Roadside Management in a Forested Landscape

Although a high proportion of our state's roads have trees alongside them, approximately 36% of Connecticut's roads – 7,600 of all 21,000 miles[7] -- cross landscapes that would be considered forested landscapes in the traditional, rural sense. Although the expanse of roads and utility corridors in such forested areas is enormous; proactive management has been minimal. Historically, maintenance of roadside trees in these forested areas has been largely limited to pruning by utilities to specified distances from lines, and occasional hazard tree removal. Few, if any, resources have been invested on management of the surrounding forest.

Challenge of managing forested roads

Trees that affect utility infrastructure and public transportation fall into two ownership categories, public (local and state roadside buffers) and private (rural and residential land). To properly manage roadside trees in forested landscape, it is important to look closely at what is being managing before determining how it should be managed.

Public roads are maintained by state and municipal officials who balance the need for public safety and aesthetics with limited budgets. Most municipalities focus their attention on the hazardous trees that they receive complaints about, while some progressive municipalities have an active pruning program. Very few municipalities have a management program that evaluates all trees in their right-of-ways (ROW). While most state or municipal officials recognize the benefits of a more comprehensive approach, they struggle to find adequate funding for implementation of a program beyond removal of identified hazard trees.

Private land outside of the municipal or State's ROW is a much more challenging area to manage due to the number of landowners and the variety of attitudes that they have about the relative importance of safety, utility service, aesthetics, and the environment. Management recommendations need to consider landowner attitudes towards tree removal and maintenance when developing an education and outreach program that works within the private property ownership constraints of Connecticut.

Current forested road management

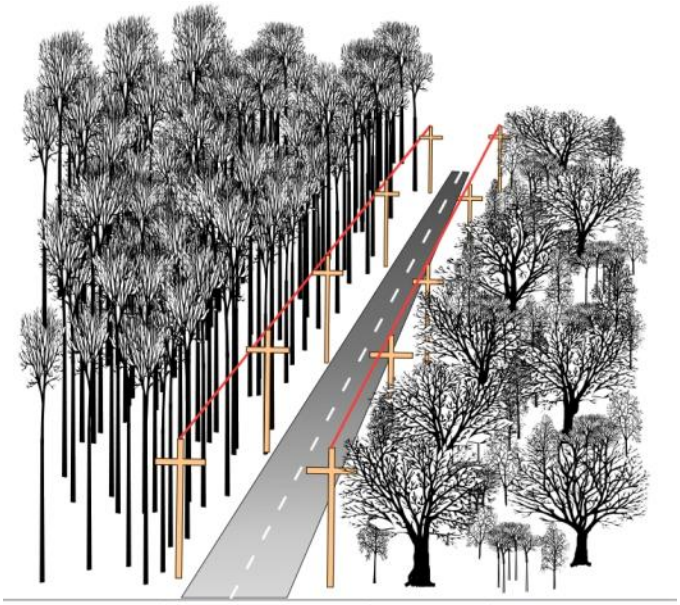
Landowners often complain about utility line pruning, arguing that it is not attractive and leaves trees deformed. There is some concern as to whether the heavy pruning required to achieve Enhanced Tree Trimming (ETT) standards could create potential future hazards. Municipal tree wardens and the general public need to be assured that any adopted practice will (1) leave

[7] Per Mark Goetz-derived using deciduous, coniferous, and forested wetland classifications from the 2006 Landcover Data from CLEAR (30 meter resolution data) and buffered by 150 ft. road centerline

trees in a healthy condition without compromising their long-term structural integrity and (2) meet community-appropriate aesthetic goals.

Creating a "storm resistant" forest

The ultimate challenge is to maintain the aesthetic appeal of forested Connecticut byways while reducing the potential of tree-caused damage to infrastructure during severe storms. Because most of Connecticut's forests do not have a diverse age structure (e.g., most large oaks originated in the early 1900's), creating a storm resistant roadside forest will provide an opportunity to increase biodiversity by increasing the diversity of age classes, species, and stand structures. These roadside biodiversity corridors will support a myriad of mammal, bird, and invertebrate species that depend on small tree and shrub species that are often lacking in unmanaged forests.



A management program which combines arboriculture (individual tree care) and silviculture (forest management), along with an enhanced outreach programs may be an effective way to manage roadside trees in forested areas. Though arboricultural pruning practices should immediately decrease the probability of utility interruption due to branch failure, their effectiveness is limited to several years and will have minimal effect during severe tropical storms. Complementary silvicultural work (forestry) in the adjacent forest is a long-term process that will require several years to fully implement, but will have benefits that last for decades.

A proactive approach would be to create a roadside forest that is resistant to severe storms. Open-grown trees, such as those in open fields, develop crowns that are wide rather than tall, have stouter stems and branches, and develop well-anchored, widespread root systems. All of the characteristics of open-grown trees make them more resistant to wind damage, especially to becoming wind thrown.

Recommendations

- Incorporate a Management Zone (MZ) or area of up to 100 feet in both directions from utility lines that includes a Wire Zone (within 25 feet of wires) and a Side Zone (extending out an additional 75 feet). (Fig. 4).
  Mature upper canopy trees in Connecticut are often 80 feet tall with some white pine, tulip poplar, and red oak reaching 100 feet or taller. Therefore, the management zone should be 80-100 feet wide to include all mature trees that could potentially damage utility infrastructure during a severe storm. Because mature forests in the Northeast typically have 60-100 upper canopy trees per acre, there are 600 to 1200 trees per mile on each side of a road (curb mile) constituting a forest that could potentially affect utilities or block roads. (A strip 1 mile long and 100 feet deep is about 12 acres in area - one 80 feet wide is slightly less than 10 acres).

- MANAGEMENT ZONE – Combine traditional pruning practices (ANSI A300 Standards), best management practices from the International Society of Arboriculture, and an enhanced hazard tree identification process with a long-term, selective tree removal program. A more in-depth review of trees that looks at above and below ground health symptoms and structural risks should be done. This includes reviewing trees that otherwise may be "aggressively" pruned, to determine if excessive live wood (more than 25%) will be removed or the tree will have insufficient leaf area after pruning (typically equivalent to 40% of total tree height). Aggressive pruning following a rigid line clearance standard may leave a tree with long-term structural and health risks that is also unaesthetic.

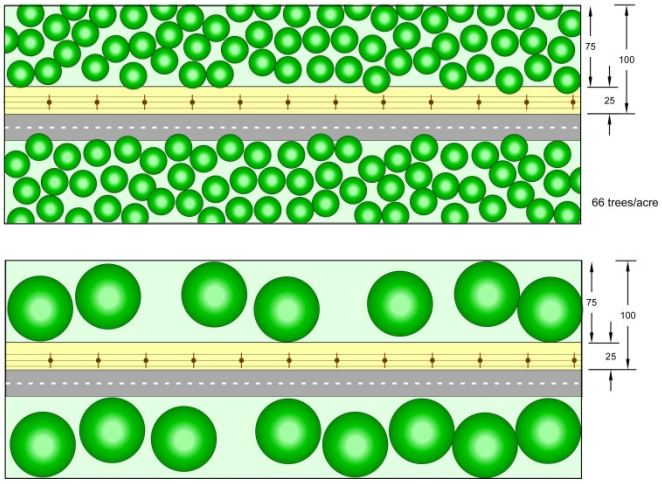


Figure 4. Bird's eye view of a typical forest in Connecticut (top) with 700-1200 trees per mile on each side of a road compared with a storm resistant forest (bottom) would have fewer trees with crowns that are wide rather than tall. Small trees and shrubs are not shown in either forest, but would occupy gaps between trees.

Tree crowns are shown as green circles, utility poles as crossed brown circles connected by brown wires. Figure 1. Critical planting zones for Right Tree, Right Place. O-Opposite side zone, H-Height

  - WIRE ZONE – Smaller growing trees, shrubs and grasses should be encouraged emphasizing the "Right Tree, Right Place" approach.

- In rural areas, protection of native species such as dogwood or hophornbeam and shrubs such as mountain laurel, witch-hazel or spicebush should be encouraged. Integrated Vegetation Management (IVM) techniques can be used for this purpose. This is a more "passive" approach to Right Tree/Right Place that should not require planting. It will be important to consider site-lines when developing a denser understory adjacent to roads.

- In residential areas a more "active" Right Tree, Right Place approach (active planting) may be necessary to encourage ornamental trees and shrubs that work with utility lines. A strong landowner outreach program will be essential in residential areas where aesthetics may need to be considered more than in rural areas. Replanting with appropriate plants would incentivize landowners and work to further develop good working relationships. This would also allow the utility or municipalities to remain involved in the replanting process, ensuring that the appropriate species are selected. An enhanced outreach program should be developed to provide landowners with a better understanding about the program and landscaping advice when planting around roads and utility lines.

o SIDE ZONE – Creation of a storm resistant forest within the side zone should begin in young stands by releasing 30 to 40 trees per acre (300 to 480 per curb mile) from competition using well-developed crop tree management prescriptions. Every 10-20 years, all trees directly competing with selected trees should be removed. As trees mature and the crowns of the crop trees close in, the goal should be to reduce the number of crop trees from 30-40 to 15-20 large trees (150 to 240 per curb mile) with wide-spreading crowns. These trees should be well spaced and managed to develop stout trunks and healthy crowns similar to what might be found in an open "park", but unlike a park, would surrounded by a diversity of small trees, shrubs, and wildflowers .

o SIDE ZONE – Creating a storm resistant forest is more challenging in mature roadside forests. Removing all but 15 to 20 trees per acre in one step would increase the susceptibility of the remaining trees to wind damage for several years until they develop increased stem taper and better anchored roots. A more pragmatic approach would be to begin with a heavy thinning that emphasized removing trees with obvious structural defects (e.g., cavities, weak forks), potential structural defects (e.g., frost cracks, fungal structures, lean, offset crowns), small crowns, perennial diseases (e.g., Neonectria), or dieback in the upper crown. The thinning would allow residual trees to become more wind firm by increasing stem taper

(more wood at bottom of tree) and developing stronger root systems.

The next step would be to conduct another thinning 10 to 15 years later, after the trees have become more wind-firm. It may be possible to proceed immediately to the goal of 15 to 20 large trees per acre if there are sufficient candidate trees with balanced crowns and well-anchored root systems. Otherwise, multiple thinnings are recommended with a goal of achieving a forest with 15 to 20 large trees per acre.

The thinning process will also encourage growth of native shrubs and small trees that will contribute to the 'natural' look by creating a multi-level canopy reminiscent of an old-growth forest.

Invasive vines and shrubs may be a problem in some areas following thinning. Depending on the level of infestation by invasive species, mechanical or chemical control may be required.

The results of this management will be a Wire Zone dominated by shorter Right Tree, Right Place trees and shrubs, and a Side Zone with widely-spaced large trees in the overstory, younger trees of multiple age and size classes growing in the mid-story, and native shrubs in the understory. In the Wire Zone, long-term pruning costs will be reduced by the removal of many Side Zone trees that would otherwise have encroached into the Wire Zone. This more active, holistic management approach focused on developing "Storm Resistant" forests along utility line corridors will reduce damage when the next severe storm does strike. This approach requires a more expansive vision of the roadside forest and utility line corridor that not only looks at reducing immediate risks, but also at long-term individual tree care and whole forest care. For maximum effectiveness, this management regime should be combined with education and outreach to landowners in order to achieve a well-informed public along with a safer, more reliable utility and transportation system.