SOUND RIGHT-OF-WAY PROGRAM MUST INCLUDE PLANT ECOLOGY

By William Bramble, Ph.D.

Plant ecology is undoubtedly the most important scientific basis for right-of-way (ROW) vegetation management. This does not mean to ignore economics and managerial skill which involve social sciences and other scientific aspects of management, but these will not be considered here.

Plant ecology is the science which treats of relations between plants and their environment—a reciprocal relationship. For example, a plant may directly affect wildlife and wildlife may, in turn, affect the plant. Witch-hobble may furnish food for deer and hare; conversely, deer and hare may destroy witch-hobble through excessive browsing.

An understanding of these ecological relationships is basic to sound ROW management. One must realize that ROW vegetation is in a dynamic state of reaction and adjustment to ROW habitat conditions. Such conditions include the habitat factors of climate, water, soil, physiography, wildlife, man, and other plants, all which makes for a complicated situation on ROWs.

To simplify and make something useful and understandable out of the complex ROW situation is the most difficult task in application of ecology to management. Often to help in this task, the use of the theory of limiting factors is employed to explain cause and effect. For example, animal destruction of weeds has been used to explain why trees do not reproduce in a scrub oak community. When this one factor was controlled, pine was established. In such a community on a ROW, a thriving small mammal population could be a limiting factor of value.

In another case, allelopathy was used to explain why black cherry did not reproduce on certain sites on the Allegheny Plateau where open orchard-like stands have persisted for 50 years without burning. Allelopathy refers to a release of biochemicals (phenolic compounds) into the environment by certain plants which has an inhibitory effect on the growth of neighboring plants. It was long held that heavy browsing by deer and hare, frosts, and herbaceous competition were the cause.

Now it is being suggested that allelopathic effect of dominant goldenrod, grass, aster, and fern is the chief limiting factor. Some of the common ROW plants which have exhibited this effect include: hayscented fern, New York fern, short huskgrass, ground pine, bracken fern, wild oat grass, goldenrod, aster elderberry and blackberry. Even the mosaic pattern of vegetation so typical of ROWs may be a result of allelopathy.

Another useful application of plant ecology is to recognize plant communities on ROWs which reflect the end effect of complex habitat factors. Plant communities are not distributed at random. When a plant species invades a ROW it becomes subject to habitat conditions which exist there and which determine its survival. Those species that survive form a plant community. To be useful in ROW management, plant communities would be easily recognizable at any season of the year (plant sociology blick). Fidelity, constancy, and cover value (dominance) are used to select characteristic species of a community. Where species distribution and grouping have not been previously described for a region, a preliminary group of characteristic species and communities may be recognized. These can be refined by later studies.

Chemicals released by certain plants may inhibit the growth of neighboring plants.

When using plant communities, the floristic composition is the primary criterion, with habitat and stage in plant succession not used to delimit a community. The characteristic species are considered to be the best indicators of a habitat. They also do reflect succesional trends when communities are arranged in order of their complexity from grassland to forest.

One of the leading tenets in an ecological approach to ROW management is the stability of shrub communities. The concept is that pure shrub patches on ROWs, once established and trees removed from them, are stable and resist tree invasion. Careful examination of this concept shows it to be true, although there are some exceptions. Many shrub patches of such species as blackberry and sweetfern are readily invaded by trees. However, pure patches of low blueberry on a ROW have been stable for at least 25 years where selective spraying has been used to remove capable trees. That utilities use such information is shown by the increase in selective spraying over the Penelec system and exclusive use of selective capable tree control by Metropolitan Edison.

Where shrub communities have persisted for many years, such as in scrub oak barrens, there is always a reason, usually a limiting factor or factors. In the case of a scrub oak barrens, fire and wildlife destruction of tree seedlings have been limiting factors. These have now been removed and the

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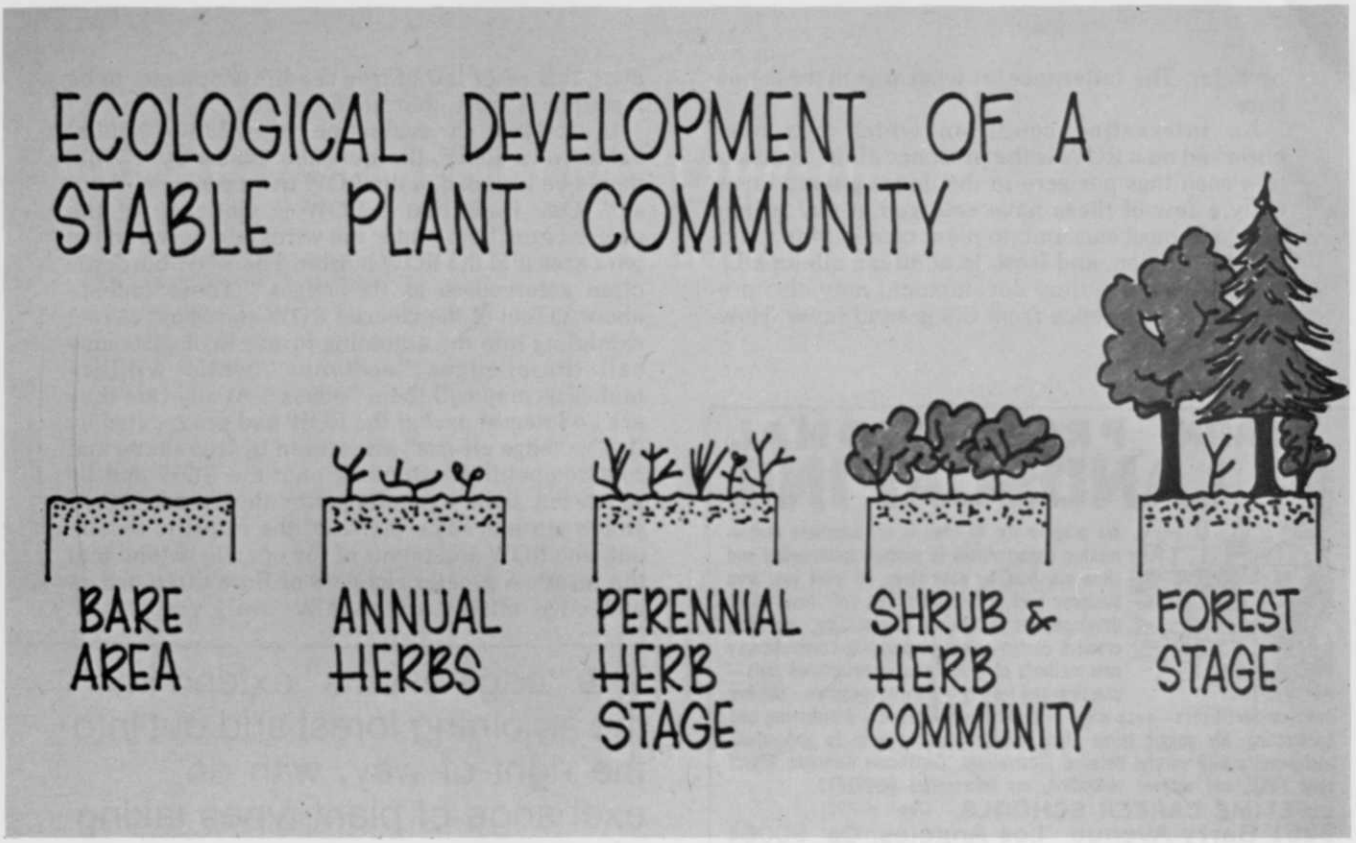

scrub oak is gradually changing to a forest with a scrub oak understory.

The sequence of events which takes place after a ROW is cleared through a forest has some very interesting ecological aspects which are also a key to what occurs on older ROWs.

In some cases, there is a sudden development of species typical of open areas not common in the forest. Blackberry has sprung up as if by magic following clearing of northern hardwoods, and this has been directly related to seeds deposited in the forest floor by birds. Many thousands of seeds have been deposited per hectare each year where they remain dormant and viable. Pin cherry has also exhibited a similar invasion and rapid development following forest clearing. It is no wonder then that ROW managers have experienced similar development of such plants following construction.

Under other circumstances, where an upland oak forest has been cleared the opposite has occurred. Plants common in the forest shrub and herb layers have developed after clearing to dominate the ROW for 25 years. They are the sole dominants for about five years. Subsequently, after about 10 years, plants of openings and open areas develop to become part of the dominant cover. They were probably present in the forest in small numbers and invaded disturbed areas on the ROW after clearance. This has produced the typical mixture of species found on older ROWs where plants of the former forest mingle with plants of open areas. The complex mixture is in a state of suspended plant succession by removal of capable trees in ROW maintenance.

This has been described as a combination of "relay foriatics" and "initial floristic composition"

Black cherry emerging from sweet fern in right-of-way.

by Egler. The latter means: what was there is now here.

An interesting condition which has been observed on a ROW is the presence of thousands of tree seedlings per acre in the dense ground layer. Only a few of these have emerged at any certain time and most succumb to plant competition, wildlife destruction, and frost. In addition, allelopathic inhibition of seedling development may also prevent tree emergence from the ground layer. However, this reservoir of tree seedlings appears to be a source of trees that need control.

In making an evaluation of wildlife habitat values of a ROW, the question comes up: "What should be included in the ROW in an ecological sense?" One finds that a ROW is made up of the cleared area both under the wires and between the wire area and the ROW border. The ROW border is often referred to as its "edges." These include about 33 feet of the cleared ROW and about 33 feet extending into the adjoining forest. Ecologists may call these edges "ecotones" while wildlife biologists may call them "edges." At any rate they are an integral part of the ROW and are created by it. The "edge effects" are caused by tree shade and root competition extending onto the ROW and by increased light extending into the forest, all of which permits some plants of the forest to extend onto the ROW and plants of the open to extend into the forest. A greater richness of flora often occurs and edge effects are usually easily recognized.

The "edge effects" extend into the adjoining forest and out into the right-of-way, with an exchange of plant types taking place.

Shrub borders are often encouraged along edges, which become important to wildlife and to visual beauty.

Probably the most valuable contribution of ecology to ROW management is that it leads to an understanding of what is happening on the ROWs. While there is no doubt that an alert manager already knows a great deal about this from experience, an understanding of ecological processes will add greatly to long-term management planning.

For example, the use of plant communities can help in predicting development of nontarget vegetation. Communities will also indicate the percent of a ROW occupied by major habitats. This information can be obtained from inventories needed for construction permits and from routine inspections of ROWs prior to maintenance treatments. A knowledge of the typical species composition of major plant communities will indicate the nontarget species that can be expected to occur on major habitats.

Application of the relationship between adjoining forest types and type-sites can be used to predict probable invasion of various capable tree species. While this will be affected by ROW tree removal in maintenance, a relationship will still exist.

Use of soil and topographic information on ROWs will aid in ROW management planning. County soil surveys can be used to predict probable soil drainage and erosion. Vegetation development on a ROW can be predicted from soil types combined with plant communities. In fact, a combination of soil with plant communities is an excellent key to ROW management planning. **WTT**