Proposal for a Virginia Seed Bank

Abstract

Climate change is causing the ranges of native species to shift northward at a pace that outstrips the ability of many plant species to migrate and adapt (Walter et al. 2002; Renwick & Rocca 2014). Although assisted migration, the process of relocating individuals or spread of seeds through human intervention, has been used successfully in some cases to preserve species, it comes saddled with potential ecological damage and legal complications arise when these ranges cross state lines. These complications threaten Virginia’s biodiversity, especially among rare plants and those plants from habitat affected most by climate change. To preserve the genetic diversity of native species before populations become isolated and inbred, this project proposes that Virginia create a seed bank. Seed banks have been used for a variety of reasons worldwide to preserve the genes of plants, species, for the preservation of crop species and for research purposes (Laarli 1997). For this proposed seed bank, Virginia would use information collected by the state Natural Heritage Program to identify eligible species that face the greatest threat from climate change in order to preserve biodiversity, establish a genetically diverse sample for research, and potentially reestablish these endangered species in the future.

Climate Change Outpacing Plant Migration

Over a quarter of the world’s plant species are under threat, largely because of human actions. In Virginia, the situation is no different and the state stands to lose rare species thanks to climate change. • Almost 3,200 plants native to Virginia • Plants provide ecological services such as carbon sequestration and water quality maintenance • Plants migrate via reproduction • Many native plants are unable to migrate north at the rate of climate change • Problem compounded by increased habitat fragmentation

Seed banks are a relatively cheap, low volume method of preserving thousands of individual seeds for long periods of time. While in situ conservation, or conservation within a species native habitat, is ideal, the cost of land acquisition as well as owner cooperation can be a major barrier to conservation. These complications threaten Virginia’s biodiversity, especially among rare plants and those plants from habitat affected most by climate change. In order to preserve the genetic diversity of native species before populations become isolated and inbred, this project proposes that Virginia create a seed bank. Seed banks have been used for a variety of reasons worldwide to preserve the genes of plants, species, for the preservation of crop species and for research purposes (Laarli 1997). For this proposed seed bank, Virginia would use information collected by the state Natural Heritage Program to identify eligible species that face the greatest threat from climate change in order to preserve biodiversity, establish a genetically diverse sample for research, and potentially reestablish these endangered species in the future.

Science of Seed Banks

• Seed banks replicate natural phenomenon in which seeds don’t germinate until conditions are ideal
• Seeds are dried and stored in a controlled climate with low temperature and humidity to prevent germination
• Ideal species sample collections consist of 10,000-20,000 seeds from 100-500 individuals to prevent inbreeding
• Of the 7,000 species preserved worldwide, 89% are expected to remain viable for up to 200 years

An Insurance Plan Against Extinction

Virginia should create a state seed bank to preserve the genes of native and threatened species in order to protect species against threats such as invasive species, diseases, and climate change, collection a controlled population for research, gather knowledge for wider plant conservation efforts, and to provide options for future repopulation or use.

Responsible Collection

Seed banks provide the opportunity to preserve native species and Virginia should not impact the sustainability of a species’ wild population or its ability to migrate naturally.

In order to responsibly collect seeds, Virginia should consider implementing the Bureau of Land Management’s protocol for seed collection for their Seeds of Success program. Additionally the Virginia Natural Heritage Program should be responsible for determining which species are the best candidates.

The yearly funding for seed banks in other states have been provided by a combination of private and non-profit donations, and state and federal grants. Costs can be partially mitigated through the use of volunteers who can be trained for proper collection. Even if seeds of some target species are found to be recyclable, meaning we cannot induce dormancy and maintain viability, accurate information about range and population size. The following lists some of the protocol that should be followed in seed collection:

• No more than 10%-20% of seeds should be collected from a population at any given time
• Federally listed under the Endangered Species Act as endangered or threatened, or are listed as candidates should not be collected
• Species classified in categories 1 or 2, meaning they are considered critically endangered under state or global ranks, should not be collected
• Sampled populations should be at least 100 individuals in an area where cross pollination is possible
• Detailed data should be recorded about the sampled population including GPS coordinates, surrounding conditions, and time and date sampled
• The state seed bank should be in close communication with federal and surrounding state seed banks for collaboration and seed and information sharing

Acknowledgements

Thank you to Dr. John Hayden of the University of Richmond who provided invaluable information and personal experience about his work with seed banks. Thank you to Johnny Townsend of the Virginia Natural Heritage Program for his advice and research.

References


An Insurance Plan Against Extinction

Virginia should create a state seed bank to preserve the genes of native and threatened species in order to protect species against threats such as invasive species, diseases, and climate change, collection a controlled population for research, gather knowledge for wider plant conservation efforts, and to provide options for future repopulation or use.

Responsible Collection

Seed banks provide the opportunity to preserve native species and Virginia should not impact the sustainability of a species’ wild population or its ability to migrate naturally.

In order to responsibly collect seeds, Virginia should consider implementing the Bureau of Land Management’s protocol for seed collection for their Seeds of Success program. Additionally the Virginia Natural Heritage Program should be responsible for determining which species are the best candidates.

The yearly funding for seed banks in other states have been provided by a combination of private and non-profit donations, and state and federal grants. Costs can be partially mitigated through the use of volunteers who can be trained for proper collection. Even if seeds of some target species are found to be recyclable, meaning we cannot induce dormancy and maintain viability, accurate information about range and population size. The following lists some of the protocol that should be followed in seed collection:

• No more than 10%-20% of seeds should be collected from a population at any given time
• Federally listed under the Endangered Species Act as endangered or threatened, or are listed as candidates should not be collected
• Species classified in categories 1 or 2, meaning they are considered critically endangered under state or global ranks, should not be collected
• Sampled populations should be at least 100 individuals in an area where cross pollination is possible
• Detailed data should be recorded about the sampled population including GPS coordinates, surrounding conditions, and time and date sampled
• The state seed bank should be in close communication with federal and surrounding state seed banks for collaboration and seed and information sharing

Acknowledgements

Thank you to Dr. John Hayden of the University of Richmond who provided invaluable information and personal experience about his work with seed banks. Thank you to Johnny Townsend of the Virginia Natural Heritage Program for his advice and research.

References