federal Highway Administration, 2013 Status of the Nation's Highways, Bridges and Transit: Conditions and Performance (FHWA - 2013 Conditions and Performance: Table of Contents)

Iowa Department of Transportation, 2015-2019 Iowa Transportation Improvement Program, June 2014 (Office of Program Management - Iowa Department of Transportation)

Iowa Department of Transportation, Office of Bridges and Structures

Iowa Department of Transportation, Office of System Planning

Summary

Iowa dams provide a number of important benefits including flood control, recreation, water for irrigation, and fire protection. The future of many Iowa dams is uncertain because of a lack of funding programs for dam owners, the below national average state budget for safety programs, and the ever increasing age of many of the dams in Iowa.

Significant steps need to be made in order to improve our current D grade. Suggested steps include the creation of a funding program to assist dam owners with rehabilitation projects for the ever-increasing age of Iowa's dams, increasing the State of Iowa's authority to require Emergency Action Plans (EAPs) for all regulated high hazard dams, and increasing Iowa's budget for dam safety programs.

Background

Iowa has almost 4,000 dams. About half are privately owned with the remainder owned and operated by state, city, or county government. A majority serve to create recreational impoundments, but others facilitate power generation, flood control, and drought reserves. Smaller dams are designed to transmit flood flows without resistance, but larger facilities, like Coralville or Red Rock, can substantially attenuate flood volumes. Dam safety is the responsibility of the owners, with oversight from the Iowa DNR.

Capacity

The State of Iowa's population is growing. The U.S. Census Bureau estimated Iowa's 2013 population just below 3.1 million residents. Such population growth could potentially move additional residential development away from urban centers to previously unpopulated areas located below dams. Dams that have long been rated as having low or significant hazard may soon find themselves in the high-hazard category with potential increases in infrastructure costs or operation and maintenance activities.

Recent reports indicate that changes in the climate could bring more intense rainfall events to Iowa with an increased probability of flooding. In many cases, dams may have been designed and constructed for certain rainfall events. With the likelihood that rainfall events may be increasing in intensity, it is more important than ever to ensure the overall capacity of Iowa's existing dams is adequate.

The State of Iowa is an agricultural based society. Even with improved crop cultivation practices, the probability of soil erosion is likely higher in an agricultural economy. Iowa dams are very susceptible to siltation caused by soil being slowly moved by water into the flow of the dam. Of Iowa's 3,927 dams, 2,177 were constructed in 1979 or earlier, which means 55% are older than 35 years. Thus, as the majority of Iowa's dams age and approach their 35 to 50 year design life, many are likely silting in, losing capacity, and ultimately affecting the overall condition of the dams.

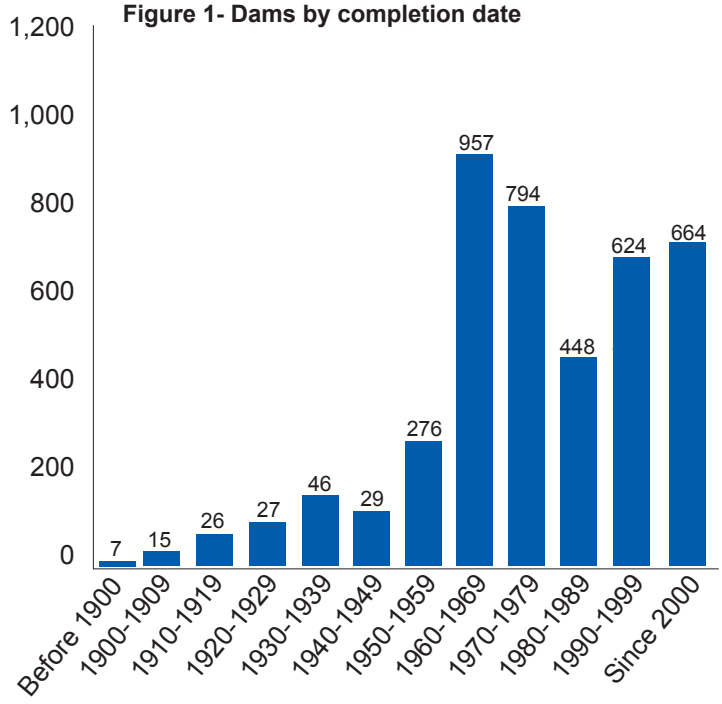
Condition

Regular maintenance of all Iowa dams is the responsibility of the individual dam owner. Iowa Department of Natural Resources (DNR) is responsible for the State of Iowa's Dam Safety Program. With only two full-time and two part-time employees in the state's program, inspection of all 3,927 dams is unrealistic. Individual dam owner education and responsibility is imperative to understand the causes of dam failures.

Less than 10% of all Iowa dams are regularly inspected. High hazard dams are inspected every two years and major dams are inspected every five years. Of the regularly inspected dams, the majority of them are listed as satisfactory. Although, it is the uncertainty of the dams not inspected that is a cause for concern. Iowa DNR counts on dam owner or neighbor input on concerns related to these dams. The Iowa DNR has implemented dam owner educational workshops in the past, though the level of responsiveness of the dam owners to potential dam failures is uncertain.

Age of infrastructure is a major component in the overall conditional assessment. Of the 3,927 dams listed in the National Inventory of Dams (NID) in the state of Iowa, 2,177 were constructed in 1979 or earlier. This equates to over 55% of all state of Iowa dams being 35 years old or older. Twenty-four percent of Iowa dams were constructed in the 1960s, while another 20% of dams were constructed in the 1970s.

Figure 1- Dams by completion date



Operation and Maintenance

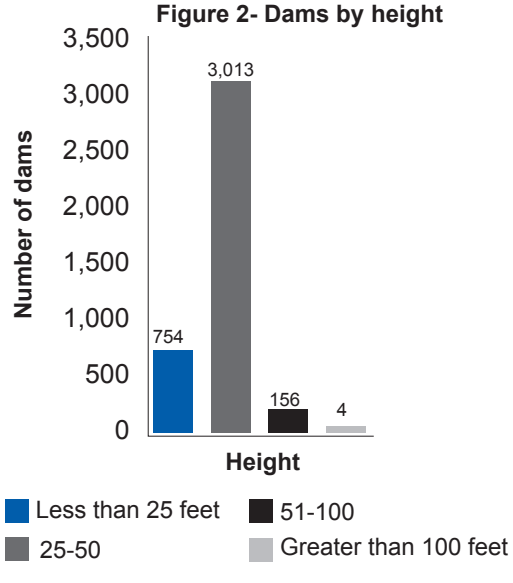
An Emergency Action Plan (EAP) identifies potential emergency conditions at a dam and specifies preplanned actions to be followed to help prevent loss of life and minimize property damage. Dam owners work with state and local officials to prepare and update EAPs to help mitigate loss resulting in dam failures.

Even though the State of Iowa has made progress on the number of EAPs in place throughout the state, only 23% of regulated high hazard potential dams have an EAP. Nationally, approximately 70% of high hazard potential dams have an EAP.

The state continues to lack the authority to require EAPs in every instance. In fact, Iowa is below national averages in state authorities related to legislation, inspection, enforcement, EAP and response, permitting, education and training, as well as public relations. The lack of state authority brings to question the overall ability for proper dam operation to occur, especially during emergency conditions and normal maintenance on Iowa dams.

Many states have loan or grant programs that assist dam owners with routine maintenance and rehabilitation projects. Without such a program, much of the routine maintenance or rehabilitation needed to keep dams up to modern criteria, complete spillway repairs, remove vegetation on the dams, and fix seepage problems may be deferred or not be completed at all.

Figure 2- Dams by height



Public Safety

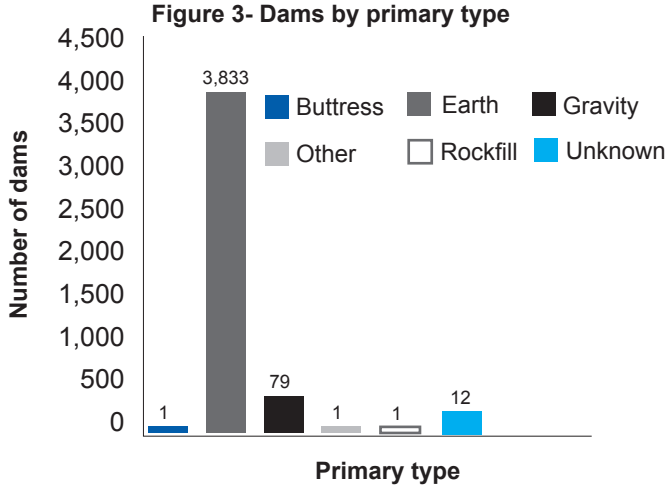
Public safety is paramount to any state program. Iowa DNR has two full-time employees and two part-time employees, or the equivalent of three full-time employees in the Dam Safety Program. Adequate staffing is important for program performance. With the 3,927 total dams in Iowa's inventory, Iowa's ratio is significantly higher regarding the number of state regulated dams to full-time equivalent employees, especially when compared to national averages, which may be an indicator for additional staff resources.

Likewise, the overall Dam Safety State Budget per regulated dam is a fraction of the national average. The national dam safety budget average is nearly $600 per regulated dam while Iowa's budget is below $50 per regulated dam. While the national dam safety budget is nearly $4,000 per regulated high hazard potential dam, Iowa's dam safety budget per regulated high hazard potential dam is below $1,600.

Major dam failures are not re-built overnight. In many cases, reconstruction takes many years to achieve. In addition to a significant loss of life risk, the economic and property damage impacts are huge. Maintaining or rehabilitating Iowa's aging dam infrastructure with adequate funding resources is a more cost effective approach rather than replacing failed dams.

The Lake Delhi dam failure in July of 2010 is a stark reminder of the impact of a dam failure. With an estimated $50 million in property damage and another $120 million in economic loss, the Lake Delhi area will certainly feel the effects of the dam failure for years to come. The Lake Delhi dam failure is a case in point that adequate resources and funding needs to be established in Iowa to avoid additional dam failures.

Figure 3- Dams by primary type



Funding

In addition to extremely limited resources for the Iowa DNR Dam Safety Program, the state of Iowa currently does not have a loan or grant program for dam owners. With nearly 50% of the dams privately owned in the state, private property owners are faced with the reality of self-funding any needed dam maintenance or improvement projects. Nearly half of all states in America have a program for dam owners ranging

from grants, loans, cost-sharing arrangements, or construction assistance programs.

Conclusions

Although there have been few major problems with dams, all are aging and only around 10% are regularly inspected. A developing concern with dams is that Iowa's flood flows have been larger and more frequent in the last two decades. This subjects the structures to more stresses than designed for and reduces the effectiveness of those specifically built for flood protection. Meanwhile, siltation is reducing low flow storage capacities and limiting recreational opportunities. Funding, especially for privately owned structures is limited. Because of the potential for loss of life and property when a dam fails, each high risk installation should have an Emergency Action Plan in place, but only 23% of Iowa sites have one prepared, well below the national average of 70%.

Recommendations

Implement a State of Iowa loan or grant program available to all dam owners for needed dam rehabilitation projects.

Increase the State of Iowa's authority to require Emergency Action Plans (EAPs) for all regulated high hazard dams.

Increase the overall Iowa Dam Safety program budget to be more in line with national averages.

Resources

Association of State Dam Safety Officials – Performance Report for the State of Iowa (2013)

National Inventory of Dams Web site: http://geo.usace.army.mil accessed in June 2014.

Personal Correspondence – Jonathan Garton, P.E., Senior Dam Safety Engineer, Iowa Department of Natural Resources
Personal Correspondence – Mark Ogden, P.E., Association of State Dam Safety Officials

Review and Evaluation of the National Dam Safety Program, December 2011

ASCE – 2013 Report Card for America's Infrastructure
US Census Bureau web site: http://quickfacts.census.gov

Figure 4- Dams by primary owner type

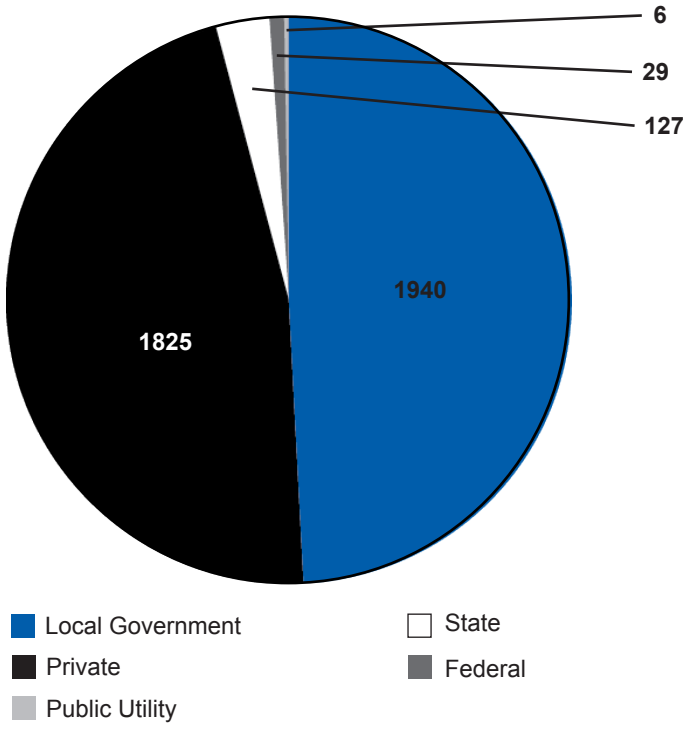


Photo 1-

Photo Credit: "Red Rock Dam" CC image courtesy of Carl Wycoff on www.flickr.com

C - LEVEES

Summary

Levees provide protection for urban, suburban, and rural/agricultural lands near waterways that would otherwise be subject to flooding. Levees are a vital piece to the success of our statewide economy. Iowa's levees are currently functioning adequately with typical stream flows, but issues frequently occur when design flow events are experienced.

Several levees in Iowa are not in compliance with the Federal Emergency Management Agency (FEMA) and/or the United States Army Corps of Engineers (USACE) guidelines. These two agencies have different sets of guidelines for compliance that affect levee funding for repair and maintenance. Additionally, it is often the case that funding under USACE only allows for rebuilding a levee to its exact pre-flood condition, even if this condition no longer provides protection from the original design frequency event.

At present time, all new levee designs within the state are sent to the Department of Natural Resources (DNR) for review prior to construction. Although this review is thorough, funding and staff are not available for follow up once these levees are constructed. New federal legislation, the Water Resources Reform and Development Act of 2014 (WRRDA), will streamline the inspection and funding process, provide additional funding at the state level to enforce continued levee maintenance and oversight, and help reduce the time required to design and construct new levees. However, the impact of this legislation will be limited by the amount of funding actually received.

Background

By definition, levees are typically embankments constructed parallel to waterways that are intended to prevent overbank flows from affecting areas located landward of the levee. Levees protecting areas with high flood damage potential are commonly designed to prevent flooding during a 100-year frequency flood event, which has a 1% probability of occurring in any given year.

Photo 1

The Mississippi River forms the entire eastern border of the state of Iowa, while the Missouri River and Big Sioux River (a tributary of the Missouri River) form the western border of the state. The Missouri River eventually flows into the Mississippi River downstream from the state of Iowa, making all of Iowa a part of the Mississippi River Basin. A large portion of the levees within the state are located along these state border rivers. However, other levees do exist in the interior of the state such as those in the Des Moines, Waterloo, Marshalltown, Ida Grove, Onawa, and Ottumwa areas.

Currently levees within the state are documented through two main national inspection/accreditation programs; USACE has a national inspection program documented through the National Levee Database (NLD) and FEMA has an accreditation program documented through the Midterm Levee Inventory (MLI). While similar in some regards, these two are independent from one another. To add to the complexity, responsibility of levees frequently falls on the locally created levee districts which are comprised of land owners benefiting from the levee. It is not uncommon for levees to be controlled by multiple levee districts located contiguously along a stream's reach. Currently, the implementation of levee safety is often disjointed because of this distribution of responsibility among different entities within several levels of government (local, regional, state, and federal).

New levees within the state are required to apply for a permit through Iowa DNR. There appears to be adequate supervision in the permit process; however, there is no follow-up maintenance program at the state level for constructed levees. Funding is not currently available to provide these services. Once permitted, levees are the responsibility of the applicant.

If a levee sponsor participates in USACE's program, USACE provides assistance if a levee is damaged as a result of flooding. However, this funding is only to construct/repair the levee to its previous condition. In situations where the hydrology for a stream has changed dramatically, the reconstructed levee might not provide protection from the original design frequency event. Also, if the design flood elevation increases where a levee is currently in satisfactory condition, this levee then moves into a non-compliance category with FEMA.

The USACE and FEMA are working on streamlining the levee evaluation process into one set of guidelines. In 2008, Congress created the National Committee on Levee Safety. The purpose of this committee is to "develop recommendations for a national levee safety program, including a strategic plan for implementation of the program." The Committee is comprised of industry representatives from USACE, FEMA, state and local entities, and the private sector. Areas of expertise of committee members include engineering, law, public administration, and communications.

The Committee prepared a report outlining their findings and presented the draft report to Congress in January 2009. From there, H.R. 8030: The Water Resources Reform and Development Act (WRRDA) of 2014 was created, approved, and signed into law in June of 2014. This bill is intended to streamline the inspection and funding process such that both entities are in alignment and provides additional funding at the state level to enforce continued levee maintenance and oversight. It is also expected that this bill will help reduce the time required to design and construct new levees.

Capacity and Condition

There are 462 miles of levees in Iowa documented in the NLD. It is estimated there are over 890 miles of levees in the state of Iowa, leaving over 428 miles, or roughly half, of all levees within the state undocumented and likely not participating in any sort of maintenance or inspection plan.

Currently, 18 of 84 levees documented in USACE's National Levee Database are rated as unacceptable, with 58 minimally acceptable, and only eight defined as acceptable.

Figure 1- Levees in the state of Iowa

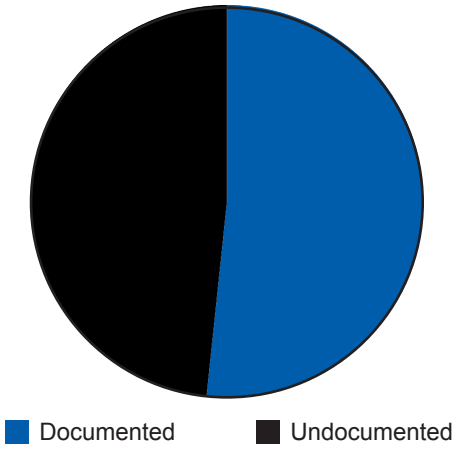


Figure 2- NLD: 92 Iowa levees in database

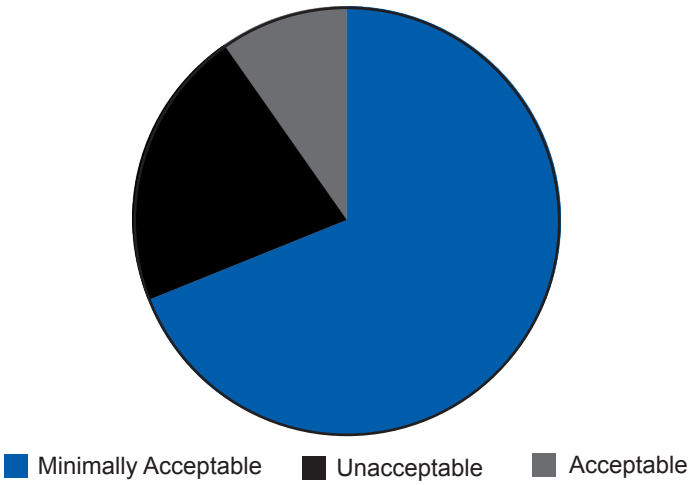
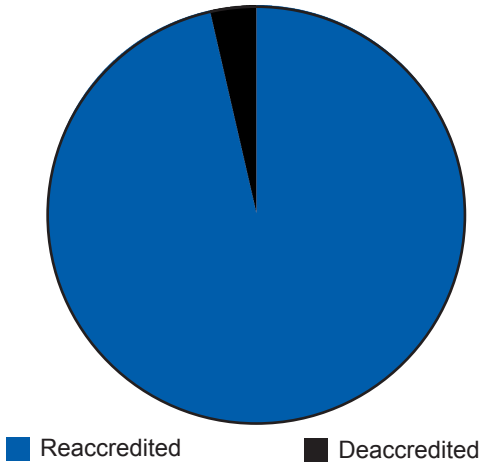


Figure 3- MLI: 23 Iowa levees in database



At present time, 17 levees are reaccredited through FEMA's Midterm Levee Database, whereas six levees within the state are de-accredited through the MLI.

Public Safety and System Resilience

In the spring of 2011, record snowfall in the Montana and Wyoming Rocky Mountains coupled with regional heavy spring rainfall events created record flow levels in the Missouri River, triggering record release rates through six major dams along the Missouri River. As a result, large scale flooding and several levee breaches occurred. A large portion of Interstate 29 within the state was closed for almost four months due to flooding, and a portion of Interstate 680 needed to be completely rebuilt as a result of this flooding. Flood repair costs of the secondary roads of Pottawattamie County alone were estimated to be $40 million dollars.

During the floods of 2008, agricultural losses in the state of Iowa were estimated to exceed $2 billion. Flood waters overtopped levees in Cedar Rapids, flooding 1,300 city blocks, including damage to buildings vital to the city's operation. A levee unexpectedly failed in Oakville, putting the town under six feet of water and damaging every building in the community. After the flood, two thirds of the town's population moved away.

Levees are a vital piece to the success of our statewide economy. Valuable farmland, urban, and rural areas are protected by levees within our state. As we have seen from past experience, failure of these levees inevitably leads to property damage, crop damage, and ultimately potential loss of life.

Additionally, other vital modes of infrastructure such as roads,

hospitals, drinking and wastewater facilities, and power plants depend on the successful performance of levees. In many cases, these levees were originally constructed to protect farmland. However, many of these protected areas have since been developed further and are now protecting large urban communities, making a levee breach and/or failure devastating.

There are about 890 levee miles documented within the state of Iowa with 90% of them, or approximately 800 levee miles, requiring maintenance over the next 20 years. If using an average figure of $100,000 - $250,000 per levee mile that is currently not funded, that yields a deficit in funding of anywhere between $80 million to $200 million for levee repairs over the next 20 years, or approximately $4 million to $10 million per year. However, this figure is merely an approximation since a comprehensive inventory/status report of all levees within the state does not exist.

Funding

One of major provisions of the WRRDA bill includes strong levee safety programs at the state level through a National Levee Safety Program. Such a program would include a set of consistent safety standards and mitigation protocols. This bill also allows for resources at the state level to provide assistance, oversight, and systems approach coordination to local levee district personnel. These services, already available throughout other facades of infrastructure, are vital to protecting land behind levees. This program also allows for customized plans for each state.

To support the establishment and maintenance of state levee safety programs that meet a minimum safety standard, the National Committee on Levee Safety has proposed a new levee safety grant program to assist states in achieving strong levee safety programs and a National Levee Rehabilitation, Improvement, and Flood Mitigation Fund to address both structural and nonstructural levee rehabilitation needs.

Future Need and Innovation

It has recently been recognized that more extreme rain events appear to be occurring. Iowa State University has been modeling annual rainfall in an effort to predict a range for future rainfall. The graph below illustrates some of their predictions. While it is difficult to accurately predict future rainfall events, the modeling does help to recognize possible future trends. As the graph indicates there is a potential increase of up to 20% in monthly precipitation over the time period of 2020-2059. This could drastically affect design flood elevations and ultimately move additional levees into non-compliance categories. Also, this could indicate that levees constructed to provide protection from current 100 year flood events may not be adequate to provide protection from future design events.

Figure 4- Projected monthly rainfall change

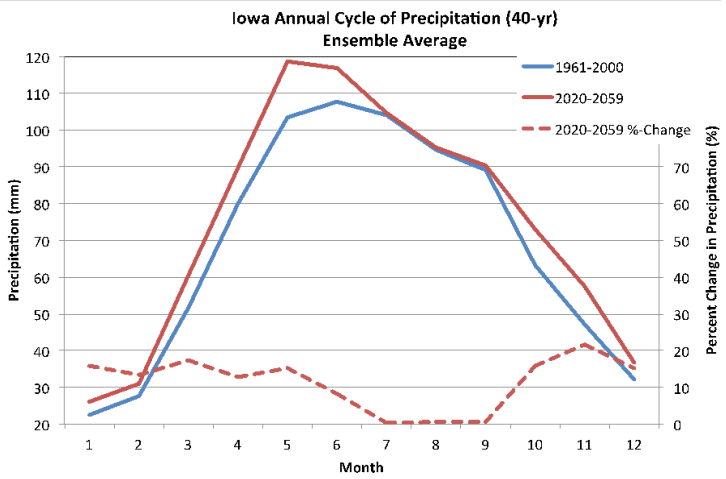


Chart Credit: Chart courtesy of Dave Claman, PE with the Iowa DOT. Chart was prepared as part of a climate model study performed by Chris Anderson with the Climate Science program at Iowa State University that is being used for infrastructure development within the State of Iowa.

New levees are being constructed throughout the state. In particular, the City of Coralville recently constructed a new flood protection system along the Iowa River after the flood of 2008 caused widespread devastation in the area including damage to major arterial roadways into vital operations such as the University of Iowa Hospital and Iowa City Veterans Administration Hospital. This flood protection system was built to an elevation of one foot above the 2008 high water elevation. The mile long flood protection system includes a removable aluminum floodwall that is only in place when flood waters are threatening, an earthen berm, and concrete floodwalls as part of a building structure.

Conclusions

Overall, levees within the state are functioning mediocre. Many levees previously classified as providing 100-year flood protection have been determined to no longer be in compliance with the requirements of FEMA. Additionally, several levees systems have been determined to be noncompliant with USACE requirements, which affects funding for post-flood repair and maintenance.

Standardization of the USACE and FEMA inspection program is greatly needed. Also, additional funding is needed to implement a levee safety program at the state level.

USACE and FEMA are working together to streamline the evaluation process. The WRRDA bill for additional funding has been created and approved and is progressing towards implementation. However, Congress will need to fund the

program in order to provide the grants the state will need to implement a levee safety program.

Recommendations

Fully fund national WRRDA: For levees in the state of Iowa to function successfully WRRDA must be fully funded, and additional funding for maintenance oversight at the state level must be provided.

Ensure adequate levee inspection staff to ensure public safety: It is necessary that funding be provided at the state level long term such that adequate staff can be permanently hired to implement this maintenance oversight. If reapplication for funds is required annually, it will be extremely difficult to adequately staff the maintenance program. It is also necessary to adequately train oversight personnel within each levee district so that they are informed regarding maintenance, inspection, and repair procedures.

Standardize national guidelines for levees: The NLD and MLI need to be standardized into one set of guidelines so that following these guidelines is easier for the levee districts. Ideally, all levees within the state should be documented and easy to access in one master database.

Use predictions to prevent future risk: It is recommended that information from the Iowa Flood Center and Iowa State University's Climate Science program regarding rainfall and stream flow predictions be incorporated into levee designs and 100 year flood maps within the state. While these are only predictions and cannot guarantee actual levels, it makes prudent sense to incorporate these predictions with other design aids when designing levees. It may be possible to enlist help from the Iowa Flood Center and Iowa State University's Climate Science program to create a customized analysis.

Resources

Iowa Department of Natural Resources

United States Army Corps of Engineers

National Levee Database

United States Army Corps of Engineers, accessed July 2014
www.nld.usace.army.mil

Living with Levees – It's a Shared Responsibility
Federal Emergency Management Agency, accessed August 2014 http://www.fema.gov/living-levees-its-shared-responsibility

Recommendations for a National Levee Safety Program
National Committee on Levee Safety, accessed August 2014
www.leveesafety.org

WRRDA Conference Report
Transportation and Infrastructure Committee, accessed August 2014http://transportation.house.gov/wrrda/conference.htm

USACE Disaster Operations
Public Law 84-99
Flood Control and Costal Emergency Act
United States Army Corps of Engineers
http://www.nfrmp.us/iltf/docs/PL84-99factsheet.pdf

Iowa Flood Information System
Iowa Flood Center
University of Iowa, accessed September 2014
http://ifis.iowafloodcenter.org/ifis/en/

Climate Science Program
Iowa State University, accessed September 2014
http://climate.engineering.iastate.edu/index.html

2013 Report Card for America's Infrastructure –Levees
American Society of Civil Engineers, accessed July 2014
http://www.infrastructurereportcard.org/a/#p/levees/overview

Photo 2

Photo Credit: "Levee L-575" CC image courtesy of U.S. Army of Corps of Engineers on www.flickr.com

C + DRINKING WATER

Summary

Iowa's Drinking Water supply infrastructure is in relatively good condition. It has adequate capacity and a good safety record. Funding for system operation and maintenance is generally sufficient, but additional revenue is needed to enable water line replacement and treatment plant modernization.While surface and ground water sources currently fulfill the demands placed on them, excessive nutrient concentrations threaten to require more expensive treatment of surface water, and some groundwater sources are at risk of overuse.

Background

We all drink and use potable water daily without giving much thought to where it comes from or what it takes to provide it. Each Iowan personally uses about 55 gallons per day. Another 80 gallons per person is used by business and industry. This totals to 135 gallons per capita per day (GPCD), which is a little under the United Nations estimate that total U.S. water consumption is 152 GPCD. It is a remarkable product: cleansed of contaminants, disinfected, clarified, and fully safe for all uses.

Most water supply systems are owned and operated by cities, but rural water systems operate extensive systems serving customers in rural areas. Water comes from two primary sources: ground water and surface water. The former is mostly used by smaller systems while the latter serves larger populations. Whatever the condition of the original water source, the public requires access to water cleansed of contaminants, disinfected, clarified, and fully safe for all uses.

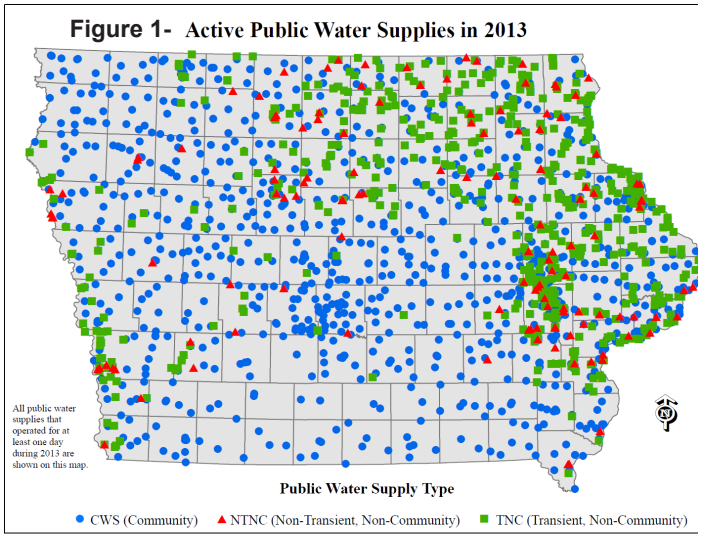
Water systems also serve a critical second purpose – that of supplying the large flows of water needed to extinguish fires. Fighting a large blaze can require use of several million gallons in just a few hours, so surplus production capacity must always be available. Lastly, water is one of modern life's true bargains; in Iowa it typically costs about 0.5% of median household income. But for those at the lowest rungs of the economic ladder, paying for drinking water can still pose a financial challenge.

Capacity

Iowa drinking water infrastructure is comprised mostly of smaller systems (93% of the state's public water suppliers serve less than 3,300 people), but the majority of the population is served by larger ones (the top 45 facilities provide half of all water consumed; the top 131 provide two thirds). Refer to Table 1.

Iowa has 1,118 community water systems, 131 non-transient, non-community water systems (such as schools and factories), and 650 transient, non-community systems (such as rest stops and parks). A total of 2.89 million of the state's

Figure 1- Active Public Water Supplies in 2013



3.05 million people are served by a community water system, or 90.7% of the state. (The other 9.3% receive the drinking water at their residence from a private well.) Collectively, these systems produce 393 million gallons per day (MGD) for public use. One hundred sixty MGD is used domestically; the remaining 233 MGD is consumed by business, industry, and leakage.

There has been a steady downward trend in the number of water utilities in Iowa over the past 10 years, dropping from 2,060 in 2004 to 1,889 in 2013. This is due to small systems opting to merge with rural water systems to achieve economies of scale, or to non-community systems closing or no longer meeting the definition of a public water system. It should be noted that a reduction in the number of agencies does not mean that many plants were closed or services discontinued, only that management and operations have been consolidated.

Most systems have adequate reserve capacities to support growth of domestic and business usage, which is vital to economic growth prospects. A few systems are limited and would not currently be able to supply the needs of a major new user, hampering business expansion or recruitment.

The sources from which Iowa draws water are mostly adequate, but there are signs that challenges lie ahead. During the most recent drought (2011-12), surface water sources became marginal for a number of communities. Ames, for instance, could not use all of its wells and had to rotate daily between those still in service. Ground water, especially the Jordan Sandstone, is showing signs of overuse, so water utilities that depend on it may have to also make investments in surface sources, which can be extremely expensive as surface water requires additional treatment processes.

Table 1- Capacity of Iowa's drinking water systems

Population Served	EPA Classification	Number of Iowa PWS	Total Population Served
25-500	Very Small	1,327	179,915
501-3,300	Small	441	533,102
3,301 – 9,999	Medium	86	487,041
10,000 – 100,000	Large	42	1,190,071
Over 100,000	Very Large	3	498,422
	Total:	**1,889**	**2,888,551**

Condition

The overall condition of the systems are good. The visible components – wells, pumps, intakes, plants, towers and controls – of the water production process are kept well capitalized and maintained. However, substantial portions of the distribution lines in urban systems are becoming old enough to cause concern about future reliability.

The network of distribution piping in the state varies widely in age. Rural water systems are relatively new in Iowa and generally have distribution systems that are less than 50 years old. Warren Water District, for example, provides water to an area to the south and west of the city of Des Moines. Almost 75% of Warren's distribution system is younger than 20 years and none are older than 40 years. By comparison, Des Moines Water Works reports 40% of its rapidly growing system is over 65 years old. Ottumwa Water and Hydro, another municipal system, reports that more than 70% of their system is older than 65 years. Marshalltown Water Works, also a municipal system, reports a similar figure with more than 56% of their distribution system being older than 65 years. Older pipes leak more than new ones, imposing a sort of surcharge on operations because the leakage loss necessitates use of energy and supplies in excess of what's needed to supply regular demand.

With the generally accepted life of a cast or ductile iron pipe being about 80 years, and the newer PVC pipe being estimated at about 100 years, communities should be investing between 1% and 1.25% of the value of their distribution system to replace their aging buried infrastructure, but few utilities claim to be able to invest at that rate. Water main breaks are becoming more frequent and often force temporary boil orders.

Operations and Maintenance

Many of Iowa's treatment facilities are more than 50 years old and, although in good condition, demand more preventative and reactive maintenance to keep them functional and operating on a 24/7 fashion than newer ones. Nearly all treatment facilities in Iowa operate using some form of a computerized Supervisory Control and Data Acquisition (SCADA) system. The degree of sophistication of those SCADA systems varies widely. Not surprisingly, the larger systems utilize more complicated and sophisticated systems, while small systems work off simpler control schemes.

Water quality impairments impact Iowa water plant operations. When nutrients in Des Moines Water Works' source waters are too high, the treatment plant must spend an extra $7,000 per day to operate a nitrate removal facility. Another problem for surface water sourced systems is that algae blooms can clog purification filters, reducing capacity.

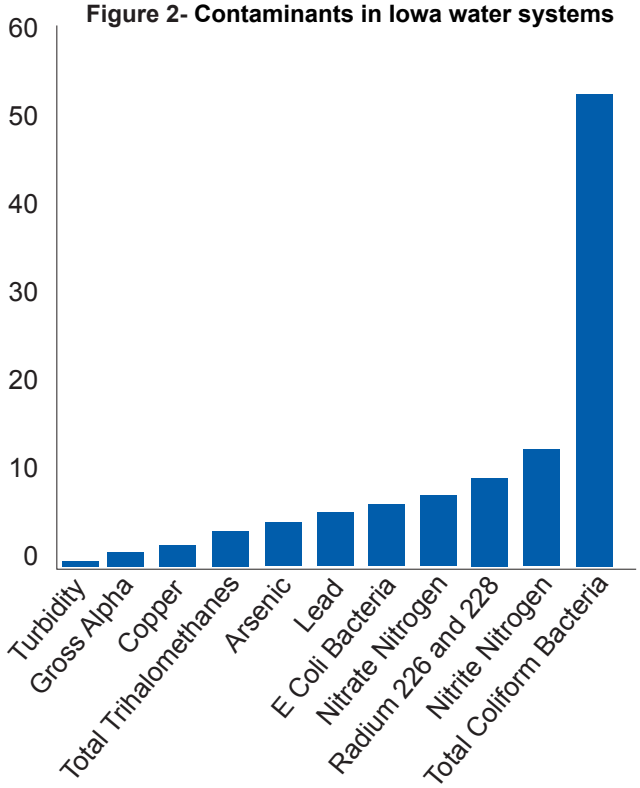
Public Safety

At the highest level, Iowa's drinking water infrastructure is meeting its core purpose of protecting public health. During 2013, there were no reported outbreaks of water-borne diseases, and there were no deaths attributed to drinking water. In 2013, 89.3% of the state's population received water from a drinking water utility that consistently met all of the health-based drinking water standards.

Only 11 of the 80 regulated contaminants were found in the state at a level that exceeded the health-based standard. The contaminant most likely to exceed a health standard was total coliform bacteria, accounting for more than half of all health-based violations. Both the total number of health-based violations and the number of systems experiencing a health-

based standards violation have declined in Iowa over the past 10 years. In 2004, 208 systems had 357 health-based standards violations; in 2013, 125 systems had 216 health-based standards violations.

Figure 2- Contaminants in Iowa water systems



Iowa's water systems in general are meeting their obligations to monitor and report on the performance of their systems. In 2013, 84% of Iowa's systems met all of their monitoring and reporting requirements. Iowa's drinking water systems are inspected on a regular basis, either by the Iowa Department of Natural Resources (DNR) or by a contracted county health department. Written sanitary survey reports are provided to each system following their inspection, outlining both required and recommended improvements to the utility's infrastructure and operations.

System Resilience

An important aspect of drinking water production and distribution is that it needs to be available without interruption. Iowa's water utilities can meet that requirement under most circumstances, but there are challenges that need to be met to prevent future disruption of service.

- Recent droughts have revealed weaknesses in source capacity that need to be remedied by new wells and reservoirs. For instance, 12 of Ames' 22 wells became restricted in 2011-12 as water table levels in their river valley aquifer fell due to lack of recharge.
- Due to increasing flood crests, such as in Cedar Rapids, where the 2008 peak stage was 11 feet higher than anything on record, or as experienced in Des Moines in 1993, water plants are finding themselves at risk of inundation and shutdown. The remedy for this requires investments in levees and flood proofing.
- Extreme floods can also scour away stream bottoms and expose water mains to being severed. This not only interrupts regular use, but also cripples firefighting capabilities during the outage.
- Increasing nutrient loads in surface water sources are threatening to exceed treatment plant capabilities, which could force some utilities to ration water until nutrient concentrations diminish and/or force plant expansions.
- Rapid increases in water use from ground water resources have led to localized shortages. The important Jordan Sandstone aquifer is at risk of overuse. This may lead the Iowa DNR to restrict future withdrawal permits, which would adversely affect communities that depend on this source. (Growing water use threatens to strain Jordan aquifer, Des Moines Register, November 16, 2014)

Funding

Water is primarily financed by usage charges billed to individual consumers. Some of the money goes to operation and maintenance with the remainder used to fund capital projects. Since such projects typically are both long term and expensive, they must often be financed by borrowing against future revenues, adding interest expense. State and federal governments also assist with grants and low cost revolving loans. The Drinking Water State Revolving Fund (DWSRF) is one of Iowa's primary sources of financing for water system upgrades and water quality projects. Since State Fiscal Year 2000, more than $590 million has been provided in loans to Iowa's Public Water Supply Systems for 463 drinking water projects.

A new capital funding mechanism is now available to Iowa's drinking water systems for larger magnitude projects. The Water Infrastructure Finance and Innovation Authority (WIFIA), was enacted by Congress and signed into law by President Obama in 2014. The Environmental Protection Agency (EPA) and the US Army Corps of Engineers (US ACE) will administer the WIFIA. Interest rates will be set by the Treasury.

Future Needs and Innovation

The EPA's 2011 Drinking Water Needs Assessment reported to Congress that Iowa drinking water systems have an estimated capital need of more than $5.9 billion over the next 20 years with the majority needed for the small and medium sized systems that dominate the state. As an example, the Des Moines Water Works needs to invest significant capital dollars

Table 2- Iowa's 20 year need by project type

Transmission & Distribution	Source	Treatment	Storage	Other	Total
$4,189.7	$294.9	$900.1	$509.6	$35.0	$5,930.2

Table 3- Iowa's 20 year need by system size (in millions of January 2011 dollars)

Large	Medium	Small	Non-public	Total
$447.9	$3,821.2	$1,640.3	$20.9	$5,930.2

http://water.epa.gov/grants_funding/dwsrf/upload/epa816r13006.pdf

in off river storage and natural denitrification to address ever increasing nutrient impairments. In 2015, 16% of that utility's capital budget will be spent to implement nutrient reduction strategies.

Conclusion

In the short term, Iowa's drinking water infrastructure is in good condition. The quality and quantity of source water available in the state has historically been quite good and is often taken for granted; however recent weather extremes, growing residential and industrial demands, and the growing challenge posed by excessive nutrients in the state's waterways are elevating the need for increased attention from utilities and the general public alike. While underground drinking water infrastructure in the state is aging, many utilities are unable to invest as heavily in the replacement of these vulnerable transmission and distribution systems as they would like. Access to readily available capital with affordable terms is essential to the future health and safety of drinking water systems in Iowa.

Recommendations

While our drinking water systems are performing adequately today, we need to continually reinvest in them to ensure their quality and dependable operation into the future.

- Water main replacement programs should receive more funding.
- Contamination of surface waters with nutrients and chemicals resulting from agricultural activities will require investing in mitigation and treatment options.
- Withdrawal policies will have to be made more restrictive to assure that ground water sources are not overused.
- Water extraction and processing assets need to be improved so that they can deliver adequate water during droughts and are strong enough to resist being compromised during floods.
- Water use efficiency and conservation should be promoted where possible.

Photo 1

Photo Credit: "Half What?" CC image courtesy of Kalyan Chakravarthy on www.flickr.com

- Funding should be made available to enable all treatment plants to operate with the most modern control systems.

Resources

State of Iowa Public Drinking Water Program 2013 Annual Compliance Report, Iowa Dept of Natural Resources, Environmental Services Division, Water Quality Bureau, Water Supply Engineering & Operations Sections, June 2014

2013 Active Public Water Supplies in Iowa – Map, Iowa DNR, June 2014

United Nations water usage estimates: http://www.data360.org/dsg.aspx?Data_set_Group_Id=757

Iowa DNR: http://www.iowadnr.gov/InsideDNR/RegulatoryWater/DrinkingWaterCompliance.aspx

US Environmental Protection Agency: http://www2.epa.gov/science-and-technology/water-science

American Water Works Association: http://www.awwa.org

C - WASTEWATER

Summary

Iowa has abundant water resources that require protection to provide a healthy environment and strong economy. Iowa needs high quality streams and lakes to provide a safe and clean resource for all users. The state has an aging wastewater infrastructure that poses a threat to our water resources. Wastewater discharges that do not meet state and federal requirements can destroy the delicate ecosystem and create costly environmental consequences.

The Clean Watersheds Needs Survey (CWNS) is a comprehensive assessment of needs to meet the water quality and water-related public health goals of the Clean Water Act (CWA). States and the U.S. Environmental Protection Agency (EPA) conduct the CWNS every four years to document the next 20 years of needs. The most current information is from the 2008 CWNS since the 2012 report was not released by Congress at the time of publication of this document.

The 2008 CWNS determined that a total of $3.7 billion is necessary for wastewater related infrastructure improvement in Iowa over the next 20 years. That number has grown from the 2004 estimated need of $1.2 billion showing a 212% increase. Significant funding resources are needed to improve the treatment of wastewater in Iowa. Without such investment, Iowa's water resources will continue to degrade and result in environmental harm.

Photo 1

Background

The ability to dispose of wastewater (sewage) safely from homes, industrial, and commercial facilities is a basic necessity for the health of our state and its citizens. Under the 1972 Clean Water Act (CWA), dramatic improvements have been made:

- The number of wastewater treatment plants has increased.
- The percentage of the population served by wastewater treatment plants has increased.
- The quality of effluent treatment from wastewater treatment facilities has been enhanced.

In 2008, 86% of Iowa residents received centralized wastewater treatment services at the secondary, advanced, or no discharge treatment level. This compares to only 26% being served in 1972. Table 1 is from the 2008 CWNS that shows the advances made in the number of treatment facilities and population served from 1972 to 2008.

In Iowa, small community (< 10,000 population) wastewater systems serve 39% of the population and comprise 96% of the total communities for wastewater treatment and collection needs. Table 2 shows that a significant portion of wastewater infrastructure needs will come from communities with less than 10,000 in population.

Another issue of concern is hypoxia. In 2008, the Mississippi River/Gulf of Mexico Watershed Nutrient (Hypoxia) Task Force (a group represented by five federal agencies, eight states and three tribes) released a national strategy and framework to reduce hypoxia in the Gulf of Mexico and improve water quality in the Mississippi River basin. Hypoxia is a lack of oxygen in the water such that it cannot sustain most marine life.

In response to the 2008 Gulf Hypoxia Action Plan, Iowa has developed a Nutrient Reduction Strategy to reduce nutrient loading to the Gulf of Mexico. The strategy follows the recommended framework provided by EPA in 2011, and Iowa was one of the first states to complete a statewide Nutrient Reduction Strategy.

The Iowa Department of Natural Resources (DNR) is working with major wastewater facilities throughout the state to reduce nutrient discharges from point sources to Iowa's waters with a goal of reducing total phosphorus by 16% and total nitrogen by 4%. It is estimated that it will cost $1.5 billion to reduce nitrogen and phosphorus to targeted levels over the next 20 years.

The Iowa Nutrient Reduction Strategy outlines a pragmatic approach to reduce nutrient loads discharged from the state's largest wastewater treatment plants in combination with targeted practices designed to reduce loads from nonpoint sources such as farm fields. This is the first time such an integrated approach involving both point sources and nonpoint sources has been attempted.

Capacity and Condition

A large portion of the nation's wastewater pipe network was installed in the 1940s through the 1970s. Many of these systems have suffered from lack of maintenance, upgrades, and funding, leaving the communities they serve with deteriorated infrastructure.

Table 1- Number of centralized treatment facilities and population served

Treatment Level	Number of Facilities			Population Served				
	1972	2008	Projected[a]	% Total population		% Total Population		
				1972	1972	2008	2008	Projected[a]
Less than secondary	100	0	0	1,063,000	37	0	0	0
Secondary	72	703	689	399,000	14	2,176,587	73	2,313,945
Advanced	21	47	77	345,000	12	393,971	13	655,424
No Discharge	0	1	1	0	0	209	<1	192
Total	193	751	767	1,807,000	63	2,570,767	86	2,969,561

[a] Number of facilities and population served if all needs documented in the CWNS 2008 are met

Table 2- Count of communities - sewered and unsewered in 2014

Community Population	Count of sewered communities	Count of unsewered communities (no centralized treatment)	Total count of communities by population (sum of sewered and unsewered)	% of total communities in Iowa
0-999	557	166	723	72
1,000-3,499	176	2	178	18
3,500-10,000	69	1	70	7
>10,000	38	0	38	4
Total	840	168	1008	100

The counts of facilities by treatment level are from the Department of Natural Resources NPDES permits database as of December 2014

The operation and condition of treatment facilities are routinely inspected; however, the condition of the buried pipes that convey the sewage to these facilities is much more difficult to determine. Many of the pipes in Iowa's oldest cities remain brick or clay, having been constructed at the turn of the 20th century. There are no requirements for sewer systems to inspect and assess the condition of their pipes, and to quantify the total length of pipes that are in need of rehabilitation would be nearly impossible.

The State of Iowa has a network of wastewater systems that have been serving citizens for over 50 years in some locations. These facilities are approaching the end of their 50 year design life. These facilities require constant operating and maintenance resources along with regular replacement of machinery, pipe tanks, and other critical components. Many of these systems have suffered from lack of maintenance and/or funding to upgrade to current water quality standards.

The need to upgrade and rebuild wastewater infrastructure is growing with lack of maintenance and growing populations in some areas of the state. Some communities have become proactive by implementing additional fees to pay for the millions of dollars in required improvements. Many communities simply do not have the resources.

Under Section 305(b) of the Clean Water Act, Iowa is required to assess the quality of its surface waters every two years. Based on the available monitoring data, Iowa's 2012 list of impaired waters contains 480 waterbodies with a total of 642 impairments. An impaired water is a stream or lake that does not fully meet the water quality standards designed to protect its designated beneficial uses. The list includes 388 stream/river segments, 74 lakes, seven segments of three federal flood control reservoirs, and 11 wetlands. The impairments are identified for all classes of beneficial uses designated for Iowa surface waters: recreation, aquatic life, drinking water, fish consumption, and general uses.

While severe impairments, which significantly affect the beneficial uses of Iowa's surface water do occur, the majority of Iowa's water quality impairments are categorized as slight-to-moderate. Streams, rivers, and lakes with slight-to-moderate impairments can generally continue to support their beneficial uses, although these uses may need to be reduced for a period of time.

Operation and Maintenance

The operation and maintenance of many wastewater collection and treatment systems tends to be a lower priority than

other types of infrastructure because it is "out-of-sight, out-of-mind" to its citizens. Most communities provide little or no maintenance on sewer lift stations or collection systems until they witness a fish kill or develop pump station or treatment plant system failures.

In addition, many communities do not make operation and maintenance a priority in their budgets. This lack of awareness leads to a very reactive situation when it comes to wastewater maintenance.

Public Safety and System Resilience

The capability for a wastewater collection and treatment system to prevent or protect against significant multi-hazard threats is difficult to assess but important to improve. Although the 2008 floods struck more than six years ago, the cities of Cedar Rapids and Iowa City are still recovering from the damage. Most systems have pump station generators and the capability to run treatment plants under extreme weather conditions, but the conditions of the Cedar River flood were unprecedented and, therefore, unplanned for. Many treatment facilities are located on floodplains of streams which may put them at risk to significant flooding.

Agencies such as the Iowa DNR and the EPA monitor effluent limit violations and other water quality issues. The actual threat of limit violations and water quality issues could be significant should certain types of pollutants be released to the environment without proper treatment. Significant health issue resulting from poor performing systems or the lack of a system to recover from a critical interruption in operation only occurs in rare instances.

Needs

According to the EPA's CWNS, the nation's total reported water quality needs as of 2008 are $298 billion. More than 60% of the nation's needs are for wastewater treatment, pipe repairs, and new pipes. Iowa's data was included in that study and appears to fall near the national average of $1,193 per person. From 2004 to 2008, Iowa's reported water quality need increased by $2.5 billion.

Iowa's cost is approximately $500 per capita to rehabilitate and replace existing pipes and to install new sewer pipes, interceptor sewers, and pumping stations. This high per capita cost can be attributed to the age of the systems as well as environmental and soil conditions. The study shows that communities in Iowa continue to plan for corrective actions related to sanitary sewer overflows (SSOs). The study estimates that $748 million in combined sewer overflow corrections is needed to ensure the reliability of the existing collection systems.

In Iowa, communities with less than 10,000 people account for $1.5 billion of the state's $3.7 billion in wastewater infrastructure needs.

Funding

The majority of funding for wastewater infrastructure needs comes from local governments. The most popular funding mechanisms for local governments are through grants and loans from Iowa's Community Development Block Grant (CDBG) program, Iowa's Clean Water State Revolving Fund (CWSRF), or the United States Department of Agriculture (USDA) Rural Development funding.

Iowa's CWSRF provides approximately $200 million per year in loan funding, the CDBG program provides grants totaling about $7 million a year, and the USDA Rural Development program provides $12 million per year in loans and grants for wastewater related projects. These programs are funded through federal resources. Currently, there are no State of Iowa grant or loan funds dedicated to wastewater infrastructure.

The State Revolving Fund (SRF) has awarded Iowa communities and municipalities more than $2.1 billion in construction loans and $130 million through planning & design loans since the program's inception. More than 500 Iowa communities have recognized the SRF as their best choice for low-cost financing of their water quality initiatives. The State Revolving Fund is an important resource for Iowa communities as they face a wide-array of water quality improvement needs. The Iowa DNR has been able to fund all applications for SRF loans.

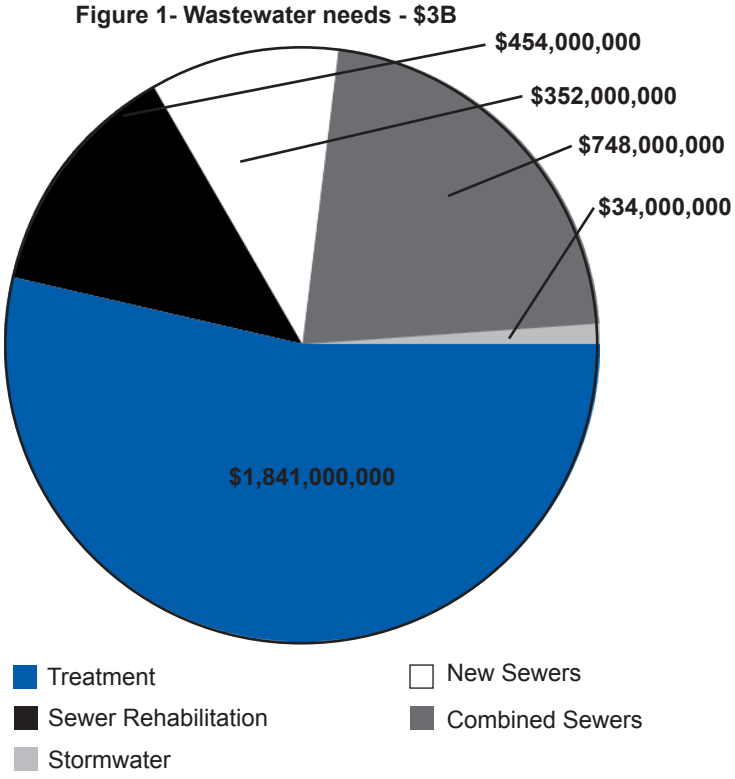
Bonding referendums are another option to pay for capital improvements for some local governments. Approval of general obligation bonds can be difficult as it takes a 60% majority of voters in the community to fund such infrastructure. No matter where the funding sources come from, the CNWS has identified over $3 billion in wastewater infrastructure needs for the next 20 years. Based on current funding sources and the limited amount of grant funds available, many small and disadvantaged communities will struggle to meet their wastewater needs. Lacking resources and the economies of scale that larger communities enjoy, small-town residents are saddled with unaffordable sewer bills.

Conclusions

Wastewater collection and treatment facilities preserve public health and help maintain the quality of Iowa's surface water environments. Eight hundred forty (840) communities have treatment facilities while 168 do not. While the plants are regularly inspected and maintained, the collection lines are

often allowed to reach the end of their service lives without being checked. When they do reach the end of their structural or functional lifetimes, they begin to present their communities with collapse, back-ups, and the need for emergency repairs. Meanwhile, urban areas are seeing growth in sewerage collection and treatment needs. Current estimates indicate that the state will need to invest about $3 billion in wastewater facilities over the next 20 years, both to repair old installations and to accommodate urban growth. Recent flood events have demonstrated that wastewater collection and processing can be impaired or taken out of service by high crest events.

Figure 1- Wastewater needs - $3B



U.S. EPA clean watersheds needs survey 2008; 20 year documented needs (not including nonpoint source)

Recommendations

Clean and safe water is no less a national priority than an adequate system of interstate highways. Many other highly important infrastructure programs enjoy sustainable, long-term sources of federal backing, often through the use of dedicated trust funds. Unfortunately under current policy, water and wastewater infrastructure does not have access to such funds.

The case for increased federal investment to assist Iowa and other states is compelling. Needs are large and unprecedented; in many locations, local sources cannot be expected to meet this challenge alone, and because water is shared across local and state boundaries, the benefits of federal help will be enjoyed by the entire nation.

The goal of the Iowa DNR is to protect public health, safety, and quality of life by protecting the state's natural environment; however, resources to accomplish this are very limited and must be improved.

The CWNS has documented Iowa's total needs for the next 20 years at over $3.7 billion. In the short term, the state needs to commit to bring all wastewater infrastructure up to a state of good repair. In the long term, the state must modernize and build new facilities in a targeted and strategic manner. By employing strategies to use every dollar resourcefully and by deploying creative solutions to infrastructure development, the state can implement the right projects in an efficient and economical manner.

Public outreach and education are keys to the collective effort necessary to improve the nation's infrastructure and its impact on the environment and quality of life. This effort can also serve to promote and generate public support for sustainable funding sources dedicated toward wastewater improvements.

Investing in infrastructure now will improve the quality of life, mobility, economics, and opportunity available in Iowa.

Resources

United States Environmental Protection Agency, Clean Watersheds Needs Survey 2008, Report to Congress. http://water.epa.gov/scitech/datait/databases/cwns/2008reportdata.cfm

Iowa Nutrient Reduction Strategy. http://www.nutrientstrategy.iastate.edu/

Iowa's 2012 List of Impaired Waters [Section 303(d)]. http://www.iowadnr.gov/Environment/WaterQuality/WaterMonitoring/ImpairedWaters.aspx

Ecological Wastewater Management in Iowa, The Iowa Policy Project. http://www.iowapolicyproject.org/2005docs/051007-wastewater-full.pdf

Summary

The ability of the electric grid to generate, transmit, and distribute a reliable supply of power at a constant voltage and affordable cost is fundamental for Iowa's continued growth and development. Upgrading and expanding existing transmission and distribution infrastructure is vital to protecting grid stability and resilience. The vulnerability of grid components to cyber-attacks requires continued vigilance. Investments in transmission and distribution structures and equipment can improve reliability and increase capacity while decreasing the average age of the infrastructure systems. Investment in smart grid technology can provide real-time grid feedback improving response to outages.

The ongoing growth and incorporation of renewable energy resources like wind and solar energy will benefit from the continued development of predictive modeling, market pricing integration, and the addition of resources for grid energy storage. Uncertainties surround the timing and costs of required repair, renovation, and replacement of existing power generating facilities as new fossil fuel emission regulations come into effect and drive the industry away from coal toward natural gas. Without adequate preparation and rational implementation, the changes required by regulations could lead to insufficient generating capacity.

Background

Electricity is transmitted through regional grids of transmission lines, towers, and substations connecting power generating facilities to local distribution grids. At any given moment the energy pulled from the grid by consumers must be equal to the energy supplied to the grid by connected generators. Any deviation from this balance will result in voltage drops or surges which can seriously and negatively affect the millions of devices connected to the grid that require a steady voltage to operate properly.

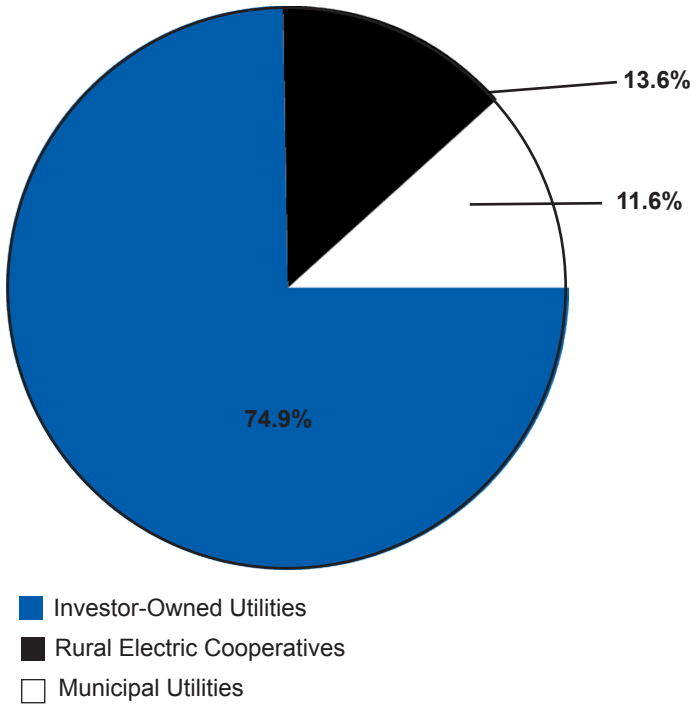
Traditional models have relied on the dependability of fossil fuel, hydroelectric, and nuclear "base load" plants to supply power continuously while fossil fuel "peaking" power plants are run only as necessary to cope with high demand. The low cost of natural gas coupled with new emission regulations are pushing traditional coal-fired plants into retirement and requiring retrofitting or replacement natural gas generators. The demand for integrating intermittent or "dispatchable" renewable power resources into the grid has presented new difficulties maintaining the necessary grid balance when compared to traditional models.

Electric utilities in Iowa can be divided into three classes; Investor-Owned Utilities (IOU), Municipal Utilities (Municipal), and Rural Electric Cooperatives (REC). IOUs are for-profit, privately owned businesses that may own and operate generation, distribution, and transmission assets. IOUs often contract with other organizations that provide these services. Municipals are publicly-owned utilities that distribute electricity locally and are not generally in possession of the high-voltage transmission lines used to carry electricity over long distances. Some Municipals own and operate generation equipment while many contract with IOUs to supply power to their local municipal distribution grid. RECs are customer-owned, not-for-profit organizations that generally provide power to rural areas that IOUs do not serve. RECs are divided into distribution, generation, and transmission cooperatives. Iowa is served by two IOUs (MidAmerican Energy and Alliant Energy's Interstate Power and Light), 136 Municipals, and 44 RECs who provide power for a total of 1,724,933 customers (2013).

Within the state, the Iowa Utilities Board (IUB) is responsible for regulating the rates and services of investor-owned electric companies. According to the IUB, "The board is an advocate of neither the public nor the utilities; the IUB is required by state statute to make decisions that balance the interests of all parties to ensure the utilities provide adequate and reliable service at reasonable prices". All infrastructure projects undertaken by IOUs have the potential to cause price increases, as approved by the IUB, to recoup the costs associated with infrastructure investment. The IUB has limited jurisdiction over municipals and RECs.

Interstate transmission and electric generation infrastructure is regulated by The Federal Energy Regulatory Commission

Figure 1- Iowa utility electric profile (2012)



(FERC). North America is separated into regions, each managed by an Independent System Operator (ISO). Iowa is part of Midcontinent Independent System Operator (MISO), which is a not-for-profit organization responsible for regional planning, reliability and maintenance coordination, market monitoring, and dispute resolution.

MISO administers a network of more than 65,000 miles of transmission lines over 15 states and one Canadian province facilitating the purchase and movement of power throughout the grid to ensure dependable access to electricity produced by the utility companies. MISO real-time market credits energy producers supplying power to the grid while charging consumers for their usage. Within MISO, the average cost for electricity rose 11.5% from 2012 to $32.90 per megawatt-hour (MWh) due primarily to increased fuel costs while still remaining significantly lower than the average cost per MWh in 2010 and 2011.

In the last four years, MISO has experienced 10 generation alerts, four warnings, and two events. To date, MISO has never issued a call for rolling blackouts due to insufficient generation supply.

Capacity and Condition: Generation

Fossil fuel power plants are extremely reliable, cost effective, and are attractive to utilities for their dependability in maintaining baseline generation levels. Installed power generating equipment is registered using the rated capacity, or nameplate capacity, of the equipment in terms of megawatts (MW). Iowa has 72 operating coal-fired units at 28 locations totaling 7,215 MW of nameplate capacity (41.78%). As of 2012, Iowa relied heavily on coal-fired plants which produced 62.34% of all electricity generated in the state. The transition away from coal as a fuel source has already begun. Natural gas generator nameplate capacity has increased to 17% of total capacity and continues to grow, but Iowa cannot currently afford to eliminate coal as a fuel source.

Iowa is home to one nuclear reactor. The Duane Arnold Energy Center (DAEC) is located nine miles northwest of Cedar Rapids and has been operating since 1975. The DAEC is owned by NextEra Energy and operates a single General Electric boiling water reactor with an output of 615 MW of power. The Nuclear Regulatory Commission (NRC), which has authority over all nuclear generation facilities in the United States, is responsible for overseeing reactor licensing, safety, and security as well as the purchase and disposal of all associated radioactive materials. The DAEC has been upgraded over time under mandates from the NRC in order to enhance the reactor's ability to deal with significant events including floods, earthquakes, tornados, and terrorism.

Figure 2- Iowa electric nameplate capacity profile (2012)

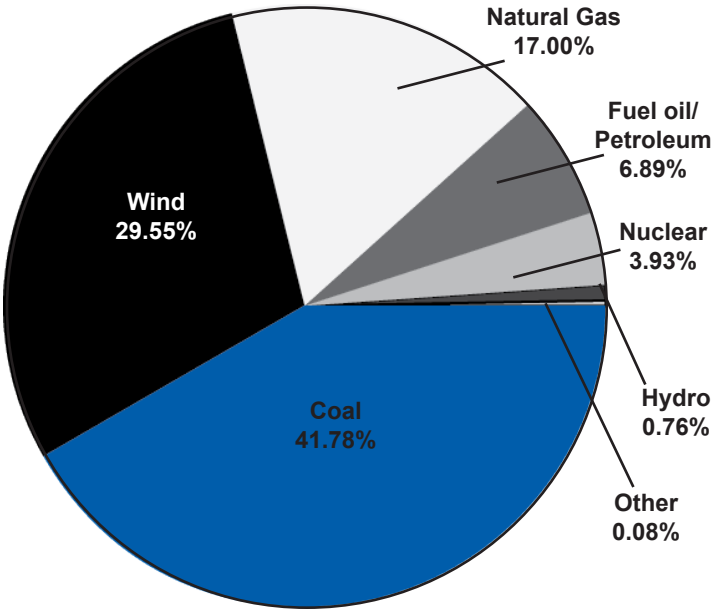
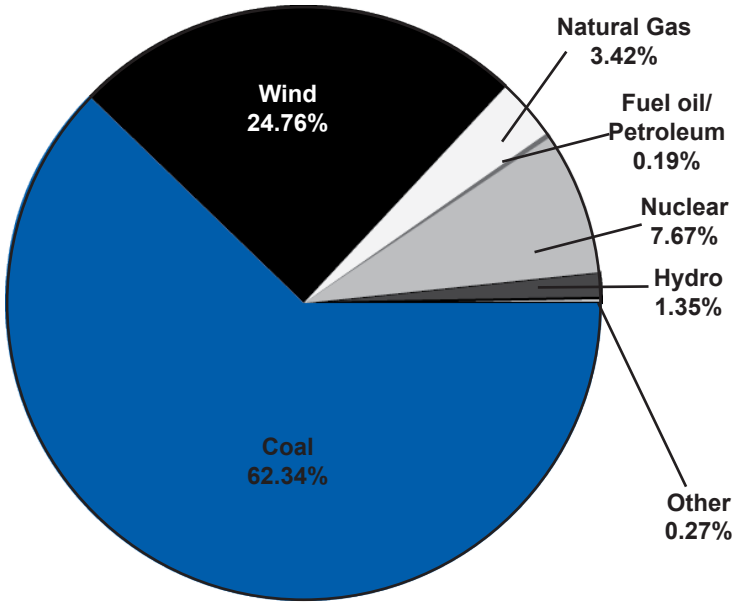


Figure 3- Iowa electric generation profile (2012)



Historically, the NRC has been the subject of criticism due to what is seen as the agency's conflicting interests of both managing and promoting nuclear energy.

Iowa has seen a significant increase in wind production in the last ten years. Currently 29.5% of Iowa's nameplate capacity (5,100 MW) comes from wind. This equipment generates nearly 25% of Iowa's total energy consumption, the highest percentage in the nation. Prior to 2011, wind and other intermittent renewable resources were treated differently than traditional generation resources, and their dispatchability was not controlled by the ISOs. Since 2011, when FERC approved a new category of Dispatchable Intermittent Resources (DIR), wind generation has integrated rapidly into the grid reducing wind curtailments (shutting down turbines to preserve electrical balance in the grid). The addition of better weather forecasting technology has allowed wind to be utilized more dependably, but without a reliable, cost-effective, scalable storage mechanism for renewable energy, fossil fuel generators will remain the benchmark for dependable base-load generation. The integration of these intermittent resources is a delicate operation requiring the analysis of immense amounts of environmental and grid feedback to maximize production allowing owners to recoup costs more quickly and further supporting the investment. Currently, in Iowa, 101 wind projects are online adding 1,055 MW of capacity.

Photo 1- Iowa wind energy

Photo Credit: "Iowa Wind Turbines" CC image courtesy of Theodore Scott on www.flickr.com

Operations and Maintenance: Transmission

Iowa reflects the nation regarding the ongoing concern with aging transmission infrastructure. Iowa's IOUs had over 1,000 miles of transmission lines greater than 50 years old in the most recent Iowa Utilities Board Report in 2006. This represents approximately 10% of the total reported miles. Nearly 60% of Iowa's reported lines are 30 years old or older. Iowa's REC and Municipals also have varying levels of similarly aged transmission lines, but totals are not reported to the IUB. Aging lines may result in lower reliability and increased operating and maintenance costs.

Local distribution grids connecting businesses and consumers are extremely dense and complex. Unquestionably, local distribution grids are the weakest part of our electric delivery structure. These local grids are estimated to contain 10 times the line mileage of the transmission grid connecting them, and the majority of problems in electric delivery lie within these local grids. A serious investment in analyzing and updating local grids is vital to overall grid health.

Iowa utilities consistently employ annual line inspection and maintenance programs with remediation as required by FERC. A number of techniques to improve transmission reliability and capacity are utilized, which include transmission and distribution pole replacements, voltage upgrades, addition of lightning shield wires where none previously existed, the use of overhead fiber-optic conductors for additional communication capability, improved clearances and structure strength, and conductor (capacity, galloping, and vibration) improvements. In addition, Iowa utilities are adding new lines required to support new commercial opportunities and generation connection to the grid as well as major high-voltage projects to eliminate transmission constraints for wind generation. All of these initiatives contribute to ongoing improvement in the overall condition of the Iowa transmission infrastructure.

The resilience of the power grid in Iowa is dependent on the quality of the transmission lines and towers making up the grid as well as the number of possible paths available to route electricity from one location to another without overloading any single line. The redundancy built into the transmission network is critical to the physical grid's ability to minimize the effect of localized damage from winds, ice storms, tornados, solar events, or terrorism to name a few. A line break on a traditional system will often cause damage to nearby towers, which greatly increases the cost and time required to restore connections. The vulnerability of existing overhead lines, towers, and substations to terrorism is also high, and ensuring the security of these systems requires the investment of time and money. The utilization of new transmission line technology, modern tower design, more intelligent computer-controlled feedback systems, and smart-grid technology coupled with macro-level planning to ensure maximum redundancy can greatly increase the robustness and efficiency of the physical grid.

System Resilience & Future

As of 2012, MISO estimated approximately 62,000 MW of coal units (approximately 1/3 of total generation capacity) could potentially become unavailable due to the requirements of EPA regulations. The MISO region has traditionally operated with sufficient reserve margins, but new and proposed emission regulations pose a significant hurdle to maintaining sufficient reserve capacity. Midcontinent Independent System Operator predicts a potential for a three to seven GW capacity shortfall by as early as 2016.

Since 2000, several coal-fired power plants in Iowa have been retired, and several proposed coal-fired projects have been suspended as a direct result of regulations and regulatory uncertainty. Recently, Alliant Energy's IPL accepted the IUB's decision and order to construct a new natural gas power plant and related high-voltage transmission line upgrade in Marshalltown with a $920 million cost cap. Alliant Energy's IPL long-term plans also include approximately $440 million in upgrades to existing power plants reducing air emissions, extending its agreement with the DAEC, and further investments in renewables and energy efficiencies. In addition, Iowa requires utilities to sell a certain amount of electricity from renewable sources, and new buildings must meet certain efficiency standards as defined by the 2006 International Energy Conservation Code (IECC).

Conclusion

The ability of the electric grid to generate, transmit, and distribute a reliable supply of power at a constant voltage and affordable cost is fundamental for Iowa's continued growth and development. Regionally, the power infrastructure in Iowa is inherently tied into the MISO network which allows Iowa utilities access to a real-time marketplace for power generated, transmitted, and distributed to and from Canada to the Gulf of Mexico.

Within Iowa, aging transmission structures and equipment require continued investment. Local distribution networks need to be analyzed and upgraded to ensure reliability. Integrating new monitoring and response technologies are critical to the efficient use of fuel thereby limiting emissions and controlling costs. Meanwhile, the development of renewable resources continues to be important. The transition from coal to natural gas as a dependable power generating fuel source is progressing, but meeting regulatory deadlines is not guaranteed, which could lead to insufficient generating capacity.

The future of Iowa's power supply is dependent upon many factors currently being contested at regional and national levels. Continued investment in infrastructure would be greatly aided by a comprehensive national energy policy adaptable and scalable to Iowa's needs. Regulatory uncertainty, particularly with new and proposed EPA regulations, could be an issue in the absence of a defined national plan.

Recommendations

Future regulation must be based on research and always strive to balance the competing needs of the public, environment, and industry. The need for a national energy plan is great and the rational implementation of regulations is vital to preserving the continued dependability of electrical power in Iowa.

Aging transmission and distribution lines in Iowa require upgrading. New transmission lines must be constructed to continue the utilization of Iowa's wind resources throughout the state and MISO. Regional transmission lines and local distribution grids must be analyzed to ensure dependability in the face of weather events, terrorism, or cyber-crime. Investment in smart grid technology, better data analysis and response tools, more robust and repairable transmission structures, and energy storage technologies will lead to better response times, shorter outages, fewer emissions, better renewable energy usage, and a stronger more resilient power grid.

The State of Iowa receives a grade of C for its electrical power infrastructure.

Resources

Iowa Utilities Board, www.state.ia.us/iub

MISO, MISO Transmission Expansion Plan 2013, www.misoenergy.org

MidAmerican Energy Company, 2013 Iowa Annual Electric Reliability and Service Quality Report

U.S. Energy Information Administration (EIA), Annual Energy Outlook 2014, April 2014

Photo 2- Iowa energy

Photo Credit: "Electric Power line towers" CC image courtesy of Stefan Andrej Shambora on www.flickr.com

B + SOLID WASTE

Summary

The solid waste management system infrastructure provides an essential public service to the citizens of Iowa. There are three basic components in the solid waste management system: collection; processing to divert recyclable and compostable materials; and disposal of waste that cannot be recycled. These three components, coupled with the implementation of waste reduction and recycled material market development programs, ensure the integrity of the solid waste management system is well maintained for the citizens of Iowa. Solid waste management systems in Iowa are operated primarily by public facilities and include waste collection, processing, and sanitary landfills. Approximately 42% of solid waste generated is diverted from landfills due to recycling. Average individual landfill capacity is estimated to be adequate until 2044. Iowa is doing a remarkable job already, but several new techniques and technologies have the opportunity to further enhance solid waste management in the state.

Background

The solid waste management system infrastructure provides an essential public service to the citizens of Iowa. There are three basic components in the solid waste management system: collection; processing to divert recyclable and compostable materials; and disposal of waste that cannot be recycled. These three components, coupled with the implementation of waste reduction and recycled material market development programs, ensure the integrity of the solid waste management system is well maintained for the citizens of Iowa.

In Iowa, solid waste is classified by type. The types of waste recognized in the solid waste regulations are listed below.

- Industrial Solid Waste: Solid waste generated by a manufacturing, industrial or mining process, or that is contaminated by solid waste generated by such a process. This includes, but is not limited to, waste resulting from electric power generation; fertilizer/agricultural chemicals; food and related products; byproducts; inorganic chemicals; iron and steel manufacturing; leather and leather products; nonferrous metal manufacturing/foundries; organic chemicals; plastics and resins manufacturing; pulp and paper industry; rubber and miscellaneous plastic products; stone, glass, clay and concrete products; textile manufacturing, and transportation equipment.
- Commercial Solid Waste: All types of solid waste generated by stores, offices, restaurants, warehouses and other nonmanufacturing activities, excluding residential and industrial solid wastes.
- Residential Solid Waste: Any solid waste (including garbage, trash, yard trash and sludges from residential septic tanks and wastewater treatment facilities) from households (including single and multiple residences, hotels and motels, bunkhouses, ranger stations, crew quarters, campgrounds, picnic grounds, and day-use recreation areas).
- Construction/Demolition (C&D) Debris: Nonhazardous waste generally considered not water-soluble that is produced in the process of construction, remodeling, repair, renovation, or demolition of structures, including buildings of all types (both residential and nonresidential).

Capacity and Condition

Iowa created 2.62 million tons of waste in 2013 which was a decrease from the 2.86 million tons produced in 2012, but it is still close to the 10-year average of 2.75 million tons. See Figure 1 showing the long term trends. [1] This steady output correlates with the low population growth of the state. Per capita generation rates of waste have been slowly declining over the past several years.

As of July 2007, the Iowa Department of Natural Resources (DNR) reports there were 45 active landfill sites with future capacity while 13 additional sites were closed or in the process of closing. In total, over 400 individual entities are granted permits by the DNR for waste disposal or handling. [2]

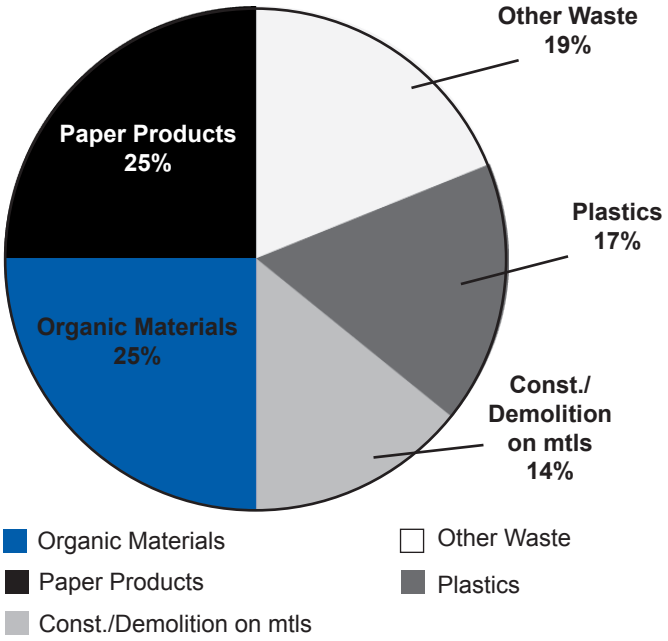
The most recent recycling data reveals that, in 2005, Iowans generated 2.68 million tons of trash, and of that, an estimated 1.13 million tons were recycled or composted. [3] This represents a 42% recycling rate, which is similar to the rate from 1999 and well above the 2005 national average of 31.4%. The national average has since increased to 34.5%, and it is likely that the statewide rate has also increased over that time. [4] Several municipalities have added recycling programs since 2005, so it is likely recycling rates have increased, but more data is needed to confirm this assumption. An independent investigation by the Iowa Center for Public Affairs Journalism has revealed slightly different data which indicates only a 35% recycling rate. [5]

Passed in 1979, Iowa's Beverage Containers Control Law, also known as the "Bottle Bill," helps reduce and clean up litter by recovering beverage containers for recycling. Consumers pay a five cent deposit when purchasing a plastic, glass, or aluminum beverage container and receive a five cent refund when returning the container to a store or redemption center.

The high level of participation by Iowa's businesses and consumers is the key to the program's success. Eighty-six percent (86%) of all eligible containers are redeemed, minimizing litter and diverting over 82,000 tons of material per year. [6]

In 2007, the Iowa DNR reported the average projected remaining capacity was 37 years. [2] If the underlying trends hold, the current projection is 30 years per each site or, in other

Figure 1- Minerals in the waste stream



Other waste: Metal, durable, glass, household, hazardous materials and similar materials

terms, until 2044. It is important to emphasize that "remaining capacity" as defined by Iowa DNR includes only that which is currently permitted. Many sites have significantly greater capacity available but will not complete permitting efforts for this volume until it is actually needed.

Operations and Maintenance

New sites are inspected by the Iowa DNR upon substantial completion of construction for compliance with the approved design plans and then granted an operating permit. Periodic inspections occur during the five year duration of the permit.

One of the bigger issues in Iowa is the performance gap between the larger landfills, which are industry leaders in their commitment to stakeholders, environmental performance, and innovation; and several of the smaller landfills, which, to a degree, have operated the same way for the last 20 to 30 years. The minimal amount of income derived from dumping fees leave little excess capital to invest in some of the initiatives the larger sites have implemented.

Public Safety

These types of facilities do not typically pose a threat to public safety as long as liners and leachate conveyance and treatment systems are maintained. If those items are not functioning properly, the biggest threat is leachate contamination of ground or surface water sources. A search of public records was unable to find any examples of public safety issues. In some cases, downstream water quality is monitored on a consistent basis to find and correct any environmental issues in a timely manner. It is unknown if this practice is widespread.

Resilience

Solid waste landfills are subjected to the same issues that face Iowa's other infrastructure – floods, storms, and other weather events. However, the determination of the location and design of the site itself are done in such a way to avoid adverse impacts due to natural disasters. A consistent challenge is managing soil erosion caused by lack of ground cover and precipitation events. Areas of the landfills that are not part of active cells are typically covered with temporary erosion control measures until permanent vegetative cover is established. Continued observation and maintenance is required to address situations in a timely manner.

Man-made disasters have occurred on occasion. One recent example is the liner fire that occurred at the Iowa City landfill a few years ago, assumed to have been started by a smoldering load of trash. A new cell liner made of recycled rubber tires caught fire and continued to burn for weeks until it was extinguished. Much of the $3.4 million cost associated with extinguishing the fire and the cleanup was covered through a settlement with the city's insurance carrier.[11] The city has since stepped up inspections.

Funding

Each landfill charges tipping, or dumping, fees that appear to be sufficient for maintaining operations. There are a few reports of fee increases and/or cost-cutting measures being necessary to balance the books.[12] [13] DNR recycling programs are funded by tonnage fees where the more a landfill diverts via recycling efforts, the less funding recycling programs receive. Some operators see this as counterproductive and suggest a model based on Minnesota's recycling system where a solid waste management tax is applied to garbage fees of residents and businesses, while no tax is charged for recycling waste.[5] All Iowa landfills are required to build and maintain a dedicated reserve fund for closure and post-closure care.

Future Needs

Iowa's projected population growth is well below the national average as well as those of several surrounding states. It is likely current and future expanded capacity will be more than enough for the foreseeable future. However, potential new regulations from the EPA may require significant capital investment in programs designed to decrease environmental impacts, including reductions in greenhouse gas emissions. Several individual sites have begun implementing a program

called Environmental Management System (EMS). The six categories EMS tabs for achievement are: recycling services, greenhouse gas reduction, water quality improvement, yard waste/composting management, hazardous household waste management, and environmental education. Contributing landfills submit yearly reports to the DNR that show efforts being made in each category, set future goals, and ways the landfill can meet them. [14] The Iowa DNR has an extensive library of information on the implementation of this program, including reports from the various participants on the execution of their individual EMS plans.

Innovation

The jurisdiction of the DNR is described in Iowa Code Chapter 455B and includes Solid Waste Disposal.[8] Additional regulations regarding solid waste disposal are included in Iowa Administrative Code Section 567, Chapter 101, which designates the DNR as the regulatory authority.[9] These rules set the waste management priorities as such, in descending order:

1. Volume reduction at the source;

2. Recycling and reuse, including composting;

3. Combustion with energy recovery;

4. Other approved techniques of solid waste management including, but not limited to, combustion for waste disposal and disposal in sanitary landfills.

Chapter 455D.3 of the Iowa Code describes the waste diversion goals and the increased or decreased fees associated with performance measured against said goals. Landfills will be charged an additional fee of $0.50 per ton if they cannot meet the 25% diversion goal but will be able to reduce the fees by $0.60 per ton if they exceed it. Additionally, another reduction in fees of $0.50 per ton is enacted if a landfill is able to divert over 50% of their waste. [10]

Several Iowa landfills have implemented gas-to-energy systems where captured methane from decomposing waste mass is burned to generate electricity, to produce heat, or transported via pipelines for use in manufacturing kiln or burn operations.

Another development related to the entrenched corn ethanol industry is the repurposing of a shuttered plant in Blairstown into a bio-refinery that processes various organic wastes into industrial sugars, which can be sold as is or further refined to produce ethanol and biogas.[15]

There is also an organization working with a city in eastern Iowa that has issued a request for proposals to develop a plasma waste to energy facility serving the greater community. [16] This technology is very new but holds exciting possibilities.

Other significant innovations happening at Iowa landfills include recycling of asphalt roofing shingles, where they are separated and sold to asphalt batch plants for use in roads, industrial waste composting (at Cedar Rapids/Linn County), electronics de-manufacturing facilities (at Waste Commission of Scott County), and others.

Iowa landfills are also leading the charge in operational innovation with equipment and landfill filling and sequencing.

It remains to be seen if these technologies will expand, but they do have the potential to greatly reduce the amount of organic and paper materials that are interred in landfills, more efficiently use the available capacity, and improve many operational aspects.

Conclusion

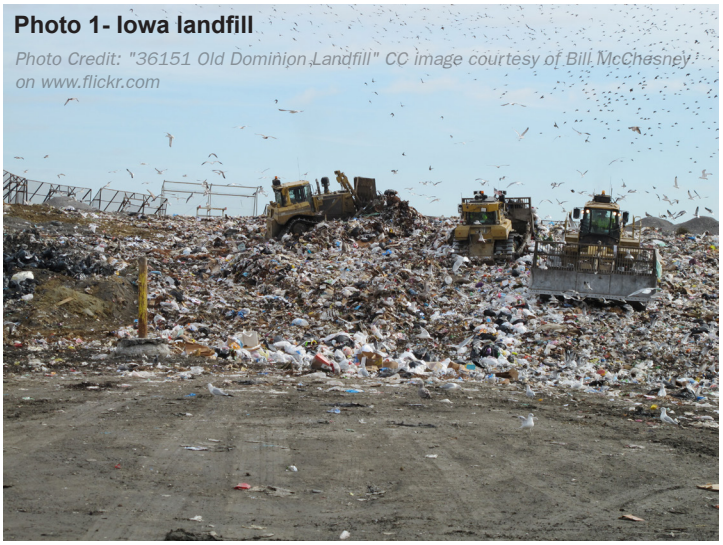
Iowa's solid waste infrastructure is performing well based on the relationship between per capita waste generation rates, population growth rates, current disposal capacity, and statewide efforts to manage both generation and expand capacity. Although per capita residential waste disposal has been trending downward, some challenges still lie ahead, such as population growth and managing the amount of imported waste from surrounding states.

Recommendations

Reconsider funding mechanism: Current funding models are self-defeating as more recyclable waste is diverted. We recommend a change to something similar to Minnesota's recycling system where a solid waste management tax is applied to garbage fees of residents and businesses, while no tax is charged for recycling waste.

Photo 1- Iowa landfill

Photo Credit: "36151 Old Dominion Landfill" CC image courtesy of Bill McChesney on www.flickr.com



Expand EMS to other sites: Currently 13 landfill sites are participating in this program. Incentives should be implemented to get more participation from the remaining sites.

Continue waste reduction education: Education for consumers on the value of recycling and the proper disposal of waste needs to continue. The Iowa Recycling Association has promoted several major recycling programs in recent years that are beginning to show tangible results in consumer awareness and waste diversion.

Increase diversion opportunities: Waste generation needs to be reduced and more waste needs to be diverted from landfills through recycling programs. A focus should be placed on publicizing innovative practices resulting in increased use of landfill materials for energy purposes.

Resources

Iowa Department of Natural Resources. Tonnage Fee Distribution Fact Sheet. Solid Waste Data. [Online] http://www.iowadnr.gov/InsideDNR/RegulatoryLand/SolidWaste/TonnageData.aspx.

Iowa Department of Natural Resources. Municipal Landfill Capacity and Tip Fee Survey. Solid Waste Data. [Online] 2007.http://www.iowadnr.gov/portals/idnr/uploads/waste/lftipfeesurvey.pdf.

R.W. Beck, Inc. Economic Impacts of Recycling in Iowa, Final Report. Iowa Department of Natural Resources. [Online] December 2007. http://www.iowarecycles.org/fileblob.asp?I=6784&table=content&ext=pdf&name=Economic%20Impacts%20of%20Recycling%20in%20Iowa%202006.pdf.

U.S. Environmental Protection Agency. MSW Recycling Rates, 1960 to 2012. [Online] http://www.epa.gov/epawaste/nonhaz/municipal/images/2012_msw_rec_rates_fig2_lg.jpg.

Sujin, Kim and Hadley, Sarah. Closing the Gap: Iowa's Effort to Recycle is Hampered by a System That Favors Dumping. Iowa Center for Public Affairs Journalism. [Online] February 3, 2013. http://iowawatch.org/2013/02/03/closing-the-gap-iowas-effort-to-recycle-is-hampered-by-a-system-that-favors-dumping/.

Iowa Recycling Association. Bottles and Cans: Iowa Container Deposit System. [Online] http://www.iowarecycles.org/content.asp?ID=4831.

Mid Atlantic Solid Waste Consultants. 2011 IOWA STATEWIDE WASTE CHARACTERIZATION STUDY. [Online] September 14, 2011. http://www.iowadnr.gov/Portals/idnr/uploads/waste/wastecharacterization2011.pdf.

Iowa Legislature. Jurisdiction Of Department Of Natural Resources, Ch 455b. Iowa Code. [Online] https://www.legis.iowa.gov/DOCS/ACO/IC/LINC/Chapter.455b.pdf.

Iowa Legislature. Solid Waste Comprehensive Planning Requirements. Iowa Administrative Code. [Online] 2014. https://www.legis.iowa.gov/docs/ACO/chapter/567.101.pdf.

Iowa Legislature. Waste Volume Reduction and Recycling, Ch 455d. Iowa Administrative Code. [Online] 2014. https://www.legis.iowa.gov/DOCS/ACO/IC/LINC/Chapter.455d.pdf.

Associated Press. Iowa City Settles with Travelers Insurance over Landfill Fire. Insurance Journal. [Online] September 6, 2013. http://www.insurancejournal.com/news/midwest/2013/09/06/304298.htm.

Woodhouse, Steve. Landfill tipping fees to increase July 1. The Pella Chronicle. [Online] July 13, 2014. http://www.pellachronicle.com/news/local_news/article_2d3812c9-6d14-5daf-a303-e0459af943d0.html?mode=jqm.

Hytrek, Nick. Cherokee County landfill lays off more workers. Sioux City Journal. [Online] May 31, 2012. http://siouxcityjournal.com/news/state-and-regional/iowa/cherokee-county-landfill-lays-off-more-workers/article_3820bb04-6698-5140-8983-2f4e85f879c2.html.

Sujin, Kim and Hadley, Sarah. New Way of Thinking About Landfill Waste Reduction Emerging in Iowa. Iowa Center for Public Affairs Journalism. [Online] February 14, 2013. http://iowawatch.org/2013/02/14/new-way-of-thinking-about-landill-waste-reduction-emerging-in-iowa/.

Fiberight LLC. Renewable Fuel from MSW a Reality. Fiberight Iowa. [Online] http://fiberight.com/iowa/.

Waste Not Iowa. About wastenotIOWA. wastenotIOWA. [Online] http://www.wastenotiowa.org/about_wastenotiowa.html.

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