**The biology, ecology, and management of herbicide-resistant, perennial, and other difficult-to-control weed species. What we know, now, and what we need to learn for the future.**

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Weeds impact crop yields (both quantity and quality) through competition for light, water and nutrients. Weeds can also physically interfere with the movement of personnel and machinery through fields, inhibit the deposition of crop protection chemicals, and can act as alternate hosts for insects and pathogens. While any weed can be a concern to growers under the right conditions, some weedy species and traits have been, historically, more problematic than others. This includes herbicide resistant biotypes, perennial species, and species with extended germination windows or deep seed dormancy. Resistance to the triazine herbicides has been formally confirmed in the state in four species, although this number does not represent the current situation in NY. Palmer amaranth, horseweed/marestail, and waterhemp have all been reported in the state and preliminary results from NYSIPM suggest that herbicide resistance is present in some populations. Each of these three species can produce prodigious amounts of seed and have mechanisms to ensure widespread dispersal of deleterious traits. The first part of this talk will focus on (1) the biological characteristics that make Palmer amaranth, horseweed/marestail, and waterhemp tough to manage even in the absence of resistance and (2) how crop production practices may need to be adjusted to ensure acceptable suppression. Perennial weeds are also difficult to control. Because of their extensive underground root reserves, perennials have the capacity to withstand and respond to significant disturbance events like cultivation and chemical treatments. Despite this, perennial weeds are not immune to management measures. The type and timing of herbicide applications (including some pre-emergent products) can significantly impact the suppression of perennial vines. The second portion of this talk will describe active ingredients that can be used to managed to manage plants as well as the importance of strategic soil disturbance. The third and final portion of this presentation will focus on concerns related to weed science research and extension. This includes the costs of labor and changes in labor availability, the consolidation of chemical company and impacts on herbicide discovery and release, Regulatory impacts on chemical availability, integrated weed management for the control of weeds in-crop, and the current use and future utility of vision-guided and autonomous weeders.