

A Student Summary

of the Oak Ridge Reservation Stakeholder Report on Stewardship



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Published May 2004
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The Oak Ridge Site Specific Advisory Board is an independent, federally appointed citizens' panel that provides advice and recommendations to the U.S. Department of Energy on its Oak Ridge Environmental Management Program.

For additional copies of this document or information about the board, please contact us at the above address or see our web site at <http://www.oakridge.doe.gov/em/ssab>.

The Stewardship Education Subcommittee would like to thank Pete Osborne for his assistance in technical editing and graphics in the publication of this document.

FOREWORD

The Oak Ridge Site Specific Advisory Board established a Stewardship Committee in August 2000 to continue the work of the End Use Working Group and the Stewardship Working Group—two citizens’ panels formed in 1997 and 1999, respectively. These groups had each written one volume of a key environmental document called the *Oak Ridge Reservation Stakeholder Report on Stewardship*.

One of the Stewardship Committee’s challenges is to create long-term awareness and understanding of the community’s responsibility for stewardship of contamination that will remain on the U.S. Department of Energy’s Oak Ridge Reservation following environmental cleanup.

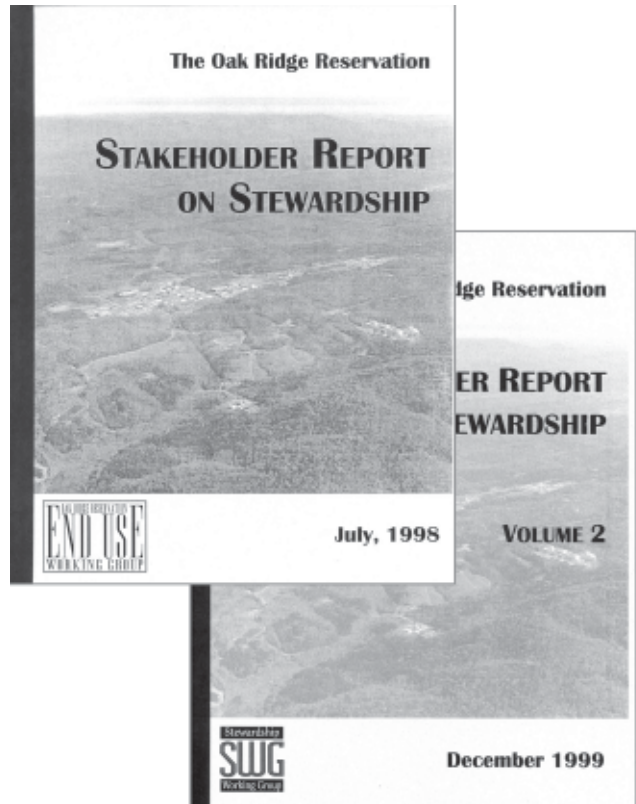
A major component of the Stewardship Committee’s efforts is to create learning opportunities for high school students. In 2001 the committee worked on a resource kit to assist teachers in educating students about site contamination and stewardship. Also that year, the committee asked students from two local schools, Roane County High School and Oak Ridge High School, to prepare summaries of the two volumes of *Oak Ridge Reservation Stakeholder Report on Stewardship*. The purpose of this effort was to provide students with a summary of the stewardship report that was easily read and understood. Who better to write such a summary than their peers?

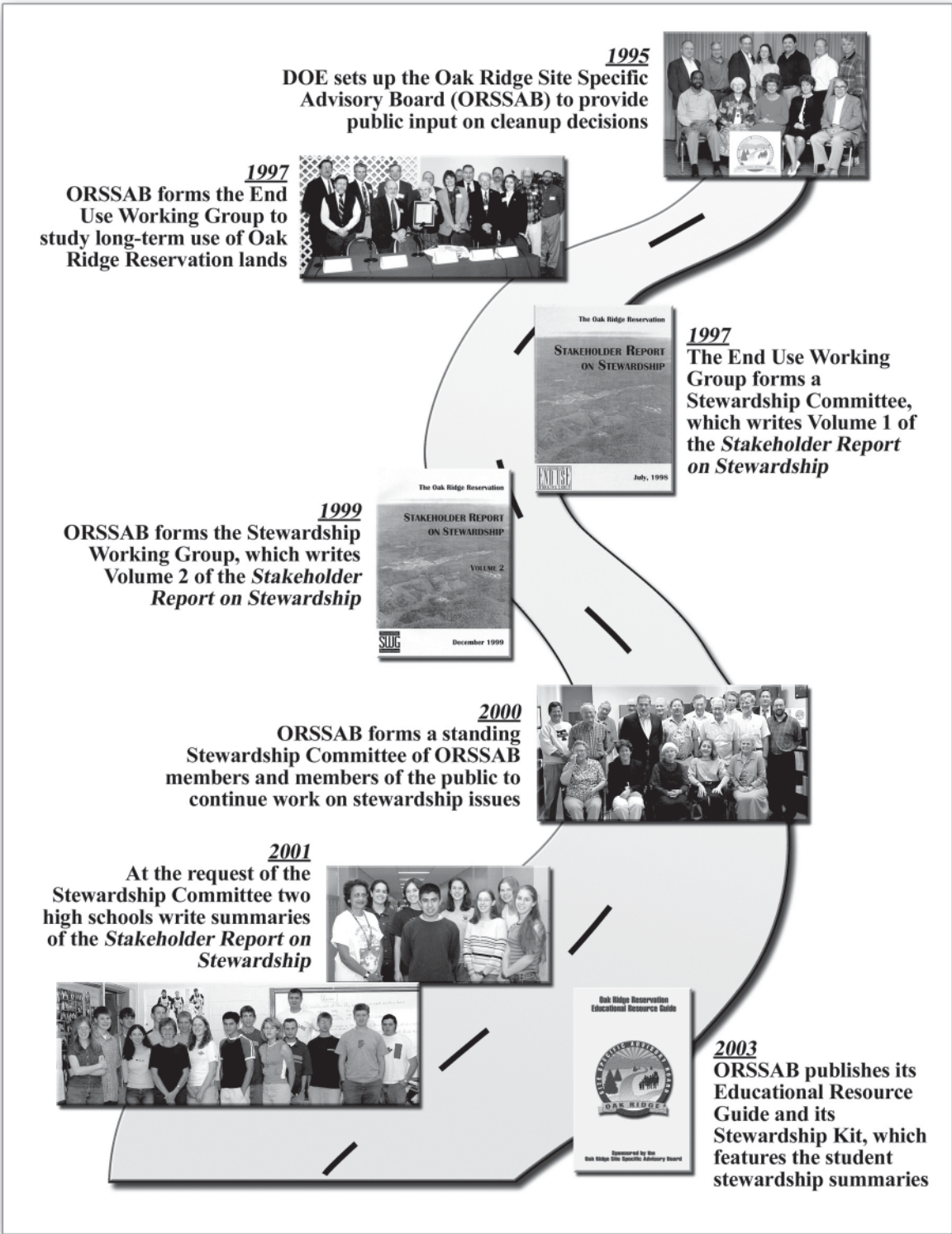
This document is the result of the outstanding efforts developed by Roane County and Oak Ridge high schools. While some overlap between the individual summaries was eliminated to avoid repetition and some minor changes were made by editors to ensure accuracy, every effort was made to maintain the original voice and intention of the students.

On behalf of the Oak Ridge Site Specific Advisory Board, I would like to express the board’s sincere appreciation to all the students who worked so hard on this project. The dedication with which the summaries were prepared is heartening evidence that stewardship of the Oak Ridge Reservation will fall into good hands in the future.



David N. Mosby, Chair





Stewardship has been a general concern of the Oak Ridge Site Specific Advisory Board since its inception in 1995.

ACKNOWLEDGMENTS

As an advanced placement Environmental Science class, it has been our pleasure to be able to take what we have learned in the classroom this year and apply it to a key community issue.

In 1998 the End Use Working Group of the Oak Ridge Site Specific Advisory Board published the *Oak Ridge Reservation Stakeholder Report on Stewardship, Volume 1*, and in 2001 members of our class were approached to summarize it. This summary defines stewardship and discusses many key aspects of stewardship planning. The summary will be used as a tool for the public to increase its knowledge and understanding of stewardship. While completing the summary we came to realize the importance of stewardship and how it functions in the Oak Ridge area.

We would like to extend our gratitude to the Oak Ridge Site Specific Advisory Board for granting us this wonderful opportunity. We would also like to thank all of those who enhanced our knowledge of the Oak Ridge Reservation and put time and effort into creating the summary.

Sincerely,
The Stewardship Committee of Oak Ridge High School



Oak Ridge High School writing team, left to right: Nita Ganguli, Jenna Carignan, Lorien Gilbert, John Trujillo, Elise Watson, Kathleen Padgett, Jasmine Kline, Rebecca Xiques. Not pictured: Jessie Foster, Bonnie McBride.

On behalf of the Advanced Placement Science Class at Roane County High School, I would like to thank the SSAB for the opportunity to create the Volume 2 summary of the *Oak Ridge Reservation Stakeholder Report on Stewardship*.

This project provided a unique opportunity for the students to work on a “real-world” document that will have lasting value for area students. Stewardship is a topic that not many students or educators are familiar with yet, but it is one that will have impact on the lives of those who live, work, and attend school in the cities and counties impacted by Department of Energy activities at its Oak Ridge Reservation.

I think the students who worked on this summary came to realize that anyone can have an effect on environmental cleanup decision-making, regardless of their age, and that it’s important for everyone to recognize their obligation to participate in the stewardship of public lands. I know that they would encourage all readers of this document to think about ways to get involved in community efforts to help clean up and manage environmental problems.

Sincerely,
Kristin Baksa
Roane County High School



Roane County High School writing team, left to right: Katie Monroe, Lloyd McDonald, Erik Seaman, Erica Stanley, James Hall, Kristin Baksa, Alan Knauth, Linda Choate, Jonathan Hagy, Ryan Burton, Chabli Balcom, Darren Langlely, Brent Dooley, Ben Herwehe, Jacob Platfoot, Elijah Hixson.

INTRODUCTION

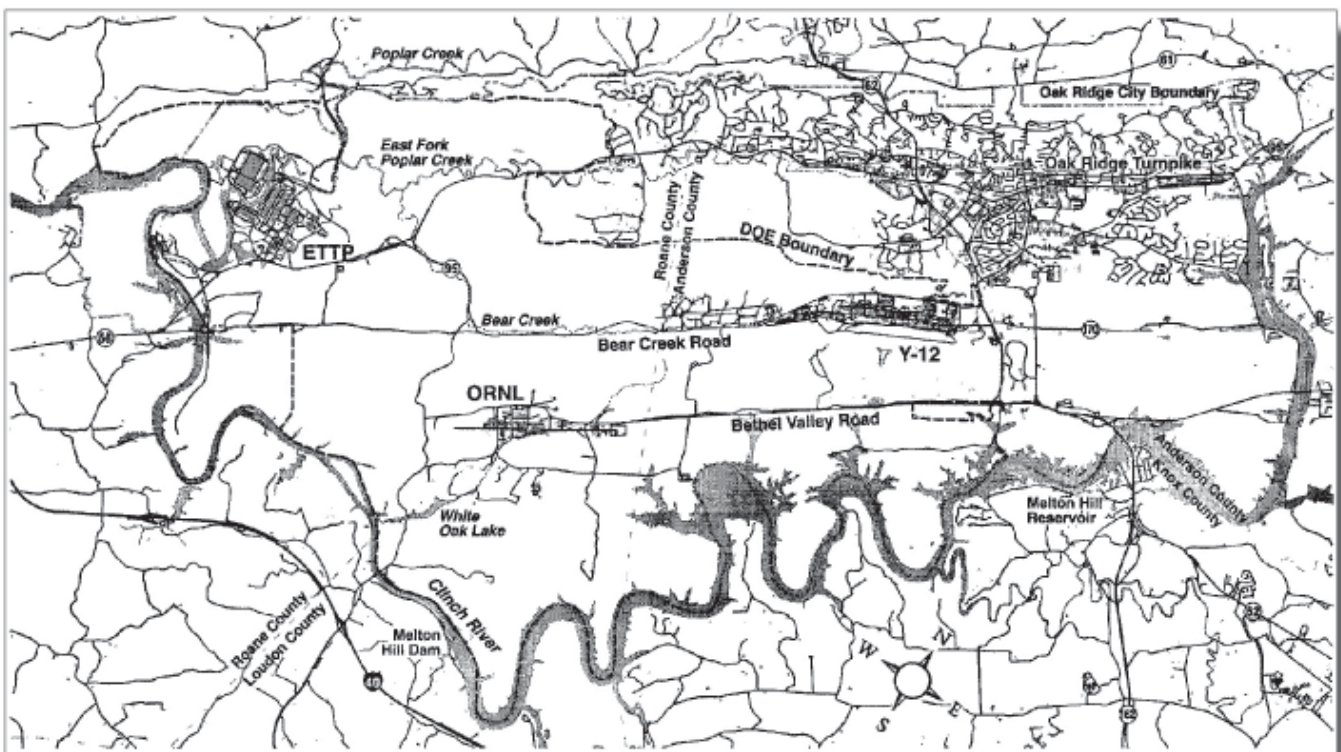
In 1997 the Oak Ridge Site Specific Advisory Board formed the End Use Working Group to help the U.S. Department of Energy (DOE) determine long-term uses for contaminated areas on the Oak Ridge Reservation following environmental cleanup. The End Use Working Group in turn formed a Stewardship Committee, which published the *Oak Ridge Reservation Stakeholder Report on Stewardship, Volume 1*, in July 1998. Both the Stewardship Committee and the End Use Working Group disbanded in 1999 following completion of the work they had been formed to perform.

The *Stakeholder Report on Stewardship* was a groundbreaking effort to describe aspects of a long-term stewardship program, which the Stewardship Committee had determined were

needed to help protect human health and the environment from the effects of residual contamination. In addition, the report called for a stakeholder group to be formed to monitor such issues. For this reason, the Site Specific Advisory Board formed the Stewardship Working Group in 1999. After a year of work, the Stewardship Working Group released Volume 2 of the *Stakeholder Report on Stewardship*, expounding more fully on issues left unresolved by the prior work. Both volumes of the report are available on the Site Specific Advisory Board web site at www.oakridge.doe.gov/em/ssab/pubs.

WHAT IS STEWARDSHIP?

The *Stakeholder Report on Stewardship* defines stewardship as “the acceptance of the



Map of the Oak Ridge Reservation showing the three main DOE facilities: the East Tennessee Technology Park (ETTP), Oak Ridge National Laboratory (ORNL), and the Y-12 National Security Complex (Y-12). The reservation is closely tied to the city of Oak Ridge; almost all of the reservation falls within the Oak Ridge city limits, and the Y-12 Complex is just over the ridge from a residential neighborhood.

responsibility and the implementation of activities necessary to maintain long-term protection of human health and of the environment from hazards posed by residual radioactive and chemically hazardous materials.” In this context, “stewardship” should not be confused with its general meaning, “the responsibility for the careful use of resources.” Here it applies specifically to the environmental cleanup of contaminated areas on DOE’s Oak Ridge Reservation. Stewardship planning, as referred to in the report, applies only to contaminated land on the reservation that is controlled by DOE.

What is a stakeholder?

A stakeholder is a person or organization that has a “stake” in something. Stakeholders are connected to an issue either because they are interested in it or because they are involved in some way. The U.S. Department of Energy is a stakeholder in environmental cleanup activities because it is obligated by law to undertake them. The Environmental Protection Agency and the Tennessee Department of Environment and Conservation are stakeholders in cleanup because these agencies are mandated to provide oversight to DOE on its cleanup program. Ordinary citizens, including students, can be stakeholders because they either are concerned about cleanup or because they are affected by it in some way.

It is important to note that many of the activities called for in stewardship planning are already being carried out. The purpose of developing further activities is to ensure long-term care of the contaminated areas. DOE has accepted the responsibility of stewardship until the lands discussed are safe for their intended uses.

WHY IS STEWARDSHIP IMPORTANT?

DOE facilities on the Oak Ridge Reservation produced radioactive and chemically toxic contamination during more than 50 years of weapons production and nuclear research. The development and application of stewardship to the reservation has come about slowly, mainly because of the Environmental Protection Agency’s (EPA’s) preference for “permanent” cleanups that would require little or no stewardship. However, the cost and feasibility of completely cleaning up these DOE sites is too expensive and difficult to be practical. Many cleanup remedies will therefore manage waste in place or in newly designed on-site disposal facilities. Despite all efforts, contamination will remain in place in the environment at levels that continue to pose a threat to human health and the environment.

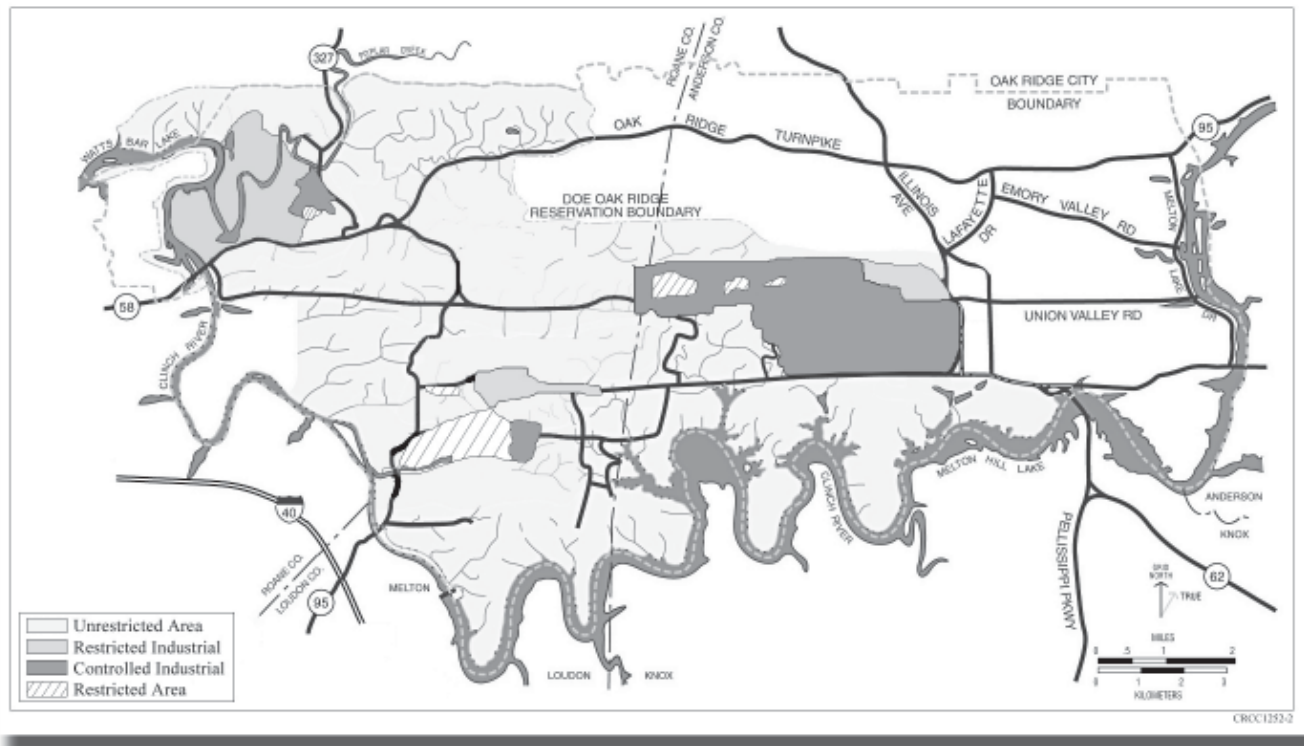
In recognition of this fact, a stewardship program is necessary to protect the public and the environment from possible harmful effects. Stewardship, however, should not be regarded as a substitute or shield to avoid the costs of cleanup. Contaminated sites should always be cleaned up to the maximum extent practical.

ENVIRONMENTAL CONTAMINATION ON THE OAK RIDGE RESERVATION

The DOE Oak Ridge Reservation consists of a 35,000-acre area, mostly within the Oak Ridge city limits. The reservation includes DOE's Oak Ridge National Laboratory, Y-12 National Security Complex, and East Tennessee Technology Park. The reservation was designated as a National Environmental Research Park in 1980, so much of the land is protected for environmental science research and educational purposes. It serves as an example of how the

environment can remain stable while coexisting with energy technology development.

About 10 percent of the 35,000 acres of the Oak Ridge Reservation have been contaminated by DOE operations since the 1940s. Not all of the waste is properly contained. Pollutants, including toxic chemicals and radioactive materials, have been stored in settlement ponds, mixed-waste burial grounds, pits and trenches,



Map showing end uses of the Oak Ridge Reservation, as defined by the End Use Working Group in the 1998 report, "Final Report of the Oak Ridge Reservation End Use Working Group." The report is available on the internet at www.oakridge.doe.gov/em/ssab/pubs.

abandoned underground pipelines, tanks, and more. Such methods of storage can lead to a leaching of these hazardous materials into the soil and groundwater in the area. The abundant annual rainfall and the high water table only add to the contamination problem. Some of the radioactive elements present are tritium, cesium, strontium, and uranium. Some of the toxic chemicals include various organic compounds and heavy metals.

For easier management and study, the reservation was divided into five sections in relation to their local watersheds. The sections are Bear Creek Valley, Bethel Valley, East Tennessee Technology Park, Melton Valley, and Upper East Fork Poplar Creek. These areas vary in terms of the contaminants present and how the contaminants are distributed in the watershed. By using the watershed approach, DOE can produce just one or several primary decision-making documents called “records of decision” for each watershed instead of the dozens that would be required if each contaminated area in a watershed were considered individually. The watershed approach will save considerable time and money.

How much time, effort, and money is spent to clean up a watershed depends on how the land will be used after cleanup. It will not be possible or practical to remove all contamination from all areas of the reservation because of the risks and

costs involved. To help make decisions about how far to go with cleanup, the End Use Working Group identified the following five future land-use categories, evaluating them in terms of intended surface use, depth of clean soil, groundwater use, surface water use, and ownership:

1. Unrestricted is just that, completely unrestricted for any use.
2. Recreational is for recreation. The soil must be clean to a depth of 2 feet, and ownership is open to government or private groups or companies. Use of surface water is allowed only for recreation. Groundwater may not be used.
3. Uncontrolled industrial is for use by industry. The soil must be clean to a depth of 10 feet, and the site may be owned by government or private groups or companies. Surface water may be used, but groundwater may not.
4. Controlled industrial is for industrial use with restrictions. The soil must be clean to a depth of 2 feet, and ownership is open to government or private entities. Neither groundwater nor surface water may be used.
5. Restricted waste disposal is limited to monitoring and maintenance activities. This designation does not allow soil disturbance and only allows for government ownership. Neither groundwater nor surface water may be used.

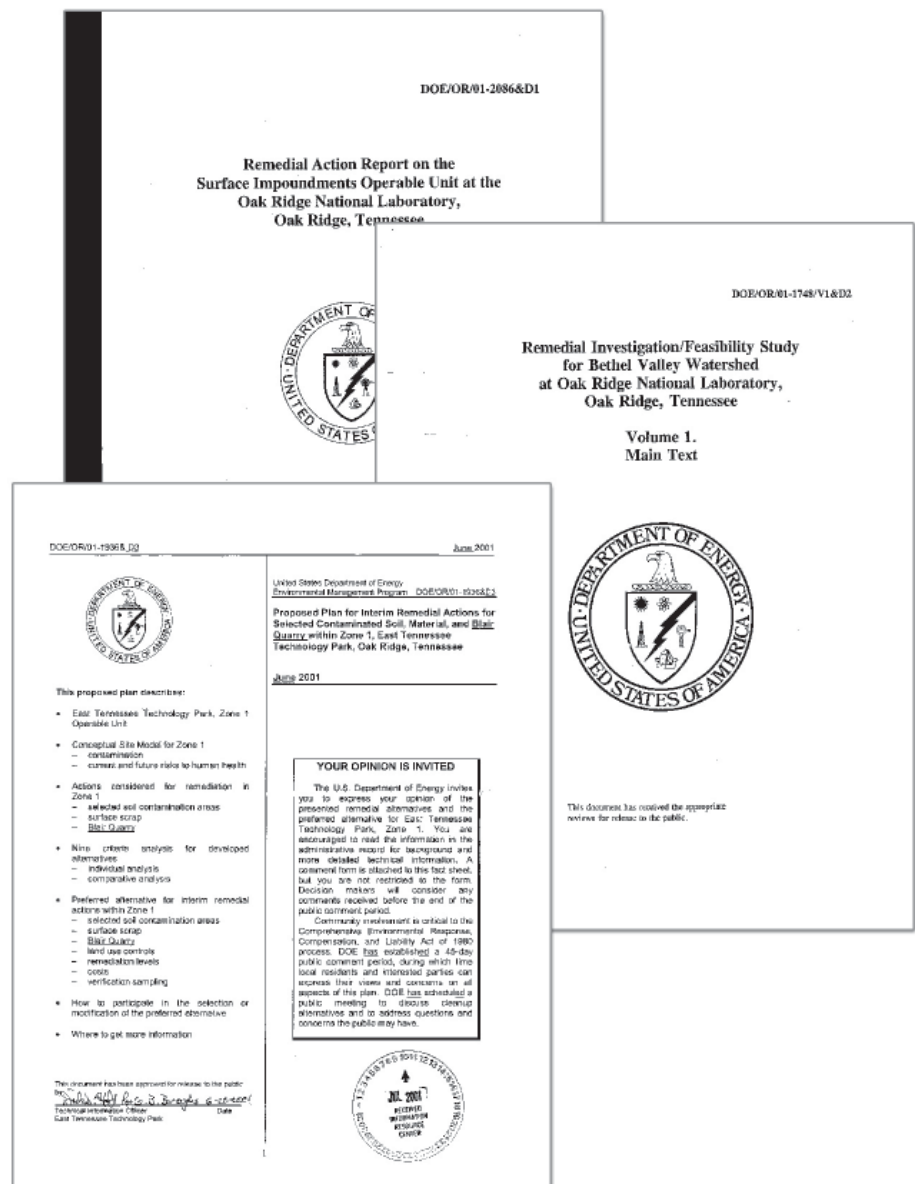
HOW THE CLEANUP PROCESS WORKS

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) is an important piece of legislation that establishes a process for cleaning contaminated areas on the National Priorities List (see sidebar). Inclusion on the National Priorities List is based on three factors: level and type of contamination, affected receptors (such as humans and ecosystems), and potential for the contamination to spread. Placement on the National Priorities List increases awareness, requires EPA to oversee the cleanup, and helps in getting cleanup funds. Of the 35,000 acres on the Oak Ridge Reservation, 6,000 acres are on the list and are therefore subject to CERCLA.

The CERCLA process is sequential and is documented by a series of reports, such as a remedial investigation/feasibility study (RI/FS), proposed plan, and record of decision. Each must be approved by the Tennessee Department of Environment and Conservation (TDEC) and EPA. These two organizations and DOE annually negotiate scheduling and completion dates for cleanup activities. This schedule is binding for DOE, and changes must be agreed to by TDEC and EPA.

DOE must commit to long-term maintenance of institutional controls until cleanup is complete.

However, long-term stewardship is not legally enforceable as currently stated in the CERCLA documents. Stakeholder pressure is seeking to legalize DOE's responsibility for long-term stewardship in the language of CERCLA documents and is encouraging DOE to explore alternative avenues of funding long-term stewardship and increase public involvement in stewardship planning.



CERCLA documentation works in the following order:

1. An RI/FS is done to determine the nature and extent of contamination and to evaluate feasible cleanup alternatives.
2. A proposed plan is released identifying the proposed solution, which is subject to public review and comment.
3. A record of decision, which is a legally binding decision, is published to provide the technical basis for the cleanup decision. This

document summarizes public comments and DOE's response to them.

4. A remedial design work plan is written to outline procedures for cleanup. The actual cleanup action is conducted in accordance with this design plan.
5. A remedial action report is issued to document that cleanup actions were performed in compliance with CERCLA.

What is the National Priorities List?

CERCLA requires that EPA develop a prioritized list of the nation's worst hazardous waste sites. This list, known as the National Priorities List, has two primary purposes: (1) to identify releases of hazardous substances, pollutants, and contaminants and (2) to inform the public about sites that warrant further investigation because they pose the most significant risk to public health, welfare, and the environment. EPA uses the Hazard Ranking System (HRS) to evaluate the potential risks to public health and the environment. HRS is a numerically based scoring system that uses site-specific information to assign each site a score ranging from 0 to 100. HRS is based on:

- the likelihood that a site has released, or has the potential to release, contaminants into the environment;
- the characteristics of the substances (for example, toxicity and quantity); and
- the people or sensitive environments affected by the release.

Sites with HRS scores of 28.5 or higher are considered for placement on EPA's National Priorities List.

UNDERSTANDING STEWARDSHIP

Recognizing that safe management of residual contaminants following cleanup is dependent on effective stewardship, members of the End Use Working Group established five goals:

1. Identify essential elements of effective stewardship.
2. Develop long-term stewardship requirements for the Oak Ridge Reservation.
3. Identify options for and promote the acquisition of adequate long-term funding for stewardship on the Oak Ridge Reservation.
4. Promote public understanding of stewardship.
5. Promote interaction concerning stewardship by individuals and governments.



Until the 1970s, much of the waste from DOE operations was dumped into unlined trenches and covered with topsoil. This disposal method allows rainwater to infiltrate the waste and leach contaminants into groundwater.

For stewardship to be successful, planning must be undertaken concurrently with cleanup. This includes the removal, treatment, and control of the spread of contamination. Stewardship is then implemented to ensure long-term protection of

both human health and the environment. Essential attributes of stewardship include the following:

- Responsibility. Society must be willing to accept responsibility for providing a healthy and safe environment now and in the future.
- Long-term effectiveness. Stewardship programs must be designed to perform their functions for the lifetime of the contaminants, however long that may be. There also must be stable funding and a legal basis for stewardship in order to maintain a long-term program.
- Adaptability. Stewardship programs must be adaptable to changes in physical, political, and technological conditions.

Seven basic elements make up an effective stewardship program. The following sections describe each of these elements in detail:

- Authority and funding
- Stewards
- Operations
- Physical controls
- Institutional controls
- Information systems
- Research

AUTHORITY AND FUNDING

At the beginning of any stewardship program, clear authority and responsibility must be established in order to ensure long-term implementation. Under the present system, DOE retains financial responsibility to fund the stewardship program. Because DOE funding is subject to the annual Congressional

appropriations process, a more stable funding option should be sought. Three options for long-term funding are as follows:

- Designated agency. Congress could create a government agency to conduct stewardship activities throughout the country. This would increase visibility for stewardship; however, it would still be subject to the constraints placed on government agencies and the annual Congressional appropriations cycle.
- Entitlement. Similar to Social Security, this method would have the federal government designate funding directly to stewardship. Funding would be more stable and would require direct Congressional action to be changed.
- Trust fund. These usually receive their money from taxes or a fee source. The distribution of the money can be made as an entitlement, or it can be subject to appropriations. Congress could authorize DOE to purchase secure stocks or bonds on a one-time basis. The investment would fund stewardship in its entirety. Alternatively, an endowment fund could be set up, with money being distributed to DOE sites, based on requirements. This incremental funding approach is politically easier than getting a lump sum.

STEWARDS

Stewards are individuals or groups responsible for stewardship activities. There are three types:

- The principal steward has legal responsibility for the contaminated land and facilities. This steward must ensure funding.
- Regulatory stewards ensure that the goals and requirements of a stewardship program are met. For the Oak Ridge Reservation, these stewards include EPA and TDEC.

- Community stewards comprise a variety of organizations that will provide public input to stewardship. These include public schools, libraries, and local organizations and governments.

OPERATIONS

Stewardship operations must include activities needed to ensure the integrity of cleanup, protect human health and the environment, and provide education and general information to the public. The various elements of long-term stewardship operations include the following:

- Monitoring. Regular sampling of all contaminated and potentially contaminated areas is needed to identify possible failure of physical controls and to provide continuous understanding of the nature and extent of contamination.



Radioactive wastes were often placed in concrete casks before burial. This disposal method provides better containment of wastes, but over the course of many years, cracks can develop in the concrete, allowing rainwater infiltration.

- Surveillance. Regular oversight of cleanup sites and remediation systems (such as burial ground caps and groundwater pumping stations) is required to determine if appropriate site conditions are being maintained.
- Maintenance. Regular upkeep of cleanup systems is necessary to ensure long-term effectiveness.
- Enforcement. Legal implementation of stewardship operations is required to maintain the protection of human health and the environment.
- Inspection and reevaluation. Periodic review of existing systems is necessary to ensure their continued need and/or effectiveness.
- Public participation. Continuous involvement of the public is required to ensure that citizens' concerns are addressed and that information is distributed.

PHYSICAL CONTROLS

Physical controls are barriers that limit public access to hazardous contaminants. The effectiveness of the controls depends on proper maintenance. Some examples include:

- Barriers to entry. Fencing or natural barriers (trees and shrubs) can serve as a buffer to limit access.
- Engineered barriers to exposure. Exposure to groundwater contamination is limited by providing alternate water sources or by pumping and treating groundwater.

INSTITUTIONAL CONTROLS

These legally binding controls are designed to control future use of land by limiting development or restricting public access to a

contaminated site. There are two types of institutional controls:

- Governmental. These controls use local, state, or national power (zoning ordinances, for example) to restrict certain areas.
- Proprietary. These controls allow property owners to manage access to their property. Examples include access advisories, easements, reversions, deed notices, and site registries.

INFORMATION SYSTEMS

These systems provide present and future stakeholders with records of the locations, amounts, and characteristics of contamination. Three aspects of stewardship information are critical:

- Development. Information essential for stewardship must be clear, concise, accurate, and readily available.
- Maintenance. Excellent records of contamination should be maintained for future reference. Information must be kept up to date and retrievable. Because this information must be stored for thousands of years, it should be maintained with carefully chosen technology.
- Accessibility. Basic information relating to stewardship should be accessible to the public.

RESEARCH

A national research program should be maintained to continue development of knowledge about contaminants and how to deal with contamination hazards. Regular sampling of hazardous sites is an important step in establishing data to better understand how the environment is affected.

IMPLEMENTING STEWARDSHIP

Defining the goals for stewardship is the simple part of the process—implementing them is more challenging. The most difficult part will be ensuring that those in positions of power have the appropriate resources to institutionalize stewardship. Only when a comprehensive stewardship plan is in place can the stakeholders of the area justify the support of cleanup proposals that leave residual contamination on the Oak Ridge Reservation. In developing a comprehensive, integrated stewardship program for the reservation, Oak Ridge stakeholders want DOE to apply the following recommendations:

- Use existing systems and organizations to the maximum extent possible.
- Develop stewardship plans during cleanup decision-making, not after.
- Apply the three attributes of stewardship: responsibility, long-term effectiveness, and adaptability.



One aspect of the Oak Ridge cleanup strategy is to ship wastes to commercial and DOE disposal sites in the western United States. These sites use the most modern disposal methods available and are typically located in desert settings, where minimal rainfall and largely inaccessible groundwater reduce opportunities for contaminants to leach into the environment.

- Involve stakeholders in planning and implementing stewardship.

As a follow-on to the End Use Working Group, Oak Ridge stakeholders formed the Stewardship Working Group to further explore stewardship issues and their application to the Oak Ridge Reservation. Their work resulted in Volume 2 of the *Oak Ridge Reservation Stakeholder Report on Stewardship*. Key recommendations from the report for implementing stewardship are discussed in the following sections.

STEWARDSHIP INFORMATION REQUIREMENTS

Effective communication and accessibility of specific information are essential to the success of stewardship. Four categories of information are required for stewardship:

- Regulatory information includes documents prepared by DOE as part of the CERCLA process to arrive at the cleanup action decision.
- Site management information includes historic information pertaining to materials or facilities on the site, designs and records of facilities, historic and future data (such as environmental and economic data), and records of contaminated material taken from the reservation.
- Land use control information includes land use restrictions, plat maps identifying contamination, deeds, maps identifying zoning requirements, etc.

- Public education information includes information appropriate for use in school curricula and publications pertaining to environmental conditions and land use.

DOE is responsible for collecting, preserving, and integrating in its information management systems all information necessary for long-term stewardship. Record maintenance is essential and must include regularly scheduled record rejuvenation, copying of paper records onto acid-free media, and accessibility of electronic data. Some major recommendations made by the Stewardship Working Group are that DOE should take the following actions:

- Incorporate stewardship in its management and tracking system.
- Establish systems to inform and educate the public.
- File information such as notices, titles, maps, and restrictions.
- Establish accurate land condition information for use in state information systems.

An effective stewardship information program reaches the public, so one additional recommendation is to establish an internet site for stewardship. The information on the web site should include maps, graphs, and other information. Much of the information is available now through existing sites (see Bibliography).

STEWARDSHIP REQUIREMENTS IN DOE DOCUMENTS

The Stewardship Working Group carefully considered the CERCLA process and reviewed the DOE and EPA approach to integrating stewardship requirements into legally binding decision documents. Most important to

What are the FFA and the 5-year review?

The *Federal Facility Agreement* was signed by DOE, EPA, and TDEC in 1992 to provide a framework for interaction on environmental cleanup of the Oak Ridge Reservation. The purposes of the agreement are to:

1. Ensure that the environmental impacts associated with past and present activities at the reservation are thoroughly investigated and that appropriate remedial action is taken to protect health and the environment.
2. Establish a framework and schedule for developing, implementing, and monitoring response actions at the site in accordance with the various state and national laws and regulations.

The *Federal Facility Agreement* also requires DOE to perform 5-year reviews on completed cleanup projects if they result in hazardous substances, pollutants, or contaminants remaining on the reservation. EPA and TDEC review the remedial actions no less often than once every 5 years to assure that human health and the environment are being protected. If EPA or TDEC judge that additional action is appropriate, then DOE is required to submit a proposal to implement corrective actions. The *Federal Facility Agreement* is available on the internet at www.bechteljaobs.com/sra/FFA/ffa-external.htm.

stakeholders (other than accuracy of information and availability of documents) are public involvement, enforceability of stewardship requirements, and funding for long-term stewardship. Overall, the Stewardship Working Group recommended that DOE do the following:

- Include stewardship requirements in all interim and final CERCLA records of decision.
- Establish *Federal Facility Agreement* milestones for use in the reservation land use control assurance plan and each project land use implementation plan, the *DOE Long-Term Stewardship Plan*, and the final reservation record of decision for areas with residual contamination.
- Assure that public involvement in the CERCLA five-year reviews be written into the *Federal Facility Agreement* and the *DOE Public Involvement Plan*.

INSTITUTIONAL CONTROLS

Institutional controls are those mechanisms that limit the use of land and resources. The stewards of these lands have the job of keeping any contamination away from the public. The most effective way to do this is by using existing local organizations, including local governments, which will help the stewardship program become more

rapidly integrated into the community. While the principal steward is the federal government, which is in charge of monitoring, maintaining, and remediating areas, the heart of institutional controls is using and managing local property records to keep track of radioactive and chemical contamination. It is imperative that the stewards find a way to manage these records and make them accessible to all. Key suggestions include the following:

- All property on the Oak Ridge Reservation should be registered, with key information about contamination provided on maps and deeds, which are updated as needed.
- Land contaminated by hazardous waste disposal should be placed on a “parcel” map,



Part of the Oak Ridge Reservation cleanup plan is to unearth problem wastes and relocate them to new, well-designed disposal facilities on the reservation. This photo shows wastes from a cleanup project being disposed in the new Environmental Management Waste Management Facility at Y-12. The facility was designed to minimize the possibility of wastes leaching into the environment by enveloping them above and below in many layers of synthetic and natural liner materials.

copies of which should become part of the city's planning records to allow enforcement of land use restrictions.

- The Oak Ridge Citizen's Board for Stewardship should oversee the effectiveness of the stewardship program and make sure that any parcel maps become part of the Tennessee State Parcel Mapping System. Parcel maps should highlight both long-term and short-term waste disposal sites.

PHYSICAL CONTROLS

Many physical controls designed to limit access to contaminated areas are in place today on the Oak Ridge Reservation. Physical controls aimed at preventing contaminants from migrating depend upon contaminant reduction, monitoring, and barriers. These controls are costly to maintain but necessary. Physical controls to prevent public exposure include fences, gates, barriers, and signs. Their need is based on the risk of serious exposure. DOE must establish the policy and guidelines to ensure that physical controls are used as needed and maintained in their effectiveness.

THE PUBLIC'S ROLE IN OVERSIGHT OF STEWARDSHIP

Regulatory oversight of cleanup, and ultimately stewardship, now lies with EPA and TDEC. While the public may continue to have general input into how stewardship is performed at DOE sites, centers of authority in Washington and Nashville are only remotely influenced by local residents. The need for public understanding and attention to long-term stewardship warrants formation of a Citizen's Board for Stewardship. Because the public is being asked to trust the long-term effectiveness of cleanup actions, local

citizens will have to help ensure that long-term stewardship of contaminated areas on the reservation is not bypassed because of ever-present budgetary shortfalls and shifting governmental priorities. A Citizen's Board for Stewardship must be planned for and put into effect now if DOE's commitment to the public in CERCLA cleanup activities is to be honored.

The Citizen's Board for Stewardship should have three functions:

- Assess stewardship performance.
- Ensure stewardship requirements are clearly stated and activities effectively planned.
- Assume responsibility for public information.

Through these functions the overall performance of stewardship should improve. The Citizen's Board would produce regular reports to the public to ensure that the community is informed of stewardship results and important developments. If problems are identified, the Citizen's Board will know what action to take.

According to the Stewardship Working Group, the Citizen's Board for Stewardship must be granted official status by the *Federal Facility Agreement*. It must be of a manageable size and have diverse membership, including ex officio membership by DOE, TDEC, and EPA, and representation by affected communities. Appointments should be long term and staggered for continuity. It is also important that members understand cleanup and stewardship activities on the reservation and that the board not be politically influenced.

The Citizen's Board could be set up in one of four ways: a self-selected volunteer group, an existing local group, a locally appointed board, or a DOE-appointed board. The structure should

be selected by DOE, TDEC, EPA, and the public, based on how important certain attributes are, such as independence, ability to focus on stewardship issues, diversity, and ease of stewards to work together.

COST AND FUNDING OF STEWARDSHIP

Cost estimates are based on summation of the costs of stewardship consistent with the preferred alternatives described in the CERCLA records of decision. It is expected that accuracy of estimates will improve, and long-term costs of stewardship will be continually refined.

Most long-term costs are for water management, monitoring, maintenance, and surveillance by principal stewards and for oversight by the State of Tennessee or the City of Oak Ridge.

In terms of budgeting, the information needed to assess stewardship activities is available in DOE's Project Baseline Summary, which provides details on cleanup schedules and waste management activities. The type of information likely to be needed for stewardship includes a description of residual contamination, controls being used to contain it, future land use after completed cleanup, and itemized costs.

The Stewardship Working Group recommended setting up a trust fund to draw income for stewardship. A satisfactory trust fund must avoid the pitfalls of many current arrangements designated as trust funds. The funds must be

specific to the Oak Ridge Reservation or to a specific cleanup project to prevent diversion to other projects, and some mechanism must be in place to ensure that the funds are not squandered.

Money must be available for its intended purpose without further legislative action at the federal or state level. Fiscal planning must provide for cost inflation, specify how and from what source

interest payments are to be credited to the account, and describe how the principal is insured against loss. Ideally, the cost of funding the trust should not siphon money away from ongoing cleanup activities.

A trust fund for stewardship could be established as a one-time appropriation, accumulated as a percentage of the costs of ongoing cleanup, or as a fixed cost per year, based on estimated stewardship costs following cleanup. Any of these would reassure the public that funding for long-term stewardship would in fact be available and should make the public feel more comfortable



The types of physical controls necessary for stewardship vary depending on the nature of the contamination at the site. Signs like these are used to warn the public about areas that are contaminated but not to the extent where fencing is required.

with the prospect of residual contamination at the Oak Ridge Reservation.

In any case, the income from the fund would be used by those responsible for implementation of stewardship. Periodic reviews, in addition to determining whether cleanup at a site is protective of human health and the environment, could evaluate use of the fund and determine any needed additions or withdrawals. Provisions for changes to or dissolution of the trust fund must also be provided because stewardship costs can be expected to decrease with time as a result of technology developments and natural decreases and radioactive decay of contaminants.

Although a trust fund may prove to be inadequate to cover all associated costs of stewardship, the Stewardship Working Group recommended that DOE aggressively explore mechanisms to reduce or remove the dependence on annual appropriations for stewardship, using a trust fund instead as the preferred approach.

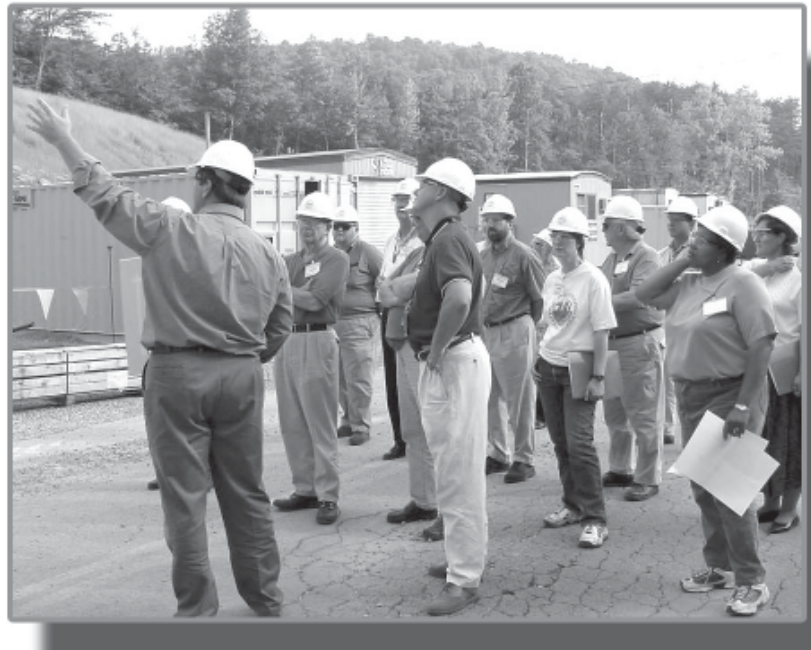
STEWARDS

Stewards are individuals or groups responsible for stewardship activities. Many stewardship functions can be carried out by existing organizations. If no existing organization can perform a necessary function, however, a new organization must be developed. When more than one steward is involved, coordination is required to avoid unnecessary conflict and duplication of effort. Stewards can be categorized as “principal,” “regulatory,” and “community.”

Principal stewards

The federal government, through the DOE-Oak Ridge Operations Office, is the principal steward of the Oak Ridge Reservation. Functions of the principal steward are as follows:

- Surveillance. This function is defined as any effort to detect unauthorized access to an area. Detection can be through personnel or instruments. Surveillance requirements and DOE’s commitment to them are specified in broad terms in records of decision. Specific requirements are to be included in remedial action design documents.
- Monitoring. This task includes environmental sampling and analysis to check the performance of cleanup remedies. Information must be kept secure, and results must be archived in the Oak Ridge Environmental Information System and published yearly.



Ordinary citizens can serve as stewards individually or through environmental groups. Here, ORSSAB members tour DOE’s transuranic waste processing facility in Melton Valley to learn first hand about this aspect of the DOE cleanup program.

- Maintenance. Any action needed to restore the effectiveness of a cleanup remedy, such as repair of a groundwater pumping station or patching of a cap over a waste burial area, is considered maintenance. For the maintenance function to operate as required, DOE must create a feedback system to ensure that surveillance activities identify deficiencies, and required maintenance information must be contained in an appropriate database.

A specific policy for maintenance should be stated in DOE's *Long-Term Stewardship Plan*. The plan requires a way to schedule and monitor maintenance activities so they are performed promptly and that any related, subsequent, or dependent events also occur. A stewardship transaction database could be developed to track maintenance and alert the principal steward when routine actions are required.

- Information management. This function includes several aspects:
 - o historic information pertinent to materials or facilities left on site at the end of cleanup actions;
 - o design and as-built records of constructed remedies or facilities;

- o historic and future environmental monitoring data, both in raw form and periodic published reports that document the effectiveness of cleanup actions; and
- o records that document the amount and location of contaminated material that was removed from the reservation for disposal off-site.

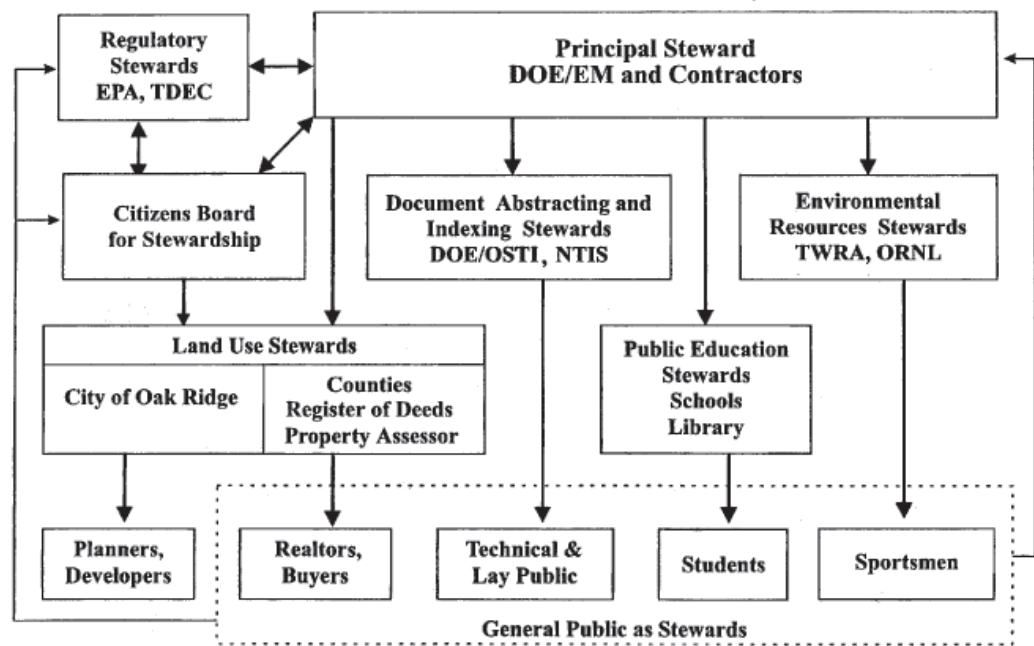


Diagram of interactions among Oak Ridge Reservation stewards.

Regulatory stewards

These stewards include federal, state, and local authorities. The most direct responsibilities for contaminated areas fall to EPA and TDEC. At the federal level, EPA oversees environmental contamination issues all across the country. Because the Oak Ridge Reservation is a federal installation, EPA has jurisdiction over it and will continue to serve as watchdog until the land is cleared for public use.

At the state level, TDEC is involved in environmental cleanup in a regulatory and administrative capacity and also exercises control over emissions from the site. To be good stewards, EPA and TDEC must receive access to all relevant environmental data in DOE databases and monitoring reports. Both agencies must review all environmental cleanup remedies every five years to determine if they are still working appropriately.

Community stewards

When Oak Ridge Reservation land passes from federal ownership, the City of Oak Ridge will have jurisdiction over it and will bear a large portion of the responsibility for informing land developers about contamination. According to federal regulations, local realtors will also serve an integral role in informing possible land buyers of contamination.

The Tennessee Department of Transportation must be made aware of contaminated areas to avoid exposure of workers building new roads, laying utility lines, or performing other support services for developing former reservation lands. The department will have access to this information if it is incorporated into deeds and used in the Tennessee State Parcel Mapping System. This system, which is the principal tool for managing cartographic information, will assist by identifying and cataloging contamination within reclaimed and industrialized land on the reservation.

In Roane and Anderson counties, the Registers of Deeds will preserve all contamination-related documents submitted to them and will tie these records to property titles so that information about contamination will be given to purchasers of reclaimed land. The Registers of Deeds will submit all contamination-related documents to

the County Property Assessors' Offices, where the documents will be preserved in the county mapping systems as well.

The DOE Office of Scientific and Technical Information (OSTI) provides an outlet through which information and knowledge gained from the reservation are made available to the world's technical audience. This will be possible for stewardship information if a proper subset of documents is forwarded to OSTI. Because OSTI routinely forwards documents to the National Technical Information Service, stewardship information will be available to the public through this organization, too.

It is important that community members understand the risks posed and precautions required because of residual contamination. Failure of the public to fully appreciate these matters can result in neglect of stewardship functions, such as funding support; unnecessary exposure of individuals to hazards; inappropriate use of released lands; and unnecessary fears of negligible hazards. Public education stewards will play a key role in keeping the public informed and involved. The two main stewards are public schools and libraries.

Public schools should inform students of the presence of contaminated lands in their communities and instill respect for protection methods and the necessity of stewardship. Public libraries will provide similar services for the adults of the communities. The Oak Ridge Public Library serves as a center for distribution and repository for DOE documents.

The reservation's environmental resources are managed by Oak Ridge National Laboratory and the Tennessee Wildlife Resources Agency under the guidance of DOE. Their duties include the

general management of the reservation environment and regulation of any hunting or fishing that may occur on or near the site. It is recommended that these duties continue.

RESEARCH ON THE RESERVATION

Researching a long-term stewardship program is extremely important and greatly needed. Stewardship encompasses not only long-term custodial responsibility but a responsibility to understand the behavior of contaminants in a waste site in order to predict future performance.

Routine surveillance can help in understanding contaminant behavior by providing information about generally understood waste-related issues, such as concentration and migration of known contaminants. Stewardship also requires working to understand phenomena that are *not* well understood, for example, uptakes and effects of contaminants on human, plant, and animal populations. Such research contributes to predicting the future conditions and safety of a waste disposal site.

For some of the Oak Ridge Reservation waste sites, nuclear radiation levels will be substantially reduced by natural decay within 300 years. This will create opportunities to reevaluate site conditions and cleanup. Therefore, stewards must not only preserve applicable historical and current data, they must also evaluate future data needs in the following areas:

- long-term performance and safety of disposal sites,

- effectiveness of hydrological isolation and limited source removal for prevention of contaminant migration,
- migration of contaminants in groundwater and biota,
- rates of natural decay of organic compounds and the fate of heavy metals in groundwater plumes,
- effectiveness of natural cleansing processes,
- human health effects of chronic low-level contaminant exposures, and
- long-term impact of contaminants on the environment.



Research provides data necessary for stewards to make informed decisions about the effectiveness of cleanup actions.

The nature of this list indicates how little is known about the long-term disposal of radioactive and chemically hazardous wastes. The Oak Ridge Reservation provides a unique opportunity for this type of research.

CONCLUSION

To protect human health and the environment, an active and effective stewardship program for the Oak Ridge Reservation must be put in place. A range of stewards should be recognized and their efforts coordinated in order to effectively continue current stewardship activities and prepare for future responsibilities.

Only after a comprehensive stewardship program is in place for the Oak Ridge Reservation can local citizens support cleanup plans that allow for residual contamination to remain as a potential threat to future generations.



Wild geese return to Mitchell Branch at the East Tennessee Technology Park, where workers put the finishing touches on a project to capture contaminated groundwater in a series of 29 extraction wells. Cleaning up contaminated areas of the Oak Ridge Reservation so they are safe for future generations is the principal goal of DOE's Environmental Management Program.

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