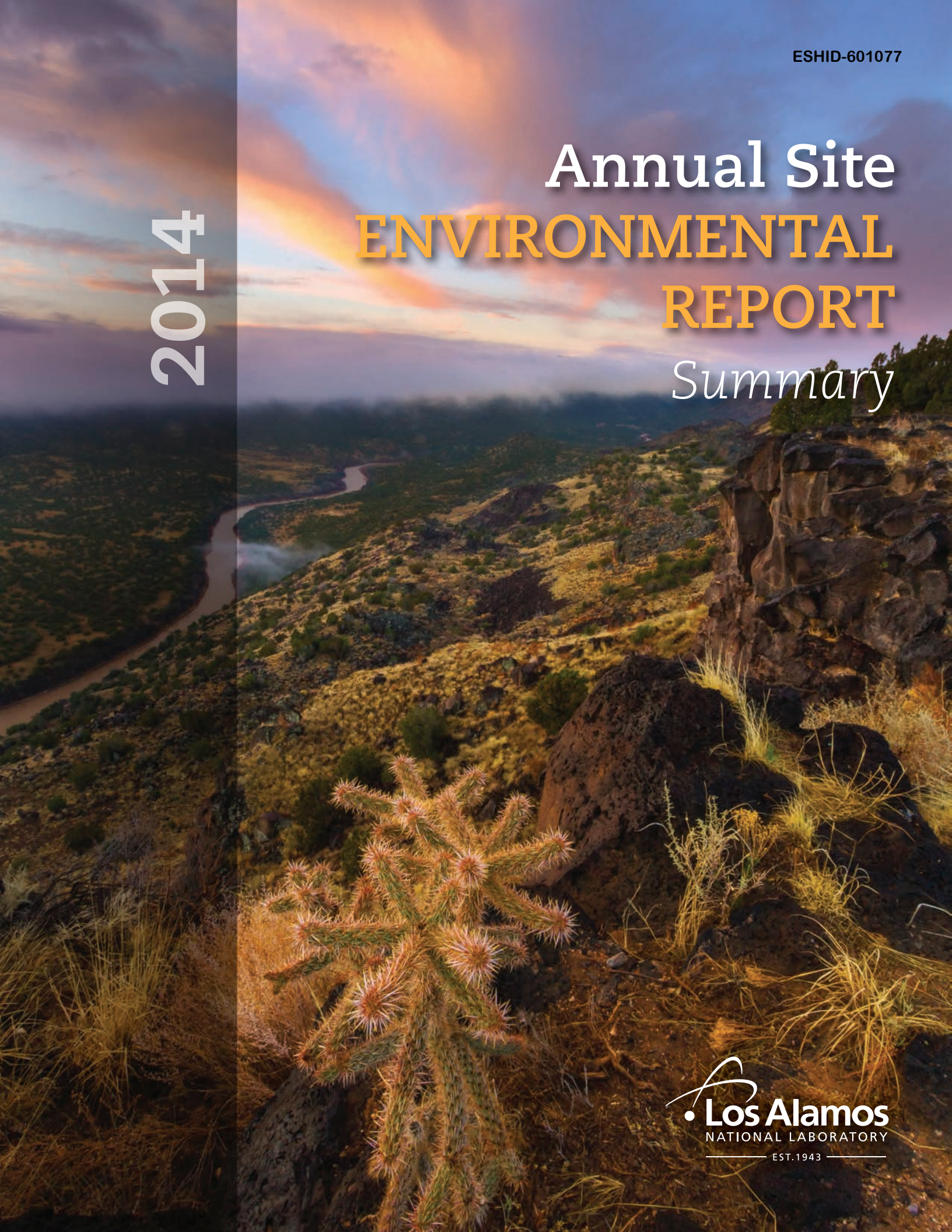
ESHID-601077

Annual Site ENVIRONMENTAL REPORT

Summary

2014



Los Alamos
NATIONAL LABORATORY
EST. 1943

LOS ALAMOS NATIONAL LABORATORY

delivers science and technology that promotes world stability while remaining a good steward of the environment. Los Alamos National Laboratory's (the Laboratory's) mission is to solve national security challenges through scientific excellence.
Inseparable from the Laboratory's commitment to excellence in science and technology is its commitment to environmental stewardship and full compliance with environmental regulations.

What are the Laboratory's Goals?

- **Deliver national nuclear security and broader global security mission solutions.**
- **Foster excellence in science and engineering disciplines essential for nation security missions by**
  - **attracting, inspiring, and developing world-class talent to ensure a vital future workforce and**
  - **enabling mission delivery through next-generation facilities, infrastructure, and operational excellence.**

Front and inside covers:
Sunset at the Rio Grande in White Rock Canyon.

COMMITMENT TO ENVIRONMENTAL STEWARDSHIP

Los Alamos National Laboratory (LANL or the Laboratory) is committed not only to excellence in science and technology but also to completing all work in an environmentally responsible manner. Every year, the Laboratory produces the annual site environmental report (ASER) in compliance with U.S. Department of Energy (DOE) Order 231.1b, Environment, Safety, and Health Reporting.

Through the ASER, the Laboratory communicates to the public the impacts its operations may have on the surrounding environment and the approaches used to avoid these impacts. This ASER summary is produced in large part by Laboratory students, provides a nontechnical overview of the ASER, and highlights many of the Laboratory's environmental programs. The ASER summary has been organized to recognize efforts made to

- create a sustainable future,
- control present processes to minimize impacts, and
- clean up past harms to the environment.

Laboratory students and staff hope you find this ASER summary document informative and entertaining. Comments are welcome at envoutreach@lanl.gov.

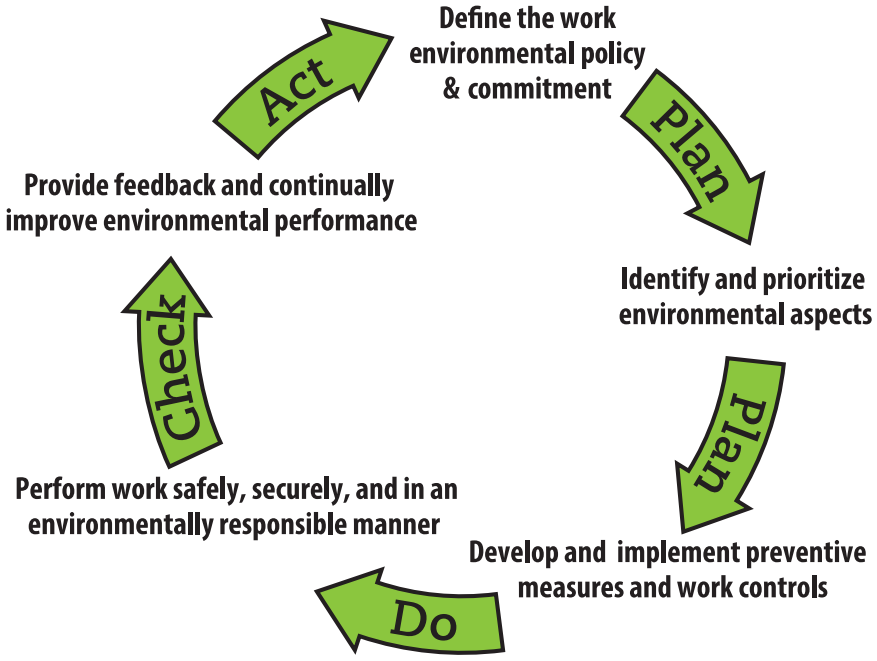
Contents

CREATE A SUSTAINABLE FUTURE: TAKING THE LONG-VIEW

Long-Term Strategy for Environmental Stewardship and Sustainability

Environmental stewardship is essential to the mission of the Laboratory. The Long-Term Strategy for Environmental Stewardship and Sustainability (the Long-Term Strategy) predicts and preempts potential environmental consequences so that the Laboratory operates in a way that protects human health and the environment. To do this, organizations at the Laboratory work together towards common goals set forth in the Environmental Management System (EMS). The Long-Term Strategy defines seven "Grand Challenges," and through applying the EMS, each organization devises annual work plans to achieve three main outcomes as shown below:

CREATE A SUSTAINABLE FUTURE
CLEAN THE PAST
CONTROL THE PRESENT



Grand Challenges:

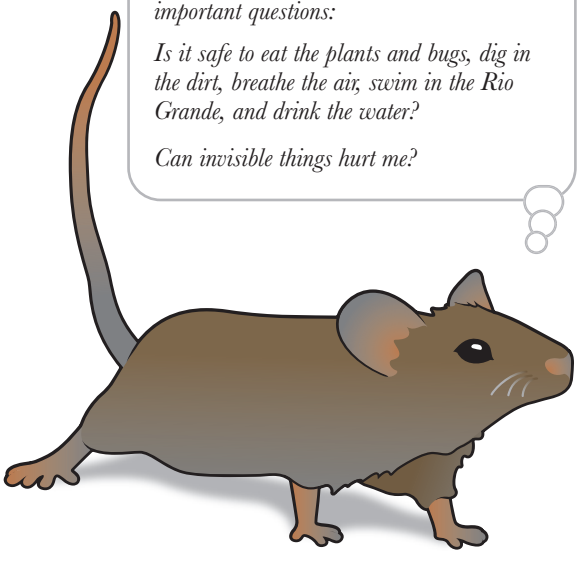
The Grand Challenges integrate environmental and operational programs, providing a coordinated approach to environmental stewardship. Each challenge is implemented through an annual set of objectives.

1. Collaborate with our stakeholders and tribal governments to ensure that the Laboratory's impact on the environment is as low as reasonably achievable (ALARA).
2. Remove or stabilize pollutants from Manhattan Project and Cold War eras.
3. Protect water resource quality and reduce water use.
4. Eliminate industrial emission, discharges, and releases to the environment.
5. Protect human and environmental health by managing and restoring lands.
6. Produce zero radioactive, hazardous, liquid, or solid wastes.
7. Use energy efficiently while creating sustainable energy sources.

Hey there! I'm Mikey Mouse, and I'm here to guide you through all of this information from the ASER. You see, my family and I have lived in your area for decades. I have been through trash cans, scurried through canyons, swum through rivers, and nibbled on plants and bugs all around the Laboratory. I know what is in our environment, and I want to give you answers to these very important questions:

Is it safe to eat the plants and bugs, dig in the dirt, breathe the air, swim in the Rio Grande, and drink the water?

Can invisible things hurt me?



What Is an Environmental Management System?

Integrated with the Laboratory's commitment to excellence in science and technology is its commitment to complete all work in a safe, secure, and environmentally responsible manner. The Laboratory's EMS provides a unifying framework for

1. assessing environmental impacts from mission activities,
2. identifying and managing necessary controls,
3. prioritizing improvements, and
4. evaluating environmental performance.

For 2014, the Laboratory's Environmental Senior Management Steering Committee identified 18 stewardship objectives to control future, present, and past environmental impacts. Laboratory organizations evaluated their work to discover potential impacts. A multidisciplinary team from each Laboratory directorate then developed specific controls to manage any activity found to have impacts. There were 351 actions, detailed and managed in 17 environmental action plans.

More information about the EMS is available at http://www.lanl.gov/community-environment/environmental-stewardship/protection/environmental-management-system.php

The leader of the Laboratory Trails Working Group conducts a tour of the Anniversary Trail for DOE, Los Alamos County, and Laboratory workers.

CONTROL THE PRESENT: PROACTIVELY PREVENT POLLUTION

The Pollution Prevention (P2) Team focuses on waste minimization and spreading the culture of sustainability throughout the Laboratory. By integrating sustainability into the culture of the organization, the P2 Team contributes to streamlining the performance and longevity of the Laboratory. Pollution prevention begins with the individual. Every small act makes a big difference. In this spirit, the P2 Team consults with Laboratory operations to integrate more sustainable measures; it also funds over $1 million in annual initiatives submitted by individuals using the following criteria:

- technical merit,
- pollution reduction potential,
- Laboratory-wide applicability, and
- risk reduction.

In 2014, the P2 Team funded 15 innovative projects to completion that saved over $5.6 million and reduced the Laboratory's environmental footprint. The P2 Team recognized the accomplishments of over 400 individuals and 32 groups during the annual awards ceremony.

Laboratory employees take part in the annual trash pick-up contest, The Great Garbage Grab.

Reinvent, Repurpose, Resist: A Focused Approach

1. P2 focuses first on preventing waste and promoting sustainability. Several programs encourage employees to recycle products for reuse within the Laboratory. By setting quotas for green purchasing, whenever possible, products purchased by the Laboratory are created from recycled materials and have a reduced impact on human health and the environment.
2. P2 works to divert items from the landfill by recycling products. In 2014, the Laboratory expanded its recycling program to accept all plastics, which allowed the Laboratory to divert 54% of solid, nonhazardous waste and 93% of construction demolition waste from the landfill.

ZEROWASTEZONE

The P2 Team is dedicated to fully implementing the Zero-Waste Initiative as described in the Long-Term Strategy. The initiative minimizes the amount of waste sent to the landfill by redesigning product lifecycles into closed-loop systems that emulate natural sustainable cycles. In 2014, the P2 Team conducted the first ever Zero-Waste event at the Laboratory.

Connecting with the Community

To be a positive, sustainable influence on the region's economy, educational systems, and the quality of life in northern New Mexico, the Laboratory operates a proactive, interactive program. Through dialog, technical staff includes input from and responds to the communities, tribes, organizations, and local governments in the region. To increase public knowledge of environmental cleanup and stewardship practices, the Laboratory uses various activities, including tours, presentations, and visits to local organizations, to discuss and share information.

Community involvement

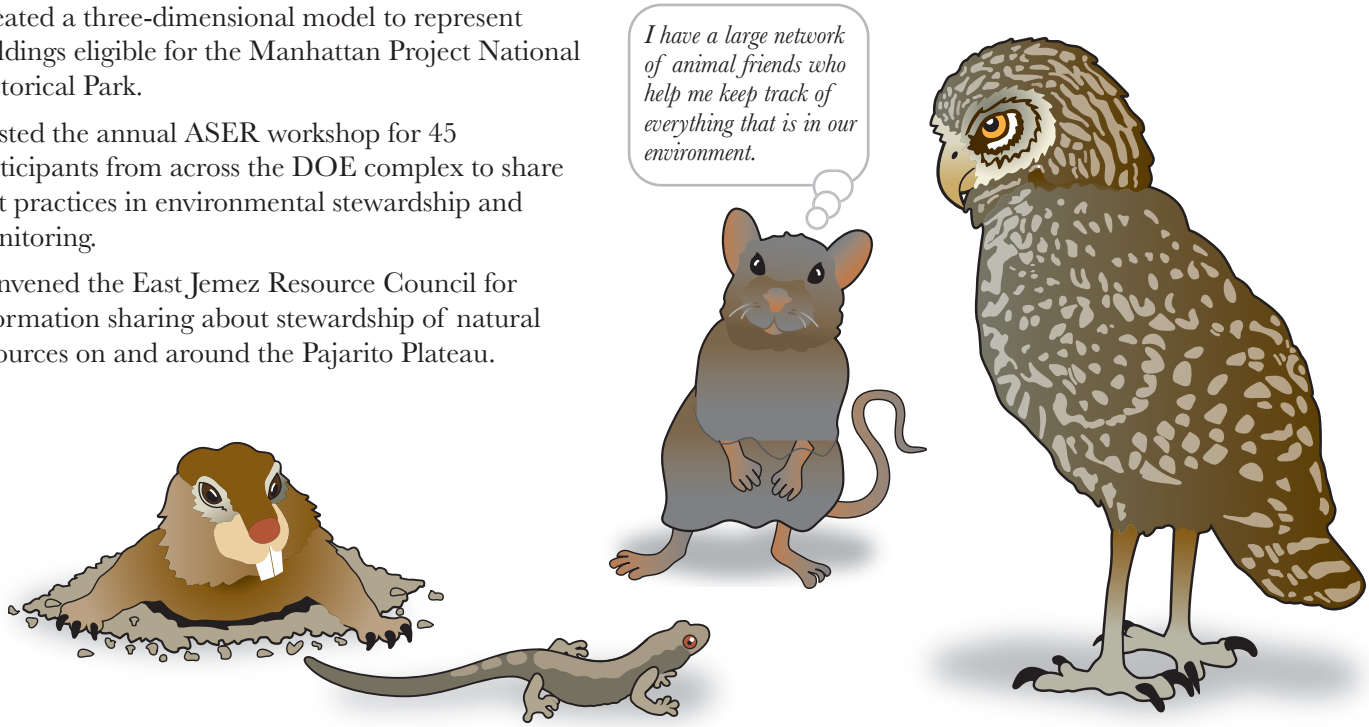
In 2014, the Laboratory conducted over 200 activities for members of the public to demonstrate our commitment to a sustainable future and to controlling current environmental impacts and conducted over 300 activities to demonstrate progress on cleaning up past harms. A few examples include the following.

- Organized talks on climate resilience by environmental scientists for the community during the Los Alamos Science Fest.
- Released videos chronicling the successes of clearing over 700 tons of formerly sequestered metals for recycling.
- Met regularly with the Regional Coalition of LANL Communities to provide updates on environmental accomplishments.
- Met quarterly with the environmental managers of the four pueblos surrounding the Laboratory to share information and methodology.
- Created a three-dimensional model to represent buildings eligible for the Manhattan Project National Historical Park.
- Hosted the annual ASER workshop for 45 participants from across the DOE complex to share best practices in environmental stewardship and monitoring.
- Convened the East Jemez Resource Council for information sharing about stewardship of natural resources on and around the Pajarito Plateau.

The listed examples represent just a few of the activities in which the Laboratory participates to help raise awareness of our environmental and stewardship practices. We solicit stakeholder input to make better stewardship decisions and to improve our understanding of public concerns. If you have a concern or wish to provide feedback or learn more, please use the following resources:

- Visit the environmental website and sign up for email notification: www.lanl.gov/environment
- Visit the electronic Public Reading Room: http://eprr.lanl.gov
- Visit the Public Reading Room: 94 Cities of Gold Road, Pojoaque, NM
- Call the Environmental Outreach Office: 505-667-0216
- E-mail the Environmental Outreach Office: envoutreach@lanl.gov

Environmental Outreach Office



Returning Lands and Promoting Economic Development: The Land Conveyance and Transfer Project

As authorized by Public Law 105-119 in November 1997, 10 original tracts of land were identified for conveyance or transfer. Since that time, the original tracts were subdivided into 32 tracts. As of December 2014, 16 tracts have been conveyed to Los Alamos County, 3 tracts were conveyed to the Los Alamos County School Board, and 3 tracts were transferred to the Bureau of Indian Affairs.

The trails southeast of the Laboratory are open for horse riding, mountain biking, and hiking.

caption

In 2014, approximately 500 acres in Pueblo Canyon (Tract A-18-A) were conveyed to Los Alamos County for recreational use.

The Laboratory coordinates the schedule for performing compliance activities before transferring designated tracts. To comply with DOE Order 458.1 for real property releases, the Laboratory coordinates sampling to ensure the tracts are safe for conveyance.

Protecting Our Trails, a Hands-on Approach

Using recreational trails at the Laboratory is a highly valued benefit of working and living in Los Alamos County. There are 28 named trails on Laboratory property currently open for public use, totaling approximately 43 miles. In 2003, the Laboratory established a Trails Management Program to help ensure trails are kept in good condition, to initiate repair and construction of trails, and to promote trail user safety. This program is carried out by the Trails Working Group, an outreach group that includes representatives from local citizen hiking groups, Los Alamos County, the U.S. Forest and Park Services, the Laboratory, and the Los Alamos Field Office. This group meets regularly and its goals include

- identification of environmental issues from trail use;
- evaluation and management of trails;
- planning, maintenance, repair, and construction of trails; and
- preparation of a management plan for trails.

More information is available at http://www.lanl.gov/community-environment/environmental-stewardship/protection/trails/index.php.

Informational kiosks made from recycled materials are placed at many trailheads.

This quonset hut was used to assemble the Fat Man device.

Bringing the Agencies Together

Initiated in 1996 by the Laboratory, the East Jemez Resources Council meets in the fall and spring to facilitate coordination and communication among land stewardship agencies on and around the Pajarito Plateau. Regular participants include personnel from the Laboratory, the U.S. Forest and Park Services, Valles Caldera National Preserve, Pueblo de San Ildefonso, Cochiti Pueblo, New Mexico Environment Department (NMED), New Mexico State Forestry, NMED's DOE Oversight Bureau, and Los Alamos County.

New Horizon: The Manhattan Project National Historical Park

Legislation creating the Manhattan Project National Historical Park was signed by President Obama on December 19, 2014. Los Alamos was chosen as one of three locations to represent the park. Properties chosen for the park will retain original federal and private ownership. Los Alamos properties listed in the legislation include historic buildings in downtown Los Alamos and 17 Laboratory properties located in eight technical areas (TAs).

The Laboratory properties include buildings and structures associated with the design and assembly of the "Gadget" (tested at Trinity Site), the "Little Boy" weapon (the gun-assembled device detonated over Hiroshima), and the "Fat Man" weapon (the implosion device detonated over Nagasaki).

A memorandum of agreement (MOA) between the Secretary of the Interior and the Secretary of Energy is being negotiated and will describe a cooperative relationship for the initiation of the park. The MOA will include how properties under the jurisdiction of the DOE will enhance public access and will allow for interpretation of key pieces of Los Alamos's history for the public.

For more information: http://www.lanl.gov/community-environment/environmental-stewardship/protection/cultural-preservation/historic_properties.php.

COMPLIANCE: STRIVING FOR EXCELLENCE

Compliance with environmental regulations and policies is part of the foundation of the Laboratory's environmental stewardship program and helps the Laboratory attain its overall goal of environmental sustainability. Many operations at the Laboratory use or produce liquids, solids, and gases that may contain nonradioactive hazardous and/or radioactive materials. These operations, emissions, and effluents are regulated by DOE orders and federal and state laws. The Laboratory complies with over 50 different orders, directives, permits, and other regulations stemming from environmental laws.

Keeping Environmental Impacts As Low As Reasonably Achievable

For a substance to pose a threat to human or environmental health, there must be

- enough of a source present to be harmful to a human, plant, or animal;
- a way for the person, plant, or animal to be exposed to the source; and/or
- a person, plant, or animal in the pathway of the source.

To prevent or lower the risk of harm, the Laboratory uses several methods:

- Remove or lower the amount of a contaminant or concentration from the source (e.g., dispose of it off-site, cover it, dilute it, or stop producing or emitting it).
- Contain the source permanently or block the pathway (e.g., package it, retain it with a dam, or stop accessing it for use).

Although relocating the person, plant, or animal away from the vicinity of the source is an option, the Laboratory does not use this method.

Storm Water Individual Permit staff discuss low-impact, storm-control design features with members of Communities for Clean Water

Groundwater Permits

NM State Water Quality Act
Administrates NMED's
Ground Water Quality Bureau

- 4 Ground Water Discharge Permits (DPs)
  - DP-857 3 locations
  - DP-1132 TA-50 Radioactive Liquid Waste Treatment Facility
  - DP-1589 12 Lab-wide septic/disposal systems
  - DP-1793 Land application sites

Surface Water Permits

Federal Clean Water Act
Administered by the U.S. Environmental Protection Agency (EPA) and the U.S. Army Corps of Engineers

- National Pollutant Discharge Elimination System (NPDES) Permits
  - 1 Industrial/Sanitary Discharge Permit 11 outfalls
  - Construction General Permit 31 active projects
  - Multi-Sector General Permit 13 facilities
  - Storm Water Individual Permit 405 monitored sites
- Dredge & Fill Permits
  - 52 Nation-wide Permits

Air Quality Permits

Federal Clean Air Act
Administered by EPA

- Title V Permit
  - Title V Operating P100
- Construction Permits
  - New Source Review Construction Permits 10 active projects

Los Alamos National Security, LLC (LANS) Permit

DOE & LANS Co-permittees

Waste Permit

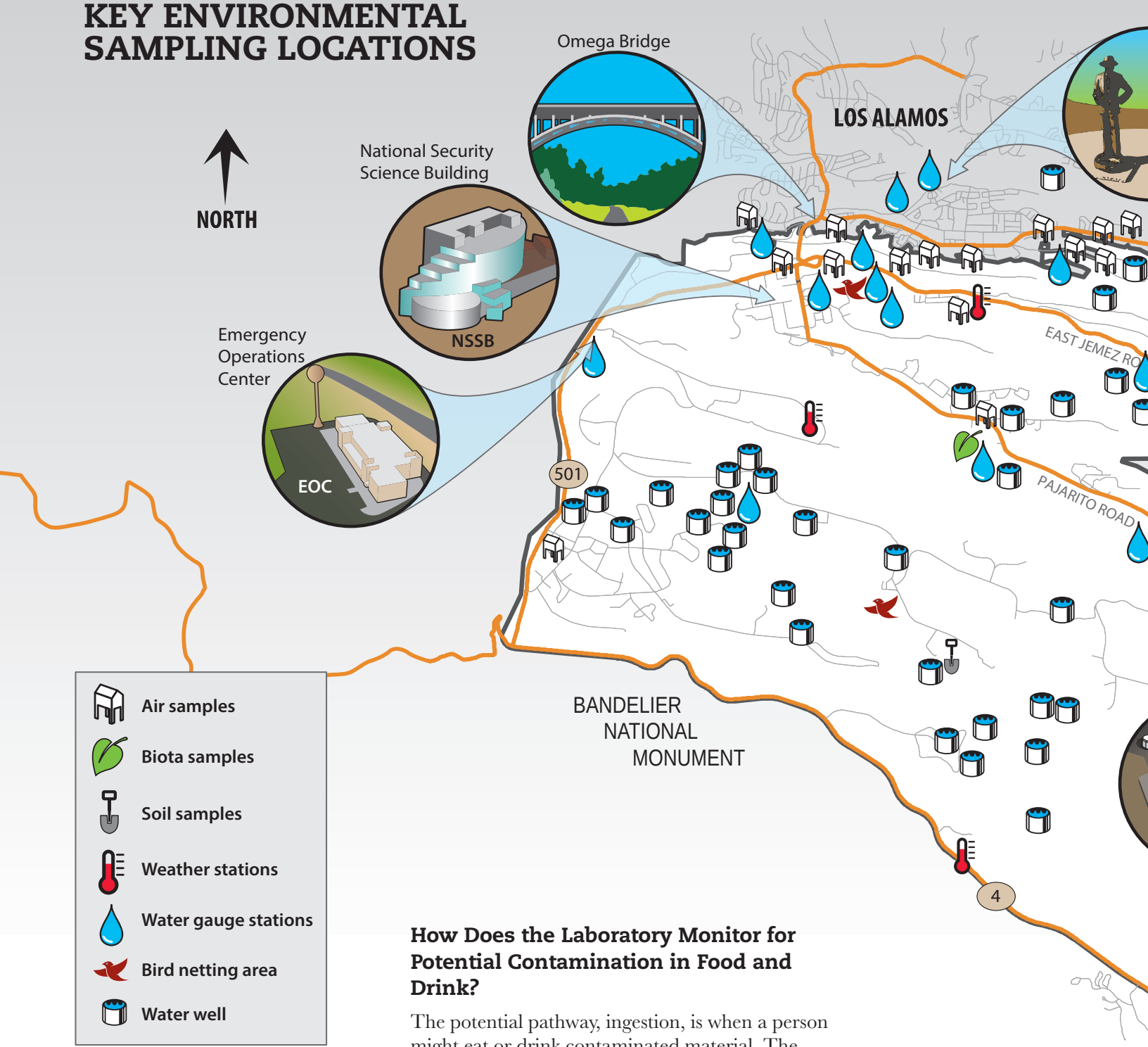
Resource Conservation and Recovery Act
Administered by NMED

- Hazardous Waste Facility Permit
  - Hazardous Waste Facility Permit # NM0890010515

24 hazardous waste management units
TA-55 storage tank system
TA-55 stabilization treatment unit
22 container storage units (TAs 3, 50, 54, and 55)
9 interim status units
4 open-detonation units
3 open-burning units
2 storage shaft units
Request for transuranic (TRU) Waste Facility permit modification

The Laboratory complies with over 200 environmental laws, orders, and agreements. Above are a sampling of the key permits.

KEY ENVIRONMENTAL SAMPLING LOCATIONS

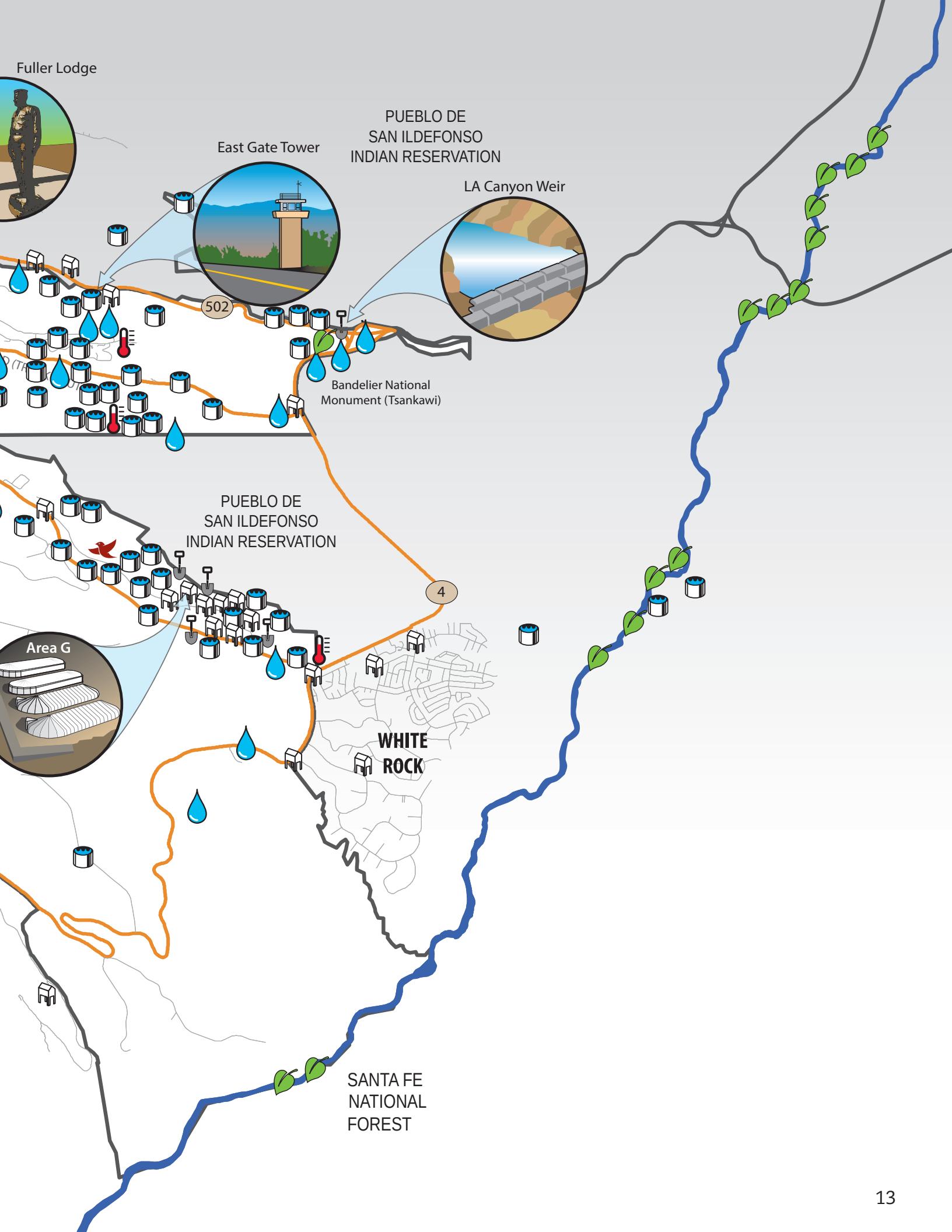


Environmental sampling sites across the Laboratory.
This map shows a few of the sites where scientists sample water, plants, soils, animals, air, and weather to track the impacts the Laboratory is having on the natural environment.

In 2014, the Laboratory conducted 3346 sampling events, taking 29,232 samples that were analyzed for 204,048 separate analytes.

How Does the Laboratory Monitor for Potential Contamination in Food and Drink?

The potential pathway, ingestion, is when a person might eat or drink contaminated material. The Laboratory thoroughly monitors this pathway and samples edible wild plant and agricultural products triennially. Water, an extremely precious resource in New Mexico, is sampled frequently. Several forms of water are sampled at the Laboratory. Sampling explanations and results can be found in the following pages.


Fuller Lodge
East Gate Tower
PUEBLO DE
SAN ILDEFONSO
INDIAN RESERVATION
LA Canyon Weir
502
Bandelier National
Monument (Tsankawi)
PUEBLO DE
SAN ILDEFONSO
INDIAN RESERVATION
4
Area G
WHITE
ROCK
SANTA FE
NATIONAL
FOREST

PROTECTING OUR HOME: ECOSYSTEM AND BIOTA HEALTH

As vigilant stewards of the environment, Laboratory scientists watch for adverse effects that may result from current or legacy releases of potentially hazardous materials.

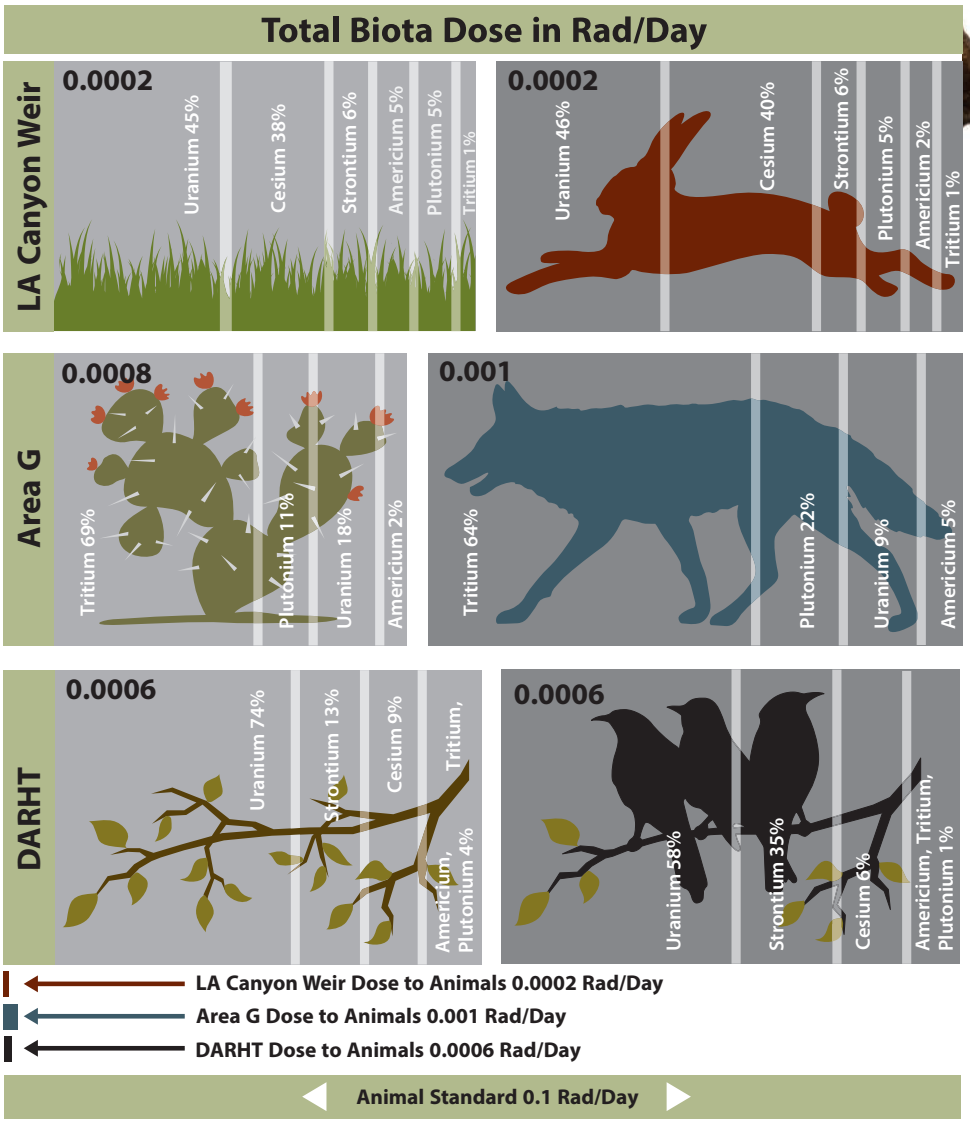
Chemical and radionuclide concentrations in the air, water, soil, sediment, and biota tissues are tested. These concentrations are compared with natural background and with threshold values that may indicate potential harm.

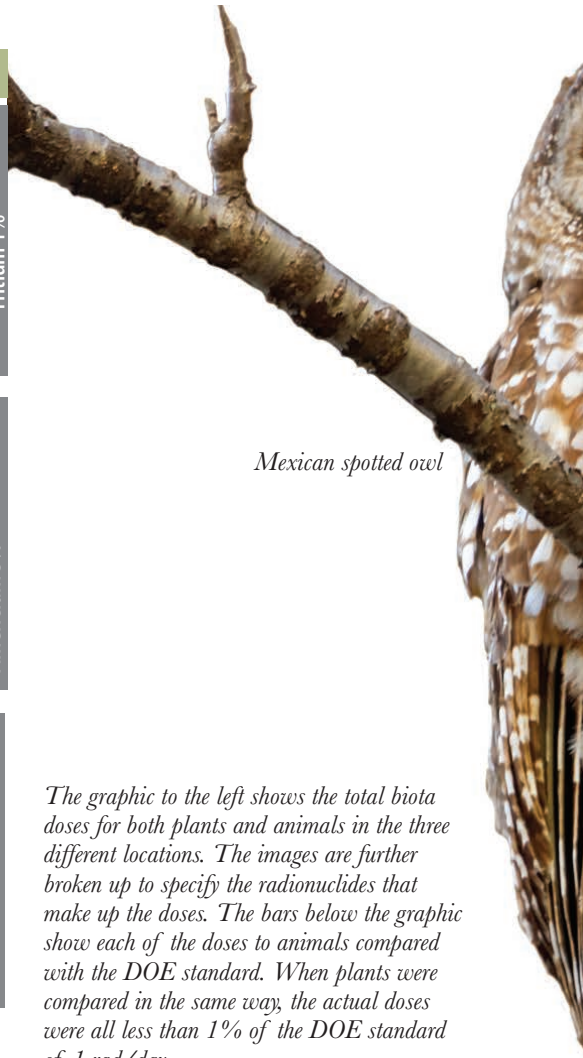
How Do We Know if Plants and Animals Are Harmed?

Biota Dose

Dose, either from radioactivity or chemicals, is a measure of potential harm to living tissue. Biota doses are calculated for populations, entire groups of plants or animals. For terrestrial biota, this is done by understanding the environment with which they most interact: soils. Soil concentrations are multiplied by a bioaccumulation factor to calculate the tissue concentrations and the dose to either a plant or animal. In addition, tissue samples are sometimes measured directly to confirm the accuracy of calculations.

Area G and the Dual-Axis Radiographic Hydrodynamic Test Facility (DARHT) have been focus areas based on the radioactive material at these locations. In 2014, these areas along with the Los Alamos (LA) Canyon weir have doses that are well below DOE standards.





Mexican spotted owl

The graphic to the left shows the total biota doses for both plants and animals in the three different locations. The images are further broken up to specify the radionuclides that make up the doses. The bars below the graphic show each of the doses to animals compared with the DOE standard. When plants were compared in the same way, the actual doses were all less than 1% of the DOE standard of 1 rad/day.

Protecting Endangered Species on Laboratory Land

The Endangered Species Act was established to protect and recover imperiled species and the ecosystems upon which they depend. The U.S. Fish and Wildlife Service has classified 41 animal species and 13 plant species in New Mexico as threatened or endangered; 5 of these animal species may have habitats within or near the boundaries of the Laboratory, including

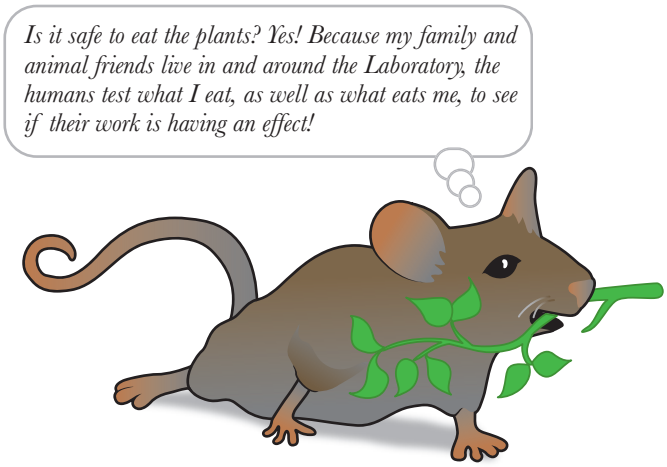
1. the Mexican spotted owl,
2. the southwestern willow flycatcher,
3. the Jemez Mountains salamander,
4. the New Mexico meadow jumping mouse, and
5. the yellow-billed cuckoo.

In 2014, two Mexican spotted owl breeding pairs were discovered, one in Mortandad Canyon and one in Threemile Canyon. During the owls' breeding season, March through May, most Laboratory work in the protected habitat is restricted. Each spring Laboratory biologists complete nighttime owl surveys. If a response to a recorded Mexican spotted owl call is heard, restrictions designed to limit disturbance to breeding owls will be in effect until the end of the nesting season in August.

Jemez Mountains salamanders spend the vast majority of their lives underground. After summer and fall monsoon rains, when the habitat is wet enough to allow them to breathe through their skin, salamanders will surface and biologists can perform surveys. In 2014, there were no salamanders found on Laboratory property, but they have been documented in Los Alamos Canyon in previous years.

During the birds' breeding season, southwestern willow flycatcher surveys are conducted. Laboratory biologists have yet to document one on Laboratory property.

Southwestern willow flycatcher

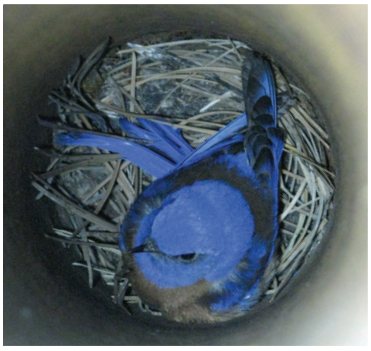


What Students Have to Say: Protecting Biological Resources

Maria Musgrave

When I began working as an undergraduate student for the Environmental Stewardship Services group during the summer of 2013, I had no idea that I would gain such a wide range of experience and knowledge. Like most people, I didn't know the extent of beautiful and diverse habitat that can be found within Laboratory boundaries. Because of the range of ecosystems found in the Los Alamos area, it is essential that biological resources be protected and understood. I work on breeding bird surveys, summer and fall bird banding stations, wildlife camera studies, and the Avian Nestbox Network. Through these projects, I have learned more about the natural environment than I could've hoped for. After seeing the range of wild species that live on Laboratory property, I fully appreciate the importance of protecting this environment and the work that the Resource Management Team does.

Wildlife biology interns with a Cooper's hawk that flew into a mist net



A western bluebird found in an open bollard. The bird was rescued by a Laboratory biologist.

Open bollards

Sheltering Migratory Birds on Their Journey

The 1918 Migratory Bird Treaty Act is a federal law that protects all native birds, including their nestlings and eggs. Best management practices described in the Biological Resources Management Plan protect birds through management requirements such as restrictions on tree/shrub removals during the nesting season.

In 2013, a Laboratory biologist discovered that bollards and other open pipes pose a serious threat to migratory birds by creating a cavity that the birds can enter but not exit. Inspection of hundreds of open pipes and bollards revealed many bird deaths, as well as some small mammals and reptiles. In 2014, Laboratory biologists worked to cover all discoverable open pipes and bollards.

Additionally, a biologist identified that certain electric power pole designs could result in the electrocution of roosting birds and wildlife-caused power outages. The Laboratory retrofitted these power poles with safer equipment and hosted trainings taught by the New Mexico Avian Protection Working Group and Hawks Aloft. For these efforts, the Laboratory received an honorable mention from DOE's Office of Environment, Health, Safety, and Security for its Presidential Migratory Bird Federal Stewardship Award submission.

Who Flies Here? Advancing Knowledge of Populations and Species

Bird banding allows overall monitoring to ensure the lowest possible impact to bird populations at the Laboratory. A Memorandum of Understanding between the U.S. Fish and Wildlife Service and DOE implements the Migratory Bird Treaty Act. There are two bird banding stations on Laboratory property. Each site has a total of 10 banding days over the course of roughly 10 weeks, with the days beginning just before dawn and continuing for 5 to 6 hours after sunrise.

At the Sandia wetland, from mid-May until the end of July, there is a station for monitoring avian population and survivorship. This site has 12 mist nets, which entangle flying birds without harming them. In 2014, 243 birds representing 49 different species were banded.

At the Pajarito wetland, from early August until mid-October, there is a fall migratory bird station. This site has 14 mist nets, and in 2014, 526 birds were banded, representing 43 different species.

In 2014, the Avian Nestbox Network had over 500 nestboxes that four Laboratory student interns, with the help of others, monitored throughout the breeding season.

A young western bluebird from the Avian Nestbox Network (Contrary to myth, birds do not abandon young that have been handled by people.)

Banding a western bluebird nestling

Once a box was declared "active," meaning it had eggs or nestlings in it, the box would be monitored more closely until the nestlings could be banded and the sex determined.

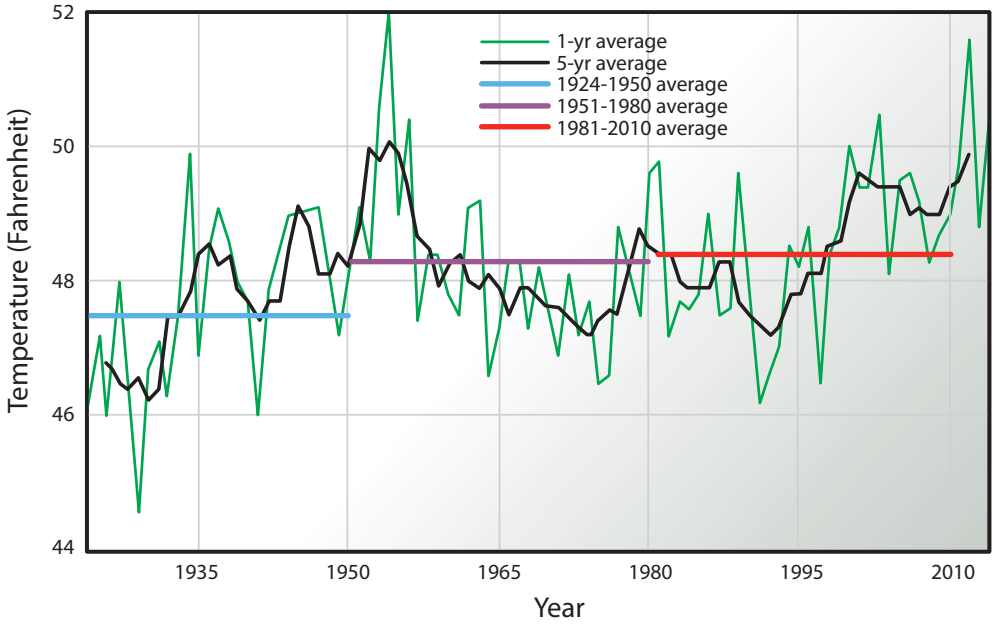
A box was considered successful if the nestlings fledged from it or a failure if the nestlings did not survive, because of predation or other causes. Any eggs that did not hatch or nestlings that did not survive were collected for further analyses.

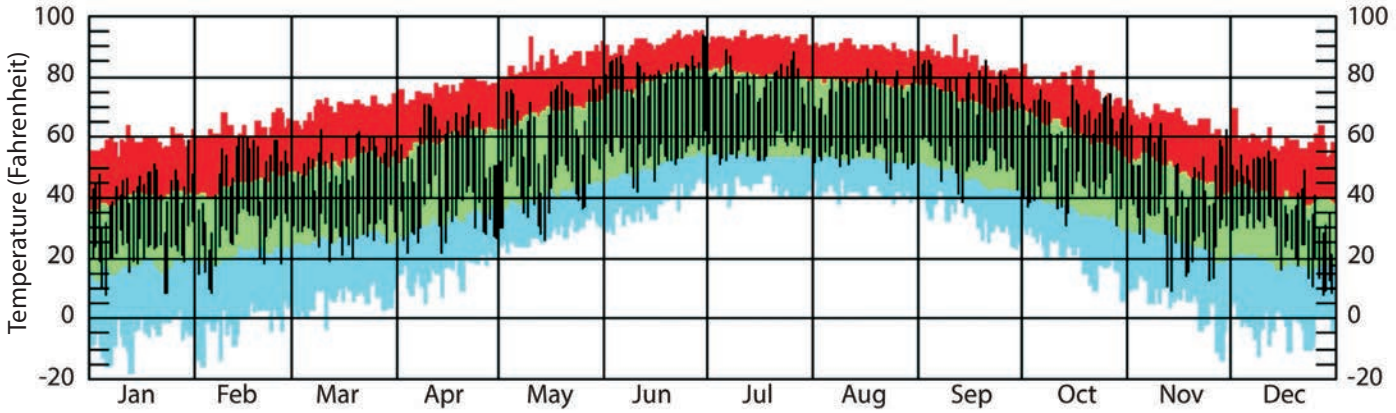
Is the Climate Getting Warmer? Long-Term Analysis of Weather and Climate on the Pajarito Plateau

Weather and climate affect transport of contamination. For example, sediment transport by storm water varies with rainfall. Aerial resuspension of contamination increases with high wind speeds, especially when ground cover is reduced by drought.

Meteorological information is necessary when making decisions about contaminant migration protections and selecting effective locations for sampling. Other decisions that may be affected by meteorological information

Studies comparing 1-year temperature averages do not clearly show how the climate is affected. In contrast, 30-year averages indicate that local temperatures have risen approximately 1°F since 1990. Although the 30-year annual average precipitation does not indicate a significant change since 1950, the past 17 years of significant drought have impacted vegetation, wildlife habitat, and the occurrence of forest fires.





During 2014, more days had temperatures above average than below; the 2014 daily ranges are shown in black, averages are green, record lows are blue, and record highs are red.

include siting a building differently based on weather patterns or using different energy sources to decrease a carbon footprint.

The topography of Los Alamos creates multiple weather conditions in a small area. At the Laboratory, seven meteorology towers effectively capture this variability. The Pajarito Plateau has a semi-arid climate with cold winters and increasingly hot summers. The highest temperature between 1924 and 2014 was 95°F in June 2013, and the coldest was -18°F in January 1963.

Temperatures Are Increasing

Climate trends are most reliably seen when looking at averages. The latest data show temperatures that are significantly warmer than the previous 30-year averages.

Willows were planted in Pueblo Canyon to stabilize sediments.

2013 Flood Recovery: Ongoing Efforts to Restore Habitat

Unusually heavy rain produced record-breaking floods in September 2013 that resulted in large amounts of damage to the Los Alamos environment.

Nearly 1000 meters of stream bank were severely eroded, and an estimated $3 million in Laboratory and Los Alamos County property was destroyed. Efforts to restore the flood effects began at more than 130 sites in 2014. One of the first restoration activities included planting almost 10,000 willows to prevent erosion and contaminants from moving off-site.

In September 2013, many Laboratory canyons withstood 4 days of downpours, a 1000-year flood event.

Cultural Resources on the Pajarito Plateau

To understand cultural and historic resources at the Laboratory, archaeologists have been documenting sites for decades, creating an inventory of sites situated within the exceptionally culturally rich region of the Pajarito Plateau. Approximately 90% of DOE land in Los Alamos County has been surveyed for prehistoric and historic cultural resources, and more than 1800 properties have been identified. Site locations and preservation needs are managed to ensure that cultural concerns are included in construction planning, legacy waste cleanup actions, and the development of the Long-Term Strategy.

Cultural sites on the Laboratory date from the Archaic period (5500 BC–600 AD) and span into the early Cold War period (1943–1963). The majority of these sites are pueblos, rock art panels, trails, and shrines associated with Ancestral Pueblo culture (1150–1600 AD). Other types of sites include agricultural sites, man-made rooms carved into the side of rock faces (known as cavates) with adjacent masonry rooms, water reservoirs, game traps, and historic homestead sites.

Buildings and structures from the Manhattan Project and the early Cold War period (1943–1963) are also considered cultural resources and are evaluated for eligibility for listing in the National Register of Historic Places. Facilities dating from 1963 to the end of the Cold War in 1990 are also evaluated for inclusion.

How Does the Laboratory Implement the National Historic Preservation Act?

The goal of the National Historic Preservation Act (NHPA) is to have federal agencies act as responsible stewards of the nation's historic cultural resources by requiring consideration of the effects projects may have on those resources. Archaeologists work under this law to identify, evaluate, and protect cultural resources eligible for the National Register of Historic Places.

Consultation with Native American communities regarding the protection and disposition of archeological sites and traditional cultural properties is also required. The DOE continues to consult with the pueblos of Cochiti, Jemez, Santa Clara, San Ildefonso, and other affected tribes with respect to identifying and protecting traditional cultural properties, human remains, and sacred objects in compliance with the NHPA and the Native American Graves Protection and Repatriation Act.

A major part of cultural preservation is to educate the public about necessary stewardship practices through touring cultural sites.

What Students Have to Say: Cultural Resources Management

Amanda Cvinar

One of the most rewarding aspects of working as an archaeologist on the Resources Management Team at the Laboratory is having the ability to take an active role in preserving thousands of sites situated on the Pajarito Plateau. At the same time, I am able to develop a well-rounded career in Cultural Resources Management. On any given day, I have the opportunity to visit and record archaeological sites to ensure they are protected from the constant progress and growth occurring at the Laboratory, survey to find previously unidentified sites, conduct records management projects to ensure sites are well documented and that information is easily accessible, and evaluate sites for inclusion in the National Register of Historic Places to ensure they are protected for generations to come. As a student, I have a unique role that is very important: to help fulfill our team's compliance responsibilities that support the Laboratory's mission and protect and manage archaeological sites. I am also able to take on additional projects that help us to further develop our understanding of prehistory of the Plateau. This in-depth, well-rounded student training helps ensure I am able to complete projects while actively exercising skills I will need as I continue my career in cultural resources management.

Why Does Cultural Preservation Matter?

Many of the sites, which may appear unremarkable to the untrained eye, are significant to pueblo people. These sites were the homes of their ancestors. The Laboratory's Environmental Stewardship Services Group assists DOE in its stewardship responsibilities, such as sharing knowledge concerning the cultural resources of the Pajarito Plateau and public outreach to dissuade looting and vandalism. Looting includes digging, excavating, and/or collecting artifacts, architecture, and human remains and can be prosecuted as a felony under laws governing burial grounds.

Bradbury Science Museum: Environmental Research and Monitoring Exhibit

A new exhibit, entitled Environmental Research and Monitoring, that focuses on the rich history and current research in archaeology, wildlife biology, and climate change opened at the Bradbury Science Museum in September 2014.

As part of compliance with the NHPA, the Laboratory's Environmental Stewardship Services Group worked with other Laboratory divisions, with the four Accord pueblos, and with the Bradbury Museum to create an exhibit that includes interactive elements and videos to demonstrate the research.

The exhibit's interactive elements include three new iPad apps, allowing museum visitors to

1. identify various species of bats and owls living within habitats on Laboratory property, listen to owl calls, and test their knowledge in a quiz;
2. explore and learn about the extensive archaeological sites and artifacts identified on Laboratory grounds, dating from 5500 years ago up to the Manhattan Project era; and
3. experience a three-dimensional virtual tour of Nake'muu, an 800-year-old archaeological site with standing masonry walls that is closed to the public.

The wildlife biology exhibit showcases research and protection efforts for three threatened and endangered species living in Los Alamos, as well as large animal and migratory bird studies. The exhibit also shows how current Laboratory research into tree mortality is giving clues to how global climate change affects our local area, and allows visitors to learn about the energy-saving activities at the Laboratory.

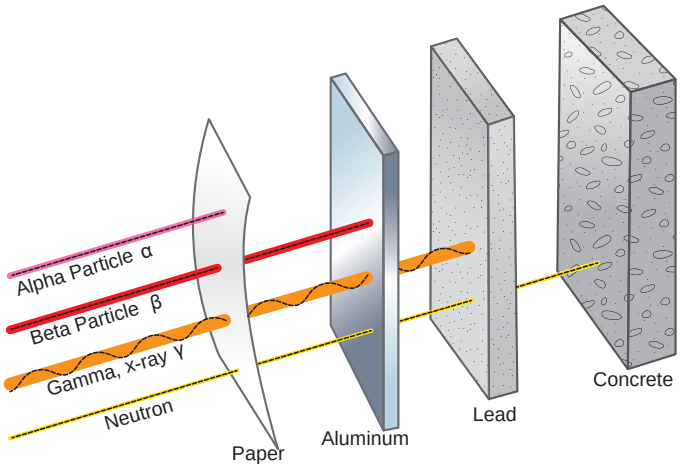
Laboratory employee enjoying the cultural resources display at the Bradbury Science Museum

ENSURING YOUR SAFETY: HUMAN HEALTH

Radiation, the emission of energy in the form of waves or particles, can describe a number of things such as radiant heat and microwaves. Ionizing radiation comes in four basic forms: alpha, beta, gamma, and neutron radiation. These forms have characteristics such as charge, energy, or speed that determine what type of material each form can penetrate (see figure to the right).

Radiation originates with material that contains radionuclides, also known as radioactive isotopes. These radionuclides all have half-lives that range from seconds to billions of years. After seven half-lives have occurred, the amount of radioactivity is decreased to a mere 1% of the original amount. Based on this premise, remediation of areas contaminated with short-lived isotopes may not be necessary, whereas areas contaminated with long-lived radionuclides, viewed from the perspective of future generations, may be remediated or cleaned up.

When living things are within the range of radioactive material or contamination, the radiation can cause damage, which is related to dose, and measured in millirems (mrem). This damage can be minimal to extreme, depending on the form of radiation and the dose. The figure below gives a comparison of an alpha emitter and a beta emitter within a person's body. An alpha emitter releases more bursts of energy over a short distance and consequently has the potential to damage DNA. A beta emitter, however, releases fewer bursts of energy over a long distance and would therefore do less damage.

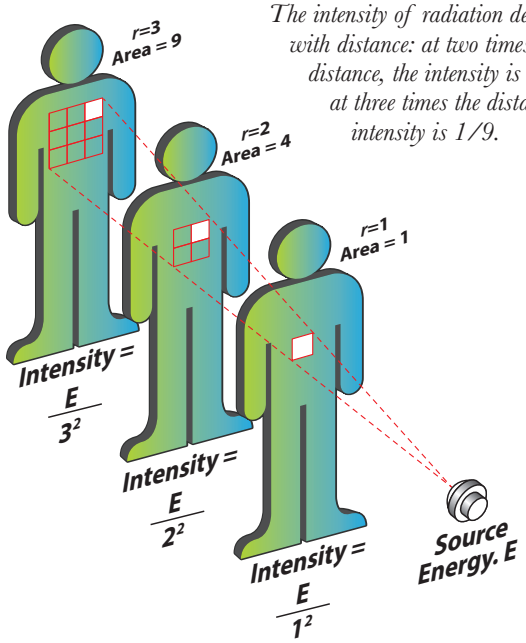


The different types of ionizing radiation require different types of shielding.

The dose to humans from various media—the type of source such as air, food, or water—is measured in various ways, depending on pathways through which a person might encounter the source. Media measured at the Laboratory include air, foodstuffs, and water. All of these are measured on-site and off-site to better understand the pathway and migration of the media.

Dose amount depends on the distance from the source and duration of exposure. Often, the inverse-square law applies. This fundamental law describes how the dose received becomes lower at greater distances from a given source. Essentially, the dose is inversely proportional to the square of the distance. The figure below illustrates this physical law in detail.

Alpha radiation does more damage to DNA than beta radiation.



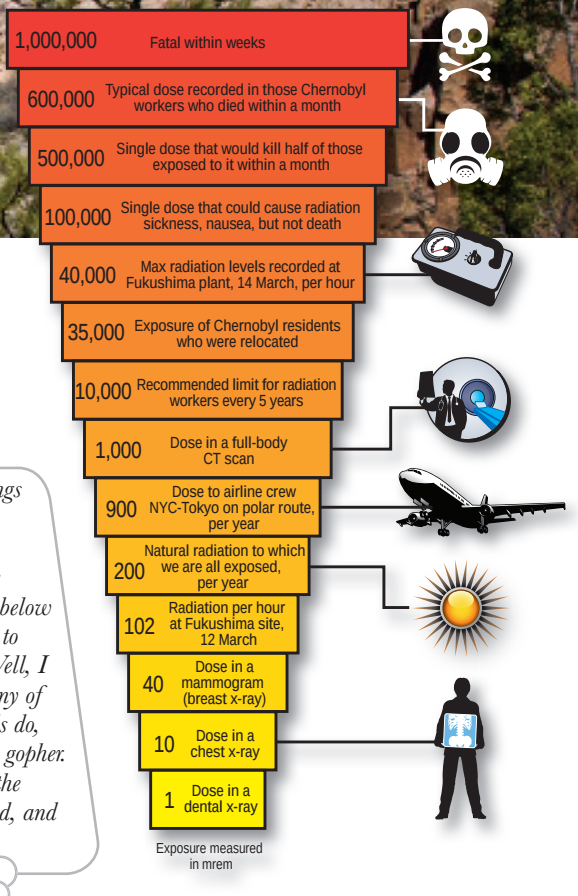
The intensity of radiation decreases with distance: at two times the distance, the intensity is 1/4, and at three times the distance, the intensity is 1/9.

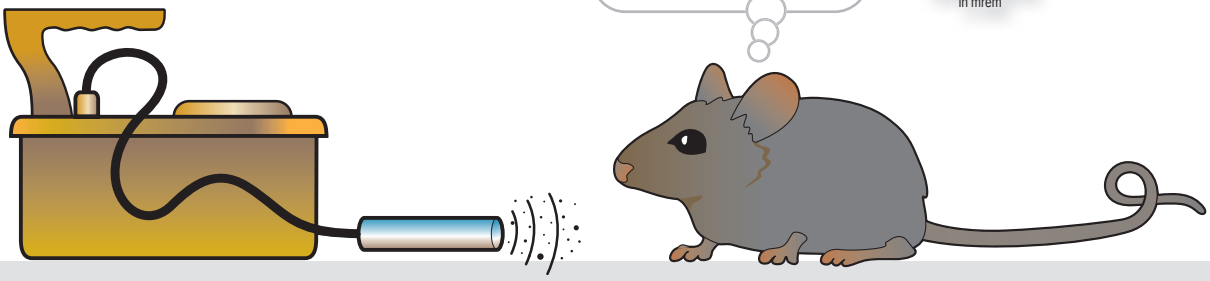
Truck route through Sandia Canyon

Is the Radioactive Source Natural or Man-made?

The Laboratory is an obvious source of radiation, but radiation exists naturally as well. For instance, we receive a natural dose from stars and the sun called cosmic radiation; from the soil, we receive dose from radon and other radiation, called terrestrial radiation.

In Los Alamos County, background dose is roughly 450 mrem annually. This background dose is somewhat higher than most other areas because of the elevation and the volcanic tuff of the Pajarito Plateau. The total permitted release by the Laboratory to the public is 100 mrem each year, which is far less than background. For examples of sources, doses, and the severity level of that dose, see the figure to the right.





What Students Have to Say: Restart of Metal Recycling

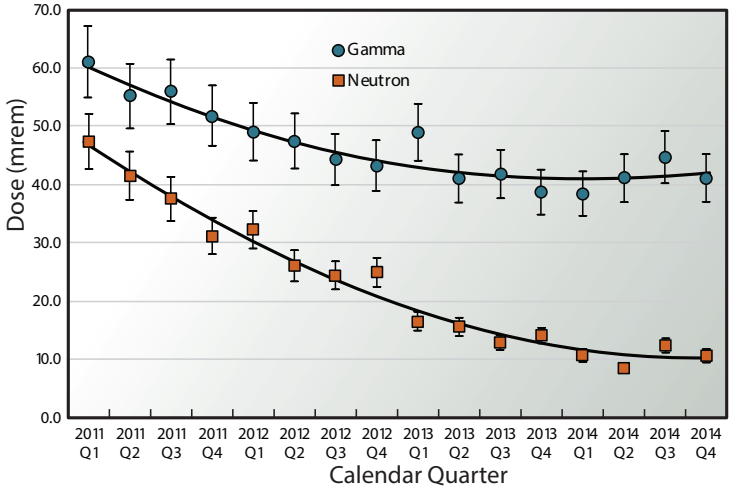
Jessica Gillis

I'm a post-master's student studying radiation in the environment and the impacts it has on people, animals, and plants. I compare radiation from manmade sources (such as past and current Laboratory operations) with natural radioactivity.

One of my most important projects in 2014 was taking radiation measurements from scrap metal. Metal items that have been exposed to the high-energy radiation produced at the Los Alamos Neutron Science Center (LANSCE) have the potential to become radioactive themselves. In this project, measurements are used to confirm that radioactivity in these metals is indistinguishable from background and the metals can be safely recycled. In 2014, I also designed radiation surveys for buildings and land tracts that the Laboratory plans to release to the public. Areas are sampled based on the potential of being exposed to radiation during past or present Laboratory operations. I modeled the location and quantity of any suspected contamination using statistical mapping software and developed plans for radiation sampling. This approach gives us a high degree of confidence that no radiological contamination has been missed in the survey.

I received my bachelor's degree in Environmental Health and master's in Radiological Health Sciences from Colorado State University. At the Laboratory, I have been a student on the Planning and Monitoring Services team since June 2014.

AIRNET stations are placed at 41 locations.



Area G, where radioactive waste is stored, is monitored extensively. This graph shows a steady decline in gamma and neutron dose around the Area G perimeter.

Direct-Penetrating Radiation Monitoring Network

Thermoluminescent dosimeters (TLDs) measuring direct-penetrating radiation are placed in 80 different locations. Sites with high potential of gamma and neutron radiation are the focus of this network

TLDs are roughly the size of a credit card and contain eight chips to detect beta particles, gamma rays, and neutrons. These measure direct radiation dose. The same type of TLDs are worn by every Laboratory employee who might be regularly exposed to Laboratory radiation.

In 2014, the overall highest dose the public could receive from direct-penetrating radiation was 0.3 mrem per year; about 1% of the DOE standard of 25 mrem per year.

How Is the Air Pathway Monitored?

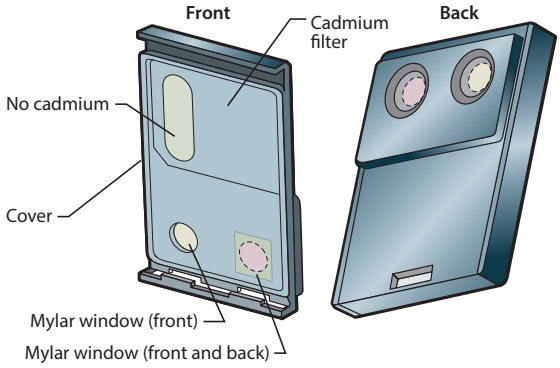
An average person inhales about one-half liter of air for every breath at a rate of around 20 breaths per minute. The Laboratory continuously samples the air to ensure the community's air pathway is well protected. Air quality is measured using the following tools.

Stack monitoring systems measure airborne emissions of tritium, gases, and particles.

AIRNET

Stations are placed in 41 locations both on-site and off-site. The apparatus is built to pull air at a steady rate through a filter that catches particles that are then analyzed for uranium and plutonium.

In 2014, all of the AIRNET samples, on-site and off-site, resulted in doses below the U.S. Environmental Protection Agency (EPA) standard of 10 mrem per year.



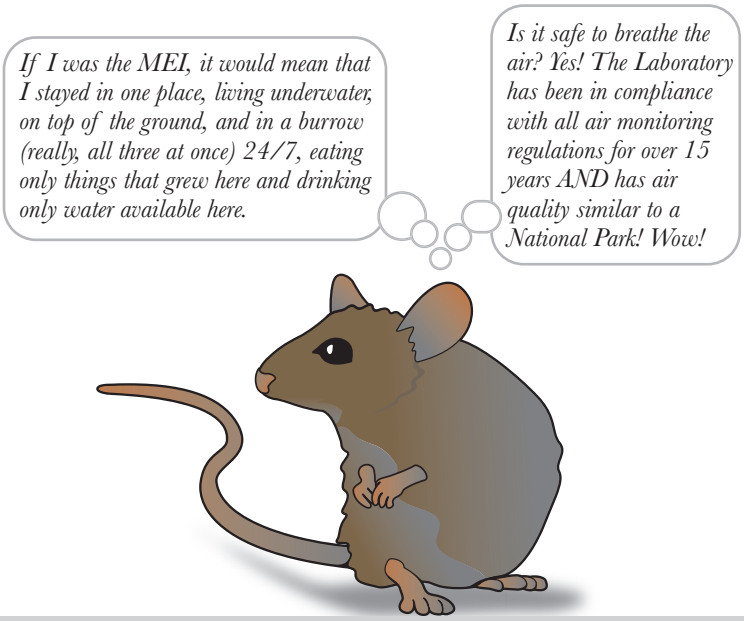
Each of the eight chips in a TLD plays an important role in measuring the dose.

Stack Monitoring

Some Laboratory buildings release air through high-efficiency filters and stacks into the atmosphere. Twenty-nine of those buildings contain materials that could be harmful if released. To prevent releases, every week a team samples the air and analyzes the samples for plutonium, uranium, tritium, and other radioactive materials. In 2014, all of the samples, on-site and off-site, resulted in doses below the EPA standard of 10 mrem per year.

The Off-Site, Maximally Exposed Individual: The Hypothetical Highest Possible Dose to the Public

Every year, the Laboratory calculates the maximum dose that could possibly be received by an individual member of the public. This hypothetical person is known as the maximally exposed individual, or MEI. When corrected for the actual time a member of the public realistically spends near the location, the actual doses are much smaller.



During 2014, the MEI off-site location was at East Gate, near the historical entrance station and guard tower, which can be seen in the photo. A person who spent 24 hours per day and 7 days per week at this location, eating food grown and water obtained at this location, would have received a dose of 0.24 mrem. This is far less than 0.1% of the background dose. Potential health effects from this dose are too small to measure.

East Gate

Most of this 0.24 mrem dose was predicted from airborne emissions created by the LANSCE accelerator, 1 kilometer to the south. Contributions from contaminated soil, water, or food were less than 0.01 mrem and too small to distinguish from background. The emissions were mostly short-lived materials such as carbon-11 and argon-41 that disperse and decay quickly, so very few people receive a dose more than 1% of the MEI dose.

On-Site, Maximally Exposed Individual

On-site locations nearer to LANSCE have a small but measurable dose from direct radiation. A person on Jemez Road directly south of LANSCE could hypothetically receive 0.6 mrem.

What Students Have to Say: Words Wisely Chosen

Aysha McClory

I think it is safe to say that I've always been an advocate for the environment. I spent my free time as a child researching ways our home could be better protected and went on to college with this passion in mind. Still., I was amazed at the ways my position at LANL expanded my views and opinions on the current environmental difficulties. Dispersion calculations with the ETSC gave me insight to how LANL would protect our community in the event of a disaster, monitoring stacks helped me understand how important initial prevention is to LANL, and many of the other experiences I received accentuated eff orts made by LANL to clean any previous oversights. The mentors and other students I was able to work with, however, are what made this experience reach its fullest potential. The discussions I had with them gave one crucial message; wisely chosen words, in both questions and answers, are undoubtedly the most powerful tool. I led the development of the 2014 Annual Site Environmental Report Summary from a perspective of a concerned community member who is still learning the ways of LANL, allowing this message guide me.

Rio Grande

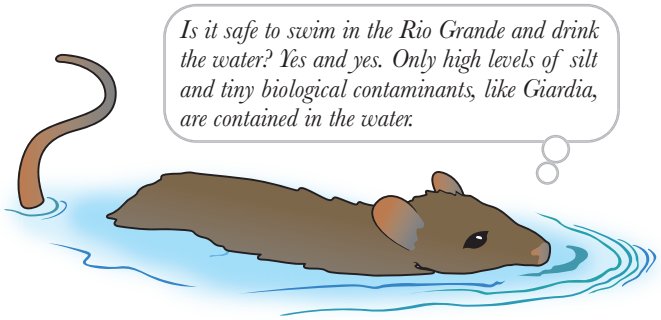
Water Quality: Protecting Our Surface Water and Groundwater

The Laboratory monitors both surface and groundwater to ensure water protection. Monitoring activities are conducted to ensure compliance with requirements established by federal and New Mexico state regulations.

Surface water, including storm-water runoff, snowmelt runoff, stream flow, and canyon-bottom sediment, is monitored to

- evaluate the effects of past Laboratory operations on surface water quality,
- evaluate the transport of contaminants, and
- ensure protection from ongoing Laboratory operations.

Groundwater, which contributes to Los Alamos County's drinking water supply, is monitored through sampling at more than 150 wells and springs and is analyzed for a wide range of contaminants.



Why is Surface Water Monitored?

The Laboratory monitors the quality of surface water throughout the year and the quality of sediment annually on Laboratory property and elsewhere in northern New Mexico. The Laboratory property encompasses seven primary watersheds, each of which drains into the Rio Grande. Surface water quality must be protected to maintain multiple uses in these watersheds and in the Rio Grande.

Keeping waters clean by protecting our water resources is a very important stewardship responsibility.

How Is Surface Water Protected? Managing Pollutants and Monitoring Results

Watershed Monitoring

Surface water and sediment samples are collected in the canyons, active stream channels, floodplains, and other areas potentially affected by flooding. During periods of storm-water runoff, samples are collected by flow-activated samplers. Extra monitoring takes place near and downstream of potential sources of Laboratory-produced substances.

Surface water and sediment samples are analyzed for potential pollutants, and results are compared with screening criteria based on protection of human and environmental health.

Point-Source Pollutant Management

The Laboratory operates under four National Pollutant Discharge Elimination System (NPDES) Clean Water Act permits. NPDES programs manage water to avoid introducing pollutants into water and to remove pollutants before discharging water to the environment. The Laboratory manages compliance with the following NPDES permits:

1. Industrial Point Source Outfall Permit
2. Construction General Permit
3. Multi-Sector General Permit
4. Individual Permit for Storm Water

Workers program automated storm-water samplers.

Non-Point-Source Pollutant Management

The Laboratory also maintains an extensive program to manage non-point-source pollutants in surface water and sediment in major canyon systems. Surface-water samples are collected away from the Laboratory to help determine appropriate background concentrations. Movement of these non-point-source pollutants are managed on a broad scale by a number of sediment-retention and stabilization features, such as ponds, weirs, grade-control structures, wetlands, and riparian vegetation.

Does Surface Water Meet Applicable Health Standards?

Similar to other urbanized areas, the Laboratory has occasional issues with surface-water pollution. The Laboratory works closely with regulators to maintain compliance with regulatory requirements and to implement process improvements and storm-water controls to continue to improve surface water quality. Sediment-control structures installed throughout the Laboratory in 2014 performed as designed to help reduce the movement of pollutants. Concentrations of pollutants in sediment are declining as older sediment is removed and replaced by newer deposits.

Does the Laboratory Affect the Rio Grande?

Surveys of fish, benthic macroinvertebrates, and sediments from Abiquiu and Cochiti reservoirs show no measurable impact from Laboratory operations. Radionuclide levels in sediments are far below screening levels, and potential doses are far below DOE aquatic standards.

Laboratory employee inspecting a flume in Sandia Canyon

Laboratory employees conducting surface-water sampling

Groundwater: Protecting Our Aquifer

There are three different forms of groundwater that occur beneath the Pajarito Plateau: alluvial groundwater, intermediate groundwater, and the regional aquifer. Los Alamos County's drinking water supply consists of water pumped from the regional aquifer.

Why Is Groundwater Monitored?

To determine the impact of past and present liquid waste discharges from Laboratory facilities on groundwater quality, the Laboratory collects and analyzes samples from the three different forms of groundwater. In compliance with DOE orders and state and federal regulations, sample analysis is used to identify contamination issues that could impact human health or harm the ecosystem.

Where Is Groundwater Located?

Hydrogeological Setting of the Pajarito Plateau

The Laboratory is located on the Pajarito Plateau, which is capped by Bandelier Tuff formed as the result of a volcanic eruption that occurred in the Jemez Mountains 1.2 to 1.6 million years ago. Underlying the Bandelier Tuff is a combination of reddish Tschicoma Formation dacite, Puye Formation conglomerate, and Cerros del Rio basalt. Beneath these formations lie the sediments of the Santa Fe Group. The three forms of groundwater are separated by layers of unsaturated rock. Because the rock has such low permeability, groundwater moves between the different forms only where cracks are present.

How Is Groundwater Monitored?

In 2014, the Laboratory used over 150 wells and springs to collect groundwater samples. Deep wells, such as monitoring and supply wells, were used to collect water from the regional aquifer and intermediate groundwater, while alluvial groundwater samples were taken from shallow wells. Because groundwater is monitored at various depths, the Laboratory is able to track the movement of materials through each of the levels of groundwater. This monitoring system allows the Laboratory to prepare for and minimize any potential impact to public drinking water.

Is Our Drinking Water Safe?

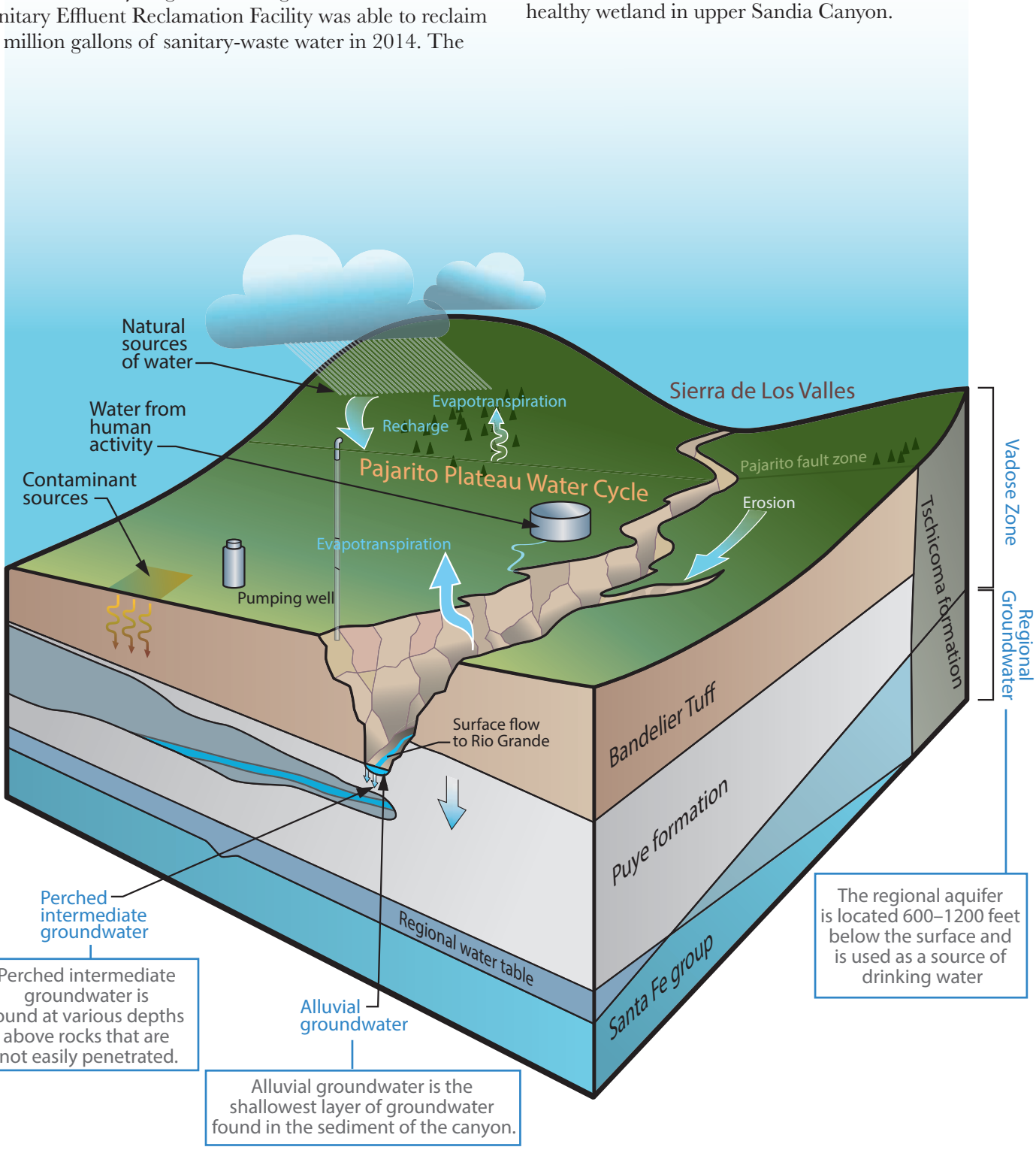
Yes, in 2014 the water samples collected from the Los Alamos County water supply wells were in compliance with both federal and state drinking water standards.

Well monitoring equipment on Laboratory property

How Many Times Does the Laboratory Reuse Water?

Reducing releases of contaminated materials is not the only environmental goal. Being prone to droughts, the Laboratory strives to conserve and reclaim its water, reusing the same water up to 11 times. The water supply of the Laboratory originates from groundwater. The Sanitary Effluent Reclamation Facility was able to reclaim 27 million gallons of sanitary-waste water in 2014. The facility processes up to 120,000 gallons per day of water from the Laboratory's sanitary-waste treatment facility, purifying it to a standard better than drinking water. The water is then circulated 4 to 7 times to cool the supercomputers at the Strategic Computing Complex.

After this use, the water is purified and remixed to meet the applicable standards, then released to support a healthy wetland in upper Sandia Canyon.



Shipment of TRU waste leaving for the Waste Isolation Pilot Plant

How Does the Laboratory Manage Hazardous/ Radioactive Waste?

In 2014, the Master Plan for Enduring Waste Management (EWM) provided a comprehensive summary of the current vision, objectives, generation rates, and short-term and long-term strategies for managing each type of hazardous and radioactive waste generated at the Laboratory.

Specific waste types include radioactive liquid waste (RLW), low-level waste (LLW), mixed low-level waste (MLLW), transuranic (TRU) waste, hazardous waste, and other wastes such as industrial waste and New Mexico special waste. Sanitary solid waste and sanitary liquid waste are also discussed.

The EWM plan incorporates the goals and objectives identified in the Long-Term Strategy. In particular, the objectives are to

- ship TRU waste to reduce risk,
- eliminate long-term storage of radioactive waste and minimize on-site LLW disposal,
- ensure the continued safe disposal of high-explosives waste,
- recycle at least 50% of nonhazardous solid waste and construction/demolition debris,
- continue aggressive waste minimization, and
- implement an environmental ALARA (E-ALARA) strategy.

The strategy for solid LLW involves shifting from predominately on-site disposal of LLW to greater than 95% off-site disposal. The strategy for solid MLLW is to continue off-site treatment and disposal of about 9 cubic meters per year. The near-term strategy for newly generated TRU waste was to continue to receive, store, characterize, and ship the waste off-site to the Waste Isolation Pilot Plant (WIPP) until the February 2014 accident forced the WIPP closure (story on page 32). Newly generated TRU waste has been stored on-site since then.

Waste storage domes at Area G

CLEAN THE PAST: REMEDIATING LEGACY CONTAMINANTS

The Manhattan Project and Cold War required extraordinary invention and production in short time frames. Most environmental laws didn't come into existence until the 1970s. Today, the Environmental Programs Directorate investigates and, where necessary, remediates sites in Los Alamos County to ensure that chemicals and radionuclides in the environment associated with releases from past operations do not pose a potential unacceptable risk or dose to human or ecological health. Below are a few actions that were taken in 2014.

Surface Water Protective Actions

The NPDES Individual Permit for Storm Water (IP) authorizes discharges of storm water associated with legacy operations at the Laboratory. The IP program manages monitoring, inspection, and corrective action implementation efforts to minimize pollutant transport from specific solid waste management units. In 2014, the IP program collected storm-water samples at 32 locations and installed storm-water controls at 78 locations. The program also initiated actions with EPA and NMED to renew the IP for another 5 years.

Groundwater Protective Actions

Chromium

From 1956 to 1972, a power plant in upper Sandia Canyon periodically flushed large quantities of water contaminated with potassium dichromate, which was commonly used as a corrosion inhibitor. The chromium-contaminated water flowed down Sandia Canyon and penetrated the underlying rock layers into Mortandad and lower Sandia Canyons, the present location of a chromium plume about one mile in length and a half mile wide within the regional aquifer.

One of the Laboratory's highest environmental priorities is addressing this plume. After the installation of a number of deep groundwater monitoring wells, the Laboratory began a pilot pumping program in the plume in 2014 to determine whether controlling the underground flow of the plume by pumping could work. The test extraction well in Mortandad Canyon pumped water at about 80 gallons per minute from October through December of 2014.

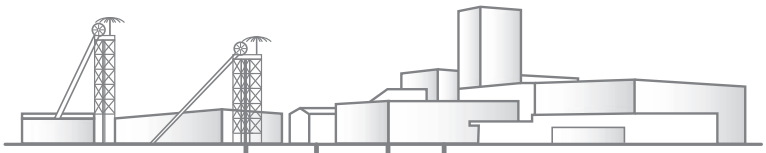
Royal Demolition Explosive (RDX)

RDX was widely used during World War II. At the Laboratory, RDX has been used as part of explosives research and development. RDX is soluble in water, and so it moves easily in groundwater. From 1951 to 1996, the Laboratory discharged RDX into Cañon de Valle. As a result, low levels of RDX have been detected in the groundwater under Cañon de Valle at TA-16. The Laboratory is currently working on the removal of contaminated soil and sediment in this area to reduce the impact to groundwater.

Soil Remediation

The Environmental Remediation Program investigates legacy sites to determine the nature and extent of the chemicals and radionuclides released into the environment from past operations and to assess the potential human health and ecological dose/risk of these releases. Accomplishments for 2014 include the following:

- The annual monitoring plan for Los Alamos and Pueblo Canyons.
- Sediment and storm-water monitoring in canyons.
- Assessment for nature and extent of one site in TA-01, two sites in TA-57, and 27 sites in TA-21, all of which were recommended for a completed designation.
- Assessment for nature and extent of 27 sites in TA-21. All were recommended for corrective action complete.
- Volatile organic carbon (VOC) monitoring in Material Disposal Area (MDA) B and VOC and tritium pore gas monitoring in MDA C. No VOCs were detected in MDA B, and no new releases were detected in MDA C.



Radiological Release at the Waste Isolation Pilot Plant

On February 14, 2014, an airborne radiological release occurred underground at WIPP near Carlsbad, New Mexico. WIPP is a deep, geologic repository mined 2150 feet below the surface and surrounded by a 2000-foot-thick bedded salt formation. Its purpose is to permanently store both TRU and mixed TRU waste in a controlled manner.

On April 16, 2015, an accident investigation board found that the root cause of the release was a heat-releasing reaction of incompatible materials in the Laboratory's waste drum 68660. This resulted in an over-pressurization of the drum, causing the seal to break and release a portion of the drum's contents. The unsuited materials were placed together in the same drum due to a change in the procedure that prescribed use of an organic absorbent instead of an inorganic absorbent with the nitrate-salt-bearing waste. A comprehensive review of the Laboratory's waste-processing procedures is one of the corrective actions identified as a result of the accident.

The nitrate-salt-bearing waste stream contained plutonium residues from recovery operations, metal preparation, metal fabrication, and analytical laboratory operations, as well as some residues from other DOE facilities. Investigations concluded that the maximum dose to a worker on-site at WIPP during the release was 10 mrem, well below the DOE worker limit of 5000 mrem per year. The public's dose was less than 1 mrem, less than the EPA air pathway limit of 10 mrem per year. The DOE standard plume-dispersion model was used to estimate that the on-site deposition was less than 10 disintegrations per minute (dpm) per 100 square centimeters, less than the DOE limit for a contamination area, which is 20 dpm per 100 square centimeters.

Currently, shipments to WIPP have been suspended, and drums containing nitrate salt waste are stored inside steel standard waste boxes that are secured in containment domes at the Laboratory. The domes have temperature control, fire-suppression systems, continuous air monitors, and use an exhaust with a high-efficiency particulate air filter. Radiological control technicians monitor the temperatures, as well as the gas in the drums, to check for the first signs of chemical reactions. All drums will be remediated to ensure they meet the waste acceptance criteria for WIPP.

Standard waste boxes contain drums awaiting shipment to WIPP.

Aysha McClory, Undergraduate Student for Environmental Stewardship Services

Aysha graduated from the University of New Mexico Los Alamos Branch with an Associate's of Science in Environmental Science and is currently working toward a Bachelor's of Science in Materials Engineering, specializing in Biomaterials and Chemistry at the New Mexico Institute of Mining and Technology.

Emma Cohen, Graduate Research Assistant for Environmental Stewardship Services

Emma is a post-baccalaureate student and part of the Pollution Prevention Team. She is getting her masters' from Harvard in Sustainability and Environmental Management. Emma is involved in spreading recycling knowledge throughout the Laboratory and working toward the zero-waste initiative. Emma's goal is to help create a sustainable culture at LANL by spreading environmental awareness and education. She does weekly Environmental Start Safe messages to help transmit this message. Emma is also involved in community outreach programs and makes monthly appearances at local schools, where she leads recycling demonstrations and art projects involving trash.

Amanda Cvinar, Graduate Research Assistant for Environmental Stewardship Services

Amanda Cvinar is currently a graduate student pursuing a master's degree in Cultural Resources Management from Adams State University while working full time in the Environmental Stewardship Services Group at the Laboratory. She graduated from the University of North Carolina at Chapel Hill with degrees in Archaeology and Anthropology. While working at the Laboratory, she developed a master's project focusing on documenting an incredibly unique archaeological site on Laboratory property. She is working to nominate that site as a National Historic Landmark. In the past year, Amanda presented at the annual Student Symposium and became red card certified for wildland fire to help protect archaeological sites at the Laboratory.

Maria Musgrave, post-Baccalaureate Student for Environmental Stewardship Services

Maria Musgrave graduated in 2015 from the University of Redlands with a bachelor's degree in Environmental Science. Since beginning her internship with the Resources Management Team, she participated in the Student Symposium with a poster on a wildlife camera study that she started, and she and two other students gave a talk about their work at the Bradbury Science Museum at the end of the 2014 field season.

Heather Hughes, Graduate Writer-Editor for the Laboratory Training Center

Heather Hughes graduated in 2015 from Arizona State University with a Master's of Education in Curriculum and Instruction: English as a Second Language. A writer-editor in the Communication Arts and Services Group since 2014, Heather is currently deployed to the White Rock Training Center. Heather edits, formats, and designs the Laboratory's training materials. She works with course managers, subject-matter experts, and instructional designers daily to ensure only the finest training materials are released. Heather has received several awards, including the Laboratory Distinguished Student Performance Award for her outstanding work performance and an award from the Los Alamos Awards Program for working with the VISIBLE Team to implement cutting-edge simulation technology within General Employee Training. Before working at the Laboratory, Heather was an instructor of English as a Second Language at both the University of Akron and Kent State University in Ohio.

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Photo opposite page: Rafts launch for trip to sample water from springs that emerge along the Rio Grande.

2014 Annual Site ENVIRONMENTAL REPORT *Summary*


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