National Laboratory of the Rockies

ENVIRONMENTAL PERFORMANCE REPORT 2025

Annual Site Environmental Report per the U.S. Department of Energy Order 231.1B Chg 1

Cover photo: A Bullock's oriole (*Icterus bullockiorum*) perches atop a skunkbrush sumac (*Rhus trilobata*) at the National Laboratory of the Rockies' Flatirons Campus. *Photo by Werner Slocum, NLR 56733*

This work was authored by the National Laboratory of the Rockies for the U.S. Department of Energy (DOE), operated under Contract No. DE-AC36-08GO28308. Funding provided by the U.S. Department of Energy's Office of Critical Minerals and Energy Innovation. The views expressed in the article do not necessarily represent the views of the DOE or the U.S. Government.

ACKNOWLEDGMENTS

The preparation of this report requires a tremendous amount of data, collaboration, and review. Thank you to all who contributed their time and effort to the report.

The National Laboratory of the Rockies (NLR) Environment, Safety, Health, and Quality staff provided their subject matter expertise by authoring content, providing data, and conducting technical reviews:

- Rachael Boothe
- Theodore DeVito
- Larry Durbin
- John Eickhoff
- Jesse Fuquay
- Blake Kullman
- Eryn Lussier
- Christopher Rolison
- Kurt Schlomberg
- Eric Schmitz
- Riley Smith

Suzanne DiMont of NLR's Intelligent Campus program provided content for the Resilience Planning and U.S. Department of Energy's Resource Optimization Goals and Energy Management Goals sections of the report.

Nataleah Small, Michael Deneen, Taylor Henry, and Glen Barber with NLR's Communications Office provided project support, editing, accessibility, and printing services.

Nicole Serio, Brandon Bammel, and Gabriella Schmitt of the U.S. Department of Energy Golden Field Office worked closely with staff of the Alliance for Energy Innovation LLC to continuously improve the report and conduct the review and approval process.

CONTACT US

We welcome your feedback and suggestions on this report and on NLR's efforts toward resource optimization, resilience, and environmental stewardship. To provide comments, request a printed copy of the report, or obtain additional information about NLR's environmental programs, contact any of the following:

Rachael Boothe
NLR Report Lead, Environmental Specialist
rachael.boothe@nlr.gov
303-275-4004

Brandon Bammel
U.S. Department of Energy Golden Field Office Report Lead, Environmental Specialist
brandon.bammel@doe.gov
240-562-1316

Gabriella Schmitt
U.S. Department of Energy Golden Field Office Report Lead, Environmental Specialist
gabriella.schmitt@doe.gov
720-670-3407

Nataleah Small
NLR Communications Office
nataleah.small@nlr.gov
303-384-6414

This report is available online at www.nlr.gov/about/ehs.html.

NLR
15013 Denver West Parkway
Golden, CO 80401
303-275-3000 • www.nlr.gov

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

TABLE OF CONTENTS

Acknowledgments ..... **iii**
Executive Summary ..... **viii**
Purpose viii
Environmental and Resource Optimization Performance viii
Environmental Compliance and Monitoring x
1 Introduction **1**
1.1 Mission 1
1.2 Sites and Facilities 2
2 Environmental Management System **8**
2.1 Structure of NLR's Environmental Management System 8
2.2 Pollution Prevention 10
2.3 Performance Indicators and Progress 10
2.4 Assessment and Improvement 10
2.5 Awards and Recognition 11
2.6 Integrated Environmental Stewardship in Construction Management 11
3 Resource Optimization **14**
3.1 Resource Optimization Goals 14
3.2 Resilience Planning 15
4 Compliance Status **16**
5 Air Quality Protection **30**
5.1 Criteria Pollutants and Hazardous Air Pollutants 30
6 Water Quality Protection **32**
6.1 Drinking Water 32
6.2 Groundwater 33
6.3 Surface Water 34
6.4 Wastewater 35
7 Hazardous Materials and Waste Management **36**
7.1 Hazardous Materials Management 36
7.2 Hazardous Waste Management 37
7.3 Aboveground Storage Tank Management 39
7.4 Petroleum Spill Prevention and Response 39
7.5 Radiological Materials and Waste Management 40
8 National Environmental Policy Act Compliance **42**
9 Natural and Cultural Resources Protection **43**
9.1 Wildlife Management 43
9.2 Endangered Species and Species of Concern 45
9.3 Vegetation Management 46
9.4 Wetlands and Floodplains 49
9.5 Cultural Resources 50
10 Conservation Easement **51**
Appendix A. Program Management **53**
EMS 53
Resource Optimization 53
Air Quality 54
Water Quality 55
Hazardous Materials and Hazardous Waste Management 56
NEPA 58
Natural and Cultural Resources 59
Cultural Resources 61
Conservation Lands 61

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

Appendix B. Environmental Permits, Registrations, Notifications, and EPA Compliance Data 62
Environmental Permits, Registrations, and Notifications 62
Appendix C. Wildlife Species Observed at the STM Campus and the Flatirons Campus 66
Appendix D. Plant Communities at the STM Campus and the Flatirons Campus.....79
STM Campus Plant Communities.....79
Flatirons Campus Plant Communities.....82

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

List of Figures

Figure 1. NLR's continual improvement cycle 9
Figure 2. NLR's environmental aspects 9
Figure 3. Results of average monthly residual chlorine monitoring in drinking water at the Flatirons Campus 33
Figure 4. Results of disinfection byproduct concentrations in drinking water at the Flatirons Campus, 2021–2025 33
Figure 5. Comparison of four waste categories generated at NLR facilities by net weight, 2021–2025 37
Figure 6. STM Campus main drainages 49
Figure 7. STM Campus boundary (black outline) and conservation easement (purple outline) 52
Figure D-1. Land cover types at the STM Campus 81
Figure D-2. Wetland types and vegetation communities at the Flatirons Campus 84

List of Tables

Table 1. Compliance Status for Federal, State, and Local Environmental Laws and Regulations 16
Table 2. Estimated Annual Air Pollutant Emissions Associated with the STM Campus, Flatirons Campus, and STEP Campus, U.S. Tons (and Metric Tons) Per Year, 2021–2025 [a] 31
Table 3. EPCRA Reporting by EPCRA Section in 2025 36
Table 4. Petroleum Spills in 2025 39
Table 5. Total Activity and Effective Dose Equivalent, 2021–2025 [a] 40
Table 6. Noxious Weed Species Identified at the STM Campus and the Flatirons Campus [a] 48
Table 7. STM Campus Middle Drainage Wetlands Summary 49
Table 8. Flatirons Campus Wetlands Summary 49
Table B-1. Environmental Permits, Registrations, and Notifications in 2025 62
Table C-1. Wildlife Species Observed at the STM Campus 66
Table C-2. Wildlife Species Observed at the Flatirons Campus 73

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

NOMENCLATURE

APCD	Air Pollution Control Division	**HMWMD**	Hazardous Materials and Waste Management Division
APHIS	Animal and Plant Health Inspection Service	**IBRF**	Integrated Biorefinery Research Facility
ARCEE	Applied Research for Communities in Extreme Environments	**ISO**	International Organization for Standardization
AST	aboveground storage tank	**mrem**	millirem
CCF	Control Center Facility	**MS4**	municipal separate storm sewer system
CCR	Colorado Code of Regulations	**MT**	metric ton
CDPHE	Colorado Department of Public Health and Environment	**NEPA**	National Environmental Policy Act
CFR	Code of Federal Regulations	**NLR**	National Laboratory of the Rockies
CO_2e	carbon dioxide equivalent	**NO_x**	nitrogen oxides
DOE	U.S. Department of Energy	**ODS**	ozone-depleting substance
EMAPS	Energy Materials and Processing at Scale	**PFAS**	per- and polyfluoroalkyl substances
EMS	Environmental Management System	**RCRA**	Resource Conservation and Recovery Act
EPA	U.S. Environmental Protection Agency	**ReFUEL**	Renewable Fuels and Lubricants Laboratory
EPCRA	Emergency Planning and Community Right-to-Know Act	**RSF**	Research Support Facility
ESA	Endangered Species Act	**S&TF**	Science and Technology Facility
ESIF	Energy Systems Integration Facility	**SERF**	Solar Energy Research Facility
FTLB	Field Test Laboratory Building	**SPCC**	spill prevention, control, and countermeasure
FY	fiscal year	**STEP**	South Table Mountain Energy Park
GHG	greenhouse gas	**STM**	South Table Mountain
HAP	hazardous air pollutant	**USFWS**	U.S. Fish and Wildlife Service
HFC	hydrofluorocarbon	**WQCD**	Water Quality Control Division

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

A Western honeybee (*Apis mellifera*) loads up on pollen from Russian sage (*Salvia yangii*) flowers in front of the Research Support Facility (RSF) on the South Table Mountain (STM) Campus. Insects such as bees and butterflies do the bulk of pollination on campus.
Photo by Werner Slocum, NLR 82371

EXECUTIVE SUMMARY

Purpose

The National Laboratory of the Rockies' (NLR's) Environmental Performance Report 2025 describes the laboratory's environmental management activities in 2025. It includes information on environmental and resource optimization performance, environmental compliance activities and statuses, and environmental protection programs, highlights, and successes.

The purpose of the report is to ensure that the U.S. Department of Energy (DOE) and the public receive timely and accurate information about events that have positively affected or could adversely affect the health and safety of the public or workers, the environment, or the operations of DOE facilities. The report meets the DOE requirements of the Annual Site Environmental Report and has been prepared in accordance with DOE Order 231.1B Chg 1, Environment, Safety and Health Reporting.

Environmental and Resource Optimization Performance

NLR is committed to environmental stewardship, pollution prevention, compliance with environmental requirements, and continual improvement in environmental protection and resource optimization performance. The laboratory's Environmental Management System (EMS) implements a framework of policies, procedures, and programs that integrate environmental protection into daily work practices. The EMS is structured based on a plan–do–check–act continual improvement management model, and it is implemented as part of NLR's integrated safety management system.

Every year, the laboratory sets measurable goals for environmental improvement through the EMS planning process. Goals are also established through the Performance Evaluation and Measurement Plan and Energy and Water Management Narrative. Progress for all goals is tracked throughout the year using an online tracking system. Summaries are prepared annually for the DOE Golden Field Office on Performance Evaluation and Measurement Plan results and for DOE headquarters on energy and water data results. The laboratory identified several goals in 2025 to enhance environmental performance and has made—and continues to make—significant progress toward them.

The following are some of the laboratory's key accomplishments in 2025:

- Partnered with a nonprofit wetland organization to install a rock dam within an eroded wetland channel on the northeastern portion of the Flatirons Campus. NLR and the organization worked together to design this protection measure to restore water quality on

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

the campus and off-site, to its downstream receiving waters in Coal Creek.

- Conducted an internal assessment for NLR's Environmental Planning program. No major issues were identified, and actions to address the minor nonconformities and opportunities for improvement have been completed or are in progress.
- Established a savings reinvestment program to expand investment in energy and water efficiency projects.
- Constructed an on-site septic/leach system for the Control Center Facility (CCF) at the Flatirons Campus, which passed its final inspection and is functioning as an additional septic system on the campus.
- Hosted external response partners (e.g., fire and police departments) to learn more about the hazardous materials within NLR's Colorado campuses for the purpose of planning future drills and exercises to meet all entities' practice requirements.
- Advanced the emergency response planning process that leverages the hazardous materials screening process to better develop emergency response plans.
- Installed a standby diesel-fired electrical generator with an integrated 600-gallon (2,271-L) aboveground storage tank (AST) at the Flatirons Campus CCF to guarantee uninterrupted power supply to the facility during unplanned outages.
- Provided annual spill prevention, control, and countermeasure (SPCC) training to 113 employees. SPCC training equips individuals with the knowledge and skills necessary to effectively respond to and mitigate spills at NLR facilities. Additionally, it reinforces employees' understanding of spill response procedures, ensuring preparedness in the event of an incident.
- Research activities using uranyl acetate and generating a small amount of low-level radioactive waste occurred during the reporting year. NLR implemented new microscopy staining techniques for uranyl acetate, resulting in only small amounts low-level radioactive solid waste compared to previous practices that generated both solid and liquid waste streams.
- Updated the National Environmental Policy Act (NEPA) internal training, content, and coverage to improve knowledge with the NEPA process, including both environmental and project staff.
- Observed a long-tailed weasel (*Neogale frenata*) darting around the Flatirons Campus during the summer. This species has not been seen or surveyed at the Flatirons Campus previously.
- Completed a cultural resources survey of the STEP Campus, identifying several previously unidentified historical tent pads.

Populus (*Populus* spp.) tree saplings grown in the NLR greenhouse. The trees were used in research using solid-state nuclear magnetic resonance spectroscopy. *Photo by Gregory Cooper, NLR 97385*

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

Environmental Compliance and Monitoring

NLR is subject to many federal, state, and local environmental laws and regulations, in addition to executive orders, DOE requirements, and agreements with government agencies. All environmental compliance required permits were received or renewed, required registrations were completed, and required notifications and reports were submitted.

Unlike some other DOE facilities, NLR does not conduct work involving nuclear materials and does not have legacy radiological or other contamination issues associated with past nuclear weapons production or research activities. Therefore, continuous radiation or radiological contamination monitoring is not conducted.

The laboratory strives to improve its environmental management and performance each year. Major environmental programs include:

- Air quality protection, including air permitting, ozone-depleting substance (ODS) management, and greenhouse gas (GHG) emissions monitoring.
- Water quality protection, including construction stormwater management, drinking water monitoring, and prevention of unallowable sanitary sewer system discharges.
- Hazardous materials and waste management, including pollution prevention; spill response; proper storage, use, and disposal of hazardous chemicals and materials; and planning, permitting, and reporting the use and emissions of materials.
- NEPA reviews.
- Protection of natural and cultural resources, including wildlife, vegetation, protected species, wetlands, and cultural resources management.

ABOUT NLR

NLR's science and technology teams span the full spectrum of innovation from fundamental science and market-relevant research to systems integration, testing, and validation. With a focus on security and reliability, NLR leads energy systems innovation and integration—enhancing existing technologies and developing new, cutting-edge solutions that unlock economic opportunity and fuel America's global competitiveness.

NLR bridges foundational research with practical applications to integrate various energy sources, storage, buildings, transportation, and emerging technologies.

An aerial view from the east entrance of the STM Campus. *Photo by Josh Bauer and Bryan Bechtold, NLR 70813*

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

NLR's welcome sign marking the entrance to the STM Campus. *Photo by Joe DelNero, NLR 105701*

1 INTRODUCTION

This report summarizes NLR's environmental management activities in 2025, including:

- Environmental protection programs.
- Environmental and resource optimization performance.
- Environmental compliance activities and their statuses.
- Environmental management highlights and successes.

The report incorporates DOE's most recent guidelines for the Annual Site Environmental Report, as required by DOE Order 231.1B Chg 1, Environment, Safety and Health Reporting.

1.1 Mission

NLR strives to achieve a vision of an affordable and secure energy future through the laboratory's mission: Leading research, innovation, and strategic partnerships to deliver integrated solutions for an affordable and secure energy future.

NLR fulfills its mission through portfolios in:

- **Advanced Manufacturing:** Develops materials and processes for energy technologies.
- **Basic Energy Sciences:** Foundational chemical and materials science enables the next generation of technologies to advance energy.
- **Bioenergy and Bioeconomy:** Develops innovative, cost-effective, and performance-advantaged biotechnologies that tap into America's abundant biomass and waste resources.
- **Buildings:** NLR leads cutting-edge research to drive affordable energy solutions and strengthen the reliability of energy systems for American buildings.
- **Chemistry and Nanoscience:** Foundational research in materials science, chemistry, and nanoscience integrates capabilities spanning from basic science to applied research—informed by iterative work with industry partners—to guide the discovery and development of next-generation energy materials.
- **Computational Science:** Provides advanced computing systems and services—and enables their highly productive use—for applied energy research while advancing the forefront of mathematics and scientific computing for energy applications.
- **Energy Systems Analysis:** Provides actionable insights to inform an affordable, secure, and reliable energy future by integrating data, modeling, and expertise across sectors and systems.
- **Energy Security and Resilience:** Research to reduce the likelihood and impact of disruptions to energy systems, ensuring essential services, critical missions, and communities can withstand and recover from evolving threats.
- **Energy Storage:** Develops transformative energy storage solutions with the flexibility to respond to changing conditions, emergencies, and growing energy demands—ensuring energy is available when and where it is needed.
- **Geothermal:** Advances cutting-edge geothermal technologies, conducts world-class analysis, and improves access to data critical to unleashing tens of gigawatts of domestic resources for always-on power,

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

heating, cooling, and storage by using the heat beneath our feet.

- **Grid Modernization:** Develops and applies innovative technologies, tools, and technical expertise that drive affordable, reliable, and secure power grid planning and operations at every scale.
- **Hydrogen and Fuel Cells:** Lowers the cost and increases the scale of technologies to make, store, move, and use hydrogen across multiple energy sectors.
- **International Activities:** NLR advances shared interests with global partners by applying U.S. research and technical expertise to strengthen energy resilience and reliability, expand access to secure and affordable energy, and bolster critical supply chains.
- **Materials Science:** Materials science discovery and problem-solving for next-generation energy sources and energy-efficient technologies.
- **Solar:** Long-standing global leadership in solar energy research enables faster, cheaper, and more reliable use of this abundant, domestic resource while advancing next-generation solar technologies for national security applications and emerging industries.
- **State, Local, and Tribal Governments:** NLR partners with state, local, and Tribal organizations to deliver customized, data-driven support that strengthens local energy systems—expanding access to America's abundant energy resources, reducing costs, and supporting energy reliability for communities across the nation.
- **Transportation and Mobility:** Develops affordable, abundant, and secure energy technologies to move people and goods across America and enhance the nation's global competitiveness.
- **Water:** Leverages more than 40 years of experience validating and accelerating the deployment of water innovations through world-class facilities, specialized capabilities, and cutting-edge design tools.
- **Wind:** NLR's world-class researchers, state-of-the-art infrastructure, and real-world testing environments help solve fundamental cross-disciplinary challenges and integrate wind as a low-cost, abundant source of power into the U.S. energy mix.
- **Workforce:** Strengthens the energy workforce needed for an affordable, secure, and reliable energy future by analyzing industry needs, fostering key partnerships, developing educational resources, and building capacity.

1.2 Sites and Facilities

NLR's facilities occupy eight locations in Colorado, Alaska, and Washington, D.C., including:

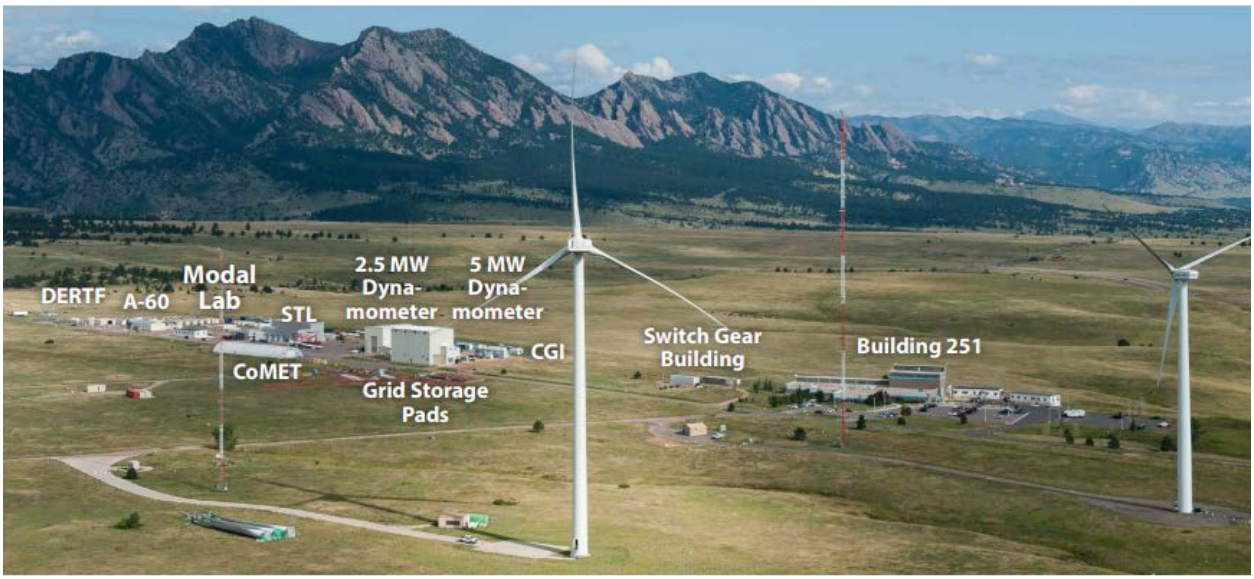
Federally owned facilities:

- Flatirons Campus in Arvada, Colorado.
- South Table Mountain (STM) Campus in Golden, Colorado.
- South Table Mountain Energy Park (STEP) in Golden, Colorado.

Leased facilities:

- Building 16 in Lakewood, Colorado.
- Golden Warehouse in Golden, Colorado.
- Renewable Fuels and Lubricants Laboratory (ReFUEL) in Denver, Colorado.
- Applied Research for Communities in Extreme Environments (ARCEE) in Fairbanks, Alaska.
- Washington, D.C., office.

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.



Aerial view of the northern portion of NLR's Flatirons Campus. *Photo by Dennis Schroeder, NLR 30766*

Flatirons Campus

The Flatirons Campus is the main facility for NLR's grid integration research, water, and wind turbine technologies. The campus is also home to DOE's most advanced energy systems research platform—offering unmatched scale and complexity to accelerate the validation of secure, affordable, and integrated technologies across the country's energy sectors. Located at the border of Jefferson County and Boulder County just east of the foothills of the Front Range, the Flatirons Campus has abundant energy resources that are critical for the variety of projects conducted at the campus. The Flatirons Campus is near the intersection of Colorado Highway 93 and Colorado Highway 128, between Boulder and Golden. It is approximately 15 miles (24.2 km) north of the STM Campus.

Land Use

The Flatirons Campus occupies 305 acres (124 hectares) that are surrounded by open space, grazing, and industrial land uses. The Rocky Flats National Wildlife Refuge borders the Flatirons Campus to the south and east. A restored sand and gravel mine is located due south of the Flatirons Campus (on the refuge's property), and an expanded shale and clay lightweight aggregate production operation is located along the southern portion of the western boundary of the campus. Also, a propellant fracturing company has a small installation along the northern part of the campus's western boundary. The city of Boulder owns open space bordering the Flatirons Campus to the north; State Highway 128 lies north of that open space.

Geology, Soils, and Hydrogeology

The Flatirons Campus is on a plain formed by stream deposits. The uppermost geological stratum beneath the site is known as the Rocky Flats Alluvium. It is composed of cobbles, coarse gravel, sand, and gravelly clay. Below the Rocky Flats Alluvium are the Laramie Formation, Fox Hills Sandstone, and Pierre Shale. These formations consist primarily of claystones with some siltstones. Unconfined groundwater flow occurs in the Rocky Flats Alluvium toward the east/southeast, and small perched zones are common. Groundwater occurs as confined aquifers in deeper bedrock formations.[1]

The Flatirons Campus has a strongly developed soil defined as a very cobbly, sandy loam. The soil is characterized by a high percentage of cobble and gravel in the soil volume, and by subsoil dominated by clay.

Surface Water

The area surrounding the Flatirons Campus is drained by five streams:

- Rock Creek flows eastward and is located southeast of the Flatirons Campus.
- North Walnut Creek and South Walnut Creek flow eastward into the Great Western Reservoir.
- Woman Creek drains eastward into Standley Lake in Westminster.

[1] EG&G Rocky Flats Inc. 1992. *Rocky Flats Plant Site Environmental Report: January through December 1992*. Golden, Colorado.

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

- Coal Creek flows in a northeasterly direction across the city of Boulder open space north of the Flatirons Campus.

Most of the Flatirons Campus drains into a tributary to Rock Creek. Some of the northern portions of the site drain into Coal Creek or its tributaries.

Vegetation

The Flatirons Campus is in the transition area between the Great Plains and the Rocky Mountains.[2] This location results in flora that contains elements of both mountain and prairie ecosystems, as well as associations that represent residual tallgrass prairie, shortgrass plains, ponderosa pine (Pinus ponderosa), woodland, and foothill ravine flora.[3]

Vegetation surveys conducted on the Flatirons Campus have identified more than 270 vascular plant species and defined five major habitat types: xeric mixed grasslands, pine woodlands, shrublands, wetlands, and disturbed areas.

Along a northwestern ridge of the Flatirons Campus is a ponderosa pine woodland area. Vegetation found in this area includes woody species with an understory of grasses, forbs, and shrubs. For details, see Appendix D. Plant Communities at the STM Campus and the Flatirons Campus.

Although the site of the Flatirons Campus was heavily grazed by cattle before 1975, surveys conducted since then have identified several species of mammals that use vegetation and habitat there.

Amphibians, reptiles, and numerous species of birds have been documented in surveys conducted since 1992. For details, see Appendix C. Wildlife Species Observed at the STM Campus and the Flatirons Campus.

An aerial view of NLR's STM Campus. *Photo by Dennis Schroeder, NLR 30709*

STM Campus

The STM Campus is the main research center for NLR, located approximately 2 miles (3.2 km) east of Golden and 12 miles (19.3 km) west of downtown Denver.

Land Use

The STM Campus occupies portions of the top and lower south-facing slopes of South Table Mountain, a mesa that stands approximately 500 ft (152 m) above the adjacent lowlands. It is composed of sedimentary rocks below a basalt lava cap that is quite resistant to erosion.

The STM Campus is a 167-acre (67.6-hectare) area bordered predominantly by open grassland that is zoned

[2] Plantae Consulting Services. 2000. *Vegetation Survey: NLR National Wind Technology Center*. Unpublished.
[3] ERO Resources. 2018. *Wildlife and Vegetation Monitoring Report at the National Wind Technology Center*. Golden, CO:

for recreation and light commercial activity. Portions of the community of Pleasant View are located immediately to the south and west. Pleasant View has constructed a recreational park immediately south of the STM Campus; offices, shops, and a tree nursery owned by the Colorado State Forest Service are located at the western edge of the STM Campus. Undeveloped state land and a Colorado State Patrol pursuit driver-training track are located along the northwestern boundary of the STM Campus on top of the mesa. Jefferson County Open Space wraps around the northern and eastern edges of the campus. Portions of the Denver West Business Park and apartment homes lie to the east.

Nineteen acres (7.7 hectares) of the STM Campus is preserved in a conservation easement with Jefferson County. No development is allowed on that land, but there are some existing utility easements for the land, and some recreational trails are to be established there by Jefferson County Open Space. For details, see Section 8: National Environmental Policy Act Compliance.

Geology, Soils, and Hydrogeology

South Table Mountain was formed as weak sedimentary rocks surrounding lava were eroded, leaving the lava-capped mesa in relief. The sedimentary rocks beneath the lava caprock are part of the Denver Formation, which consist of layers and lenses of claystone, sandstone, and conglomerate. Sedimentary rocks of the Arapahoe Formation underlie the Denver Formation.

The Arapahoe, Laramie-Fox Hills, and Denver formations are considered aquifers in portions of the Denver Basin. The Denver Formation underlies the areas on which most NLR construction has occurred. Groundwater on the STM Campus is found primarily in the weathered and fractured silts and sands of the Denver Formation. Some groundwater, in the form of perched aquifers, may also be below the basaltic lava cap on South Table Mountain and within the materials above the Denver Formation, which are largely the result of stream deposits. Groundwater on the site generally flows in a southeasterly direction.

The soil covering the top of South Table Mountain is Lavina loam. Loam is composed of a mixture of clay, sand, silt, and organic matter. The loam on the mesa top is a shallow, well-drained clayey soil. Soil on the upper-side slopes of South Table Mountain is also loam and consists of extremely stony soils with significant amounts of clay. Much of the remainder of the campus, including the area designated for major development, has a deep, well-drained soil referred to locally as Denver clay loam that consists of clayey material containing some calcium carbonate. Also, two smaller soil areas within the southwestern part of the campus consist of cobbly clay loam and very stony clay loam are similar in character to other soils within the campus.

Surface Water

About 90% of the surface drainage from the STM Campus, both from the mesa top and across the lower portions, flows in a southeasterly direction toward Lena Gulch (a tributary of Clear Creek). Though there is no permanent stream flow on the STM Campus, occasional flow from extended periods of precipitation, usually in the late winter and early spring, is found in the drainage channels, and seasonal springs are evident along some of the mesa top slopes. The mesa top features one seep that is often active throughout much of the year, but the water that reaches the surface evaporates quickly in the dry season.

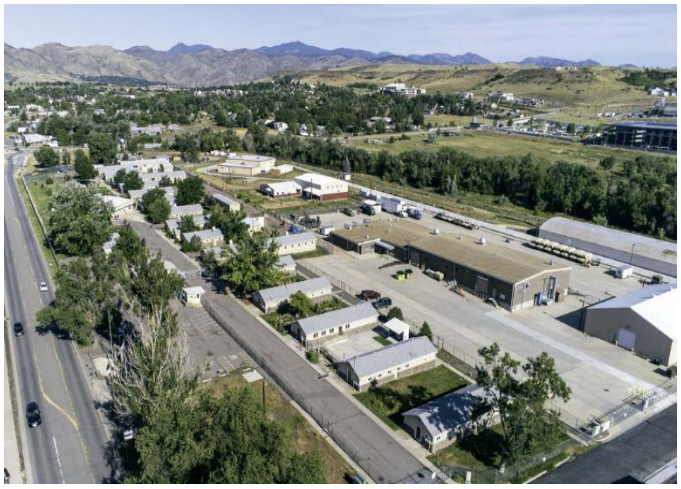
Vegetation

Two primary vegetation types are present on the STM Campus: grasslands and shrublands. The most common plant communities on the STM Campus are mixed grasslands, comprising more than 80% of the vegetation on the site. These communities are generally dominated by shortgrass and midgrass species. Two primary upland shrub communities are found on the STM Campus: Mountain mahogany shrublands are found on the shallow soils of the mesa, and upland shrublands appear in both drainages lacking active channels and drainages with associated wetlands. Field surveys have identified limited wetland and riparian areas along drainages. The wetland communities identified on the STM Campus are a minor component of the total vegetation cover, accounting for less than 1% of the vegetation. Riparian shrub communities are also found adjacent to the emergent wetlands. For details, see Appendix D. Plant Communities at the STM Campus and the Flatirons Campus.

Wildlife

Since 1987, several comprehensive wildlife surveys have been conducted on the STM Campus. Numerous mammals and several types of amphibians and reptiles have been identified in the surveys. More than 100 bird species and several raptor species have also been recorded at or above the STM Campus through formal wildlife surveys or employee observations. For details, see Section 9.1: Wildlife Management and Appendix C: Wildlife Species Observed at the STM Campus and the Flatirons Campus.

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.



An aerial view of NLR's STEP Campus. *Photo by Joshua Bauer and Bryan Bechtold, NLR 77072*

STEP

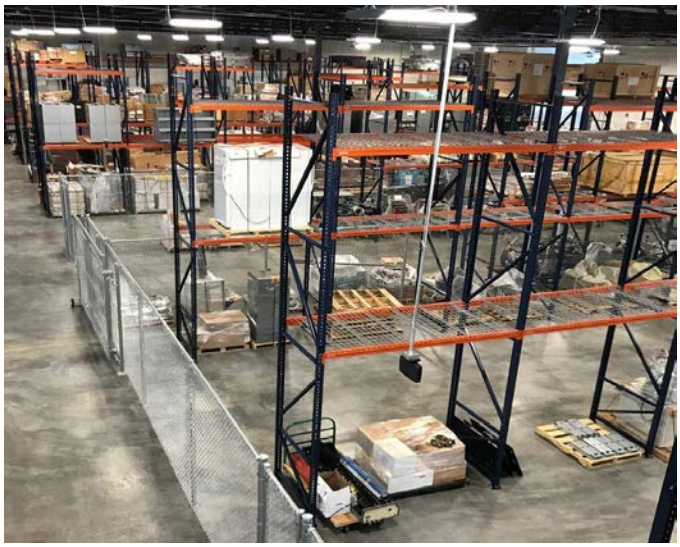
In early 2023, the state of Colorado, Jefferson County, and DOE finalized a land swap that granted DOE ownership of what is now STEP. The site, now the third DOE-owned NLR campus, is located on South Golden Road in Golden, just south of the STM Campus.

Like the STM Campus, STEP is within the boundary of former Camp George West, and more recently housed a state correctional facility. In the future, improvements will be made to buildings and infrastructure to support research and operations.

Denver West Business Park, Building 16. *Photo by Dennis Schroeder, NLR 44872*

Building 16

Building 16 is a leased office building within the Denver West Business Park, in Lakewood, approximately 2 miles (3.2 km) east of Golden and 12 miles (19.3 km) west of downtown Denver. The Denver West Business Park is a fairly flat, landscaped office complex, consisting of several four-story office buildings, parking lots, and common areas. Building 16 is bordered on the south by commercial areas (on West Colfax Avenue) and on the west by the Camp George West facility and STM Campus. In addition to office spaces, activities at Building 16 include fuel and battery characterization research, thermal analyses of vehicle cooling loops, vehicle electrical systems analysis, and photoelectrochemical hydrogen production research.



Overlooking the inside of the Golden Warehouse. *Photo by Scott Walters, NLR 61700*

Golden Warehouse

NLR's leased Golden Warehouse is at 16201 Table Mountain Parkway in Golden, about 6.1 miles (9.8 km) north of the STM Campus. It is in a commercial area surrounded by residential neighborhoods and small businesses just east of North Table Mountain. It is primarily used as a secure warehouse storage space.

An NLR researcher works on a propane test engine at the ReFUEL research lab. *Photo by Dennis Schroeder, NLR 62741*

ReFUEL Laboratory

The ReFUEL Laboratory is a leased facility used for research, testing, and support activities related to advanced fuels, engines, and vehicles to objectively evaluate performance, emissions, and energy efficiency impacts, including the evaluation and development of heavy-duty hybrid vehicles. ReFUEL consists of a single-

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

vehicle high bay and a small office area housed within the Regional Transportation District's District Shops and Operations Center at 1900 31st Street in Denver, approximately 12 miles (20 km) east of the STM Campus. The operations center facility occupies approximately 22 acres (9 hectares) and serves as the primary maintenance facility for the Regional Transportation District's bus and light rail train systems. The area around the facility consists of commercial and light industrial development. ReFUEL lies on predominantly flat terrain with a slight gradient to the northwest. The general area is highly developed with concentrated industrial and commercial activities. Very little natural vegetated habitat exists within the facility or in the immediate vicinity. Trees and shrubs line the South Platte River adjacent to the facility's southern, eastern, and northeastern boundaries.

Climate of Colorado Facility Locations

The climate of the geographic region of NLR's Colorado operations is classified as semiarid and is typified by limited precipitation, low relative humidity, abundant sunshine, and large daily and seasonal temperature variations.

The area experiences an average annual rainfall of less than 20 in. (50 cm). Almost half the annual precipitation occurs from March to June. Summer showers contribute 33% of the annual precipitation total. Precipitation begins to decrease significantly in the fall and reaches the minimum in winter. Winter is the driest season, contributing less than 10% of the annual precipitation, primarily in the form of snowfall.

Spring is a season of unstable air masses with strong winds along the foothills of the Front Range. The highest average monthly snowfall typically occurs in March, when at least one snowstorm of 6–10 in. (15–25 cm) often occurs.

The solar radiation (sunlight energy) of the region is excellent for conducting research outside and testing solar energy conversion devices and systems. Sunshine is abundant throughout the year and remarkably consistent from month to month and season to season.

Inside NLR's Alaska Campus in Fairbanks. *Photo by Joe DelNero, 91004*

Research and Testing Facility

NLR leases a facility in Fairbanks, Alaska. The Alaska Campus is an industry-based, nonprofit corporation that promotes and advances healthy, affordable, sustainable shelter for Alaskans and circumpolar people. It was formed in 1999 by Alaska home builders who identified the need for applied research and testing to create better buildings for Alaska's extreme climate. ARCEE's LEED Platinum Research and Testing Facility is considered the most energy-efficient building at this latitude in the world, demonstrating a wide array of innovative building techniques and alternative energy technologies. ARCEE's three core programs include building science research, social and economic analysis, and sustainable northern communities.

Climate of Alaska Facility

The ARCEE is located in a subarctic climate characterized by typically long, cold winters (5–7 months) and short, cool summers (45–100 days at most). The region is typified by limited precipitation (less than 15 in. [31 cm]), and temperatures can range throughout the year from −50°F to 80°F (−46°C to 27°C).

Washington, D.C., Office

Staff in NLR's leased Washington, D.C., office provide energy analysis and technical program support to DOE.

Climate of Washington, D.C., Facility

The Washington, D.C. office is in the District of Columbia in a humid, subtropical zone. Winters are typically cool with little snow, and summers are hot and humid.

Although hurricanes are unlikely, flooding of the Potomac River caused by high tides, storm surge, and runoff has been known to cause considerable property damage. Additionally, high temperatures and strong rainfall are a concern for building management.

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

Fall colors begin to turn on aspen (*Populus tremuloides*) trees within the STM Campus' detention basin.
Photo by Rachael Boothe, NLR 105934

2 ENVIRONMENTAL MANAGEMENT SYSTEM

NLR's EMS supports the laboratory's commitment to continually improve environmental and resource optimization performance by providing environmental stewardship and minimizing the environmental impacts of the laboratory's activities and operations. The EMS integrates environmental protection into daily activities throughout the laboratory, including:

- Protecting and enhancing vegetation, wildlife, and natural resources.
- Practicing pollution prevention.
- Complying with environmental requirements.
- Continually improving environmental protection and resource optimization performance.

The laboratory strives to continually minimize waste, prevent pollution, and thus reduce its environmental footprint. Pollution prevention is implemented through the laboratory's EMS, the hazard identification and control process, and effective and efficient end-of-life practices for waste.

ISO 14001:2015 Certification

NLR's EMS is certified to the ISO 14001:2015 standard for environmental management systems. ISO 14001 is a globally recognized standard that defines the structure of an organization's EMS to improve its environmental performance. ISO 14001 requires an organization to identify potential environmental impacts, establish controls needed to minimize impacts, monitor and communicate environmental performance, and establish a formal process for continually improving the EMS.

2.1 Structure of NLR's Environmental Management System

NLR's EMS is structured based on a plan–do–check–act continual improvement framework described in this section and depicted in Figure 1.

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

Figure 1. NLR's continual improvement cycle

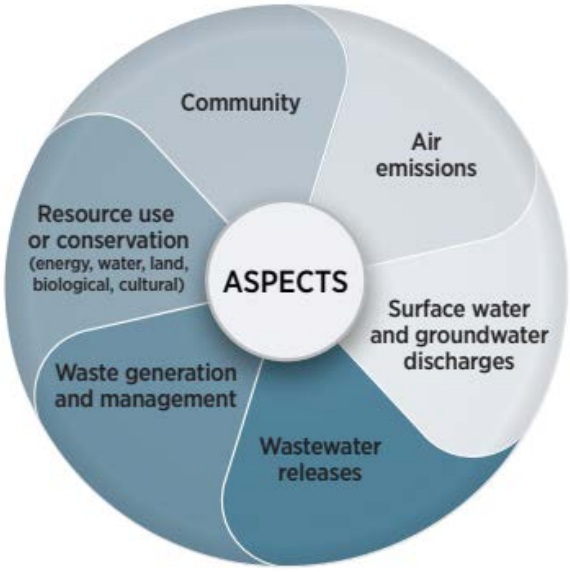


Figure 2. NLR's environmental aspects

Planning

- **Environmental Policy:** NLR states its commitments to the environment through this overarching policy. The policy commits specifically to environmental stewardship, pollution prevention, compliance with legal requirements and highly efficient business practices, and continual improvement of environmental and resource optimization performance.
- **Environmental Aspects of the Laboratory:** NLR's environmental aspects (Figure 2) are those activities, products, or services that are identified annually and have the potential to interact with the environment. The significance of an identified aspect is determined by assigning a frequency of occurrence and level of severity. Using this method, NLR's Environment, Safety, Health, and Quality staff review potential impacts to the environment annually and prioritize activities in the EMS according to the aspects that are identified as significant. NLR also uses a robust hazard identification and control process to manage environmental risks as part of its integrated safety management system.
- **Legal and Other Requirements:** NLR maintains a formal process to identify regulations and standards that are necessary and sufficient to address specific environmental hazards, including federal laws and regulations, state and local requirements, executive orders, and DOE orders.
- **Objectives and Targets:** Regular planning of activities and programs is needed to achieve NLR's environmental goals. The laboratory plans, implements, monitors, and reports on environmental stewardship goals and actions to generate continual improvement. For details, see 2.3 Performance Indicators and Progress.

Implementation

- **Structure and Responsibility:** NLR policies and procedures establish roles and responsibilities for environmental management within the organization.
- **Competence, Training, and Awareness:** NLR verifies that staff are competent based on education, training, or experience, and the laboratory implements a robust environment, health, and safety training program.
- **Communication:** NLR provides several avenues for communication between the laboratory and the community, including community meetings, lunch-and-learn events, publicly available websites, scientific publications, newsletters, and periodic community mailings. NLR tracks and responds to all environmental concerns through the NLR Communications Office. Internal communications regarding environmental issues are provided via intranet sites, newsletters, emails, meetings, posters, trainings, and personal interaction with Environment, Safety, Health, and Quality staff.
- **Operational Control:** NLR plans and manages operations and activities in line with its environmental policy and objectives. Staff continually identify and review activities that could impact the environment, and engineering and administrative controls are put in place to minimize or avoid impacts to the environment.
- **Document and Records Control:** Policies and procedures ensure the current, correct versions of

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

documents are available for use and that records are maintained to meet requirements.

Checks and Corrective Action

- **Monitoring, Measuring, and Evaluating Compliance:** NLR monitors key activities, tracks performance and progress toward environmental objectives, and conducts periodic assessments of compliance with legal requirements.
- **Assessments:** NLR periodically conducts assessments to verify that its EMS is operating as intended. A formal system for tracking corrective and preventive actions supports continual improvement of the management system. For details, see Section 2.4: Assessment and Improvement.

Feedback

- **Management Review:** NLR's leadership team reviews the EMS regularly to provide feedback and direction to continually improve the environmental performance of the organization.

These recycling bins are located at each staff's workstation. Recycling paper and minimizing waste helps keep NLR's commitment to pollution prevention.
Photo by Dennis Schroeder, NLR 32222

2.2 Pollution Prevention

NLR has formally committed to preventing pollution through its laboratory-wide environmental policy. NLR's hazard identification and control process helps staff regularly identify opportunities to prevent pollution, and formal pollution prevention assessments are conducted periodically to identify opportunities to reduce pollution and improve program effectiveness. The laboratory also fulfills its commitment to pollution prevention by implementing controls for certain laboratory operations and properly using chemicals and fuels.

Reducing Pollution

Examples of positive impacts of reducing pollution from NLR's activities include:

- Replacing toxic chemicals with safer alternatives, where possible, to reduce potential exposure to staff, the public, and local ecosystems.
- Choosing bio-based and recycled content products to reduce impacts on natural systems.
- Using resource-optimized and innovative technology solutions and design for buildings to meet mission requirements and reduce energy and water requirements.
- Performing waste audits in facilities to improve diversion of materials from the waste stream to recycling/reuse streams.

2.3 Performance Indicators and Progress

NLR's measurable goals for environmental improvement are identified in two documents:

- The Performance Evaluation and Measurement Plan establish key priorities and provides specific objectives, expected outcomes, and measures of performance for managing and operating the laboratory. Each fiscal year (October through September), NLR and the DOE Golden Field Office collaborate to develop performance objectives.

The Energy and Water Management Narrative support DOE's resource optimization goals. The results of implementing the plan are presented in Section 3.1: Resource Optimization Goals.

2.4 Assessment and Improvement

Assessments support the continual improvement of environmental management. Periodic assessment of the EMS and its components provide assurance that the EMS continues to be an effective tool to achieve and maintain compliance with regulatory and legal requirements, meet the established environmental goals of the laboratory, and

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

demonstrate to us and others that NLR is “walking the talk.”

Internal and external assessments are performed to evaluate the functionality of NLR’s EMS:

- Internal assessments are performed regularly to evaluate consistency of the EMS with the ISO 14001 standard, legal, and other requirements.
- Periodically, external third-party assessments are conducted by technical experts for specific components of environmental programs as part of continual improvement efforts. Annual surveillance assessments and triennial recertification assessments are conducted for the EMS to maintain ISO certification.

Improvements are developed and implemented as needed based on the results of each assessment performed.

The following assessment activities that took place in 2025 allowed NLR to enhance program effectiveness and make substantial environmental performance improvements:

- **Internal Assessment:** An internal assessment was completed for NLR’s Environmental Planning program. No major issues were identified, and actions to address the opportunities for improvement have been completed or are in progress.
- **External Assessments:** NLR underwent a recertification assessment to verify conformance to the ISO 14001:2015 standard. A team of external auditors conducted the virtual assessment, including interviews with staff at all levels of the organization, observations of processes in place, and reviews of documents and records. No major issues were identified, and certification was maintained.

Staff analyze energy use during an energy and water audit of the Solar Energy Research Facility (SERF). NLR regularly performs energy audits of existing campus buildings.
Photo by Dennis Schroeder, NLR 21752

2.5 Awards and Recognition

In 2025, NLR received the Global Electronics Council Award. NLR is committed to purchasing products designated by the Electronic Product Environmental Assessment Tool (EPEAT), ENERGY STAR®, and the Federal Energy Management Program, whenever feasible and cost-effective, to continue to positively impact the environment through such purchases. In 2025, NLR received the “5 Product Categories” EPEAT Purchaser Award from the Global Electronics Council for 2024 EPEAT purchases.

Construction and NLR staff celebrate the topping off of the Energy Materials and Processing at Scale (EMAPS) facility.
Photo by Agata Bogucka, NLR 101146

2.6 Integrated Environmental Stewardship in Construction Management

NLR designs, builds, and refurbishes facilities using an integrated approach that allows the laboratory to fulfill its mission while addressing environmental, safety, health, and community considerations.

Project Planning and Design

An interdisciplinary team that includes members of the laboratory’s research, facilities, and operations staff, along with DOE Golden Field Office staff, collaborates on projects beginning with conceptual planning and design selection and continuing through construction. Project staff facilitate the identification and inclusion of environmental requirements, resource optimization requirements, and best management practices into project designs.

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

During the project planning and design phase, NLR evaluates opportunities to incorporate features such as:

- Reclaimed materials.
- Bird-friendly window glass.
- Weed-free soil amendments.
- Drought-tolerant and native vegetation.
- Connectivity with existing infrastructure.
- Wildlife- and community-friendly efficient lighting.
- Water reuse and conservation of natural drainages.

Environmentally Responsible Construction Practices

During construction projects, DOE and NLR staff participate in weekly construction team meetings, monitor performance criteria, and provide ongoing feedback to project teams regarding environmental management. Environmentally responsible construction practices include reviewing preconstruction project plans, using a "plan of the day" to coordinate and control activities, performing nesting bird surveys and implementing stormwater controls before commencing earth-disturbing activities, controlling dust, tracking waste diversion, and properly storing hazardous materials. Minimizing impacts to wildlife is a consideration for all construction projects.

Benefits of the EMS to the Environment

- **Improved Overall Compliance Management:** NLR follows a formal process to identify regulations and standards that are applicable to the laboratory, including federal laws and regulations, state and local requirements, executive orders, and DOE orders. In addition, the laboratory regularly reviews compliance with these requirements through various mechanisms, including internal assessments, inspections, and monitoring.
- **Personnel Health and Safety:** Continually improving the environment, safety, health, and quality management helps make NLR a safer, more effective, and more environmentally responsible workplace.
- **Pollution Prevention:** Staff regularly identify opportunities to prevent pollution through NLR's hazard identification and control process. Resources are dedicated to effective operations and pollution prevention through the laboratory's waste management efforts.
- **Improved Air and Water Quality:** EMS goals related to using innovative on-site energy resources, as well as minimizing the quantity of chemicals used on-site, all contribute to improved air quality. NLR continually strives to protect water quality both on-site and off-site by refining and implementing requirements related to the management of runoff, facility operations, and outdoor storage and use of materials throughout facility grounds, including at temporary construction sites.
- **Improved Hazardous Material, Hazardous Waste, and Solid Waste Management:** Hazardous material tracking through NLR's chemical inventory reduces the purchase of new supplies by allowing staff to determine whether a needed chemical is already on-site, which in turn minimizes the generation of hazardous waste.
- **Optimized Use of Water, Natural Resources, Energy, and Fuel:** Each year, the laboratory sets goals for water, energy, and fuel usage, and it monitors progress toward each goal throughout the year.
- **Reduced Number of Operating Permits Needed:** Implementing the EMS provides a mechanism to identify, evaluate, and implement pollution prevention opportunities, including waste minimization, product substitution, and process modification. Such efforts can reduce the number of regulatory requirements that the laboratory must meet.

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

Benefits of the EMS to NLR

- **Reduced Risk to Facility and the Organizational Mission:** NLR's hazard identification and control procedure incorporates an environmental risk assessment. System improvements also support the use of requirements to reduce the risk of noncompliance and potential enforcement actions.
- **Improved Fiscal Efficiency and Cost Avoidance:** Cost savings are realized through energy efficiency projects, innovative on-site energy solutions, waste reduction and recycling, and reduced environmental incidents such as spills.
- **Greater Understanding and Recognition of Environmental Issues at All Levels of the Organization:** Staff are made aware of the potential environmental impacts of their work activities through postings on the NLR intranet, new employee orientation and activity-specific trainings, published policies and procedures, management communications, Intelligent Campus communications, and special events such as Staff Awards (an annual employee recognition event). These actions help improve awareness of environmental issues and support environmental performance throughout the laboratory.
- **Integration of Environment into the Organizational Culture and Operations:** NLR strives to maintain a high level of awareness in the laboratory about safety, health, and environmental responsibilities. This awareness is supported through regular communications from executive management, trainings, inspections, and risk assessments.
- **Integration of Environment into Real Property Asset Management:** NLR includes environmental considerations into long-term planning for the STM Campus and the Flatirons Campus. Long-term site plans consider wildlife movement across the site, surface water management, and climate change impacts.
- **Improved Community Relations:** The laboratory works to improve community relations by responding to and tracking all community input through phone calls, emails, and community meetings, and by soliciting feedback from stakeholders through the NEPA review process. NLR also proactively engages the community with public tours, newsletters, and mailings to neighborhoods near its facilities.
- **Improved Effectiveness in Overall Mission:** NLR's EMS supports the organization's overall mission and improves effectiveness by systematically addressing environmental opportunities and risks, ensuring compliance with regulations, and implementing innovative commitments to achieve superior performance.
- **Improved Collaboration with Other Groups:** The laboratory actively collaborates with stakeholders on environmental issues such as innovative energy resources, waste management, energy and water efficiency, and resource conservation and management.

2025 Accomplishments and Highlights

- Maintained certification to the 2015 version of the ISO 14001 standard. An external third-party assessment verified that the laboratory meets the requirements of the standard and demonstrates the laboratory's commitment to environmental stewardship.
- Conducted an internal assessment for NLR's Environmental Planning program. No major issues were identified, and actions to address the minor nonconformities and opportunities for improvement have been completed or are in progress.

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

A lead product engineer from an NLR research partner visits the Thermal Test Facility at NLR's STM campus. This business partner is participating in a program which allows them to test their technologies using NLR's facilities. *Photo by Joe DelNero, NLR 104362*

3 RESOURCE OPTIMIZATION

NLR pursues resource optimization in all laboratory operations and strives to minimize the environmental impacts of doing business. As one of the nation's foremost scientific institutions, the laboratory embraces the best in energy operational practices and ecological management, setting the standard for the wise use of natural resources. NLR's goal is to minimize the use of energy, materials, and water while meeting all research needs. In all site development, NLR seeks opportunities to integrate energy efficiency, innovative on-site energy, and high-performance buildings. NLR's dedication to resource optimization supports the laboratory's success by applying what is learned, through R&D, to campus facilities and infrastructure systems.

3.1 Resource Optimization Goals

NLR updates an Energy and Water Management Narrative and dashboard every year to report on past performance and set goals for the coming year. These performance goals are integrated into the laboratory's EMS.

To meet DOE energy and water performance goals, efficiency considerations are incorporated into operations. The goals address:

- Energy, water, and waste management.
- Building design, construction, and ongoing maintenance.
- Environmental management planning.
- Strategic purchasing.
- Resilience planning.
- Measurement and tracking of environmental objectives, targets, and actions.
- Awareness and engagement of staff and community members.

Performance Status

Energy Management Goals

Goal-Subject Buildings

In Fiscal Year (FY) 2025, NLR reduced overall natural gas consumption by 19,769 MBtu, which significantly contributed to the 7% reduction in goal-subject building energy use intensity. The natural gas reduction can be attributed to the Renewable Fuel Heat Plant running in FY 2025 (which was offline in FY 2024) and the continued reduction in Field Test Laboratory Building (FTLB) hot water consumption due to central plant improvements and repairs to leaks in the system.

Goal-Excluded Facilities

In FY 2025, the laboratory was able to retire the Eagle high-performance computing data center at the Energy Systems Integration Facility (ESIF), which reduced energy consumption by 24,300 MBtu. This reduction accounted for nearly the entire 31% reduction in energy use intensity for goal-excluded facilities.

Water Management

In FY 2025, the laboratory reduced potable water use intensity by 12%. This was mainly driven by the reduced load of 2,098,000 gal at the ESIF with the retirement of the Eagle data center; however, reductions in other areas also

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

played a role. At the Integrated Biorefinery Research Facility (IBRF), FY 2024 research included large-scale fermentation activities that required significant amounts of water, and the lack of these activities in FY 2025 reduced facility potable water consumption nearly 1,000,000 gal. Additionally, in the Solar Energy Research Facility (SERF), ongoing ventilation equipment replacements required laboratory shutdowns in FY 2025, which, combined with a decrease in cooling degree days, reduced facility water consumption nearly 250,000 gal. Finally, a domestic water energy conservation measure was completed in early FY 2025, which also reduced FY 2025's potable water consumption, as did leaks repaired at the STM Campus and Flatirons Campus.

Renewable Energy

On-Site-Generated Renewable Energy

In FY 2025, on-site electrical production decreased by about 23%. This was mainly driven by the STM Campus parking garage and visitor parking carport solar photovoltaic systems, which produced 737 MWh less than in FY 2024. The parking garage was offline for a majority of the fiscal year due to required inverter repairs. These repairs are expected to be completed in FY 2026. The visitor parking solar photovoltaic system was also locked out for production for the entire fiscal year due to construction activities on the STM Campus related to the new EMAPS facility. The wind systems at the Flatirons Campus also had reduced energy production due to changes in research activities. One wind system remained offline for the entire fiscal year during contract negotiations, and a second wind system produced at half capacity compared with the previous fiscal year. All wind systems at the Flatirons Campus are used for research activities.

Purchased Renewable Energy

In FY 2025, NLR increased purchased renewable energy by about 14% due to the increased electrical load at the Flatirons Campus. This increased load was mainly driven by the reduction in on-site energy production and increase in research activities related to the Advanced Research on Integrated Energy Systems program. This included a hydrogen electrolyzer system, a new controllable grid interface equipment, and the new CCF.

Facilities and Workforce Performance Status

Direct Agency Obligations

In FY 2025, NLR continued the Savings Reinvestment Program; however, no new projects were added to the portfolio.

Energy Savings Performance Contracts

In FY 2025, NLR continued efforts with Solutions Energy Savings Performance Contracts. This included nearing the closeout replacements for heating systems and efficiency improvements to the building envelope, domestic water fixtures, and building controls. This also included beginning efficiency improvements to building controls; heating, ventilating, and air-conditioning equipment; lab ventilation; lighting; building envelope; and on-site generation, guaranteeing a total of $4.3 million in savings over the life of the contract.

NLR was awarded an Assisting Federal Facilities with Energy Conservation Technologies grant in FY 2025. This project will use the waste heat from the ESIF high-performance computing data center to heat NLR facilities.

Peregrine, a supercomputer capable of 1 quadrillion calculations per second. Peregrine resides in the ESIF data center, designed to be the world's most energy-efficient high-performance computing data center. *Photo by Dennis Schroeder, NLR 31716*

3.2 Resilience Planning

NLR is proactively engaged in the development and implementation of mitigation and adaptation strategies to manage the risks that extreme events pose to laboratory operations. Improving operational resilience ensures continuity for the laboratory to achieve its mission.

2025 Accomplishments and Highlights

- Continued installing laboratory-wide improvements to heating systems, domestic water fixtures, and building controls, guaranteeing a total of $4.3 million in savings over the life of the contract.
- Awarded an Assisting Federal Facilities with Energy Conservation Technologies grant in FY 2025 to implement changes to use waste heat from the ESIF high-performance computing data center to heat NLR facilities.

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

Researchers at NLR's Alaska facility work on a duct blaster. Duct leakage is a significant problem in many residential buildings that can contribute to energy waste, reduced comfort, poor indoor environmental quality, and moisture problems. *Photo by Josh Bauer, NLR 92006*

4 COMPLIANCE STATUS

NLR is subject to many federal and state laws and regulations, executive orders, DOE orders, and memoranda of understanding with government agencies. By observing these rules and regulations, NLR continues its strong record of environmental compliance.

Table 1 includes a brief description of the statute or regulation and how compliance requirements were met in 2025. Detailed information for each area of compliance is found in the referenced sections of this report. For details, see Appendix B. Environmental Permits, Registrations, Notifications, and EPA Compliance Data.

Table 1. Compliance Status for Federal, State, and Local Environmental Laws and Regulations

Regulatory Program	Compliance Status	Regulator Requirement: Regulation Title
Environmental Performance Report		
DOE Order 231.1B Chg 1, *Environment, Safety and Health Reporting*, was implemented to ensure DOE receives timely, accurate information about events that have affected or could adversely affect the health and safety of the public or workers, the environment, or the operations of DOE facilities. The order requires DOE facilities to report specific site environmental information annually, including environmental management performance, environmental occurrences and response, compliance with environmental standards and requirements, significant programs and efforts, and property clearance activities for property contaminated with radiological materials.	NLR reports annually via this Environmental Performance Report.	DOE Order 231.1B Chg 1, *Environment, Safety and Health Reporting*

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

Air Quality		
For facilities and stationary sources that emit criteria air pollutants and hazardous air pollutants (HAPs), there are both federal and state requirements for permitting, reporting, emissions limits, and operation of emissions controls depending on the source, type, and amount of air pollutants emitted. Generally, these requirements become stricter as the quantity of air pollutants emitted increases or as the air pollutants have a higher potential for harm or adverse effect. On Oct. 1, 2021, the U.S. Environmental Protection Agency (EPA) implemented hydrofluorocarbon (HFC) phasedown requirements authorized by the American Innovation and Manufacturing Act of 2020 that are intended to reduce the use of HFCs in manufacturing to 15% of a 2011–2013 baseline by 2036. As of 2025, the manufacture of HFC refrigerants in the United States has been reduced to 60% of the baseline amount. EPA's Protection of Stratospheric Ozone includes repair, servicing, recordkeeping, and other requirements for appliances containing more than 50 lb (23 kg) of any regulated refrigerants, including chlorofluorocarbons, hydrochlorofluorocarbons, HFCs, and hydrofluoroolefins. Appliances containing 5 lb (2.3 kg) or more of these refrigerants are subject to end-of-life refrigerant recovery, recycling, and documentation requirements. EPA regulations require GHGs emitted by certain facilities to be tracked and reported if the emissions exceed 27,557 U.S. tons (25,000 metric tons [MT]) of carbon dioxide equivalent (CO_2e) per year. The purpose of this reporting is to better identify the actual emissions of such gases across the United States and provide the EPA with data on which to base future GHG regulations. Reporting and permitting of GHGs may be required under the EPA Prevention of Significant Deterioration regulation, Title V Tailoring Rule, and Mandatory Greenhouse Gas	In 2025, program activities complied with all requirements. NLR did not exceed any air permit standard or other air regulatory requirement at any facility. Management of refrigerants, including ODSs, is accomplished by maintaining a detailed inventory of refrigerants and appliances containing more than 1 lb (0.45 kg) of any refrigerant. The inventory identifies (1) equipment that is subject to end-of-life disposal requirements and (2) larger appliances that are subject to detailed repair and documentation standards. HAP emissions for each individual facility were below the EPA reporting and permitting thresholds of 10 U.S. tons (9.1 MT) per year for each individual HAP, and 25 U.S. tons (22.7 MT) per year for all HAPs combined. NLR completed an annual evaluation of compliance with federal and state facility-wide permitting and emissions control requirements. All facilities and individually permitted equipment items remain classified as minor sources. Laboratory CO_2e and GHG emissions were below the federal reporting and permitting threshold of 27,500 U.S. tons (25,000 MT) per year. All equipment registrations, including annual registration renewals, for state-required ODSs were completed for the STM Campus and Flatirons Campus. Permits for two diesel-fueled emergency generators were issued by the APCD in 2025. Proposed EPA regulations for maintenance and repair of HFC-containing appliances were finalized in 2024. NLR uses at least 42 HFC-	H.R. 133 Consolidated Appropriations Act, 2021 Section 103 in Division S: American Innovation and Manufacturing Act of 2020 EPA 40 Code of Federal Regulations (CFR) Part 40: Mandatory Greenhouse Gas Reporting EPA 40 CFR Part 50: National Primary and Secondary Ambient Air Quality Standards EPA 40 CFR Part 51: Requirements for Preparation, Adoption, and Submittal of Implementation Plans EPA 40 CFR Part 52: Approval and Promulgation of Implementation Plans EPA 40 CFR Part 60: Standards of Performance for New Stationary Sources EPA 40 CFR Part 63: National Emission Standards for Hazardous Air Pollutants for Source Categories EPA 40 CFR Part 70: State Operating Permit Programs EPA 40 CFR Part 71: Federal Operating Permit Programs EPA 40 CFR Part 82: Protection of Stratospheric Ozone EPA 40 CFR Part 98: Mandatory Greenhouse Gas Reporting CDPHE 5 Colorado Code of Regulations (CCR) 1001-3: Stationary Source Permitting and Air Pollutant Emission Notice Requirement CDPHE 5 CCR 1001-15: Control of Emissions of Ozone-Depleting Compounds CDPHE 5 CCR 1001-16: Street Sanding Emissions

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

Reporting Rule, depending on the amount of GHGs emitted. Permits for major emissions sources per year of a criteria pollutant may be required to include GHGs in the permit if CO_2e emissions exceed 75,000 U.S. tons (68,000 MT) per year. The EPA has designated the Denver metropolitan area's ozone nonattainment status as "severe." Major source permitting thresholds for nitrogen oxides (NO_x) and volatile organic compounds are 25 U.S. tons (24.7 MT) per year. The Air Pollution Control Division (APCD) of the Colorado Department of Public Health and Environment (CDPHE) administers the federal Clean Air Act in Colorado and implements regulations for all point sources (facilities or other types of operations) in Colorado under authority delegated by the EPA. Categories of regulated air pollutants include criteria air pollutants, HAPs, ODSs, HFCs, and GHGs. Several state air regulations for sources of particulate pollution include large construction sites and cold weather street sanding operations. Particulate emissions, such as dust from construction sites larger than 25 acres (10.1 hectares) or those occurring for more than 6 months, are subject to state fugitive particulate emissions permits. State regulations require federal, state, and local government facilities to track and report street sanding in the winter and to minimize sand use as much as possible.	containing appliances that are covered under this regulation. The STM Campus is within the Denver metropolitan area's "severe" ozone nonattainment status. The NLR STM Campus NO_x emissions exceed 25.0 U.S. tons per year; a Title V facility-wide air permit application was filed in 2023, and a permit is anticipated to be issued in 2026. In 2025, APCD conducted a records and stationary source inspection of the STM Campus. No issues were identified. NLR maintains an STM Campus air permit allowing fugitive dust emissions from construction activities. NLR provided an annual street sanding report to the state of Colorado and Jefferson County in 2025, as required. The report confirmed that no sand was used at the STM Campus or the Flatirons Campus.	

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

Drinking Water Quality		
The federal Safe Drinking Water Act establishes minimum drinking water standards and monitoring requirements for drinking water supplies. Under this act, the EPA has established allowable levels for contaminants in drinking water that are known as maximum contaminant levels. The Water Quality Control Division (WQCD) of CDPHE implements the federal Safe Drinking Water Act in Colorado under authority delegated by the EPA.	Program activities were in compliance with requirements; all monitored water quality parameters met requirements. A total of 273,596 gallons (1,035,675 L) of drinking water was provided to the Flatirons Campus.	EPA 40 CFR Part 141: National Primary Drinking Water Regulations EPA 40 CFR Part 142: National Primary Drinking Water Regulations Implementation EPA 40 CFR Part 143: National Secondary Drinking Water Regulations EPA 40 CFR Part 149: Sole Source Aquifers CDPHE 5 CCR 1002-11: Colorado Primary Drinking Water Regulations
Groundwater Quality		
Colorado groundwater quality standards are established by CDPHE. Permits for groundwater wells are issued by the Colorado Department of Natural Resources. Permits are required for drinking water, water use by irrigation, livestock watering, dewatering, monitoring wells, geothermal technologies, and well installations.	Program activities were in compliance with requirements. In 2025, there were no spills or releases that impacted groundwater. There are currently no permitted groundwater monitoring wells at either the STM Campus or the Flatirons Campus. There are two permitted closed-loop geothermal systems at the STM Campus. Three test boreholes were installed on the STM Campus to better understand the potential for developing a geothermal energy heat exchange system.	CDPHE 2 CCR 402-2: Rules and Regulations for Water Well Construction, Pump Installation, Cistern Installation, and Monitoring and Observation Hole/Well Construction CDPHE 2 CCR 402-10: Rules and Regulations for Permitting the Development and the Appropriation of Geothermal Sources Through the Use of Wells CDPHE 5 CCR 1002-41: The Basic Standards for Ground Water
Storm and Surface Water Quality		
The Energy Independence and Security Act of 2007 requires federal agencies to reduce stormwater runoff from federal development projects to the maximum extent technically feasible. Stormwater runoff levels should reflect predevelopment hydrology specifically with regard to runoff rate, volume, duration, and water temperature. Compliance can be achieved by using low-impact design elements such as porous pavers, cisterns, and bioswales	Program activities were in compliance with requirements. Periodic stormwater inspections were performed at locations where earth-disturbing activities occurred. Inspections and required maintenance of stormwater erosion and sediment controls were completed on construction sites operating under an EPA Construction General Permit, as well	Public Law 110-140: Energy Independence and Security Act of 2007 EPA 40 CFR 122.26: Storm Water Discharges EPA 40 CFR 122.34: Permit Requirements for Regulated Small MS4 Permits CDPHE 5 CCR 1002-38: Classifications and Numeric

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

and by retaining stormwater runoff and releasing it at predevelopment rates. Stormwater discharges resulting from construction activities at federal facilities that disturb 1 or more acres (0.4 or more hectares) of land are administered in Colorado by the EPA. To obtain coverage under an EPA Construction General Permit for stormwater discharges, a site-specific stormwater pollution prevention plan must be prepared, and a notice of intent must be filed with the EPA. The WQCD within CDPHE regulates stormwater discharges at nonfederal facilities within Colorado. For NLR construction projects that occur off federal property, a Colorado Discharge Permit System stormwater permit might be required. Owners and operators of a regulated municipal separate storm sewer system (MS4) are required to develop a management program to minimize the discharge of pollutants into local bodies of water. Surface water quality is protected by the federal Clean Water Act, the Energy Independence and Security Act of 2007, and the Colorado Water Quality Control Act.	as smaller areas where permit coverage is not required but where stormwater best management practices are followed. MS4 programs were active during 2025 with the intention of reducing discharge of pollutants in stormwater runoff from the STM Campus. NLR terminated coverage of EPA's 2022 Construction General Permit for the Flatirons Campus' "Second Controllable Grid Interface" project. NLR continued coverage under EPA's 2022 Construction General Permit for the Flatirons Campus' "Behind-the-Meter Storage" and grid projects, and the STM Campus' EMAPS facility. NLR obtained coverage under the EPA's 2022 Construction General Permit for the Flatirons Campus' "Waterline" project.	Standards South Platte River Basin, Laramie River Basin, Republican River Basin, Smoky Hill River Basin CDPHE 5 CCR 1002-61: Colorado Discharge System Permit Requirements CDPHE 5 CCR 1002-65: Regulation Controlling Discharges to Storm Sewers CDPHE 5 CCR 1002-93: Colorado's Section 303(D) List of Impaired Waters and Monitoring and Evaluation List
Wastewater Quality		
Wastewater is regulated at the federal level under Clean Water Act, a U.S. federal law, and at the state level under the Colorado Water Quality Control Act by the WQCD. On-site septic systems are regulated by the WQCD. Inspection and permitting of individual sewage disposal systems have been delegated to Jefferson County by CDPHE. Metro Water Recovery manages wastewater at its treatment plant per federal and state requirements. Domestic and non-domestic wastewater flows are delivered to Metro Water Recovery's plant via conveyance systems owned, operated, and regulated by numerous sanitation districts.	Program activities were in compliance with requirements.	EPA 40 CFR 122: EPA Administered Permit Programs, The National Pollutant Discharge Elimination System EPA 40 CFR 123: State Program Requirements EPA 40 CFR 125: Criteria and Standards for the National Pollutant Discharge Elimination System EPA 40 CFR 127: National Pollutant Discharge Elimination System Reporting EPA 40 CFR 129: Toxic Pollutant Effluent Standards

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

Nondomestic wastewater discharges must comply with Metro Water Recovery rules and regulations, which incorporate requirements of the Clean Water Act.		EPA 40 CFR 130: Water Quality Planning and Management EPA 40 CFR 131: Water Quality Standards EPA 40 CFR 133: Secondary Treatment Regulation EPA 40 CFR 136: Guidelines Establishing Test Procedures for the Analysis of Pollutants CDPHE 5 CCR 1002-62: Regulations for Effluent Limitations CDPHE 5 CCR 1002-63: Pretreatment Regulations
Hazardous Materials Management		
Hazardous materials management is regulated at the federal level through Title III of the Superfund Amendments and Reauthorization Act, which is also known as the Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA). It was created to help communities and federal, state, and local governments plan for emergencies involving hazardous substances. It also requires industry to report on the storage, use, and accidental release of hazardous chemicals to federal, state, and local governments. NLR facilities are subject to Sections 302, 304, 311, 312, and 313 of EPCRA. EPCRA Section 302 requires a facility to notify state and local emergency response and planning agencies if any extremely hazardous substances in the facility's inventory are stored in quantities greater than regulatory thresholds. EPCRA Section 304 requires facilities to immediately notify state and local emergency response and planning agencies if there is an accidental spill or release of more than the predetermined reportable quantity. EPCRA Section 311 requires a one-time submittal of safety data sheets to state and local emergency response agencies and local fire departments for chemicals stored on-site in quantities greater than regulatory thresholds.	Program activities were in compliance with requirements. Section 302 notification was not required. There were no releases of hazardous materials that required reporting under Section 304. In accordance with DOE requirements, NLR screened selected chemicals to confirm quantities were below those requiring elevated operational protocols. An EPCRA Section 311 submission was not required. EPCRA Section 312 Tier II hazardous materials reports were submitted for the STM and Flatirons campuses. Chemicals reported from the Flatirons Campus included sulfuric acid, lead contained in sealed lead acid batteries, and petroleum oil from transformers and hydraulics. Chemicals reported from the STM Campus included sulfuric acid, lead contained in sealed lead acid batteries, diesel fuel from standby generators and storage drums, and petroleum oil from transformers and hydraulics. An EPCRA Section 313 Toxics Release Inventory report was not required. Hazardous materials permits are required by the local fire jurisdiction	EPA 40 CFR 355: Emergency Planning and Notification EPA 40 CFR 370: Hazardous Chemical Reporting, Community Right-To-Know EPA 40 CFR 372: Toxic Chemical Release Reporting, Community Right-To-Know DOE Order 151.1D: Comprehensive Emergency Management System International Fire Code

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

EPCRA Section 312 requires an annual report of EPCRA Section 311 information. EPCRA Section 313 requires that a Toxics Release Inventory report be filed with the EPA in the event of a release for any chemical that is manufactured, processed, or otherwise used in quantities exceeding regulatory thresholds.	for the STM Campus, Building 16 at the Denver West Business Park, and ReFUEL. Hazardous materials permits were acquired for facilities as appropriate. No reportable hazardous material spills occurred.	
Hazardous Waste Management		
The Resource Conservation and Recovery Act (RCRA) established requirements for the management of regulated waste, including hazardous waste. In Colorado, the Hazardous Materials and Waste Management Division (HMWMD) of CDPHE administers requirements under authority delegated by the EPA. In Alaska, the EPA administers the RCRA requirements with the Alaska Department of Environmental Conservation, which manages certain aspects of waste generated by a “very small quantity generator.” Additional requirements for hazardous material transportation are regulated by the U.S. Department of Transportation. Per state and federal regulations, annual generator notifications are delivered, and applicable fees are paid to the state based on monthly volumes of hazardous waste generated at each facility. EPA has three hazardous waste generator classifications: Very small quantity generator: Those that generate no more than 220 lb (100 kg) of hazardous waste and no more than 2.2 lb (1 kg) of acute hazardous waste per month. Small quantity generator: Those that generate less than 2,204.6 lb (1,000 kg) of hazardous waste and less than 2.2 lb (1 kg) of acutely toxic waste per month. Large quantity generator: Those that generate 2,204.6 lb (1,000 kg) or more of hazardous waste or more than 2.2 lb (1 kg) of acutely hazardous waste per month.	NLR incurred a penalty for non-compliance with the hazardous waste regulations as a “large quantity generator” from a state regulator conducting an inspection. This penalty was due to noncompliance with select program documents and observations made in the field by the state regulators involving on-site container labeling and time tracking. All corrective actions were completed and NLR returned to full compliance within thirty days from receiving written notice of the violations. Applicable staff receive annual hazardous and universal waste training in accordance with state and federal regulations. NLR maintains unique EPA identification numbers for four of its seven facilities: the STM Campus, Building 16, the Flatirons Campus, and ReFUEL. All regulatory notifications were completed, and applicable waste generator fees were paid. Waste generator status: STM Campus: Large quantity generator. Flatirons Campus: Very small quantity generator. Building 16: Very small quantity generator. ReFUEL: Very small quantity generator.	EPA 40 CFR 260-273: Hazardous Waste EPA 40 CFR 279: Standards for the Management of Used Oil CDPHE 6 CCR 1007-3: Hazardous Waste Regulations Alaska Department of Environmental Conservation 18 Alaska Admin Code 60.020: Hazardous Waste

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

	STEP Campus: No hazardous waste generated. Golden Warehouse: No hazardous waste generated. Alaska facility: Very small quantity generator. Washington, D.C., office: No hazardous waste generated.	
Aboveground Storage Tank Management		
ASTs owned and operated by NLR are not regulated by the Colorado Department of Labor and Employment Division of Oil and Public Safety. However, NLR manages Colorado-located tanks in accordance with Colorado AST regulations. The Colorado Department of Labor and Employment Division of Oil and Public Safety requires that ASTs be constructed and installed according to specific standards, that they be regularly inspected with all inspections being documented, and that facilities meeting certain oil storage quantities employ an SPCC plan to manage oil sources of 55 gallons (208 L) or more.	All tanks were inspected to confirm continued adherence to state of Colorado regulations.	Colorado Department of Labor and Employment 7 CCR 1101-14: Storage Tank Regulations
Petroleum Spill Prevention, Control, and Countermeasure		
Oil spill prevention and response are regulated at the federal level under the Oil Pollution Prevention Act and the Clean Water Act, and at the state level through the Colorado Storage Tank Regulations enforced by the Division of Oil and Public Safety. SPCC plans are required by the EPA and Colorado state regulations for facilities that meet certain oil storage criteria. Generally, facilities storing more than 1,320 gallons (5,000 L) of oil and with the potential for spills to reach U.S. or Colorado waters must have an SPCC plan. The regulations mandate that any equipment or container with a capacity of 55 gallons (208 L) or more must be included in the plan. The purpose of an SPCC plan is to prevent the discharge of oil and hazardous substances, provide site-	Program activities remained in compliance with all applicable SPCC requirements throughout the reporting period. No reportable oil discharges occurred, and there were no spill incidents that met federal or state reporting thresholds. SPCC plans are current and maintained for the STM Campus, Flatirons Campus, and ReFUEL, ensuring each facility's oil storage systems, spill prevention controls, and response procedures are documented and available for implementation as needed. In addition, applicable personnel continue to receive annual SPCC training in accordance with federal and state regulatory requirements.	EPA 40 CFR Part 112: Oil Pollution Prevention EPA Clean Water Act, Section 319: Nonpoint Source Management Program Colorado Department of Labor and Employment 7 CCR 1101-14: Storage Tank Regulations Colorado Water Quality Control Commission Colorado Revised Statutes 25-8-205: Control Regulations

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

specific petroleum storage information, list spill response resources, and minimize the impact of spills on adjacent waterways.		
Radiological Materials and Waste Management		
CFR Title 40, Protection of the Environment, Part 61, National Emission Standards for Hazardous Air Pollutants, Subpart H, “National Emission Standards for Emissions of Radionuclides Other Than Radon From Department of Energy Facilities,” requires the measurement and reporting of radionuclides emitted from DOE facilities and the resulting off-site dose from those emissions. DOE Order 458.1, Radiation Protection of the Public and the Environment, establishes radiation emission limits for DOE facilities, which must annually demonstrate compliance with EPA radiological air standards that limit emissions to amounts that would prevent any member of the public from receiving an effective dose equivalent of 10 millirem (mrem) per year or more. DOE Order 458.1 establishes requirements that must be followed when the release of any radiologically contaminated equipment or real property to another DOE national laboratory, collaborating agency, or outside entity is proposed. These requirements detail the measurable radiological levels that must be verified and documented to comply with DOE-authorized limits. DOE Order 435.1, Radioactive Waste Management, establishes requirements to ensure radioactive waste is managed in a manner that protects the health and safety of workers, the public, and the environment. This is accomplished by evaluating and planning for proposed activities that would generate radioactive waste and documenting all requirements before those activities are authorized to commence.	Program activities were in compliance with requirements. Small quantities (less than 2.0 yd^3 [1.5 m^3]) of low-level radioactive waste are in storage awaiting off-site disposal. In 2018, two chemical fume hoods and laboratory cabinetry were removed during decommissioning of the laboratory’s only low-level radioactive work area. Radiological sampling indicated the items were within limits for release and would not pose a hazard to workers, the public, or the environment. The items are being prepared for off-site disposal in accordance with DOE requirements. In accordance with 40 CFR 61, Subpart H, NLR submitted its Radionuclide Air Emissions Annual Report to the EPA to confirm that the laboratory is in compliance with air emissions standards. For 2025, the effective dose equivalent of radiation to the public was 0.040 mrem, which is far below the limit of 10 mrem per year. No property was either requested or authorized for clearance, or to be released for reuse or disposal.	40 CFR 61, Subpart H: Emissions of Radionuclides Other Than Radon From Department of Energy Facilities DOE Order 458.1: Radiation Protection of the Public and the Environment DOE Order 435.1: Radioactive Waste Management

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

NEPA		
NEPA requires federal agencies to analyze and disclose the potential environmental impacts of proposed federal actions and alternatives as part of its decision-making process. Under NEPA, DOE considers the potential impacts to the environment, including natural, social, and economic factors, to determine the appropriate level of review for a proposed action. These include categorical exclusions, environmental assessments, and environmental impact statements.	Program activities were in compliance with requirements. NEPA reviews were completed for multiple projects being planned, including a wave measurement buoy deployment, research installations on the Flatirons Campus, and uncrewed aircraft system flights.	33 CFR 230: Procedures for Implementing NEPA
Wildlife Management		
The Migratory Bird Treaty Act of 1918, as implemented by the U.S. Fish and Wildlife Service (USFWS), and the Damage or Destruction of Dens or Nests—Harassment of Wildlife statute as administered by the Colorado Division of Parks and Wildlife, address the protection of migratory birds. The Migratory Bird Treaty Act and its amendments implement several treaties between the United States, Canada, Mexico, Japan, and Russia. The act prohibits the taking, killing, or possession of migratory birds, nests, and eggs. The USFWS developed a system of permits for activities that involve the taking of migratory birds, including those governing scientific collection and bird banding, as well as lethal and nonlethal measures taken to prevent depredation of agricultural crops and to protect public health and safety. Under the memorandum of understanding between DOE and the USFWS (Regarding Implementation of Executive Order 13186, Responsibilities of Federal Agencies to Protect Migratory Birds), DOE agrees to integrate migratory bird conservation principles, measures, and practices into agency activities and to avoid or minimize adverse impacts on migratory bird resources and their habitats.	Program activities were in compliance with requirements. Potential wildlife impacts are considered for proposed projects and routine maintenance activities. Ground-nesting bird surveys were conducted before annual mowing, weed control operations, and various research projects at the STM Campus, the Flatirons Campus, and the STEP Campus in compliance with the Migratory Bird Treaty Act. To help reduce bird collisions with structures, various methods are evaluated for use, such as applying films or adhesives to window glass, using fritted window glass, adding bird diverters to power pole guy wires, adding motion sensors to interior and exterior lighting, down-shielding exterior lighting, and turning off interior lights at night.	USFWS 16 U.S.C. 703-712: The Migratory Bird Treaty Act Memorandum of Understanding Between DOE and the USFWS Executive Order 13186: Responsibilities of Federal Agencies to Protect Migratory Birds Colorado Division of Parks and Wildlife Colorado Revised Statutes 33-6-128: Damage or Destruction of Dens or Nests, Harassment of Wildlife

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

Within Colorado, no wildlife dens, nests, young, or eggs may be damaged or destroyed unless permitted by the Colorado Division of Parks and Wildlife. It is unlawful for any person to willfully harass wildlife, including birds.		
Endangered Species and Species of Concern		
Federal agencies are required to abide by the Endangered Species Act (ESA) to ensure their actions do not adversely affect species that are federally listed under the ESA as threatened, endangered, or candidate species. The ESA, which is jointly administered by the USFWS and the National Marine Fisheries Service, protects threatened and endangered wildlife and plant species and associated critical habitat. Additional federal and state laws and regulations, such as the Bald and Golden Eagle Protection Act, protect wildlife. DOE's formal consultation with the USFWS for the 2014 sitewide environmental assessments for the STM Campus and the Flatirons Campus resulted in an agreed-upon threshold for water usage to limit impacts to the Platte River system. The Colorado Division of Parks and Wildlife maintains a list of endangered, threatened, and wildlife species of concern for Colorado.	Program activities were in compliance with requirements. NLR supported DOE with informal consultation with USFWS that was completed for activities planned in designated critical habitat for the federally threatened Preble's meadow jumping mouse (*Zapus hudsonius preblei*). No threatened or endangered plant species were identified at the STM Campus, the Flatirons Campus, or the STEP Campus. Water usage at the STM Campus, STEP Campus, and Flatirons Campus were below the thresholds identified through the DOE and USFWS formal consultation.	USFWS 50 CFR 17: Endangered and Threatened Wildlife and Plants Colorado Division of Parks and Wildlife 2 CCR 406-10, Article 2: Endangered Wildlife Colorado Division of Parks and Wildlife 2 CCR 406-10, Article 3: Threatened Wildlife

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

Vegetation Management		
The Federal Insecticide, Fungicide, and Rodenticide Act, as implemented by the EPA, regulates the use, storage, and disposal of herbicides and pesticides. For application of certain types of herbicides designated as “restricted use” by the EPA, a certified applicator must be used. Under the Presidential Memorandum: Creating a Federal Strategy to Promote the Health of Honey Bees and Other Pollinators, a Pollinator Health Task Force was created to develop the National Pollinator Health Strategy to enhance pollinator habitat on federally managed lands and facilities and to incorporate pollinator health as a component of all future restoration and reclamation projects. In Colorado, the commissioner of agriculture develops and implements state noxious weed management plans for three categories of weed species. Class A plants are targeted for eradication. Class B species are subject to management plans designed to stop their continued spread. Class C species are subject to additional planning intended to support the efforts of local governing bodies to facilitate more effective integrated weed management. Executive Order 13112, Invasive Species, requires the control of invasive species at federal facilities. Importation of regulated plants and animals/organisms from other states and countries requires permitting by the Animal and Plant Health Inspection Service (APHIS) of the U.S. Department of Agriculture. NLR’s Biosafety Program manages the importation and use of these materials. The Colorado Natural Heritage Program has a list of rare species that is not regulatory in nature but is unique in that it is the only designation in addition to the ESA’s that considers rare plants.	Program activities were in compliance with requirements. Herbicides were applied to control Class A-, B-, and C-listed weeds in conjunction with other management methods, such as mowing and hand pulling on the STM Campus, STM Campus conservation easement, STEP Campus, and Flatirons Campus. When applying herbicides, a spot-spraying method is preferred to protect the health of bees (*Anthophila* spp.) and other pollinators. NLR acquired certified weed-free seed mixes to minimize the introduction of invasive weed species at its campuses. NLR held three active APHIS permits in 2025, one for *Panicum virgatum*, a microorganism found in switchgrass, one for *Populus tremula x Populus alba*, a microorganism found in poplar trees, and Sphingobium spp., a bacteria microorganism.	Executive Order 13112: Invasive Species Presidential Memorandum: Creating a Federal Strategy to Promote the Health of Honey Bees and Other Pollinators EPA 40 CFR 162: State Registration of Pesticide Products EPA 40 CFR 171: Certification of Pesticide Applicators Colorado Water Quality Control Commission 25-8-205: Noxious Weed Management, Municipal Authority U.S. Department of Agriculture 7 U.S. Code Ch. 61: Noxious Weeds U.S. Department of Agriculture Public Law 106-224: Agricultural Risk Protection Act of 2000 EPA 7 U.S. Code 136 et seq.: Federal Insecticide, Fungicide, and Rodenticide Act

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

Wetlands and Floodplains		
Wetlands became regulated under the 1972 amendments to the Clean Water Act. Wetlands that meet certain soil, vegetation, and hydrologic criteria are protected under Section 404 of the Clean Water Act, which is administered by the U.S. Army Corps of Engineers and the EPA. Executive Order 11988, Floodplain Management, requires federal agencies to provide leadership and take action to reduce the risk of flood loss; minimize the impact of floods on human safety, health, and welfare; and restore and preserve the natural and beneficial values served by floodplains. Under Executive Order 11990, Wetlands Protection, federal agencies must provide leadership and take action to minimize the destruction, loss, or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands. Counties protect floodplains by mapping 100-year floodplain boundaries within their jurisdiction in coordination with the Federal Emergency Management Agency. Counties then formulate regulations to control the type and amount of development within the designated boundary. In Colorado, Jefferson County requires approval of development proposed in floodplains within its jurisdiction.	Program activities were in compliance with requirements.	U.S. Army Corps of Engineers Clean Water Act Section 404: Permit Program Executive Order 11988: Floodplain Management Executive Order 11990: Protection of Wetlands DOE 10 CFR 1022: Compliance with Floodplain and Wetland Environmental Review Requirements
Cultural Resources		
Cultural resources are protected under Sections 106 and 110 of the National Historic Preservation Act, which is administered in Colorado by the Colorado Office of Archaeology and Historic Preservation and the State Historic Preservation Office. Federal agencies must establish preservation programs—commensurate with their mission and the effects of their activities on historic properties—that provide for the careful consideration of historic properties. Significant cultural	Program activities were in compliance with requirements. NLR completed an additional historic resource survey for a new water line linking Smart Reservoir on Rocky Flats National Wildlife Refuge to the Flatirons Campus. The survey was conducted by a local environmental consulting firm to identify any cultural resources prior to construction.	National Park Service 36 CFR 60: National Register of Historic Places National Park Service 36 CFR 63: Determinations of Eligibility for Inclusion in the National Register of Historic Places National Park Service 36 CFR 79: Curation of Federally Owned and Administered Archaeological Collections

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

resources are either eligible for or listed in the National Register of Historic Places. Cultural resources are defined as any prehistoric or historic district, site, building, structure, or object considered important to a culture, subculture, or community for scientific, traditional, religious, or other reasons.	Section 106 consultation was completed for multiple projects at STM.	National Park Service 36 CFR 800: Protection of Historic Properties 16 U.S.C. 470: National Historic Preservation Act State Historic Preservation Office 8 CCR 1504-7: Historical, Prehistorical, and Archaeological Resources

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

A chiller system inside of the ESIF on the STM Campus. *Photo by Dennis Schroeder, NLR 52250*

5 AIR QUALITY PROTECTION

NLR strives to protect air quality and the environment by:

- Minimizing air emissions from research and operations activities and employee commuting.
- Tracking and trending air emissions from on-site sources.
- Anticipating and meeting federal and state air emissions and permitting requirements. Emitted air pollutants include criteria pollutants (e.g., carbon monoxide, NO_x, volatile organic compounds, particulate matter [PM_{10} and $PM_{2.5}$], sulfur dioxide) and noncriteria pollutants (e.g., HAPs, GHG compounds, ODSs).

Minimizing air emissions generated by the laboratory contributes to the improvement of regional air quality, benefiting both neighbors immediately adjacent to laboratory facilities and those in the greater Denver metropolitan area. Laboratory staff members participate in project planning, safety evaluations, startup reviews, and operations activities to ensure permit and regulatory compliance and address air quality considerations.

5.1 Criteria Pollutants and Hazardous Air Pollutants

The primary sources of regulated pollutants at NLR are fuel use, chemical use, and facility operations. Specific sources include process heat boilers, process cooling systems, comfort heating and cooling systems, emergency generators, construction and maintenance equipment with gasoline or diesel engines, bench- and pilot-scale research activities, use of chemicals, facility operation, and maintenance activities. A summary of the estimated annual air pollutant emissions in 2025 is included in Table 2.

In late 2022, the EPA and state of Colorado reclassified the ozone nonattainment status of northeastern Colorado from “serious” to “severe,” which lowered the major source threshold for NO_x and volatile organic compound emissions from 50 U.S. tons (45.4 MT) to 25 U.S. tons (22.7 MT) per year. The reclassification requires NLR to obtain a Title V air permit for the STM Campus facility. The application for the Title V air permit was submitted to the APCD in November 2023. Issuance of the Title V air permit is pending and is expected in 2026.

Two diesel-fueled emergency generators were selected for installation at the new EMAPS facility on the STM Campus. Air modeling was conducted and provided to the APCD as part of the permit application’s submission. The construction permits were issued in 2025.

2025 Accomplishments and Highlights

- Supported the State of Colorado APCD preparation of the STM Campus’ Title V permit.
- Hosted the APCD for a stationary source inspection of the STM Campus. All records and operational practices were in conformance with permits. No issues were identified.

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

Table 2. Estimated Annual Air Pollutant Emissions Associated with the STM Campus, Flatirons Campus, and STEP Campus, U.S. Tons (and Metric Tons) Per Year, 2021–2025 [a]

Year	Criteria Pollutants					GHGs			HAPs
	CO	NO_x	VOC	PM_{10}	SO_2	CO_2	CH_4	N_2O	All HAPs
2021	7.65 (6.94)	15.43 (14.00)	0.70 (0.64)	3.14 (2.85)	0.42 (0.38)	10,389 (9,425)	0.34 (0.31)	0.25 (0.23)	0.52 (0.47)
2022	7.73 (7.01)	15.71 (14.25)	0.71 (0.64)	3.34 (3.03)	0.47 (0.43)	11,038 (10,014)	0.54 (0.49)	0.38 (0.34)	0.56 (0.51)
2023	7.67 (6.96)	15.50 (14.07)	0.71 (0.64)	3.21 (2.94)	0.46 (0.42)	10,550 (9,575)	0.51 (0.46)	0.38 (0.34)	0.54 0.49)
2024	6.23 (5.65)	10.44 (9.47)	0.54 (0.49)	2.15 (1.95)	0.51 (0.46)	9,386 (8,517)	0.41 (0.37)	0.96 (0.87)	0.40 (0.36)
2025	5.91 (5.36)	10.84 (9.84)	0.43 (0.39)	2.18 (1.98)	0.53 (0.48)	8,762 (7,949)	0.33 (0.30)	0.95 (0.87)	0.33 (0.30)

[a] CO: carbon monoxide; VOC: volatile organic compound; PM_{10}: respirable particulate matter less than 10 micrometers in diameter; SO_2: sulfur dioxide; CO_2: carbon dioxide; CH_4: methane; N_2O: nitrous oxide.

5.2 Refrigerants

Refrigerants such as chlorofluorocarbons and hydrochlorofluorocarbons are considered ODSs, have largely been banned from import into or manufacture in the United States, and are largely only available as recycled refrigerants. Non-ozone-depleting compounds such as HFCs, hydrofluoroolefins, and other EPA-approved alternative refrigerants are used to replace ozone-depleting refrigerants. Many HFC compounds are potent GHGs, and some EPA-approved alternates to HFC refrigerants are flammable or toxic compounds such as propane or ammonia.

NLR uses refrigerant-containing “appliances” (i.e., sealed units that do not normally emit refrigerants) such as comfort cooling systems, research environmental chambers and experimental equipment, and small appliances such as refrigerators, coolers, and air conditioners. NLR also conducts testing of appliances that use HFC and HFC-alternative refrigerants. These appliances contain various refrigerants in varying quantities. Emissions of refrigerants may occur either because of appliance leaks or during servicing activities. NLR follows state of Colorado and EPA regulations and strives to minimize the release of refrigerants.

There is increased interest by the EPA and state regulatory agencies to reduce the use of HFC refrigerants because of their high level of use and increased release to the atmosphere due to leaks. In November 2021, Congress enacted legislation that limits the use of HFCs in manufacturing. This legislation, now enacted as a rule by the EPA, mandates a reduction in HFC use starting in 2022 and progressively reducing its use to 15% of a 2011 baseline by 2036. On Sept. 23, 2024, the EPA finalized the Emissions Reduction and Reclamation Program that establishes maintenance and repair requirements for appliances containing 15 or more pounds (6.8 kg) of HFC refrigerants and sets allowable leak repair standards and recordkeeping requirements starting Jan. 1, 2026. This reduction in use does not require the retirement of existing appliances using HFC refrigerants. However, the availability of these refrigerants will decrease, and costs are expected to increase over the phasedown period. The rule is expected to lead to a future decrease in the laboratory’s use of HFC refrigerants as older equipment is replaced.

The refrigerant inventory process was revamped in 2025 to improve accuracy and tracking across all appliances. The updated process standardized data collection, documentation, and reporting workflows to support better compliance and operational oversight. This effort also expanded inventory coverage to include NLR’s Alaska campus, ensuring it is fully integrated into the program.

The inventory includes 138 appliances, 20 of which contain 50 or more lb (23 kg) of refrigerant and are subject to strict “leak and repair” requirements. At the end of 2025, the total inventory of all refrigerants was 9,351 lb (4,242 kg); of this amount, 320 lb (145 kg) were ODSs, and the remaining 9,031 lb (4,096 kg) were non-ozone-depleting HFC refrigerants that are GHGs.

Additional information about management of NLR’s air quality protection program can be found in Appendix A: Program Management.

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

A late afternoon rainstorm tested NLR's South STM Campus storm drainage and retention system. Water coming off the mountain passing between the Cafe and Research Support Facility. *Photo by Bryan Bechtold, NLR 80705*

6 WATER QUALITY PROTECTION

Water quality is critical to human health and the health of natural ecosystems. Water quality protection at NLR falls within four main areas: drinking water, groundwater, surface water, and wastewater. Additional information about program management for each area can be found in Appendix A. Program Management.

6.1 Drinking Water

The STM Campus and the Flatirons Campus are provided with potable drinking water by two different means.

STM Campus

The STM Campus is serviced by a municipal public water supplier, Consolidated Mutual Water Company, whose source water is primarily stormwater runoff and snowmelt from within the Clear Creek Watershed.

Flatirons Campus

The Flatirons Campus is not located within the bounds of a municipal public water supply distribution system; consequently, treated water is purchased from Denver Water and transported by truck to the campus. The treated water originates from rain and snowmelt from across 4,000 mi^2 (10,360 km^2) of mountains and foothills west of Denver. Water is trucked-in approximately 3–4 times per week and is then transferred to a holding tank with a capacity of 15,000 gallons (56,781 L). Water is pumped from the holding tank to a 2,000-gallon (7,571-L) day tank, where chlorine is added to boost disinfectant levels before the water is distributed to campus buildings (Figure 3 and Figure 4).

The state of Colorado issues a permit for the Flatirons Campus drinking water system. Weekly monitoring and periodic required sampling and analysis are conducted in accordance with the state of Colorado's annual monitoring plan. In 2025, monitoring results for residual chlorine and disinfectant byproducts levels were within allowable regulatory ranges (Figure 3 and Figure 4). Copper sampling was also conducted in November 2025, and all levels were below regulatory limits. Lead has not been detected in Flatirons Campus drinking water samples, which are collected annually. The lead and copper sampling schedule was reduced in December 2025 due to compliance with lead and copper levels at the Flatirons Campus, and the next lead and copper sampling will be conducted in 2028. Fecal coliform bacteria were absent from all monthly samples collected in 2025.

Construction kicked off in 2025 for the Flatirons Campus water system project. The project will deliver raw water from a nearby reservoir via a new 3-mile (4.8-km) pipeline. Once on campus, the raw water will be used to fill two new fire suppression water storage tanks and to feed a new drinking water treatment plant that will deliver potable water to campus buildings. The system will eliminate vulnerabilities associated with current trucked-in water and will provide sufficient fire suppression water storage for campus buildings. The project is slated to be completed in 2026, with final commissioning and transfer to new water supply in early 2027.

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

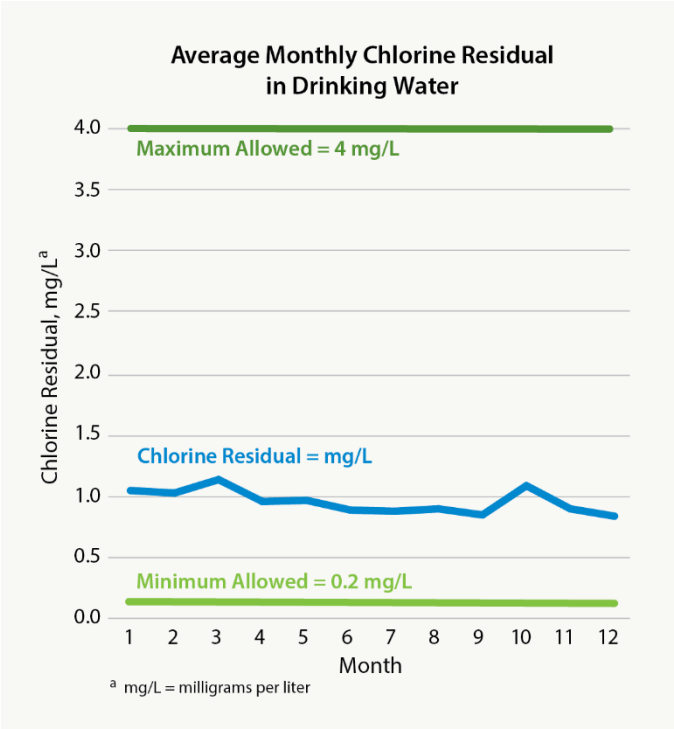


Figure 3. Results of average monthly residual chlorine monitoring in drinking water at the Flatirons Campus

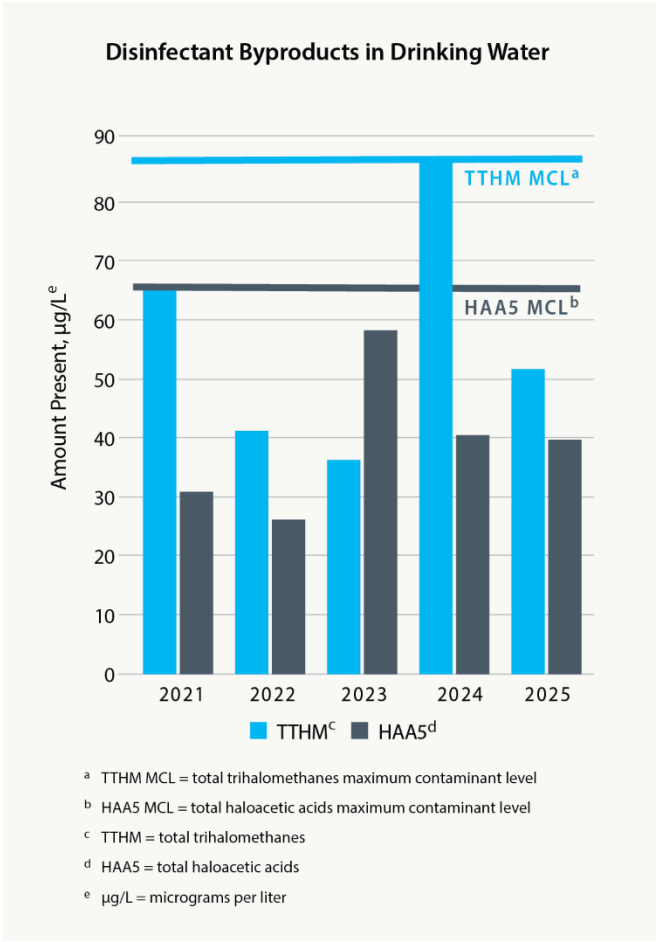


Figure 4. Results of disinfection byproduct concentrations in drinking water at the Flatirons Campus, 2021–2025

The construction of a new laboratory facility is a unique opportunity to incorporate “smart lab” principles. NLR’s Research and Innovation Laboratory facility incorporated these principles and included a reduction in water usage.

Photo by Josh Bauer, NLR 095548

6.2 Groundwater

The Denver Basin aquifer system underlies an area of approximately 7,000 square miles (1,812,992 hectares) that extends from Greeley south to near Colorado Springs and from the Front Range urban corridor east to near Limon. The aquifer system provides groundwater to urban, rural, and agricultural users. The aquifers within the larger aquifer system, which include the Dawson, Denver, Arapahoe, and Laramie-Fox Hills aquifers, form a layered sequence of rock in an elongated, bowl-shaped structural depression. The STM Campus, STEP Campus, and Flatirons Campus are located at the western edge of the Denver Basin aquifer system. The STM Campus and STEP Campus overlie the shallowest portions of the Denver, Arapahoe, and Laramie-Fox Hills aquifers. The Dawson formation is the shallowest of the Denver Basin aquifers and is the most relied upon by groundwater users in the basin. The northern extent of the Dawson aquifer is approximately 20 miles (33 km) south and east of the STM Campus and STEP Campus; consequently, wells drilled at any of the campuses would not intersect the Dawson aquifer, nor would a source of contamination affect the groundwater quality in this aquifer. Despite the low likelihood of contaminants reaching the Dawson aquifer, NLR’s groundwater management program is focused on controlling potential pollutant sources that could affect this important resource. The program includes careful evaluation of all outdoor projects to eliminate, substitute, or control potential sources of pollution.

There are currently no open, permitted monitoring wells at either the STM Campus or the Flatirons Campus. Two permitted closed-loop geothermal systems that were

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

installed as part of research activities are in operation at the STM Campus: one at the Solar Radiation Research Laboratory and one near the South Site Entrance Building. Three test boreholes were drilled to a depth of 800 feet (248 meters) on the STM Campus. These borings were installed to better understand the potential for developing a geothermal energy heat exchange system to provide heating and cooling to buildings on the STM Campus. Colorado's Division of Water Resources does not note any wells installed on the STEP Campus.

PFAS and Emerging Contaminants

Per- and polyfluoroalkyl substances (PFAS), a family of manufactured chemicals that have been used since the 1940s, have been identified as emerging contaminants of concern. PFAS are used in consumer products and industrial processes to repel oil and water, resist heat, and reduce friction.

Common applications include food packaging, household products (e.g., stain- and water-resistant carpets and fabrics), nonstick products, waxes, chrome plating, electronics manufacturing, and firefighting foam. Though many PFAS chemicals are no longer manufactured in the United States, they persist in the environment and have been detected in soil, groundwater, and drinking water supplies, prompting the federal government to begin developing PFAS standards and regulation, including the addition of several PFAS compounds to the Toxics Release Inventory under Section 313 of EPCRA. The state of Colorado has developed an action plan to further minimize PFAS contamination in the environment and subsequent risks to state residents. To date, the state of Colorado has completed the following major elements of the action plan:

- Banned PFAS-containing Class B firefighting foam used for testing or training.
- Facilitated sampling of approximately half of the state's public water systems, including groundwater and surface water bodies that serve as drinking water sources.
- Issued a PFAS narrative policy that describes how the state will implement narrative provisions until quantitative standards are developed.

NLR previously identified one 500-gallon (1,893-L) fire suppression system that contains a 3% PFAS solution within an aqueous film-forming foam (AFFF) at the STM Campus. The fire suppression system was evaluated, and it was determined that if the system were activated, the PFAS-containing AFFF would likely be contained within the building and there would be little possibility of a release to the environment. Replacing the system with a non-PFAS product would require replacing the tank and associated infrastructure; the removal of the tank with PFAS-containing AFFF has been added to a list of projects for future funding.

The STM Campus' detention basin collects stormwater in forebays that hold water and promote infiltration.
Photo by Chris Rolison, NLR 104487

6.3 Surface Water

Through its surface water program, NLR seeks to protect the quality of nearby waters into which the STM Campus, STEP Campus, and Flatirons Campus drain. These receiving waters include Lena Gulch at the STM Campus and the STEP Campus, and Coal Creek and Rock Creek at the Flatirons Campus. Sediment, debris, and chemicals transported to these water bodies via stormwater runoff could harm or kill fish and other wildlife either directly or by destroying aquatic and riparian habitat. High volumes of sediment could result in stream bank erosion and clogging of waterways.

Water quality protection is accomplished through compliance with federal and state stormwater permitting requirements, management of stormwater runoff flowing across active construction sites, inclusion of project design elements that promote infiltration and detention of stormwater, and management of NLR grounds to minimize erosion and support infiltration.

In December 2018, EPA Region 8 issued an MS4 permit to DOE for the STM Campus. This permit requires the development and implementation of programs to reduce

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

the discharge of pollutants in stormwater runoff from the site to the maximum extent practicable to protect water quality in Lena Gulch, the water body to which runoff from the STM Campus flows. An MS4 permit renewal application was filed in 2023, and issuance is expected in 2026. The programs must include the following elements, termed “minimum control measures”:

- Public education and outreach.
- Public involvement.
- Illicit discharge detection and elimination.
- Construction site runoff.
- Post-construction runoff.
- Good housekeeping.

Programs have been developed to address each of these control measures. These programs were implemented and further refined in 2025.

2025 Accomplishments and Highlights

- Implemented rock-hard armoring to stabilize sections of the central arroyo on the STM Campus, preventing continued erosion and reducing ponding and pool formation that could create maintenance safety hazards.
- Completed a maintenance project to remove sediment and vegetation from the detention pond forebays on the STM Campus, as well as large vegetation around the pond outlet to protect infrastructure from impacts caused by overgrowth.

6.4 Wastewater

Untreated or poorly treated wastewater can contaminate surface water and groundwater used for drinking water, irrigation, industrial, commercial, and recreational purposes. Most wastewater from the STM Campus and Denver West Business Park facilities flows into the Pleasant View Water and Sanitation District’s system, and ultimately to the Metro Water Recovery central treatment plant. Wastewater from the ReFUEL Laboratory also flows to this central treatment plant.

Primary nondomestic wastewater discharge is generated at the STM Campus’ IBRF, where research related to the production of bio-based products and fuels is conducted. Acids and bases are used in pilot-scale processes to convert cellulosic biomass into various fuels and chemicals. The effluent from these processes is adjusted to fall within the target pH range of 6–9 before being discharged into the sanitary sewer system. Neutralized waste from solar cell processing equipment at the STM Campus’ Science and Technology Facility (S&TF) is also directed to the sanitary sewer system. Boiler blowdown water from several buildings constitutes a third category of nondomestic wastewater discharge from the STM Campus. Pleasant View Water and Sanitation District’s system managers periodically tour the facility and review operational controls.

For facilities that lack sanitary service, four septic systems are in place, each consisting of a tank or multiple tanks and a leach field: one at the STM Campus mesa top Solar Radiation Research Laboratory and three on the Flatirons Campus. A preventive maintenance and inspection program is in place to confirm proper system function.

2025 Accomplishments and Highlights

- Provided wastewater discharge guidance to multiple researchers and site operations to ensure compliance with regulatory requirements. Support included reviewing proposed discharges, answering technical questions, and coordinating with operations to prevent improper releases.

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

Chemical lab pack drums are readied for shipment off-site. *Photo by Eric Schmitz, NLR 32739*

7 HAZARDOUS MATERIALS AND WASTE MANAGEMENT

Responsible acquisition, use, and disposal of materials and waste are critical to meeting regulatory compliance, preventing pollution, and caring for the environment. NLR seeks to purchase materials that contain recycled content and have low toxicity to reduce the environmental impact of the laboratory's waste streams.

Hazardous materials used on-site are thoughtfully controlled with internal procedures designed to limit health and environmental risks. Waste is carefully managed and disposed of through fully permitted facilities.

Areas of focus for the laboratory include:

- Hazardous materials management.
- Hazardous waste management.
- AST management.
- Spill prevention and response.
- Radiological materials and waste management.

Additional information about program management for each of these five areas of focus can be found in Appendix A. Program Management.

7.1 Hazardous Materials Management

Various chemicals and materials, some of which are hazardous, are used in research and maintenance activities at NLR facilities. Hazardous materials are stored, used, and managed in a manner that is protective of laboratory personnel, the public, and the environment. A hazardous materials management program is in place to guide and track the acquisition, use, and disposal of these materials; doing so accomplishes environmental protection through compliance with state and federal requirements.

Table 3 summarizes EPCRA reporting requirements that were met in 2025. The reporting requirements for each EPCRA section are defined in Section 4: Compliance Status.

Table 3. EPCRA Reporting by EPCRA Section in 2025

EPCRA Section	Description of Reporting	Status [a]
302	Planning notification	Not required
304	Extremely hazardous substance release notification	Not required
311	Safety data sheet notification	Not required
312	Tier II reporting	Reported
313	Toxics Release Inventory reporting	Not required

[a] "Not required" indicates NLR was not required to report because it did not meet the threshold, or it did not have an extremely hazardous substance release.

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

2025 Accomplishments and Highlights

- Relocated and configured used lithium battery collection areas to better align with International Fire Code.
- Replaced two large mercury-filled barometers located at the ReFUEL and Solar Radiation Research Laboratory facilities with modern technology. Elemental mercury presents a significant spill risk and poses an unnecessary hazardous materials liability. Their removal reduced the potential for mercury exposure, spill response incidents, and costly remediation efforts.

An NLR waste technician responds to a hazardous waste pickup call in the Solar Energy Research Facility at the STM Campus. Waste pickup calls allow researchers to quickly remove unwanted chemicals from their lab space.
Photo by Taylor Mankle, NLR 99730

7.2 Hazardous Waste Management

R&D activities and sitewide facility operations generate a variety of waste streams, some of which contain toxic chemicals or metals. NLR typically disposes of or recycles the following categories of waste:

- Hazardous waste (as defined by environmental regulations).
- Nonhazardous waste, such as used antifreeze and low-toxicity chemicals and containers including laboratory debris contaminated with chemicals (not including municipal solid waste, such as regular office trash).
- Universal waste, such as mercury-containing articles and lamps, batteries, aerosol cans, computers, hard drives, monitors, and research instrumentation containing electronic circuitry.
- Used oil.

Figure 5 provides an overview of the waste generated at NLR between 2021 and 2025.

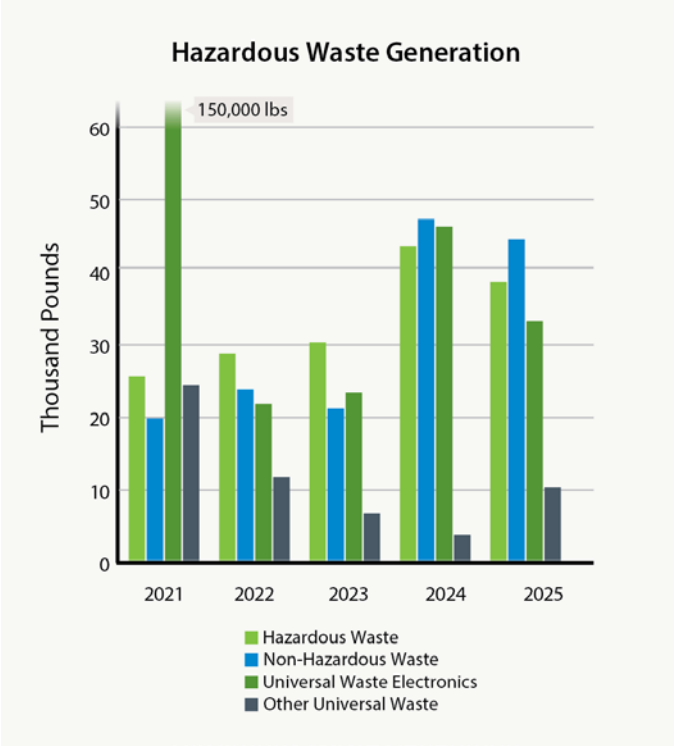


Figure 5. Comparison of four waste categories generated at NLR facilities by net weight, 2021–2025

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

Joint Compliance Inspection

In August 2025, a joint compliance inspection was conducted by the CDPHE's Hazardous Materials and Waste Management Division and the EPA which resulted in the issuance of a Compliance Advisory. While the report documented adherence with a majority of the state and federal regulations applicable to "large quantity generators" of hazardous waste, the inspection also identified the need to address shortcomings with program documents and noncompliance with rules regarding on-site container management. All issues were either immediately addressed at the time of the inspection or within the 30-day response time allotted by the corresponding Compliance Advisory. Final closeout of the inspection is anticipated sometime in the spring of 2026.

In response to the joint compliance inspection, a revised weekly central accumulation area inspection program was developed and implemented. This included creation of a standardized inspection checklist and an accompanying guidance document outlining regulatory requirements, inspection criteria, documentation procedures, and corrective action protocols. The updated process helps ensure that waste management staff consistently evaluate container condition, labeling, accumulation time limits, aisle space, secondary containment, and emergency preparedness equipment in accordance with applicable hazardous waste regulations. Formalizing the weekly inspection program strengthens oversight of central accumulation areas across NLR facilities, promotes early identification and correction of deficiencies, and supports continued regulatory compliance.

A spill cart inside lab space on the STM Campus. Spill response kits are strategically placed where spills might occur. Inside each spill kit contains a wide variety of oil-sorbent materials, which aid in spill response. *Photo by Rachael Boothe, NLR 106692*

2025 Accomplishments and Highlights

- Conducted excess chemical cleanouts at the STM Campus' FTLB, SERF, S&TF, IBRF and ESIF.
- Removed and disposed of 10,220 lb (4,636.7 kg) of nonhazardous fume hoods and associated ducting as part of the SERF laboratory renovation project. The project involved replacing aging fume hoods with upgraded units to improve laboratory safety, performance, and operational efficiency.
- Removed and disposed of nanomaterial-bearing HEPA filtration units from the SERF Penthouse laboratory exhaust system. After fulfilling their service life capturing engineered nanomaterials from laboratory fume hoods, the filters were characterized and managed as nonhazardous waste in accordance with federal and state regulations.
- Decommissioned and safely removed six legacy glass bubblers containing 5 lb (2.3 kg) of elemental mercury from the SERF. The bubblers were stabilized; containerized in compatible, sealed vessels with secondary containment; and managed under hazardous waste regulations. This effort supports the broader institutional initiative to systematically identify and eliminate mercury-containing devices across NLR facilities to reduce environmental risk, minimize long-term liability, and align with best management practices for pollution prevention and regulatory compliance.
- Worked with the Environmental Health and Safety department at the University of Colorado Boulder to learn from their hazardous waste management processes, including waste characterization, container management, and accumulation practices. This coordination allowed NLR to compare internal procedures with those of another local research institution and identify best practices for maintaining compliance with RCRA while improving overall program efficiency.

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

7.3 Aboveground Storage Tank Management

Appropriate tank management prevents or minimizes spills and leaks of petroleum that can contaminate soil, surface water, groundwater, and drinking water. Monthly, annual and interstitial inspections, including inspections for proper ullage of fuel, support the laboratory's commitments to environmental stewardship and pollution prevention.

NLR operates several petroleum-based ASTs, including:

- Thirteen on the STM Campus with a total capacity of 12,702 gallons (48,082 L).
- Eight on the Flatirons Campus with a total capacity of 2,418 gallons (9,153 L).
- One at Building 16 with a capacity of 500 gallons (1,893 L).

2025 Accomplishments and Highlights

- Brought into service a 600-gallon (2,227-L) standby diesel-fired electrical generator with an integrated AST at the Flatirons Campus CCF to guarantee uninterrupted power supply to the facility during unplanned outages.
- Expanded the AST program to include preventative management of unregulated underground collection tanks on campus, promoting proper maintenance and risk prevention.

7.4 Petroleum Spill Prevention and Response

Petroleum spills can contaminate soil, surface water, and groundwater, posing risks to ecosystems, wildlife, and human health. To mitigate spills and minimize environmental impact, SPCC plans are in place at the STM Campus, Flatirons Campus, and ReFUEL.

SPCC plans are not required for Building 16 and Golden Warehouse, as the total aboveground oil storage capacity remains below the regulatory threshold of 1,320 gallons (4,997 liters). SPCC plans are not required for the Washington, D.C., office or the Alaska facility, as petroleum is not stored at these locations.

NLR policy requires staff to report all spills internally, regardless of size, to track spill history, identify high-risk areas, and reinforce spill prevention awareness. In 2025, 15 spills totaling 16.05 gallons (60.75 L) were recorded. None were reportable to the EPA or the state of Colorado; no spills reached waterways, and all were promptly cleaned per NLR SPCC procedures. NLR remains committed to spill prevention, response training, and preparedness to minimize spill incidents and volumes.

Table 4. Petroleum Spills in 2025

Location: Description	Estimated Quantity (gal [L])
STM: EMAPS construction, 6 spills/leaks	11.9 (45)
STM: mobile equipment failures, 4 spills/leaks	1.4 (5.3)
FC; mobile equipment failures, 4 spills/leaks	2.5 (9.5)
FC; material handling, 1 spill	0.25 (0.95)

2025 Accomplishments and Highlights

- Installed two new petroleum spill kits at the Golden Warehouse and the Flatirons Campus. Strategically locating spill kits at these facilities enhances rapid response capabilities, supports timely containment and cleanup, and reduces the potential for environmental impacts across the laboratory.
- Conducted annual SPCC training for 84 employees. The training provides personnel with the knowledge and practical skills necessary to effectively prevent, respond to, and mitigate oil spills at NLR facilities. It also reinforces established spill response procedures and regulatory requirements, ensuring staff remain prepared to act promptly and appropriately in the event of an incident.

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

A hazardous waste collection area is in use at the Composites Manufacturing Education and Technology facility on the Flatirons Campus. *Photo by Werner Slocum, NLR 56889*

7.5 Radiological Materials and Waste Management

The laboratory uses a small amount of depleted uranyl acetate in electron microscopy staining. Several sealed sources are also present in analytical and process equipment, check sources, and emergency exit signs. Unlike many DOE facilities, NLR does not have legacy radiological contamination issues associated with past nuclear weapons production or research.

In 2017, NLR determined there was no longer a need to use low-level radiological isotopes as biological tracers in research. As a result, in 2018, the designated laboratory space where those activities occurred was decommissioned and remediated before being returned to use for non-radiological experiments. All laboratory items (e.g., personal protective equipment, glassware, isotopic standards, chemical fume hoods, laboratory benchtops, cabinets) removed during remediation remain on-site as preparations for final off-site shipment and disposal—in accordance with applicable state, federal, and DOE requirements—are completed.

Table 5 lists the total activity on-site and the estimated effective dose equivalent to a member of the public for the past 5 years.

Equipment and Real Property Clearance

DOE orders identify the requirements that must be followed when releasing any potentially radiologically contaminated equipment or real property (i.e., land and buildings) to another DOE national laboratory, collaborating agency, or outside entity. These requirements detail the measurable radiological levels that must be verified and documented to comply with DOE-authorized limits. Furthermore, internal NLR procedures prohibit the disposition of equipment unless it has been decontaminated to background levels. No equipment or real property was either requested or authorized for clearance to be released for reuse or disposal in 2025.

2025 Accomplishments and Highlights

- Implemented a new research microscopy staining technique for uranyl acetate, resulting in small amounts low-level radioactive solid waste compared to previous practices that generated both solid and liquid waste streams.

Table 5. Total Activity and Effective Dose Equivalent, 2021–2025 [a]

Activity	2021	2022	2023	2024	2025
Total activity (millicurie)	3.87	3.87	3.87	3.87	3.87
Effective dose equivalent (mrem/yr)	0.043	0.040	0.040	0.040	0.040

[a] The allowable effective dose equivalent limit for each year is 10 mrem.

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

What Is "Effective Dose Equivalent"?

To understand effective dose equivalent, dose and dose equivalent must first be defined:

- **Dose:** A generic term to describe the amount of radiation a person receives.
- **Dose equivalent:** A measure of the biological risk of the energy that the radiation deposits in tissue, which depends on the type of radiation and the tissues exposed; the units of dose equivalent are called rems, and a thousandth of a rem is called a millirem.
- **Effective dose equivalent:** The total of the dose equivalent to the organ or tissue multiplied by weighting factors applicable to each of the body organs or tissues that are exposed to radiation.

An average person in the United States receives about 620 mrem each year, half (310 mrem) from natural sources and another half (310 mrem) from human-caused sources of radiation, including medical procedures, consumer products, and industrial sources.[4]

[4] Learn more about radiation doses at the U.S. Nuclear Regulatory Commission's website: www.nrc.gov/about-nrc/radiation/around-us/doses-daily-lives.html.

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

The STM Campus' newest facility, EMAPS, is well underway on its construction. *Photo by Josh Bauer and Taylor Mankle, NLR 99492*

8 NATIONAL ENVIRONMENTAL POLICY ACT COMPLIANCE

NEPA serves as the national charter for protection of the environment, including natural, social, and economic impacts. NEPA requires the federal government to evaluate and understand the potential environmental impacts of a proposed action before resources—such as federal funds, properties, facilities, staff, and equipment—are committed. NEPA mandates that federal agencies weigh the potential for environmental impacts equally among all factors when making decisions about proposed actions.

In compliance with NEPA, NLR staff work with Golden Field Office federal staff to evaluate potential environmental impacts from a wide range of activities before funds are committed or work commences. The NEPA process represents an effective means for project managers, scientists, engineers, and other stakeholders to understand the potential environmental impacts of proposed activities and identify actions to minimize impacts. Additional information about NLR's management of its NEPA program activities can be found in Appendix A. Program Management.

2025 Accomplishments and Highlights

- Developed and implemented a NEPA SharePoint application to track the status of NEPA reviews and associated permits. This tool tracks NLR's NEPA projects and their associated agency consultations, creates automated alerts, and is a document library for NEPA determinations and associated documents.
- Updated procedures and training to clarify roles and responsibilities relating to permits, notifications, consultations, project duration changes, communication, and training.

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

Goldenrod soldier beetles (*Chauliognathus pensylvanicus*) have a mutually beneficial relationship with rabbitbrush (*Chrysothamnus* spp.). The beetles feed on the nectar and pollen of rabbitbrush flowers to pollinate the plant. Rabbitbrush's late-blooming yellow flowers also serve as a critical "meeting place" where beetles congregate to find mates in the early fall. The beetles also help pest control, acting as predators for small rabbitbrush pests, such as aphids. *Photo by Rachael Boothe, NLR 105939*

9 NATURAL AND CULTURAL RESOURCES PROTECTION

Natural resources at the STM Campus, the Flatirons Campus, and the STEP Campus are managed responsibly to ensure NLR's research needs are met while protecting native wildlife, vegetation, and cultural resources. Responsible management benefits not only the environment, but also NLR employees and the surrounding community. Management focuses on these key areas:

- Wildlife management.
- Endangered species and species of concern.
- Vegetation management.
- Wetlands and floodplains.
- Cultural resources.

Additional information about program management for these five areas can be found in Appendix A. Program Management.

9.1 Wildlife Management

Given the laboratory's location just east of the foothills of the Front Range, wildlife is plentiful at the STM, Flatirons, and STEP campuses.

NLR promotes responsible management of wildlife and habitat through periodic formal surveys and reviews of impacts to wildlife when designing and implementing projects. The original wildlife survey of the STM Campus was completed in 1987. Additional surveys were completed at the STM Campus in 1999, 2005, 2011, and 2017. A new survey of the STM Campus, including the STEP Campus, was conducted in 2025 with results pending.

An NLR employee works with a wildlife survey contractor to catch and release small mammal species on the Flatirons Campus. Wildlife and vegetation surveys are conducted once approximately every seven years at both the STM Campus and Flatirons Campus to better understand species presence and approximation of population density.
Photo by Ryan Borgmann, NLR 105944

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

Mammals identified in surveys of the STM Campus include mule deer (*Odocoileus hemionus*), elk (*Cervus canadensis*), coyotes (*Canis latrans*), bobcats (*Lynx rufus*), striped skunks (*Mephitis mephitis*), cottontail rabbits (*Sylvilagus* spp.), and various smaller mammals. More than 100 species of birds have been recorded by formal wildlife surveys and supplemental employee observations. At least seven raptor species have been recorded at or flying above the STM Campus, especially during spring migration. Two raptor species are residents at the STM Campus: the American kestrel (*Falco sparverius*) and the red-tailed hawk (*Buteo jamaicensis*). Owls that occupy the STM Campus include the great horned owl (*Bubo virginianus*) and northern pygmy owl (*Glaucidium californicum*). Reptiles and amphibians also inhabit the STM Campus; most notably, the prairie lizard (*Sceloporus consobrinus*) lives within the Colorado Amphitheater along rocky terrain within the STM Campus conservation easement.[5]

DOE prepared a biological characterization inventory in 1992 for the entire Rocky Flats Plant area, a former production site for nuclear weapons. The area includes the Flatirons Campus, which was part of the no-activity buffer zone of the Rocky Flats Plant at the time. Signs or tracks of bears (*Ursus americanus*) and mountain lions (*Puma concolor*) were identified. Approximately 20 species of birds were sighted at or near the Flatirons Campus at that time.

Raptor surveys conducted at the Flatirons Campus in 1994 and 1995 identified seven raptor species on or in the vicinity of the campus. An avian survey was again completed in 2003 and updated in 2011.[6] A 2023 survey included mammals, reptiles, and amphibians; results of that survey duplicated the 2016 survey that showed that various mammals including elk (*Cervus canadensis*), mule deer (*Odocoileus hemionus*), coyotes (*Canis latrans*), cottontail rabbits (*Sylvilagus* spp.), bobcats (*Lynx rufus*), several species of bats (*Chiroptera* spp.), deer mice (*Peromyscus maniculatus*), prairie voles (*Microtus ochrogaster*), and masked shrews (Sorex cinereus) continue to feed at and occupy the Flatirons Campus. Although they are seldom seen, Western (prairie) rattlesnakes (*Crotalus viridis*), bull snakes (*Pituophis catenifer*), yellow-bellied racers (Coluber constrictor), and several other reptiles are also known to occupy the Flatirons Campus. Amphibians, including boreal chorus frogs (*Pseudacris maculata*), Woodhouse's toad (*Anaxyrus woodhousii*), and northern leopard frogs (*Lithobates pipiens*), occupy ephemeral wetlands at the Flatirons Campus.

Complete lists of all wildlife species identified at the STM Campus (Table C-1) and the Flatirons Campus (Table C-2) are found in Appendix C: Wildlife Species Observed at the STM Campus and the Flatirons Campus.

NLR staff are trained to be cautious and informed on Western (prairie) rattlesnakes (*Crotalus viridis*), which live on South Table Mountain. Trained staff safely move snakes to protect both the snakes and employees on campus.
Photo by David Parsons, NLR 04068

Rattlesnake Safety and Research

Western (prairie) rattlesnakes (Cro*talus* viridis) are important to the native ecology of South Table Mountain and are commonly found on the STM Campus. Rattlesnakes can be found on campus in locations where human safety can be compromised by their presence, including, for example, doorways and equipment boxes. Staff are made aware to call NLR security to have rattlesnakes and any other type of snake removed. Security staff are trained to safely capture and relocate snakes to a safer location on the STM Campus.

NLR previously worked with a local environmental firm specializing in rattlesnake safety and research. From 2018, this firm trained NLR staff on snake ecology and taxonomy to minimize injuries to snakes and to increase safety awareness of responders during relocation activities. Additionally, the firm had been tagging relocated snakes with passive integrated transponder (PIT) tags to monitor snake movements and better understand their behavior. The capture location, date, and sex of the snake are recorded along with the PIT tag number. From 2018 to 2022, 27 rattlesnakes were given a PIT tag and relocated to safer locations on the STM Campus. Although snake tagging was discontinued in 2023, NLR environmental

[5] Walsh Environmental Scientists and Engineers LLC. 2011. *2010-2011 Vegetation and Wildlife Surveys at the National Renewable Energy Laboratory, South Table Mountain*. Jefferson County, CO.

[6] Tetra Tech EC Inc. 2011. *Avian Monitoring and Mortality Report: National Wind Technology Center*. Jefferson County, CO.

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

staff still check captured snakes for PIT tags to document recaptures.

2025 Accomplishments and Highlights

- Completed wildlife surveys at the STM and STEP campuses in 2025. The results from the surveys are being compiled and expected to be completed in 2026.
- Protected and corralled a skunk (*Mephitis mephitis*) that visited the STM Campus back to the mesa top to minimize interactions with staff.
- Rescued a trapped raccoon (*Procyon lotor*) from a dumpster on the STM Campus.
- Paused EMAPS construction activities to protect an American robin's (*Turdus migratorius*) nest. A plan was developed and implemented, which included establishing a buffer with signage around the area to help protect the nest and eggs.

9.2 Endangered Species and Species of Concern

The federal ESA provides the designation and protection of wildlife, fish, and plant species that are in danger of extinction and preserves the habitats on which these species depend. Compliance with the ESA ensures the laboratory's actions do not adversely affect threatened, endangered, or candidate species listed under the ESA. NLR also complies with Colorado Division of Parks and Wildlife restrictions related to endangered, threatened, and species of concern for Colorado, as well as the rare plant species listed under the Colorado Natural Heritage Program.

The USFWS, which administers the ESA, lists eight species that are threatened, endangered, or a candidate for listing that could potentially be found in Jefferson County or Boulder County. Of these species, two have the potential to occur at the STM Campus, the Flatirons Campus, or the STEP Campus: the Preble's meadow jumping mouse (*Zapus hudsonius preblei*) and the Ute ladies' tresses orchid (*Spiranthes d*iluvialis). In December 2020, the monarch butterfly (*Danaus plexippus*) was proposed for listing and is considered a candidate for listing. According to the USFWS's Information for Planning and Consultation database, an additional eight bird species listed as species of special concern, along with several other species on the state of Colorado's list of Species of Greatest Conservation Need, could also exist in Jefferson County or Boulder County.

In 2017, a survey of the STM Campus did not detect any threatened species, endangered species, or species of concern. In 2023, the Flatirons Campus survey revealed three state of Colorado Species of Greatest Conservation Need: the fringed myotis (*Myotis thysanodes*), little brown myotis (*Myotis lucifugus*), and northern leopard frog (*Lithobates pipiens*). Note that for a bird species to be counted as occupying the STM Campus or the Flatirons Campus, the bird cannot simply be flying over the campuses but must be stopping over or otherwise using habitat at the campus, such as by nesting or foraging.

The USFWS has designated critical habitat associated with the federally endangered Preble's meadow jumping mouse (*Zapus hudsonius preblei*) within the upper reaches of Rock Creek, including a small area at the southeastern corner of the Flatirons Campus. This area may not be disturbed without prior coordination with the USFWS.

A red-tailed hawk (Buteo jamaicensis) takes flight near the Flatirons Campus. Hawks, owls, eagles, and falcons are among the raptors that are frequently spotted on the NLR campus and protected by the Migratory Bird Treaty Act.
Photo by Werner Slocum, NLR 73599

Four species that occur in the Platte River watershed in Nebraska are listed by the USFWS as species that must be considered for Colorado and Wyoming projects that may deplete water supplies to the Platte River system. These include two birds (the piping plover [*Charadrius melodus*] and the whooping crane [*Grus americana*]), a fish (the pallid sturgeon [*Scaphirhynchus albus*]), and a plant (the western prairie fringed orchid [*Platanthera praeclara*]). As part of the STM Campus' and Flatirons

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

Campus' NEPA environmental assessments conducted in 2014, DOE consulted with the USFWS for future activities that have the potential to deplete water in the Platte River system.

2025 Accomplishments and Highlights

- Evaluated potential impacts to designated critical habitat for the Preble's meadow jumping mouse (*Zapus hudsonius preblei*) associated with security infrastructure upgrades at the southeast corner of the Flatirons Campus. The review assessed planned activities for potential effects to nearby Rock Creek riparian habitat and confirmed that the work could proceed while avoiding impacts to the federally protected species and its habitat.

9.3 Vegetation Management

Native plants have evolved over long periods of time in harmony with the local climate and surrounding soil, growing in association with microorganisms and resident wildlife to create diverse ecosystems. Through this evolution, native plants have developed natural defenses against pests and disease specific to their locale. Non-native plants introduced into an environment can overcome native plants, attract new types of pests and diseases, and outcompete native plants for nutrients and water. They can also deprive wildlife of nutrients and shelter. Plants such as kochia (*Bassia scoparia*), Canada thistle (*Cirsium arvens*e), Russian olive (*Elaeagnus angustifolia*), diffuse knapweed (*Centaurea d*iffusa), Dalmatian toadflax (*Linaria genistifolia* subsp. *dalmatica*), and myrtle spurge (*Euphorbia myrsinites*) are examples of non-native plants that can have destructive effects on natural habitats.

Vegetation management at NLR encompasses four main areas:

- **Native Landscaping:** Landscaped areas near NLR buildings and common areas are designed to incorporate features such as native plantings, xeriscape principles, and infiltration of stormwater to provide water and nutrients to landscape plants and recharge groundwater in the area. Adhering to designs with such features helps promote wildlife-friendly vegetation and reduces the introduction of non-native species and the pests and diseases that can accompany them. NLR actively manages the vegetation on its sites to maintain the native plant communities and manage wildfire risk.
- **Weed Management:** Where non-native species exist, NLR uses an integrated weed management approach that incorporates various types of weed control methods, including mechanical practices (e.g., mowing or hand pulling), cultural practices (e.g., reclamation of disturbed areas), prevention (e.g., limiting or eliminating driving off established roadways), biological practices (e.g., introducing state-approved insects and fungi that feed on specific weed species), and treatment using herbicides. For example, the laboratory has successfully used multiple control strategies to significantly reduce populations of diffuse knapweed (*Centaurea diffusa*) and Canada thistle (*Cirsium arvense*) on the STM, Flatirons, and STEP campuses. The weed control program maintains the flexibility needed to respond to changes in weed populations from year to year, and the program periodically assesses the effectiveness of the control methods it employs. Comprehensive sitewide weed surveys and mapping are performed approximately every 7 years. Smaller areas of NLR's main sites are assessed annually. The noxious weed species, as defined on the state of Colorado's noxious weed list, that have been identified at the STM Campus and the Flatirons Campus are listed in Table 6. The STEP Campus is expected to receive a vegetation survey with results on the campus's weed species and mapping during 2026.
- **Wildfire Risk Management:** Part of managing native vegetation at NLR is balancing the conservation and manipulation of the landscape to reduce wildfire risk. NLR has a fire management program that includes wildfire assessments, fire risk management, and identification of areas of wildland–urban interface. These areas are being managed to achieve and maintain defensible space around buildings and other infrastructure against wildland fires. Most fire management activities can be done in conjunction with other vegetation management activities, such as weed control. Annual assessments of defensible space are conducted for the STM, Flatirons, and STEP campuses.

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

- **Imported Plant and Organism Permits:** An additional component of NLR's vegetation management program relates to the periodic use of certain animal and plant materials in research at the laboratory. Certain organisms and plants that are obtained from other states or from outside the United States are controlled by APHIS. These might include the use of certain pathogenic organisms used in biomaterials research or plants such as sugarcane bagasse and other scrap agricultural products that are tested for their value in biofuels and biomaterial production. NLR held three active APHIS permits in 2025, one for *Panicum virgatum*, a microorganism found in switchgrass, one for *Populus tremula x Populus alba*, a microorganism found in poplar trees, and *Sphingobium* spp., a bacteria microorganism.

- An NLR environmental specialist releases knapweed weevils (*Cyphocleonus achates*) on diffuse knapweed (*Centaurea diffusa*) at the Flatirons Campus. These weevils help control noxious weeds by the use of biological controls prior to using herbicides. *Photo by Rachael Boothe, NLR 105940*

2025 Accomplishments and Highlights

- Applied herbicides to control B- and C-listed weeds on approximately 17.2 acres (7.0 hectares) at the Flatirons Campus. In addition, roadside mowing was employed to reduce the growth of Russian thistle (*Salsola* spp.), kochia (*Bassia scoparia*), and diffuse knapweed (*Centaurea diffusa*).
- Applied herbicides targeted to control the spread of Canada thistle (*Cirsium arvense*), diffuse knapweed (*Centaurea diffusa*), jointed goatgrass (*Aegilops cylindrica*), and myrtle spurge (*Euphorbia myrsinites*) in various locations across the STM Campus totaling approximately 5 acres (2 hectares).
- Applied herbicides to a 40-ft (12-m) width centered on the access road within the transmission line corridor on the Rocky Flats National Wildlife Refuge, as agreed via permitting between DOE and USFWS.
- Mechanically removed the prolific species rabbitbrush (*Chrysothamnus* spp.) within courtyards and along the outer perimeter buildings. Where they were considered too dense, individual plants were treated with herbicide once they grew back. These efforts balance growth with other native plants, landscaping, and fire risks while maintaining pollinator habitat.
- Conducted weed maintenance activities at the newly acquired STEP Campus in 2024. Weed management activities included a combination of hand pulling and herbicide applications within rock trim, around utility boxes, and in pavement cracks throughout the site. A total of 1.25 acres (0.51 hectares) were managed.

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

Table 6. Noxious Weed Species Identified at the STM Campus and the Flatirons Campus [a]

Noxious Weed Class	Species at the STM Campus	Species at the Flatirons Campus
Class A [b]	Myrtle spurge (*Euphorbia myrsinites*)	None identified
Class B [c]	Canada thistle (*Cirsium arvense*) Common teasel (*Dipsacus fullonum*) Dalmatian toadflax – broad-leaved (*Linaria genistifolia* subsp. *dalmatica*) Diffuse knapweed (*Centaurea diffusa*) Hoary cress (*Cardaria draba*) Houndstongue (*Cynoglossum officinale*) Jointed goatgrass (*Aegilops cylindrica*) Leafy spurge (*Euphorbia esula*) Musk thistle (*Carduus nutans*) Russian olive (*Elaeagnus angustifolia*) Scotch thistle (*Onopordum acanthium*)	Bull thistle (*Cirsium vulgare*) Canada thistle (*Cirsium arvense*) Common teasel (*Dipsacus fullonum*) Dalmatian toadflax – broad-leaved (*Linaria genistifolia* subsp. *dalmatica*) Diffuse knapweed (*Centaurea diffusa*) Hoary cress (*Cardaria draba*) Leafy spurge (*Euphorbia esula*) Moth mullein (*Verbascum blattaria*) Musk thistle (*Carduus nutans*) Sulfur cinquefoil (*Potentilla recta*)
Class C [d]	Common mullein (*Verbascum thapsus*) Downy brome (cheatgrass) (*Bromus tectorum*) Field bindweed (*Convolvulus arvensis*) Poison hemlock (*Conium maculatum*)	Chicory (*Cichorium intybus*) Common mullein (*Verbascum thapsus*) Common St. John's wort (*Hypericum perforatum*) Downy brome (cheatgrass) (*Bromus tectorum*) Field bindweed (*Convolvulus arvensis*)

[a] Species identified reflect the findings of sitewide weed surveys performed in 2011 at the STM Campus and in 2023 at the Flatirons Campus.
[b] Identified by the state of Colorado for eradication.
[c] Identified by the state of Colorado to stop the spread.
[d] Identified by the state of Colorado to more effectively manage on private and public lands through education, research, and biological control resources.

Stormwater runoff from the Flatirons Campus and Coal Creek creates a wetland pond just north of the northern boundary of the Flatirons Campus. This pond serves as habitat for various species on campus, including the northern leopard frog (*Lithobates pipiens*).
Photo by Dennis Schroeder, NLR 56165

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

9.4 Wetlands and Floodplains

Wetlands are lands that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support the prevalence of vegetation typically adapted for life in saturated soil conditions. Wetland areas typically take the form of swamps, marshes, bogs, and groundwater seeps, and they are frequently within or adjacent to floodplains. Floodplains are land areas adjacent to rivers and streams that are subject to recurring inundation.

Both wetlands and floodplains play a key role in providing floodwater storage, reducing flood flow rate, filtering floodwater, and recharging groundwater. The resulting enriched floodplain soils promote the growth of wetland and riparian vegetation that provides habitat for a rich diversity of terrestrial and aquatic plants and animals. NLR strives to conserve the important natural functions of its wetlands and floodplains, regardless of size or extent, to protect the physical, biological, and chemical integrity of receiving waters and riparian areas on and adjacent to the STM Campus, the Flatirons Campus, and the STEP Campus.

Floodplains vary in extent from those that can contain more frequent low-volume rain event flows to those that can contain a 100-year flood event or greater. In general, stream channels at NLR sites are better characterized by the former description, as there are no 100-year floodplains as defined by Jefferson County or the Federal Emergency Management Agency on NLR sites.

A field investigation conducted within the middle drainage portion (Figure 6) of the STM Campus in 2019 identified approximately 1.7 acres (0.69 hectares) of non-jurisdictional wetlands within the study area. These areas, which comprise both palustrine emergent wetlands and palustrine scrub-shrub wetlands, are summarized in Table 7.

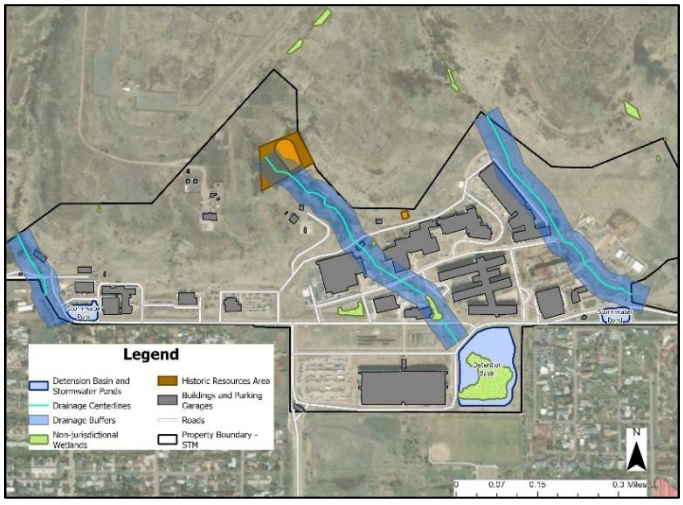


Figure 6. STM Campus main drainages

Table 7. STM Campus Middle Drainage Wetlands Summary

Cowardin Classification	Area (acres [hectares])
Non-Jurisdictional Areas	
Palustrine emergent wetland	0.12 (0.05)
Palustrine emergent wetland and palustrine scrub-shrub wetland	1.58 (0.64)

A field investigation conducted within the Flatirons Campus in 2020 identified approximately 7.53 acres (3.05 hectares) and 2,142 ft (653 m) of jurisdictional and non-jurisdictional wetland areas. These areas, which include palustrine emergent wetlands and an ephemeral stream channel, are summarized in Table 8.

Table 8. Flatirons Campus Wetlands Summary

Cowardin Classification	Area (acres [hectares])	Length (ft [m])
Jurisdictional Areas (Waters of the United States)		
Palustrine emergent wetland	2.03 (0.82)	—
Non-Jurisdictional Areas		
Palustrine emergent wetland	5.50 (2.23)	—
Ephemeral stream channel	—	2,142 (653)

A formal wetland delineation has not been conducted at the STEP Campus since DOE took ownership of the land in 2023.

2025 Accomplishments and Highlights

- Monitored the northeastern portion of the Flatirons Campus where a rock dam was installed in 2024 within an eroded wetland channel. The efforts have shown to be effective in minimizing further erosion and improving water quality associated with the downstream waters associated with Coal Creek. Future improvements are expected in 2026.

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

A firing line from Camp George West was preserved and relocated as a part of the STM Campus parking garage and south entrance project. *Photo by Robert Smith, NLR 25492*

9.5 Cultural Resources

Cultural resources are defined as any prehistoric or historic district, site, building, structure, or object considered important to a culture, subculture, or community for scientific, traditional, religious, or other reasons.

Much of the land currently occupied by the STM Campus was once part of Camp George West, a military facility operated by the Colorado National Guard from 1903 through the early 1930s. Several formal surveys of historical and cultural resources have been performed on the STM Campus. Although formal cultural resource surveys did not identify any significant archaeological sites,[7] significant historical resources were identified and recommended for further research and documentation. Three historical resources have been identified as significant cultural resources[8] that should be preserved under the Archeological and Historic Preservation Act of 1974. These three resources, which were constructed in the 1930s and early 1940s during the Works Progress Administration era, include:

- An open-air amphitheater.
- A stone bridge spanning a natural drainage channel adjacent to the amphitheater.
- A stone and concrete ammunition bunker south of the amphitheater.

Through NLR's efforts, these structures have been added to the National Register of Historic Places, with the amphitheater and stone footbridge being listed together as a single resource. Additionally, a portion of the STM Campus south of Denver West Parkway lies within the 98-acre (40-hectare) Camp George West Historic District.

Like the STM Campus, the STEP Campus is within the boundary of former Camp George West. As such, activities at the STEP Campus could have the potential to disturb cultural resources. The mess halls (building numbers 12–26), pedestrian underpass, orderly rooms (building numbers 96–97), and three tent pad structures are listed in the National Register of Historic Places. STEP Campus features also contribute to the overall character of the Camp George West Historic District, which is also listed in the National Register of Historic Places.

A formal survey of the Flatirons Campus conducted in 1995 did not identify any additional significant historical or archaeological resources.[9]

2025 Accomplishments and Highlights

- Completed an additional cultural resources survey in preparation for the planned Flatirons Campus water system project, which will bring water to the campus from Rocky Flats Lake. No new historical resources were identified.
- Developed a cultural resources consultation procedure.

[7] S.M. Nelson. 1980. *Historic and Prehistoric Resources, South Table Mountain, Golden, Colorado*. University of Denver Department of Anthropology. A Literature Search, Survey, and Evaluation conducted for the Heritage Conservation and Recreation Services, U.S. Department of the Interior under an Inter-Agency Service, Denver Office.

[8] W.B. Butler. 1992. *Archeological Survey of Camp George West and the Works Progress Administration South Table Mountain Basalt Quarries, Jefferson County, Colorado*. Camp George West (Phase I) Department of Defense Legacy Resource Management Program, DOD Project 60.

[9] Labat-Anderson Inc. 1995. *Archaeological Assessment of the National Wind Technology Center*.

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

Preparation and early construction have begun creating the new Jefferson County Open Space public trail through the trail easement on the STM Campus. *Photo by Rachael Boothe, NLR 105945*

10 CONSERVATION EASEMENT

In 1999, DOE granted Jefferson County a conservation easement of 177 acres (72 hectares) at the STM Campus. In early 2023, the state of Colorado, Jefferson County, and DOE finalized a land swap that granted DOE ownership of what is now the STEP Campus. As part of the land swap, DOE exchanged the majority of its land on the mesa top that was under a conservation easement to Jefferson County for use as open space. The remaining portion of DOE land under conservation easement (Figure 7) is now 19 acres (7.7 hectares).

A baseline inventory of the property was prepared in 1999 to document the condition of the easement property and to assess its conservation value.[10] The baseline inventory includes descriptions of the geographical setting and adjacent property owners, access and use of the property by the public, and the existing environmental conditions of the property (including geology, hydrology, vegetation, wildlife, and cultural resources). Vegetation within the easement area includes grasslands interspersed with shrubland communities and trees, primarily in the drainages. Several seeps also occur throughout the area.

The easement helps preserve the natural character of the property, including its visual, biological, and recreational resources. The goals of the easement are to:

- Retain, preserve, and protect natural, scenic, ecological, and historical resources.
- Protect the ecosystem and provide sustainable habitat for diverse vegetation and wildlife.
- Ensure the scenic and biological integration with adjoining open space land.
- Prevent further industrial, commercial, or residential development.
- Preserve the property as open space.

Local policies established by Jefferson County, the city of Golden, and the city of Lakewood reflect community sensitivity about the visual qualities provided by natural resources in the area around the STM Campus. Specifically, the Jefferson County General Land Use Plan characterizes North Table Mountain and South Table Mountain as “unique landscapes” and states that “maintaining landscapes that have a unique visual quality” is key to maintaining the quality of life in Jefferson County.

Jefferson County Open Space maintains two formal trails that cross the conservation easement property and connect Denver West Parkway (near the STM Campus east entrance) to the trails on the mesa top. NLR staff, DOE staff, and the public use these trails frequently. Each year, at least one visual inspection of the conservation easement property is conducted to identify management activities needed to address erosion, weed management, trail conditions, or other issues that may exist.

[10] U.S. Department of Energy Golden Field Office. 1999. *National Renewable Energy Laboratory Site Conservation Easement Baseline Inventory*. Golden, Colorado.

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

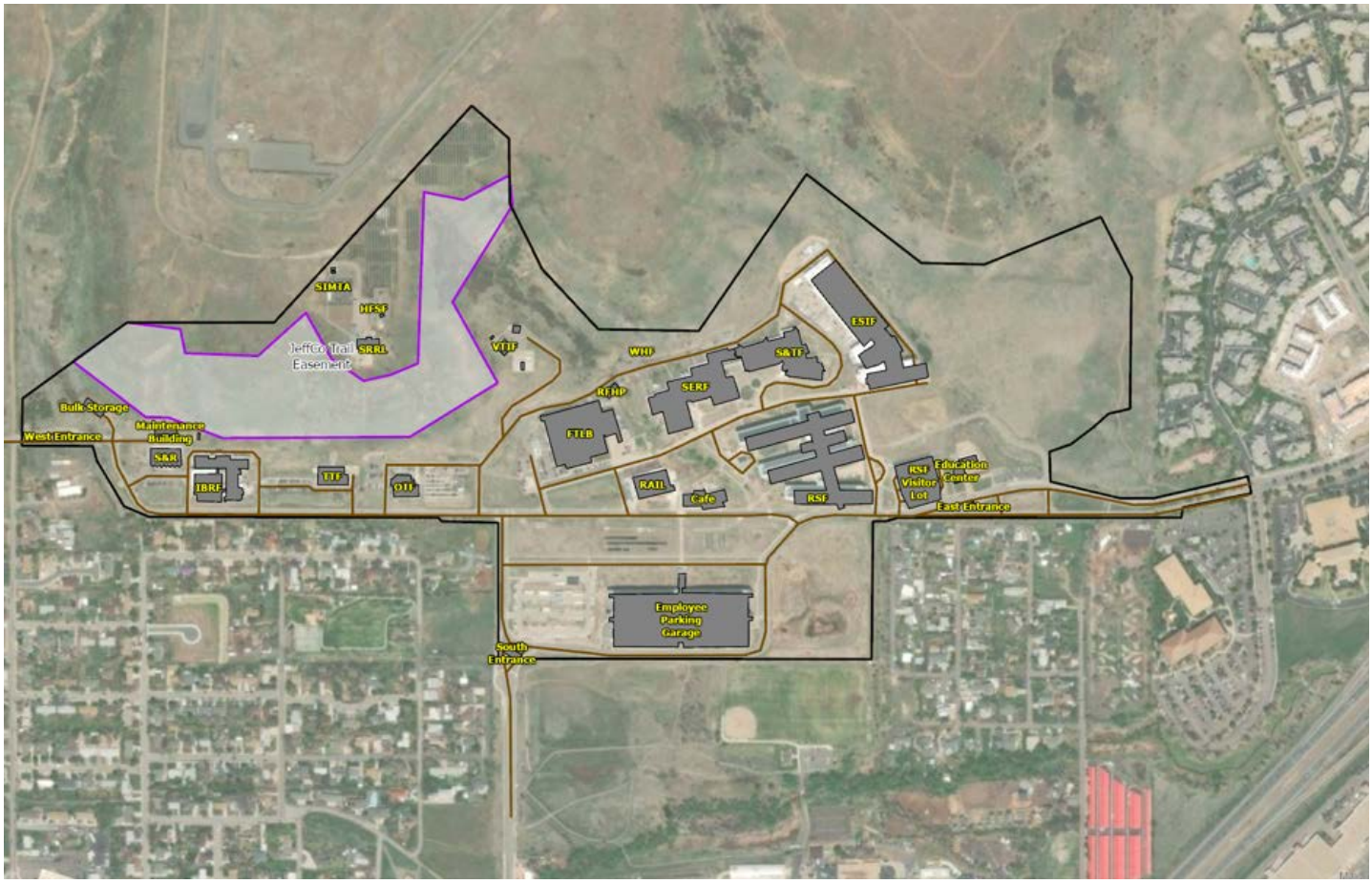


Figure 7. STM Campus boundary (black outline) and conservation easement (purple outline)

2025 Accomplishments and Highlights

- Monitored construction of a new trail across the STM Campus' trail easement. Trail construction was developed, planned, and executed by Jefferson County Open Space with coordination from NLR staff to protect trail users' safety and NLR resources.

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

A double-exposed film photo of the STM Campus' RSF with the EMAPS construction crane. *Photo by Rachael Boothe, NLR 105943*

APPENDIX A. PROGRAM MANAGEMENT

This appendix provides additional information about how NLR manages the environmental programs and activities described in the body of the report. For information about the laboratory's performance in a given area, refer to the specific section in the body of the report for that area.

EMS

NLR's EMS is implemented by:

- Establishing environmental policies and programs that guide site operations (including research and site development) and maintenance; these policies and programs undergo regular reviews and updates in pursuit of continuous improvement.
- Identifying and complying with federal laws and regulations, state and local requirements, executive and DOE orders, and standards.
- Identifying environmental stewardship goals and performing regular planning to achieve them.
- Verifying worker competence with regard to environmental requirements through various training programs.
- Communicating within the laboratory to unify staff on environmental strategy and application.
- Communicating with surrounding communities and regional agencies to collaborate on environmental goals.
- Maintaining accurate document records and controls.
- Monitoring and performing corrective actions.
- Conducting internal and external program assessments.
- Maintaining adherence to the ISO 14001 standard.

For information and current performance in this area, see Section 2: Environmental Management System.

Pollution Prevention

The laboratory prevents pollution by implementing environmental and resource optimization programs that cover waste management and minimization, hazard identification and control, energy conservation, efficient purchasing, transportation, water conservation, and optimized building operation and maintenance.

For information and current performance in this area, see Section 2.2: Pollution Prevention.

Resource Optimization

The resource optimization efforts at NLR address multiple areas, including GHG management and reduction, high-performance sustainable buildings, energy efficiency, renewable energy, water management, fleet management, waste management and reduction, efficient procurement processes, climate change resiliency planning, community engagement, and changes in employee culture.

NLR addresses resource optimization using an integrated and holistic approach. For example, NLR is committed to the design, operation, and maintenance of high-performance and efficient buildings by employing building design and operation strategies that promote optimal performance and maximize life cycle asset value. NLR can leverage a variety of expertise and experience to integrate resource optimization operations throughout the laboratory to improve performance and resilience.

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

In addition, NLR's Intelligent Campus program works closely with researchers throughout the laboratory to continually develop partnerships that support NLR's mission while improving facility operations.

For general information and current performance in this area, see Section 3: Resource Optimization.

Resilience

NLR's resilience efforts are designed to (1) anticipate, prepare for, and adapt to a myriad of climate conditions and (2) withstand, respond to, and recover rapidly from disruptions through adaptable and holistic planning and technical solutions. To accomplish these objectives, the laboratory has developed a list of actions to manage short- and long-term risks. Each year, the laboratory works to make progress on these action items.

For information and current performance in this area, see Section 3.2: Resilience Planning.

Air Quality

For general information and current performance in this area, see Section 5: Air Quality Protection.

Criteria Pollutant and HAP Permitting

The laboratory maintains an air emissions inventory to track potential emissions and identify whether future notification and permitting could be required for a particular facility or activity. Projected emissions for new infrastructure projects and research experiments are evaluated, and air emissions reporting and permitting are performed as required.

NLR maintains air permits issued by the state of Colorado for "minor" sources (e.g., standby electrical generators, building comfort heating systems, pollution control systems, and certain research activities) that are subject to permit and compliance requirements.

The laboratory has in place a fugitive particulate emissions permit for the STM Campus that was originally required for construction activity over the last several years. This permit has been maintained because of the need for new construction activity. The permit requires certain fugitive emission controls during earth-moving activities to minimize associated particulate emissions, such as applying water, limiting driving speeds, pausing construction activities in periods of high winds, and stabilizing stockpiled soils. To further minimize the generation of airborne particulates, NLR uses a non-sand deicer to maintain roadways. Avoiding road sanding minimizes potential fugitive particulate emissions from snow removal operations and contributes to improved air quality for neighbors. This meets the Denver metropolitan area's requirement to control particulate matter emissions from on-site vehicle traffic. NLR submits an annual report to Colorado detailing how NLR complies with required particulate control and how deicer is used, and confirming sand is not used on NLR roadways.

For information and current performance in this area, see Section 5.1: Criteria Pollutants and Hazardous Air Pollutants.

GHG Emissions Tracking and Permitting

Permitting and reporting of GHGs are not currently required for NLR facilities, as their emissions are below EPA permitting and reporting thresholds. The EPA requires that CO_2e GHG emissions (from any source greater than 27,500 U.S. tons [25,000 MT] per year) be reported to the EPA annually. The EPA also requires that a major source of criteria pollutants include CO_2e emissions in the major source permit if CO_2e emissions exceed 75,000 U.S. tons (68,000 MT) per year. The STM Campus is a "minor" source for most criteria air pollutants and is classified as a "major" source for NO_x emissions. CO_2e emissions for all NLR campuses are lower than both aforementioned limits, and therefore GHG and CO_2e reporting are not required.

Certain GHGs are essential for safe operation of certain equipment. As an example, sulfur hexafluoride, a potent GHG, is used in certain high-voltage or high-amperage electrical equipment as a dielectric gas. Such use may include circuit breakers, particle accelerators, some electron microscopes, and similar equipment. NLR maintains an equipment and gas inventory of equipment using sulfur hexafluoride and reports to DOE sulfur hexafluoride released to the atmosphere resulting from leaks or equipment failures.

For information and current performance in this area, see Section 5.1: Criteria Pollutants and Hazardous Air Pollutants.

Refrigerant Management

The EPA and state of Colorado regulate refrigerants to reduce emissions of these compounds to the atmosphere. The NLR refrigerant management program is intended to achieve that goal.

Management of refrigerants includes ODSs and HFC substances. This is accomplished by maintaining a detailed inventory of refrigerants and appliances containing more than 1 lb (0.45 kg) of any refrigerant. The inventory identifies (1) equipment that is subject to end-of-life disposal requirements, (2) larger appliances containing ODSs that are subject to specific detailed repair and documentation standards for ODSs, and (3) larger HFC-containing appliances that are subject to EPA-specific HFC repair and documentation standards. NLR's management of refrigerants requires:

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

- Certification of repair technicians in accordance with EPA requirements.
- Recovery of refrigerants before equipment repair and/or disposal.
- Reuse or recycling of refrigerants.
- Use of specific repair procedures.
- Use of the smallest quantity and least harmful refrigerants possible, consistent with efficient research and facility operations.

NLR follows, to the extent practicable and consistent with research requirements, the requirements, guidelines, and suggestions of the EPA Significant New Alternatives Policy Program, which recommends substituting refrigerants that have low or zero impact on air quality.

For information and current performance in this area, see Section 5.2: Refrigerants.

Water Quality

For general information and current performance in this area, see Section 6: Water Quality Protection.

Drinking Water

Treated drinking water is provided to the STM Campus by Consolidated Mutual Water Company, a municipal water provider. Because of this, NLR does not have direct control over drinking water quality. However, NLR does maintain the integrity of the on-site distribution system and notifies Consolidated Mutual Water Company of any drinking water quality issues or complaints.

When treated municipal water is hauled to the Flatirons Campus, chlorine is added to achieve proper disinfectant levels at the points of use. Drinking water quality is maintained and protected through water quality testing as specified by the monitoring plan CDPHE issues each year. The plan identifies which tests are to be performed and at what frequency.

Monthly tests are required for bacteria and disinfectant levels. Testing for disinfection byproducts (haloacetic acids and trihalomethanes) is completed annually; lead and copper testing is completed every 3 years.

For information and current performance in this area, see Section 6.1: Drinking Water.

Groundwater

To protect groundwater quality, NLR carefully evaluates all outdoor projects to eliminate, substitute, or control potential sources of pollution. If any materials are used that pose a risk to groundwater, the laboratory incorporates safeguards such as secondary containment, double-walled tanks, leak detection, and collection and off-site disposal of concrete wash water.

When the laboratory conducts activities that could impact groundwater, NLR implements its monitoring program. Occasionally, groundwater wells may be installed and monitored to obtain water level data needed for construction or building maintenance purposes.

For information and current performance in this area, see Section 6.2: Groundwater.

Surface Water

Surface water bodies to which NLR sites drain are protected by a management program that focuses on construction site runoff and outdoor research and maintenance activities.

For all construction projects, NLR implements an interdisciplinary planning and design process that includes a NEPA review and assessment of design documents for potential impacts to stormwater and its receiving waters. Design teams are encouraged to incorporate low-impact design elements that promote infiltration and evapotranspiration. NLR continues to evaluate site conditions during construction for opportunities to reduce runoff volume and enhance runoff quality.

Erosion and sediment controls, proper chemical storage, fueling procedures, and good housekeeping practices (e.g., prompt cleanup of drips and incidental vehicle and equipment spills) are implemented during construction according to the stormwater management plans developed by contractors and reviewed by NLR staff. These documents are developed and reviewed for EPA-permitted sites, as well as construction sites that do not require an EPA permit. Though construction projects that disturb less than 1 acre (0.40 hectares) are not regulated by the EPA, and they typically involve minimal disturbance within a short time frame, such projects still have the potential to contribute pollutants to stormwater runoff. These projects follow elements of the NLR stormwater pollution prevention program, including the development of a site-specific erosion and sediment control plan.

Contractors and staff conduct regular inspections throughout construction to verify that the required controls are functioning properly. Any repairs or modifications to the plans are documented on an inspection report; prompt actions are required to correct any noncompliant conditions.

NLR manages areas outside active construction sites to minimize erosion, promote infiltration of rainwater and snowmelt, and prevent possible contamination of stormwater from exposure to materials stored outdoors. These objectives are accomplished by landscaping with native materials, revegetating site areas that have

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

experienced a loss of vegetative cover, incorporating "low-impact development" elements in NLR design guidelines for new construction and redevelopment, and storing materials with the potential to contaminate stormwater either indoors or under cover.

The STM Campus operates under an EPA MS4 permit that became effective in December 2018. During the first 5-year permit term, programs have been developed that are needed for compliance with the permit's six minimum control measures. The programs will be implemented in subsequent permit terms. The second MS4 term has been applied for, and the current permit has been administratively extended.

For information and current performance in this area, see Section 6.3: Surface Water.

Wastewater

The wastewater management program at NLR is multifaceted and encompasses activities across all NLR sites and facilities, from using "green" cleaning supplies to minimizing the use of harmful chemicals in laboratory operations. The program addresses the requirements of Metro Water Recovery, which receives and treats wastewater from the STM Campus and STEP Campus. The program also addresses disposal of wastewater from STM Campus mesa top facilities and from the Flatirons Campus, which must comply with state and county health department requirements.

NLR has design guidelines for construction of new buildings and refurbishment of existing buildings to minimize the possibility of a hazardous material discharge. Examples of these requirements include measures to preclude inadvertent spills to sink drains, prohibition of floor drains in laboratory areas unless a specific need can be shown, and mandatory caps for floor drains installed in laboratory areas. New research and operations activities, as well as ongoing activities that undergo significant modifications, are reviewed through NLR's risk assessment process for their potential effect on wastewater. Regular training on appropriate rinsing and disposal practices when dealing with hazardous chemicals is provided to laboratory staff.

For information and current performance in this area, see Section 6.4: Wastewater.

Hazardous Materials and Hazardous Waste Management

For general information and current performance in this area, see Section 7: Hazardous Materials and Waste Management

Hazardous Materials Management

In addition to EPCRA reporting obligations, a cornerstone of NLR's hazardous material management program is its laboratory-wide chemical management system. The system serves as a centralized chemical inventory and is a valuable tool for managing and reporting chemicals used at the laboratory. Using a barcoding system, the chemical management system tracks chemicals from point of receipt through end use and disposal. The system also contains technical data and reporting information for many of the chemicals in the chemical management system's database. Key functions of the system include:

- Providing current inventories by room, building, and campus.
- Providing access to chemical safety data sheets.
- Improving research efficiency and minimizing hazardous waste generation by allowing staff to determine whether needed chemicals are already available on-site before purchasing them.
- Providing quick access to chemical inventories and hazard information during emergency responses.
- Facilitating accurate and efficient reporting to external agencies (e.g., fire districts, state and local emergency response agencies, EPA, DOE).

The chemical management system tracks chemical amounts, locations, and hazards, which helps NLR rigorously manage hazardous materials. Researchers and safety personnel ensure chemicals are properly stored in locations suitable for their hazards (e.g., storing flammable materials in designated flammables cabinets).

When requested by the state and local emergency response agencies or local fire departments, additional emergency response and reporting information is provided. NLR has been represented on the Jefferson County Local Emergency Planning Committee since its inception, and the laboratory is involved in the emergency planning concepts of EPCRA.

Emergency response plans for a spill or release of a hazardous material are also in place. These plans evolve with changing research initiatives and are coordinated with state and local emergency planning and response agencies in addition to first responders such as West Metro Fire Rescue, Rocky Mountain Fire Rescue, Jefferson County Emergency Management, and the Jefferson County Local Emergency Planning Committee.

For information and current performance in this area, see Section 7.1: Hazardous Materials Management.

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

Hazardous Waste Management

Waste management and minimization efforts begin in the planning stages of all experimental and operational activities. Processes are evaluated based on the quantities and toxicities of products that will be brought on-site before an activity begins, and evaluations continue until material use is complete and materials are ready for disposal. Hazardous materials proposed for use are also assessed for the potential substitution of less hazardous products to lessen the hazardous waste stream.

The laboratory is committed to the appropriate management of regulated waste generated through its daily operations.

These wastes are handled, stored, and disposed of responsibly and in accordance with regulatory requirements to minimize the potential for health and environmental impacts that could result from a release or improper disposal.

Implementation of regulatory requirements includes:

- A documented waste management and minimization program.
- Annual training for all staff members who generate or handle regulated waste.
- Regular inspection and tracking of all waste containers.
- Storage, packaging, shipment, and tracking of wastes until final disposition at a properly permitted waste disposal or recycling facility.
- Active monitoring of waste volumes to determine generator status.
- Maintenance of records that are generated through cradle-to-grave waste management activities.

For select unregulated materials that still pose a potential hazard, NLR follows a conservative waste management policy whereby nonhazardous materials are collected and disposed of as nonhazardous materials at properly permitted disposal facilities. For example, nonhazardous nanomaterial-bearing wastes are not federally regulated; however, because they pose a potential health risk, they are managed and disposed of using the same management methods used for hazardous waste. In a general order-of-management preference, hazardous waste items are shipped off-site for final disposal via incineration, treatment, or landfilling.

For information and current performance in this area, see Section 7.2: Hazardous Waste Management.

AST Management

The AST management program applies to petroleum fuel tanks and is intended to ensure compliance with requirements and minimize releases from tanks. The program consists of inspections, tank maintenance, training, and spill preparedness. Personnel who operate and manage ASTs are trained annually on program requirements, including inspection and response requirements, the spill history of each site, lessons learned, and recent changes to rules and regulations.

Several important mechanical and procedural safeguards have been incorporated into NLR's AST management program to prevent an accidental release of diesel or gasoline from the storage tanks. Mechanical safeguards include overfill and spill protection, double-walled tanks equipped with sensors that result in an alarm if the inner tank wall leaks, and secondary containment for single-walled tanks. Procedural safeguards include written operating and tank-filling procedures, monthly and annual inspections, and recordkeeping of inspection results. ASTs with more than 60 gallons (227 L) of capacity are visually inspected monthly, and all double-walled ASTs are visually inspected annually to confirm the absence of interstitial liquid.

For information and current performance in this area, see Section 7.3: Aboveground Storage Tank Management.

Spill Prevention and Response

The laboratory prepares for petroleum-based spills and continually improves spill response procedures. Formal SPCC plans have been developed and are periodically updated for the Flatirons Campus, the STM Campus, and the ReFUEL facility. The plans are designed to minimize the number and size of spills, as well as facilitate the efficient cleanup of spilled materials. SPCC plans are updated every 3 years or whenever regulations, operations, or equipment change significantly. The laboratory's aggressive approach to spill prevention and control exceeds the EPA's requirement that SPCC plans be updated at least every 5 years.

Emergency notification and hazardous materials procedures are in place to provide additional support for spill response. Proper preventive planning and training minimizes the potential for spills and the size of spills, and advance preparation for spill response speeds the response and helps protect water and ecological resources.

SPCC training occurs annually for individuals who are responsible for petroleum-containing equipment and AST operation and maintenance. Training covers inspection and response requirements, location and use of spill response equipment, identification of spill control locations, and notification and spill reporting protocols.

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

The laboratory typically does not experience spills that require notification to federal or state agencies. Small, incidental hydraulic system leaks, lubricant leaks, fuel transfer spills, and similar events occur occasionally. NLR's policy for spills is that, regardless of spill size, they are to be reported to appropriate internal responders. This policy makes clear that reporting of and responding to any spill are important to NLR and DOE. Lessons learned from spill incidents and cleanup activities are used to improve management and spill response planning.

Spill response kits are strategically placed at every NLR facility near where spills might occur. Petroleum spill kits across NLR facilities are routinely inspected, maintained, and restocked to ensure adequate response materials are readily available for oil- and fuel-related releases. Used or expired absorbents, pads, socks, and disposal supplies were promptly replaced, and inventory levels were verified to align with site-specific storage volumes and operational risks. Maintaining fully stocked petroleum spill kits supports rapid containment and cleanup, minimizes the potential for environmental impacts to soil and stormwater, and reinforces compliance with applicable spill prevention and response requirements. Spill kits are periodically evaluated as laboratory activities change over time. Spill kits are continually added as NLR continues to grow.

For information and current performance in this area, see Section 7.4: Petroleum Spill Prevention and Response.

Radiological Materials

Through its radiation safety program, NLR has established strict protocols for radiation-generating devices, equipment containing sources of radiation, and the use of radioisotopes in laboratory experiments. These protocols include:

- Confining work with radioisotopes to a few specific laboratories.
- Limiting the types and quantities of radioisotopes on-site.
- Monitoring equipment and facilities for removable contamination or sealed-source leakage.

No radioactive air emissions monitoring is conducted at the laboratory because of its extremely low use of radioactive materials. NLR demonstrates compliance with radiological air emissions standards by using the EPA's COMPLY model (Version 1.7.1) to determine the effective dose equivalent to the public. COMPLY uses radionuclide data to calculate extremely conservative dose values rather than measured emissions that provide actual dose values.

Current laboratory procedures prohibit any activity that might result in radioactive waste that is federally regulated under the RCRA and is categorized as "mixed waste." Therefore, all radioactive waste generated is classified solely as low-level radioactive waste.

Waste is temporarily stored on-site until disposal is arranged at an off-site facility permitted to accept low-level radioactive waste.

For information and current performance in this area, see Section 7.5: Radiological Materials and Waste Management.

NEPA

Once a project is proposed, the NEPA process is initiated, and it must be completed before the proposed project or activity begins. In accordance with regulations, all NLR activities (both on-site and off-site) must undergo a NEPA review to evaluate and understand the potential environmental impacts of a project. A NEPA determination is the outcome of such a review.

NLR and the DOE Golden Field Office use sitewide environmental assessments to streamline the environmental review process. These documents represent comprehensive analyses of potential environmental impacts associated with NLR's current and future actions over 5–10 years at both the STM Campus and the Flatirons Campus. The environmental assessments serve as planning tools that aid ongoing and future operational and development decisions related to NLR's sites. The sitewide environmental assessments for the STM Campus and the Flatirons Campus provide a baseline environmental analysis that streamlines future environmental reviews, improves and coordinates site and agency planning, and maximizes cost savings.

NLR and the DOE Golden Field Office have developed several programmatic NEPA determinations to further streamline the environmental review process for recurring activities that have minimal environmental impacts. These activities generally involve business and administrative actions, information gathering and technical advice, and bench-scale R&D. The programmatic NEPA determinations are based on the existing sitewide environmental assessments or DOE categorical exclusions and are reviewed periodically for applicability.

Using the sitewide environmental assessment and programmatic NEPA determinations, NLR and the DOE Golden Field Office analyze administrative, operational, and research activities, and they place each in one of three categories to streamline the environmental review process:

- **Require No Further NEPA Review:** Actions have been assessed by NLR and the DOE Golden Field Office, and they have been determined to have negligible environmental impacts.

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

- **Require a NEPA Sufficiency Review:** Actions might have minimal potential for environmental impacts, and they might require a sufficiency review by the NLR NEPA coordinator.
- **Require Further NEPA Review and Documentation:** Actions have a greater potential for environmental impacts, involve actions with a federal agency or foreign government, or require the application of a categorical exclusion. The DOE Golden Field Office must complete the NEPA review.

If a proposed activity has not already been evaluated in an existing sitewide environmental assessment or programmatic NEPA determination, further environmental analysis must be conducted. Potential environmental impacts of an activity are evaluated, and measures are taken as needed to avoid or minimize those impacts. The level of review conducted is appropriate to the potential impacts of the proposed activity. For example, a proposed construction project would receive a more rigorous review than routine office or laboratory work.

For information and current performance in this area, see Section 8: National Environmental Policy Act Compliance.

Natural and Cultural Resources

For information and current performance in this area, see Section 9: Natural and Cultural Resources Protection.

Wildlife Management

NLR developed its wildlife management program to implement measures to meet or exceed regulatory requirements and to minimize or avoid impacts to wildlife species and their habitats. Regulatory requirements include those of the Migratory Bird Treaty Act, a Colorado Parks and Wildlife statute prohibiting the harassment of wildlife (including damaging or destroying dens or nests), a memorandum of understanding between DOE and the USFWS to promote the conservation of migratory bird populations, and a presidential memorandum to promote the health of bees and other pollinators. The Migratory Bird Treaty Act provides for penalties for "take" of birds or bird parts, whether it occurs with or without intent.

Several laboratory activities help achieve the program's intent, including:

- **Monitoring:** The laboratory conducts nesting bird surveys before any ground- or vegetation-disturbing activities are conducted between mid-March and mid-September every year. If nests are found in an area, it is closed off, and a buffer area is established until nestlings fledge. In this manner, projects avoid "take" and conserve nesting birds. Staff also periodically conduct sitewide surveys to document biological conditions.
- **Project Reviews:** Environmental professionals conduct project reviews to assess and reduce potential impacts to wildlife.
- **Coordination:** Environmental professionals coordinate with local, state, and federal agencies to improve wildlife management in concert with surveys for threatened and endangered species and habitats. Because habitat conservation is intertwined with wildlife protection, program activities often overlap with vegetation management (Section 9.3: Vegetation Management).

Other program goals include maintaining wildlife movement through the STM Campus by retaining access to the adjacent conservation easement north of the site and to Pleasant View Community Park and Lena Gulch to the south. At the Flatirons Campus, ecologically sensitive areas and linkages with surrounding open space areas are preserved.

When control of pest wildlife species is needed, a graded approach is used to humanely control pests and minimize other potential impacts. Building design features and administrative controls are the first line of defense against pests. When these are not fully effective, additional controls are used. Native wildlife pests are relocated whenever possible. When pests must be destroyed, mechanical methods are preferred over poisoning. When needed, pesticides that pose the least harmful effects to nontarget wildlife are selected.

For information and current performance in this area, see Section 9.1: Wildlife Management.

Endangered Species and Species of Concern

NLR conducts periodic surveys at the Flatirons Campus and STM Campus to determine the presence or absence of species that are listed under the ESA as threatened or endangered. These include the Preble's meadow jumping mouse (*Zapus hudsonius preblei*) and the Ute ladies' tresses orchid (*Spiranthes diluvialis*). The USFWS has designated critical habitat associated with the Preble's meadow jumping mouse within the upper reaches of Rock Creek, including a small area at the southeastern corner of the Flatirons Campus. This area may not be disturbed without coordination with the USFWS.

Species of special concern listed by the USFWS on the Information for Planning and Consultation website, as well as species listed by the state of Colorado as rare plants, species of special concern, or Species of Greatest Conservation Need, are surveyed. These baseline surveys, which are typically conducted every 5 years, are a vital part of the laboratory's NEPA program, which

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

assesses impacts to natural resources from mission activities.

In accordance with the ESA, the USFWS lists four species in the Platte River watershed in Nebraska that must be considered for projects in Colorado and Wyoming that might deplete water supplies to the Platte River system. For any NLR activities that might deplete water in the Platte River system, the USFWS must be consulted to determine potential impacts.

For information and current performance in this area, see Section 9.2: Endangered Species and Species of Concern.

Vegetation Management

The focus of NLR's vegetation management program is to:

- Conserve existing ecosystems in their natural state as much as possible.
- Strive to replace disturbed vegetation with native species or with adapted but noninvasive species when necessary.
- Implement a program of weed management to prevent the spread of noxious weeds and implement measures to control these species.

To maintain existing native vegetation and to ensure the success of revegetated areas, the laboratory has developed sustainable landscape management practices that:

- Provide supplemental water during seedling growth and establishment, and minimize water use thereafter.
- Maximize ground cover to reduce soil erosion.
- Establish a variety of habitats to support diverse wildlife.
- Reduce the need for and use of pesticides and fertilizers.
- Reduce maintenance costs.
- Create an aesthetically pleasing landscape.

When removal of native vegetation cannot be avoided, reseeding is done using mixes of grass and broadleaf herb seed that are native to the local area. To enhance ecosystem diversity and integrity, NLR has identified a suite of native flowering plants, shrubs, and trees for use on the STM Campus, the STEP Campus, and the Flatirons Campus. NLR staff continually evaluate and modify revegetation techniques as needed to promote healthy plant establishment.

NLR participated in a Sustainable Sites Initiative 2-year pilot program (June 2010–June 2012) established by the American Society of Landscape Architects, Lady Bird Johnson Wildflower Center at the University of Texas at Austin, U.S. Botanic Garden, and a diverse group of other stakeholders. The pilot program was intended to develop the first national rating system for sustainable landscapes. Certification under the program demonstrates that the stewardship activities needed for sustaining healthy ecosystems are being implemented. For the program, NLR developed and submitted a plan for implementing sustainable landscape practices and received a rating of three out of four stars. The plan is now integrated into NLR's landscape maintenance plan and other relevant sitewide procedures. Integrated components of the plan include plant stewardship, invasive species management, organic materials management, soil stewardship, irrigation and water use, stormwater management, materials management, snow and ice management, and monitoring. The Sustainable Sites Initiative also serves as a critical foundation that supports NLR's objective in creating adaptive and resilient sites to meet the challenges of dynamic climate change.

NLR uses an integrated weed management approach that incorporates various types of weed control methods, including:

- Mechanical practices (e.g., mowing or pulling weeds by hand).
- Cultural practices (e.g., reclaiming disturbed areas).
- Prevention (e.g., limiting or eliminating driving of vehicles off established roadways).
- Biological practices (e.g., introducing living organisms such as fungi or insects that prefer certain weed species).
- Applying herbicides through spot-spraying.

The use of multiple strategies for control has been successful in significantly reducing populations of diffuse knapweed (*Centaurea diffusa*), Canada thistle (*Cirsium arvense*), and sulfur cinquefoil (*Potentilla recta*). The weed control program maintains the flexibility needed to respond to changes in weed populations from year to year. Periodic mapping of weed infestation areas helps target weed control efforts.

The laboratory periodically assesses the effectiveness of control methods for noxious weeds. At the STM Campus and the Flatirons Campus, comprehensive weed surveys and mapping are performed approximately every 5 years, and smaller areas are assessed annually.

For information and current performance in this area, see Section 9.3: Vegetation Management.

Wildfire Risk Management

Because wildfires could affect DOE property and impact operational activities, NLR developed a fire protection

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

program. To protect staff, buildings, infrastructure, and outdoor research from wildfire, NLR evaluates the wildland–urban interface on DOE properties. Areas within the interface are actively managed to reduce fuel sources. Management activities include mowing vegetation, applying herbicide in graveled areas, and removing shrubs and trees where applicable. At the STM, STEP, and Flatirons campuses, vegetation management is balanced with maintaining native vegetation and wildlife habitat.

For information and current performance in this area, see Section 9.3: Vegetation Management.

Imported Plants and Organisms

The vegetation management program also addresses the use of certain animal (i.e., pathogen) and plant species brought to the laboratory for research purposes, primarily for biofuels and biomaterials investigations. Some of the plants and pathogens obtained from other states or from outside the United States are controlled by the U.S. Department of Agriculture's APHIS, and they require permitting to protect against their release either into the immediate work area or to the outside environment. In addition to the required management practices identified in APHIS-issued permits, management of these materials is also controlled through NLR's Biosafety Program. This program provides guidance to researchers on various aspects of working with biological materials, such as the identification of materials that can and cannot be used at NLR, when approvals are required by NLR's Institutional Biosafety Panel, and good laboratory practices.

For information and current performance in this area, see Section 9.3: Vegetation Management.

Wetlands and Floodplains

Functional wetlands, whether regulated (jurisdictional) or unregulated (non-jurisdictional), are considered valuable features that serve many ecological functions, and the laboratory seeks to protect these from site development to the maximum extent practicable.

NLR protects its wetlands and floodplains by:

- Periodically surveying vegetation and conducting wetland delineations.
- Mapping wetland areas that may be potentially affected by proposed construction.
- Identifying and avoiding or minimizing potential impacts.
- Coordinating with other jurisdictions on the control of floodwaters leaving the STM Campus, STEP Campus, or Flatirons Campus.

Wetland delineations are periodically conducted and submitted to the U.S. Army Corps of Engineers to ensure regulated and unregulated wetlands are properly identified.

For information and current performance in this area, see Section 9.4: Wetlands and Floodplains.

Cultural Resources

Cultural resources are protected by:

- Integrating cultural resource management into site activities and minimizing and mitigating impacts to historic properties and features.
- Implementing procedures to manage historic features and protect undiscovered cultural resources and artifacts.
- Periodically conducting surveys to document the presence or absence of cultural or historical resources. This includes working with the Colorado Office of Archaeology and Historic Preservation to determine how to proceed should any evidence of cultural resources be discovered in surveys or ground-disturbing activities. For example, workers are to stop all work in the vicinity of a potential find until a qualified archaeologist evaluates its significance.

For information and current performance in this area, see Section 9.5: Cultural Resources.

Conservation Lands

Approximately 19 acres (7.7 hectares) at the STM Campus have been granted by DOE to Jefferson County as a conservation easement. This area is maintained by NLR as a natural landscape. Each year, at least one visual inspection of the conservation easement property is conducted to identify management activities needed to address erosion, weed management, trail conditions, or other potential issues.

At the Flatirons Campus, approximately 60 acres (24 hectares) of land are managed as a conservation area. Development is limited in this area, and the land is managed to conserve specific features, including seeps, ephemeral drainages, ponds, wetlands, native grassland habitat, areas supporting ancient soils (i.e., a soil structure in association with plant species forming a stable ecological community that is resistant to weed invasion), a small area designated as critical habitat for the Preble's meadow jumping mouse (*Zapus hudsonius preblei*), and a rocky outcropping supporting ponderosa pine (*Pinus ponderosa*) and shrublands.

For general information and current performance in this area, see Section 10: Conservation Easement.

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

NLR obtains numerous permits and registrations to ensure environmental compliance. *Photo by Alexis Powers, NLR 23815*

APPENDIX B. ENVIRONMENTAL PERMITS, REGISTRATIONS, NOTIFICATIONS, AND EPA COMPLIANCE DATA

Environmental Permits, Registrations, and Notifications

Table B-1 lists NLR's environmental permits, including each permit's issuing agency, identification, and status.

Table B-1. Environmental Permits, Registrations, and Notifications in 2025

Campus (Building): Description	Category	Issuing Agency or Division	ID	Permit or Registration Status
Air				
Laboratory-wide: servicing of chlorofluorocarbon-containing equipment	Notification	APCD	647	Active
STM Campus: fugitive dust from construction activities	Permit	APCD	08JE0889L	Active
STM Campus (EMAPS): diesel-fired standby electrical generator #1	Permit	APCD	25JE0196	Active
STM Campus (EMAPS): diesel-fired standby electrical generator #2	Permit	APCD	25JE0197	Active
STM Campus (ESIF): diesel-fired standby electrical generator	Permit	APCD	11JE3542	Active
STM Campus (ESIF): research diesel-fired electrical generator #3	Permit	APCD	13JE2829	Active

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

Campus (Building): Description	Category	Issuing Agency or Division	ID	Permit or Registration Status
STM Campus (FTLB): waste gas combustor (Thermal Oxidizer)	Permit	APCD	99JE0400	Active
STM Campus (FTLB): diesel-fired standby electrical generator	Permit	APCD	10JE1630	Active
STM Campus (IBRF): ammonia scrubber and baghouse	Permit	APCD	20JE0749	Active
STM Campus (IBRF): diesel-fired standby electrical generator	Permit	APCD	20JE0748	Active
STM Campus (Parking Garage): diesel-fired standby electrical generator	Permit	APCD	11JE1997	Active
STM Campus (Research and Innovation Laboratory): diesel-fired standby electrical generator	APEN [a]	APCD	25JE0029	Active
STM Campus (Renewable Fuel Heat Plant): wood waste boiler	Permit	APCD	07JE0277	Active
STM Campus (RSF 1): diesel-fired standby electrical generator	Permit	APCD	10JE1400	Active
STM Campus (RSF 2): diesel-fired standby electrical generator	Permit	APCD	11JE1303	Active
STM Campus (SERF): diesel-fired standby electrical generator	Permit	APCD	13JE2275	Active
STM Campus (S&TF): diesel-fired standby electrical generator	Permit	APCD	13JE2274	Active
STM Campus: 12 boilers and heaters at FTLB, SERF, and S&TF under one permit	Permit	APCD	20JE0747	Canceled
Flatirons Campus (Building 251): diesel-fired standby electrical generator	APEN	APCD	13JE2272 XP	Active
Flatirons Campus (CCF): diesel-fired standby electrical generator	Permit	APCD	25JE0028	Active
Flatirons Campus (Site 4.0): diesel-fired standby electrical generator	Permit	APCD	10JE1712	Active
Flatirons Campus (Site 4.4): diesel-fired standby electrical generator	APEN	APCD	13JE2270 XP	Active

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

Flatirons Campus (Structural Testing Laboratory): diesel-fired standby electrical generator	APEN	APCD	13JE2271 XP	Active
Building 16: diesel-fired standby electrical generator	APEN	APCD	13JE2273 XP	Active
Alcohol				
Laboratory-wide: tax-free alcohol use	Permit	TTB [b]	US-TF-20125	Active
Laboratory-wide: specially denatured spirits procurement	Permit	TTB	US-SDS-20087	Active
STM Campus (IBRF): alcohol fuel production	Permit	TTB	AFP-CO-00255	Active
Animals and Plants				
STM Campus: controlled import of *Populus tremula x Populus alba* from Athens, Georgia	Permit	APHIS	122-HE2EHC7	Active
STM Campus: controlled import of *Panicum virgatum* from Oak Ridge, Tennessee	Permit	APHIS	122-CX31NBQ	Active
STM Campus: controlled import of *Sphingobium* spp. from Japan	Permit	APHIS	526-24-302-29229	Active
Drinking Water				
Flatirons Campus: drinking water system ID	Registration	WQCD	CO0230860	In effect; does not expire
Hazardous Materials				
Denver West Business Park (Building 16): hazardous material storage and use permit	Permit	West Metro Fire Rescue	N/A	Completed
ReFUEL: hazardous material storage and use permit	Permit	Denver Fire Department	2025DFD-HZ-000535	Completed
STM Campus (ESIF): hazardous material storage and use permit	Permit	West Metro Fire Rescue	N/A	Completed
STM Campus (FTLB): hazardous material storage and use permit	Permit	West Metro Fire Rescue	N/A	Completed
STM Campus (IBRF): hazardous material storage and use permit	Permit	West Metro Fire Rescue	N/A	Completed
STM Campus (S&TF): hazardous material storage and use permit	Permit	West Metro Fire Rescue	N/A	Completed

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

STM Campus (SERF): hazardous material storage and use permit	Permit	West Metro Fire Rescue	N/A	Completed
STM Campus (Shipping and Receiving): hazardous material storage and use permit	Permit	West Metro Fire Rescue	N/A	Completed
STM Campus (Waste Handling Facility): hazardous material storage and use permit	Permit	West Metro Fire Rescue	N/A	Completed
Denver West Business Park (Building 16): RCRA hazardous waste generator status EPA ID	Notification	HMWMD	CO4890000017	Completed
Flatirons Campus: RCRA hazardous waste generator status EPA ID	Notification	HMWMD	COD983802448	Completed
ReFUEL: RCRA hazardous waste generator status EPA ID	Notification	HMWMD	COR000207563	Completed
STM Campus: RCRA hazardous waste generator status EPA ID	Notification	HMWMD	CO3890090076	Completed
Historic Resource				
STM Campus: ammunition bunker	Registration	National Park Service	93000379	In effect; does not expire
STM Campus: amphitheater and stone footbridge	Registration	National Park Service	93000378	In effect; does not expire
Stormwater				
Flatirons Campus: Second Controllable Grid Interface (CGI2)	Permit	EPA	COR10F07J	Terminated
Flatirons Campus: CCF	Permit	EPA	COR10F09Z	Active
Flatirons Campus: Behind-the-Meter Storage (BTMS)	Permit	EPA	COR10F0AO	Active
Flatirons Campus: grid projects (34.5-kV H_2 electrolyzer, switchgear pad)	Permit	EPA	COR10F0BX	Active
Flatirons Campus: Waterline Project	Permit	EPA	COR10F0CE	Active
STM Campus: MS4	Permit	EPA	COR042009	Active
STM Campus: EMAPS	Permit	EPA	COR10F0BH	Active

[a] Air Pollutant Emission Notice.

[b] Alcohol and Tobacco Tax and Trade Bureau (U.S. Department of the Treasury).

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

During formalized surveys, small mammal live-traps are used to temporarily capture species to record species information prior to release. *Photo by Rachael Boothe, NLR 105942*

APPENDIX C. WILDLIFE SPECIES OBSERVED AT THE STM CAMPUS AND THE FLATIRONS CAMPUS

This appendix lists the wildlife species observed at the STM Campus and the Flatirons Campus. Species listed for the STM Campus (Table C-1) were observed by staff and/or observed in surveys completed in 2005, 2011, and 2017.[11] A new survey of the STM Campus was completed including the STEP Campus, with results expected in 2026. Species listed for the Flatirons Campus (Table C-2) were identified in surveys completed in 2003, 2011, 2016, and 2023.[12]

Table C-1. Wildlife Species Observed at the STM Campus

STM Campus				
Common Name	**Scientific Name**	**2005 Survey**	**2011 Survey**	**2017 Survey**
Birds				
American coot	*Fulica americana*			X
American crow	*Corvus brachyrhynchos*	X	X	X
American goldfinch	*Carduelis tristis*		X	X
American kestrel	*Falco sparverius*	X	X	X
American pipit	*Anthus rubescens*		X	X
American redstart	*Setophaga ruticilla*		X	X
American robin	*Turdus migratorius*	X	X	X

[11] For 1987 survey results, refer to: NREL. 2016. *Environmental Performance Report 2016: Annual Site Environmental Report per the U.S. Department of Energy Order 231.B Chg 1*. Golden, CO: National Renewable Energy Laboratory. NREL/MP-1900-68671. docs.nlr.gov/docs/fy17osti/68671.pdf.

[12] For the 1996 survey results, refer to: NREL. 2016. *Environmental Performance Report 2015: Annual Site Environmental Report per the U.S. Department of Energy Order 231.B.* Golden, CO: National Renewable Energy Laboratory. NREL/MP-1900-65807. docs.nlr.gov/docs/fy16osti/65807.pdf.

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

STM Campus				
Common Name	**Scientific Name**	**2005 Survey**	**2011 Survey**	**2017 Survey**
American tree sparrow	*Spizella arborea*	X	X	
American white pelican	*Pelecanus erythrorhynchos*		X	
Bald eagle	*Haliaeetus leucocephalus*			
Barn swallow	*Hirundo rustica*		X	X
Black-billed magpie	*Pica hudsonia*	X	X	X
Black-capped chickadee	*Poecile atricapillus*	X		X
Black-crowned night heron	*Nycticorax nycticorax*	X		
Black-headed grosbeak	*Pheucticus melanocephalus*		X	
Blue-gray gnatcatcher	*Polioptila caerulea*		X	
Blue jay	*Cyanocitta cristata*	X	X	
Blue-winged teal [a]	*Spatula discors*			
Brewer's blackbird	*Euphagus cyanocephalus*		X	
Brewer's sparrow	*Spizella breweri*		X	X
Broad-tailed hummingbird	*Selasphorus platycercus*		X	X
Broad-winged hawk	*Buteo platypterus*		X	
Brown-headed cowbird	*Molothrus ater*	X	X	X
Bullock's oriole	*Icterus bullockii*	X	X	X
Bushtit	*Psaltriparus minimus*		X	
California gull	*Larus californicus*	X		
Canada goose	*Branta canadensis*	X	X	
Cassin's kingbird	*Tyrannus vociferans*		X	X
Cedar waxwing	*Bombycilla cedrorum*		X	
Chestnut-collared longspur	*Calcarius ornatus*		X	
Chipping sparrow	*Spizella passerina*		X	X
Clay-colored sparrow	*Spizella pallida*			X

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

STM Campus				
Common Name	**Scientific Name**	**2005 Survey**	**2011 Survey**	**2017 Survey**
Cliff swallow	*Petrochelidon pyrrhonota*		X	X
Common grackle	*Quiscalus quiscula*		X	X
Common nighthawk	*Chordeiles minor*	X	X	X
Common raven	*Corvus corax*	X	X	X
Common yellowthroat	*Geothlypis trichas*			X
Cooper's hawk	*Accipiter cooperii*	X	X	
Dark-eyed junco	*Junco hyemalis*	X	X	X
Double-crested cormorant	*Phalacrocorax auritus*		X	X
Eastern kingbird	*Tyrannus tyrannus*		X	
Eurasian collared-dove	*Streptopelia decaocto*			X
European starling	*Sturnus vulgaris*	X	X	X
Golden eagle	*Aquila chrysaetos*	X		
Grasshopper sparrow	*Ammodramus savannarum*		X	
Gray catbird	*Dumetella carolinensis*			X
Great blue heron	*Ardea herodias*	X	X	
Great horned owl	*Bubo virginianus*			X
Greater roadrunner [a]	*Geococcyx californianus*			
Green-tailed towhee	*Pipilo chlorurus*		X	
Hammond's flycatcher	*Empidonax hammondii*			X
Hepatic tanager	*Piranga flava*		X	
Hermit thrush	*Catharus guttatus*		X	
Horned lark	*Eremophila alpestris*		X	
House finch	*Carpodacus mexicanus*	X	X	X
House sparrow	*Passer domesticus*	X	X	X
House wren	*Troglodytes aedon*		X	X

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

STM Campus				
Common Name	**Scientific Name**	**2005 Survey**	**2011 Survey**	**2017 Survey**
Killdeer	*Charadrius vociferous*	X	X	
Lark bunting	*Calamospiza melanocorys*	X		
Lark sparrow	*Chondestes grammacus*		X	X
Lazuli bunting	*Passerina amoena*		X	
Lesser goldfinch	*Carduelis psaltria*		X	X
Lincoln's sparrow	*Melospiza lincolnii*			X
Loggerhead shrike	*Lanius ludovicianus*	X		
MacGillivray's warbler	*Oporornis tolmiei*	X		
Mallard	*Anas platyrhynchos*	X		
Mountain bluebird	*Sialia currucoides*	X		X
Mountain chickadee	*Poecile gambeli*		X	
Mourning dove	*Zenaida macroura*	X		X
Northern flicker	*Colaptes auratus*	X		X
Northern goshawk	*Accipiter gentilis*		X	
Northern harrier	*Circus cyaneus*	X		X
Northern mockingbird	*Mimus polyglottos*			X
Northern pygmy owl	*Glaucidium californicum*			X
Northern rough-winged swallow	*Stelgidopteryx serripennis*			X
Northern saw-whet owl [a]	*Aegolius acadicus*			
Orange-crowned warbler [a]	*Oreothlypis celata*			
Osprey	*Pandion haliaetus*	X		X
Peregrine falcon	*Falco peregrinus*		X	
Pine siskin	*Carduelis pinus*		X	
Prairie falcon	*Falco mexicanus*	X		X
Red-breasted nuthatch	*Sitta canadensis*	X		X

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

STM Campus				
Common Name	**Scientific Name**	**2005 Survey**	**2011 Survey**	**2017 Survey**
Red-tailed hawk	*Buteo jamaicensis*	X		X
Red-winged blackbird	*Agelaius phoeniceus*			X
Rock dove	*Columba livia*	X		X
Rock wren	*Salpinctes obsoletus*	X		
Ruby-crowned kinglet	*Regulus calendula*		X	
Sage thrasher	*Oreoscoptes montanus*		X	X
Say's phoebe	*Sayornis saya*	X		X
Sharp-shinned hawk	*Accipiter striatus*		X	X
Spotted towhee	*Pipilo maculates*	X		X
Swainson's hawk	*Buteo swainsoni*	X		
Tree swallow	*Tachycineta bicolor*	X	X	X
Turkey vulture	*Cathartes aura*	X		X
Vesper sparrow	*Pooecetes gramineus*	X		X
Violet-green swallow	*Tachycineta thalassina*		X	X
Virginia's warbler	*Oreothlypis virginiae*		X	
Western kingbird	*Tyrannus verticalis*	X		X
Western meadowlark	*Sturnella neglecta*	X		X
White-crowned sparrow	*Zonotrichia leucophrys*	X		X
White-faced ibis	*Plegadis chihi*		X	
White-throated swift	*Aeronautes saxatalis*		X	
Woodhouse's (western) scrub-jay	*Aphelocoma californica*	X		X
Wilson's snipe	*Gallinago delicata*	X		
Yellow warbler	*Setophaga petechia*			X
Yellow-breasted chat	*Icteria virens*		X	X
Yellow-rumped warbler	*Dendroica coronata*		X	

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

STM Campus				
Common Name	**Scientific Name**	**2005 Survey**	**2011 Survey**	**2017 Survey**
Mammals				
Big brown bat [a]	*Eptesicus fuscus*			
Black bear [a]	*Ursus americanus*			
Black-tailed jackrabbit	*Lepus californicus*		X	
Bobcat [a]	*Lynx rufus*			
Bushy-tailed woodrat [a]	*Neotoma cinerea*			
Common muskrat [a]	*Ondatra zibethicus*			
Coyote	*Canis latrans*	X	X	
Deer mouse	*Peromyscus maniculatus*		X	
Elk [a]	*Cervus canadensis*			
Fox squirrel	*Sciurus niger*	X		
Hoary bat	*Lasiurus cinereus*			X
Long-tailed weasel	*Mustela frenata*	X		
Mexican woodrat	*Neotoma mexicana*	X	X	
Mountain cottontail rabbit	*Sylvilagus nuttallii*	X	X	X
Mule deer	*Odocoileus hemionus*	X	X	X
Prairie vole	*Microtus ochrogaster*	X		
Raccoon	*Procyon lotor*	X	X	
Red fox	*Vulpes vulpes*		X	
Striped skunk	*Mephitis mephitis*		X	
Western harvest mouse	*Reithrodontomys megalotis*	X	X	
Western spotted skunk	*Spilogale gracilis*		X	
White-tailed jackrabbit	*Lepus townsendii*	X		
Reptiles and Amphibians				
Boreal chorus frog	*Pseudacris maculata*		X	X

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

STM Campus				
Common Name	**Scientific Name**	**2005 Survey**	**2011 Survey**	**2017 Survey**
Bull snake	*Pituophis catenifer*		X	
Plains garter snake	*Thamnophis radix*	X		
Prairie lizard	*Sceloporus consobrinus*		X	
Six-lined racerunner	*Cnemidophorus sexlineatus*	X		
Tiger salamander	*Ambystoma tigrinum*	X	X	X
Wandering garter snake [a]	*Thamnophis elegans*			
Western (prairie) rattlesnake	*Crotalus viridis*	X	X	
Woodhouse's toad	*Anaxyrus woodhousii*		X	
Yellow-bellied racer	*Coluber constrictor*		X	
Terrestrial Arthropods				
Aphrodite fritillary [a]	*Speyeria aphrodite*			
Monarch butterfly [a]	*Danaus plexippus*			
Tiger swallowtail [a]	*Papilio rutulus*			

[a] Species were observed at a time other than during a survey.

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

Table C-2. Wildlife Species Observed at the Flatirons Campus

Flatirons Campus					
Common Name	**Scientific Name**	**2003 Survey**	**2011 Survey**	**2016 Survey**	**2023 Survey**
Birds					
American crow	*Corvus brachyrhynchos*		X		X
American goldfinch	*Spinus tristis*	X	X		X
American kestrel	*Falco sparverius*	X	X	X	X
American pipit	*Anthus rubescens*		X		
American robin	*Turdus migratorius*	X	X	X	X
American tree sparrow	*Spizella arborea*		X		X
Bald eagle	*Haliaeetus leucocephalus*		X		
Barn swallow	*Hirundo rustica*	X	X	X	X
Bell's sparrow	*Artemisiospiza belli*				X
Black-billed magpie	*Pica hudsonia*	X	X	X	X
Black-capped chickadee	*Poecile atricapillus*	X	X		X
Blue-gray gnatcatcher	*Polioptila caerulea*	X		X	X
Blue grosbeak	*Passerina caerulea*				X
Blue jay	*Cyanocitta cristata*		X		
Brewer's blackbird	*Euphagus cyanocephalus*	X	X	X	X
Brewer's sparrow	*Spizella breweri*		X		
Broad-tailed hummingbird	*Selasphorus platycercus*	X	X	X	X
Broad-winged hawk [a]	*Buteo platypterus*				
Brown-headed cowbird	*Molothrus ater*	X	X		X
Bullock's oriole	*Icterus bullockii*		X	X	X
Canada goose	*Branta canadensis*		X	X	X
Cedar waxwing	*Bombycilla cedrorum*		X		X
Chipping sparrow	*Spizella passerina*	X	X		X

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

Flatirons Campus					
Common Name	**Scientific Name**	**2003 Survey**	**2011 Survey**	**2016 Survey**	**2023 Survey**
Cliff swallow	*Petrochelidon pyrrhonota*	X			
Common grackle	*Quiscalus quiscula*	X	X		
Common nighthawk	*Chordeiles minor*	X		X	X
Common raven	*Corvus corax*	X	X	X	X
Common yellowthroat	*Geothlypis trichas*				X
Cooper's hawk [a]	*Accipiter cooperii*				
Dark-eyed junco	*Junco hyemalis*		X		X
Double-crested cormorant	*Phalacrocorax auritus*	X		X	X
Downy woodpecker	*Picoides pubescens*		X		X
Eurasian collared-dove	*Streptopelia decaocto*		X		X
European starling	*Sturnus vulgaris*	X	X	X	X
Ferruginous hawk	*Buteo regalis*	X	X		
Franklin's gull	*Larus pipixcan*		X		
Golden eagle [b]	*Aquila chrysaetos*	X	X		
Grasshopper sparrow	*Ammodramus savannarum*	X	X	X	X
Gray catbird	*Dumetella carolinensis*		X	X	X
Great blue heron	*Ardea herodias*	X	X	X	
Great egret	*Ardea alba*				X
Great horned owl	*Bubo virginianus*		X	X	
Great-tailed grackle	*Quiscalus mexicanus*				X
Green-tailed towhee	*Pipilo chlorurus*	X		X	X
Hairy woodpecker	*Picoides villosus*		X		
Horned lark	*Eremophila alpestris*	X	X		
House finch	*Carpodacus mexicanus*	X	X	X	X
House wren	*Troglodytes aedon*			X	X

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

Flatirons Campus					
Common Name	**Scientific Name**	**2003 Survey**	**2011 Survey**	**2016 Survey**	**2023 Survey**
Killdeer	*Charadrius vociferus*		X	X	X
Lark bunting	*Calamospiza melanocorys*		X		
Lark sparrow	*Chondestes grammacus*	X		X	X
Lesser goldfinch	*Spinus psaltria*				X
Loggerhead shrike	*Lanius ludovicianus*		X		
Long-billed curlew	*Numenius americanus*		X		
Mallard	*Anas platyrhynchos*	X	X		
Mountain bluebird	*Sialia currucoides*	X	X		X
Mountain chickadee	*Poecile gambeli*		X		
Mourning dove	*Zenaida macroura*	X	X	X	
Northern flicker	*Colaptes auratus*	X	X		X
Northern harrier	*Circus cyaneus*	X	X		
Northern rough-winged swallow	*Stelgidopteryx serripennis*				X
Peregrine falcon	*Falco peregrinus*	X	X		
Prairie falcon	*Falco mexicanus*	X			
Red-headed woodpecker	*Melanerpes erythrocephalus*		X		
Red-tailed hawk	*Buteo jamaicensis*	X	X	X	X
Red-winged blackbird	*Agelaius phoeniceus*	X	X	X	X
Rock pigeon	*Columba livia*				X
Rough-legged hawk	*Buteo lagopus*	X	X		
Ruby-crowned kinglet	*Regulus calendula*		X		
Sandhill crane	*Grus canadensis*		X		
Savannah sparrow	*Passerculus sandwichensis*		X		X
Say’s phoebe	*Sayornis saya*	X	X	X	X
Sharp-shinned hawk	*Accipiter striatus*				X

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

Flatirons Campus					
Common Name	**Scientific Name**	**2003 Survey**	**2011 Survey**	**2016 Survey**	**2023 Survey**
Song sparrow	*Melospiza melodia*		X	X	X
Spotted towhee	*Pipilo maculatus*		X	X	X
Swainson's hawk	*Buteo swainsoni*		X		
Swainson's thrush	*Catharus ustulatus*				X
Townsend's solitaire	*Myadestes townsendi*		X		
Tree swallow	*Tachycineta bicolor*		X		
Turkey vulture	*Cathartes aura*	X	X		
Vesper sparrow	*Pooecetes gramineus*	X	X	X	X
Virginia rail	*Rallus limicola*				X
Western kingbird	*Tyrannus verticalis*	X	X	X	X
Western meadowlark	*Sturnella neglecta*	X	X	X	
Western wood-pewee	*Contopus sordidulus*			X	
White-crowned sparrow	*Zonotrichia leucophrys*				X
Wild turkey	*Meleagris gallopavo*				X
Wilson's snipe	*Gallinago delicata*		X	X	
Wilson's warbler	*Wilsonia pusilla*	X			
Yellow-rumped warbler	*Dendroica coronata*	X			X
Mammals					
Big brown bat	*Eptesicus fuscus*		X	X	
Black-tailed prairie dog [a]	*Cynomys ludovicianus*	X			
Bobcat	*Felis rufus*			X	
Coyote	*Canis latrans*		X	X	X
Deer mouse	*Peromyscus maniculatus*		X	X	X
Desert cottontail rabbit	*Sylvilagus audubonii*		X	X	X
Eastern red bat	*Lasiurus borealis*		X	X	

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

Flatirons Campus					
Common Name	**Scientific Name**	**2003 Survey**	**2011 Survey**	**2016 Survey**	**2023 Survey**
Elk	*Cervus canadensis*		X	X	X
Fringed myotis [b]	*Myotis thysanodes*		X	X	
Hoary bat	*Lasiurus cinereus*		X	X	
Little brown myotis [b]	*Myotis lucifugus*		X	X	
Long-tailed weasel	*Neogale frenata*				
Masked shrew	*Sorex cinereus*		X	X	
Meadow vole	*Microtus pennsylvanicus*		X	X	X
Mexican woodrat	*Neotoma mexicana*		X	X	X
Mountain lion	*Puma concolor*			X	
Mule deer	*Odocoileus hemionus*		X	X	X
Myotis bat	*Myotis* spp.		X	X	
Red fox	*Vulpes vulpes*				X
Prairie vole	*Microtus ochrogaster*		X	X	
Silver-haired bat	*Lasionycteris noctivagans*		X	X	
Thirteen-lined ground squirrel	*Spermophilus tridecemlineatus*		X		X
Western harvest mouse	*Reithrodontomys megalotis*		X	X	
Western small-footed myotis	*Myotis ciliolabrum*		X	X	
White-tailed deer	*Odocoileus virginiana*			X	X
Yellow-bellied marmot [a]	*Marmota flaviventris*				
Reptiles and Amphibians					
Boreal chorus frog	Pseudacris maculata		X	X	
Bull snake	Pituophis catenifer		X	X	
Northern leopard frog b	Lithobates pipiens			X	
Painted turtle a	Chrysemys picta				
Tiger salamander	Ambystoma tigrinum			X	

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

Flatirons Campus					
Common Name	**Scientific Name**	**2003 Survey**	**2011 Survey**	**2016 Survey**	**2023 Survey**
Western (prairie) rattlesnake	Crotalus viridis	X	X	X	
Woodhouse's toad	Anaxyrus woodhousii		X	X	
Terrestrial Arthropods [c]					
Aphrodite fritillary	*Speyeria aphrodite*		X		
Cabbage white	*Pieris rapae*		X		
Checkered white	*Pontia protodice*		X		
Common wood nymph	*Cercyonis pegala*		X		
Dainty sulphur	*Nathalis iole*		X		
Gray hairstreak	*Strymon melinus*		X		
Orange sulphur	*Colias eurytheme*		X		
Western white	*Pontia occidentalis*		X		

[a] Species were observed at a time other than during a survey.

[b] Colorado State Species of Highest Conservation Need, Tier 1, 2015.

[c] Terrestrial arthropods were surveyed in 2011 at the STM Campus and Flatirons Campus but only observed during the survey at the Flatirons Campus.

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

A photo of selective milkweed (*Asclepias* spp.) seeds that were harvested from the STM Campus' detention basin, dried and planted around natural areas on the STM Campus and Flatirons Campus. NLR biologists continue to monitor milkweed plantings around the STM Campus. These plants encourage pollinator use, specifically monarch butterflies (*Danaus plexippus*), which have a symbiotic relationship with milkweed. *Photo by Rachael Boothe, NLR 105941*

APPENDIX D. PLANT COMMUNITIES AT THE STM CAMPUS AND THE FLATIRONS CAMPUS

Vegetation surveys are periodically completed for the STM Campus and the Flatirons Campus. The most recent surveys occurred at the STM Campus in 2017 and at the Flatirons Campus in 2023. In those recent surveys, plant communities and species were identified for each site, and changes from previous surveys are noted in this appendix. The STEP Campus was surveyed in 2025, with results to follow in 2026.

STM Campus Plant Communities

Most vegetation at the STM Campus belongs to the grassland community type. Within that association there are two distinct community types: short grassland on the mesa top and mixed grassland on the mesa slopes and toe areas. Other mapped vegetation communities at the STM Campus include ravine shrubland, tall shrubland, short shrubland, and wetlands. The plant communities are described in this section and mapped as illustrated in Figure D-1.

Short Grassland

Short grassland is found on the flat top of the mesa. The dominant grass species are blue grama (*Chondrosum gracile*), a native prairie species, and downy brome (cheatgrass) (*Bromus tectorum*), a Class C noxious weed in Colorado. Populations of diffuse knapweed (*Acosta d*iffusa) and Dalmatian toadflax *(Linaria genistifolia* subsp. *dalmatica*) are scattered throughout the whole community; these two noxious weeds comprise approximately 1% of the short grassland.

Alyssum (*Alyssum* spp.), an introduced species, is the dominant forb. Several species of prickly pear cactus (*Opuntia fragilis, O. macrorhiza, O. phaeacantha*, and *O. polyacantha*) occur throughout the short grassland on the mesa top, as do hen and chicks (Echinocereus viridiflorus) and pincushion cacti (*Coryphantha missouriensis* and *C. vivipara* var. *vivipara*). Well-drained hillocks often support thick stands of needle-and-thread grass (*Hesperostipa comata*) and yucca (*Yucca glauca*). Some short shrubs such as rubber rabbitbrush (*Ericameria nauseosa*), chokecherry (*Padus virginiana*), and skunkbrush (*Rhus aromatica* subsp. *trilobata*) appear infrequently in the short grassland area and concentrate along the rimrock areas. Several large hackberry trees (*Celtis reticulata*) are clustered at the very edge of the mesa top.

Historically, the short grassland on the mesa top was most likely dominated by blue grama grass (*Chondrosum gracile*) and other shortgrass species such as buffalo grass (*Buchloë dactyloides*) intermixed with the other species associations described above. However, the entire mesa top area has become dominated by downy brome (cheatgrass) (*Bromus tectorum*), an aggressive noxious weed. It is changing the appearance and general species composition of the area by outcompeting native plants.

Mixed Grassland

On the STM Campus, the mesa slopes and toe areas also support blue grama (*Chondrosum gracile*) and downy brome (cheatgrass) (*Bromus tectorum*) but are dominated

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

by a mixed-grass species association of needle-and-thread grass (*Hesperostipa comata*) and western wheatgrass (*Pascopyrum smithii*), with smaller amounts of big bluestem (*Andropogon gerardii*), sideoats grama (*Bouteloua curtipendula*), three-awn (Aristida purpurea), and green needlegrass (*Nassella viridula*). As in the short grassland areas, many forbs are also found in the mixed grasslands.

A few patches of anomalous vegetation occur within the mixed grasslands where subsurface water appears to be close to the surface. These areas support wide swaths of mat muhly (*Muhlenbergia richardsonis*). One such area is on a south-facing slope near the eastern property boundary. The other is on a southwest-facing slope of the ravine north of the NLR Education Center. A small number of plains cottonwood (*Populus deltoides*) saplings, skunkbrush (*Rhus aromatica* subsp. *trilobata*), chokecherry *(Padus virginiana*), and snowberry occur in this patch as well.

The mixed-grass areas grade into both the upland and ravine shrublands and contribute most of the understory in these areas. Some mixed-grass areas also blend into disturbed areas, where reclamation species, such as crested wheatgrass (*Agropyron cristatum*) and smooth brome (*Bromus inermis*), have been planted and subsequently spread into the mixed-grass community.

Upland Shrubland

Upland shrubland habitat occurs along the upper sides of ravines and on the steeper mesa slopes, and it becomes more prominent as elevation increases up to the top of the mesa. The upland shrubland habitat, which excludes the shrublands in the ravine bottoms, comprises tall shrubland and short shrubland communities that are very similar in overall composition, but the habitat is distinguished by the dominant species.

Tall Shrubland

The tall shrubland areas are defined by stands of mountain mahogany (*Cercocarpus montanus*) that occur along the rim of the mesa, usually where volcanic cap rock is exposed, and on the upper mesa slopes below rimrock areas. The understory, with a large amount of bare soil, is notably sparse throughout this community. Downy brome (cheatgrass) (*Bromus tectorum*) is the most common herbaceous species in these areas, and it is intermixed with needle-and-thread grass (*Hesperostipa comata*), yucca (*Yucca glauca*), and many cacti (*Cactaceae* spp.).

Short Shrubland

The short shrublands occur on elevated flat areas amid the surrounding grasslands, some of which appear to have experienced surficial disturbance in the past. These areas are distinctive because of the dominance of rubber rabbitbrush (*Ericameria nauseosa*). The other common location for short shrublands is on the outer slopes of the ravines.

Skunkbrush (*Rhus aromatica* subsp. *trilobata*) defines these and other short shrublands along the upper portions of the steepest slopes of the mesa. These communities usually grade into the ravine shrublands along the drainage bottoms and the tall shrublands near the top of the mesa slopes. The short shrubland community also has a sparse understory of the same grasses and forbs as the tall shrub community.

Ravine Shrubland

Ravine shrublands are limited to the lower sides and bottoms of the drainages that cut down through the mesa slopes. These communities support a variety of shrubs such as skunkbrush (*Rhus aromatica* subsp. *trilobata*), chokecherry (*Padus virginiana*), and wild plum (*Prunus americana*), which often grow in dense, impassible thickets. A few plains cottonwoods (*Populus deltoides*) and peachleaf willows (*Salix amygdaloides)* occur at the top of the ravine channels and in other portions of the channel where the water table appears to be higher. A diverse herbaceous component is found in these drainages. In one instance near the southeastern boundary, a ravine shrubland grades into an ephemeral drainage at the toe of the mesa. This drainage is vegetated with grassland species and conveys only occasional surface water runoff.

Wetlands Vegetation

Five small communities on the STM Campus have been identified as supporting wetland vegetation. These have been roughly quantified as measuring less than 0.5 acres (0.2 hectares) in total.

One is in a shallow swale at the mouth of the ravine at the southwestern corner of the site boundary where surface water and subsurface drainage have created a pocket of saturated soil. Species here include sedges (*Carex* spp.), rushes (*Juncus* spp.), bulrush (*Schoenoplectus* spp.), and peachleaf willow (*Salix amygdaloides*). The area at the mouth of the ravine may no longer experience the hydrology that originally allowed these plants to establish there.

The second area may have been formed as a result of past construction activities. This linear depression supports wetland vegetation along the central portion of the western site boundary, northeast of the photovoltaic array. This area, which is perhaps situated where equipment was once staged, appears to hold seasonal water for enough consecutive growing seasons to support some wetland vegetation, including Arctic rush (*Juncus*

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

arcticus), American speedwell (*Veronica americana*), and broadleaf cattail (*Typha latifolia*).

Three small seeps are located on the hillslope between the Education Center and the public trail on the far eastern boundary of the STM Campus. These seeps are dominated by sedges (*Carex* spp.), rushes (*Juncus* spp.), and Canada thistle (*Cirsium arvensis*).

Disturbed and Reclaimed Land

This habitat type comprises all the areas at the STM Campus that have experienced surface disturbance to vegetation caused by human activities. These activities mostly occur on the perimeter of the buildings, roads, parking lots, and soil stockpile areas. Most of these areas appear to have been revegetated and support a combination of native grassland plants, planted ornamental revegetation species, and native and introduced weeds.

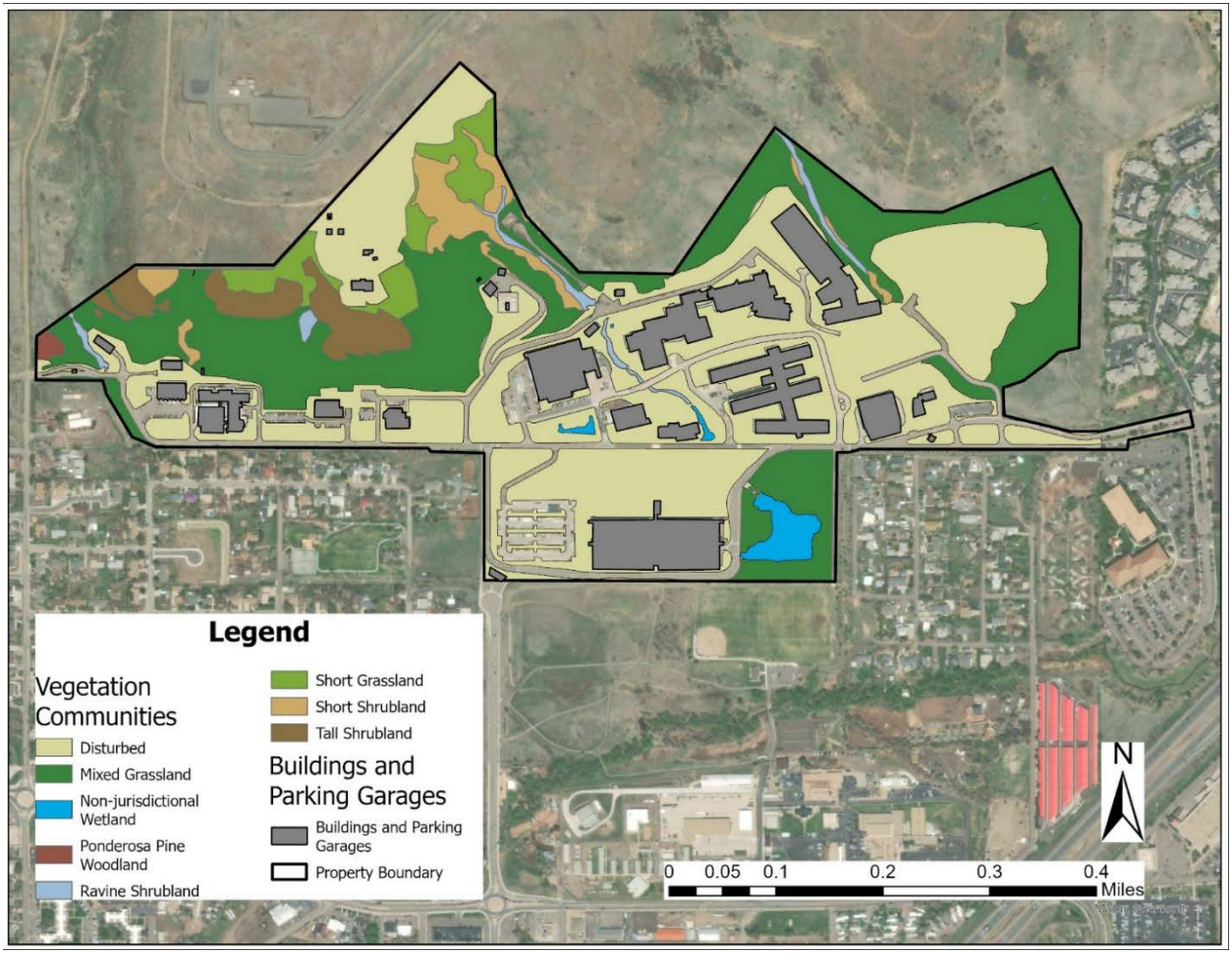


Figure D-1. Land cover types at the STM Campus

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

Flatirons Campus Plant Communities

Most vegetation at the Flatirons Campus belongs to the mixed-grass prairie association of the grassland formation. Mixed-grass prairie is defined by the presence of grass species typical of the tallgrass or true prairie such as big bluestem (Andropogon gerardii), little bluestem (*Schizachyrium scoparium*), and prairie dropseed (*Sporobolus heterolepis*), alongside species more typical of the shortgrass prairie such as blue grama (*Chondrosum gracile*) and buffalo grass (*Buchloë dactyloides*). Intermediate grasses (mid-grasses), such as the needle grasses (Hesperostipa and Nassella spp.), wheat grasses (*Pascopyron, Agropyron, Elytrigia*, *Elymus*, and *Thinopyrum* spp.), and blue grasses (*Poa* spp.), are also important constituents of mixed-grass prairie.

The grasslands at the Flatirons Campus fall into the xeric mixed-grassland community type that are identified and classified primarily on available soils and soil moisture, and that are reflected in xeric mixed-grassland plant species assemblages.

Several changes in vegetation patterns since the Flatirons Campus was first surveyed are discussed in this section, by specific plant community. In addition, the plant communities are described and mapped as illustrated in by specific plant community. In addition, the plant communities are described and mapped as illustrated in Figure D-2.

Mixed Grassland

This community is distinguished from the non-native grassland community by the higher cover of native grasses and forbs. Native species typically make up 50%–60% of the vegetative cover. Common grasses in this community include smooth brome (*Bromus inermis*), Kentucky bluegrass (*Poa pratensis*), Canada bluegrass (*Poa compressa*), big bluestem (Andropogon gerardii), little bluestem (*Schizachyrium scoparium*), switchgrass (*Panicum virgatum*), and purple three-awn (*Aristida purpurea*). Common forbs in this community include scurf pea (*Psoralidium* spp.), fringed sage (*Artemisia frigida*), prairie sage (*Artemisia ludoviciana*), and hairy golden aster (*Heterotheca villosa*).

Non-Native Grassland

The non-native grassland community is the most common community type at the Flatirons Campus. It is dominated by introduced pasture grasses, including smooth brome (*Bromus inermis*), Kentucky bluegrass (*Poa pratensis*), and Canada bluegrass (*Poa compressa*). Non-native species make up 65%–90% of the vegetative cover in this community. Commonly observed forb species include alyssum (*Alyssum* spp.), Canada horseweed (*Conyza canadensis*), fringed sage (*Artemisia frigida*), prairie sage (*Artemisia ludoviciana*), scurfpea (*Psoralidium* spp.), and hairy golden aster (*Heterotheca villosa*). Native grasses within this community, particularly big bluestem (*Andropogon gerardii*) and switchgrass (*Panicum virgatum*), occur most frequently along roadside depressions, possibly because additional soil moisture from precipitation runoff is captured there.

Disturbed Native Grassland

This community occurs along the northern fence line of the Flatirons Campus. Total vegetative cover in this community ranges from 30% to 70%, and exposed soil in this community consists of coarse gravel. The proximity of this community to machinery and buildings, the abundance of exposed ground, and the gravelly soil texture indicate this area has been significantly disturbed by human activity. However, this community has the highest vegetative cover of native grasses within the Flatirons Campus. This community is dominated by purple three-awn (*Aristida purpurea*), big bluestem (*Andropogon gerardii*), and switchgrass (*Panicum virgatum*). Other commonly observed species in this community include non-native grasses such as smooth brome (*Bromus inermis*) and ruderal weed species, including common sunflower (Helianthus annuus), prickly lettuce (*Lactuca serriola*), common mullein (*Verbascum thapsus*), and bigbract verbena (*Verbena bracteata*).

Non-Native Yucca Grassland

This community is very similar in composition to the non-native grassland community, but it is distinguished by the presence of stands of yucca (*Yucca glauca*) shrubs. Yucca typically occurs as scattered individuals throughout the grassland communities at the Flatirons Campus. In the areas identified as non-native yucca grassland, yucca occurs at a higher density than in the surrounding grassland, and the structural change from the surrounding grasslands warrants its inclusion as a separate community. Dominant grass species in this community include downy brome (cheatgrass) (*Bromus tectorum*), smooth brome (*Bromus inermis*), Kentucky bluegrass (*Poa pratensis*), and intermediate wheatgrass (*Thinopyrum intermedium*).

Degraded Grassland

The degraded grassland community has been heavily influenced by human disturbance and is dominated by non-native and noxious grass species with minimal native vegetation (typically less than 10%). The

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

dominant species in this community are downy brome (cheatgrass) (*Bromus tectorum*) and intermediate wheatgrass. An area near the southwest corner of the Flatirons Campus contains significant bare soil that is dominated by annual and biennial weed species, including kochia (*Bassia scoparia*), downy brome (cheatgrass), and common sunflower (*Helianthus annuus*). The soil in this area has a distinctive reddish color that is visible in recent aerial imagery. The degraded grassland community along the western boundary of the Flatirons Campus is possibly influenced by historical and ongoing disturbance that might originate from off-site activities.

Ponderosa Pine Woodland

This community occurs along a granite outcrop in the northwestern corner of the Flatirons Campus. Dominant tree and shrub species include ponderosa pine (*Pinus ponderosa*), skunkbrush sumac (*Rhus trilobata*), wax currant (*Ribes cereum*), and wild plum (Prunus americana). Understory vegetation consists of native and non-native grass and forb species. Common species include smooth brome (*Bromus inermis*), crested wheatgrass (*Agropyron cristatum*), junegrass (*Koeleria macrantha*), sulfur cinquefoil (*Potentilla recta*), golden banner (*Thermopsis rhombifolia*), harebell (*Campanula rotundifolia*), and James' nailwort (*Paronychia jamesii*).

Mixed Shrubland

The mixed shrubland community occurs on the southeastern end of the same granite outcrop that supports the ponderosa pine (*Pinus ponderosa*) woodland. The southeastern end of this outcrop is lower and less exposed than where the ponderosa pine woodland occurs. Dominant shrub species include wax currant (*Ribes cereum*), skunkbrush sumac (*Rhus trilobata*), chokecherry (*Padus virginiana*), and western serviceberry (*Amelanchier alnifolia*). This community supports higher cover and diversity of native grasses and forbs than the surrounding non-native grassland community. Common grasses in this community include smooth brome (*Bromus inermis*), Kentucky bluegrass (*Poa pratensis*), big bluestem (*Andropogon gerardii*), junegrass (*Koeleria macrantha*), and sideoats grama (*Bouteloua curtipendula*). Common forbs include scurfpea (*Psoralidium* spp.), prairie sage (*Artemisia ludoviciana*), golden banner (*Thermopsis rhombifolia*), hairy golden aster (*Heterotheca villosa*), and sulphur flower (*Eriogonum umbellatum*). An isolated group of hawthorn shrubs (*Crataegus erythropoda*) occurs along the western site boundary within the Flatirons Campus site boundary. These trees are at the top of the slope, directly east of an active area of construction disturbance that is outside the Flatirons Campus boundary.

Palustrine Emergent Wetlands

Palustrine emergent wetlands have been identified at the Flatirons Campus.[13] Dominant species in these communities include broadleaf cattail (*Typha latifolia*), Arctic rush (*Juncus arcticus*), common spikerush (*Eleocharis palustris*), and Nebraska sedge (*Carex nebrascensis*). Other commonly observed species include foxtail barley (*Hordeum jubatum*), Torrey's rush (*Juncus torreyi*), cloaked bulrush (*Scirpus pallidus*), and willowherb species (*Epilobium* spp.). Patches of smooth brome (*Bromus inermis*), Kentucky bluegrass (*Poa pratensis*), big bluestem (*Andropogon gerardii*), and western wheatgrass (*Pascopyrum smithii*) occur on the fringes of these wetland communities.

A large palustrine emergent wetland occurs in the southwestern portion of the campus. The southernmost road separates this large wetland form a second smaller wetland along the southern fence line of the Flatirons Campus. These wetlands are hydrologically connected and supported by seepage from a reservoir south of the property boundary. Capture of surface water runoff provides additional hydrology to these wetlands. Hydrological support has evidently increased since 2011, as the area was dominated by obligate wetland species, and surface water was present throughout the area in the 2023 field surveys.

Another palustrine emergent wetland occurs in the northeastern portion of the Flatirons Campus. This wetland consists of a large stand of cattails (*Typha* spp.) and foxtail barley (*Hordeum jubatum*) surrounded by sandbar willow (*Salix exigua*) and plains cottonwood (*Populus deltoides*).

Headwater, or Riparian Emergent, Wetlands

Headwater, or riparian emergent, wetland communities occur within the two prominent drainages in the eastern half of the Flatirons Campus (Figure D-2), both of which show evidence of an ephemeral channel; both drainages are tributaries to Rock Creek. Dominant species within these wetlands include Arctic rush (*Juncus arcticus*), foxtail barley (*Hordeum jubatum*), Nebraska sedge (*Carex nebrascensis*), and prairie cordgrass (*Spartina*

[13] Lewis M. Cowardin, Virginia Carter, Edward T. LaRoe, and Francis C. Golet. 1979. *Classification of Wetlands and Deepwater Habitats of the United States*. Washington, D.C.

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

pectinata). Significant patches of Canada thistle (*Cirsium arvense*), bull thistle (*Cirsium vulgare*), and common teasel (*Dipsacus fullonum*), all Class B noxious weeds, occur within the northernmost drainage. Other observed species include short-beak sedge (*Carex brevior*), swordleaf rush (*Juncus ensifolius*), longstyle rush (*Juncus longistylis*), Torrey's rush (*Juncus torreyi*), common spikerush (*Eleocharis palustris*), and switchgrass (*Panicum virgatum*). Occasional plains cottonwood trees (Populus deltoides) and sandbar willow shrubs (Salix exigua) occur along these drainages.

Disturbed Areas and Non-Habitat

These cover types reflect surface disturbance due to human activities, including roadsides, pad sites, parking lot perimeters, construction sites, and storage areas. Some of these areas have been revegetated and now include a combination of species from surrounding natural plant communities, reclamation species, and adventive (non-native) or ruderal (native or adventive, disturbance colonizer) species. Dominant species noted include smooth brome (*Bromus inermis*). (These areas are not specifically listed in Figure D-2.)

Ornamental Trees/Shrubs

Disturbed areas around buildings have been planted with a combination of native and ornamental trees and shrubs. Planted trees include multiple species of junipers (*Sabina* spp.) and pines (*Pinus* spp.) interspersed with ornamental deciduous trees. Shrubs in these areas are mainly chokecherry (*Padus virginiana*) and rose (*Rosa* spp.) bushes. (These areas are not specifically listed in Figure D-2.)

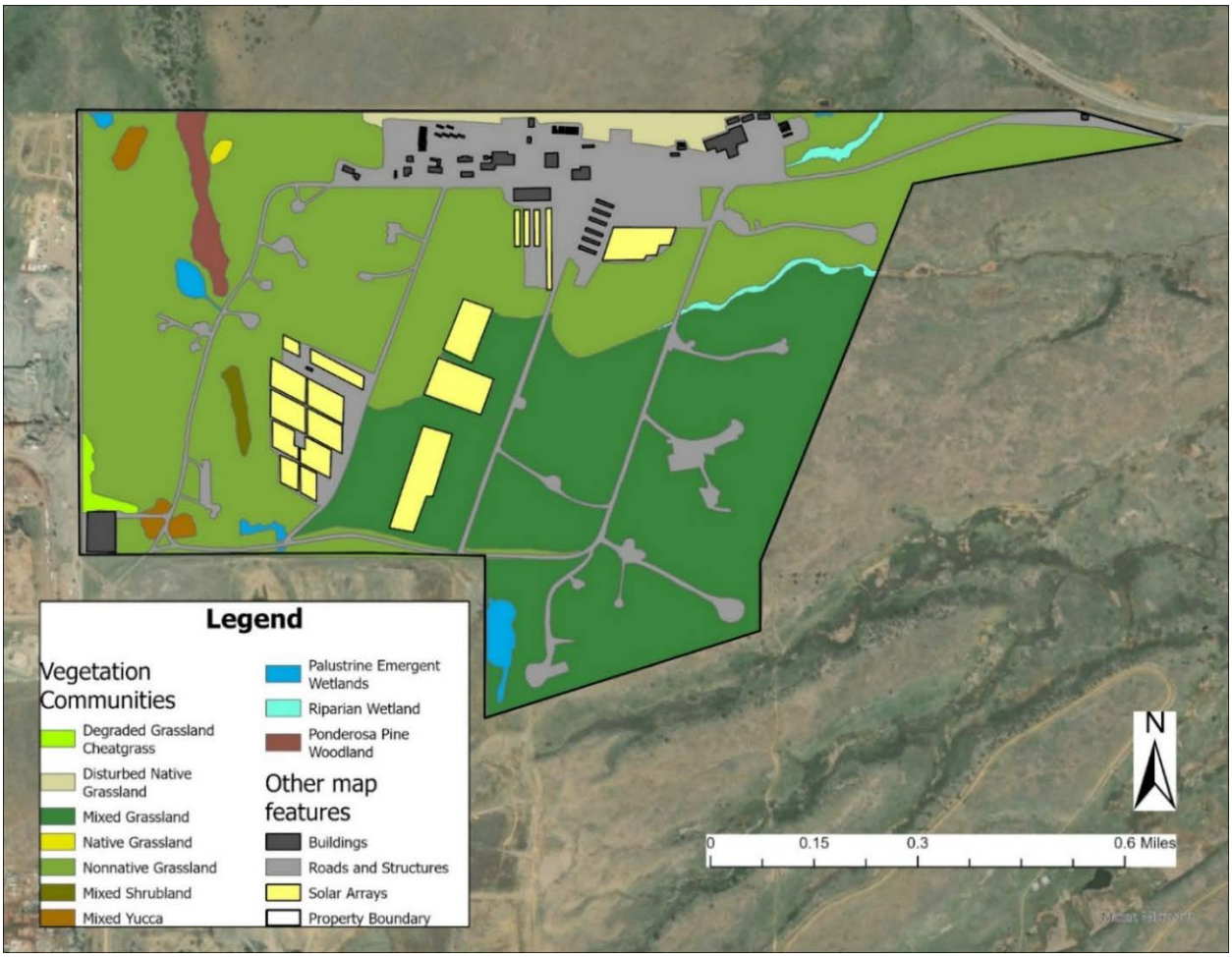


Figure D-2. Wetland types and vegetation communities at the Flatirons Campus

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

National Laboratory
of the Rockies

15013 Denver West Parkway
Golden, CO 80401

303-275-3000 • nlr.gov

The National Laboratory of the Rockies is a national laboratory of the U.S. Department of Energy, Office of Critical Minerals and Energy Innovation, operated under Contract No. DE-AC36-08GO28308.

NLR/MP-1900-101476 • August 2026 *The National Laboratory of the Rockies prints on paper that contains recycled content.*