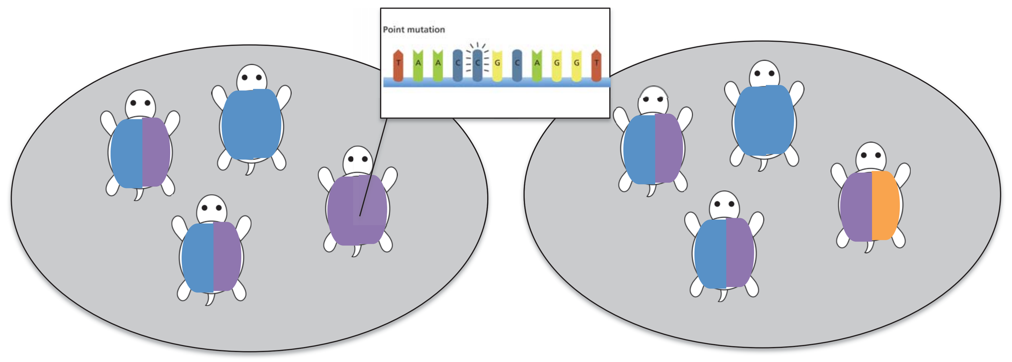
Understanding Evolution Can Save Endangered Species

Whether we refer to evolution in terms of the formation of new species or simply changes within a species, the basic principles are the same.

Before After*

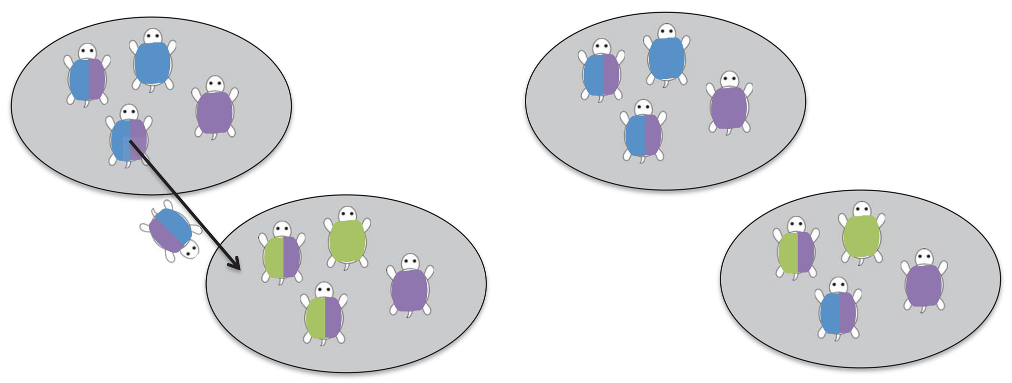
Mutation:

Permanent change in genetic sequence (in this case heritable change)



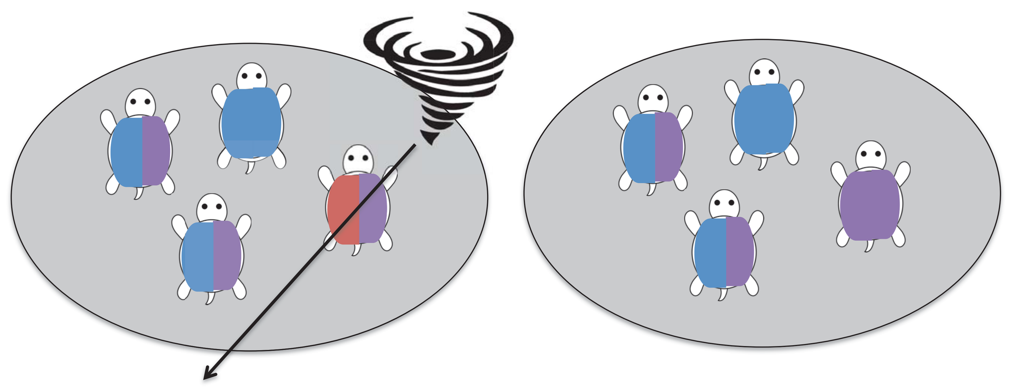
Gene flow:

Transfer of alleles from one population to another (via migration)



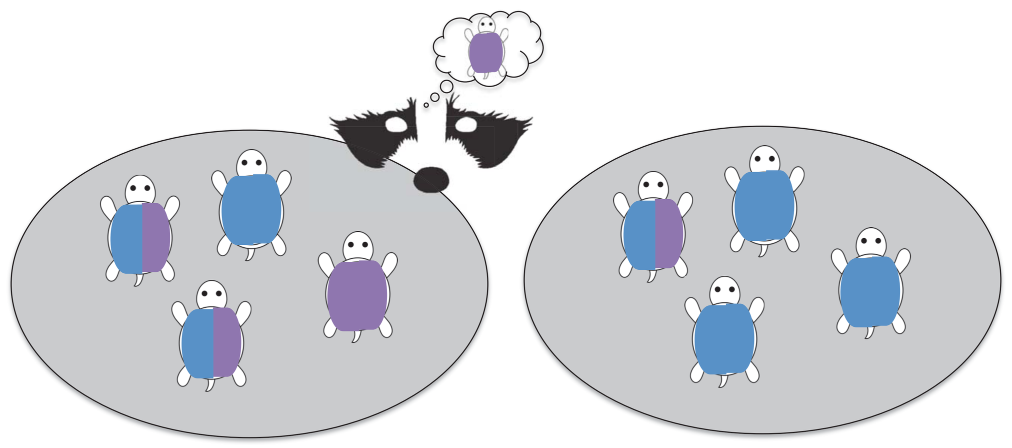
Genetic drift:

Random change in allele frequency (caused by stochastic events such as random mating, natural disasters, etc.)



Selection:

Differential survival and reproduction of individuals due to differences in phenotype



KEY

Allele (variant form of a gene)

Population (group of interbreeding individuals)

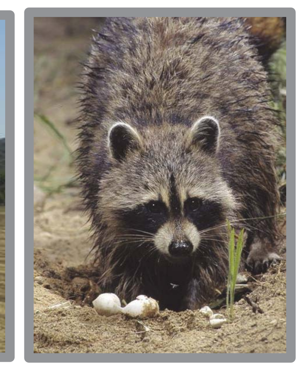
*After = next generation of individuals

Applied to the conservation of endangered species:

Habitat fragmentation

Habitat loss / degradation

Predators



Small, isolated populations

The Problem with Small Populations:

↑ Likelihood of mating with close relatives (i.e. individuals carrying the same alleles)
↑ Likelihood of inheriting two copies of a deleterious mutation
↑ Proportion of individuals expressing that deleterious allele
↑ Vulnerability to elimination by natural selection

↓ Genetic diversity
↓ Probability that allele(s) beneficial to future environmental changes is present
↓ Likelihood that population can adapt

↑ Likelihood that one random event (such as a natural disaster) will completely eliminate an allele

↑ Barriers to migration and geographic distance between suitable habitat (i.e. loss of gene flow)
↓ Opportunities for genetic rescue of lost diversity from another population

↑ Likelihood of extinction

Such as the bog turtle (*Glyptemys muhlenbergii*):

Researchers at the University of Tennessee and the Knoxville Zoo are collaborating on a study to assess the current genetic health of bog turtles. Genetic data is necessary to prevent pairing of close relatives in the captive breeding program, to ensure translocations mimic historical dispersal patterns, and to identify the populations that are at greatest risk of extirpation (typically populations with low genetic diversity).

*Poster created by Cassie M. Dresser (PhD Student in the Ecology & Evolutionary Biology Department at the University of Tennessee; contact cdresser@vols.utk.edu for more information)