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In addition to the obvious features that distinguish forest trees from agronomic crops, and the implications these have for assessing the potential impacts of releasing transgenic trees, the diversity of forest species that may be engineered, with regard to their biology, silvical characters, current health status and potential uses will demand a great deal of flexibility and creativity for all those involved in deployment decisions. Thus, I support the position that potential risks (and potential benefits) will need to be addressed on a trait by trait and species by species basis. I will give two examples of potential application of transgenic technology to forest trees that may not fit with models developed for agronomic crops: (1) The use of transgenic trees for restoration of forest species endangered by fungal pathogens and insect pests to which they have little or no natural resistance, and (2) Trees and other plants engineered with genes that detoxify organic or heavy metal pollutants that may be deployed to return polluted sites to productive use.

Restoration of trees under severe attack from pathogens or pests

The tools of biotechnology may offer hope of restoration in cases where forest species have been devastated by insect pests or diseases to which no resistance has been found in the natural population (e.g. American chestnut, American elm, flowering dogwood, eastern hemlock, butternut, oaks susceptible to sudden oak death). American chestnut (*Castanea dentata*) was virtually wiped out as a canopy species by a fungal disease accidentally introduced into the United States around 1900. Similarly, American elm (*Ulmus americana*) has virtually disappeared as a favored street tree from Northeastern U.S. cities following the introduction of the Dutch elm disease fungus in the 1940s. Little or no natural resistance to these pathogens has been found in the native populations. In these cases, restoration of these "heritage trees" may be facilitated by engineering them with anti-fungal genes or insecticidal genes. American chestnut is a particularly interesting case, on several levels: (1) Since no natural resistance to chestnut blight has been documented in the species, the current conventional approach to "restoring" the tree involves generating resistant hybrids by crossing with Chinese chestnut; (2) In the case of this species, those interested in restoring the species can be expected to advocate deliberate spread of anti-fungal transgenes to the wild population; (3) The tree is a true multiple-use species (timber production, nut production, wildlife, landscape), such that transgenic genotypes may eventually be planted by a variety of client groups with different goals. Thus, assessing the potential release of transgenic American chestnut may be quite complicated.

Use of transgenic trees for remediation of contaminated soil and water

Some transgenic trees will no doubt be employed for goods and services never previously associated with forestry. One such service is environmental remediation. In Europe, woody species have already been employed as filters for pollution from municipal waste. However, the use of transgenic trees may make it possible to enormously enhance the abilities of plants, including forest trees, to take up and detoxify or sequester organic and heavy metal pollutants from soil and water. Cottonwood trees engineered with genes to enhance breakdown of halogenated hydrocarbons or to detoxify or sequester mercury or arsenic compounds are already being tested for their ability to remediate sites contaminated with these chemicals. Indeed, trees engineered for phytoremediation may constitute one of the early applications for actual field release of transgenic trees. Similar to the case with American chestnut, the fact that these trees are being engineered for a non-traditional application adds new dimensions to assessing the potential impact of their release. Some factors to be included in planning would be that: (1) Such trees actually provide a service, rather than being harvested for products; (2) The trees would only be deployed on very specific sites, such as brownfields, where the impact of their "extended genotypes" on the ecosystem would almost certainly by positive; (3) These trees would probably be grown on very short rotations, perhaps only 2-3 years, precluding the potential for flowering; (4) The handling/disposal of the resulting biomass, rather than the fact that the trees are transgenic, could potentially be the most critical consideration in their deployment.