2025 REPORT CARD FOR COLORADO'S INFRASTRUCTURE

ASCE
AMERICAN SOCIETY OF CIVIL ENGINEERS

INFRASTRUCTUREREPORTCARD.ORG/COLORADO

Cover photo: Colorado National Monument; Caspar Schlageter

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2025 REPORT CARD
FOR COLORADO'S INFRASTRUCTURE

Executive Summary

Colorado's infrastructure is at a critical crossroads. As the state's population continues to grow and climate-related challenges intensify, the systems that support daily life, from clean water and safe roads to reliable energy and resilient parks, are under increasing strain. In 2025, the Colorado Section of the American Society of Civil Engineers (ASCE) conducted its comprehensive assessment of the state's infrastructure across **14 categories**. The result: Colorado's overall infrastructure grade remains a **C-**, unchanged from 2020, signaling persistent challenges and urgent needs despite areas of progress.

This grade reflects a system that is largely functioning but shows signs of distress. Many of Colorado's assets are aging, underfunded, and increasingly vulnerable to extreme weather, population pressures, and evolving regulatory demands. Some sectors have made commendable strides, such as dams and wastewater, which saw improved grades due to targeted investments and modernization efforts; however, others, including energy, roads, and aviation, continue to lag due to outdated systems and insufficient investment.

Key findings from the 2025 report include:

- **Aging Infrastructure:** From schools averaging 41 years old to wastewater and drinking water systems exceeding their design life, aging assets are a recurring theme. Deferred maintenance and limited funding are compounding long-term risks.
- **Climate Resilience:** Wildfires, floods, and droughts are testing the limits of Colorado's infrastructure. Levees, stormwater systems, and energy grids are particularly vulnerable, underscoring the need for climate-adaptive planning and investment.
- **Funding Gaps:** Despite new legislation and federal support, many sectors; especially roads, transit, and water systems face significant funding shortfalls. For example, Colorado's roads cost drivers $1,705 annually in wear and tear, more than double the national average.
- **Innovation and Progress:** Bright spots include the expansion of renewable energy (now 41% of electricity generation), bridge construction innovations, and the economic impact of aviation, which now contributes over $71 billion annually. Transit agencies are also embracing new models and technologies to improve access and efficiency.
- **Equity and Access:** Rural and underserved communities face disproportionate challenges, particularly in education, water quality, and transit access. New policies, such as House Bill 24-1448, aim to address these disparities, but implementation will take time.

Colorado's engineers, planners, and policymakers are working hard to stretch limited resources and adapt to changing conditions. However, maintaining the status quo is not enough. Without bold, sustained investment and strategic planning, the state risks falling behind in its ability to support economic growth, protect public health, and ensure a high quality of life for all Coloradans.

The 2025 Report Card is a call to action. It highlights the need for:

- **Stable and increased funding mechanisms**
- **Resilient and adaptive infrastructure planning**
- **Workforce development and innovation**
- **Stronger data collection and asset management**

Colorado stands at the headwaters of the nation both literally and figuratively. The choices made today will shape the state's infrastructure legacy for decades to come.

Photo: Rocky Mountain National Park: SNEHIT PHOTO

Recommendations to Raise the Grade

1 **INVEST IN ASSET MANAGEMENT:** Plan for the full life cycle of infrastructure projects at inception to mitigate potential failures and protect the public health, safety, and well-being of communities. Maintenance needs, water use, and potential co-benefits are integral in the planning for infrastructure projects. Infrastructure owners should clearly establish responsibility and procedures for regularly assessing conditions and upkeeping data as a first step to asset management. Infrastructure budgets and strategic plans must also consider maintenance needs in conjunction with capital projects. Data-based decisions can then help prioritize projects when budgets are tight.

2 **PRIORITIZE RESILIENCE:** Undertake regional partnerships in infrastructure planning for a holistic approach to intertwined needs and challenges. For water systems, planners should also consider a "One Water" approach during design to incorporate all aspects of water life-cycle - such as stormwater, wastewater, drinking water, dams, and levees - and protect this critical resource. Up-to-date design codes can ensure infrastructure projects are more resilient to the challenges of modern-day usage and climate as well. Diversity and redundancies in systems contribute to overall resiliency as well as innovative technologies, materials, and construction methods. Further, agencies should adopt the Envision Sustainable Infrastructure framework to promote resiliency in their work.

3 **STRENGTHEN INTERGOVERNMENTAL PARTNERSHIPS:** Partnerships are essential across all levels of government both within Colorado and at the national level. Both promoting and regulating safety at state and national levels protect communities across Colorado, especially those in historically underrepresented, rural, and climate-vulnerable areas.

4 **ENGAGE COMMUNITIES AS INFRASTRUCTURE STAKEHOLDERS:** Recognize the public as active stakeholders in infrastructure, as they are the primary users. Meaningful engagement with communities affected by infrastructure projects can significantly enhance project outcomes. In Colorado, where TABOR limits public funding decisions, clear communication with residents is especially critical. Education and outreach efforts should aim to build mutual trust between government entities and the public.

About The Report Card for America's Infrastructure

Every four years, America's civil engineers provide a comprehensive assessment of the nation's 18 major infrastructure categories in ASCE's *Report Card for America's Infrastructure*. Using a simple A to F school report card format, the Report Card examines current infrastructure conditions and needs, assigning grades and making recommendations to raise them.

The ASCE Committee on America's Infrastructure is made up of 52 dedicated civil engineers and infrastructure professionals from across the country, with decades of expertise in all categories, who volunteer their time to work with ASCE Infrastructure Initiatives staff to prepare the Report Card. The Committee assesses all relevant data and reports, consults with technical and industry experts, and assigns grades using the following criteria:

Methodology

CAPACITY
Does the infrastructure's capacity meet current and future demands?

CONDITION
What is the infrastructure's existing and near-future physical condition?

FUNDING
What is the current level of funding from all levels of government for the infrastructure category as compared to the estimated funding need?

FUTURE NEED
What is the cost to improve the infrastructure? Will future funding prospects address the need?

OPERATION AND MAINTENANCE
What is the owners' ability to operate and maintain the infrastructure properly? Is the infrastructure in compliance with government regulations?

PUBLIC SAFETY
To what extent is the public's safety jeopardized by the condition of the infrastructure and what could be the consequences of failure?

RESILIENCE
What is the infrastructure system's capability to prevent or protect against significant multi-hazard threats and incidents? How able is it to quickly recover and reconstitute critical services with minimum consequences to public safety and health, the economy, and national security?

INNOVATION
What new and innovative techniques, materials, technologies, and delivery methods are being implemented to improve the infrastructure?

In addition to this national Report Card, ASCE's sections and branches prepare state reports on a rolling basis. Visit **InfrastructureReportCard.org** to learn about your state's infrastructure.

The 2025 Report Card on Colorado's Infrastructure

Aviation
B-

Bridges
C+

Dams
B-

Drinking Water
C-

Energy
C

Levees
D+

Parks
C

Rail
B-

Roads
D+

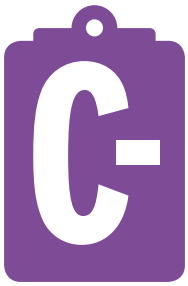
Schools
D+

Solid Waste
C-

Stormwater
C-

Transit
C-

Wastewater
C



OVERALL GPA

Comparison of 2020 and 2025 Grade

COLORADO			
Category	**2020**	**TREND**	**2025**
Aviation	B	↔	B-
Bridges	C+	↔	C+
Dam	C+	↑	B-
Drinking Water	C-	↔	C-
Energy	C+	↓	C
Hazardous Waste	C-	↔	C-
Levees	D+	↔	D+
Parks	C	↔	C
Rail	B-	↔	B-
Roads	C-	↓	D+
Schools	D+	↔	D+
Solid Waste	C-	↔	C-
Stormwater	N/A	N/A	C-
Transit	C-	↔	C-
Wastewater	C-	↑	C

Aviation

B-

GRADE COMPARISON

CO: B-

Nat'l: D+

Photo: Denver International Airport

AVIATION

EXECUTIVE SUMMARY

Colorado's aviation network includes 66 public-use airports, comprising 13 commercial service airports and 53 general aviation airports, as documented in the 2025 Colorado Aviation Economic Impact Study (CEIS). This robust system remains vital to the state's economy and infrastructure. Since the release of the 2020 Colorado Aviation System Plan (CASP), the Colorado Department of Transportation (CDOT) has continued its effort to assess and strengthen aviation infrastructure. The 2025 CEIS highlights the sector's growing importance, showing that Colorado airports collectively generate $71.2 billion in annual business revenue for the State, support 358,293 jobs, and contribute $25.5 billion in payroll—marking significant growth despite post-pandemic challenges. The report also highlights Denver International Airport's (DEN) outsized impact, accounting for $45.3 billion of the total revenue and supporting over 240,000 jobs. As Colorado continues to grow, sustained investment in its aviation infrastructure is critical to ensure long-term economic resilience, public access, and intermodal connectivity across the state. While current federal investment through the Infrastructure Investment and Jobs Act (IIJA) has helped support many ongoing Capital Improvement Programs (CIP) at airports across the state, the significant increase in user demand of Colorado airports has strained capacity of airport infrastructure which largely results in report grade drop from 2021 to 2025. For example, DEN is designed to service about 40 to 50 million passengers but serviced 82 million passengers in 2024.

CONDITION AND CAPACITY

Colorado is home to 60 general aviation airports supporting small towns and regions and 14 commercial service airports. Current system performance aligns with the needs of most airport classifications, though some smaller airports face constraints. In the post-COVID era, commercial airports have handled an increase in passengers, which is starting to strain capacity. Denver International Airport (DEN), the largest commercial airport in Colorado, served 82 million passengers in 2024. The airport has a goal to improve facilities to service more than 100 million projected annual passengers in the future, referred to as Vision 100.

Future demand, as forecasted, shows a need for expanded facilities in certain classifications (e.g., hangars,

terminals) to accommodate growth through 2038. For example, terminal capacity is highlighted as a key issue for commercial service airports. Several regional airports are either under construction or starting to plan for their terminals to be expanded. DEN is starting to work on adding a new runway to increase capacity.

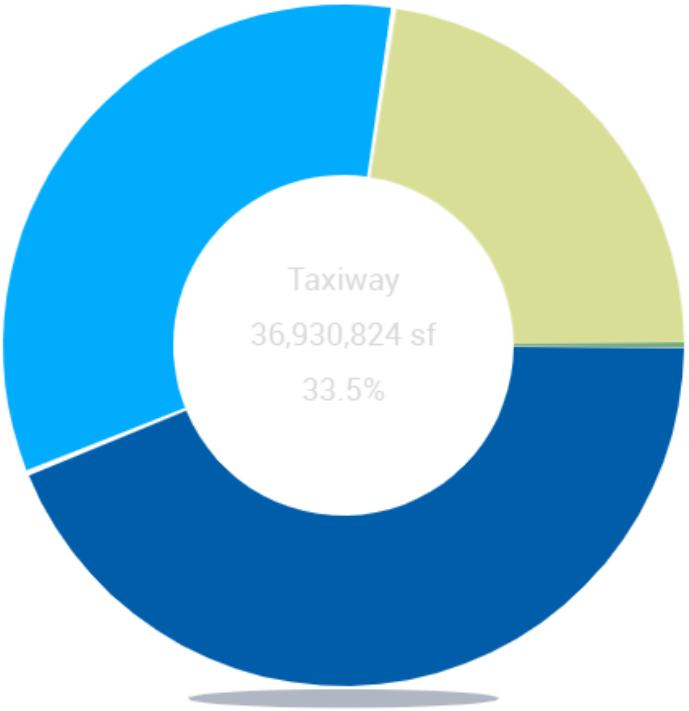
Figure 1: Total Statewide Pavement Area by Type

By Surface Type

Surface Type	Area, sf	Percentage
AAC	49,488,353	44.9%
AC	36,725,278	33.3%
PCC	19,611,282	17.8%
APC	3,201,363	2.9%
PFC	1,312,243	1.2%

Note: AC = asphalt concrete, AAC = asphalt over asphalt concrete, APC = asphalt over portland cement concrete, PCC = portland cement concrete, and PFC = porous friction course.

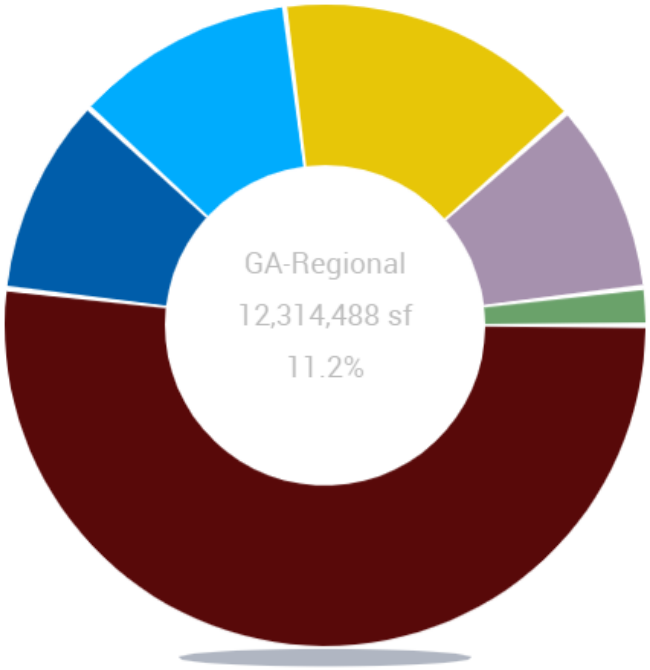
Figure 2: Total Statewide Pavement Area by Branch Use



By Branch Use

Branch Use	Area, sf	Percentage
Runway	48,427,500	43.9%
Taxiway	36,930,824	33.5%
Apron	24,940,158	22.6%
Helipad	40,036	0.0%

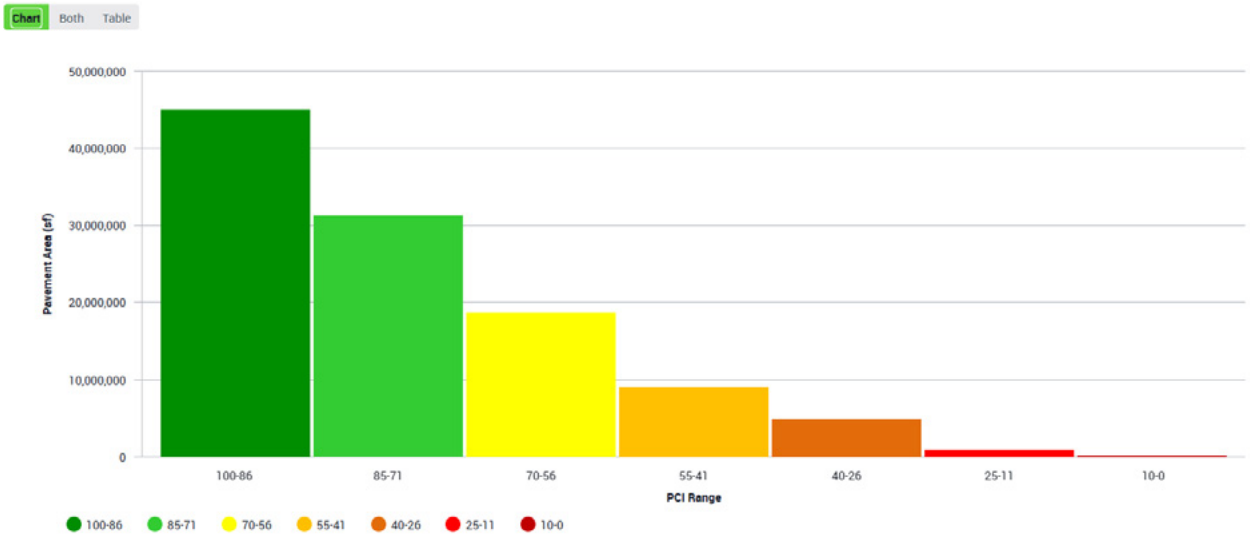
Figure 3: Total Statewide Pavement Area by CASP Classification



By CASP Classification

CASP Classification	Area, sf	Percentage
Commercial Service	57,182,394	51.8%
GA-National	11,033,695	10.0%
GA-Regional	12,314,488	11.2%
GA-Local	17,134,342	15.5%
GA-Community	10,585,133	9.6%
GA-Rural	2,088,466	1.9%

Figure 4: Total Statewide Pavement Area by Pavement Condition Index Range



Pavement Condition Index (PCI) ratings are used to assess airfield conditions. As indicated in Figure 4, most of the state's airport pavements maintain acceptable PCI ratings, but some fall below acceptable thresholds requiring upgrades to meet desired performance targets.

Continued federal, state, and local funding will need to occur to maintain these pavements within the airfield. Some airports have pavements that are reaching their expected lifespans of 20 years. In these cases, typical maintenance activities, which include mill and overlay,

crack sealing and repair, and fog sealing, are no longer viable and a full pavement replacement is needed. Partial replacement, called panel replacement, is currently being performed at DEN and is ongoing.

In addition to the condition and capacity at the airport, it's important to think about public transportation and roads for getting passengers and workers to and from the airport. For Denver International Airport (DEN), the Vision 100 goal of handling 100 million annual passengers will be hard to achieve without improving Peña Boulevard, the main road to the airport. Recently, the airport did not get the Federal Aviation Administration (FAA) funding needed to widen this road for more capacity.

Beyond the roads, airport functionality relies on many airside and landside assets. While the terminal and runways often get the most focus, systems like maintenance facilities, fueling infrastructure, and de-icing operations are essential for airside operations. On the landside, facilities such as parking and rental car services—especially as DEN looks into a consolidated rental car facility (CONRAC) and parking improvements—play a key role in passenger flow and convenience. Understanding these connected systems gives a clearer view of airport operations and helps with planning for future growth.

OPERATION AND MAINTENANCE, FUNDING, AND FUTURE NEED

Figure 5: 2025 CEIS Summary of Impacts

Colorado's largest airport, Denver International Airport (DEN), along with regional airports such as Colorado Springs Municipal Airport, fund infrastructure projects primarily through capital improvement programs (CIPs). These are supported by a blend of private bond sales, local municipal contributions, and federal funding from the Federal Aviation Administration (FAA). While airports do generate revenue—through airline fees, user charges, tenant leases, and land leases—these sources often fall short relative to the scale of debt-financed projects.

The Infrastructure Investment and Jobs Act (IIJA) has allocated $5 billion ($1B annually from 2022-2026) is a program that infuses funds with the intent for airports to build, modernize and upgrade airport facilities. As of January 10, 2025, over $518 million has been allocated to Colorado through the Airport Infrastructure Grants (AIG) program and Airport Terminals Program. That includes $123.6 million for the airport terminal improvements at DEN including improving the baggage handling system, increasing capacity, and improving energy efficiency.

Despite significant investments, funding gaps remain a major challenge across Colorado's aviation system. Even with federal and state contributions, including support from programs like the CARES Act, current funding levels are insufficient to meet the infrastructure needs necessary to sustain growth and operational efficiency. The 2025 Colorado Aviation Economic Impact Study (CEIS) reveals that the aviation system in Colorado supports over $71.2 billion in annual business revenues, 358,293 jobs, and $25.5 billion in payroll—yet critical infrastructure demands outpace available funding.

At DEN specifically, capital improvement investments from 2023 through 2025 are projected at $12.1 billion, with less than 10% expected to come from local or federal sources. This funding imbalance places a substantial financial burden on the airport, often requiring complex long-term debt strategies. Meanwhile, general aviation and smaller commercial service airports remain reliant on FAA grants and state funding to maintain even basic levels of operation and safety.

The 2020 Colorado Aviation System Plan (CASP) previously estimated a 20-year funding need of over $9.1 billion, excluding Denver. However, the 2025 CEIS indicates that inflation, rapid passenger growth, and evolving operational requirements—especially at high-demand mountain and resort airports—have escalated capital needs beyond those earlier projections. Ongoing construction, terminal expansion, and technology upgrades at multiple regional airports underscore the urgency of strategic investment.

Airports also generate substantial tax revenues that benefit both state and local governments. According to the 2025 CEIS, aviation-related activity contributes over $960 million annually in tax revenues. This includes state and local sales tax, aviation fuel taxes, and income taxes generated by airport employment and visitor spending. DEN alone accounts for nearly half of these revenues, driven by high volumes of passenger and business activity. These recurring fiscal impacts further illustrate the importance of ongoing public and private investment in airport facilities.

Beyond passenger services, Colorado's aviation system supports key sectors such as aerial agriculture and air cargo. Aerial agricultural operations contribute significantly to rural economies by enhancing crop yields and reducing disease and pest impacts. The 2025 CEIS estimates that aerial application supports over $240 million in crop value and plays a vital role in preserving Colorado's agricultural productivity, especially in remote regions.

Air cargo also plays a growing role in Colorado's economy. In 2023, Colorado exported high-value goods—such as electronics, pharmaceuticals, and aerospace components—through its airports to both domestic and international markets. The total statewide economic impact of off-airport air cargo movement was estimated at over $3.8 billion, underscoring the importance of airport infrastructure in supporting just-in-time logistics, e-commerce, and supply chain connectivity.

Colorado's aviation system is an economic engine that facilitates tourism, cargo logistics, business travel, and rural connectivity. Airports are vital in supporting industries ranging from aerospace to agriculture. The economic return on investment remains compelling: every dollar spent on airport infrastructure supports jobs, regional business activity, and long-term tax revenue generation. To meet the demands of the future, Colorado must prioritize sustainable, multi-source funding strategies to ensure its aviation network remains resilient, efficient, and competitive.

PUBLIC SAFETY AND RESILIENCE

Safety and resilience are essential priorities for Colorado's aviation infrastructure, with airports focusing on enhancing security and public safety. While Colorado's larger airports demonstrate robust resilience and preparedness, smaller airports face significant gaps in safety infrastructure and resources. Addressing these disparities through targeted investments, advanced technologies, and comprehensive planning will ensure a safer and more reliable aviation network across the state. These efforts not only protect passengers and communities, but also strengthen Colorado's role as a hub for global transportation and connectivity.

FAA Part 139 inspections are annual assessments conducted by the FAA to ensure airports with scheduled passenger-carrying operations comply with safety and emergency response standards. FAA Part 139 inspections play a vital role in ensuring compliance with federal safety standards and helping to prevent accidents that could endanger passengers, pilots, and nearby communities. For example, DEN has tackled challenges from ongoing construction by implementing proactive measures like wayfinding signs and temporary Americans with Disabilities Act-compliant pathways, ensuring safe and accessible pedestrian routes. These efforts highlight the importance of balancing immediate safety needs with long-term operational improvements.

In rural areas, safety challenges are often tied to

infrastructure limitations. Inadequate runway lengths and insufficient lighting increase risks during takeoffs and landings, particularly in adverse weather. Wildlife hazards further compound these risks, as smaller general aviation (GA) airports often lack full perimeter fencing, leading to an increased likelihood of runway incursions from animals. Obstructions such as trees and buildings near airport approaches also compromise safety, as not all airports maintain clear zones or adhere to FAA height zoning standards. Emergency preparedness varies widely, with smaller airports frequently lacking Aircraft Rescue and Fire Fighting (ARFF)-trained personnel and necessary facilities to respond effectively to incidents.

Resilience to environmental hazards and disruptions is another critical factor. Larger airports such as DEN benefit from advanced systems, such as robust snow removal capabilities and comprehensive emergency management protocols, which enhance their capacity to recover from disruptions. Conversely, smaller GA airports often lack the resources to handle extreme weather events or environmental risks such as flooding, exacerbated by insufficient planning resources. The disparity in emergency management resources, such as emergency operations centers and trained personnel, further highlights the need for equitable investments across all airport facilities.

Key strategies for improving airport safety and resilience include infrastructure hardening, such as enhancing perimeter security, constructing storm-resilient buildings, and adopting sustainable drainage systems. Increasing interagency collaboration and conducting regular emergency drills are vital for improving coordination during crises. Advanced technologies, including automated weather monitoring systems and early warning mechanisms, can significantly enhance preparedness and situational awareness, reducing response times and mitigating risks.

INNOVATION

Recent advancements in aviation technology have significantly impacted airport operations. Many airports are adopting automated surface/weather observing systems (ASOS/AWOS) to enhance safety and operational efficiency. While these systems are primarily implemented at commercial and some regional airports, other airports in the region are exploring the use of unmanned aircraft systems (UAS) such as drones for inspections and emergency response purposes.

Sustainability has become a key focus for airports striving to reduce their carbon footprint. Denver International Airport (DEN), for instance, is aiming to become the "greenest" airport in the world by utilizing large solar fields for power and collaborating with Xcel Energy on a new microgrid system. Additionally, the construction industry is increasingly using environmentally friendly materials, such as recycled materials for pavements, to promote sustainability in airport infrastructure.

Intermodal connectivity is another area of improvement, with airports like DEN demonstrating seamless integration with transit networks for passenger convenience. Such connectivity is less prevalent at other airports in Colorado, though some have made progress by installing electric vehicle charging stations.

Digital transformation is also reshaping airport operations, particularly as passenger numbers grow and new terminals are constructed. Airports are adopting digital tools for passenger flow management and operational efficiency, leveraging data-driven decision-making systems. For example, DEN recently installed a state-of-the-art security system in its main terminal and plans to expand this advanced system further.

Innovation in both airside and landside operations has included eco-friendly and efficient de-icing technologies to minimize environmental impact. Smart hangar systems have also been implemented in select locations, enabling better tracking of maintenance schedules and improvements to operational efficiency. These advancements underscore the ongoing evolution of airports to meet modern demands.

RECOMMENDATIONS TO RAISE THE GRADE

- Advocate for FAA Reauthorization Stability:
  Partner with Congressional representatives to secure long-term FAA funding, ensuring uninterrupted AIP grant availability.
- State Legislation for Dedicated Airport Funding:
  Approve state legislation to establish a dedicated aviation infrastructure fund separate from general fuel taxes.
- Community Engagement:
  Raise public awareness about the economic impact of aviation infrastructure to garner support for increased funding measures.
- Environmental Grants for Sustainability Projects:
  Secure grants and subsidies tied to environmental sustainability projects (e.g., renewable energy, energy-efficient terminal retrofits).
- Fund Supporting Infrastructure Projects:
  Create a funding program specifically for non-airport infrastructure projects that are critical to passenger transportation to and from airports.

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Bridges

C+

GRADE COMPARISON

CO: C+

Nat'l: C

Photo: Red Cliff Bridge

BRIDGES

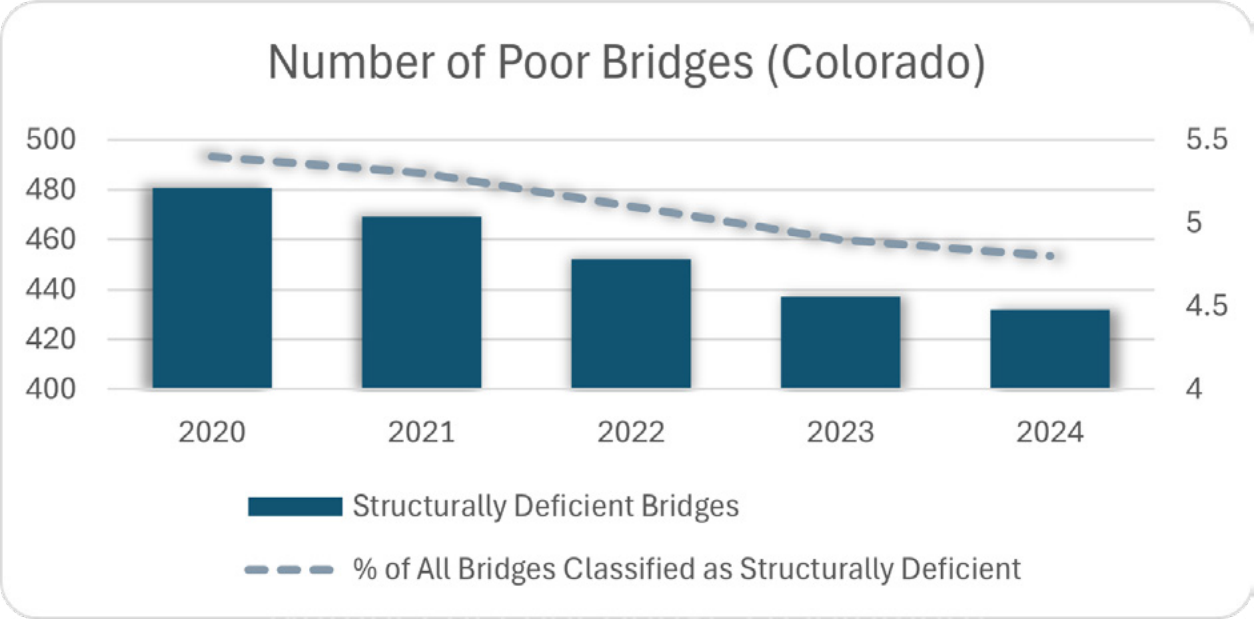
EXECUTIVE SUMMARY

Colorado's 8,965 bridges play a vital role in transporting people and goods and spurring economic activities. Currently, 4.8% of these bridges are in poor condition, which means they need substantial maintenance and rehabilitation, and in some cases, replacement. In total, the state has identified 1,254 bridges that are in need of repair, with an estimated cost of $1.1 billion. Recent legislative measures, such as the Statewide Bridge and Tunnel Enterprise, which will increase funding through new bridge and tunnel impact fees, are anticipated to generate over $500 million over the next decade. Bridges are essential to Colorado's transportation network, supporting over 88 million daily crossings that facilitate both commuting and economic activity across the state. To ensure the safety, reliability, and longevity of Colorado's bridge infrastructure, investments in innovative design, construction methods, and resilience measures are necessary to meet the demands of the state's growing population and economic activities.

CONDITION AND CAPACITY

Bridges are a vital component of Colorado's transportation infrastructure, facilitating the movement of people and goods across the state. Colorado is home to 8,965 bridges, each playing a crucial role in maintaining connectivity and supporting economic activities. However, the condition and capacity of these bridges vary, with some requiring significant attention and maintenance.

The most recent available data indicates that 432 bridges in Colorado, or 4.8% of the total, are in poor condition. This marks an improvement from 2020, when 481 bridges (5.4%) were in poor condition. "Poor" or formerly "Structurally deficient" refers to bridges that require significant maintenance, rehabilitation, or replacement due to critical load-carrying elements being in poor condition. These bridges must be inspected at least annually to ensure safety, although they do not pose an immediate threat to public safety.



The average age of bridges in Colorado is 41.7 years as of 2024, slightly younger than the current national average of 47. The design life of bridges is typically around 50-75 years, indicating that many of Colorado's bridges are approaching the later part of their expected lifespan. This underscores the importance of ongoing maintenance and timely rehabilitation to extend their service life.

Poor bridges in Colorado account for 3.7% of the total deck area on all structures. This means that a significant portion of the state's bridge infrastructure requires attention to ensure continued safety and functionality. Daily, over 3.1 million bridge crossings, or 3.5% of the total 86.3 million daily crossings, occur on bridges rated as structurally deficient or poor.

In contrast, 35.7% of Colorado's bridges are in good condition, with a general condition rating of 7 or higher, while 59.5% are rated as fair, with condition ratings of 5 or 6. This indicates that a substantial portion of the state's bridge infrastructure is well-maintained and capable of supporting current and future transportation needs.

The ownership of bridges in Colorado is distributed among state, municipal, and federal entities. State-owned bridges make up 40% of the total, municipally-owned bridges account for 50%, and federally-owned bridges represent 10%. The condition of bridges can vary based on ownership, with each entity responsible for the maintenance and rehabilitation of their respective structures.

Additionally, 2.9% of the bridges in Colorado have posted load restrictions, indicating limitations on the weight of vehicles that can safely cross these structures. This is an important consideration for transportation planning and logistics, as load-restricted bridges can impact the movement of heavy goods and vehicles.

While Colorado's bridge infrastructure is generally at an acceptable level of service, there are still areas that require attention. The ongoing maintenance and rehabilitation of poor bridges is crucial to ensure the safety and efficiency of the state's transportation network. By addressing these needs, Colorado can continue to support its economic activities and provide safe and reliable transportation for its residents and visitors.

FUNDING AND FUTURE NEED

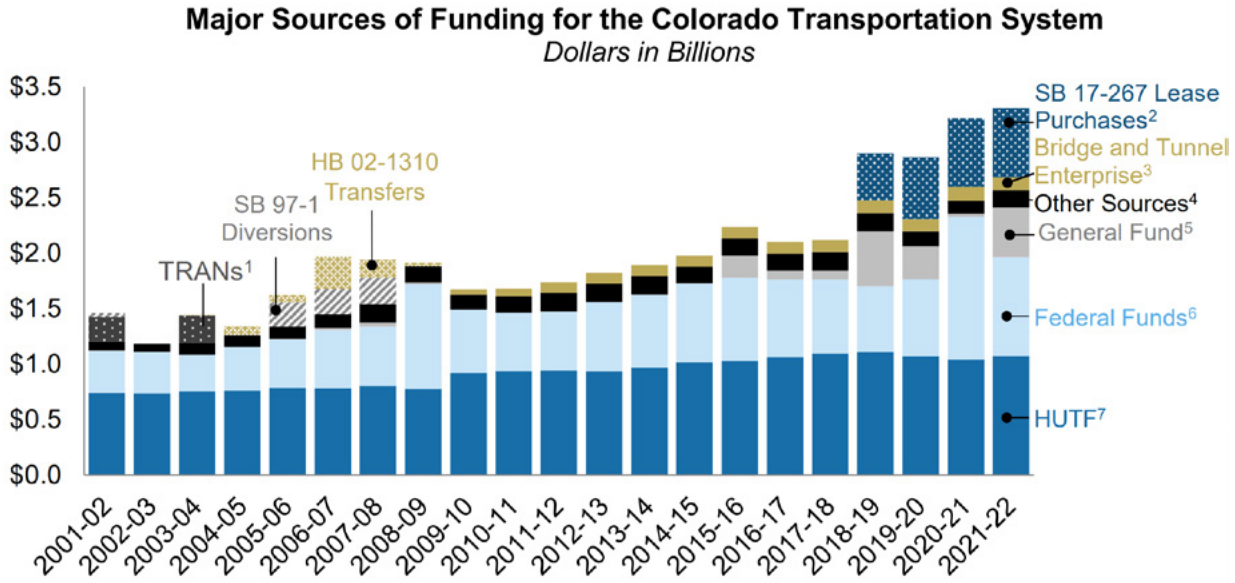
Colorado's transportation infrastructure serves both urban and rural communities, supporting nearly 88 million daily bridge crossings. Sustained funding is essential to maintain and improve this critical network. To enhance bridge conditions, the state's transportation proposal includes substantial investments in maintenance and replacement, ensuring that bridges meet modern safety standards and can accommodate the demands of a growing population and economic activities.

The state's transportation system is funded through a combination of state, federal, and local sources. The Highway Users Tax Fund (HUTF) is the largest source, generating revenue primarily from state motor fuel taxes and vehicle registration fees. The federal Highway Trust Fund (HTF), supported by federal motor fuel taxes, also plays a crucial role. Together, these funds, along with the state's General Fund, support the maintenance and improvement of highways, bridges, and other critical infrastructure.

However, Colorado has the 12th lowest state gas tax in the country at 28 cents per gallon, which was raised effective July 1, 2025. The state's relatively low gas tax has significantly reduced purchasing power over time, constraining the state's ability to maintain and improve transportation infrastructure. To address funding challenges, Colorado has implemented additional sources, including the Bridge and Tunnel Enterprise (BTE), which generates about $125 million per year from an annual bridge-safety surcharge collected from vehicle registrations. Legislation passed in 2021 (Colorado Senate Bill 21-260) will increase this amount over a 10-year phase through new bridge and tunnel impact fees, anticipated to generate more than $500 million over a decade. The Bridge and Tunnel Impact Fee (BTI) is a per-gallon fee applied to special fuels and is collected from fuel distributors who pay the state excise tax.

Public-private partnerships have also been utilized to combat funding challenges, such as through the use of tolling or other user fees to repay lenders and debt holders. Notable examples include the Central 70 Project on a 10-mile stretch of Interstate 70 through Denver, C-470 Express Lanes on a portion of State Highway 470, and the I-25 North Express Lanes projects.

Colorado Department of Transportation (CDOT) analysis shows that maintaining the estimated 2022 bridge condition level requires an additional annual investment of $200 million. While there are no performance gaps anticipated within the 2022-2031 timeframe, continued investment is necessary to achieve performance outcomes. The cost to eliminate the backlog of poor bridges is estimated at approximately $2.2 billion.



Source: Colorado General Assembly 2023 Transportation Handbook, Figure 6 on pg. 21

Over the life of the Infrastructure Investment and Jobs Act (IIJA), Colorado will receive a total of $225 million in bridge formula funds, with $135 million currently accessible. As of June 2024, $60.7 million has been committed to 62 bridge projects. Despite this, the state has identified needed repairs on 1,254 bridges (14%) with an estimated cost of $1.1 billion. CDOT projects that over $180 million will be collected in Fiscal Year (FY) 2026 for the Bridge and Tunnel Enterprise through various fees, with another $185 million from tolling and managed lane revenue. Some of this revenue is allocated to pay down past debt issuances, while most funds go towards capital construction projects and maintenance operations.

Funding challenges for Colorado's bridges and transportation infrastructure are significant and multifaceted. Many bridges are aging and require extensive repairs or replacement. Primary funding sources have not kept pace with inflation and rising construction costs. The growing population adds strain to existing bridges, accelerating wear and tear and increasing pressure to address deficiencies while planning for future needs.

In recent years, Colorado has established sustainable funding sources to support robust and resilient bridge infrastructure. However, infrastructure improvement work still heavily relies on state and federal gas taxes, which have been stagnant for many years. The increasing popularity of fuel-efficient and electric vehicles is also causing a decline in gas tax revenue. This trend poses a significant challenge for funding transportation projects, highlighting the need to modernize funding approaches to ensure sustainability for the future. The state has evaluated a Road Usage Charge (RUC) model and plans to continue exploring it as a potential funding solution to help maintain a robust transportation system that supports Colorado's economy and quality of life.

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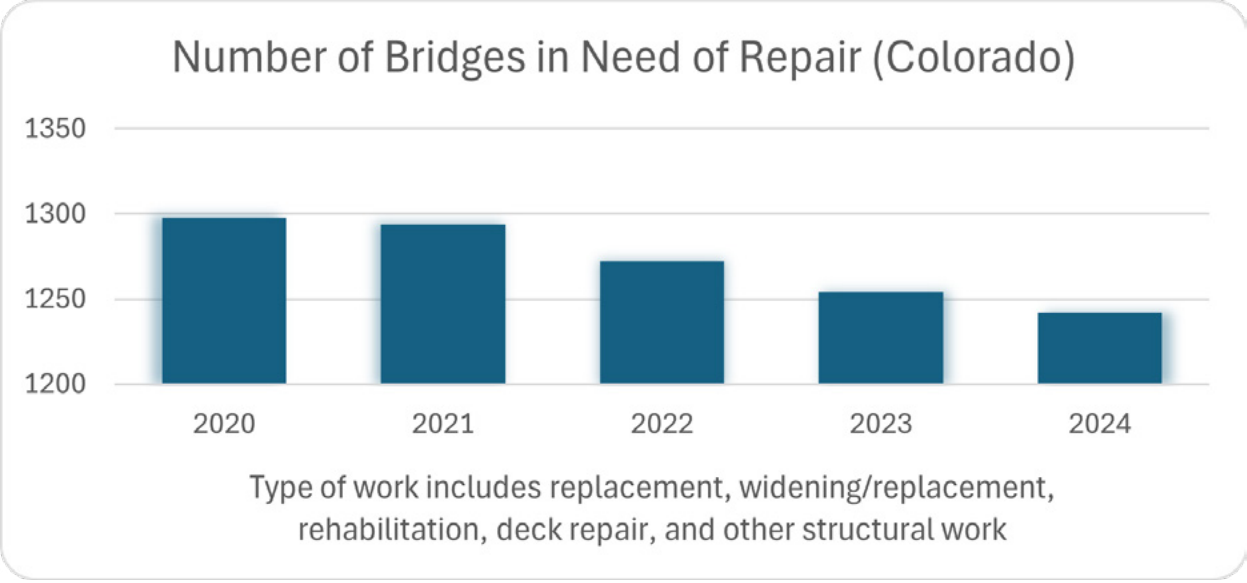
OPERATION & MAINTENANCE

Operation and maintenance (O&M) activities are essential to keeping Colorado's bridges safe for travel and reducing life-cycle costs when properly funded and executed on time. O&M for bridges at CDOT involves various stakeholders, including regional maintenance forces, project managers, fleet maintenance personnel, headquarters branches, and specialized entities such as the Bridge and Tunnel Enterprise (BTE).

Bridge maintenance is crucial for the safety, longevity, and reliability of the state's transportation infrastructure, ensuring roads remain accessible for commuters, businesses, and emergency services. In 2024, CDOT aimed to keep at least 90% of bridges in good or fair condition, aligning with FHWA targets. To achieve this goal, CDOT implements a risk-based and proactive maintenance strategy that includes regular inspections, preventative repairs, and timely rehabilitation of aging structures. By investing in bridge preservation efforts, CDOT minimizes life-cycle costs, reduces travel disruptions, and enhances overall public safety. These ongoing maintenance initiatives ensure Colorado's bridges remain resilient and durable against environmental damage, heavy traffic loads, and natural wear and tear while supporting the state's growing transportation needs.



Bridges are one of the nine Maintenance Program Areas (MPA) funded through CDOT's Asset Management Program. Of the 2024 annual O&M budget of $285 million, bridge maintenance sections directly receive about 2% of the funding. Indirect funding also benefits bridge maintenance through operations such as snow and ice removal, pothole filling, guardrail repairs, and equipment maintenance.

Additional maintenance activities are performed through CDOT's Bridge Preservation Program (Staff Bridge) and the Bridge and Tunnel Enterprise. Staff Bridge is responsible for inspecting, maintaining, repairing, and rehabilitating major structures in good or fair condition, while BTE focuses on replacing poor-rated bridges and maintaining those it funds for replacement.

The percentage of deck area in each condition serves as an indicator of adequate O&M funding. Historically, CDOT maintained a higher percentage of good deck area than fair deck area. However, recently, this ratio has reversed, with fair deck area now exceeding good deck area by nearly 20%. This trend, linked to reduced funding for Staff Bridge since 2014, could accelerate the deterioration of structures into poor condition if unaddressed.

Overall, Colorado has multiple programs available for funding and executing O&M bridge activities. These programs focus on cost-effective life-cycle treatments designed to extend the lifespan of bridges and lower overall life-cycle costs. However, the estimated annual needs related to life-cycle treatments on state-owned bridges exceed projected budgets, requiring Colorado to maximize every resource dedicated to maintaining and preserving its bridges.

SAFETY

Colorado's bridge infrastructure is vital for the safe movement of people and goods across the state. The state has made significant progress in maintaining and improving its bridges, ensuring they remain safe for public use. Bridges that require significant maintenance, rehabilitation, or replacement are closely monitored and inspected regularly to ensure they meet safety standards. This proactive approach helps prevent any immediate threats to public safety.

CDOT employs a comprehensive maintenance strategy to keep bridges in good and fair condition. This includes regular inspections, preventative repairs, and timely rehabilitation of aging structures. By investing in bridge preservation efforts, CDOT minimizes disruptions and

enhances overall public safety. Additionally, advancements in materials and design contribute to the resilience and safety of Colorado's bridges. While challenges remain, particularly with aging infrastructure and funding constraints, ongoing efforts and innovative solutions are essential to maintaining a safe and reliable transportation network for Colorado's residents and visitors.

In addition to bridge maintenance, CDOT is implementing wildlife crossings, such as underpasses and overpasses, to reduce wildlife-vehicle collisions and enhance safety for both motorists and animals. These crossings, along with wildlife fencing, are strategically placed in areas with high incidences of such collisions, aiming to decrease these accidents by up to 90%. This initiative not only protects Colorado's diverse wildlife but also reduces the economic costs associated with these accidents.

Photo: Royal Gorge Suspension Bridge, malajscy

RESILIENCE

Due to the long-expected lifespan of large infrastructure such as bridges, changes occur gradually. The three primary environmental hazards in Colorado are scour, freeze-thaw, and rockfall. Freeze-thaw refers to the repeated freezing and thawing of water within concrete, which creates internal pressure that can crack and deteriorate the material over time. Freeze-thaw and rockfall are of particular concern in the higher elevations of the state and remain a constant threat. Locations such as the high mountain passes and Glenwood Canyon frequently fall victim to these hazards, which increase the rate of deterioration of exposed concrete and asphalt.

Innovation in concrete has the potential to increase the durability of concrete structures, but development has been slow and is still an emerging science. Resilience to rockfall is strongly associated with prevention, requiring frequent inspection of the slopes above roadways to identify potential rockfall before it occurs. Rockfalls are often triggered by rainfall or freezing. Destruction of vegetation by wildfires reduces the natural reinforcement of hillsides, leading to larger and more frequent events. Fences and barriers have been developed but are not able to prevent damage from larger events.

Scour, which refers to the erosion of soil around a bridge's foundation due to fast-moving water, is increasing with more severe weather and flooding driven by changes in weather patterns. As more climate data is collected, design events are adjusted to more accurately reflect the probability of occurrence. Significant improvements in resilience have been achieved through advancements in design and armoring. While these improvements are generally balanced by increases in design flood events, the overall impact remains stable.

Additionally, although neither CDOT nor the American Association of State Highway and Transportation Officials (AASHTO) currently mandates sustainability in design, individual designers and agencies are proactively driving these changes. Notable advancements in materials, such as the adoption of non-epoxy rebars that are less susceptible to damage and corrosion, further enhance infrastructure durability.

INNOVATION

Innovation in Colorado's bridge infrastructure primarily focuses on project delivery methods, such as Design-Build-Finance-Operate-Maintain (DBFOM), public-private partnership as well as Accelerated Bridge Construction techniques.

There have been promising advances in materials, such as lightweight concrete, which reduces the overall dead load of structures and leads to savings in the substructure. However, these advancements, though beneficial, are still preliminary and not sufficient to impact the overall innovation score.

A notable example of innovative bridge design in Colorado is the four-acre park over a portion of the Central 70 project in Denver. This TIFIA (Transportation Infrastructure Finance and Innovation Act) funded project not only improved traffic flow along the highway but also reconnected neighborhoods previously divided by the highway with park space open to the community. The concept of placing valuable green space over the freeway in urban areas is relatively new and has been implemented on a limited basis across the country. These pioneering projects presented significant challenges, such as dismantling a 57-year-old viaduct and lowering a section of I-70 below ground level, that were met with innovative, industry-leading engineering solutions.

The Central 70 Project faced significant challenges with its bridge structure and has received several awards for its innovative design and execution. These include the Design-Build Institute of America's Best in Design – Engineering award and the American Council of Engineering Companies of Colorado's 2024 Grand Conceptor Award, which recognizes exceptional innovation, complexity, and value in engineering design.

RECOMMENDATIONS TO RAISE THE GRADE

- Increase and expand funding: Secure additional funding at all levels to address the $1.1 billion in identified repairs for 1,254 bridges. This includes leveraging the Bridge and Tunnel Enterprise, public-private partnerships, and exploring alternative funding mechanisms such as tolling and managed lane revenue.
- Modernize funding mechanisms: Raise the state and national gas tax, which is deposited into the Highway Users Tax Fund (HUTF), or change to a road usage charge (RUC). Due to increased fuel economy standards and the increase in electric vehicles, an RUC is preferred for long-term viability. Ensure this tax is tied to inflation.
- Develop and fund a program to systematically extend the service lives of fair bridges before they deteriorate into poor condition.
- Fund research into the use of innovative technologies, materials, and construction techniques to extend the life of bridges and ensure they are climate resilient.
- Improve resilience: Enhance the resilience of bridges to environmental hazards such as scour, freeze-thaw, and rockfall by incorporating advanced design and armoring techniques. Prioritize investments in bridges that are most critical, such as those that experience the highest daily traffic volume or are located on major freight corridors and evacuation routes.
- Ensure bridge repair and construction is a top priority in CDOT's yearly budget.

DEFINITIONS & ACRONYMS

BTE: Bridge and Tunnel Enterprise - Definition: A specialized entity within CDOT responsible for the maintenance and replacement of bridges and tunnels.

HUTF: Highway Users Tax Fund - Definition: The largest source of transportation funding in Colorado, generated primarily from state motor fuel taxes and vehicle registration fees.

MPA: Maintenance Program Areas - Specific areas within CDOT's Asset Management Program that receive funding for maintenance activities.

Structurally Deficient: A classification for bridges that require significant maintenance, rehabilitation, or replacement due to critical load-carrying elements being in poor condition.

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2023_transportation_handbook.pdf

CO | ARTBA Bridge Report.

CDOT Bridge Maintenance Program Data

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Colorado General Assembly. 2023 Transportation Handbook

Photo: Blue Mesa Dam

DAMS

EXECUTIVE SUMMARY

Colorado is located in an arid environment and at the headwater of the Colorado river that provides water for much of the western united states. The dams within the state of Colorado have increased in importance due to a growing population, resilience to provide downstream needs of other states, and support to irrigation within the state. Colorado has a total of 42 high-hazard dams, with some of the state's largest infrastructure projects currently undergoing construction of new dams. While the reservoir storage capacity for the state continues to increase, increased permitting requirements, growing construction costs, increased maintenance needs, and other restrictions pose challenges to maintaining and building these important assets.

CONDITION AND CAPACITY

Dams are classified as high hazard potential (HHP, probable loss of life if dam fails), significant hazard potential (SHP, possible loss of life) or low hazard potential (LHP, no loss of life expected). According to the National Inventory of Dams (NID), Colorado has 1,983 dams in total. Ninety-nine percent of HHP dams in Colorado have an Emergency Action Plan (EAP) in place. Only 3% of the state's dams produce electricity. While 99% of the Colorado's dams are state regulated, only 8% are federally regulated.

While new dam construction was relatively slow from the 1970s until the 2010s, a handful of new dams are currently under construction. At the same time, many of colorado's existing dams are undergoing upgrades which will greatly increase the overall storage capacity within the state. For example, work on the Gross Reservoir Expansion Project, the subject of more than 20 years of planning, got underway in April 2022. Expected to be completed in 2027, the project will raise the height of the existing dam by 131 feet. The higher dam will nearly triple the amount of water that can be stored in Gross Reservoir, providing Denver Water with more flexibility to manage its water supply in the face of increasingly variable weather and snowpack patterns. The additional storage capacity also will provide a greater balance between Denver Water's separate north and south water collection areas. The project is currently undergoing significant legal challenges due to environmental permitting.

The Chimney Hollow Reservoir project, a collaborative project involving 12 northeastern Colorado water providers will create 90,000 acre-feet of storage and provide a reliable 30,000 acre-feet of water each year. The Chatfield Reservoir Reallocation Project is an effort to help meet Colorado's water supply and demand gap. The project brings environmental, agricultural, and outdoor recreational benefits along with new, critical multi-purpose water storage capacity for growing front range communities including Centennial, Castle Rock, and Castle Pines.

The storage of water for beneficial use comes with risk. The risk profile for dams is, in part, determined by the consequences that would be experienced should failure occur. Colorado provides information on their portfolio of dams to the U.S. Army Corps of Engineers (USACE) for inclusion in theNID, and publicly accessible platforms such as the Colorado Information Marketplace (CIM).

OPERATION AND MAINTENANCE

As dams continue to age and downstream development increases, proper operation and maintanence becomes increasingly more important. Loans and grants are available for local government and private projects through the Colorado Water Conservation Board. The construction loan program is a successful, self-supporting fund that continues to grow as interest on loan debt is paid.

While much of Colorado's more recent dam construction has been dedicated to increasing storage capacity, many current and future projects are repairs toexisting structures. In total, dam modification and rehabilitation projects for existing dams across Colorado have totaled over $160 million dollars in the past 5 years.

Additionally, USACE replaced emergency service gates at the Bear Creek Dam's reservoir. Bear Creek Dam is important to manage flooding within the Denver metro area as variable snowmelt and rainfall fill the dam and drastically have a reduced impact elsewhere. While the dam is still operational, inspections in 2024 indicated that corrosion is impacting the proper function of gates. It is important for USACE to replace the gates now for the dam to remain functional for years to come.

Photo: Evergreen dam on Evergreen Lake in the Colorado Rocky Mountains; Faina Gurevich

SAFETY

Colorado's population will continue to grow and is anticipated to reach nearly 8 million by the year 2040. The larger population does not itself increase the likelihood of failure of existing dams, but increased age can increase the probability of dam failure, and population increases, and subsequent downstream development are tied to hazard-potential, known as "hazard creep.".

To address the ongoing change in dam safety, Colorado's Dam Safety Program provides state regulatory oversight of the infrastructure and manages risk across the state. Colorado's approach to dam safety leads the country for providing safe dam infrastructure: The CO-NM Regional Extreme Precipitation Study results provide engineers with state-of-the-practice tools to estimate extreme precipitation for spillway design across the state of Colorado. A "best-practice" guidance documents is available for a range of dam engineering activities in Colorado. Dam Safety Branch engineers regularly collaborate with outside entities on projects of statewide

interest. Finally, the Dam Safety Branch coordinates with the Hazard Mitigation Section of the Colorado Division of Homeland Security and Emergency Management (CDHSEM) to define high Hazard dam rehabilitation projects that are suitable for grant funding from the various FEMA Hazard Mitigation Assistance programs.

Emergency Action Plans (EAP's) and inundation maps are required by the Dam Safety Program for high and significant hazard potential dams. EAPs improve dam safety by identifying potential emergency conditions at dams and outlining a preplanned set of actions to help prevent loss of life and minimize property and environmental damage. Due to oversight and hard work from owners, the NID indicates that 99% of dams in Colorado have EAPs. However, failures and incidents may occur that go unreported. The increase in dam incidents and failures can be traced to a combination of factors including age, an increase in severe weather events and the need for rehabilitation.

FUNDING AND FUTURE NEED

In 2023, ASDSO estimated that nation's dam rehabilitation costs are $157.48 billion dollars for all non- federal dams.

While there is much ongoing construction of current projects, it is just a small portion of the total amount needed to rehabilitate existing dams and an additional $20 billion is needed in terms of water supply, infrastructure, and storage capacity. To continue meeting that goal, Denver Water expects to invest about $1.8 billion into its water system during the next 10 years, from large projects to regular inspection and maintenance programs designed to ensure the system is flexible, resilient and efficient.

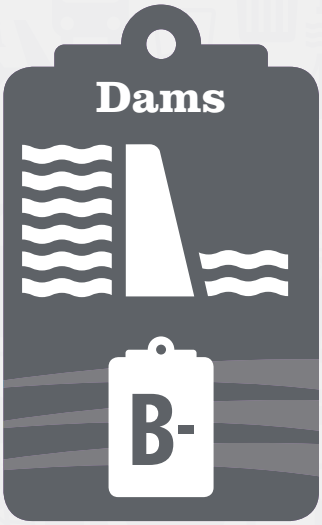
The U.S. Department of the Interior awarded a total of $849 million to repair and improve water infrastructure projects across 11 Western states. The funding includes $118.3 million for 14 projects located in the Colorado River Basin, where federal officials and state negotiators are weighing decisions about the future management of the river ahead of the 2026 expiration of current operating guidelines. The funding comes from the U.S. Bureau of Reclamation's Aging Infrastructure Account, which received a $3 billion boost from the 2021 Infrastructure Investment and Jobs Act. The program funds repairs and upgrades to existing water storage infrastructure, hydropower generation and treatment plants.

Funding announced by the previous administration also included $34 million for several federal projects relating to the Blue Mesa Reservoir in Gunnison County, including a $32 million award for the replacement and refurbishing of equipment in the Blue Mesa Dam's small hydropower plant. Other Colorado projects included $20 million in improvements to the Mt. Elbert Forebay reservoir near Twin Lakes, $4.6 million for infrastructure connected to Turquoise Lake and $3 million in safety upgrades for the Upper Molina Power Plant, a small hydroelectric unit near Grand Mesa.

RESILIENCE AND INNOVATION

Resilience continues to be a growing need for Colorado dams. While new dams can be built with greater quality assurance and better materials, older dams continue to age and are susceptible to more variable weather events and other potential variable modes. As the funding levels are limited along with the design and construction capabilities to complete all needed upgrades, it is important that risk management programs continue to evaluate the inventory of dams to make critical upgrades when funding and resources become available.

During the last two years, from July of 2022 through July of 2024, the Colorado Water Conservation Board has funded $232.7 million in loans and awarded $156.3 million in grants, and completed about 20% of the projects and activities the Colorado Water Plan has identified are needed to ensure the state has enough water in decades to come. The news came as part of a water plan status update presented to the Colorado Water Conservation Board. The board is responsible for putting the plan into action and channeling loans and grants to dozens of major programs, including drought planning for farmers, turf replacement for homeowners and businesses, and helping prepare mountain watersheds and forests for wildfire.



RECOMMENDATIONS TO RAISE THE GRADE

- Increase awareness between owners and the public regarding the importance of dam safety.
- Facilitate the construction of dams and educate the public that increased water storage provides resiliency for their water supply.
- Develop funding sources and continue to hire additional staff within the state dam safety program as development increases downstream from existing dams and new construction. The 2024 ASDSO Colorado Dam Safety Performance Report documents this trend of increasing number of state regulated dams per dam safety staff member that has occurred since 1999.

SOURCES

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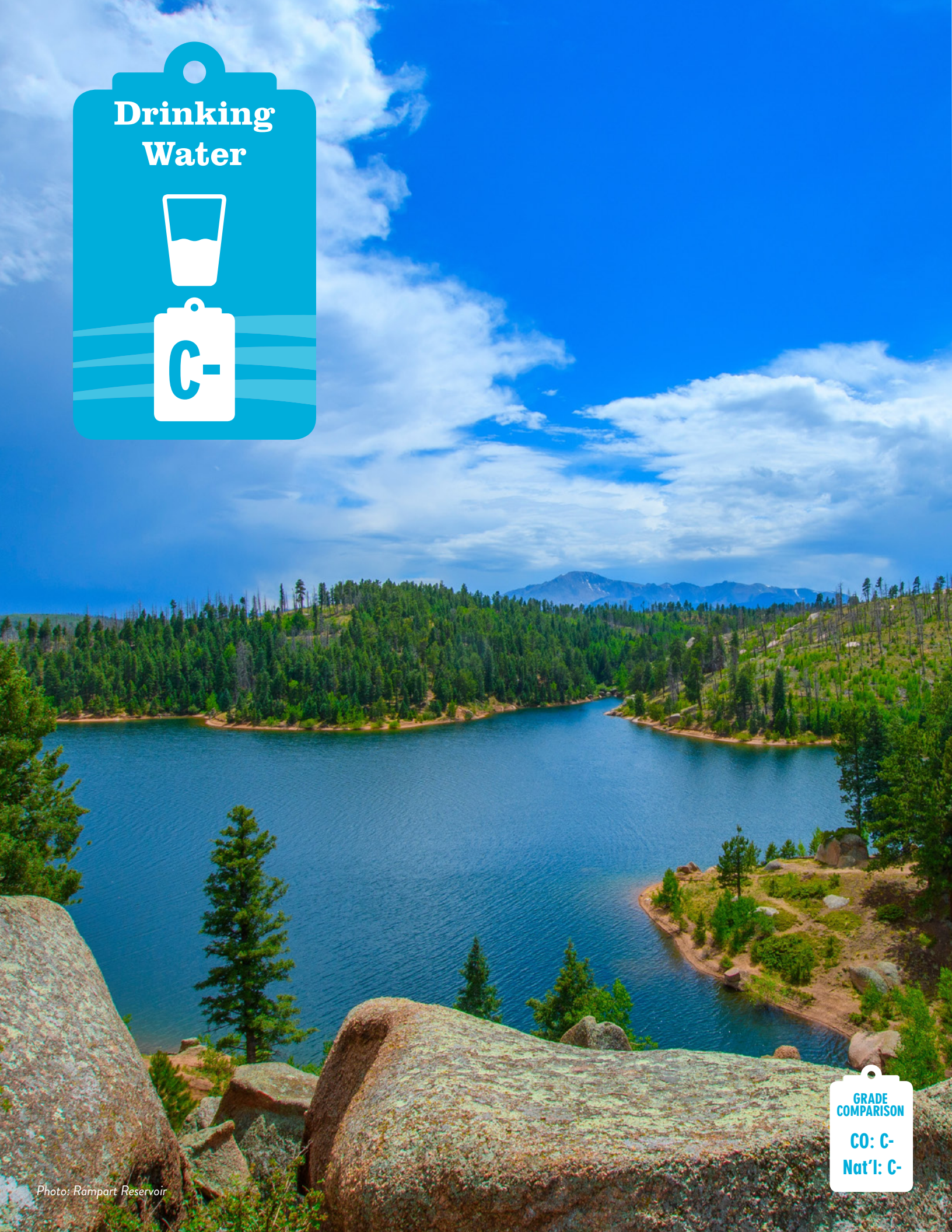

Drinking Water
C-
GRADE COMPARISON
CO: C-
Nat'l: C-
Photo: Rampart Reservoir

DRINKING WATER

EXECUTIVE SUMMARY

Colorado's drinking water is under increasing pressure due to aging infrastructure, population growth, and climate-related stresses. The state's position at the most upstream point of four major U.S. river basins (i.e., headwaters state) makes it a crucial water source for 19 states and Mexico, yet only 40% of its water stays within its borders. Water for irrigation and potable water supply place competing demands on the available water sources, currently a tenth of Colorado's in-state potable water is consumed by the higher population east of the Continental Divide via transmountain diversions. The Colorado Water Plan anticipates a future annual water supply gap by 2050 to approximately 250,000 households due to the increased pressures from population growth, increasing temperatures, reduced snowpack and associated droughts. With over 2,000 public drinking water systems - many over 50 years old - the state faces a growing funding gap for maintenance and upgrades, compounded by workforce shortages and an aging staff. Water systems rely heavily on ratepayer funding, while capital investments from federal sources have only partially filled the need. The EPA estimates the state needs more than $10 billion in upgrades over the next decade to maintain and improve these systems, while Colorado Water Conservation Board (CWCB) estimates an additional $1.5 billion is required over 25 years to meet capacity and supply needs. While the state has been both proactive and reactive to challenges like per- and polyfluoroalkyl substances (PFAS), lead service lines (LSL), and naturally occurring contaminants, these continue to threaten water quality, especially in small and rural communities. A sustainable drinking water future hinges on stable funding, a trained workforce, and improved resilience.

CONDITION AND CAPACITY

As a headwaters state, Colorado is the origin of several major rivers which collectively supply water to millions of people across 19 states and Mexico. While these water sources are high-quality, Colorado's ability to provide clean, reliable drinking water depends on a delicate balance of the supply of these natural water sources, transport through aging infrastructure, and equitable distribution.

It is estimated that between 70% and 90% of the state's water supply is surface water originating from snowmelt and precipitation. The remaining drinking water sources include groundwater wells and reservoirs. While nearly 80% of the state's water lies west of the Continental Divide (a continuous ridge of mountains that run the length of the state's borders from north to south), nearly 90% of residents live to its east. This geographical imbalance requires a complex infrastructure of pumps, tunnels, and reservoirs to move water to where it needs to be. Agriculture and industry, foundational to Colorado's economy, make up approximately 90% and 3% of the state's water needs, respectively. Additionally, with neighboring states reliant on Colorado's water, only 40% of the water stays in the state with the remainder serving the Lower Colorado Basin states (Arizona, California and Nevada, and Mexico). This reliance on Colorado's water sources, in addition to challenges such as aging infrastructure, population growth, and extreme weather, continues to threaten the sustainability and quality of Colorado's water resources.

Many cities in the state, like Denver and Colorado Springs, have made progress in water conservation efforts, allowing them to minimize and maintain water usage despite population increases. For example, despite adding half a million people and half a million jobs to the Denver service area, they are using the same amount of water as in the mid-70s through domestic (e.g., low-flow faucets) and municipal (e.g., low-irrigation landscaping) water conservation measures. Municipalities are also taking action to address potential water shortages and ensure water security. The Chatfield Reallocation Project completed recreational modifications and environmental mitigation projects to accommodate an additional 20,600 acre feet of water storage, for water supply for Adams, Morgan and Weld counties, without compromising its flood control function.

In addition to the larger municipalities, Colorado has over 2,000 active public drinking water systems ranging from small and rural systems to the vast urban utilities. Much of Colorado's drinking water infrastructure, including key treatment plants and pipelines, is over 50 years old and nearing the end of its design life. Many agricultural water projects were built over 100 years ago. Additionally, there isn't sufficient data to understand the quality and quantity challenges of decentralized or private water systems across the state.

OPERATION & MAINTENANCE AND FUNDING

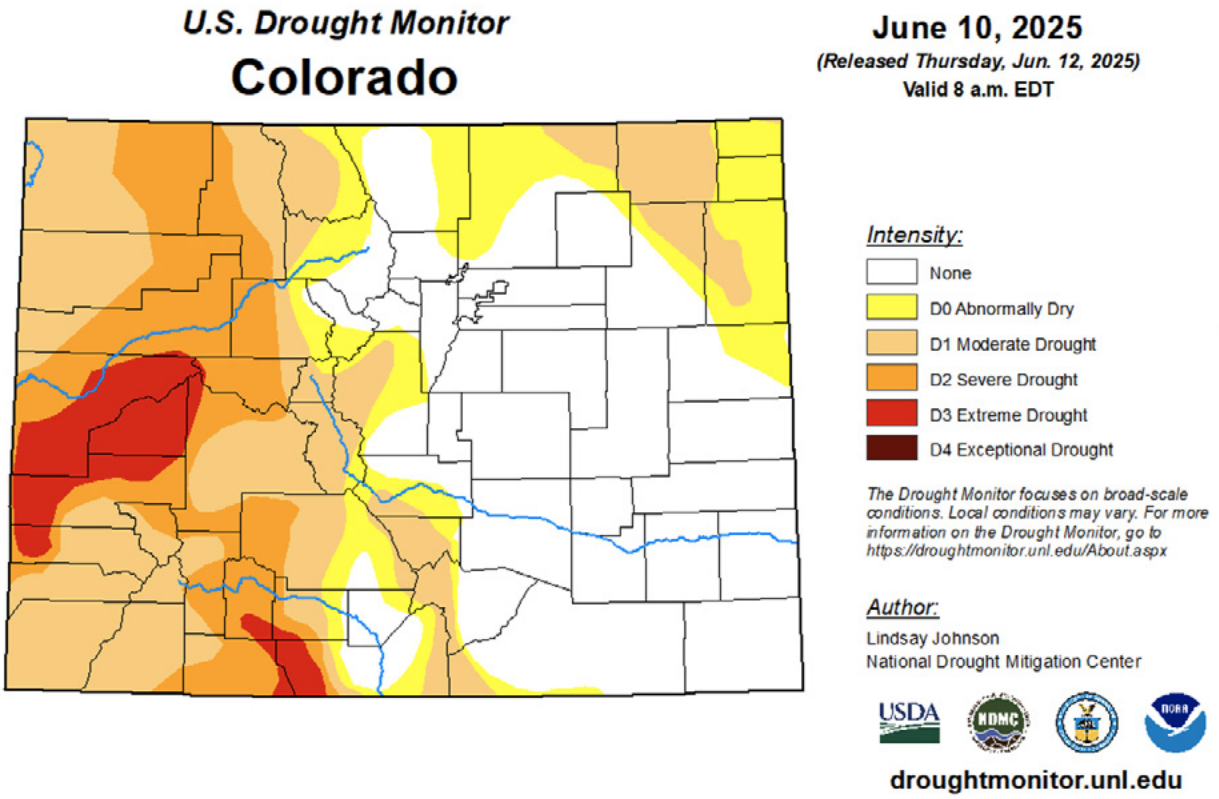
Drinking water infrastructure in the state faces significant funding challenges, with the rate-based system not providing enough to meet the full needs, leading to a noticeable funding gap. While municipalities often overdesign their systems with conservative engineering to plan for future growth, this increases operating costs due to oversized equipment like pumps. However, rising costs of engineering services and construction have led to a focus on value engineering, and municipalities and Special Districts are increasingly responsible for managing these systems with limited resources. Capital spending in Colorado on drinking water infrastructure has risen by about 50%, largely due to federal funding from sources like the Drinking Water State Revolving Fund and the Water Infrastructure Finance and Innovation Act.

In terms of operation and maintenance, most water systems are managed by county and municipal governments or Special Districts. While larger cities and newer systems tend to have asset management plans, most jurisdictions across the state lack formal plans. Maintenance is largely reactive, with only about 30% of work being proactive, leading to challenges in addressing issues before they escalate. Timely repairs of plants, pump stations, storage tanks, and pipelines are required, and contractors often assist with tasks like exercising valves and checking hydrants. Recruitment and retention of workers for water operations and maintenance is a significant issue, compounded by long hours, on-call duties, and harsh working conditions. The sector struggles to promote these roles to younger generations, with a need for more outreach to high schools to educate about career opportunities in the field.

FUTURE NEED

While the state's overall population growth has slowed, counties experiencing the greatest increases are already the most populous in the Front Range. Colorado anticipates a future water supply gap of up to 740,000 acre-feet per year by 2050 (approximately 250,000 households). Given that 80% of water falls to the west of the Continental Divide, while 90% of the population lives to the east, there is an accompanying need for water transfers across the Divide. Many cities have implemented innovative water-saving programs, but continued urban population growth combined with increasing hot and dry spells are driving an increasing need for reliable new water sources in the east.

With average temperatures projected to increase by 2.5°F to 5°F by mid-century, Colorado's threat of long-lived drought also increases substantially. The Colorado River Basin has been experiencing it worst drought in history with the driest 21-year period since 2000. At the time of writing, 60% of the state with a total population of 618,033 has experienced moderate to extreme drought over the last year, with conditions extended drought conditions that are projected to continue with a commensurate elevated wildfire risk. The Colorado River Basin continues in a state of mega-drought arising from consecutive years with low snowpack. Wildfires pose a substantial threat to all infrastructure, including reservoirs and water treatment. The ten largest wildfires in Colorado's history have all occurred in the last 8 years, with 2020 holding the record for largest total burned area (744,120ha) and 2021 for the most destructive fire (1,091 structures).



Source U.S. Drought Monitor June 2025.

As a headwaters state, more than 60% of the water originating in the state is obligated to other states and controlled through nine Interstate Compacts. Each of the main river basin obligations place an additional constraint on Colorado's ability to meet future demands in the face of changing streamflow conditions. The Post-2026 Operating Conditions plan for the Upper Colorado, the largest interstate compact, is currently under negotiation and may further exacerbate identified supply shortfalls.

The Colorado Water Conservation Board estimates $20 billion is required to complete 1,800 locally identified

water conservation projects by 2050. Of this, CWCG envisages a shortfall of $1.5 billion within state funds over the next 25 years. Similarly, the EPA estimates the need for $10 billion over the next decade to upgrade Colorado supply infrastructure that is nearing its end of life. While Colorado was the recipient of considerable federal funds in recent years, this is not guaranteed to continue. Sustained financial investment not dependent on state or federal grants is required, particularly to support small rural communities. In common with many other locations, there is also considerable concern about the availability of a skilled workforce, with an aging workforce, and recruitment posing challenges. Utilities emphasize the importance of growing a well-trained workforce to meet future needs.

PUBLIC SAFETY

Colorado's drinking water quality is governed by the Safe Drinking Water Act (SDWA), with oversight from the Colorado Department of Public Health and Environment (CDPHE). Within CDPHE, the Water Quality Control Division (WQCD) is responsible for implementing the SDWA and ensuring that active public drinking water systems, varying from small communities to large metropolitan areas like Denver, comply with both federal and state regulations to provide safe drinking water. While CDPHE reports that the state typically exceeds the regional goal that 90% of the population served by community water systems receives water that meets all health-based standards, with this average metric most recently ranging from 96% to 98%, many small systems struggle to comply due to aging infrastructure, workforce shortages, and naturally occurring contaminants like uranium and radium. There also isn't sufficient data to understand the quality and quantity challenges of decentralized or private water systems across the state.

In recent years, the state has faced challenges related to emerging contaminants, notably per- and PFAS. Colorado has actively initiated addressing PFAS contamination through its 2019 and 2024 PFAS Action Plans, which includes sampling campaigns, regulation development, and the implementation of the PFAS grant program. The PFAS action plan also outlines strategies to address PFAS in water sources. Through a voluntary testing program launched by CDPHE in 2020, 29 water systems have been identified with a PFAS problem as of May 2024. Addressing these contaminants poses significant financial burdens, particularly for small and rural communities that may lack the necessary resources for mitigation. In response to long-standing water quality issues in mobile home parks, Colorado enacted a law in 2023 granting state authorities the power to test and mandate improvements to drinking water in these communities.

Colorado faces significant challenges with LSL in its drinking water infrastructure. The EPA's 7th Drinking Water Infrastructure Needs Survey and Assessment (DWINSA) projects that Colorado has over 111,000 LSLs statewide, with the majority located in Denver. Denver Water has been proactive on LSL removal since 2016, and in 2020, they launched their Lead Reduction Program, a 15-year initiative aiming to replace all identified LSLs at no direct cost to customers.

RESILIENCE AND INNOVATION

The 2023 Colorado Water Plan established a decade-long coordination effort across local entities to identify and implement actions and funding opportunities to conserve water resources. Immediate actions have focused on reducing water demand, for instance through turf replacement programs and options to reduce irrigation. The Water Plan identified 50 Agency actions to enhance the viability and security of different aspects of Colorado water. At the date of this report, the plan is on track at 20% complete, addressing issues from public education and outreach through to wildfire mitigation and conservation activities.

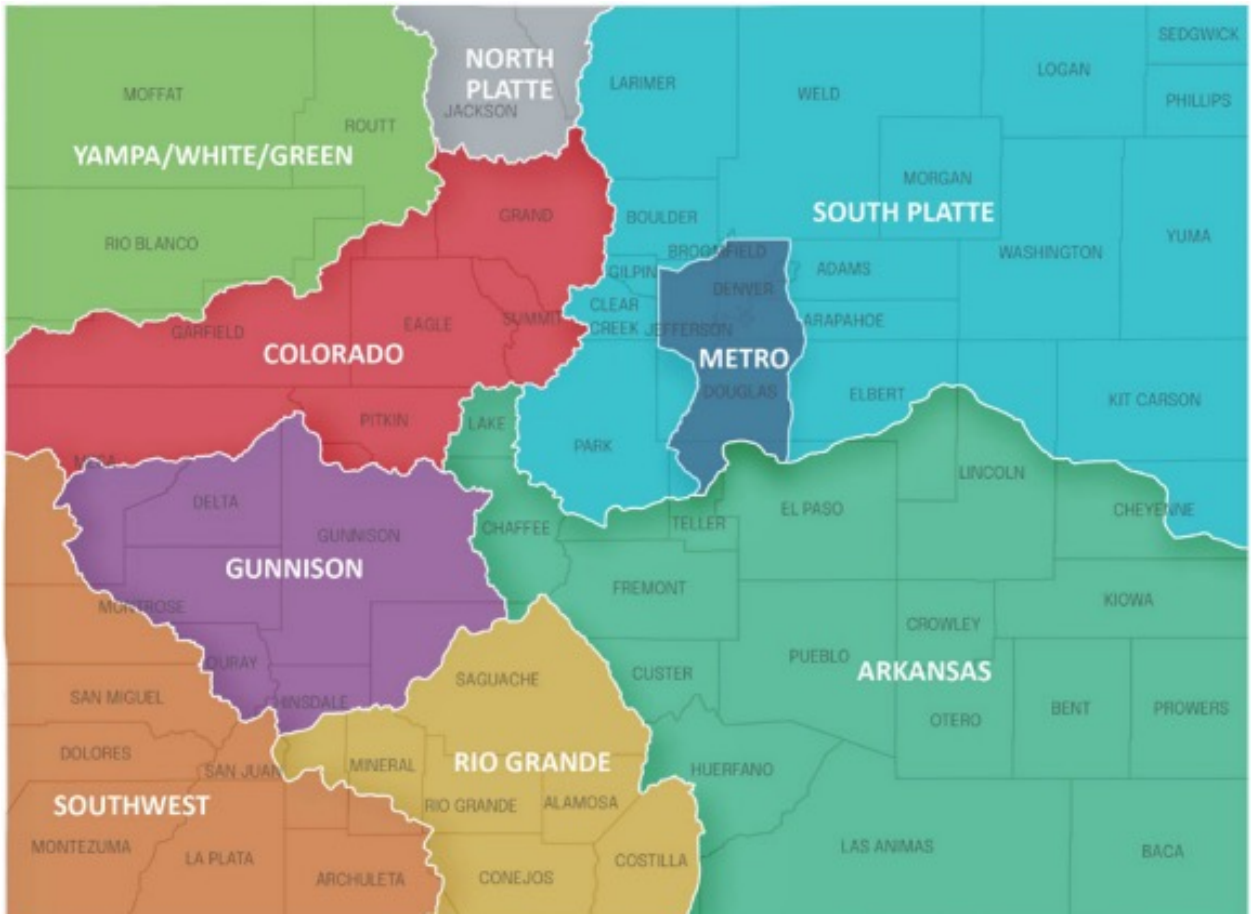
There is an unmet shortfall of water supply in all basins that is growing. For instance, an estimated 6.5 million acre feet (2.2 million household per year) additional storage is required to meet increasing water demand and manage increases in dry periods. Some of this additional need could be met through aquifer storage and recovery, enlargement or rehabilitation of existing reservoirs and reallocation of

existing storage space. However, expansion of existing facilities must be carefully considered against the potential for reduced snowpack and available water that might prevent reservoirs from filling to capacity in the future.

Increasing volatility of wet and dry periods is also increasing the risks of wildfire, flooding and debris flows. Persistent drought in the Southwest basin has cause numerous wildfires, with post-fire debris flows contaminating water supply in addition to infrastructure at risk from burning. The considerable need for communities to assess the susceptibility of their water supplies and critical infrastructure to wildfire is a nascent activity that requires ongoing investment to enhance resilience infrastructure and minimise downstream effects on water quality and quantity. Adaptation to meet these needs could be better supported through streamlining planning and permitting operations for targeted projects, identifying additional funding and update decision support tools. Colorado is home to federal, state and private research institutes who have developed a wealth of knowledge on the diverse impacts from climate change that could be better leveraged within the industry through improved collaborations to advance decision-making.

Irrigated agriculture contributes $47 billion to the state's annual income. It is also, one of the major users of Colorado water that may suffer increasing pressure, both related to changing meteorological conditions and increases in population. Meeting increased urban water needs needs to be carried out collaboratively with the agricultural sector to ensure that this is not at the expense of agricultural and ecosystem needs.

The current Colorado River Compact that covers the seven Basin States (Arizona, California, Colorado, Nevada, New Mexico, Utah and Wyoming) and Colorado River Tribes expires in 2026. Meeting the requirements for the sustainable operation of Lake Powell (managing interannual storage and releases from the Upper Colorado Basins) and Lake Mead (controlling Lower Colorado Basin operations) will require major investment in improved usage monitoring, hydrologic modelling, and subseasonal-to-seasonal forecasts.



Source: CWCB Colorado Water Plan 2023

RECOMMENDATIONS TO RAISE THE GRADE

- Support public outreach and communication to set user fees and rates that cover the full cost of service, including operation, maintenance, and capital needs.
- Develop and fund affordability programs to ensure low-income and vulnerable communities do not bear a disproportionate burden of rate increases. Enhance collaboration and regionalization across systems to support community needs.
- Develop a well-trained workforce through high-quality and affordable training, and work in collaboration with schools and higher education establishments to improve recruitment.
- Identify and maintain sustainable funding mechanisms/sources for drinking water infrastructure improvements.
- Prioritize enhancement and state-wide accessibility of the state-wide asset management tool for drinking water infrastructure in Colorado.
- Continue to develop sustainable water agreements with downstream users, with a focus on securing post-2026 Colorado River Operations that balance in-state needs against export requirements and reduced availability.

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Photo: Power plant in the San Luis Valley of central Colorado

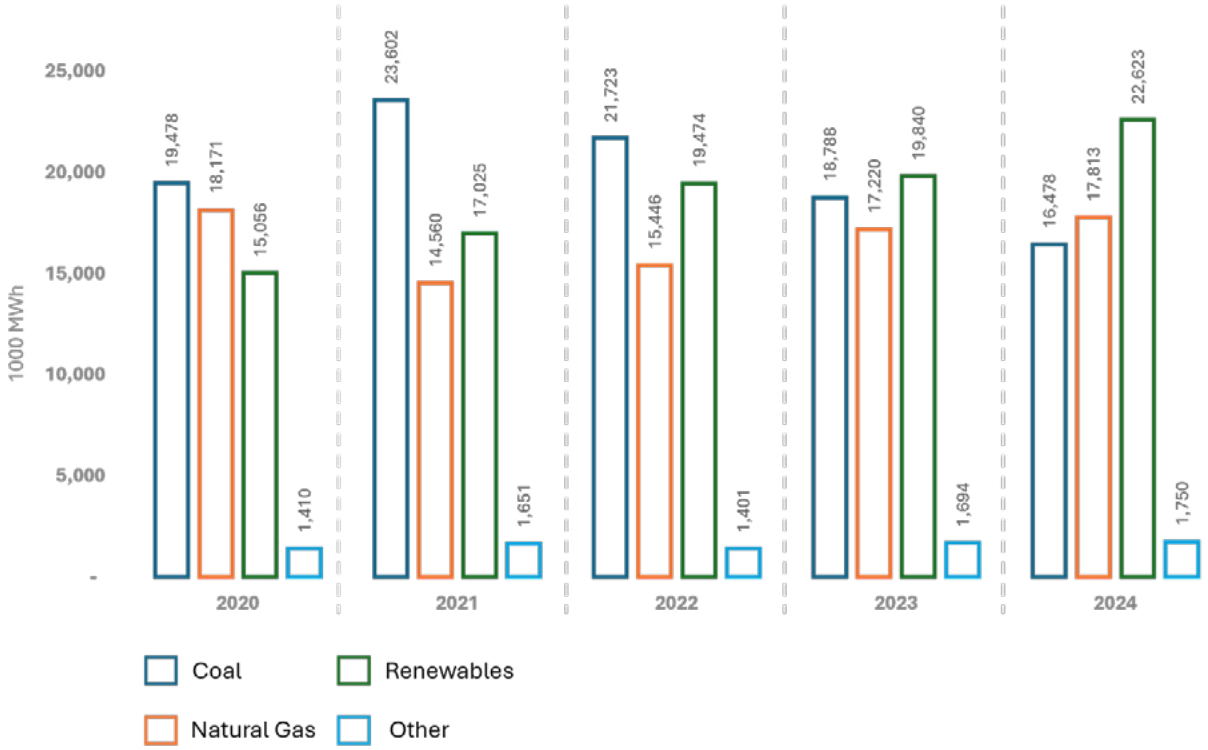
ENERGY

EXECUTIVE SUMMARY

Colorado's energy infrastructure faces mounting pressures due to aging assets, climate-driven disruptions, and a rapidly transforming energy mix. While renewables now contribute 41% of the state's electricity, outdated coal plants and insufficient energy storage capacity threaten reliability. Severe weather events, including the Marshall Fire linked to electrical infrastructure failures and major storms affecting over 150,000 residents, highlight the urgent need for resilience investments, such as microgrids, advanced smart-grid technologies, and pipeline modernization. Utilities are proactively investing billions in transmission upgrades, wildfire mitigation, and renewable integration, yet significant additional resources and strategic planning are essential to safeguard Colorado's energy future.

CONDITION AND CAPACITY

Colorado's electricity sector comprises a mix of investor-owned utilities (IOUs), publicly owned utilities, cooperatives, and independent power producers. Investor-owned utilities are for-profit corporations regulated by the Colorado Public Utilities Commission (PUC). Colorado has two investor-owned electric utilities: Black Hills Energy and the Public Service Company of Colorado (Xcel Energy). Additionally, Coloradans receive electricity from 29 municipal utilities and 22 rural electric cooperatives. These utility companies are not regulated by the PUC because they operate as nonprofit corporations. According to the U.S. Energy Information Administration (EIA), Colorado was the fourth-largest oil-producing state in 2023, accounting for nearly 4% of the total U.S. crude oil output. The state also ranked eighth in natural gas production, with marketed production totaling 1,825,784 million cubic feet. Additionally, Colorado produced 12,371 short tons of coal in 2023, representing 2.1% of the national total. Electric generation capacity in Colorado has been in flux. Historically, the state maintained surplus capacity due to large coal and gas plants, but as these plants age and retire, new capacity is being primarily added through wind and solar. Colorado plans to retire approximately six plants by closing or converting them between 2024 and 2030. In November 2024, the state's total net electricity generation was 4,624 MWh, and the total system net summer capacity in 2024 was approximately 19,639 MW. Colorado continues to generate about 57,000 GWh annually (average of 2020–2024), but the energy mix has shifted significantly. Coal-fired power plants reduced their share to 28% in 2024, down from over 35% in 2020. Renewable energy accounted for 41% of Colorado's electricity generation in 2024, with wind comprising 77% of renewable generation and solar accounting for 22%. Wind and solar combined increased from 27% of the total generation in 2020 to 42% in 2024. Natural gas also saw a slight decrease of 3% between 2020 and 2024. In 2023, Colorado ranked among the top five solar states, with nearly 40% of the state's total installed solar capacity of 4,112 MW. It currently ranks 12th nationally for total installed solar capacity .



Created by using EIA data[5]

While renewable energy now represents 41% of the state's electricity generation, storage capacity remains inadequate. As of July 2023, Colorado had only 237 MW of energy storage capacity, leaving the grid vulnerable to supply-demand imbalances during peak periods. Many of Colorado's coal units (Craig, Hayden, and the older Comanche 1 and 2 units) exhibit typical wear-and-tear for facilities built in the 1970s and are scheduled to shut down between 2025 and 2030.

Infrastructure projects such as Colorado's Power Pathway, approved in 2022 with a budget of $1.7 billion, aim to expand transmission infrastructure in eastern Colorado to accommodate new renewable energy projects. Additionally, Xcel Energy has significant plans to upgrade its transmission system, budgeting $7.4 billion from 2022 to 2027. In 2023, Xcel reported a generation mix of 34.4 GWh, consisting of 40% wind, 11% solar, 33% coal, 15% natural gas, and 1% from other sources, with commitments to increasing the renewable energy share.

Colorado has invested heavily in "smart grid" technologies to help utilities better manage consumer demand, launching Retail Dynamic Pricing Programs. Public Service Company of Colorado reported that an additional 486,000 customers enrolled in dynamic retail pricing programs in the Mountain Census Division in 2022. By the end of 2022, Xcel Energy had installed approximately 850,000 smart electric meters in Minnesota and Colorado as part of grid modernization efforts. The introduction of time-of-use (TOU) rates encourages customers to shift their electricity use away from peak hours (1 pm–7 pm weekdays) when electricity is most expensive to produce. Additionally, the Colorado Commission approved a pilot program for a Virtual Power Plant (VPP).

Several local distribution companies (LDCs), including Xcel Energy, Atmos Energy, Black Hills Energy, and Colorado Natural Gas, operate within Colorado. While exact mileage data of Colorado's intrastate natural gas distribution pipelines is unavailable, ongoing modernization projects aim to enhance safety and reliability. Notable initiatives include the Weld County Pipeline Upgrades and the Greeley-Evans Pipe Replacement Project in 2024. Atmos Energy is replacing aging pipelines and installing new gas service

lines, with the Greeley-Evans project alone affecting approximately 800 customers. These upgrades align with state and federal regulations aimed at reducing methane emissions and strengthening infrastructure resilience. Xcel Energy, Black Hills Energy, and Atmos Energy are also investing significantly in advanced pipeline monitoring, leak detection, and replacement programs to modernize Colorado's natural gas distribution systems.

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OPERATION & MAINTENANCE, FUNDING AND FUTURE NEED

Colorado's energy infrastructure is funded through a combination of IOUs, rural cooperatives, municipal utilities, and private sector investments. IOUs such as Xcel Energy and Black Hills Energy finance infrastructure projects through capital investments, which are typically recovered via regulated rates approved by the Colorado PUC. A prominent example is Xcel Energy's Colorado Power Pathway project, a significant transmission expansion initiative budgeted at $1.7 billion, with costs recovered through customer rates. Rural cooperatives and municipal utilities secure funding through member rates, federal loans, or bonds, supported by programs like the U.S. Department of Agriculture's Rural Utility Service, which provides low-interest loans for rural infrastructure development. The private sector also plays a critical role, particularly in renewable energy projects, using mechanisms such as Property Assessed Clean Energy (PACE) financing to allow property owners to finance renewable and efficiency upgrades through property tax assessments. Together, these diverse funding sources support Colorado's evolving energy landscape, balancing infrastructure expansion, modernization, and sustainability goals. Tri-State G&T and many rural cooperatives have aging coal assets, such as the Craig Station, requiring substantial funding for decommissioning and replacement with renewable energy sources. Historically, co-ops have depended heavily on low-interest federal loans. However, recent federal initiatives, like the USDA's "Empowering Rural America" (New ERA) program, have provided new funding opportunities. In 2023, six Colorado electric co-ops and Tri-State received nearly $3.2 billion in federal grants and loans under this program to support the transition away from coal and toward renewable energy sources. In 2021, the Colorado Electric Transmission Authority was established through Senate Bill 21-072, granting authority to issue bonds and coordinate financing for high-voltage transmission projects. Additionally, in 2022, the state legislature approved smaller appropriations, such as $3.5 million seed funding for the Department of Local Affairs (DOLA) Microgrids for Community Resilience program. Sustainable Rebuilding Program Fund (SB22-206): Governor Polis and the Colorado Energy Office received $1.96 million from the U.S Department of Energy through Renewable Energy Siting Through Technical Engagement and Planning (R-STEP) to streamline the development of solar, agrivoltaics, wind, battery energy storage, geothermal projects, and other critical clean energy infrastructure across Colorado by improving siting and permitting of projects. In 2022, the Geothermal Energy Grant Program allocated $12 million to businesses, Local and Tribal Governments, Public-Private partnerships (may vary by grant subtype).

There are active proposals for natural gas pipelines and upgrades, primarily for reliability and efficiency improvements. The state's utilities are tasked with

operating and maintaining a mix of aging infrastructure, modern renewable energy systems, and innovative technologies like microgrids and battery energy storage systems. Xcel Energy has annual programs for tree trimming in high-risk areas and uses infrared scanning to detect hot spots in substations before they fail.

Currently, active proposals are underway to enhance reliability and efficiency in natural gas pipelines across the state. Colorado's utilities face ongoing challenges of operating and maintaining a combination of aging infrastructure and advanced renewable energy systems, including innovative technologies like microgrids and battery storage. Xcel Energy proactively manages operational risks through annual programs like tree trimming in high-risk wildfire areas and infrared scanning to detect overheating components in substations before they fail.

Photo: bambang

By 2023, Xcel Energy installed nearly 1.5 million smart meters in Colorado. These meters and the associated communications networks provide system operators with real-time visibility down to the neighborhood level, enabling faster outage detection and automated fault isolation. Colorado utilities have developed comprehensive wildfire mitigation plans, which include aggressive vegetation clearance near power lines in fire-prone zones, installation of weather stations, remote cutoff switches, and public safety power shutoffs during critical wildfire conditions.

For distribution system operations, Xcel's rollout of TOU rates from 2022–2023, enabled by smart meter infrastructure, helps shift consumer electricity use away from peak periods, reducing strain on the grid. About 310,000 Colorado customers enrolled in TOU rates in 2023 as part of this demand management strategy. Colorado's fossil fuel pipeline network continues to evolve with both new pipeline proposals and upgrades to existing infrastructure. Increased natural gas production in western and northeastern Colorado has driven proposals for new gathering and transmission pipelines to bring gas to market. The West Mamm Creek Pipeline Project near Rifle, Garfield County, led by TEP Rocky Mountain LLC, involves installing approximately seven miles of new pipeline to collect natural gas from well pads and transport produced water to a central facility. Although this project does not include new oil or gas drilling, it is designed to support future production. Additionally, ONEOK, Inc. has announced plans to construct a new 230-mile, 16-inch diameter pipeline

running from Scott City, Kansas, to Denver International Airport (DIA). Suncor Energy is also planning a new 49-mile crude oil pipeline as part of its Rocky Mountain Pipeline Project.

Colorado's future energy infrastructure must address increasing challenges from wildfire risks, extreme winter storms, and heavy rainfall events, all of which significantly impact grid reliability. For instance, Xcel Energy has already invested over $500 million in wildfire mitigation initiatives. In 2023, Xcel also secured an additional $100 million from the U.S. Department of Energy specifically for wildfire mitigation and grid resiliency enhancements. Battery-based microgrids have been installed at critical sites, including Denver International Airport, Alamosa, and Nederland, enhancing energy reliability during disasters. Colorado's transmission planning documents highlight aging infrastructure, wildfire risk, and extreme weather as persistent vulnerabilities necessitating significant grid modernization investments. Legislation such as Senate Bill 24-218 (2024) supports distribution system modernization aligned with electrification and climate resilience goals. Transportation electrification plans filed by Xcel and Black Hills Energy, totaling over $100 million, are vital for infrastructure upgrades and electric vehicle (EV) integration across Colorado. Moving forward, continued investment in smart grid technologies, renewable energy integration, and expanded grid infrastructure will be essential to meet the state's clean energy and resilience goals amid increasing climate-related disruptions.

PUBLIC SAFETY, RESILIENCE, & INNOVATION

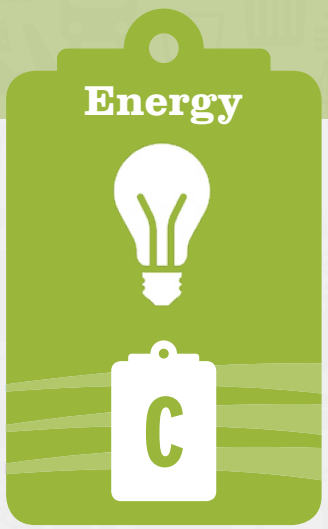
Colorado faces increased threats from severe weather events, notably extreme temperatures, wildfires, and intense winter storms. The state's transmission planning explicitly recognizes extreme weather as a critical challenge, underscoring the growing need for robust financial investments in resilient infrastructure. Sustainability and resilience are now systematically incorporated into infrastructure development via frameworks such as the Colorado Resiliency Framework. This initiative explicitly requires resilience and sustainability considerations for projects funded or supported by state-administered programs, aligning infrastructure bids with broader state sustainability objectives. Also, the Colorado PUC actively integrates sustainability into its policies, guided by legislative mandates to decarbonize the electricity sector, such as Senate Bill 19-236 and House Bill 19-1261, which require utilities to include environmental and sustainability criteria explicitly in transmission planning and energy generation strategies. The Colorado PUC mandates detailed 10-year transmission planning involving all regulated utilities, indicating strong and coordinated asset management practices. These plans explicitly address reliability, load growth, and resilience and core components of systematic asset management strategies. Colorado supports innovative renewable energy systems such as microgrids through targeted initiatives like the Microgrids for Community Resilience Grant Program, administered by the Department of Local Affairs (DOLA). Xcel Energy is also expanding its use of advanced leak detection technologies, such as drones and mobile aerial monitoring, to enhance its methane leak inspections. These innovative methods significantly improve the safety and resilience of Colorado's natural gas infrastructure.

Colorado faces increased threats from severe weather events, notably extreme temperatures, wildfires, and intense winter storms. The state's transmission planning explicitly recognizes extreme weather as a critical challenge, underscoring the growing need for robust financial investments in resilient infrastructure.

Since 2020, Colorado has experienced numerous significant weather and climate disaster events, including at least two severe storms annually and a 60% likelihood of winter storms each year. From January 2020 through January 2025, Colorado faced approximately 20 major power outages, with 2020 being especially disruptive due to extreme wildfires and a rare windstorm that caused eight significant outages. Some outages each affected 50,000–100,000 customers or more. For instance, a severe windstorm in April 2024 left over 150,000 Xcel Energy customers without power. A rare derecho windstorm on June 6, 2020, caused widespread damage and left over 208,000 customers statewide without power. Additionally, on an exceptionally windy day with gusts up to 115 mph, the Marshall Fire ignited in Boulder County, partially due to a downed Xcel Energy power line. This wildfire destroyed over 1,000 structures and severely damaged local power infrastructure. Xcel reported restoring power to 94% of affected customers within 24 hours after major storm-related outages in 2022.

Heatwaves, increased cooling demands, and peak grid operations significantly stress infrastructure. According to Xcel Energy's 2023 Sustainability Report, Colorado had approximately 2,417 MW of solar capacity installed in 2023, contributing to Xcel's total system-wide solar capacity of 4,023 MW, including both utility-scale and distributed solar . The Solar Energy Industries Association (SEIA) reported Colorado's total installed solar capacity at 4,194.59 MW in 2023. This rapid expansion of solar and wind energy requires significant ongoing operation and maintenance (O&M) for generation assets, including wind turbines, solar panels, and inverters. To enhance safety and reliability, Xcel Energy is exploring advanced mobile and aerial leak detection technologies, such as drones, to complement its regular methane leak inspections.

Xcel Energy has substantially invested in smart grid technologies, deploying approximately two million advanced smart meters across Colorado by 2023. These smart meters significantly enhance grid responsiveness and resilience through real-time monitoring, improved outage management, and demand-side energy management strategies. In 2023 alone, about 310,000 Colorado customers enrolled in TOU rates, helping reduce grid strain by shifting usage away from peak demand periods. Moreover, rapid growth in customer participation in renewable energy programs saw over 300,000 Xcel customers engaged in renewable energy initiatives by 2023.



RECOMMENDATIONS TO RAISE THE GRADE

- Expand the existing Microgrids for Community Resilience Grant Program, especially targeting rural and high-risk wildfire zones, in addition to educating and outreaching about the advantages of microgrids to the communities.
- Expand use drone-based and aerial leak-detection systems across all utilities to improve methane monitoring and pipeline safety.
- Promote installation of advanced smart meters and grid software systems.
- Rapidly scale infrastructure outlined in Colorado's Transportation Electrification Plans. With over $100 million already committed by Xcel Energy and Black Hills, immediate implementation of EV charging stations and grid integration projects can help reduce emissions and meet electrification targets.
- Enhance education and outreach about the advantages of microgrids.

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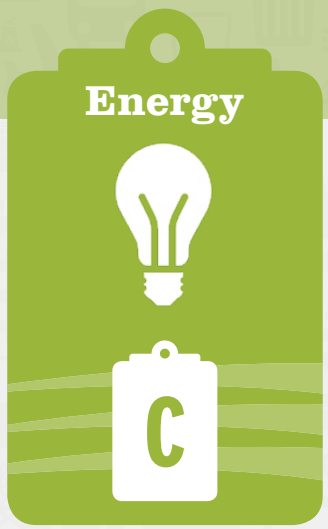

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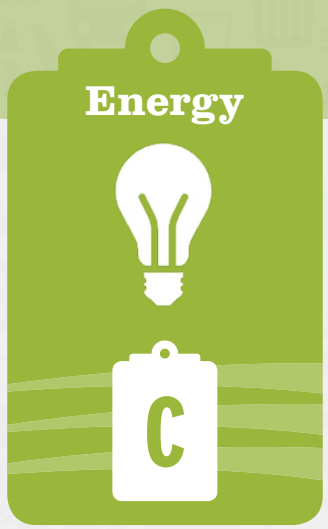

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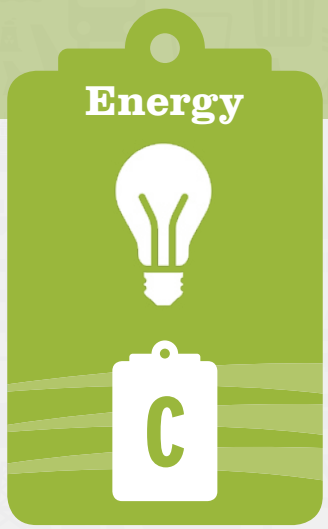

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Levees

D+

GRADE COMPARISON

CO: D+

Nat'l: D+

Photo: A piece of a most unusual levee along the Arkansas River in Pueblo, Colorado

LEVEES

EXECUTIVE SUMMARY

Since the last ASCE report card on Colorado levees there has been very little change in the situation of levee systems in the state. There are still no consistent standards or regulations in the state governing the evaluation or inspection of levee performance and condition. With the occurrence of more frequent extreme weather, levees prove to be more and more critical to the communities they protect.

On the national level, there is the beginnings of an effort to improve and provide a consistent approach for levees in the nation. This includes a one-time inspection and assessment of every levee in the nation, consolidating all data for levees (used by both US Army Corps of Engineers and Federal Emergency Management Agency) in the National Levee Database, the design of a model state Levee Safety Program that will include sample legislative language for building state programs, and the development of national guidelines for levees from conception to decommissioning.

The National Levee Database is the best source of information about the levees in the United States and is a Congressionally authorized database maintained and published by USACE. The NLD provides the general condition, population and structures at risk, property value, and last known assessment/inspection dates of levees recognized by the database.

The levee infrastructures of Colorado are located within FEMA Region 8. These structures are sponsored and maintained by the Federal government, local governments, conservation districts, public universities, private institutions and other entities. There are at least 15 levee systems, totaling over 10 miles, in Colorado recognized by the NLD where the sponsor or owner is unknown or undefined. More concerning is over 70% of the permitted levees in Colorado were constructed prior to 1988, when specific levee design requirements were adopted by Colorado's Department of Natural Resources in the Rules and Regulations for Regulatory Floodplains. A statewide inventory of levees has never been undertaken and many unpermitted levees exist, especially in rural areas.

CAPACITY

Any levees designed to protect communities and reduce or eliminate the need for flood insurance are required to be built to protect against the 100-year flood. However, as climate change increases the intensity of floods, the 100-year flood level for many communities may change. The capacity for the majority of levees in the State of Colorado is at or below flood protection for a 100-year event, usually based on the need for flood protection and certification under the NFIP. A few of the primary river systems flowing through the state are the Colorado River, the Gunnison River, the Dolores River, the San Juan River, the Animas River, the Big Thompson River, the Platte River, the Republican River, the Arkansas River, and the Rio Grande River.

Aging levees require more intensive maintenance and vigilance to ensure proper performance should a large flood event occur. The communities protected by Colorado levees often are not aware of this protection nor do they understand the maintenance and repair these structures require.

CONDITION

Colorado levees in the NLD have an average age over 47 years, which is lower than the national average age of 61 years. Although the information gathered on documented levees indicates good inspection and maintenance frequency, the NLD information represents much less than half of the actual levee miles in Colorado. Because the levees in the NLD are typically in the USACE PL 84-99 Rehabilitation Program and/or are considered for the National Flood Insurance Program, they see much more maintenance and repairs than levees not included in the NLD. As part of the National Levee Safety Program initiative, Congress has authorized an effort to perform an initial inspection on every levee in the nation, regardless of its ownership or affiliation with federal programs. However, the funding for these inspections is limited and Colorado has not yet been part of this effort.

Aging levees require more intensive maintenance and vigilance to ensure proper performance should a large flood event occur. The communities protected by Colorado levees often are not aware of this protection nor do they understand the maintenance and repair these structures require. According to the 2019 USACE Levee Safety Report, there are approximately 30,000 people living behind known levees in Colorado. Further, hundreds of critical infrastructure systems are protected by levees throughout Colorado, which represents billions of dollars in assets. Without state standards and regulations for inspection, operation, and maintenance of levees, the actual condition and risk to properties protected by levees is often misunderstood.

The USACE has two types of levee inspections: routine and periodic. Routine inspections include the visual verification and rating the levee system operation and maintenance, which are typically performed annually for all USACE Levee Safety Program levees. Periodic inspections are more comprehensive and are performed by USACE multidisciplinary teams led by a professional engineer. Periodic inspections occur every five years on the federally authorized levees in the USACE Levee Safety Program.

Because the full extent of levees in Colorado is not accurately inventoried, the hazards associated with levee failures have not been fully identified and the resources required to provide acceptable levee hazard mitigation are unknown. Where information on levee condition does exist, it shows the condition is typically poor. Funding is limited and cannot be effectively prioritized due to lack of information on hazard level and levee condition.

Photo: saeedreza

OPERATIONS AND MAINTENANCE

Regular maintenance and inspection of all levees in Colorado is the responsibility of the individual levee owners or non-federal sponsors. Only 20 of the 59 levee systems that have been identified in Colorado are regularly inspected to meet the requirements of eligibility for the NFIP or PL 84-99 Program. As previously stated, the limited set of levees that have been inspected have typically received a poor condition rating.

In most cases, for levees designed and constructed by the USACE in Colorado, non-Federal sponsors have the responsibility of operations and maintenance. Non-Federal sponsors are typically a community, drainage district, Colorado State agency (such as the Colorado Water Conservation Board), or levee district. The Templeton Gap Floodway, currently managed by the City of Colorado Springs, is an example of a non-Federal sponsor. These communities participate in the USACE's PL 84-99 program, which allows the USACE to provide funding and assistance for preparedness, response activities, and certain types of rehabilitation. As part of this program, the USACE completes annual inspections and more detailed periodic inspections of the levee systems once every five years. Eligibility for the PL 84-99 program requires the levee sponsor to maintain the levee system in an acceptable or minimally acceptable condition.

FEMA requires that all levees providing protection for the 1% chance annual flood event (the 100-year flood) on a FIRM must be certified by a Colorado licensed professional engineer. FIRM are used by local communities to administer floodplain management ordinances and to remain in compliance with the National Flood Insurance Program (NFIP). FIRM are also used by lending institutions to determine if a home is in a 100-year floodplain.

Homeowners with federally backed mortgages whose homes are within the 100-year floodplain are required to purchase NFIP flood insurance. If a levee system in Colorado were to lose its FEMA accreditation, then those residents would be mapped as being in

the 100-year floodplain and subject to mandatory flood insurance requirements for federally backed mortgages and other regulations. The requirements for levee certification are in FEMA's Code of Federal Regulations, Section 65.10 (CFR 65.10). Among these requirements are the expectation of adequate freeboard (vertical distance between the top of the levee and the full supply level on the reservoir) for the 1% chance annual flooding event, meeting levee seepage and stability levee design requirements, and maintaining an operations and maintenance manual. FEMA requires this documentation of certification to continue to be shown as providing protection on any new FIRM project.

FUNDING

Most work on levees in Colorado is funded by the local owner. Those projects that have an association with USACE do have the ability to work through the federal funding process to compete for federal appropriations for improvement projects. These improvements cannot fall under the scope of O&M activities.

Without adequate data it is difficult to quantify the cost of the repairs, inspections, and relevant operation and maintenance (O&M) activities Colorado's levees. It is unknown at this time what the future need will be for O&M. Although USACE hopes to provide tools in the near future to help levee owners better understand the costs associated with O&M, as well as capital improvements, those tools are not yet available.

Based on past projects, environmental construction cost factors of 13% were used for levees within the western portion of the U.S., whereas 4% was used for the rest of the Nation. The USACE pays 75-100% of repairs if the levee system in USACE's programs and funding is available. Following the methodology used by the Kansas chapter of the American Society of Civil Engineers' 2013 Infrastructure Report Card Committee for estimating the cost of repairs, levee repairs can be up to $50,000 per levee mile for minor repairs and upkeep to several million dollars per mile for upgrades or repairs following a levee failure.

Assuming twice the number of miles than reported in the NLD, there are approximately 132 miles of levee in the state, and nearly all will require maintenance in the next 20 years. Assuming an average improvement cost of $500,000 to $1 million per levee mile, the resulting funding deficit is likely $500 million to $1 billion over the next 20 years, or approximately $25 to $50 million per year. It is likely that only a small percentage of levees in the state have adequate funding for long-term repairs that will be required as the levees continue to age.

Assuming an average improvement cost of $500,000 to $1 million per levee mile, the resulting funding deficit is likely $500 million to $1 billion over the next 20 years, or approximately $25 to $50 million per year.

FUTURE NEED

The largest future need for levees in Colorado is the development of a State Levee Safety Program that can oversee the evaluation and performance of all levee systems in the state, similar to the Colorado State Dam Safety Program. The first step in this process will be the completion of the National Levee Safety Program. As part of that effort, a model State Levee Safety Program will be provided for State Legislatures to consider implementation of a state level program to better understand the levees that are in their state. Although FEMA is authorized to manage a grant program associated with the National Levee Safety Program, Congress has not appropriated funds for grants to be made available. If grants were available, the best use of those grants may be to the states to stand up their own levee safety programs.

PUBLIC SAFETY

Homelessness has become a rising concern for public safety around levees. Many homeless encampments are built up on the water side of levees because it gives people close access to a water source. This can be extremely hazardous to an even more vulnerable population that is difficult to warn and evacuate in the event of a flood event.

There is also a growing conversation on the impact of levees and their surrounding environment. Levees have the potential to change ecosystems, induce flooding in areas that may not have otherwise flooded, and create development challenges for communities. It is critical for levee owners to coordinate closely with those impacted to ensure necessary flood risk management is well integrated into the other needs of the community.

RESILIENCE

It is difficult to estimate the resilience of levees in Colorado without a comprehensive understanding of their current condition. A statewide inspection is necessary to assess their structural integrity, maintenance status, and ability to withstand extreme weather events.

Building resilient levees is critical to protecting communities from increasingly frequent and severe flooding events driven by climate change. Without resilient infrastructure, the risk of catastrophic levee failure rises, potentially leading to loss of life, property damage, and long-term economic disruption. Investing in resilient levees now helps ensure public safety, reduces future recovery costs, and supports sustainable development in vulnerable areas.

INNOVATION

Guidance is expected to be coming from the National Levee Safety Program in the next two years. It will be key to supporting levees from design, to construction, to operations and maintenance, and potential decommissioning. This guidance is anticipated to include guidance for implementing newer concepts like planning for future climate change challenges.

Currently there is no State Levee Safety Program to help levee owners manage their operations and decision making. Any policies impacted by levees would likely come from the environmental policies of the state.

RECOMMENDATIONS TO RAISE THE GRADE

While there should be a strong Federal role in supporting levee safety programs, Colorado state agencies and municipalities have a key role to play as well. Specific action items that Colorado should adopt include:

- Advocate for full implementation and funding for the USACE National Levee Safety Initiative, and full support for a risk-informed approach to levee safety. Risk gives all communities protected by levees a voice to communicate their needs, instead of those communities along the largest and most vocal river systems getting all of the resources available to the nation.
- Establish performance standards for Colorado levees that are consistent with other hazards faced by state residents, rather than relying on the Federal default protection for 1 in 100 year floods.
- Encourage hazard assessments for all Colorado levees.
- Establish regular inspection of all significant and high hazard levees within the state's jurisdiction and provision of the information to the national levee database.
- Identify funding sources to implement levee improvements for all high or significant hazard levees in an unacceptable condition.

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Photo: Broken levees pouring water into towns, during massive floods;Topaz

Photo: Great Sand Dunes National Park

PUBLIC PARKS

EXECUTIVE SUMMARY

Colorado proudly maintains 13 national parks and monuments, 11 national forests, two national grasslands, 43 state parks, and numerous open areas, recreation areas, city parks, and trails across the state. The last 4 years have been marked by unprecedented events such as the COVID-19 Pandemic and ongoing economic and environmental impacts. Parks are crucial to Colorado's economy, contributing approximately $65.8 billion annually to the state and supporting over 400,000 jobs. Despite their importance, many park agencies lack the financial resources to adequately maintain trails, restrooms, and more, especially as usage rates rise. The National Park Service (NPS) identified $558 million of deferred maintenance in the 13 parks and monuments managed in Colorado. Colorado Parks and Wildlife (CPW) and the NPS are implementing innovative timed entry systems and shuttles to accommodate the increasing number of visitors to Colorado parks. Meanwhile, park managers throughout the state are finding ways to adapt to climate change and make their parks more resilient.

CAPACITY

Colorado is home to 13 national parks and monuments, 11 national forests, 2 national grasslands, 43 state parks, and numerous open space areas, recreation areas, city parks, and trails across the diverse state. Since 2019, Colorado has added a new national park and two new state parks. Colorado's parks are managed by various entities, including the NPS, CPW, the U.S. Forest Service (USFS), and numerous local municipalities and volunteer organizations. According to CPW, 72% of Coloradans recreate outdoors at least once per week, and 64% use Colorado's vast recreation system in their neighborhoods or local communities. According to data collected by the Trust for Public Land, 80% of Coloradans have access to open space, parks, or trails within a 10-minute walk of their homes.

Additionally, over 93.3 million tourists visited Colorado in 2023, up from 85 million in 2017, to enjoy the outdoors, often hiking one of Colorado's estimated 39,000 miles of trails. In 2023, National Parks in Colorado had approximately 7.8 million visitors, a decrease of 2.1 percent from a peak in 2021. Most of this decrease is because Rocky Mountain National Park has seen an overall reduction in visitorship, likely due to the NPS implementing an innovative timed entry and reservation system. This system caps the number of visitors throughout the day and will likely lead to continued reduced or plateaued visitorship and a less congested park. State Parks have also seen a decrease in visitorship since a peak in 2021. The timed entry system will relieve stresses on the park infrastructure, ideally

leading to longer lifecycles for park infrastructure. An example of stressed infrastructure is the vault toilets in BigHorn National Forest, where facilities have been closed due to disrepair, but are being addressed via the Great American Outdoors Act (GAOA) projects. The NPS and CPW are also exploring expanded shuttle systems, such as the Eldorado Canyon State Park shuttle from Boulder, the Rocky Mountain National Park shuttle from Estes Park, and the Bustang from Denver, which will all help reduce congestion.

While visitation numbers have stabilized in the last few years, this is likely due to parks at all levels seeing a new baseline attendance rather than a shift away from outdoor recreation. Visitation is still higher than pre-pandemic levels, and the new baseline suggests parks are seeing capacity stresses that were not predicted prior to the pandemic.

Photo: Chessman Park in Denver, Colorado; zimmytws

CONDITION

Park conditions vary across Colorado. Throughout the state, outdoor recreation priorities are being addressed through various initiatives and funds, such as the Great Outdoors Colorado Fund (GOCO), which is financed through state lottery revenues. GOCO has assisted with funding for 125 projects with $99 million in grant funding in fiscal year 2024 alone. One of these projects was the expansion of the Heil Valley Ranch Open Space in Boulder County. Initiatives and grants like these are adding to and improving parks across the state.

Despite these efforts, many parks and trails are still in poor condition, including landmark recreation locations like many Colorado Fourteeners. “Fourteeners” are peaks in Colorado that are above 14,000 feet in elevation, and most are on public land. Twenty percent of the peaks and routes inventoried by the Colorado Fourteeners Initiative in 2019 received a grade of D+ or lower due to degradation from overuse and misuse. However, this is an improvement of about 10 percent since 2015. Ill-defined trails and user-created routes can

result in trail braiding and loss of fragile alpine tundra soil and vegetation, quickly eroding the peak and its routes. Many Fourteeners trails are estimated to need $1 million or more to restore routes to ideal conditions.

While research has largely been influenced by the Denver Metro area as a whole, towns outside of Denver, such as Erie, Longmont, and Colorado Springs, continue to invest in park infrastructure. The Town of Erie is one of the nation's fastest-growing towns, and it prioritizes connecting the new population with parks via its Connecting YOU to FUN Playbook. This refreshes their 2016 Parks plan, and is evidence that smaller towns are investing in their local outdoors. While Erie is excited and continuing to fund new parks and infrastructure, Longmont is struggling to fund its aging infrastructure, not having updated its parks master plan since 2014. This juxtaposition highlights the need for continued improvement of aging infrastructure, while providing glimpses of things to come when the local jurisdiction prioritizes funding.

OPERATION AND MAINTENANCE

Funding for operations and maintenance is not keeping up with usage increases or the needs of aging infrastructure. The National Park Service estimates $558 million of deferred maintenance for the 13 parks and monuments managed in Colorado, more than double the deferred maintenance costs in 2019. At the local level, park operations and maintenance are facing ongoing struggles. Federal money is rarely directed to local operations and maintenance. In 2024, budget cuts to Denver Parks and Recreation's maintenance budget delayed the hiring of approximately 130 seasonal maintenance workers by about four months.

In addition to financial backing, Colorado parks rely heavily on Coloradans who volunteer their time and effort for everything from organizing events to trail building and maintenance. However, volunteer hours have decreased by approximately half since 2018. Volunteers for Outdoor Colorado logged more than 19,600 hours of volunteer time in 2023 for a total donated labor value of roughly $675,000. Over 15,000 Denver Parks and Recreation volunteers contributed over 58,000 hours of service for a total donated labor value of approximately $1.9 million.

FUNDING AND FUTURE NEED

Ninety percent of CPW funding comes from sources other than taxes, including grants, licenses, fees, donations, the Land and Water Conservation Fund, and GOCO. Due to demographic changes, reduced participation in hunting and fishing, and increased demand for parks and open space, funding for parks and wildlife has not kept up with inflation and population growth.

According to the 2024 Statewide Comprehensive Outdoor Recreation Plan (SCORP), funding is the most common challenge for parks and open space managers, and grants were the most common strategy for addressing these challenges. The SCORP lays out specific strategies to increase and diversify funding. CPW implemented the Keep Colorado Wild program in 2023, which allows residents to purchase a state park pass for $29 when renewing a license plate. In 2023, the Keep Colorado Wild program generated $32.5 million for state park maintenance and capital improvements.

Many cities and counties do not receive adequate funding for local parks, open spaces, and trail systems. There are some grant and partnership programs available through organizations such as the Trust for Public Land, GOCO, and the Land and Water Conservation Fund. However, these programs cannot fully fund local parks. Some communities have developed park-specific tax funds, such as Denver's Parks Legacy Fund. This fund is a sales tax passed by voters in 2018, dedicated to parks, and has been a significant funding source over the last 4 years for Denver Parks and Recreation.

Colorado's population of 5.9 million is projected to expand to 8.7 million by 2050.

In addition to a growing population, Colorado has an aging population. By 2040, the population over the

age of 65 will be nearly three times what it is today, increasing twice as fast as the total population within the state. Planning for future recreation and park spaces must consider the needs of the changing population, including parks and spaces that are easily accessible for people with disabilities. Colorado is also home to tribal lands that present unique needs with respect to parks and outdoor recreation, with priorities such as the development of team sports facilities and improving outdoor education facilities and programs. The future of Colorado parks includes an increased need for funding to manage parks and landmark locations that have defined the landscape of Colorado, such as its many Fourteeners or Rocky Mountain National Park. However, Colorado must also grow and adapt to the changing population's needs for local and accessible outdoor and green space.

RESILIENCE

Colorado park managers must find ways to minimize the impacts of natural and human-induced hazards on park infrastructure and on the natural environment. Park systems in Colorado have implemented many different types of plans to improve resiliency, including integrated pest management plans, wildfire resilience plans, floodplain and stormwater management plans, and habitat management plans.

Additionally, as Colorado sees increasing threats from droughts, irrigation needs are putting an increased strain on overall water resources. In response to water scarcity concerns, most park systems in Colorado have implemented water management plans to reduce water consumption. These plans include improving irrigation systems to reduce waste and using less water, such as by planting native plants. The Quebec Street medians project in Denver is an example of the kind of resilience projects that park managers throughout Colorado are implementing. This project replaced 10 acres of Kentucky bluegrass with native prairie grass meadows to reduce irrigation usage and add native pollinator habitat. The project is a partnership with Denver Water, which is also helping fund the project.

Photo: Colorado Springs, Garden of the Gods; Danita Delimont

PUBLIC SAFETY

As climate change causes more extreme weather events, wildfires will likely continue to worsen, and increased funding will be needed to manage the risk in open spaces. The three largest wildfires in Colorado's history occurred in 2020, and two of the most destructive wildfires by homes lost occurred in 2020 and 2021. In 2020 alone, over 744,000 acres were burned, 30,000 of which were in Rocky Mountain National Park.

As Colorado's population continues to grow, the urban-wildland interface, where people live and work in regions closer to parks and open spaces, are most at risk for wildfires, will also increase, which presents an elevated public safety concern. Wildfires can also harm water quality in Colorado's parks, increase flood risk after a fire, and damage structures and electrical grids. The Colorado Division of Fire Prevention and Control (CDFPC) works with federal, state, and local agencies to coordinate wildland fire management throughout the state through technical, funding, response, preparedness, and planning support. Colorado also maintains a statewide mutual aid plan to efficiently mobilize resources to fight wildfires.

In the 2024 SCORP, 79% of park users identified maintaining visitor safety as their highest service priority. This concern was ranked third in the 2014 and 2019 SCORPs. In urban parts of the state, local officials have struggled with increased homelessness since the COVID-19 pandemic began. Denver has closed multiple parks since 2021 due to safety concerns, such as drug use, sanitary conditions, and assaults. Park Rangers play a critical role in preserving public safety. Since 2006, the Denver Park Rangers program has grown from 2 to nearly 50 employees, adding 17 in 2023, bringing the total to 45 rangers. The rangers are compassionate and help address systemic causes of homelessness, addiction, and other public safety matters. They can connect people to resources and administer medical assistance in life-threatening situations.

As Colorado's population continues to grow, the urban-wildland interface, where people live and work in regions closer to parks and open spaces, are most at risk for wildfires, will also increase, which presents an elevated public safety concern.

INNOVATION

The 2022 transformation of Panorama Park in Colorado Springs exemplifies how Colorado park managers are innovating. Colorado Springs collaborated with several funding partners to revitalize an underused space into a community park through a robust stakeholder input process. The new park has many activity areas, including a universally accessible playground, event space, a bike park, and sports fields. It also fully integrates stormwater management practices throughout the site, such as incorporating detention ponds within the bike park.

As Colorado parks continue to experience increased visitor traffic, park managers have turned to innovative systems, such as the timed entry system at Rocky Mountain National Park, to manage park capacity and visitors.

In addition to parks within city limits, some communities, including Denver, also have a vast mountain park system. As part of its mountain park system, Denver also maintains two bison herds, which are descended from the last wild bison in North America. Beginning in 2021, the City has donated 125 bison to the Cheyenne and Arapaho Tribes. The bison herds help support the health and survival of the species by preserving genetic diversity, protecting ecological functions, and providing educational opportunities.

Like most aspects of infrastructure, parks lack sufficient funding opportunities, which limits innovation.

RECOMMENDATIONS TO RAISE THE GRADE

- Focus on a sustainable approach to maintaining and creating infrastructure. When designing future park infrastructure, consider maintenance, water use, potential co-benefits, safety, and full life-cycle costs.
- Continue to identify and invest in park systems that are valuable to a diverse population and reduce the strain on existing parks.
- Encourage local agencies to emphasize identifying and creating green spaces and parks within urban environments.
- Secure grants, public-private partnerships, and other alternative funding options to fund large capital projects, streamline projects, and improve park access.
- Implement entry reservation systems and shuttles, as appropriate, to reduce congestion.
- Continue to improve park safety through wildfire mitigation efforts and hiring appropriately trained park rangers.

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Photo: The historic Durango and Silverton steam locomotive traverses up a beautiful canyon through the San Juan mountain range

RAIL

EXECUTIVE SUMMARY

Every day, Colorado's rail system transports 400,000 tons of goods—including coal, crude oil, lumber, cement, and grain—into, out of, and through the state. Amtrak also provides over 228,000 annual boardings on its Colorado passenger rail service. Class I freight rail lines transport the majority of goods in Colorado, while Class II and Class III (regional and short line) routes provide connections to towns and key agricultural and natural resource-producing regions. Two year-round passenger services run through the state and connect Colorado communities to each other and to neighboring states. Colorado rail is largely privately-funded, since nearly all rail is privately owned, and meets acceptable standards in most criteria, but challenges remain. Short line rail is underfunded and often struggles to maintain standards needed for Class I connectivity. Passenger rail seeks increased funding to support underserved regions and to better connect existing rail routes. Overall, investment through continued development across the whole spectrum of freight and passenger rail is needed to improve the state's rail. As the population grows, Colorado should be able to provide a safe, efficient, and well-financed freight and passenger rail network to ensure the success of the state and its residents.

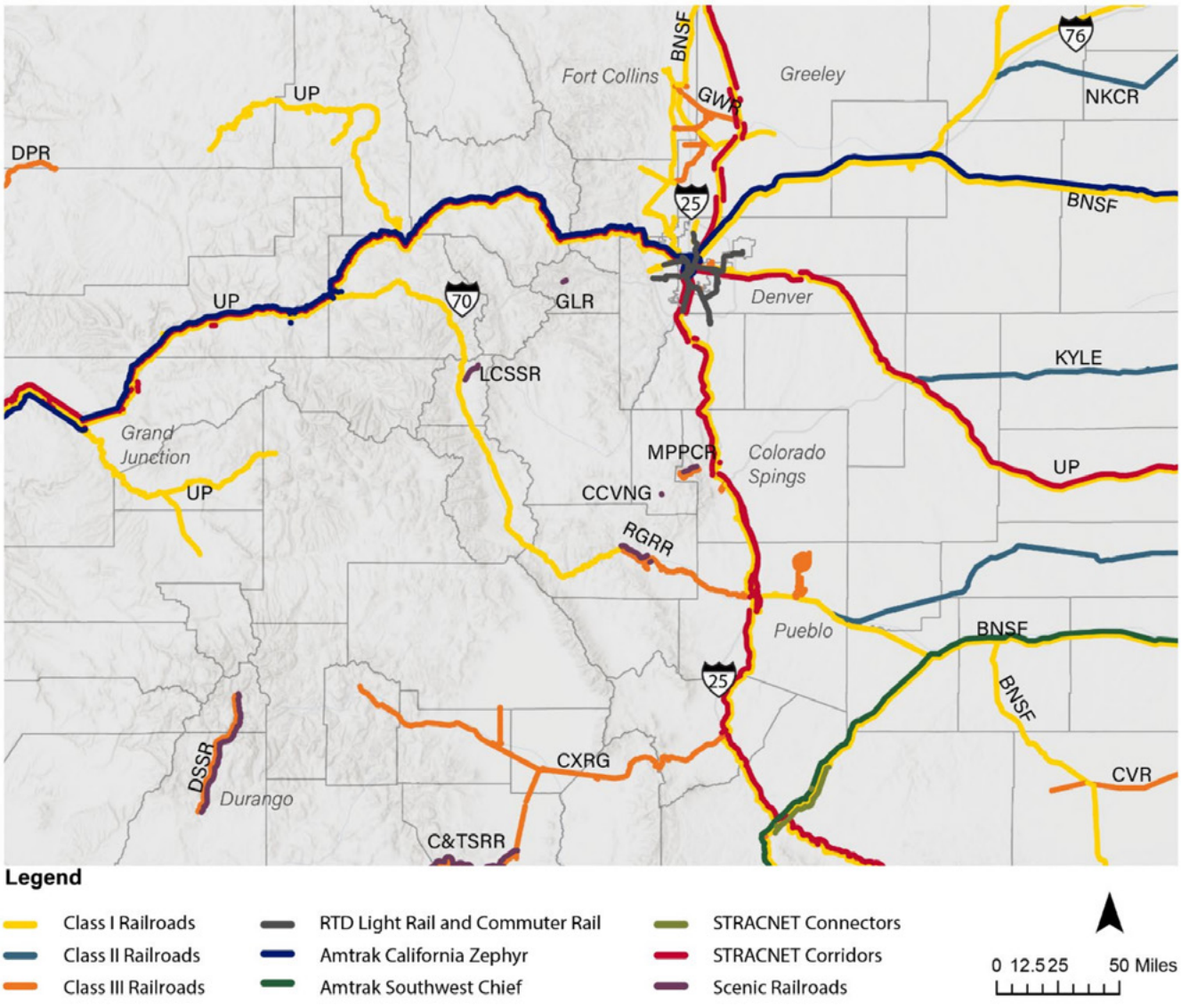
INTRODUCTION

Two Class I railroads operate in Colorado: Union Pacific Railroad (UP) and BNSF Railway (BNSF). They own and operate about 80% of the state's freight track miles, a total of 1,968 route miles. These railroads are the primary corridors within the state. The three Class II and eight Class III railroads connect with the Class I railroads to provide access to specific customers and regional industries. Class II and III railroads operate about 20% of freight track miles. In total, these railroads operate on 2,545 route miles of track. In addition, Amtrak, the primary provider of intercity passenger rail service in the state, operates two interstate routes and one intrastate route. These include the California Zephyr, which runs between San Francisco and Chicago, as well as the Southwest Chief, which runs between Chicago and Los Angeles. Additionally, there is a winter seasonal rail service connecting Winter Park Resort with Denver, named the Winter Park Express. Lastly, a private luxury option can be found in the Rocky Mountaineer, which runs a seasonal tourist train between Denver and Moab, Utah, on UP tracks.

Colorado is also home to seven scenic railroads, which serve as tourist attractions with roots in Colorado's mining past. In addition, portions of the Colorado railway system are part of the 41,300-mile Strategic Rail Corridor Network (STRACNET) track, a network serving over 193 military installations in the U.S., including with two in Colorado: Fort Carson and Piñon Canyon Maneuver Site.

In 2019, Colorado's freight railroads transported more than 143 million tons of goods and products, with over two-thirds of the volume assigned to "through movements," rail traffic that passes through the state, and merchandise destined for consumers outside the state. This figure is a decrease in total freight tonnage from 2014. In 2019, the inbound and outbound commodities amounted to 38.6 million tons, generating a revenue of $1.976 billion.

COLORADO FREIGHT AND PASSENGER RAIL PLAN, CDOT, 2024.



CONDITION & CAPACITY AND OPERATION & MAINTENANCE

Freight Rail Capacity

The Federal Highway Administration's (FHWA) Freight Analysis Framework predicts a 21% decrease in total rail tonnage in Colorado, from 18.4 million tons in 2020 to 14.6 million tons by 2050, mostly attributed to a decline in coal shipments. Excluding coal however, overall rail tonnage in Colorado is projected to increase from 7.7 million tons in 2020 to 12.6 million tons by 2050, driven by increased reliance on short-line railroads for agricultural and natural resource commodities, with intermodal rail traffic contributing minimally. Colorado is well-positioned to satisfy future demand.

BNSF has invested in auto-handling intermodal yards and is actively upgrading tracks and facilities. All BNSF lines in Colorado are now capable of carrying 286,000-pound cars, the current standard weight. In addition, Short Line Colorado Pacific upgraded 120 miles of track to 25 mile per hour (mph) speeds and constructed a new 8,000-foot siding at the western end of their line to improve interchange with BNSF and UP.

Challenges remain, such as several vertical clearances on the Moffat Corridor between Denver and Salt Lake City that do not permit double-stacked cars. Additionally, a few branches of UP rail lines and much of Colorado's short lines do not meet the current standard weight limit. In addition to weight limits, some of Colorado's mainlines and short lines have speed restrictions in certain areas due to curves, grades, and operations through metro areas.

Because Colorado's freight railroad network is privately owned, operated, and maintained, the freight railroad companies are primarily responsible for investments and improvements to their lines. The Colorado Department of Transportation (CDOT) and other public agencies such as FHWA play a role in assisting with these improvements through highway connectivity, connections to intermodal facilities, grade crossings (with oversight by the Colorado Public Utilities Commission), rail consumers, and access to economic development areas.

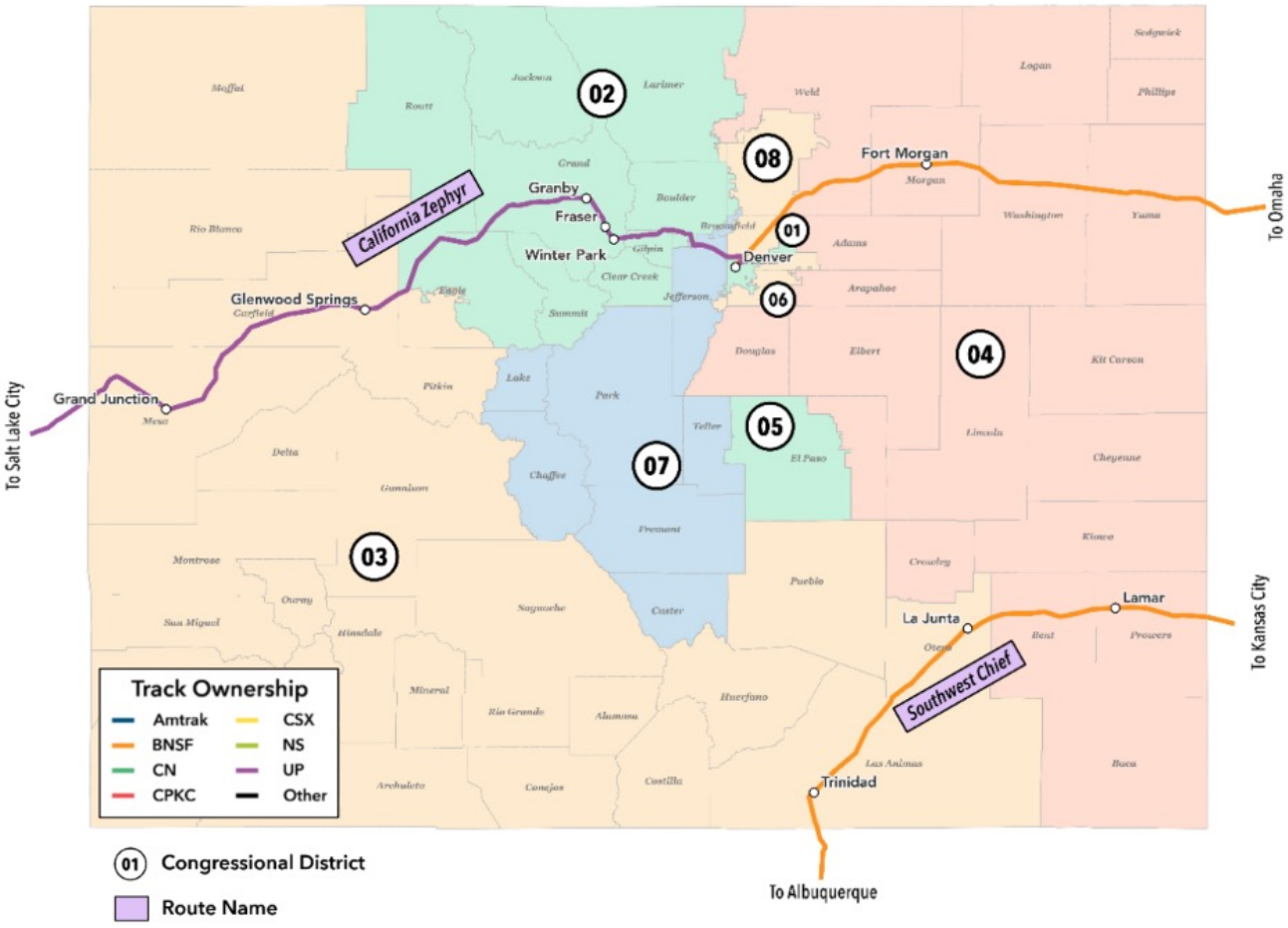
Passenger Rail Capacity

Colorado's population, employment, and tourism industry are anticipated to grow faster than the national average, driving an increased need for Amtrak services. Amtrak ridership rose to over 228,000 riders in the last fiscal year. Ridership may increase faster with the ongoing operation of Amtrak's Winter Park Express and the potential extension of Southwest Chief services to Pueblo. However, the COVID-19 pandemic had a great impact on Amtrak operations, and the operator is struggling to acquire new locomotives and passenger cars and maintain their current fleet of long-distance cars.

There are multiple scenic railroads in Colorado. Scenic railroads require significant annual investments to maintain a state of good repair. Otherwise, they may pose safety risks, slower speeds, delays, and decreased customer satisfaction. One example of recent investment in scenic rail is the Broadmoor Manitou and Pikes Peak Cog Railway, which underwent a complete rebuild with new tracks and cars, reopening in 2021.

CDOT is making progress on developing new plans for passenger rail service, but Coloradans are still awaiting implementation of the first new service. CDOT and Front Range Passenger Rail (FRPR) are finalizing a Service Development Plan (SDP) for a Fort Collins-Pueblo corridor, while also working on a separate SDP for a Mountain Rail Service for a Denver-Craig line.

AMTRAK IN COLORADO, FISCAL YEAR 2024



FUNDING

Freight and passenger rail accumulate their funding through different means. Class I railroads continue to invest heavily into their rail infrastructure. Between 2018 - 2022, UP invested more than $253 million into its Colorado infrastructure. Likewise, as of 2023, BNSF has acquired 1,400 acres for its planned Dual-served Class 1 Southern Colorado Rail Park and has recently completed its Logistics Center Hudson. New transloading, multimodal, and industrial facilities are currently under development in various locations, while others are envisioned for Fountain and Grand Junction. Most rail track capital needs are met without federal assistance. Colorado has also enacted a Freight Rail Tax Credit meant to incentivize freight-dependent businesses to use Colorado rail lines.

Short line railroads, on the other hand, often fall short of meeting their maintenance funding requirements. Many improvements are needed for Colorado's short line rail infrastructure, including modernizing assets to attract and retain businesses and development of new industrial sites. For short lines to remain a competitive transport option, upgrades to existing track, bridges, assets, and equipment would be needed. Total short line operating expenses represented approximately 81% of operating revenue. Colorado is one of the few states with significant short line activity without a funded assistance program.

On the passenger side, Colorado rail has many avenues to receive funding. The state has received a grant for $66.4 million from the U.S. Department of Transportation (DOT) through the Consolidated Rail Infrastructure

and Safety Improvements (CRISI) Program. The state is matching $28 million from the state's Infrastructure Investment and Jobs Act (IIJA) funding, bringing the total to $94.3 million. This funding is geared toward the improvement of rail crossings and the establishment of new passenger lines north of Denver. There are grants available from History Colorado, a Division of the Colorado Department of Higher Education, for the purpose of preservation and maintenance but most are not typically pursued due to regulatory requirements and use restrictions associated with historic railroad preservation standards.

Colorado rail has also received $35 million in funding from CDOT from 2021-2022 that went towards safety improvements, capital infrastructure projects, and rail planning initiatives. In 2021, Colorado Senate Bill 21-260 created new sources of dedicated funding for preserving, improving, and expanding existing transportation infrastructure, allocating $380 million for transportation projects.

When compared to other states, funding for rail improvements is limited in Colorado. There is a need to identify existing and potential resources for maintaining the state rail infrastructure. Currently, the state has a plan to better identify and integrate freight-specific projects into current planning, programming, and project selection.

FUTURE NEED

Colorado's population is estimated as 6 million residents with expectations to grow faster than the national average, currently ranking 21st in total populations. This increase in spending power and demand for goods will call for an increase in rail infrastructure across the board.

Economic and industry growth has been fueled by traditional industries such as agriculture, mining, energy, and tourism, all of which rely on freight rail operations to send and receive goods. Freight rail service in Colorado will need to support continued business development.

The future of the state's passenger rail demand will be driven by the growing population. Amtrak routes through the state are expected to grow and there are various ongoing studies associated with these projections. Moreover, a decline in freight movements associated with decreased coal traffic has opened up the possibility for more passenger service.

The FRPR District plan, which outlines a corridor that would link Pueblo to Fort Collins, has been generally supported by most businesses, economic developments, transportation planners, and local organizations and officials. The state was recently given $66 million to upgrade a freight line between Denver and Longmont. The funding will also be used to upgrade high priority crossings. These upgrades will hopefully support and accelerate the FRPR's project timeline.

CDOT is also looking at re-establishing or expanding certain routes, including the Mountain Rail corridor through the Rockies and Amtrak's Southwest Chief corridor.

Freight railroads are generally unwilling to maintain their tracks beyond freight service requirements for lines they own. It is estimated that $97 million would be needed in capital improvements and $111 million in ongoing maintenance over 10 years necessary for passenger service.

Current roadway infrastructure is not going to be able to accommodate future growth in travel. The state must continue to plan for and preserve right-of-way space for future improvements to rail infrastructure for extended service and rapid travel options. Local land use, development, and zoning will impact transportation decisions regarding future passenger rail viability or rail corridor alignments. Decisions made by CDOT accounting for these things in the design of bridges, overpasses, or right of way use can also help provide future flexibility of rail projects. The acquisition, preservation, and maintenance of rail lines that are at risk of abandonment will be vital for future statewide passenger rail developments.

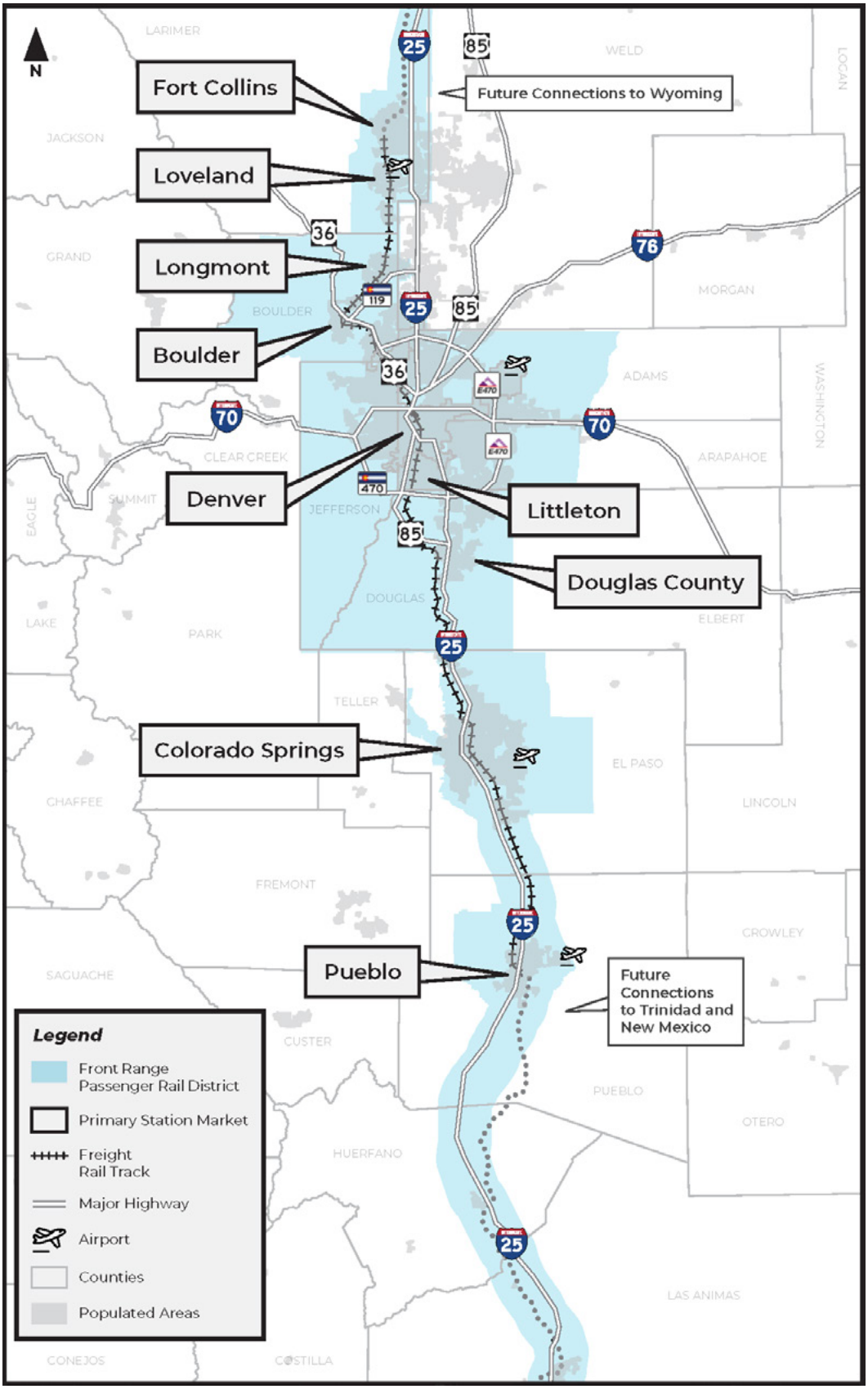
SHORT LINE AND REGIONAL RAILROADS IN COLORADO

Railroads	Type	Miles Operated in Colorado in 2021
Kansas and Oklahoma Railroad	Regional	3
Kyle Railroad	Regional	84
Nebraska, Kansas, & Colorado Railway	Regional	68
Cimarron Valley Railroad	Short Line	28
Colorado & Wyoming Railway	Short Line	5
Colorado Pacific Railroad	Short Line	122
Colorado Pacific Rio Grande Railroad	Short Line	154
Denver Rock Island Railroad	Short Line	6
Deseret Power Railway	Short Line	22
Great Western Railway of Colorado	Short Line	80
Rock & Rail	Short Line	55
San Luis Central Railroad	Short Line	13
Utah Railway	Short Line	32

Source: Association of American Railroads (AAR).

Photo: Royal Gorge beside the Arkansas River in Colorado; Jordan

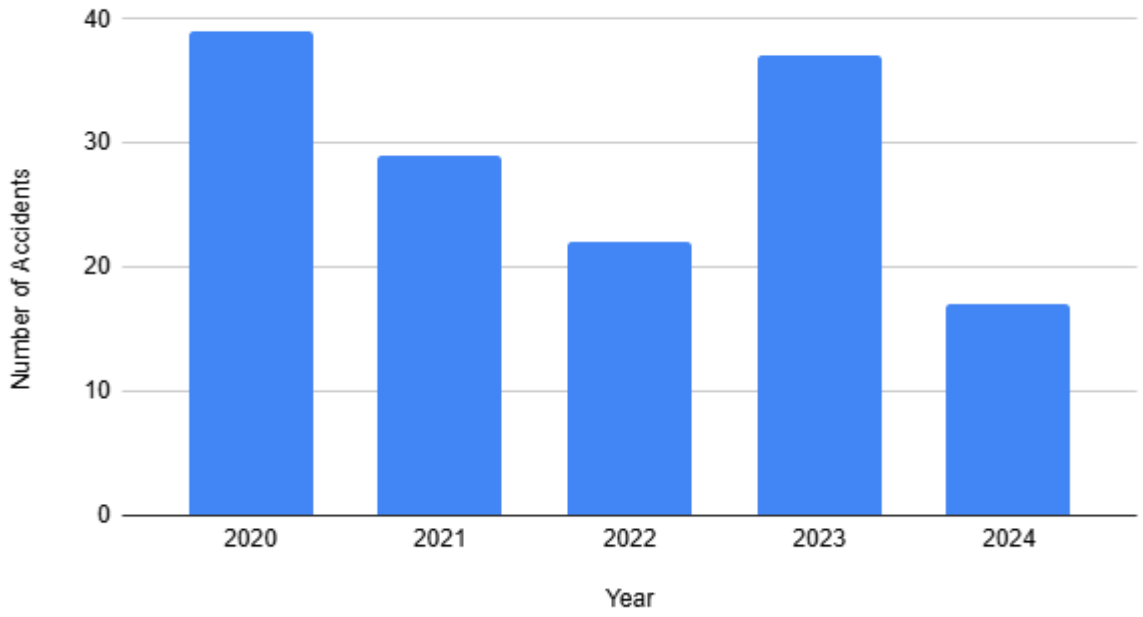
FRONT RANGE PASSENGER RAIL DISTRICT MAP, 2025



PUBLIC SAFETY

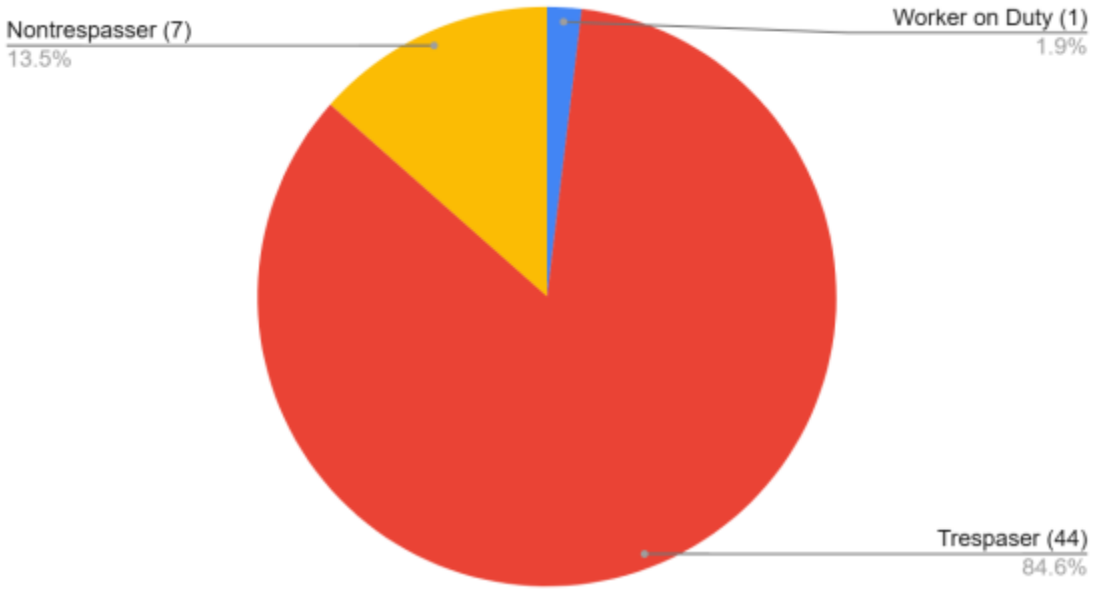
As Colorado's population has grown, the total number of rail accidents has remained relatively the same as shown in the graph below. Compared to its surrounding states, Colorado ranks among the lowest in train accidents per year. Most major accidents occur at at-grade crossings, which is where railway lines and roads meet at the same level, rather than being separated by an overpass or tunnel. While Colorado received a federal grant up to $700,000 to complete a feasibility study to remove two at-grade crossings, the majority of funds towards crossing safety tends to go towards signalization improvement. Below is a graphic showing the annual number of accidents in Colorado.

ANNUAL NUMBER OF TRAIN ACCIDENTS IN COLORADO



The figure below represents the cause of train-related accidents that resulted in a fatality. The majority of fatalities occur due to trespassing at highway-rail crossings and other locations. This data is from the Department of Transportation's Fatalities, Injuries, Illness in Train Accidents, Highway-Rail Incidents, and Other Incidents (4.08)

TOTAL COLORADO RAIL RELATED FATALITIES



RESILIENCE

In Colorado, 800 miles of BNSF's and UP's railways contribute to STRACNET, which supports the Department of Defense's rail needs and connects critical sites like Fort Carson and Pinon Canyon Maneuver Site. This is shown in the Colorado Freight and Passenger Rail Plan, CDOT, 2024 map above. BNSF and UP enhance the resilience of Colorado rail networks through wayside detectors, GPS-based positive train control (PTC), real-time data integration, and infrastructure upgrades to prevent derailments and improve recovery from disruptions. Railroads mitigate climate change risks with warning systems, including weather notification networks to provide warnings for high winds, high rainfall, and temperature extremes; high water detectors for flood-prone bridges; rockfall and landslide detectors; and seismic notification networks. Most of these systems are linked to the railroads' dispatching centers. As temperature extremes become more common, railroads have increased research on continuous welded rail and hot-weather track buckling prevention.

INNOVATION

MxV Rail, along with the FRA and Ensco at the Transportation Technology Center (TTC), conduct railroad equipment testing and ongoing research into rail technology at their respective research and testing facilities east of Pueblo. This technology is further incorporated into Colorado rail systems by private entities to detect defects before incidents can occur. New technologies use ultrasound, lasers, and machine vision to monitor tracks and rolling stock. Class I railroads are increasingly using autonomous track measurements taken by equipment mounted on locomotives or specially-equipped freight cars running in revenue service trains. This technology allows much more frequent measurement, and the data can be used to better predict and plan maintenance needs. Railroads are also using more wayside detectors and machine vision inspection portals to assess the condition of vehicle health. The technology provides quantitative measurements and the data is used to plan capital programs, track maintenance, and rolling stock maintenance.

The two primary railroad locomotive suppliers, as well as the major railroads, continue to explore greener locomotive technologies. Over the past two decades, locomotives have greatly improved in both fuel efficiency and reduced emissions. Greener concepts that have been evaluated include hydrogen power, battery electric power, and hybrid power. Much of this testing takes place in Colorado at the two Pueblo-area rail research facilities, as well as on the Colorado Pacific Rio Grande Railroad, which is used for high-altitude performance and emission testing.

RECOMMENDATIONS TO RAISE THE GRADE

- Increase vertical clearances to 22.5' to accommodate double stacked rail cars and make rail more competitive with trucking.
- Develop detailed investment needs for rail infrastructure renewal and expansion with a specific emphasis on underfunded and under-maintained Class III lines and passenger rail in underserved geographic areas.
- Define public funding opportunities and actively develop state, local, and other stakeholder funding sources to match federal financing options.
- Foster public-private partnerships to support funding of statewide rail maintenance and capital projects.
- Acquire and preserve existing track in the face of abandonment.
    - One rail line to consider for preservation is the UP North Fork Branch from Grand Junction south to Delta, east to the Paonia area coal mines, with a branch from Delta to Montrose. The line currently carries coal traffic and it is up to the 286,000 lb weight standard.
    - Additionally, there is an opportunity to pursue additional funding to finance repairs on the Raton Pass Line.
- Continue working towards implementation of new passenger rail services for which planning is underway (Front Range Passenger Rail - FRPR)

DEFINITIONS

CLASS I, II, & III RAILROADS - As of January 2024, a Class I railroad was defined as one that generates revenues of $1.054 billion or more each year. Class II railroads are those with annual revenues between $47.3 million and $1.054 billion. Class III railroads have earnings of less than $47.3 million.

FREIGHT RAIL - Rail service transporting goods and commodities for industrial and commercial use.

INTERMODAL - Shipping method involving multiple modes of transportation, most commonly truck, railroad, and ship, often consisting of consumer goods.

PASSENGER RAIL - Rail service transporting regional and interregional users, not consisting of RTD (Regional Transportation District) service (see Transit Chapter).

POSITIVE TRAIN CONTROL (PTC) - A signal and operation system designed to utilize a train's location, direction, and speed to prevent collisions, derailments, and unauthorized movements.

RAILWAY-HIGHWAY GRADE CROSSING - Infrastructure location where a railroad and a roadway for automobiles intersect, resulting in increased difficulty in maintenance and safety for both.

DEFINITIONS (cont.)

SHORT LINE - A railroad operating over a significantly lesser distance than the national railroad networks, used interchangeably with Class III railroads in this report.

SPEED RESTRICTION (aka SLOW ORDER) - A local speed restriction on a rail line which is set below the track's normal speed limit. Speed restrictions are usually imposed by railway maintenance of way personnel for sections of track that are in some way deficient, or when there is a requirement to perform maintenance on a section of railway.

FRA - Federal Railroad Administration

FRPR - Front Range Passenger Rail

THRU-TRAIN - Rail or Passenger Rail

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Photo: Road to Bear Lake at Rocky Mountains National Park

ROADS

EXECUTIVE SUMMARY

Colorado's road conditions have not seen the improvement seen nationally due to challenging, mountainous terrain with poor funding. In Colorado, only 34% of roads are in good condition compared to 45% nationally. Additionally, the natural beauty and economic growth that draw new residents to the state also lead to roadway congestion. Colorado has some of the costliest maintenance challenges in the country. Lower investment levels across operation, maintenance, capacity, and innovation are borne by drivers. Colorado's cost per motorist due to deteriorated and congested roads is almost $1900, about 35% higher than the national average. Additionally, even with the recent increase in gas tax, Colorado's transportation infrastructure will remain underfunded, particularly as more trips are made without using gas.

INTRODUCTION

Colorado's extensive network of roads and highways is the backbone of the state's economy and daily life. From the busy urban interstates of Denver to the winding mountain passes of the Rockies, Coloradans rely on road infrastructure to commute, transport goods, and access essential services. Maintaining this network is uniquely challenging – Colorado's mountainous terrain and extreme weather make its roads some of the most difficult in the nation to maintain. Despite these challenges, the overall road conditions in Colorado historically have been slightly better than national averages (with about 44% of roads in good condition, above the U.S. average of 28% as of 2020).

In recent years, Colorado's booming population and economy have driven increased strain on the transportation system. The state's population (now over 5.7 million people and growing) and robust economic growth (Colorado's GDP grew 83% from 2000 to 2023) have led to rising travel demand. This rapid growth underscores the importance of expanding capacity and sustaining maintenance to keep roads efficient and safe.

CAPACITY

Colorado's population grew to nearly six million residents in 2024, a 39% increase since 2000 and the seventh largest population increase in the nation since then. Similarly, Colorado's annual vehicle miles traveled (VMT) increased by 31% from 2000 to 2019, and traffic congestion has generally followed the same increasing trend. Due to the COVID-19 pandemic, vehicle travel in Colorado dropped by as much as 42% in April 2020 compared to April 2019. By 2024, VMT in Colorado had rebounded to 1% above pre-pandemic levels. Congested roads hinder

commuting and commerce; the national transportation research group TRIP estimates that congestion costs approximately $4.8 billion each year in the form of lost time, wasted fuel, and the cost of crashes. The cost to the average motorist is shown in the chart below for the state's largest urban areas. (see Table 1).

Colorado roads are primarily used for ground transportation, which includes highways, county and municipal roads. The Colorado Department of Transportation (CDOT) manages the state highway system, while local governments maintain their own networks. Highways are the main transportation method for most residents, especially outside the Denver and Colorado Springs metropolitan areas.

Freight Haulers

Colorado's extensive road network is crucial for freight transportation. With over 79.4% of communities relying solely on trucks to move goods, the trucking industry is a backbone of the state's economy. In 2016, the industry contributed approximately $459 million in federal and state roadway taxes and fees. The Federal Highway Administration (FHWA) tracks significant freight flows, highlighting the importance of Colorado as a transit hub.

Tourists

Tourism is another major user of Colorado's roads. In 2023, the state welcomed 93.3 million visitors, a 3.6% increase from the previous year. These tourists spent $28.2 billion, supporting around 187,710 jobs. Popular activities for visitors include shopping, sightseeing, and attending celebrations.

Combined Impact

Together, freight haulers and tourists significantly influence Colorado's road usage. The efficient movement of goods ensures that local businesses thrive, while the influx of tourists boosts hospitality and service sectors. This dual usage underscores the importance of maintaining and improving the state's transportation infrastructure to support both economic pillars.

TABLE 1: THE COST OF CONGESTION (KEEPING COLORADO MOBILE 2025)

Location	Hours Lost to Congestion	Annual Cost Per Driver	Gallons of Fuel Wasted Per Driver
Colorado Springs	54	$1,268	21
Denver	67	$1,675	26
Grand Junction	13	$326	4
Northern Colorado	25	$639	9
Pueblo	31	$827	10

CONDITION

Colorado's transportation system is a diverse network designed to connect communities and support the movement of people and goods throughout the state. While counties and municipalities manage their own road networks, the CDOT is primarily responsible for the state highway system. This system includes:

- Interstate Highways: These are major, high-speed roadways that facilitate travel across the state and connect Colorado to other regions.
- U.S. Highways: Another key component of the state highway system, serving both interstate and intrastate travel.
- Toll Roads: Designated roadways where users pay a fee to travel, offering alternative routes and traffic management.
- State Highways: Numbered routes that connect cities, towns, and different regions within Colorado, sometimes co-aligned with U.S. or Interstate highways.

Colorado's unique geography, with its prominent Rocky Mountains, also necessitates a system of mountain passes that are an integral part of the transportation network. CDOT actively works to address transportation challenges, including construction, maintenance, and operations of the state's multimodal transportation system, which encompasses various modes such as transit, airports, railroads, and bicycle and pedestrian routes, along with crucial functions like snow and ice operations, avalanche control, and rockfall mitigation in mountainous regions.

Due to inadequate state and local funding, 24% of locally and state-maintained roads and highways in Colorado are in poor condition. Driving on rough roads costs the average Colorado driver $831 annually in additional vehicle operating costs. TRIP estimates the impact from congestion at approximately $3.7 billion a year due to lost time and wasted fuel (see Table 3).

TABLE 2: THE COST OF DETERIORATED ROADS, TRAFFIC CONGESTION, AND CRASHES IN COLORADO (KEEPING COLORADO MOBILE 2025)

2025 Costs of Deteriorated Roads, Traffic Congestions and Crashes in Colorado				
Location	**VOC***	**Safety**	**Congestion**	**Total**
Colorado Springs	$ 787	$ 555	$ 1,268	$ 2,610
Denver	$ 901	$ 484	$ 1,675	$ 3,060
Grand Junction	$ 787	$ 591	$ 326	$ 1,704
Northern Colorado	$ 843	$ 617	$ 639	$ 2,099
Pueblo	$ 621	$ 983	$ 827	$ 2,431
Colorado Statewide	$ 3.7 Billion	$ 2.9 Billion	$ 4.8 Billion	$ 11.4 Billion

**VOC – Vehicle Operating Costs*

TABLE 3: PAVEMENT CONDITIONS ON MAJOR ROADS (KEEPING COLORADO MOBILE 2025)

2025 Colorado Roadway Conditions			
Location	**Poor**	**Fair**	**Good**
Colorado Springs	28%	45%	27%
Denver	33%	46%	21%
Grand Junction	27%	46%	27%
Northern Colorado	31%	47%	22%
Pueblo	37%	42%	20%
Colorado Statewide	**24%**	**41%**	**35%**

Photo: Glenwood Canyons Red Rocks; Nicholas J. Klein

FUNDING

Improvements to Colorado's roads and highways are funded by local, state, and federal governments. State funding for transportation increased in 2021, when Colorado's legislature approved Senate Bill 260, which is projected to provide approximately $5.3 billion in transportation infrastructure investment over the next 10 years. SB 260 created new sources of dedicated transportation funding, including an eight-cent per gallon increase in the state's fuel fee (which had been 22 cents since 1991), to be phased in over 10 years, at which point it will be indexed to the National Highway Construction Cost Index. The legislation also created new fees on retail deliveries, electric vehicle registrations, and ridesharing, as well as new state enterprises with the power to issue revenue bonds.

CDOT has an annual budget of $1.55 billion. Of that, nearly half ($747 million) goes toward maintaining the existing system. Another 14% ($209 million) is directly passed through to counties and cities for local projects. After accounting for other budget commitments, too little remains to expand Colorado's transportation system.

Colorado is one of 32 states that charge an annual electric vehicle registration fee, which, at $57.19 annually, is the lowest fee of these states. Colorado electric vehicle registration fees will increase annually for inflation. Additionally, Colorado imposes an annual EV road usage fee, currently at $12, as well as an annual hybrid road usage fee, currently at $8. In Colorado, the number of registered EVs in 2024 was nearly 36 times the number in 2014 - increasing from 4,364 in 2014 to 155,558 in 2024. The average fuel efficiency of U.S. passenger vehicles increased from 20 miles per gallon in 2010 to 24.5 miles per gallon in 2020. It is expected to increase another 31% by 2030 (to 32 mpg) and 51% by 2040 (to 37 mpg). The share of EV sales of total U.S. passenger vehicle sales is expected to grow from 8% in 2024 to 49% by 2030.

In addition to state transportation funding, the Infrastructure Investment and Jobs Act (IIJA), signed into law in November 2021, will provide $3.7 billion in federal funds to Colorado for highway and bridge investments over five years, representing a 31% increase in annual federal funding for roads and bridges compared to the previous federal surface transportation program.

FUTURE NEED

Despite recent increases in state transportation funding, CDOT's current asset management funding will not be sufficient to maintain the existing condition of the transportation network or to meet long-term goals for performance. CDOT estimates a shortfall of $350 million per year in funding needed to maintain and enhance the system. Of this, $284 million is needed specifically for pavement and system maintenance.

The ability of revenue from Colorado's motor fuel tax – a critical source of state transportation funding – to keep pace with the state's future transportation needs is expected to decline due to vehicles' improved fuel efficiency, the increasing use of electric vehicles, and inflation in highway construction costs.

Increasing inflation has further limited Colorado's ability to complete needed projects and improvements, as available funding now covers significantly less work. The FHWA National Highway Construction Cost Index, which measures labor and materials costs, increased by 45% from early 2022 through the second quarter of 2024.

Highway and bridge spending has broad economic impacts. A 2021 macroeconomic analysis by IHS Markit found that that every dollar spent on highway and bridge improvements results in $3.40 in combined direct, indirect, and induced economic output across multiple industries. This results in an investment multiplier of 3.4 for highway and bridge investment.

A significant source of increased demand is expected to be freight traffic. By 2050, freight moved by trucks is expected to grow by 63% in tonnage. These increased demands will require increased capacity on key highway segments in the form of climbing lanes in mountainous areas and stronger pavement sections to withstand these loads.

With demand on the transportation system increasing, both capacity expansion and demand management strategies will need to be employed. Increased capacity and safety on projects such as Floyd Hill will continue to be necessary, but multimodal options are also increasing in demand, and road infrastructure such as bike lanes, bus lanes, and pedestrian thoroughfares in urban areas will need to be part of the transportation solutions in the state.

OPERATION AND MAINTENANCE

Operating and maintaining Colorado's road infrastructure is an ongoing challenge that requires substantial effort and resources, especially given the state's tough environment and aging assets. O&M encompasses routine activities including filling potholes, snow plowing, and minor repairs as well as longer-term periodic maintenance such as roadway resurfacing. CDOT's annual budget is $1.55 billion. 48% of that, 747 million, goes to maintaining the pavement in the state, amounting to a C+ road surface grade.

Colorado's harsh weather and terrain impose heavy demands on road maintenance. The state's roads cross high mountain passes, see severe winter storms, and experience considerable freeze/thaw cycling. Additionally, avalanches, rockfalls, and heavy snow can block roads and require rapid response. Such realities necessitate active mitigation such as controlled avalanche blasting and snow fence installation.

Asset management is one area that Colorado continues to improve, using more data to understand the conditions within the state. When looking at the asset management performance goals, intelligent transportation systems assets are the best funded (16.6 million annually) and is over 100% the need for it's 10-year performance. That is in stark contrast to pavement (229 million annually), with only 60% of anticipated needs being funded.

The Transportation Commission adopted the updated Policy Directive 14.0 in 2020, which revised goals for asset management, safety, and mobility while supporting national goals for surface transportation. The following year, Policy Directive 1609.D required 12 asset classes to maintain inventory, condition, performance metrics, and performance targets. This is to have data informed decisions to utilize the limited resources efficiently.

PUBLIC SAFETY

Colorado continues to see an increase in traffic deaths despite the growing adoption of Vision Zero policies across the state. Vision Zero is a strategic approach to eliminate all traffic fatalities and severe injuries while improving mobility for everyone within the transportation system. In 2013, the state recorded 482 traffic fatalities, which climbed to 597 in 2019, and 720 in 2023, per federal Fatality Analysis Reporting System (FARS) data. Colorado's traffic fatality rate per 100,000 population was 12.2, which is lower than the national 13.4 in 2023. CDOT regions 3 and 5 (Western Colorado) stand out in that they account for 11% of the population, but 16% of the crashes, suggesting that mountainous terrain is a significant contributor to crash risk. In contrast, Region 1 (Denver and surrounding counties) carries the highest number of fatal crashes and accounts for 50% of the state population. Crash data remain primarily sourced from police departments, whose reporting is focused on determining faults rather than evaluating safety. As a result, planning and design decisions based on this data are often reactive and incomplete.

One promising policy adopted by cities such as Denver, Boulder, and Lakewood is a 20 miles per hour residential speed limit.

FIGURE 1: COLORADO ANNUAL TRAFFIC FATALITY DATA (FATALITY ANALYSIS REPORTING SYSTEM)

Colorado Traffic Fatality Data											
	2015	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2015-2024 Change**
Traffic Fatalities	547	608	648	632	597	622	691	764	720	688	+26%
Region 1 (Denver Area)	213	242	225	213	237	227	273	307	289	284	+33%
Region 2 (Colorado Springs and SE Colorado)	95	110	146	164	116	158	146	164	146	133	+40%
Region 3 (Grand Junction and NW Colorado)	66	66	77	60	68	67	55	80	71	72	+9%
Region 4 (Boulder, Fort Collins, NE Colorado)	133	142	165	155	132	141	156	158	161	160	+20%
Region 5 (SW Colorado)	40	48	35	40	44	29	61	55	53	39	-2%

In 2022, the US DOT adopted the National Roadway Safety Strategy, using the Safe System approach. CDOT holds a Safety Summit each year to bring together safety professionals from all sectors relating to roadway safety: public agencies, emergency response, engineers, and planners. With this summit, the elements of Safe Systems: Safer People, Safer Roads, Safer Vehicles, Safer Speeds, and Post-Crash Care are addressed and ideas shared to provide improved safety infrastructure for motorists, pedestrians, and bicyclists. Additionally, crash data dashboards have become increasingly common throughout the state for local governments. CDOT has its own crash dashboard that includes performance tracking to better understand and monitor crashes in the state.

To operate and maintain the highway system with limited resources, Colorado must remain innovative and continue exploring new designs and technologies.

RESILIENCE AND INNOVATION

Colorado continues to adopt innovative designs and technologies to help relieve congestion and improve safety for all road users. Innovations in traffic management include enhanced traveler information systems that provide updates on road closures and real-time detour suggestions. The state has also expanded the use of variable speed limit signs and variable message signs to inform drivers of changing road conditions due to traffic, crashes, or poor weather.

In 2021, the Transportation Commission of Colorado passed a pollution reduction planning standard for CDOT and the five largest metropolitan regions. This rule requires estimates of total Greenhouse Gas (GHG) emissions is expected from the projects in their plans while ensuring the plan doesn't exceed the GHG targets for each region. This has resulted in a shift toward more multimodal projects and delays of several large highway projects, such as the I-25 and Broadway project.

Furthermore, Governor Polis signed the updated Colorado Resilience Framework. Part of this document is targeted at improving the resiliency of Colorado's infrastructure while integrating social equity, investment, planning, and mitigation across jurisdictions. The Colorado Resiliency Working Group is fundamental to coordinating strategies, monitoring progress, and sharing resilience stories. Per their 2024 report, a climate adaptation highlight was CDOT's participation in a pilot program to apply a climate-informed science approach to hydrology projects as well as participating in the Whole of State Critical Infrastructure Transportation Subcommittee that identifies and protects critical infrastructure within Colorado.

Ramp meters, adaptive traffic signal control, and transit signal priority are more widespread. CDOT has installed more remotely controlled avalanche mitigation systems, which help prevent uncontrolled avalanches from burying vehicles and creating hazardous conditions. Presently, CDOT monitors and controls 278 of the 522 (the most in the country) known avalanche paths located above Colorado Highways.

To operate and maintain the highway system with limited resources, Colorado must remain innovative and continue exploring new designs and technologies. Asset criticality, a measure of risk of high cost related to failure of the asset, as been added as a metric for asset management. Continued efforts by CDOT's Multimodal Planning Branch are showing early results, including the creation of the Bike/Ped Coordinator positions. CDOT's Office of Innovative Mobility is in the early stages and has funded some small projects.

RECOMMENDATIONS TO RAISE THE GRADE

- To raise the road safety in the state, municipalities should continue to lower speeds on all roads and streets that see high conflicts, adopt target speed criteria, and continue to develop and implement strong Vision Zero Action Plans/Safety Action Plans.
- Funding remains a big challenge. Securing reliable, diverse, and sustained funding outside of gas taxes will be necessary to meet future needs, maintenance costs, and increased demand. Funding should include both fuel taxes as well as user fees to account for alternative energy vehicle use and tourist use of the system.
- Continue to evaluate the existing road network to optimize it's capacity through creative use of existing lanemiles. This is to include expanded use of technology and evaluate construction project scopes through Transportation Demand Management perspectives when appropriate.
- Asset management systems should continue to build out to inform decisions for both state and local roads. Additionally, this should start including more information about multimodal infrastructure such as amenities at bus stops and bike lane pavement condition.

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Schools

D+

GRADE COMPARISON

CO: D+

Nat'l: D+

Photo: School bus on highway in Colorado Rocky Mountains

SCHOOLS

EXECUTIVE SUMMARY

Schools in Colorado are aging, with an average age of 41 years, and require significant repairs and retrofits. The estimated cost to address these deficiencies is over $13.5 billion, projected to rise to $17.5 billion by 2030. Declining birth rates and school enrollments have led to closures in some districts, while new schools are needed in others. Funding remains a significant challenge, with Colorado ranking 33rd in per-pupil spending. House Bill 24-1448, which will take effect on 2025- 2026 school years and be gradually implemented over 6 years, aims to increase funding for K-12 education, focusing on at-risk students and rural districts. Community involvement in funding decisions and increased state support are vital for improving school conditions and operations.

CONDITION AND CAPACITY

As of the 2024-2025 school year, the State of Colorado boasts 179 public school districts that are spread across 34,910 acres. Within these districts, there are a total of 1,927 schools, including 264 charter schools. These institutions collectively educate over 881,000 students, with a student-to-teacher ratio of 16.1, which is slightly higher than the national average of 15.2.

In 2016, the Division of Capital Construction reinstated the Statewide Facility Assessment Program for Colorado public school facilities. This program, now known as "Facility Insight," conducts continuous and comprehensive condition assessments of public schools throughout the state. The assessment team evaluates various aspects of school facilities, including structural integrity, plumbing, site conditions, equipment, electrical and HVAC systems, fire protection, furnishings, and other major building systems and school sites.

Each school building and its facilities receive a Facility Condition Index (FCI) score, an industry-standard metric that ranges from 0 to 1. The FCI score is calculated by dividing the total cost of remedying deferred maintenance requirements by the current replacement value of the facility. A higher FCI score indicates the poorer condition of the facility.

According to the latest estimates, the FCI scores for school buildings and sites (which include outdoor facilities such as parking lots, bus lanes, and athletic fields) in Colorado are 0.46 and 0.50, respectively. These values have increased from previous scores of 0.37 and 0.46, indicating that the condition of school facilities is deteriorating and requiring more funds to bring them up to current standards. The average age of Colorado school buildings is 41 years.

Facility Insight has also estimated the statewide cost to address the deficient conditions of all identified systems to be more than $13.5 billion. This cost is projected to rise to over $17.5 billion by 2030, highlighting the growing financial burden of maintaining and improving Colorado's public-school facilities.

As if planning for needed school capacity were not difficult enough, Denver County experienced the second largest decline in births among the 100 most populous counties in the country from 2021 to 2022, leading to declining school enrollments and significant community questions. The number of babies born dropped 6.3%, to 8,649 from 9,232. Colorado's population demographics make it one of the youngest states in the country with its long history of luring 20- to 40-year-olds seeking good jobs and access to the outdoors. But Colorado's total fertility rate is down, and to fully replace Colorado's population, the average total fertility rate would have to jump by 30%, according to Colorado State Demographer Elizabeth Garner. Fewer students have led to closures or planned closures of twenty-one schools in Jefferson County, seven schools in Denver plus three in Douglas County. The influx and increase of population in Denver are being considered in the planning but forecasting what the longer-term additional needs is presenting a challenge. Similar to the development changes in Denver, population demographics and distribution in Douglas County has resulted in closures but also the need for new schools where there were none before.

Although numerous school closures have occurred due to declining enrollment at different locations, the capacity of the remaining schools in the region, even after the closures, is higher than the current and predicted future enrollment at those locations. Moreover, 33 new buildings have been built since 2020 to address the need at several locations. Thus, closures of schools do not necessarily indicate a decline in the capacity of Colorado schools, but a decreased enrollment. However, in some cases, closures do reflect the conditions of their facilities.

The influx and increase of population in Denver are being considered in the planning but forecasting what the longer-term additional needs is presenting a challenge.

OPERATION & MAINTENANCE, FUNDING AND FUTURE NEED

School funding is a complex issue, and funding mechanisms and opportunities vary widely throughout the state. For the 2022-2023 school year, $13.1 billion was spent on Colorado public schools, averaging about $14,845 per student. According to 2022 finance data provided to the U.S. Census Bureau, Colorado ranked 33rd in the nation for per pupil spending.

In the state of Colorado, school operating budgets have been determined by the Total Program. This program lays out a school finance formula that determines the amount of total state and local funding each school district is required to receive. This base funding is established as a per-pupil amount, and is adjusted based on factors such as the local cost of living, school size, at-risk population, etc. The source of this funding begins at the local level with property taxes and specific ownership (vehicle registration) taxes. If these local taxes are enough to reach the funding amount determined through the Total Program, then the state will not contribute any additional funding. However, if the local tax revenue is insufficient, then the state must step in and provide the rest. This state funding ultimately comes out of state income and sales tax revenue.

House Bill 24-1448 was passed on May 23, 2024, which establishes a new public school finance formula that will replace the formula provided by the Total Program. According to Speaker Julie McCluskie, "the new, student-focused formula will increase funding for K-12 education and drive more resources to at-risk students, English Language Learners, special education, and rural school districts." The new formula is expected to be implemented over six years beginning in the 2025-2026 school year. The Colorado Department of Education currently estimates $20 billion in capital construction needs, and this new legislation may impact funding these projects throughout the state.

Since 2008, the state Capital Construction Assistance Fund has received more than $1.8 billion in revenue. Most of that revenue, approximately 62% comes from State Land Trust Fund proceeds. The next largest portion comes from the excise tax on marijuana products, accounting for just under 30%. The remaining 8% comes from lottery proceeds and interest. These state funds are typically matched with locally derived funds. Notably, the percentage of revenue reportedly coming from the marijuana excise tax has increased by 7% when compared to the data used in the 2020 Report Card. The revenue from the State Land Trust Fund has therefore decreased by 7%. This inverse correlation is most likely due to the 2017 bill that increased the cap on marijuana excise tax from $40 million to 90% of all revenue. Since reassessments began in 2016, roughly $2.6 billion in capital needs have been identified. This equates to an approximately 46% increase in needs when compared to 2012 for the schools that have been assessed so far.

Photo: Crested Butte School, Jon Camrud

In most of the United States, local property taxes are the primary source of funding for public schools. The Gallagher Amendment adopted in 1982 severely hindered Colorado schools looking to leverage local taxes. The amendment reduced assessment values leading to reduced property taxes and therefore depleting a source of funding from the local government. However, the Gallagher Amendment was repealed in 2020. Since then, property taxes have been an uncertain source as state policymakers worked to find a new standard for this revenue going forward. The standard was ultimately outlined in Senate Bill 24-233. Under this legislation, "K-12 education funding would be somewhat unaffected because the long-term residential rate cuts would not apply to the taxes paid toward local school districts."

Colorado's Building Excellent Schools Today (BEST) program was established in 2008 to allocate funding from the state Capital Construction Assistance Fund to provide "funds to rebuild, repair or replace the State's

most dangerous and most needy K-12 facilities". The BEST grants, combined with district matching funds and other financing, have funded 3.7 billion in projects since its inception in 2008. However, the program is oversubscribed and has only been able to meet 64% of requests. For the 2024-2025 school year, 36 projects were awarded BEST cash grants which totaled $155 million from the Capital Construction Assistance Fund. This number is out of the 56 total applications received which totaled $658 million requested.

Historically, projects that receive BEST grants include school replacements, additions, and renovations (29%), roof repair and replacements (28%), safety and security upgrades (20%), HVAC upgrades (15%), and other miscellaneous projects (8%). The most significant example from the 2024-2025 funding year involves a $47 million cash grant to McClave School District in Bent County for a complete PK-12 school replacement. Smaller examples include a $234,000 roof replacement project for Peyton School District in El Paso County. Every grant recipient is required by statute to match funds based on a series of factors, from the district's funding abilities to per pupil spending. In the prior examples, McClave School District had an approved match of roughly 10% ($5.3 million), while Peyton School District matched at 71% ($573,000). In the past, there has been an alternative type of BEST grant called Lease Purchase Grants. Unlike cash grants, they are financed and "the financing is paid back with future assistance fund revenues". However, this type of grant has not been used since the 2021-2022 school year. That year, the BEST program was able to award $289 million since approximately $139 million were approved as lease purchase grants. The remaining $150 million were awarded as cash grants.

Deteriorating Colorado public schools need $17 billion in repairs, according to the Colorado Department of Education. State Treasurer Dave Young calls it a "crisis point." Thirty-three of Colorado's 178 districts, representing more than half of all Colorado students, went to voters in 2024 asking for nearly $7 billion in tax measures. More than half of the measures passed, including most of the largest districts asking for support. The City and County of Denver voters passed a $975 million dollar bond package while Aurora passed a $1 billion bond issue - the largest in Colorado state history - and a $30 million annual capital mill levy that will fund new buildings and facility upgrades.

Deteriorating Colorado public schools need $17 billion in repairs, according to the Colorado Department of Education. State Treasurer Dave Young calls it a "crisis point."

INNOVATION

Colorado has been implementing the Innovation Schools Act (§ 22-32.5-102, C.R.S.) to promote innovative teaching and learning methods in school. This act provides a pathway for schools and districts to obtain greater individual school autonomy and managerial flexibility in order to implement diverse approaches to learning." Currently 105 schools from 18 school districts are participating in this program.

Individual school districts should consider the ASCE Policy Statement 452 if they are not already in place: Focus on Life-Cycle Cost Analysis (LCCA) principles in the planning and design processes to evaluate the total cost of projects.

PUBLIC SAFETY AND RESILIENCE

Since schools may be required to function as emergency shelters and to function as multi-use resources, their design and construction needs to provide for the functionality necessary during and after the occurrence of environmental hazard events. Large, infrequent, and damaging events, including earthquakes and high winds should be addressed in the design by means of higher importance factors and additional detailing to achieve a robust response and thereby mitigate disaster. In the case of earthquakes, overhead falling hazards are particularly important. These components should be securely anchored.

Both the Structural Engineers Association of Colorado and the Colorado Earthquake Hazard Mitigation Council have formally recommended that the State of Colorado enact amendments to the International Building Code that would eliminate the use of Seismic Design Category A for schools (CEHMC) and for all Risk Category II and higher structures including schools (SEAC). The CEHMC also recommends that falling hazards in school buildings be securely anchored as required for higher seismic regions. The Colorado Department of Fire Prevention and Control (DFPC) oversees and permits the design and construction of Colorado schools K-12. DFPC has not formally adopted either of these recommendations.

Since the average age of Colorado school buildings is 41 years, newer building code requirements would not have been included in their design and construction. Operational and maintenance needs will continue to increase for these older buildings. However, code upgrades and improvements are not always the highest priority until a lack of safety becomes readily apparent, or an environmental hazard serves as a trigger for action.

Improving school resilience requires funding. Unlike some states, Colorado does not routinely provide funding for school buildings. Bonds allow districts to take on debt to finance school construction and renovations, including safety improvements and technology. The Colorado School Finance Project states the reason the bond requests were significant in 2024 is that districts are looking to replace and renovate decades-old schools as construction costs are rising. The cost to build one comprehensive high school in Colorado right now is around $200 million dollars. The State of Colorado promotes energy-efficient and sustainable construction for school buildings through programs like the High-Performance Certification Program (HPCP), Energy Performance Contract (EPC), Buy Clean Colorado Act, and Building Life Cycle Policy. These initiatives aim to ensure low life-cycle costs, improved occupant health, and minimal environmental impact. They apply to projects being renovated, designed, or constructed with significant state funding or those exceeding certain cost thresholds.

Photo: marcantabrico

RECOMMENDATIONS TO RAISE THE GRADE

- Develop funding requests and plans based on condition assessments of existing school infrastructure, conducted at regular intervals. Integrate the planning into regular, comprehensive major maintenance, renewal, and construction programs.
- Address $20 billion in capital construction needs by increasing the revenue allocated to the Capital Construction Assistance Fund. This could involve exploring additional funding sources or increasing existing ones, such as the marijuana excise tax.
- Encourage and engage local communities to support school funding measures, such as bond issues and mill levies. Highlight the success of recent measures passed in Denver and Aurora to demonstrate the positive impact of local funding initiatives.
- Continuously monitor the effectiveness of funding mechanisms and capital construction projects. Evaluate their impact on educational outcomes and make adjustments as needed to ensure the best use of resources.
- Implement preventive maintenance programs including hazard assessments to extend the life of school facilities.
- Encourage school communities and the State of Colorado to adopt the recommendations from SEAC and CEHMC for the design of new school buildings.

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Solid Waste
C-
GRADE COMPARISON
CO: C-
Nat'l: C+

SOLID WASTE

EXECUTIVE SUMMARY

Solid waste is any discarded material varying from compostable items, industrial waste, or even as simple as your local trash collection. The State of Colorado generates about 6.87 million tons of municipal solid waste (MSW) annually, which has decreased by 30,000 tons in the last four years. This waste is then transported to one of the 76 landfills in the state. Although funding has increased, research still shows the state struggles with decreasing diversion rates, reporting on currently closed landfills, and the impacts they have on the environment. Further attention is required to enhance solid waste overall including through the promotion of various recycling innovations, initiatives, and aid. If Coloradans can view their trash as nutrients and fuel, then waste can become useful and have a positive impact on the state.

CONDITION & CAPACITY, OPERATION & MAINTENANCE

In 2023, Colorado produced over 14.85 million tons of solid waste, 5.04 million tons being diverted to recycling centers. Colorado industries produced 7.98 million tons and diverted 4 million tons to recyclers, generating a diversion rate of 49.8%. Colorado citizens produce over 6.87 million tons of MSW, and divert only 1.06 million tons to recycling centers, creating a diversion rate of 15.5%. Both produce a similar amount of disposal leading to landfills. However, Coloradans have seen a small improvement, producing 6.4 pounds of MSW per person per day compared to 6.8 pounds per person per day in 2018. According to EPA (2018), the national average of pounds of MSW generated per person per day was 4.9. To put this into perspective, this is a difference of 550 pounds of waste per person per year.

Colorado is often labeled for its efforts toward sustainability as the "environmentally friendly state," however, the state's recycling rates have steadily gone down since the last report card. The state goal for 2026 is to achieve a MSW Diversion rate of 35.0%, and according to the *"2023 Annual Report to the Colorado General Assembly: Status of the Solid Waste Management Program in Colorado"*, the state is at 15.5%. Although there were infrastructure updates of recycling centers over the past four years to support this goal, the diversion rate still decreased. From 2019 to 2023, there was an increase in: 20 composting facilities, 66 recycling facilities, 17 medical waste facilities, and 269 waste tire registrants. There was one MSW landfill closed, 4 less solid waste impoundment facilities, and 1 less commercial exploration and production waste Impoundments.

According to the *2023 Program Report*, there are 76 operating landfills, and 194 closed landfills in the state of Colorado. The larger landfills are primarily located in the more populated areas and are owned mainly by private companies as it is typical across the nation.

Smaller landfills are primarily owned and managed by local governments. Curbside pickup is still the primary method for receiving trash in residential areas, and apartments resort to hiring private waste haulers for most of their waste disposal. There is a lot of potential for improvements in diverting solid waste to recycling centers through these methods. Specific programs per region should consider the long-term benefits in funding diversion days and/or bins to help residents with one of the main struggles of recycling - ease of access.

Colorado has taken a significant step in regulating landfill emissions with the Air Quality Control Commission's recent update. This expansion requires over 30 municipal solid waste landfills, previously unregulated for emissions reporting, to begin tracking and reporting their greenhouse gas emissions by March 31, 2025.

This move aligns with the state's broader climate action efforts, but questions remain about the impact on Colorado's 194 closed landfills, which were subject to an inventory initiative in 2018 to monitor post-closure compliance, including groundwater, leachate, and landfill gas emissions. It is unclear if closed landfills will be required to report emissions under this new rule.

The state will need to seek alternate solutions if they want to see their goals come to fruition. Current goals include the 35.0% MSW Diversion Rate by 2026 as well as a 45% diversion rate by 2036. Efforts in ease of access programs should be prioritized to help incentivize recycling from the citizens to increase the diversion rate to meet these goals.

Colorado has taken a significant step in regulating landfill emissions with the Air Quality Control Commission's recent update.

FUNDING AND FUTURE NEED

The main issue preventing recycling and composting is funding facilities. In most jurisdictions, trash services are free or a minimal charge while recycling is primarily supported through fees. Charging for trash and recycling collection is costly when costs for both are incurred especially for lower income communities. One way to address multiple costs is Denver's "Pay-As-You-Throw" initiative which started in July of 2023. This waste program has homeowners paying for trash services that covers both the cost of trash and composting services. This incentivizes the users to choose positive solid waste recycling habits since the service is included in their now mandatory trash fee, essentially presenting the composting program as 'free'. Now that residents are paying for trash collection, the previous funding that came from Denver's City General Fund can now be rotated to other areas in need. Affordability for lower income communities was accounted for by creating an income criterion, allowing for discounts to be applied for these waste services.

Most recently, Colorado passed the Solid Waste Management Grants Program that began in January of 2025. This program is designed to assist communities by awarding funding to qualified organizations that provide technical assistance and training to help reduce or eliminate the pollution of water resources and improve planning and management of solid waste sites in rural areas. Applications for these grants were due at the end of 2024, allowing the funds to be dispersed for the 2025 fiscal year. Funding will vary in amount dependent on the applications, but citizens can anticipate the overall fund amount to equal around $4 million. This is just one of many bills Colorado has passed to increase funding for solid waste, with several education initiatives advocated for by the state such as the classes offered through the Eco Cycle Schools Program. Through free classes, the Eco Cycle Schools program offers in person and remote presentations, as well as field trips doctrine to teach students about resource conservation, pollution, waste reduction, recycling, composting, energy and water conservation, and air quality. This program also is the first in the nation to introduce an award winning, zero waste program serving over sixty schools in Boulder County. Colorado to date has doubled their funding towards waste programs and initiatives, starting at $8.5 million in 2018 to $18 million as of 2024. Taking initiative

to increase funding and awareness surrounding the misconceptions of solid waste was a critical plea in 2020 and it has sufficiently been implemented throughout the state in various programs beyond these listed.

In 2020, citizens advocated for additional funding to be allocated to inspections within the Colorado Department of Public Health and Environment (CDPHE), a state government department regulating public health and the corresponding environment. In response, the State of Colorado and the department received an additional $2 million in funding to advance environmental cleanups in 2022. Funding was received through an application to the Brownfields Cleanup, Assessment and Revolving Loan Fund Grant. With these resources, up to 48 environmental site assessments were completed, providing financial support to overburdened and vulnerable communities. Between 2020 and 2024, funding concerns were acknowledged and education improved, but there is still a significant need to increase both areas.

For smaller communities competing with larger groups such as Denver Water, it is difficult to keep up with the demands of the environment and dealing with aging equipment and infrastructure all while receiving significantly less funding due to their overall population. In turn, smaller plants and groups must prioritize what upgrades they can afford before a failure arises. Funding for solid waste programs has increased over the past four years, but with the Colorado population steadily increasing, there is a need for even more support; populations and funding should be increasing linearly because more people means more waste. The future is bright with the implementation of new inventions, but it is more important than ever to continue investing into the solid waste programs.

PUBLIC SAFETY

The CDPHE oversees solid waste facilities in the state. In the past four years, the Hazardous Materials and Waste Management Division has amended the regulation standards 11 times. These adjustments account for improvements in the solid waste area such as composting, landfill remediation grants, producer responsibility, and more. In the most recent amendment of the regulations, Colorado added Producer Responsibility Regulations. Through the Producer Responsibility Program for Statewide Recycling Act (Section 25-17-701 through 25-17-716 of the Colorado Revised Statutes), the State now gains the power of establishing rules requiring all producers provide records and data if requested by the department, showcasing their recycling rates, collection rates, and post consumer-recycled-content rates comply with the Program. The eye for detail the CDPHE is pushing forward in 2024 is a step in the right direction when it comes to the State's solid waste management. All of this data will aid in the reliability of future evaluations. Ensuring information is public and accurate will allow critical decisions to be made regarding solid waste within a reasonable time frame.

Although regulations have been upgraded, landfills throughout Colorado remain operating at less-than-optimal circumstances. Decomposing trash and organic waste saturate landfills, producing harmful greenhouse gases such as methane. This hydrocarbon is extremely potent and is a substantial influence to climate change. Larimer County Landfill, soon to be closed, produces nearly 196,000 tons of carbon dioxide equivalent a year. This is just one of 270 landfills within the state, 194 of those already at capacity and no longer operating.

The best way to combat these aging facilities is innovation. There are several corporations, companies, and individuals that are brainstorming solutions to limit solid waste's impact on the environment and the public health.

INNOVATION

Methane, while it can contribute to harmful air quality, can also be put to work for good. Per Colorado's Office of Energy, several landfill projects across the state are recycling the methane produced by the landfill and using it as fuel. Front Range landfill in Erie can generate power to about 3,000 homes with the help of Aria Energy repurposing methane as fuel for an electrical generator. Converting methane into electricity is just one innovation moving Colorado in the right direction to protect the public. Other approaches may yield desired

outcomes as well, such as repairing digital electronic equipment, reducing and reusing tire rubber, battery recycling. Another technology being tested is the densifier which is a device able to condense polystyrene foam packaging material into recyclable bricks. These can have a positive impact on the solid waste quantity that exists in Colorado. The biggest obstacle for these break-the-mindset solutions is funding.

Recently, Colorado has taken significant steps to reduce plastic waste and improve sustainability through legislative actions. In 2021, the state passed House Bill 21-1162, which introduced a phased approach to limiting single-use plastics. Beginning in 2023, a 10-cent fee was imposed on plastic and paper bags at major retailers. By 2024, a statewide ban on

single-use plastic bags took effect for large retail stores, along with a ban on styrofoam food containers for restaurants and grocery stores. These measures aim to reduce landfill waste and litter while encouraging consumers to shift toward reusable alternatives, without significant costs put onto the consumer.

Photo: AZ Studio

RESILIENCE

The State has put forward some impressive bills that will boost solid waste initiatives. In 2022, Governor Jard Polis signed into law HB22-1355, which made Colorado the third state to pass an extended producer responsibility law for packaging. The law enforces a fee onto large manufacturers such as Coca-Cola and Molson Coors for their packaging of their products, which funds a public health department account. In turn, the account's balance can be utilized to increase inspections and safety initiatives for solid waste around the state.

Some facilities, such as water treatment plants, cannot afford the most efficient technology to aid in the reduction of solid waste. Water treatment plants remove residuals from the local waters, containing a plethora of harmful chemicals, and removal of such residuals creates a new form of solid waste. The State of Colorado now requires residuals produced on-site to be sent to another facility to be disposed of. This imposes additional costs not only on the water treatment plant, but also on the facility taking in the new solid waste. For small communities, the financial burden of exporting residual waste limits their ability to invest money into improving the technology separating the residuals in the first place. However, even with the limited funds, these smaller water treatment plans save lives every day by removing waste and improving the water. Operators have spoken up regarding the difficulties of the job, but the optimism they share for future innovations keeps the plant moving.

Many facilities have similar experiences and concerns, yet they are persistent in putting the need to reduce solid waste at the forefront of production. Efforts to increase funding for smaller facilities would promote the quantity of solid waste removed and ensure it is properly exported.

RECOMMENDATIONS TO RAISE THE GRADE

- Improve recycling education for the public, especially regarding excluding unsuitable items from recycling. Additionally, more education can be provided to the public regarding both the use and reuse of materials in a sustainable way throughout the lifecycle of the material and the safe collection and management of lithium-ion batteries.
- Implement local financial incentives, such as reduced monthly household disposal costs for recycling and incentive programs that provide funding based on the actual tons of recyclables collected
- Create a rapid review and testing program within Colorado EPA to support the development of new and innovative technologies
- Increase funding for research and development of alternative uses of waste, including waste-to-energy and additional markets for recyclable materials such as glass and plastics
- Develop a reporting mechanism to track waste collected and hauled directly to out-of-state transfer stations or landfills since this information is currently unknown.
- Decrease recycling costs or create better incentives to recycle; moving forward, this could increase the state's diversion rates. Funds are needed to make recyclable materials more marketable, to find innovative ways to manage MSW for a useful purpose and to create new technologies that provide alternative pathways for solid waste rather than entering a landfill. For instance, Colorado is currently performing a waste characterization study that will result in a statewide strategy for diverting organics from disposal. Funding mechanisms are also needed to help transition citizens, local governments and the waste industry into recognizing MSW as a resource to be utilized.
- Invest in infrastructure and funding to address the volume and complexity of lithium-ion battery disposal, including the development of specialized facilities, advanced recycling technologies and public education initiatives to mitigate environmental and safety risks
- Develop alternative disposal methods for biosolids currently managed through landfilling or land application, and implement programs for recyclable organics that address potential PFAS contamination.

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Stormwater
C-
GRADE COMPARISON
CO: C-
Nat'l: D
Photo: Anastasiia

STORMWATER

EXECUTIVE SUMMARY

Colorado's stormwater infrastructure system is under increasing pressure from urban growth, aging assets, limited funding, and climate-related threats. The state's network of stormwater pipes, channels, and green infrastructure is vital for public safety, environmental health, and economic resilience. Despite regional innovations and planning, there remains a significant gap between funding levels and infrastructure needs.

Stormwater threats are growing due to wildfire burn scars, snowmelt patterns, and more frequent extreme weather. For example, the 2013 floods caused over $2 billion in damages and revealed significant vulnerabilities in infrastructure capacity and resilience.

Across Colorado, impervious surface coverage is expanding, with Denver reporting over 51% impervious land cover as of 2025, projected to increase by 5% per decade. This growth leads to higher runoff volumes and flood risks, particularly in older urban areas with undersized or deteriorated infrastructure. Many systems lack sufficient capacity to manage high-volume precipitation events, as demonstrated in both local flooding and statewide emergencies.

INTRODUCTION

Stormwater infrastructure in Colorado is crucial for protecting the environment and ensuring the safety and well-being of the state's residents. This infrastructure includes a network of pipes, channels, and structures designed to manage rainwater and snowmelt runoff from various surfaces, including roads, buildings, parking lots, construction sites, and other impervious and pervious surfaces. Effective stormwater management is essential for flood control, water quality protection, and protecting Colorado's residents, property, and waterways.

In addition to the structural components of stormwater infrastructure, there is also natural infrastructure that plays a crucial role in managing runoff. These natural systems, such as floodplains and wetlands, act as natural buffers and storage areas for excess water, helping to reduce the risk of flooding and improve water quality.

Stormwater management in Colorado is influenced by a variety of unique factors. These include burn scars from wildfires, which can increase runoff and erosion, and snowmelt, which contributes to high spring runoff volumes. Additionally, Colorado's water rights system and the need to balance various water uses, including agriculture, recreation, and urban development, add complexity to stormwater management. It is crucial to consider all factors when planning and implementing stormwater management strategies in Colorado.

CAPACITY

The capacity of Colorado's stormwater infrastructure is a growing concern due to factors such as increased urbanization, aging infrastructure, and changing precipitation patterns. As urban and suburban areas expand, more impervious surfaces are created, leading to increased runoff volumes and peak flows. This puts additional stress on the existing stormwater infrastructure, which may not have been designed to handle such high volumes. Additionally, aging infrastructure components may have reduced capacity due to deterioration or damage.

In Denver, for example, the city's stormwater system is struggling to keep up with the increasing urbanization and development. The city's impervious surfaces have increased significantly, leading to more runoff and a higher risk of flooding. Denver's Department of Transportation and Infrastructure (DOTI) estimates that, as of 2025, 51% of Denver is impervious with that number projected to increase by 5% each decade. This is a common trend throughout Colorado's urbanized areas. To mitigate the impacts of increasing imperviousness, local governments will typically have ordinances and regulations in place mandating volume/peak flow control as well as treatment of stormwater.

One example of the types of challenges faced by Colorado's stormwater infrastructure is the 2013 Colorado floods, which caused significant damage to the state's infrastructure and resulted in an estimated economic loss of $2 billion. The floods were a result of record-breaking rainfall caused by an unusually persistent and powerful storm. Floods like the 2013 Colorado flood highlight the vulnerability of the state's infrastructure to extreme weather events and the need for increased investment in resilience and maintenance.

CONDITION

The condition of Colorado's stormwater infrastructure varies across the state, with some areas facing significant challenges due to aging systems and deferred maintenance. Compounding this is the lack of a comprehensive, statewide source for stormwater infrastructure inventory and condition. Assessment of Colorado's stormwater infrastructure is challenging due to the buried and uncatalogued nature of storm sewers, leading to a lack of regular inspection. Coupled with funding limitations and the wide range of materials, age, and condition of storm infrastructure, agencies are left with many unknowns about the condition of stormwater.

The Colorado Department of Public Health and Environment (CDPHE) is responsible for administering Colorado's Discharge Permit System (CDPS). The CDPS is the state-level equivalent to the National Pollutant Discharge Elimination System (NPDES). The CDPS aims at protecting water quality in Colorado by regulating point source (i.e. wastewater plant & industrial discharge) and nonpoint source pollution (i.e. stormwater & agricultural).

Colorado has over 90,000 miles of rivers and more than 270,000 acres of lakes. According to the 2022 Integrated Report from CDPHE which assessed 85,356 river miles and 186,734 lake acres, 30% of the rivers and 31% of the lakes are considered impaired, meaning they do not meet water quality standards for their designated uses (i.e. aquatic life, recreation, drinking water source, or agricultural/industrial supply). This is compared to 51% of assessed river miles and 55% of assessed lake acres being considered impaired across the entire United States. Colorado has generally cleaner water than other states, largely due to being a headwater state with minimal upstream pollution. However, mitigating and managing pollution from stormwater remains critical for downstream states and communities. As the State's inventory and assessment of waterways continues to increase over the coming years, the trends and condition will become better understood.

FUNDING

To fund stormwater infrastructure projects, most major municipalities within Colorado charge a fee associated with stormwater. This funding appears to meet basic operations but leaves little excess for preventative projects. Municipalities are able to operate and maintain the systems that already exist, but they are lacking the funding for projects. Generally, funding is dedicated through stormwater utilities which establish fee structures for properties. Special districts and flood districts may provide funding and resources to fill the gaps in funding for stormwater infrastructure. On the front range, the Mile High Flood District (MHFD) handles more specialized projects as they are not typically responsible for day-to-day operation and maintenance as typical municipalities are. MHFD's regional scope allows it to concentrate on large-scale, complex projects that often exceed the capacity of individual municipalities. These projects frequently involve major drainageways, flood control structures, and stream restoration efforts that benefit multiple jurisdictions. MHFD receives around $60-70 million annually for funding coming from property tax mill levies.

To determine the demand and funding needed, the Division of Natural Resources in Colorado has developed a dedicated team that handles the mapping of stormwater systems. Colorado has been ranked among the top ten states with the most significant infrastructure funding gaps in the country. Municipalities and other local entities are increasingly turning to stormwater fees to fund stormwater infrastructure. These fees are typically through a stormwater utility and are collected monthly from residents and businesses and are used to fund the maintenance and repair of existing infrastructure, as well as the construction of new infrastructure. The average monthly stormwater utility fee in Colorado is approximately $8.00. However, the amount of the fee varies depending on the size of the property and the amount of impervious surface. For example, the average monthly fee for a single-family home in Denver is $5.00, while the average monthly fee for a commercial property is $10.00.

Nationwide, it is estimated that 62% of stormwater utilities report their fees are inadequate with many municipalities in Colorado reporting the same inadequacies.

FUTURE NEED

As water quality measures for MS4 permitting become more stringent, local governments and stormwater utilities in Colorado will face increasing pressure to update or expand their stormwater infrastructure. Factors that will compound this need are:

- **Increasing Impervious Surfaces:** Continued population growth and development across Colorado, which has seen a roughly 10.8% increase (approximately 578,693 people) in population over the last 10 years, are increasing impervious surfaces, resulting in greater stormwater runoff volumes and necessitating improved stormwater management practices and infrastructure.
- **Aging Infrastructure and Facilities Management:** Many of Colorado's existing stormwater assets are aging, requiring proactive and consistent facilities management practices to ensure continued functionality. Implementing GIS cataloging and structure rating systems is crucial for prioritizing maintenance and rehabilitation efforts.
- **Extending Resources to Growing Communities:** As more communities in Colorado grow and develop, there will be an increased need for education, outreach, and stormwater management resources, particularly for those areas not currently regulated under MS4 permits. Proactive engagement and resource provision are essential to prevent future stormwater-related challenges in these communities.
- **Long-term Investment and Regional Variations:** The scale of investment needed varies across the state. For example, based on current funding projections for Fort Collins, construction of identified stormwater improvements is anticipated to continue until 2050, with total costs estimated at approximately $300 million. The result of this investment in the City's stormwater infrastructure will be a reduced flood risk to more than 2,300 structures with flood damages reduced by more than $600 million (2020 dollars).

Despite ongoing efforts and planned investments, a general consensus from municipal outreach indicates that current funding levels are insufficient to meet the growing need for stormwater projects across Colorado. This shortfall underscores the urgency of exploring innovative funding mechanisms, prioritizing infrastructure investments, and implementing more efficient and sustainable stormwater management practices to address the state's future needs effectively.

OPERATION AND MAINTENANCE

For stormwater systems to remain operational, they need to be maintained. The responsibility of the operation and maintenance of stormwater infrastructure is divided between local governments, special districts, and private owners. With multiple parties sharing this responsibility, this can add complexity and challenges to ensure the proper operation and maintenance of stormwater infrastructure. Conflating this is Colorado's MS4 permits requiring routine inspection and maintenance to ensure the longevity of these systems.

It is difficult to ensure the maintenance is performed, particularly when it leaves the hands of public entities. In an attempt to ensure that maintenance is performed on private property, O&M should be included on all stormwater system designs.

PUBLIC SAFETY

Stormwater infrastructure plays a critical role in protecting public safety in Colorado. Flooding is a major natural hazard in Colorado, and stormwater systems are designed to reduce the risk of flooding by conveying stormwater away from structures and developed areas. When stormwater systems fail, it can lead to property damage, injuries, and even fatalities. Minor failures typically occur when catch basins and drains get clogged causing minor flooding and property damage. The next level of failures occur when heavy rainfall and compounding minor failures lead to stormwater systems being overwhelmed, leading to broader urban flooding and property damage. Structural failures can lead to sinkholes, severe subsidence, major property loss and a greater risk for injuries and fatalities. Lastly, the most severe failures are catastrophic breaches which can occur due to overtopping, foundation collapse, or structural failures of levees and dams.

Colorado's unique mountainous terrain, arid climate, and severe storms can exacerbate the risk of flooding. Major rivers in Colorado, such as the South Platte, Arkansas, and Colorado Rivers, have experienced numerous floods throughout history, causing extensive damage and loss of life. The Big Thompson Flood of 1976, which resulted in 144 fatalities, is considered one of the worst floods in Colorado's history. The 2013 Colorado floods, which caused widespread damage across the Front Range and other areas, are another notable example of the state's vulnerability to flooding.

In response to the challenges posed by flooding, Colorado has implemented various flood mitigation measures, including dams, levees, and flood warning systems. Notable examples of these types of projects include raising the height of the Gross Reservoir dam, the Chimney Hollow Reservoir Project, and improvements to the Halligan Reservoir.

There are dedicated groups focused on spreading awareness of the dangers of flooding. These groups include HEART (Hazard Evaluation, Awareness, and Resilience Task Force), CASFM (Colorado Association of Stormwater and Floodplain Managers), FTAP (Flood Technical Assistance Partnership), and the CWCB (Colorado Water Conservation Board). The MHFD has been on the leading edge as they have performed valuable research to enhance public safety. Most municipalities and entities have developed flood warning systems including the MHFD, Denver, Fort Collins, Larimer County, Littleton, Pueblo, and many mountain towns. Ultimately, the risk of flooding remains a significant concern, particularly with the increasing frequency and intensity of extreme weather events due to climate change.

RESILIENCE

Resilience Strategies

Impacts from climate change will have variable effects on the form and frequency of extreme events in Colorado. To withstand these effects, stormwater infrastructure is increasingly implemented with a context-sensitive approach that leverages a localized understanding of flood risk, land use practices, and regulatory expectations. This approach informs the types, designs, locations, and long-term sustainability of stormwater systems. Resilience for stormwater infrastructure is reflected by a mix of optimized green, gray, and natural infrastructure, land planning and urban growth, updated asset management and, in water-scarce areas, the productive reuse of stormwater.

Colorado is enhancing stormwater infrastructure resilience through several key initiatives:

- **Colorado Resiliency Framework:** This statewide framework provides a comprehensive, coordinated approach to reducing risks and vulnerabilities across various sectors, including water resources and infrastructure. It recognizes that effective stormwater management is crucial for mitigating flood risks, protecting water quality, and ensuring the long-term sustainability of communities. The framework emphasizes the importance of integrating climate change projections into infrastructure planning, promoting land use coordination to minimize development in flood-prone areas, and enhancing collaboration among state agencies, local governments, and stakeholders. It serves as an overarching guide for resilience efforts throughout the state.
- **Waterway Resiliency Program (Denver):** The City of Denver's Waterway Resiliency Program is a transformative initiative focused on reshaping key waterways – the South Platte River, Weir Gulch, and Harvard Gulch – to achieve multiple benefits. Beyond simply managing stormwater, the program aims to enhance natural ecosystems, reduce flood risks, and create inviting spaces for plants, wildlife, and people. This multifaceted approach exemplifies the integration of natural systems into urban stormwater management, creating more sustainable and aesthetically pleasing communities. The project also demonstrates that water quality is a priority across the nation. The project aims to provide water that is under the NPDES program, which allows systems to meet the goal of reducing the discharge of pollutants from runoff.
- **Resilient St. Vrain Project (Longmont):** The Resilient St. Vrain Project in Longmont is a significant effort to restore the St. Vrain Greenway and improve the St. Vrain Creek channel, demonstrating a strong commitment to enhancing flood resilience while also creating community amenities. This project highlights the importance of restoring natural floodplains to reduce flood risks, improving channel capacity to handle increased flows, and enhancing recreational opportunities for residents. The St. Vrain project showcases a holistic approach to stormwater management that benefits both the environment and the community.
- **Watershed Resilience Pilot Program:** This innovative program adopts a holistic approach by aligning watershed restoration and risk mitigation efforts with community and economic development goals. It provides significant financial resources (approximately $36 million) to watershed coalitions for capacity building, planning, and project implementation. By empowering local stakeholders and supporting collaborative initiatives, the program aims to address long-term system improvements while also promoting sustainable economic growth and community well-being.
- **Improved Roadway Flood Resilience (CDOT):** The Colorado Department of Transportation's (CDOT) completion of the permanent flood repair projects from the 2013 floods that devastated Northern Colorado's Front Range highlights the critical importance of resilient transportation infrastructure. By rebuilding and upgrading roadways and bridges to withstand future flood events, CDOT is ensuring the safe and reliable movement of people and goods throughout the region. The projects implemented are to support the states economy, reduce risks to public safety, and improve the overall quality of life for residents. The initiative showcases the role of transportation agencies in building more resilient communities.

INNOVATION

Advancing Stormwater Management Through Innovation in Colorado

Colorado is a national leader in stormwater management innovation, integrating advanced tools, green infrastructure, and novel materials to enhance resilience and sustainability. The state's success stems from leveraging cutting-edge research, strategic collaborations, and new technologies, addressing stormwater challenges with forward-thinking solutions. Key drivers of this progress include the Colorado Stormwater Center (CSC) and the MHFD.

Catalyzing Innovation through Education, Research, and Outreach (Colorado Stormwater Center):

The CSC at Colorado State University acts as a central hub for stormwater management advancement through:

- **Comprehensive Training Programs:** Equipping engineers, contractors, and municipal staff with best practices in SCM maintenance, design, and implementation.
- **Groundbreaking Research Initiatives:** Exploring urban hydrology, stormwater treatment efficiency, and the impacts of climate variability, informing evidence-based solutions.
- **Strategic Partnerships:** Bridging the gap between academia, industry, and policymakers to foster sustainable stormwater solutions and facilitate technology transfer. The CSC's work directly supports and empowers local communities in implementing innovative approaches.
- **Applied Research and Tools:** Advancing GSIs through partnership of research and applied tools for consultants and municipalities.

Context-Sensitive Green Infrastructure and Low-Impact Development (LID):

Colorado has prioritized green stormwater infrastructure (GSI) and LID technologies to mitigate urban runoff and restore natural hydrology. Cities are adopting permeable pavements, rain gardens, bioswales, and vegetated roofs to reduce stormwater pollution and enhance groundwater recharge. The Mile High Flood Control District and the Colorado Stormwater Center support these efforts by providing research, guidance, and technical assistance to communities implementing GSI projects. The Mile High Flood Control District, as well as the Colorado Stormwater Center, are advancing GSIs through partnership of research and applied tools for consultants and municipalities.

Stormwater Transformation Programs:

The Stormwater Transformation and Enhancement Program (STEP), spearheaded by the High Line Canal Conservancy, is revitalizing an aging irrigation canal into a state-of-the-art stormwater conveyance and treatment system. This collaborative initiative between Denver Water, Mile High Flood District, and local jurisdictions exemplifies a forward-looking approach to multi-functional infrastructure.

Data Driven Decisions and Real-Time Monitoring:

The Mile High Flood District also contributes to data collection and dissemination throughout the Denver region through various different real time monitoring and alerts.

Innovative Product Evaluation and Materials (CDOT):

CDOT is testing and implementing advanced stormwater control measure (SCM) products to enhance system performance and longevity. These efforts include smart stormwater sensors, eco-friendly filtration materials, and modular stormwater treatment units. This innovative approach allows for stormwater methods and products to be refined and improved, allowing for continued advances in technologies state wide.

Colorado's commitment to stormwater innovation is evident in its investment in cutting-edge technologies, interdisciplinary collaboration, and green infrastructure adoption. These advancements, particularly through the work of the Colorado Stormwater Center and the strategic partnerships facilitated by the Mile High Flood District, not only improve water quality and flood resilience but also contribute to a more sustainable and adaptive urban landscape. As climate change intensifies hydrological challenges, Colorado's leadership in stormwater innovation will serve as a model for other states seeking to modernize their infrastructure.

RECOMMENDATIONS TO RAISE THE GRADE

Implement and Track Statewide Asset Management Systems

- Launch a state-supported stormwater asset management initiative, requiring and/or incentivizing local governments to catalog their stormwater systems.

Expand Dedicated and Tiered Stormwater Utility Funding

- Encourage broader implementation of equitable, tiered utility fees based on impervious surface area.
- Incorporate stormwater credit programs that reward on-site BMPs and green stormwater infrastructure.
- Assessment and adjustment of current stormwater utility fees to ensure coverage of full cost of service including operation, maintenance, and capital needs.

Formalize Condition Assessment & State Reporting Requirements

- Continue and further develop routine infrastructure condition assessment efforts.
- Establish a centralized, state-wide reporting portal.

Incentivize and Standardize Green Stormwater Infrastructure Implementation

- Mandate GSI/LID feasibility assessments for new developments.
- Provide grant bonuses or stormwater fee credits for use of GSI (rain gardens, bioretention, green roofs, etc.).

Establish Resilience & Flood Hazard Adoption Metrics

- Adopt resilience scorecards or risk assessments that evaluate drainage systems under climate scenarios.

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Transit

C-

GRADE COMPARISON

CO: C-

Nat'l: D

Photo: Bustang bus headed northbound on I-25 approaching Larkspur, Colorado. By Xnatedawgx - Own work, CC BY-SA 4.0, https://commons.wikimedia.org/w/index.php?curid=43152059

TRANSIT

EXECUTIVE SUMMARY

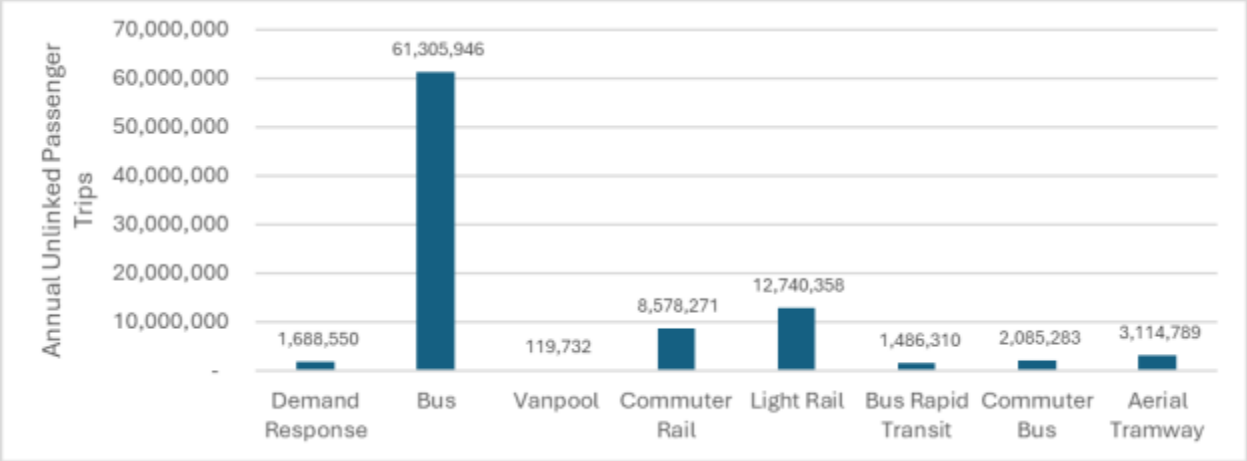
Colorado's transit agencies continue innovating in response to challenges in urban, rural, and resort transit systems. Agencies throughout the state use state and local policies, alternative transit operations models, technology, and regional collaboration to meet evolving needs. There has been an increased focus on transit and active transportation at state and local levels, helping to address funding gaps and improve first/last mile connectivity – key barriers that can make using transit difficult in some areas. However, the state's transit system has not yet fully recovered from the effects of the COVID-19 pandemic and is still working to meet the needs of transit-dependent people in some of the state's less population dense regions. Continuing efforts by state and local policymakers, along with strong support from Colorado's voters, are expected to keep the state on track to surpass pre-pandemic service levels and increase conditions and access for Coloradans.

Photo: Denver Metro area; Real Window Creative

CAPACITY AND CONDITION

Colorado's transit infrastructure reflects both strengths and challenges shaped by its geography, which includes high-altitude mountain passes, expansive rural areas, and isolated resort towns. These physical features, combined with a growing population and evolving transportation needs, influence how transit is planned, delivered, and maintained across the state. The state is served by approximately 60 transit agencies operating across 53 of Colorado's 64 counties, providing diverse transit options such as bus, light rail, commuter rail, demand-response services, and vanpools. These services support mobility for both residents and visitors in urban, rural, and resort areas.

FIGURE 1. STATEWIDE 2023 ANNUAL TRANSIT RIDERSHIP (UNLINKED PASSENGER TRIPS) BY MODE



Transit ridership data reported to the National Transit Database (NTD) in 2023 shows significant variation among transit modes and agencies across the state. The Regional Transportation District (RTD) in Denver, the state's largest transit agency, serves approximately 3.09 million people over a 2,342-square-mile area. RTD recorded more than 61 million boardings in 2023 across its bus, light rail, commuter rail, and demand-response services.

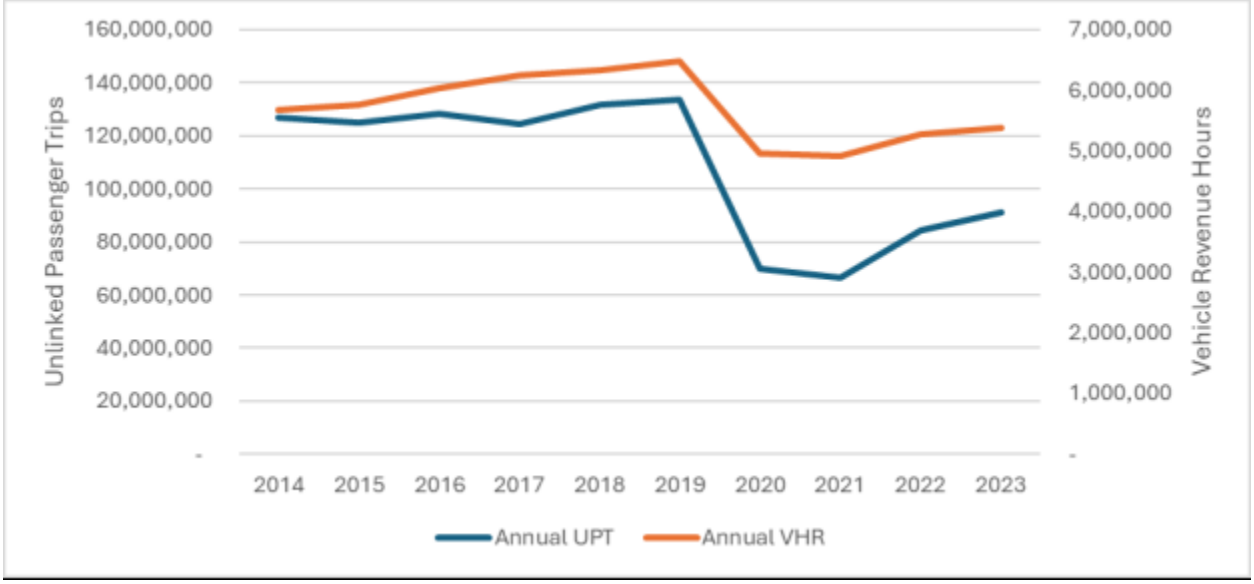
The Roaring Fork Transportation Authority (RFTA), the state's second-largest transit agency and the nation's largest rural transit provider, operates in the Roaring Fork Valley of western Colorado. Its service area includes resort and mountain communities such as Aspen, Glenwood Springs, Carbondale, and Basalt. RFTA offers a mix of bus, commuter bus, Bus Rapid Transit (BRT), and demand-response services, including the VelociRFTA BRT system. In 2023, RFTA recorded over 8.5 million unlinked passenger trips, demonstrating the agency's critical role in supporting rural mobility and regional economic vitality.

Colorado's transit systems were significantly affected by the COVID-19 pandemic. In the early months, ridership dropped by approximately 79% nationwide. In 2020, Colorado experienced nearly a 50% decrease in UPT and nearly a 25% decrease in vehicle revenue hours. This sharp decline led to service reductions and financial strain, compounded by staffing shortages that have delayed full restoration of pre-pandemic service levels.

Colorado's transit systems were significantly affected by the COVID-19 pandemic. In the early months, ridership dropped by approximately 79% nationwide. In 2020, Colorado experienced nearly a 50 percent decrease in UPT and nearly a 25 decrease in vehicle revenue hours.

The graph below illustrates trends in unlinked passenger trips (UPT) and vehicle revenue hours (VRH) for Colorado transit systems from 2014 to 2023. The data show strong ridership growth up to 2019, followed by sharp declines in 2020 due to the pandemic. Both metrics have gradually recovered, though neither has yet returned to pre-pandemic levels. Moderate increases in VHR during 2022 and 2023 suggest a phased approach to service restoration, prioritizing alignment with ridership demand rather than full-scale expansion.

FIGURE 2. STATEWIDE TRENDS IN UNLINKED PASSENGER TRIPS (UPT) AND VEHICLE REVENUE HOURS (VRH) BY YEAR



In 2016, the Federal Transit Administration (FTA) mandated that all federally funded transit agencies develop Transit Asset Management (TAM) Plans to guide proper maintenance of transportation assets. The Colorado Department of Transportation (CDOT) Group Transit Asset Management (TAM) Plan estimates that over $241 million will be needed to replace all aging assets from 2023-2026 (approx. $30 million for facilities and equipment and $211 million for vehicles). However, the current annual capital budget of $23 million would reduce the investment backlog by less than $18 million from 2023 to 2026.

Colorado agencies can join the CDOT Group TAM Plan. However, some—such as RTD, RFTA, Mountain Metropolitan Transit (MMT), and Summit Stage—have developed individual TAM plans tailored to their service models.

Colorado's transit asset conditions generally mirror national trends but face persistent funding and maintenance challenges. Many vehicles in the state's fleets exceed their Useful Life Benchmark (ULB), impacting reliability. Nationally, transit buses average 7.8 years old, while Colorado's fleet trends older. As reported in the CDOT Group TAM Plan, around 8% of the state's administrative, maintenance, passenger, and parking transit facilities are below a 3 on the FTA's 5-point Transit Economic Requirements Model (TERM) Condition Assessment scale, indicating a need for maintenance or replacement.

OPERATION & MAINTENANCE

One of the primary obstacles transit providers face in maintaining operations is difficulty in driver hiring and retention. This challenge is mainly driven by Colorado's high cost of living, which is especially problematic for rural transit providers serving the state's ski tourism industry. Agencies like RFTA already pay some of the highest wages among transit providers in the country, advertising a starting wage of about $31 an hour, and still struggle to hire/maintain enough drivers. Similar challenges coupled with a more time consuming training process makes it difficult to hire maintenance staff as well.

To address this, agencies have implemented solutions such as driver stipends, employee transportation from more affordable areas, and the purchase of properties for conversion into reduced-cost employee housing.

Seasonal demand in resort areas has also complicated the ability to provide full-time employment.

Obstacles and needs among rural transit providers vary greatly. Agencies serving the ski industry along the I-70 corridor experience high ridership and strong local funding, while others - such as those on the eastern plains – face common rural challenges like serving large areas with sparse populations. These agencies often rely on on-demand services, which can pose reliability and accessibility issues for transit-dependent riders.

FUNDING

The breakdown of revenue sources reported to NTD in 2023 were 11% fares and directly generated revenue, 13% local funding, 2% state funding, 22% federal funding, and 53% from sales tax levied by RTD in the region they serve. Governor Jared Polis has championed the expansion of transit statewide. Colorado Transportation Vision 2035, released in November 2024, aims for an 83% increase in transit revenue miles, the miles traveled by a transit vehicle while in revenue service, and at least 52% of new housing units placed in transit-oriented areas by 2035.

To help meet these goals, several bills have been passed:

- House Bill 24-1313 requires jurisdictions to permit specific numbers and densities of dwelling units in zoning to support transit-oriented development. The goal of this bill is to encourage higher density development and improve housing affordability in areas with frequent transit service.
- Senate Bill 24-230 is expected to generate over $50 million annually from the oil and gas industry to fund transit expansion and mitigate sector impacts.
- Senate Bill 24-032 reimburses transit agencies for providing free fares to youth year-round and other riders during high-ozone months.

A significant portion of federal funding for transit projects in Colorado comes from the Infrastructure Investment and Jobs Act (IIJA), which will provide an estimated $950 million through formula funding alone from 2022-2026 to improve transportation options across the state. In 2023, Colorado also received funding through grant programs such as the FTA Bus & Bus Facilities Program (5339), which includes the FYA Low or No Emission Grant Program (5339c). As of January 2025, Colorado had received nearly $111 million through these competitive programs. This funding will help the state reach the goals laid out in the Transit Zero Emission Vehicle (ZEV) Roadmap, discussed later in the resilience section.

In addition, many communities have passed local tax initiatives to further support transit funding and small transit systems in small towns such as Sterling. Others like Montrose provide Non-Emergency Medical Transport (NEMT) to help fund their public transportation system. Continued and increased investment from federal, state, and local sources will be essential to reaching the goals of Vision 2035.

TABLE 1: NTD DATA, REVENUE AND EXPENSES 2019-2023

REVENUES EARNED:

	2019	2020	2021	2022	2023
Fares and Other Directly Generated	$240,939,091	$125,966,575	$121,651,867	$142,102,109	$175,183,955
Taxes & Fees Levied by Transit Agency	$805,391,269	$632,664,677	$756,974,223	$855,245,801	$858,132,902
Local	$117,735,511	$112,763,207	$89,431,872	$136,716,395	$213,911,924
State	$13,620,261	$9,980,856	$15,454,535	$27,390,947	$27,721,077
Federal	$250,992,461	$468,786,853	$422,314,764	$397,154,066	$354,576,035

FUNDS EXPENDED:

	2019	2020	2021	2022	2023
Operating Expenses	$1,031,274,708	$968,448,550	$918,215,711	$1,176,013,031	$1,127,303,850
Capital Expenses	$396,565,085	$140,783,274	$89,475,596	$92,197,719	$211,988,881

According to federal NTD data, since 2019, overall revenue sources have kept pace with increasing operating expenses. The COVID-19 pandemic significantly shifted funding sources: in 2019, 27% of funding came from government sources; by 2023, that share had risen to 37%, largely due to a surge in federal funding – up 87% in the pandemic's first year. As federal funding declines, increased state and local contributions, as well as new taxes and fees, have helped fill the gap. Direct revenue sources make up roughly 10% of the 2023 reported revenues earned and includes passenger fare revenues, advertising revenues, donations, bond proceeds, and taxes imposed by the transit agency. Revenue from these sources has risen by 40% since the pandemic began, though they remain 27% below 2019 levels.

One bright spot for both ridership recovery and funding is Bustang, the interregional bus service operated by CDOT. Following a $30 million grant from SB 22-180, Bustang doubled service on the I-25 corridor and tripled service along the I-70 corridor; it is among the few providers in the state that has surpassed pre-pandemic ridership levels.

FUTURE NEED

The CDOT Accountability Dashboard reports project status, total estimated costs, strategic funds, and all funds for the department over a 10-year period, 2019-2028. The total estimated cost of transit projects over this period is $473 million with an allocated $471 million of total funds. This leaves a funding gap of $2 million, which is a small portion of the total ~$1.7 billion funding gap reported by CDOT. The reported total estimated cost on the dashboard only includes actual and planned funds, and CDOT reports these estimated costs will likely increase as details become available, so this gap is likely to grow in the coming years.

Many projections of future transit demand in Colorado are based on population growth, which increased about 15% from 5.03 million in 2010 to 5.77 million in 2020. The U.S. Census Bureau estimates the 2024 Colorado population as 5.96 million, which represents a significant decrease in year-over-year population growth. It is unclear how this change in population trend will affect future funding needs.

Photo: Light rail train at the Union Station in Denver; Arina P Habich

PUBLIC SAFETY

Colorado's transit organizations and municipalities face both observed and perceived safety concerns. Most observed incidents occur during collisions involving general traffic and transit vehicles, with a strong concentration in dense metro areas. To reduce conflict points between vehicles and more vulnerable road users, protected bike lanes have become a significant focus in urban settings.

Significant collisions involving public transit are rare. However, when such incidents occur (such as the RTD R Line derailment in September 2022), they tend to receive widespread media coverage, increasing public perception of danger and discouraging potential riders. In contrast, privately owned vehicle collisions, which are far more common, do not typically generate the same level of alarm. In 2023, there were 4,154 serious injury crashes and 720 fatalities on Colorado Roadways, according to the CDOT Advancing Transportation Safety Program. Public transit fatalities remain low, with the Bureau of Transportation citing 345 transit fatalities in 2024, 90 being passengers, nationwide. Since the 2022 derailment, RTD has committed to a proactive safety approach, including the planning, announcement, and completion of preventative repairs.

Another facet of safety concerns rider comfort and experience. Major deterrents to transit use include crime, lack of cleanliness, and unreliability of routes. A survey conducted by New Bridge Strategy found that 33% of respondents held an unfavorable view of RTD, with "safety concerns" cited as the top concern, followed by "drug use on buses and trains" and homelessness. According to the Colorado Bureau of Investigation, drug violations at air, bus, and train terminals rose from 89 in 2019 to 310 in 2023. Similarly, RTD police issued an average of 527 citations per month in 2023, up from 372 in 2022.

Metro areas are exploring alternative response strategies for improving system safety. Denver's Support Team Assisted Response (STAR) Program is addressing public safety by fortifying security measures, hiring additional staff, and implementing new equipment. RTD's Welcoming Transit Environment strategic initiative includes upgrades to transit stops and pavilions to improve rider comfort and safety. Similarly, Bustang has enhanced stops with new fencing, security gates, and, in some cases, entire stop relocations.

In September 2020, the U.S. Department of Homeland Security awarded RTD a $2.4 million grant for a new software system that allows public safety dispatchers to access live video and audio feeds during emergencies on RTD vehicles.

RESILIENCE

Alternative Fuel-Powered Vehicles

In November 2021, CDOT released the Transit Zero Emission Vehicle (ZEV) Roadmap, a strategic guide to help Colorado's transit agencies transition to zero-emission technologies. This plan focuses on full-size buses and rail vehicles, including battery electric vehicles (BEVs), plug-in hybrid electric vehicles, and fuel cell electric vehicles. It does not address school buses, charter or intercity bus services, or intercity passenger rail transportation.

As of 2020, transit providers across Colorado had 100 zero-emission buses either deployed, on order, or planned for procurement. Adoption of alternative fuel technologies varies widely across agencies, depending on factors such as topography and routes that are conducive to electric vehicle usage, whether the technology can meet the demands of the service and if there are vehicles available that meet the FTA procurement requirements. The 2023 bankruptcy of electric bus manufacturer Proterra Inc. has negatively impacted some transit agencies, which are now struggling to obtain parts and maintain operational BEV fleets.

Several transit agencies have developed their own ZEV transition plans. RTD's plan includes infrastructure improvements to support electric and alternative fuel buses, while RFTA's has committed to reducing fossil fuel use by 50% by 2030 and 90% by 2050.

Weather Resilience and Emergency Preparedness

Colorado transit agencies must navigate a range of natural hazards, including tornadoes, flash floods, hailstorms, wildfires, and avalanches. The December 15, 2021, windstorm, with gusts reaching 112 mph, caused major disruptions - RTD anticipated operational delays, and Pueblo's city bus services were suspended for three hours to ensure passenger safety. Similarly, the March 2021 blizzard resulted in whiteout conditions across the Rocky Mountains, leading CDOT to advise residents to avoid travel. Rolling closures on Interstates 70 and 25 often significantly affect transit schedules.

To address these challenges, CDOT launched a statewide Risk and Resilience Program, focusing on identifying transportation system vulnerabilities and mitigating the impact of extreme weather. In January 2025, HB25-1007 was introduced, requiring transit agencies to develop emergency communication plans in coordination with local emergency services, ensuring continued paratransit access for individuals with disabilities during crises.

Most agencies do not maintain dedicated risk and resilience programs but follow CDOT's statewide guidance, integrating resilience strategies into long-range plans at the agency, county, metropolitan planning organization, or regional transportation authority levels.

Sustainability and Environmental Stewardship

While public transit is inherently sustainable, the 2022 Greening of State Government Executive Order (D 2022 016) established aggressive sustainability targets for public transportation agencies. These targets include improving energy and water efficiency, reducing petroleum use and greenhouse gas emissions, expanding renewable energy use, and enhancing recycling and landfill diversion efforts.

Colorado agencies are also encouraged to follow national sustainability standards. The U.S. Green Building Council Leadership in Energy and Environmental Design (LEED) framework and rating system, typically used for buildings, and the Institute for Sustainable Infrastructure's Envision framework and rating system, typically used for infrastructure, are leading nationwide benchmarks for sustainable design and construction. Currently, no Envision-certified projects are operational in the state. However, Denver's Bus Rapid Transit project is pursuing Envision certification and is anticipated to be operational in late 2027.

A few transit facilities in Colorado have achieved LEED certification, including:

- Transfort's South Transit Center (Fort Collins)
- RTD's Denver Union Station Bus Concourse
- MMT's service contractor facility (Colorado Springs)
- The City of Durango's Transit Center.

Agencies are also enhancing community resilience through partnerships. For example, MMT collaborates with the Pikes Peak Regional Office of Emergency Management (PPROEM) to offer transportation to homeless facilities during extreme cold. Starting in January 2025, following a fleet equipment analysis, MMT implemented snow routes to maintain service during severe weather.

In addition to long-term planning, real-time GPS-based tracking systems have become standard among Colorado's highest-ridership transit agencies. These platforms – such as, RTD's Next Ride, MyRFTA, MMT's My Next Bus, Greeley Evans Transit Routematch, and Grand Valley Transit Routematch – along with third-party apps like the Transit app, TransLoc, and Google Maps transit directions, provide riders with real-time alerts and service updates, particularly during disruptions.

CDOT integrates environmental stewardship into all transit capital projects through its Environmental Stewardship Guide and Transit Capital Projects Local Agency Manual. The agency's strategy includes reducing transportation-related greenhouse gas emissions by 60% by 2037, with a focus on shifting more travel to public transit.

CASTA continues to advocate for effective transit policies and funding to support a more environmentally responsible, resilient statewide system.

Photo: Lime Electric scooter sharing rental; Miljan Zivkovic

INNOVATION

Colorado has been innovative in funding programs that expand access to transit through free-fare programs and expanding the active transportation system. Fourteen agencies took advantage of state-funded programs to instill long-term transit habits: Zero Fare for Better Air, which offers free rides during peak summer months to reduce emissions and increase transit use, and Zero Fare for Youth, which provides free transit for individuals under 19.

The state has also prioritized active transportation, which strengthens first/last mile connections to transit. New state and federal funding programs have supported active transportation infrastructure, while bike and scooter share programs in many communities offer alternatives to car trips or serve as connectors to transit. Although these services can be costly, major companies offer fare reductions or operate in opportunity zones to improve access for lower-income users.

Finally, the Greenhouse Gas Transportation Planning Standard, which was approved in 2021, requires CDOT and the state's five Metropolitan Planning Organizations to achieve individually set greenhouse gas reduction levels. The standard is a requirement established in the state's transportation funding bill, Senate Bill 21-260, and has helped prioritize investment in active transportation, aligning emissions goals with long-term infrastructure development.

Colorado has also been innovative in using software to improve user experience and operations with many agencies providing real-time bus locations, and mobile ticketing and RTD using live camera footage in buses to improve public safety responses. With support from the Colorado Association of Transit Agencies (CASTA), small rural transit providers are also collaborating to develop affordable, proprietary scheduling software tailored to their specific needs and CDOT is working with several agencies to develop COtransit, a statewide platform that integrates trip planning and mobile ticketing between regional and local systems.

RECOMMENDATIONS TO RAISE THE GRADE

- Increase investment at the local, regional, and state levels in both transit operations and capital projects. Revise existing funding structures to better support a shift away from highway and privately owned vehicle (POV) travel toward more sustainable transportation modes.
- Strengthen coordination among transit agencies, local governments, and state entities to ensure transit considerations are integrated earlier in planning and decision-making processes. This will help the transit system more effectively respond to evolving community needs and development patterns.
- Support incremental service improvements that enhance the efficiency and reliability of the bus network. These improvements can help alleviate traffic congestion along major transportation corridors and make transit a more attractive option for travelers.
- Incentivize domestic manufacturing, streamline procurement, invest in workforce development, and improve housing attainability to support transit agencies' access to vehicles, parts, and skilled maintenance staff. Strategies may include tax credits for manufacturers, bulk purchasing agreements, and vocational training programs to attract businesses and strengthen local supply chains.

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Photo: Sewage effluent from Denver metro wastewater treatment facility creating a foam votex upstream the Sout Platte River

WASTEWATER

EXECUTIVE SUMMARY

Colorado's wastewater infrastructure faces significant challenges, including aging systems, capacity limitations, evolving regulatory requirements, and ongoing workforce shortages. Many facilities are operating with infrastructure that has surpassed or is approaching its intended lifespan, necessitating frequent maintenance and costly upgrades. These issues are compounded by a growing population that places additional stress on wastewater systems.

Colorado's wastewater infrastructure needs are estimated at $6.2 billion for systems serving populations of 10,000 or more. Funding sources include state and federal programs and local rate-based systems. However, revenue from rate-based systems remains inadequate, delaying essential projects and requiring a rate increase for many communities.

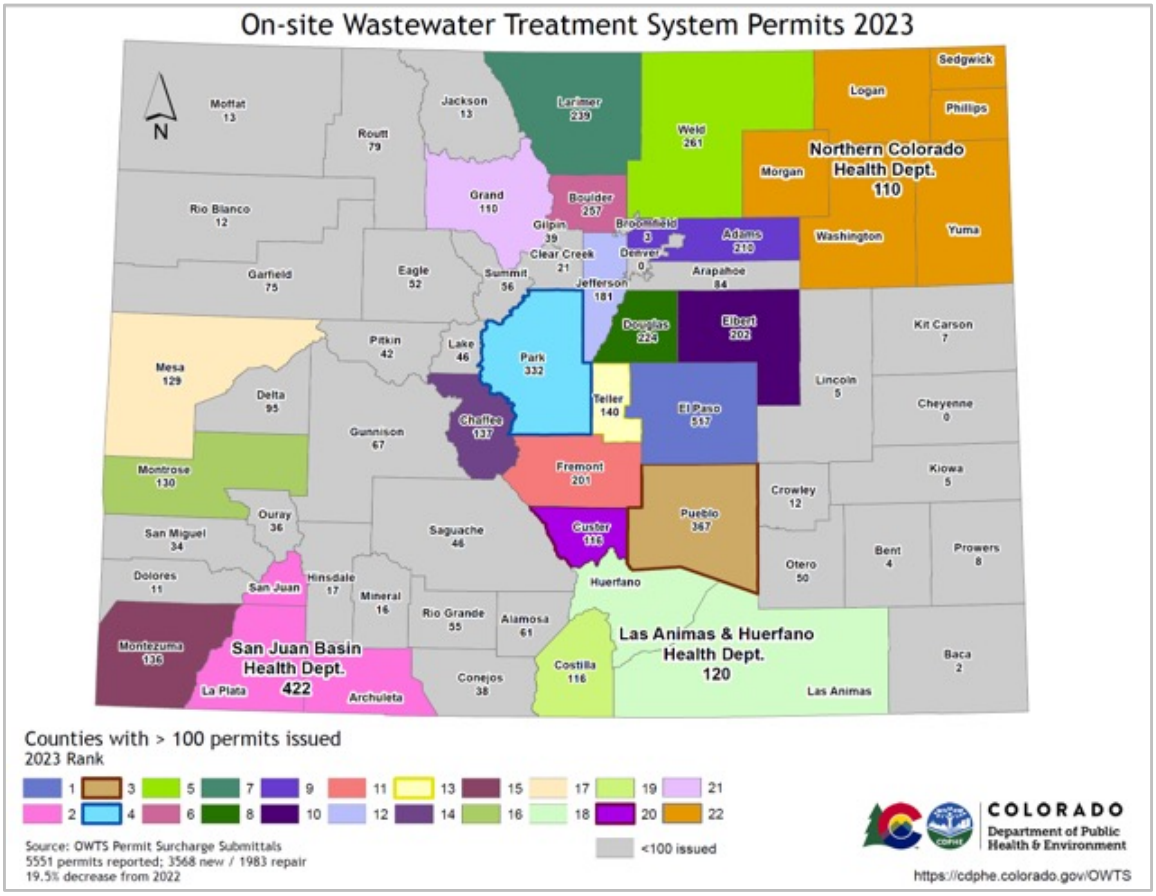
Emerging contaminants, such as PFAS (per- and polyfluoroalkyl substances), and the push for advanced technologies, like wastewater reuse, underscore the urgent need for strategic planning and investment. To safeguard public health, meet regulatory standards, and build resilience to climate change and natural disasters, Colorado must prioritize funding for infrastructure improvements, workforce development, and innovative solutions.

The Colorado Wastewater Utility Council (CWWUC) supported the American Society of Civil Engineers (ASCE) in evaluating the state of Colorado's wastewater infrastructure. The CWWUC identified aging infrastructure and slow permitting timelines as key challenges that delay critical upgrades and limit access to funding, underscoring the need to expedite permitting and increase investment to maintain capacity, address emerging contaminants like PFAS, and ensure long-term system sustainability.

CONDITION AND CAPACITY

Colorado's largest metropolitan areas are served by wastewater systems such as Metro Water Recovery, Colorado Springs Utilities, and South Platte Renew, primarily located in Denver, El Paso, and Arapahoe counties. However, over 900,000 septic systems are in use statewide, growing by 1.9% annually. A 2023 map from the Colorado Department of Public Health and Environment (CDPHE) shows that on-site wastewater systems are widespread, even in highly populated areas that are also served by publicly owned treatment works (POTWs), such as El Paso and Pueblo counties, among others.

FIGURE 1: COLORADO ON-SITE WASTEWATER TREATMENT SYSTEM PERMITS BY COUNTY 2023 (CDPHE)



According to CDPHE, many of Colorado's wastewater treatment facilities are aging, with some nearing or exceeding their expected original operational design lifespan of 40 to 50 years. While many facilities are generally overall designed to last around 100 years, components like mechanical and electrical and instrumentation systems often have shorter lifespans of just 5 to 15 years. As a result, these systems require frequent upgrades and maintenance to enable continued compliance and optimal performance of wastewater treatment facilities. For example, Denver's Department of Transportation and Infrastructure (DOTI) is overseeing a 6-year rehabilitation project with Metro Water Recovery (in Denver County) to repair over 12.5 miles of pipes and 60 manholes between 2024 and 2025 to prevent future failures.

OPERATION AND MAINTENANCE

National data suggests approximately 70% of the influent entering wastewater treatment facilities is not wastewater, with 35% coming from stormwater and 35% from inflow and infiltration (I&I). According to Metro Water Recovery, 99.94% of its influent is water, with only 0.06% consisting of waste and other materials - likely a typical range in Colorado. I&I occurs when groundwater and stormwater infiltrate sewer systems through leaks, risking exfiltration, where wastewater contaminates the environment. Regular inspections, repairs, and replacements are essential to minimize I&I and enable long-term functionality, requiring substantial resources and investment.

In parallel, the wastewater industry faces a critical workforce challenge. Nearly one-third of current workers are nearing retirement, and while Colorado's water workforce grew by 8% in 2022, recruiting and retaining skilled personnel remains difficult. The loss of institutional knowledge and experienced staff could strain operations and increase the risk of system failures. Addressing this issue requires workforce development programs, such as those from Colorado State University's Colorado Water Center and the Urban Systems for Hydro Education and Research (USHER) initiative, to establish the industry's future. Additionally, the Water Environment Federation (WEF) is working to educate communities on water treatment, reuse, and recycling, to promote a circular water economy. WEF is also addressing the workforce shortage by expanding outreach to build a larger workforce to enable long-term sustainability in wastewater management. Supporting long-term workforce stability also requires investment in retention strategies, including competitive pay, professional development, industry networking, and a supportive work environment.

FUNDING

Wastewater infrastructure funding in Colorado relies on various sources, such as the state's Water Pollution Control Revolving Fund (WPCRP), United States Department of Agriculture (USDA) Rural Development, Colorado Department of Local Affairs (DOLA), the Infrastructure Investment and Jobs Act (IIJA), and local rate-based systems. While the rate-based system serves as the primary funding source, it remains insufficient to fully address the state's estimated $6.2 billion infrastructure investment needs for systems serving populations over 10,000 individuals. Without additional funding support from additional sources such as these, even more delays to essential projects aimed at capacity expansion, efficiency improvements, and water quality enhancement are expected.

Utility rates have seen incremental increases over the past several years to sustain operational support. For example, the rate-based system in place in the City and County of Denver (CCoD) has increased as follows:

2020:
$4.51 per thousand gallons, with a monthly minimum of $12.32

2022:
$4.99 per thousand gallons, with a monthly minimum of $13.63

2023:
$5.40 per thousand gallons, with a monthly minimum of $14.75

2024:
$5.65 per thousand gallons, with a monthly minimum of $15.44

For a three-person household averaging 100 gallons of wastewater per day per person, Denver's 2024 rates would result in a monthly utility bill of $66.29. This is notably higher than the 2023 national average of $49.00, as reported by the National Association of Clean Water Agencies (NACWA). NACWA predicts wastewater utility rates will increase by 4-5% annually from 2024 to 2028. Rates across Colorado remain in a similar range, often using tiered structures to ensure large producers pay proportionally.

Colorado Springs Utilities announced a 9% wastewater rate increase for 2025 following their 2024 Five-Year Rate Case. Additionally, the Water Infrastructure Finance and Innovation Act (WIFIA) provided a new funding mechanism for wastewater utilities; several Colorado communities have been able to utilize this funding, including Upper Thompson Sanitation District and Englewood.

Unprecedented wastewater funding has also been provided by the IIJA, creating a generational opportunity for many wastewater utilities to address some of their longstanding underfunded needs. The IIJA helps benefit utilities by providing $5 billion in water, wastewater, and water reuse investments, $11.7 billion for the Clean Water State Revolving Fund, and $1 billion for emerging contaminants including PFAS, among others. This funding is significant, though additional investment needs remain.

In 2024, Colorado secured a $96 million loan from the United States Environmental Protection Agency (U.S. EPA) to upgrade wastewater services in the northern region of the state. Additionally, the state received allocations from the Clean Water State Revolving Fund (CWSRF), a federal program that provides financial support for water quality projects. The CWSRF offers low-interest loans to states, which then distribute funds to local entities for wastewater infrastructure improvements. According to the U.S. EPA, Colorado's total allocation for the fiscal year of 2024 was approximately $26.42 million. This includes base funding, general BIL funding, and IIJA emerging contaminants funding.

Despite this progress, funding gaps persist. Without sustained and expanded investment, Colorado's wastewater systems will continue to struggle with aging infrastructure, regulatory demands, and population growth.

Photo: Workers inspecting wastewater treatment plant; Galaxyd

FUTURE NEED

The 2022 EPA Clean Watersheds Needs Survey (CWNS) indicated that Colorado wastewater utilities reported needs of $602 million for secondary treatment and $5.6 billion for advanced treatment at treatment facilities serving populations greater than 10,000 individuals. The latest 2022 CWNS results represent an improvement from the 2012 CWNS results for secondary treatment but shows a much greater need for funding for advanced treatment. The 2012 CWNS results stood at funding needs of $800 million for secondary treatment and $1 billion for advanced treatment. The updated results are indicative of investment and prioritization of funding for secondary treatment but also support additional funding and needed investment for advanced treatment.

Over the past four years, Colorado's population growth has slowed compared to the previous decade, with an increase of approximately 170,300 people from 2021 to 2024 (around 3,550 people per month). However, concerns remain about future capacity without adequate funding for necessary improvements and expansion. Even with a lower growth rate, the state's nearly 6 million residents are still driving more strain on existing resources as the count of population continues to increase. As the population continues to rise, even at a slower pace, the challenge lies in meeting the growing need for capacity expansion and maintenance, which requires adequate funding to prevent strain on operations and facilities.

In addition to challenges from the anticipated capacity limitations, treatment plants must take strides in complying with state and federal regulations. The government regulatory process, even with input from the wastewater community, has yielded ever-changing effluent quality requirements which can take years to develop and implement. These regulatory actions catalyze research and the implementation of new technologies at wastewater utilities to bring them into compliance. In the meantime, challenging new effluent quality requirements could lead to consent decrees; compliance schedules may be negotiated such that regulatory requirements may be achieved in a timely and effective fashion.

Medium and large wastewater treatment plants throughout Colorado have continued to perform upgrades that improve nutrient removal, namely ammonia, nitrogen, and phosphorus, all of which are known to often compromise the aquatic health of receiving waters. However, some utilities have been granted delayed implementation that extends into 2027.

With the promulgation of the U.S. EPA regulations on PFAS limits in drinking water, a focus on the treatment of the persistent chemical compounds in wastewater has emerged. In early 2023, the U.S EPA announced their initial plans for wastewater regulations and studies; at the end of 2024, indications of finalized rules and regulations being released in 2025 were evident. PFAS regulation will indeed increase and further the need for additional infrastructure and funding.

PUBLIC SAFETY

Ensuring public safety is a fundamental priority in wastewater management, encompassing facility operations, cybersecurity, community education, and addressing emerging contaminants like PFAS to protect both human health and the environment.

At facilities, proper maintenance and technological upgrades are crucial to ensuring public safety and preventing incidents like boil-water advisories, contamination, or untreated wastewater flooding. For example, in 2018, flooding overwhelmed Colorado treatment plants, causing a temporary shutdown due to excessive silt. Proactive infrastructure maintenance and upgrades are essential to prevent such disruptions and protect public health, as well as routine condition and performance inspections, and investment in maintaining and communicating this data.

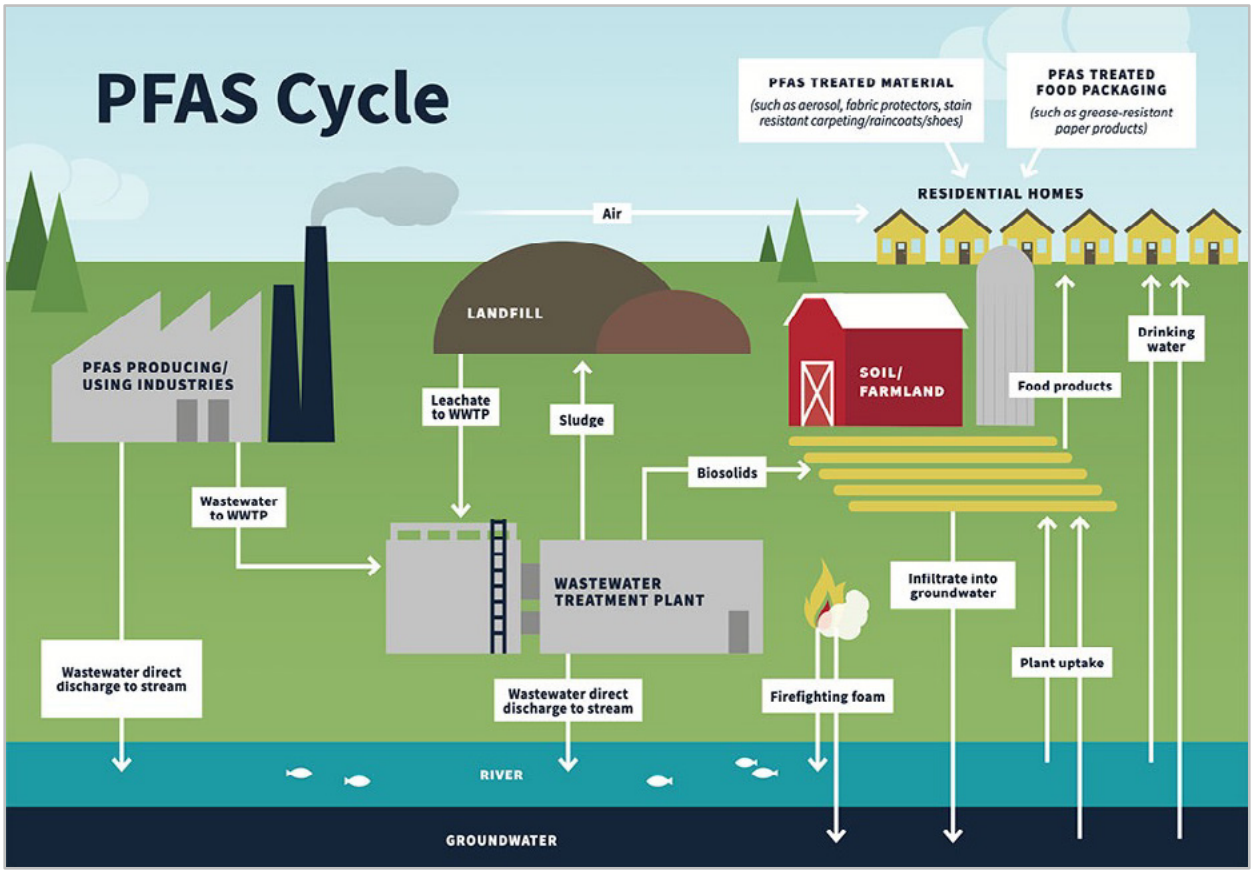
Cybersecurity has also emerged as a vital component of wastewater facility safety. Smaller systems serving populations under 10,000 often lack the resources needed to protect against cyber threats. The U.S. EPA and the Cybersecurity and Infrastructure Security Agency (CISA) offer guidance on common vulnerabilities and strategies for securing critical infrastructure. However, increased funding and support are necessary to implement these protections broadly.

Wastewater management education helps communities optimize treatment processes and safeguard public health. Educated customers tend to maintain better systems, incur lower costs, and comply with regulations. Community engagement initiatives raise awareness, foster a sense of responsibility, and encourage greater participation in protecting water resources.

PFAS are found in products like firefighting foam, as well as cookware, packaging, and many other household products used by Americans every day. These man-made chemicals resist degradation and pose significant health risks. Colorado has actively initiated addressing PFAS contamination through its 2019 PFAS Action Plan, which includes testing water sources, proper disposal of firefighting foam, ongoing research, and exploring removal methods. CDPHE has begun piloting strategies to address PFAS in water sources.

The PFAS Cycle flow chart from EnviroForensics illustrates a simplified PFAS cycle. This schematic highlights PFAS movement through the environment and the impact as it flows through wastewater treatment facilities and more.

FIGURE 2: PFAS CYCLE (ENVIROFORENSICS)



The IIJA provides significant federal investment in clean drinking water infrastructure, including efforts to remove PFAS and prioritize environmental justice. Continued investment and resources are needed to reduce PFAS exposure by addressing its presence in wastewater systems and minimizing its release into the environment.

RESILIENCE

As the population continues to rise in the state, strategic planning and management of treated wastewater will continue to grow in importance. Forward thinking in regard to the state's ability to generate and beneficially reuse treated wastewater will serve to protect public safety by increasing the state's resilience to periods of drought through the provision of an additional source of water.

Resilience initiatives are also being undertaken to address the longevity and functionality of wastewater treatment facilities to check that serviceability remains high during and after emergency situations including natural disasters. Designs for improvement projects or new facilities frequently include seismic considerations, provisions for standby power generation, and improved physical and information technology security measures.

According to the ASCE-CO WW IRC 2024 survey conducted with the CWWUC, many wastewater facilities in Colorado consider themselves mostly resilient under normal conditions. However, their primary concern lies in the potential impact of severe natural disasters, which, influenced by changing climate, are becoming increasingly frequent and intense. Such events could cause significant damage to facilities, requiring costly days or even weeks for recovery for service to return. This growing vulnerability underscores the need for enhanced resilience strategies.

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INNOVATION

It is clear that innovative technology and alternative uses for treated wastewater will play a vital role in improving the resilience to limited statewide water resources. As drinking water scarcity continues to pose a threat to Colorado's residents, various alternatives for wastewater treatment plant effluents continue to be considered or implemented. One critical avenue for strengthening water resource resilience is the adoption of innovative technologies and alternative uses for treated wastewater. These approaches address the challenges posed by growing drinking water scarcity and include strategies such as direct potable reuse (treating wastewater to drinking water standards), indirect potable reuse (blending treated wastewater with natural sources before treatment), and non-potable reuse (treating water for uses like irrigation). An example of this innovation that, depending upon its final consumptive purposes, can be either indirect potable or non-potable reuse is aquifer recharge; it involves injecting treated wastewater effluent into aquifers where the water can be withdrawn at a later point.

Non-potable reuse can be seen in action just outside of Denver where the Metro Water Recovery District (MWRD) and Denver Water participate in non-potable reuse. MWRD's treated wastewater effluent is discharged from the wastewater plant into the receiving waters of the South Platte River upstream of the intake for Denver Water's non-potable water treatment plant. Once the water from the river is diverted to the non-potable treatment plant, it is further treated and primarily used for irrigation throughout the City of Denver.

Photo: Water treatment facility; sangkribo

Demonstration of direct potable reuse within the state continues and currently includes a fixed installation site in Denver and a mobile unit deployed in Colorado Springs. The first direct potable reuse regulatory framework was finalized and released in 2022, thanks in large part to participation from Colorado wastewater agencies, regulators, and the WateReuse Association.

Despite the importance of innovations or innovative technologies, many facilities responding to the ASCE-CO WW IRC 2024 survey indicated they are primarily focused on maintaining permitting compliance, leaving limited resources available to invest in advanced techniques.

To address these limitations, a growing number of facilities are rebranding themselves with terms like "recovery" or "renew," signaling their commitment to sustainability and the capture and recycling of valuable resources, such as phosphorus, from wastewater. This shift aligns with the broader adoption of the "One Water" approach, which views water as a unified resource across all uses—from drinking water to wastewater. By promoting sustainable management and fostering collaboration, this holistic framework supports resilience in meeting the needs of both communities and ecosystems.

Additional beneficial reuse opportunities beyond those noted above have been pursued in recent years and include, for instance, thermal energy capture and capturing biogas as an energy source. Descriptions and examples are presented below:

Thermal energy capture seeks to harness and utilize the thermal energy contained in wastewater by using it to heat a facility via a heat-exchanger and closed loop heating and cooling system thereby reducing the need for traditional heating. The National Western Complex in Denver completed installation of a thermal energy capture system in 2022 and now receives 90% of its heating and cooling from the system.

Biogas is a conditioned methane (also called renewable natural gas) captured from the digestion process of wastewater solids. Several wastewater utilities have completed design or construction of biogas conditioning systems in Colorado over the past 5 years including Longmont, Boulder, Englewood, Grand Junction, and Metro Water Recovery. Continued development and furthering of resource recovery at wastewater utilities will serve to reduce reliance on non-renewable resources while also delivering additional sources of revenue for utilities both of which will help enable increased funding and continued investment.

Looking ahead, strategic planning for wastewater reuse will be essential as Colorado's population grows. Expanding reuse initiatives provides an additional water source, enhances resilience during droughts, protects public safety, and supports long-term sustainability in the face of increasing demands and environmental challenges.

RECOMMENDATIONS TO RAISE THE GRADE

- Increase statewide investment in wastewater infrastructure through state, federal, and private sector funding, while prioritizing regular facility upgrades and rehabilitation supported by adequate permitting, funding, and resources.
- Strengthen collaboration between utilities and regulators to streamline permitting timelines and align with regulatory goals. Advance asset management through performance-based lifecycle assessments, strategic planning, and the use of tools like CMMS, GIS, and mobile technologies to optimize efficiency and investment decisions.
- Promote integrated approaches such as “One Water” or “Renew and Recover” to enhance sustainability and implement innovative technologies to improve treatment efficiency and address emerging contaminants like PFAS.
- Support workforce development to address labor shortages and expand community outreach to raise public awareness about maintaining efficient and sustainable water systems.
- Adjust service user rates to better fund wastewater facility operations, maintenance, and capital improvements.

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