Converting Hazardous Trees Into Wildlife Trees

Although tree risk management often involves the complete removal of dead or dying trees, some defective trees can be treated to reduce the threat to human life and property to an acceptable level, while leaving a portion of the tree intact to provide wildlife habitat. This approach has been coined *converting board feet into bird feet* (Ostry and Nicholls 1998). Several techniques exist for converting hazardous trees into good wildlife habitat in a safe and environmentally responsible fashion. These techniques ensure that if a tree falls (or when it falls) there are no targets within striking range.

Not all defective trees are good candidates for providing wildlife habitat, nor can all good candidates be safely converted to wildlife trees. For example, converting hazardous trees into wildlife trees is not recommended for street trees, and should be reserved for use in parks and natural areas. We will describe the *wildlife cycle* of a tree, and discuss criteria to determine if a tree can be safely converted into a wildlife tree. We will introduce a decision-modeling tool that provides a logical approach to deciding whether to convert a defective tree into a wildlife habitat tree.

Communities often overlook the environmental benefits that a tree risk management program can provide, especially as it relates to creating wildlife habitat. A community tree risk management program that helps to create wildlife habitat will nurture public interest in the program. People value a variety of wildlife in and around the places where they live and work, from inner city to rural communities. The 1996 National Survey of Fishing, Hunting and Wildlife-Associated Recreation reports that 62.9 million people intentionally fed, observed, or photographed wildlife around their homes and on trips away from home (USDI 1996). Other studies have shown that in urban areas 93 percent of residents want to know how to attract wildlife and support habitat components.

Wildlife in cities and rural communities may offer greater opportunities for environmental education and non-consumptive recreation than remote locations because of the proximity to large numbers of people (Shaw et al. 1985). Demonstrations sites, located in parks, nature areas and on school properties, can be very effective teaching tools and serve as *living laboratories* to display and interpret the wonders of nature. Demonstration sites, showcasing wildlife habitat areas as a managed component of the community forest, can also encourage the observer to think beyond the individual tree and gain a greater understanding of natural systems.

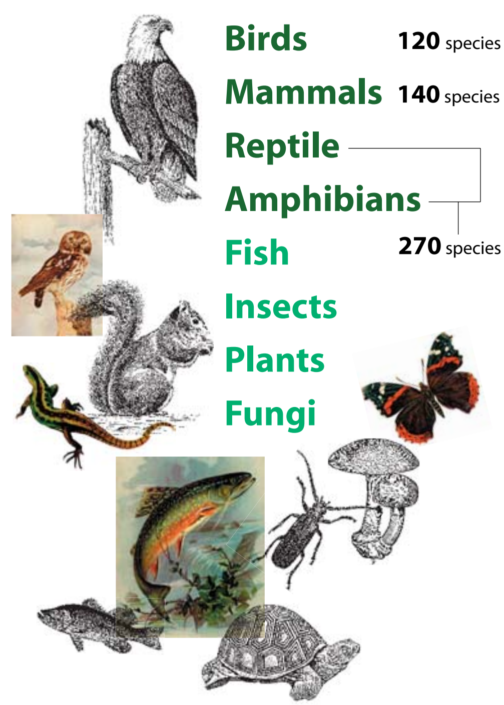


Figure 5.18. *Over 120 species of birds, 140 species of mammals, and 270 species of reptiles and amphibians depend on standing dead and dying tree of all sizes*

How Trees Benefit Wildlife

Standing dead trees and dead or dying parts of live trees are beneficial to wildlife for foraging and food storage, nesting and den sites, shelter and cover, bridges, perches, and roost sites. Over 120 species of birds, 140 species of mammals, and 270 species of reptiles and amphibians depend on standing dead and dying trees of all sizes (Ackerman 1993) (Fig 5.18). In addition, many species of insects, spiders, mites, millipedes, centipedes, slugs, and fungi use these trees for the completion of their life cycle and in turn provide a food source for many other species. For example, the white-breasted nuthatch, common in urban forests, is a cavity nester that prefers mature stands with large decaying trees, and feeds its young an animal-based diet consisting of many of the arthropod species listed above.

Wildlife Cycle of a Tree

A tree's capacity to provide wildlife habitat changes over time. As a tree matures and begins to decline (due to insects, diseases, injury or old age), the tree enters into a "wildlife cycle" and plays a vital role in providing habitat and promoting ecosystem biodiversity. Even when a tree dies, its usefulness does not end; it continues to provide valuable habitat for many species of wildlife. When evaluating a tree as a possible wildlife tree, certain characteristics make them suitable for different types of wildlife habitat, depending on what phase of the "wildlife cycle" they are in. The "wildlife cycle" can be simplified into three identifiable phases, each phase being unique and adapted for different types of wildlife:

Phase 1: The first phase in the "wildlife cycle" of a tree involves standing dead or dying trees that initially attract non-cavity nesting species and primary cavity excavators (e.g., woodpeckers). These trees contain sound wood and the branches are intact (Fig 5.19). Trees in this initial phase provide foraging sites and perches for insect-feeding birds and raptors, singing perches for many songbirds, nest sites for species such as great blue herons, osprey, hawks and eagles, and nesting sites for primary cavity excavators such as woodpeckers, nuthatches, chickadees, and others.

Phase 2: The second phase in the "wildlife cycle" of a tree involves increased decay. The tree is still standing, but the wood is no longer sound. The branches and bark are shed and the top and larger portions of the stem break off. During this phase, the tree becomes attractive to secondary cavity users that colonize existing cavities, excavated and abandoned by primary cavity nesting species or formed when branches are shed or when tops are broken off. (Fig 5.20). Secondary cavity users include owls, some species of ducks, birds (e.g., bluebirds, swallows, wrens and flycatchers), raccoons, flying squirrels, bats, and some amphibians. These species use the tree for nesting, foraging, roosting, and perching.

Figure 5.19. *Example of a Phase 1 Wildlife Tree: a standing dead tree that initially attracts non-cavity nesting species. Here, it serves as a nesting site for a bald eagle.*

Phase 3: In this third and final phase of a tree's "wildlife cycle," decay has reduced the tree to a stump and debris pile (Fig 5.21). Woody debris is important habitat for many wildlife species such as salamanders, toads, mice, grouse, and woodpeckers. It is used for nesting and shelter, as a source of and place to store food, as a lookout site, for drumming, sunning, and preening sites, and as a natural bridge or highway across streams. Decaying logs also serve as nurse-trees for seedlings and contribute to nutrient cycling.

Figure 5. 20. *Example of a Phase 2 Wildlife Tree: a tree with existing cavities that is attractive to secondary cavity dwellers. Here, a boreal owl has discovered a cavity and established a nesting site.*

Criteria for Selecting Wildlife Trees

Within community parks and other natural areas, a variety of wildlife trees should be selected for use, ranging from trees suited for long-term management to trees suited for short-term management. Phase 1 trees will be the most valuable trees for providing long-term wildlife habitat since they will remain standing for an extended period and will likely develop a large number of cavities over time. Trees greater than 15 inches in diameter, and more than 50 feet tall, are considered the most valuable to wildlife. These trees should be slow decaying tree species such as oak and pine. Phase 2 trees provide immediate habitat for secondary cavity users and serve as foraging, roosting, and perching sites. To identify Phase 2 trees, look for existing cavities, dens or foraging holes; existing nesting or roosting sites; and/or the presence of fresh scats or bird droppings. Phase 3 trees provide immediate habitat for wildlife and contribute to nutrient recycling. Selecting trees that are currently inhabited or used by wildlife has the obvious advantage for educational purposes and demonstration projects.

Figure 5.21. *Fallen, decayed logs provide nesting and shelter, a source and a place to store food, lookout sites, drumming, sunning and preening sites, and as a natural bridge or highway across streams.*

When to Consider Converting a Defective Tree into a Wildlife Tree

Only consider establishing wildlife trees when human safety will not be compromised or damage to property is not imminent, and when the defective tree is a good candidate for wildlife habitation. For these reasons, it is not a recommended corrective action for street trees, and the establishment of wildlife trees should be reserved for parks and natural areas.

Reduction of risk may be as simple as moving targets such as picnic tables, benches, or kiosks out of striking distance of the defective tree. If the target can be moved, risk to public safety is mitigated, and the tree can be preserved for wildlife habitat. If it is not feasible to move the target, other corrective actions such as pruning to remove defective branches or to reduce tree height should be considered. For example, wildlife trees that are located along high-use urban trails and in parks will often require corrective pruning to reduce tree height to a level where the tree will no longer strike a target, should it fail. Placing a nesting box near the location where a cavity has been lost through tree or limb removal may be a successful habitat replacement. If it is not feasible to perform corrective actions that will reduce risks to public safety with minimal impact to wildlife, closing the area to pedestrian traffic is a final option. Closing the site temporarily (such as during the breeding season) is often a possibility. With proper fencing and interpretive signing, a site closed to pedestrian traffic may still be valuable as an educational/demonstration area.

The Wildlife Habitat/Defective Tree Decision Model, developed by the U.S. Forest Service, provides a logical approach to deciding whether to convert a defective tree into a wildlife tree (Fig 5.22). The model operates under two assumptions: 1) a defective tree exists and various corrective actions can be performed to reduce the public safety risks to an acceptable level, and 2) wildlife is using or could potentially use the tree. This simple tool poses basic questions to help determine what corrective action(s) could be implemented that will reduce risk to public safety and preserve as much of the tree as possible for wildlife habitation. Corrective management strategies include: 1) removing targets within striking distance of a wildlife tree, 2) performing corrective pruning, 3) closing off the site, with fencing or signs, to restrict pedestrian traffic within striking distance of a wildlife tree and, 4) removing the tree and leaving the felled tree on site.

Closing the Area

Closing an area and denying the public access to a portion of the urban forest is an extreme action that should be considered only in the direst situations. However, there are times when closing an area, either temporarily or permanently, is the only option available (Fig 5.23). One example of the effective use of temporary closures is a situation where an adverse weather event such as an ice storm or tornado has left so many hazardous trees in an area that it is impossible to guarantee public safety. Closing a public area temporarily until the needed tree maintenance is done should be an option that is available to tree maintenance workers in communities.

Figure 5.23. *Place a Do Not Enter sign to close the site to visitors.*

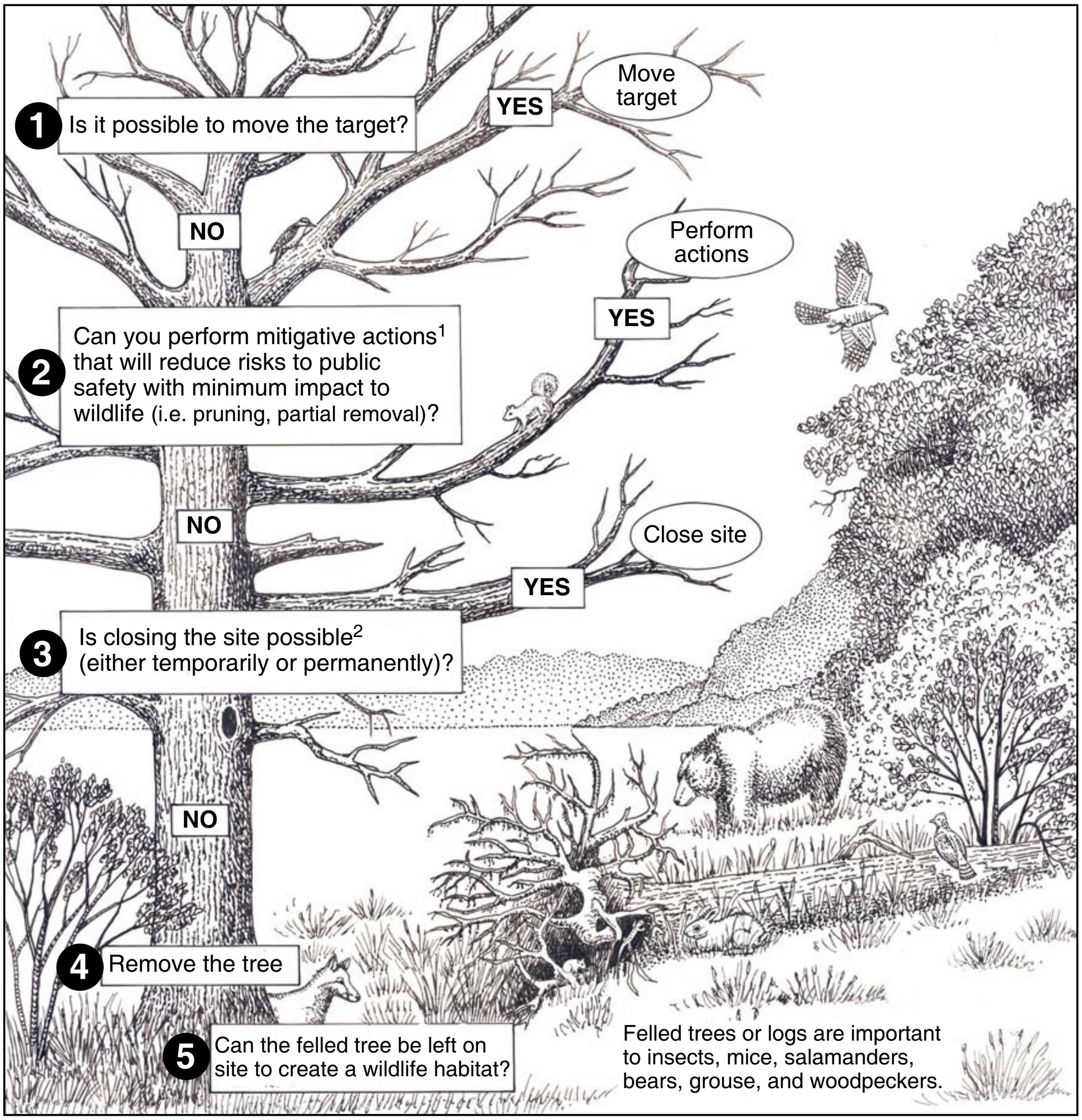
In more permanent or sensitive situations, judicious use of a "close the area" approach can also be an effective tool for managing risk. As an example, placing a fence around a large tree to keep the public from compacting

Wildlife Habitat/Hazardous Tree Decision Model

This decision model provides a logical approach to deciding whether to convert a hazardous tree into a wildlife habitat tree. The model's function is to help maintain and create wildlife habitat and reduce public safety risks associated with trees with hazardous defects. Assumptions of the model are:

1. A hazardous tree exists and various mitigation actions can be performed to reduce public safety risks to an acceptable level.

2. Wildlife is using or could potentially use the tree.



[1] *Placing a nesting box (Screech Owl, Northern Flicker, squirrel) on a site can be a successful replacement for cavities that are lost through tree or limb removal.*

[2] *If it is not possible to move a target, prune the tree or conduct a partial removal, consider closing the site. This mitigative action can prevent disturbance to wildlife during the most critical (breeding) time. Remember, risk and values must be balanced with common sense when making decisions about hazard trees.*

Text prepared by: Mary Torsello and Toni McLellan, USDA Forest Service. Illustration by Julie Martinez

Figure 5.22. *Wildlife Habitat/Hazardous Tree Decision Model.*

the soil over tree roots, or from being at risk from falling branches is in many ways equivalent to closing the area. For large trees of significant cultural heritage, placing a fence around them is often the only acceptable way to mitigate a hazard. Alternatively, planting wide, fenced, or densely continuous beds of flowers around an architecturally unsound tree may be an acceptable way of retaining an otherwise hazardous tree in the urban landscape. This will keep the public at a safe distance, and will also prevent the trampling of roots and soil compaction around the hallowed monarchs of the urban forest. But at the same time the hazardous situation is being resolved, consider eventual replacement of the defective tree. Wise management can extend the lifetime of a tree by only so long. Communities need long-term strategies for tree removal and replacement to achieve sustained development of the urban forest.

Removing the Tree

Removing a hazardous tree is the option of last resort. Implement this action only when other corrective actions cannot reduce the level of risk to an acceptable level. Before removing the tree, consider and balance all options, including the possibility of cabling and bracing, against the opportunity that removing a tree provides in the development of the overall community tree risk management plan. The effects of removing a tree, including visual impact on the site, and emotional impacts to people who value a particular tree, can be substantial. While removing a tree is not an option to be considered lightly, it is sometimes an unavoidable cost to abate a hazard. Always couple the removal of a tree with a community tree planting program that includes strategies to reestablish trees that are best suited for the urban landscape and the site on which they will grow. For example, plant small-stature trees under utility lines, and consider trees with smaller crowns and root systems for narrow lawn extensions and other places with restricted root space. Make educating the public about the benefits of matching trees to specific sites a goal of every tree risk management plan. See Chapter 4 (Prevention of Hazardous Tree Defects) for more information on proper species selection.

Following are some examples of high-risk tree defects that warrant tree removal. Refer to Chapter 3 (How to Detect and Assess Hazardous Tree Defects) for additional photographic examples of all the tree defects listed below.

Bole Decay: Trees that do not meet the minimum sound shell thickness guidelines described in Chapter 3 must be removed (Fig 5.24). There is no other remedy for a tree that lacks the necessary amount of sound wood. Filling cavities or other methods for bracing or cabling such trees are not effective.

Leaning Trees: Trees with an excessive lean, as described in Chapter 3, must be removed. Trees that have evidence of soil mounding on the side away from the lean are particularly dangerous. Such mounding indicates that the roots on that side of the tree are failing, and usually mean that the tree has recently begun to lean. A tree that has grown for a long time with a lean less than 45 degrees may not be a significant hazard, but should be monitored closely for evidence of an increase in the lean angle.

Dead Trees: Dead trees are at great risk of failure, and should be considered highly hazardous in all situations. These trees should receive priority attention by the maintenance crew, and should be removed as soon as they are found.

Cankers on the Main Stem: Trees with cankers that affect 40 percent or more of the tree's circumference or are associated with decay or other defects should be considered hazardous and removed (Fig 5.25).

Figure 5.24. *This tree has a large cavity with extensive wood decay that affects >40 percent of the tree's circumference. This tree does not meet safe shell requirements and should be removed.*

Figure 5.25. *This tree has a canker and associated decay that affects >40 percent of the tree's circumference. This tree does not meet safe shell requirements and should be removed.*

Unsound Architecture: Some trees with a tendency to form multiple upright branches can become dangerously defective if timely pruning is not provided over the life of the tree (Fig 5.26). Other trees, particularly conifers, can develop "twin stems" if the leader is killed and two branches assume dominance. The branch unions of these trees tend to form "included bark" as described in Chapter 3, which acts as a wedge to force such branches apart. If it is feasible to remove one branch in such a tree to correct the problem or to buy time while other nearby trees grow larger, the trees might be pruned.

Severe Root Injury: Trees where root damage such as root decay or root severing affect more than 40 percent of its critical rooting area (Fig 5.27).

Figure 5.26. *This tree has experienced major crown failure. The remaining branches are declining as evidenced by poor leaf development, and the overall health of the tree is very poor. This tree should be removed.*

Figure 5. 27. *This tree has experienced damage to two sides of the root system and surface root loss due to re-construction activities. An older sidewalk restricts the roots on a third side of the root system, making this tree a prime candidate for failure.*

Implementing Corrective Actions

Just as it may take several decades for trees in an urban setting to accumulate the injuries and structural defects that make them hazardous, it may take decades of careful maintenance and planning to develop an urban tree population into the ultimately desired condition. However, individual corrective actions must be completed in a timely manner. When a community first establishes a tree risk management program, the number of maintenance activities that seem necessary can be overwhelming. Aside from the removal or corrective treatment of very high-risk trees, which must be a top priority, a community has many options available to deal with correctible trees that pose a low or moderate hazard.

One strategy available to communities to help control the initial costs and visual impacts of mitigating hazardous trees lies in spreading corrective maintenance and planting over several years. This strategy requires ranking the corrective maintenance needs of all defective trees, and identifying those trees that require immediate attention as well as those with problems that can safely be put off for future correction. Be prepared to explain the rationale used for assigning or delaying treatments for all trees with identified defects, preferably with guidelines that are consistently used by tree inspectors and maintenance workers. Carefully consider benefits, risks, costs, and visual impacts when making decisions regarding tree risks.

Consider the tree shown in Figure 5.28. It is clear from the photo that a large and presumably defective limb was removed some years ago. The photograph clearly shows that there was a target within range. At the time the photo was taken the tree does not appear to create an imminent hazard, yet as an urban tree it is not in the desired condition. The storm-damaged tree had a defective limb that was removed, eliminating the immediate hazard. However, the resulting wound is so large that there is a high probability that it will become invaded by decay fungi before the tree has time to seal over the branch stub. There is also a high probability that the decay process will result in a cavity developing in the main stem that will one day violate the minimum "shell thickness guidelines" discussed in Chapter 3. Prudent hazard tree management dictated that the storm-damaged limb be removed; however the corrective action resulted in the creation of a tree that was not in its ultimately desired condition, which is a tree with only small wounds, or no wounds at all. Although the immediate hazard was corrected, the action itself has likely contributed to the development of a future hazard. In this case, the usable lifespan of this tree in the urban setting has been extended, and the community has bought some time in which to defer removal costs and plan for the replacement of this wounded tree.

Figure 5.28. *This tree has a very large wound that was created when a large branch was previously removed.*

Always include tree risk inspections and maintenance as part of the overall vegetation management strategy of a community, including plans for replacing trees that will be removed. For example, trees with large defective branches can be pruned, but preparations should be made to replace trees that require drastic corrective actions with young, defect-free trees. Cabling and bracing a defective tree can also extend its lifetime in an urban setting, but a tree that requires such treatment most often is a prime candidate for replacement. Young trees can be planted near older ones that will require removal in the near future, and the removal and planting schedules can be coordinated so that marginal trees can be replaced over time with younger, vigorous trees.

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