2023 IOWA REPORT CARD FOR INFASTRUCTURE

Iowa Section of the American Society of Civil Engineers

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ASCE
AMERICAN SOCIETY OF CIVIL ENGINEERS

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Firm: Shive-Hattery

Bridges D+

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Author: **Kevin Arp, PE**
Title: Principal Transportation Engineer
Firm: Kirkham Michael

Dams D

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Author: **Jenifer Bates, PE**
Title: Local Systems Urban Engineer
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Drinking Water C

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Title: Engineering Project Manager
Firm: West Des Moines Water Works

Energy C+

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Author: **Della Caldwell**
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Inland Waterways D+

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Authors: **Katherine (Katie) Madson, PhD** and **Jing Teng Te**
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Author: **Mike Barkalow, PE**
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2023 Infrastructure Report Card for Iowa

GPA C

Aviation	C-
Bridges	D+
Dams	D
Drinking Water	C
Energy	C+
Inland Waterways	D+
Levees	C
Public Parks	C
Rail	C+
Roads	B-
Solid Waste	B-
Stormwater	D+
Wastewater	C-

GRADING SCALE

A

Exceptional, Fit for the Future

The infrastructure in the system or network is generally in excellent condition, typically new or recently rehabilitated, and meets capacity needs for the future. A few elements show signs of general deterioration that require attention. Facilities meet modern standards for functionality and are resilient to withstand most disasters and severe weather events.

B

Good, Adequate for Now

The infrastructure in the system or network is in good to excellent condition; some elements show signs of general deterioration that require attention. A few elements exhibit significant deficiencies. Safe and reliable, with minimal capacity issues and minimal risk..

C

Mediocre, Requires Attention

The infrastructure in the system or network is in fair to good condition; it shows general signs of deterioration and requires attention. Some elements exhibit significant deficiencies in conditions and functionality, with increasing vulnerability to risk.

D

Poor, at Risk

The infrastructure is in poor to fair condition and mostly below standard, with many elements approaching the end of their service life. A large portion of the system exhibits significant deterioration. Condition and capacity are of serious concern with strong risk of failure.

F

Failing/Critical, Unfit for Purpose

The infrastructure in the system is in unacceptable condition with widespread advanced signs of deterioration. Many of the components of the system exhibit signs of imminent failure.

Executive Summary

Iowans depend on roads, bridges, aviation, rail, water systems, energy, solid waste, recycling, and recreation facilities. With this system of systems, engineering provides the essential foundation for improving quality of life and opportunity: safety, reliability, resilience, access, and equity. Engineer experts from the state produced the 2023 Report Card for Iowa's Infrastructure so residents understand the positive and concerning trends with their state's infrastructure. The report card provides a performance analysis for policymakers to engage in conversation about current conditions and act to improve the built environment.

Analyzing the latest public data, engineers writing in 2023 conclude much of the state's infrastructure is treading water. Following on the 2019 report card, this new iteration holds Iowa infrastructure steady at C grade overall, with roads climbing to B- and Solid Waste dropping to that grade. Landfill capacity is estimated to be adequate until 2044, but household waste increased to 1.22 tons per capita in FY 2021 and recycling rates are relatively low at 0.12 tons per capita.

The Iowa roads grade increased after successful state of good repair work funded by the 2015 gas and diesel tax increase. Iowa DOT focuses on a "fix-it-first" approach to project planning and spending decisions which improve pavement conditions. Iowa's bridges remained at D+, even after four years of successful focus on state-owned bridges. Iowa's Department of Transportation notably achieved a 26% reduction in the total of poor condition structures. Yet, Iowa still has the highest number of structurally deficient bridges in the country, many of them local bridges. In the last four years, bridges owned by cities and counties only reduced their numbers of poor bridges by 5% and 4% respectively. Today, all but 30 of Iowa's 4,599 poor bridges are owned by local governments who face severe funding constraints, requiring significant investment and upgraded project delivery capabilities. Fortunately, the 2021 Bipartisan Infrastructure Law is set to spend more than $432 million on bridge projects in the Iowa, with a portion reserved specifically for "off-system," or local bridges.

The Report Card found that Iowa can be better prepared for increased flooding frequency and severity. Iowa communities have already demonstrated forward-thinking by coordinating investments and water decision-making based on watersheds rather than political jurisdictions. Much more is needed, starting with the state legislature fully funding the Natural Resources and Outdoor Recreation Trust Fund. Targeted investments will enable infrastructure to withstand and protect against flooding and other natural disasters.

Despite concerns with resilience, the future looks bright. Additional recommendations below provide insight needed to start conversations and ignite action to raise the grades.

Recommendations to Raise the Grade

Support funding enhancements for present and future needs

Iowa's 2015 motor fuel tax increase delivered demonstrable benefit, but those funds are losing value to inflation, supply chain challenges, and the passenger fleet churning toward fuel efficiency. Iowa should modify motor fuel taxes to automatically rise with inflation and direct dedicated money to locally owned bridges. Decision-makers should also approve a 3/8th cent sales tax increase supporting the Natural Resource and Outdoor Recreation Trust Fund. 63% of Iowans approve of the change delivering funds to $45 million worth of shovel-ready projects.

Fortify water systems for greater resilience

Iowa sits between nationally important rivers with integral freight capacity, vital ecosystems, and powerful economic potential. Water is an Iowa cornerstone, and it must be protected. Wastewater, stormwater, and drinking water utilities – the operators of dams, levees, and inland waterways – should centralize resilience in planning, procurement, and procedure. From 1953 to 2018, Iowa had more disaster declarations due to flooding than any other state in the nation, a trend that's likely to continue. Resilience can't be addressed without greater investment in the aging underground systems of sometimes inferior materials and above ground facilities under-capacity for treatment and conveyance. Safety of life and property depend on those fundamentals and greater operational fortitude.

Foster inter-government and non-political organization for improved capacities

Project delivery capacity, data collection and use, and stakeholder inclusion can be improved when decision-making expands beyond traditional silos. Iowa already coordinates some investments based on watersheds rather than political jurisdictions. That kind of forward-thinking organization can stem the tide of political impasse. Iowa's local bridges need serious improvements. The state could store more of Iowa's renewable power generation if local communities participated more directly and felt ownership of proposed energy grid projects. Iowa's parks and natural infrastructure enjoy broad public support, but better data could exist demonstrating visitation, performance, and need. Who could help departments collect those data?

Subject	2023 Grade	2019 Grade	Change
Aviation	C-	C-	-
Bridges	D+	D+	-
Dams	D	D	-
Drinking Water	C	C	-
Energy	C+	C+	-
Inland Waterways	D+	D+	-
Levees	C	C	-
Parks, Recreation, and Trails	C	C	-
Rail	C+	C+	-
Roads	B-	C+	↑
Solid Waste	B-	B	↓
Stormwater	D+	Not Graded	
Wastewater	C-	C-	-
Overall	C	C	-

AVIATION

C-

Executive Summary

Aviation is key to many Iowans: visiting family on a commercial airline, utilizing a business-owned aircraft to reach remote places, maintaining agricultural fields from above, or receiving freight in cargo planes. The overall condition of Iowa's aviation infrastructure is relatively stable. Iowa's airport network serves current passenger and freight demand with the FAA data indicating no delays due to traffic volume from 2013-2023. Pavement condition continues to deteriorate with age, dropping into the poor classification at some airports though most airports, 73%, remain in good or fair condition. While aviation funding has grown in recent years ($64.4 million annually between 2010 and 2019), work is still ongoing to replace or repair components in poor condition with an estimated annual need of $126.6 million. Efforts should continue to maintain the existing system as well as expanding capacity to meet growing demand.

Background

Iowa has a vast aviation inventory, totaling 114 public-use airports. Eight airports accommodate commercial air service. The remaining 106 are classified as general aviation airports, accommodating a wide range of business, agricultural, and recreational craft. Since the last Report Card for Iowa's infrastructure, three general aviation airports have closed; Orange City, Primghar, and Des Moines-Morningstar and one has opened in Ringsted.

Iowa has a five-role system to further classify airports that serves to assess current performance and project future roles. The roles are defined as:

- **Commercial Service** – Includes airports that support scheduled commercial airline service and provide support for all types of general aviation activity. These airports are essential in the national transportation system and are economic pillars in the state and their communities such as Des Moines International Airport.
- **Enhanced Service** – Includes airports that have runways over 5,000 feet and services for a wide range of general aviation activity. Airports in this role serve as economic centers for regions, supporting business jet operations as well as other general aviation activity such as Ankeny Regional Airport.
- **General Service** – Includes airports that have runways over 4,000 feet and services that cater to small and mid-size business jets. The airports in this role are recognized as community assets such as Monticello Regional Airport.
- **Basic Service** – Includes airports that have runways over 3,000 feet and services that meet recreational general aviation activity such as Fort Madison Municipal.
- **Local Service** – Includes airports that primarily support local activities and provide limited aircraft services such as Audubon County Airport.

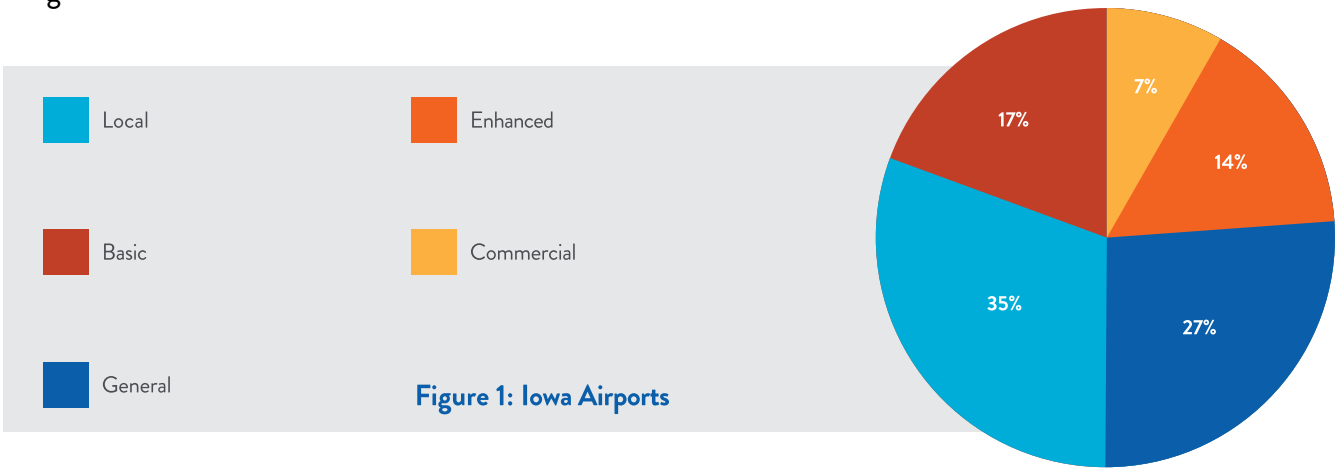


Figure 1: Iowa Airports

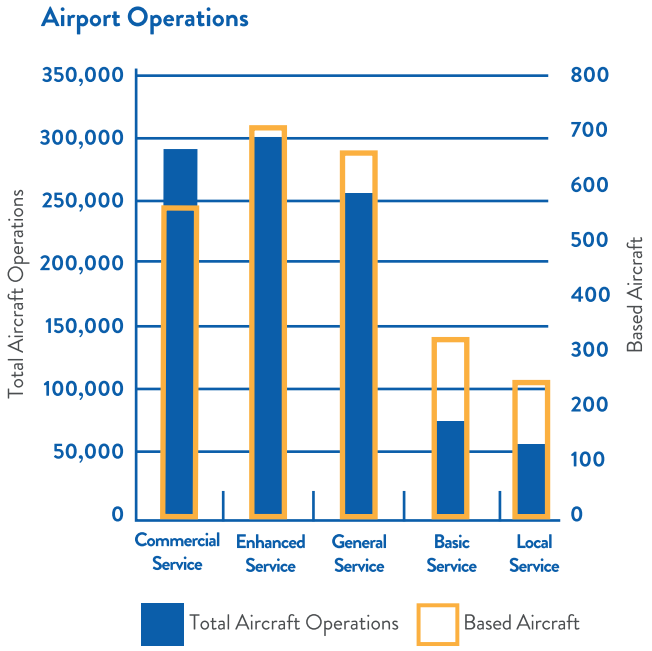
Condition

One key indicator of maintenance and pavement health is Pavement Condition Index. The Iowa Department of Transportation has set the critical PCI for runways at 65, 60 for taxiways, and 55 for aprons. A PCI rating of 70 and above is considered to be in good or satisfactory condition and only needs preventative maintenance in most cases. A PCI rating of 70 to 55 is considered to be in fair condition and major rehabilitation should be anticipated to continue normal operations. A PCI rating of less than 55 is considered to be in poor condition and reconstruction should be anticipated.

Of surface area at all of Iowa's airports, 16% are in good condition, 57% are in fair condition, 6% are in poor condition, and 19% have turf runways. The area-weighted ratings include ratings for runway, taxiway, and aprons and cover several inspection years from 2018 through 2021. Since the last ASCE Iowa Section Report Card, 18% of airports have PCI rates that have improved, including just under 3% that improved from poor to fair or good condition, indicating rehabilitation or reconstruction occurred.

Capacity

In 2019, there were over 1 million airport operations and over 2,500 based aircraft in Iowa. While the COVID-19 pandemic put a halt to much commercial passenger traffic for a period, commercial traffic is anticipated to return to and exceed earlier volumes in Iowa. In general, in the 10 years prior to 2019, aircraft based in Iowa were increasing at about 0.3% per year, contrary to the trend of a -0.2% decline regionally and -0.1% decline nationally. While commercial travel is increasing in Iowa, from 2013-2023, there were only 17 delays from runway closure or decreased volume of traffic due to a non-weather circumstance. Just over 69% of Iowans are within a 60 minute drive of at least one commercial service airport in Iowa. This fell by 7% in fall of 2022 when Dubuque Airport lost their one and only commercial service. In early 2023, Dubuque Airport resumed commercial service with another airline.



If aviation activity increases as anticipated, demand for aircraft storage will increase. Hangar occupancy rates paint a clear picture of the pressing capacity issues. The occupancy review shows 87% of conventional hangars are full and 94% of T-Hangars are full, with over half of the airports in Iowa having a wait list for hangar storage space. Iowa DOT has identified having covered storage for 100% of the based aircraft as an objective for commercial, enhanced, general, and basic service airports. Local service airports do not have this objective. While there is a substantial wait list for hangar storage, only 4% of airports statewide do not meet this criterion; Sioux County Regional, Decorah Municipal and Manchester Municipal.

Iowa has identified an additional objective for commercial, enhanced and general service airports: ensuring overnight storage for the average business user aircraft at the respective airports. Statewide, 67% of airports meet the target. The largest number of airports that do not currently meet this objective are general service airports, demonstrating that while business demand exists at these airports, the extra hangar space to accommodate the overnight storage of a transient business aircraft does not.

Fuel is a crucial component in keeping crafts airborne. There are two main types of fuel utilized by aircraft

-general piston engine aircraft use 100 Low Lead aviation gasoline, while larger turboprop, twin-engine, and jet aircraft utilize Jet A fuel. In Iowa, 87% of aircraft are single engine, utilizing 100LL, and thus Iowa DOT has identified providing 100LL as a minimum for basic service airports. All of the state's basic service airports meet this criterion. Without both fuel types, aircraft may be limited in what airports they can utilize. In an effort to best accommodate potential traffic, general service airports are expected to provide both fuel sources and 100% of airports meet that criterion. Two enhanced service airports fall short of the expectation for commercial and enhanced service airports to provide 24-hour fuel capabilities for both fuel types, though the two airports do have both fuel types.

Operations and Maintenance

Airports are run by various parties throughout the state. A large portion of airport operations are managed by either an airport commission or city or county agency. Of the state inventory, 43 are managed by an airport commission and 43 are managed by a city or county agency. The remaining 28 are managed either by an airport authority, airport advisory board, or other entity, which covers privately owned and public-private partnership arrangements.

Enhanced and general service airports are expected to have on-call assistance available. Local service airports are encouraged, and basic service airports are expected to have an identified airport contact for after-hour arrangements. Currently, 42% of basic service airports fall short of this objective, lacking an identified on-call person.

Aircraft may need maintenance and Commercial, Enhanced and General airports largely meet the objectives to support this. However are starting to see a declining workforce in this field that needs attention imminently. Air and landside facilities also need to be maintained. Almost all airports have snow removal equipment to meet DOT identified performance objectives with some utilizing shared equipment in lieu of having dedicated equipment.

Ongoing repairs or replacement are needed to ensure pavement stays in good to fair working condition. The Iowa Department of Transportation maintains a database of overall system pavement conditions and 68% of airports supplement that information with routine inspection. Only 25% of airports put local funds to pavement maintenance, relying mostly on Airport Capital Improvement Programs

Funding

As reported in the Iowa Aviation System Plan 2020 prepared for the Iowa DOT, there is a significant discrepancy between funding available and anticipated project costs to maintain and improve aviation in Iowa. Each airport has an Airport Capital Improvement Program that is reviewed and approved by a partnership with members from the Iowa DOT Modal Transportation Bureau, the Federal Aviation Administration's Central Regional Airports Division, and Iowa airport sponsors. Each ACIP is intended to project maintenance and new facility needs to aid in allocation of funding. The ACIP totals for Fiscal Year 2021 to FY 2030 are $1.06 billion, coming out to about $106.3 million per year which is nearly double the historic ACIP allocations.

Also identified in the system report, and important for continued stakeholder satisfaction with the aviation system in Iowa, are improvements to existing facilities. These are focused on bringing airports up to Iowa DOT-identified performance objectives and aiming to equip airports for evolving technology. The total anticipated project costs are just short of $50 million over 10 year.

Many of the airports--79 total--are eligible to receive federal funding. Federal funding makes up the majority of investment into these airports' infrastructure needs, on average $46 million is accessible via FAA grants though IIJA has increased funding to FAA for distribution. Local funding is a key component and additional funding can be secured through the State Aviation Fund and multiple vertical infrastructure funds. The State Aviation Fund includes revenue from aircraft registration and aviation fuel taxes and provides an average of $5.8 million annually. The vertical infrastructure funds come from the Rebuild

Iowa Infrastructure Fund. Combined, state aviation programs provide about $8 million annually to airport development projects, ongoing airside services, and special projects. Passenger facility charges, while only collected and accessible to commercial airports, serve as an additional source of funding.

Future Needs and Resilience

As commercial travel returns to Pre-COVID levels and overall aviation activity increases, terminal building improvement projects are a heavy weight of facilities' ACIP plans, accounting for 30.1% of total estimated ACIP costs. Between 5 commercial airports, $5.4 million of IIJA funds was allocated as of January 2023. This does not fully meet estimated terminal building improvement needs but frees that money to serve another part of the state aviation system.

Not only does the physical infrastructure of aviation need to be maintained, but the people who operate the aviation system also need to be considered. As one generation reaches retirement, there is not the same volume of pilots, fixed-base operators, air traffic controllers, airport managers, or aircraft technicians to fill the open spots. Limitations of flight and trade instruction, paired with the growing cost to break into that industry, has limited younger generations that have chosen to pursue those roles. Nationally, consideration is being given to allowing pilots to retire later so the demand can be met for a bit longer, ideally until younger staff can reach a level to perform the same roles.

Public Safety

Recently, a growing focus on safe and standard operations has emerged. Perimeter fences can limit unauthorized personnel and wildlife from interfering with aviation activity. Additionally, airports have undertaken projects to install land-based equipment, including weather reporting devices and a range of navigation aids, to improve safety, especially in poor weather conditions. This includes Des Moines International airport implementing FAA Next Generation Transportation System to expand low visibility operations.

Innovation

A total of 40% of Iowa airports report having implemented some form of sustainable initiative in the past several years, including installation of LED runway lights, solar panels for electrical and heating needs, and recycling in terminal buildings. As sustainable initiatives grow throughout the US, so too will they grow in Iowa.

Recommendations

- Continued pavement maintenance and replacement to maintain fair or good PCI ratings. Consideration of local and basic airport investment in pavement maintenance or replacement efforts at places are where the lowest PCI numbers are most frequently observed.
- Maintain and increase funding sources to support all ranges of airports, focusing on meeting all performance objectives for airports and working to eliminate or decrease hangar wait lists to aid in the projected steady growth of aviation in Iowa.
- Continue to develop programs to engage young Iowans in aviation, working to grow interest in pilot and technician fields.
- Continue to balance available funding and funding needs of infrastructure investment, enhanced safety measures, and technology improvements.

Sources

IOWA DOT system Report 2020-2040 IOWA AVIATION SYSTEM PLAN | Iowa DOT

FAA OPSNET Data The Operations Network (faa.gov)

Interview with Dubuque Airport Manager Todd Dalsing October 18, in person at Dubuque Airport

Interview/draft review with IOWA DOT Tim McClung and Shane Wright December 15 via Microsoft Teams

BRIDGES

D+

Executive Summary

There are 23,799 bridges in Iowa, and the state has the seventh largest bridge stock in the nation. The Iowa Department of Transportation owns 4,195 bridges, counties own 18,365 bridges, and cities own the remaining 1,239 bridges. One in every five bridges in Iowa is rated poor, giving the state the worst ranking in the nation by total number of poor bridges, and seventh worst by total of poor bridge deck area. Reducing the number of poor bridges is a priority for the Iowa Department of Transportation: over the last four years, Iowa DOT achieved a 26% reduction in state-owned poor bridges. However, all but 30 of Iowa's 4,599 poor bridges are owned by cities and counties which face serious funding constraints and reduced their poor bridge numbers only by 5% and 4%, respectively. Most of the remaining poor and aging bridges are on low-volume roadways, but their improvement requires significant investment and increased project delivery capabilities.

Background

Inspection data on the state's bridges is compiled by the Iowa DOT and this information is submitted to the Federal Highway Administration. The FHWA records this information in the National Bridge Inventory database. Structures included in the NBI are bridges on public roads, but do not include those owned by railroads, toll bridges, or privately-owned and pedestrian bridges even though these are also inspected on a regular basis.

The FHWA defines a bridge as any structure, including intermediate supports, erected over a depression and/or obstruction (such as water, highway, or railway), possessing a track or passageway for carrying traffic or other moving loads, and having an opening measured along the center of the roadway of more than 20 feet. Inspections on bridges are generally required to be performed during a 24-month cycle or less. Bridges that are in good condition can be put on a 48-month inspection interval when the structure meets several special conditions. Data collected is then used to identify any structural issue and evaluate the overall condition (good, fair, or poor) for a particular structure. Definitions and information regarding condition categories is explained in more detail in the Condition section on page 11.

Figure 1: I-74 bridges over the Mississippi River

Capacity

Capacity, in the context of a transportation facility, is the ability of the element to convey vehicles and people efficiently by minimizing delays in the transportation system. Bridges can produce bottlenecks, creating time consuming and costly interruptions for the traveling public and freight traffic. Although congestion is typically not a major concern in Iowa, traffic volumes on the state's roadways have steadily been increasing. Passenger vehicle miles traveled on Iowa roadways increased 40% between 1991 and 2019; and while there was a drop in VMT in 2020 due to the COVID-19 pandemic, numbers from 2021 and 2022 indicate that previous upward trend has resumed.

Additionally, there are 4,037 posted bridges within the state and another 751 restricted bridges. Posted structures are often bridges that have a weight restriction while restricted bridges are those that limit traffic on the structure to a certain number of vehicles at any one time, with either circumstance producing a reduction in capacity.

In other cases, physical constraints can affect the traffic capacity of a bridge. Some bridges have vertical clearances and/or deck widths that restrict the use of the bridge by tall and/or wide vehicles.

Condition

The condition of a bridge is the physical ability of the structure to carry design loads. To compare the relative conditions of existing bridges, rating systems have been developed by bridge professionals to assign values that describe the overall operating condition of the structure. The biennial inspection data is submitted to FHWA for inclusion in the NBI. This data includes 116 data fields and details the functional performance and physical condition of the individual bridge, producing a condition category of good, fair, or poor. As part of this data, three of these fields contain assessments of the deck, superstructure, and substructure(s) with a value between zero and nine reported as an overall grade of the component. The condition classification system used by FHWA takes the lowest of these values and considers the structure good, if the value is seven or greater; fair, if the value is five or six; and poor, if the value is less than five. The breakdown of Iowa's bridges using this system is shown below in Table 1.

Another commonly used term when describing the condition of a bridge 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. A structurally deficient bridge does not necessarily imply it is unsafe or in danger of imminent collapse. As of 2018, structurally deficient and poor are used interchangeably.

Table 1: Summary of Iowa Bridges – Ownership and Condition Rating

	State Owned	County Owned	City Owned	Total
Good	2,011	6,783	510	9,304
Fair	2,154	7,216	526	9,896
Poor	30	4,366	203	4,599
Total	4,195	18,365	1,239	23,799

In Iowa, just under 20% – 4,599 of the total bridges – are in poor condition. Iowa is first in the nation for the number of poor bridges within its state boundaries. Based on the individual bridge, poor bridges are kept open without restriction, posted for a maximum allowable vehicle weight, restricted by lane or number of vehicles, or closed. Poor bridge restrictions and postings generally do not affect small vehicles, but they do affect larger vehicles such as trucks, school buses, fire engines, and farm equipment. Table 2 below illustrates the status of the poor condition bridges in the state.

It should again be noted that Iowa's poor bridges are primarily located on low-volume facilities. The average daily traffic on these poor bridges is 147 vehicles per day, and the median ADT value is less than 35 vehicles per day.

The Iowa DOT has created a Bridge Condition Index rating to determine how to prioritize needed repairs. The BCI incorporates the structural condition of the bridge; but also considers load carrying capacity, horizontal and vertical clearances, width, traffic levels, type of roadway the structure services, and the length of necessary detour in the event the bridge is closed. This approach was designed to be more sensitive to changes in condition, and the addition of traffic and capacity criteria to the index means that, given two structures with identical physical conditions, the structure carrying a higher traffic load would have a higher funding priority for improvements over the bridge with the lower traffic load.

All state owned and locally owned bridges in Iowa have been rated using the BCI system, which produces an index value between 0 and 100. A bridge is considered to be in a state of good repair when the BCI value is greater than or equal to 50.

Table 2: Status of Iowa's Poor Bridges

	Open	Posted	Restricted	Closed	Other	Total
State	25	3	1	1	0	30
County	1,291	2,408	293	317	57	4,366
City	103	70	4	24	2	203
Total	1,419	2,481	298	342	59	4,599

Public Saftey

Many of the bridges in the secondary, or rural areas, are not adequate for the full range of vehicles currently traveling the state's highways. Deck widths or overhead clearances that will not accept over-sized loads in each traffic lane also require bridges to be posted for use by vehicles subject to size restrictions.

Approximately 99% of the poor bridges, and 99% of the posted and restricted bridges, in the state are located on the county and city systems. While these posted and restricted posted bridges are not an immediate threat to the general traveling public, failure of these structures is possible if operators of vehicles exceed the bridges' use restrictions.

Iowa has many bridges that cross waterways, and these structures are subject to a process called scour. Scour is the erosion of streambed and bank material due to flowing water, a process frequently made worse during flooding. The removal of this material near bridge abutments and piers can cause a failure when enough material is removed to cause the loss of foundation support. Such a structure is categorized as scour critical, and scour is the primary cause of bridge failures in the US. Within the last 20 years, four bridges in the state are known to have failed due to scour. Damage to a bridge abutment due to scour is shown in Figure 2.

Figure 2: Example of Abutment Scour

Iowa has 110 scour critical bridges on the state system. Additionally, there are 766 scour critical bridges on the city and county system. Virtually all scour critical bridges on the state system have scour countermeasures installed to prevent scour from occurring or to lessen its impact to a bridge.

Funding

The Iowa DOT maintains a Transportation Improvement Program which outlines the projects planned over the upcoming five-year period on the primary and interstate systems. The current program covers fiscal years 2023 through 2027 and includes $1.3 billion of bridge investments. Funding for the Transportation Improvement Program comes from federal, state, and local sources.

A significant portion of funding for the Transportation Improvement Program comes from the federal government, based on the current federal authorization bill. With the passage of the Infrastructure Investment and Jobs Act in November 2021, increases in the level of federal funding will amount to about a 30% increase over current amounts. While this is a significant increase, inflation of construction costs will absorb some of the value of these funds. It should also be noted that a portion of the IIJA funding is reserved for "off system" or local bridges, which will be enormously helpful to Iowa counties and towns where most of the poor condition bridges are located.

Funding for bridge and roadway improvements is also derived from state revenues. The Road Use Tax Fund and the Transportation Investment Moves the Economy in the 21st Century Fund are two means by which transportation projects are funded within the state. The revenue to the RUTF and TIME-21 is obtained from sources listed in Table 3.

Table 3: Revenue Sources for Iowa Road Use Tax Fund and Transportation Investment Moves the Economy in the 21st Century.

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Table 3: Revenue Sources for Iowa Road Use Tax Fund and Transportation Investment Moves the Economy in the 21st Century.

Funding Source	FY 2022 (Estimate)	Percent of Total	State Constitution Requires Funds Be Used Only for Roads?
Fuel Tax	$699 million	38%	Yes
Annual Registration Fees	$651 million	36%	Yes
Fees for New Registration	$384 million	21%	Yes
Other	$93 million	5%	No
Total	$1.797 billion	100%	

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

RUTF revenue is distributed as follows: 47.5% to the primary system, 32.5% to the secondary system, and 20% to the cities. TIME-21 revenue is distributed as follows: 60% to the primary system, 20% to the secondary system, and 20% to the cities.
To address the growing popularity of hybrid and electric vehicles on Iowa's roadways, on which traditional fuel taxes would not be assessed, Iowa enacted House File 767. This legislation provided for the collection of increased registration fees and an excise tax on the electricity used to charge the vehicles. This legislation also enacted an excise tax on hydrogen when used as a special fuel.

From 2018 to 2021, the Iowa DOT has increased its annual bridge funding from $175 million to $310 million per year for replacement, rehabilitation, and repair of the state's bridges, including the border bridges over the Missouri and Mississippi Rivers. These funds are the aggregation of federal, state, and local resources.

The Surface Transportation Block Grant Program currently being considered by the state will be revising the formulas for distributing funds to counties and cities, generally increasing the funding levels for these agencies. With most structurally deficient/poor bridges existing within these local jurisdictions, there is an expectation that these bridge owners will have greater means available for addressing their local bridge needs.

Typical Rural Iowa Bridge

Recommendations

- Obtain funds and implement the newly refined asset management systems to address the needs of the bridges that will be at least 50 years old within the next few years.
- Maintain focus on repair and/or replacement of the poor bridges.
- Federal and state funding should be required to be adjusted 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 the number of hybrid and electric vehicles using Iowa's roads and bridges continue to increase, the state should closely monitor tax assessments on these vehicles to ensure the levels of revenue remain commensurate with gasoline-powered vehicles.
- Investigation and implementation of a mileage-based user fee should be undertaken as a possible future funding mechanism.
- 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.

Sources

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DAMS

Executive Summary

There are currently 4,270 Iowa dams, over 4,030 of which are state regulated dams. Of the total dams in the state, 2,055 are privately owned. Iowa's State Dam Safety Program budget has remained unchanged for the last five years. The average budget for Iowa's regulated dams of $29 each is significantly lower than the national average of $799 per regulated dam. Approximately 54% of the state's high-hazard potential dams have emergency action plans, compared with approximately 83% nationwide. Iowa does not have a state loan or grant program to assist dam owners with rehabilitation projects and many structures are aging beyond their original design life.

Background

Many of Iowa's dams serve useful purposes including flood control, recreation in reservoirs, water supply (for irrigation, drinking water, fire control, etc.), power generation, and more. However, there are many vestigial dams in Iowa that are no longer needed for their original purpose (small scale power generation, grain milling, etc.), and create public safety hazards, owner liability, unnecessary maintenance expenses, and impaired ecological conditions.

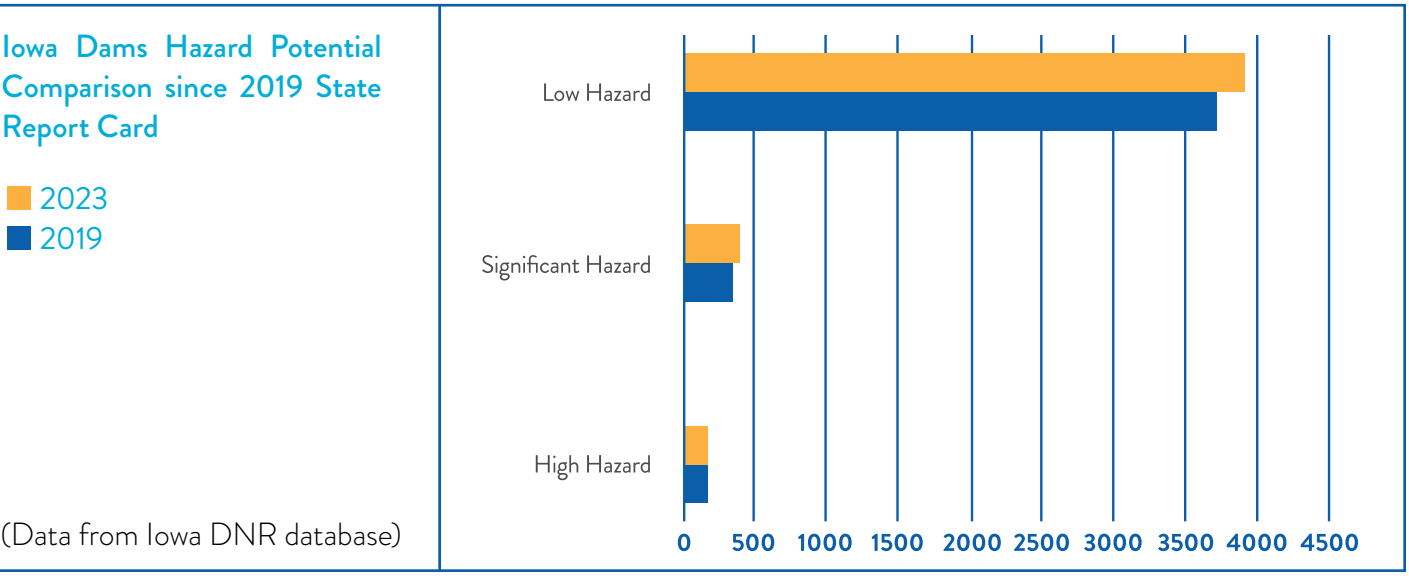
Condition

There are 4,270 total dams in the state of Iowa. Of that total, 4,032 at the time of this report were state regulated, and 2,055 dams are privately owned. The Iowa Department of Natural Resources maintains a database of dams in the state that is populated with among other things, owner information, dam characteristics, latest inspection date, hazard classification, condition assessment, and year construction was completed.

Dam classification is not related to an assessment of the dam's condition but is more a determination of the hazard potential to the surrounding area in the event of a dam failure. Of Iowa's dams, 93 (2.5%) are classified as having "high-hazard potential," according to the Iowa DNR database (a designation based on height, location, and volume detained), 275 are "significant hazard," and the rest are "low hazard." Below is a chart showing how this compares with the last report card update completed in 2019.

Failed Lake Delhi Dam Embankment in 2010.

Iowa Dams Hazard Potential Comparison since 2019 State Report Card



(Data from Iowa DNR database)

Iowa's dams are also given a condition assessment at each inspection that best describes the condition of the dam based on available information. Condition assessment definitions, as accepted by the National Dam Safety Review Board, are as follows:

- Satisfactory – no existing or potential dam safety deficiencies are recognized.
- Fair – no recognized deficiencies for normal operating/ loading conditions, however rare or extreme events may result in a deficiency.
- Poor – a dam safety deficiency is recognized for normal operating conditions and remedial action, or further investigation is necessary.
- Unsatisfactory – a dam safety deficiency is recognized that requires immediate or emergency remedial action.
- Not Rated - the dam has not been inspected, is not under state or federal jurisdiction, or has been inspected but, for whatever reason, has not been rated.

Condition	All Dams[1]	Dams[1]
Satisfactory	244	66
Fair	74	18
Poor	14	1
Unsatisfactory	4	0
Not Rated[2]	3934	
Other[3]		8

[1]- According to the Iowa DNR Online Dam Inventory

[2]- "Not Rated" means not inspected in the last 10 years

[3]- USACE owned dams no longer use a condition rating, but a separate risk assessment

It should be noted that there are 29 dams in Iowa that are federally owned. Twenty are owned by the US Army Corps of Engineers, and 10 of those are high-hazard potential. Two are owned by the Army, and the remainder are owned by the US Fish and Wildlife.

Like all infrastructure, dams require periodic inspection and maintenance to ensure proper function and safe operation. Unlike most infrastructure that has the potential to affect the safety and welfare of the public, operation and maintenance of dams are the primary responsibility of the dam owner. With about half of Iowa's dams privately owned, this means safety of the public downstream is often in the hands of private entities. This public-private risk factor creates the need for stringent condition monitoring, oversight, and maintenance standards. Despite this need, less than 10% of Iowa dams are regularly inspected – high-hazard dams are inspected every two years and all significant hazard dams are inspected every five years. At this time, all high-hazard dams are up to date on inspections.

The Iowa DNR Dam Safety Program has regulatory authority for the vast majority of the state's dams. In October of 2021, the Dam Safety Rule Updates produced by the program went into effect. The Rule Updates modify the state's program accordingly:

- Updates the size of dams that fall under the Program's authority to match the standards in the National Dam Inventory
- Requires Emergency Action Plans for all High Hazard Dams
- Has less prescriptive dam design requirements and allows dam designers to use national standards as appropriate
- Allows for reduced freeboard designs in some specific situations, based on specific analysis

The Iowa Dam Safety Program currently employs two full-time engineers and one summer intern, which is below half of the national average for full-time employees per state regulated dam.

Dams are typically designed to be in service for approximately 50 years (35 to 100 depending on the design) before major maintenance, replacement, or removal is expected. As you can see on the chart below, approximately half of Iowa's dams may be currently exceeding their intended design life, with another 10 to 20% added to that list with each coming decade.

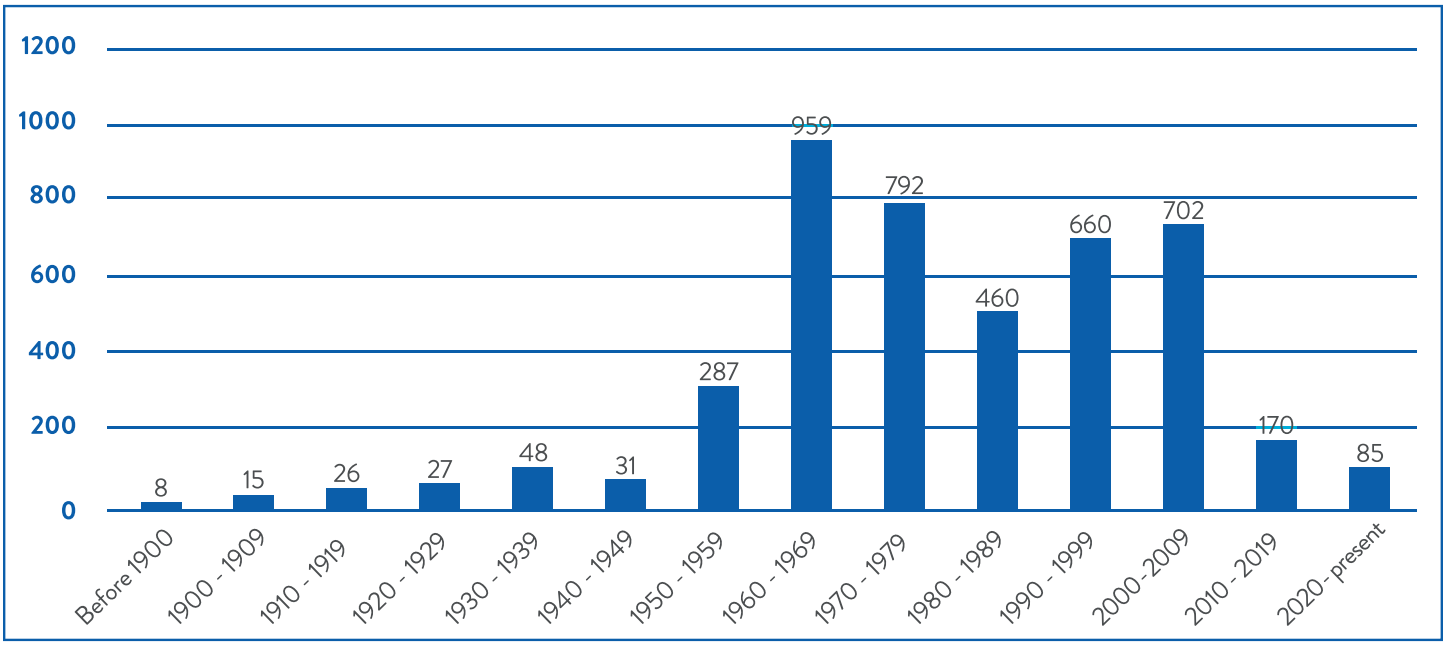
Capacity

Dams intended for water supply preservation and flood control are typically designed for specific impoundment volumes in the reservoirs upstream based on intended use forecasts and historical river discharge observations. Currently, the capacity of such dams is under the dual threat of reduced volume due to sediment accumulation and rapidly changing discharge due to increasing flood frequency and severity. These incidents are punctuated by changes in drought frequency (which can adversely impact shallow reservoirs intended for recreational purposes). While the effects of climate change vary by region within the state, the general expectation for Iowa is a warmer, wetter trend with larger increases in precipitation expected for the eastern part of the state as compared to the western region, with a marked increase in rainfall intensity and large precipitation events.

Iowa is largely an agricultural state with much of the rural landscape converted to the cultivation of annual row-crop grains. While the adoption of farming methods focused on soil conservation is growing rapidly, soil loss by erosion is a significant and continuous concern. After eroding from the landscape, the soil is transported into creeks and rivers and remains suspended in flowing water until the velocity slows enough to halt further transport, where the particles settle to the bottom. This sedimentation process occurs naturally in water bodies, especially river deltas which are artificially simulated at the upstream end of reservoirs behind dams. Most reservoirs in Iowa are losing water detention capacity as the volume is filled by sediment. While sedimentation does reduce the consequences of dam failure, volume lost to sedimentation is value lost for the dam if the original intent was for water supply or flood control impoundment. Reservoirs can be dredged to remove the sediment; however, the process is prohibitively expensive for all but the most critical cases.

Iowa Dams By Completion Date

(Data from Iowa DNR database)



Operations and Maintenance

An Emergency Action Plan identifies potential emergency conditions at a specific dam site and lists pre-planned actions to be followed to help mitigate the disastrous effects of an emergency event. Iowa's dam safety officials continue to make progress in developing EAPs for high-hazard potential dams with approximately 54% completed. However, this is still less than the nationwide average of approximately 83%. Iowa's dam safety officials have also completed inundation mapping (which is available online) for 69 of the 85 state-regulated, high-hazard (non-federal) dams.

The state previously did not require EAPs for all Iowa dams. However, with the new rule updates, all high-hazard dams are now required to have EAPs - a critical improvement to protecting the public. While Iowa's percentage of the high-hazard potential dams having completed EAPs has increased from 30% to 54% since 2018, there's still a ways to go to meet the new Rule Update.

Funding

Many states have loan or grant programs to assist dam owners with rehabilitation projects. Iowa has no such program. In its absence, much of the routine maintenance or rehabilitation needed to modernize dams, complete spillway repairs, remove problematic vegetation, and fix seepage problems may be deferred or not be completed at all.

According to data from the Association of State Dam Safety Officials, Iowa's state budget for its Dam Safety program per regulated dam is a fraction of the national average. The national dam safety budget average is about $799 per regulated dam while Iowa's average is $29. For each high-hazard dam, the national dam safety budget is about $5,000, while Iowa's budget is about $1,400. Iowa's budget has decreased slightly since 2017. While the 2021 Infrastructure Investments and Jobs Act – also known as Bipartisan Infrastructure Law – contained significant increases in funding for several dam safety programs, the major effects of that are yet to be seen by the state. Future funding should be increased as IIJA implementation continues to evolve. For now, the state is using an additional $135,000 of grant funding from IIJA to do a High-Hazard Potential Dam Screening Level Risk Assessment to identify any unacceptable risks or additional data needs for up to 27 of our oldest high hazard dams.

Future Need

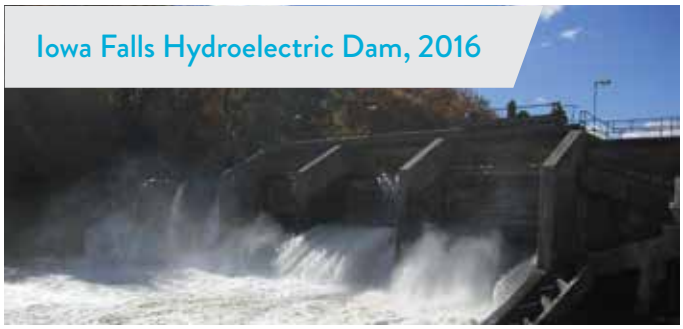
It is essential that funding for Iowa's Dam Safety Program be increased - not just for inspections but also for enforcement and to increase analysis of existing dams to compare their design to modern criteria. The 2017 Oroville Dam spillway failure showed that visual inspections alone are not enough.

The State should also consider establishing a State Revolving Loan Fund similar to the State's Clean Water SRF program. The Iowa DNR and the Iowa Finance Authority jointly administer the Clean Water SRF and through it provide low-interest loans to fund wastewater treatment, sewer rehabilitation, and stormwater quality improvements, as well as non-point source projects. A similar program would be an important low-expense mechanism to improve dam safety and bring Iowa in line with most other states.

Resilience

Increasing flood frequency and severity associated with climate change is adding new importance to the concept of infrastructure resiliency for assets near rivers and streams. To make infrastructure more resilient, critical-route bridges are built higher, primary storm drains are designed larger, and levees are raised above the original design height to protect communities developed around waterways that previously had lower and less frequent flood events. Unfortunately, modifying a dam to address increasing river flows is not so simple. Raising the height of a dam to reduce flooding downstream increases the flood elevation and flooded area upstream. Decreasing a dam's height to prevent increasing upstream inundation reduces the dam's original design utility and may increase the severity of flooding

Iowa Falls Hydroelectric Dam, 2016



downstream. Resilience based-improvements to dams are typically treated on a case-by-case basis depending on a wide variety of risks and benefits. The first line of infrastructure resiliency is consistent inspection and maintenance. Implementing the approved Rule Updates, followed by increasing funding for inspection and maintenance would lead to increased resilience. In many cases, the most sustainable improvement for resiliency may be the removal of the dam if it no longer serves its original purpose, which would allow the river to return to a more natural state and permanently eliminate an unnecessary maintenance burden.

Public Safety

Dams inherently pose numerous public safety risks and owner liability concerns, which are exacerbated by inadequate funding for dam maintenance, inspection, emergency action planning, and mitigation or removal. Specifically, risks to public safety posed by dams include structural dam failure, flooding induced by mechanical failures of dam appurtenances (accessory parts), uncontrolled overtopping during flooding, and recreational hazards posed by low-head dams. Additional risks can include public health issues associated with stagnant water in reservoirs, nuisances such as blockage of fish migration routes or harboring of invasive species in reservoirs, among others.

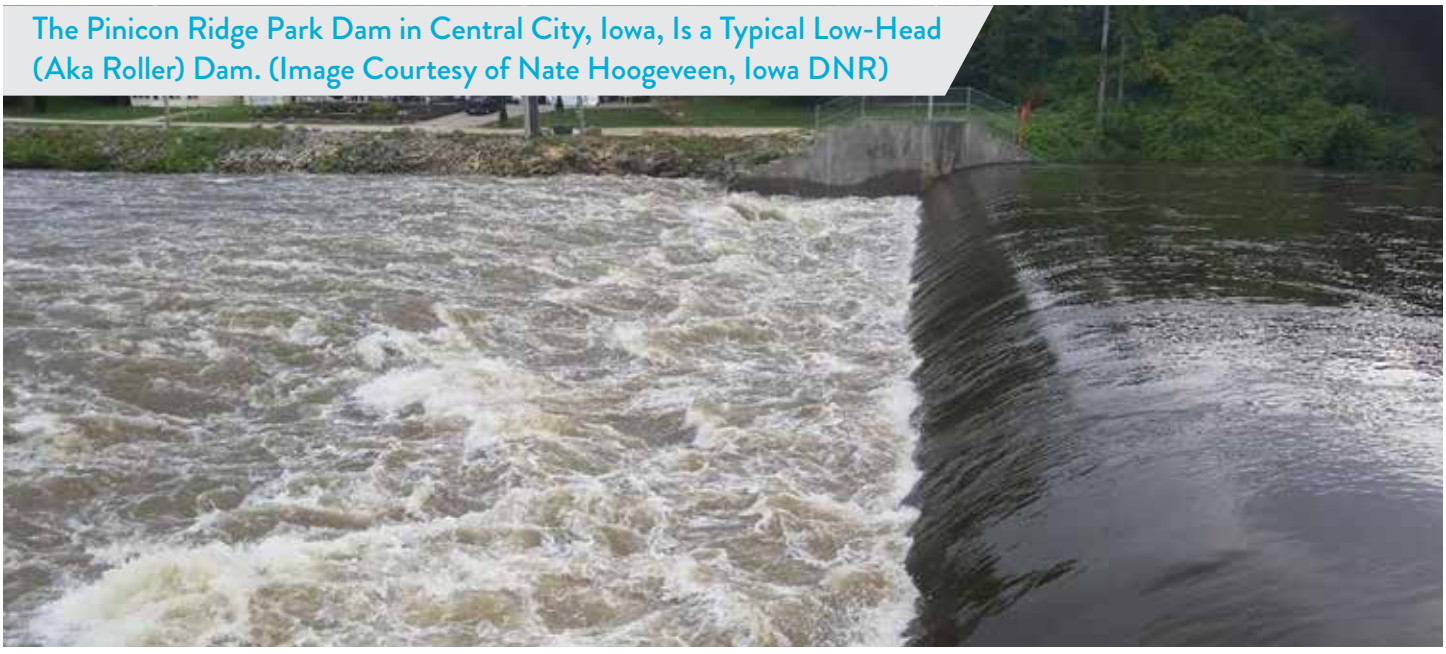
There have been 181 dam-related fatalities in Iowa since record-keeping began in the early 1900s, with the trend being relatively constant at just under two per year. While most fatalities are accidental, many recreational injuries and fatalities occur because citizens underestimate the dangerous recirculating currents present at low-head (aka roller) dams and dam outfall structures. Indeed, low-head dams have earned the nickname "drowning machines" by industry officials.

Innovation

Many smaller low-head dams on Iowa's waterways are vestigial remnants of previous uses (such as grain or timber mills) and no longer serve their original purpose. These dams present a public safety hazard, impediment to fish migration and ecological continuity, as well as ongoing unnecessary maintenance burdens. Retiring dams from service, also a nationwide trend, is driving an overall movement toward dam mitigation in Iowa. This includes modifications to reduce the hazard or complete removal of the dam and restoration of the natural river channel.

Since 2008, a total of 22 hazardous low-head dams have already been mitigated or removed across Iowa. The option to innovatively re-purpose vestigial low-head dams and transform the hydraulic head differential into recreational amenities creates an encouraging, value-added economic incentive for Iowa communities.

The Pinicon Ridge Park Dam in Central City, Iowa, Is a Typical Low-Head (Aka Roller) Dam. (Image Courtesy of Nate Hoogeveen, Iowa DNR)



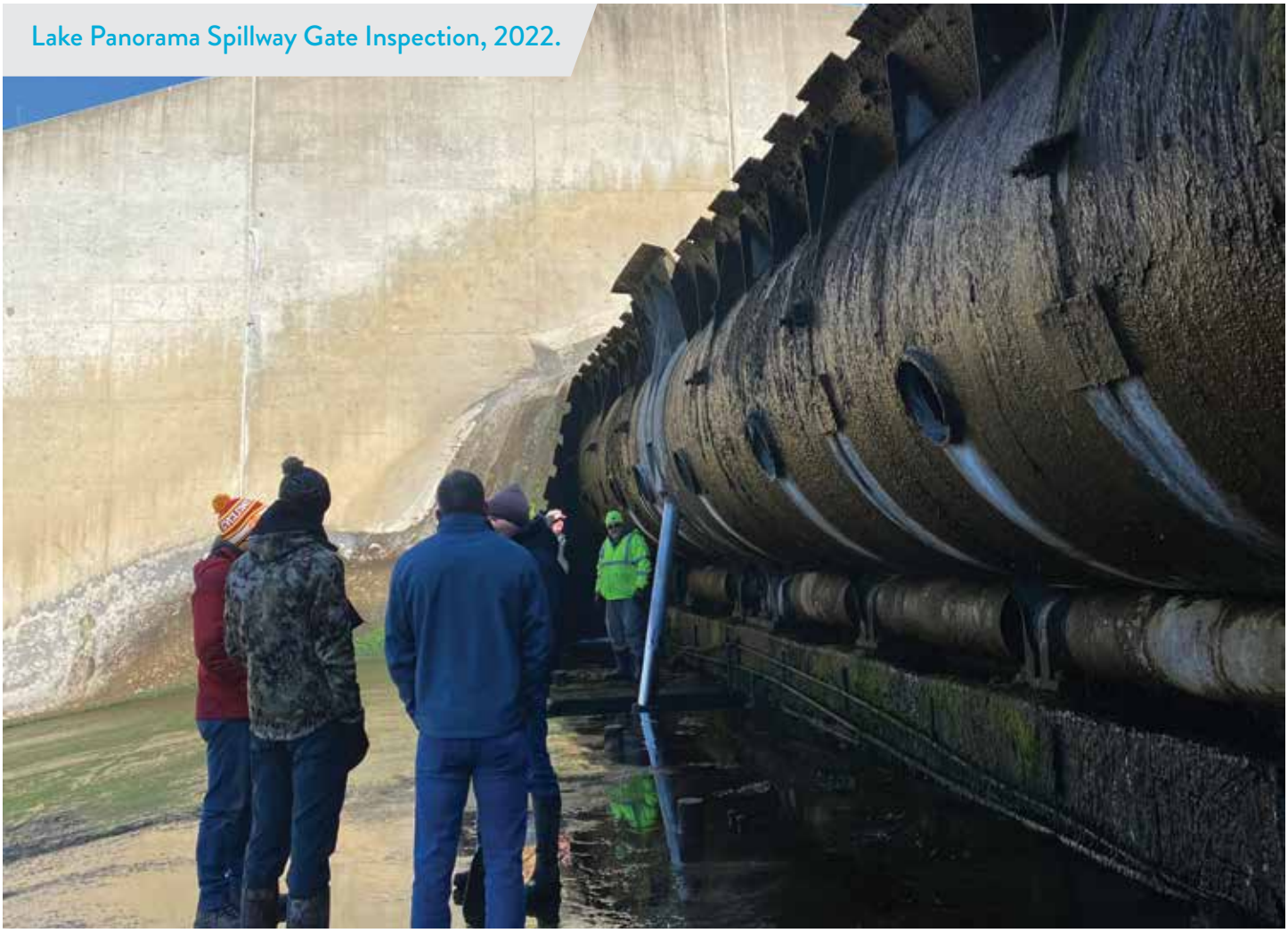
Manchester, Iowa's, Former Dam Site, after Conversion to a Public Recreational Amenity. (Image courtesy of Iowa Rivers Revival)

Manchester, Charles City, and Elkader, among others, have removed or modified their dams, and created entirely new recreation economies and river-based public park spaces in their wake. Dam conversions carry the additional benefits of removing the former safety hazard, reducing maintenance, reconnecting fish passage and ecological corridors, and improving water quality. The Iowa Dam Mitigation Manual lists 82 dams that have strong potential for removal or mitigation based on both ecological and safety/navigation benefits (50th percentile or greater based on specific factors).

Recommendations to Raise the Grade

- Develop and implement Emergency Action Plans for all high-hazard dams in the state.
- Increase state funding for dam inspection, Emergency Action Plan development, analysis, and enforcement to levels that match or exceed the national averages.
- Implement a State Revolving Fund for the repair and maintenance of dams owned by cities, counties, and private entities (the vast majority of dams in Iowa).
- Increase funding and create a separate revolving fund program for the state water trails program and dam removal, mitigation, and safety improvements.
- Environmental Protection Commission 2021 Iowa Dam Safety Rule Updates Expedite the removal of vestigial dams that pose risks to public safety, obstruct navigation, create liability for owners, and create unnecessary ecological discontinuity.

Lake Panorama Spillway Gate Inspection, 2022.



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DRINKING WATER

C

Executive Summary

Approximately 92.3% of Iowans are served by public water systems, nearly all of which connect less than 3,300 residents and 71% less than 500 people. Public health violations are trending downward. In 2021, 70 systems had 107 violations compared to 151 PWS incurring 259 violations in 2011. Rural water systems are relatively new in Iowa, requiring lower maintenance, but municipal water systems report most of their distribution system is greater than 50 years old – compared to an expected useful life as short as 20 years for some components. Communities should be investing between 1% to 3% of the value of their distribution system to replace their aging buried infrastructure. Few, if any utilities are currently reinvesting in their systems at that rate. All public water systems need additional revenue for increased maintenance and replacements of older components, to expand water sources, and install more advanced treatment facilities for a growing list of chemicals and nutrients.

Capacity

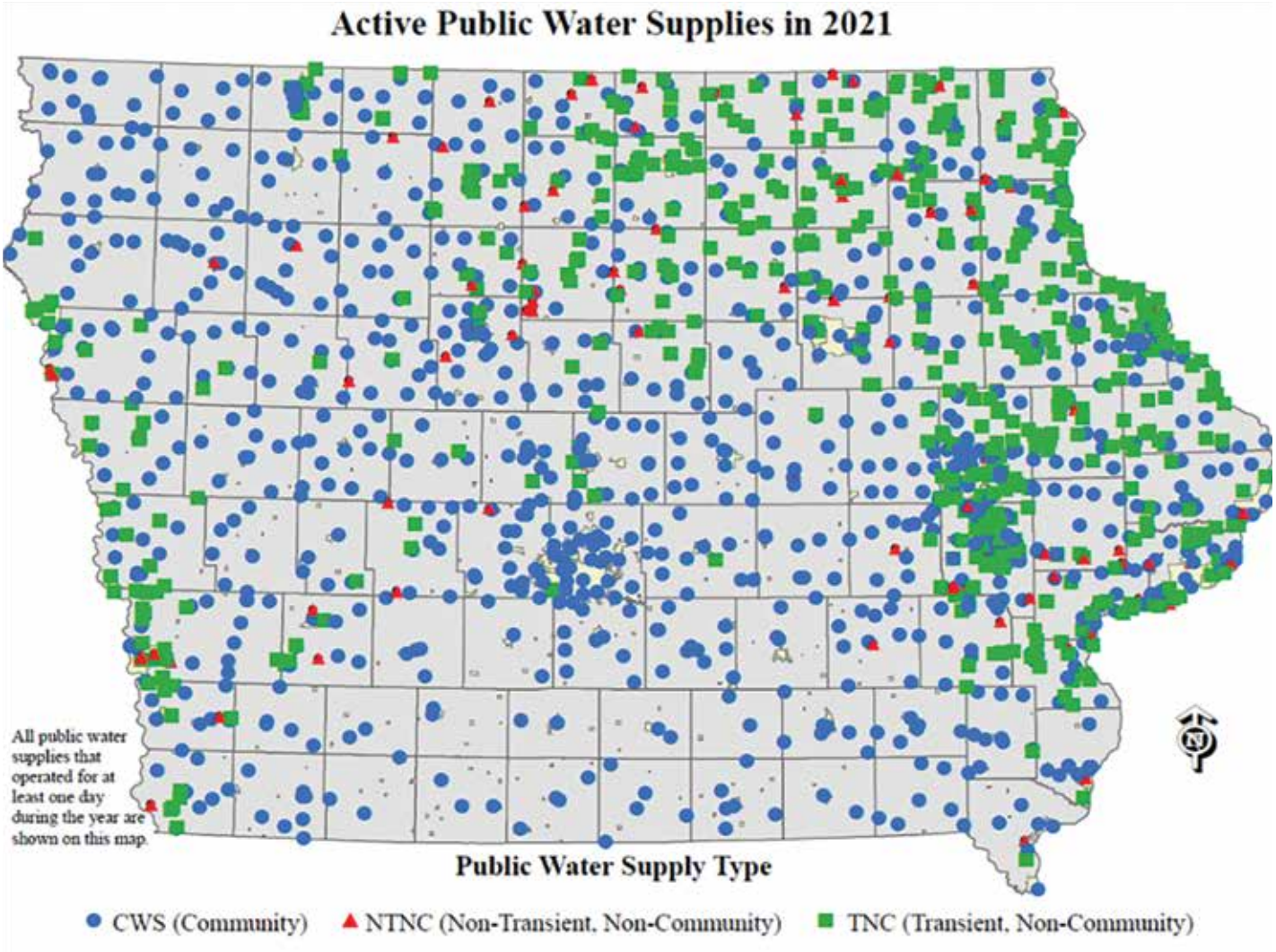
The Iowa Department of Natural Resources defines a public water supply system as a system that provides water to the public for human consumption which has at least 15 service connections, and regularly serves an average of at least 25 individuals daily for a minimum of 60 days out of the year.

A PWS is further classified as a community water system, CWS, serving year-round residents (e.g., municipalities), a non-transient non-community system, NTC, for large facilities (e.g., schools, hotels, hospitals), or a transient non-community system, TNC, serving non-residents and recreation (e.g., highway rest areas, campgrounds, golf courses).

Iowa's drinking water infrastructure consists primarily of small systems. Of the state's public water suppliers, 93% serve less than 3,300 people. The total number of regulated PWS in Iowa continues to trend downward. In the last ten years, the total number of PWS has decreased by approximately 4% to 1,842 in 2021.

Source: State of Iowa Public Drinking Water 2021 Annual Compliance Report

Population Served	EPA Classification	Number of Iowa PWS	Percentage of Total Number of PWS	Total PWS Population Served
25-500	Very Small	1,302	70.7	183,546
501-3,300	Small	403	21.8	497,207
3,301-10,000	Medium	88	4.7	490,586
10,001-100,000	Large	46	2.5	1,351,830
Over 100,000	Very Large	3	0.2	534,263
	Total	1,842	100.0	3,057,432



Source: State of Iowa Public Drinking Water 2021 Annual Compliance Report

The majority – 91.3% – of Iowa PWS provide water from a Groundwater Source or a well (deep or shallow). Less common – 7.1% – are Surface Water Source (rivers, lakes, reservoirs) and only 1.7% using Influenced Groundwater Sources (groundwater sources which has been shown by testing to be under the direct influence of surface water). Over the last four years, the number of groundwater source PWS has decreased slightly compared to the other sources.

The sources from which Iowa draws water are mostly adequate, but challenges lie ahead. Cones of depression in the Jordan Aquifer were noted in a 2019 update issued by the Iowa DNR. These cones of depression are most prevalent in Johnson and Webster counties and are developing in Polk, Marion, and Cerro Gordo Counties.

In response to these cones of depression, a new Jordan Aquifer rule was implemented in 2015. As of 2019, this rule has affected the water permitting process in parts of Webster, Linn and Johnson Counties. As a result of this rule, water use permittees using this aquifer must submit and implement a water use reduction plan.

Increased regulatory requirements for fire suppression systems mean many smaller communities have significantly under-sized systems which cannot meet modern minimum fire flow requirements. In many cases, capacity expansion of the treatment plants and reconstruction of a significant portion of the water distribution system is required to meet these fire flow capacities.

Condition

The visible components – wells, pumps, intakes, plants, towers, and controls – of the water production process are generally well maintained but are aging and will require significant reinvestment in the future. Typical water systems such as wells, pumps, and treatment facilities have a 20-year expected useful life before requiring major rehabilitation or replacement. Many communities have exceeded the life of these components and they must invest in major rehabilitation or replacement projects.

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. Municipal water systems report that greater than 50% of their distribution system is greater than 50 years old, with some systems having pipes exceeding 100 years old. Water main breaks can force temporary boil orders if the break causes a loss of system pressure.

Substantial portions of the distribution lines in systems are becoming old enough to cause concern about future reliability. The generally accepted life of pipe is between 80 years to 100 years, depending on material type and other environmental conditions. Therefore, communities should be investing between 1% to 3% of the value of their distribution system to replace their aging buried infrastructure. Few, if any utilities are currently reinvesting in their systems at that rate.

Operations and Maintenance

Many of Iowa's treatment facilities are more than 50 years old and while they may be in fair condition, these aging facilities demand more preventative and reactive maintenance to keep them operational. Similar to the distribution systems, many of these facilities are aging and will require significant rehabilitation in coming years.

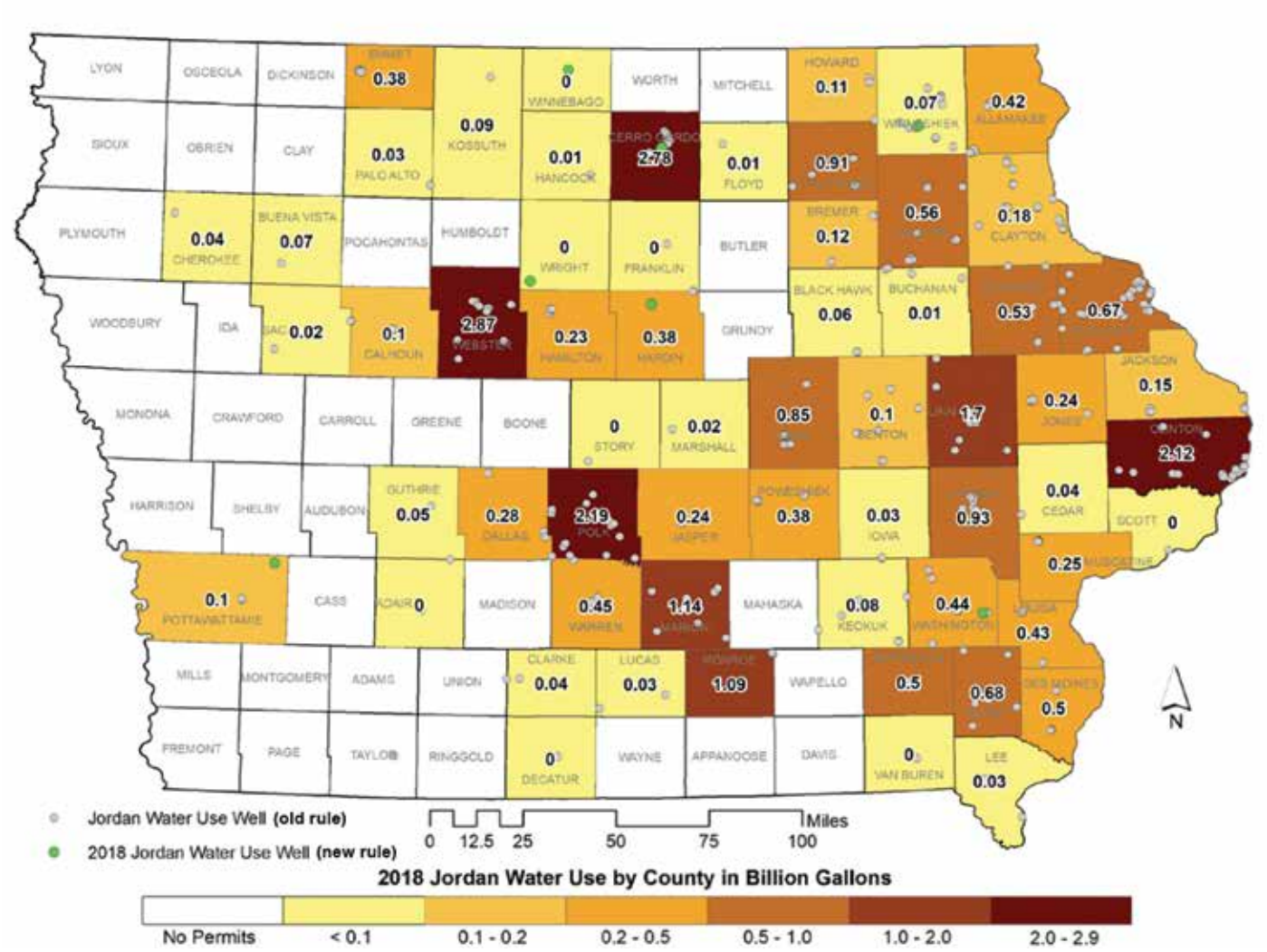
Additionally, many certified operators are retiring or nearing retirement, and communities of all sizes are struggling to find certified operators to replace them. This follows other engineering and construction labor trends, and an outreach program should be considered to educate and invite greater participation.

Funding

Water is primarily financed by usage charges billed to individual consumers. A large portion of the funding is directed to operations and maintenance with the remainder used to fund capital projects. Because capital projects typically are both long term and expensive,

Source of Water

Source of Water	Number of PWS	Percentage of Total Number of PWS	Percentage of Total Population Served
Surface Water	130	7.1	37.3
Influenced Groundwater	24	1.3	9.0
Groundwater	1,688	91.6	53.7
Total	1,842		



Source: State of Iowa Public Drinking Water 2021 Annual Compliance Report

they must often be financed by borrowing against future revenues, adding interest expense. State and federal governments assist with grants and low-cost revolving loans. The Drinking Water State Revolving Fund is one of Iowa's primary sources of financing for water system upgrades and water quality projects. During State Fiscal Year 2020, more than $97 million was committed to 34 loans. Approximately half of the 2020 projects was for Treatment and approximately one-third was for transmission and distribution. The remainder was for planning, storage and land acquisition.

Future Need

The EPA's 2015 Drinking Water Needs Assessment reported to Congress that Iowa drinking water systems have an estimated capital need of more than $7.8 billion over the next 20 years with the majority needed for the small and medium sized systems that dominate the state.

Since the Flint, Michigan lead event in 2014, lead and copper pipes have become more of a focus for water utilities in Iowa – as well as nationwide. In January 2021, the EPA issued the Lead and Copper Rule Revisions. This rule is intended to find more sources of lead in drinking water and to complete more lead service line replacements in communities. As a result of this rule, utilities are working to complete an inventory of service line materials by October 16, 2024. The number of lead service lines in Iowa is presently unknown. Completing

these service line inventories will provide data on how many service lines of various types exist in the state and where property owners or utilities will need replace these lead service lines.. The 2021 Infrastructure Investment and Jobs Act, aka Bipartisan Infrastructure Law, included approximately $15 billion for lead service line removal and replacement across the country, of which Iowa received $44.9 million in FY 2022.

Another challenge is the quality of source water, primarily nitrates in source water. State and local jurisdictions along with industry representatives have been debating the appropriate nutrient reduction standards. The fiscal impact of degraded surface water will need to be addressed for most water systems. In the last year "forever chemicals" have also been identified in Iowa's source water. The testing capability for these chemicals, perfluoroalkyl and polyfluoroalkyl substances, among others has improved resulting in the detection of PFAS in source waters across the state. Many utilities are currently testing for and identifying treatment strategies for these chemicals. Upcoming treatment costs for these chemicals are presently unknown and will depend greatly on the quantities of these chemicals which are found through testing. The treatment strategies selected to treat for these chemicals will drive the ultimate cost of implementation.

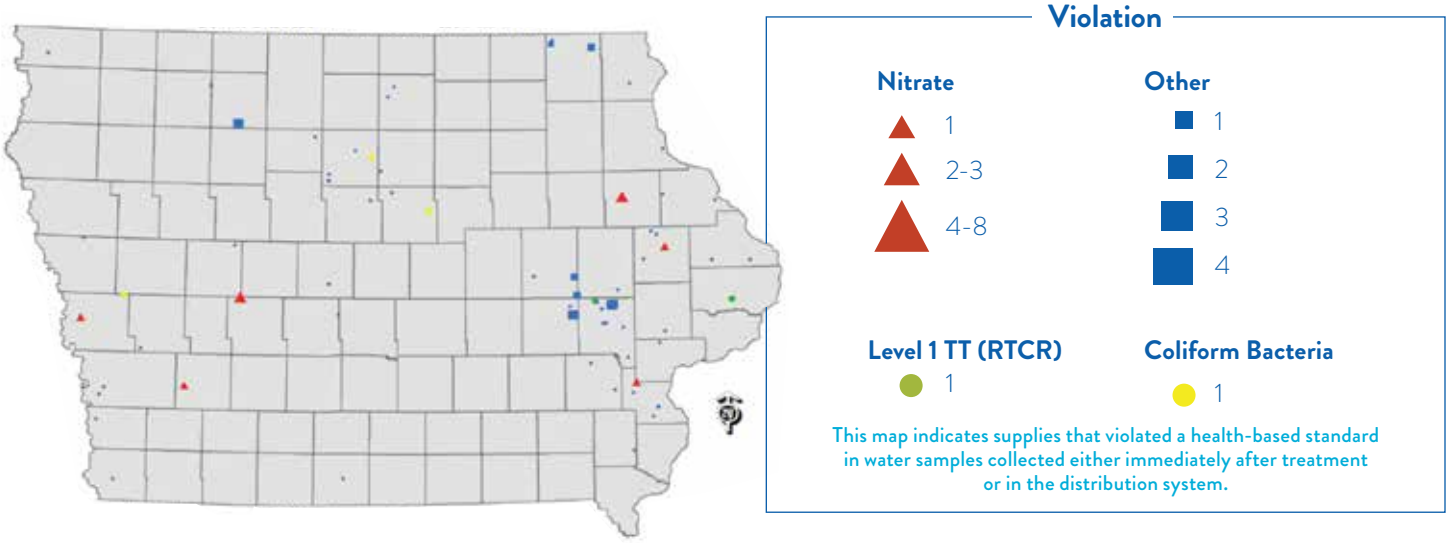
Public Safety

The majority of Iowa PWS are meeting the core purpose of protecting public health. No waterborne diseases or deaths were reported from Iowa public water supply systems in 2021. Over 2.94 million people served by Iowa's PWS regularly received water from systems meeting all health-based drinking water standards.

Of the 1,842 regulated public water supplies, 96.2% met all health-based standards. This is slightly better than the 10-year average of 94.9 percent. And 70 PWS had 107 violations. The number of violations are trending downward. In 2017, 77 PWS had 122 violations – and in 2011, 151 PWS had 259 violations.

Compliance with monitoring and reporting requirements is also improving. In 2021, all major monitoring and reporting requirements were met by 82.1% of the 1,842 PWS. There were a total of 373 major monitoring violations at 224 systems. At least one reporting violation was incurred by 165 systems for a total of 329 reporting violations. These violations are

Health-Based Standard Violation Iowa Public Water Supplies in 2021



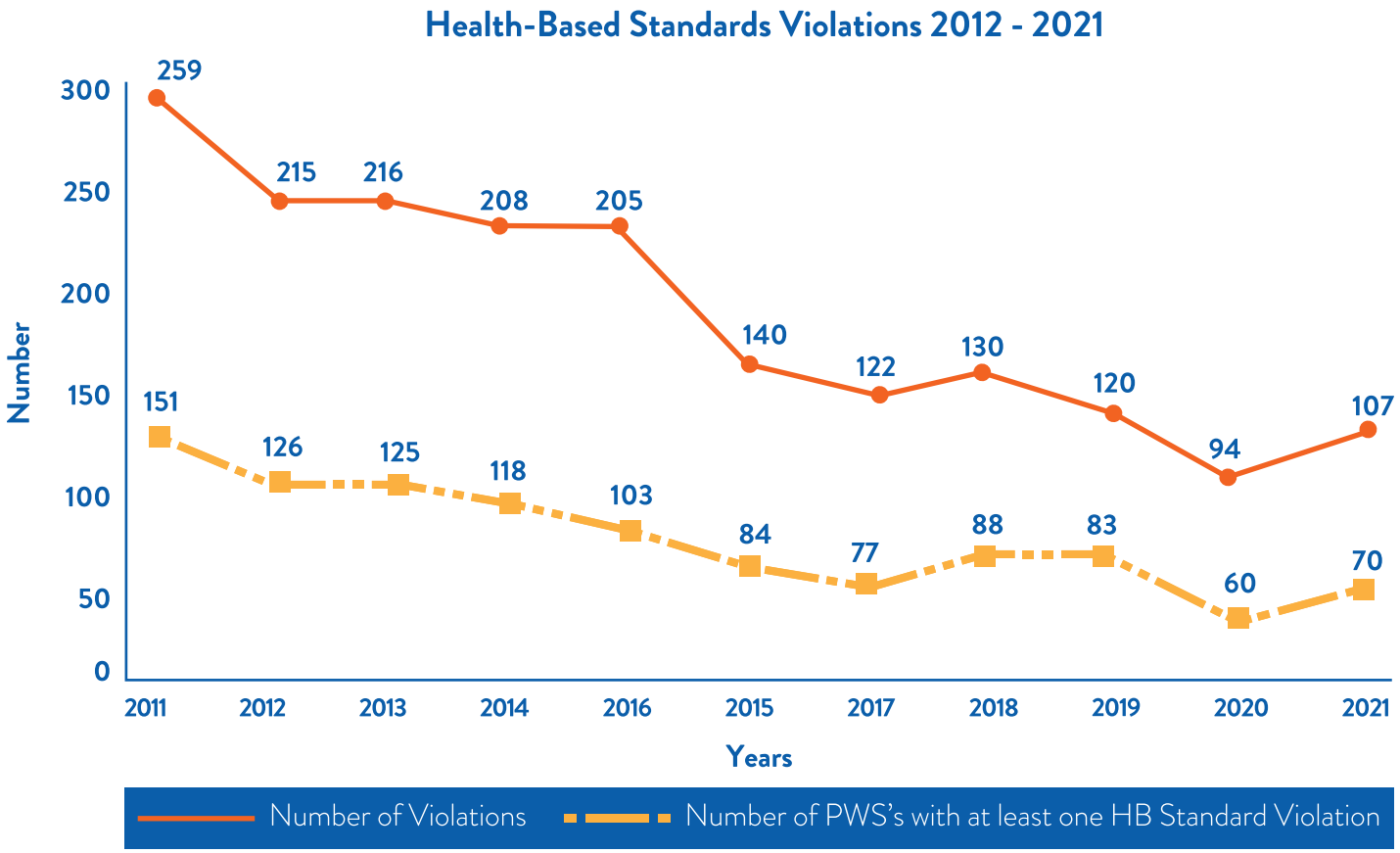
also trending downward. For comparison, in 2017, 245 systems had a total of 483 major monitoring violations and 185 systems had a total of 349 reporting violations. As with previous years, the majority of the violations were related to reporting and monitoring of Total Coliform Bacteria and Nitrate

Resilience and Innovation

A critical aspect of drinking water production and distribution is that the water needs to be available every hour of every day without interruption. Iowa's water utilities currently meet this difficult requirement under most circumstances. Common threats to meeting this requirement include response to increasing urbanization and response to natural disasters.

- The ongoing drought, which began mid-2020 and continues in portions of the state, is revealing weaknesses in source water capacity. These will need to be remedied in the future with new wells, reservoirs, and groundwater recharging techniques.
- Rapid increase in the amount of groundwater withdrawal and leading to stress on aquifers in certain portions of the state. Since the last report card, the Iowa DNR has implemented restrictions on the Jordan Aquifer in three counties within the Iowa. If present practices continue, there is a risk that similar restrictions could be imposed on additional areas within the state.
- Increasing nutrient loads in surface water sources are threatening the ability of Surface Water PWS to treat water to eliminate these contaminants. The removal of these nutrients can be very costly to PWS.
- Recent testing improvements have lead to the detection of "forever chemicals"

Source: State of Iowa Public Drinking Water 2021 Annual Compliance Report



Recommendations to Raise the Grade

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

- Additional funding should be made available for water main replacement programs and treatment plant upgrades. While these programs are available to municipalities state wide, additional resources are needed due to rising costs. While unpopular, water rate increases will need to be considered by municipalities and other water providers to increase funding for these projects. Water rates should account for the full cost of service including operation, maintenance and capital improvements.

- Contamination of surface waters with nutrients and chemicals resulting from agricultural and industrial activities will require investing in mitigation at both the source and treatment facilities.

- Utilities should consider the implementation of asset management systems to optimize ongoing maintenance and capital spending.

- A push should be made to increase the number of individuals pursuing a career in water treatment and distribution to replace the high number of anticipated retirees in the next several years. Additional outreach should be combined with financial and other incentives for those who pursue certification in this field.

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ENERGY

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Executive Summary

Iowa is served by three private, investor-owned utilities, 136 publicly owned utilities, and 43 rural electric cooperatives that provide power for a total of 1.7 million customers. Iowa is a wind powerhouse, with just under 60% of Iowa's total electricity generation coming from wind in 2020. However, partially due to the challenges associated with storing renewables, excess wind energy is sent out-of-state over the electric grid more often than it is consumed at home. In fact, natural gas – not wind – is the most used energy source in Iowa. In addition to building out renewable storage capacity, Iowa's energy network needs investments to modernize the grid and improve its resilience. To that end, Midcontinent Independent System Operator recently approved $10.3 billion for transmission projects in its Midwest subregion, including projects located in Iowa. These investments are important, but distribution lines are overwhelmingly the cause of outages around the country, and Iowa's grid is aging. Storms exacerbate challenges, as the roughly 250,000 Iowans without power in the aftermath of the 2020 derecho will remember.

Background

Iowans are already experiencing the intensity of climate change, as the frequency and intensity of floods, droughts, and extreme heat instances grow. Over the past 10 years, Iowa's energy industry has responded by increasing the share of green energy produced in the state. While investments in green sources of energy are important, focus and priority is still needed for the transmission and distribution systems in Iowa to ensure access to reliable electricity at all times.

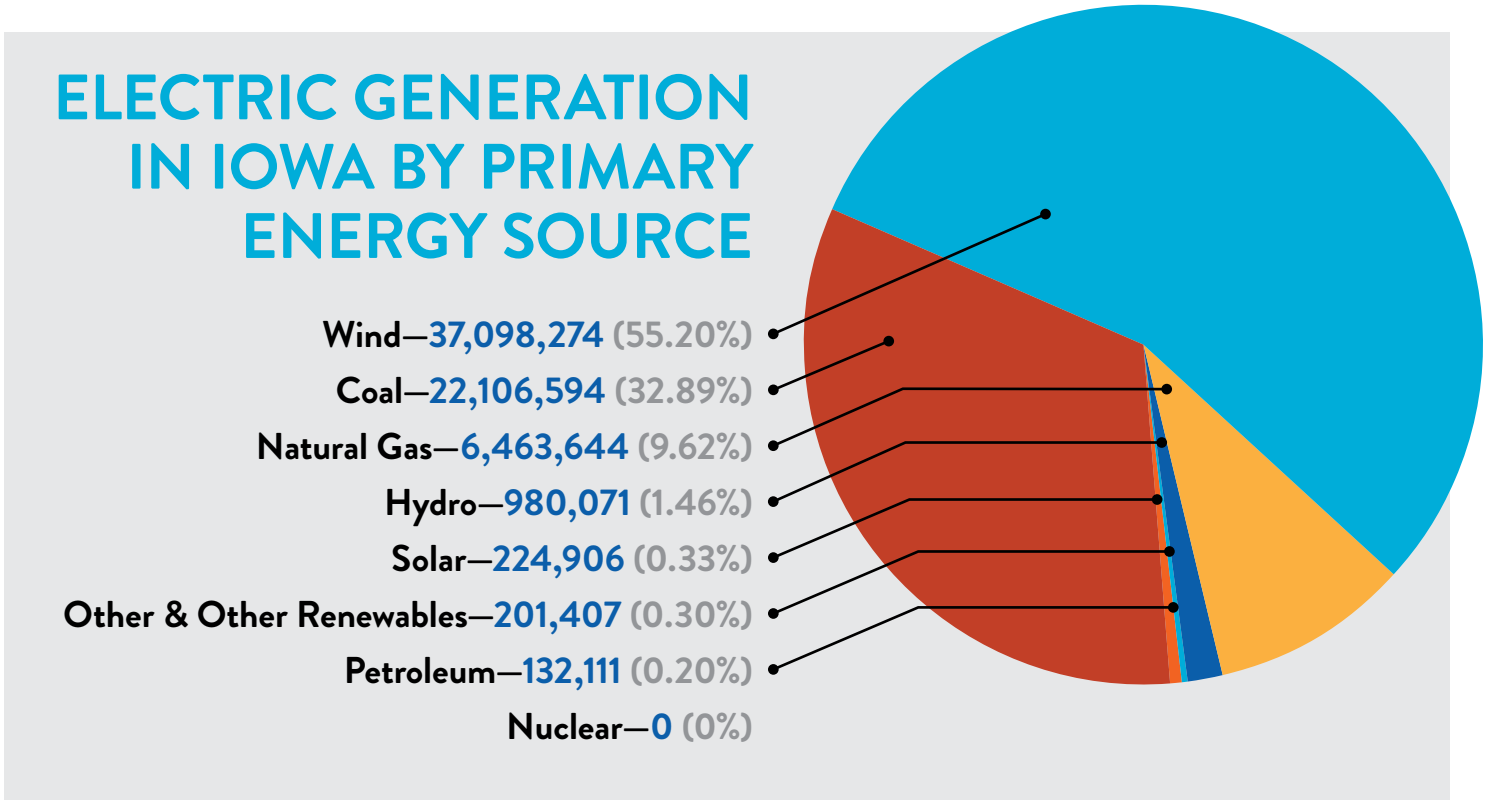
In 2016, the primary source of electricity for Iowa was imported coal, but by in 2019, Iowa was first in the nation for wind energy as a total percentage of generation. In 2020 according to data recently released from the Energy Information Administration, 59.6% of Iowa's total electricity generation came from wind. However, generation does not equal consumption, partially because the wind energy generated in Iowa is often transmitted on the grid to be used out of state. Figure 1 shows electric generation in Iowa by primary energy source.

Operations and Maintenance

North America is separated into regions, each managed by an Independent System Operator. Iowa is part of MISO. MISO operates the transmission system and the wholesale energy market Transmission lines can be thought of as the "interstate highway"

New Cedar Rapids Battery Project Powers Renewable Energy Growth

Figure 1: Iowa Electric Profile (2021 - Including Non-Utility Generation)



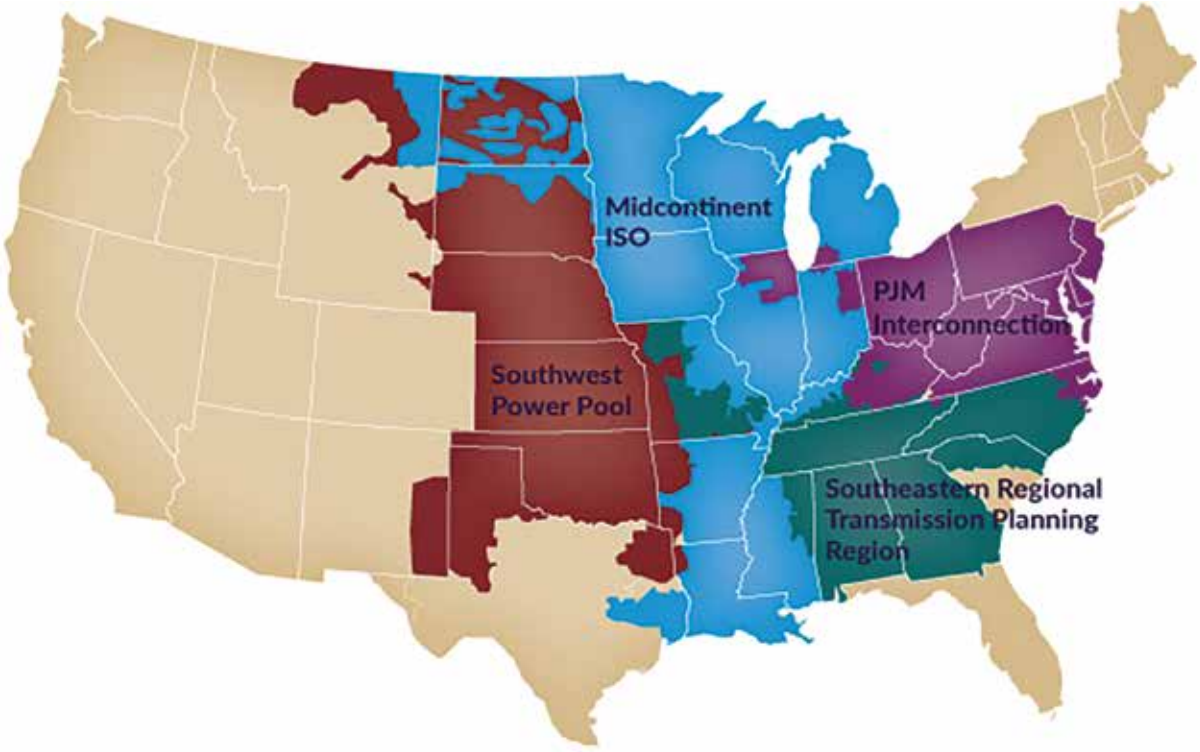
segments of the electricity grid, while distribution is the "last-mile."

Electric utilities own the generation, transmission, and distribution. Utilities can be divided into three classes: investor-owned utilities, municipal utilities, and rural electric cooperatives. IOUs are for-profit, privately owned businesses that may own and operate generation, distribution, and transmission assets. IOUs will often contract with other organizations that provide any of 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 municipalities own and operate generation equipment while many will contract with IOUs to supply power to their local municipal distribution grid. Rural electric cooperative utilities are customer-owned, not-for-profit organizations that generally provide power to rural areas that IOUs do not serve. RECs are divided into two types: distribution and G&T (generation and transmission). Iowa is served by three IOUs (Alliant, MidAmerican Energy, and ITC), 136 municipals, and 43 RECs who provide power for a total of 1.7 million customers.

Capacity

Generally, electricity is generated from coal, natural gas, wind, or other resources at a centralized power plant. High-voltage electricity then travels through interconnected transmission lines, before reaching substations, where the electricity is "stepped down" to a lower voltage. Distribution lines take the lower-voltage electricity to consumers through distribution line networks.

In Iowa, coal and natural gas are all imported. According to the US Energy Information Administration, natural gas is imported by pipelines primarily from Minnesota, Nebraska, and Missouri. Almost all of the coal consumed in Iowa is brought by rail from Wyoming. When looking at "electricity generation capacity," or the maximum electric output an electricity generator can produce, five of Iowa's 10 largest power plants are coal-fired, and



US Energy Information Administration

only two wind farms are in the top 10. But when ranked by actual energy output generated, four of the top 10 plants are wind-powered and three are coal-fired. Natural gas-fired power plants contributed 9% of Iowa's in-state generation in 2021, and as of 2021, the only nuclear plant in Iowa is permanently closed. The state's remaining electricity is generated from a combination of hydropower, solar, biomass, and petroleum.

Since 2008, Iowa has generated more electricity each year than the state has consumed. This means that excess power generated in Iowa is sold to other utilities and sent over the electric grid to other states. Ian Dobson, an engineering professor at Iowa State University, describes how "electricity is made and consumed at the same time. Thus, the energy put into the grid must equal the energy pulled from it, especially with the lack of storage within the system." Historically, the grid relies on the burning of fossil fuels to generate power, and the amount of power generated can be adjusted based on the demand for energy. But the generation of solar and wind energy fluctuates, and can cause massive strain on a system that relies on a constant balance. As the regional grid operator, MISO is tasked with making sure the right amount of electricity is generated across its various zones. That energy can then be sold and transmitted between its member utilites that distribute the power to their customers.

Local distribution grids, which are estimated to contain 10 times the line mileage of the transmission grid connecting them, are unquestionably the weakest part of our electric delivery structure. Nationally, 92% of outages occur on the distribution network. To improve reliability, one scale trend that is taking hold in Iowa is to bury distribution lines underground. Burying lines underground has numerous advantages, including increased resiliency against weather, temperature shifts, and sabotage. However, line burying is very expensive and not always appropriate, especially in areas prone to flooding.

Along with transmission and distribution lines upgrades, modernizing the grid itself is paramount to ensure the continued use and growth of renewable energy.

Investments in storage are especially necessary to ensure a more modern grid that can accommodate greener sources of electricity generation.

Resilience

If consumers need more electricity than baseload power plants can provide, operators respond by increasing production from centralized generation facilities that are already operating at a lower level or on standby, importing electricity from distant sources, or calling on end-users who agreed to consume less electricity from the grid through demand response programs. This becomes of the utmost importance during times of natural disasters that impact energy transmission and delivery.

Resiliency during extreme weather events should be a top priority for policymakers. In Iowa, aging energy infrastructure is the main cause of power losses to homes and businesses, and storms exacerbate challenges associated with aging transmission and distribution infrastructure. In fact, 90% of outages across the US are caused by weather related events. Iowa saw this firsthand during recent storm events like the August 2020 derecho. In the derechos aftermath, roughly 250,000 residents were without power. A resilient and reliable power grid can help protect residents and businesses from extreme weather, which starts with a much stronger transmission system. Dusky Terry, President of ITC Midwest, noted that "The widespread power outages caused by last summer's devastating derecho in Iowa and the recent extended sub-freezing temperatures across much of the US demonstrate the importance of a resilient and reliable electric power grid.

Cedar Rapids After Derecho

Continued investments in transmission are essential to ensure older transmission lines are rebuilt to provide greater system resiliency and reliability during extreme weather events". Eric Larson, Climate Central's Senior Scientist of Energy Systems, has noted that Iowa, "... needs a much beefier transmission system, not only beefier in terms of resilience against climate change impacts, but also much larger than we have now...."

Funding

Funding for the energy sector can be as complicated as the grid system itself. Entities that produce, transmit, and distribute energy across Iowa and beyond its borders rely on a mixture of public and private funds, depending on their designation. Most companies and organizations involved in energy production to consumption rely on private capital and investments, tax dollars, utility payments from end-users, federal subsidies, and tax credits, just to name a few.

In general, utilities fund infrastructure capital and maintenance projects with user fees. Iowa ranks 14th in the nation for average electricity prices when ranked from lowest to highest. In 2022, the rate was $12.50 cents per kilowatt-hour compared to the 15.64 national average. But this cost can be misleading, as the state has a low industrial rate which drives down the average. Most Iowans pay commercial or residential rates, which tend to be higher.

The 2021 Infrastructure Investment and Jobs Act authorized, $73 billion in new fundings for grant programs and initiatives to support investment in energy infrastructure. According to the Midwest Energy Efficiency Alliance, Iowa is one of a handful of states that will see a large portion of these funds, specifically from the Energy Efficiency Revolving Loan Fund Capitalization Grant Program. As of November 2022, aaccording to the White House, "approximately $57 million has been allocated to Iowa for clean energy, energy efficiency, and power. This includes $45 million for weatherization, $6 million through the State Energy Program, and $6 million to prevent outages and make the power grid more resilient."

Future Need

Iowa energy consumption varies across sectors, with the industrial sector seeing the highest consumption

by end-use, as shown in Figure 2. The EIA notes Iowa's industrial sector, which includes agriculture and biofuels production, ranks among the top 10 states in industrial sector total energy consumption.

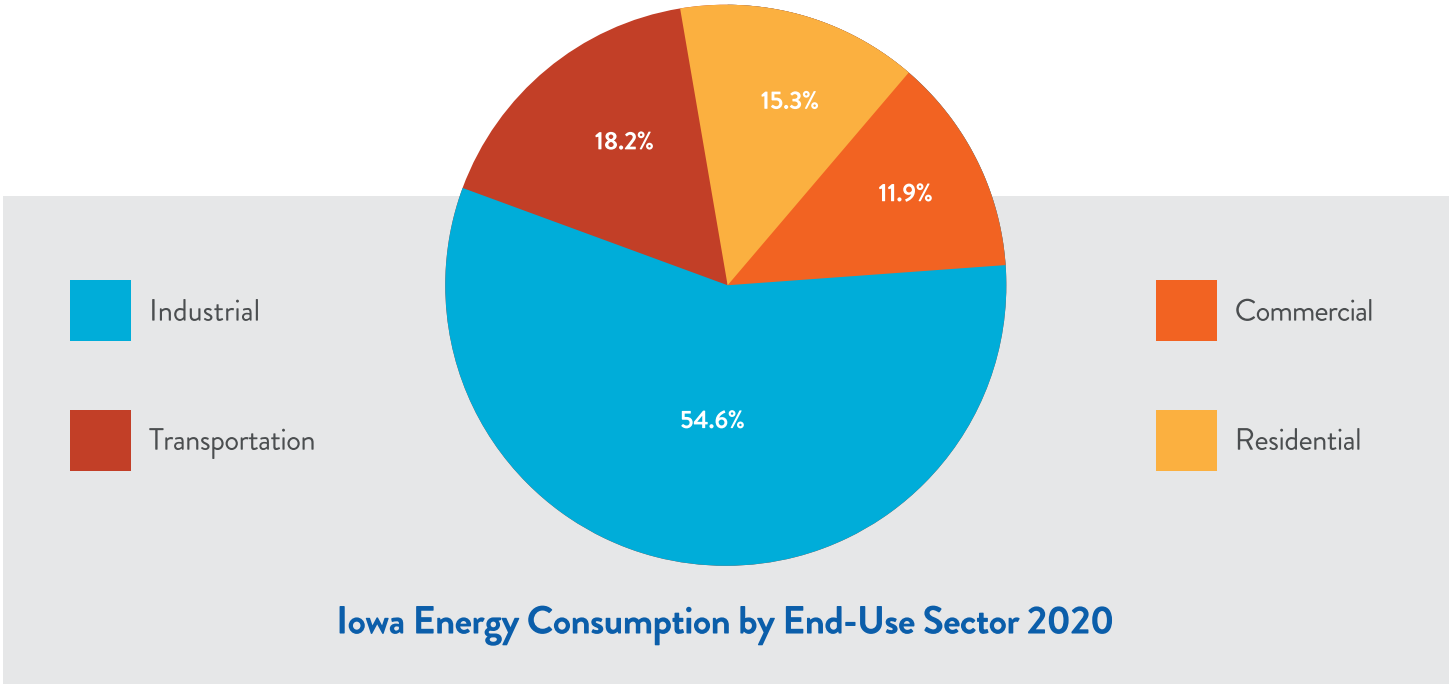
Energy consumption in Iowa has historically increased roughly 2.7% each year, and this trend shows no sign of slowing down. To deal with the growing need for energy, numerous investment and construction projects are expected around the state. Investments in advancements in wind energy production and transmission in solar energy alone since 1992 totaled $34.5 billion in economic impacts. Solar energy saw similar investments, and planned projects set for implementation between 2020 and 2025 reached $3 billion in total impacts. MISO's Board approved $10.3 billion for 18 transmission projects in its Midwest Subregion – improvements that are aimed at improving the ability of the gird to respond to extreme weather events and accommodate new sources of energy...."
But challenges remain for continued growth of the renewable energy sector. For example, the SOO Green HVDC Link has faced regulatory hurdles in its bid to construct a 350-mile buried transmission line that would run along a Mason City, Iowa, and Yorkville, Illinois railroad. If completed, the line would facilitate the delivery of 2,100 MW of wind power from MISO to the 13 Mid-Atlantic and Midwest states, plus the District of Columbia. SOO Green is stuck in PJM's queue awaiting study before it can be approved A backlog in the regulatory queue for study and permitting of new large scale generation projects has resulted in long delays for projects like the one proposed by SOO Green. This interplay of energy investments and regulatory agencies represents one of the multiple hurdles facing the energy infrastructure sector in Iowa and the Midwest.

Another hurdle for electricity projects is local opposition. In 2022 Madison County Iowa residents united to oppose a project to build 30 turbines in the area. After a court battle and loss of support from local government representatives, MidAmerican withdrew plans for the turbines. Conflicts over the appropriate use of land and disagreements between landowners, often pitting neighbors against neighbors, is one of the largest constraints that is limited expansion of renewable energy generation in Iowa.

Innovation

One of the largest areas of need with regards to innovation is storage technology and infrastructure. As mentioned, the energy grid relies on a balance between

Figure 2: Iowa Energy Consumption by End-Use Sector



supply and demand of energy. Renewable energy needs to be generated and stored during high production times - i.e. when the wind is blowing – and then released back into the power grid during high demand. Many emerging storage mechanisms are currently being studied and tested throughout the US, and Iowa has seen a major push to battery storage.

- NextEra Energy is set to build 200 MW of solar and a 75-MW/300-MWh battery storage facility through two subsidiaries at the site of its shuttered Duane Arnold nuclear plant.

- Alliant Energy has opened a new battery complex in Cedar Rapids that it says doubles its energy storage in Iowa and enables more growth in renewable energy like wind and solar. The 5-megawatt facility next to Alliant's Deer Run substation can store enough electricity to power 5,000 homes for two hours.

- A project jointly supported by Alliant Energy, US Department of Energy Office of Electricity, Sandia National Labs and the Iowa Economic Development Authority was recently constructed in Decorah, Iowa. The project's 2.5-megawatt, 2.9-megawatt-hour battery connects to a circuit in the town with a high concentration of customer-owned solar systems. The battery will absorb much of the excess energy these customers generate at the brightest parts of the day and release it onto the grid when customers need it most. This solution provides low-cost renewable energy at peak times of the day. It also relieves the load on the circuit and avoids the cost for rebuilding the grid to accommodate the excess electricity from the solar panels

Recommendations

Level Playing Field In Energy Pricing

Some renewables find it hard to compete against fossil fuel alternatives due to greater upfront costs than fossil-fuel incumbents. Supporting subsidies and tax credits aimed at renewable and alternative energy sources allows for lower upfront capital cost of clean power (investment) or incentivize renewable electricity output (production). Renewing the states solar tax credit, incentivizing small wind innovation zones, and supporting storage tax credits are three ways legislatures can ensure that renewable and clean energy resources can proceed on par with reducing the reliance on fossil fuels.

Foster Public Support For Renewables At Local Level

Local public opposition to certain renewables schemes has been a barrier to the expansion of renewables

Upgrade Aging Infrastructure

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.

Modernize the Grid

Investment into 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.

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INLAND WATERWAYS

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Executive Summary

The Upper Mississippi River and Missouri River inland waterways are vital to Iowa's economy because they provide an efficient and cost-effective transportation mode to export Iowa products to worldwide markets. Waterways and ports contributed more than $18.7 billion in revenue to the state's economy and supported an estimated 101,000 jobs in 2018. However, revenue and security of jobs are threatened by aging UMR navigation locks and dams. The average age of locks and dams in Iowa is 85 years old, or 35 years past their intended design life. Unscheduled lock closures for maintenance and repairs cause delays and congestion, which can cost upward of $739 per hour for an average tow. Ultimately, these costs are passed on to the consumer. Unexpected closures from 2010 to 2020 averaged 3,881 hours annually across Locks and Dam 9 through 18 in Iowa but have generally decreased over time. Recent funding appropriated to the Navigation and Ecosystem Sustainability Program will not only improve navigational capacity and provide ecosystem restoration, but will further extend the ability of the US Army Corps of Engineers to perform backlogged maintenance and rehabilitation.

Background

Iowa is unique in that it is the only state bordered by two navigable waterways. The Missouri River on the western border provides 179 miles of navigable waters and the Mississippi River on the eastern border provides 312 miles of 9-foot navigation channel. There are 63 barge terminals (six on the Missouri River and 57 on the Mississippi River) and 11 locks and dams (all on the Mississippi River) along Iowa's borders. Lock and Dam 9 near Lynxville, Wisconsin, is the furthest upstream and Lock and Dam 19 in Keokuk, Iowa, is the furthest downstream on the Iowa border. Approximately 400,000 cubic yards of material are dredged along riverbeds tangential to Iowa annually in order to maintain the necessary 9-foot navigation depth. In 2019 and 2020, however, material dredged spiked to approximately 1.5 million CY due to the 2019 spring Midwestern flooding. The shipping window on the Mississippi River is typically from late March to early December.

Since locks and dams do not exist along Iowa's border on the Missouri River, water levels depend on flow releases from the mainstem reservoir system located in the UMR basin. Dredging of the Missouri River to maintain channel depth rarely occurs because reservoir release rates combined with an extensive system of stone dikes and revetments provides a continuous self-scouring navigable channel. Recent port investments completed in 2021 have extended agriculture shipping opportunities to Blencoe, Iowa, allowing for approximately 80 barges, or the equivalent of 240,000 tons of corn, soybeans, and other products to be shipped out of Iowa along the Missouri River annually. Although infrastructure enables barge traffic to travel as far north as to Sioux City, water levels can limit navigational capacity and frequency. The shipping window on the Missouri River is typically from late March to early December.

Inland waterways are beneficial because they help divert goods from roadways, thereby reducing crashes, road congestion, and emissions of greenhouse gases. Not only can a single, 15-barge tow transport the equivalent of 1,050 trucks or 216 rail cars, but it can also generate 1,000% less emissions than trucks and 30% less emissions than trains. In 2020 alone, inland waterways along Iowa move nearly 11.1 million tons of freight valued at nearly $2.7 billion. By 2045, this is expected to increase by approximately 40% to nearly 15.5 million tons of freight.

In 2021, the total amount of commodities that traveled through locks bordering Iowa was approximately 11.3 million tons, with nearly 8.5 million tons shipped domestically, 2.5 million tons received domestically, and 0.3 million tons shipped intrastate. Nearly 77% of the total value of goods shipped through Iowa's inland waterways are agricultural products (e.g., fruits, vegetables, oils, and seed), cereal grains, and machinery. By weight, nearly 66% of the total weight

of goods is attributed to agricultural projects, fertilizer, and sand and gravel.

Capacity

Capacity on the UMR is heavily dependent on downstream performance because the inland waterway works as a system. Traffic projections indicate the UMR lock system will exceed its current capacity within the next 25 years. A five-year average of 1,640 tows travel through the locks on the UMR, with Lock and Dam 9 receiving the least at 1,134 tows, and Lock and Dam 19 receiving the most at 1,945 tows. Figure 1 provides an overview of the lock system. Of the 11 locks and dams along Iowa's eastern border, only one lock chamber, Lock 19, is long enough to accommodate modern barge tow lengths of 1,200 feet. All other locks have 600-feet chamber lengths, which require barges to uncouple and travel through in two lockages. A typical 30-minute lockage can take upwards of four times as long when uncoupling is necessary. This process increases wear and tear on the locks, the likelihood for an adverse incident to occur, and processing and delay times which results in higher shipment costs.

Operation and Maintenance

All of Iowa's inland navigation waterways are under USACE stewardship. On the Mississippi River, USACE responsibilities include operation and maintenance of the locks and dams, dredging in the main channel to sustain the authorized 9-foot depth, and debris removal. On the Missouri River, nearly all of USACE's maintenance responsibilities are to preserve the stone dikes and revetment in and along the channel. Along the Iowa borders, the Rock Island District of USACE oversees Locks and Dams 11-19, the St. Paul District oversees Locks and Dams 9-10, and the Omaha District oversees the Missouri River. Barge terminals are owned and operated by private companies.

Inland waterways can experience a pause in operations under both scheduled and unscheduled circumstances. A scheduled closure is typically the result of some inspection, maintenance, repair, or rehabilitation event, whereas unscheduled closures can occur as a result of high water, sudden failures, or sudden impact events to the infrastructure. In 2020, approximately 12%, or 34 hours, of the closures of Locks and Dams 9-19 were unscheduled. The remainder of that time was a result of scheduled closures. In total, the locks were non-operational for an average of nearly 283 hours that year. This was down 69% from an average lock closure time of 920 hours in 2017, though only 5% of those closures were unscheduled that year.

Closures can lead to delays. The average delay time for Locks and Dams 9-19 was 2.5 hours in 2020. This is up approximately 71.5% since 2017. These delays negatively impact shippers, many of whom rely on the inland waterways to transport agricultural commodities and other time-sensitive products. Furthermore, delays can cost upward of $739 per hour for an average tow. Ultimately, these costs are passed on to the consumer.
Routine and major maintenance on the inland waterways is federally funded. Recent major maintenance and repairs include gate and lift replacements, dewatering and inspection of Locks 14 and 15, guidewall repair at Lock and Dam 15, and anchorage replacements across multiple locks. Even though the USACE has been able to tackle a backlog of major maintenance, much remains to be done to restore the safety, efficiency, and reliability of locks and dams along the UMR.

Condition

The average age of the locks and dams in Iowa is 85 years old (with an average age of 77 years old for UMR locks), or 35 years past their intended design life. The oldest locks and dams in Iowa were put into operation in 1922 and the newest, Lock 19, was put into operation in 1957. The age of the system is resulting in deteriorating infrastructure that requires locks to be closed so maintenance and repairs can be completed. Unexpected lock closures have generally trended down over the past decade. The average hours of unexpected closure from 2010 to 2020 was 3,881 hours across Locks and Dam 9 through 18 and has trended downward over time (note data was unavailable for the years of 2021, 2022 and excludes Lock 19). The minimum unexpected closure delay time occurred in 2020 with 325 hours and the maximum occurred in 2019 with 7,527 hours due to a substantial 96-day flood event.

The dike and revetment structures on the Missouri River require continual maintenance. There is a substantial fluctuation in annual cost to maintain these structures and cost is typically dependent on peak water levels. The structures are considered to be in acceptable condition to facilitate barge movement and provide a stable channel for the Missouri River. However, the exact condition is not well identified and more attention should be paid to this river as shipping traffic increases due to the recent port investments.

Funding and Future Need

The USACE programs and projects are funded annually by the federal government. Federal funding from general revenue sources provides 100% of routine operations and maintenance and major maintenance costs, while capital improvement, major rehabilitation, and new construction projects are funded with a 65/35 split between the Inland Waterways Trust Fund (a 29 cent-per-gallon tax on barge fuel) and General Fund from the federal government. Appropriated federal funds are not sufficient to support all of the current and future needs of the navigation system. Even without long-overdue reinvestment in navigation infrastructure, small-scale rehabilitation and reliability improvements on Locks 9-19 must be made in order to meet current and future traffic demands. As of 2022, approximately $948 million of investment is needed to address the backlog of maintenance and major rehabilitation for the locks along Iowa's borders. Based on limited funding available to clear this backlog, projects listed as high priority are funded first.

Locks and Dams in Iowa are managed by two separate USACE districts: St. Paul and Rock Island. Federal funding for operations and major maintenance in the Rock Island and St. Paul Districts has fluctuated substantially in the past five years. Funding for the Rock Island District reached a 10-year high in 2018 at approximately $93 million, but hit a 10-year low by 2020 at just over $61 million. Since then, funding for the Rock Island District rebounded to an average of approximately $74 million. Research has indicated the inconsistent and incomplete funding received each year for inland waterways can lead to inefficient projects and add upwards of $229 million to the cost of one project.

In 2009, NESP authorized 1,200-foot lock chamber capacity improvements on UMR waterway infrastructure downstream of Iowa (Locks and Dams 20 – 25). As part of the Infrastructure Investment and Jobs Act in 2021, work on Lock and Dam 25 authorized by NESP was appropriated funding for the construction of a new, secondary chamber to accommodate tows of 1,200-feet. Once all new locks authorized by NESP are completed, that investment moves the choke point north to Lock and Dam 18 along Iowa's border, as all locks south will be 1,200-foot chambers. As this chokepoint moves further north, Iowa will economically benefit from increased cargo movement due to shortened shipping times and decreased costs.

Public Safety

Waterborne freight transportation has the lowest fatality rate and is the most energy efficient when compared to other modes of transportation. No fatalities have been reported along the Mississippi or Missouri River in the past 10 years, though 22 crew members were injured. Besides that, a 2017 report by the Texas A&M Transportation Institute showed that for every barge-related fatality, there are 21.9 rail-related

deaths, and 79.3 truck-related deaths. A modern barge can transport one ton of cargo 647 miles per gallon of fuel. By comparison, rail transport moves one ton of cargo 477 miles per gallon and trucks move one ton of cargo only 145 miles per gallon. Consequently, barges have the smallest footprint of carbon dioxide compared to transportation such as trains or trucks, which have 30% and 1,000% percent more emissions, respectively. Unscheduled maintenance and decreased performance of the inland waterway system can lead to an increase in rail and truck transportation due to the loss of capacity.

Innovation

State departments of transportation can improve their investment on these inland waterways through innovative funding approaches. For example, in recent years, the Iowa DOT and the USACE have been working together to develop a contributed funding agreement, which would support the construction of a mooring cell near Lock and Dam 14. Some of these funds were from available federal freight funding allocated to the Iowa DOT.

Recommendations

- Encourage USACE to use risk-based decision-making processes to prioritize inland waterway funding.
- Advocate for increased and reliable funding to keep the existing system operating at or above acceptable levels of service reliability and identify ways to expand Iowa's role.
- Urge Iowa representatives and inland waterway interest groups (agriculture, barge operators, shippers, and environmental stakeholders) to drive legislation in Washington, D.C., to address funding and legislative changes.
- Initiate a study to investigate the cost-benefit of providing more consistent and reliable navigation channel depths on the Missouri River to facilitate increased transportation utilization of the waterway.
- Continue to fund NESP projects south of Iowa to increase the competitiveness of the waterways.
- Increase awareness of the value of inland waterways throughout Iowa.
- Streamline the administrative processes required for non-USACE entities to invest in inland waterway infrastructure (e.g., departments of transportation).

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Lock and Dam 15 on the Mississippi River

LEVEES

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Executive Summary

There are 181 documented levee systems totaling 862 miles in Iowa. These structures – either earthen embankments or concrete and steel floodwalls – protect an estimated 55,000 buildings with an associated property value of $32.2 billion. Most major levees in Iowa are currently functioning adequately when exposed to normal storm flows, but there are serious concerns about levee stability during major rain events. This is especially true in rural areas, which are struggling to obtain state and federal grant dollars or raise required matching funds. Flooding is a major concern no matter where you live in Iowa; Presidential disaster declarations were issued in 16 of the 25 years between 1997 and 2021, for a total of 26 times. Each of those disaster declarations applied to multiple counties at once, and communities have begun to respond by investing in flood infrastructure on a watershed approach rather than piecemeal. Coordinated strategies can't come soon enough; it estimated that Iowa needs $10 billion of flood and watershed quality improvements.

Background

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 flows into the Mississippi River at a point downstream from the state of Iowa, making all of Iowa a part of the Mississippi River Basin. A large portion of the levees within Iowa are located along these three rivers that border the state. Other levees exist in 18 interior counties of the state such as those in the Des Moines, Waterloo, Iowa City, Cedar Rapids, Amana, Coralville, Marshalltown, Ida Grove, Red Oak, and Ottumwa areas.

By definition, levees are earthen embankments and floodwalls are concrete and steel structures both built along water courses that are intended to reduce the risk of flooding or convey water flow. Historically the majority of the early levees built in the Midwest were constructed to protect agricultural interests.

Currently there is no single agency with responsibility for nationwide oversight of levees. However, federal regulatory interest in flood risk management has been established for over 100 years. The US Army Corps of Engineers has been involved in the design and construction of levees that have federal interest since the 1920s.

The Iowa Department of Natural Resources regulates permitting of new levees or levee modifications via state flood plain development permits in drainage areas greater than 10 square miles for rural areas and in drainage areas greater than 2 square miles for urban areas. Some levees also require a permit from the local floodplain manager.

The National Levee Safety Program, authorized by Congress in 2007 as part of the Water Resources Development Act is led by the USACE and the Federal Emergency Management Agency. They have been tasked with developing National Levee Safety Guidelines by late 2023. At this time, there is no single engineering standard for the design of levee systems or the amount of flood risk reduction a levee must provide. In the absence of a national standard, the 1-percent-annual-chance flood has become the de-facto minimum design standard for levees in many communities because of the savings on flood insurance it can provide to residents living behind the levee.

Capacity and Condition

Of the currently 181 documented levee systems in Iowa, the National Levee Database lists a total of 77 systems under USACE authority and 104 known levee systems not covered by USACE authority. The majority of Iowa's levee systems were built in the 1950's and 1960's. The average levee system age is 53 years and only 30.4% of those systems have been accredited, meaning FEMA has determined a levee's design, data, and documentation meet the requirements to reduce the base flood hazard. Iowa's documented levee systems are estimated to protect over 55,000 buildings with an associated property value of $32.2 billion.

In the larger urban areas of Iowa, the condition of levee systems and the protection they afford is slowly improving. The improved conditions can be attributed to two major factors. First, USACE currently inspects a major portion of levees in Iowa, utilizing a qualitative risk assessment, and is improving communication of inspection findings to local sponsors so that they can take effective action. Secondly, municipalities are reinvesting to keep the condition of their levee system satisfactory, whether it be to maintain their FEMA accreditation or their USACE accreditation status.

Based on the impact of flood damage that has occurred over the past 15+ years, multiple cities in Iowa are in the process of conducting flood management studies or completing long term flood mitigation projects including Davenport, Cedar Rapids, Coralville, Dubuque, Des Moines, and Cedar Falls.

Funding

In 2014, Congress authorized the establishment of the National Levee Safety Program. Through the passage of subsequent legislation, Congress has made significant improvements in authorizing USACE to be better able to measure the overall integrity of levees around the country. However, Congress has fallen short in appropriating adequate funding to programs which would allow municipalities to leverage federal funds for improving or expanding levee systems.

Some municipalities in Iowa have been able to secure federal funds for levee construction, but only after a long and complex grant process. On a national basis, only projects with high benefit-cost analysis ratios tend to receive federal levee grant funds and it can often take a decade or more for municipalities to secure funds.

The recently passed Infrastructure Investment and Jobs Act and the 2022 Disaster Relief Supplemental Appropriations Act did provide USACE additional funding. In Iowa, $50 million for FY22 and FY23 was allocated by USACE to exclusively support reservoir projects to address priority backlog maintenance and provide additional flood control capabilities beyond levees. In addition to USACE funds, FEMA also offers funding through grant opportunities such as the Hazard Mitigation Grant Program and Pre-Disaster Mitigation Program. Hazard mitigation funds for the HMGP are distributed on the state level but can only be accessed after a qualifying storm damage event. PDM funds are nationally competitive.

Investment in mitigation projects before major disaster events occur can avoid significant for future repair costs. A recent study by the National Institute of Building Sciences concluded that mitigation funding can avoid $6 in future disaster recovery costs for every $1 spent on hazard mitigation. A 2009 FEMA and Iowa Department of Homeland Security and Emergency Management joint study reported similar results. Of the nine flood mitigation projects that were constructed between 1993 and 2008 for a total of $2.6 million, the total value of the losses avoided for studied projects was $52.9 million. This equates to a return-on-investment value of 18.9. Despite the demonstrated value of pre-disaster mitigation projects, use of FEMA grant funds for levee improvements or new construction continues to be restricted, in part due to FEMA policies and in part due to the USACE's historical role in regulating levee construction.

FEMA's Flood Mitigation Assistance grant program that can be used to reduce or eliminate the risk of repetitive flood damage to buildings insured under the National Flood Insurance Program, including localized flood control projects. Unfortunately, no applications were submitted from the State of Iowa in FY 2021. For FEMA's Building Resilient Infrastructure and Communities FY 2021 grant applications, eight Iowa grant applications were approved for a total amount of $1.1 million out of $993.5 million available nationally. The recently passed Infrastructure Investment and Jobs Act adds significant funding to FEMA's flood mitigation grant programs which should help Iowa communities better access these federal funds.

Within the State of Iowa, the Iowa Flood Mitigation Program is the primary source of funding for levee construction and maintenance. This program was created to assist local governments in their efforts to break the cycle of repetitive damage caused by flooding. The program is intended to reduce or eliminate the risk and effects of flooding by providing funds for

flood mitigation projects that otherwise would not be funded. An eligible project "means the construction and reconstruction of levees, embankments, impounding reservoirs, or conduits that are necessary for the protection of property from the effects of floodwaters and may include the deepening, widening, alteration, change, diversion, or other improvement of watercourses if necessary for the protection of such property from the effects of floodwaters."

Three funding sources support the program:

- Sales tax increment funding is based on the amount of increased sales tax revenue within a governmental entities' boundaries.

- The Flood Mitigation Fund consists primarily of funds appropriated by Iowa General Assembly.

- The Flood Recovery Fund (created in 2019) consists of Iowa General Assembly appropriations for counties that recently experienced a Presidential Disaster Declaration.

The Iowa Flood Mitigation program is managed by the Flood Mitigation Board. Through 2021, the Board has approved 10¢ sales tax increment/Flood Mitigation Fund projects for a total of $1.38 billion, with $889 million expended. The Board has approved 32 Flood Recovery Fund projects for a total of $14.3 million, with $21.7 million expended.

Future Need and Innovation

The Iowa Watershed Approach is a collaborative program that brings together local, state, federal, and private organizations to work together to address factors that contribute to increased flood risk and poor water quality. The IWA advocates for an Iowa that voluntarily engages stakeholders throughout a watershed to achieve common goals, while moving toward more resilient infrastructure and mitigation of flood hazards. It has been estimated that Iowa needs $10 billion of flood and watershed quality improvements. To affect meaningful change, comprehensive watershed management strategies must be universally adopted and become the norm.

With the improvements in flood modeling capabilities over the past several years, new types of reliable analysis are now possible such as levee breach and inundation studies, along with the Iowa Department of Natural Resource's base two-dimensional hydraulic modeling that will help improve the accuracy of future Flood Insurance Rate Maps and probabilistic analysis for graduated risk assessment. These types of studies are valuable in predicting rates of increasing water depth during a flooding event or after a levee is breach or overtopped. This data can then be used to support emergency preparedness planning and predict the amount of time available to evacuate people living or working within the flood zone or breach impact area. The data is also valuable to emergency management personnel who use it for pre-disaster planning such as creating more effective evacuation plans. Most importantly, accurate modeling data that can provide accurate risk assessments allow levee sponsors to make cost effective risk management decisions and more effectively communicate flood risk to the public.

Public Safety and Resilience

Levees are a vital piece to the success of our statewide economy. Valuable farmland, urban, and rural areas are protected by levees within the state. As we have seen from past experiences, failure of levees inevitably leads to significant property and crop damage and sometimes loss of life. Vital types of infrastructure such as roadways, hospitals, schools, railroads, drinking and wastewater facilities, and power plants also depend on the successful performance of levees in Iowa. In many cases levees were originally constructed to protect farmland, but over time these protected areas have been developed and the levees are now protecting large urban communities, making the consequences of a levee breach and/or failure devastating.

If trending data on climate change patterns in Iowa hold true in the future, the state will be facing more intense rainfall events along with annual increases in precipitation. The Fourth National Climate Assessment indicates annual precipitation in the Midwest has increased 5%-15% from the first half of the last century (1901-1960) when compared with the present day. Additionally, winter and spring precipitation are an important flood risk factor and

they are predicted to increase by 30% by the end of this century. This will create a "moving target" for municipalities working to keep their levee systems classified under FEMA as providing risk reduction from the 1-percent-annual-chance flood. The predicted increase in precipitation patterns will only further increase the importance of levee systems to municipalities and the extent to which they are relied upon for flood risk reduction. Continued changes in precipitation patterns and events increase the importance of being able to accurately model flood flows for a given area so that levee systems can be designed to provide the intended flood risk reduction while accounting for future precipitation changes.

Recommendations

- Fund Iowa's Natural Resources and Outdoor Recreation Trust Fund. The fund was created via a 2010 referendum and could generate approximately $200 million annually through a sales tax increase.

- Ensure national agencies such as USACE and FEMA continue to track and record the ongoing changes to physical floodplain properties. It is critical that available modeling data is kept up-to-date to ensure engineers and levee stakeholders have best available information to make effective risk based decisions regarding flood mitigation projects.

- Standardize national inspection and design performance requirements for levees. The key to effectively spending limited financial resources is to ensure that municipalities can evaluate flood risk reduction options by starting with a clear understanding of the risks associated with a particular levee system. Risk assessment is best accomplished through a single set of national design standards and continuous levee assessment programs which would require periodic inspection of all levee systems in Iowa. Through this process, the NLD becomes a critical asset management tool that needs to be financially supported and sustained on a national level.

- Provide reliable funding sources for new construction, improvements, and repairs to levee systems. Flood damage is something that impacts all Iowans and is worthy of a dedicated funding source that can be leveraged by municipalities. In most locations for each dollar spent on flood mitigation in advance of a flood event, multiple dollars are saved that would otherwise need to be spent on flood damage recovery.

- Fund continued study of floodplain hydraulics to maintain accurate data sets that incorporate impacts from climate change and infrastructure activities which can cause variations in runoff rates and stormwater volumes. Iowa municipalities have no capacity to analyze changes in regional weather patterns, nor measure impacts to floodplain profiles due to infrastructure improvements that change the hydrologic characteristics of large watersheds and flood corridors. USACE and other federal agencies have the most extensive resources available to be able to integrate regional data collection assets such as those maintained by the Iowa Flood Center and Iowa State University's climate science programs. Successful integration of all available data sets on a regional and national level provides the best opportunity for civil engineers to access information that will produce the most accurate floodplain models.

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PUBLIC PARKS

C

Executive Summary

Iowa parks are extremely popular, and visitations to recreation sites across the state have steadily increased since 1995. In 2021, visitations rose to a record 16.6 million. With significant increases in outdoor and park uses, investment is needed to manage and maintain the parks. Unfortunately, a 2019 report noted that funding for Iowa's park operations and maintenance fell from $6.6 million in 2010 to $5.7 million in 2019 – a 26% decrease when adjusting for inflation – before ticking up modestly to $6.2 million in 2021. In 2017, the Iowa Association of County Conservation Boards identified a $664.4 million backlog of infrastructure, maintenance, expansion, and resource protection needs for parks and recreation entities across the state.

The Iowa Water and Land Legacy has identified $44.5 million in shovel ready recreational projects that are stalled due to lack of funding. Fortunately, the state legislature can take immediate action by funding the National Resources and Outdoor Recreation Trust Fund, which 63% of voters approved.

Background

Like many other infrastructure networks in Iowa, the outdoor recreation system consists of multiple components overseen by various jurisdictions and organizations. National, state, regional, county, and local municipalities each have systems of parks, lakes, playgrounds, trails, etc. These systems can be independent of each other, or influence the system as a whole, both physically and economically. Recreation areas can include all types of infrastructure, including roads and bridges, drinking water and wastewater systems, trails, and parking lots. They increasingly serve important roles in stormwater management as the number and intensity of flooding events grow.

A cursory review of recreation opportunities in Iowa results in a large list of types. Because of the variance between types, this report will focus on two main categories: recreation facilities and trails, as defined in Table 1. 1 For the purpose of the ASCE Iowa Section Infrastructure Report Card, federally owned lands in Iowa were not considered due to funding and control mechanisms beyond state jurisdiction.

Table 2 lists a sampling of the outdoor recreation opportunities available in Iowa. Due to the varying management agencies and differences in monitoring and assessment programs, data points on usage, infrastructure condition, economic impacts, and other characteristics can often be difficult to find. As such, multiple sources from public, private, and non-profit institutions were analyzed in order to identify commonalities in the needs of Iowa's recreation system.

Capacity and Condition

Capacity at parks can be measured in part by usage rates. Visitations in 2021 rose to a record 16.6 million following an upward trend dating back to 1995. With significant increases in outdoor and park uses, investment is needed to manage and maintain the parks. According to an article by the Globe Gazette/ Iowa Parks Foundation, the increase of park visitors is outpacing the amount of state park rangers. The number of park rangers statewide decreased from 55 to 35 from 1995 to 2021. This downward trend mirrors the decrease in overall funding to the recreation system, including the delay of much needed maintenance and renovations statewide.

For trail usage, the story becomes one of tracking usage patterns on local and regional scales. The Iowa Department of Transportation notes that since 64.3% of Iowa's population lives in urban areas, the majority of pedestrian and bicycle traffic happens within cities. Most residents utilize bike trails close to their home (within one mile or closer). However, trail usage for long distance recreational biking, specifically, is growing in popularity, taking users more than a mile from their residence. In 2017, Iowa DOT began work on a statewide bicycle and pedestrian long-range plan as a standalone document that builds upon the State Transportation Plan.

Definition

Recreation Facilities

Recreation areas can be outdoor spaces, parks, nature preserves, or other outdoor public areas that are used for recreation purposes.

These areas may include facilities such as shelters and restrooms, r contain amenities such as ballfields and playgrounds.

Do not include larger built structures such as concert or sports complexes unless they are directly tied to outdoor spaces for public purposes (such as an outdoor ampitheater).

EPA Classification

Trails are defined as a pathway for walking and bicycling that is separated from motor vehicle traffic.

Routes are included in trails, but are definied as a bicycle or pedestrian route that predominantly utilizes a paved shoulder or shared roadways.

Innovation and Resiliency

In a world where the climate is changing and people's interest in public spaces are increasing, green parks and trails are a great way to invest in diverse communities and regions. According to a 2017 study by Texas Trees Foundation on urban heat island management, planting 280,000 trees can result in cooling local areas by 10 to 15 degrees Fahrenheit. Parks and green spaces can also help protect and restore the health of local streams and rivers. An increase in green areas has proven to reduce the volume of pollutants entering Iowa's waterways and protected nearby communities from floodwaters, including those located on the Big and Little Sioux and the Mississippi Rivers.

Funding

In 2012, a comprehensive Iowa State University study showed that those traveling to recreation sites or participating in recreation activities spent more than $3 billion. In turn, this spending contributed to approximately 31,000 jobs and $717 million of income throughout the state. The study total takes into account revenue generated from state and county parks, lakes, rivers, streams, and multi-use trails. It is likely that recreation's contributions to Iowa's economy have only increased over the last 10 years as visitation rates have grown.

Funding sources for recreation come from multiple origins, and can vary based on both the granting and receiving agency. Federally, Community Development Block Grants provide funds for community-based needs, primarily in low income or underserved areas, and can be leveraged for parks, trails, and other recreation infrastructure. In 2022, $16.6 million was awarded to Iowa Communities. The Land and Water Conservation Fund, another federal source of recreational funding, was created in 1964 and has provided matching funds

totaling $3.9 billion to local agencies for outdoor recreation. For trails specifically, a major contributor of funds on a federal level is the Recreational Trails Program. The RTP is an assistance program overseen by the Department of Transportation's Federal Highway Administration. Between 1993 and 2017, Iowa was obligated $17.9 million for the construction and maintenance of recreational trails and related facilities.

On a state level, renewed calls for funding have generated action within the state legislature beyond the traditional funding sources. In the 2021 session, a bill was introduced to provide $3 million a year for three years in order to create a program to support vertical infrastructure projects by the department of natural resources, include replacing trail bridges, extending trail areas, and providing open-air interpretive shelters and exhibits. The Iowa DNR, itself, not only manages the majority of state recreation holdings but is a major source of recreation investment funds for local agencies. The Iowa DNR itself is funded by a combination of revenue streams. The state general fund provides 7% of its $228 combined annual budget, while the balance originates from multiple sources such as fees and federal funds. The DNR, in turn, administers multiple funds and grants, including the Recreational and Resource Enhancement Program. REAP provides funds through eight programs, some of which are grants that can be used by county and city agencies for park expansion, land acquisition, and other multi-purpose recreation developments (see Figure 1).REAP is authorized to receive $20 million per year until 2026, but each year the amount is set by the legislature. In 2022, REAP was approved to receive $12 million from the state's Environment First Fund (Iowa gaming receipts) and from the sale of the natural resource license plate.

Like the DNR, the Iowa DOT is similarly poised to administer funds to any state or local agency, municipality, county, or non-profit organization for trail infrastructure. Primarily funded by the Rebuild Iowa Infrastructure Fund, the DOT manages the Recreational Trails Program which is directed at the acquisition, construction, or improvement of public trails. The program also can be used for construction or improvement of trail amenities such as lighting, restrooms, and information centers, but cannot be used for routine maintenance. The Surface Transportation Block Grant - Transportation Alternatives Set-Aside is another Iowa DOT administered fund that, according to the DOT, is generally used for street and road projects, but, "...some Metropolitan Planning Organizations fund bicycle and pedestrian accommodations with Surface Transportation Black Grant Program STBG funding, either through standalone projects or as part of larger roadway projects."

Local sources of recreation infrastructure funding can include private donations, local referendums, property taxes, public-private partnerships with local businesses, special assessments, charitable community groups, grassroots fundraising, or leveraging of local general funds. Although multiple funding sources are available on a local level, committing funds for recreation is often a second level priority due to other infrastructure needs. However, even with budgets and staff stretched thin, many small communities have taken steps to invest in recreation opportunities by gathering funds through multiple channels. One notable funding source has historically been utilized successfully throughout Iowa is the Rails to Trails program. Administered by the Rails to Trails Conservancy, national nonprofit organization, Rails to Trails grants have been used in numerous Iowa communities to transform abandoned rail lines to recreational trails.

Figure 1 Resource Enhancement and Protection Program Citation

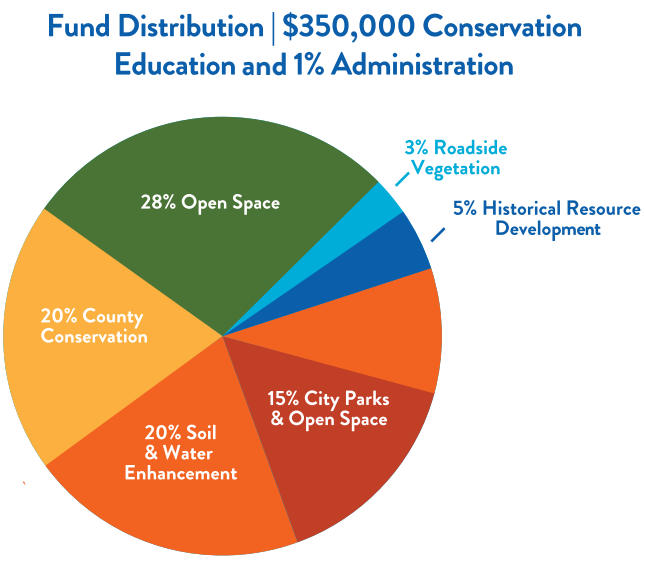
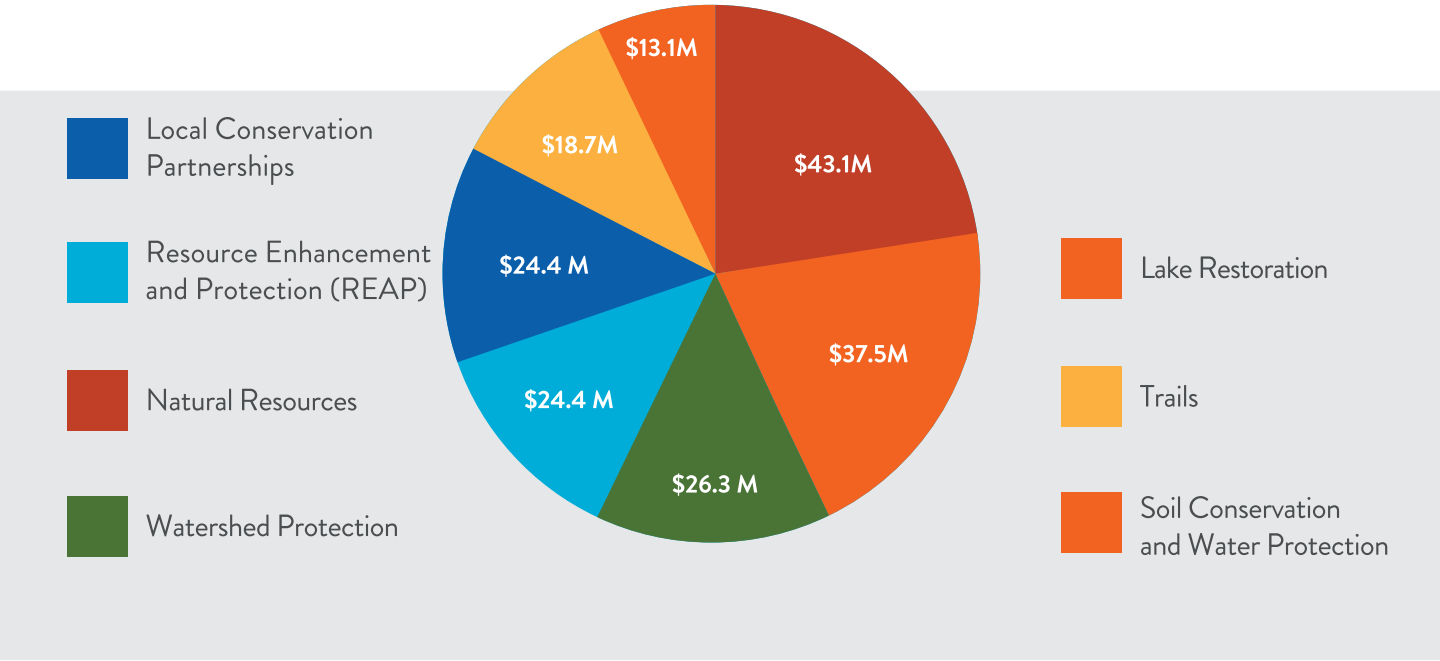


Figure 2 Natural Resources and Outdoor Recreation Trust Fund Formula



Despite multiple funding sources, a report published by the Iowa Parks Foundation noted that funding for park operations and maintenance fell to $5.7 million in 2019 from $6.6 million in 2010 – a 26% decrease when adjusting for inflation – before ticking up to $6.2 million in 2021.

One notable gap in funding could be filled by the Natural Resources and Outdoor Recreation Trust Fund. In a 2010 an amendment was voted in by 63% of Iowa Voters making the Trust Fund part of the state's constitution. The amendment put in place a dedicated funding source for Iowa's water quality and outdoor recreation through a 3/8th of a cent sales tax. No sales tax has been put in effect, and the fund remains empty. Should the Iowa Legislature vote to support the Trust, it will serve a permanent revenue source for natural resources and recreation in the state of Iowa. Funding will be split among seven categories (see figure 2).

Future Need

In 2017, the Iowa Association of County Conservation Boards reported there was a $664.4 million backlog of infrastructure, maintenance, expansion, and resource protection needs for parks and recreation entities across the state. 13 In 2021, "Iowa County" magazine reported the state remains at the "near-bottom" in the percentage of public land available and conservation investments, per capita.

The Iowa Department of Natural Resources' surveys and public listening sessions indicated a desire for consistent and increased funding for recreation. The Iowa Water and Land Legacy has identified $44.5 million in shovel ready recreational projects in Iowa that are stalled due to lack of funding. IWILL estimates it will take $23 million per year for 22 years to erase the backlog of maintenance, renovation, and growth projects in Iowa's County Conservation System. Similarly, the Iowa Natural Resource Commission notes in their 2016 annual report that the DNR faces increasing capital costs related to construction and land improvement. They estimate program cuts of 10% to 15% will be needed in the near future in order to make needed infrastructure improvements.

Like the DNR, many local and regional recreation agencies continually call for additional funding for long-term maintenance. A report by the Outdoor Industry Association notes that, "...as states add new outdoor recreation infrastructure and as visitation increases, demand for long-term operations and maintenance can

overwhelm state resources and make it hard to care for what is already acquired." This situation is similar for trails, as although there are multiple sources of financial support for planning, design, and construction, the burden of maintenance costs usually rests on local agencies.

Public Safety

An area of concern when it comes to the safety of recreational users in Iowa focuses on the condition of lakes and rivers in the state. The Iowa DNR manages routine water testing and monitoring for all of Iowa's state beaches as well as many of those managed by local agencies. According to the Iowa Environmental Council, swim advisories issued by the DNR for E. coli

levels have shown an increasing trend annually from 2000 to 2017. Advisories for microcystin, a toxin produced by blue-green algae (or cyanobacteria), follow this same upward trend from 2006 to 2017. A 2018 report by the Iowa Policy Project notes that, "...fresh analysis confirms that this serious problem is expanding. Cyanobacteria already affect recreational use of Iowa water," but is also "a looming threat to drinking water systems that draw source water from surface waters."

Recommendations

- On November 2, 2010, 63% of Iowa voters approved the creation of a constitutional amendment that created the Natural Resource and Outdoor Recreation Trust Fund. In order to fund the Trust, a 3/8 of a cent sales tax increase must be approved by the Iowa Legislature. To date, no increase has been approved, and the fund remains empty. ASCE joins many private and public groups by supporting the call to fund the Trust. Conservation and Water Protection, 23% Natural Resources.

- In order to keep up with the growing desire for public recreation areas, ASCE recommends that local and regional agencies develop data collection and monitoring efforts of already established recreation areas. By collecting usage data, local agencies and recreation departments are better equipped to monitor the success of past investments, and plan for future need.

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RAIL

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Executive Summary

Iowa's rail network consists of over 4,000 total miles of track owned by five Class I railroads, one Class II railroad, and 13 Class III railroads. Amtrak operates two long-distance routes over freight rail lines; six depots board an average of 60,000 passengers annually. A new Chicago to Iowa City passenger rail line has been awarded federal funding, with implementation split into two phases: Chicago to the Quad Cities and the Quad Cities to Iowa City. In general, Iowa's freight railroads have adequate capacity and are in good condition. However, chokepoints exist, sometimes the result of insufficient track capacity due to size and weight restrictions. Just 45% of public at-grade highway-rail crossings have flashing lights and/or gates, but the state is receiving federal funding from the bipartisan infrastructure law to improve safety at unprotected locations.

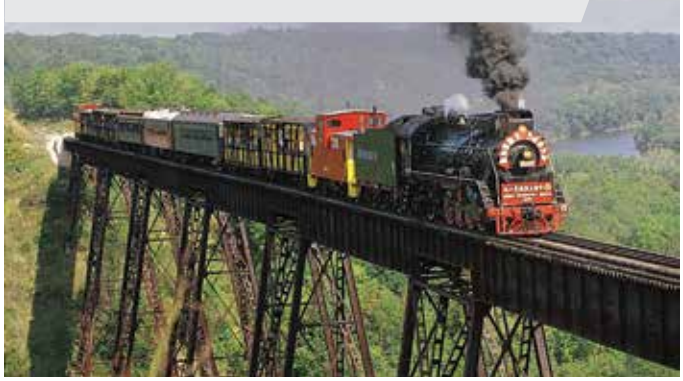
Background

Railroads have played an important role in Iowa's economy since the state was founded in 1846. While they originally served as general purpose carriers serving all citizens and businesses in nearly every community, they have since evolved into specialists that efficiently transport large quantities to and from high-volume terminals in and out of the state.

At their peak, from 1911 to 1917, some 10,500 miles of rail lines crisscrossed Iowa and handled almost all freight movement as well as a large volume of passengers. Due to competition from other modes of transportation, regulations, labor efficiency, and changes in the agricultural economy, many lines became uneconomical, leading to a decrease to the current 4,083 miles of track.

Iowa is currently serviced by five Class I railroads (revenue greater than $250 million) one Class II railroad (revenue between $20 million and $250 million) and 13 Class III railroads (revenue less than $20 million). These 19 railroads operate on 4,083 miles of track and the five Class I railroads account for 83% of the track in Iowa.

Boone and Scenic Valley Railroad



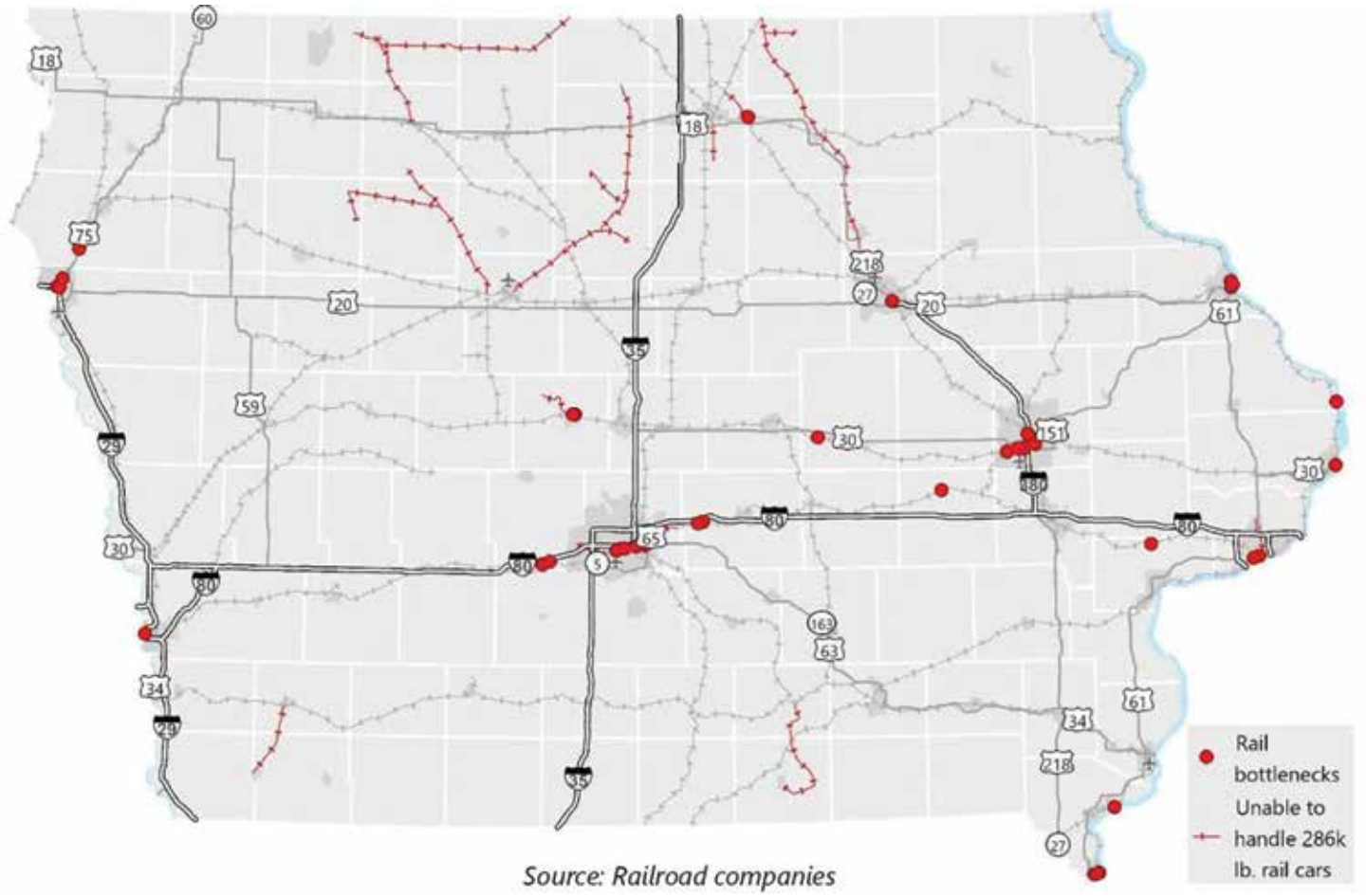
Capacity and Condition

Although freight tonnage has increased over the past decade, there has been a more recent decrease of freight tonnage. From 2017 to 2021, freight dropped from 61.8 million tons to 60.1 million tons originating in Iowa and 34.3 million tons to 29.9 million tons terminating in Iowa. Freight passing through the state was 215.4 million tons which accounts for 77% of the volume in Iowa.

The Iowa State Rail Plan (2021) and Iowa State Freight Plan (2022) include detailed lists of railroad choke points. The causes of these choke points include track congestion, operational issues, insufficient track capacity due to size and weight restrictions, flood-prone areas, and a lack of transload accommodations. The industry standard for rail car weight is 286,000 pounds (including the weight of the freight and the rail car). Track unable to handle this weight and the chokepoints are shown in Figure 1. The diminished capacity of these lines can decrease the efficiency of moving local freight, such as food products, chemicals, and farm products. Several upcoming transload projects for improving the loading and unloading of rail cars will increase the efficiency of freight moving on the rail network.

Net ton-miles and operating revenues are two factors that can indicate the condition and performance of railroad infrastructure. A net ton-mile is the revenue

Figure 1: Railroad Freight Chokepoints



Source: Railroad companies

generated by moving one ton of freight (not including the weight of the freight train cars or locomotives) across one mile. Operating revenue is the dollar amount generated from a company's primary business activity. The steady increase of both indicators to 47.4 million net ton-miles and $2.4 billion in operating revenues in 2021 shows adequate capacity of Iowa railroads and the highest revenue per ton-mile in 35 years. Figure 2 shows the performance of these indicators from 1985 to 2021.

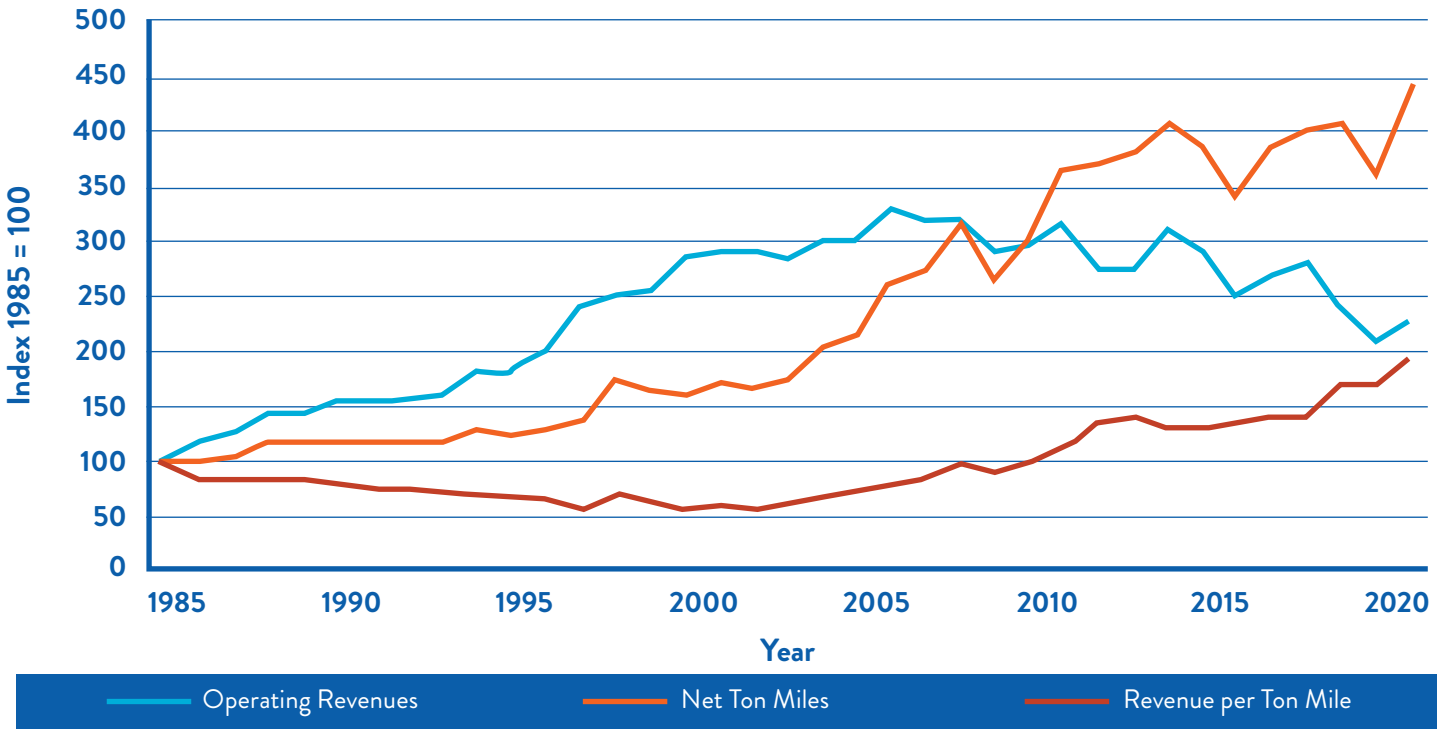
Passenger rail in Iowa has had little change in recent years, with only two long-distance Amtrak lines running through the state. Six passenger depots board an average of 60,000 passengers each year. A Chicago to Iowa City passenger rail line has been awarded federal funding. Implementation will be split into two phases: Chicago to the Quad Cities and the Quad Cities to Iowa City. The line is expected to carry 300,000 passengers annually with two daily trips traveling at 79 miles per hour. This line is expected to eventually be extended to Omaha, with speeds reaching 110 mph.

Operations and Maintenance

The increased ton-miles of freight moving across the Iowa rail network have required an increased investment in maintenance and improvement of rail infrastructure. In 2019, $166.7 million was spent on maintenance and improvements, with over $1 billion being spent in the past five years. In 2021, Iowa railroad companies totaled $2.4 billion in revenue, marking the highest revenue total Iowa has ever seen for railroads. This mark is part of a continued trend since the 1990s and includes recovery from a dip due to the COVID-19 pandemic.

Track rail inspectors have been able to identify areas in need of maintenance. Inspection and safer conditions and operations have led to safer railroads across the state. As previously shown, a trend of increased operating revenues has indicated an adequate capacity of the Iowa rail network. The steady capacity is in part

Figure 2: Performance of Rail Operations in Iowa



due to the diligent maintenance and operations of the tracks.

Public Safety and Resilience

There have been 378 crashes between highway and railroad traffic and 331 train derailments in the past decade, with a relatively consistent number occurring each year. A total of 85 injuries and 98 fatalities resulted from those crashes and derailments. In spite of these incidents, Iowa continues a more than 30-year trend of decreasing crashes, with incidents leveling off in the previous decade.

Iowa has 4,094 public and 2,441 private at-grade highway-rail grade crossings. Approximately 45% of the public crossings are actively protected, meaning they have flashing lights or have flashing lights with gates. The Iowa Department of Transportation expects $25.7 million in federal funds for eliminating hazards at highway at-grade crossings. These funds matched, with local funds, provided $28.5 million to fund 107 projects from fiscal year 2019 to FY 2023.

A study from Iowa DOT's Iowa Crash Analysis Tool identified driver behavior as the prominent challenge regarding railroad crossing safety. The typical one-mile grid pattern of Iowa roads in conjunction with increased train lengths has caused drivers to exhibit riskier behavior in order to avoid multiple blocked crossings. These risky behaviors include motorists trying to beat a train by going around gates or taking other measures in an attempt to not be delayed. In conjunction with infrastructure improvements, several education and awareness programs will continue to be implemented to decrease risky behavior and continue the trend of decreasing crashes.

Bridges continue to be vulnerable, as most in operation were built over 100 years ago. On September 6, 2022, a Union Pacific train derailed near Hampton. The derailment included 44 cars and caused liquid asphalt to spill into Otter Creek. Fortunately, hazardous material crews were able to contain the asphalt and no crew members were hurt.

Funding and Future Need

Since the rail in Iowa is privately owned, most funding come from the owners of the track. However, there are several public funding mechanisms in place to support Iowa's railroad network. These sources are a mix of state and federal funds.

The State Highway-Railroad Crossing Signal Maintenance Program and the State Highway-Railroad Surface Repair Program allocate $700,000 and $900,000 respectively to help maintain safe railroad crossings. However, the funds are inadequate for meeting the annual needs of all crossings in need of repair or replacement. In both cases, there is a backlog of projects requesting the use of these funds or the funds are divided equally for all requests depending on the rules of the funding source. A Primary Surface Repair Program for repairing railroad crossings on the state highway system is also available for crossings not eligible from the previously stated funds. As noted in the previous section, an additional $25.7 million over five years is also available for highway-railroad grade crossing signal projects.

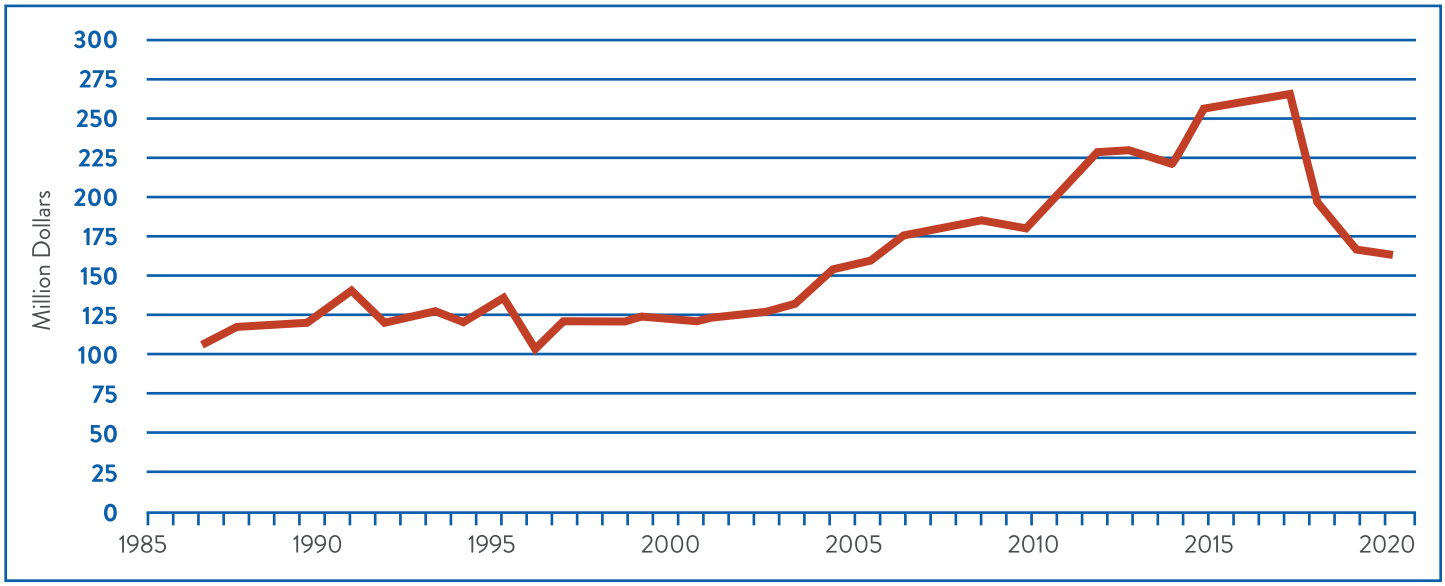
Maintenance and improvement costs of $166.7 million in 2019 and over $1 billion in the last five years make up approximately 11% of operating expenses. As shown in Figure 3, there has been some sharp decline in investments by the railroads. While there has been a recent decrease in freight movement across Iowa, there is an expected increase in the future due to anticipated growth in corn and soybean yields and ethanol production. Freight tonnage is expected to increase from 1.1 billion tons in 2015 to 1.4 billion tons in 2045.

As oil prices remain volatile, passenger rail continues to offer an energy-efficient and cost-effective alternative to automobiles and air travel. The creation of a commuter rail line between Iowa City and Cedar Rapids has been studied. The Iowa City to Chicago project has $53 million set aside for the second phase and the amount is no longer sufficient for full implementation. Conservative annual projections show growth in usage on the Chicago to Omaha line from 300,000 to 1.3 million passengers annually by 2040. Frequency of service will increase from two to seven trips per day demand. However, line expansion is contingent on funding and construction of the route from Chicago to the Quad Cities.

Innovation

Technology has also played a role in increasing the amount of freight moving across the network despite the decline of track mileage. Supply chain technology has increased efficiency, while technology such as Positive Train Control has improved safety. PTC uses GPS and onboard sensors to control the speed and location of the train. PTC can reduce the speeds of trains moving through certain corridors, resulting in no fatal accidents occurring on freight railroads since the mandatory implementation of PTC in 2020.

Figure 3: Iowa Railroad Maintenance Investments, 1987-2019



Recommendations

- Increase investment in the Iowa railroad network by applying sustainable and resilient solutions.
- Increase freight accessibility and flow by addressing known chokepoints in the railroad network and continuing to upgrade tracks to handle the industry standard of 286,000 pound rail cars.
- Continue to increase safety by funding education programs and increasing funding for programs that identify, maintain, and upgrade hazardous highway-railroad crossings.
- Further collaborate with neighboring states on regional issues and solutions to passenger and freight rail needs through regional multi-state coordination and organizations.

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Iowa River Railroad

ROADS

B-

Executive Summary

Highways are the backbone of Iowa's transportation system. A 2015 increase in Iowa's fuel tax helped improve pavement conditions statewide. Today, 25% of Iowa's roads are in poor or mediocre condition. This is an improvement since 2019, when 29% of Iowa's roads were in poor or mediocre condition. Iowa's rural roads still have deficiencies, but the state has made positive progress there too. Of Iowa's rural roads, 6% are rated in poor condition and 14% are rated in mediocre condition, compared to 15% and 19% respectively in 2019. However, there is still room for improvement. Annual congestion costs in Iowa's two largest cities account for $250 million in to lost time and wasted fuel, and truck tonnage is projected to grow by over 26% in the next 20 years. In the short term, the federal Infrastructure and Investment Jobs Act will provide approximately 30% more highway-related funding for the Iowa Department of Transportation to address capacity, condition, and safety projects. However, inflationary pressures have left a $111 million funding gap in the current highway five-year program.

Background

Iowa's economy relies on a robust transportation system to move products to a global marketplace. Iowa has over 114,700 miles of public roadway, allowing Iowa motorists to travel 33.5 billion miles annually and facilitating a significant portion of the $383 billion in commodities shipped to and from the state each year. Iowa is uniquely positioned at the crossroads of two major interstate highways: I-35 and I-80. While the size of the state's roadway system has not increased considerably in recent years, the infrastructure burden remains significant. Iowa ranks 14th in miles of roadway, yet the state ranks just 36th in population density. This network helps support Iowa's significant agricultural output.

Capacity

Over the past 20 years, travel growth has outpaced population growth; vehicle travel on Iowa's roads increased by 11% while the state's population increased by 9%. Iowa is a major agricultural producer and approximately 76% of goods rely on trucking to get to market. The primary system carries most vehicle miles traveled in the state, particularly by large trucks.

Vehicle miles traveled in Iowa increased steadily since the 1990s. However, the COVID-19 pandemic in 2020 caused significant drops in VMT. 2021 Iowa DOT data suggests a return to near pre-pandemic VMT levels, but uncertainty remains as to whether the future trend will stay relatively flat or begin to increase again. Over the last 30 years, interstates and other primary highways have accounted for 62% of the VMT on Iowa's roadway system. Interstate VMT growth has far outpaced the remainder of the system, reflecting the continued importance of these routes for intrastate and interstate freight and passenger traffic. By 2050, Iowa's roadway system is projected to move over 691 million tons of freight with an estimated value exceeding $574 billion. Goods exported from Iowa are projected to grow more than goods imported into the state or moving solely within the state, showing Iowa's continued importance as a producer state and the capacity of its transportation network.

Bottleneck Locations on the Primary Highway System - Statewide View

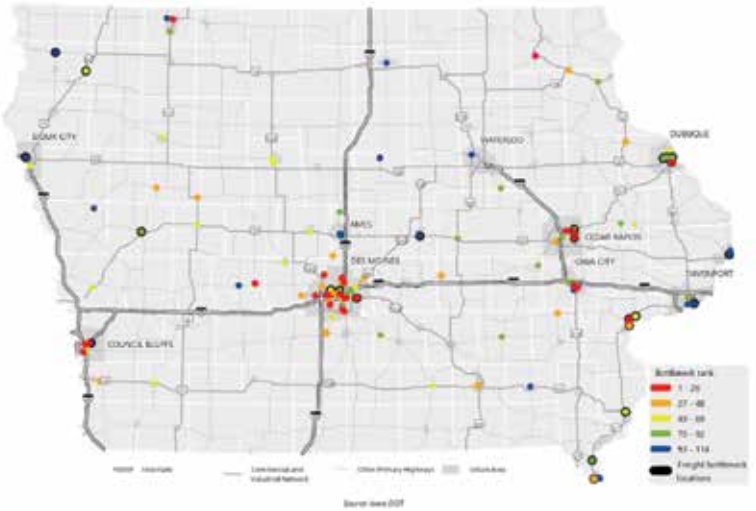
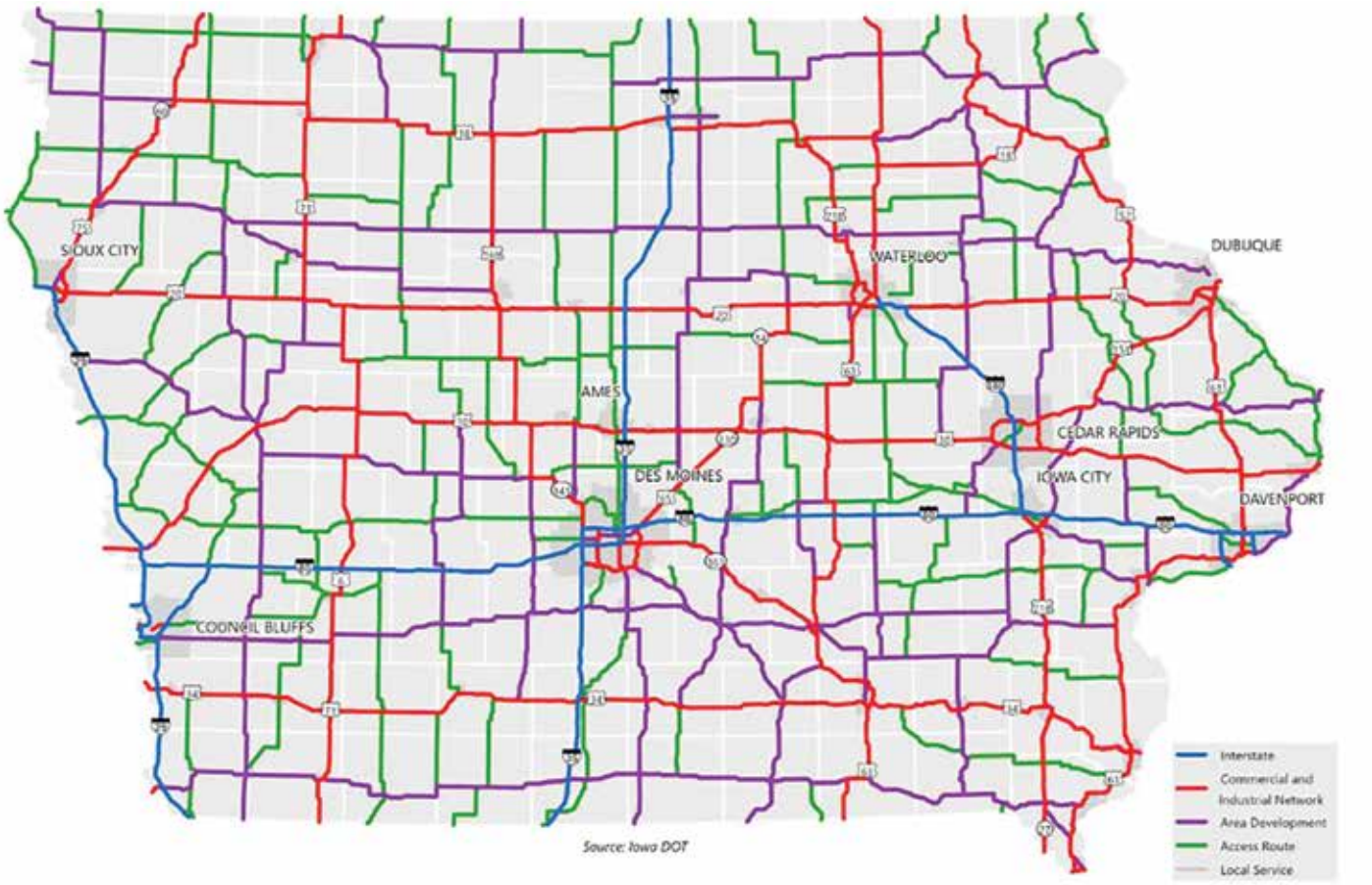


Figure 3.9: Iowa DOT Planning Classes for the Primary Highway System



Over the last 20 years, Iowa's cities grew modestly while rural communities saw their populations shrink, with 63 of 99 Iowa counties having lost population. Slow growth makes it more difficult for transportation revenues to keep up with the growing maintenance and operation needs of the state's transportation system. Iowa's population has become increasingly urbanized and concentrated around the state's nine metropolitan areas. Although average travel time to work has increased, Iowans still have one of the lowest commute times nationally.

Analysis of Iowa's primary roadway network shows limited congestion on the system. However, growth, urbanization, and freight trends are showing some primary highway segments are projected to face overcapacity by 2050. Most of these highway segments are in metropolitan areas. Annual congestion costs for Des Moines and Cedar Rapids, Iowa's two largest cities, account for $250 million due to lost time and wasted fuel. A combination of safety improvements, adding capacity, traffic management, and multi-modal solutions will need to be assessed and implemented. The Iowa DOT has already begun to address some of these interstate corridors, with significant projects programmed in the past five years.

Funding

State revenues for transportation primarily come from Iowa's Road Use Tax Fund and Transportation Investment Moves the Economy in the 21st Century Fund, which receive revenue from fuel taxes, registration fees, and other miscellaneous fees. After remaining at the same level for more than two decades, the legislature increased the fuel tax rate by 10 cents per gallon in 2015 from 21 cents per gallon to 31 cents for regular gasoline. The funding increase helped stabilize funding for Iowa's roads and was a contributing factor to the

recent condition improvements. However, as shown in Figure 6.2, inflation has since negated that increase in terms of constant dollars.

Iowa DOT's 2021 RUTF Study shows that just to maintain Iowa's existing roadway assets (stewardship cost) without adding capacity until 2050, the Iowa DOT faces a funding gap of over $158 million annually. It is estimated that revenues would cover approximately 90% of the anticipated Iowa DOT stewardship costs. This does not take into account the $4 billion funding gap of capacity needs by 2050. While maintaining the existing public roadway system is most critical, an inability to deliver capacity improvements would limit the efficiency and reliability of the transportation system and its ability to support the state's economy.

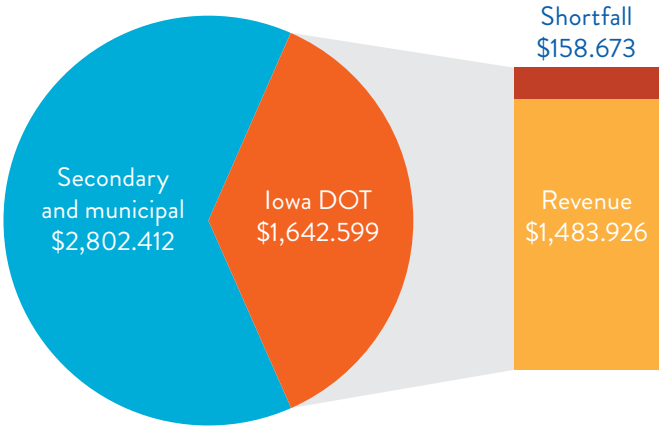
Iowa DOT also receives road funding from the federal government. The bipartisan Infrastructure Investment and Jobs Act, passed in 2021, provides an increase in federal funds of approximately 30% over 2021 amounts, as well as year-over-year increases through 2026. While this is a significant increase over past funding levels, the existing funding gap is significant, and Iowa and the nation are trying to improve roadway conditions after decades of underinvestment. Further, it is unknown whether the federal increase will be sustained beyond the time frame of IIJA.

Future Need

The passage of the IIJA can help shrink the gap needed to repair and rebuild Iowa's roads. Based on formula funding alone, Iowa is expected to receive $3.4 billion for federal-aid highway apportioned programs over the five-year lifespan of the bill. Iowa can also compete for the nearly $16 billion of national funding in the bill dedicated for major projects that will deliver substantial economic benefits to communities.

As mentioned above, the IIJA provides approximately 30% more highway-related funding by increasing revenue for existing programs and creating new ones. With state and federal funding increases, Iowa DOT's FY 2023-2027 highway program is expected to grow from $3.6 billion to approximately $4.2 billion. The Iowa DOT's primary investment objective remains stewardship

Figure 6.7: Highway average annual stewardship needs, Iowa DOT share, revenue, and shortfall, 2022-2050 ($ millions)

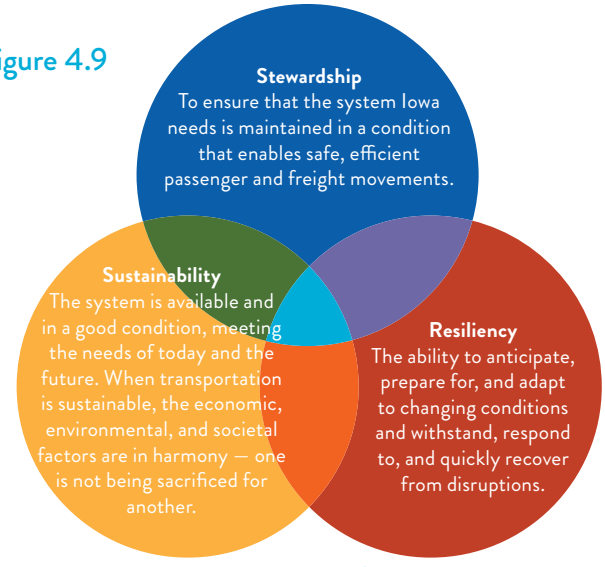


Total: $4,445.011

source: Iowa DOT

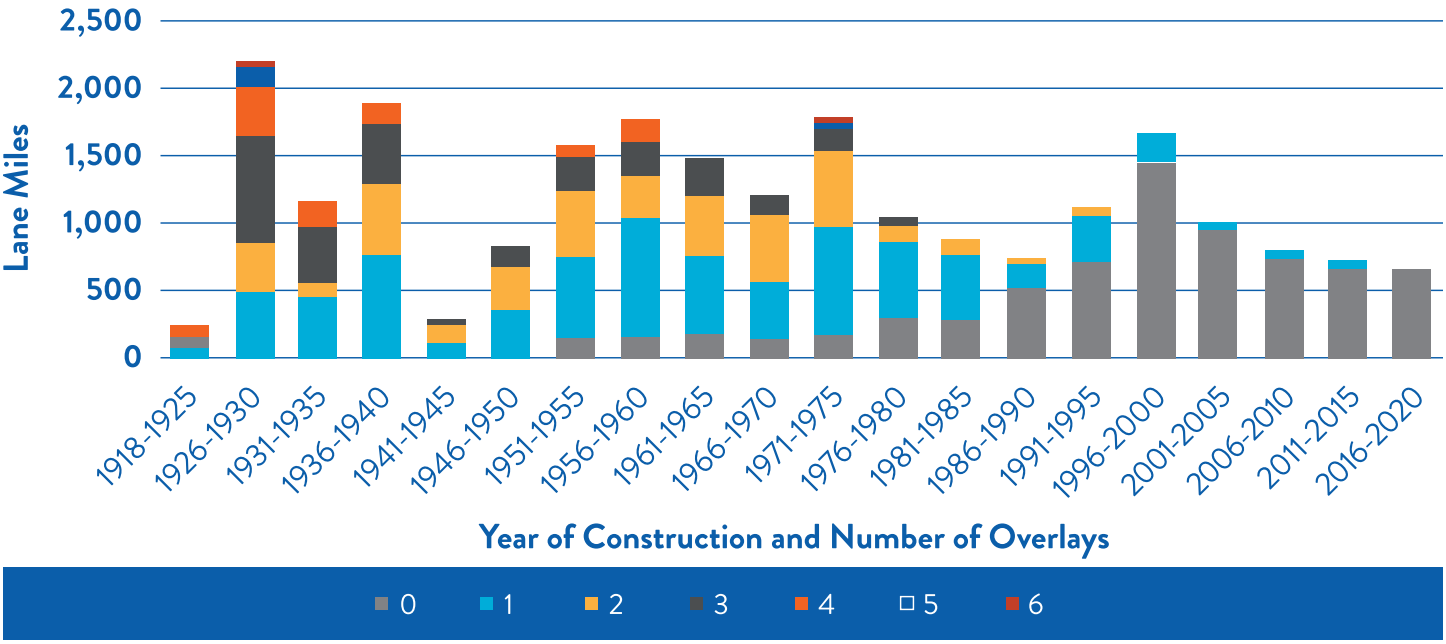
(i.e., safety, maintenance, and modernization) of Iowa's existing highway system. Over $3.3 billion is programmed from FY 2023 through FY 2027 for the modernization of Iowa's existing highway system and for enhanced highway safety features. While the IIJA has allowed several significant projects that address safety and operational needs to be included in the Iowa DOT program, large inflationary increases in construction materials and fuel required the allocation of a significant portion of the additional revenue to already scheduled projects, leaving a $111 million funding gap in the current highway five-year program. As Iowa looks to the future, they must continue efforts to look at alternative funding models that support the varied fuel and infrastructure needs of the future transportation system.

Figure 4.9



source: Iowa DOT

Figure 3.12: Year Built and Number of Overlays for Primary System Pavements



Source: Iowa DOT

Resilience

Iowa's highway system is vulnerable to disruptions in the form of natural and human-induced events. Over the last couple of decades, Iowa has been increasingly impacted by natural disasters, including historic flooding, snowstorms, tornados, and derechos. This trend is likely to increase, as climate data shows strong trends towards increasing temperatures, precipitation, stream flows, and flooding. The Iowa DOT is committed to incorporating resiliency and sustainability principles into the decision-making process and project development to further support their commitment to stewardship.

Several resiliency and sustainability efforts have been undertaken or are underway, including flood resiliency analysis of the primary highway system to identify locations vulnerable to a 100-year flood event, coordination of the Emergency Relief program, the Iowa Living Roadway Trust Fund, the concept of integrated roadside vegetation management, and a pilot study of bridges to develop a methodology to evaluate their vulnerability to climate change and extreme weather.

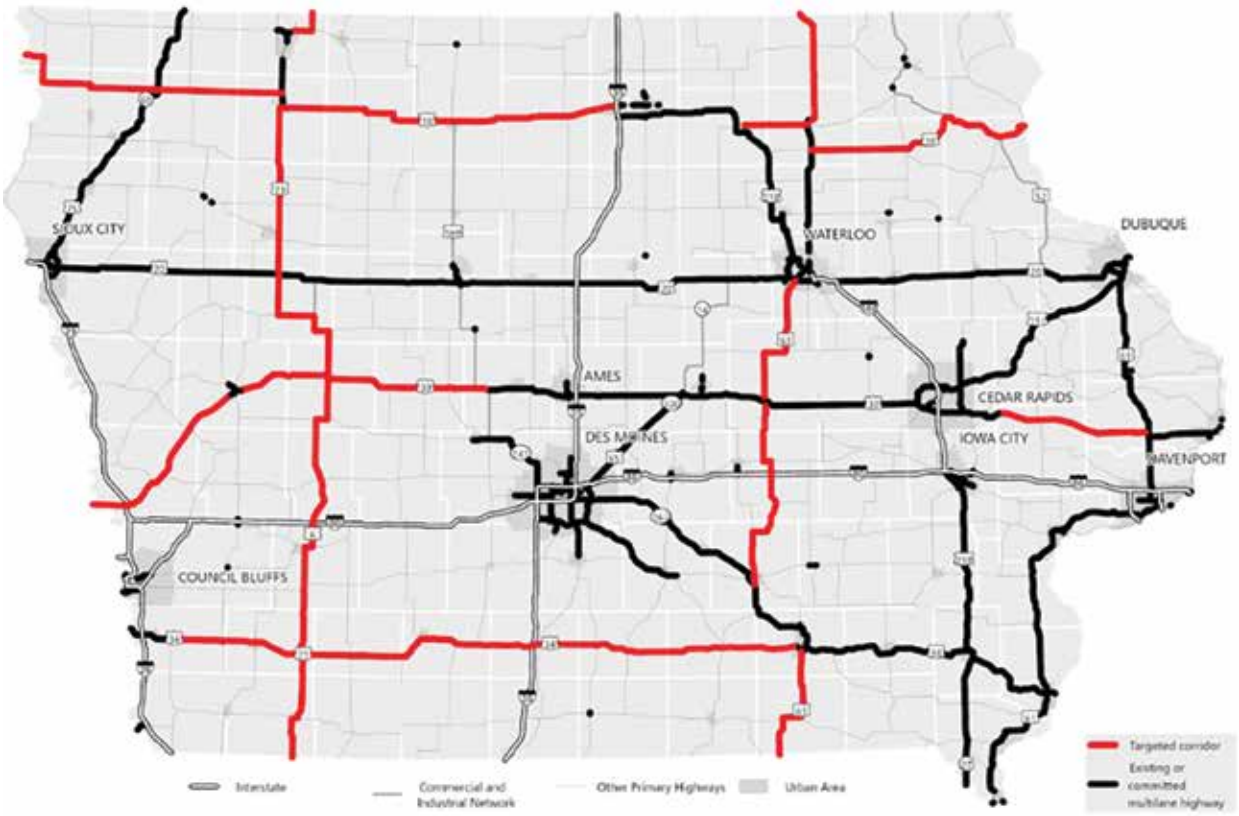
Innovation

Iowa DOT leadership has identified innovation as one of the five priority goals in their current five-year business plan, viewing innovation as an integral part of improving the organization and has committed to nurturing a stronger culture of innovation, cultivating improved processes, and adopting modern systems and technologies. The key outcomes they are pursuing include:

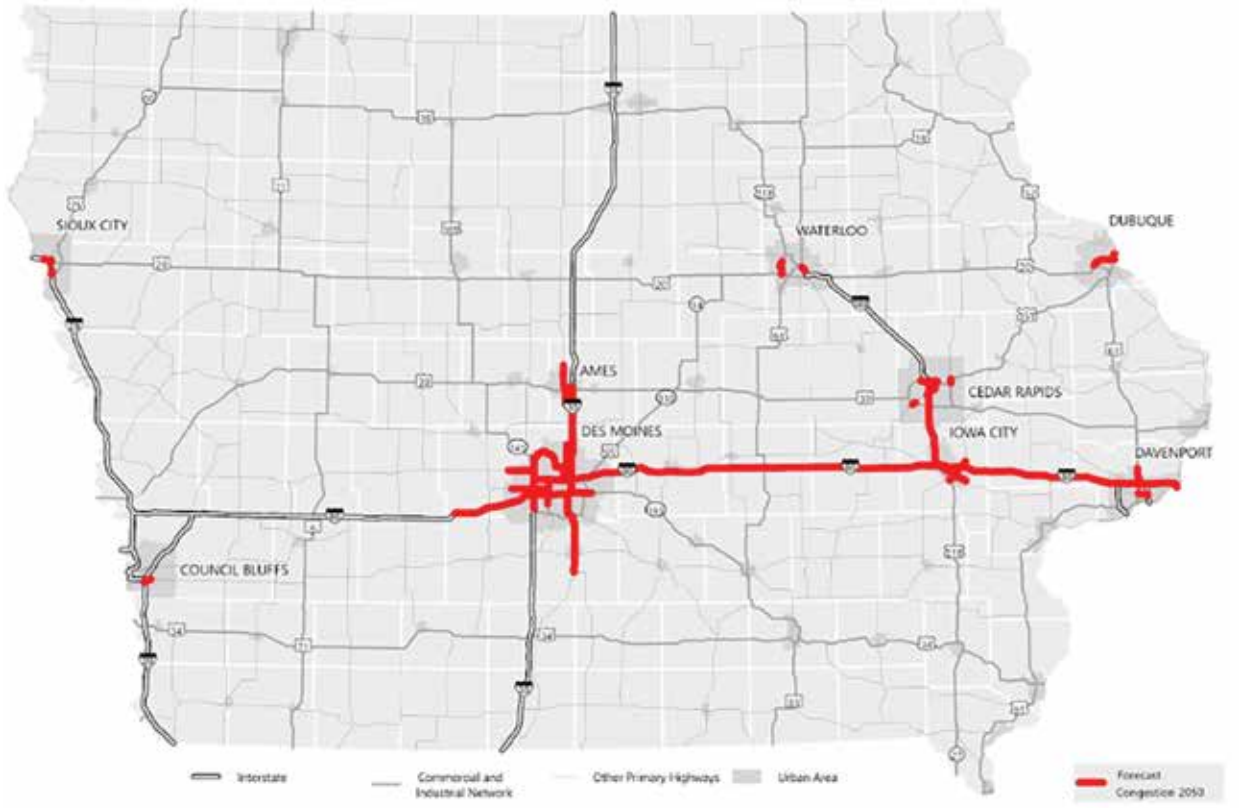
- Adopt and deploy technology solutions.
- Integrate business performance throughout the DOT.
- Implement new approaches to growing innovation.
- Support programs and initiatives to advance new and emerging technologies.
- Improve prioritization process for IT investment portfolio.
- Modernize business systems.

Examples of innovative techniques and delivery methods implemented by the Iowa DOT include digital delivery, SWAP program (federal-aid swap for state funds), e-ticketing, virtual reality for transportation projects, and implementing Complete Streets concepts into the design process.

Figure 5.16: Corridors Targeted for Mobility and Safety (Super-2) Improvements



Source: Iowa DOT



Source: Iowa DOT

Figure 2.10: Primary Highway System Pavement Age

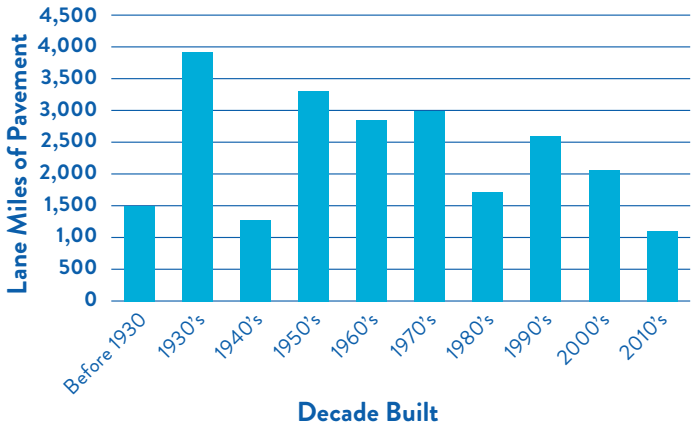


Figure 4.10: Total Crashes by Severity, 2016-2020

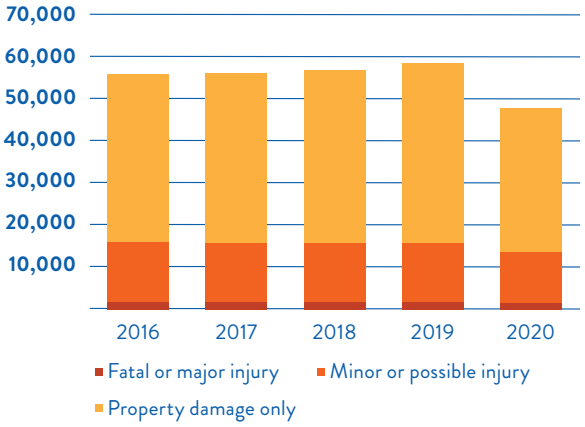
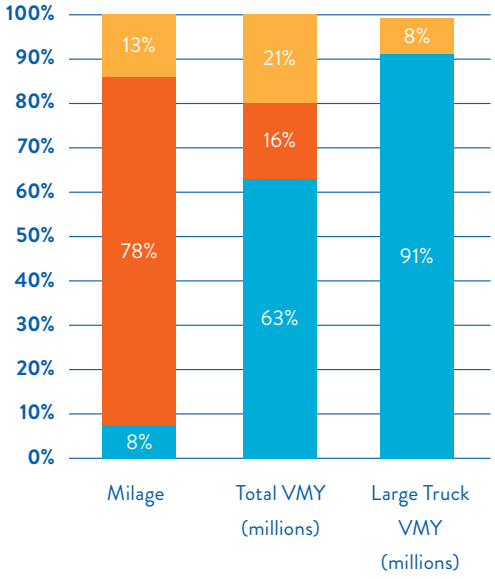
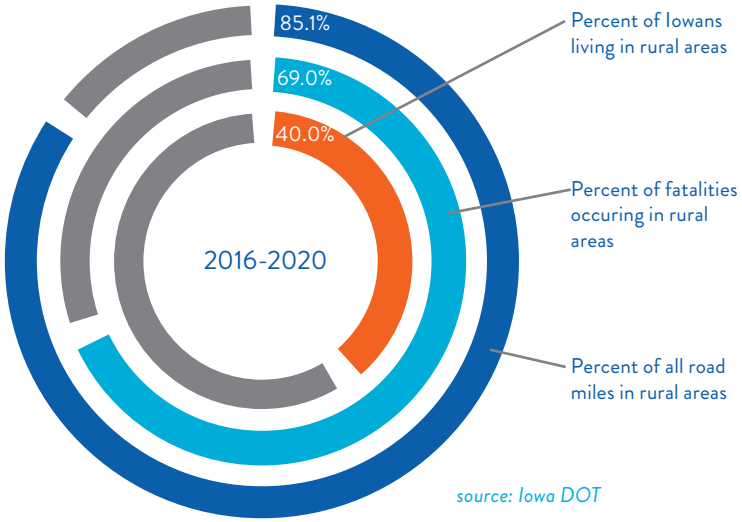


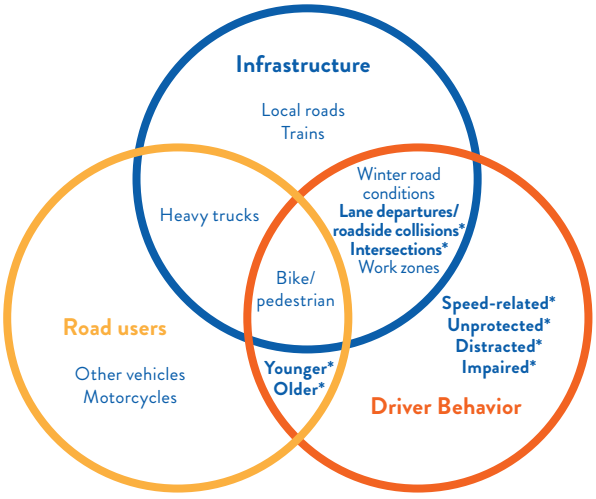
Figure 4.11: Crash Fatalities by Rural Areas, 2016-2020





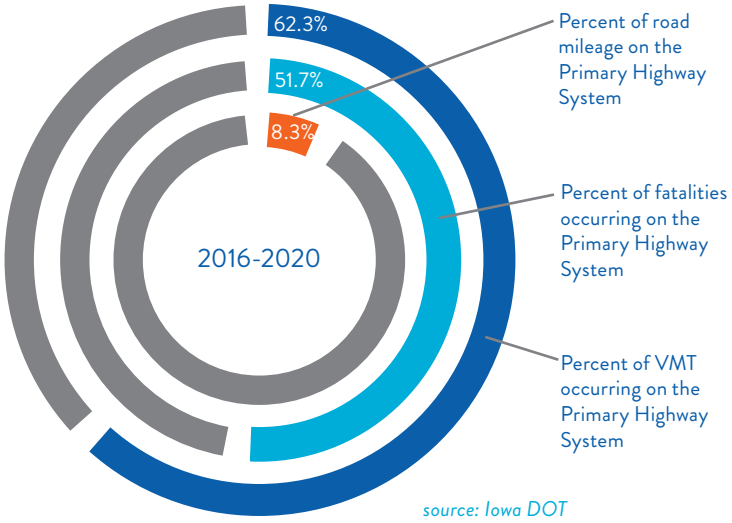
source: Iowa DOT

Figure 4.12: Crash Fatalities and the Primary Highway System, 2016-2020

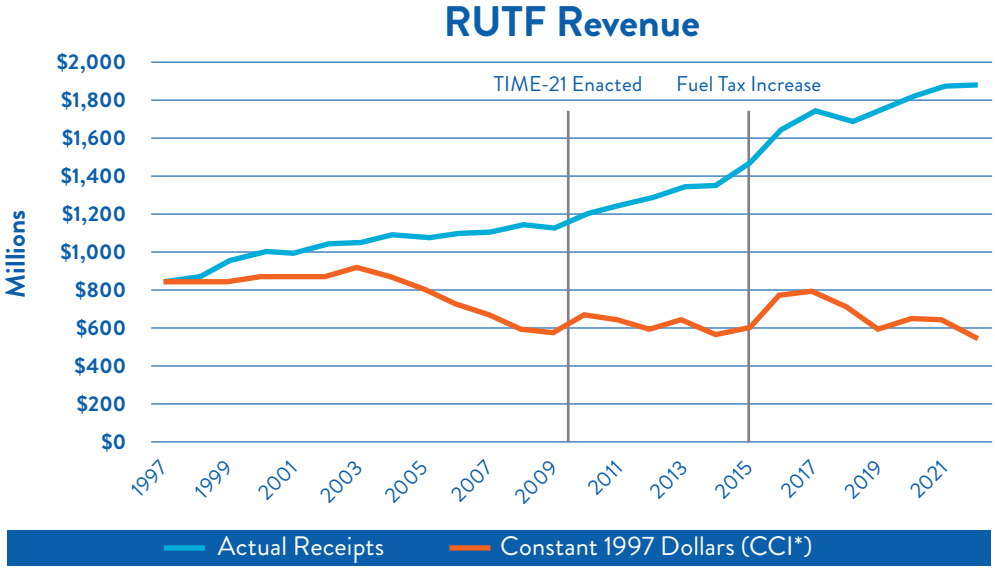


Note: the eight priority safety emphasis areas are bold and marked with an asterisk.

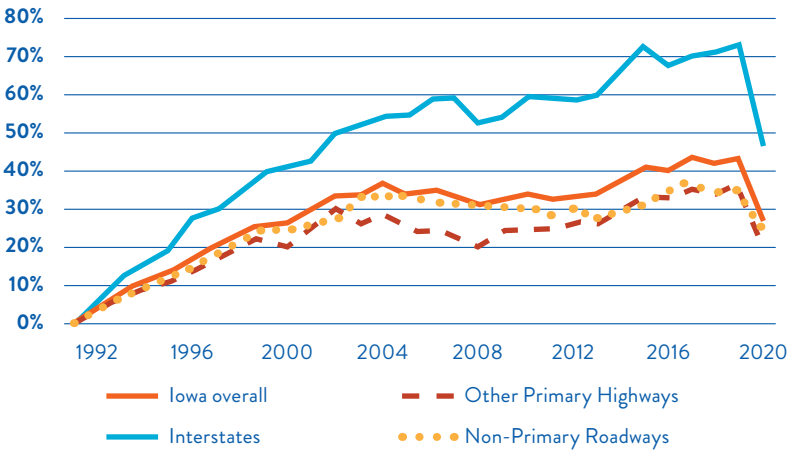
source: Iowa DOT



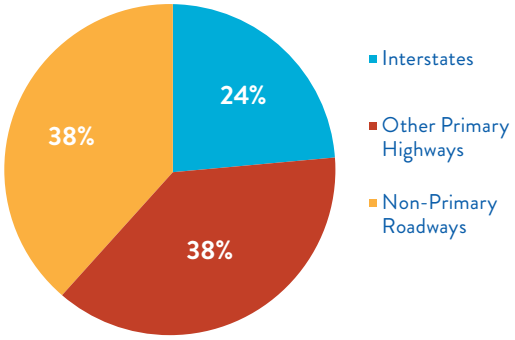
source: Iowa DOT



*CCI= Iowa Construction Cost Index. This reflects the inflation of roadway construction costs in Iowa and corresponding loss in buying power.



source: Iowa DOT



source: Iowa DOT

Figure 2.5: Pavement Inventory and Conditions

Owner	System	Lane Miles	Good	Fair	Poor	Average PCI
Iowa DOT	Interstate	3,436	57.8%	41.7%	0.5%	83
	Non-Interstate NHS	12,964	37.5%	58.8%	3.7%	72
	Non-NHS	7,225				69
	Total	**23,625**				**72**
Other	NHS	405				
	Total	**405**				
All	Interstate	3,436	57.8%	41.7%	0.5%	83
	Non-Interstate NHS	13,369	37.5%	58.8%	3.7%	72
	Non-NHS	7,225				69
	Total	**24,030**				

Recommendations

- Advance priority projects on key interstate system corridors.
- Index fuel tax rates to inflation to create a more sustainable, long-term funding source.
- Implement alternative fuel vehicle registration fee to capture an alternate means of funding beyond the gas tax so electric and hybrid vehicles pay their fair share of the transportation infrastructure burden.
- Implement the Iowa Electric Vehicle Plan.
- Address traffic congestion with increased transit frequency, freight planning, bike networks, and roadway design to prioritize those modes moving more goods and people within existing roadway capacity, transit, and active transportation.
- Explore mechanisms to keep the SWAP program in place.
- Expand use of analysis tools and benefit/cost evaluation tools.

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SOLID WASTE

B-

Executive Summary

The solid waste management system continues to provide an essential public service to the citizens of Iowa. Solid waste infrastructure includes 47 active landfill sites across the state, with one site in process of closing. On average, the landfill capacity is estimated to be adequate until 2044. Iowa's solid waste infrastructure is performing adequately, although the COVID-19 pandemic and the derecho of 2020 created a significant increase in the per capita waste generation. Iowans produced approximately 3.91 million tons of municipal solid waste in fiscal year 2021, or 1.22 tons per capita. Iowa diverts waste material from landfills through recycling and composting rates which are in the top 10 nationally. This results in 233 pounds (0.12 tons) recycled per capita per year. However, market threats to recycling programs and non-recyclability of many materials continue to present challenges that need to be addressed to maintain long-term viability. Looking to the future, new techniques and technologies have the potential to enhance solid waste management in the state.

Background

There are three basic components to the solid waste management system: collection, diversion and processing of recyclable and compostable materials, and disposal of non-recyclable waste. 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 for the citizens of Iowa.

In Iowa, the types of municipal solid waste listed under applicable regulations are listed.

- 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)

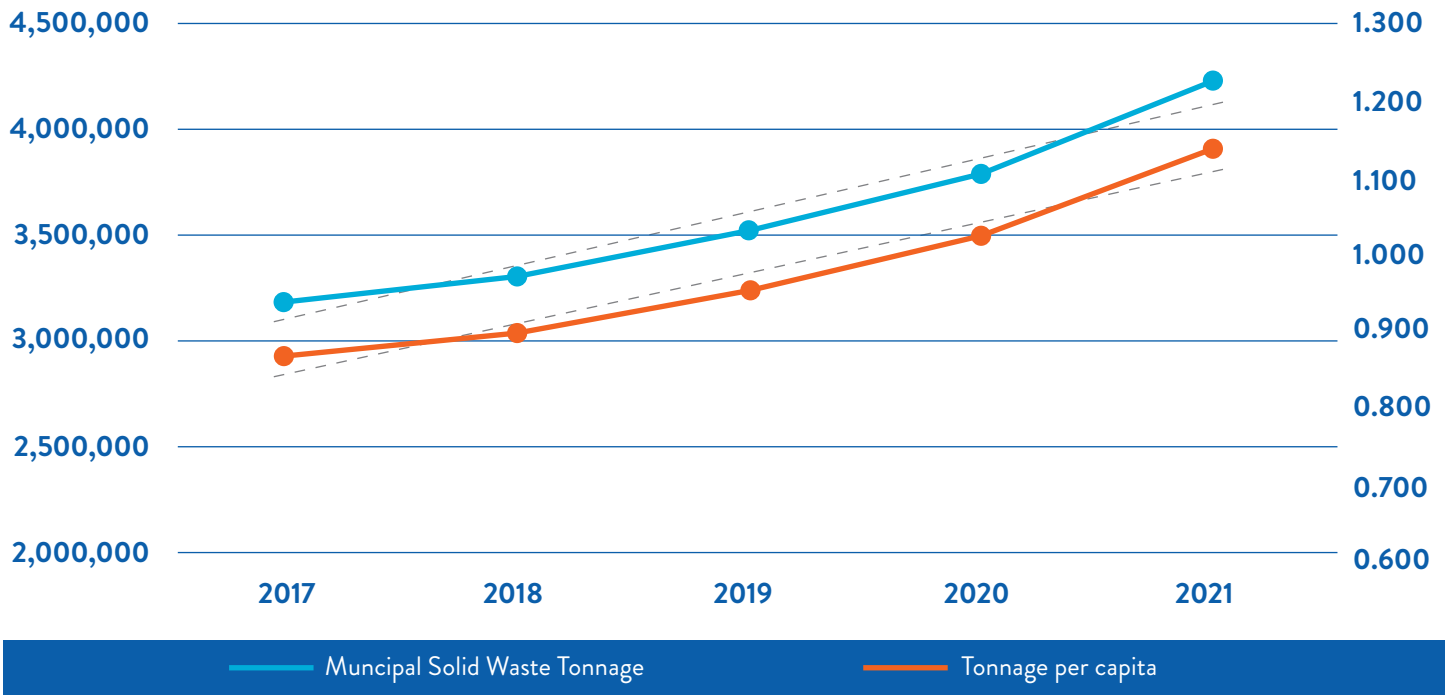
- Commercial Solid Waste: All types of solid waste generated by stores, offices, restaurants, warehouses and other nonmanufacturing activities, excluding residential and industrial solid wastes

- 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 including, but 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

- Construction/Demolition 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)

Condition

Iowa produced 3.91 million tons of MSW in FY 2021 (July 1, 2020 - June 30, 2021). The most recent years show an increasing trend of about 241,000 tons of growth per year. See Figure 1. This average growth in annual waste production is significantly higher than reported in the 2019 ASCE Iowa Infrastructure Report Card. Iowa's increases in MSW are attributed to COVID-19 and the derecho storm event in 2020. At 1.22 tons per capita, Iowans have an average waste generation rate that is higher than the nationwide average (0.82 tons per capita) and is increasing at a rate of approximately 140 pounds (0.07 tons) per capita per year.



As of November 2022, the Iowa Department of Natural Resources reports there were 47 active landfill sites with future capacity while one site is in the process of closing. In total, over 400 individual entities are granted permits by the DNR for waste disposal or handling.

In 2021, the Ball Corporation commissioned a state-by-state assessment of container and packaging recycling rates. This study indicated Iowa has a 44% recycling rate, which places it in the top 10 states. In general, recycling data can be hard to find because the DNR does not require recycling operators to report statistics. However, by way of the most recent DNR Waste Characterization Study, it is estimated over 70% of the MSW disposed of in Iowa is divertible through increased reuse, recycling, and composting.

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. Iowa still enjoys a high level of participation, with a 76% recycling rate for glass bottles and aluminum cans. However, several factors have combined to reduce this rate since 2014. The number of redemption facilities has decreased because the handling rate of one cent per container is not profitable enough. Also, the growing market of water and sports drink style beverages are not included in the program. In 2022, the "Bottle Bill" was modified to increase the handling rate to three cents per container. The bill went into effect January 1, 2023. The impacts of the modifications are yet to be seen.

The 2022 Waste Characterization Study indicates paper and organics are the largest components of MSW at 21.7% and 21.6%, respectively. Plastics are the third largest at 15.3%. Table 1 compares the waste distribution with that from the 2017 Waste Characterization Study.

Current Policies

The jurisdiction of the DNR is described in Iowa Code Chapter 455B and includes Solid Waste Disposal. (9) Additional regulations regarding solid waste disposal are included in Iowa Administrative Code Section 567, Chapter 101, which designates the DNR as the regulatory authority. 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.

Capacity

In 2007, the Iowa DNR reported the average projected remaining capacity of landfills was 37 years. If the underlying trends hold, the current projection is 21 years per each site or, in other 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 additional volume until it is 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 operating 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 for smaller landfills to invest in some of the initiatives the larger sites have implemented.

Public Safety

Typically, solid waste facilities do not pose a threat to public safety as long as cell liners, leachate conveyance, and leachate treatment systems are maintained. If those items are not functioning properly, contamination of ground or surface water sources by leachate can occur. A search of public records was able to find only one example where a nearby property was damaged by uncontained leachate. Landfills are required to biannually test groundwater around the perimeter of the landfill, as established in each landfills DNR operating permit.

Landfills produce methane due to the anaerobic break down of organic materials, such as food waste and paper. As the size of the landfill and gas production increases, gas collection may be required. This also requires a Title V air permit. There are eight Iowa landfills with gas collection systems.

Resilience

Solid waste landfills are subject to the same issues that face Iowa's other infrastructure – floods, storms, and other weather events. The review of landfill site locations and design of the sites are completed to reduce the potential impacts of natural disasters. A consistent challenge is managing soil erosion caused by lack of ground cover and precipitation events. Areas of 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 are required to address situations in a timely manner.

Table 1: Waste Characterization Studies Waste Distribution

Year	Organic Materials	Paper	Plastic	Construction/ Demolition	Other	Metals	Glass	Durables	HHM
2017	31.6%	25.5%	18.3%	5.4%	11.4%	3.9%	2.1%	1.4%	0.4%
2022	21.6%	21.7%	15.3%	14.4%	13.0%	4.5%	1.7%	7.3%	0.5%

Funding

While some landfills fund operations based on a per-capita fee, most landfills charge 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. Iowa DNR recycling programs are funded by tipping 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. 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 that the 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. The six categories the 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 to the DNR yearly reports that show efforts being made in each category, set future goals, and ways the landfill can meet them. 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. Unfortunately, adoption of EMS has been slow with only 13 of Iowa's 47 landfills participating. Operators seem to reject the amount of documentation associated with adoption of the program. Oil prices and other economic factors may have significant impacts on the market for recyclable materials. This could have the disastrous effect of drying up demand for these products and needing to return to putting them in the landfill or store them, if appropriate, until conditions improve. China, which was a major importer of US recycling materials, restricted importing of certain recyclables beginning in 2018, including most plastics and many kinds of paper. The impacts of that decision required Iowa's municipalities to begin making tough choices on whether to pay higher rates to remove recycled materials or throw recyclable goods away. Waste reduction and circular economies at the business, governmental and household level must be elevated in conversation and funding.

Innovation

According to the EPA Landfill Methane Outreach Program webpage, four Iowa landfills have implemented gas-to-energy systems where captured methane from decomposing waste mass is burned to generate electricity, to produce heat, or transport via pipelines for use in manufacturing kiln or burn operations. One Iowa landfill is converting the methane to renewable natural gas and injecting it directly into natural gas pipelines for use.

To evaluate recycling efforts in rural areas of Iowa, the DNR commissioned a study to evaluate the viability of a hub and spoke recycling system. The "hubs" of the network benefit from the value of the recovered materials they sell but they must operate and assume liability for a processing center. The "spokes" benefit by diversion of material from their local landfills and they don't have to invest in and operate a processing center. This study found that private, public, and public-private-partnership recycling facilities are widespread throughout Iowa and implementation of a DNR-incentivized hub and spoke system could actually harm the existing entities. One surprising finding of the study is that the state does not currently track the amount of recycled materials. Many of the operators are private and the state does not require a license with associated reporting requirements. This makes it difficult for planning areas to know if they are meeting the state mandate to reduce landfilled waste by 50%, through various means, including recycling.

Two innovations mentioned in the 2019 ASCE Iowa Infrastructure Report Card, recycling of asphalt roofing shingles and electronics demanufacturing, has expanded

to other facilities. An internet search did not reveal that industrial waste composting has expanded beyond the Cedar Rapids Linn County Solid Waste Agency. The DNR is currently reviewing the composting regulations. Any changes to ease burdens or perceived burdens on facility development or expansion could impact commercial and industrial composting across the state. The fluctuating price of crude oil has an effect on the market for recycled asphalt shingles which has caused at least one facility to suspend this practice.

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 placed in landfills, more efficiently use the available capacity, and improve many operational aspects.

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.

- 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 of 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. An increase in the bottle bill redemption fee and expanding the program to non-alcoholic and soft drink beverages would bring more entrepreneurs to this market. Focus should be placed on publicizing innovative practices resulting in increased use of landfill materials for waste to energy purposes. Iowa landfills could see a 58.6% reduction in MSW with the development of programs to divert and/or recycle the organic materials, paper, and plastic currently being thrown away.

- Increase awareness of the Iowa Waste Exchange: Established in 1990 by the Iowa State Legislature to divert waste materials from the landfills, it has a proven record of success. This no-cost, non-regulatory, confidential service matches institutions that produce byproducts and waste with other groups interested in using or recycling those materials. The program assists clients in saving disposal and raw material costs while subsequently enhancing our natural resources through reducing, reusing, recycling, and renewing materials. The program has diverted 4,196,030 tons of materials from landfills. This has resulted in 67,957 companies benefitting from $122,404,626 in cost savings through avoided landfill fees.

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STORM WATER

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Executive Summary

There are over 70,000 miles of streams and 117,000 acres of lakes and ponds in our state. The quality of our water bodies is directly related to the effectiveness of our stormwater management systems. In 2022, more than 55% of Iowa's assessed rivers and stream segments were impaired, with another 23% requiring more investigation before a determination can be made. Fortunately, Iowa is innovating and collaborating to clean up our natural resources. There are at least 95 stormwater utilities in Iowa, far more per capita than any other state. Utility fees exist, which help fund green and gray stormwater infrastructure projects, and generally range from $2 to $15 per month for residential properties. Additionally, 27 Watershed Management Authorities have been established, covering about 40% of the state. These organizations assess and reduce flood risk, as well as allocate funding for water quality and flood mitigation projects, among other responsibilities. To date, WMAs have implemented more than 800 projects to reduce the magnitude of downstream flooding and improve water quality. Future improvements are urgent; from 1953 to 2018, Iowa had more disaster declarations due to flooding than any other state in the nation, a trend that's likely to continue.

Introduction

Iowa's stormwater system directs runoff produced by rain and snowmelt to receiving waters. Cities across the state typically utilize gray infrastructure such as intake structures and sewer piping to convey flows, while more rural portions of the state utilize ditches, canals, drainage tiles, and culverts to handle stormwater. The effectiveness of these stormwater drainage systems helps to prevent stormwater runoff from hindering or interrupting daily life, damaging public or private property, and creating health risks to Iowans, receiving waters, and the ecosystems they support.

Background

Iowa is home to over 70,247 miles of streams and 117,000 acres of lakes and ponds. The quality of these natural resources and recreational assets is directly related to the effectiveness of the state's stormwater management systems. Of Iowa's total footprint, 1.7% of the area is considered urban, which supports 64% of the state's population. The remaining 98.3% of predominant land use is in row crop agriculture. There are 947 incorporated cities in Iowa, but more than half have fewer than 500 residents. The growth trend has been moving towards more people living in urban areas.Of the incorporated communities in Iowa, 44 are regulated under the federal Clean Water Act as Municipal Separate Storm Sewer System communities, and nine have combined sanitary and stormwater systems.

Capacity and Condition

Current stormwater infrastructure was built for the meteorological conditions of a previous time such that many components of stormwater infrastructure in Iowa are outdated, undermaintained, or unequipped to deal with current precipitation and weather patterns. Evaluating the condition of the state's stormwater system is difficult due to the various agencies and organizations that independently manage their systems. No statewide requirement or methodology exists for recording stormwater assets and evaluating their condition and capacity.

The Iowa DOT maintains a database of all multi-cell box culverts across the state and their susceptibility to sedimentation-induced capacity reductions. More than 90% of these structures contain silt and sedimentation that adversely affects capacity.

Very little data is available on the various publicly owned stormwater systems across the state. No standard strategy exists for stormwater asset identification, capacity, and condition evaluation in Iowa's municipalities. Most cities in Iowa have incomplete stormwater asset data, making it impossible to evaluate the system's overall capacity and condition.

Operations and Maintenance

Most organizations managing stormwater infrastructure have a general understanding of their stormwater system. However, only a small percentage have documented physical conditions of or complete regular maintenance of all stormwater facilities. As infrastructure continues to age, system failures and service interruption become increasingly likely without the presence of an asset management system coupled with proactive maintenance.

Public Safety

Stormwater has the potential to impact citizens in multiple ways, from being a nuisance, slowing traffic, and hindering commerce to severe property damage and even loss of life. Stormwater impacts can be separated into two main categories – flooding and environmental. From 1953 to 2018, Iowa had more disaster declarations due to flooding than any other state. In 2018, flooding in Des Moines resulted in the death of a person who was swept away in a flooded street. Most cities in the state do not experience frequent flooding that threatens life, safety, and property; however, cities do recognize that rapid development and aging, poorly maintained infrastructure increases flood risk. And there are areas where chronic, long-term repetitive flooding with economic, social, and environmental damages often disproportionately affects minority communities. Many Iowa communities participate in the National Flood Insurance Program that identifies flood-prone properties within the 100-year floodplain, requiring that they carry flood insurance if encumbered by a mortgage. Even though the insurance rates are discounted, the cost can burden low-to-moderate income families who live in houses inherently devalued due to flood risk.

Flooding can also present public safety challenges due to the concentration and varied nature of pollutants released into waterways. Excess stormwater runoff can also flood sanitary sewer systems causing the overflow of sewage into the street, into basements, and into local waterways. Inadequate stormwater controls can contribute to nonpoint source pollution in the state's waterways.

A 2019 water-based recreational use survey by Iowa State University found that 65% of Iowans visit lakes multiple times each year. Unfortunately, 67% of Iowa lakes and reservoirs are impaired – they don't meet at least one standard for their intended use (i.e., for drinking, recreation, or supporting aquatic life). In 2022, more than 55% of Iowa's assessed rivers and stream segments were impaired, with another 23.3% requiring more investigation before a determination can be made. Over 50% of impaired stream segments were identified as being impaired due to bacteria. Stormwater is one of the biggest contributors to high levels of bacteria in Iowa. Cyanobacteria blooms can become harmful to humans ranging from minimal skin irritation to loss of life. Since 2011, 30 suspected cyanobacteria poisoning cases have been reported to the Iowa Department of Public Health. The bacteria can originate from improperly constructed and operated septic systems and sewage treatment plants, manure spills, stormwater runoff from land with wildlife and livestock. Identifying the source of pollutants in stormwater can be challenging. There were 97 documented fish kills between 2018 and 2020. Over 60% was attributed to agricultural related sources (i.e., animal waste, pesticides, fertilizer spills, etc.). With only 5% of Iowa communities being regulated under the federal Clean Water Act and agricultural land use largely exempt from regulation, many pollutants of concern are directly deposited into Iowa's streams and lakes via stormwater. Stronger water quality regulations statewide would directly benefit the state's aquatic resources.

Resilience and Innovation

Following the record-setting 2008 floods, the state established funding for the Iowa Flood Center, which provides an invaluable resource for flood research, prediction, and mitigation for Iowa. The IFC continues to be actively engaged in helping Iowans to understand flood risk and to prepare for flooding. They have developed cost-efficient stream monitoring – providing real-time information on watersheds, precipitation, and stream levels for more than 1,000 Iowa communities. They also maintain a library of flood-inundation maps for 30 communities and all of the state's counties.
Because over 98% of Iowa's landscape is rural, flooding

and water quality issues related to stormwater runoff can originate outside a community's corporate boundary leading Iowa to turn to a watershed approach where communities and stakeholders within a watershed cooperatively engage in watershed planning and management. To coordinate the effort, 27 Watershed Management Authorities have been established, covering about 40% of the state. WMAs are governed by a citizen board comprised of appointees from the communities and organizations that are parties to the intergovernmental agreements. They assess and reduce flood risk, assess and improve water quality, monitor federal flood and water quality programs, provide stakeholders with updates on flood risks and water quality, and allocate funding for water quality and flood mitigation projects.

In 2016, the US Department of Housing and Urban Development awarded the state $96.8 million, which served as a catalyst for the further development of the "Iowa Watershed Approach." The federal support funded a collaboration of numerous agencies, universities, non-profits, and municipalities that focused on nine specific watersheds. WMAs were formed if they did not already exist, hydrologic assessments and watershed plans were developed with the help of the Iowa Flood Center, and more than 800 projects were implemented to reduce the magnitude of downstream flooding and improve water quality. In addition, flood resilience programs were implemented to help increase community resilience to future floods.

Behind the success of the IWA and every WMA in Iowa is a watershed coordinator that is actively involved with the board, coordinates meetings with stakeholders throughout the watershed, continually engages and grows partnerships, keeps abreast of partner activities as well as state and federal policies and programs, and generally champions the WMA. Because WMAs do not have taxing authority and must rely on funds from watershed partners or state and federal grant programs, less than half of the 27 WMAs have coordinators.

Iowa Statewide Urban Design and Specifications manuals were developed to provide standardized design guidance and construction specifications across the state. Roughly 70% of polled communities utilize SUDAS manuals for stormwater infrastructure. The Iowa Stormwater Management Manual also provides design and policy guidance, promoting "green" stormwater infrastructure. This type of infrastructure tries to mimic historical hydrology and relies on natural systems for stormwater management. Since 2015, $36 million has funded the construction of green infrastructure in over 70 communities through the State's Urban Water Quality Initiative Program.

Figure 1. Green Streetscape in West Union, Iowa

Funding

Historically, public stormwater infrastructure has been funded using property tax-generated general funds which are also used for a wide variety of basic city/government functions. Additionally, tax-exempt properties and large low valued impervious paved areas do not equitably contribute funds to help maintain these systems. In a recent survey involving 76 of the larger Iowa communities, funding was identified as the most important topic.

There are at least 95 stormwater utilities in Iowa, far more per capita than any other state. Utility fees generally range from $2 to $15 per month for residential properties. Non-residential fees are typically based on a comparison of the property's impervious area to that of a residential property, providing an equitable scaling factor for all ratepayers. This methodology provides a stable funding source to address some of the community needs for programming and allows for short and long-term planning and project implementation.

The State Revolving Fund program has been primarily used for addressing point-source discharges such as improvements to a city's public wastewater treatment facility. However, Iowa's program also allows for funding for stormwater improvements that provide a water quality benefit. In addition to cities, farmers, livestock producers, private landowners, and watershed organizations can receive funding assistance for nonpoint-source Best Management Practices.

Iowa law allows a community with a sanitary sewer utility to utilize sewer utility revenue to finance sponsored projects that include BMPs for nonpoint-source pollution. These "sponsored projects" can be within or outside the community's corporate limits. With a sponsored project, the interest to be repaid is reduced with the corresponding savings added to the loan principal to fund a sponsored project. The utility's ratepayers do not pay any more or less than they would have for just the point-source improvements. The State typically makes available $10 million per year for sponsored projects. From 2009 to 2021, the SRF program has sponsorship projects in over half of the 99 counties across the state with 56 projects being completed, and 68 more under development. Iowa's SRF program does not provide funding for stormwater infrastructure projects that do not provide water quality benefits.

The Iowa Flood Mitigation Program was created in 2012 to assist local governments in their efforts to mitigate flooding. The program, administered by the Iowa Flood Mitigation Board, is intended to mitigate the risk and effects of flooding. There are three funding sources to support the program: the Sales Tax Increment Fund, the Flood Recovery Fund, and the Flood Mitigation Fund. The Sales Tax Increment Fund allows for the use of the state share of the sales tax revenues from communities with qualifying applications. The maximum state sales tax that can be diverted from the state and used for flood mitigation projects is $30 million a year for 20 years for a total of $600 million. The maximum award for any single community is $15 million per year. As of October 31, 2021, the Flood Mitigation Board had approved the use of close to $596 million in sales tax increment for 10 projects across the state that are forecasted to prevent more than $6 billion in flood damages.

In 2019 and 2020, the state appropriated a total of $36 million into the Flood Recovery Fund specifically earmarked for improvements within the 10 counties designated under a 2019 Presidential Disaster Declaration. As of October 2021, the Flood Mitigation Board had allocated all the available funding leaving an estimated unmet need of over $55 million in the eligible counties.

Future Need

Extreme rainfall events and flooding in Iowa increased during the last century by up to 20% in some areas. If that trend continues, it will amplify existing stormwater-related risks to people, ecosystems, and infrastructure. It is expected that a greater percentage of annual precipitation will fall in the top 1% of events with projections between 50% (for the mid–low scenario) and 90% (for the higher scenario). A study of the Cedar and Skunk Rivers in Iowa showed that between 2009 and 2099, the 100-year flood could

increase by between 47% and 52% in Cedar River and between 25% and 34% in South Skunk River. Without action, the frequency and impact of flooding in Iowa will increase over the decades to come. As growth continues in Iowa, stormwater management will remain important for Iowa's communities and waterways. With the two primary drivers of stormwater expected to increase (rainfall and impervious surfaces), it can be expected that the current systems will lack sufficient capacity. Additional funding and resources will be needed to repair, upgrade, or replace current stormwater systems. In addition to flooding, warmer temperatures and increased precipitation could increase the threat of harmful algal blooms and continued beach closings or even compromise public water supply systems.

Recommendations to Raise the Grade

- Continue to fund and utilize the expertise of the Iowa Flood Center.
- Provide funding planning assistance for communities to address local flooding issues.
- Provide outreach to all communities on the benefits of Green Stormwater Infrastructure.
- Promote the collection of capacity and condition information and asset management practices in communities.
- Develop and implement programming for local policy-ordinance development related to flood management and stormwater management and a training program for elected officials and city administrators.
- Expand monitoring programs to identify the source of pollutants causing beach closures.
- Provide funding to monitor and assess all waterbodies to reduce or eliminate those on the impaired list.
- Develop and strengthen Watershed Management Authorities across the state and provide funding for the employment of watershed coordinators and to implement projects.
- Regulate the pollutants discharging from agricultural land or provide more funding to incentivize and expand water quality practices and projects on agricultural land.

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WASTEWATER

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Executive Summary

Iowa residents depend on wastewater infrastructure to collect, treat, and safely distribute waste within a state bordered by two of America's most important rivers. Specific wastewater needs are difficult to report until the federal government completes a new Clean Watershed Needs Survey expected later this year. With available information, Iowa is holding steady. Since the 2019 ASCE Report Card for Iowa's Infrastructure, communities have constructed several new treatment plants replacing old structures and upgraded several treatment plants to meet more stringent limits for chemical and nutrient concentrations. Underground wastewater equipment in Iowa is often aging past their useful life, undersized for residential growth, or made of inferior materials and require costly removal and replacement: Marion, Iowa recently completed a sanitary sewer study calculated $82 million cost ($2,000 per resident) for necessary pipe system upgrades, plus other costs. Iowa received money from recent federal legislation to improve water infrastructure, but much of the spending discretion and implementation lies with localities – the results of which are yet unseen.

Background

The Clean Watersheds Needs Survey will not be released until after the release of this report card. The 2012 CWNS report (which is also the information used in previous ASCE Iowa Section Infrastructure Report Cards) showed over $2.4 billion worth of needs to the wastewater systems in Iowa. This is the main data source for an assessment of current and future needs for the system, which is normally created every four years. EPA, in partnership with states, territories and the District of Columbia, typically conducts the Clean Watershed Needs Survey every four years. Congress requires EPA to conduct the CWNS under sections 205(a) and 516 of the Clean Water Act (33 U.S Code §1375). The 2021 Bipartisan Infrastructure Law amended the CWA to direct EPA to conduct and complete an assessment of capital improvement needs for all projects that are eligible under Section 603(c) for assistance from state water pollution control revolving funds. It also authorizes $5 million for implementing the Clean Watershed Needs Survey. Data is being gathered for the current report. However, until Congress approves the report, it is not available publicly.

Capacity and Condition

While there have been many additional funding streams added to improve the system, the true impact will not be known directly at this time and even with the increase in funding, there is still a gap in funding needs. According to the most recent Failure to Act study, there was (prior to the passage of the IIJA) an expected $434 billion investment gap over the next decade across water sectors nationwide. There are also increases in regulations from the EPA such as the Nutrient Reductions Strategy. For example, the City of Marion recently did a sanitary sewer study and found that for a population of 41,000, there was a need for $82 million (cost of $2000 per person) just for the pipe system upgrades to convey the sanitary sewer. This did not include the needs and additional costs of the wastewater provided by the City of Cedar Rapids for the City of Marion.

In addition to repairs and upgrades necessary due to the aging wastewater infrastructure, improvements will be required at many wastewater treatment plants to meet more stringent discharge limits for ammonia and *E. coli* and address nutrients (total nitrogen and total phosphorous) and emerging contaminants. While these needs have continued to grow in Iowa, there has been significant progress on wastewater infrastructure improvements. Since the 2019 ASCE Report Card for Iowa's Infrastructure, Iowa communities have constructed several new wastewater treatment plants to replace the aging wastewater plants and upgraded several treatment plants to meet more stringent limits for ammonia, *e. coli* and address nutrients. Iowa has funded many of these projects and will continue to do so.

Iowa is required to assess the quality of its surface waters every two years. In the 2016 Report (last time data was used for the ASCE Iowa Section Infrastructure Report Card), 768 impairments were listed. For the 2022 report, it has increased to 785, which is 17 additional impairments. While the impairments can vary from category 1 to 5 (severity of impairment) it does not mean the water body is not functioning or cannot sustain wildlife, but that it does not meet all requirements of the Clean Water Act in some way. Not all of this can be attributed to point sources such as wastewater but is an indication that further action should be taken where it can. Some sources of the impairments are from non-point sources such as chemicals used for residential yards as well as agricultural operations, etc.

Operations and Maintenance

With wastewater lines being buried, visual observation requires remote methods such as inserting a camera in the pipe. This takes more effort than, for example, evaluation of a roadway where defects are easier to identify. It is therefore much harder to identify and estimate repair and replacement needs. Wastewater facilities have many different types of treatment systems, many of which need to be updated to meet new requirements or to be able to treat the amount of flow coming at them. In Iowa, we have a lot of smaller systems and communities due to being an agricultural state. Some of these are county and individual septic systems. While many investments have been made (not all can be measured directly), the impact of those investments has not been quantified yet.

Funding

Rate Payers

Most funding for the treatment of the wastewater is from rate payers. For a typical family that uses 600 cubic feet (4,500 gallons) per month, their bill will range from $11.06 to $76.45 with a median of $40.03 in the state of Iowa in cities with a population more than 10,000. This is only for the sanitary portion of the monthly utility bill. Most cities charge for other rates such as water (which is how most sanitary usage rates are calculated - based on the domestic water usage) as well as other monthly utility bills that go through the city.

Community Development Block Grant

"Funds awarded through this annual competitive program assist cities and counties with projects such as sanitary sewer system improvements, water system improvements, water and wastewater treatment facility projects, storm sewer projects related to sanitary sewer system improvements and rural water connections." This fund has provided over $30M in grant funding in the last four state fiscal years (2019-2022).

Iowa Clean Water State Revolving Fund

The CWSRF program has awarded Iowa communities and municipalities over $3B in cumulative wastewater loan funding since program inception in 1987. The SRF is an important resource for Iowa communities as they face a wide array of water quality improvement needs. More than 600 Iowa Communities and municipalities recognized the SRF as a great choice to finance the design and construction of quality drinking water and wastewater infrastructure. Thousands of Iowa landowners, livestock producers and homeowners have also benefited from the SRF's unique affordable financing programs." This program has provided over $1B in low interest loan funding in the last four state fiscal years (2019-2022). The SRF program has been able to fund all applications requesting SRF funding through Clean Water SRF loans. The Bipartisan Infrastructure Law includes amendments to Title VI of the Clean Water Act that made changes to the base CWSRF program. The BIL reauthorized the CWSRF for the next five federal fiscal years (2022 - 2026). The funding levels will be set by the annual appropriations process.

United States Department of Agriculture Rural Development

USDA RD is a program that targets rural areas and towns with a population of 10,000 or less. With our state being more rural this funding is especially important and this program has provided grants and low interest loan funding of over $210M in the last four state fiscal years (2019-2022). The smaller systems are harder to get the economy of scale so these smaller systems are much harder to fund with some of the previous funding.

Senate File 512 Grant Funding – Wastewater Treatment Financial Assistance Program

In the past three years, a total of 27 community wastewater projects from communities were funded by approximately $7.2 million. There should be approximately $6 million available for the 2022 funding round. The legislation is intended to provide funding through the year 2029.

American Rescue Plan Act

This funding can be used for sanitary sewer projects but this is dependent on each city and their choice of allocation among the many things ARPA money can be used for. The funds can be used for several different components and wastewater is just one of them. Some cities will get a direct allocation of money and some will get their allocation from the state so the exact amount of money each community uses on wastewater will not be known.

IIJA/BIL

This law provides $162.13M investment in wastewater infrastructure over the next five years (FY 2022 – FY 2026) through the Clean Water SRF Program ($149.38M BIL General Supplemental and $12.75M for BIL Emerging Contaminants). The law provides for a mandatory loan forgiveness requirement of 49% for the BIL General Supplemental and 100% for BIL Emerging Contaminants funds. The BIL expands the CWNS to include all capital projects eligible for CWSRF funding under the CWA Section 603(c). It also authorizes $5 million for implementing the Clean Watershed Needs Survey. In fiscal year 2022, Iowa was allocated approximately $25.3 million for CWSRF capitalization grants and for emerging contaminants.

Water Infrastructure Fund

The state is allocating $75 million for the program through the ARPA allocation of federal funding. It is investing $15 million for approximately 160 Iowa Communities that are considered unsewered and $40 million for Economically significant Projects as part of the State Revolving Fund eligible projects.

Partnership and Training Programs

There are also partnership programs and training occurring to find better solutions and to perform better. They promote wastewater treatment plan optimization for energy efficiency and nutrient reduction. The partnership is between the Iowa Department of Natural Resources, the Iowa Water Environment Association, Iowa Rural Water Association, and Iowa Wastewater and Waste to Energy Research Program in an innovative statewide wastewater optimization program. The program will generate performance data, reflective of midwestern conditions and climate, for new wastewater treatment technologies that seek approval in Iowa. The partnership aims to reduce levels of nitrogen and phosphorus and yield energy savings at Iowa's wastewater treatment facilities.

Training was provided by the Environmental Protection Agency to wastewater treatment plant operators for nutrient reduction in 2021; provided optimization training tour in Iowa in 2022 (Great Iowa Wastewater Treatment Tour).

Water/Wastewater Infrastructure Funding Coordination is an Iowa DNR/SRF program coordinated with the Iowa Finance Authority, Iowa Economic Development Authority - Community Development Block Grant and USDA - Rural Development to coordinate funding and joint funding opportunities for wastewater projects. Regular meetings are held to discuss projects, progress, milestones, challenges, and solutions.

Public Safety

Without conveying and treating wastewater it can become a major pubic health problem. In some cases sewage is simply pumped out of the sewer and in to the storm sewer instead of allowing it to backup into houses. The treatment plants are also almost always placed along a main waterway that is prone to flooding and with the increase in rainfall this is becoming more of an issue. During the recent pandemic many cities such as Cedar Rapids performed testing in partnership with others to determine the amount of covid in the sewerage.

Resilience and Innovation

There are two main components that need addressed. The first is the pipe that conveys the sewage. This sewer needs to be watertight for two reasons. One to keep the clean water out of the pipe which then causes it to be treated later and two to keep the sewer water from infiltrating into the ground water and causing issues by not treating it. This can be done by sliplining the system or even upgrading the system where the sewer may have been undersized based on todays flows.

The second is the treatment of the sewage. Iowa has the Nutrient Reduction Strategy to lower these chemicals from getting into the water. This can be done by updating the many WWTF that are not up to date and many that are not treating everything that needs to be treated. An example is Webster City that is working on updating its facility that was built in 1939. Some cities are looking at different treatment methods such as the City of Indianola. New ways of looking at how wastewater is dealt with is an important component of this issue to make it more resilient, sustainable and affordable.

Recommended Actions

Due to the current CWNS report not being released, the new needs are not known at this time, so the recommendations remain. Again, infrastructure spending for wastewater has increased in the last several years, but the true measure of the impact is not yet known.

- More aggressively address non-point and point sources of pollution from agriculture, urban stormwater runoff, sanitary, and combined sewer outflows.
- Include advances in scientific and engineering knowledge about non-point source and point source pollution and new treatment approaches.
- Allow alternative compliance strategies and innovation to achieve healthy and robust ecosystems in lieu of strict compliance with water quality standards.
- Employ strategies to use every dollar resourcefully and deploy creative solutions to infrastructure development that can implement the right projects in an efficient and economical manner.
- Recommend Congress provide funding to implement the CWA on a consistent basis.
- EPA needs funding to authorize and initiate the CWNS which has been suspended since 2012.
- Incorporate redundant systems to improve resiliency and provide capacity improvements to reduce effluent violations.
- Incorporate asset management for systems at the most cost effective life cycle cost.
- Sewer rates should be looked at to cover the complete cost of the service including but not limited to operation, maintenance, and capital needs.

This is not just a problem for cites and government but also for the everyday citizen. Many of Iowa properties are on private septic systems that may go bad at any time. Solutions are up to property owners if they are not close enough to tie into a municipal sanitary sewer system. Even if a municipal system is available, connection costs can run into the thousands.

2021 Sewer Rate Survey: All Wastewater Plants, Iowa Cities (Population 10,000+)
Prepared by the City of Ames, Iowa

0 CF	
Fort Dodge	**40.30**
Muscatine	31.27
North Liberty	31.24
Keokuk	30.38
Fort Madison	26.01
Spencer	25.93
Marshalltown	23.75
Pella	23.13
Storm Lake	22.73
Oskaloosa	21.85
Cedar Falls	21.44
Davenport	20.97
Cedar Rapids	18.07
Ankeny	18.03
Indianola	18.00
Burlington	16.98
Ottumwa	16.90
Waterloo	16.75
Waverly	15.88
Waukee	14.95
Newton	13.81
Coralville	**13.75**
Altoona	13.74
Council Bluffs	12.50
Sioux City	12.32
Ames	11.58
Pleasant Hill	11.41
Dubuque	10.85
Mason City	10.60
Clinton	9.63
Le Mars	8.51
Clive	8.16
Iowa City	8.15
Grimes	7.65
Norwalk	7.50
Johnston	6.46
Iowa Great Lakes Sanitary District	5.00
Des Moines	4.40
Marion	4.00
West Des Moines	3.77
Boone	3.00
Urbandale	3.00
Bettendorf	**2.00**

600 CF	
Oskaloosa	**76.45**
Clinton	57.78
Waukee	54.33
Davenport	53.67
Norwalk	53.41
Fort Madison	53.02
Indianola	52.36
Boone	50.82
Ottumwa	50.20
Pella	49.12
North Liberty	48.13
Ankeny	47.92
Burlington	47.36
Keokuk	47.11
Altoona	44.23
Fort Dodge	43.74
Spencer	43.58
Storm Lake	42.34
Marshalltown	42.23
Pleasant Hill	41.97
Muscatine	40.45
Des Moines	**40.03**
Waverly	38.88
Cedar Falls	36.80
Grimes	34.33
Johnston	33.21
Clive	33.04
Dubuque	32.54
West Des Moines	32.27
Newton	31.49
Coralville	31.35
Sioux City	30.79
Marion	30.34
Ames	29.34
Iowa City	28.10
Cedar Rapids	27.69
Urbandale	25.66
Waterloo	24.79
Bettendorf	23.30
Council Bluffs	21.60
Mason City	20.69
Le Mars	19.05
Iowa Great Lakes Sanitary District	**11.06**

1,000 CF	
Oskaloosa	**112.85**
Clinton	96.30
Waukee	88.12
Norwalk	84.03
Boone	82.70
Indianola	81.84
Davenport	75.47
Ottumwa	72.40
Fort Madison	71.03
Altoona	70.38
Ankeny	67.85
Burlington	67.63
Keokuk	67.18
Pella	66.44
North Liberty	65.02
Waverly	64.80
Des Moines	63.80
Pleasant Hill	62.36
Spencer	58.72
Grimes	57.23
Storm Lake	55.42
Marshalltown	**54.55**
Dubuque	54.24
Fort Dodge	54.06
Muscatine	52.69
Cedar Falls	52.16
Clive	51.70
West Des Moines	51.27
Johnston	51.05
Sioux City	49.25
Newton	49.17
Coralville	48.95
Marion	47.90
Iowa City	44.06
Ames	41.18
Urbandale	40.78
Bettendorf	37.50
Cedar Rapids	37.32
Council Bluffs	36.00
Waterloo	35.51
Mason City	30.96
Le Mars	26.07
Iowa Great Lakes Sanitary District	**15.10**

High	**40.30**
Median	**13.75**
Low	**2.00**

High	**76.45**
Median	**40.03**
Low	**11.06**

High	**112.85**
Median	**54.55**
Low	**15.10**

10,000 CF	
Clinton	**963.00**
Oskaloosa	931.85
Waukee	848.21
Boone	800.00
Norwalk	772.76
Indianola	744.98
Altoona	658.80
Waverly	648.00
Des Moines	598.35
Grimes	572.26
Ottumwa	571.90
Davenport	565.97
Dubuque	542.33
Ankeny	538.70
Burlington	523.41
Keokuk	502.00
West Des Moines	478.78
Fort Madison	476.19
Sioux City	471.93
Clive	468.44
Pella	456.25
Johnston	**452.30**
Newton	446.97
Coralville	444.95
Marion	443.00
North Liberty	442.23
Pleasant Hill	435.34
Iowa City	403.16
Cedar Falls	397.76
Urbandale	380.77
Spencer	363.42
Council Bluffs	360.00
Bettendorf	357.00
Storm Lake	349.63
Marshalltown	331.75
Muscatine	328.09
Ames	307.58
Fort Dodge	284.54
Waterloo	276.71
Mason City	261.99
Cedar Rapids	253.85
Le Mars	184.12
Iowa Great Lakes Sanitary District	**105.99**

50,000 CF	
Clinton	**4,815**
Oskaloosa	4,572
Waukee	4,226
Boone	3,988
Norwalk	3,834
Indianola	3,692
Altoona	3,274
Waverly	3,240
Des Moines	2,974
Grimes	2,861
Ottumwa	2,792
Davenport	2,746
Dubuque	2,712
Ankeny	2,614
Keokuk	2,567
Burlington	2,549
West Des Moines	2,379
Sioux City	2,345
Clive	2,334
Fort Madison	2,277
Johnston	2,236
Newton	**2,215**
Coralville	2,205
Marion	2,199
Pella	2,189
North Liberty	2,131
Pleasant Hill	2,006
Iowa City	1,999
Cedar Falls	1,934
Urbandale	1,892
Council Bluffs	1,800
Bettendorf	1,777
Storm Lake	1,657
Marshalltown	1,564
Muscatine	1,552
Ames	1,492
Spencer	1,444
Waterloo	1,349
Fort Dodge	1,317
Mason City	1,289
Cedar Rapids	1,216
Le Mars	887
Iowa Great Lakes Sanitary District	**510**

100,000 CF	
Clinton	**9,630**
Oskaloosa	9,122
Waukee	8,449
Boone	7,973
Norwalk	7,660
Indianola	7,376
Altoona	6,543
Waverly	6,480
Des Moines	5,944
Grimes	5,723
Ottumwa	5,567
Davenport	5,471
Dubuque	5,423
Ankeny	5,247
Keokuk	5,148
Burlington	5,081
West Des Moines	4,754
Sioux City	4,684
Clive	4,661
Fort Madison	4,528
Johnston	4,465
Newton	**4,425**
Coralville	4,405
Marion	4,394
Pella	4,354
North Liberty	4,237
Iowa City	3,994
Pleasant Hill	3,970
Cedar Falls	3,854
Urbandale	3,781
Council Bluffs	3,600
Bettendorf	3,552
Storm Lake	3,292
Marshalltown	3,104
Muscatine	3,082
Ames	2,972
Spencer	2,794
Waterloo	2,689
Fort Dodge	2,603
Mason City	2,572
Cedar Rapids	2,419
Le Mars	1,765
Iowa Great Lakes Sanitary District	**1,015**

High	**963.00**
Median	**452.30**
Low	**105.99**

High	**4,815**
Median	**2,215**
Low	**510**

High	**9,630**
Median	**4,425**
Low	**1,015**

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