Summary of Environmental Surveillance at Los Alamos during 2009

Los Alamos
NATIONAL LABORATORY
EST. 1943

LA-14431-ENV

Los Alamos, views from the past

Photographs of Los Alamos during and immediately after the war years.

Summary of Environmental Surveillance at Los Alamos during 2009

Los Alamos
NATIONAL LABORATORY
EST. 1943

What is the purpose of this Summary of the Environmental Surveillance at LANL?

Each year, Los Alamos National Laboratory (LANL or the Laboratory) produces an Environmental Surveillance Report in compliance with a Department of Energy (DOE) order. The report summarizes LANL's efforts to monitor environmental impacts, minimize these impacts, and comply with environmental regulations. This Summary Report condenses the methods and results of environmental monitoring done in 2009 in a form that is applicable and inviting to the public. This summary report:

- Characterizes site environmental management performance, including water releases, environmental monitoring, and estimated radiological doses to the public from releases of radioactive materials.
- Summarizes environmental occurrences and responses reported during the calendar year.
- Confirms compliance with environmental standards and requirements.
- Highlights significant programs and efforts, including environmental p erformance indicators and/or performance measures programs.

What is the environmental policy of LANL?

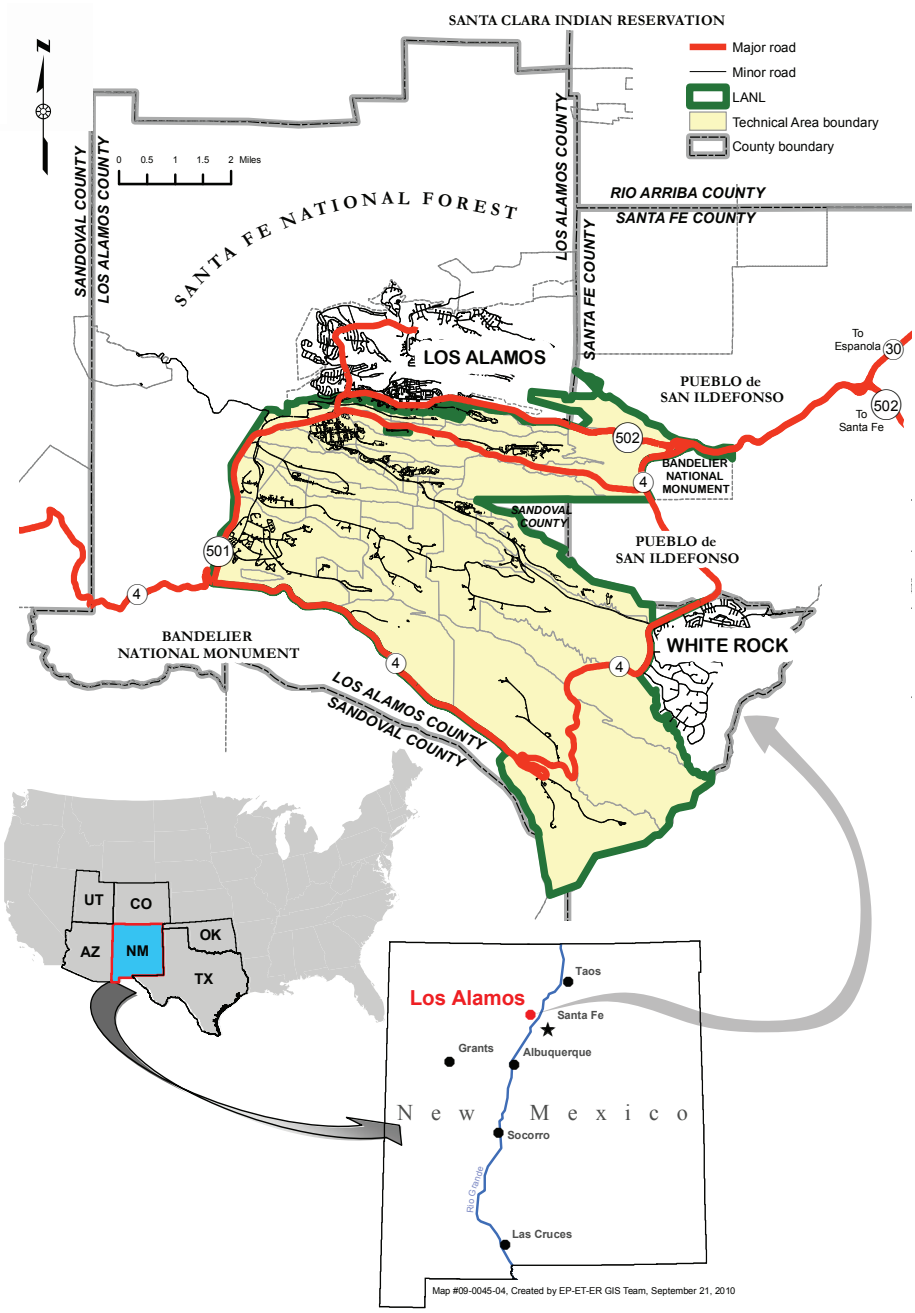
It is the policy of Los Alamos National Laboratory that we will be responsible stewards of our environment. It is our policy to:

- Manage and operate our site in compliance with environmental laws and standards and in harmony with the natural and human environment.
- Meet our environmental permit requirements.
- Use continuous improvement processes to recognize, monitor and minimize the consequences to the environment stemming from our past, present, and future operations.
- Prevent pollution.
- Foster sustainable use of natural resources.
- Work to increase the body of knowledge regarding our environment.

What is LANL?

Los Alamos National Laboratory (LANL or the Laboratory) began in March 1943 when a small group of scientists came to Los Alamos for Project Y of the Manhattan Project. Their goal was to develop the world's first nuclear weapon. Although planners originally expected that the task would require only 100 scientists, by 1945, when the first nuclear bomb was tested at Trinity Site in southern New Mexico, more than 3,000 civilian and military personnel were working at Los Alamos Laboratory. In 1947, Los Alamos Laboratory became Los Alamos Scientific Laboratory, which in turn became Los Alamos National Laboratory in 1981. The Laboratory now contributes much more than weapons design and has made essential contributions to physics, magnetism, chemistry, energy research, and other scientific fields. Currently LANL is working on projects in energy, medicine, magnetism, counter terrorism, fuel cell cars, and much more.

LANL is located in Los Alamos County in north-central New Mexico (NM), approximately 60 miles north-northeast of Albuquerque and 25 miles northwest of Santa Fe. The 37-square-mile Laboratory is surrounded by largely undeveloped land with the exception of the communities of Los Alamos and White Rock.

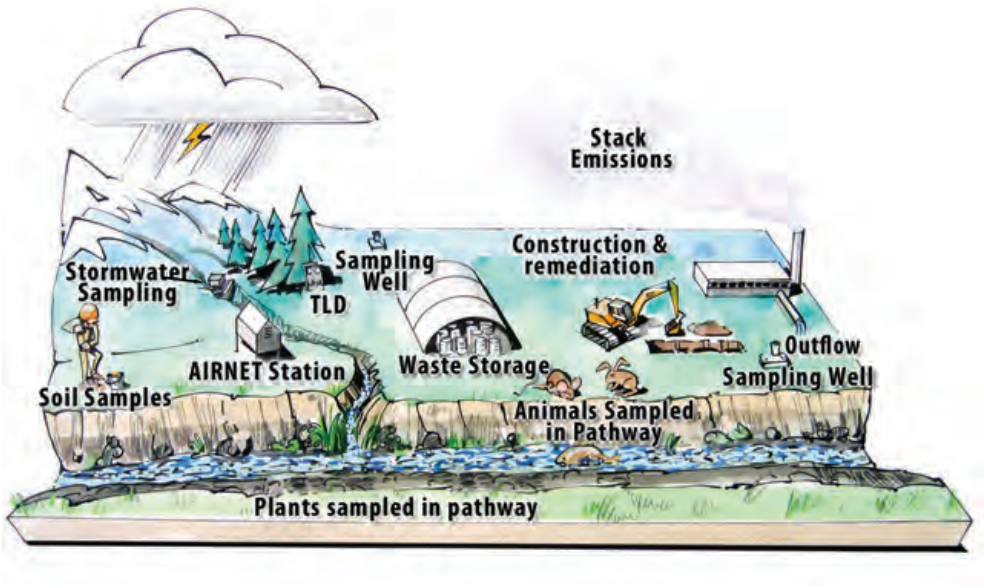


What is LANL's purpose today?

Since its creation in 1943, LANL has grown from a small team of 100 scientists to a national laboratory that employs over 9,000 people. The Laboratory now contributes much more than just weapons design and has made essential contributions in physics, magnetism, chemistry, energy research, and other scientific fields. Some recent achievements are RAPTOR, a robotic telescope; Roadrunner, the world's fastest supercomputer; and MagViz, a liquid analysis machine for potential use at airports. Currently LANL is working on projects in energy, medicine, magnetism, fuel cell cars, and much more.

The mission of LANL is to develop and apply science and technology to (1) ensure the safety and reliability of the US nuclear deterrent, (2) reduce global threats, and (3) solve other emerging national security challenges. Meeting this diverse mission requires excellence in science and technology to solve multiple national and international challenges. Inseparable from the Laboratory's focus on excellence in science and technology is its commitment to environmental stewardship and full compliance with environmental protection laws. Part of LANL's commitment is to report on its environmental performance.

How does LANL monitor environmental impacts?



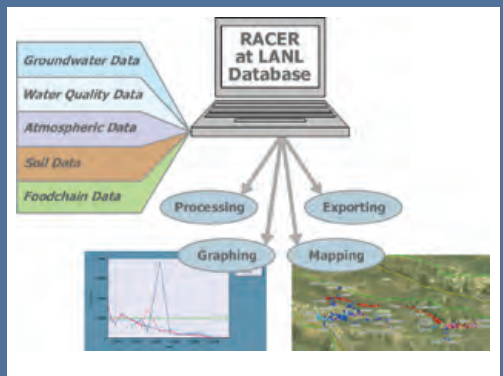
The Laboratory uses data from monitoring (surveillance) of known release points and multiple receptors (people, air, water, soil, foodstuffs, plants, and animals) over a long time period as a basis to determine actions to protect the environment. The Laboratory collects data from the surrounding region to establish baseline environmental conditions not influenced by its operations and to determine whether operations are impacting areas beyond LANL boundaries. Data are also collected on-site and at the Laboratory perimeter to determine if operations are impacting LANL or neighboring properties. Perimeter monitoring also measures the highest potential impact to the public.

How many samples and what types of samples were taken around LANL?

Sample Type or Media	Locations	Samples	Analytes or Measurements
Ambient Air	65	2,969	9,792
Stack Monitoring	28	2,761	22,266
Biota	79	168	5,242
Soil	80	156	8,028
Sediment	60	69	35,706
Foodstuffs	22	34	3,246
Groundwater	200	1,605	131,175
Surface water base flow	30	149	16,394
Surface water storm runoff	22	83	9,749
NPDES Outfall	14	168	2,176
Neutron Radiation	47	188	188
Gamma Radiation	89	356	356
Environmental Restoration	2,849	5,551	686,498
Subsurface vapor monitoring	65	1,381	93,478
Totals:	**3,650**	**15,640**	**1,119,308**

Where can I see the data?

Environmental measurement data collected by the New Mexico Environmental Department (NMED) and LANL are available to the public online. The Risk Analysis, Communication, Evaluation, and Reduction (RACER) database is available at www.racernm.com and provides access to almost six million historical and recent records. RACER is designed to allow users to select, evaluate, and analyze data collected in and around LANL. By making the environmental data accessible to everyone in a way that promotes an understanding of the data, LANL can be held accountable by the surrounding communities.



What federal regulations did LANL comply with in 2009?

Federal and state regulations and statutes provide specific requirements and standards for environmental protection and to maintain environmental quality. The Environmental Protection Agency (EPA) and the NMED are the principal administrative authorities for these laws. The Laboratory is also subject to DOE requirements for control of radionuclides.

Federal Statute	What it Covers	Status
Clean Air Act (CAA)	Requirements for air quality and air emissions from facility operations	• Air quality operations permit was renewed by NMED. • The laboratory was below all permit limits for both non-radioactive and radioactive air emissions. • LANL removed 7,914 lbs of ozone-depleting refrigerants from inventory. • LANL provided the first greenhouse gas emissions report to NMED.
Clean Water Act (CWA)	Requirements for water quality and water discharges from facility operations	• Seven samples collected from the Sanitary Wastewater Systems Plant's outfall exceeded effluent limits for pH, residual chlorine levels, total suspended solids, or PCB level concentrations. • 99% of the Laboratory's permitted construction sites were compliant with National Pollutant Discharge Elimination System (NPDES) requirements. • LANL installed 52 new site-specific surface water samplers, maintained 60 runoff gage stations, collected 85 storm water samples, installed 150 new erosion control measures, and conducted over 1,000 inspections at 290 sites.
Compliance Order on Consent	Requirements for investigation and cleanup of SWMUs and AOCs	• LANL submitted all deliverables (reports, letters, plans) on time. • Paid fines for a vapor-sampling report not being complete and for not plugging and abandoning a well in Mortandad Canyon on time. • Installed 14 new groundwater monitoring wells.
Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)	Mitigation of pollution and contaminants on LANL property	• No properties were transferred from LANL ownership. • Completed a pre-assessment screen towards completing a Natural Resource Damage Assessment.
Emergency Planning and Community Right-to-Know Act (EPCRA)	Public's right to know about chemicals released into the community	• LANL had no reportable leaks, spills, or other releases of chemicals into the environment. • Chemical inventory reports were updated to the Los Alamos County Fire and Police Departments for 20 chemicals or explosives. • LANL was above the threshold for reporting the use of lead in 2009 mostly at the on-site firing range where security personnel conduct firearms training.
Endangered Species Act (ESA) and Migratory Bird Treaty Act (MBTA)	Protection of rare species of plants and animals in addition to their habitat	• LANL reviewed 612 excavation permits, 115 project profiles, and seven storm water pollution prevention plans for potential impacts to threatened or endangered species.
Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)	Storage and use of pesticides	• The Laboratory used 600 lbs of fertilizers, 127 gal. of herbicides, 77oz of insecticides, 5 gal. of color marker, and 4 lbs plus 5.5 gal of water treatment chemicals.
National Environmental Policy Act (NEPA)	Projects evaluated for environmental impacts	• During 2009, six additional elements of the Expanded Operations Alternative in the Site-Wide Environmental Impact Analysis were released.
National Historic Preservation Act (NHPA)	Projects evaluated for environmental impacts to historical sites	• The Laboratory conducted 40 projects that required some field verification of previous cultural surveys. • Twenty-one new archaeological sites and 7 new historical buildings were identified in 2009. • Five historic buildings were determined eligible for the National Register of Historic Places.
Resource Conservation and Recovery Act (RCRA)	Generation, management and disposal of hazardous waste and cleanup of inactive, historical waste sites	• In the process of renewing the hazardous waste facility permit. • No hazardous waste management units at LANL underwent full closure activities in 2009. • Laboratory completed 1,467 self-assessments with a nonconformance rate of 3.07%. • LANL discovered three issues with the packaging of hazardous waste. All instances were corrected and did not result in actual or potential hazards to the environment or personnel. • LANL failed to plug and abandon a well by the deadline resulting in a penalty of $1,300,000.
Toxic Substances Control Act (TSCA)	Chemicals such as PCBs	• The Laboratory shipped 263 containers of PCB waste containing 1,941 lb (880.5 kg) of capacitors and 2,605 lb (1,181.6 kg) of fluorescent light ballasts for disposal or recycling.

What are examples of Environmental Restoration Programs?

What is the goal of Environmental Restoration?

The environmental restoration efforts at the Laboratory began in 1989 as part of a DOE nationwide program. The purpose is to investigate hazardous and/or radioactive materials that may be present in the environment as a result of past Laboratory operations, to determine if they pose an unacceptable risk to human health or the environment, and to remediate (clean up, stabilize, or restore), as appropriate, those sites where contamination is present. In 2009, 26 work plans and 22 reports were developed and/or revised. These plans and reports presented approaches for investigation activities and the results and assessments related to the investigations conducted.

How does LANL Reduce Risk?

Risk is evaluated either as current or future risk. The Laboratory assesses hazards and the corresponding risks by evaluating environmental data, measurements, inventories of buried or stored materials, and potential exposure pathways and scenarios. We use models, data, and computer programs to assist with these estimates.

Examples of ongoing risk reduction activities include the transport of stored legacy transuranic waste from Area G to the Waste Isolation Pilot Plant (WIPP) in Carlsbad, NM, the planned cleanup and remediation of the plutonium processing facility, ongoing studies of groundwater contamination to evaluate future hazards and risks, and numerous investigations and corrective actions at potentially contaminated sites. These efforts have significantly reduced or eliminated potential exposure and risk to workers, the public, and the environment.

Corrective Actions Programs

The Corrective Actions Program addresses the remediation of septic tanks and outfalls; sanitary waste lines and sewage treatment facilities; industrial waste lines, drains, storm drains and outfalls; contaminated areas; landfills and surface disposal areas; transformer sites; and incinerators located primarily within the Laboratory boundaries at various technical areas, and some historical sites that are now located within the Los Alamos town site. Activities also include canyons investigations, groundwater monitoring, storm water and surface water monitoring, soil sampling, and the installation of erosion control measures (ranging from straw tubes to concrete structures) to minimize erosion. In 2009, PCB (see page 13) clean up began in upper Los Alamos Canyon and continued into 2010. Additionally, the Laboratory reported the results of sampling investigations conducted on the Upper Los Alamos Canyon Aggregate Area, Upper Mortandad Canyon Aggregate Area, North Ancho Canyon Aggregate Area, and Middle Cañada del Buey Aggregate Area as well as Sandia Canyon, Cañada del Buey, and North Canyons.

TA-54 Closure Project

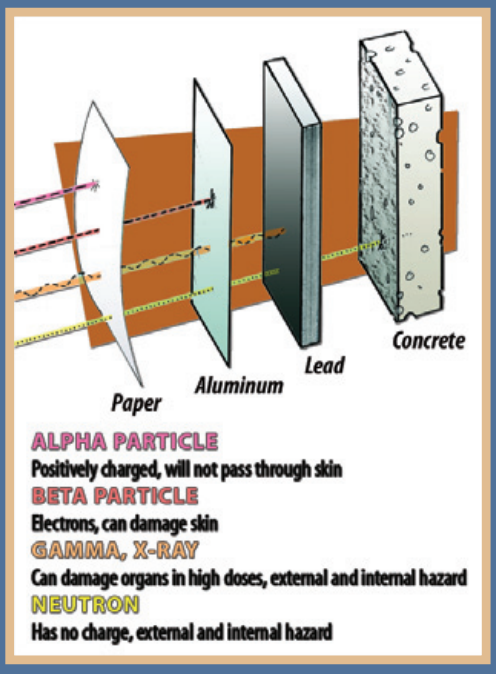
Technical Area 54 (TA-54) is a 100-acre area that served as the Laboratory's primary low-level radioactive waste management facility for below-ground disposal and above- and below-ground storage in the 1960s and 1970s. TA-54 includes the four material disposal areas—G, H, J, and L—which are storage areas for hazardous and mixed waste, and supporting structures or offices. Activities conducted in 2009 involved monitoring of the groundwater and vapor below ground and the development and implementation of corrective measures. In 2009, new holes were drilled and samples were collected to monitor for tritium and organic compounds.

TA-21 Closure Project

Located east of downtown Los Alamos on DP Road, TA-21 served various uses during the Manhattan Project and Cold War eras, including chemical research for refining plutonium and plutonium metal production from 1945 to 1978. Activities conducted in 2009 included removal and remediation of early Laboratory waste, collection of vapor samples, geologic investigations, collection of soil samples, and installation of groundwater monitoring wells. In 2009, six buildings were demolished, 21 buildings were decontaminated, new monitoring wells were installed, and investigation activities at the various sites continued.

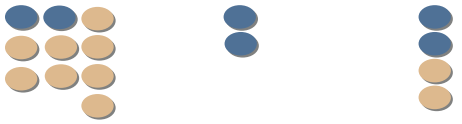
What is a false positive?

Measuring radioactivity and chemicals in the environment may involve detecting very small amounts, and it can be difficult to distinguish small values from zero. It is important to know the smallest concentration of a constituent that can be consistently distinguished from zero to determine if it is present. These values can help decide if the decision about the presence of the constituent is correct. Due to human error involved in measurements and random variation, occasionally it is either incorrectly determined that a constituent is present (false positive) or absent (false negative). Radioactivity results may vary because of the random nature of radioactive decay, variations in the measuring process, instrument variation, techniques used to sample, and differences in the sample material, interferences, or other sources of radioactivity.



To understand false positives, it is important to understand natural variability. To illustrate this concept, pretend there is a pile of ten coins. There are two possible options for each coin: tan or blue. The probability of a coin being tan is one out of two or 50%. Pretend we cannot see the coins but can detect the number of tan coins. We assume that there are twice as many coins as detected because there is a 50% probability of a coin being tan (detected).

Actual: 10 **Detected: 2** **Assumed: 4**



Conclusion:

False negative because there are actually ten coins and only four were expected.

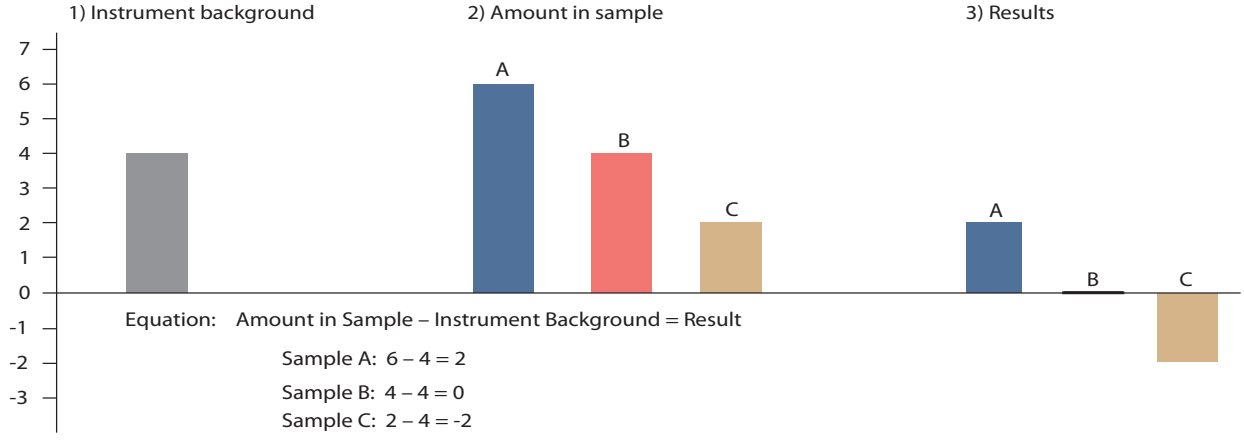
Actual: 10 **Detected: 6** **Assumed: 12**

Conclusion:

False positive because there are only ten coins and twelve were expected.

How do we get negative numbers?

When measuring the decay of radioactive elements, it is possible to calculate a negative amount. The negative result is obtained by subtracting results from "dummy" (blank) samples to account for the always-present low levels of radioactivity, small amounts of contaminants that might be in the measuring equipment and other sources. If a counted amount is lower than established background levels at the analytical laboratory, then the final result will be a negative number. If negative numbers are removed when calculating averages, results will incorrectly show higher concentrations of contaminants (high bias).

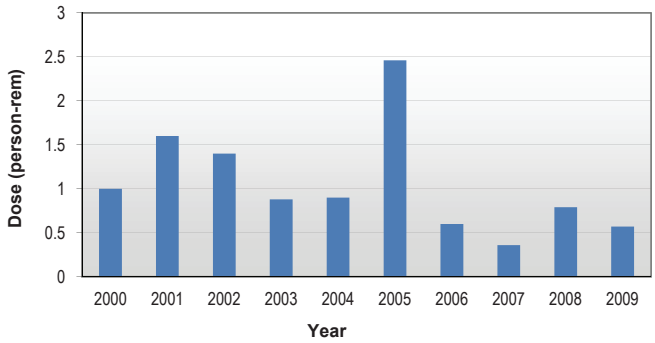


What is the MEI?

Humans, plants, and animals potentially receive radiation doses from various LANL operations. To monitor the dose the public is exposed to, the Laboratory calculates the dose to the maximally exposed individual (MEI) using results from AIRNET stations, stack sampling, and computer models. The MEI is a hypothetical person situated in a business or residence where the person has the potential to receive the largest airborne radiation dose outside of Laboratory property.

The 2009 all-pathway MEI was located at the boundary between LANL and the San Ildefonso Pueblo sacred area. No one currently lives at this location. The calculated dose to this hypothetical individual was 1 mrem/yr, which is far below DOE's 100 mrem/year dose limit. The 2009 air pathway MEI was located at East Gate near the east end of Los Alamos Airport and was estimated to be 0.55 mrem/yr. The total calculated dose to an average resident of Los Alamos during 2009 was 0.035 mrem/yr and to a White Rock resident was 0.025 mrem/year. Both are extremely minimal and no observable health effects are expected from these doses.

The location of the "all pathways" MEI for 2009 at the boundary between LANL and San Ildefonso



The graph illustrates doses to the MEI from 2000 to present.

What is a dose?

Dose is the amount of energy a person receives internally or externally as a result of a radioactive source; it is measured in rem.

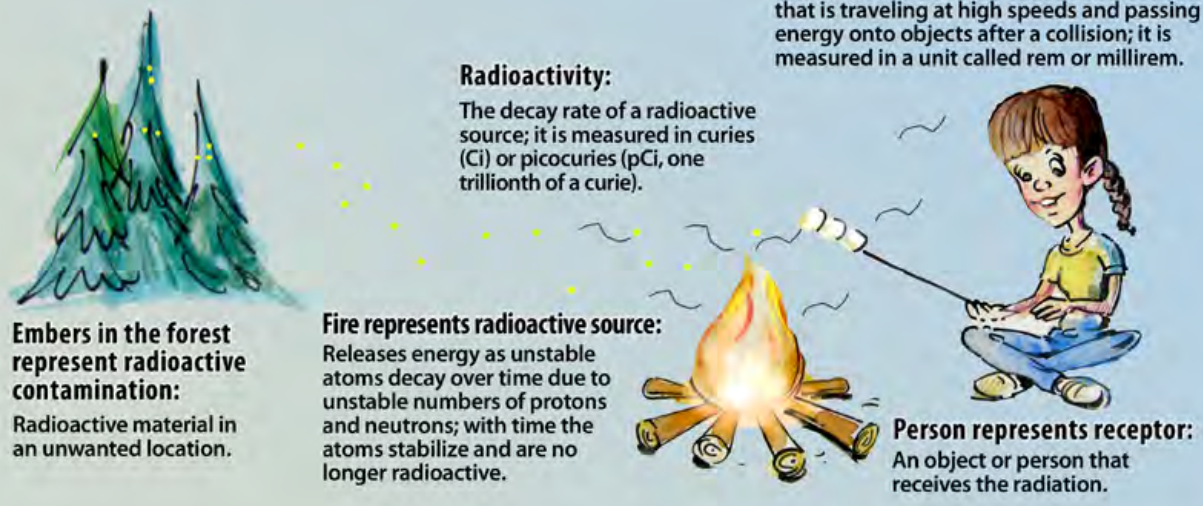
What is my dose?

You can calculate the dose you receive in your daily life: **http://newnet.lanl.gov/info/dosecalc.asp**

NEIGHBORHOOD ENVIRONMENTAL WATCH NETWORK
NEWNET

LANL also takes into consideration the possibility of receiving a dose through eating or drinking. Many water samples were analyzed for 2009. The potential dose from food was also calculated using samples of road-killed deer, alfalfa forage, and crawfish. The dose for food ingestion was also very minimal.

What is Radiation?



What is the AIRNET system?

The Laboratory collects ambient air samples within LANL boundaries, at the LANL perimeter, and regionally to estimate the extent and concentration of radionuclides that may be release from Laboratory operations. This monitoring network is referred to as AIRNET.

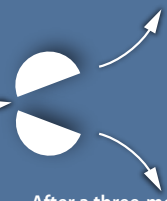
AIRNET stations monitor ambient air on-site and off-site

Inside the AIRNET station

Silica gel absorbs water vapor; samples are collected every two weeks and tested for tritium

Polypropylene filters collect particulate matter; samples are collected every two weeks; the entire filter is tested for alpha, beta, and gamma emitters

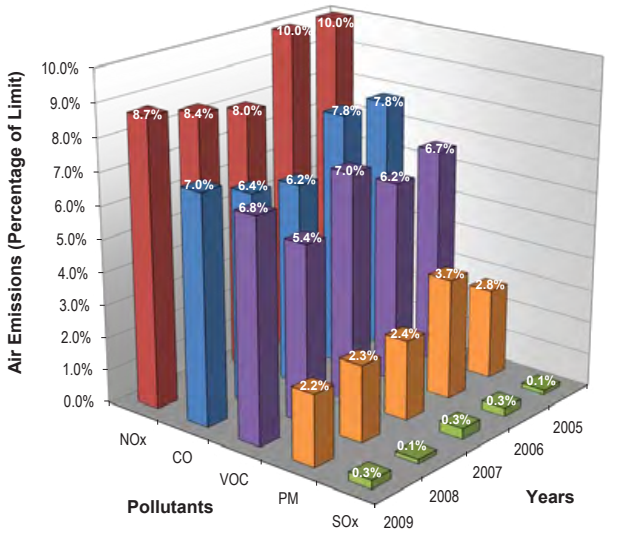
Half the filter is placed in long-term storage



After a three-month period, half-filters from the same station are tested for plutonium, americium, uranium, aluminum, beryllium, and calcium

What were the Results of Air Monitoring?

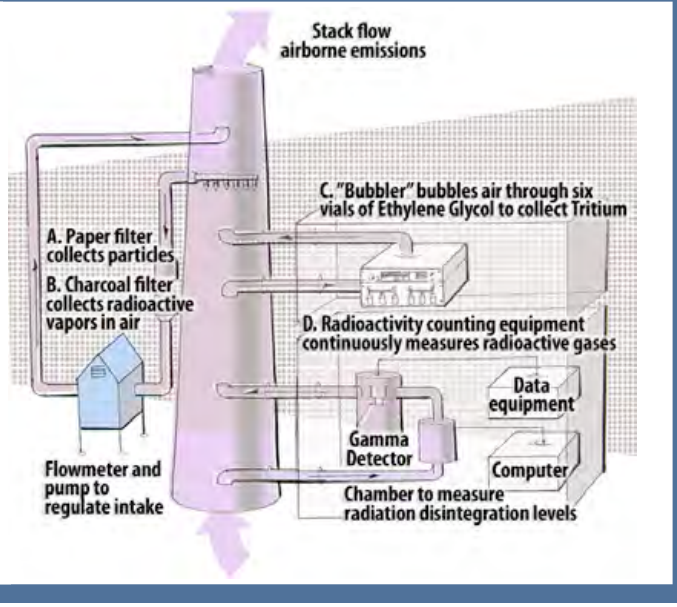
In 2009, there were 65 operating AIRNET stations. Annual average radionuclide concentrations at all LANL perimeter stations were less than 1% of the EPA dose limit for the public. At regional locations away from Los Alamos, all air sample measurements were consistent with background levels. As in past years, the AIRNET system detected slightly elevated radionuclides from known areas of contamination. No new or increased airborne radioactivity was detected and there were no unplanned airborne releases. Additional sampling is done yearly at Area G and DAHRT.



Percentage of the Limits of Non-radiological Air Pollutant Emissions

How are stack emissions monitored?

The Laboratory monitors stacks and categorizes these emissions into one of four types: (A) particulate matter, (B) vaporous activation products (radioactive elements created by the LANSCE particle accelerator beam), (C) tritium, and (D) air activation products. Stacks with the potential to emit more than a certain amount of radioactive material are monitored with one or more of these types of systems.



Stack monitoring results

In 2009, the Laboratory monitored 26 stacks. No elevated levels of radioactivity were detected for any of the monitored elements. If stacks do not meet the radiological emissions threshold, an annual operations review is performed to ensure the potential emissions levels remain low.

What is a Thermolumnescent Dosimeter (TLD)?

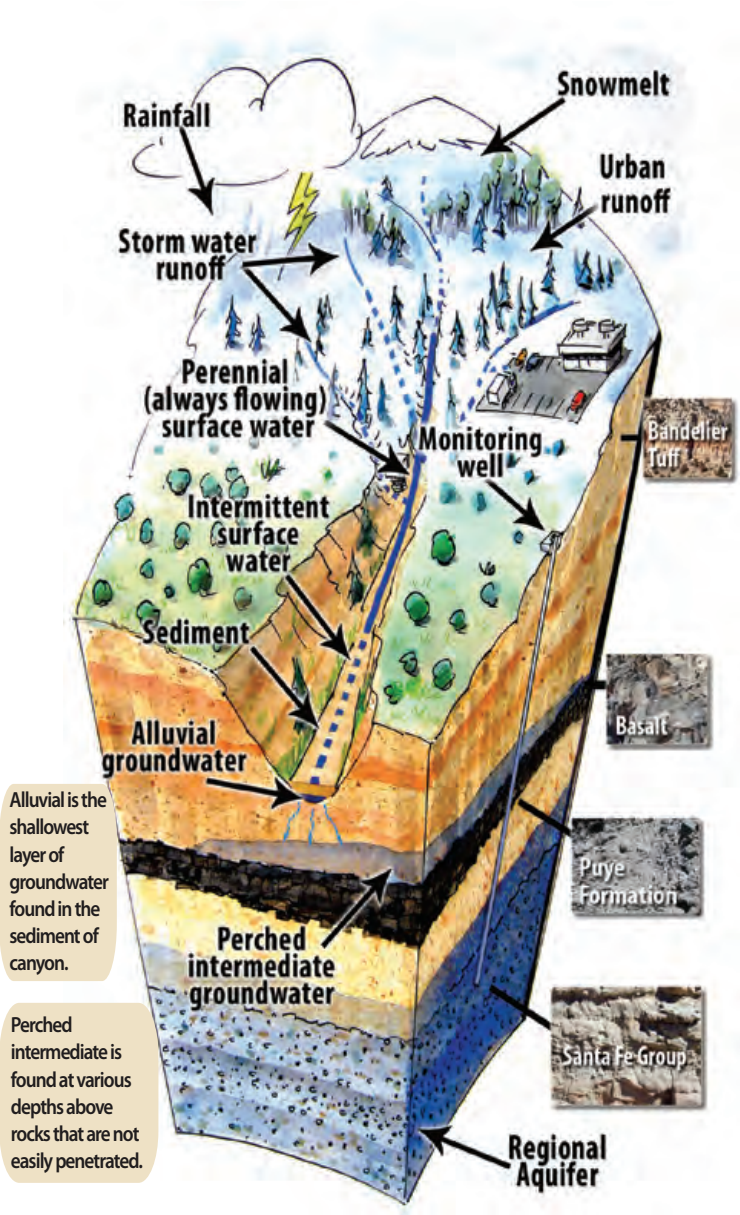
- A TLD is a radiation detector worn by employees who have the potential for routine exposure to radiation.
- TLDs are also placed in the environment to detect ambient radiation.
- TLDs detect neutron and gamma radiation and are analyzed at regular intervals.
- During analysis, the TLDs are heated and emit light proportional to the amount of radiation absorbed.
- TLDs measure all radiation, both man-made and natural.

What monitoring for nonradioactive air pollutants does LANL perform?

LANL calculates emissions of non-radiological contaminants such as nitrogen oxides, volatile organic compounds, carbon monoxide, particulate matter, and sulfur oxides. Emissions from 2005 through 2009 are very similar and remain relatively constant. The Laboratory has consistently been below the permit limits for these emissions. LANL reports these emissions data to NMED each year. In 2009, LANL provided the first greenhouse gas emissions report to NMED for emissions of CO_2. LANL emitted approximately 57,430 metric tons of carbon dioxide equivalents from the combustion of fossil fuels. In the future, LANL will report all greenhouse gases.

The main radioactive emissions stack at the Los Alamos Neutron Science Center which is monitored for emissions of radioactive gases.

How is groundwater and surface water monitored?



Alluvial is the shallowest layer of groundwater found in the sediment of canyon.

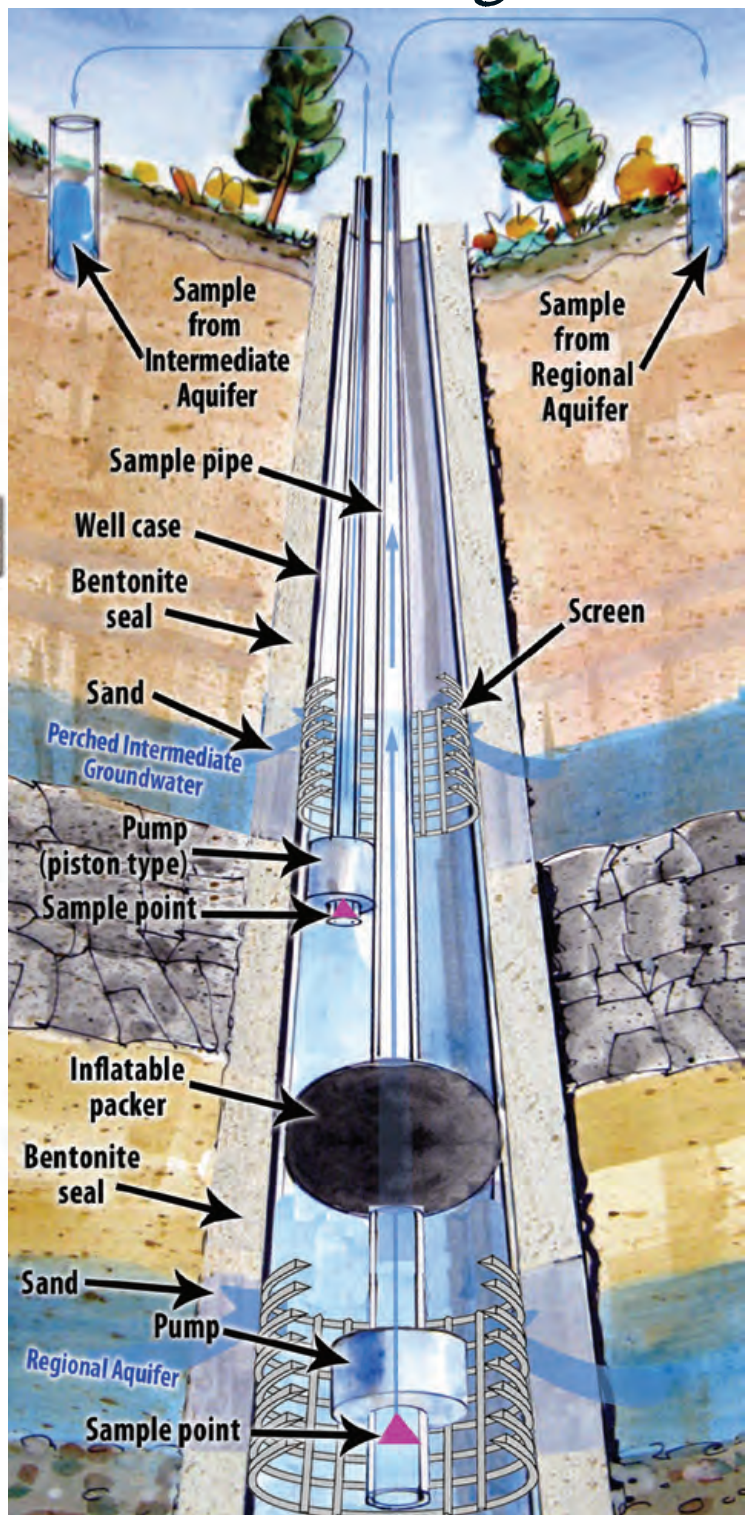
Perched intermediate is found at various depths above rocks that are not easily penetrated.

The regional aquifer is located 600-1200 feet below the surface and is used as a source of drinking water. The contaminated alluvial and perched intermediate bodies are separated from the regional aquifer by hundreds of feet of dry rock, so infiltration occurs slowly. The regional aquifer also contains a high amount of water within the rocks and sediment which dilutes the contaminants. As a result, less contamination reaches the regional aquifer and the impacts to it are small.

How is surface water sampled?

Surface water samples are collected in all major canyons that cross current or former Laboratory land. The procedure for sampling depends on the type of stream flow and the location. Most samples are collected by automated samplers that are triggered by stream flow.

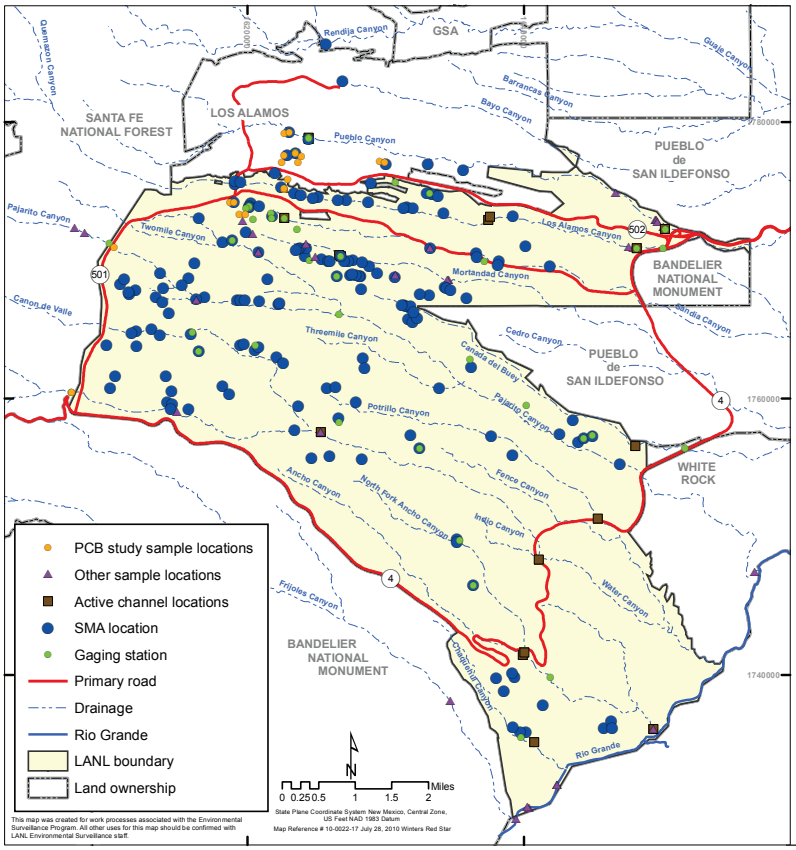
How does a monitoring well work?



How is groundwater sampled?

Groundwater is monitored with wells at various depths, thus enabling LANL to find contaminants and observe trends. The inflatable packer, similar to a large balloon, prevents cross contamination between aquifers and enables samples to be collected from multiple levels of groundwater in one well. Prior to collecting a sample, the well must be purged to ensure the sample is an accurate representation of the flowing groundwater.

Where is surface water monitored?

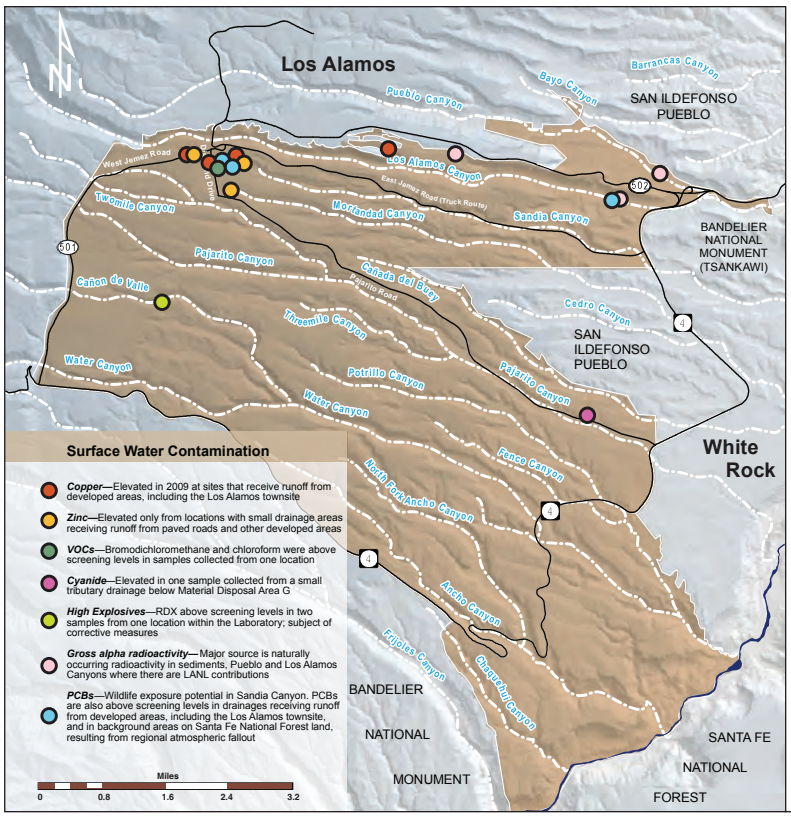


LANL has been monitoring surface water annually since 1969. Watersheds that drain LANL property are dry for most of the year. Of the more than 80 miles of watercourse, approximately three miles have natural year-around flow and approximately four miles have flow from effluent discharges (most notably in upper Sandia Canyon). Excluding effluent, stream flow in 2009 on the Pajarito Plateau was dominated by storm water runoff, mostly occurring in July. No snowmelt runoff was recorded crossing the eastern Laboratory boundary.

There were no unusual storm water runoff events in 2009. Total storm water runoff measured at downstream gages in the canyons leaving the Laboratory was estimated at about 24 acre-feet, the least since 1995, the first year for which runoff estimates are available for all the canyons.

This map shows the location of all surface water sample locations.

Where is contamination found in surface water?



The surface water within the Laboratory is not a source of municipal, industrial, or irrigation water, though wildlife do use the water. There were no unplanned releases of radioactive liquids but there were 28 spills or releases of non-radioactive liquids, mostly of drinking water. LANL reported all liquid releases to New Mexico Environment Department (NMED).

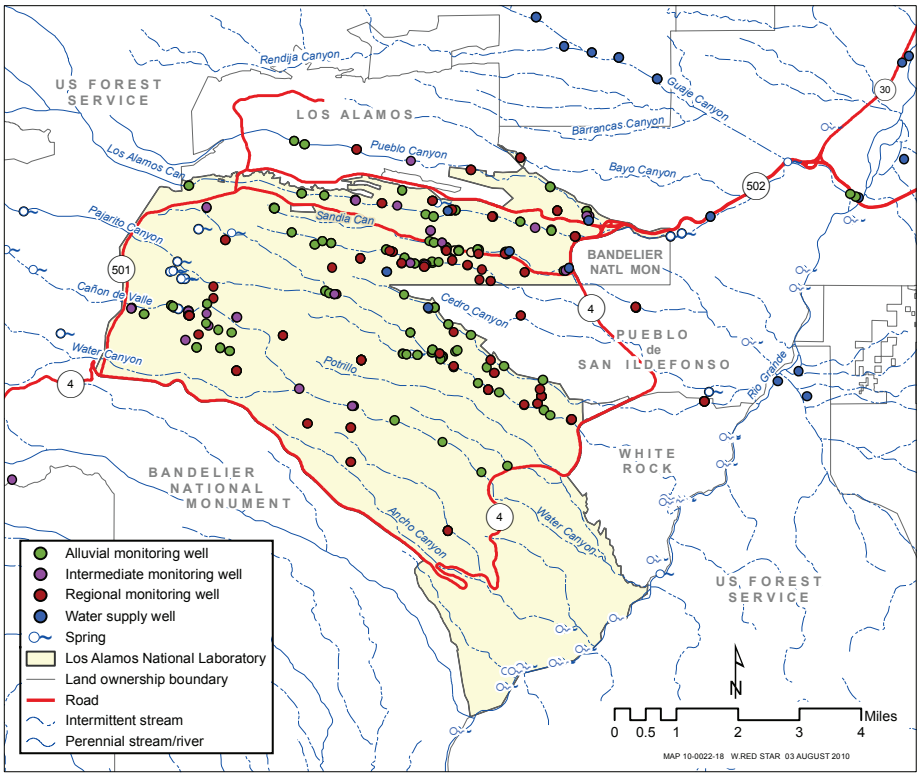
The overall quality of most surface water in the Los Alamos area is good. Of the more than 100 analytes measured in sediment and surface water within the Laboratory, most are at concentrations far below standards and screening levels. However, nearly every major watershed indicates some effect from Laboratory operations, often for just a few contaminants.

This map shows where one or more samples were collected containing contaminants that are over their corresponding screening level or standard.

Where is groundwater sampled?

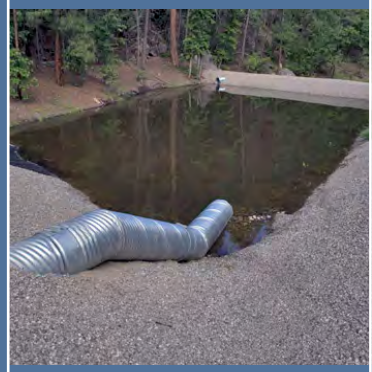
In 2009, LANL sampled 244 groundwater wells and springs and installed six perched-intermediate monitoring wells and eight regional monitoring wells. Five wells were plugged and abandoned. LANL also rehabilitated two wells to improve their reliability and usability for monitoring groundwater.

To protect the water in New Mexico, LANL follows applicable federal and state standards. In 2009, LANL met all standards except for minor exceedances at some industrial outfalls on seven occasions. All releases from the Sanitary Wastewater Systems Plant's outfall met effluent limits.



This map shows the locations of wells used to monitor groundwater.

How does LANL prevent run-off of contaminated surface water?



Sediment traps on upper Los Alamos Canyon.

The sediment traps in Upper Los Alamos canyon are an example of a control measure. Control measures are physical or structural devices that help reduce negative impacts on downstream storm water quality and quantity on and off Laboratory property. There are a number of control measures such as wetlands, sand and gravel barriers, silt fences, and straw wattles. After a storm event, each affected control measure is checked within a week to ensure it is still effective. In Upper Los Alamos, where there is known PCB (see pg. 13) contamination, sediment traps allow contaminated sediment to fall to the bottom of ponds before rainwater continues down the canyon.

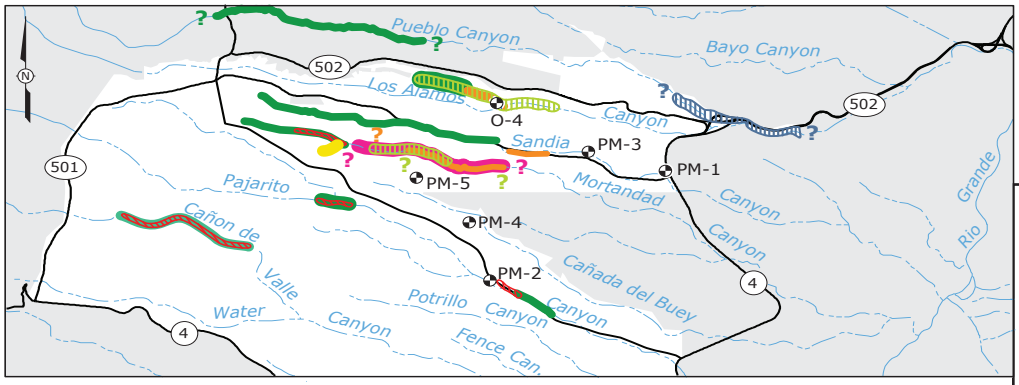
Standards and Screening Levels: What are they and what do they mean?

Standards are created to protect a defined group from a specific contaminant for a known exposure pathway during a specific time frame. There are unique standards for different hazards, exposure pathways, and the extent and duration of exposure. The Laboratory compares concentrations of radioactive and chemical constituents in air and water samples with relevant standards or guidelines in regulations of federal and state agencies. When a standard is exceeded, action is required to treat or remove the contaminant.

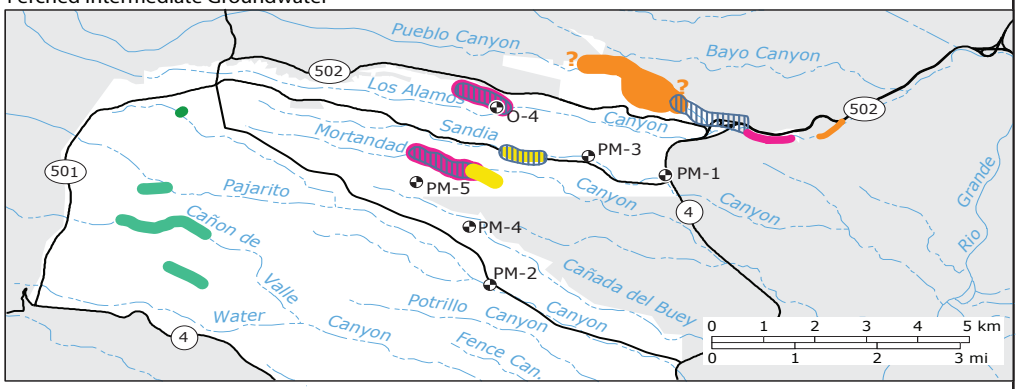
The Laboratory also sets screening levels to raise awareness of the presence of a contaminant. A screening level (SL) is like a red flag and results in research on the contaminant's source, the extent of contamination, and the future risk. If a contaminant is above the SL or standard it does not necessarily mean it poses a threat to human health.

Where is contamination found in the groundwater at values over half of the screening level?

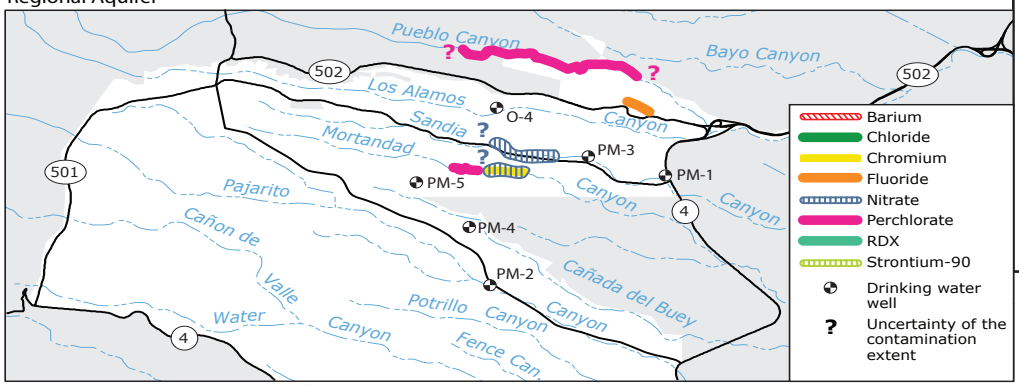
Alluvial Groundwater



Perched Intermediate Groundwater



Regional Aquifer



This map illustrates the locations where samples were collected containing contaminants that are over half of their corresponding screening level or standard.

Chemical	Trends	Off-site	Alluvial	Pearched Intermediate	Regional Aquifer	Significance
Barium	Generally stable, seasonal fluctuations		•			Not in the drinking water; limited contamination
Chloride	Seasonal fluctuations	•	•	•		May be caused by salt in snowmelt runoff
Chromium	Fairly steady		•	•	•	Over the standard in the regional aquifer but not effecting the drinking water. Source eliminated in 1972
Fluoride	Slow decrease in concentration due to improvements in effluent quality	•	•	•		Result of historical effluent releases; not effecting drinking water supply wells
Nitrate	Generally steady	•	•	•	•	Due to effluent discharges, both LANL and Los Alamos county
Perchlorate	Decreasing in Mortandad Canyon alluvial groundwater due to effluent quality improvement;	•	•	•	•	Reflects historical discharges;
RDX	Seasonal fluctuations		•	•		Not in the drinking water
Strontium-90	Some decrease due to improvement in effluent quality		•			Not in the drinking water; mainly in a fixed location
Trichlorethane (TCE)					•	Close to a drinking water well, likely from gas

Does LANL Impact the Rio Grande River?

Canyons from LANL drain into the Rio Grande and storm runoff occasionally reaches the Rio Grande. Total runoff leaving the Laboratory in 2009, measured at downstream gages in the canyons, was the lowest since 1995. None of the streams within the Laboratory boundary averages more than one cubic foot per second (cfs) of flow annually. The largest flows in 2009 occurred due to storm runoff on July 30, with a total estimated mean daily flow of 7.2 cfs. By comparison, the average daily flow in the Rio Grande at Otowi Bridge on July 30 was 1,040 cfs, or approximately 145 times higher than the flow from LANL.

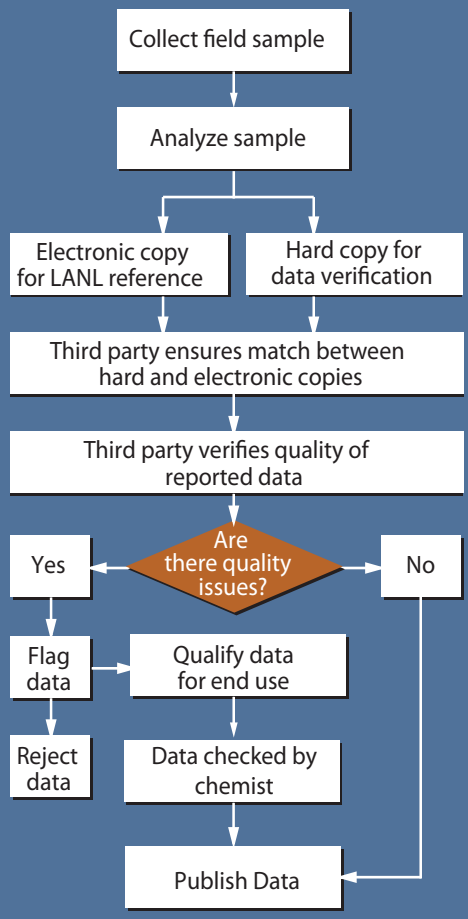
To assess LANL's impact on the river, samples of sediment, water, and foodstuffs were collected both upstream and downstream of the Laboratory and were tested for a variety of contaminants including, metals, organic compounds, and inorganic compounds. There is no significant effect of LANL on the Rio Grande. The Risk Assessment Corporation, which evaluates radionuclides and chemicals in the environment, estimated the potential annual cancer risk to be less than 3 in 1 million for exposure to any LANL-derived chemical or radioactive material that may have been carried in the surface water and sediments to the Rio Grande and Cochiti Lake. Data do show, however, that elevated levels of mercury and PCBs are present in the river and derive from sources upstream. LANL contributions to the Rio Grande, if any, are masked by contaminants from up-river sources.

A chemical comparison of PCB "fingerprints" upriver and downriver from Los Alamos Canyon with data within the Los Alamos Canyon watershed was completed in 2009. The data allow evaluation of the types of PCBs present above and below the primary LANL sources and also allows further comparison with PCBs present in LANL canyons. The mixtures of PCB upriver and downriver of LANL are not from a potential LANL source. These data therefore show no measureable evidence of LANL contributions to PCBs along the Rio Grande. The results of the sediment analysis are consistent with the fish sampling conducted in 2008, the crayfish sampling in 2009, water samples, and alfalfa field sampling in 2009.

What are PCBs?

PCB stands for Polychlorinated Biphenyls, a type of long-lived synthetic organic chemical. PCBs are odorless and tasteless liquids that range in color from clear to pale-yellow. They were commonly used in hydraulic systems, flame retardants, oil, inks, wire insulators, and metal coatings. Although banned over three decades ago, PCBs continue to enter the environment from various sources including leaks, landfills, urban runoff, sewage sludge, incineration of municipal refuse, and illegal disposal. Due to their chemical structure, PCBs tend to accumulate in sediment and fatty tissue.

How does LANL ensure the quality of data?



What is the Pollution Prevention (P2) Program?

The Pollution Prevention (P2) Program implements waste minimization, pollution prevention, sustainable design, and conservation projects to enhance operational efficiency, reduce life-cycle costs of programs or projects, and reduce risk to the environment. Reducing waste directly contributes to the efficient performance of the Laboratory's national security, energy, and science missions. LANL received four awards by DOE for pollution prevention in 2009:

National Nuclear Security Administration Best in Class Awards:

- RCRA-less Oxidation approach: replaces toxic Resource Conservation and Recovery Act (RCRA)-listed salts with non-toxic reagents for actinide separation schemes.
- Radiological Laboratory/Utility/Office Building Integrated Planning, Design, Procurement, and Construction: approximately 85% (by weight) of construction wastes were recycled or reused.

National Nuclear Security Administration Environmental Stewardship Awards:

- Electronic Recycling Program: a new electronics recycling program shipped 93,554 pounds of e-waste to a company at Terrell, TX, where the electronics are crushed and recycled.
- Alternative Fuel Use: At the end of 2009, one-half of LANL's fleet of vehicles are equipped for both E-85 and regular fuel and 75 percent of the security officers' fleet in Los Alamos was powered by E-85 fuel.

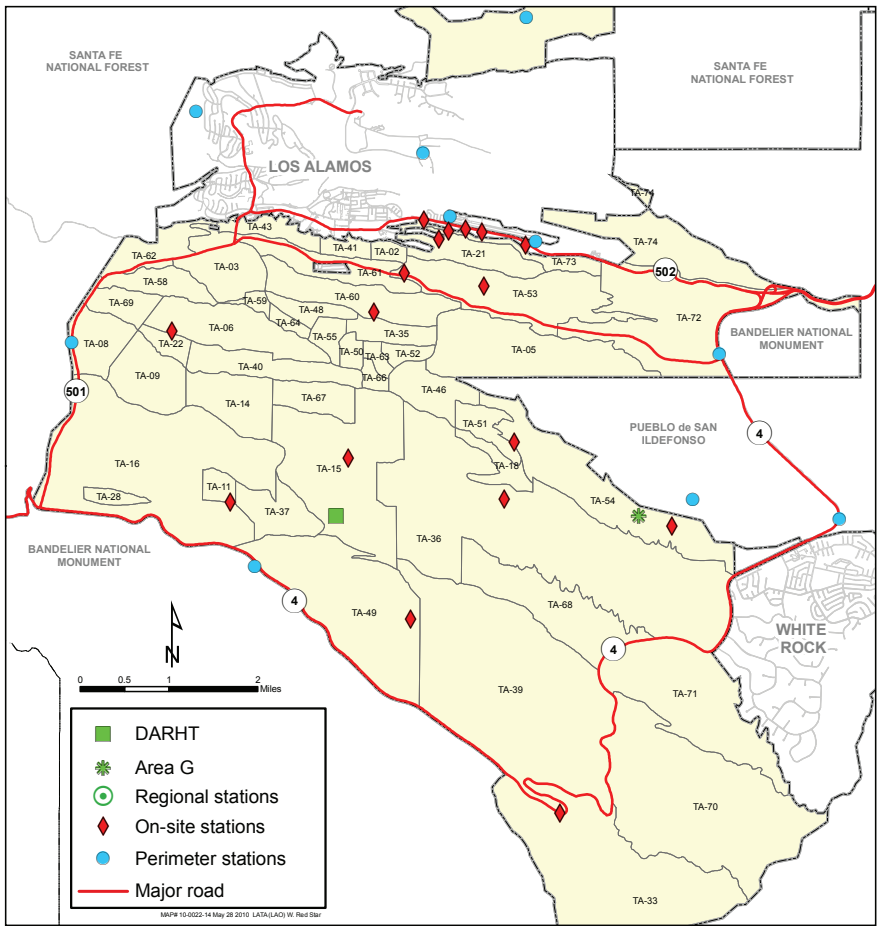
How does LANL protect Endangered Species?

The Laboratory must comply with the Endangered Species Act. This means that the Laboratory must avoid harming the habitats of federally listed endangered or threatened species such as the Black-footed Ferret, Mexican Spotted owl, and the Southwest Willow Flycatcher. These habitats are recognized as Areas of Environmental Interest (AEI) and are subject to restrictions annually. Restrictions include a limit of three people or two vehicles in the area, low noise levels, and no harm to the wetland and riparian habitat. In addition to protecting endangered and threatened species, the Laboratory has protective measures in place for additional sensitive species identified by the federal government, state government, and local non-profit organizations.

Black-footed ferret

How does LANL monitor soil?

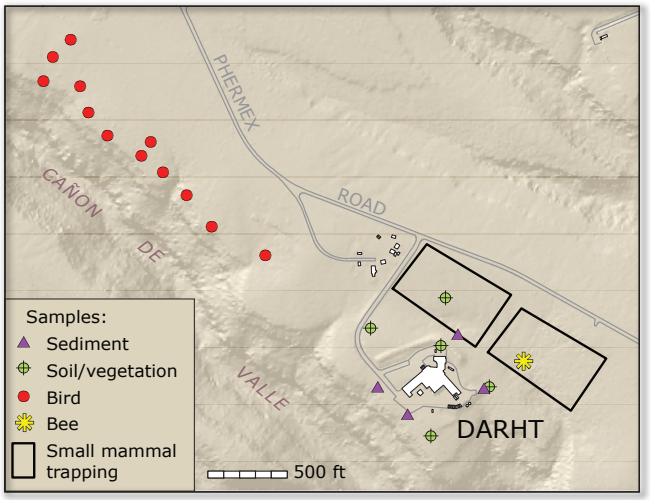
LANL conducted large-scale soil sampling within and around the perimeter of LANL in 2009 in addition to collecting samples from Pueblo de San Ildefonso land, Area G, and DARHT. In general, results of that investigation showed that soil samples from on-site and perimeter areas contained radionuclides at very low concentrations, and most PCB, high explosive, and semi-volatile organic compounds were not detected. These findings are consistent with the historical data. Soil is also sampled and analyzed to assess the potential dose from direct radiation. The calculated dose for the soil in 2009 was less than 0.1 mrem.



Fourteen soil samples from sites located along the north side of East Jemez road and on the south side of historic plutonium processing operations show levels of plutonium that are well below residential screening levels.

In 2009, we conducted additional sampling of soils from alfalfa fields upstream and downstream of LANL irrigated with Rio Grande water. Radionuclides and metals from upstream and downstream were not statistically different. No high explosives or semi-volatile organic compounds were detected in any of the field soils. PCBs were detected in soils from fields upstream and downstream of LANL and chemical analysis showed that the type of PCBs present in the Rio Grande soils both upstream and downstream is different from that known to be on LANL property.

At DARHT, uranium showed significantly lower levels than measured in the past three years. High explosives were not detected in any soil samples around DARHT. Most constituents in biota samples were within expected levels. The exception to this trend was the slightly elevated tritium concentrations in bees, which remained below the screening level.



Location of monitoring sites around the DARHT facility.

What is DARHT?

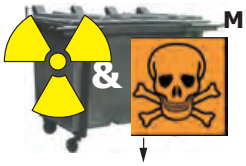
- Dual Axis Radiographic Hydrodynamic Test facility (DARHT).
- Location where scientists simulate nuclear explosions using electron accelerators to create two-dimensional images.
- Allows LANL to make progress to keep the nuclear arsenal safe without conducting underground nuclear tests.
- Experiments are fully contained in steel vessels to prevent environmental contamination.

What is Area G?

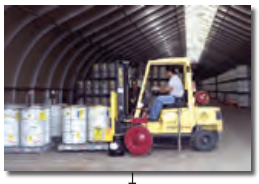
- Area G is the Laboratory's primary radioactive waste storage and disposal facility.
- Waste is contained in pits, shafts, or trenches in the bedrock, or stored in drums awaiting shipment off-site.
- Drums are stored in tents with high efficiency air filters to prevent air from leaving the building without first being filtered.

Low-level
Waste such as paper, building rubble, and soil that is contaminated with radionuclides (but is not transuranic or high-level waste)

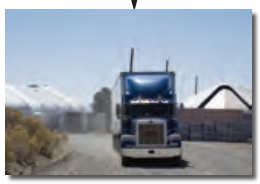
Disposed of in pits and shafts which are then covered with soil and planted with native grasses on top



Mixed low-level
Waste that is contaminated with both radionuclides and hazardous components as defined by the EPA



Stored in drums and then large domes to protect them from the weather



Shipped off LANL property to commercial disposal facilities

Transuranic
Waste that contains more than 100 nanocuries per gram of a man-made element whose atomic number is greater than uranium (such as Pu or Am) and has a half-life over 20 years

Stored in drums and then large domes to protect them from the weather

Shipped off LANL property to Waste Isolation Pilot Plant (WIPP) if it meets requirements; if not, contents of container are processed to meet requirements

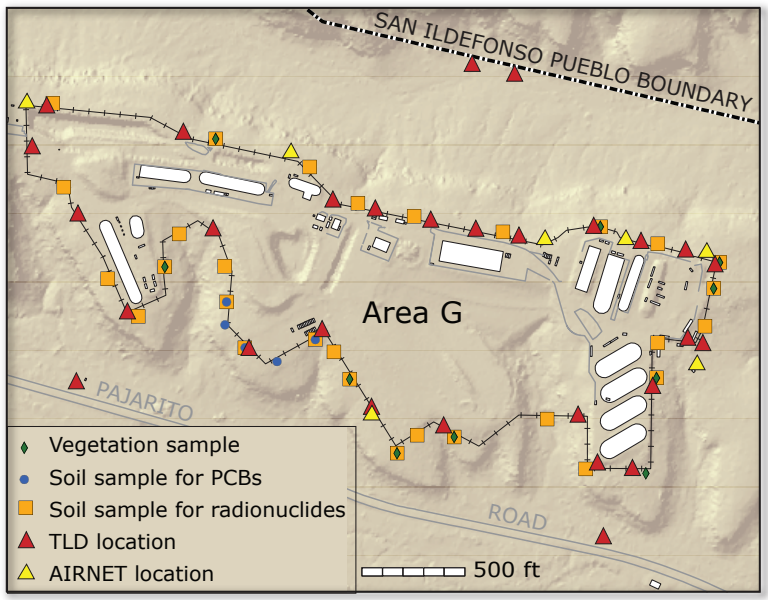
How does LANL monitor biota?

Biota are organisms not eaten by humans and include native vegetation, small mammals, birds, and bees. In 2009, branches and needles from trees were sampled. Radionuclides and elements of concern were not above screening levels and did not result in adverse health impacts to the plants. In 2008, biota was sampled above the Los Alamos Canyon low-head dam, also known as a weir. The concentrations of all radionuclides, metals, and PCBs in all living and non-living media collected above the weir were below screening levels and do not pose a potential unacceptable dose to humans or to the biota sampled.

How does LANL monitor foodstuffs?

Foodstuffs are products eaten by humans such as fruits, vegetables, and various animal tissues, and are monitored every three years. Crayfish sampling in 2009 generally confirmed results of fish sampled in 2008. Crayfish are believed to provide a better estimate of contaminant location than fish because the animals are less mobile. The sampled crayfish did not contain elevated levels of radionuclides. PCB concentrations in the crayfish were similar both upstream and downstream, indicating that LANL is not a significant source of PCBs to the Rio Grande.

Some elements were higher in crayfish collected from downstream reaches compared to upstream. However, the risk to humans from ingestion of these crayfish is minimal because the majority of these elements may be associated with the non-edible portions rather than the edible portions.



Monitoring sites around Area G.

What do students think about LANL?

"My biggest concern involving LANL and the environment is the fact that I don't feel like enough time and money is spent on research and development of solutions to some of the environmental issues we are currently facing."

~Burgandy Brock, University of New Mexico Los Alamos

"I think LANL is a responsible steward of the environment. The Lab is working to monitor its impact (releases and such) and is very concerned with remediation of any negative impact that does occur. The Lab is concerned about the people and environment of northern New Mexico, and is both an active member in the community and knowledgeable constituent."

~Tanner Johnson, Northern Arizona University

"I do believe that LANL is a responsible steward of the environment. LANL carefully and effectively handles the dangerous and toxic waste that its important lab facilities produce, safely placing nuclear waste in storage and properly disposing of any other Laboratory wastes. I am also impressed with their careful and constant monitoring of natural resources surrounding the Laboratory."

~Lauren Murray, University of Colorado at Boulder

Get Involved

- Attend environmental meetings and workshops for the public to provide input and learn more about the Laboratory. A calendar of events can be found at: **www.lanl.gov/environment/calendar/index.htm**.
- Check out LANL's environmental outreach website at: **www.lanl.gov/environment/outreach/involvement.shtml**.
- Read environmental investigations and reports at the Laboratory's Public Reading Room located at J. Robert Oppenheimer Study Center and Research Library or online at **www.lanl.gov/prr**.
- Attend meeting of the Northern New Mexico Citizen's Advisory Board as a member or nonmember to learn about issues at LANL and provide feedback to DOE. Information on meeting times and becoming a member can be found at: **www.nnmcab.org**.
- For additional information, you may contact Lorrie Bonds Lopez at (505) 667-0216 or electronically at **envoutreach@lanl.gov**.

Helpful Websites

Department of Energy: **www.energy.gov**

DOE/NNSA Los Alamos Site Office: **www.doeal.gov/laso**

LANL: **www.lanl.gov**

LANL's Public Reading Room: **www.lanl.gov/environment/outreach/prr.shtml**

LANL's Environmental Surveillance reports and supplemental data tables: **www.lanl.gov/environment/all/esr.shtml**

LANL's Air Quality group: **www.lanl.gov/environment/air**

LANL's Water Quality group: **www.lanl.gov/environment/h2o**

LANL's Waste group: **www.lanl.gov/environment/waste**

LANL's Biological Resources group: **www.lanl.gov/environment/bio**

LANL's Risk Reduction group: **www.lanl.gov/environment/risk**

LANL's Clean-Up group: **ww.lanl.gov/environment/cleanup**

RACER: **http://racernm.com/**

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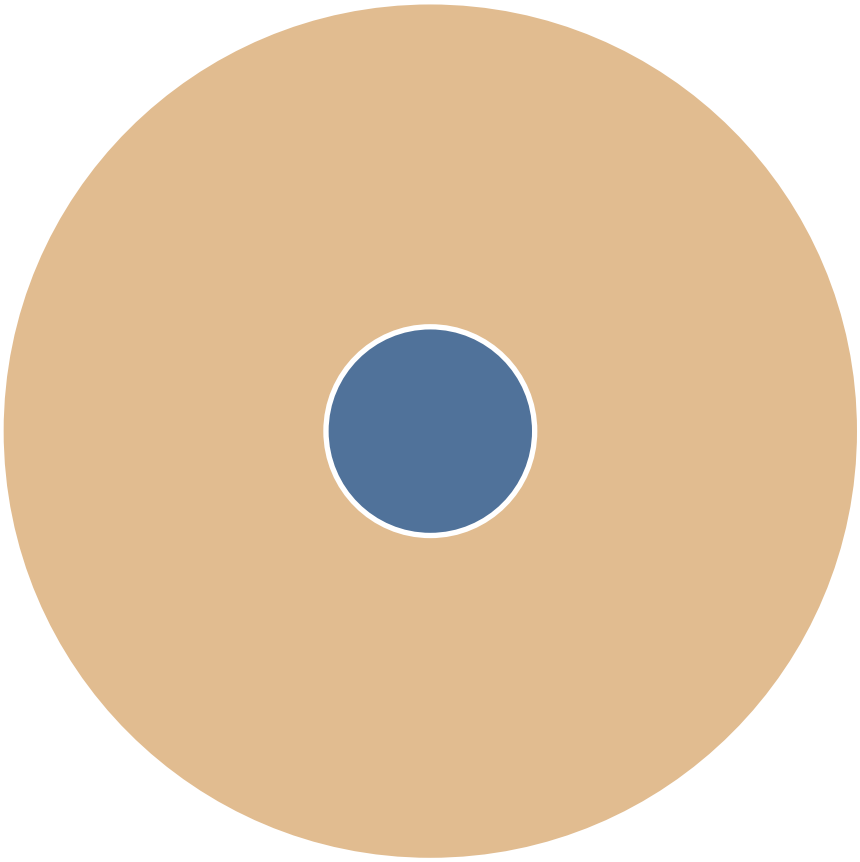

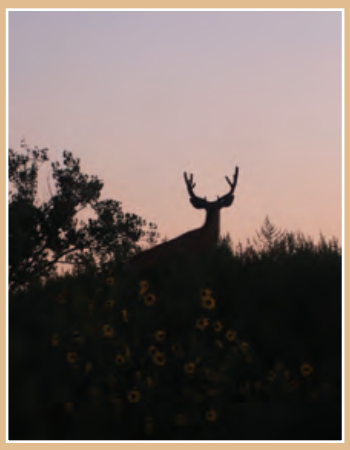

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