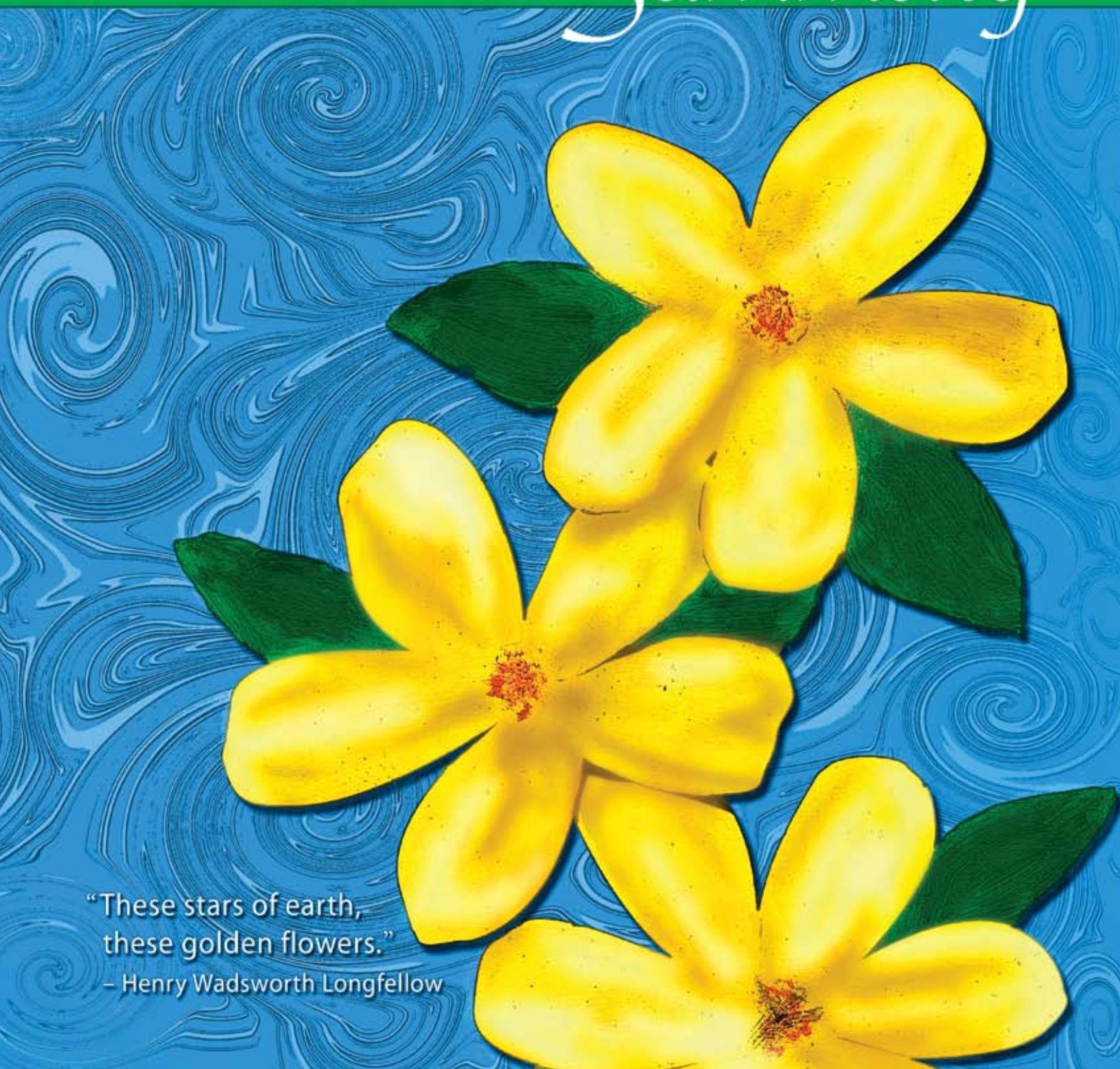
2006

DOE/ORO-2234

the Oak Ridge Reservation Annual Site Environmental Report Summary



"These stars of earth,
these golden flowers."
– Henry Wadsworth Longfellow

Message from the Department of Energy and the National Nuclear Security Administration

Each year the Department of Energy conducts environmental monitoring at each of the three sites on the Oak Ridge Reservation – the Oak Ridge National Laboratory, the East Tennessee Technology Park, and the Y-12 National Security Complex. The information we collect is presented in this summary report, the data volume, and the more comprehensive publication entitled the Annual Site Environmental Report.

Each of these reports is highly important because it allows the Department of Energy to clearly and concisely explain our environmental-monitoring programs to our stakeholders. The environmental monitoring also assists us in achieving our mission in science, national security, environmental management, and nuclear energy.

The information presented in this summary clearly shows that Oak Ridge is a safe community for its citizens, and part of the reason for that is the Department's unwavering focus on safety. The work at each of our facilities is highly detailed and technically complex, but it is our commitment to perform each of our activities safely. No matter what we do, our first priority is to protect the well-being of our workers, the surrounding communities, and the environment.

In closing, we would like to offer our sincerest thanks and appreciation to the hardworking, intelligent, and dedicated students at Karns High School who worked tirelessly to put together this summary document. On behalf of the entire Department of Energy, we congratulate each of you for your effort, enthusiasm, and willingness to support the Department of Energy with this project.

We hope that you enjoy reading the 2006 Annual Site Environmental Report Summary.

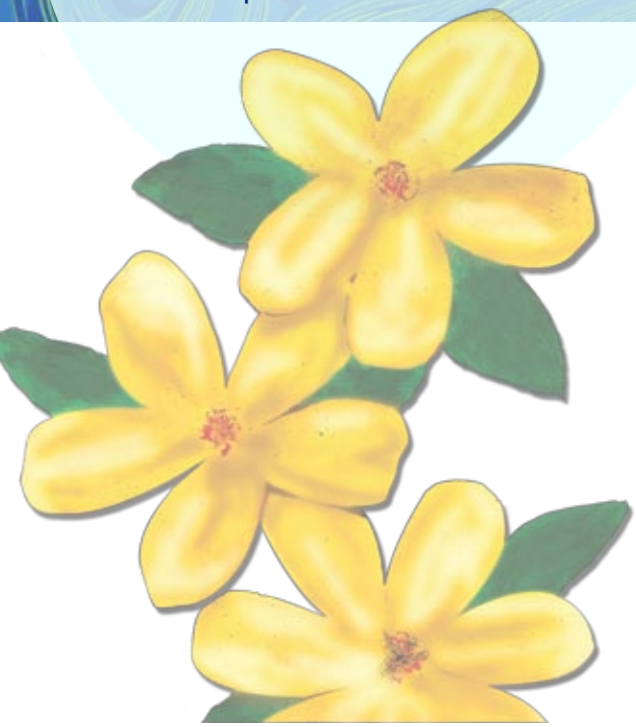
Gerald G. Boyd

Theodore Sherry

The Oak Ridge Reservation

Annual Site Environmental Report Summary

Date published: March 2008



the Write Stuff

Experiential learning. This educational "buzz phrase" only grazes the surface of a semester-long training opportunity afforded my English II Honors Class at Karns High School.

From the time our first guest speaker, Ray Smith, Oak Ridge Reservation Historian, opened his heart so eloquently to share his amazing stories about the Oak Ridge National Laboratory, the East Tennessee Technology Park, and Y-12, I knew these were going to be a series of unforgettable moments for my students.

These students are the leaders of tomorrow, and I believe that educational partnerships such as this where students can pair textbook reading with real life learning provide an unparalleled depth of experience.

So from all of us…thanks!

Kim Eaton
Instructor
English II Honors Class
Karns High School

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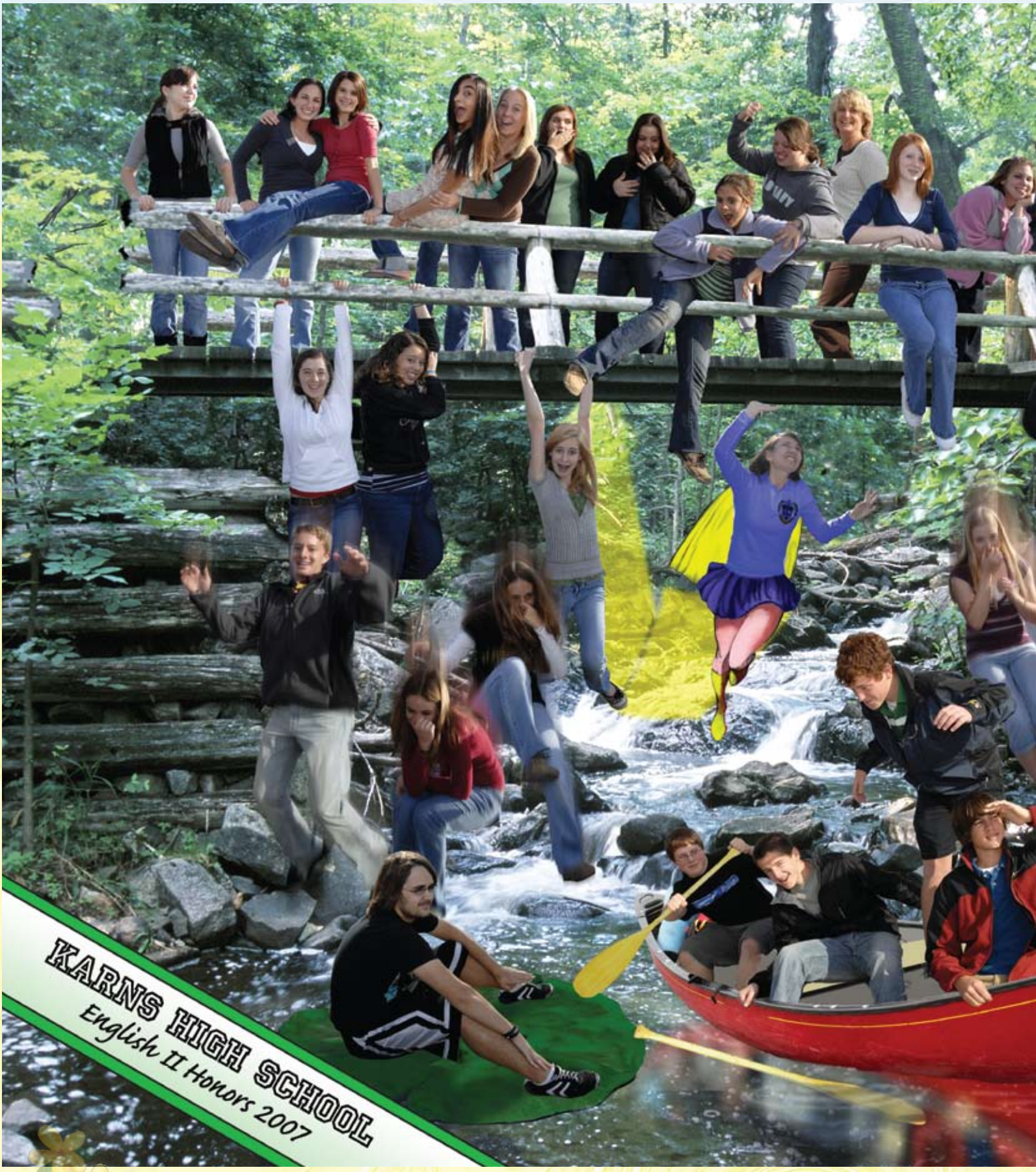
Credits



This is a graphic representation.

Pictured Contributors:

Standing on bridge, from left to right:
Nicolette Hart, Jessica Wheeler, Sara Denton, Sara Hussein, Ariel Hunter, Olivia Hicks, Ciara Wheeler, Katie Birdwell, Jennifer Price, Joan Hughes, Caitlin Glennen, Crystal Gann, Megan Tinker, Jessica Clifton, Lindsey Kiser

Hanging from bridge, from left to right:
Rachel Jackson, Courtney Leo, Kayleigh Seagraves, Kyle Boden

Holding bridge up: Kim Eaton

Falling from bridge, from left to right:
Drew Thomas, Rachel Ladd, Taylor Gallaher, Cassie Savage

In canoe from left to right: Josh Hinkle, Patrick Meek, Charlie Burris, John Stewart

On lily pad: Stephen Pippin

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The Oak Ridge Reservation Annual Site Environmental Report Summary for 2006 is on the worldwide web:
http://www.ornl.gov/aser

History of the Oak Ridge Reservation

THEN | NOW

Spallation Neutron Source, 2005

President and Mrs. John F. Kennedy at the Oak Ridge Research Reactor, 1960

More than 40 years before the United States government even had an inkling there would be a need for the secret Manhattan project, John Hendrix prophesied great factories and buildings in East Tennessee's Bear Creek Valley. John Hendrix, born in 1865, was a mystic who roamed the woods in the area around what later became the Department of Energy's Oak Ridge Reservation. He described his vision for the area as follows: "In the woods, as I lay on the ground and looked up into the sky, there came to me a voice as loud and as sharp as thunder. The voice told me to sleep with my head on the ground for 40 nights and I would be shown visions of what the future holds for this land.... And I tell you, Bear Creek Valley someday will be filled with great buildings and factories, and they will help toward winning the greatest war that ever will be. And there will be a city on Black Oak Ridge.... Big engines will dig big ditches, and thousands of people will be running to and fro. They will be building things, and there will be great noise and confusion and the earth will shake."

"Oak Ridge's history is truly fascinating. John Hendrix had it right." – Ciara Wheeler

Twenty-eight years after he died, John Hendrix's prophesy proved to be eerily accurate. In late 1942 nearly 60,000 acres in East Tennessee were chosen as a site to develop materials for the United States government's secret Manhattan Project. This site was chosen because of the proximity to cheap power from Norris Dam and the availability of labor in nearby Knoxville and because valleys and ridges provided protection in the event of an accidental explosion. As John Hendrix predicted, buildings and factories supporting the war effort filled the area, and a town for the workers, later known as Oak Ridge, was built on Black Oak Ridge in the eastern end of the valley. The residents of several communities – Scarboro, New Hope, Robertsville, Elza, and Wheat – were given just a few weeks' notice that they would be forced to vacate their homes for a government project.

"Materials for the first atomic bomb were built in Oak Ridge." – Nicolette Hart

Between 1942 and 1945 the population of the Oak Ridge area grew from about 3,000 to about 75,000. The K-25 building alone covered 44 acres and was the largest building in the world. However, Oak Ridge was kept an official government secret and was surrounded by guard towers and a fence. It did not appear on maps and was not named until 1949, referred to instead as "the Clinton Engineering Works."

The goal of the Manhattan Project was to create an atomic bomb fueled by uranium and another bomb fueled by plutonium. The K-25, S-50, and Y-12 plants were built in Oak Ridge to separate the isotope uranium-235 from natural uranium. The X-10 site was established as a pilot plant for production of plutonium.

The Graphite Reactor at X-10, built in only 11 months, was designed to show that plutonium could be extracted from irradiated uranium slugs.

The Y-12 plant used calutrons for the electromagnetic separation of uranium-235. While constructing the magnets for the process, 15,000 tons of silver was borrowed from the United States Treasury due to a shortage of copper. The K-25 Plant, now the location of the East Tennessee Technology Park, was the last of the Oak Ridge facilities to become operational and was the world's first gaseous diffusion plant. K-25 was huge, with 50 four-story buildings totaling 2,000,000 square feet, in a U-shape measuring 2,600 feet long by 1,000 feet wide. Covering some 44 acres, the K-25 building was the world's largest roofed structure when it was completed in March 1945. A third facility, known as X-10, now the location of the Oak Ridge National Laboratory, housed a graphite plutonium production reactor and the facilities needed to extract the plutonium from the irradiated fuel.

"I was surprised to learn that the calutrons were run by young girls." – Josh Hinkle

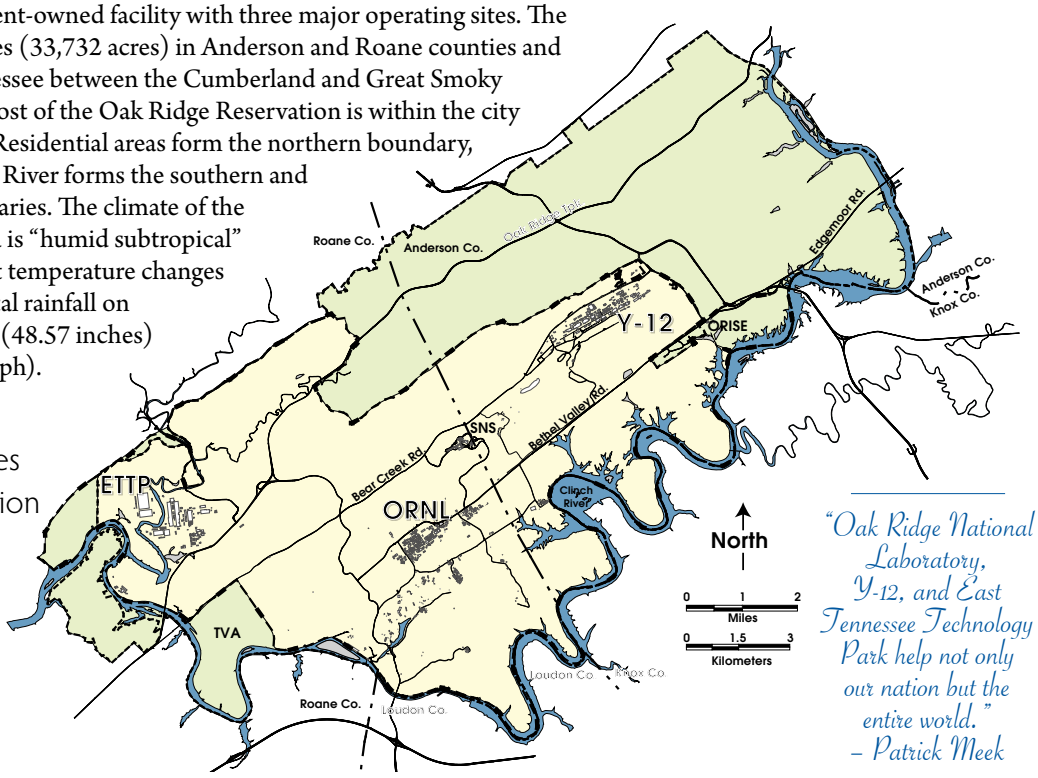
It wasn't until the first atomic bomb was dropped on Japan on August 6, 1945, that most of the people in Oak Ridge became aware of what they had been working on.

Setting and Site Overview

The Oak Ridge Reservation is a government-owned facility with three major operating sites. The Oak Ridge Reservation spans 13,651 hectares (33,732 acres) in Anderson and Roane counties and is located in the great valley of eastern Tennessee between the Cumberland and Great Smoky Mountains. Most of the Oak Ridge Reservation is within the city of Oak Ridge. Residential areas form the northern boundary, and the Clinch River forms the southern and western boundaries. The climate of the Oak Ridge area is "humid subtropical" with significant temperature changes between summer and winter. In 2006 the total rainfall on the Oak Ridge Reservation was 1,233.6 mm (48.57 inches) with wind speeds averaging 1.4 m/s (3.13 mph).

"I had a blast! Y-12, Oak Ridge National Laboratory, and East Tennessee Technology Park are crazy big!" – Ariel Hunter

Today there are three major facilities located on the Oak Ridge Reservation



"Oak Ridge National Laboratory, Y-12, and East Tennessee Technology Park help not only our nation but the entire world." – Patrick Meek

East Tennessee Technology Park

Today activities at the East Tennessee Technology Park focus on restoring the environment, decontaminating and decommissioning facilities, and managing legacy wastes. Production activities ceased at the East Tennessee Technology Park in 1986, and cleanup efforts are aimed at converting the site into a commercial industrial park. The goal of the new closure plan is to clean up the site, leaving as many buildings as possible free from contamination. Whenever possible, these buildings will be leased to private industry.

The following decontaminating and decommissioning projects are in various stages of completion at the East Tennessee Technology Park.

- The K-25 and K-27 buildings, which both contain hazardous materials and radioactive waste, are in the process of being demolished. After the demolition of most of the K-25 building, the north side may be made into a museum.
- The K-29 building has been demolished.
- The Department of Energy's Reindustrialization Program has transferred the K-1036 and K-1400 buildings to the Community Reuse Organization of East Tennessee.
- The last of 7,200 uranium hexafluoride cylinders were shipped from the East Tennessee Technology Park for disposal. Most were shipped to Portsmouth, Ohio.

Y-12 National Security Complex

Since its beginning in 1942, Y-12 has expanded into one of the country's premier nuclear manufacturing complexes. Y-12 is currently managed by B&W Technical Services Y-12 L.L.C. (B&W Y-12) as a part of the National Nuclear Security Administration Nuclear Weapons Complex. It has many missions, including

- production and rework of nuclear weapon components,
- storage and protection of special nuclear materials,
- evaluation and surveillance of the nation's nuclear weapon stockpile,
- dismantlement and disposition of weapon components, and
- national security.

The employees at Y-12, over 6,000 on site, play a critical role in developing the technologies of tomorrow. The Y-12 complex encompasses 811 acres, spanning 2.5 miles, with some 500 buildings that house some 7 million square feet of laboratory, machining, dismantlement, and research and development areas.

Oak Ridge National Laboratory

The Oak Ridge National Laboratory is the Department of Energy's largest science and energy laboratory. The Laboratory supports the country with peacetime science and technology that differs from, but is equally important to, that of the Manhattan Project. Oak Ridge National Laboratory has been managed since April 2000 by UT-Battelle.

Today's major missions at the Oak Ridge National Laboratory include neutron science, energy, high-performance computing, systems biology, materials science at the nanoscale level, and national security. The Oak Ridge National Laboratory has a staff of more than 4,200 and annually hosts approximately 3,000 guest researchers, who spend 2 weeks or longer in Oak Ridge.

UT-Battelle is completing a $350 million project to provide a modern campus for the next generation of great science. One of the newest facilities is the Spallation Neutron Source. This facility, combined with the High Flux Isotope Reactor, makes Oak Ridge National Laboratory one of the world's foremost centers for neutron science research.

Environmental Compliance

on the Oak Ridge Reservation during 2006

"Talking with Crystal, a lawyer on the Oak Ridge Reservation, made me realize that Oak Ridge is not hurting us – they are required to follow so many regulations that I feel very safe." – Caitlin Glennen

All Department of Energy activities are required to be in compliance with applicable environmental standards established by federal, state, and local statutes and regulations. The Environmental Protection Agency and the Tennessee Department of Environment and Conservation are the primary regulatory agencies ensuring that all requirements are met.

"The presentation by the Oak Ridge National Laboratory Legal Department taught me a lot. I didn't even know you could be an environmental lawyer." – Cassie Savage

Throughout the history of the Department of Energy's Oak Ridge operations, the use of hazardous and radioactive materials has been required, thus creating the possibility of releases of these materials to the environment. Today's activities also have the potential to release small amounts of hazardous chemicals and radionuclides to the environment. UT-Battelle, B&W Y-12, and Bechtel Jacobs Company are all committed to conducting environmentally responsible operations and employ environmental management systems to identify, control, and monitor environmental impacts. An environmental management system also provides a mechanism for responding to changing environmental conditions and requirements, reporting on environmental performance, and reinforcing continual improvement. Each of the three major contractors has implemented a high-level policy that integrates principles of environmental protection into all facets of operations and expresses a commitment to conducting activities in a manner that protects the public and the environment, prevents pollution, complies with applicable regulations, and continually improves performance.

UT-Battelle's Environmental Management System was designed to meet the rigorous requirements of the globally recognized International Organization for Standardization 14001 environmental management standard, with additional emphasis on compliance, pollution prevention, and community involvement. UT-Battelle was registered to International Organization for Standardization 14001 by third-party registrar in 2004. The UT-Battelle Environmental Management System is implemented through the work-control process, which requires identification of potential environmental impacts during planning phases to ensure that appropriate controls are in place to protect workers and the environment.

The B&W Y-12 Environmental Management System is based on the principles of the International Organization for Standardization 14001. An independent assessment conducted in 2005 found that B&W Y-12 has successfully implemented this system in accordance with the International Organization for Standardization 14001 standard. The B&W Y-12 Environmental Management System is also implemented through work-control processes that identify potential environmental impacts and protective controls before work is performed and ensure that protective controls are in place.

"Crystal's talk to our class strengthened my interest in becoming a lawyer." –John Stewart

The Bechtel Jacobs Company implements an environmental management system as part of its existing Integrated Safety Management System established pursuant to Department of Energy Policy 450.4, "Safety Management System Policy," and Department of Energy Order 450.1, "Environmental Protection Program." Using a graded approach appropriate for environmental cleanup work, the Bechtel Jacobs Company's Environmental Management System incorporates environmental performance goals and provides a unified strategy for the management, conservation, and protection of natural resources; the control and attenuation of risks; and the establishment and attainment of all environmental, safety, and health goals. Bechtel Jacobs Company's Environmental Management System was initially verified by an independent assessment team in 2005.

Applicable Environmental Statutes

The three major facilities that occupy the Oak Ridge Reservation manage activities to comply with federal, state, and local environmental protection laws. Numerous environmental regulations are applicable to the Oak Ridge facilities:

Clean Air Act – This act provides the principal framework for national, state, and local efforts to protect air and improve air quality. The airborne radiological off-site dose limit for protection of the public established by the National Emission Standards for Hazardous Air Pollutants is 10 millirem per year from all Department of Energy operations. Oak Ridge levels were significantly below this dose limit at 0.8 millirem in 2006. There were no Clean Air Act nonconformances on the Oak Ridge Reservation in 2006.

Clean Water Act – This act is the cornerstone of surface water quality protection in the United States. It established the National Pollutant Discharge Elimination System permit program, which controls water pollution by regulating sources that discharge pollutants into waters of the United States. The three major facilities on the Oak Ridge Reservation all achieved a National Pollutant Discharge Elimination System permit compliance rate greater than 99.9% in 2006.

Safe Drinking Water Act – This act ensures the quality of American's drinking water by setting standards that make sure all drinking water is safe and nontoxic. There were no violations or concerns with any of the drinking water sample results from the three major Oak Ridge Reservation facilities in 2006.

Federal Facilities Compliance Act – This act requires the federal government to comply completely with solid and hazardous waste laws, even subjecting it to potential fines and penalties.

Comprehensive Environmental Response, Compensation, and Liability Act – This act was established to provide a systematic approach for locating, investigating, and cleaning up uncontrolled or abandoned hazardous waste sites as well as accidents, spills, and other emergency releases of pollutants and contaminants into the environment. There were no Comprehensive Environmental Response, Compensation, and Liability Act releases above reportable limits on the Oak Ridge Reservation during 2006.

Resource Conservation and Recovery Act – This act provides a system for the management and control of solid and hazardous waste from origin to disposal or "cradle to grave." There were four notices of violation issued on the Reservation during 2006.

National Historic Preservation Act – This act establishes a program to protect and preserve agreed-upon historic properties.

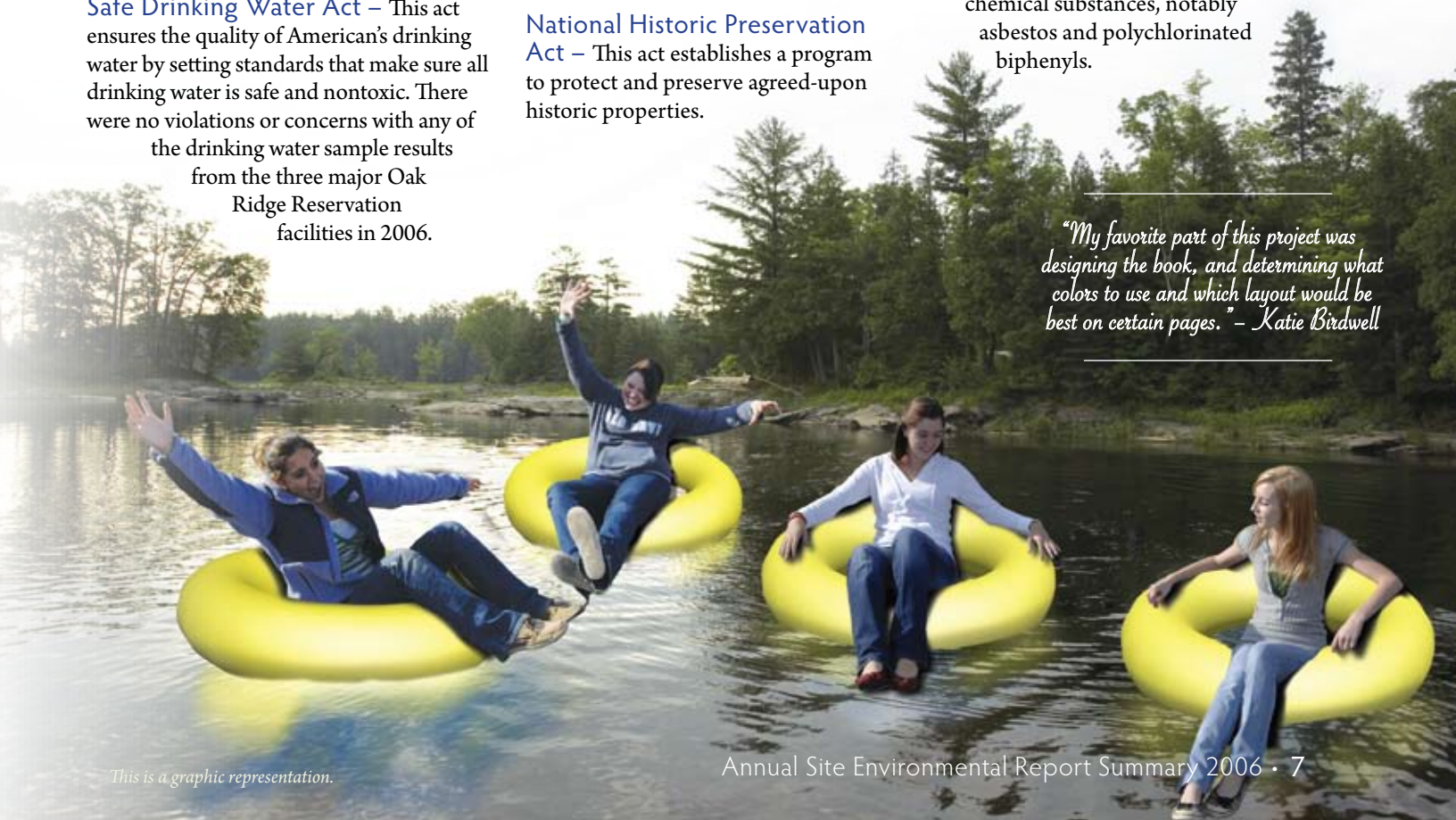
Endangered Species Act – This act provides for the conservation of threatened and endangered plants and animals and critical habitats. When operations or new projects are planned, the effects on animals and plants are taken into consideration. There are many plant and animal species of concern on the Oak Ridge Reservation protected under this act.

Federal Insecticide, Fungicide, and Rodenticide Act – This act establishes controls for pesticide distribution, sale, and use. There are no restricted-use pesticide products used at the Oak Ridge National Laboratory, the Y-12 Complex, or the East Tennessee Technology Park.

National Environmental Policy Act – This act requires evaluation of the environmental impacts of proposed federally funded projects and the examination of alternatives.

Toxic Substances Control Act – This act regulates the manufacture, use, and disposal of certain toxic chemical substances, notably asbestos and polychlorinated biphenyls.

"My favorite part of this project was designing the book, and determining what colors to use and which layout would be best on certain pages." – Katie Birdwell



This is a graphic representation.

Environmental Occurrences, Noncompliances, Notices of Violations, and Releases in 2006

"Nate from Oak Ridge National Laboratory really put some of my worries about radiation to rest because I did not really know much about radiation and his presentation was really cool in explaining how radiation affects us." – Charlie Burris

▸ The Oak Ridge National Laboratory received one notice of violation from the Tennessee Department of Environment and Conservation for issues found during a 2006 Resource Conservation and Recovery Act inspection. The notice of violation included failure to label two used oil containers, failure to properly label a satellite area container, and failure to comply with the Low-Level Waste Management Agreement. The first two were corrected during the inspection.

▸ The Bechtel Jacobs Company received one notice of violation from the Tennessee Department of Environment and Conservation for issues found during a 2006 Resource Conservation and Recovery Act inspection. The notice of violation included violations for failure to provide accumulation start dates and labeling of some containers, failure to close a hazardous waste container when bulking operations ceased, containers stored greater than 1 year with burden of proof considered unacceptable, failure to comply with the Low-Level Waste Management Agreement, inappropriate labeling of a pesticide container, and decanted waste labeled as newly generated. The alleged violation for failure to close a container after bulking operations had ceased was rescinded.

▸ Y-12 received one notice of violation from the Tennessee Department of Environment and Conservation for issues found during a 2006 Resource Conservation and Recovery Act inspection. The issue involved the storage of universal waste (used lamps) for more than one year.

▸ Y-12 received a notice of violation dated January 11, 2006, from the Tennessee Department of Environment and Conservation for the Dry Ash Handling System Baghouse pressure drop readings, which were reported as being below the permitted range in July 2005.

▸ Y-12 had one National Pollutant Discharge Elimination System noncompliance in 2006 for elevated total residual chlorine readings at outfall 201. The cause of the elevated reading is unknown.

▸ The East Tennessee Technology Park had one National Pollutant Discharge Elimination System noncompliance on November 27, 2006, for total residual chlorine at outfall 100 due to an underground sanitary water line break. Repairs to the water line were completed on December 14, 2006. On December 11, 2006, several dead fish were observed in the channel that transports discharges from the outfall 100 storm drain. The cause is believed to be related to the sanitary water line break. It took a couple of days to mobilize the repair crews, and in the interim the water was being dechlorinated. The dead fish were all shad, and this species is particularly stressed at that time of year, so the combined effects of the chlorine (which damages the gills) and the dechlorination process (which lowers the oxygen content of the water) were lethal.

▸ Toxicity tests on discharges from the Sewage Treatment Plant at the Oak Ridge National Laboratory resulted in *Ceriodaphnia dubia* reproduction significantly different from the control. A confirmatory toxicity test was conducted as required by the Oak Ridge National Laboratory National Pollutant Discharge Elimination System permit. Reproduction was not significantly different from the control, indicating a temporary condition of unknown cause.

▸ Four National Pollutant Discharge Elimination System noncompliances resulted from temperature measurements at the Oak Ridge National Laboratory's outfall 281. A number of actions have been implemented in an effort to reduce cooling tower blowdown temperatures.

"Frank, at Spallation Neutron Source, was cool. . . he related scientific things to issues we understand. I learned that neutrons are really stubborn and don't take direction well at all." –Jennifer Price

Radiation Primer

Radiation is energy in the form of particles or waves moving through space ☘ Radiation is naturally occurring and human-made ☘ Every person on earth is constantly exposed to naturally occurring radiation on a daily basis ☘ There are two main kinds of radiation–ionizing and non-ionizing. Ionizing radiation can break molecular bonds, causing unpredictable chemical reactions. Ionizing radiation can cause tissue damage ☘ There are three major kinds of ionizing radiation: alpha, beta, and gamma ☘ The many routes of human exposure to radiation are called "pathways" ☘ The amount of radiation a person receives is referred to as "dose"–dose is measured in a unit called "rem" (a millirem is a thousandth of a rem) ☘ An average person in the United States receives about 300 millirem every year from natural sources such as the sun, rocks in the earth, and food

☘ An average person in the United States receives an additional 60 millirem per year from consumer and medical products such as X rays and CT scans ☘ The size or weight of a material does not indicate how much radioactivity is present. A large quantity of material can contain a very small amount of radioactivity, or a very small amount of material can have a lot of radioactivity ☘ Radiation cannot be detected by human senses. A variety of handheld and laboratory instruments is available for detecting and measuring radiation. ☘ Time, distance, shielding, and containment are primary means of reducing or eliminating exposure to radiation. ☘ The highest dose any member of the public could have possibly received from activities on the Oak Ridge Reservation in 2006 was approximately 6 millirem, which is well below the 100 millirem limit established by the Department of Energy. ☘ The National Emission Standards for Hazardous Air Pollutants establishes a 10 millirem dose limit from airborne emissions. The maximum dose a member of the public could have received from airborne emissions from Department of Energy operations in Oak Ridge in 2006 was 0.8 millirem

Calculated radiation doses to maximally exposed off-site individuals from airborne releases during 2006

	Total effective dose equivalents (millirem)	
	At plant max	At Oak Ridge Reservation max
Oak Ridge National Laboratory	0.06	0.008
East Tennessee Technology Park	0.09	0.01
Y-12	0.8	0.8

Annual maximum individual (millirem) & collective (person-rem) effective dose equivalents from waterborne radionuclides [a,b]

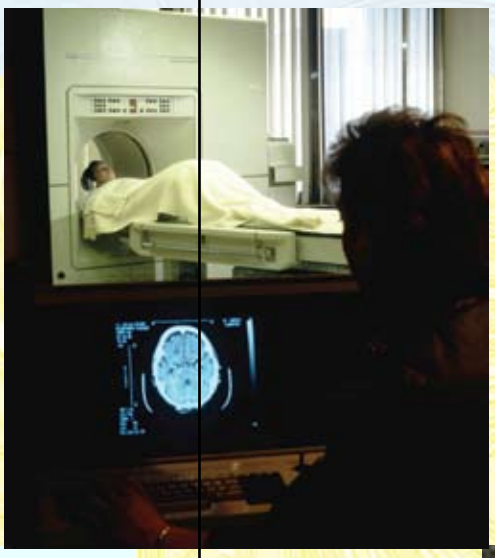
	Effective Dose Equivalents			
	Drinking Water	Eating Fish	Other Uses	Total [c]
Upstream of All Oak Ridge Reservation discharge locations (City of Oak Ridge Water Plant)				
Individual	0.003	0.03	0.000004	0.03
Collective	0.04	0.002	0.000001	0.04
Melton Hill Lake (Knox County Water Plant)				
Individual	0.003	0.00007	0.00005	0.003
Collective	0.04	0.002	0.00001	0.04
Upper Clinch River (Gallaher Water Plant)				
Individual	0.01	0.7	0.00005	0.7
Collective	0.009	0.1	0.00001	0.1
Lower Clinch River				
Individual	NA[d]	0.08	0.004	0.08
Collective	NA[d]	0.03	0.01	0.04
Upper Watts Bar Lake, Kingston Municipal Water Plant				
Individual	0.02	0.01	0.0006	0.03
Collective	0.23	0.016	0.004	0.25
Lower System (Lower Watts Bar Lake and Chickamauga Lake)				
Individual	0.02	0.01	0.0005	0.03
Collective	2	0.1	0.04	2.1
Poplar Creek				
Individual	NA[d]	0.3	0.006	0.3
Collective	NA[d]	0.009	0.0000002	0.009

[a] 1 millirem = 0.01 millisievert.
[b] Doses based on measured radionuclide concentration in water or estimated from measured discharges and known or estimated stream flows.
[c] Rounded difference between individual pathway doses and total.
[d] Not at drinking water supply locations.

☘ A worst case scenario of public exposure to waterborne radionuclides from all pathways (drinking water, eating fish, swimming, wading, boating, and use of shoreline) is an exposure of 0.7 millirem ☘ At the upper limit, a person eating deer, two geese, and two turkeys harvested from the Oak Ridge Reservation could have received 3 millirem in 2006.

"Radiation is often viewed as a negative, but after listening to the presentations, I learned radiation allows human existence to be possible." – Kyle Boden

Dose Facts

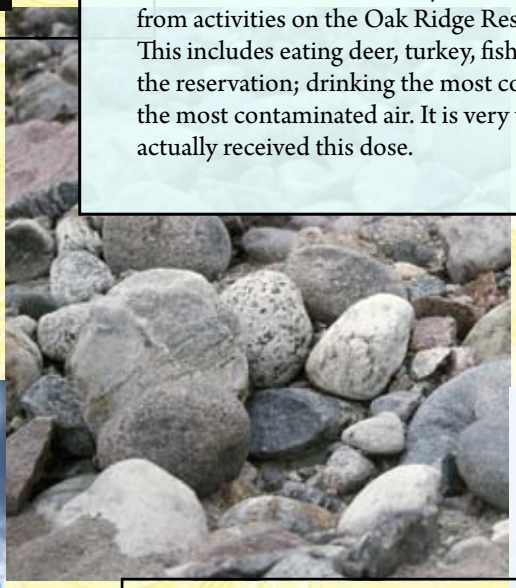


What is it?

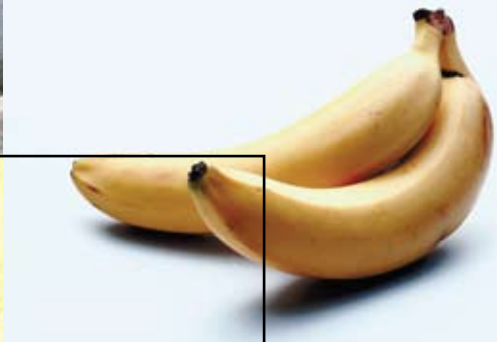
"Dose" is a general term that describes the amount of radiation a person receives. In radiation protection, "dose" has a specific meaning–it is the energy of ionizing radiation absorbed per unit mass of any material. In many situations, the energy of radiation absorbed per unit mass of material can be related directly to radiation effects. It is measured in a unit called "rem" – a thousandth of a rem is called a millirem. An average person in the United States receives approximately 300 millirem every year from natural sources, including rocks in the earth, the sun, and food. An additional 60 millirem come from consumer and medical products such as CT scans and X rays, natural gas for heating, and road construction material.

How much do the Oak Ridge facilities contribute to dose?

The Department of Energy has established a 100 millirem dose limit to members of the public from any Department of Energy activities. National Emission Standards for Hazardous Air Pollutants specifies a 10 millirem dose limit from the airborne emissions component. The maximum estimated dose that any member of the public could have received from activities on the Oak Ridge Reservation in 2006 was 6 millirem. This includes eating deer, turkey, fish, and geese harvested on or near the reservation; drinking the most contaminated water; and breathing the most contaminated air. It is very unlikely any one person could have actually received this dose.



"Well – I never knew bananas had radiation in them." – Jessica Wheeler



Summary of maximum potential radiation effective dose equivalents

Pathway	Dose to maximally exposed individual	
	millirem	millisievert
Airborne effluents		
(All pathways)	0.8	0.008
Liquid effluents		
- Drinking water	0.02	0.0002
- Eating fish	0.7	0.007
- Other activities	0.004	0.00004
Eating deer	3.0	0.03[a]
Eating geese	0.2	0.002[b]
Eating turkey	0.04	0.0004[c]
Direct radiation	0.8	0.008[d]
All pathways	6.0	0.06

[a] The maximum estimated Effective Dose Equivalent from consumption of a deer harvested on the Oak Ridge Reservation in 2006.

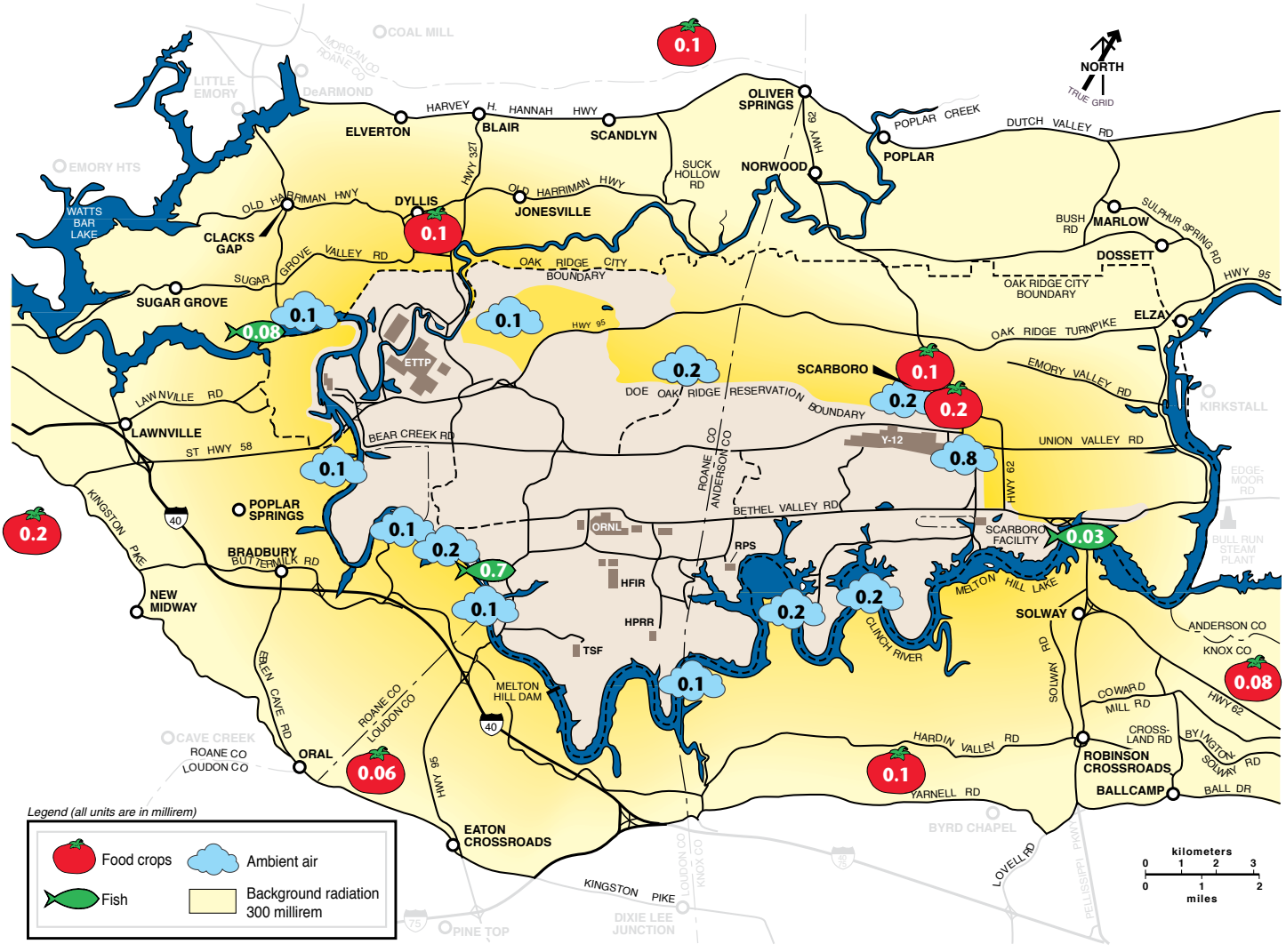
[b] Maximum estimated dose from consuming two hypothetical worst-case geese harvested on the Oak Ridge Reservation in 2006.

[c] Maximum estimated dose from consuming two hypothetical worst-case turkeys harvested on the Oak Ridge Reservation in 2006.

[d] Direct radiation dose estimate based on exposure of a fisherman on Poplar Creek.

"I learned from the presentation on radiation that it can take billions of years for some types of radiation to decay – even just a little bit." – Taylor Gallaher

Possible radiation doses *(on or near the Oak Ridge Reservation)*



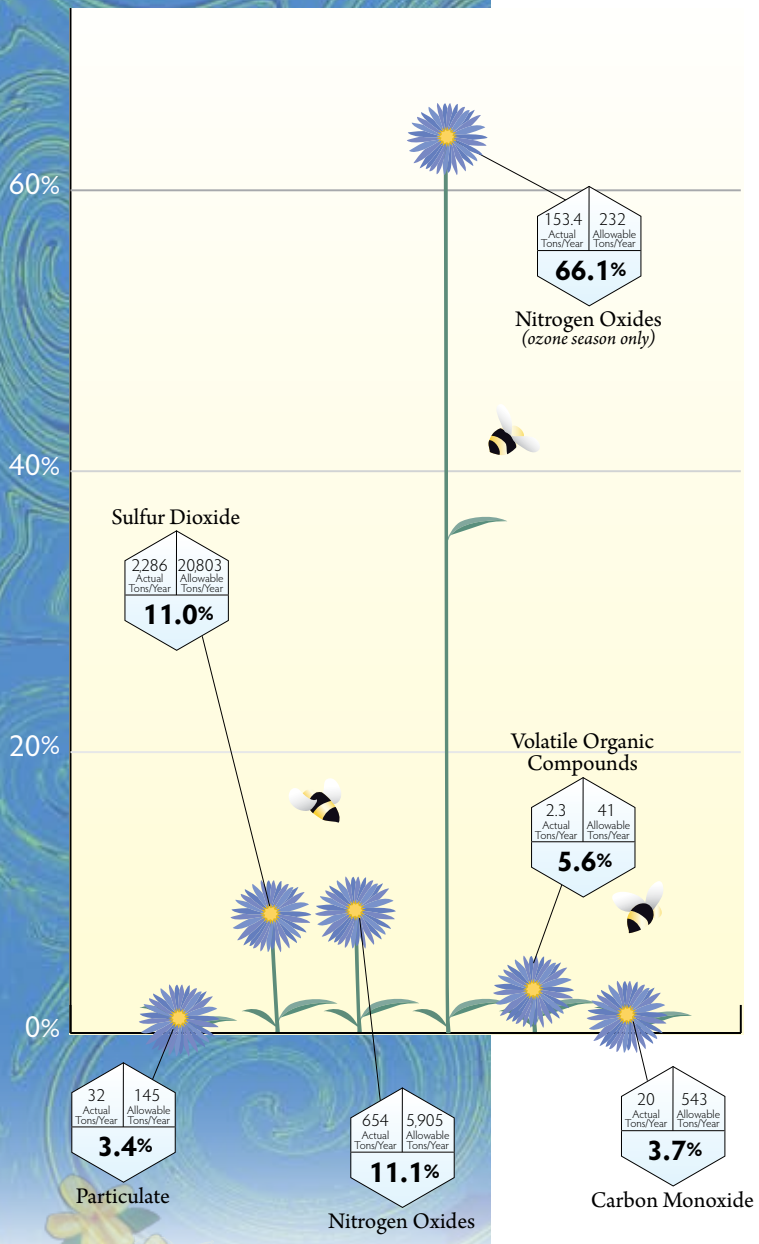
Environmental Monitoring

Environmental monitoring is performed across the Oak Ridge Reservation to confirm that no member of the public is exposed to hazardous substances or radionuclides above regulatory levels from Department of Energy activities. There are two primary types of environmental monitoring and sampling. Effluent monitoring involves collecting and analyzing liquid or gaseous samples at the point of emission. This could be a pipe discharging water from a facility or a stack emitting gaseous discharges from an operation or activity. Surveillance monitoring involves collecting and analyzing samples of air, water, soil, vegetation, wildlife, biota, and other media from the reservation and the nearby areas.

"I believe the Department of Energy facilities are doing a good job and are working very hard to clean up the pollution and other environmental problems caused by work done in the early war years in Oak Ridge." – Rachel Jackson

Each major facility conducts site-specific monitoring programs and participates in a reservation-wide surveillance monitoring program that measures radiological and nonradiological parameters directly in environmental media adjacent to the facilities.

Actual vs allowable air emissions from Y-12 steam plant, 2006



Y-12 National Security Complex

The Y-12 environmental protection program focuses on monitoring of water, air, soil, and biota, and on making progress in achieving identified environmental performance goals.

Surface streams and wastewater discharges are regulated by the Tennessee Department of Environment and Conservation under a site-wide National Pollutant Discharge Elimination System permit. This permit covers more than 65 outfalls and storm water monitoring locations. More than 900 water samples were collected for analysis in 2006. During 2006 the Y-12 National Pollutant Discharge Elimination System compliance rate was greater than 99.9% with one National Pollutant Discharge Elimination System permit violation, a total residual chlorine exceedance at outfall 201. There were no Y-12 exceedances of the industrial and commercial users wastewater permit for discharge of sanitary wastewater to the city of Oak Ridge publicly owned treatment works.

A Clean Air Act Title V permit regulates air emissions from 35 emission sources and more than 100 air emission points at the Y-12 Complex. An estimated 0.020 Ci (1.45 kilograms) of uranium was released into the atmosphere from Y-12 activities in 2006. The resulting total effective dose equivalent of 0.8 millirem is significantly less than the Department of Energy limit of 10 millirem. The Y-12 Steam Plant burns coal and natural gas and is a primary source of criteria pollutants at Y-12.

More than 250 groundwater wells and springs were sampled in 2006. Results were consistent with past sampling data. Primary contaminants in groundwater are nitrates, volatile organic compounds, metals, and radionuclides. Overall trends are stable or decreasing.

"Ever since we started working on the Oak Ridge project I have loved the calutrons. I found Y-12 the most interesting." – Olivia Hicks

Five environmental audits/inspections by outside regulatory agencies (Tennessee Department of Environment and Conservation and the city of Oak Ridge) were conducted at the Y-12 National Security Complex during 2006. A notice of violation was received at Y-12 as a result of the November 2006 Resource Conservation and Recovery Act inspection due to storage of used lamps for

longer than one year. Following the inspection the used lamps were shipped to an off-site recycle facility.

There were no releases of hazardous substances exceeding reportable quantities, no reportable oil sheens, and no fish kills at Y-12 during 2006.

"Y-12 was my favorite tour stop – the history and the security are impressive." – Stephen Pippin

As a means to measure progress in continual environmental performance improvement, B&W Y-12 establishes environmental objectives and targets (or goals) and tracks performance during the year. In 2006, Y-12 achieved 10 goals that resulted in overall environmental improvements. Significant among them were reducing the inventory of ozone-depleting materials by 5,000 pounds, implementing 100% use of E-85 (85% ethanol) in its flex-fuel vehicle fleet, and recycling more than 34,000 metric tons of material.

Oak Ridge National Laboratory

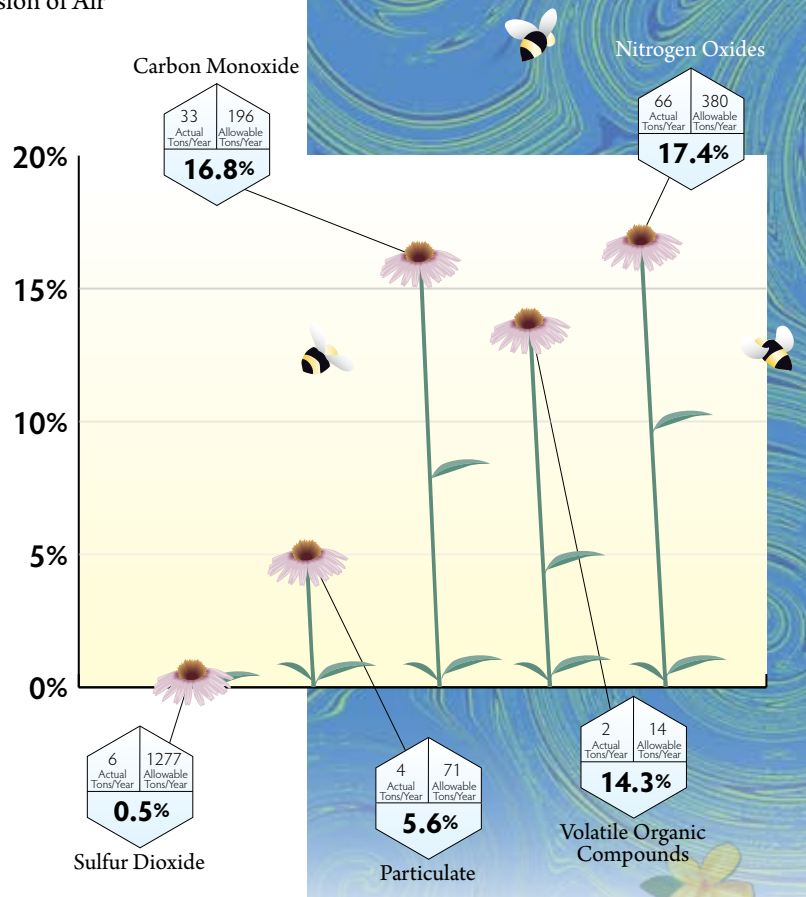
UT-Battelle demonstrates compliance with environmental requirements and a commitment to achieve environmental excellence through the employment of an environmental management system modeled after International Organization for Standardization 14001, an international environmental management standard. The National Pollutant Discharge Elimination System permit for the Oak Ridge National Laboratory involves approximately 7,500 annual samples, measurements, and observations from 169 locations. The 2006 National Pollutant Discharge Elimination System compliance rate was greater than 99.9%, with only five permit noncompliances. Four of these noncompliances were for temperature change exceedances noted at the same location in four rounds of sampling. Several surface water monitoring points and 49 groundwater wells were also sampled at the Oak Ridge National Laboratory during 2006, and all data were consistent with historical monitoring results.

Airborne discharges from the Oak Ridge National Laboratory, both radioactive and nonradioactive, are subject to regulation by the Environmental Protection Agency and the Tennessee Department of Environment and Conservation Division of Air Pollution Control. Radioactive airborne discharges at Oak Ridge National Laboratory consist primarily of ventilation air from radioactively contaminated or potentially contaminated areas, vents from tanks and processes, and ventilation for hot cell operations and reactor facilities. The calculated dose to the maximally exposed off-site individual from all radiological airborne release points at Oak Ridge National Laboratory during 2006 was 0.06 millirem, which is well below the National Emission Standards for Hazardous Air Pollutants standard of 10 millirem. UT-Battelle holds a Title V permit for ten emission sources and one construction permit for the Central Exhaust Facility at the Spallation Neutron Source. During 2006 the Tennessee Department of Environment and Conservation inspected all permitted emission sources and found all to be in compliance.

Eight environmental audits/inspections were conducted at the Oak Ridge National Laboratory by the Tennessee Department of Environment and Conservation and the Environmental Protection Agency during 2006.

There were no releases of hazardous substances exceeding reportable quantities and no fish kills at Oak Ridge National Laboratory during 2006. A reportable oil sheen occurred on November 16, 2006, when a utility contractor's street sweeper leaked hydraulic fluid on Bethel Valley Road, and runoff from the area caused a visible sheen on White Oak Creek. Spill response staff immediately placed absorbents, including spill booms, to contain the release and to minimize the extent of the sheen. The release was reported to the National Response Center on November 16, 2006.

Actual vs allowable air emissions from Oak Ridge National Laboratory steam production, 2006

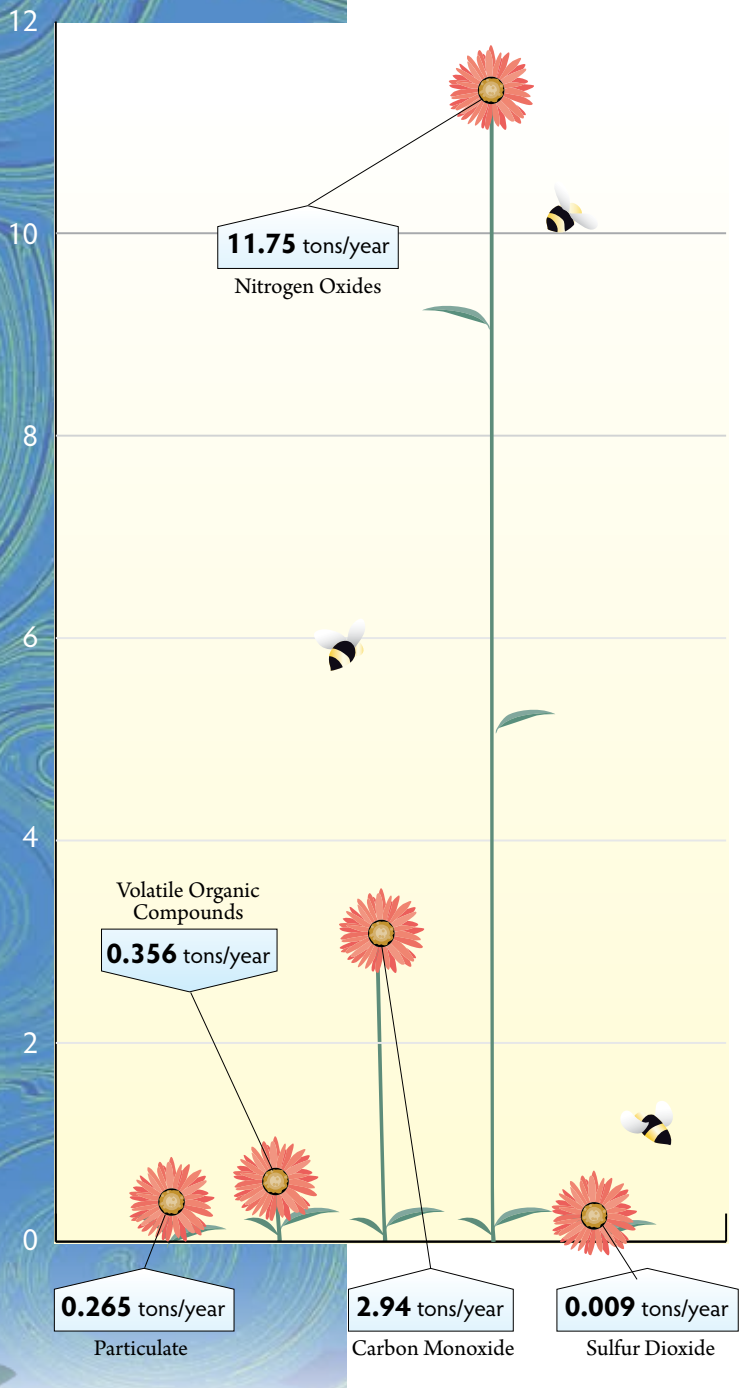


East Tennessee Technology Park

During 2006, thousands of samples and field measurements were taken at surface water and air monitoring locations. Liquid effluent discharges from the East Tennessee Technology Park were over 99% compliant with the National Pollutant Discharge Elimination System permit limits. Only a single permit exceedance, a release of chlorinated sanitary water from a broken water line into a storm drain, occurred in 2006, resulting in the death of approximately 1,000 shad. It is believed that the additional stress of the chlorinated water exacerbated the typical, naturally occurring die-off of the shad, and approximately 1,000 fish died. Caged clams were analyzed for uptake of polychlorinated biphenyls at various locations, toxicity tests were run on water from selected locations, and fish and aquatic invertebrate community studies were conducted. The results of these studies show that while past operations at the East Tennessee Technology Park have negatively impacted the environment, changes in operations and remedial activities have begun to heal the damage and the aquatic environment has begun to recover.

"I found the presentation on environmental monitoring very interesting. I never dreamed there were such intricacies and details involved in collecting samples." – Rachel Ladd

Actual emissions of criteria pollutants from permitted East Tennessee Technology Park sources, 2006



In late 2006, monitoring at one location in Mitchell Branch detected a sudden increase in the concentration of chromium. Although the levels detected in 2006 were within the state of Tennessee's Water Quality Criteria, the levels detected in early 2007 exceeded the criteria. East Tennessee Technology Park personnel worked with scientists from Oak Ridge National Laboratory and regulators from the state of Tennessee to investigate the cause of the increase in chromium and to suggest corrective actions. Although the source could not be determined, the general area where the chromium was seeping into Mitchell Branch was identified and the investigation continues there. In one other instance, monitoring detected low oxygen levels that were below the minimum water quality criteria in a stream. In that instance, East Tennessee Technology Park personnel were able to determine that the low levels were due to natural causes of very high temperature and very low flow, resulting in stagnant water conditions. The streams are regularly inspected to determine the health of the aquatic organisms, and no adverse effects to wildlife were found.

Dose estimates from radiological air emissions from East Tennessee Technology Park in 2006 demonstrate levels well below the National Emission Standards for Hazardous Air Pollutants standard of 10 millirem per year. In 2006, the maximally exposed individual was estimated to have received a total effective dose equivalent of 0.09 millirem from East Tennessee Technology Park operations. No direct monitoring of nonradiological air contaminants is required at East Tennessee Technology Park. Instead, monitoring of key processes and air pollution control device parameters is performed to ensure compliance with permit limits.

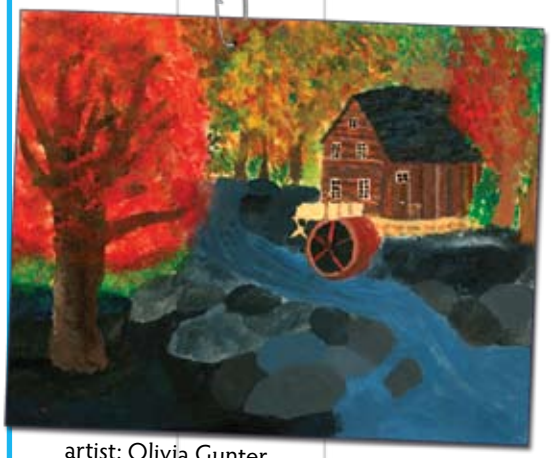
In 2006, the state of Tennessee conducted an inspection of the permitted hazardous waste storage areas at East Tennessee Technology Park. The findings of the inspection resulted in a notice of violation. The state of Tennessee has agreed that the problems have been corrected.

Date	Reviewer	Subject	Issues
	Y-12 Complex, B&W Y-12		
3/16	City of Oak Ridge	Sanitary Sewer Pretreatment Inspection	0
3/23–24	TDEC—City of Knoxville	TDEC Annual Clean Air Compliance Inspection	0
8/1	City of Oak Ridge	Sanitary Sewer Pretreatment Inspection	0
9/9	EPA	Spill Prevention Control and Countermeasures Plan	0
11/14–16	TDEC	TDEC Annual RCRA Inspection	0
	Y-12 Complex, UT-Battelle		
11/14–16	TDEC	TDEC Annual RCRA Inspection	0
	Y-12 Complex, Bechtel Jacobs		
11/14	TDEC	TDEC Annual RCRA Inspection	1
	ORNL, UT-Battelle		
3/29 & 12/7	TDEC	NPDES Permit Renewal	0
5/15–18	TDEC, RCRA	TDEC Annual RCRA Inspection	2
6/20–21	TDEC	NPDES Program	0
9/12	EPA	SPCC Plan and Program	0
10/14	TDEC, CAA	Title V Air Permit	0
12/07	TDEC, CAA	Relative Accuracy Test Audit	0
	ORNL, Bechtel Jacobs		
5/15–18	TDEC	TDEC Annual RCRA Inspection	1
11/14	TDEC, CAA	Title V Air Permit	0
	ORNL, 0800 Area		
8/1	TDEC	RCRA Inspection	0
	ETTP		
2/13	TDEC	Annual RCRA Inspection	1
2/23	TDEC	Air Source Inspection	0
	NTRC		
3/22	EPA/TDEC	RCRA Inspection	1

"The environmental lawyer's presentation was interesting, but what sticks out was how many acronyms there are." – Kayleigh Seagraves

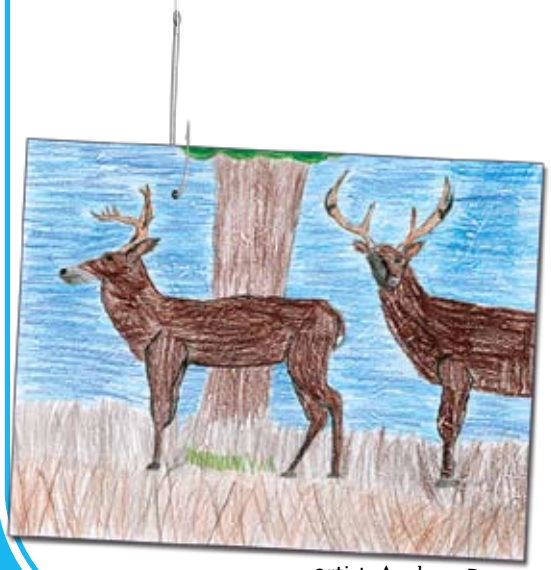
Abbreviations:

CAA	Clean Air Act
EPA	Environmental Protection Agency
ETTP	East Tennessee Technology Park
NPDES	National Pollutant Discharge Elimination System
NTRC	National Transportation Research Center
ORNL	Oak Ridge National Laboratory
RCRA	Resource Conservation and Recovery Act
SPCC	Spill prevention, control, and countermeasure
TDEC	Tennessee Department of Environment and Conservation



artist: Olivia Gunter

artist: Krista Covert



artist: Andrew Dyer

photo by: Harry Quarles

Oak Ridge Reservation Surveillance Monitoring

Meteorological Monitoring – Eight meteorological towers provide data on atmospheric conditions on the Oak Ridge Reservation. Data from the towers are used in modeling to predict impacts from facility operations and as input for emergency-response atmospheric models. The meteorological data are also used to support various research and engineering projects.

"Even after all the lectures in class, actually going and seeing what went on was a great learning experience." – Drew Thomas

Ambient Air – Ambient air by definition is "the surrounding air," and in this report refers specifically to the air surrounding the Oak Ridge Reservation. Ambient air is routinely monitored to measure radiological parameters at eight stations established in areas that could be affected by Oak Ridge Department of Energy activities, and from a reference location. The data are used to assess the impact of Department of Energy operations on local air quality. The sampling systems consist of a high-volume air sampler used to collect particulates on a glass fiber filter and a column of silica gel used to collect tritiated water vapor. Laboratory analyses are performed to determine the concentrations of radionuclides, and the results are compared to Department of Energy reference levels known as "derived concentration guides." In 2006 all radionuclide concentrations were less than 1% of the applicable derived concentration guide, indicating that the Department of Energy did not have a significant impact on local air quality.

"Wow, I never knew that Oak Ridge was so big!" – Lindsey Kiser

Surface Water – Surface water is a possible route for contaminants to move from the Oak Ridge Reservation into areas that could be accessed by the public. In 2006 surface water samples were collected from three locations on the Clinch River in addition to the samples collected to meet the requirements of the National Pollutant Discharge Elimination System permits and other site-specific monitoring programs at the three major operating facilities. The samples were analyzed for metals, radioactivity, water quality parameters, and in some cases volatile organic compounds and polychlorinated biphenyls. Comparison of 2006 surface water sampling results from a location upstream of Department of Energy operations with samples from a downstream location show that

there were no statistically significant differences in the parameters of interest, indicating that Oak Ridge activities are not adversely affecting the water quality of the Clinch River.

Food Crops – Another possible route for contaminants from the Oak Ridge Reservation to reach the public is through the consumption of food crops grown in areas that could potentially be affected by Department of Energy activities. In 2006 samples of hay, tomatoes, lettuce, and turnips were collected from farms and fields near the reservation and were analyzed for gross alpha, gross beta, gamma emitters, and uranium isotopes. The results were at background levels and were consistent with historical values, indicating that Department of Energy activities in Oak Ridge do not significantly impact the radionuclide concentrations of locally grown produce.

"It was great to see everything we've been learning about in action." – Megan Tinker

Milk – The Oak Ridge Reservation 2006 milk-sampling program consisted of grab samples collected every other month from dairy farms in Powell, Claxton, and Maryville. The milk samples were analyzed for gamma emitters and tritium and for total radioactive strontium to ensure that radionuclides from reservation activities are not reaching the public through the grass-cow-milk route. All results were consistent with historical and background levels, indicating that Department of Energy operations are not influencing radionuclide concentrations in local milk.

Fish – Fish from three locations on the Clinch River are collected annually to ensure that members of the public are not exposed to contaminants from Oak Ridge activities by consuming fish from the river. Sunfish and catfish are collected at each location, filleted, frozen, and sent to a laboratory for analyses for selected metals, pesticides, polychlorinated biphenyls, tritium, gross alpha, gross beta, gamma-emitting radionuclides, and total radioactive strontium. Consumption of fish in the Melton Hill reservoir, including areas that are not impacted by Oak Ridge Reservation activities, is limited by an advisory issued by the Tennessee Department of Environment and Conservation for polychlorinated biphenyls. Polychlorinated biphenyls are found in water bodies all over the United States, and the local advisory is for the entire reservoir and not just areas around the Oak Ridge Department of Energy facilities. This advisory is applicable to atypical consumers such as pregnant or nursing women, children, and subsistence fishermen. Consistent with this advisory, in 2006 polychlorinated biphenyls were detected in both species at all locations.

White-Tailed Deer – During the final quarter of 2006, three weekend deer hunts were held on the Oak Ridge Reservation. The 21st annual deer hunts were managed by the Tennessee Wildlife Resources Agency and Department of Energy. Shotgun and archery hunters brought the year's total harvest to 286 deer (128 bucks and 158 does). Two deer were retained by officials for exceeding administrative release limits. This is consistent with retention rates from previous years. Since 1985, 9,501 deer have been harvested on the Oak Ridge Reservation, and only 185 (< 2%) have been retained due to potential radiological contamination.

The average deer, assuming that 55% of field weight is edible, would yield 50.21 pounds of meat. The total harvest in 2006 was estimated to have yielded about 14,255 pounds of meat.

Canada Geese – Open hunts for Canada geese are held each year in counties adjacent to the Oak Ridge Reservation. In addition, in September 2006, a Canada goose hunt was initiated in the Solway and Freels Bend area of the reservation with hunters being allowed to take wood duck and teal on one of the hunt days. Two geese and six wood ducks were screened during the 2006 hunt; none exceeded release limits. In addition, a roundup of 203 geese from the Oak Ridge Reservation was completed in June 2006, and whole body gamma scans were conducted to determine concentrations of gamma-emitting radionuclides accumulated by waterfowl that live and feed on the Oak Ridge Reservation. No geese exceeded administrative limits.

Turkey – Two wild turkey hunts were held on the reservation during April 2006. Hunting was open for both shotguns and archery. Thirty-nine turkeys were harvested; none exceeded administrative release limits established for radiological contamination. Since 1997, 458 turkeys have been harvested, and only three (0.7%) have been retained because of potential radiological contamination.

artist: Alexa Carroll

artist: Christy Vitkus

artist: Damien Parker

Environmental Management

Environmental Management is the largest Department of Energy Oak Ridge program, with cleanup programs under way to correct the legacies remaining from more than 50 years of energy research and weapons production. The program includes an aggressive effort to complete the majority of environmental cleanup by 2011 at the East Tennessee Technology Park site. Already, significant progress has been made in cleaning up large gaseous diffusion plant buildings at this site. Reservation-wide, the Department of Energy has accelerated the completion of the Oak Ridge Environmental Management program by 6 years and reduced total lifecycle costs by ~$2 billion.

"I believe the Department of Energy facilities are doing a wonderful job protecting the environment, and I'm glad Oak Ridge has such great facilities and workers." – Crystal Gann

Because of past practices, portions of land and facilities on the Oak Ridge Reservation are contaminated with radioactive elements, mercury, asbestos, polychlorinated biphenyls, and industrial wastes. The Oak Ridge Reservation is on the Environmental Protection Agency's National Priorities List and is being cleaned up under a Federal Facilities Agreement with the Environmental Protection Agency and the state of Tennessee.

The Oak Ridge Environmental Management Accelerated Closure Project includes three major subprojects: Melton Valley Closure, East Tennessee Technology Park Closure, and Balance of Reservation. Each of these subprojects is driven by specific records of decision, the Federal Facility Compliance Act, and the Site Treatment Plan for the Oak Ridge Reservation. The overall Oak Ridge Environmental Management Program is managed by Bechtel Jacobs Company LLC, along with a variety of other contractors and subcontractors for specific projects.

The fiscal year 2006 edition of *Cleanup Progress: Annual Report to the Oak Ridge Community* is available to the public at the Department of Energy Information Center, 475 Oak Ridge Turnpike, Oak Ridge (865-241-4780 or 1-800-382-6938, Option 6). This document discusses the status of the accelerated environmental cleanup on the Oak Ridge Reservation. The status of projects at the East Tennessee Technology Park, the Melton Valley area of the Oak Ridge National Laboratory, and other Reservation sites are included. The report also addresses waste management initiatives and public involvement activities for fiscal year 2006.

Examples of fiscal year 2006 accomplishments include

- completion of shipments of more that 6,000 cylinders of uranium hexafluoride off site to Portsmouth, Ohio;
- the completion of the Melton Valley Project at Oak Ridge National Laboratory, which included the capping of 145 acres of old burial grounds, grouting of pipelines, pits and trenches, and retrieval of transuranic wastes from underground storage;
- completion of the six-mile haul road between East Tennessee Technology Park and the Environmental Management Waste Management Facility in Bear Creek Valley;
- transfer of two buildings to the Community Reuse Organization of East Tennessee, bringing the total to six; and
- remediation of the David Witherspoon 901 site in south Knoxville.

Public Involvement

Most remediation projects on the Oak Ridge Reservation have moved from the decision-making phase to actual field work. However, the Department of Energy continues to seek public involvement in many decisions affecting cleanup of the Oak Ridge Reservation. In 2006 public input was sought on a number of initiatives, including the following:

- East Tennessee Technology Park Parking Lot Expansion at Portal 5
- Engineering Evaluation/Cost Analysis for the demolition and disposal of the Central Pollution Control Facility at the Y-12 National Security Complex
- Covenant Deferral Request for the transfer of Building K-1652 to the city of Oak Ridge
- Engineering Evaluation/Cost Analysis for remediation of contaminated ponds at East Tennessee Technology Park

Public involvement initiatives also included the monthly distribution of *Public Involvement News*, distribution of the fiscal year 2006 version of *Cleanup Progress*, and updates of project fact sheets that are made available at the Department of Energy Information Center. Other venues through which members of the public can participate in decision making or obtain information include the following resources.

- The Department of Energy Information Center–the central location for public information about all Department of Energy programs in Oak Ridge. The center is located at 475 Oak Ridge Turnpike in Oak Ridge; 865-241-4780 or 1-800-382-6938, option 6. A website is available at http://www.oakridge.doe.gov/info_cntr.
- The Oak Ridge Site Specific Advisory Board–an independent, federally appointed citizens' panel that provides advice and recommendations to the Department of Energy on the Environmental Management Program in Oak Ridge. All meetings are open to the public. Information is also available at http://www.oakridge.doe.gov/em/ssab/ or by calling 865-241-4583. The Site Specific Advisory Board also has a video lending library.
- The Oak Ridge Reservation Local Oversight Committee–represents counties and communities affected most directly by Department of Energy activities in Oak Ridge. The Local Oversight Committee is funded by a grant from the Tennessee Department of Environment and Conservation's Department of Energy Oversight Division. Local Oversight Committee board members are concerned with human health and the environment and with their communities' economic and social well-being. The Local Oversight Committee publishes the annual *Tennessee Department of Environment and Conservation Department of Energy Oversight Division's Status Report to the Public*, which presents an independent view of the safety and quality of the Oak Ridge environment. The Local Oversight Committee may be contacted at http://www.local-oversight.org, or at 865-483-1333.

"The trip was entertaining, the food was good, talking trash cans are amazing, and I really love badges with my name printed on them." – Courtney Leo

- The City of Oak Ridge Environmental Quality Advisory Board–an appointed advisory board of the Oak Ridge City Council. Information is available at http://orserv01.ci.oak-ridge.tn.us/eqab/oakridge.htm.
- The Roane County Environmental Review Board–established to enable qualified individuals to review matters brought before the Roane County Commission concerning nuclear energy, hazardous waste, and/or the environment.
- The Tennessee Department of Environment and Conservation Department of Energy Oversight Office–provides independent state oversight of Department of Energy's Oak Ridge activities. Information is available at http://www.state.tn.us/environment/doeo.
- The Department of Energy Oak Ridge Public Affairs Office–covers programs in science, environmental management, and nuclear fuel supply at Oak Ridge National Laboratory, the East Tennessee Technology Park, and the Oak Ridge Institute for Science and Education. This office may be reached at 865-576-0885.

artist: Matthew Worsham

artist: Krista Covert

artist: Elaina Riggs

artist: Olivia Gunter

artist: Kelsey Baker

- The Y-12 National Security Complex Public Affairs Office–may be contacted for national security programs information at 865-576-9918. Information is available at http://www.yso.doe.gov.
- Monthly calendar of meetings and announcements–highlighted on the web at http://www.oakridge.doe.gov under the Public Activities section.
- *The Public Involvement Plan for Comprehensive Environmental Response, Compensation, and Liability Act Activities at the U.S. Department of Energy Oak Ridge Reservation* (Department of Energy/OR/01/2163&D2)–highlights opportunities for public participation in environmental cleanup activities at Department of Energy sites in Oak Ridge. The plan is available at the Department of Energy Information Center.
- The American Museum of Science and Energy–contains exhibits highlighting the history of Department of Energy in Oak Ridge along with educational displays on science, nuclear energy, national security, and environmental management. The museum is located at 300 S. Tulane Avenue in Oak Ridge. Public bus tours of the Oak Ridge Reservation are offered May through September. The museum may be reached at 865-576-3200 or through the website, http://www.amse.org.

Other Information Resources Available via Internet Sites or Telephone

- Department of Energy-Oak Ridge Office Public Information Line: *1-800-382-6938*
- Department of Energy: *http://www.energy.gov*
- Department of Energy-Oak Ridge Office: *http://www.oakridge.doe.gov*
- Department of Energy Environmental Management Program: *http://www.oakridge.doe.gov* *(Click on "Programs" then select "Environmental Management")*
- Oak Ridge Accelerated Cleanup: *http://www.bechteljacobs.com/doeclean/*
- Oak Ridge National Laboratory: *http://www.ornl.gov/*
- B&W Y-12: *http://www.y12.doe.gov/*

"This project was fun. I liked how we got to express our creativity and it's cool to know that something we worked on will be seen around the country." – Jessica Clifton

"The Oak Ridge Project was influential to me. It allowed me to learn things that I otherwise would have never known."
– Sara Hussein

Disclaimer

"The Department of Energy is doing a very important job in Oak Ridge and doing it very effectively. So Thank You Department of Energy."
– Sara Denton

This is a graphic representation.

http://www.ornl.gov/aser

ORNL 2007-G00480/aas