

**Tennessee Oversight Agreement
Status Report to the Public
Fiscal Year 2014**

**Tennessee Department of
Environment and Conservation**

Division of Remediation
Department of Energy Oversight Office

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This report was published
with 100% Federal Funds
under Grant Numbers
DE-EM0001620 and
DE-EM0001621

This report was produced by the Tennessee Department of Environment and Conservation, Division of Remediation,
DOE Oversight Office.

Cover Photo, Pink Lady's Slipper (*Cypripedium acaule*) is a member of the Orchid family and is found on the Oak
Ridge Reservation. (TDEC Photo)

Tennessee Department of Environment and Conservation, Authorization No. 327121
September 2014

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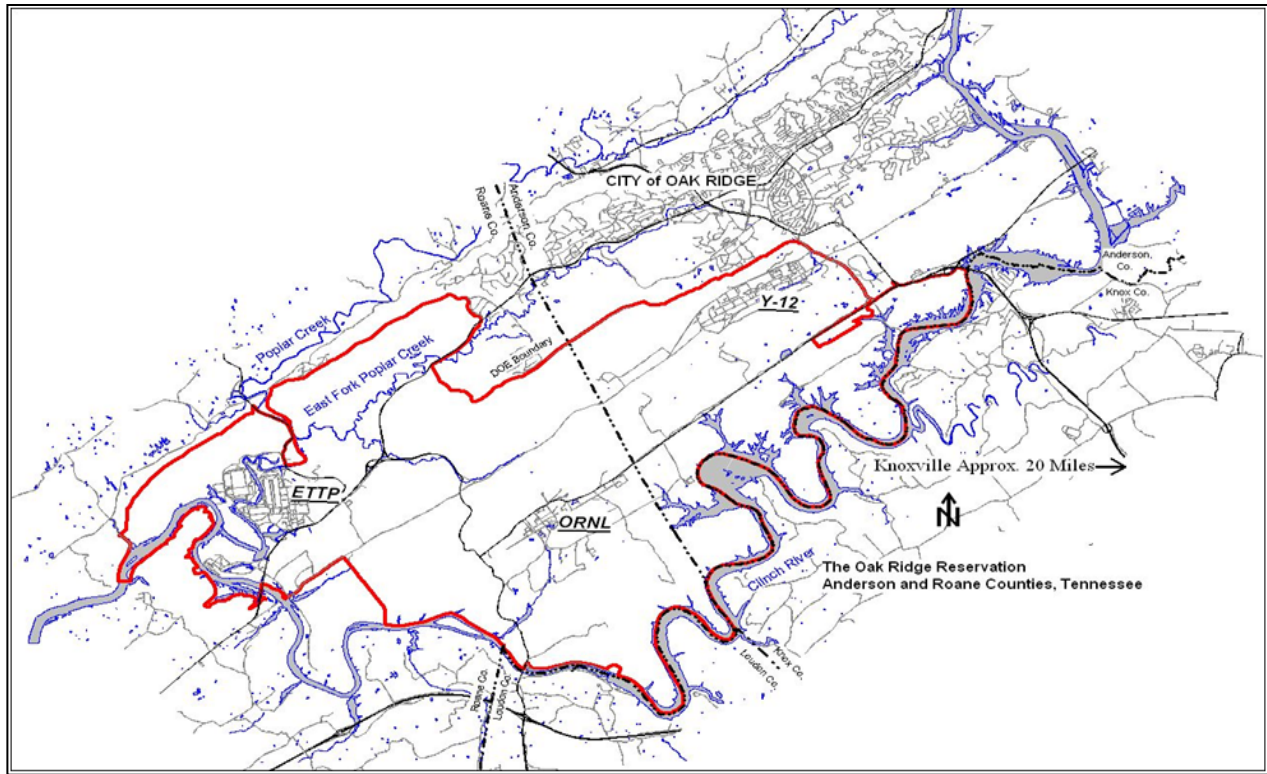
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Acronyms

BCK	Bear Creek Kilometer
BORCE	Black Oak Ridge Conservation Easement
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
COC	Contaminant of Concern
D&D	decontamination and decommissioning
DOE	U.S. Department of Energy
DOE-O	Department of Energy Oversight Office
DOE-ORO	Department of Energy Oak Ridge Operations
EFK	East Fork Poplar Creek Kilometer
EMWMF	Environmental Management Waste Management Facility
EPA	U.S. Environmental Protection Agency
ERSP	Environmental Remediation Sciences Program
ETTP	East Tennessee Technology Park
FFA	Federal Facilities Agreement
FFCA	Federal Facility Compliance Act
FY	fiscal year
GPS	Global Positioning System
GW	Groundwater
HAPs	Hazardous Air Pollutants
HFIR	High Flux Isotope Reactor
HVAC	Heating ventilation and air conditioning
ITRC	Interstate Technology and Regulatory Council
LEFPC	Lower East Fork Poplar Creek
Linac	Linear Accelerator
LLW	Low Level Radioactive Waste
LWBR	Lower Watts Bar Reservoir
M&O	Monitoring and Oversight
m ³	cubic meters
MCL	Maximum Contaminant Level
mg/L	milligrams per liter
mrem	millirem
MSRE	Molten Salt Reactor
NA	Not Available
NEPA	National Environmental Policy Act
NGA	National Governors Association
NNSA	National Nuclear Security Administration
NPDES	National Pollutant Discharge Elimination System
NRDA	Natural Resource Damage Act
NTU	Nephelometric Turbidity Units
ORELA	Oak Ridge Electron Linear Accelerator
ORNL	Oak Ridge National Laboratory
ORR	Oak Ridge Reservation
ORRCA	Oak Ridge Reservation Communities Alliance
PCB	polychlorinated biphenols
pCi/g	picocuries per gram
PRG	Preliminary Remediation Goal

RCRA	Resource Conservation and Recovery Act
RMO	Radiation Monitoring Oversight
ROD	Record of Decision
RPM	Radiological Monitoring Portal
SNS	Spallation Neutron Source
SSAB	Site Specific Advisory Board
STP	Site Treatment Plan
T&E	Threatened and Endangered Species
TDEC	Tennessee Department of Environment and Conservation
TEMA	Tennessee Emergency Management Agency
TMI	Tennessee Macroinvertebrate Index
TOA	Tennessee Oversight Agreement
TRU	Transuranic
TSCA	Toxic Substances Control Act of 1976
TVA	Tennessee Valley Authority
TWPC	TRU Waste Processing Center
TWQC	Tennessee Water Quality Criteria
TWRA	Tennessee Wildlife Resources Agency
UEFPC	Upper East Fork Poplar Creek
WAC	Waste Acceptance Criteria
WIPP	Waste Isolation Pilot Plant

Summary and Purpose



Major features of the Oak Ridge Reservation area (TDEC map)

The United States Department of Energy (DOE) Oak Ridge Reservation (ORR)

The ORR is located almost entirely within the corporate boundaries of the City of Oak Ridge, Tennessee, and straddles the line between Anderson and Roane counties. To the north and east lie residential areas of the City of Oak Ridge and the Clinch River bounds the ORR on the south and west. Counties adjacent to the Reservation include Knox and Loudon. Meigs and Rhea counties are downstream of Roane County on the Tennessee River. The nearest cities are Oak Ridge, Oliver Springs, Kingston, Lenoir City, Harriman, Farragut, and Clinton. Knoxville is the nearest major metropolitan area and lies approximately 20 miles to the east.

The state of Tennessee, through the Tennessee Department of Environment and Conservation's (TDEC) Division of Remediation, DOE Oversight Office, monitors the area to ensure that there is no threat to public health and the environment from DOE's activities on the ORR. In addition, division staff oversee DOE's cleanup of contamination resulting from decades of nuclear weapons production and other site missions.

Overall Conclusions

TDEC Monitoring results from the year 2013-14 showed no unacceptable risk to the public. DOE has made efforts to improve the overall health of the public and the environment. There are still significant sources of contaminants that could be released as a result of engineering and/or administrative control failure. Additionally, sources of gamma radiation exposure that still exist must be effectively isolated from the public. The probability of offsite groundwater contamination is also a concern that is being addressed. Mercury in water exceeds standards for protection of aquatic life in East Fork Poplar Creek and originates from the stream and floodplain and not just sources in Y-12. Monitoring indicates potential issues with EMWMF that has inferences to new disposal development. Technetium-99 contaminated storm water was detected at a local sewage treatment plant and in storm water leaving ETTP. It is necessary and prudent for the state and DOE to continue monitoring efforts in order to detect and evaluate, as early as possible, potential releases and radiation that could affect the public. The state considers these factors in helping to manage cleanup with DOE and the U.S. Environmental Protection Agency (EPA).

Regulatory Programs

Tennessee Oversight Agreement (TOA)

In 1991 the State of Tennessee and DOE signed the TOA, and TDEC created the office to carry out its responsibilities under the agreement. The TOA provides a framework and funding for the state to oversee DOE's impact on the community in four ways: (1) a regulatory program to support state participation in the Federal Facility Agreement (FFA); (2) a non-regulatory program of independent environmental monitoring and oversight; (3) an emergency response program; and (4) an outreach program to increase public awareness and involvement. Figure 1 shows the organizational structure of the Department of Energy Oversight Office.

Federal Facility Agreement (FFA)

The state, DOE, and the EPA ratified the FFA in 1992. It provides a legal framework allowing this office to enforce DOE cleanup of contamination from past ORR activities. The FFA outlines procedures for investigation of problems, scheduling of activities and implementation and monitoring of appropriate responses. Actions taken under the FFA conform to Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), the Resource Conservation and Recovery Act of 1976 (RCRA), and other federal and state laws.

The National Environmental Policy Act of 1969 (NEPA) applies to proposed federal actions that could significantly affect the human environment, requiring federal agencies to consider environmental impacts and provide for public review and comment. DOE is required to incorporate NEPA values into CERCLA actions on the ORR.

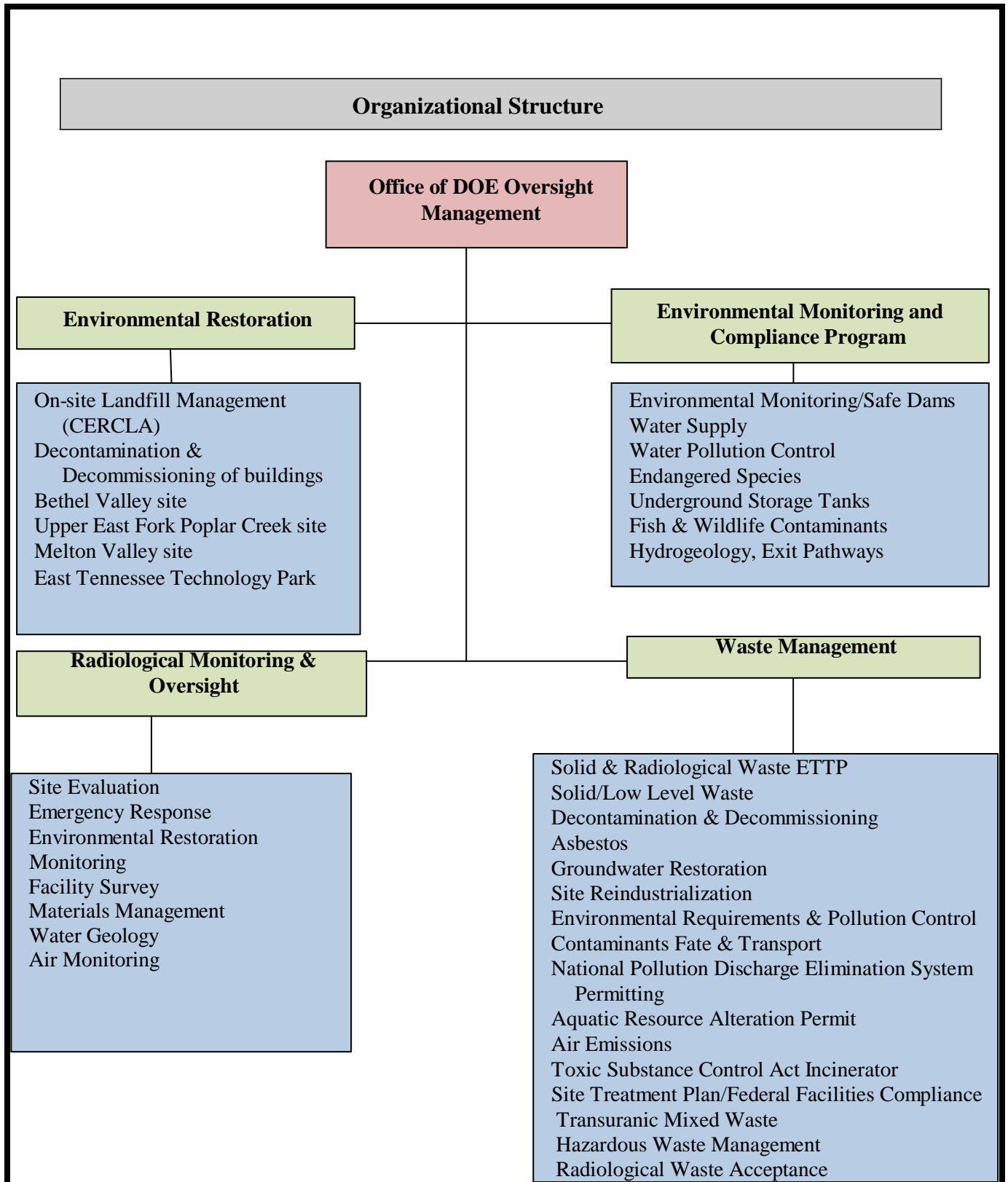


Figure 1: Organizational Structure of the DOE-O Office

Key Products and Services

The Tennessee Oversight Agreement provides for comprehensive and integrated monitoring and surveillance for all media (i.e., air, surface water, soil, sediments, groundwater, drinking water, food crops, fish and wildlife and biological systems) and better public understanding of issues involving the Oak Ridge Reservation. The emissions of any pollutants (hazardous, toxic, chemical, radiological) from DOE operations on the Oak Ridge Reservation and surrounding environment are monitored and evaluated. This agreement allows the state to oversee radiological materials that are otherwise exempted from external regulation by the Atomic Energy Act.

DOE-O ensures that clean-up activities scheduled at DOE-ORR are implemented as scheduled. Enforcement is used as needed including assessment of stipulated penalties. The state participates in, and initiates when necessary, resolution of disputes as provided in the FFA and works with the parties involved to resolve disputes as expediently and efficiently as possible. The office also serves as the state natural resource trustee representative for the DOE-Oak Ridge National Priority List site, investigating natural resource injuries and determining monetary damages in accordance with the Natural Resource Damage Assessment Act (NRDA).

The Federal Facilities Compliance Act (FFCA) Site Treatment Plan mandates that the department promptly review each deliverable submitted by DOE for the characterization and treatment of legacy mixed waste. Reviews result in approval, conditional approval, or disapproval of waste characterization packages and treatment schedules. Disapproval comments are provided to DOE for correction of deficiencies

Workload Management

DOE-O regularly reviews program workload, including progress in completion of annual work plan activities. Staff resources are distributed based on overall office workload. DOE-O management meets routinely to discuss workloads and staffing patterns. Staffing resources are utilized across program boundaries when necessary to achieve a goal or complete a work project.

Internal Controls

DOE-O develops an annual budget based on its work plan each year. The budget for the work plan is determined with funding levels provided by DOE in TOA grants. The work plan includes the costs for personnel along with administrative costs such as equipment, rent, utilities, communications, travel, etc. Staff members are required to complete *Time and Activity Reports* daily. At the end of each pay period (twice monthly), time is entered into the state's computer system (Edison). DOE-O uses this information and reviews of monthly expenditure reports from the Division of Fiscal Services to make informed decisions about expending revenue. This includes decisions about hiring, travel and training. The goal each year is to insure that DOE-O expenses do not exceed revenue.

Challenges & Issues

1. Consistent annual funding required for the continuous and effective cleanup of the DOE Oak Ridge Reservation
 - a. DOE's inability to provide necessary funding for continuous and effective environmental restoration at DOE-ORR has required TDEC and EPA to accept an extended cleanup schedule. Continuous physical onsite remedial action is required by CERCLA; and
 - b. DOE-O needs assistance from local, state and federal representatives to ensure that DOE conducts an effective cleanup of the Oak Ridge Reservation.
 - c. DOE-ORO and DOE-Headquarters must request the funds necessary to perform the environmental investigations and cleanup activities on the Oak Ridge Reservation from Congress as stipulated in the FFA
2. Mercury in Lower East Fork Poplar Creek water and fish is likely from the stream itself and not just from sources up in the Y-12 plant. A more comprehensive solution is necessary than just mercury treatment in Y-12.
3. Complicated hydrogeology at EMWMF creates questions for a proposed new disposal facility. Deep groundwater may be an off-site exposure pathway. Development of near and long term strategies is necessary.
4. Maintaining environmental response capabilities to react to onsite and offsite releases when emergencies occur on the Oak Ridge Reservation. DOE-O assists TEMA by participating in environmental response exercises and responses to site emergencies to prevent/minimize radiological, chemical or physical hazards from these releases.

Annual Budget & Program Staffing FY 14

1. DOE Oversight Annual Funding

Funding Source	Funding Amount (\$)
State General Funds	0
DOE M&O Grant	1,959,000
DOE FFA Grant	2,938,300
Environmental Protection Fees	0
STP Review, Cost Recovery*	39,493
Total Budget	4,936,793

*Billed to SWM and reimbursed by DOE, typically

2. Program Staffing

Program Area	Positions (filled)
Administration	5 (4)
Monitoring and Oversight	16 (13)
FFA	23 (20)
NRDA staff*	1 (1)
Total*	44 (37)

*Includes one NRDA Staff Person (EPM2) that works for the office of general council

Tennessee Oversight Agreement Activities

MONITORING ON THE OAK RIDGE RESERVATION (ORR) AND ENVIRONS

Biological Sampling

Stations/oversight	Number	Met Criteria
Benthic Macroinvertebrates ^a	20	9
Periphyton (Diatoms) ^b	5	2
Aquatic Vegetation ^b	22	14
Geese Roundups, Rad ^c	1	1
T&E Surveys ^a	6	6
Deer GPS Tracking ^{a,e}	17	15
Deer Hunts ^d	2	1
Turkey Hunts ^d	2	2
Total	66	43

a - Met ecological protection (non-impaired) criteria

b - >2X background as compared to a reference station.

c - One or more captured geese failed the administrative release limit of 5 pCi/g.

d - One or more harvested animals failed the administrative release criteria of 20 pCi/g bone tissue and/or 5 pCi/g for the whole body count.

e- Successful deployment/recovery of GPS collar and evaluation of tracking and samples. Two deer had elevated contaminants in hair.

Benthic Macroinvertebrate Monitoring

The biotic integrity of impacted streams on the Oak Ridge Reservation is less than optimal compared to reference conditions. Of all sites sampled during 2013, two headwater locations, BCK 12.3 and EFK 25.1, received the lowest Tennessee Macroinvertebrate Index (TMI) scores and ratings, non-supporting (TMI < 10, D rating and partially supporting/moderately impaired (TMI = 18-20, C rating) respectively. Each headwater stream continues to receive impacts (i.e., metals, nutrients) from within the confines of the Y-12 Plant. The remaining ORR stream sites had biological condition ratings of partially supporting systems with slight to moderate impairment. Surface water sampling results indicate that mercury continues to be persistent in East Fork Poplar Creek; elevated nutrient concentrations, uranium and strontium, and high conductivity continue to persist in upper Bear Creek, and elevated gross alpha, gross beta, plus mercury and nutrients persist in White Oak Creek.

Future benthic monitoring will test for the potential confounding perturbations associated with tributary outfall into Bear Creek associated with the EMWMF waste cell operations. Ongoing CERCLA remedial activities on the ORR continue to have an impact on the aquatic biological communities in East Fork Poplar Creek, Mitchell Branch, the White Oak Creek watershed and Bear Creek. Future benthic monitoring should capture temporal and spatial changes by documenting changes in the macroinvertebrate communities on the ORR.

A searchable database (Microsoft® Access 2010) of all 2010-2014 benthic taxa collected and identified from ORR streams is available upon request.

Periphyton Monitoring

The Periphyton (Diatom and non-Diatom algae) program collected 25 samples in FY2013 at five locations along Bear Creek (BCK) and its northern tributaries 3, 4 and 5. The periphyton stream survey is used to analyze and develop scores to generate a biological index value for comparison of impacted stream sites to a reference.

Diatom taxa responded to impacts in Bear Creek by exhibiting increasing relative abundance and distributions of pollution-tolerant diatoms in the upper BCK sites. In contrast, pollution-sensitive diatoms became more dominant and increased their relative abundance at the downstream sites which compared well with the reference stream data.



Gerry Middleton and John Wojtowicz segregate benthic macroinvertebrates after collection. (TDEC photo)

Aquatic Vegetation

Aquatic Vegetation is monitored from springs, wetlands, and streams on the Oak Ridge Reservation. The aquatic vegetation sampled (such as watercress, and cattails) is then analyzed for radiological contaminants. While the likelihood of human consumption is remote, there is a definite potential for contaminated vegetation to be consumed by wildlife and for the contaminants to bioaccumulate in them, creating both ecological and potential human health risks. In 2013, 14 of the 22 vegetation samples met sampling criteria for gross alpha and gross beta contamination. Three sites had levels of gross alpha and gross beta greater than twice the background levels. Four other sites had levels of gross beta and one site measured levels of gross alpha activity greater than twice the background levels. Analysis of metals (mercury, uranium, and strontium) was added during 2013. Most of the sites sampled had known or suspected contamination.



DOE-O staff member collects vegetation for sample analysis.
(TDEC photos)

Goose Roundup

During the annual roundup, the Department of Energy (DOE), Oak Ridge National Laboratory (ORNL) Environmental Protection and Waste Services, ORNL Analytical Chemistry Division, ORNL summer interns, university staff and graduate students, and Tennessee Wildlife Resource Agency (TWRA) staff form field teams to capture geese on the ORR and perform whole body screenings on them to determine if the birds are radioactively contaminated.

During the June 2014 roundup, 17 geese were captured and none were retained that exceeded the game release limit (ORNL 1998). Geese were captured at the following locations:

- Sewage treatment ponds (Oak Ridge National Laboratory)
- K-29 pad (ETTP)

All captured geese were transported and relocated to an offsite TWRA wildlife management area in Greene County, Tennessee. Since none of the birds analyzed showed signs of contamination, no additional offsite sampling was conducted by DOE-O staff.

Bat Population Monitoring

The detections of both federally-endangered bats (i.e., Gray bat, Indiana bat) provide significant new information to our knowledge of species present on the ORR. Additional acoustic studies are needed to further characterize ORR bat communities for future environmental assessments

and ecological studies. High quality Indiana bat roosting habitat on the ORR should be identified and monitored periodically (Mitchell and Martin 2002).



Left, a Pipistrelle bat is seen in Cherokee Caverns near the Oak Ridge Reservation. Right, a bat (photographed in time lapse) in flight over the Oak Ridge Marina. (TDEC photos)

Threatened and Endangered (T&E) Species Surveys

There remains botanical fieldwork to be completed on all 3000 acres of the Black Oak Ridge Conservation Easement, particularly to map additional rare habitat and associated plant communities, and to document exotic pest-plant invasions. TDEC DOE-O staff will continue to report new rare plant findings to the Resource Management Division, (Natural Areas Program and Natural Heritage Inventory Program) and to the TWRA, and to provide field support as needed. The 2013 TDEC DOE-O field staff re-surveyed and characterized sections of the BORCE exhibiting rich diversity of species observed on woodland trails (i.e., Big Oak trail, Gallaher trail, McKinney Ridge trail, Twisted Beech trail, Dove trail, Gray Fox trail) and off-trail areas. A total of 38 species were identified including 12 ferns, one tree (American chestnut sprouts), three shrubs, and 22 herbaceous plants. Of these, nine are state-listed species and one is federally-listed. Thus the majority of plants that were documented during 2013 are non-T&E species, but collectively represent the tremendous importance of floral diversity present on the ORR.

Deer GPS Tracking

The goal is to determine their home range and potential movements outside their home range. The scientific literature provides considerable evidence that wildlife (i.e., carnivores, herbivores, omnivores, piscivores), subsisting in habitats impacted by industrial pollution, are ingesting environmental contaminants from their respective food chains. Tracked deer sometimes traveled miles outside home ranges. Two deer exhibited elevated metals in hair samples.

Office staff monitored results from two fall deer hunts. Two weekend deer hunts were conducted in 2013, 256 deer were harvested one deer was retained due to internal radiological contamination. One Oak Ridge deer hunt was canceled because of a security breach at Y-12. There are normally three weekend hunts each fall.



Gerry Middleton uses a radio receiver to track the deer with the GPS tracking collar. (TDEC photos)

The office monitored results from the turkey hunts. TWRA conducted weekend turkey hunts in 2013, 49 turkeys were harvested and none were retained for internal radiological contamination.



Wild Turkey on the DOE Oak Ridge Reservation, (TDEC photo)

Drinking Water Sampling

Stations	Number	Met Criteria
ORR Potable ^a	4	4
RadNet, utility drinking water	5	5
Total	9	9

a - Rules for Public Water Systems - TDEC 1200-05-01

In the Oak Ridge area, EPA’s RadNet Drinking Water program provides radiochemical analysis of finished drinking water collected quarterly from five local water systems by division air and water staff. These are sampled to determine if contamination from the Oak Ridge Reservation is impacting the water supplied by public water utilities. Results for the five local water treatment facilities in the program have all been well below applicable drinking water standards for the multiple radionuclides analyzed in this project.



Collecting a RadNet Drinking Water sample from a local utility (TDEC photo)

The ORR potable water program conducts monthly and non-routine inspections of the potable water distribution system. Thirteen samples were collected and all samples were compliant with TDEC Rules for Division of Water Supply, Public Water Systems (1200-05-01).

Surface Water

Stations	Number	Met Criteria^a
Ambient Surface Water Sampled	10	9
Physical Field Parameters	7	5
Benthic Macroinvertebrates, chemicals	19	14
Rain Event	1	NA
EMWMF	11	10
Sediment Grab ^{b(c)}	11	11 (6)
Sediment Trap ^{b(c)}	1	1 (0)
Total	60	50

a - Tennessee Water Quality Criteria (TWQC) - TDEC 1200-04-03
b - DOE Recreation Preliminary Remediation Goals (PRG)
c Probable Effects concentration for toxicity to aquatic invertebrates

Ambient Surface Water Monitoring

The 2013 ambient surface water final results indicated that very low concentration levels of *arsenic*, *mercury*, and *strontium-90* were present in the Clinch River tributaries. These low-level Contaminants of Concern (COC) values compare very well to historical data. None of the non-radiological COC results were greater than the TWQC, except for the fall event *Clinch River Mile 78.7 dissolved oxygen* result which was less than the TWQC dissolved oxygen limit (>5.0 mg/L). None of the radiological COC results were greater than DOE Preliminary Remediation Goals (PRG). There are no TWQC for radiological compounds.

For the surface water physical parameters, other than the low pH and dissolved oxygen values observed in Bear Creek and Mitchell Branch, the remaining data was in control relative to Tennessee water quality criteria for the parameters observed at the seven monitoring stations on the ORR. The low dissolved oxygen values in both Bear Creek and Mitchell Branch remain a concern. In addition, the elevated conductivity values observed in Bear Creek are also of concern. As legacy DOE ORR pollution has negatively impacted East Fork Poplar Creek, Bear Creek, and Mitchell Branch, continued physical parameter monitoring is justified and needed at the seven monitoring creek stations.

Along UEFPC, continuous monitoring of the physical parameters revealed the effects that augmentation water have on the stream. The office continues to monitor the stream to determine if fish kills or other discharges at Y-12 can be identified with continuous monitoring.

Benthic Macroinvertebrate Surface Water Monitoring

The Benthic Macroinvertebrate Surface Water Monitoring program is performed in conjunction with the benthic macroinvertebrate survey. Water samples are collected and analyzed to determine the stressors for the macroinvertebrates. The water samples are compared to the TWQC. Mercury levels exceeded the TWQC in all five East Fork Poplar Creek sample locations.

Rain Event Surface Water Monitoring

The Rain Event Surface Water Monitoring program was not conducted in 2013 but has been restarted in 2014. One qualifying rain event occurred in April and water was sampled. The complete results were not available as this report was being compiled.

Environmental Management Waste Management Facility Surface Water Monitoring

The Environmental Management Waste Management Facility (EMWMF) was constructed to dispose of waste generated by remedial activities on the ORR and thus contains a variety of hazardous substances, including various radionuclides. In accordance with the Tennessee Oversight Agreement, which requires the state to provide monitoring as needed to verify DOE data and assess the effectiveness of DOE contaminant control systems on the ORR, the effluents of the site are sampled when deemed necessary. In addition, staff visits the site at least twice weekly to monitor basic water quality parameters and operations. The pH level was observed above criteria at the sediment basin outfall.

Ambient Sediment Monitoring

The Sediment Monitoring program collected seven sediment grab samples located on the Clinch River and some of its tributaries that are considered potential exit pathways. The sediment samples were compared to DOE Preliminary Remediation Goals (PRGs). No compounds exceeded DOE PRGs.

Trapped Sediment Monitoring

The Trapped Sediment Monitoring program captures sediments that are actively being transported in the river. Of the three traps one sediment trap contained enough sediment for analysis. The sample was analyzed for metals and radiological compounds and compared to DOE PRGs. No compounds exceeded DOE PRGs. Probable Effects Concentrations for aquatic toxicity was exceeded for mercury at East Fork Poplar Creek Mile 6.3.



Robert Storms records water quality parameters before he collects a water sample from the EMWMF V-weir/outfall. (TDEC photo)

Groundwater Sampling

Stations	Number	Met Criteria*
Springs	2	1
Monitoring Wells	3	1
Residential Well GW ^b	8	7
Total	13	9

*Groundwater Criteria is EPA (MCL) Maximum Contaminant Levels)



Eddie Worthington collects water parameters prior to collecting samples at a residential well offsite. (TDEC photo)

Two springs and three monitoring wells were sampled for DOE-related contaminants. One spring and one well met criteria. As of this writing not all of the data has been received and no determination for the one spring can be made. The monitoring wells are offsite, on TVA property, and were sampled as a result of a TVA aquifer pump test.

Eight (8) residential water wells were sampled with only one well completely meeting all drinking water standards. The only exceedance of an EPA MCL was for turbidity (>5 NTU) in one well. In all wells there were exceedances of National Secondary Drinking Water Regulations (Secondary Standards). The EPA Secondary Standards are non-enforceable guidelines that may cause aesthetic or cosmetic effects in drinking water.

Air Quality Sampling

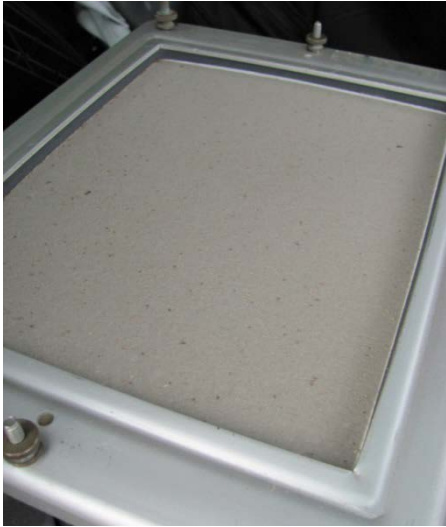
	Stations	Number Met Criteria*
HAPs**	3	0
RadNet Air	5	5
Fugitive	8	8
RadNet Precipitation	3	3
Total	19	16

*For hazardous air pollutants or radionuclides.

**If assume chromium is hexavalent only. This is a conservative way to evaluate data. Most chromium in the environment is not hexavalent. Results are well below the risk specific guidelines for chromium III, and the chromium analysis does not distinguish between the two common oxidation states of chromium (III and VI).

Hazardous Air Pollutants

The results of the 2013 HAPs monitoring conducted by TDEC at three stations (ETTP, ORNL and Y-12 sites) do indicate possible elevated levels of chromium VI at all locations throughout much of the year, assuming it was entirely hexavalent chromium. Results are well below the risk specific guidelines for chromium III, and the chromium analysis does not distinguish between the two common oxidation states of chromium (III and VI). This is a conservative way to evaluate data. Most chromium in the environment is not hexavalent. Due to the continuing reduction in permitted sources on the ORR and the completion of the demolition of the K-25 building at ETTP, this project will be on hiatus until other major demolition projects on the ORR are initiated or other potential sources of hazardous air pollutants are identified.



Air filter used in HAPS monitoring

RadNet Air Monitoring

Particulate air samples are collected twice weekly at five RadNet Air monitoring stations on the Oak Ridge Reservation and analyzed for radioactive contaminants at the EPA's National Air and Radiation Environmental Laboratory in Montgomery, Alabama. In 2013, all five sites sampled met the designated criteria.



RadNet sample media being collected for shipment to EPA labs. (TDEC photos)



Fugitive Air Sampling

Eight high-volume air samplers comprise the fugitive air monitoring program. Four samplers are mounted on trailers and three are on non-mobile mounts to monitor fugitive/diffuse sources of radioactive air emissions. The other is at Fort Loudoun Dam and serves as a background station. Since four samplers are mobile, the units can be placed near sites where contaminants might be released (e.g. due to building demolition or remedial activities) on short notice. The three non-mobile mounted samplers could be moved with slightly longer lead times. The data from the samplers is compared to the background station and standards provided in the Clean Air Act. All seven monitored locations and the background site were in compliance in FY2014.



A Fugitive Air Monitoring Sampler on the right with the remaining section of the K-25 building in the background. The rest of the K-25 building has since been removed. (TDEC photo)

RadNet Precipitation

The RadNet Precipitation monitoring program analyzes monthly composite precipitation samples from three stations on the Oak Ridge Reservation. Analysis of the samples measures radiological contaminants that are washed out of the atmosphere and carried to the earth's surface by precipitation. There are no standards that apply directly to contaminants in precipitation, but the data can provide an indication of the presence of radioactive materials that may not be evident in particulate analysis. This project uses RadNet precipitation data throughout the United States for reference, as well as drinking water limits. All three sites met sampling criteria in 2013.



Collection of a precipitation sample in Melton Valley at ORNL

Radiological Monitoring

Stations/events	Number	Met Criteria*
Real Time Gamma	6	6
Haul Road Survey	52	52
Environmental Dosimetry	141	123**
Transportation	0	NA
Facility Surveys	4	4
Surplus Sales	0	0
Total	209	186

* Contamination not present and exposure pathways below criteria.

** Criteria is 100 mrem/year (allowable dose to members of the public). None of the areas that exceeded criteria were accessible to the public.

Real Time Gamma

Gamma radiation is emitted by various radionuclides that have been produced, stored and disposed of on the ORR. The office deploys continuously reading gamma exposure rate monitors at locations on the ORR where exposure rates are expected to fluctuate over relatively short periods of time. These monitors record gamma radiation levels at predetermined intervals over extended periods, providing an exposure rate profile that can be correlated with changing environmental and/or man-made conditions. Some sites are downloaded weekly while others are downloaded monthly, depending on the type of site being monitored. In FY14, the office monitored five sites plus background. All sites were in compliance.



Gamma tracer monitoring the Molten Salt Reactor Experiment (MSRE) at ORNL (TDEC photo)

Haul Road Radiological Surveys

The Haul Road was constructed for, and is dedicated to, trucks transporting CERCLA radioactive and hazardous waste from remedial activities on the ORR to the Environmental Management Waste Management Facility in Bear Creek Valley for disposal. To account for wastes that may fall or be blown from the trucks in transit, office personnel perform walk over inspections of this road and associated access roads weekly. Items noted are surveyed for radiological contamination, documented, and their description and location submitted to DOE for disposition. During FY14, a number items were noted that had potentially fallen from trucks transporting waste to the EMWMF, but none exhibited radioactivity in excess of free release limits and all were removed expeditiously after being reported to the Department of Energy.



David Foster conducts a radiological survey of the EMWMF haul road. (TDEC photo)

Ambient Gamma Radiation Monitoring using Environmental Dosimetry

In order to assess the risks posed by radioactive contaminants on the ORR, the division began monitoring ambient radiation levels on and in the vicinity of the reservation in 1995. The program provides conservative estimates of the potential dose to members of the public from exposure to external radiation attributable to DOE and baseline values for measuring the need and effectiveness of remedial activities. In this effort, environmental dosimeters were placed at 141 locations on and in the vicinity of the ORR in 2012, collected and processed quarterly, and the quarterly results compiled to derive the annual dose over the year for each location. The annual dose for each location was then compared to background values, previous results, and the state dose limit for members of the public of 100 mrem/year. It should be noted, the annual dose for the monitoring locations represents the total dose of radiation an individual would receive, if he remained at the location twenty-four hours a day for a year. Since this is unlikely on the reservation, the actual dose to any individual would be expected to be a fraction of the annual dose reported for the stations. Of the 141 sites monitored in FY14, twenty-two locations (twenty-one at ORNL and one at Spallation Neutron Source) exceeded the 100 mrem/year standard used to evaluate the results.



Environmental Dosimeter used to monitor quarterly dose at each location

Facility Survey and Infrastructure Reduction Program

The primary objectives of the Facility Survey Program of DOE-O is to investigate and inform citizens and local governments of the physical condition and, the past and present-day potential for release of chemical and radiological contaminants from facilities to the environment on the Oak Ridge Reservation. This information is also incorporated into local emergency preparedness planning. Four facilities were surveyed and none were found to have a potential to release contamination to the environment.



David Foster measures the radioactivity during a facility survey (TDEC photo)

Survey of Surplus Materials Released to the Public

DOE conducts online and onsite auctions of surplus materials to the public. These materials range from furniture to shop equipment to vehicles. Some materials, such as scrap metal, may be sold under annual sales contracts. Other materials are staged at various sites around the ORR awaiting public auction or sale. Staff from the office's Radiological Monitoring and Oversight (RMO) Program review radiological control procedures to ensure that DOE and its contractors follow guidelines for release of these materials to the public. Office staff members conduct random, onsite radiological surveys before these materials are dispositioned. These surveys are part of the division's larger radiological monitoring role on the ORR. Scrap metal sales at ORNL and Y-12 and procedures for release are also monitored under this program. Surplus Sales have been suspended due to an accident loading a purchased piece of equipment. Personnel will continue to conduct radiological surveys when sales resume.



John Wojtowicz scans a surplus desk to verify that DOE is following proper radiological control procedures (TDEC photo)

EMWMF Radiation Portal Monitor

Only radioactive waste with concentrations below limits imposed by wastes acceptance criteria (WAC) agreed upon by FFA parties are authorized for disposal in the EMWMF. To help ensure compliance with the WAC, the state has placed a Radiation Portal Monitor (RPM) at the check-in station for trucks transporting waste into the facility. As the waste passes through the portal, radiation levels are measured and transmitted to a secure web site, monitored by the office's RMO staff. When anomalous measurements are noted, EMWMF personnel are notified, the source and nature of the waste determined, and readily available information on the waste reviewed. If the preliminary review fails to account for the elevated results, the information is submitted to the office's waste audit team for further investigation and disposition.

ORNL Neutron Sciences, Spallation Neutron Source (SNS) and High Flux Isotope Reactor (HFIR)

Neutrons are produced for experimental purposes at ORNL to do materials research and sample analysis. SNS uses a linear accelerator (linac) to produce neutrons by mercury spallation; HFIR uses a nuclear reactor to produce neutrons by uranium fission.

The newest of ORNL's neutron sources is SNS, a linear hydrogen ion accelerator with a liquid mercury target fully commissioned in 2006. Construction materials in the linac, proton accumulator ring, beam dumps, and target become activated by protons or neutrons impacting on SNS confinement structures. Escaping protons can, to a lesser degree, activate soil berms that are placed for on top of the linac and accumulator ring for protective shielding. Air from around target components is filtered and released through a stack. TDEC monitors the ambient environment on the linac berms with environmental dosimeters and the stack with a gamma radiation logger. The berm and stack measurements indicate levels that are compliant with DOE orders and state regulations for radiation dose to the public. Indeed, the stack mounted gamma logger is able to track the operation of SNS closely as compared to the operational schedule and power levels. Long term monitoring will consider activation of berm soils and the potential for migration of activation products into groundwater. Specialized nuclear instruments to monitor muons (unstable nuclear particles) are being considered by the state. Relativistic velocities at high operating power levels may cause muons to escape shielding and be detectable in the ambient outdoor environment. SNS is located in an interior area of the Oak Ridge Reservation.

HFIR, a uranium fueled research reactor was first operated in 1965 and has been used for a variety of research purposes for almost 50 years. The fundamental design and vessel is vintage, but associated experimental facilities and control features are modernized. TDEC environmental monitoring for HFIR is not specialized. Ambient air and precipitation monitoring is done at a site situated adjacently. Monitoring results are compliant with DOE orders and state regulations even though constituents (predominantly tritium) can also come from surrounding legacy disposal areas. Environmental dosimeters and gamma loggers positioned on the ORR do not isolate a significant public dose from HFIR. HFIR is located in the interior of the Oak Ridge Reservation and does not impact the public during normal operations.

EMERGENCY/ENVIRONMENTAL RESPONSE

Events	Number	Met Criteria*
Exercises, Graded	1	1
General Emergencies	0	na
Site Area Emergency	0	na
Exercises, not graded	2	2
Total	3	3

Actions met core exercise objectives, or response to actual event.



A look into the Environmental Monitoring Control Center (EMCC) at TEMA East during a recent exercise (TDEC photo)

NATIONAL ENVIRONMENTAL POLICY ACT REVIEW (NEPA)

NEPA requires federal agencies to ensure that citizen participation and environmental impacts are properly factored into the agency's decision-making.

The office commented on the following NEPA document in 2013-14.

- The Final Supplemental Environmental Impact Statement on Long-Term Management and Storage of Elemental Mercury was reviewed for content.

NEPA requires decisions to be made through a sustained process of inquiry, analysis, and learning. It ensures that federal agencies provide the public an opportunity to learn about and comment on significant proposals. When followed as required, it ensures adequate planning and prevents costly mistakes.

NEPA documents related to federal decisions affecting the ORR are available for the public to review at DOE's Information Center.

LOW-LEVEL RADIOACTIVE WASTE

Legacy Low-Level Radioactive Waste

At ETTP, the implementation of the Compliance Agreement between TDEC and DOE which addressed the management and disposition of hazardous and mixed wastes generated by sorting, segregating, processing and characterizing wastes previously determined to be non-hazardous, which (including the category of “newly generated” low-level radioactive waste), is almost complete. The Phase II of the Compliance Agreement is being implemented as funding and capacities become available. As of the end of FY 2014, this inventory was 120 containers/items, which includes five PCB electrical transformers and 115 newly generated low-level waste containers.

As of the end of FY 2013, Y-12 did not have legacy LLW inventory. The containers that formed the security wall around Bldg. 9720-5 have been removed and continue to be processed. The disposition of the contents is continuing and expected to be completed by the September 2014.

ORNL does not have legacy LLW inventory.

Newly Generated Low-Level Radioactive Waste

The “newly generated” category contains low-level waste generated since October 1, 2000. As of the end of FY 2014, DOE-EM’s inventory of this category of waste stood at 60 m³. This represents a decrease of 6 m³ from the previous year.

NNSA has established a track record of routinely disposing of the newly generated LLW waste within the 365 day timeframe, as required. At the end of FY 2014 this inventory was 452 containers.

As of the end of FY 2014, ORNL had generated 426 m³ of low-level waste since October 1, 2013, which is the beginning of DOE’s new fiscal year. Of this amount, 316 m³ had been shipped for disposal. The remaining 110 m³ has been in compliant storage awaiting shipment for disposal.



Waste awaiting shipment from ETTP. (DOE photo)

FEDERAL FACILITY COMPLIANCE ACT, SITE TREATMENT PLAN (STP)

TRU Waste Processing

Throughput has increased, but equipment breakdowns and waste anomalies caused lower productivity than expected. Office oversight of the facility shows no serious concerns, even though a faster processing goal is expected by schedule. The facility must be expanded with a build-out to be able to treat legacy sludge. This build-out is now a line item appropriation that is subject to external financial and engineering oversight. There is no current certification of TRU wastes for offsite disposal at the Waste Isolation Pilot Plant (WIPP). This processing results in suspected TRU, low-level and mixed low-level waste. The low-level and mixed low-level wastes are then shipped offsite for disposal and credit is given towards the total volume reduction of the STP. The suspected TRU waste is then placed back into storage awaiting certification for shipment to WIPP.

TRU waste is not considered completely processed and off the STP until it is certified for disposal at WIPP, or treated, if necessary and shipped to disposal.

TSCA Incinerator

The incinerator closed operations. The RCRA permit has been closed out. DOE Oversight has integrated the closed facility with the CERCLA ROD for ETTP since the RCRA closure is complete.

Non-CERCLA Decontamination and Decommissioning

Y-12 National Security Complex

Modernization at Y-12 is a high priority. However, due to a lengthy federal sequestration, followed by non-availability of funds, there was no demolition of facilities under non-CERCLA D&D program during FY 2014.

Oak Ridge National Laboratory

During FY 2014, the following activities took place at ORNL under the non-CERCLA D&D program:

- Demolition of large carousel file cabinets in Building 7001 was completed in August 2013
- Removal of HVAC units at Building 7077 was completed in September 2013.
- Demolition of fence/gate between 7001 and 7015 was completed in September 2013.
- Demolition of Meteorological Tower 1057 was completed in May 2014.
- Building 7005 demolition was complete in June 2014.
- Waste cleanout and dismantlement of the Environmental Remediation Sciences Program (ERSP) Field Research Center at Y-12 was initiated.
- Characterization to support Building 6010 interior demolition and renovation planning was completed in October 2013. Interior demolition was initiated. Preparation of project plan for deactivation of the ORELA (underground portion of 6010) began in January 2014, and characterization, cleanout, and closure activities are ongoing.

- Supported the development of scrap metal procurement package for ORNL@Y-12 Buildings 9201-2 and 9201-4 to support ultimate goal of enabling utility isolation.
- Removal of former steam plant waste water pH Adjustment Tank interior to Building 2644 was completed.
- Abatement of asbestos-containing materials and fiberglass for Building 7018 Upgrade Project was initiated in April 2014. Demolition of the original structure (excluding dock and slab) was completed in June 2014.
- Planning activities were initiated in June 2014 for the removal of 2652 A, B, C trailers, three Environmental Sciences experiment stations and several small support structures.

Oak Ridge Reservation Landfills

The office’s Waste Management Program oversees DOE’s solid waste disposal activities to ensure that DOE adheres to provisions of the Resource Conservation and Recovery Act (RCRA) and to the rules and regulations governing solid waste disposal in Tennessee. DOE disposes of ORR’s solid wastes in landfills located at the Y-12 National Security Complex. All wastes going to these landfills must be non-radioactive and non-hazardous. DOE must use approved procedures when receiving, compacting, and covering waste.

The office performs a monthly audit of DOE’s landfills on the ORR. It also reviews DOE practices to ensure that radioactive waste is not disposed in these landfills. Additionally, Special Waste Requests submitted to the State by DOE for the utilization of the landfills are randomly audited on a frequent basis.

During FY 2014 the landfills were found to be operating in full compliance with all regulations. For this reporting period the summary of the approximate waste deposition in the three ORR landfills and the remaining capacities is as follows:

<u>Landfill</u>	<u>Volume (cubic yards)</u>	<u>Remaining Capacity</u> <u>(in years)</u>
Industrial Landfill IV	<1,000	127
Sanitary/Industrial Landfill V	<1,000	37
Construction/Demolition Landfill VII	<10,000	45

FEDERAL FACILITY AGREEMENT (FFA) FOR THE OAK RIDGE RESERVATION (NEGOTIATED ACTIVITIES)

Y-12 National Security Complex

- a. Upper East Fork Poplar Creek (UEFPC)
Planning efforts continue on the Outfall 200 mercury treatment facility.
- b. Bear Creek Valley – No activities have occurred here since the completion of Phase I of the Bear Creek Valley Interim Record of Decision.
- c. Planning continues on the Environmental Management Disposal Facility

Oak Ridge National Laboratory (ORNL)

- a. Bethel Valley
Disposal of surveillance and maintenance waste continues.
- b. Melton Valley – Monitoring of offsite monitoring wells continued.

East Tennessee Technology Park (ETTP)

- a. Zone 1 – Work continues toward developing a final ROD for this area.
- b. Zone 2 – No current activities have occurred in the past year.
- c. The D&D of the K-25 building was completed. Preparation for the D&D of the K-31 building continues.

Offsite – Outside the DOR-ORR Boundary

- a. Lower Watts Bar Reservoir (LWBR) – Long-term monitoring continues.
- b. Clinch River/Poplar Creek – Long-term monitoring continues.
- c. Lower East Fork Poplar Creek (LEFPC) floodplain – this action was completed in 2000. Factors affecting the risk to ecological receptors from floodplain soils are being reevaluated.
- d. The FFA parties agreed upon a groundwater strategy encompassing all of the ORR and areas adjacent to it. Planning continues for sampling to start in FY 2015.

Natural Resource Damages

- a. Lower Watts Bar Reservoir – The Trustee Council finalized all matters pertaining to the settlement of damages. An Administrative Order of Consent was signed by DOE and the state to finalize this agreement. Construction of fishing projects will close out this project.
- b. Oak Ridge Reservation – The Trustee Council is pursuing a final settlement for damages on the entire ORR.

LOCAL OUTREACH

The office is supportive of efforts to inform the community about environmental issues associated with the ORR. It undertakes community outreach efforts at venues such as the Secret City Festival and National Night Out. The office also provides grant funding for the Oak Ridge Reservation Communities Alliance (ORRCA). An office representative attends ORRCA meetings. The office has an *ex officio* membership on DOE's Oak Ridge Site Specific Advisory Board (SSAB) and has a representative present at its monthly meetings. On request, the office provides speakers for schools and citizen groups.

The office not only discusses ORR environmental issues but also disseminates information and materials related to general pollution prevention, home radon monitoring, recycling and similar activities. The office is often the first contact by a concerned individual for just about any environmental question. Likewise other TDEC offices may receive questions regarding ORR issues that are then forwarded to the DOE Oversight Office.

The office works specifically with the following local and regional organizations on issues associated with the ORR:

- Watts Bar Interagency Working Group,
- Oak Ridge Reservation Communities Alliance, and
- Oak Ridge Site Specific Advisory Board.



Curious deer captured by a trail camera on the Oak Ridge Reservation (TDEC photo)

National Outreach and Cooperative Interstate Activities



The division participates in activities and meetings as a member or affiliate of the following organizations.

Interstate Technology and Regulatory Council The Interstate Technology and Regulatory Council was formed in 1995 as a multi-state coalition working to achieve regulatory acceptance of innovative environmental technologies. The state-led council became affiliated with the Environmental Council of States in 1999 and has been working closely with that organization to promote innovative technologies that would lead to more cost-effective and efficient site cleanups. ITRC offers free internet training and documents provided by the different teams. The division has a representative on the Natural Attenuation of Metals and Radionuclides Team. Another member in the office is the Point of Contact for the State of Tennessee and was instrumental in the document development and internet training of “Decontamination and Decommissioning of Radiologically Contaminated Facilities.” Access to the ITRC website is www.itrcweb.org. Another serves on the ITRC advisory board.

National Governors Association Federal Facilities Task Force The task force is composed of governor-appointed policy and technical representatives from states hosting major DOE facilities. NGA task force members work collaboratively with DOE officials on technical, economic, and political challenges, including budget and regulatory issues, waste treatment and disposal options, and equitable decisions on waste management.

National Conference of State Legislatures’ State and Tribal Government Working Group The State and Tribal Government Working Group is a forum in which all tribes affected by DOE sites can interact directly with the states and DOE. The working group helps ensure that DOE facilities are operated and cleaned up in compliance with all applicable federal and state laws and regulations, and tribal rights. These rights include those retained by treaty and conferred by statute and the trust responsibility. Remedies must also protect human health, safety, and the environment.

Intergovernmental Meeting with DOE The Energy Communities Alliance, Environmental Council of the States, National Association of Attorneys General, National Governors Association, and State and Tribal Government Working Group meet annually with DOE. The meeting provides an opportunity for senior DOE officials to talk with these groups collectively. It also allows the groups to coordinate on issues involving the operation and cleanup of the DOE complex.

The Association of State and Territorial Solid Waste Management Officials Radiation Task Force This organization tracks radiation-related issues that could affect states. The group emphasizes federal facility issues and has cooperative projects with the EPA, DOE, Department of Defense, Council of Radiation Program Directors, the Health Physics Society, and the American National Standards Institute. The office has members on the Radiation Focus Group and the Sediment Focus Group.

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LOCAL GOVERNMENT BOARDS

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Roane County Environmental Review Board

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STAKEHOLDER ORGANIZATIONS

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