



Lessons From the Woods: Landscaping Sustainably at ORNL

Pat Parr, ORNL Natural Resources Manager



2011

Changes at ORNL
brought opportunities
to improve landscaping



1995

Reflect uniqueness



Attractive



Ecologically functional



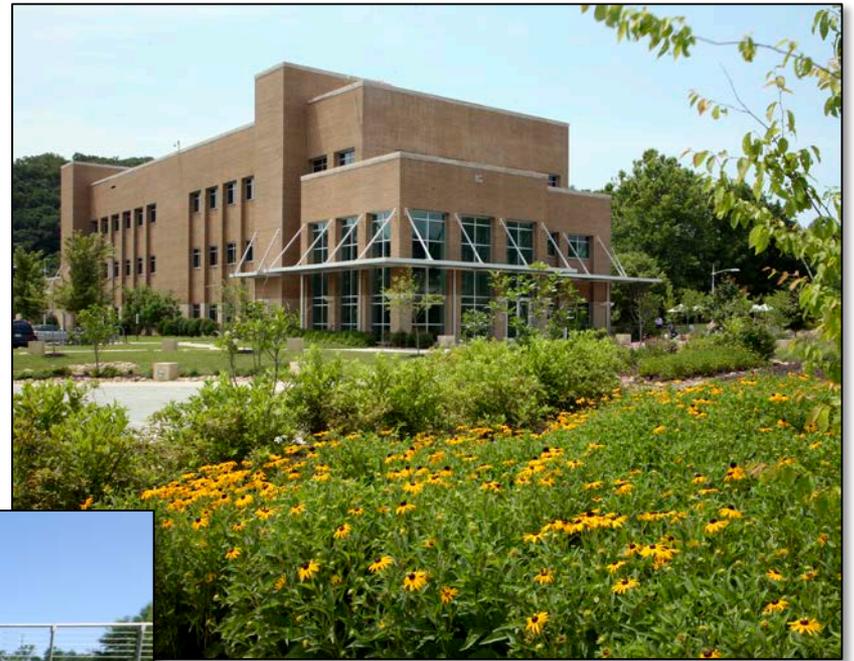
Biologically diverse



Low maintenance



"Lab within a Park" concept

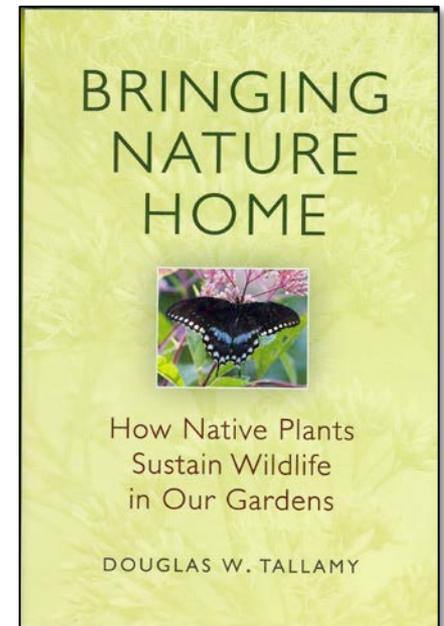
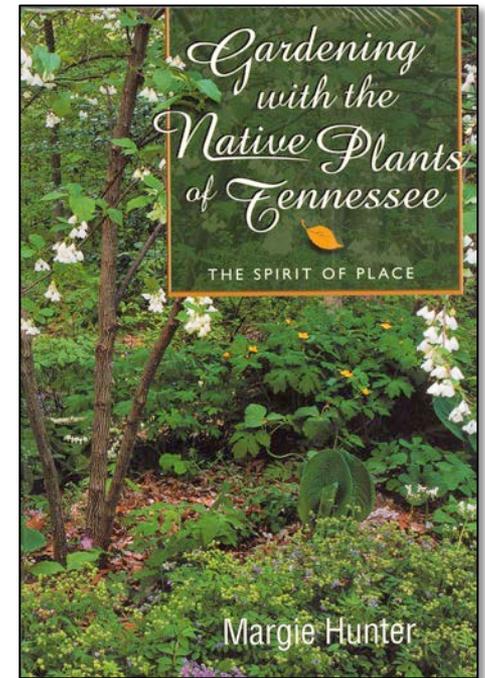


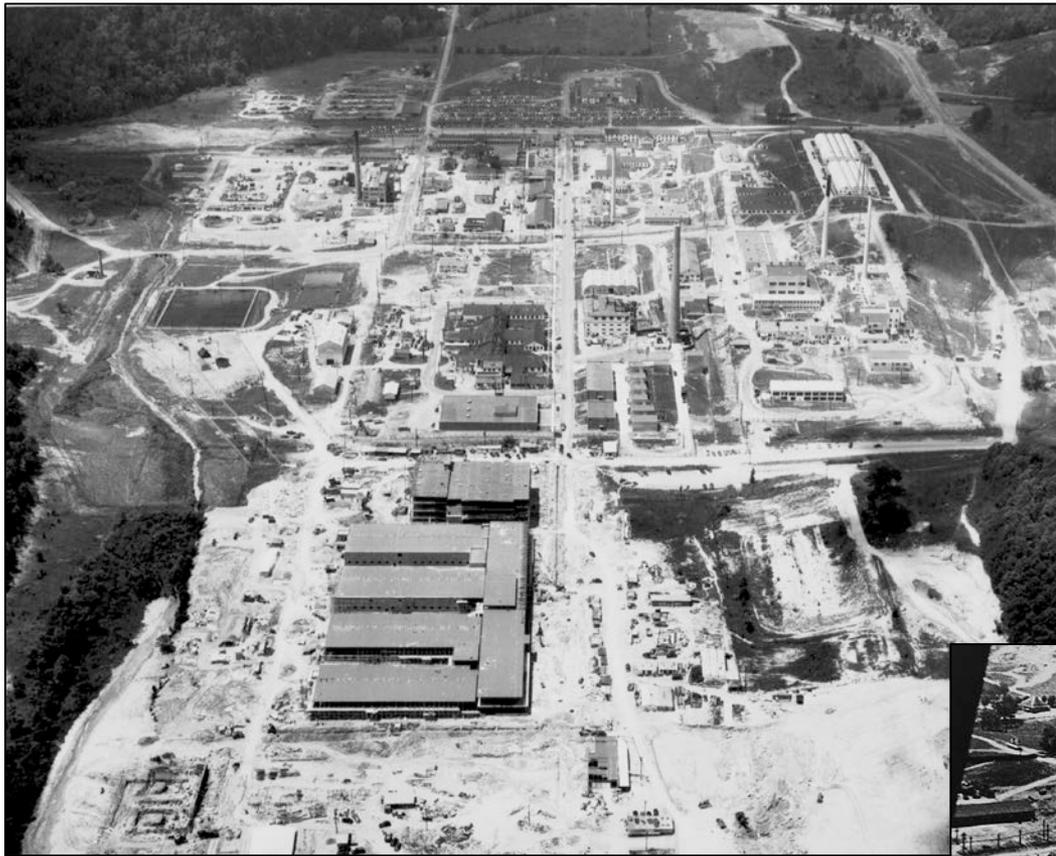
Use native plants



Advantages of native plants

- Provide a sense of place and highlight native flora
- Adapted to site and environmental conditions
- Not aggressive as many non-natives are
- Provide opportunities to educate and demonstrate sustainable approaches
- Support native insects, birds, and other wildlife for pollination, food sources, and nesting
- Often are deep-rooted providing effective stabilization

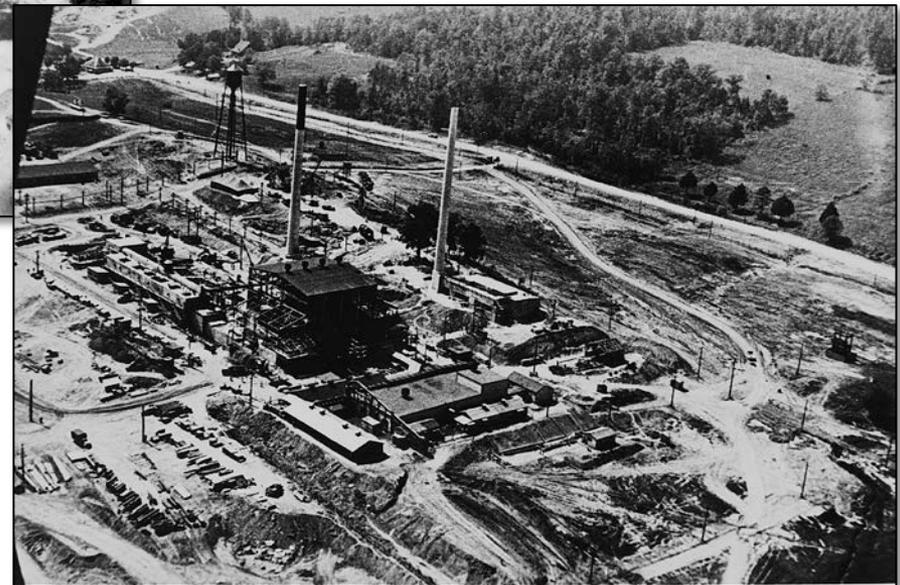




ORNL facility legacy for landscaping

1950's

- fill-material
- buried and channelized creeks
- altered vegetation
- eroded lands
- highly impacted streams



1943



Creating a Lab with a Park

9/3/2008

Forest blocks

Plant communities

Pollination

Riparian buffers

Walking paths

Wildlife habitat

Slowing runoff

Migration corridors

Sense of place

Image USDA Farm Service Agency
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Evolution of Landscaping at ORNL



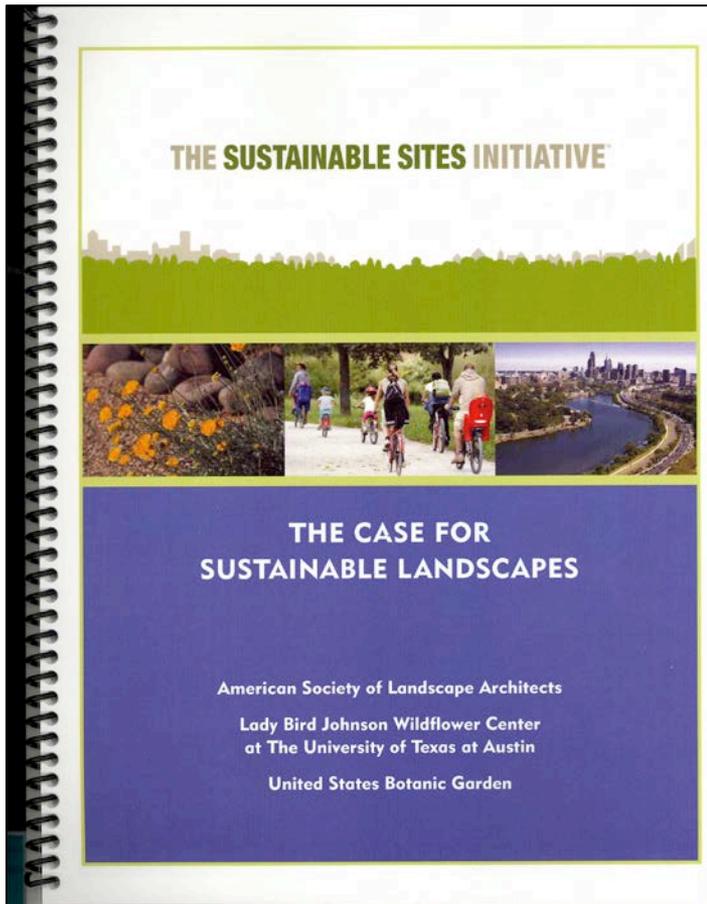
Ornamentals

Native Plants

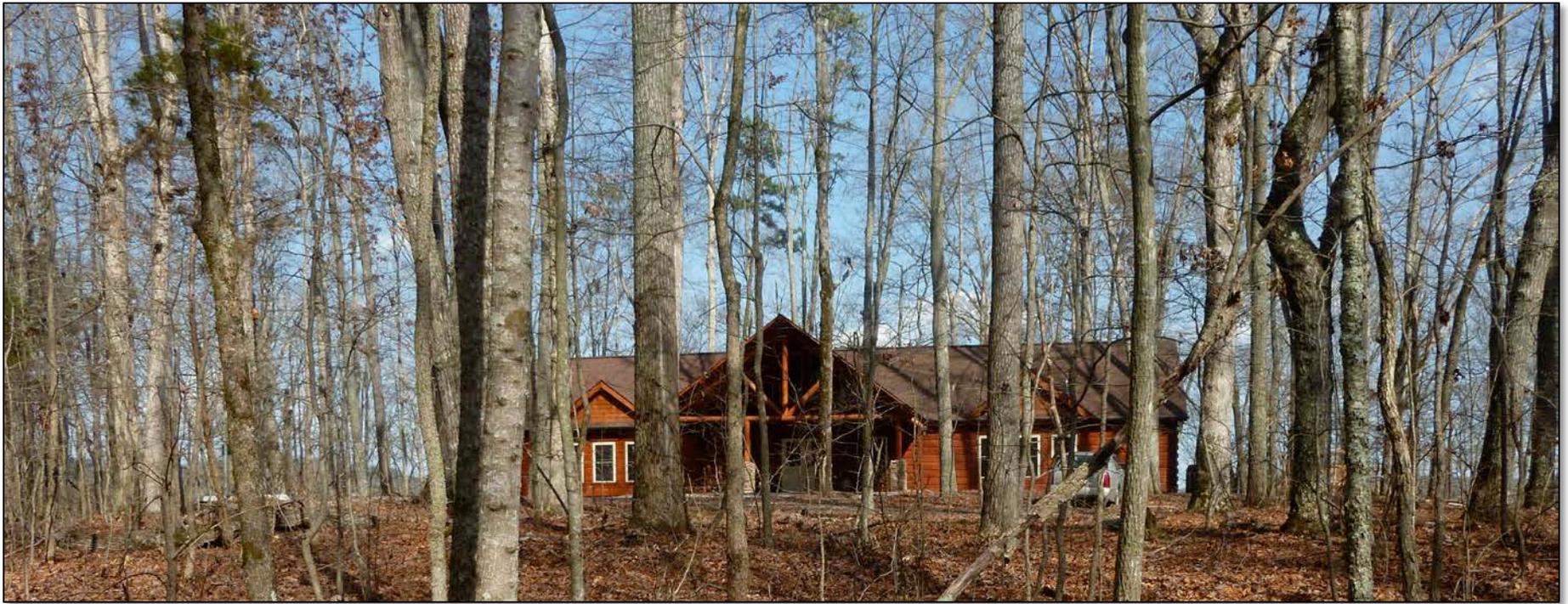
Plant Communities

Ecosystem Services

- air and water cleansing (reducing pollutants)
- erosion and sediment control (retaining soil)
- global climate change regulation (locking up carbon)
- habitat functions (refuge and reproduction habitat)
- hazard mitigation (reduce vulnerability from floods, wildfire)
- human well-being benefits (from interaction with nature)
- local climate regulation (shading, windbreaks)
- pollination (providing pollinator species for other plants)
- water supply and regulation (watershed and aquifer storage)



www.sustainable sites.org



Clinch River Cabin in White Cedars Natural Area



4500N native woodland wildflowers



Purchased from a local native plant nursery





5800 courtyard and outside



ORNL Detention Basin

- Basin captures runoff from parking area;
- Original design was to use fescue grass;
- Area too wet to mow effectively;
- We proposed use of wetland plants to create a pocket wetland.



Photo: J. Richards



Drop ponds at parking structure





HTML Riparian Mitigation



SUSTAINABLE LANDSCAPES

Replacing steep areas of lawn next to a stream with a *ledge garden*...

...ledge garden

- * reduces erosion by stabilizing the slope with rock-supported planting pockets
- * minimizes energy use by reducing mowing and the use of fertilizers
- * improves water quality by providing a more effective stream buffer than lawn
- * shades the stream to minimize summer temperatures and retain soil moisture
- * increases biodiversity (variation of life forms within a given ecosystem)
- * creates more habitat and nesting sites for songbirds and other wildlife
- * provides a more diverse food supply for wildlife, especially insects
- * brings beauty, visual interest, and seasonal variation to the landscape

- A Elderberry - *Sambucus racemosa*
- B Crossvine - *Bignonia capreolata*
- C River Cane - *Chamaedorea latifolia*
- D Cherokee Sedge - *Carex cherokeensis*
- E St. Andrew's Cross - *Hesperis matronalis*
- F Coralberry - *Symphoricarpos orbiculatus*
- G Oakleaf Hydrangea - *Hydrangea quercifolia*
- H Limestone Ledge
- I Sycamore - *Platanus occidentalis*
- J Dwarf Red Buckeye - *Aesculus parva*
- K Ironwood - *Cornus canadensis*
- L Leaf litter or Duff



This is a demonstration project of the Sustainable Landscapes Initiative, a collaborative effort involving Oak Ridge National Laboratory and Environmental Landscape Design Associates. The primary goal of this initiative is to enhance both the aesthetic appeal and the environmental quality of the Oak Ridge National Laboratory campus landscape. Please visit: <http://sustainable.ornl.gov> for more information.

First Creek Riparian and Edge



SUSTAINABLE LANDSCAPES

Creating rain gardens with native plants is a great way to solve stormwater runoff problems because they...

...rain garden

- * reduce streambank erosion and flooding by slowing storm water runoff
- * improve water quality by filtering pollutants and sediment from runoff
- * help to recharge local ground water supplies
- * minimize energy use by reducing mowing and the use of fertilizers
- * increase biodiversity (variation of life forms within a given ecosystem)
- * create mecca habitat and nesting sites for songbirds and other wildlife
- * brings beauty, visual interest, and seasonal variation to the landscape

A. Blue Lobelia *Lobelia cardinalis*
 B. Swamp Milkweed *Asclepias incarnata*
 C. Leaning crab with channeling storm runoff from pavement
 D. Cardinal Flower *Lobelia cardinalis*
 E. Wild Aster *Aster multiflorus*
 F. Blue Flag Iris *Iris versicolor*
 G. Owl or Ice Tree *Fraxinus pennsylvanica*
 H. Chokeberry *Ajonon*
 I. River Birch *Betula nana*
 J. River Birch *Betula nana*
 K. Elderberry *Sambucus racemosa*
 L. Stream Alder *Alnus verticillata*

OAK RIDGE

This is a representative project of the Sustainable Landscapes program, a collaborative effort involving Oak Ridge National Laboratory and Environmental Landscapes Design Associates. The primary goal of this initiative is to enhance both the aesthetic appeal and the environmental quality of the Oak Ridge National Laboratory campus landscape. Please visit www.elsdesign.com for more information.



East Campus Pond

- More natural environment
- Enhance wildlife
- Reduce maintenance
- Welcoming to people



WOODLAND PLANT COMMUNITY

- REFLECTS OAK-HICKORY WOODLAND OF EAST TENNESSEE RIDGES COMMON IN THE OAK RIDGE VICINITY
- CANOPY TREES INCLUDE WHITE OAK, CHESTNUT OAK, PIGNUT HICKORY, SHAGBARK HICKORY, SASSAPARILLA, VIRGINIA PINE, SWEETGUM, RED MAPLE, AND SUGAR MAPLE
- SUB-CANOPY AND EDGE SPECIES INCLUDE WHITE FLOWERING DOGWOOD, EASTERN REDBUD, SOURWOOD, SHING SHUMAC, AND RUSTY BLACKHAW

RAVINE PLANT COMMUNITY

- INTERPRETS AND REPRESENTS A MESIC (MOIST) PLANT COMMUNITY TYPICAL OF EAST TENNESSEE AND CUMBERLAND MOUNTAIN RAVINES
- SPECIES INCLUDE WHITE PINE, HEMLOCK, MOUNTAIN LAUREL, RIVER BIRCH, VIRGINIA SWEETSPICE, NINEBARK, CHINA WOOD CLETHRA, UMBRELLA MAGNOLIA, WINTERBERRY, RIVER OATS, YELLOW ROOT, AND CUMBERLAND ROSEMARY
- INCORPORATES EXISTING WATERFALL AND CASCADES BY RETROFITTING THE ASSOCIATED RAVINE PLANT COMMUNITY FEATURE

SLOPE PLANTINGS - SUN & SHADE

- TOUGH, LOW-MAINTENANCE NATIVE PLANTINGS MASSED FOR SIMPLICITY AND TO REDUCE MOWING/WEED TRIMMING
- SPECIES INCLUDE GROUND SUMAC AND LITTLE BLUESTEM IN SUNNY AREAS; WHILE CORALBERRY, OAK LEAF HYDRANGEA, AND RIVER OATS THRIVE IN THE SHADE

SITE AMENITIES

- SEVERAL NEW SHADED SITTING AREAS ALONG THE POND PERIMETER
- TWO NEW OPEN-AIR PAVILIONS OVERLOOKING THE POND
- A LINEAR ARCHITECTURAL TRELLIS TO PROVIDE A SHADY INTERLUDE ALONG THE LOOP TRAIL, JUST WEST OF THE EXISTING BOARDWALK
- INTERPRETIVE SIGNS TO CONVEY THE ENVIRONMENTALLY SUSTAINABLE CONCEPTS OF THE LANDSCAPE, AS WELL AS PLANT IDENTIFICATION

NOTE: ALL NEW STRUCTURES (INCLUDING TRELLIS, PAVILIONS, PLATFORMS, BOARDWALKS, AND RAILINGS) WILL REFLECT SUSTAINABILITY IN THEIR DESIGN AND CONSTRUCTION. RECYCLED/LOW-IMPACT MATERIALS FROM LOCAL SOURCES WILL BE USED WHEREVER POSSIBLE AND WILL BLEND VISUALLY WITH THE EXISTING BOARDWALK AND SURROUNDING BUILDINGS.

NATIVE BOUQUET GARDEN

- COLORFUL, SUNNY BORDER FEATURING NATIVE GRASSES AND WILDFLOWERS IN A CULTIVATED SETTING
- SPECIES INCLUDE BUTTERFLY WEED, PURPLE CONEFLOWER, BLAZING STAR, AROMATIC ASTER, AND LITTLE BLUESTEM
- LINEAR BEDS OF THESE HERBACEOUS SPECIES ARE FRAMED BY BLOCKS OF A NATIVE LOW-GROWING SUMAC THAT PROVIDES BEAUTIFUL FALL COLOR AND A VISUALLY PLEASING TRANSITION BETWEEN SUNNY AND SHADY AREAS

RAIN GARDEN

- A BIO-SWALE FILTERING RUNOFF FROM SURROUNDING LAWNS, WALKS, AND OTHER HARDSCAPE AREAS
- FEATURES NATIVE PLANTINGS ADAPTED TO LOW-LYING DRAINAGEWAYS
- DESIGN DETAILS FOR THIS RAIN GARDEN ARE NOT INCLUDED IN THIS DESIGN SET

COURTYARD

- AN OUTDOOR SOCIAL SPACE SERVING PERSONNEL FROM CAFETERIA AND OTHER NEARBY BUILDINGS
- INCLUDES MOVABLE FURNITURE WITH UMBRELLAS FOR SHADE, AND A PERMEABLE PAVING SYSTEM SURROUNDED BY PLANTING BEDS
- COULD BE CONNECTED TO THE ADJACENT BUILDING BY EXTENDING THE WALKWAY AND BRIDGING OVER THE PROPOSED RAIN GARDEN

RIPARIAN PLANT COMMUNITY

- SELECTIVE THINNING (PLEASE SEE S.T.E.M. ZONE NOTES ON SHEET 3) OF VEGETATION IN THIS AREA WHICH REPRESENTS PLANT COMMUNITIES ASSOCIATED WITH STREAMS, PONDS AND LAKES OF EAST TENNESSEE
- EXISTING SPECIES INCLUDE BLACK WILLOW, BUTTON BUSH, AND SWAMP MALLOW
- SUGGESTED SUPPLEMENTAL PLANTINGS INCLUDE SYCAMORE, INDIGOBUSH, ELDERBERRY, BLACKHAW, POSSUM HAW, AND STREAM ALDER

CEDAR BARREN PLANT COMMUNITY

- REPRESENTS A REMNANT OF THE UNIQUE CEDAR BARREN PLANT COMMUNITIES SCATTERED THROUGHOUT EAST TENNESSEE, ESPECIALLY IN THE OAK RIDGE AREA
- SPECIES INCLUDE NATIVE GRASSES AND WILDFLOWERS INCLUDING LITTLE BLUESTEM, BLAZING STAR, AND ROSE VERBENA
- ASSOCIATED THICKETS OR PATCHES INCLUDE EASTERN RED CEDAR, PERSIMMON, REDBUD, CAROLINA BUCKTHORN, FRAGRANT SUMAC, RUSTY BLACKHAW, AND GOLDEN ST. JOHN'S WORT

SLOPE PLANTINGS - SUN & SHADE

- TOUGH, LOW-MAINTENANCE NATIVE PLANTINGS MASSED FOR SIMPLICITY AND TO REDUCE MOWING/WEED TRIMMING
- SPECIES INCLUDE GROUND SUMAC AND LITTLE BLUESTEM IN SUNNY AREAS; WHILE CORALBERRY, OAK LEAF HYDRANGEA, AND RIVER OATS THRIVE IN THE SHADE

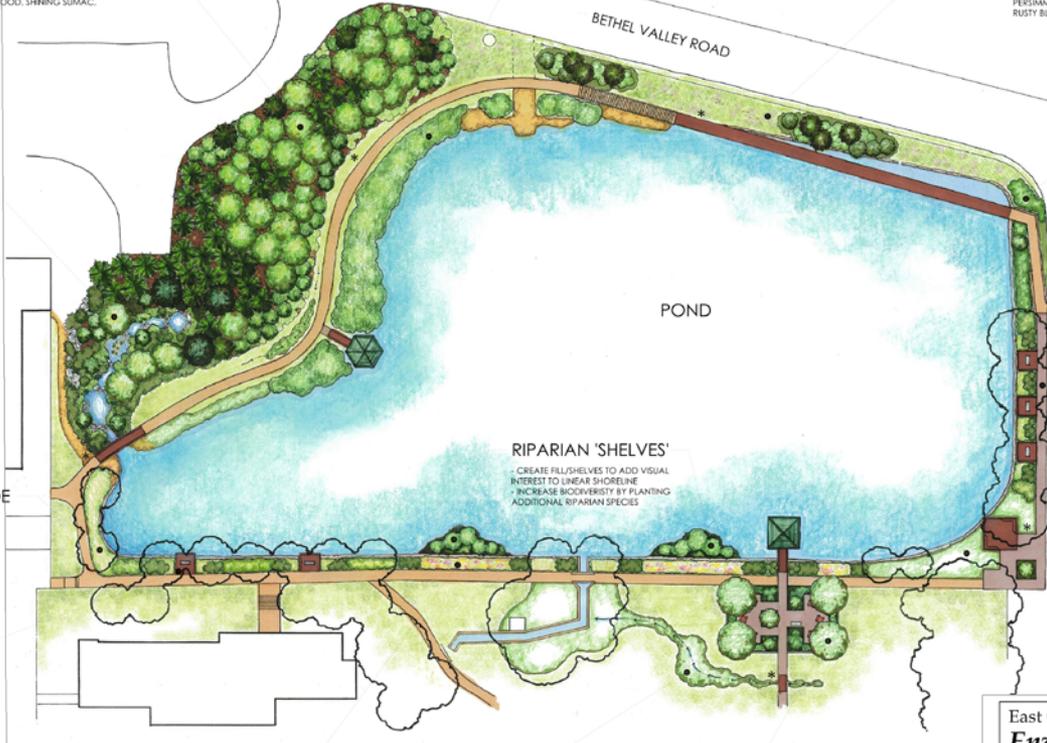
PEDESTRIAN CONNECTION

- COMPLETES THE EXISTING LOOP TRAIL
- PROVIDES ACCESS TO ADDITIONAL SITTING AREAS
- INSTALLING A PERMEABLE PAVEMENT SYSTEM WILL MINIMIZE ANY NEGATIVE ENVIRONMENTAL IMPACTS A HARD SURFACE MIGHT OTHERWISE HAVE ON THE ADJACENT POND; AND WILL VISUALLY UNIFY THIS AREA WITH THE COURTYARD AND OTHER PROPOSED HARDSCAPE COMPONENTS

S.T.E.M. ZONE & SHADE MOSAIC

- SELECTIVE THINNING OF VEGETATION IN THIS AREA WILL ACCENTUATE THE VIEW OF THE POND FROM THE PROPOSED DECK
- SHADE-LOYING WILDFLOWERS AND GROUNDCOVERS WILL BE NATURALIZED IN THIS AREA TO ENHANCE HABITAT AND AESTHETIC DIVERSITY
- PLEASE SEE S.T.E.M. ZONE AND NATIVE SHADE MOSAIC NOTES ON SHEET 3 FOR MORE DETAILED INFORMATION

* INTERPRETIVE SIGN LOCATION



East Campus Pond - ORNL
Environmental Landscape Plan
 Conceptual Master Plan

Environmental Landscape Design Associates (ELDA)

Prepared by:
 Sam Rogers, ASLA, RLA
 Leah Gardner, M.L.A.

Prepared 08/11/10

0 30 60

Sheet **1 of 6**

Rushes and Sedges



Lotus and Lilies



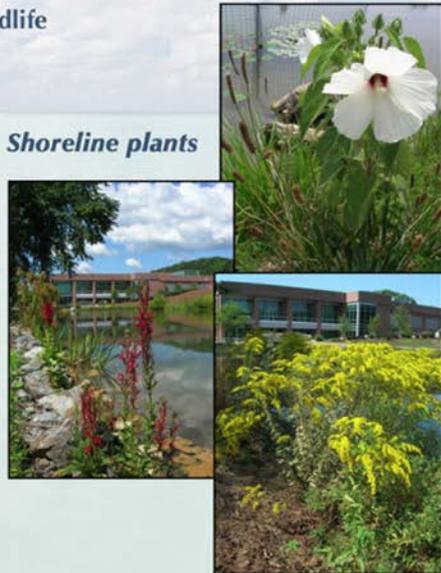
Improvements:

- Added aquatic and shore plants
- Added native fish and turtles
- Created walkway with sidewalk and boardwalk
- Added turtle platforms and bird houses for wildlife
- Added waterfall feature

Wildlife and habitat



Shoreline plants



Special Species Restoration: American Chestnut



Special Landscape Elements: Equisetum

Our landscape link to our
energy heritage





West Campus landscaping
includes vegetation
researched as biofuels

switchgrass



Landscaping to screen utilities



Managing the Landscape





Prescribed burns

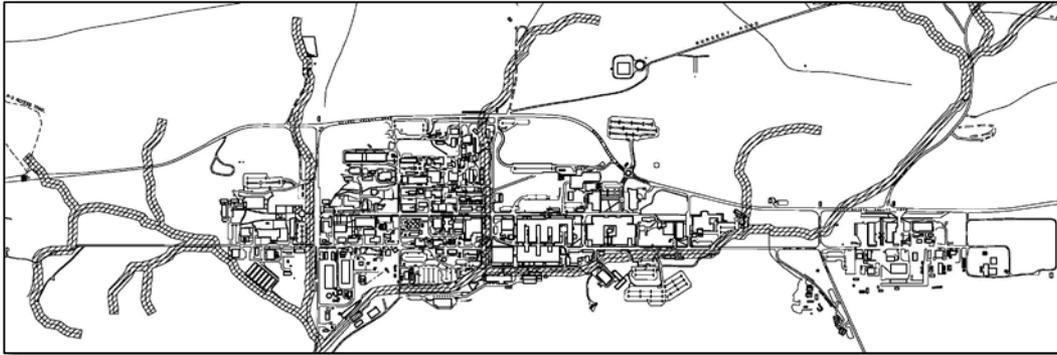


Invasive plant treatments

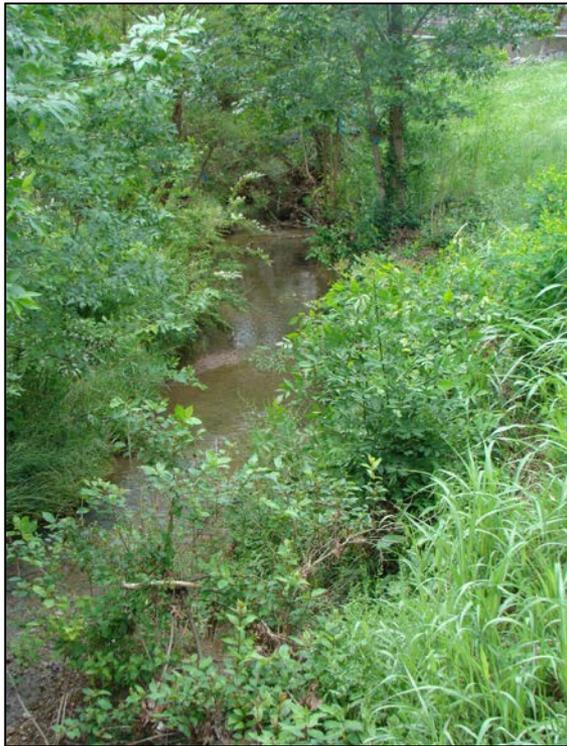


Pond maintenance

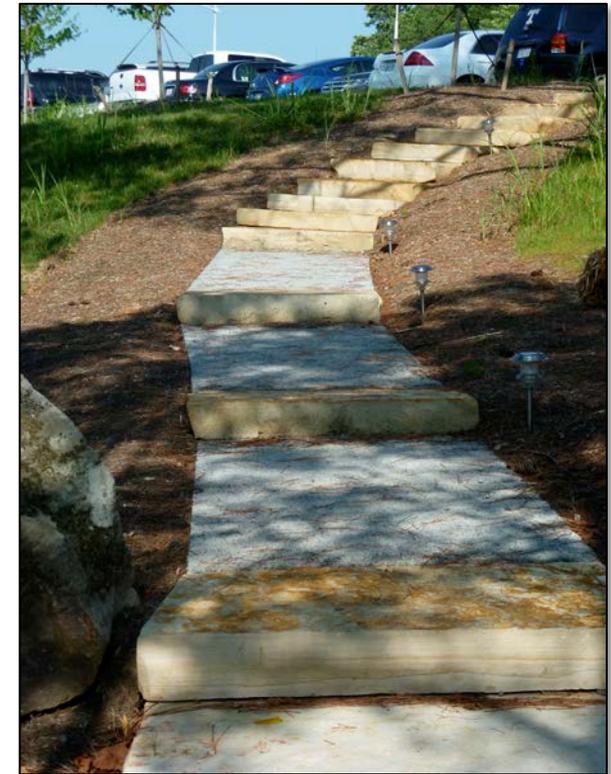
Protect and Improve Water Quality



Vegetation buffers
along streams



Pervious pavement
for storm water
control and retention





Propagation of plants
not available locally





Carbon storage by protecting existing trees and planting new ones

Sharing information



SUSTAINABLE LANDSCAPES

Replacing areas of lawn with *native bouquet and edge plantings... ..ecological edge*

- * minimizes energy use by reducing mowing and the use of fertilizers
- * improves water quality by slowing water runoff, retaining sediment, and increasing water infiltration more effectively than lawn
- * increases biodiversity (variation of life forms within a given ecosystem)
- * creates more habitat and nesting sites for songbirds and other wildlife
- * provides a more diverse food supply for wildlife, especially insects
- * brings beauty, visual interest, and seasonal variation to the landscape

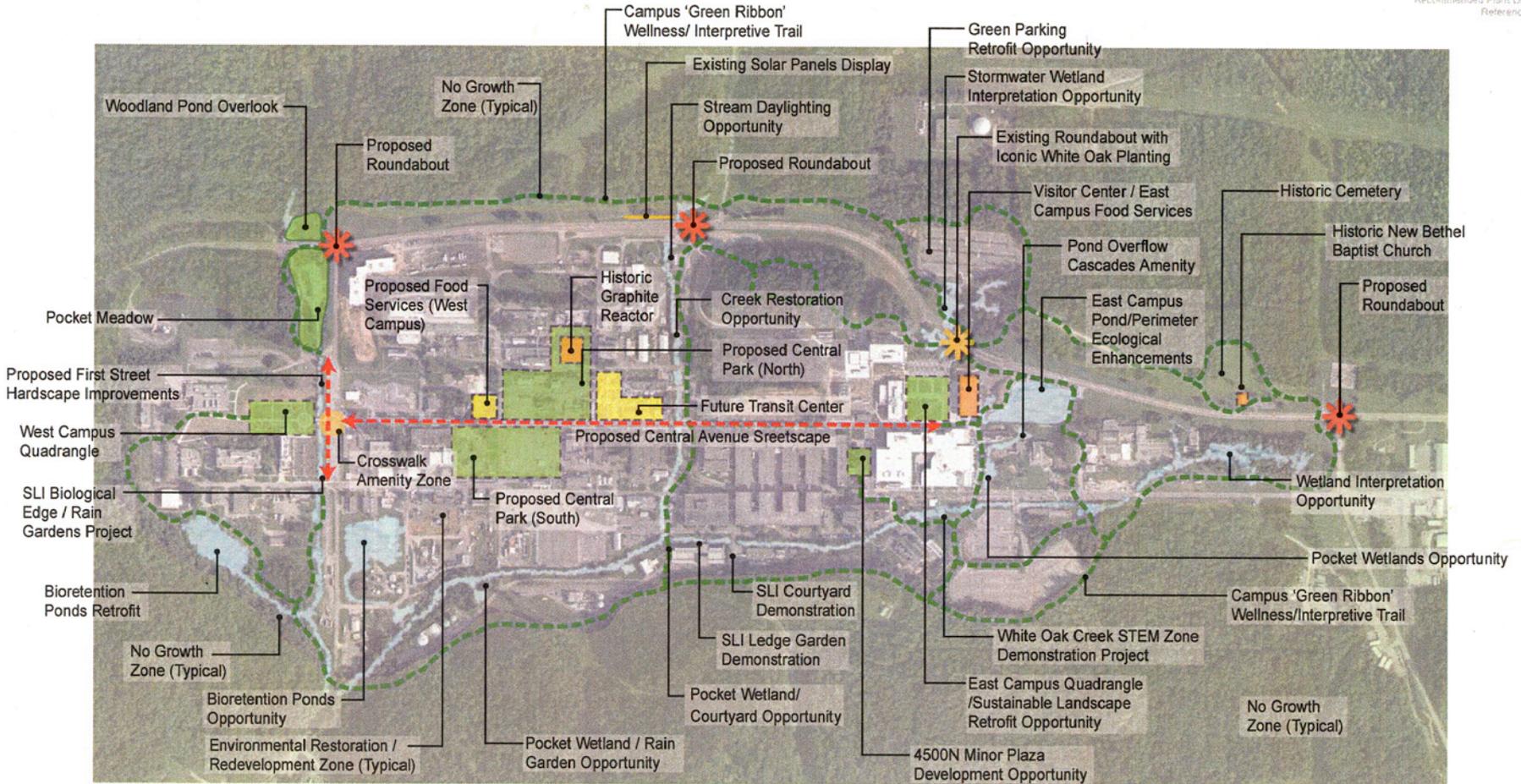
A Prairie Coneflower *Ratibida pinnata*
 B Purple Coneflower *Echinacea purpurea*
 C Butterfly Weed (seed pod) *Asclepias tuberosa*
 D Rough Blazingstar *Liatris aspera*
 E Black-eyed Susan *Rudbeckia fulgida*
 F Winged or Shining Sumac (fruit) *Rhus copallina*
 G Winged or Shining Sumac (leaf and stem) *Rhus copallina*
 H White Flowering Dogwood *Cornus florida*
 I Winged or Shining Sumac (habit) *Rhus copallina*
 J Eastern Red Cedar *Juniperus virginiana*
 K Wild Cherry *Prunus serotina*

OAK RIDGE
National Laboratory

Environmental
Landscape
Design
Partners

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Revised Campus Landscape Plan





Native vegetation in ROW areas
to reduce maintenance and
improve wildlife habitat



Oak Ridge National Laboratory



Sustainable Landscapes Initiative 2020

September 2011

Future Directions

- **Reduce high-maintenance areas (e.g. lawn)**
- **Convert ROW areas to native vegetation**
- **Store and use salvaged rock**
- **Explore wetland mitigation banking**
- **Use storm water as a resource**
- **Identify no-growth zones to protect existing resources**
- **Integrate research into the landscape**
- **Extend planning to areas off of main campus**
- **Incorporate more walking paths**

Expanding ORNL Experiences to Oak Ridge Reservation

- Approved plant list for landscaping
- Wetland plant propagation research
- Nuisance wildlife management
- Enhancement of wetland areas
- Native grass restoration
- Workshops on invasive management

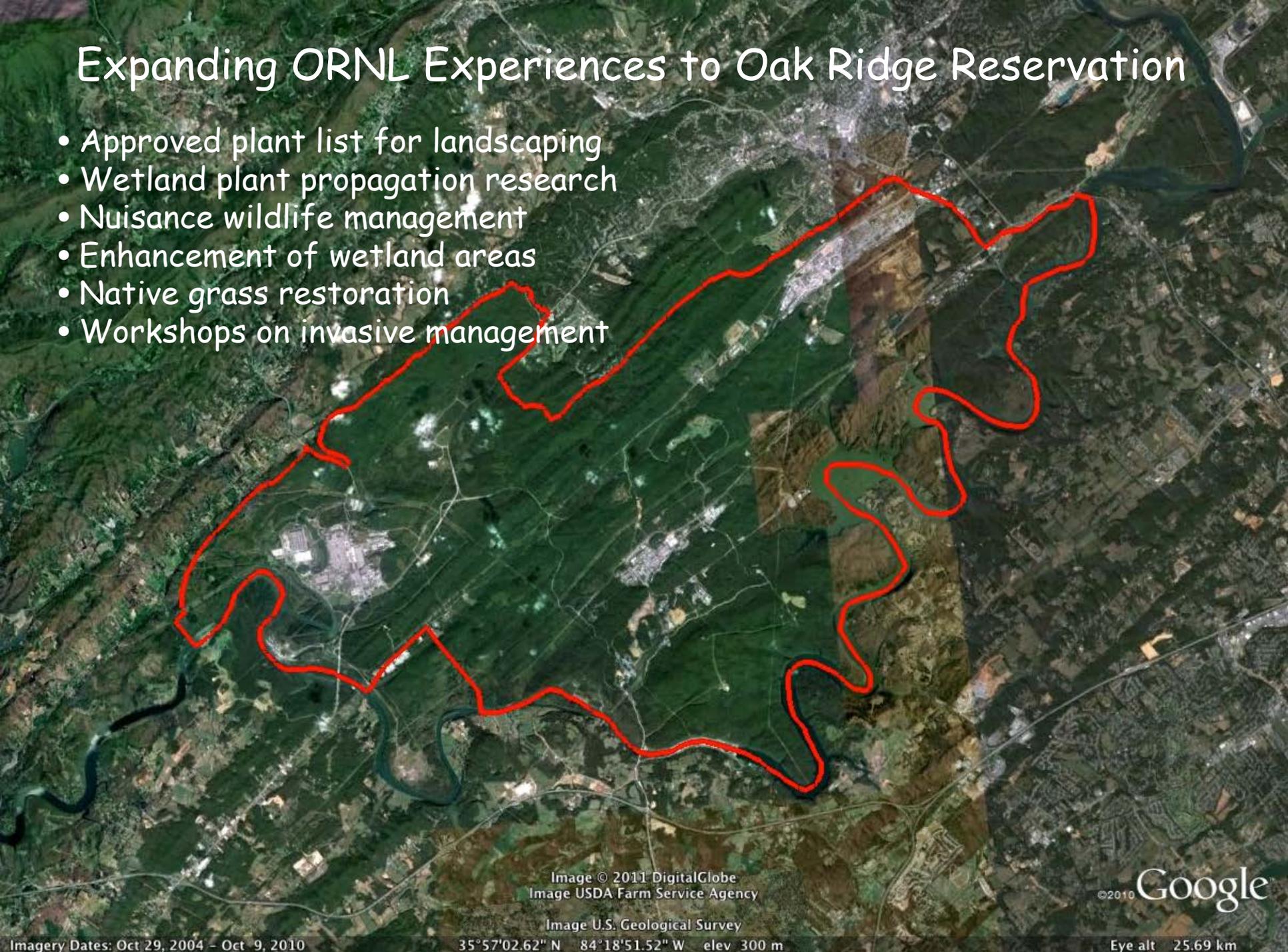


Image © 2011 DigitalGlobe
Image USDA Farm Service Agency

Image U.S. Geological Survey

35°57'02.62" N 84°18'51.52" W elev 300 m

©2010 Google

Eye alt 25.69 km

Imagery Dates: Oct 29, 2004 - Oct 9, 2010

LANDSCAPING at OAK RIDGE NATIONAL LABORATORY

Oak Ridge National Laboratory (ORNL) is the largest and most diverse energy research and development institution within the Department of Energy. ORNL's landscaping plan specifies that species native to the Oak Ridge Reservation (ORR) or the Valley and Ridge biological province of East Tennessee in which ORNL is located are the preferred choice for new plantings. It also advocates using ecological approaches to protect and enhance the lab's environment.

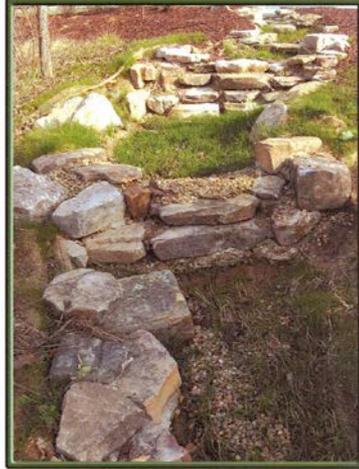
Ecological landscaping uses sustainable practices to improve habitat, protect water quality, and enhance native wildlife. Using local plant species in an appropriate community design instead of typical ornamentals highlights the lab's uniqueness, strengthens its relationship with its natural surroundings, and demonstrates its dedication to conserving and showcasing the environment.

People often expect plants to conform to their image of the "perfect" tree or flowering shrub and to show conformity that is not exhibited in nature. ORNL's outdoor environment demonstrates how a less controlled landscape provides equal beauty and an experience that allows the user to notice small changes and variations.

Landscape management

Landscapes are living entities that are in a constant state of flux—growing, changing with the seasons, and responding to even subtle changes in the environment. Plants in the wild survive without human help. Unfortunately, the developed environment provides numerous stresses for plants, requiring more management.

ORNL's landscaping plan includes a clear set of management principles covering watering, pruning, fertilizing, pest management, and lawn care. Prescribed burns, for example, provide more benefit to native grass communities than periodic mowing and are more cost effective. Following these principles ensures that the landscape meets or exceeds the expectations outlined in the plan.



Rain gardens, such as this one along First Creek, reduce stream bank erosion and flooding by slowing stormwater runoff. They also improve water quality, help to recharge local groundwater supplies, provide nesting sites and habitat for songbirds and other wildlife, and bring beauty and visual interest to the landscape. (ORNL photo)



Many native plants used in ORNL landscaping delight viewers with their beautiful flowers, including (from left) oakleaf hydrangea (*Hydrangea quercifolia*), purple coneflower (*Echinacea purpurea*), Virginia sweetspire (*Itea virginica*), butterfly weed (*Asclepias tuberosa*), and dwarf foerthgilla (*Fothergilla gardenii*). (Photos by P. D. Parr)



Tennessee's Native Plant Alternatives to Exotic Invasives

A Garden & Landscape Guide

Beautiful flowers, interesting foliage, ample fruit, tough constitution, and fast growth are plant qualities that appeal to gardeners and landscapers. When these desirable horticultural characteristics occur in plants that are not native to Tennessee or the eastern U.S., these exotics could escape from maintained landscapes, invade natural areas, and damage native plant communities in the state. Non-native plants that readily spread in natural areas, either vegetatively or via seed, pose a significant threat to the health and welfare of Tennessee's rich biological diversity. These plants are considered exotic invasive pests.

The Problem

Plants introduced to the U.S. from other areas of the world are an important part of gardening and landscaping. Most of these plants are well-behaved and rarely stray beyond the garden wall. Only about one percent of these non-natives readily escape into the wild and become invasive in natural areas. Invasive plants exhibit certain traits.

- Adaptation to local climate
- Rapid growth
- Mature quickly to flower and set seed
- Produce copious amounts of seed
- Effective seed dispersal
- Rampant vegetative spread
- No major pest or disease problems

These traits can give exotic invasive plants undue advantage in wild habitats like forests, wetlands, cedar glades, and grasslands. Exotic species can overwhelm native plants depriving them of nutrients, water, light, and space and may totally displace native species, replacing a diverse ecosystem with a near sterile monoculture and resulting in the reduction of biodiversity, loss of endangered species and their habitats, loss of habitat and food sources for wildlife, and disruption of native plant-animal associations. Exotic invasive plants threaten the health and stability of Tennessee's beautiful natural heritage and across the United States cost an estimated \$35 billion annually in control efforts and crop losses. (Pimentel, et al., 2004)

Continued inside

Discover Tennessee's Natural Beauty

To learn more about our state's natural beauty, visit these websites:
Tennessee Native Plant Society
www.tnpps.org
Tennessee State Parks
<http://tn.gov/environment/parks/>
TDEC Resource Management Division
<http://tn.gov/environment/na/>

Other good sources to explore the natural beauty of Tennessee include municipal parks, nature centers, botanic gardens and arboretums.

Native Plant Sources

Please support local nurseries carrying nursery-propagated native plants—stock supplied through seed, division or tissue culture of existing nursery plants and not collected from the wild. A partial list of state nurseries selling native plants may be found on TN-EPPC's website www.tneppc.org

www.tneppc.org

ORNL homepage "L" landscaping

Questions?

