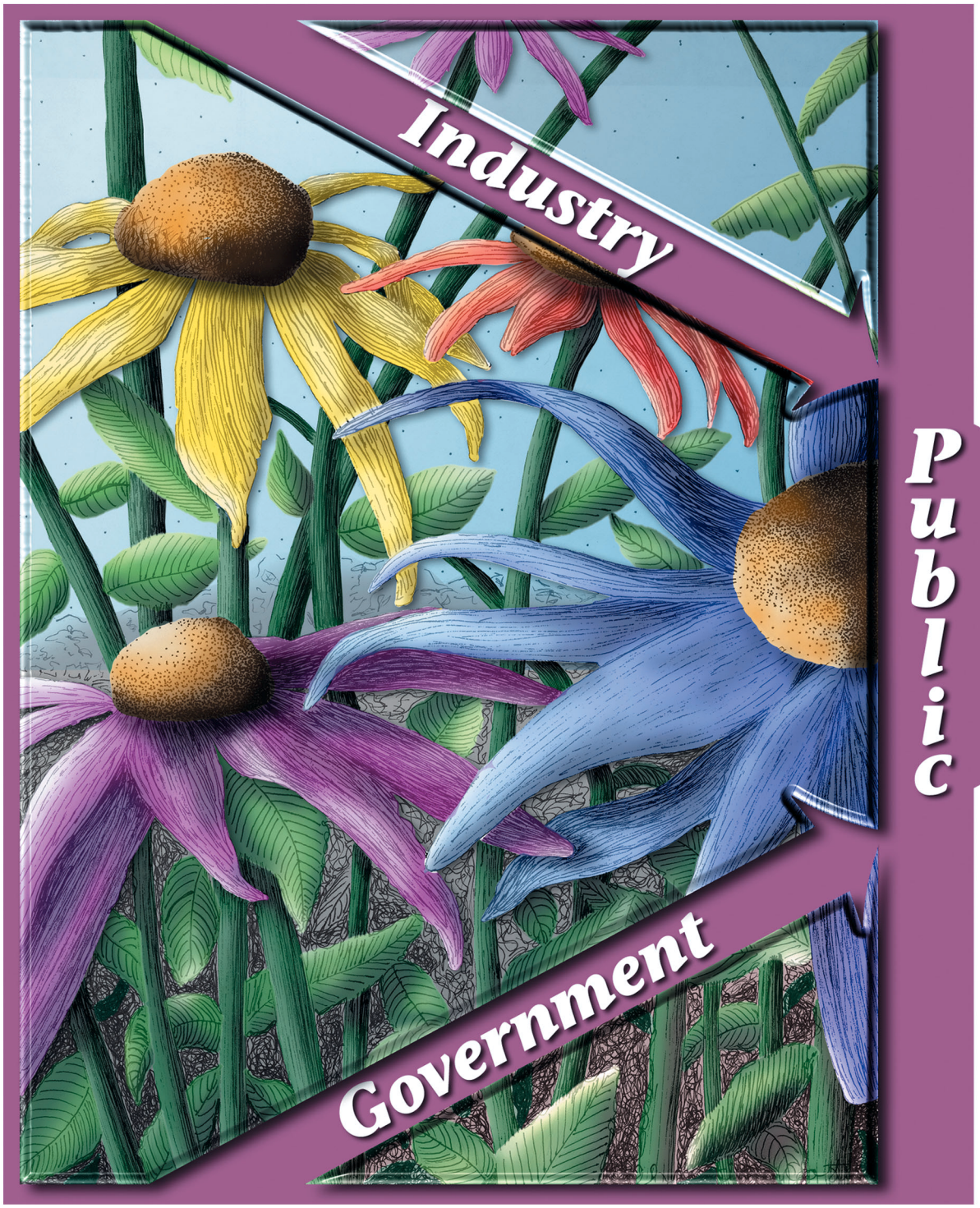
DOE/ORO/2118

OAK RIDGE Reservation

Annual Site Environmental Report Summary



2000

Growing Toward Success

Message from the Students

Hello,

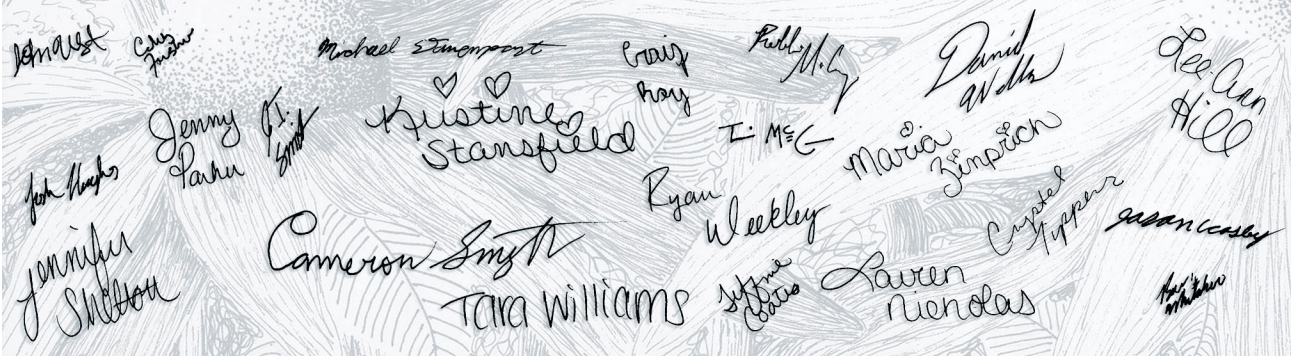
We are the Fall 2001 Applied Communication Class at Karns High School. This semester we were given the opportunity to compose a simplified and condensed environmental document for the Oak Ridge Reservation. We wrote this document so that the Reservation could distribute an easily comprehended summary. It includes the environmental events that have occurred on the Reservation, surveys from the public, an interview with Leah Dever, manager of Oak Ridge Operations, and many other interesting facts.

While learning how to write a document, we also learned numerous facts about the environment, the Reservation, and working together as a team.

We would like to give a big thanks to everyone who helped us with this document. This document would not be possible without the following people: Dr. Tim Joseph, Jennifer Webster, Joan Hughes, Gail Sweeden, Leah Dever, Mike Coffey, Pat Scofield, Rick Dailey, Lynn Freeney, and everyone in our class.

Everyone contributed much time and effort to this document. Many of these people had to come and speak in our classroom because we were not able to go onto the Reservation. Security would not allow our visit after the events of September 11, 2001. We also want to thank you, the public, for reading our document.

Our hearts go out to everyone affected by the tragic events of September 11, 2001.



About the cover:

A flower alone in the field will struggle to reach its potential against all that compete against it, but many flowers growing together will prosper and bloom beautifully with ease. Growing and working together is a garden of opportunity for the public, industry, and government. By continuing to unite our energies, strategies, and expertise in cooperation and understanding, our difficulties can be resolved, our goals met, and our missions accomplished — TJ

Cover artwork: Cristina Costar, Karns High School student artist; cover format by Sean Dietrick.

Layout and design:
Gail S. Sweeden, Computing, Information, and Networking Division, UT-Battelle.

Contents

Artwork by student artist: Stream – Justin Miller

Credits

Front row left to right: Crystal Tippens, Tiffany Coates, Jennifer Shelton, Travis McCown, Josh Hughes, and Lauren Nicholas
2nd row left to right: Jennifer Webster, Craig Roy, Caleb Freshour, J. T. Smith, and Jenny Parker
3rd row left to right: Joan Hughes, Michael Davenport, Ryan Weekley, Tara Williams, Maria Zimprich, Robbie McConkey, and Kristine Stansfield
Back row left to right: John West, Cameron Smyth, Tim Joseph, Ben Whitaker, Jason Crosby, Lee Ann Hill, and Daniel Wells

Oak Ridge Reservation Annual Site Environmental Report Summary for 2000
on the World Wide Web: **http:/www.ornl.gov/aser/aser.htm**

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Oak Ridge Y-12 National Security Complex
P.O. Box 2009, Oak Ridge, TN 37831-2009
Managed by BWXT Y-12 L.L.C.
for the U.S. Department of Energy
under Contract No. DE-AC05-00OR22800

East Tennessee Technology Park
P.O. Box 4699, Oak Ridge, TN 37831-4699
Managed by Bechtel Jacobs Company LLC
for the U.S. Department of Energy
under Contract No. DE-AC05-98OR22700

Preface

Oak Ridge Reservation
Annual Site Environmental Report Summary for 2000

The Department of Energy measures tens of thousands of data points in the water, air, soil, and in animal life on and around the Oak Ridge Reservation on a continual basis. The results are compiled and interpreted in the *Oak Ridge Reservation Annual Site Environmental Report* every year. This extensive, ongoing monitoring activity is performed for three important reasons:

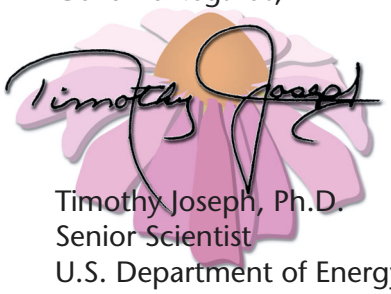
1. A legacy of contamination does exist on and off the Oak Ridge Reservation and must be closely watched and managed.
2. Existing operations do produce pollutants that must be measured and controlled.
3. The Department of Energy must monitor and fully understand how all chemical and radiological contaminants move in order to be certain no harm is done to the public or the environment.

This report summarizes the information presented in the extensive and somewhat technical *Oak Ridge Reservation Annual Site Environmental Report* for 2000. I consider these two documents the most meaningful public reports we produce simply because they are a report card to the public on how well we are taking care of our environmental commitments and responsibilities. These documents are distributed to government regulators, scientists, engineers, business people, special interest groups, and members of the public. They are available in public reading rooms and libraries and can be easily accessed on the internet at: **http:/www.ornl.gov/aser/aser.htm**.

Because this summary document is written to be easily understood by all stakeholders, I have once again asked talented young high school students from Karns High School to produce a summary report that is easily read and understood. I asked them to be creative in their presentation of the information and to try and make the document a pleasure to read. This is their report, and I am proud of it and of them. I personally thank each of the bright, young adults that worked so hard together with only a little guidance and a few doughnuts. They were a joy to work with.

As the Department of Energy's project manager for the *Annual Site Environmental Report,* it is my utmost goal to provide the public and all our stakeholders with documents of quality, value, and usefulness. Toward that end, I welcome and invite your input if you have any suggestions whatsoever in how we might improve upon the technical report or this summary. I can be reached by phone at 865-576-1582 or by email at: **josepht@oro.doe.gov.**

Genuine Regards,



Timothy Joseph, Ph.D.
Senior Scientist
U.S. Department of Energy
Oak Ridge Operations

The History of the Department of Energy in Oak Ridge

The Department of Energy Presence in Oak Ridge

The facilities on the Oak Ridge Reservation began operating in 1943 as part of the Manhattan Project, producing components for the first nuclear weapons. The Oak Ridge Reservation remains government-owned, although the nature of the work at the facilities has changed. The Reservation contains three major Department of Energy installations: the Oak Ridge Y-12 National Security Complex, the Oak Ridge National Laboratory, and the East Tennessee Technology Park. The primary missions of the three sites have evolved during the past 57 years and continue to adapt to meet the changing defense, energy, and research needs of the United States.

The Oak Ridge Reservation encompasses about 34,424 acres of mostly contiguous land owned by the Department of Energy in the Oak Ridge area. The majority lies within the corporate limits of the city of Oak Ridge; 608 acres west of the East Tennessee Technology Park lie outside the city limits. The Tennessee Valley Authority's Melton Hill and Watts Bar Reservoirs on the Clinch and Tennessee Rivers form the southern and western boundaries of the Reservation.

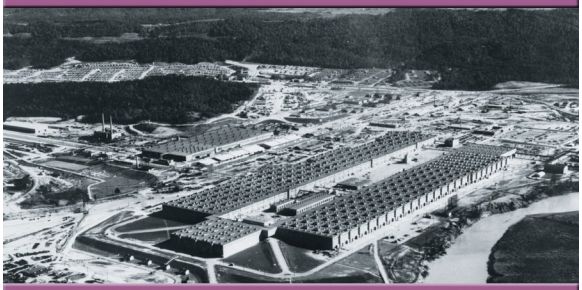
The population of the 10-county region surrounding the Oak Ridge Reservation is about 805,491 people, with 3.7 percent of its labor force employed on the Reservation. Other towns in close proximity to the Reservation include Oliver Springs, Clinton, Karns, Lenoir City, Farragut, Kingston, and Harriman. Knoxville, the major metropolitan area nearest Oak Ridge, is located about 25 miles to the east and has a population of about 173,890.

Except for the city of Oak Ridge, the land within five miles of the Oak Ridge Reservation is semirural and is used primarily for residences, small farms, and cattle pasture. Fishing, boating, water skiing, and swimming are popular recreational activities in the area.

President and Mrs. Kennedy visit with Dr. Alvin Weinberg

Operators working in the ORNL Graphite Reactor

Operators at the controls in Y-12



The K-25 Plant during the early years

Over 50 years later...

The Oak Ridge Reservation contains three large plant sites:

The East Tennessee Technology Park. Formerly known as the K-25 Site, the East Tennessee Technology Park is the smallest of the three major sites on the Oak Ridge Reservation. In 1943, the plant was established to produce enriched uranium for the first atomic bomb using the gaseous diffusion process. The plant filtered the raw uranium hexafluoride gas through a series of barriers. Uranium-235 (enriched uranium) was separated and shipped to other labs assisting in building the atomic bomb. The remaining isotopes, mostly uranium-238, were stored in huge cylinders and kept in cylinder yards at the K-25 Site.

After the war, the K-25 Site continued to make enriched uranium for bombs, but it also began to make fuel for nuclear reactors. The plant also was the site of several experimental efforts to enrich uranium by other processes, such as laser enrichment or centrifuge enrichment.

In the 1980s, demand for enriched uranium decreased, so the process at the K-25 Site was shut down. During the 1990s, the K-25 Site was renamed the East Tennessee Technology Park, and the priority for the plant shifted to cleaning up the environment and old buildings for potential industrial reuse.

Oak Ridge National Laboratory. The Oak Ridge National Laboratory was built in 1943. From its modest beginning as a wartime pilot plant, it has grown to become one of the world's premier scientific research centers and the Department of Energy's largest and most diversified national laboratory.

The Oak Ridge National Laboratory's research into fission, fusion, fossil, and other sources of energy grew from wartime efforts to produce plutonium from uranium. The Graphite Reactor was established to demonstrate the feasibility of producing the plutonium needed to create the bomb dropped on Nagasaki, Japan. After the war, the Graphite Reactor produced the first electricity from nuclear energy and played an important role in the study of the health hazards of radioactivity. The High Flux Isotope Reactor is a major producer of isotopes for medicine and research. The Spallation Neutron Source is currently under construction and will be a premier research facility.

Y-12 National Security Complex. Since World War II, the number of buildings at the Y-12 Complex has doubled. Its mission and capabilities have changed as well. The first site mission was the separation of uranium-235 from natural uranium by electromagnetic separation. The magnetic separators were decommissioned in 1946 when gaseous diffusion became the accepted process for enriching uranium. For more than 50 years, the plant has been a premier Department of Energy weapons manufacturing facility. Every weapon in the stockpile has some components manufactured at the Y-12 Complex. The plant's work in the Manhattan Project helped produce the first nuclear weapons. Weapon components later produced at the plant helped win the Cold War. Nuclear weapons remain an integral part of national security. Today, the Y-12 Complex is a manufacturing facility that stretches over 811 acres. Its 250 buildings contain about 7 million square feet of floor space. (That's the square footage of 150 football fields!)

Compliance — Laws and Regulations

The History of the Department of Energy and the Environment

The 40s—In 1943, when construction of the facilities on the Oak Ridge Reservation began, World War II raged across Europe and Asia. Winning the war was the issue of concern, while protecting the environment was given little thought. This was the attitude across America as industry geared up to produce what was necessary for victory. The military was in control of the Oak Ridge facilities. As the war came to an end in 1945, a new manager for this new nuclear industry was sought. In 1946, the Atomic Energy Act was passed, giving the authority and oversight for atomic energy programs to the newly established Atomic Energy Commission.

The 50s—Post-World War II America was experiencing a happy time. America was doing very well for itself. No more depression of the 30s, and no more war of the 40s. Industry, factories, and production skyrocketed. Housing construction for middle-class America during this period gave us the "American dream." Resources seemed unlimited, and the environment seemed indestructible. The nuclear industry was looking for domesticated uses of the many new isotopes being discovered.

The 60s—This decade brought about the realization that we could hurt the world around us. In her book, *Silent Spring,* Rachael Carson brought it to our attention that the birds weren't singing in the springtime anymore because the chemical boom of the 50s had killed large numbers of them. In 1965, Congress passed the Solid Waste Disposal Act to get a handle on the large volume of waste produced by industry. America was waking up to the realization of environmental damage.

The 70s— On April 22, 1970, the first Earth Day was held. In the largest demonstration of its kind in history, millions of Americans forced their environmental concerns into the political arena. This decade brought several new laws to protect our environment, and the Environmental Protection Agency was established to enforce these new laws. In 1977, residents of Love Canal, a small community near Niagara Falls, New York, began to notice an epidemic of health problems and discovered chemicals leaking out of the ground into their yards, basements, and playgrounds from a former chemical landfill. This incident drew America's attention to the fact that many of the wastes generated during the 50s and 60s had been buried and left without regard to the harm they later may create for those living near the burial sites.

The 40s
Construction began in Oak Ridge

The 50s
End of war; sought new uses for isotopes

The 60s
1965: Solid Waste Disposal Act

The 70s
1970: Earth Day established

The 80s
Focus on cleanup turned to small communities

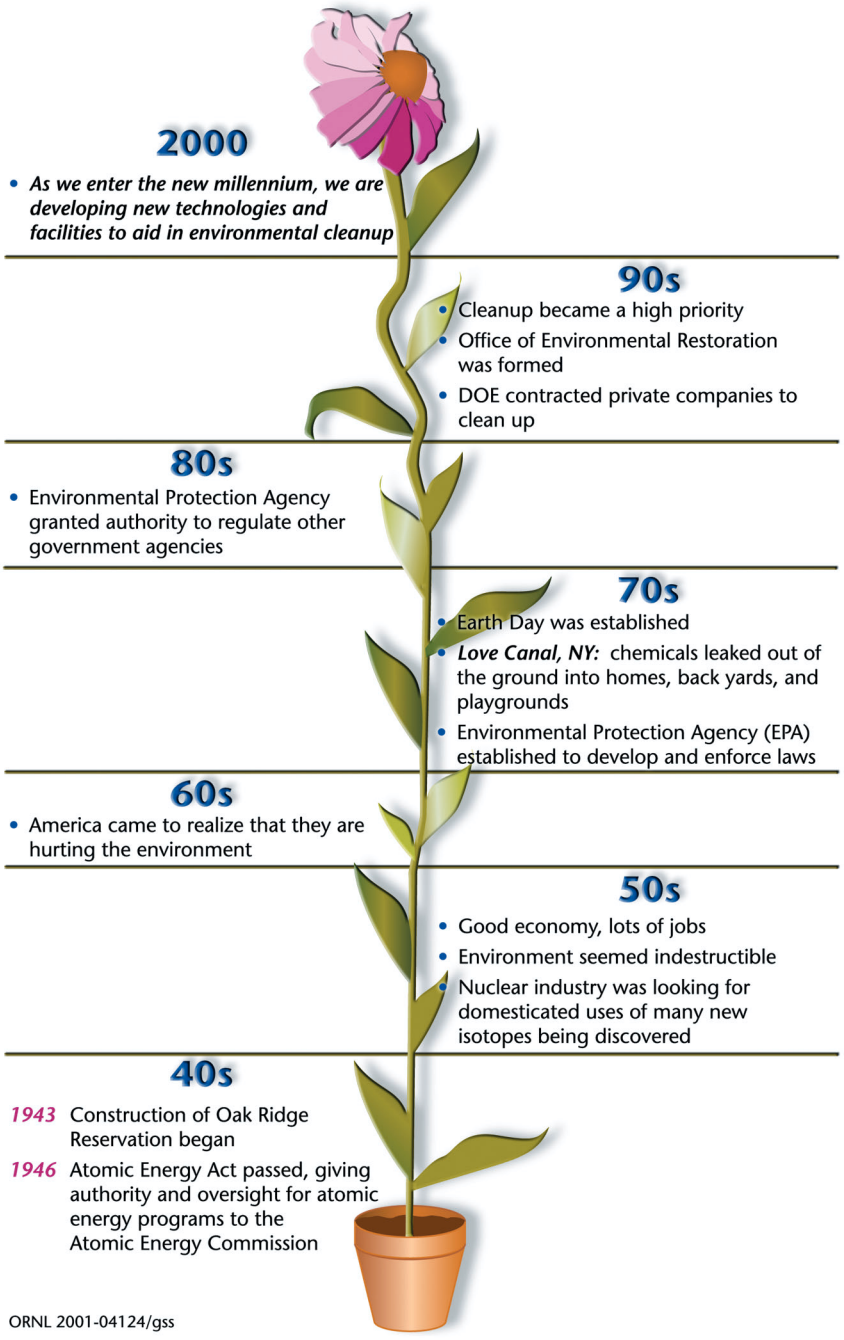
The 90s
More government agencies join in the cleanup

The New Millennium
Cleanup continues

The 80s—Cleanup of these old waste disposal sites became the focus of this decade. Many contaminated sites were found to be government installations, and Congress extended the Environmental Protection Agency's authority to other government agencies such as the Department of Energy.

The 90s—The 90s brought other government agencies into the environmental age. For instance, prior to 1989, separate offices within the Department of Energy had responsibility for the cleanup of contamination at these facilities; and cleanup was not always a high priority. In 1989, the Office of Environmental Restoration was created within the newly established Office of Environmental Management to consolidate, centralize, and promote the cleanup of contaminated waste sites and surplus facilities within the Department of Energy Complex. The Department of Energy contracted several private-sector companies in the 1990s to clean up its facilities across the nation.

The New Millennium—As America faces a new millennium, it has realized the importance of keeping the environment in mind when developing new technologies and building new facilities, and has enacted federal regulations to protect the environment. As Leah Dever, manager of Oak Ridge Operations, puts it, "When we look to the future and are building new facilities, it is important to build them to state-of-the-art specifications that include pollution prevention and pollution control technology."

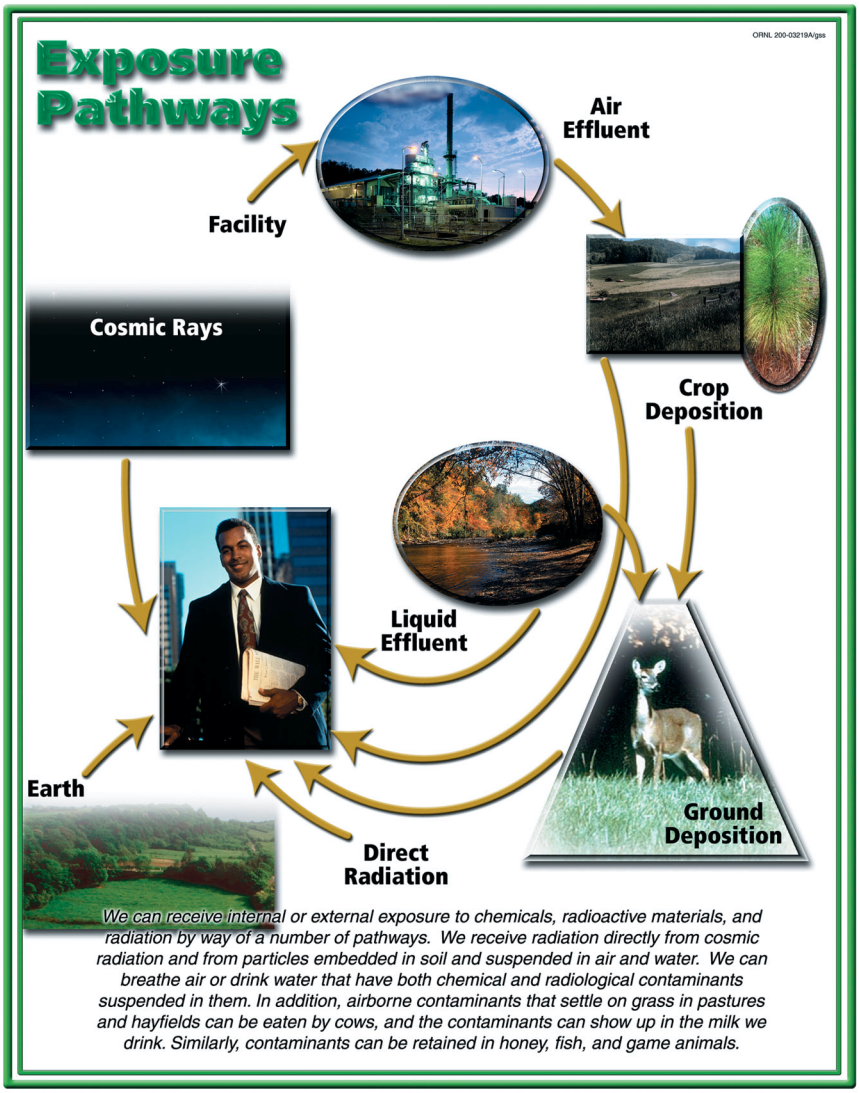


Radiation — What Is It?

Matter is composed of atoms. Some atoms are unstable. As these atoms change to become more stable, they give off invisible energy waves or particles called radiation. Radiation has been present on this planet since its birth. It comes from the sky above us, the earth beneath us, and even from our own bodies. It is everywhere.

Radiation can be classified into two categories: man-made sources, and natural sources. Radiation used in medical and dental procedures is the largest source of man-made radiation to which people in the United States are exposed. Another exposure pathway to man-made radiation is the use of consumer products such as televisions, lantern mantles, and smoke detectors. The dose from consumer products is very small compared to other naturally occurring sources of radiation, and accounts for less than three percent of an average person's annual exposure. Nuclear power plant operations contribute less than an hundredth of a percent of the average American's total radiation exposure.

Approximately 68 percent of our exposure to natural sources of radiation is from radon, a colorless, tasteless, and odorless gas that comes from the decay of uranium found in nearly all soils. We receive another 16 percent of our exposure to radiation from outer space (cosmic radiation) and from radioactive elements in the earth's crust (terrestrial radiation). The human body contains natural radionuclides, and approximately 10 percent of our total average dose is attributable to these internal sources.



We can receive internal or external exposure to chemicals, radioactive materials, and radiation by way of a number of pathways. We receive radiation directly from cosmic radiation and from particles embedded in soil and suspended in air and water. We can breathe air or drink water that have both chemical and radiological contaminants suspended in them. In addition, airborne contaminants that settle on grass in pastures and hayfields can be eaten by cows, and the contaminants can show up in the milk we drink. Similarly, contaminants can be retained in honey, fish, and game animals.

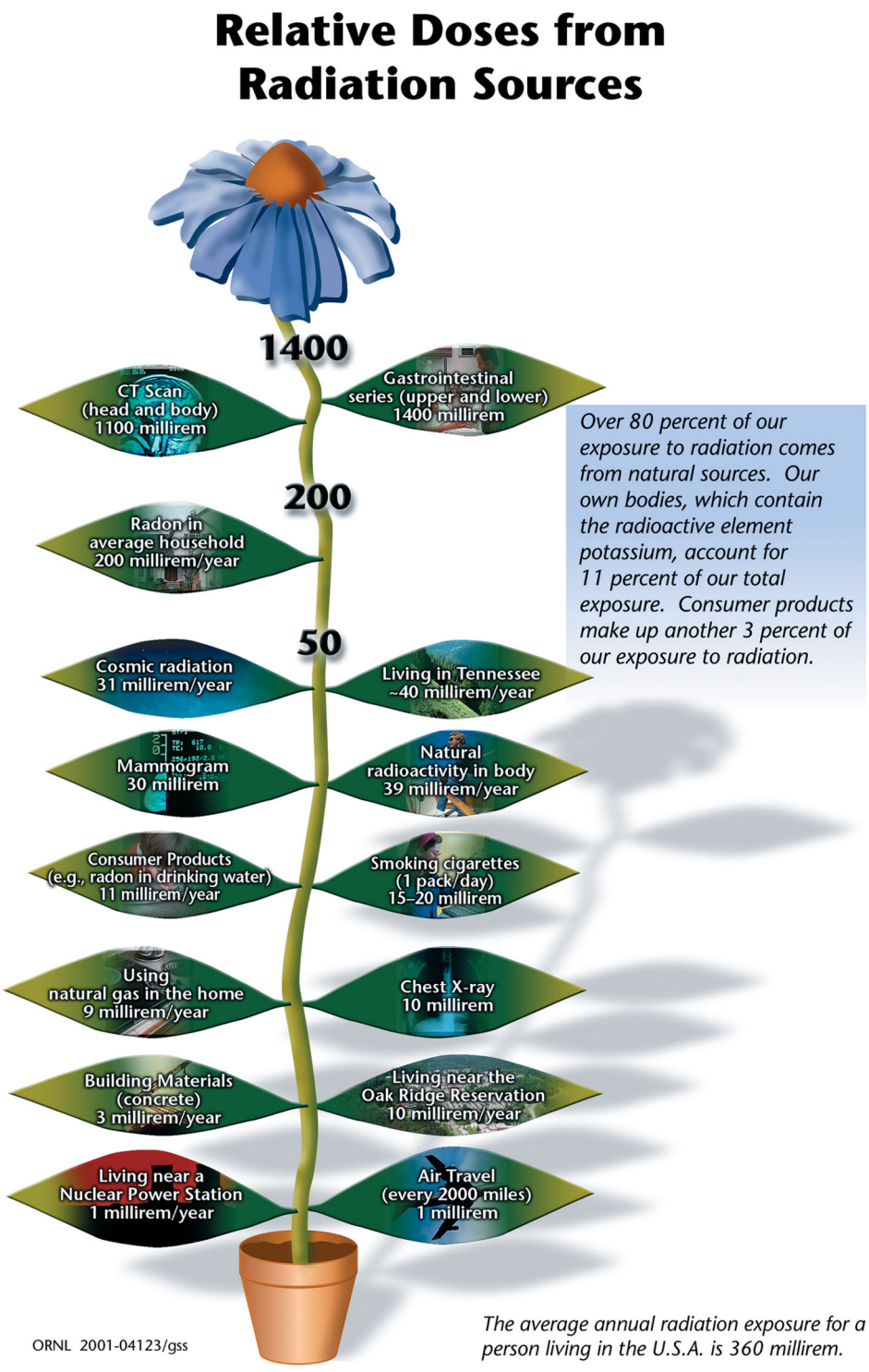
Radiation dose can be measured in units called "rem," a measure of damage to human tissue (small doses are measured in millirem: one rem = 1000 millirem). Scientists estimate the average person in the United States receives a dose of about 360 millirem per year. Twenty percent comes from man-made radiation, and 80 percent comes from the natural sources.

Radiation is a carcinogen; like many hazardous chemicals found in the environment, it can cause cancer. There may also be other effects, such as genetic defects in the children of exposed parents or

mental retardation in the children of women exposed while pregnant. The risk of developing cancer from radiation exposure is greater than the risk of developing these other effects. The other effects are observed at high radiation exposures such as those received by pregnant women when the atomic bombs were dropped on Japan. The population surrounding the Oak Ridge Reservation is protected against receiving radiation doses from Department of Energy activities that could result in any significant increase in the risk of cancer or other ill effects.

Our knowledge about the risks from radiation is based on studies of over 100,000 survivors of the atomic bombs in Hiroshima and Nagasaki. Scientists have been able to observe the effects of a wide range of radiation doses. These include doses comparable to an average person's lifetime dose from naturally occurring background radiation. Important findings from these studies include:

- The higher the radiation dose a person receives, the greater the chance of developing cancer.
- Most cancers do not appear until many years after the radiation dose is received.
- It is the chance of cancer occurring, not the kind or severity of cancer, that increases as the radiation dose increases.
- It is estimated that over your lifetime the risk of developing cancer from naturally occurring radiation is about one in one hundred.



Over 80 percent of our exposure to radiation comes from natural sources. Our own bodies, which contain the radioactive element potassium, account for 11 percent of our total exposure. Consumer products make up another 3 percent of our exposure to radiation.

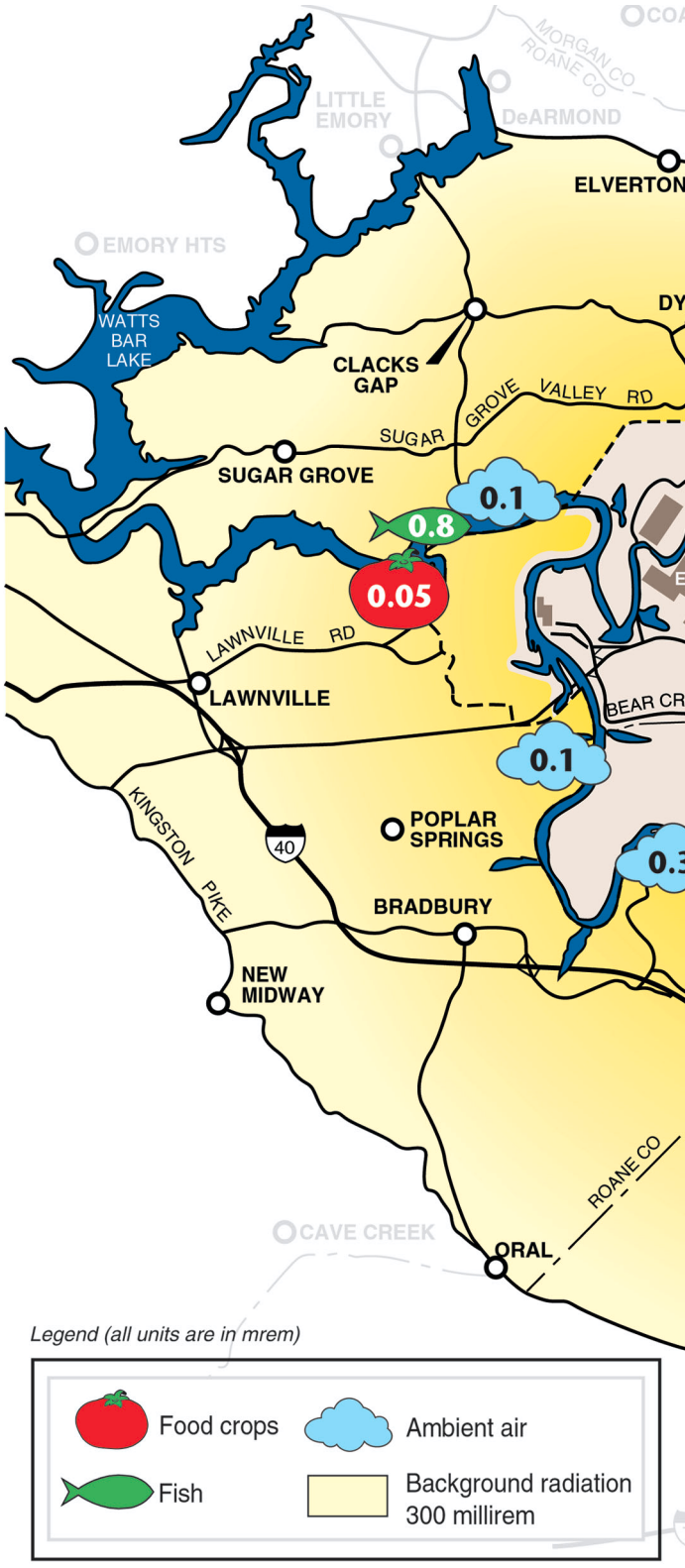
The average annual radiation exposure for a person living in the U.S.A. is 360 millirem.

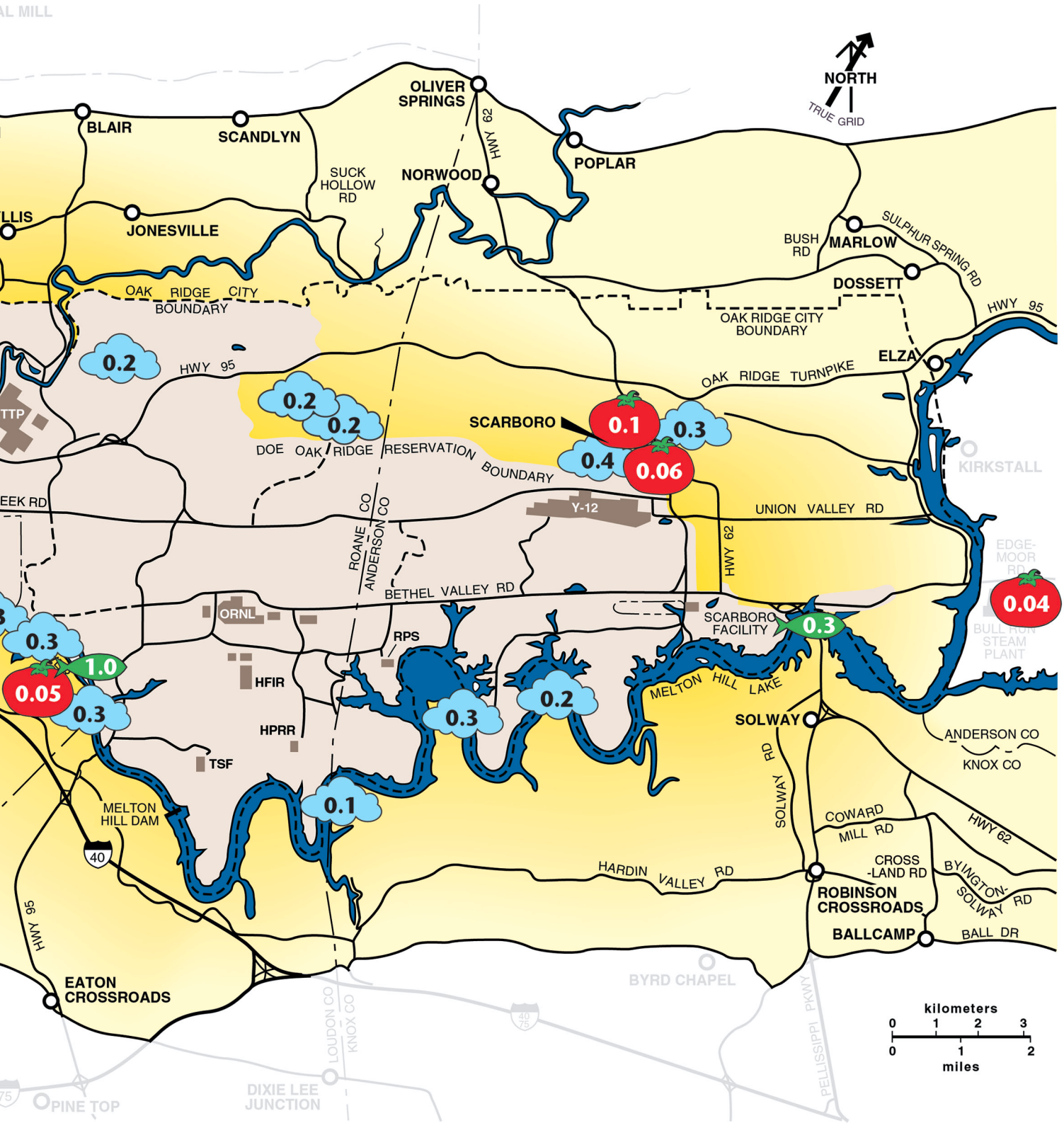
Dose Map

Everyone is exposed to radiation through normal daily activities. The amount of radiation a person receives in a year depends on a variety of factors. A typical person in the United States receives approximately 300 millirem per year from all natural sources of radiation, such as cosmic rays from outer space; radon from the ground; and natural radioactive elements found in soil, water, and food. Approximately another 40 to 60 millirem per year come from human-made sources, such as medical and dental exams, air travel, and consumer products.

Activities on the Oak Ridge Reservation have the potential to release small quantities of radioactive materials to the environment. Monitoring of air, water, vegetation, fish, and wildlife on or near the Reservation provides data that are used to confirm that doses from radionuclides released by the Department of Energy activities are low and are in compliance with all laws. The accompanying map shows the Department of Energy's possible contribution to the radiation dose that a person could receive from breathing the air and eating large quantities of local crops and fish. It does not include contributions from naturally occurring isotopes (in particular, potassium-40 and beryllium-7, which are common in the environment). The radiation dose varies depending on the location. The dose from breathing the air in the vicinity of the Scarboro Community could be 0.4 millirem per year. A similar dose, 0.3 millirem per year, could be received in the vicinity of Jones Island. This is far less than drinking water (11 millirem) or using natural gas in our homes (9 millirem.)

If you live in the vicinity of the Oak Ridge Reservation, you may have received up to an additional 3 millirem, or approximately 1 percent of background, due to the Department of Energy activities. If you live in the area and also eat wildlife harvested locally, the maximum possible amount of radiation you could receive is an additional 10 millirem, or about 3 percent of natural background.




NORTH
TRUE GRID
OLIVER SPRINGS
BLAIR
SCANDLYN
SUCK HOLLOW RD
NORWOOD
HWY 62
POPLAR
JONESVILLE
BUSH RD
MARLOW
SULPHUR SPRING RD
DOSSETT
OAK RIDGE CITY BOUNDARY
HWY 95
ELZA
OAK RIDGE TURNPIKE
0.2
0.2
0.2
SCARBORO
0.1
0.3
0.4
0.06
DOE OAK RIDGE RESERVATION BOUNDARY
KIRKSTALL
Y-12
UNION VALLEY RD
ROANE CO
ANDERSON CO
BETHEL VALLEY RD
HWY 62
EDGEMOOR RD
0.04
BULL RUN STEAM PLANT
ORNL
SCARBORO FACILITY
0.3
RPS
0.3
1.0
0.05
0.3
HFIR
0.3
0.2
MELTON HILL LAKE
SOLWAY
ANDERSON CO
KNOX CO
HPRR
TSF
SOLWAY RD
MELTON HILL DAM
0.1
COWARD MILL RD
HWY 62
40
HARDIN VALLEY RD
CROSS-LAND RD
BYINGTON-SOLWAY RD
ROBINSON CROSSROADS
BALLCAMP
BALL DR
HWY 95
EATON CROSSROADS
BYRD CHAPEL
LOUDON CO
KNOX CO
PELLISSIPPI PKWY
PINE TOP
DIXIE LEE JUNCTION
kilometers
0 1 2 3
0 1 2
miles

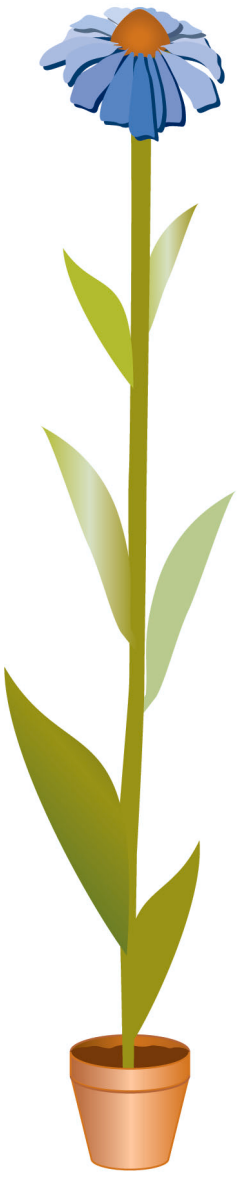
Environmental Monitoring

Introduction

Information from the Oak Ridge Reservation environmental monitoring programs is used to document compliance with environmental laws and DOE requirements, identify trends, inform the public, and contribute to general environmental awareness. The information gathered during specific monitoring events is published in routine reports to local, state, and federal agencies and to the public.

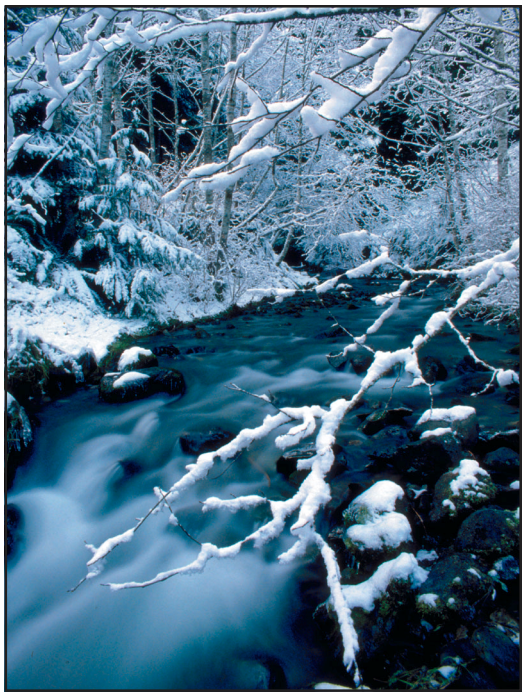
External Gamma Radiation

External gamma radiation exposure rates are measured at a number of locations on and off the Oak Ridge Reservation to determine whether radioactive releases from the reservation are significantly increasing radiation levels above normal background levels. Normal levels of external gamma radiation exposure in Tennessee range from 2.9 to 11 microroentgens per hour, which corresponds to dose equivalent rates between 19 and 72 millirem per year. This means that everyone living in Tennessee is exposed to and, therefore, receives radiation doses due to external gamma radiation from the natural environment, with the average exposure rate across Tennessee being 6.4 microroentgens per hour, which corresponds to a dose rate of 42 millirem per year.



The average exposure rate at perimeter air monitoring stations around the Oak Ridge Reservation during 2000 was about 5.3 microroentgens per hour, which corresponds to a dose rate of 35 millirem per year. This is within the range of background levels in Tennessee; it is not in addition to background. Operations on the reservation are not making a significant contribution to external gamma levels in the area.

Groundwater



Most residents in Oak Ridge do not rely on groundwater for domestic needs such as drinking water. The local groundwater is, however, used for irrigation and other industrial uses, and it is a potential pathway of contaminant transport and exposure to hazardous materials. Environmental programs on the Oak Ridge Reservation monitor the groundwater to meet Department of Energy requirements and to ensure compliance with Environmental Protection Agency and state regulations. Groundwater is monitored for organic compounds, metals, major ions (electrically charged atoms and particles), specific radionuclides, and general levels of radioactivity.

Contaminants can be carried by groundwater past the reservation boundary. Therefore, tests are performed to determine the water quality

of springs, seeps, surface water, and groundwater. This information is used to assess potential migration of contaminants beyond the boundary of the Reservation.

The primary groundwater contaminants on the Oak Ridge Reservation are nitrates, volatile compounds, trace metals, and radionuclides. Most contamination is from former waste sites, which are subject to ongoing remediation, or from past projects no longer in operation. There has been migration of volatile organic compounds from the Y-12 Complex, extending eastward across Scarboro Road into Union Valley. There are no users of the groundwater in the affected area; however, controls restricting future groundwater use have been established. Groundwater monitoring at the Oak Ridge National Laboratory, the East Tennessee Technology Park, and at offsite wells has not detected groundwater contamination migrating off Department of Energy property.

Fish

The consumption of fish caught in the Clinch River near the Oak Ridge facilities is limited due to posted advisories for polychlorinated biphenyls issued by the Tennessee Department of Environment and Conservation. This advisory applies to the entire reservoir, not just areas below Oak Ridge that could be affected by Department of Energy activities. However, eating fish is a potential exposure pathway resulting from Reservation activities, and fish from three Clinch River locations are collected and analyzed to monitor this pathway. Edible fish flesh is tested for selected metals, pesticides, polychlorinated biphenyls, tritium, gross alpha, gross beta, gamma-emitting radionuclides, and total radioactive strontium.

In 2000, most nonradiological contaminants included in the fish program were undetected, but polychlorinated biphenyls were measured in catfish at levels of potential public health concern at all three locations, supporting the need for the posted advisories in the Melton Hill Reservoir. Only a small amount of polychlorinated biphenyls comes from the Department of Energy facilities, and the advisory is not because of the Department of Energy activities. Most of the polychlorinated biphenyls probably come from the electric utilities in the area over a long period of time. Polychlorinated biphenyls are in nearly every waterway. Though the fish advisory is for nonradiological contaminants, potential doses due to radionuclides measured in fish tissue were also evaluated. An avid fisherman is assumed to eat 46 pounds of fish per year. Given this assumption, an avid fisherman could have received a dose between 0.003 and 0.008 millirem for the year from eating fish caught in the Clinch River upstream from all Oak Ridge Reservation inputs, and a dose of between 0.03 and 0.1 millirem from eating fish caught from the Clinch River downstream of the Oak Ridge National Laboratory, and a dose of between 0.005 and 0.04 millirem from eating fish caught in the river below all Oak Ridge Reservation activities. This indicates that eating fish caught downstream from the Oak Ridge Reservation is not a significant pathway for radiological exposure to the public.

Eastern Wild Turkeys

Fifty-three wild turkeys were harvested during hunts held on the Oak Ridge Reservation in 2000. None was confiscated because of above-limit radioactivity levels. The data indicate that eating wild turkey from the Reservation is not a significant pathway for radiological exposure to the public. The average weight of the turkeys was 8.6 kilograms (18.9 pounds).

Growing

Vegetables

The maximum individual dose from eating tomatoes, lettuce, and turnips grown on local farms near the Oak Ridge Reservation in 2000 was estimated to be between 2 and 5 millirem, not including the naturally occurring potassium-40: if potassium-40 was included, the maximum dose would be about 6 to 9 millirem.

Hay was analyzed from six areas on the Oak Ridge Reservation

Hay

Analysis of hay from six locations on the Oak Ridge Reservation shows that 95 percent of the dose from consuming beef and milk from cattle that eat this hay would come from the naturally occurring potassium-40 and beryllium-7 isotopes. If these naturally occurring radionuclides are excluded, the effective dose equivalent from eating cattle that consume hay on or near the Oak Ridge Reservation is about 0.7 millirem.

Reservation deer are harvested in annual hunts

White-Tailed Deer

The sixteenth annual reservation deer hunt managed by the Department of Energy and the Tennessee Wildlife Resources Agency was held in the final quarter of 2000. From the total of 370 animals harvested, five were confiscated because beta-particle activity in the bone was more than established release limits. The remaining deer had an average field-dressed weight of about 87 pounds. Because about 55 percent of the dressed weight is edible, the average deer had about 47.8 pounds of edible meat. The dose for a person consuming an average-weight deer from the Reservation was about 0.15 millirem.

Surface water sampling is performed in streams, reservoirs, and public water intakes

Surface Water

Surface water is another pathway for contaminants to move from the Oak Ridge Reservation into public or private areas. Water that is discharged from the Oak Ridge Department of Energy facilities directly into lakes and streams is called effluent discharge. The Tennessee Department of Environment and Conservation regulates effluent discharges. Each of the three major sites has a distinct permit for water discharges.

Surface water from 22 locations on and around the Reservation is analyzed to compare with Department of Energy action levels and with the quality of local background water to detect any potential contaminant releases. Programs for water quality testing involve analyses for metals, industrial chemicals, radioactive compounds, and inorganic as well as organic compounds.

Based on samples taken from surface water (even though not all sampling locations are drinking-water sources), the dose to individuals from drinking that water could have been between 0.4 and 1.03 millirem (based on an assumed annual consumption of 730 liters of river water). The highest dose occurs downstream from the Oak Ridge National Laboratory, where drinking water is not obtained. A person who drank untreated water, ate fish, and used the area for other purposes (e.g., swimming or boating) could have received a dose of between 0.05 to 2 millirem from radionuclides emitted from the Oak Ridge Reservation, and up to 2 millirem from background radiation. The dose from the Reservation is similar to background and does not exceed levels normally found in nature.

Air

Both effluent air and ambient air are sampled on the Oak Ridge Reservation. Effluent air flows from sources such as exhaust stacks. Ambient air is the air that exists in the surrounding area. Both radiological and nonradiological air emissions from certain buildings and specific plant sites are monitored.

In 2000 the air emissions for all permitted air emission sources at the three facilities on the Reservation were lower than the Tennessee Department of Environment and Conservation limits. The Tennessee Department of Environment and Conservation did not find any violations of air quality regulations at any facility during inspections of permitted emission sources.

The radiological and nonradiological ambient air monitoring programs for the facilities and for the Oak Ridge Reservation show that plant emissions do not significantly affect local air quality.

Milk

Milk is a potential exposure pathway for some airborne radionuclides, such as tritium, iodine, and strontium, which could be deposited on pasture grass eaten by dairy cows. A person who drank 310 liters (82 gallons) per year of milk collected from nearby dairy farms could have received a dose of between 0.05 and 0.08 millirem.

Canada Geese

Canada Geese are not harvested from the Oak Ridge Reservation, but there are hunts in adjacent areas. In June 2000, 77 Canada Geese were rounded up and screened for radioactive contamination from areas on the reservation near known contamination sources. None of these geese had to be kept because of radiation, and they were all released.

The maximum effective dose to a person who consumed a goose with the maximum concentrations is approximately 0.09 millirem. If one person consumed two entire geese, the effective dose equivalent would be about 0.2 millirem.

Community and Reservation Activities

Community Environmental Programs

Thirty volunteers led 271 people on nature rambles around the Reservation between March 4 and August 19, 2000, in conjunction with the 2000 Community Adventure Rambles Program. This program is sponsored by the Environmental Sciences Division at the Oak Ridge National Laboratory, the American Museum of Science and Energy, and the Oak Ridge National Laboratory's Office of University and Science Education.

Deer and Turkey Hunts

Deer hunts are held each fall on the Oak Ridge Reservation. The hunts were started in an effort to control the deer population and reduce the number of auto collisions with deer. The strategy has reduced road kills from 300 to around 150 per year while giving hunters a chance to harvest the game. The wild turkey population has grown in recent years, and hunts on the Reservation have been scheduled each spring since 1997.

Oak Ridge National Environmental Research Park

The Oak Ridge National Environmental Research Park, a 21,980-acre "outdoor laboratory" and biosphere provides a protected, biologically diverse land area for environmental research and education. It represents the eastern deciduous forest, having more than 1,100 species of plants and 315 wildlife species, some of which are federally or state-listed rare species. The area also plays a significant role as a breeding and nesting ground for migratory birds.

The park is an ORNL user facility, its outstanding biodiversity providing a foundation for ecological research and environmental studies. More than 700 individuals have conducted research in the Oak Ridge National Environmental Research Park User Facility in the last eight years. Users include students and faculty from more than 75 colleges and universities as well as participants from ORNL and other state and federal agencies.

Site Specific Advisory Board

The Oak Ridge Site Specific Advisory Board is a federally appointed citizens panel that provides advice and recommendations to the Department of Energy on its Oak Ridge Environment Management Program. The board is made up of as many as 20 members who reflect the diversity of gender, race, interests, and occupations of people living near the Oak Ridge Reservation. Members are appointed by the Department of Energy and serve on a voluntary, unpaid basis. Each meeting is open to the public, and any member of the public is encouraged to join, participate, and contribute a viewpoint. The Board maintains a site on the World Wide Web, where other information can be found: http://www.oakridge.doe.gov/em/ssab/.

An Interview with Leah Dever

We interviewed Leah Dever, Manager of Oak Ridge Operations for the Department of Energy, on October 22, 2001. This was a special opportunity for each of us to ask questions about issues in Oak Ridge that are important to us. Leah Dever is on call 24 hours a day, 7 days a week, yet she devoted a morning to this interview, which demonstrates her belief in the importance of this summary document as a means to communicate to the public about the Department of Energy activities.

The Department of Energy is a part of the executive branch of government, which is headed by the President. Spencer Abraham is currently the Secretary of Energy. The Department of Energy contributes to the welfare of the nation by supporting efficiency in energy use, finding energy sources, improving environmental quality, and helping to secure national defense. It is the Department of Energy's responsibility to clean up its environmental legacy, including the trash and waste that has accompanied activities on the Oak Ridge Reservation since production of the atomic bomb began.

When asked what her job typically involves, Ms. Dever replied that she attends meetings, spends hours on the phone, is constantly involved in decision making, travels back and forth from Washington, D.C., and communicates with the public. She said that the most important aspect of her job is strategic planning. Constant communication with the work force on where they're going, why, and how is needed. She tries to avoid getting caught up in the crises of the moment and to focus on long-term goals. Other important aspects of her job are building the morale of employees and making sure that contractors are doing the best job possible. The most difficult part of her job is the people part – she manages a diverse group. Coaching, training, and recognition of achievement consumes a great deal of time.

We asked Ms. Dever if Oak Ridge employees have been affected by recent events such as the declining economy and the terrorist attacks of September 11, 2001. She explained that a lot of Department of Energy and contractor employees have been laid off recently because of shrinking budgets, and that future layoffs are expected. Those not laid off are required to work longer shifts. In addition, as a result of the terrorist attacks in New York and Washington, D.C., security is much tighter on the Oak Ridge Reservation, causing added stress and the need for many employees to work extra hours. Oak Ridge, like the rest of the nation, is affected by current political and economic events.

We asked for a definition of "millirem" in high school terms. Ms. Dever defines a rem as a unit of measure (similar to a cup or teaspoon) for radiation doses. A millirem is one one-thousandth of a rem. Most people receive about 360 millirem each year from the sun, medical tests, and other natural sources. Department of Energy regulations allow their facilities to contribute another 100 millirem per year to members of the public. The limit for Department of Energy workers is 5 rem, but workers in Oak Ridge receive much less. When asked how much radiation it would take to kill a person, she discussed the differences in people that prevent scientists from being able to exactly quantify a fatal exposure. These differences include age, health condition, and use of drugs or cigarettes.

Growing Toward Success

The Department of Energy spends $650-$700 million annually on environmental management and cleanup in Oak Ridge. We questioned whether the Oak Ridge environment will ever be back to normal. Ms. Dever said that the Oak Ridge Reservation will never be back to the pristine conditions that existed before the Manhattan Project, but that steady improvements are being made. The Department of Energy will have facilities in Oak Ridge for the long term and will monitor remaining contamination levels. Radioactive wastes will decay over time, so continual improvements will be seen. She stressed that Oak Ridge is a safe place to live.

When asked what new projects are going on in Oak Ridge, Ms. Dever mentioned the Spallation Neutron Source, the world's second largest science project, construction of a new landfill, taking down buildings at the Oak Ridge National Laboratory and at the East Tennessee Technology Park, a new mouse house, and new building construction at the Oak Ridge National Laboratory.

We enjoyed interviewing Leah Dever. She is definitely an energetic spokesperson for the Oak Ridge Reservation. Her parting words of advice to us were to continually obtain more education throughout our entire lives and to have jobs that are fun and interesting to us.

Artwork by student artists: Chair in Garden – Morgan Harris and Wolf – Valerie Evans

Public Involvement and Participation

As part of its public involvement program, the Department of Energy held regular stakeholder meetings in 2000, where citizens were given updates and detailed information on environmental management work on the reservation. DOE also hosted numerous other workshops and public meetings. The latest information on environmental topics in Oak Ridge can be obtained on the World Wide Web.

http://www.energy.gov/ reaches the national DOE web site

http://www.oakridge.doe.gov reaches the DOE Oak Ridge Operations web site

http://www.ornl.gov/~dmsi/cip/cip.htm gives you the Comprehensive Integrated Plan for the Oak Ridge Reservation

http://www.bechteljacobs.com/facts/facts-or.htm gives you a list of fact sheets on each of the Oak Ridge environmental management projects

http://www.em.doe.gov/index4.html takes you to the national DOE environmental management web site

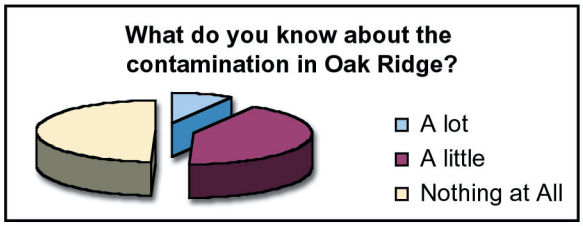
http://www.ornl.gov/emef/facts/public.htm provides public involvement information for the environmental management program in Oak Ridge

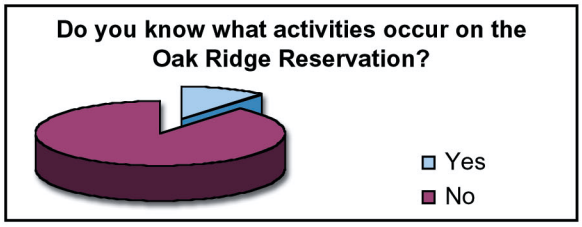
Artwork by student artists: Opossums – Casey Phillips; Swans – Danielle Dusina; Apple Still Life– Morgan Harris; and Shamrocks – Janelle Covert

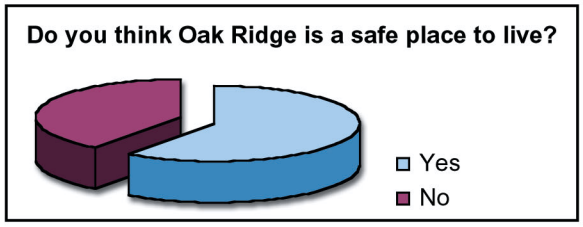
Student Survey

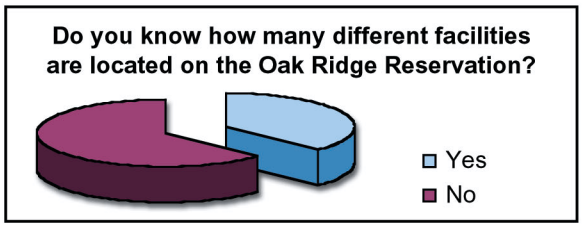
The students of Jennifer Webster's Fall 2001 Applied Communication class interviewed approximately 100 Karns High School students during the month of October to determine whether fellow students were aware of the Department of Energy's activities in nearby Oak Ridge.

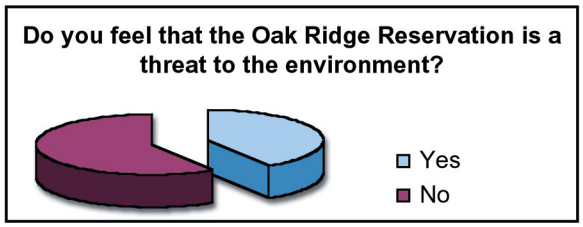
A list of questions was prepared and distributed to participants. We thought it was interesting that most of the students interviewed did not have significant knowledge about the Oak Ridge Reservation. See the charts below.

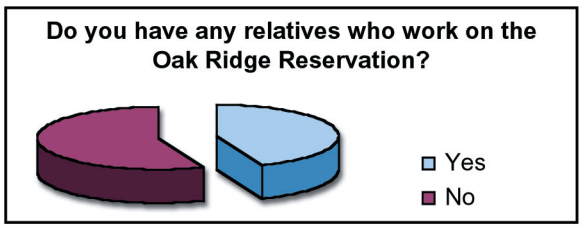


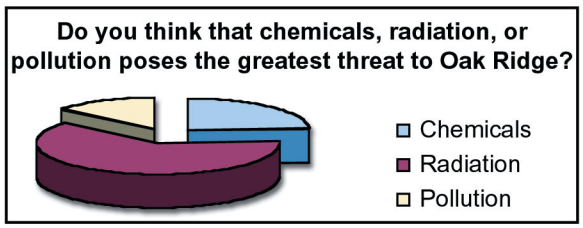


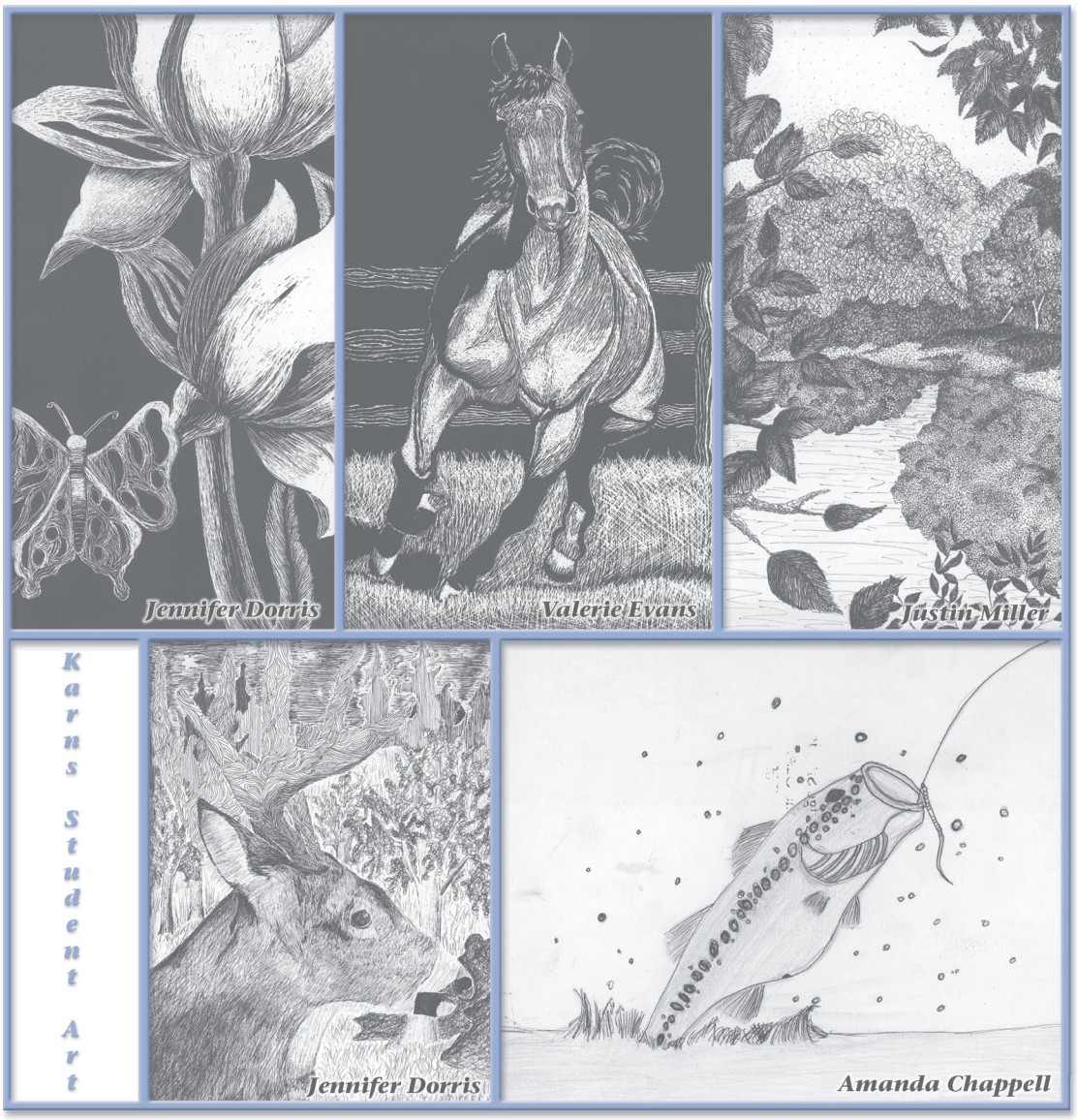












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