Relevant Literature Notes

Recruitment Failure Outline

* Nuisance species have a profound impact on regional ecosystems
* There is a documented overabundance of white-tailed deer (*Odocoileus virginianus*) (*Publication referenced in McGravey et al. 2013*) which can be attributed to human influence (*Publication referenced in McGravey et al 2013*)
* White-tailed deer consume seedlings and saplings, negatively impacting seedling and sapling survival, density and growth (*Publications referenced in McGravey et al. 2013*, *Holm et al. 2013*)
* This can lead to decreased understory diversity, species richness and decreased abundance of dominant species in a typical forest (in this case Quercus spp.) (*Holm et al. 2013*)
* Define or contextualize non-endemic plants (Look for a reference)
  + Working definition: Plants that were not historically present in an area, region or ecosystem or were found at different abundances or densities
* Deer selectively browse on palatable species, and some non-endemic species, including pawpaw, are considered non-palatable by deer (*McGravey et al. 2013*) This can create dense stands of non-endemic species (*Knauer et al. 2023*)
* Non-endemic species may be able to utilize niche space in a forest faster or more efficiently (Reference - considered common knowledge?)
* As a result, they may be able to out compete endemic species
* These nuisance species can contribute to recruitment failure
  + Consider defining and contextualizing recruitment failure a little more here
  + The effects of these recruitment failure on species composition and forest structure are often not apparent for decades (*McGravey et al. 2013* - potentially move to regeneration debt paragraph).

Recruitment Failure Literature

McGarvey et al. 2013

* Chronic over-browsing by white tailed deer can influence the life history of forests
* Deer browsing had the greatest effect on seedling establishment
* Browsing has an effect with smaller stems and saplings, but less of an effect on larger stems
* The effects of deer browsing might not be apparent in species composition and forest canopy for decades
* An increase in white deer over the past 50 years, which can be attributed to human influence
* Deer browsing reduces seedling survival rates and densities
* Deer selectively browse on palatable species
* Some non-endemic species, including pawpaw, are considered to be unpalatable to deer
* Seedling height and small-sapling abundance were most effected

Knauer et al. 2023

* Heavy browsing by deer reduces palatable species, which can create ideal conditions for dense stands of non-endemic species to form
* Removing deer for long periods of time (8-20 years) does not lead to increased species diversity
  + Once browsing has reduced species to low levels of abundance, it can take decades for them to recover
* Many forest understories, especially in urban-fringe forests, and infested with non-endemic plants

Holm et al. 2013

* In a model predicting the effects of deer browsing on forest composition in 200 years, deer browsing decreased understory diversity, decreased species richness and decreased the abundance of Quercus spp. (a dominant species in this forest type)
* Gap disturbances exacerbated these impacts (could tie into paragraph on non-endemic pests and pathogens and tree mortality)
* Deer browsing can reduce survival and growth of several woody species and change the dominance rank of species at the sapling stage
* Impacts of browsing are likely to be greater in areas with high gap disturbance
* Deer herbivory on saplings reduced tree diversity in the understory

The population of the predominant herbivore in eastern North American forests, the white-tailed deer (*Odocoileus virginianus*), have substantially increased in the past 50 years.

The population of white-tailed deer (*Odocoileus virginianus*) have substantially increased in the past 50 years, a population shift which can be partially attributed to changes in human behavior and management (McShea et al. 1997, a whole host of other authors).