DNA Electrophoresis Gel – Using DNA to determine genetic diversity within a population of Cottonwoods.

Background. Located in an area of California's Plumas National Forest exists a grove of Cottonwood trees. These Cottonwood trees are located in a highly utilized recreational area near Eagle Lake, where people use this area for camping, hiking, fishing, hunting, bird watching and photography. The local Forest Service professionals would like to expand the grove to provide more wildlife habitat and shade. But to expand the grove some information needs to be determined. Scientists would like to know how much diversity exists within the grove. This will help them in their decision making process. The amount of diversity that exists within this grove will dictate planting and/or seeding methods.

DNA gels: DNA from organisms is run very similarly to how we ran our marker fingerprints in class. The DNA is treated, then placed in a gelatin material where electricity is passed through. This is where the term "gel" comes from. The electricity causes the DNA to migrate, similar to how our markers migrated. As the DNA migrates across the gel, a fingerprint is left behind. By comparing unknown samples to know samples, we can determine identity. In this particular gel, we will see the fingerprints of the different genotypes of individuals within the Cottonwood grove. For example, a Cottonwood will have a homozygous recessive (aa) genotype, a homozygous dominant (AA) genotype, or a heterozygous genotype (Aa). Based on the size and shape the alleles (A and a), they will migrate at different rates. (see example)

Reading the Gel: We are looking at six different gels taken from 6 different populations of Cottonwoods located at Eagle Lake.

Gel Key:

Homozygous recessive	**Homozygous Dominant**	**Heterozygous**
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		–
–		–

Means:

aa	**AA**	**Aa**

Procedure: Now look at your actual gel. For each individual in the populations write the genotype of the individual below the map. Once finished take a look at the six populations and answer the following questions:

Questions:

1. What kinds of activities occur at Eagle Lake?
2. Why are scientists interested in identifying the Cottonwood species?
3. Define genotype, allele, homozygous, heterozygous and population.
4. Which of the six populations of Cottonwoods have no diversity?
5. What disadvantage might a lack of diversity have on the population?
6. What might be a cause for having no diversity in a population of organisms?
7. Which population had the most diversity?
8. What advantage might this have for the population of Cottonwoods?
9. How might this information help forest professionals decide how to manage this area?

Application:

In a paragraph, write a conclusion to the managing forest professionals that includes your findings. You must state the diversity, or lack of it, of each population. Also include what managers might want to consider, for example, a population that lacks diversity might need new genetic info introduced via seeding using other Cottonwoods from outside the area. You must state your case using scientific data only, from your gel to be more specific.