An Astonishing Oasis: Transforming a Munitions Facility into Open Prairie

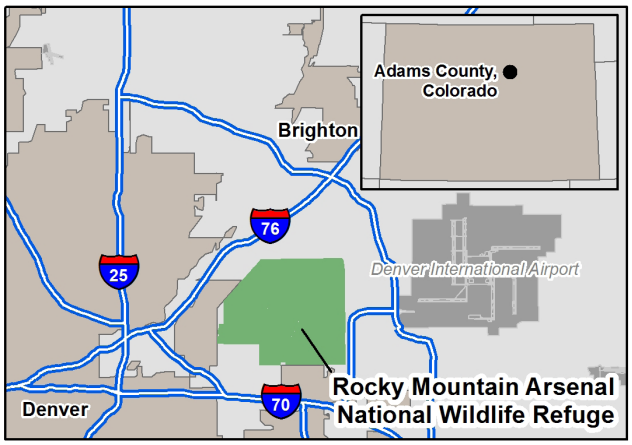
THE ROCKY MOUNTAIN ARSENAL SUPERFUND SITE IN ADAMS COUNTY, COLORADO

Introduction

Just outside of Denver, Colorado, Rocky Mountain Arsenal was established in 1942 to produce incendiary munitions and chemical warfare agents during World War II. Following the war, weapons production continued and a succession of other private and military facility uses included pesticide and rocket fuel production. In the early 1980s, the primary liquid waste and munitions disposal area was one of the most polluted sites in America. Today, the site has been transformed into a valuable wildlife refuge and community asset. This case study tells the remarkable story of the cleanup and reuse of the Rocky Mountain Arsenal Superfund site.

When manufacturing activities ceased and sampling identified potential groundwater contamination in the 1980s, the future of this 26.6-square-mile site was unclear. The discovery of bald eagles roosting on site highlighted the area's potential as a valuable part of the U.S. Fish and Wildlife Service (FWS) National Wildlife Refuge system. Collaboration among EPA, the U.S. Army, Shell Oil Co., FWS, the Colorado Department of Public Health & Environment (CDPHE), the Tri-County Health Department, the city of Commerce City, and many more public and private organizations, as well as local, state and national elected officials, over several decades resulted in the site's successful cleanup and reuse. "This transformation shows how agencies working together and with communities on Superfund cleanups can make a lasting and powerful difference," said EPA Region 8 Superfund Redevelopment Coordinator Fran Costanzi.

Today, over 340,000 annual visitors enjoy fishing, hiking and bird watching at the refuge, which has become one of the most visited wildlife refuges in the country. It supports hundreds of species of wildlife, including bison, prairie dogs, bald eagles and black-footed ferrets. A 917-acre area on the south and west end of the property, known as the Western Tier Parcel, was deleted from the National Priorities List (NPL) in 2003 and sold to Commerce City. Today, this land supports a high school, the Commerce City Civic Center, 400 acres of community parks and soccer fields, a 25,000-seat stadium, and room for commercial development. Most cleanup activities finished in 2010. The U.S. Army continues to treat contaminated groundwater and retain control of areas where capped waste has been left in place.



Sources: US Fish and Wildlife Service, Esri, DeLorme, AND, Tele Atlas, First American, UNEP-WCMC and USGS.

NORTH

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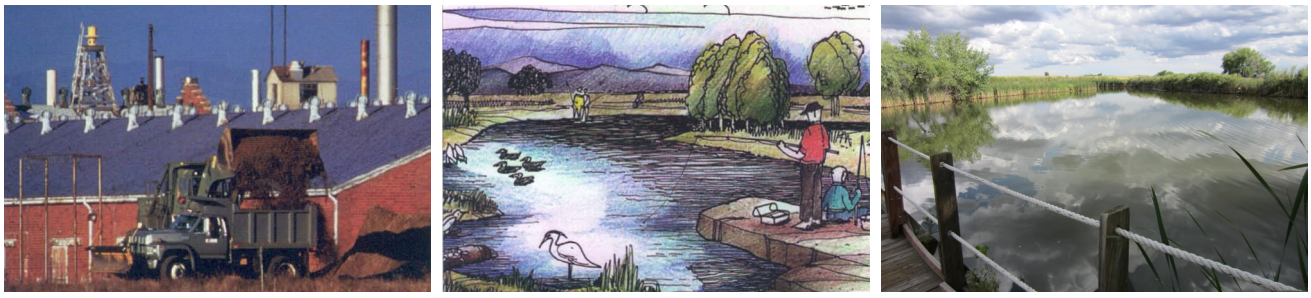
The site is part of a highly developed area just outside Denver, to the west of Denver International Airport.

This case study explores the tools and partnerships that have led to the successful cleanup and transformation of Rocky Mountain Arsenal. The following pages trace the evolution of cleanup and reuse efforts, highlighting innovative redevelopment tools, project partnerships, and coordination of remedy and reuse considerations. The case study provides information and lessons learned for parties interested in Superfund site reuse, habitat conservation, and the adaptation of federal facility and military sites for public use.



During planning, FWS contrasted images of shuttered manufacturing facilities with renderings of the future refuge (left and center). Today, the restored land provides valuable wildlife habitat as well as recreation opportunities (right). Images used with permission of FWS.

Site History, Contamination and Remediation

In 1942, the U.S. Army established Rocky Mountain Arsenal (the Arsenal) on 20,000 acres of land outside of Denver purchased from homesteaders. The location was both difficult to reach by enemy bombers and accessible by rail, important considerations for the chemical warfare agent and incendiary munitions production facility. The Army continued using parts of the Arsenal following the war and leased other parts to private chemical manufacturers to offset operational costs and foster local economic growth. Operations after the war included production of rocket fuel for the Apollo 11 flights in the 1960s and agricultural pesticide production by Shell from 1952 to 1982. The Army also demilitarized munitions at the facility. Materials handling and waste disposal practices, while in line with accepted practices at the time, caused significant and widespread contamination in soil, surface water, sediment, groundwater and structures. Disposal of chemicals using deep well injection in the 1960s was suspected of causing earthquakes in the area, so this practice ended.

In the 1950s, crops and livestock on farms north of the Arsenal were identified with higher than normal levels of contaminants, which raised concerns about potential off-post groundwater contamination. By the late 1970s, the Army had begun efforts to contain groundwater contamination at the facility boundary and undertaken interim actions to mitigate contamination at several sites. Contaminants of concern include pesticides, heavy metals and solvents. EPA proposed listing the site on the NPL in 1984 and finalized its listing on the NPL in 1987. A Federal Facility Agreement signed in 1989 delineated cleanup responsibilities. The Army has conducted the cleanup with oversight from EPA and CDPHE. The Tri-County Health Department's oversight program responsibilities included off-post domestic well sampling, groundwater monitoring and arrangements for the provision of alternate water supplies.

Top: Women working at the South Plants, 1952.
Above: South Plants prior to demolition.
Images used with permission of the Army.

To manage the cleanup, EPA divided the site into two operable units (OUs) – the 27-square-mile On-Post OU and the Off-Post OU, which includes groundwater contamination north and northwest of the Arsenal and a Shell property north of the facility boundary. The selected long-term remedies for the On-Post and Off-Post OUs were documented in the site's 1995 and 1996 Records of Decision (RODs) and approved by EPA and CDPHE after consideration of significant input from local citizens and communities, and scrutiny by the regulatory agencies for protectiveness and compatibility with the land use restrictions established in the 1989 Federal Facility Agreement. On-Post OU cleanup included groundwater interception and treatment, containment of contaminated soil in on-site hazardous waste landfills, retention and long-term operation and monitoring of capped areas by the Army, public health monitoring, and institutional controls to restrict land and groundwater use and prohibit fish and game consumption. Cleanup at the Off-Post OU included groundwater treatment and monitoring, surface water monitoring, provision of alternative sources of water for domestic well owners with contaminated groundwater, and institutional controls to prevent future use of contaminated groundwater.

Surface cleanup work was finished in 2010. The Army permanently retains and manages approximately 1,000 acres of site landfills, capped areas and groundwater treatment facilities. Ongoing operation and maintenance activities include groundwater treatment and monitoring, landfill and cap maintenance, and management of land use controls to ensure that the remedy continues to protect public health and the environment.

Project History

1984 – 1992
Putting the Pieces in Place

When manufacturing ceased and EPA proposed listing the site on the NPL in 1984, options for the Arsenal's future use were unclear. Early interest in expanding nearby Stapleton Airport onto the unused land was dampened by concerns about size constraints and noise. Ultimately, the new Denver International Airport was established further to the east. While the Arsenal had been in industrial and military use for decades, much of the area surrounding its manufacturing facilities lay undisturbed, leading to an interesting alternative.

Building Support for a Refuge

The Army had concentrated manufacturing operations in the center of the site to provide a buffer between munitions production and surrounding land uses. Left undisturbed by development, the buffer area supported a variety of wildlife, including prairie dog colonies and mule deer. Trees and shrubs originally planted by early homesteaders created cover and nesting habitat for migratory songbirds and hawks. Manmade lakes, ditches and wetlands created by the homesteaders and the Army provided vibrant aquatic habitats and fishing opportunities. Army personnel understood the landscape's value; members of the local rod and gun club frequented the site.

The discovery of roosting bald eagles raised interest in the site's habitat value.

The Army began working with FWS to examine the site's potential as a national wildlife refuge. Discovery of endangered bald eagles at the site in 1986 provided evidence of the habitat's value, a key consideration in awarding the refuge designation. Prairie dogs, a food source for the eagles, had established colonies in the undisturbed buffer area, and cottonwood trees provided perch and cover habitat. The eagles' discovery captured the community's imagination, and public support for protection of the habitat grew quickly. Until this point, the primary role of FWS at the site had been enforcement. To move into a management role, the agency added a full-time staff member on site that year, established a station on site in 1989, and began to allow controlled public access for recreation visits and catch-and-release fishing shortly thereafter.

Formal establishment of the Rocky Mountain Arsenal National Wildlife Refuge was possible thanks to community support and outreach as well as the tenacity and talent of many different stakeholders. FWS staff persisted in building interest in the site's potential and in making the connections with key decision makers. National Wildlife Federation staff contributed to drafts of the necessary legislation, with a vision of establishing in perpetuity a valuable environmental education resource in a major metropolitan area. Congressional members Pat Schroeder and Wayne Allard proposed the legislation in 1989 and in 1992, the Refuge Act became law.

Cultivating Relationships and Defining Roles

As FWS moved forward with establishing the refuge, site cleanup was also getting underway. This period was marked by litigation among the State of Colorado, the Army and Shell over financial responsibility, jurisdiction and other issues. Moving from a litigious approach to a mediated dialogue required community involvement to build support among elected officials and encourage leaders to collaborate. "The community's interest in moving things along helped build

Prairie Dog – A Keystone Species

At one time, prairie dog colonies could be found across the west. Today, development, disease and other factors have led to their decline. The Arsenal's undisturbed land offered a valuable habitat opportunity, and prairie dog colonies thrived. Their presence was a necessary component in the development of a robust ecological system. Prairie dogs create variations in the landscape that provide habitat for other species, such as burrowing owls. They also provide a food source for predators such as black-footed ferrets, hawks and bald eagles. Without this keystone species, many of the other kinds of wildlife at the refuge would not be present today.

Prairie dog colonies thrived on the Arsenal's undisturbed buffer lands.

Timeline of Events

1941	Japan attacked Pearl Harbor and U.S. entered World War II
1942	Rocky Mountain Arsenal established
1946-1984	Private and military manufacturing operations continued
1984	All private and military manufacturing and demilitarization operations stopped Site proposed for NPL listing
1986	Bald eagles discovered on site
1987	EPA listed site on NPL
1989	Federal Facility Agreement signed FWS field office established on site
1992	Rocky Mountain Arsenal National Wildlife Refuge Act signed
1995	Off-Post Operable Unit ROD signed
1996	On-Post Operable Unit ROD signed Remediation Venture Office established Refuge Master Plan published
2003	EPA deleted Western Tier parcel from NPL
2004	Western Tier parcel transferred to the General Services Administration for eventual sale to Commerce City Select Perimeter Area and the Surface Deletion Area deleted from NPL and transferred to FWS Rocky Mountain Arsenal National Wildlife Refuge established
2006	Internal Parcel deleted from NPL and transferred to FWS
2007	EPA honored Rocky Mountain Arsenal with Land Revitalization Award Bison reintroduced on site Colorado Rapids Stadium complex opened
2008	Shell transferred 100 acres of Shell property to Commerce City
2009	EPA issued Ready for Reuse Determination for most of Shell property in Off-Post OU
2010	Surface environmental remediation and remedy construction completed Central Area and Eastern Surface Area deleted from NPL and transferred to FWS Off-Post OU surface media deleted from NPL
2011	New visitor center opened
2015	Black-footed ferrets reintroduced
2016	New section of wildlife-viewing drive opened

political will to work together," said retired Tri-County Health Department staff member Ken Conright.

A 1988 Interim Consent Decree defined cleanup roles and cost responsibilities. The 1989 Federal Facility Agreement followed; it established how federal, state and local agencies would work together and resolve disputes during the cleanup. The Army has conducted the cleanup with oversight from EPA and CDPHE. Several years later, all parties signed onto a Principles of Interaction Agreement to lay the groundwork and expectations for their working relationships.

In addition to establishing roles for the various agencies, the Federal Facility Agreement established committees to manage coordination and troubleshoot issues during the cleanup process. The Rocky Mountain Arsenal Committee, which included agency representatives with technical expertise and some decision-making authority, would handle most issues. Issues could also be forwarded to the Army's deputy for environment, safety and occupational health, EPA Region 8's regional administrator, CPDHE's director, and a vice president at Shell. "Working through issues at the committee level meant that people with the right expertise could jump in and were empowered to solve problems," said EPA project manager Greg Hargreaves. With these mechanisms in place to facilitate collaboration, all parties were ready to move forward.

"I've spent a lifetime in the west, and some of the most interesting wildlife experiences in my life were in those early years at Rocky Mountain Arsenal."

– Pete Gober, FWS

Prior to the establishment of the National Wildlife Refuge, members of the local rod and gun club took advantage of fishing and gaming opportunities at the site.

1993 – 2011
Landscape Transformation

With future land use considerations settled, cleanup and reuse efforts could proceed in tandem, and community engagement began in earnest. Four new stakeholder working groups were established – the citizen-run, site-specific Advisory Board; the Restoration Advisory Board (chaired by an Army representative and a citizen representative); the Area Boards, made up of representatives from local government agencies; and the Northern Community Coalition, which included the Tri-County Health Department, the city of Commerce City, the South Adams County Water and Sanitation District, and other concerned agencies and citizens. These groups helped educate group members and the public, provided an opportunity to share information, ideas and concerns, and helped make sure that local perspectives were part of cleanup and reuse discussions.

Bringing Local Voices to Cleanup Design

During cleanup design negotiations, each stakeholder group and the agencies had a seat at the table. Lt. Governor Gail Schroeder was a key convener of the process that led to final remedy selection. A court-appointed mediator oversaw the negotiations, and helped to facilitate high-level discussions among the federal, state and local agencies and the stakeholder groups, each of which had their own interests. The Northern Community Coalition, for example, proposed cleanup criteria to the Army and Shell. Community stakeholders stressed the importance of a locally appropriate remedy that considered future use – cleanup plans should meet a 1,000-year design life and the community should have a guaranteed long-term water supply. "Through the negotiation process, everyone got a little of what they wanted and we were able to build buy-in for the effort," said U.S. Army Rocky Mountain Arsenal Program Manager Charlie Scharmann.

By 1995, the parties had completed a conceptual agreement. The Off-Post OU ROD was signed in 1995 and On-Post OU ROD was signed in 1996. Remedies designs balanced technical requirements for long-term protectiveness with community priorities and included caps using native soil and vegetation designed to support short-grass prairie and to fit in with the surrounding landscape. The Army also worked to ensure the availability of a safe water supply for the community in perpetuity. The RODs also retained land use restrictions for the site that had first been established in the Federal Facility Agreement and then in the Rocky Mountain Arsenal National Wildlife Refuge Act of 1992. The restrictions prohibit residential, industrial and agricultural use of the property, use of groundwater and surface water for drinking water, and consumption of fish or game from the property. These restrictions would later become an important consideration as FWS established and began operating refuge facilities.

Planning for the Future

In 1994, FWS kicked off work on a Comprehensive Management Plan to guide the refuge's future development. The planning team started by reviewing existing maps and plans, including the region's Emerald Strands Plan, an open space and trail plan for the area surrounding the new Denver International Airport. Refuge staff and the planning team participated in a workshop to establish a vision for the plan, and held scoping meetings for the refuge. A series of focus groups

Federal Facilities: A Closer Look

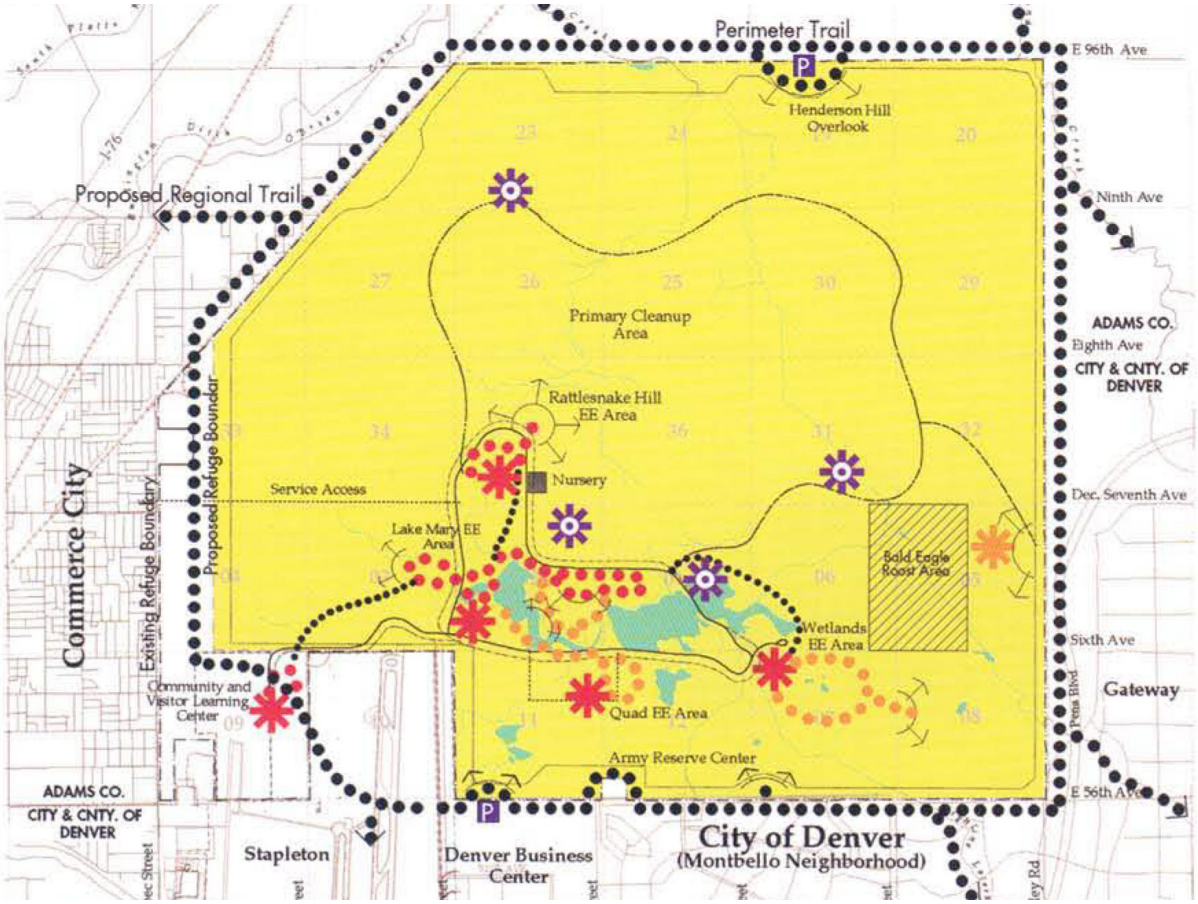
In addition to military installations like the Arsenal, federal facilities include former nuclear production plants, abandoned mines and landfills. Common types of contamination include radioactive waste, munitions and unexploded ordnance, mining waste, fuels and solvents. There are 174 federal facilities on the NPL. EPA is responsible for overseeing their cleanup under the Superfund law (CERCLA Section 120).

At Department of Defense sites such as Rocky Mountain Arsenal, EPA's responsibilities include efforts to support community involvement and reuse planning, facilitate property transfer, implement remedies as soon as practicable, and maintain remedies that protect human health and the environment.

The Longhorn Army Ammunition Plant, a federal facility in East Texas, has been transformed into the Caddo Lake National Wildlife Refuge, which features pristine mature flooded bald cypress forest.

Remediation Venture Office

In 1996, the Army, Shell and FWS formed the Remediation Venture Office, a unique partnership to tackle the site's cleanup and prepare the land for its future use. "This partnership ended up working because each of the organizations involved people who were invested in its success," said retired FWS staff member Bruce Hastings. "The Remediation Venture Office concept was to clean up in a way that would create a premiere national wildlife refuge. It was a different approach than a typical cleanup, and it took a while to get all of the engineers to buy into it, but it worked."



The 1996 Comprehensive Management Plan mapped out a vision for refuge development. Image used with permission of FWS.

involving local stakeholders such as civic and business leaders, environmental organizations, public agencies and the scientific community helped gather input and ideas and identify potential issues. In September 1995, FWS presented a preliminary vision for the refuge at three public meetings and facilitated small discussion groups to generate ideas and feedback.

Feedback from the public showed that opinions on the appropriate level of public access to the refuge varied, so FWS focused its alternatives development on varying levels of access. After gathering input on its presentation strategy from its focus groups, FWS held another series of public meetings to present the alternatives; the preferred alternative allowed for moderate public access. In June 1995, FWS presented its draft Environmental Impact Statement for the preferred alternative. The focus groups convened one more time to help develop the final plan. The final 1996 Comprehensive Management Plan outlined six overarching goals for the refuge (see text box) and called for three phases of implementation – a period of development from 1996 to 2000, a second phase of major development, and a future development phase following cleanup.

1996 Comprehensive Management Plan Goals

1. Manage wildlife and habitat to contribute to ecosystem management using strategies that recognize the refuge's different resource types and the varying purposes specified in the enabling legislation.
2. Interact with communities and organizations through outreach and cooperative agreements to create mutually beneficial partnerships.
3. Develop environmental education and outreach programs for urban communities to nurture an appreciation of nature that ultimately results in fostering an environmental consciousness that promotes conservation of our natural resources.
4. Provide opportunities for wildlife-oriented recreation activities.
5. Use the refuge for research opportunities compatible with refuge management.
6. Develop a program support system to provide facilities, funding and resources necessary to accomplish refuge purposes.

An artist's rendering of the future refuge illustrates the goals in the 1996 Comprehensive Management Plan. Image used with permission of FWS.

Putting the Pieces in Place

As cleanup proceeded, EPA, the Army and FWS began a series of partial deletions and land transfers (removing parcels of property from the NPL site) to create the refuge. Cleaning up parts of the site and taking them off the NPL addressed contamination concerns and enabled the areas to be returned to use while cleanup continued in other areas. The process began in 2003. EPA deleted 917 acres of land on the southern and western sides of the facility – the Western Tier Parcel – from the NPL. The Army transferred this land to the General Services Aministration for eventual sale to Commerce City in exchange for funds that would later be used to build the refuge visitor center. At that time, Commerce City envisioned development of the Western Tier parcel in a manner that would capitalize on the city's proximity to the refuge to create a tourism resource for the community. The agreement with FWS placed the sole refuge entrance on the property, bringing hundreds of thousands of future refuge visitors through the core of the city, a huge economic development win.

CERCLA

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) is the law passed by Congress on December 11, 1980, that is commonly known as Superfund.

Commerce City has since used the land to develop community resources, including the 25,000-seat Dicks' Sporting Goods Park and adjacent soccer complex, Adams City High School, Commerce City Civic Center, South Adams County Fire District headquarters, and the 190-acre Prairie Gateway open space and trail, and still has room for commercial development. Building the new city hall on the property was an effort to show faith in the cleanup and build public support. "That showed people that we feel comfortable spending our work days there - we wouldn't be here if we didn't think it was safe," said Commerce City Mayor Sean Ford.

In 2004, the EPA deleted over 5,000 acres of the site known as the Select Perimeter Area and the Surface Deletion Area from the NPL. The Army transferred 5,000 acres of the deleted area to FWS to establish the Rocky Mountain Arsenal National Wildlife Refuge, and another 126 acres to municipalities for

Throughout the planning process, local, state and federal agencies have focused on community outreach. Images used permission of the Tri-County Health Department and the Army.

roads. In 2007, EPA recognized the deletion and transfer effort with its Land Revitalization Award.

Additional deletions and transfers of On-Post lands in 2006 and 2010 brought the refuge to its current size of 15,000 acres. In 2009, EPA issued a Ready for Reuse determination for a 349-acre Off-Post portion of the site owned by Shell and deleted this area from the NPL in 2010. The Army retains approximately 1,000 acres of the On-Post portion of the site which has not been deleted from the NPL.

Integrating Cleanup and Reuse

Throughout the cleanup process, agencies collaborated to ensure that future use goals were incorporated in the cleanup approach and to make sure cleanup activities were compatible with visitor access and wildlife activities. To protect bald eagle roosting areas, cleanup activities were scheduled during periods when the birds had migrated off site. When the birds were on site, cleanup was planned to minimize their disturbance. Preserving cottonwood trees, an important component of bald eagle habitat, involved tailoring surface soil cleanup to preserve the area around the dripline of the trees. Visitors enjoyed controlled access to some areas of the refuge during cleanup. The Army, Shell, EPA and CDPHE worked together to manage visitor access and safety during cleanup work, monitoring air quality and using day-to-day information about site activities to determine appropriate levels of access.

Building trust with the community was crucial at this stage, and involved several layers of engagement efforts. Early cleanup actions had created strong odors in the surrounding area, which had increased local fears about the site and the safety of the cleanup. After building community trust through its community groundwater monitoring program, the Tri-County Health Department had staff trained in the operation of remedial equipment. They performed daily oversight and then shared information and their observations with the public. With support from an EPA technical assistance grant, the site-specific Advisory Board also reviewed data and provided feedback to the community. The Restoration Advisory Board also reviewed designs and operational plans as part of the community's oversight of the cleanup program. CDPHE administered a community health monitoring program and

Munitions debris recovered from a former munitions testing area during cleanup.

Natural Resources Damage Assessment

To compensate for damages done to environmental resources at the Arsenal, which are accounted for as part of the Natural Resources Damages Assessment process, a $27.4 million award in 2008 provided funding for the acquisition, enhancement and restoration of natural resources in and around the Denver metropolitan area. With an additional $25 million in matching funds from local project sponsors, projects funded by the award have expanded the region's integrated greenway and open space network.

helpline. TCHD regularly monitored cleanup activities at the fenceline to make sure odors did not impact the community and established the Rocky Mountain Helpline for community members to speak directly with health professionals about their concerns. "The outreach programs were a real success story, said Susan Newton, CDPHE Project Officer. "They helped to alleviate the anxiety in the community about the cleanup following those early challenges."

In 2010, the 15-year, $2.1 billion environmental cleanup of surface areas finished. The effort had been a high-profile focus of the Army's remedial program, consuming up to 80 percent of the overall U.S. Department of Defense budget for site remediation in some years. Its successful completion highlighted the Army's dedication to site restoration and brought a transformational chapter in the life of the site to a close. The following year, the visitor center opened and the refuge became fully accessible to visitors, ushering in the next phase of project activities at the refuge.

Safety First

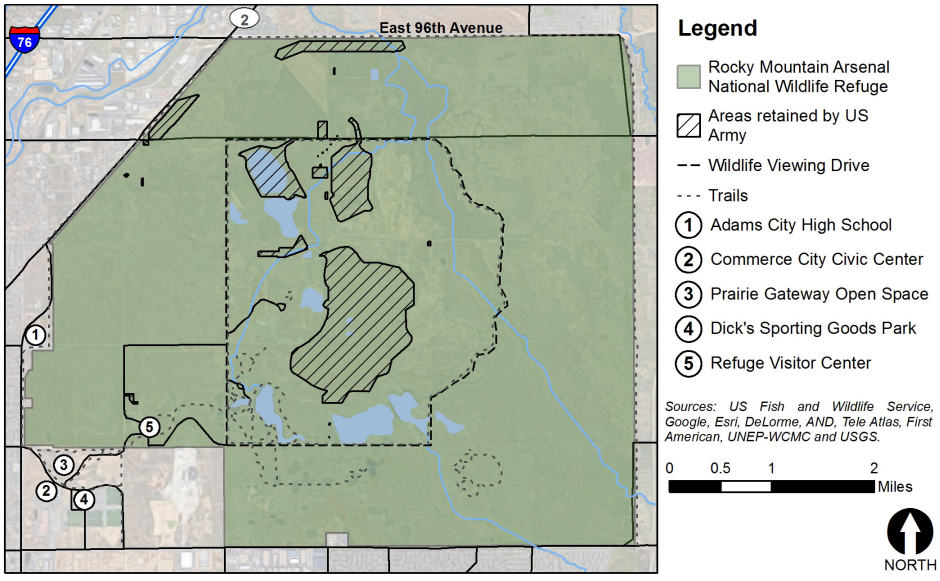
Throughout the cleanup and reuse of the Arsenal, safety has been a foundational concern for all parties. OSHA first recognized the Rocky Mountain Arsenal for outstanding safety achievements in 1999, when the Army's prime contractor, Tetra Tech, achieved "Star" status under OSHA's voluntary protection program (VPP). Star status is awarded in recognition of employers and employees demonstrating exemplary achievement in the prevention and control of occupational safety and health hazards and the development, implementation and continuous improvement of safety and health management system.

Shell's contractor and the Army earned Star status through OSHA's VPP in 2003 and 2009, respectively. The organizations all maintain their involvement with OSHA VPP and were recertified in 2017. Lessons learned were made part of the site's Emergency Management/ Contingency Plan. Balancing safety requirements with visitor access involved daily monitoring of site activities and documenting contingencies in a Visitor Access Plan. Access to areas maintained by the Army will continue to be restricted.

Above left: The landfill cover was carefully graded so the area would blend in with the surrounding landscape.

Above right: The Denver skyline and Rocky Mountains provide a stunning backdrop to remedial work at the site.

Right: Reuse of Rocky Mountain Arsenal includes the National Wildlife Refuge as well as municipal and commercial development.

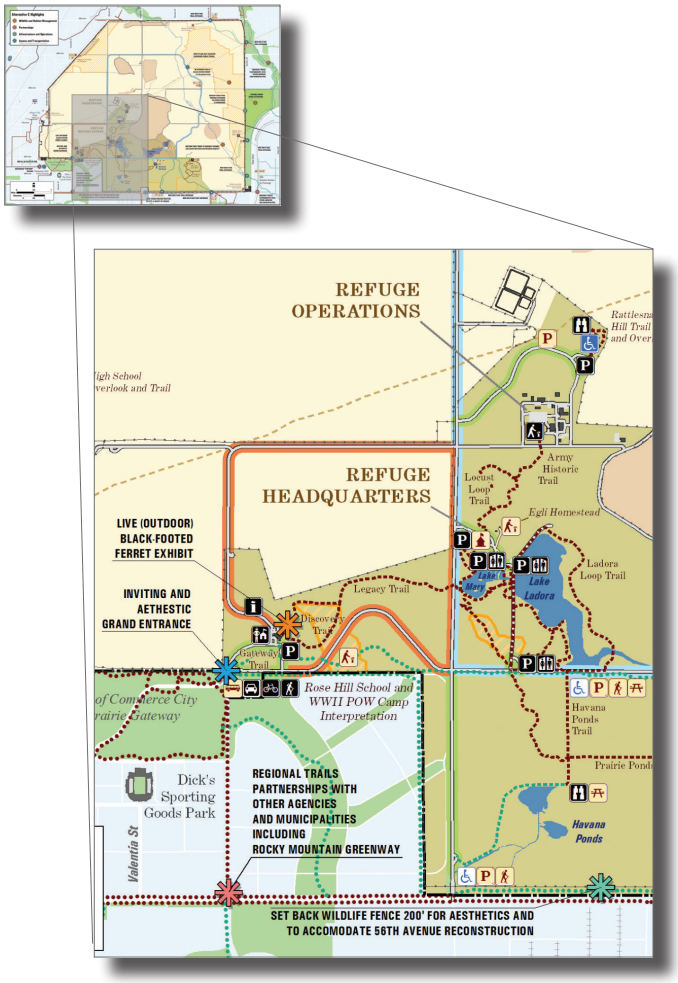


2012 – present
Realizing a Vision

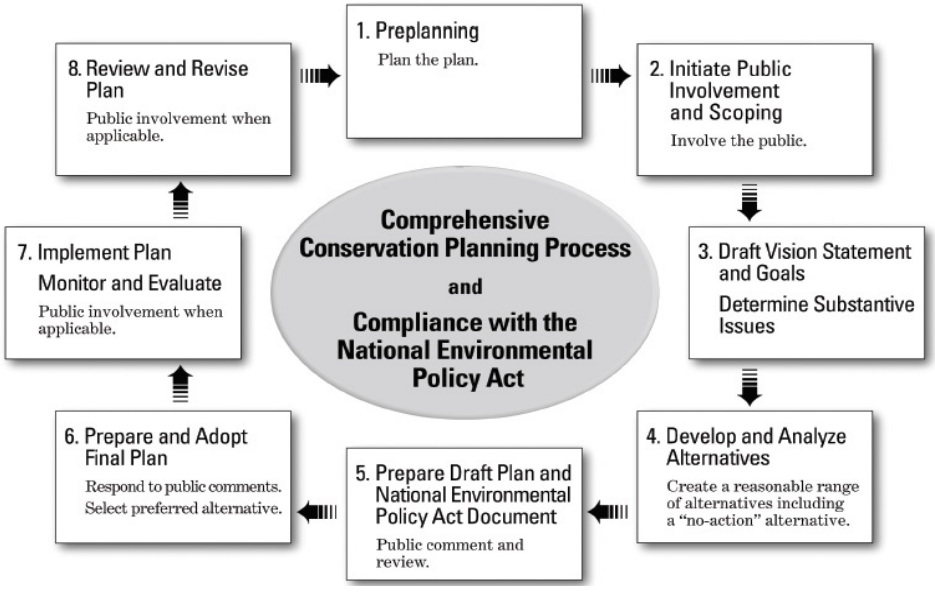
Planning for the Future

Following the completion of the cleanup of surface areas and opening of the visitor center, FWS started planning for the long-term management of the refuge. In 2013, FWS began work on its Comprehensive Conservation Plan, the successor document to the 1996 Comprehensive Management Plan. Agency staff held a series of site visits and meetings to kick off the project. Four public meetings in the summer of 2013 helped to inform the community about the process and provided an opportunity to gather ideas and express concerns. A core planning team collaborated during a series of workshops to develop four management alternatives. The planning team included representatives from the Army, EPA, CDPHE, the Tri-County Health Department, Adams County, Commerce City, the city and county of Denver, Colorado Parks and Wildlife, Denver International Airport, Denver Water, the Urban Drainage and Flood Control District, and many federal agencies.

FWS' proposed approach follows a plan based on the goals of the 2010 FWS Urban Refuge Initiative, which seeks to engage urban communities in the refuge system nationwide. The proposed approach involves outreach efforts and a focus on increased access to bring nontraditional visitors into the refuge and to increase the refuge's visibility in the Denver metropolitan area. Through an increased focus on partnerships, the refuge seeks to establish community links to bring citizen science into local schools and build connections with transportation and trail networks. The finalized plan is slated for publication in the near future.



The Comprehensive Conservation Plan maps out opportunities to increase access to the refuge, enhance infrastructure and facilities, and make connections with regional networks. Image used with permission of FWS.



The multi-stage Comprehensive Conservation Planning process involved many levels of public involvement. Image used with permission of FWS.

Developing the Refuge

Over the course of the past several decades, FWS has worked steadily to establish resources at the refuge to meet its dual goals of protecting wildlife and providing opportunities for people to experience the outdoors. This work has involved restoring habitat, developing trails and building facilities. When FWS started managing the site, buffer land around the facility showed the results of years of disturbance. Most of the land had been plowed under for agricultural use prior to the 1940s; native plants had been lost and weeds and crested wheat grass had taken hold.

FWS has worked steadily to control invasive species and establish native prairie habitat, treating and seeding 10,000 acres for native grassland. The Army and FWS eventually reached an agreement for a multi-year restoration funding award, in place of the typical annual award. This funding change has allowed FWS to realize the benefits of advance planning. "If you are certain of funding, you can make long-term plans for habitat restoration, which result in more successful outcomes," said retired FWS staff member Bruce Hastings.

Vision for the Refuge

"As the sun rises, bison thunder across the prairie, red-tailed hawks soar overhead, and the urban bustle begins. Lands once known for their agricultural and industrial uses are being restored on the Nation's premiere urban wildlife refuge, where time moves at nature's pace and wildlife have the right-of-way. Propelled by public and private partnerships, refuge stewards at Rocky Mountain Arsenal, Two Ponds, and Rocky Flats National Wildlife Refuges continue to work to repair and regenerate wildlife habitat. These prairie oases nestled within Colorado's Front Range communities welcome visitors from near and far and foster an appreciation for nature. They will connect people with the land for generations to come."

– from the Draft Comprehensive Conservation Plan

Bison have thrived at the refuge.

Dedicated restoration funding has allowed FWS to irrigate newly planted areas, a management approach that is costly up front, but saves resources in the long term as it helps the areas to re-establish more successfully. "Disturbance of the land by grazing bison and managing the landscape with prescribed burning have helped to improve species diversity," said FWS staff member Cindy Souders.

The habitat established at the refuge is not an island, but is tied ecologically with the surrounding landscape and with the broader community. FWS has partnered with many different organizations to build regional connections. With grant funding, FWS is establishing connections with the Rocky Mountain Greenway and Sand Creek Greenway regional trails. Collaboration with Commerce City and Bass Pro Shops brings local anglers to the Annual Youth Fishing Frenzy. With GoWild Northeast Metro Coalition, an initiative with 14 other state, local and nonprofit agencies, FWS works to get young people interested in natural resources and careers in the field.

Enjoying the Results

Today, the refuge is home to over 330 species of wildlife, including badgers, coyotes, deer, migratory song birds, burrowing owls, pelicans and waterfowl. The refuge supports over 150 bison, which were introduced in 2007 as part of an effort to re-establish pure strains of the rare species. In 2015, black-footed ferrets were reintroduced at the refuge. A highly-endangered species with only 400 individuals left in the country, the ferrets depend on healthy populations of prairie dogs to survive. Since their reintroduction, 25 of the ferrets have been born at the refuge. Animals are on display as a tool to teach visitors about conservation. Each winter, 40 to 50 bald eagles roost behind Lake Derby, and a nesting pair fledges one or two eaglets. Located on an important migratory pathway for birds, the refuge has been designated a Colorado Important Bird Area and is sought out by birders.

Burrowing owls making use of abandoned prairie dog burrows.

"The project is a huge success. Some of the early naysayers are the ones you see most frequently out enjoying the refuge."

- Former Mayor Pro Tem René Bullock

Over 340,000 guests visit the refuge every year, a marked increase from 45,000 guests who visited in 1994. The number continues to increase each year. "The outcome for the entire region is such a tremendous resource," said Ken Conright. "It's gratifying to be part of it." FWS has risen to the challenge of providing the infrastructure to support this level of use and provide quality experiences. Ten miles of trail are open to hiking and an 11-mile wildlife drive in the northeastern corner, which had previously only been accessible on a guided tour, opened in October 2016. Annual events include a youth fishing frenzy day and a fall refuge day to celebrate national wildlife refuge week.

More visitors means more opportunities to teach people about habitat conservation. "It's important that we connect with communities and get them involved at the refuge," said Cindy Souders. "Efforts to preserve habitat depend on the community's interest and support." Visitor engagement activities at the refuge include working with youth crews on habitat restoration projects and providing monthly volunteer stewardship opportunities involving planting and collecting seeds and pulling weeds. FWS works closely with the Friends of the Front Range Wildlife Refuges, an active group that supports Rocky Mountain Arsenal and Rocky Flats refuges, to increase volunteerism and get visitors more engaged at the refuge.

Community amenities built on the Western Tier Parcel include the Commerce City Civic Center and Adams City High School.

U.S. Navy sailors collect four-winged saltbush seeds for future distribution throughout the refuge.

Thinking Long Term: Land Use Constraints

As reuse has taken shape, challenges posed by the site's land use controls have come to light. Controls restricting residential uses preserved land from development, but also preclude housing for refuge staff on site. A prohibition against consuming game at the refuge prevents consumption of potentially contaminated fish, but also makes it difficult to transfer bison off the refuge once the herd has reached the limits of its habitat. Since the site remedy was based on the inclusion of these land use controls, any changes would require sampling efforts and a thorough evaluation of potential risks, a resource-intensive process.

FWS is collaborating with EPA and CDPHE to troubleshoot these challenges and identify solutions that will protect public health and the environment and allow FWS to effectively operate the refuge. FWS, EPA and CDPHE are working on a bison sampling program to identify any effects of site contamination on the herd and evaluate future options for their use. Commerce City is working on building political support for adjustments to land use controls on the Western Tier Parcel.

"Development of the Western Tier Parcel has transformed the eastern boundary of Commerce City. It has become the tremendous resource we envisioned when we first planned to purchase the land."

- Mayor Sean Ford

Refuge visitors can enjoy an extensive trail system.

Recognizing the Arsenal's History

The Arsenal's history is still very much alive at the site. Army buildings house FWS biological, administrative and management offices and a former officer's club now houses environmental education programs. Family members of the original homesteaders who cultivated the land before 1942 return to the site to participate in public events and have provided oral histories, as have Army personnel who were stationed there. At the visitor center, interpretive displays share the site's history. "Sharing our history is a point of pride for the community," said former Mayor Pro Tem René Bullock. "We were proud of our support of the military's efforts here, and we're proud of what the site has become."

Displays at the visitor center share the history of the site.

Lessons Learned

Stakeholders who contributed to the project identified several significant factors that contributed to the project's successful outcomes.

- The prime location near downtown Denver and the Denver International Airport, and surrounded by new development, has made the refuge a highly visited wild oasis.
- Undisturbed for decades, the Arsenal's former buffer area was ideally suited to supporting wildlife.
- Partial deletions by EPA facilitated reuse and encouraged redevelopment, removing negative perceptions of the site and addressing safety concerns.
- Skilled mediation and facilitated collaborative processes helped stakeholder groups resolve conflicts and establish common goals so that all parties could move forward constructively.
- Establishing ground rules and a tiered committee structure to handle decision-making and troubleshooting made addressing issues that came up during cleanup easy to resolve at the right level.
- Successfully negotiating for multiple years of habitat restoration funding from the Army allowed the FWS to plan for refuge work over the long term.
- Outreach efforts by local agencies, including the medical monitoring program and Rocky Mountain Helpline, helped address community contamination and cleanup concerns.

"We were lucky to have a lot of good people working on this. They learned how to work together and how to make things happen, and have brought that to other work. That was one of the benefits of this project."

- Bruce Hastings, FWS

Funded by the sale of the Western Tier Parcel, the visitor center opened in 2011.

Bigger Picture

While these factors created an ideal climate for the successful reuse of the Rocky Mountain Arsenal site, a range of broader lessons learned can also help guide similar projects at contaminated lands across the country:

Local governments can play a unique leadership role in reuse planning projects.

As the organizations responsible for their communities' general welfare, local governments are particularly well-positioned to bring together diverse stakeholders and use planning tools and incentives to foster positive outcomes. The work of Commerce City, the Tri-County Health Department, and other local agencies and organizations helped ensure that that community interests were well represented throughout planning activities for the refuge. "It's a transformative process that occurred out there," said former Tri-County Health Department Deputy Director Tom Butts. This robust collaboration continues to yield benefits both at the refuge and in other community initiatives.

Community engagement and capacity building are vitally important.

A well-designed community engagement process ensures transparency and allows information to flow in both directions. Providing detailed information helps dispel rumors, address concerns and establish trust. Community members can provide valuable information and ideas throughout the planning process, making the remedy and reuse plan more locally appropriate and successful. Getting community members engaged builds a sense of ownership, which has resulted in high levels of volunteerism and support for the refuge. "If we had this to do again, I would ask City Council to engage communications specialists to advise on our public engagement efforts," said Mayor Sean Ford. "The more effectively you can communicate with people in the community, the better."

Dick's Sporting Goods Arena is part of a massive soccer complex at the site.

EPA's work with communities and stakeholders supports reuse outcomes that are compatible with site cleanups.

The Agency places a priority on supporting the return of contaminated sites to productive and beneficial uses. As part of its ongoing effort to coordinate with the community to integrate cleanup and reuse considerations, EPA provided technical assistance grant funding to support the community's effective engagement and produced a Ready for Reuse Determination to eliminate any confusion over what future uses were appropriate at the Shell Off-Post property. Ongoing collaboration by EPA with FWS and CPDHE to address challenges posed by land use constraints will help to protect public health and the environment and allow FWS to effectively manage the refuge.

Think long term and take changing conditions into account. Adjust cleanup and post-cleanup plans as needed.

It can take many years to remediate contamination that has accumulated over decades. Decisions made early in the cleanup process will impact future site use decades later. Early decisions about land use controls at the Arsenal constrained options for site uses today in ways unforeseen at the time of their development.

EPA and Reuse: Lessons Learned

Since the inception of the Superfund program, EPA has been building on its expertise in conducting site characterization and remediation to ensure that contamination is not a barrier to the reuse of property. Today, consideration of future use is an integral part of EPA's cleanup programs from initial site investigations and remedy selection through to the design, implementation, and operation and maintenance of a site's remedy.

Throughout cleanup, remedial activities at the Arsenal were designed to minimize impacts on the habitat and wildlife, to ensure the site's successful establishment as a national wildlife refuge. EPA scheduled the cleanup schedule around bald eagle migration patterns and tailored soil cleanup to preserve bald eagle habitat.

EPA also works with site stakeholders to consider how future land use considerations can inform the implementation and long- term stewardship of site remedies as well as cleanup planning. At some sites, for example, reuse considerations can inform the future location of groundwater monitoring wells and other operation-and-maintenance equipment that might inadvertently hinder redevelopment efforts. At other sites, detailed site reuse plans have provided additional benefits that save time and reduce redevelopment costs. For example, future infrastructure corridors or building footers can be installed in coordination with site cleanup activities.

Public agency collaboration with the private sector brings innovation to cleanup and reuse planning efforts.

Through the unique Remediation Venture Office teaming arrangement, the Army, FWS and Shell collaborated to ensure that cleanup would be timely, cost-efficient and support the establishment of a premiere national wildlife refuge. The remedial design addressed site contamination and supports ecological reuse, with landfill caps designed to support shortgrass prairie and cover for wildlife.

Think beyond site boundaries.

Land uses and community needs change over time. Development around the refuge today has exceeded even the expectations at the time the refuge was planned, creating a unique oasis of open space and habitat near a vibrant urban area. FWS continues to build connections with partners, neighboring communities and regional transportation networks to make the refuge's mission even more relevant in the Denver metropolitan area.

FWS offers monthly guided tours aboard its bus, with opportunities to view bison, hawks, coyotes, waterfowl and deer, as well as other interpretive programs.

The new South Adams County Fire District headquarters is located on the Western Tier Parcel.

Looking Forward

In the years to come, FWS will realize the vision of its Comprehensive Conservation Plan by building new partnerships and connections to increase refuge access. The refuge will be one of the first in the nation to implement the innovative goals of the 2010 Urban Refuge Initiative, increasing the relevance of the refuge system to nontraditional visitors and stakeholders across the region. Refuge visitors will travel through Commerce City's vibrant development and Prairie Gateway, bringing economic growth to the area.

Future refuge work will include restoring historical habitats, building trails to connect with regional transportation systems, establishing thousands of new acres of native shortgrass and mixed-grass prairie habitat, and working to create self-sustaining, biodiverse landscapes throughout the refuge.

The remarkable transformation of one of the country's most toxic sites into a rich prairie oasis illustrates how collaboration among local, state and federal partners can yield remarkable benefits. Due to innovation, forward thinking and cooperation, this refuge will continue to be an important community resource and national treasure.

> ***"It's become an astonishing oasis. The vision that the area should remain as a large area of open space was a prescient one."***
>
> – Susan Newton, Colorado Department of Public Health and Environment

Visitors to the refuge enter through Commerce City's Prairie Gateway, which offers a trail, picnic shelters and an overlook area.

AN ASTONISHING OASIS: TRANSFORMING A MUNITIONS FACILITY INTO OPEN PRAIRIE

THE ROCKY MOUNTAIN ARSENAL SUPERFUND SITE IN ADAMS COUNTY, COLORADO

Sources and Resources

Sources

Images and maps for this case study are provided courtesy of EPA Region 8, FWS and the Army.

Resources

EPA site profile page:
https://www.epa.gov/superfund/rocky-mountain-arsenal

EPA Superfund Redevelopment Initiative:
https://www.epa.gov/superfund-redevelopment-initiative

US Army public outreach website:
http://www.rma.army.mil

FWS Rocky Mountain Arsenal National Wildlife Refuge:
https://www.fws.gov/refuge/rocky_mountain_arsenal

Colorado Department of Public Health & Environment:
https://www.colorado.gov/cdphe

Tri-County Health Department:
http://www.tchd.org

Commerce City:
http://www.c3gov.com

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