

To: 2016 NASP participants

From: Andy David, Forest Genetics module presenter

RE: Pre-NASP readings

Although all information about genetics is inherently interesting some is more pertinent to the concepts we will be covering in our NASP Forest Genetics module than others. Read the following chapter from Zobel and Talbert's *Applied Forest Tree Improvement* paying attention to my comments in the margins about which concepts will be stressed when we meet. The intention here is to help refresh your memory about basic genetics and learn a bit about genetic variation in natural populations – how it is structured, what forces affect it, and how it is maintained.

The second article written by Thomas Ledig, entitled *Human Impacts on Genetic Diversity in Forest Ecosystems*, strikes a tone that is somewhat more negative than I think it needs to be but again touches upon several concepts that we will explore more in depth when we meet. Hopefully while reading this you begin to think about how historical activities have impacted genetic variation of forests and how current forest management activities are both similar and different from historical.

When you are finished with these readings you should have a grasp of what the following vocabulary words mean:

Allele – a piece of DNA that codes for a protein that makes (or helps make) a trait; often used interchangeably, but erroneously, with the word 'gene'.

Gene – a location on a strand of DNA, comprised of two alleles, one from mom and one from dad. Also known as a locus.

Locus – a location on a strand of DNA, comprised of two alleles, one from mom and one from dad. Also known as a gene.

Loci – plural of locus.

Genotype – the alleles at a given gene, or the collection of genes in an individual tree.

Trait – something we can see and measure like height, dbh, insect resistance, needle color etc.

Phenotype – the collection of physical traits that we can see.

Homozygous – having two alleles that are identical at a gene, e.g. AA or aa or A_1A_1 , etc.

Heterozygous – having two alleles that are different at a gene, e.g. Aa or A_1A_3 etc.

Dominant allele – the allele that is expressed in a dominant – recessive pair of alleles. Typically dominant alleles are written in upper case letters, e.g. A , S , or Cr .

Recessive – the allele that is not expressed in a dominant – recessive pair of alleles. Typically recessive alleles are written as lower case letters, e.g. *a*, *s*, or *cr*, and are expressed only when they occur as homozygous recessives, e.g. *aa*, *ss* or *cr cr*.

Genetic variability – the variation in all alleles at the gene, individual, population or species level.

Gene frequency – how often a particular allele occurs in a population.

Mitosis – the process by which one cell creates a copy of itself; a daughter cell.

Meiosis – the process by which pollen and ovules are made with half the genes of a typical cell.

Progeny – children.

Outcrossing mating system – a system of reproduction that relies on pollen from one individual to pollinate an ovule from a different individual to create the next generation.

Self-crossing mating system – a system of reproduction that relies on pollen and ovules from the same individual to create the next generation.

Inbreeding – mating with relatives.

Inbreeding depression – the decrease in survival and/or growth that may occur as a result of inbreeding.

Mutation – a change in DNA.

Gene flow – the movement of genes from one population to another.

Migration – the movement of individuals from one population to another.

Genetic drift – the change in allele frequency from one generation to the next due to chance alone.

Provenance test – a genetic trial that takes seedlings from many different places and plants them at one location. Also known as a common garden test.

Genotype x environment interaction – different genotypes perform differently (are ranked differently) on different sites. For example, some genotypes do well on wet sites but not dry sites while other genotypes are the opposite.