2. Random mating - the random mixing of gametes do not occur if there is a preferential mating, resulting in changes in the genotype frequency.
3. No natural selection - the difference in survival and reproductive success of individuals can influence the allele frequencies in the population.
4. Extremely large population size - small populations are more likely to have greater fluctuations from one generation to the next (genetic drift)
5. No gene flow - moving alleles in and out of the population will affect allele frequencies.

It is important to remember that natural populations can exist in a state of both evolutionary change and equilibrium as the population may be evolving at some loci, yet remaining in equilibrium at another. Slowly evolving populations have incremental changes in their genotype frequencies that it can be hard to distinguish from those for a non-evolving population.

Populations are not ideal however, and these conditions don't usually hold. Mutations do occur, and can ultimately have a large impact not eh allele frequencies when it has a strong positive or negative influence. Nonrandom mating can cause changes in the homo/heterozygous allele frequencies but won't usually have an affect on allele frequencies in the gene pool. The occurrence of natural selection, genetic drift and gene flow are there phenomena that also violate the conditions stated.

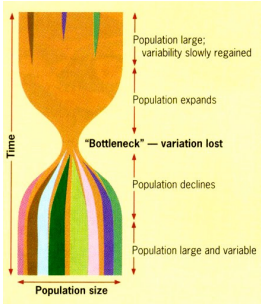
Factors affecting gene flow

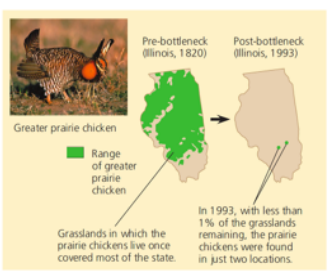
Natural selection
Natural selection is based on differential success in survival and reproduction. In the event of natural selection, the proportions of genes from one generation to the next will differ because certain traits are being selected for. Natural selection can also result in *adaptive evolution* where its outcomes are a better match between the organisms and its environment.

Genetic Drift
Genetic drift are chance events that alter allele frequencies. Changes in allele frequencies (evolution) produced by random factors. If populations are small, it is more likely that chance itself will cause a deviation from the predicted results (like flipping a coin 10 times and ending up with 7 heads and 3 tails. Some of these unpredictable changes in allele frequencies can be caused by chance events associated with survival and reproduction. Genetic drift have a significant effect on a population, and a greater effect on smaller populations.

The founder effect is a type of genetic drift that occurs when a few individuals are isolated from a population, and this smaller group establishes a new population whose gene pool differs from the source population (for example, when members of a population are blown by a storm to another population, or in case of survivors from a war or famine). The founders essentially colonise a new region that is away from the parent group.

The bottleneck effect is when a factor such as a fire or flood causes a drastic reduction in the population size after genetic drift. This can cause reduced variation and some rare alleles and harmful alleles can themselves become common and fixed in such events. As a result of chance, some alleles may be over represented, under represented or absent in comparison to other survivors. As mentioned earlier, chance events have a greater impact on small populations and therefore will have ongoing genetic drift until the population recovers in size. Despite the recovery, the population may still experience low genetic variation for a long period of time as an outcome of this genetic drift. Bottleneck events can bring about evolutionary change.





(a) The Illinois population of greater prairie chickens dropped from millions of birds in the 1800s to fewer than 50 birds in 1993.

From the Prairie chicken bottleneck event (1993), it was suggested that the genetic drift caused a loss in genetic variation and that there was an increase in the frequency of harmful alleles. Researchers found that the 1993 Illinois prairie chicken population had lost 9 alleles that were present in the museum specimens. The negative