Technical Standards Recommendations

The Technical Standards Working Group was called to action for two primary reasons: 1) provide guidance for landowners on what trees to plant within the roadside forest of the future; and 2) highlight tree care standards designed to enhance public safety while preserving the ecological and societal benefits that trees provide. Before delving into other recommendations, it is important to envision how we want to manage the roadside forest, and what we would like the future roadside forest to look like.

The Future Roadside Forest

The damage to utility infrastructure caused by roadside trees during the severe storms of 2011 highlighted the benign neglect of our roadside forest and the need to envision what the future roadside forest should be in Connecticut. By the future we mean a long-term time frame – one that represents the span of a tree's lifetime – sixty to eighty years. This future state is one that we will work toward over the coming decades to reach the goal of roadsides that are beautiful, functional, safe and wildlife-friendly.

We are beginning to recognize that just as we design and manage our roads - we also need to design and manage our roadside forest. Arboricultural research has increased our understanding of structural problems of individual trees and assessing their risk. We now recognize that the roadside forest is an integral part of our infrastructure and there is a need to allocate sufficient resources to balance the roadside forest's ecological values with societal needs of minimally interrupted power, communication, and vehicular access.

While Connecticut's residents are asking for a roadside forest compatible with our built infrastructure (e.g., roads, utility poles and wires), the roadside forest must still perform its core environmental and scenic functions. These basic roadside functions were laid out early in The Connecticut Arboretum in Bulletin #11 published in 1959:

1. Adequate visibility for motorists, which necessitates removal of certain woody growth along the roadsides, especially at intersections and the insides of curves.
2. Adequate space for pedestrians and areas where motorists can safely pull off of the travelled pavement.
3. The eradication of plants specifically known to be undesirable in regard to human health and maintenance procedures. Today we would also include invasive, non-native plants in this group.
4. A roadside attractive to motorists, whether on vacation or commuting to and from work.
5. The accomplishment of the foregoing objectives at a minimum cost, figured on a long-range basis.

The Task Force is adding three more needs to this list:

6. A storm-resistant roadside forest managed to minimize the likelihood of infrastructure failures and other forms of storm damage to the greatest extent possible.
7. The roadside forest must also continue to play its role of providing ecosystem services such as reducing storm water runoff into adjacent riparian zones.
8. A good statewide biomass management plan to guide both roadside wood removal work and creative wood product use.

Who Must Be Involved?

The successful future of the roadside forest will require a wide spectrum of participants (state and municipal government, utilities, private owners, businesses) along with a cultural shift toward understanding the complexities of roadside forests. Although there will be variations from community to community, the following are some preconditions for the successful management of our future roadside forests:

- State agencies, municipalities, homeowners, utility companies, and environmental groups must work together to design and maintain a roadside forest with diverse species that is appropriate for the Connecticut's wide mosaic of urban to rural landscapes, while supporting a range of scenic and ecological values, and infrastructure protection.

- Roadside forest management must be designed to be as economical and sustainable as possible by encouraging site-appropriate vegetation.

- Roadside forest maintenance must be done within the context of "Right Tree, Right Place" and include pruning and invasive control along with planting. Long-term, a multi-pronged program will result in a roadside forest that is healthier, more resistant to storm damage (i.e., less likely to impact utility infrastructure), and retains the scenic appeal of our Connecticut roads.

- Roadside forest management must be partnered with education and outreach for Connecticut residents to enhance the understanding of roadside forest values so that trees on private property adjacent to roads will also be managed to protect our shared infrastructure.

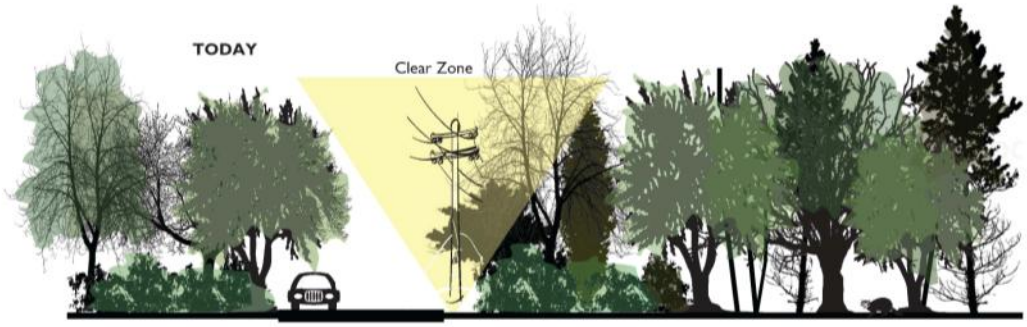
- Roadside forest management provides jobs that are necessary and vital, and that should be filled by skilled professionals.

What Should Our Roadside Forest Look Like?

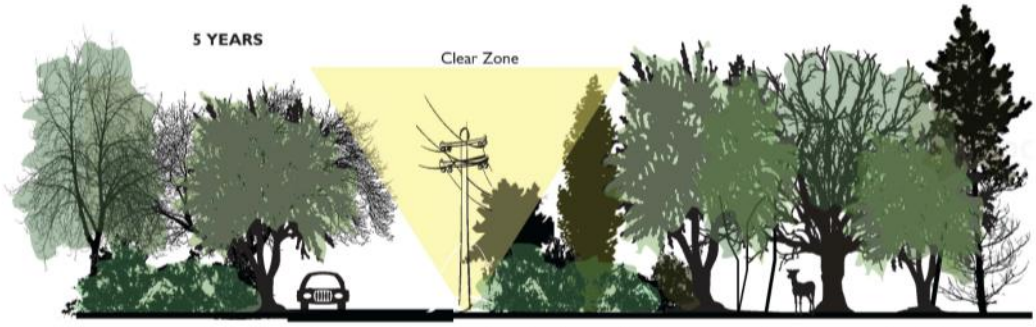
The future roadside forest must include diverse vegetation types and heights that range from stately trees to managed herbaceous plants and low shrubs. These roadsides will be designed and maintained to achieve as many of the aforementioned local, regional, and state objectives as possible.

If we are to manage the roadside forest to both meet our aesthetic goals and reduce future storm impacts, it is important to have some ideas of what it could look like [see Figures 1 and 2 on the following pages]. The following are two graphic depictions of the rural roadside forest where there is a gradual conversion to a "storm resistant" forest of large trees that are wider rather than tall, interspersed with small statured native trees and shrubs. These figures are meant to be examples rather than prescriptive. Visions like this one should be developed at the community-level and will vary widely based upon local preferences, history, specific site characteristics, and community goals.

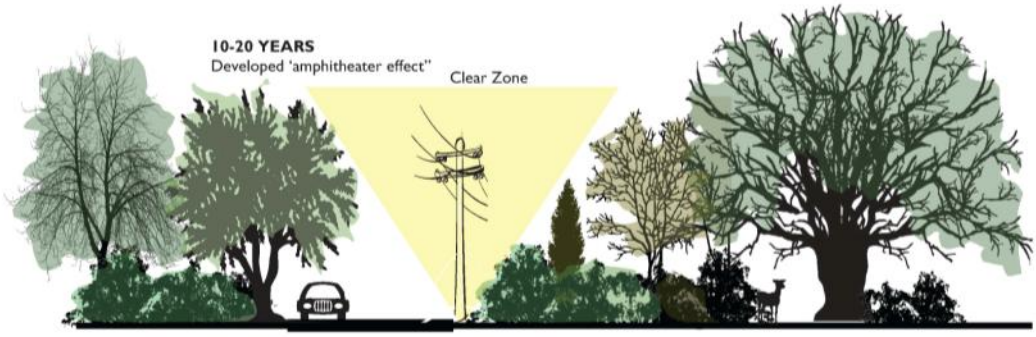
Figure 1. One vision for the suburban/rural roadside forest



A typical road surrounded by forested land—the branches overarch the roadway and interfere with existing utility lines. Trees are crowded and growing together with narrow silhouettes and small root balls—creating unstable trees along the road opening.



That same road with selective clearing around utility lines and overhanging trees. Understory trees and shrubs are permitted to flourish. Trees that have expanded into the Clear Zone are either trimmed or removed/replanted.

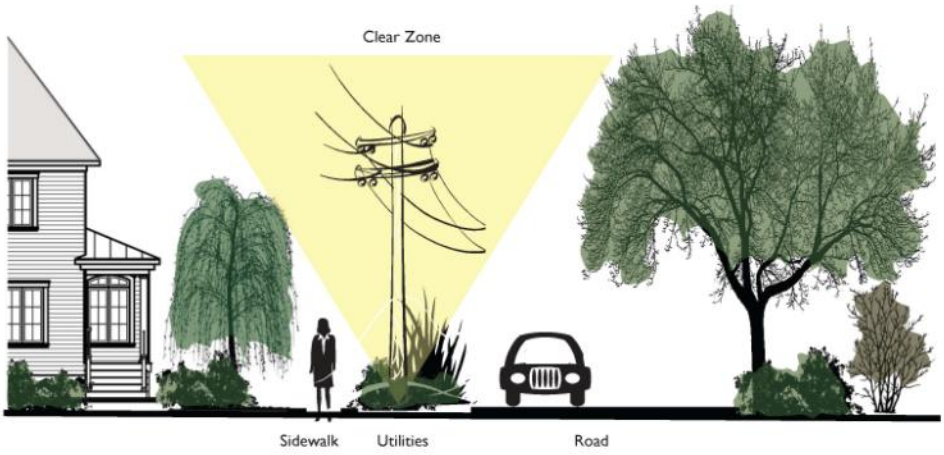


Further selective clearing over time allows large well rooted and larger canopy trees to develop. A hierarchy of shrubs, understory trees and shade trees are permitted to grow surrounding the roadway maintaining an aesthetic and attractive area surrounding the road without posing any threat to property, or services.

THE PROGRESSIVE DEVELOPMENT OF THE FUTURE ROADSIDE FOREST OVER TIME

An illustration of a thin slice of a sample suburban/rural road

Figure 2. One vision for the future suburban/rural roadside forest



A hierarchy of shrubs, understory trees and shade trees are permitted to grow surrounding the roadway maintaining an aesthetic and attractive area surrounding the road without posing any threat to property, or services. The heights of the various plant material create an 'amphitheater effect' surrounding the road and support a human-scale landscape.

THE FUTURE RESIDENTIAL ROADSIDE FOREST

An illustration of a thin slice of a residential road

As Connecticut moves beyond the "Two Storms," we have two visions of the future – one where it's simply "business as usual," and one where we proactively manage our roadside forests. We carry a shared risk with shared responsibility to make our roadside forests a valued, shared resource. The Task Force has made "Right Tree, Right Place" recommendations for appropriate plantings for our future roadside forests (especially in close proximity to utility infrastructure). It will be up to the many parties involved to invest in and maintain an aesthetic and safe future roadside forest for the citizens of Connecticut.

As citizens, we do have a choice. We can continue to manage our roadside forests with the current minimal standards and we can expect that expenses (including damage and resultant loss of power, communications, and road access) will be concentrated after extreme storm events. Or, we can chose to actively manage the roadside forests by spreading maintenance expenses over multiple years and by making that choice, we can expect to minimize damage and loss of emergency services during future storm events.

Role of Property Owners in Responsible Tree Stewardship

Responsible planting and maintenance of trees are critical to the well-being of our state and communities. Private property owners play an important role in both activities, since their land and trees abut most of the public right of way in Connecticut.

It is important to acknowledge that trees are a major feature not only of the urban and rural landscapes, but also of the individual landscapes that surround our houses, apartments, condominiums and businesses.

At the same time that trees represent beauty and health, they can also present a danger to life and property if not cared for properly. Although the property owner may not have a legal obligation to be a responsible tree steward, we encourage property owners to help ensure that their tree (or trees) is cared for such that its roots will not lift up the sidewalk, nor its branches or entire trunk fall on pedestrians, cars, utility wires or the roadway itself.

Caring for trees starts with planting the right tree in the right place. A list of suggested trees and shrubs for planting near or under utility wires is provided in the Right Tree, Right Place section of this Report. Planting a tree that won't grow into wires and then require pruning will save money and resources. A tree planted in the right place can grow into its natural form and will become an amenity both for the property and the community.

Depending upon the site and community goals, larger trees can be planted as set-backs farther from the right of way. In all cases, it is important for the property owner to be aware that trees are not maintenance-free. Proper early pruning will pay huge benefits in the longer life of the tree, as well as avoiding later, more expensive pruning which often is harmful to the tree's vitality and long-term structural stability.

Trees with roots below or branches above the right of way may become the responsibility of the local tree warden who is charged with the care and control of "town trees" within the urban forest. This care and control does not negate the responsibility of the property owner to ensure the safety of his or her trees.

The Task Force recommends that property owners visually inspect all their trees on at least an annual basis, especially those that could present a danger to pedestrians, traffic or the right of way. When property owners have questions about a tree's health or growth habits, a licensed arborist should be called in for a consultation. By Connecticut statute, any work done for hire to improve the condition of a tree, including pruning, must be performed by a licensed arborist. A list of Connecticut licensed arborists is available at www.kellysolutions.com/ct.

Older and larger trees can have hazards that are not obvious to the untrained eye, so it is part of the property owner's responsibility to have such trees inspected regularly. Pruning of dangerous branches or cabling of leaders can prolong the life of the tree, helping to keep the benefits of a healthy tree in the roadside forest.

Property owners are encouraged to maintain their existing trees and to plant new ones within the guidelines of this report for the overall health and beauty of their landscapes and of our state.

Roadside Trees on Private Property: Legal Considerations

The Task Force did consider the role of property owners with regards to trees on private property alongside roads, and the responsibility of those private property owners with respect to those trees. Unfortunately, as a full consideration of this issue entails detailed interpretation of State Statutes [see Appendix 6] and of case law, the Task Force was not able to come up with a clear answer with respect to what the role of these private property owners should be. There is agreement that the issues involved need further consideration and, possibly, additional action.

The Task Force discovered the following:

- State Statute, through CGS 23-59, appears to put the responsibility for the maintenance of many of the trees located along roads that would normally be considered as belonging to the private property owner on the municipal tree warden. Normally, ownership of a tree is determined by where the base of the tree lies. However, the Statute states that "care and control" of roadside trees belongs to the tree warden when that tree extends "in whole or in part" into the public right of way.
- Additional interpretation of State Statute further suggests that, not only does the tree warden have care and control of these trees, but that the property owner should not maintain or remove these trees, as their action might be determined to be interfering with the tree warden's care and control.
- The Task Force heard references to existing Connecticut case law that support an interpretation of Statute that, at a minimum, places all responsibility for any damage caused by roadside trees on the tree warden and the municipality, even when that tree is owned by a private property owner, if parts of that tree extend into the public right of way. It should be noted that tree roots can extend a considerable distance beyond the edge of a tree's crown.
- The Task Force saw this as a disincentive for private property to care for or remove roadside trees, due both to the understanding that, under this interpretation, the private property owner may not have the authority to care for these trees, despite their ownership of these trees, and also due to the understanding that, should the tree fail and cause damage, the private owner of the tree would not bear any financial responsibility for those damages.
- The Task Force found this interpretation discouraging. It finds that this places an additional burden on municipalities and on the tree wardens, who are already overburdened and under-resourced with respect to the care, control and maintenance of those trees that are clearly municipally owned.
- At the same time, the Task Forces recognized that placing the full burden of responsibility for maintenance of roadside trees owned by private property owners is

also very likely to be an ineffective solution, for a variety of reasons. It gave thorough consideration to the many reasons why it is good for the tree warden to have the right and responsibility to inspect trees outside of municipal ownership, when the tree warden does have care and control of these trees. It is also good for the tree warden to have the authority to make determinations as to what should be done so as to mitigate the risk to the public when such risks are discovered from those trees.

- The Task Force, however, was unable to decide upon a mechanism by which this should occur. Difficulties included giving the tree warden clear authority to enter onto private property and inspect private trees, and determining a reasonable means for follow-up activity that would lead to mitigation of the concern. In this discussion, the Task Force also encountered questions regarding funding limitations, the rights of private property owners, and potential liability concerns with respect to the tree warden and the municipality should the municipality be unable to effect action when it is determined that action is needed.
- The Task Force did find that there may be circumstances where there are trees on private property that do not extend into the public right of way and hence are not under the care and control of the tree warden, but that would nonetheless have the potential to fail and impact the public safety. These trees should be maintained as a part of responsible stewardship by the owners of those trees. Examples might include tall conifers set back sufficiently from the road such that no limbs extend over the right of way, but which are tall enough that, should they fail, they could contact the traveled portion of the road or nearby utility infrastructure.
- In general, the Task Force reached agreement that it would favor a system that would:
    - Encourage private property owner responsibility for privately owned trees.
    - Encourage public oversight, through the tree wardens, over trees on private property that pose risks to the public, the public right-of-way and utility infrastructure.
    - Foster public-private collaboration in a way that encourages proactive tree management, such that risks to the public would be mitigated before they became severe and that the municipality would also have the clear authority to intervene once risks are determined to have become severe.
- Examples by which such public-private collaboration could occur might include:
    - Educational campaigns emphasizing the responsibilities of tree owners for their trees, along with clearly outlined parameters by which the owners of roadside trees could act without interfering with the tree warden's "care and control" when it applies to these trees.

- Funding sources, such as that proposed by the Two Storm Panel (Recommendation #22) that could allow for financial assistance to both municipalities and private property owners in circumstances such as these.

Right Tree, Right Place Standards

Tree-lined streets provide not only the aesthetic 'sense of place' that is Connecticut, but provide many benefits along roadways including reducing traffic speeds, prolonging pavement life, and improving stream quality by reducing storm water runoff. In the absence of forward looking planning and maintenance, however, these benefits are not without the potential cost of losing power and communication along with road obstruction during severe weather. Part of the solution for reducing damage caused by trees during severe weather events is to favor trees with short mature heights adjacent to roads and overhead utilities.

Trees grow. For example, very common Connecticut trees like eastern white pine and oaks can transform from small seedlings to heights overtopping utility lines within several decades, and can continue to grow to one hundred feet or more. To reduce disruption of electrical and telecommunication services during severe weather, trees adjacent to utility poles and wires should have mature heights shorter than the wires, or be set back a sufficient distance from the wires that broken branches or wind-thrown trees are unlikely contact them. This strategy will also increase access by public safety officials (police, fire) during and after storms by reducing road debris.

Over the next several decades, many of the larger trees in our maturing roadside forests will decline and will to need to be replaced. This will provide an opportunity to replace tall trees that can damage critical infrastructure (utilities and roads) with shorter species that can maintain the forested aesthetic, e.g., replacing roadside Norway maples with paperbark maples or saucer magnolias. Because trees can survive for a century or more, many of the trees we plant today will be around for decades if not well into the 22nd century.

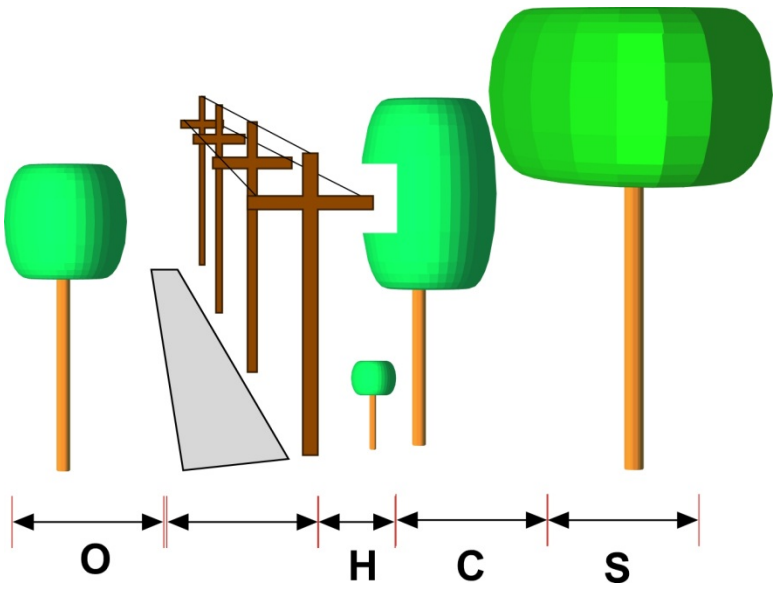


Figure 3. Critical planting zones for Right Tree, Right Place. O-Opposite zone, H-Height reduction zone, C-Clearance zone, S-Strike zone.

The concept of "Right Tree, Right Place" is that tree selection should be matched to the particular conditions at a given site. This includes planting or favoring existing species that have short mature heights adjacent to utility infrastructure and roads, while allowing progressively taller species at increasing distances from roads and wires. The utility companies have developed a zone approach for vegetation near

their wires and poles:(Fig. 3): Opposite zone – street trees on the opposite side of the road from utility wires, Height reduction zone – trees growing directly under utility wires, Side clearance zone – trees growing adjacent to utility wires whose crowns can expand horizontally into wires, and Strike zone – trees beyond the side clearance zone that may be tall enough to impact wires if they fell.

We include two lists of woody plants: shrubs that are an appropriate size for the height reduction zone (H) and small trees that are appropriate for the opposite (O) and side clearance zones (C). The lists were developed from a variety of sources including Dreyer (1991), Alexopoulos et al. (2007), and Gerhold et al. (1993) with input from the Connecticut Nursery and Landscape Association, Audubon Connecticut, and the Connecticut Notable Trees Project.

Trees with tall mature heights, such as these pin oaks, are inappropriate for planting under utility wires.

It is hoped that this list will assist local planning officials and private residents to select species that are appropriate for a given site. It is recommended that private property owners consult with their local tree warden or others knowledgeable on growth patterns and site requirements when planting new trees to ensure the tree is tree for the location.

The optimal maximum height for vegetation in each zone will vary depending on the width of the road (for the Opposite zone) and the actual height of the wires. As a general guideline, it is safest for a tree to be at least as far from the wires as it can get in height. So a 30 foot maximum height tree should be located at least 30 feet from a point directly below the wires. However, shrubs and small trees, especially evergreens, would be inappropriate in locations where they would block site lines for people backing out of driveways or parking lots.

No list can be fully comprehensive since mature heights will vary by local environmental conditions (soil fertility, moisture, and volume; amount of light, etc.), individual tree genetics, and care. There are a wide variety of native and non-invasive introduced shrubs that can be appropriate under utility wires. We have listed only a few with an emphasis on native species.

We do not list specific cultivated varieties (called cultivars) because plant breeders are continually introducing new types with novel flowers, growth characteristics, and increased disease resistance. There are cultivars of some species not included in this list that have short mature stature that could be used in locations near wires. In addition, many species have upright varieties, called columnar or fastigate, that have narrow growth forms and rarely get as

tall as is standard for the species. Please consult with local nursery and horticulture professionals to discuss cultivar characteristics and availability. In addition, this list should be updated regularly to keep current with new research, changing climate, and new potential non-native pests and disease.

Once again, this is a list of some, not all, of the trees and shrubs with low to medium mature heights that could be used when it is deemed appropriate to plant near roads with above ground utility equipment. It is not a comprehensive list of every possible plant for every conceivable situation. It does not only include native plants because there are a limited number of regionally native species that are appropriate for roadsides and available in nurseries, and because not all non-native species are considered to be invasive. We are not advocating the wholesale removal of existing trees and replanting with only species on this list. Where low growing trees and shrubs are currently present, they should be favored in management operations. In more natural forested roadside situations we recommend preserving or planting native species. We did not include tall trees because the purpose of the list is to draw attention to smaller size plants that are less likely to interfere with aboveground utilities.

References

Alexopoulos, J.; Stahl, P.; Ricard, R.M. 2007. Urban tree selection manual. University of Connecticut, College of Agriculture and Natural Resources, Storrs, CT. 121p.

Dreyer, G.D. 1991 Trees and shrubs for your community. Electric Council of New England. 25p.

Gerhold, H.D.; Lacasse, N.L.; Wandell, W.N. (Eds.).1993. Street tree factsheets. Publications Office, Pennsylvania State University, University Park, PA. 385p.

Trees with Short Mature Heights

Connecticut State Vegetation Management Task Force

Glenn Dreyer[1] (Connecticut College)
Jeffrey Ward[2] (The Connecticut Agricultural Experiment Station)

Common name	Scientific name[3]	Origin[4]	Height (ft)[5]		Not for	Notes
			Typical	CT max	Urban Sites	
Trident Maple	*Acer buergerianum*	NE Asia	20-25	57		
Hedge maple	*Acer campestre*	Europe	30+	60		Tolerates urban conditions well. No fall color.
Paperbark maple	*Acer griseum*	China	30	40		Beautiful shiny copper-colored bark
Japanese maple	*Acer palmatum*	NE Asia	15-30	48		Is spreading from planted locations; Invasive in nearby states
Tatarian maple	*Acer tataricum*	Europe	20-25			Is spreading from planted locations; Invasive in nearby states
Horsechestnut hybrids	*Aesculus hybrids*	Hybrid	30-35	45-55	?	
Common serviceberry	*Amelanchier arborea*	Native	<30	55		White flowers in late April; edible fruit in July
Allegheny serviceberry	*Amelanchier laevis*	Native	<30	50		White flowers in late April; tasty fruit in July
European hornbeam	*Carpinus betulus*	Europe	30-40	72		
American hornbeam	*Carpinus caroliniana*	Native	30+	37		Smooth, gray bark
Eastern redbud	*Cercis canadensis*	Native	25	45	?	Purple-pink spring flowers and heart-shaped leaves
Chinese Fringetree	*Chionanthus retusus*	NE Asia	15-25	17	?	Weak wood, bushy habit
Flowering dogwood	*Cornus florida*	Native	30	47	?	Showy white flowers in mid-May; (may be listed as *Benthamidia florida*)
Dogwood hybrids	*Cornus hybrids*					Dogwood hybrids

Common name	Scientific name[3]	Origin[4]	Height (ft)[5]		Not for Urban Sites	Notes
			Typical	CT max		
Kousa dogwood	*Cornus kousa*	NE Asia	30	36		Showy white flowers in late May; (may be listed as *Benthamidia japonica*)
Cornelian cherry dogwood	*Cornus mas*	NE Asia	15-25	28		
Smokebush	*Cotinus coggygria*	Europe	15	20	?	
American smoketree	*Cotinus obovatus*	Native	30	51	?	
Hawthorn hybrids	*Crataegus* sp.	Native	25			All have some level of susceptibility to rust and a few have some resistance to leaf spot, some have thorns
Redvein Enkianthus	*Enkianthus campanulatus*	Japan	15		?	Bushy habit
Seven-son flower	*Heptacodium miconioides*	China	12	25		Fragrant, late summer flowers
American holly	*Ilex opaca*	Native	30+	47	X	
Long stalk holly	*Ilex pedunculosa*		15-20	26	X	
Eastern redcedar	*Juniperus virginiana*	Native	30+	64	X	Evergreen
Amur maackia	*Maackia amurensis*	NE Asia	30	41		Clusters of yellow flowers in July
Star magnolia	*Magnolia stellata*	Japan	20	40		Upright shrub with large white flowers
Sweetbay magnolia	*Magnolia virginiana*	Native	25	28		Creamy flowers have a sweet fragrance
Saucer magnolia	*Magnolia x soulangiana*	China	30	44		Large white or pink flowers early spring
Crabapples	*Malus* sp.	Mixed	25	55		Showy flowers in spring and persistent fruit
Hophornbeam	*Ostrya virginiana*	Native	30+	67		Rough bark
Sourwood	*Oxydendrum arboreum*	Native	25	87	?	Showy white flowers in July
Persian parrotia	*Parrotia persica*	SW Asia	20-40	28		Interesting mottled bark

Common name	Scientific name[3]	Origin[4]	Height (ft)[5,6]		Not for Urban Site	Notes
			Typical	CT max		
American red plum	*Prunus americana*	Native	20		?	
Cherry plum	*Prunus cerasifera*	NE Asia	25	29		White flowers in spring; purple leaved forms popular
Cherry hybrids	*Prunus hybrids*					
Sargent cherry	*Prunus sargentii*	Japan	35-40	42		
Japanese flowering cherry	*Prunus serrulata*	NE Asia	25	33		Pink early spring flowers; 'Kwanzan' a popular type
Higan cherry	*Prunus subhirtella*	Japan	30+	67		Pink spring flowers; weeping forms available
Bosc (common) pear	*Pyrus communis*	Europe	30	59	?	White spring flowers; fruit could be a problem
Pussy willow	*Salix discolor*	Native	30		?	Appreciated for its small, fuzzy early flowers
Japanese stewartia	*Stewartia peuedocamellia*	Japan	30	39		Large showy June flowers and colorful mottled bark
Japanese snowbell	*Styrax japonicus*	Japan	25	28		White bell shaped flowers in June
Japanese tree lilac	*Syringa reticulata*	Japan	25	51		Creamy flower clusters in June, very adaptable
English yew	*Taxus baccata*	Europe	30+	47	X	Evergreen
Arborvitae	*Thuja occidentalis*	Native	30	70	X	Good evergreen screen: susceptible to deer damage

[3]Common and scientific names from USDA Plants database (http://plants.usda.gov)

[4]Native refers to eastern North America

[5]Typical height from personal observation and Dirr (1998) Manual of woody landscape plants, 5th edition

[6]Maximum Connecticut height from database of Connecticut Notable Tree Project

Selected shrubs suitable for planting near utilities

Connecticut State Vegetation Management Task Force

Glenn Dreyer[1] (Connecticut College)
Jeffrey Ward[2] (The Connecticut Agricultural Experiment Station)

Common name	Scientific name[3]	Origin[4]	Height (ft)[5]	Root suckers[5]	Notes
Canadian serviceberry	*Amelanchier canadensis*	Native	15	n	White flowers in late April; edible fruit in July
Red chokeberry	*Aronia arbutifolia*	Native	6	Yes	Good flowers and fall color (may be listed as *Photinia pyrifolia*) ,
Black chokeberry	*Aronia melanocarpa*	Native	6	Yes	Conspicuous white flowers, formerly (may be listed as *Photinia melanocarpa*)
Carolina allspice	*Calycanthus floridus*	Native	8	n	Fragrant flowers
Chinese fringetree	*Chionanthus retusus*	NE Asia	15	n	
White fringetree	*Chionanthus virginicus*	Native	20	n	Large clusters of white flowers in June
Japanese clethra	*Clethra barbinervis*	Japan	15	n	White flowers in summer, attractive bark
Alternate-leaved dogwood	*Cornus alternifolia*	Native	20	n	Large shrub with small clusters of creamy white flowers
Redosier dogwood	*Cornus sericea*	Native	10	Yes	Bright red stems maintained by cutting older stems
American hazelnut	*Corylus americana*	Native	12	n	Edible nuts are commercially cultivated
Redvein enkianthus	Enkianthus campanulatus	Japan	15		Great fall color follows midsummer flowers that attract bees
Chinese witchhazel	*Hamamelis mollis*	China	15	n	Flowers in early spring
Witchhazel	*Hamamelis virginiana*	Native	15	n	Small yellow flowers in October

Common name	Scientific name[3]	Origin[4]	Height (ft)[5]	Root suckers[5]	Notes
Rose-of-Sharon	*Hibiscus syriacus*	SW Asia	12	n	Summer flowers in various colors
Panicled hydrangea	*Hydrangea paniculata*	Asia	10	n	Needs constant pruning
Winterberry	*Ilex verticillata*	Native	10	n	Shrub with abundant red berries
Beach plum	*Prunus maritima*	Native	12	n	White flowers in spring; edible fruit
Winged sumac	*Rhus copallinum*	Native	15	Yes	Suckering shrub with brilliant red fall foliage
Smooth sumac	*Rhus glabra*	Native	15	Yes	Suckering shrub with brilliant red fall foliage
Arrowwood	*Viburnum dentatum*	Native	6	n	Small white flowers clusters in spring
Nannyberry	*Viburnum lentago*	Native	15	n	Creamy white flower clusters in June
Withe-rod	*Viburnum nudum* var. *cassinoides*	Native	12	n	Flower clusters in June, multi-colored fruit in fall
Blackhaw viburnum	*Viburnum prunifolium*	Native	12	n	Creamy white flower clusters in June
Cranberry viburnum	*Viburnum trilobum*	Native	6	n	Edible red fruit persists into winter

[3]Common and scientific names from USDA Plants database (http://plants.usda.gov) [4]Native refers to eastern North America

[5]Typical height and root suckering from personal observation and Dirr (1998) Manual of woody landscape plants, 5th edition

Tree Pruning Standards

The Task Force endorses the following tree care industry standards for ensuring proper pruning:

- ANSI Z133.1
- OSHA 29 CFR 1910.269
- ANSI A300 Part 1: Tree, Shrub, and Other Woody Plant Maintenance – Standard Practices, Pruning
- Best Management Practices, Utility Pruning of Trees

The Task Force also recommends that the recently released standards/best management practices from ISA (International Society for Arboriculture) be utilized.

Utility Line Clearance Standards (proposed jointly by CL&P and UI)

The following standards shall be considered the minimum requirements for each electric distribution company's vegetation management plan. Line clearance shall be performed to protect the company's primary electric lines and equipment during normal and severe weather.

Vegetation Management Plan

By November 15 of each year, the company shall file an annual Vegetation Management plan that includes but shall not be limited to the following:

1. Work scope and budget details
    a. Roadside miles scheduled, backbone and lateral
    b. Right-of-Way miles, brush control and side pruning
    c. Risk tree removal
    d. Vine control
    e. Traffic control
    f. Customer request tree work
    g. Mid-Cycle
    h. Emergency restoration, minor storm
    i. Other

2. Tree and brush work specification

3. Line clearance organization

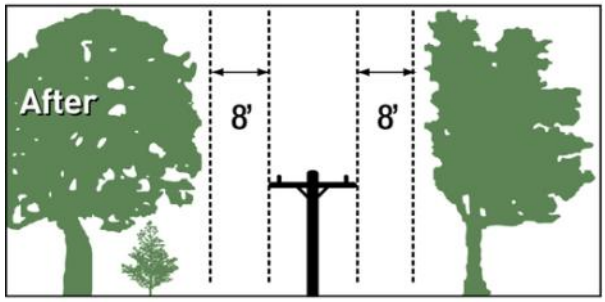
4. Property owner notification and consent procedures

5. The planned maintenance within each town within the company's service territory

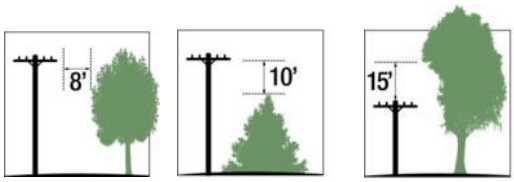
Clearance Requirements

1. Routine maintenance tree and brush work (tree pruning) shall be performed on a 4-year cycle.
    a. All roadside and off-road primary voltage lines shall be cleared at least once every 4 years.
2. The utility clearance zone shall be the area 8 feet to the side of all primary conductors from the ground to the sky.
    a. Enhanced Clearance shall be performed to achieve the following clearances on all circuit backbone and lateral conductors selected for enhanced tree work:

i. Remove all tall growing tree species below within the clearance zone
ii. Remove all overhanging limbs within the clearance zone



b. Scheduled Maintenance Clearance shall be performed to achieve the following clearance around all primary voltage conductors not selected for enhanced tree work:
    i. 10 feet below within the clearance zone
    ii. 15 feet overhead within the clearance zone



3. Remove hazard trees within the clearance zone
4. Each tree shall be evaluated at the time that it is pruned. The tree crew shall consider tree species, condition, growth rate and location when performing line clearance.
5. Clearance shall be performed in accordance with the following tree care industry standards:
    a. ANSI Z133.1
    b. OSHA 29 CFR 1910.269
    c. ANSI A300 Part 1: Tree, Shrub, and Other Woody Plant Maintenance – Standard Practices, Pruning
    d. Best Management Practices, Utility Pruning of Trees

Utility Line Clearance Standards – Communications (proposed by AT&T)

AT&T has operational agreements with both major power companies to share costs for trees removed as the result of either a major storm or for a mutually agreed hazard tree. The trimming guidelines provided below are utilized by technicians or contractors when trimming branches for the business as usual scenario.

AT&T's practices address utility line clearance in the communications gain on the utility pole which is approximately 16 feet above ground level. The communications gain is below the power gain which is located at the top of the pole and is where power facilities are placed. Communications providers do not face the same challenges as power companies in regards to tree trimming due to the nature of our facilities as well as our attachment location on the utility pole.

Under a business as usual scenario, AT&T will trim branches as necessary when trees interfere with our ability to place or replace facilities. When specific hazard trees are identified which pose a significant risk to our communication facilities, AT&T utilizes certified tree contactors to remove the hazard tree.

Tree Trimming Guidelines

This section outlines the principles that should guide telecommunication employees and tree removal contractors engaged in “Line Clearance” type work. All work shall be performed in a safe and professional manner consistent with good service, while still maintaining the health and appearance of the trees and shrubs alongside and under telecommunication lines.

As a result of the environmental awareness in our country, people are concerned for the welfare of our trees, particularly those trees that grow along the roadside. Therefore, the utmost care and proper pruning practices must be used in line clearance operations.

The goal of **construction trimming**, either road-side or right-of-way, is to provide a clear path for the construction of a new pole line or cable. The “clear path" will include removal of all undesirable woody plants under the pole line, and pruning trees not removed to keep them from interfering with telecommunication facilities for a 3- to 5-year period.

Local policy will decide how much trimming will be performed by telecommunication employees, but they can do telecommunication trimming as assigned. Trimming by telecommunication employees should be confined to those areas that can be done from the ground with pruning tools, from a ladder, or an aerial lift vehicle. Many phases of tree trimming and pruning require experience and sophisticated tools unavailable to telecommunication employees; therefore, such activities as joint trimming (trimming both electric and

telecommunication lines), dismantling large trees, and rope climbing, shall be performed by outside contractors.

Employees and tree removal contract personnel must consider the appearance and welfare of all trees during trimming operations; not only from the standpoint of maintaining the natural beauty of these trees, but also from the standpoint of successfully maintaining the aerial plant and promoting good public relations.

Tree Removal Standards

The current Connecticut roadside forest has many large trees, many neglected trees, and many trees that pose a serious risk to people and property. A stepped-up effort towards removal of trees that are a significant risk because of structural defects or being in poor health with numerous dead limbs, for example, is essential for the safety and well-being of the people of the state. For this to be acceptable to the public, there must be a generally agreed-upon understanding of the benefits and values of trees as well as their inherent risks. The standards for determining when a tree should be removed must be guided by the insights and knowledge of qualified professionals, including certified tree wardens and licensed arborists, and implemented by municipalities, private property owners, the State of Connecticut and the public utilities in a manner that also includes a commitment to the stewardship of our roadside forest.

The approach we advocate towards encouraging this increased level of tree removal has two components. First, it is important that field crews and field decision makers be given clear, concise and specific guidance as to the causes and conditions that would lead to a decision to remove a tree. Second, it is important that an educational network regarding trees and tree removals be fostered, so that, as a group, we learn, get better, and adapt as our knowledge improves.

In the middle of this balance between guidance and learning is a commitment to tree removal training for municipal, private arborist, utility tree crews, and others.

<u>The Basic Elements of a Tree Removal Training Program</u>

Training programs with regards to tree removals should start, first and foremost, with safety. Tree work in any manner is inherently dangerous. Safety is essential.

Experts in tree care should be called on to provide clear guidance on the types of situations and circumstances in which a tree ought to be removed. These can range from trees that are determined to be structurally compromised to trees that are unsafe due to their location with regards to the road.

Training should also focus on the basic physiology and structure of trees, how tree conditions can negatively impact the structural condition of a tree, and how trees respond to stress and adverse conditions such as recent construction. The seven categories of tree defects as outlined by the USDA Forest Service should be a key component of this training:

1. Decayed Wood
2. Cracks
3. Root Problems

4. Weak Branch Unions
5. Cankers
6. Poor Tree Architecture
7. Dead Trees, Tops or Branches

Training should emphasize proper techniques and alternative methods of tree removal. All companies involved in tree removals, including, especially, municipal and utility crews, should be encouraged to take this training. The general outline for this training should be developed by the tree care professional groups as a whole, and supported by efforts at the state level.

Standardized Approach to Tree Removals

Training:

One of the non-profit organizations in Connecticut (e.g. CUFC, CTPA, or TWAC) takes the lead in authorizing the development of a standardized training program for tree removals, with the emphasis on tree removals within the roadside forest. This training program would include:

- safety
- an overview of form and function within the healthy tree
- the seven structural defect categories from the US Forest Service (*Urban Tree Risk Management*, 2003)
- tree growth response, including to structural defects
- the role of environment
- tree assessment, including both tools and methods
- the importance of identifying targets
- an overview of various methods of tree removal along with directions as to where to go to get additional training
- guidance on how to best reuse or otherwise capture the value of the wood produced by removals

As part of this training program, a decision key will be developed to help guide tree removal decisions. This tree removal key may be based on one of the existing hazard tree rating sheets.

The "Tree Risk Management" program developed by Bartlett Tree Experts and used by CT DOT for training may be used as a guide for how to set up this program. A grant may be sought to allow this training program to be created. Once created, it will be shared and presented widely throughout the state.

Municipal Planning:

It must be recognized that a proportionally high number of trees need to be removed along our state roads and highways, due to the age, size, condition and deferred maintenance of these trees.

To help tackle this backlog, each municipality will be encouraged to develop a plan for the prioritized removal of trees from the roadside forest. Priorities for tree removal will be based upon:

- the condition of the tree
- the importance of a road section, especially during emergencies (e.g., main roads leading to a hospital)
- areas where the risk to targets should a tree fail are greatest (e.g., busy intersections)

Each town will take these three parameters into consideration as they assess trees for removal, and remove those with the highest priority rating first.

Tree wardens will recognize that the authority of the tree warden includes all trees that extend into or overhang the public right of way, and so will assess those trees whose base is outside of the right-of-way in a manner similar to town-owned trees, and with the same authority to call for their removal.

As a first step in developing the plan, each municipality should at a minimum conduct a windshield survey to identify and record those trees that present the greatest risk, according to the three categories mentioned above.

The State DEEP is encouraged to assist the towns in developing their plans for tree removal by developing a model tree removal plan. The State might also develop a system by which tree removals and tree inventory data are compiled in a comprehensive database that is based on standardized input from communities around the state.

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

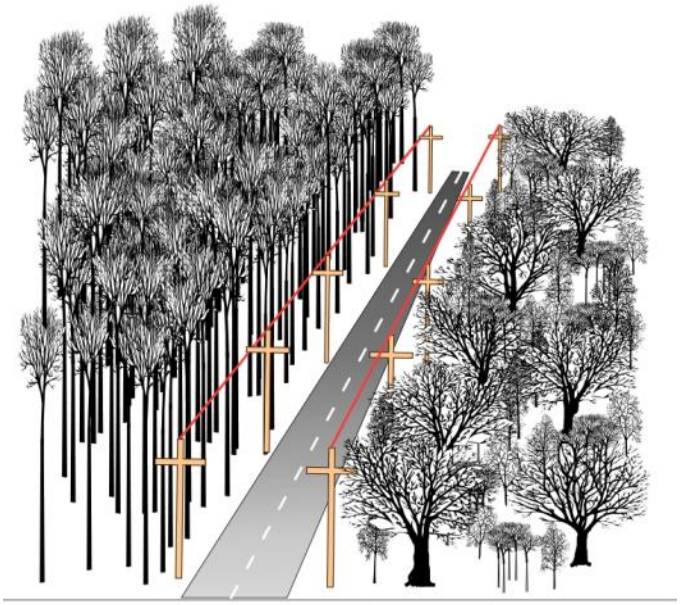
Landowners often complain about utility line pruning, arguing that it is not attractive and leaves trees deformed. There is some concern as to whether the heavy pruning required to achieve Enhanced Tree Trimming (ETT) standards could create potential future hazards. Municipal tree wardens and the general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

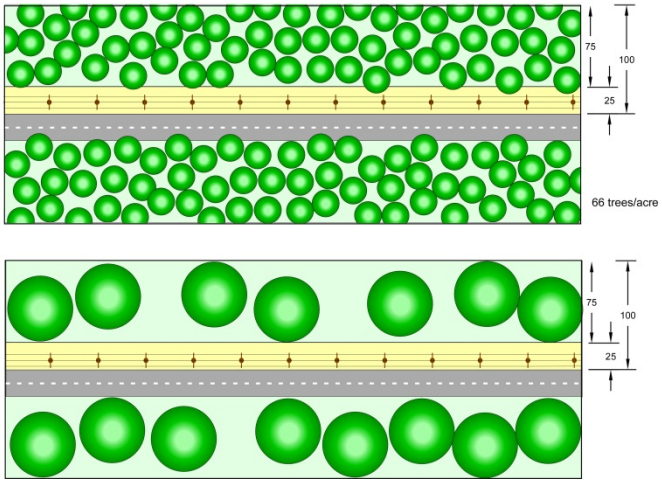


Figure 4. Bird's eye view of a typical forest in Connecticut (top) with 700-1200 trees per mile on each side of a road compared with a storm resistant forest (bottom) would have fewer trees with crowns that are wide rather than tall. Small trees and shrubs are not shown in either forest, but would occupy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

Trees with a dense infestation of oriental bittersweet are more likely to fail during severe storms.

Controlling Vine Infestations

Vines in trees can cause increased risk of a tree's failing and disrupting utilities during wind, ice, and wet snow storms. Vines increase the 'sail' area of a tree during high winds and the surface area for accumulation of damaging heavy wet snow or ice. The most common species that have been observed to increase the risk of a tree failing during a storm are oriental bittersweet (*Celastrus orbiculatus*) and grape (*Vitis* spp.). Occasionally, other species such as wisteria (*Wisteria* spp.) or kudzu (*Pueraria montana*) can infest a tree sufficiently to increase the risk of tree or large limb failure. Not all vines are necessarily detrimental. Poison ivy (*Toxicodendron radicans*) and Virginia creeper (*Parthenocissus quinquefolia*) are usually found growing on the main trunk of a tree and not over or along branches. These two species rarely need to be controlled to reduce the risk of tree failure.

Ideally, vines are controlled before they form a dense infestation mat in the tree's canopy. After they are killed, it may take several years for the vines to decompose and eliminate the risk of tree failure during severe weather. However, any control of infesting vines will reduce the risk of tree failure by killing the leaves that increase the sail (wind) and accumulation (wet snow, ice) areas.

The simplest method of vine control is to cut the stems as close to the ground as possible. This will cause death of all aboveground tissues. However, the surviving root systems of all species will quickly send up new vines that again infest the trees. To provide longer protection, it is suggested that the cut stems of problematic species be treated with an herbicide to kill the root systems. Treating the cut stems, and not spraying the foliage, dramatically reduces the amount of herbicide that is needed and reduces the impact to any vegetation that is near the treated vines. It is important to follow all label directions when applying herbicide.

Herbicide control is not a panacea because new plants will develop from seeds buried in the soil or deposited by birds or deer. Therefore, it will be necessary to periodically treat an area to control any new vines. Because the new vines are much smaller, it should be relatively easier to implement a maintenance program than for the initial control effort.

Inventory/GIS Recommendations

Chapter six of the Two Storm Panel Report recommended municipalities, utilities, and state agencies share Geographical Information Systems (GIS) mapping with an emphasis on GIS data relating to streets and utility infrastructure. Recommendation #20 in Chapter three of the Two Storm Panel Report stated "Conduct a state-wide tree risk assessment and prioritization schedule particularly targeting hazardous trees." There was a great deal of discussion in the Task Force meetings regarding the inventorying and assessing the quantity and quality of the trees along the roadside forest of Connecticut. The information gathered in an inventory or assessment will have great value to the utility companies, municipalities and the State of Connecticut by providing an understanding of the number and condition of trees within the public Right-of-Way. In order to relate the inventory to other features in and near the right-of-way such as transformers and property owners, these assessments should be conducted within a GIS environment.

For the utility companies, the inventory or assessment could be assimilated with outage data to determine which areas should be prioritized for trimming and other maintenance. In the long term, if the inventory or assessment is continued over time, this information could be used to validate which types of trimming practices and trimming cycles are most appropriate for a given area.

For the municipalities, the inventory or assessment provides a means to understand the anticipated costs of properly maintaining its roadside forest and correcting liabilities that could be harmful to its inhabitants. In several towns, like Milford, Norwalk and East Lyme, proactive citizens have conducted inventories with the goal of improving the condition of street trees. These efforts not only provided benefits described earlier but have provided a means to recover costs when disaster strikes. The same inventory used to improve tree conditions can be used to quickly provide FEMA with the conditions of trees damaged during a storm event.

For the state, the benefits of an assessment or inventory of trees within the state ROW are the similar as for municipalities with the additional condition that most state ROW's are critical for keeping the state up and running after a storm event. These roads must be able to be cleared quickly after a major storm occurs.

One of the benefits of implementing GIS is the ability to share geographic information in an intuitive manner. Chapter four of the Two Storm Panel Report covered many of the problems in communication and sharing of information between utilities and municipalities. Much of the confusion revolved around outage maps and where power was getting restored. This not only was a nuisance, but was potentially deadly. Utility companies should share outage information

in real-time to the state and municipalities so that field personnel know where downed wires are no longer live and present eminent danger.

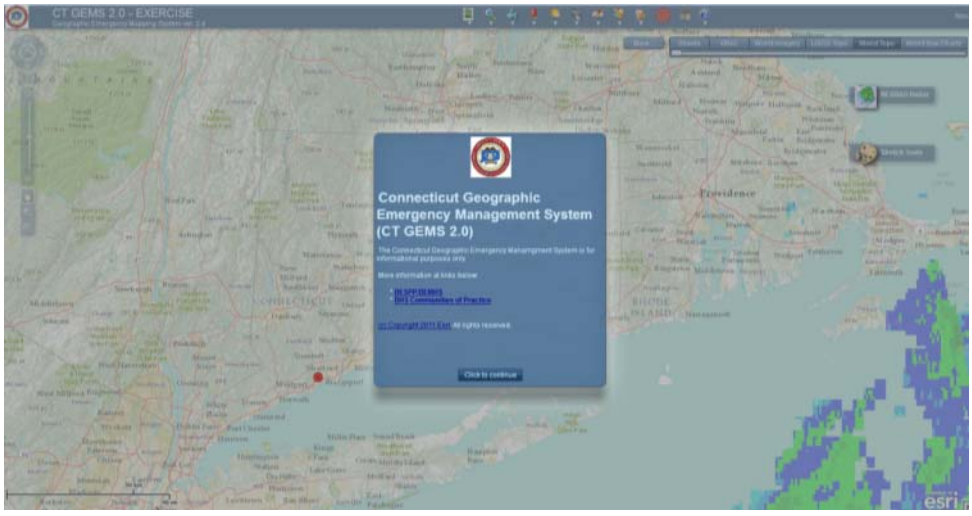
The major recommendations follow three themes: Coordination, data and systems. Coordination is critical because of the shared nature of the vegetation management within public rights-of-ways. As for data, Town of South Windsor Public Works Director's mantra is "You cannot manage what you cannot measure." In order to manage trees, we need actionable information to assess the problems and devise plans to properly manage those resources. Hand in hand with data are systems to help further refine the information collected the trees and disseminate that data and information to the appropriate entities that share managerial responsibilities over the care of our roadside forests.

Recommendations:

1. GIS Coordination. Like recommended in the Two Storm Panel Report, the Connecticut GIS Council (www.ct.gov/gis) should expand representation to include a broader GIS user base beyond State, Regional or Municipal Representation. This should include quasi-public agencies and private entities.
    a. The Council should revise the Connecticut Enterprise GIS Strategic and Business plans from 2007 to accommodate Utilities and the Public Sector in those plans.
    b. More emphasis should be placed in finalizing and updating Data Subcommittee Standards and Guidelines if necessary to accommodate additional participants on Geospatial Council.
    c. The Council should plan for the development of interoperable systems for sharing information between the utilities, state agencies, regional planning agencies and municipalities.
    d. The State should fund the four core framework datasets described in both the Strategic and Business plans with particular emphasis on the Statewide Orthophoto (aerial photography) and Parcel programs.
    e. Fill empty GIS positions within state agencies when vacated, especially DEEP.
    f. Establish GIS Coordination Unit within the Office of Policy and Management to implement policies established by the Connecticut GIS Council.
2. Aerial Photography. Continue and establish new funding mechanism to procure statewide high resolution aerial photography at minimum every four years at the specifications detailed in the digital orthoimagery data guidelines published on the CT GIS Council base map imagery subcommittee website: http://www.ct.gov/gis/cwp/view.asp?a=3034&q=410762.

a. Additional funding to insure the USDA NRCS National Aerial Imagery Program flights covering the State of Connecticut will include a Color Infrared band in addition to the natural color (RGB) bands.
b. Additional funding for UConn CLEAR program to classify land cover using the USDA NRCS National Aerial Imagery Program flight data for canopy coverage and other environmental conditions such as impervious surfaces.
c. Additional funding to expand DEEP Coastal Color Infrared aerial photography program to include complete coverage for coastal communities.
d. Additional funding for UConn CLEAR and or MAGIC to georeference and mosaic the various collections of historic aerial photography collections including the highest resolution 193 and 1965 aerial photos housed at the State Library.

3. Parcel Data. Continue and establish new funding mechanisms to develop a statewide parcel dataset. This also includes easements and other encumbrances on private property including electric utility easements and rights-of-way. Continue funding regional parcel development programs through OPM's Regional Performance Incentive Grant with emphasis on programs that accurately build parcel data through subdivisions and other surveyed sources. Parcel data should be developed with the specifications detailed in the Cadastral Data Standards and Guidelines on the CT GIS Council cadastral data subcommittee website: http://www.ct.gov/gis/cwp/view.asp?a=3034&q=410780.
    a. Encourage the Department of Transportation to translate existing paper and CAD Right-of-Way mapping to GIS format compatible with GIS parcel data.
    b. Encourage municipalities to properly research town right-of-ways and make that information readily available for incorporation into GIS parcel datasets.
4. GIS Systems. Expand the use of existing state web-based GIS systems already in place. The Connecticut Geographic Emergency Management System (GEMS) was set up and utilized during the Statewide Emergency Preparedness Drill starting on July 29th. This tool is made available on an as-needed basis.



5. Through actions of the Geospatial Council, enable tools similar to GEMS to allow for roadside forest inventories and assessments be uniformly created, updated and maintained. This should be secure and have the ability for the tree managing participants (utilities, municipalities and the state) to create, update and maintain tree information. For many small municipalities, this would be the only resource available to conduct such activities. This system needs to be made available through standard web browsers as well as common mobile devices such as smart phones and tablets.
6. In addition to a system to maintain tree condition data, there should be a system for citizens and rate payers to provide feedback to the tree care provided by the tree stewards similar to the Town of South Windsor's Community Citizen Service Request Dashboard http://www.southwindsor.org/Pages/swindsorct_it/csrd/csrdashboard. This system allows the citizens of South Windsor to submit requests for services, see current or pending Town projects, and highlight town events. This system currently provides this functionality from any computer connected to the internet but soon this functionality will be made available on certain mobile devices.