

Rocky Mountain Arsenal

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Rocky Mountain Arsenal, south entrance. (photo 1960)

The **Rocky Mountain Arsenal** was a [United States chemical weapons](#) manufacturing center located in the [Denver Metropolitan Area](#) in [Commerce City, Colorado](#). The site was operated by the [United States Army](#) throughout the later [20th century](#) and was controversial among local residents until its closure.

In 1942, the U.S. Army acquired 19,915 [acres](#) (80.59 [km²](#)) of land on which to manufacture weapons in support of [World War II](#) military activities. Additionally, some of this land was used for a [prisoner of war](#) camp (for [German combatants](#)) and later transferred to the city of [Denver](#) as [Stapleton Airport](#) expanded.





Manufacturing Operations



 **Rocky Mountain Arsenal, south plant. (photo 1970)**

Weapons manufactured at RMA included munitions filled with [white phosphorus](#), [napalm](#), and chemical agents. The manufacture of these weapons continued until 1969. Subsequently, through the 1970s until 1985, RMA was used as a demilitarization site to destroy munitions and chemically related items. Coinciding with these activities, from 1946 to 1982, the Army leased RMA facilities to private industries for the production of [pesticides](#). One of the major lessees, [Shell Oil Company](#), along with [Julius Hyman and Company](#) and [Colorado Fuel and Iron](#), had manufacturing and processing capabilities on RMA between 1952 and 1982.

Deep Injection Well

RMA contained a deep injection [well](#) that was constructed in [1961](#). It was drilled to a depth of [12,045 feet](#) ([3671 m](#)). The well was cased and sealed to a depth of [11,975 feet](#) ([3650 m](#)), with the remaining [70 feet](#) ([21 m](#)) left as an open hole for the injection of [Basin F](#) liquids. For testing purposes, the well was injected with approximately [568,000 US gallons](#) ([2150 m³](#)) of city water prior to injecting any waste. The injected fluids had very little potential for reaching the surface or usable [groundwater](#) supply since the injection point had [11,900 feet](#) ([3630 m](#)) of rock above it and was sealed at the opening. The Army discontinued use of the well in February 1966 because the fluid injection was triggering [earthquakes](#) in the area. The well remained unused for nearly 20 years. In 1985 the Army permanently sealed the disposal well in stages.

Environmental Issues



[CLICK HERE TO VIEW THE DOCUMENT ON SARIN](#) – a rabbit was used to check for leaks at the Sarin nerve gas production plant. (photo 1970)

In 1984, the Army began a systematic investigation of site contamination in accordance with the [Comprehensive Environmental Response, and Compensation and Liability Act of 1980](#) (CERCLA). In 1987, the site was placed on the [National Priorities List](#) (NPL), colloquially called a Superfund site. As provided by CERCLA, a Remedial Investigation/Feasibility Study (RI/FS) was conducted to determine the extent of contamination. Since 1985, the mission at RMA has been the remediation of the site.



was used to check for leaks at the SARIN nerve gas production plant (1970)

Photo of the caged rabbit that

Contaminants

The primary contaminants include [organochloride](#) pesticides, [organophosphate](#) pesticides, [carbamate](#) insecticides, [organic solvents](#) and feedstock chemicals used as raw products or intermediates in the manufacturing process (e.g., chlorinated benzenes), heavy metals, and chemical warfare materiel and their related breakdown products. Additionally, [ordnance](#) (including incendiary munitions) was manufactured and tested and [asbestos](#) and [polychlorinated biphenyls](#) (PCBs) were used at RMA.

Rocky Mountain Arsenal NWR Act

A winter communal roost of [bald eagles](#), then an [endangered species](#), was discovered on site in 1986. The [U.S. Fish and Wildlife Service](#) soon realized that more than 330 species of [wildlife](#) inhabit the Arsenal including [deer](#), [coyotes](#), [white pelicans](#) and [owls](#). The [Rocky Mountain Arsenal National Wildlife Refuge Act](#) was passed in October 1992 and signed by then [President George H. W. Bush](#). It stipulates that the majority of the site will become a [National Wildlife Refuge](#) under the jurisdiction of the Fish and Wildlife Service when the environmental restoration is completed. The Act also provides that to the extent possible, parts of the Arsenal are to be managed as a Refuge in the interim. Finally, the Act provides for the transfer of some Arsenal land for road expansion around the perimeter of the Arsenal and 915 acres (3.70 km²) to be sold for development and annexation by Commerce City.

Developments Since 2004

Although comprising 17,056 acres (69.02 km²) at the beginning of remediation in 1997, 5,976 acres (24.18 km²) of the RMA have been determined to meet cleanup requirements and are no longer part of the National Priorities List. Of that, approximately 4,927 acres (19.94 km²) were transferred by the Department of Army to the USFWS in April of 2004 and another 917 acres (3.71 km²), located in the southwest corner of the site, were sold to Commerce City in June of 2004. Also, in 2004, approximately 129 acres (0.52 km²), located at the boundaries, were transferred to local jurisdictions and to the U.S. Army Reserve Center for road improvement projects. An additional 7,200 acres was transferred to the USFWS in October 2006, making the Rocky Mountain

Arsenal Wildlife Refuge one of the largest urban refuges in the United States. The refuge is currently comprised of 12,500 acres and is home to more than 330 species of animals. Implementation of the remedy for the estimated 11,080 acres (44.84 km²) remaining is ongoing and is scheduled for completion in 2011.

Public Use

Congruent with the outline of the June 1996 USFWS Comprehensive Management Plan, RMA will be available for public use through both community outreach and educational programs (as provided by the Visitor Access Plan and the USFWS). This public availability will be implemented while simultaneously supporting the remediation effort and the USFWS activities.

Dick's Sporting Goods Park

In April of 2007 Dick's Sporting Goods Park, a soccer-specific stadium, was opened on part of the former Rocky Mountain Arsenal land that was transferred to Commerce City. The new venue hosts the Colorado Rapids of Major League Soccer.

Bison

A small herd of wild bison were introduced to the refuge in March 2007 as part of the USFWS Pilot Bison Project. The animals were transferred from the National Bison Range in Montana [1].

[Rocky Mountain Arsenal](#)

[Rocky Mountain Arsenal History](#)

[The Rocky Mountain Arsenal: States' Rights and the Cleanup of Hazardous Waste](#)

[An Assessment of One of the Largest & Most Studied Superfund Sites in the Country: The Rocky Mountain Arsenal \(pdf\)](#)

Rocky Mountain Arsenal is at coordinates  [39°49'42"N 104°51'32"W](#) [39.828258, -104.858740](#) [Coordinates:](#)

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Rocky Mountain Arsenal was constructed during World War II near Denver, Colorado to produce [mustard gas](#), but was converted after the war to begin producing [nerve agents](#). It quickly became the prime facility for industrial scale [Sarin](#) production.

After the arsenal ceased production in 1957, environmental problems continued. Tucker notes that "because of the intense pressure at the height of the Cold War to turn out thousands of tons of [Sarin](#), little effort had been made to control pollution" ([Tucker, 2006](#)). Weak environmental laws allowed companies such as Shell, who leased out part of the Arsenal to produce insecticides, to scrimp on environmental safeguards. Waterfowl were poisoned and groundwater was polluted around the site for years after production ceased and the acres surrounding the site were dubbed the most polluted piece of real estate in America ([Tucker, 2006](#)).

Rocky Mountain Arsenal – From Weapons to Wildlife

Just ten miles outside of Denver, Colorado, lies an area contaminated by hazardous materials from years of chemical agent and pesticide production. The **27-square-mile Rocky Mountain Arsenal (RMA) Superfund site**, located northeast of Denver, is now in the process of being cleaned up and transformed into one of the largest urban national wildlife refuges in the country. Through collaboration with potentially responsible parties, other governmental agencies, and concerned citizens, EPA is helping to restore the 17,000-acre former weapons manufacturing facility to native prairie land to be used for public recreational activities and wildlife habitat.

The Rocky Mountain Arsenal Site

During World War II, the U.S. Army purchased 17,000 acres in Commerce City, Colorado, to manufacture and assemble weapons to support the country's efforts for WWII. After the war, the Army leased a portion of the Arsenal to private industry to offset operational costs. In 1946, Julius Hyman and Company began producing pesticides at the site until 1952, when it was acquired by Shell Chemical Company. From 1952 until 1982, Shell Chemical Company (now Shell Oil Company) manufactured pesticides and herbicides at the site. On its portion of land, the Army produced chemical agents until 1957 and continued weapons operations until 1969.

The Army and private chemical manufacturers disposed of liquid wastes in numerous unlined waste-disposal basins and trenches, resulting in groundwater, surface water, and soil contamination. By the mid-1950s, nearby residents discovered that the contamination was causing crop damage and affecting groundwater supplies. Soil contaminated with aldrin, dieldrin, dibromochloropropane (DBCP), and arsenic posed the most serious threat to public health.

The Cleanup

Both the Army and Shell Oil Company have been engaged in cleanup activities at the site since 1982. Thus far, more than \$1.3 billion has been spent by the responsible parties in the cleanup effort. In 1987, the site was officially added to EPA's National Priorities List (NPL) of hazardous waste sites needing cleanup. The cleanup plan, developed with EPA oversight, used an "outside-in" approach. In other words, to protect surrounding communities from the contamination, cleanup activities were prioritized in the outer areas closest to neighborhoods. Over the years, hundreds of public meetings have been held to strengthen community involvement in the decision-making process related to the cleanup and reuse plans.

During the initial stages of the cleanup, the U.S. Fish and Wildlife Service (USFWS) discovered that the site was inhabited by close to 300 wildlife species, including an abundance of deer, eagles, prairie dogs, hawks, coyotes, and owls. In recognition, Congress passed the RMA National Wildlife Refuge Act in 1992, which provides for the Arsenal to become a National Wildlife Refuge. It is anticipated that the 17,000-acre site will be fully cleaned up by 2011.

Progress Made

To date, work has been completed on the 940-acre Western Tier Parcel (WTP) portion of the RMA site, allowing the Agency to delete the area from the National Priorities List. Several proposals being considered for reuse of the WTP include commercial, recreational, ballfields, and open space options, as well as a community center and a Visitor Center for the refuge. Additional portions of the site are expected to be removed from the NPL in 2003, further establishing the wildlife refuge.

Cleanup crews remediate soil contaminated with aldrin, dieldrin, dibromochloropropane and arsenic from years of destructive disposal practices.



Overall, the RMA cleanup has included the treatment and removal of equipment and structures on the site, the incineration of approximately 10.5 million gallons of liquid waste, and the clean up of more than 2 million cubic yards of contaminated soil. Groundwater treatment systems have been constructed and currently treat 2.4 million gallons of water a day, and more than 9,000 tons of steel have been recycled from demolished structures. These cleanup activities use methods that will not only allow the wildlife refuge to thrive, but will also assure the protection of the many human visitors who will come to enjoy the area.

Benefits to the Community and Wildlife

The community has also seen a renewal of development in the areas surrounding the Arsenal. Since the cleanup began, 43,000 new households have either been planned or constructed immediately north of the site. These are the first housing developments planned by Commerce City in 40 years. Cleanup work has also created jobs in the area. Depending on the season, between 570 and 820 people involved in the cleanup are employed at the RMA site.

Restoring the refuge's prairie ecosystem is a major cleanup goal. Prairie ecosystems are highly endangered and have been destroyed faster than any other ecosystem in the country. The wildlife refuge will provide protected habitat for an estimated 3,600 black-tailed prairie dogs, more than 850 deer, hundreds of migrating waterfowl, and more than 50 bald eagles (the bald eagle is currently listed as a threatened species). The successes of the Rocky Mountain Arsenal Superfund Site will continue as the wildlife refuge grows in size and scope. EPA is working



tirelessly to rehabilitate this contaminated land that was environmentally scarred after years of destructive disposal practices. Through collaboration with the surrounding community, the responsible parties, local government, and the USFWS, EPA is ensuring that the cleanup of the site will result in a safe and healthy prairie ecosystem to be enjoyed by generations to come.

Just the Facts??!

- Responsible parties have spent more than \$1.3 billion on cleanup efforts so far.
- Installed water treatment systems decontaminate 2.4 million gallons of groundwater per day. More than 2 million cubic yards of soil have been cleaned up, and over 9,000 tons of steel from demolished structures have been recycled.
- The wildlife refuge will provide safe habitat to hundreds of waterfowl, deer, black-tailed prairie dogs, and bald eagles.
- The 940-acre Western Tier Parcel was deleted from the National Priorities List on January 21, 2003.

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The RMA National Wildlife Refuge will provide protected habitat for hundreds of mule deer, as well as black-tailed prairie dogs, migrating waterfowl, and eagles.

Superfund Help: [Acronyms](#) | [Topics](#) | [Frequent Questions](#) | [Publications](#) | [Sitemap](#)

World War I chemical warfare agent found at arsenal site

The Associated Press – Article Last Updated: 11/01/2007 10:51:31 PM MDT

DENVER—Crews digging a trench as part of the ongoing cleanup of the Rocky Mountain Arsenal discovered the presence of lewisite, a chemical warfare agent developed for use in World War I and produced at the site in 1943. The discovery Wednesday led to the closure of the Rocky Mountain Arsenal National Wildlife Refuge, created on parts of the 17,000 acre site, once a classified chemical munitions plant 10 miles northeast of downtown Denver.

"This work was in an area of the arsenal that was known for disposal of chemical agents," Dr. Ned Calonge, Colorado Chief Medical Officer said in a statement Thursday. "The closure of the refuge is the appropriate precautionary measure until we are certain there is no risk to human health." Workers, who were wearing protective clothing, were decontaminated and none showed any symptoms of coming into contact with the blistering agent. State health officials said none of the lewisite was detected in the air outside of the 5 acre work site.

More than 12,000 acres of the site have been removed from the Rocky Mountain Arsenal Superfund Clean-Up site and turned into a wildlife refuge.

Areas part of the Superfund site include former processing areas, waste disposal sites, munitions demolition areas, as well as some structures, roads and drainage areas.

Crews were working in an area that was used to destroy mustard agent. The discovery of the chemical agent is part of several incidents announced over the years. Crews discovered a Sarin-filled bomb inside the walls of a plant that apparently had rolled off a conveyor belt during manufacturing and wedged itself there.

Later while removing industrial waste from a scrap pile in 1999, workers found an M-139 bomblet, a grapefruit-sized sphere filled with 1.3 pounds of sarin, which kills humans the same way pesticides kill bugs. Crews found at least 10 such spheres, some containing sarin, during clean up between 1999 and 2001 that were destroyed with explosives and chemicals.