Polyploidy in Plants: Implications for Restoration

Douglas W. Schemske, Department of Plant Biology, 166 Plant Biology Bldg., Michigan State University, East Lansing, MI 48824-1312, Phone:(517) 353-1674. FAX: (517) 353-1926.
and W. K. Kellogg Biological Station, 3700 E. Gull Lake Dr., Hickory Corners, MI 49060-9516
http://www.plantbiology.msu.edu/schemske.shtml
e-mail: schem@msu.edu

Polyploidy, defined as the possession of three or more complete sets of chromosomes, is an important feature of chromosome evolution in many organisms. Yeasts, insects, amphibians, reptiles, and fishes are known to contain polyploid forms, and recent evidence of extensive gene duplication suggests that the mammalian genome has a polyploid origin. In plants, polyploidy represents a major mechanism of adaptation and speciation. It is estimated that between 47% and 70% of angiosperm species are polyploid. Differences in ploidy have been observed among related congeners and even within populations of taxonomic species.

Research in agricultural and natural systems indicates that polyploids often possess novel ecological, physiological and life-history characteristics not present in the “non-polyploid” ancestor. Some of these new attributes may be adaptive, allowing a plant to enter a new ecological niche. There is considerable evidence that polyploids possess unique ecological characteristics that distinguish them from their non polyploid relatives. For example, the common perennial plant yarrow (*Achillea millefolium*) has both tetraploid (four complete sets of chromosomes) and hexaploid (six chromosome sets) populations in western North America. Research conducted by J. Ramsey indicates that the tetraploids are adapted to beach habitats, while the hexaploids are adapted to bluffs.

The goals of habitat restoration are to recover the ecological function and native species composition of degraded habitats, and this may require a greater emphasis on the taxonomy and ecology of polyploid plant systems. Of the thousands of polyploid forms in natural plant populations, very few have received formal recognition as distinct species. More often, plant taxonomists combine populations of different chromosome numbers into a single taxonomic species. For example, Big Bluestem, a major component of restoration efforts in the tall grass prairie ecosystem, is comprised of plants with several different ploidy levels. There is evidence that these differ in a number of ecological characteristics (Keeler and Davis, 1999). Thus, failure to recognize polyploids as different ecological and evolutionary entities could undermine restoration efforts.

Keeler, K. H. and G. A. Davis. 1999. Comparison of common cytotypes of *Andropogon gerardii* (Andropogoneae, Poaceae). American Journal of Botany 86:974-979.

Ramsey J, DW Schemske 1998 Pathways, mechanisms, and rates of polyploid formation in flowering plants. Annu Rev Ecol Syst 29:467501.