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## Oak Ridge Reservation Natural Resource Damage Assessment

### Watts Bar Reservoir

Prepared for:

Oak Ridge Natural Resource  
Trustee Council

Prepared by:

Rachel DelVecchio  
Industrial Economics, Incorporated

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# Overview

- Under CERCLA, natural resource damage assessments are conducted by government officials designated to act as “trustees” to bring claims on behalf of the public for the restoration of injured natural resources.
- For the Oak Ridge Reservation (ORR), several Federal and state agencies serve as Trustees.
  - State of Tennessee Department of Environment and Conservation (TDEC).
  - Tennessee Valley Authority (TVA).
  - U.S. Department of the Interior (DOI), Fish and Wildlife Service (FWS).
  - U.S. Department of Energy (DOE).

# Overview

- A Trustee Council was formed in 1993.
- Assessed the type and scope of natural resource injury and service loss resulting from the release of hazardous substances from DOE's operations at ORR.
- Current focus is injuries to natural resources of Watts Bar.
- Selected a set of restoration options intended to make the public whole for these injuries and service losses (DOI regulations 43 CFR 11).
- Purpose of this briefing: provide a review of the analytic basis for these proposed restoration actions.
  - Context for the NRDA.
  - Overview of the natural resource injury assessment.
  - Overview of the restoration benefits analysis.
  - Public process.

# Site History

- Oak Ridge Reservation (ORR).
  - ~37,000 acres.
  - Owned by DOE.
  - Located along the Clinch River near Oak Ridge, Tennessee.
  - Three facilities constructed in the early 1940s.
    - Oak Ridge National Laboratory.
    - Oak Ridge Y-12 National Security Complex.
    - East Tennessee Technology Park.
  - Operated for research, development, and processes in support of the Manhattan project.

# Site Map



Fig. 2.4. Oak Ridge Reservation.

# Site History

- ORR placed on the NPL December 1989.
  - CERCLA requires that sites be investigated for potential remedial action, based on the nature and extent of human health and environmental risks.
  - DOE, EPA, and TDEC signed a Federal Facility Agreement to ensure coordinated effort in remedy/restoration.
- Divided into multiple operable units (OUs).
  - Lower Watts Bar Reservoir (from the Watts Bar Dam to the confluence of the Clinch and Tennessee Rivers).
  - Clinch River (including Poplar Creek)
- Record of Decision published in 1995 for LWBR.
  - Included institutional controls, fish consumption advisories to limit exposure, and annual monitoring to detect changes in contaminant levels or mobility.
- Record of Decision for Clinch River signed in 1997.

# NRDA Versus Remedy

- Natural resource damages are *in addition* to remedial actions.
  - Remedial action objectives are risk-based: protect human health and the environment from further “unacceptable” harm.
  - Natural resource damages are based on restoration of natural resources to their baseline condition and are estimated over time through full restoration of the resource (referred to as “interim” losses).
  - Baseline is the condition that would have existed absent the release of hazardous substances.

# Objective of Watts Bar NRDA

- Implement restoration projects that provide ecological and human use services of sufficient type and quality to compensate for resource services lost due to DOE-related contamination in Watts Bar Reservoir.

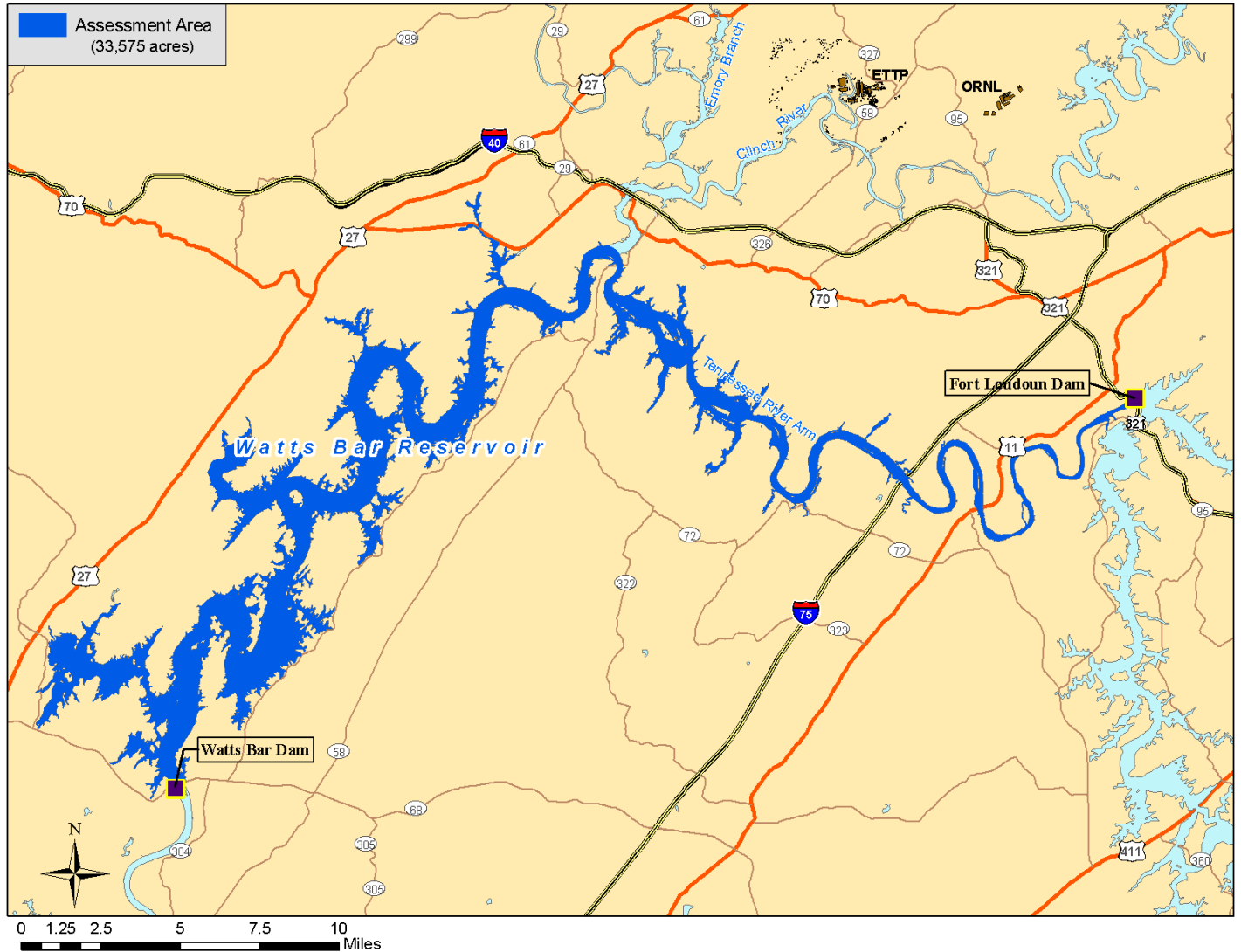


# NRDA Process at ORR

- Define scope: Area and time period over which natural resources have been impacted by contamination.
- Evaluate injury: Assess type, severity, and magnitude of adverse impacts to natural resources (as defined in DOI regulations) and corresponding losses in resource services as compared to baseline.
- Develop Restoration Plan: Identify restoration actions that will provide the type, quality, and quantity of resource services sufficient to compensate for these losses.

# Watts Bar Assessment Area

Geographic  
Scope



# Ecological Losses

- Calculate present value of losses (acre-year equivalents).
- Present value losses range from ~148,000 to ~181,500 acre-years.

# Recreational Fishing Losses

- A recreational fishing advisory is in place on Watts Bar due to PCB contamination in fish.
- The Trustees applied an existing model of the behavior of anglers in response to this advisory to establish the magnitude of recreational fishing loss (Jakus 1997).
- In previous work, PriceWaterhouseCoopers LLP (2000) calculated recreational fishing losses of approximately \$6.64-\$9.96 million.

# Commercial Fishing Losses

- Contaminant-related closure of commercial fishery in April 2008 by TWRA. Expected duration of closure is unknown.
- Data available on harvests of four commercial species.
- Economic damages measured as the loss in producer surplus experienced by fishers.
  - Producer surplus is the difference between the market price for a good and the minimum price at which the producer is willing to supply the good.
  - Estimated as 20 percent of wholesale prices (based on literature).
  - Losses calculated from 2008 in perpetuity.

# Commercial Fishing Losses

SPECIES	LOST HARVEST (LBS)	WHOLESALE PRICE (PER LB)	LOST PRODUCER SURPLUS (PER LB)	ANNUAL VALUE	TOTAL PRESENT VALUE 2008-PERPETUITY
Catfish	109,000	\$0.44	\$0.09	\$9,553	\$191,058
Buffalo	4,500	\$0.24	\$0.05	\$219	\$4,382
Drum	2,000	\$0.15	\$0.03	\$58	\$1,169
Carp	3,500	\$0.15	\$0.03	\$102	\$2,045
Total				\$9,933	\$198,654

# Restoration Goals

- Implement restoration that:
  - Provides sufficient compensation for ecological and human use service losses.
  - Is consistent with local and regional resource management goals.
  - Satisfies the DOI criteria for restoration.
  - Is timely.

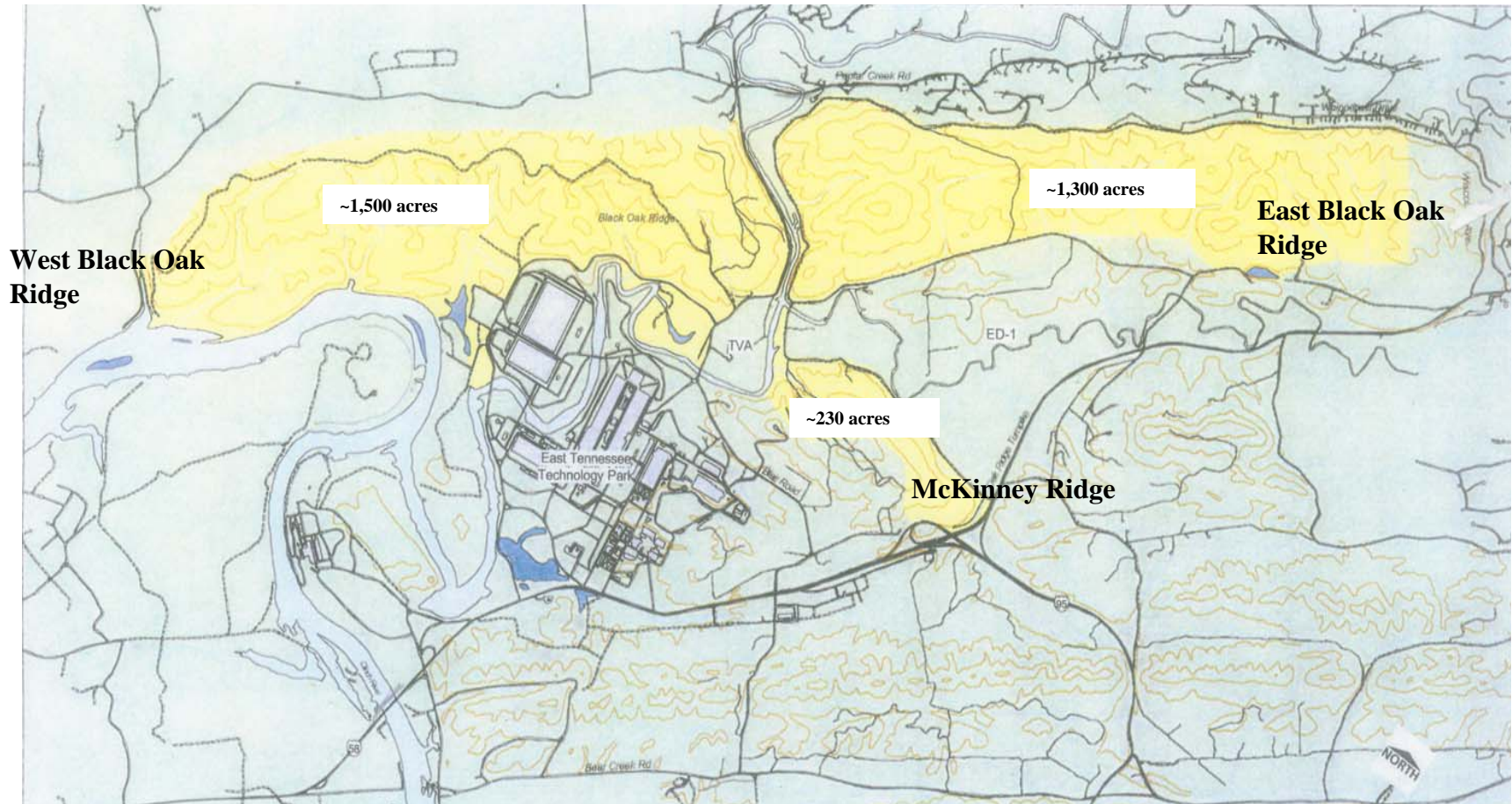
# Restoration Projects

- Conservation easement on Black Oak Ridge (BORCE).
  - Initiated in 2005 between DOE and State of Tennessee as an indefinite easement.
- Recreational fishing improvements.



# BORCE Geographic Scope

- Includes ~3,000 acres on East BOR, West BOR, and McKinney Ridge.



# BORCE Temporal Scope

- Timeframe of benefits:
  - Begin in 2006 (first full year after initiation of BORCE).
  - Continue in perpetuity (in accordance with terms of BORCE).

# BORCE Baseline

- Available information indicates that BORCE would be under development pressure.
  - Population increasing, number of building permits increasing.
  - Timing and extent of development uncertain.
- Development would interfere with ecological and human use services.
  - Ecological services of large, contiguous forested habitat (songbirds).
  - Human use services measured based on public access/use.
- Trustees analysis assumes that BORCE would provide no ecological services or public use services without easement.

# BORCE Habitat

- Upland habitat provides full suite of ecological services.
- Focused on suite of upland habitat types on BOR.

UPLAND HABITAT TYPE	CHARACTERISTICS	ACRES
Interior Forest	>70% canopy cover, >50 acres, >200m buffer.	271
Sensitive	Supports T&E species.	1,111
Basic	Provides upland ecological services but is not interior forest or sensitive habitat.	1,584

# BORCE Ecological Gains

- Benefits quantified based on services provided under the BORCE.

UPLAND HABITAT TYPE	EQUIVALENCE	RATIONALE	ACRES OF BASIC UPLAND HABITAT	ACRE-YEARS GAINED (2006-PERPETUITY)
Interior Forest	1:2	Local/regional priority, specific habitat characteristics	542	18,083
Sensitive	1:10	Increased fines for take of T&E species	11,106	370,208
Basic	1:1	NA	1,584	52,803
<b>Total</b>				<b>441,094</b>

# BORCE Human Use Gains

- Benefits quantified based on services provided under the BORCE.
  - Easement management and operations.
  - Hunting.
  - Trail use recreation.

# BORCE Easement Management and Operations Gains

- Annual funding provided to State of Tennessee by DOE:
  - \$20,500 for management.
  - \$16,000 for maintenance and operations.
- Present value of \$730,000.

# BORCE Hunting Gains

- Value expected to be generated by white-tailed deer and turkey hunting.
- Based on harvest data (TWRA) and literature values.

SPECIES	ANNUAL HUNTING TRIPS	PER TRIP VALUE	ANNUAL VALUE	TOTAL PRESENT VALUE 2006 - PERPETUITY
White-Tailed Deer	267	\$46	\$12,400	\$247,400
Turkey	34	\$46	\$1,600	\$31,600
<b>Total</b>	<b>301</b>	<b>-</b>	<b>\$14,000</b>	<b>\$279,000</b>



# BORCE Trail Use Recreation Gains

ACTIVITY	PARTICIPATION	ANNUAL NUMBER OF TRIPS (2006)	VALUE PER TRIP
Walking	37%	4,100	\$11.21
Hiking	15%	1,700	\$22.42
Biking	13%	1,500	\$13.50
Bird Watching	14%	1,600	\$37.55
Wildlife Viewing	20%	2,300	\$37.55
<b>Total</b>	<b>100%</b>	<b>11,200</b>	<b>-</b>

# BORCE Trail Use Recreation Gains

- Gains estimated from 2006 in perpetuity.

ACTIVITY	ANNUAL VALUE (2006)	TOTAL PRESENT VALUE (2006 - PERPETUITY)
Walking	\$46,000	\$2,044,500
Hiking	\$38,100	\$864,300
Biking	\$20,300	\$735,400
Bird Watching	\$60,100	\$798,600
Wildlife Viewing	\$86,400	\$1,144,800
<b>Total</b>	<b>\$249,000</b>	<b>\$5,587,600</b>

# BORCE Human Use Gains

- Summary.

HUMAN USE SERVICE	PRESENT VALUE
Management	\$410,000
Maintenance	\$320,000
Hunting	\$279,000
Trail Use	\$5,588,00
<b>Total</b>	<b>\$6,597,000</b>

# Comparison of WBR Losses and BORCE Gains

- Trustees conclude that BORCE provides sufficient compensation for natural resource damages in WBR due to ORR-related contamination.

	PRESENT VALUE OF ECOLOGICAL SERVICES (ACRE-YEARS)		PRESENT VALUE OF HUMAN USE SERVICES (MILLION)	
	Loss Due to ORR-Related Contamination in WBR	Aquatic Habitat	148,000 -181,500	Recreational Fishing
Commercial Fishing				\$0.20
Gains Under BORCE	Upland Forested Habitat	441,000	Management Maintenance Hunting Trail Use	\$6.60

# Additional Projects to Address Recreational Fishing

- Trustees concerned that BORCE does not provide sufficient benefits directly to recreational fishers.
- DOE has agreed to fund relevant projects, as determined by the State of Tennessee, to improve existing recreational fishing access and opportunities.