



# FORESTRY, WILDLIFE & FISHERIES UPDATE NEWSLETTER

SEPTEMBER 2010



Source: Kosichfirewood.org (artist: Alastair Heseltine)

## IN THIS ISSUE . . .

BURNING WHERE YOU BUY IT, DON'T MOVE FIREWOOD . . . . .	page 2
BENEFITS OF PRESCRIBED BURNING . . . . .	page 4
GOALS FOR MANAGING FOREST STANDS . . . . .	page 5
COMMON HARDWOOD MANAGEMENT MISTAKES . . . . .	page 6
U. S. WOOD PRODUCTS HAVE EXPORTING ADVANTAGES. . . . .	page 7
WILDLIFE MANAGEMENT CALENDAR FOR SEPTEMBER . . . . .	page 8

## RECENTLY ASKED QUESTIONS . . .

page 11



**“What’s All This I Hear About Wood Pellets?  
.....What are they?, How are they made?, Are they good?”**

## “BURNING WHERE YOU BUY IT” – DON’T MOVE FIREWOOD!

---

Resourced from the USDA – APHIS.GOV WEBSITE



Whether used to heat your home or build a campfire, firewood is a must-have item for millions of Americans. However, firewood also presents a very real threat to the Nation’s forests. Invasive species including the Asian longhorned beetle (ALB) and emerald ash borer (EAB) can be spread into new areas of the country on firewood. To date, ALB and EAB have

been detected in a total of 13 States and without intervention the continued spread of these pests is likely. To this end, APHIS is combating these invasive pests with quarantines, public awareness campaigns and other efforts in known infested areas, while some States have adopted regulations limiting the movement of firewood. However, these actions alone are not enough; it is up to all of us to contribute to the preservation of our Nation’s forests by committing to not move firewood from where it is cut. By “burning where you buy it” you can be sure that you’re not accidentally moving these damaging forest pests into new areas.

Bringing firewood from home to the place your camping could put your favorite campsite or park in danger. Thousands of campgrounds are scattered throughout the United States and camping is a popular recreational activity for millions of people each year. Campfires are an integral part of camping, and campers often bring their own firewood due to the cost and quality of firewood provided at or near campgrounds. Some campers have been known to bring firewood from one side of the country to another.

Firewood is often made from diseased or insect-ridden or killed trees, and curing or drying times for firewood can be as little as three months. People camp more often during the summer and early fall months, and insects or other pests are most active during these seasons. Movement of firewood by campers is often limited to 100 or 200 miles, presenting a substantial risk for exacerbating the spread of pests locally. Because some campers move firewood long distances, this is a greater risk for new long distance spread infestations.

As an example of a specific camping-related activity, stockcar racing is a popular spectator sport for millions of people in the United States. Races take place from February through November at venues scattered throughout the country and many fans camp while traveling the circuit. In 2006, after an employee at Great Smoky Mountains National Park noticed a visitor with firewood coming from an EAB-quarantined area. USDA-APHIS Plant Protection and Quarantine (PPQ) Agency conducted a firewood survey in eastern Tennessee, including Sullivan County, where the Bristol Motor Speedway is located. Campgrounds near the speedway hosted campers from 40 different states; campers from 14 states had transported firewood to the race. Four seizures were made in violation of EAB quarantines, approximating 120 pieces of firewood (Pentico, 2006). The hardwood firewood seizures came from Michigan, Indiana, and the Canadian province of Ontario, localities over 500 miles from the campgrounds. Additionally, most of the out of state visitors with firewood came from Florida, North Carolina, Georgia, and other southern states. This is noteworthy because the redbay ambrosia beetle, *Xyleborus glabratus*, is associated with a fungal

pathogen, *Raffaelea lauricola*, which causes laurel wilt disease (LWD) and kills trees in the Lauraceae family, including redbay, sassafras, and others. These tree species occur in LWD-infected areas and are often utilized as firewood. Similar blitzes were conducted in the Bristol, TN, area in 2007 and 2008. In 2008, a total of 29 firewood seizures occurred. Of these seizures, 75% of the people moving firewood knew about the quarantines, but moved the wood out of the quarantined areas anyway.

Conversely, people who made reservations at campgrounds that expressly directed people not to bring firewood with them did not bring firewood, thus demonstrating the potential efficacy of citizen outreach programs. Much work has been done to raise awareness of the issues surrounding the movement of firewood by campers, and it does appear that people are becoming aware of the associated risks and that some are altering their habits. Many campgrounds and state forestry agencies are adding their assistance and urging visitors to parks and campgrounds to leave firewood at home and purchase it locally.

When you bring firewood camping, you risk carrying a tree killing insect or disease. The bugs can crawl out, spread to the trees and forest at the campground or state or national park, and begin to destroy those trees and forests. That means less fun for future campers. We are all careful to extinguish campfires, pick up after ourselves in campgrounds, state parks and national parks, so we should be conscientious campers when it comes to moving firewood as well.

What can you do to stop the spread of invasive pests on firewood?

- Never take firewood with you – always buy it near where you will burn it.
- Tell your friends and family members not to move firewood.
- Firewood you buy should be from only a few miles away, or at least in the same county of the park you are staying.

For more information on the risk of moving firewood, click on the following link  
<http://www.dontmovefirewood.org>

Check out more technical risk assessments at the USDA Aphis site,  
[http://www.aphis.usda.gov/newsroom/hot\\_issues/invasive\\_species&firewood/downloads/firewood\\_pathway\\_assessment.pdf](http://www.aphis.usda.gov/newsroom/hot_issues/invasive_species&firewood/downloads/firewood_pathway_assessment.pdf)

## BENEFITS OF PRESCRIBED BURNING

---

*Wayne K. Clatterbuck, Professor, Forest Management and Silviculture*

Prescribed burning is defined as fire applied in a knowledgeable manner to forest fuels on a specific land area under selected weather conditions to accomplish predetermined, well-defined management objectives. A premise of fire ecology is that fire is neither innately destructive nor constructive. Fire simply causes change and change is biologically necessary to maintain a healthy ecosystem. A few of the benefits of prescribed burning are described below.

Periodic fire tends to favor understory species that require a more open habitat. A mosaic of burned and unburned areas tends to produce a large and varied wildlife population. Wildlife benefits from burning include: stimulation of fruit and seed production; increases in yield and quality of herbage, legumes and browse from hardwood sprouts; and creations of openings for feeding, dusting and travel.

Low-value, poor-quality, shade-tolerant hardwoods often occupy or encroach upon land best suited to growing pine. Unwanted species may crowd out or suppress pine seedlings. With the judicious use of prescribed fire, the understory can be managed to **limit competing vegetation** while at the same time providing browse for wildlife. Burning is most effective in controlling hardwoods less than 3 inches in diameter. Periodic fires throughout the rotation can keep competing vegetation below that 3-inch threshold.

Prescribed burning can **enhance the appearance** of many forests for recreation and visual values. Burning maintains open stands for viewing, produces vegetative changes, and increases numbers and visibility of flowering plants. Unburned islands increase vegetative diversity that will attract a wider variety of wildlife.

Many plants have structural adaptations or reproductive features that favor them in a fire-dominated environment. Changes in the natural fire pattern as a result of fire exclusion have lead to dramatic decreases in many of these fire-tolerant and fire-dependent species. Periodic prescribed burning can **perpetuate fire-dependent species**, in both the understory and overstory.

**Forest access is improved** for forest harvesting operations and other activities with prescribed fire. Judicious burning **reduces the amount of fuel** to help offset the greater risk of wildfire. **Visibility** for hunting and other recreational activities is enhanced with prescribed burning.

Many plants need bare-mineral soil for the seed to germinate. Prescribed burning can **prepare sites for seeding and planting** by removing debris from logging operations or heavy litter layers that have accumulated through many years of fire exclusion.

Changes in food and cover caused by prescribed fire can **benefit wildlife**. Prescribed burning can increase the amount of browse material, thereby improving conditions for deer and other wildlife. Quail and turkey favor food species and more open conditions that can be created and maintained by burning.

Prescribed burning has been recommended primarily in pine stands, not hardwood stands. Fire can damage many high-valued hardwood trees, reducing the economic and growth potentials. Research at the University of Tennessee is evaluating prescribed burning regimes in hardwoods, primarily for wildlife enhancement as well as a tool to regenerate and maintain oaks over trees that are not as fire tolerant such as maple and poplar. Although, we are not at the stage to make recommendations of using prescribed fire in hardwoods, its potential is being investigated. Fire shaped many of our present hardwood forests and its judicious use may benefit some management alternatives.

The benefits of prescribed fire are many, but prescribed fire is a complex tool and should be used only by those trained in its use. Proper diagnosis and detailed planning are needed for every area where burning is contemplated. The incomplete assessment of any factor can pose serious liability questions should a fire escape or its smoke cause damage. Contact a forestry professional to help you evaluate and apply the use of prescribed fire to your property.

## GOALS FOR MANAGING FOREST STANDS

---

*Wayne K. Clatterbuck, Professor, Forest Management and Silviculture*

Forest stands are managed to achieve some combination of desired products or values. These products or values may include tangible benefits such as income from timber production or fees for hunting rights. The values may be intangible such as the satisfaction of seeing wildlife or flowering plants, having a scenic view, enjoying recreational activities or just the simple pleasure of watching nature over time.

With such a diversity of benefits, landowners and land managers should first define land ownership goals/objectives before any decisions are made on how to manage the land. For some objectives, management may be very intensive. For other objectives, proper management may involve doing nothing more than providing protection against damaging agencies such as fire, insects and diseases.

The manipulation of forest cover is the primary tool of the forester to implement prescriptions that address the objectives of ownership; it will influence aesthetics, visual and biological diversity, wildlife habitat, water yields, plant and animal species composition, tree growth, economic returns and many other forest attributes. Some of the most important stand management activities are:

**Establish regeneration.** For long-term forest development and sustainability, establishing regeneration of desirable species is one of the most critical management tasks and is often the task most neglected.

**Control species.** Species composition determines the timber value produced, food and habitat value for wildlife and scenic value. Species composition also determines growth potential since certain species grow faster than others.

**Control density.** Stand growth and yield and timing of yield are determined by stand density. In dense stands, individual trees grow slowly, harvests are delayed, economic returns are reduced and trees with poor vigor are more susceptible to insect and disease damage. Such stands offer little vegetative cover

or browse for wildlife. In stands that are too open, total yield may be reduced and individual tree quality is often poor because of excessive branching and other bole defects.

**Reduce losses to insects, diseases and fire.** By providing adequate growing space and maintaining desirable species mixtures through timely silvicultural treatments, forest stands remain healthy and losses to insects, disease, and fire are minimized.

**Enhance non-timber value.** The quality and quantity of nontimber benefits are affected by stand management practices. For example, dead snags and den trees can be protected for wildlife, minimum disturbance zones can be identified and harvest cuts can be distributed in time and space to assure consistent wildlife habitat. With forethought and planning, many nontimber benefits can be enhanced with little effect on timber production.

Forests should be managed to meet specific landowner objectives or combination of objectives. Silvicultural practices are implemented to move each stand toward meeting those objectives by manipulating vegetation. Most stand management practices are aimed at establishing regeneration; controlling species composition and density; reducing loss from insects, diseases or fire; and enhancing nontimber values.

## COMMON HARDWOOD MANAGEMENT MISTAKES

---

*David Mercker, Extension Specialist, Forestry*

Sometimes misguided by traditions of the past or the lack of adequate science-based information, forest landowners make mistakes with regard to their hardwood forest management. What seems logical at first, once implemented could prove problematic, particularly if such mistakes are repeated through the generations. Based on observations made while assisting and advising private forest landowners, there are a number of common errors made repeatedly. These are addressed here:

1. Maintaining a closed canopy through a selection harvest is always good forestry. Single tree selection is one method of harvesting. It has application particularly for those landowners who rank aesthetics and recreation high on their ownership objectives. It can be used in combination to thin younger stands or remove undesirable trees, particularly when overcoming mistakes of the past. However, most hardwood forests if managed for quality timber production, at some point, should undergo a heavier stand regenerating harvest (even if only applied in small patches). This allows adequate sunlight to reach the forest floor, stimulating new growth. By not periodically regenerating a forest, the composition and quality will change over time.
2. A stand marked with paint means responsible forestry is being practiced. This depends. Under what parameters were the trees chosen for harvest? If tree size, species, or value were the only considerations, then responsible forest management was likely not practiced. Harvesting only these types of trees will leave a residual stand poor in quality or low in value. Instead, harvest consideration should also be given to include the “D” trees: **d**warfed, **d**ying, **d**iseased, **d**amaged, **d**eformed, **d**efective, and **u**ndesirables. This is the necessary part of weeding the stand and eliminating unwanted seed sources.

3. The forest soil will take care of itself. Don't be so sure. We tend think of fallen and decomposing leaves and twigs as soil in the making, rather than the organic matter and nutrient recycling they are. True soil is derived from weathering of subsoil rocks, from wind-blown particles that escaped from distant places, or from alluvial sediment deposited after transport via water. All are processes that can take centuries to occur. Stresses that are placed on forest soils during logging are normally restricted to skidding lanes, haul roads, log landing areas, and stream crossings. Concerted effort should be made to protect soil in these areas and thereby assure protection of the water resources. Landowners should understand and follow accepted best management practices (BMP's).
4. Harvest timber only when you need the money. Saving timber as a security to hedge against off-years of other sources of income is not always advisable. Trees are a crop. Though somewhat unique in that they can be retained on the stump for years, doing so could sacrifice considerable production and income. Annual growth rate and return on forest investment peaks, then declines. Harvesting timber crops at or near the peak, then converting those funds to a more favorable alternative investment, is a more prudent decision. Also, it is wise to track timber markets. Waiting to sell timber when other sources of income are lower, may miss optimum markets.
5. This has always been the "assumed" property boundary. Landowners beware! The penalty for timber trespass can be very high. Be certain of property boundaries. Study the deed, reach agreement with your neighbors, and seek assistance from a professional forester or surveyor.
6. Small trees will grow to become big trees - some will, and some won't. If a tree has for too long been suppressed by growing in the understory of larger trees, it will not likely release and grow vigorously once the taller tree(s) are removed.
7. Knots on the trunk of a tree will cover up and make fine lumber. This depends. On younger, vigorously growing hardwood trees, knots often become concealed and produce quality lumber, particularly if the knots are small-sized. However, large knots or knots formed on slow growing, over-mature trees may heal superficially, but never produce clear lumber.
8. I can handle this on my own – The opportunity to sell timber is infrequent for most landowners, and achieving proficiency is difficult (and usually forgotten between sales). Therefore, it is always advisable to first see a forester, and perhaps several. Not only is a forester's professional expertise needed, but foresters have knowledge of current cost-share programs, laws/regulations/taxes, etc. This expertise can **save you money, make you money, or preserve your money.**

## U. S. WOOD PRODUCTS HAVE EXPORTING ADVANTAGES

*Adam Taylor, Associate Professor, Forest Products*

In 2008 the Lacey Act was amended by the US congress to include wood products. This meant that it was illegal for American manufacturers to use wood that was illegally harvested – even if it was harvested in another country. Now it appears that there will be similar rules for countries in Europe. This good news for the Tennessee producers is that hardwood from US will likely be considered at “negligible risk” for being illegal. This could be an advantage for US hardwood exports to Europe.

The trade in wood products is rapidly becoming globalized. Between 10-15% of the lumber produced in Tennessee is currently being exported and this number is increasing. It is often difficult for American producers to be ‘low-cost’ competitors in the global market but American hardwood producers have a

good reputation for product quality and professionalism. With an increasing global emphasis on preventing the illegal harvesting of wood products, we may be able to benefit also from the assumption of legal harvest for American wood.

A study by the consulting firm Seneca Creek found that less than 1% of US hardwoods were illegally harvested. This study is part of why the European Union and other countries will assume that wood sourced from the United States is legally harvested, with no further assurance (for example by forest certification programs such as FSC) required.

For further information, contact Adam Taylor at [AdamTaylor@utk.edu](mailto:AdamTaylor@utk.edu) or 865-946-1125

## WILDLIFE MANAGEMENT CALENDAR FOR OCTOBER

---

*Craig A. Harper, Professor, Wildlife Management*

### **Wildlife Notes**

Groundhogs are preparing for winter hibernation  
 Black bears are feeding heavily in preparation for denning  
 Wild turkeys begin forming flocks  
 Juvenile ruffed grouse are dispersing  
 Woodcock begin migration  
 Crows begin to congregate in roosts  
 Chimney swifts may begin congregating in chimneys

### **Habitat Management**

Spray perennial cool-season grasses (such as tall fescue and orchardgrass)

- October through mid-November is the optimum time to kill these grasses!
- spray in preparation to plant native warm-season grasses next spring and/or to release the seedbank; also spray in preparation to plant food plots next spring or to control these grasses in existing food plots
- use 1.5 – 2 quarts per acre of a glyphosate herbicide (such as Roundup) if spraying to release the seedbank or in preparation to plant native grasses or a food plot; use a grass-selective herbicide if controlling these grasses in a clover/chicory forage plot
- refer to *A Landowner's Guide to Native Warm-Season Grasses in the Mid-South*, PB 1746, or Chapter 5 in *Native Warm-Season Grasses: Identification, Establishment, and Management for Wildlife and Forage Production in the Mid-South*, PB 1752 for additional information on eradicating perennial cool-season grasses

**Burn** and disk old-fields and other early successional habitat

- will stimulate forb growth next spring, which will provide brooding cover for wild turkeys and bobwhite, and will improve forage availability for white-tailed deer
- will reduce grass dominance where nwsg have become too dense
- will reduce woody encroachment by sweetgum, elms, and other undesirable woody saplings in the field
- don't be afraid to burn; prepare adequate firebreaks by disking around the perimeter of the field and burn against the wind



- Smokey Bear actually likes for you to burn – it provides him with more food!
- refer to Chapter 6 in *Native Warm-Season Grasses: Identification, Establishment, and Management for Wildlife and Forage Production in the Mid-South*, PB 1752 for additional information on managing early successional habitat for wildlife

Prepare firebreaks this fall/winter if you plan to burn old-fields next March/April

- disking now will stimulate forbs next spring
- firebreaks can be planted to cool-season food plots if desired

Plant firebreaks and other disked strips not left for natural vegetation

- annual cool-season grains (especially wheat) along with annual legumes (crimson and arrowleaf clover and Austrian winter peas) are excellent choices
- refer to *A Guide to Successful Wildlife Food Plots*, PB 1769 for additional information

Finish planting cool-season food plots

- refer to *A Guide to Successful Wildlife Food Plots*, PB 1769 for additional information on seeding rates and management recommendations

Spray perennial forage food plots for weed control if necessary

- refer to *A Guide to Successful Wildlife Food Plots*, PB 1769 for specific information

Continue to strip-mow or silage-chop dove fields to provide seed and hunting opportunities

- strips can be disked and top-sown with winter wheat (2 bushels per acre) to provide additional forage opportunities

Continue watching and identifying good acorn producers

- one-third of the oak trees produce roughly 75% of all the acorns
- if you are interested in improving acorn availability in your woods, distinguishing good producers from poor producers will help you identify which trees to favor
- once acorns begin to fall, walk through the woods and mark trees with good acorn crops with aluminum tags or tree marking paint near the bottom of the tree
- continue this for at least 3 years and a pattern will begin to develop identifying those trees that do not ever produce many acorns (even in a good acorn year)
- good producers can be released by killing or removing unwanted adjacent competitors, allowing the crowns of favored trees to expand and produce more acorns

Continue timber stand improvement work

- October is a great time to kill unwanted trees; herbicides applied via hack-and-squirt or girdle and squirt are readily transported to the root system as trees prepare for winter senescence
- stimulate growth among oaks, beech, blackgum, cherry, persimmon, and other mast producers by killing surrounding competitors
- girdle unwanted trees and spray wound with a 50% mixture of Garlon 3-A and water or a 20% solution of Arsenal AC and water; refer to herbicide labels for efficacy on various tree species

Build brushpiles from thinned trees and pruned limbs

- put large limbs on bottom and small limbs on top for crevice space and overhead protection
- this is best done and the effect greatest along the edges of and within high-quality early successional habitat (native forbs and grasses with scattered brambles and shrubs) where quality cover already exists

- building brushpiles along a woods edge adjacent to a tall fescue pasture or hayfield may do more harm than good because all rabbits present will then be isolated for predation

Sow winter wheat along edges of flooded fields to provide important forage for migrating Canada geese and American wigeon later this winter

Clean out bluebird boxes to allow more room for roosting bluebirds when cool weather arrives

- 10 or more bluebirds may roost in a single box on cold nights

Clean out wood duck boxes and replace old wood shavings with fresh shavings

- screech owls and squirrels may use the boxes through fall and winter
- repair/install predator shields if necessary

Put up bird feeders

- it's not too early
- refer to *Improving Your Backyard Wildlife Habitat*, PB 1633, for information on specific feeders and seed for birds

### **Wildlife Damage/Population Management**

Close crawl spaces under the house and check for openings in the attic

- helps keep snakes, skunks, and squirrels from getting into places where they are not welcome
- rodents are beginning to cache food for the coming winter; take action now to keep them out of your house

Bats are leaving summer hang-outs for winter hibernacula

- allow bats to leave attics before closing crevices, then make sure all openings are closed so they can't get back in next spring/summer

Blackbirds and starlings are gathering into large winter flocks

- don't allow them to roost in your trees; if they start, they'll form a habit
- repel them with noise makers (shotguns, firecrackers, banging metal pans together)
- be persistent

Deer hunting season is underway

- allow hunters access to your land if you have a problem with too many deer
- shoot the females (does); concentrating on bucks does nothing to control overpopulation
- in areas that are highly overpopulated, it may be necessary to kill 1 doe per 10 acres (sometimes more) before the population is reduced to acceptable levels
- where Quality Deer Management is desirable, reduce the population so plenty of forage is available, shoot does to even the sex ratio, and allow bucks to reach 3 ½ years of age before shooting them (refer to *Quality Deer Management: Guidelines for Implementation*, PB 1643, for additional information)

Refer to *Managing Nuisance Animals and Associated Damage Around the Home*, PB 1624 for additional information on wildlife damage management.



## RECENTLY ASKED QUESTIONS

**Question: “What’s All This I Hear About Wood Pellets?”**

**Answer: Adam Taylor, Associate Professor, Forests Products**

Go to the follow website for great information on Wood Pellets....

[Wood Pellets – An introduction to their production and use](#)

## DEPARTMENT OF FORESTRY, WILDLIFE & FISHERIES

2431 Joe Johnson Drive  
274 Ellington Plant Science Bldg.  
Knoxville, TN 37996-4563



E-mail: <http://fwf.ag.utk.edu>  
Telephone: (865) 974-7346  
Fax: (865) 974-4714

### EXTENSION FACULTY AND STATE SPECIALISTS

---

Dr. Keith L. Belli, Professor and Department Head  
865-974-7346, [kbelli@utk.edu](mailto:kbelli@utk.edu)

Dr. Wayne K. Clatterbuck, Professor, Silviculture & Forest Management  
865-974-7990, [wclatterbuck@utk.edu](mailto:wclatterbuck@utk.edu)

Dr. Craig A. Harper, Professor, Wildlife Management  
865-974-7346, [charper@utk.edu](mailto:charper@utk.edu)

Dr. Patrick D. Keyser, Associate Professor, Native Grasslands Management  
865-974-0644, [pkeyser@utk.edu](mailto:pkeyser@utk.edu)

Dr. Adam Taylor, Associate Professor, Forest Products  
865-946-1125, [mtaylo29@utk.edu](mailto:mtaylo29@utk.edu)

Dr. David C. Mercker, Extension Specialist, Forestry Specialist  
731-425-4703, [dcmercker@utk.edu](mailto:dcmercker@utk.edu)

Mr. Larry A. Tankersley, Extension Associate, Forestry Specialist  
865-974-7977, [ltanker1@utk.edu](mailto:ltanker1@utk.edu)

Extension Associate in Wildlife — Vacant  
Fisheries Specialist — Vacant

### FISHERIES FIRST RESPONDERS

---

#### East Tennessee Region

Mr. Kelly Amonett, Morgan County  
423-346-3000, [damonet1@tennessee.edu](mailto:damonet1@tennessee.edu)

#### Middle Tennessee Region

Mr. Creig Kimbro, Grundy County  
931-592-3971, [ckimbro@tennessee.edu](mailto:ckimbro@tennessee.edu)

#### West Tennessee Region

Mr. Ron Blair, Henderson County  
731-968-5266, [rblair3@tennessee.edu](mailto:rblair3@tennessee.edu)

### EXTENSION PROFESSIONAL STAFF

---

Ms. Misty Huddleston, Extension Assistant, Web-Based Learning  
865-974-1568, [mhuddles@utk.edu](mailto:mhuddles@utk.edu)

Mrs. Mirian Wright, Administrative Assistant  
865-974-7346, [mwright@utk.edu](mailto:mwright@utk.edu)