Description of Use

Project Overview and Goals: Our research focuses on the health and habitat of the threatened Butternut tree (*Juglans cinerea).* This research aims to enhance our understanding of the Butternut tree population and contribute to conservation via botanic gardens. Specifically, we would like to assess its conservation status by counting the number of live and dead trees, assessing the size and health of the trees, and sample seeds if available to contribute to its long-term preservation, and appreciation by the public, by growing Butternut at The Morton Arboretum and other botanic gardens. This study aims to contribute to long-term efforts for its conservation and management. We have prior experience in safely conducting plant exploration, seed collection, and tree surveys.

Background: The Butternut tree is of ecological importance due to its contribution to mast for wildlife, and support of a biodiverse ecosystem. The Butternut tree (*Juglans cinerea*) has faced population declines for decades, since at least the 1960s, primarily due to the lethal Butternut canker disease (*Sirococcus clavigignenti-juglandacearum*). This fungal disease kills some trees quickly and other trees over a period of several decades. Additionally, habitat loss, competition from invasive species, and land development are contributing factors to the species' decline. Yet, there is ongoing scientific research and collaborative efforts to study, safeguard and eventually restore this species.

Field Procedures and Collection Activities:

1. **Identifying butternut trees:** We will locate and take the GPS location of any butternut trees found on the site, using records from prior studies or from scouting on site. Each tree will be given a number to use for our records and tracking results of health assessments over time.
2. **Health Assessments:** For any trees found, we will perform our Health Assessment protocol, which includes taking quantitative data such as DBH, height, crown size, and approximating the amount of the trunk and canopy affected by the fungus and covered with canker. It will also include taking photographs of any identifying features of the trunk, canopy, branches, and canker.
3. **DNA Collection:** For any seedlings or trees where the canopy is reachable we will take a leaf sample to perform DNA analysis, to determine if the tree is a pure butternut, or is the product of hybridization with Japanese heartnut. The leaf sample will also be necessary in preserving DNA for genes that may contribute to canker resistance. Singular leaflets will be plucked by hand from the leaves when possible. A pole pruner may be used to obtain leaves from taller branches if possible.
4. **Seed collection:** If field visits are conducted during mast season and seeds are available, seeds may be collected. This is important to support future conservation efforts at botanic

gardens. It is important to leave seed in hopes of future regeneration and to support wildlife, so no more than 50% of available seed will be collected. This process will be conducted with care to not damage the Butternut tree or any other vegetation. Collected seeds will be documented, stored, and made available for research, propagation, or restoration purposes.

Materials: Nothing used during health assessments will be left behind on site. We will use various forestry measurement tools during health assessments, including DBH tapes, GPS devices, cameras, calipers, and tape measures. Anything that touches the tree material, namely calipers, are frequently sterilized so as to minimize possible spreading of fungal material from tree to tree.

Duration of Research

The proposed research is planned from March 2026 to October 2027. This time frame could change depending on extension of the project and funding, at which point we will be in contact. Exact dates and frequency of field visits are unknown at this time.

Disposition of Specimens

Leaves collected will be deposited at The Morton Arboretum herbarium and a small portion of leaf will be stored in a deep freezer. Seeds will be grown at the Arboretum tree nursery until large enough to distribute to other botanic gardens or plant on the grounds.

Compliance with Regulations: We understand that we must comply with all local, state, and federal regulations regarding research activities within the State of Vermont. We are committed to respecting the natural habitat and minimizing our ecological footprint.

Overrocker Park Study

The goal of our field work at Overrocker park is to locate and assess the health of butternut trees in the area. We are attempting to locate various populations of butternut trees in Vermont and the surrounding area, and aim to collect information that could help us in determining the factors that promote or impede the success of butternut trees in the wild, as well as give us a more up to date picture of the health of butternut trees on our landscape.

What we aim to do at this site is locate and take GPS points for any live or dead butternut trees, along with a health assessment. Our health assessment protocol includes taking quantitative data such as the height and diameter of the tree, paired with qualitative data including the level of damage to the tree caused by the butternut canker. We will also look at characteristics of the tree that can visibly help us determine if the tree is a pure butternut (*Juglans cinerea),* or if it is a hybrid cross with Japanese heartnut *(Juglans ailantifolia),* as the latter non-native tree has been historically ornamentally planted and have since cross-bred with the native butternut. We will also take photos of the trees and their characteristics, and record what plant species inhabit the surrounding areas. Finally, we would like to be able to take a leaf sample from any trees where possible. A leaf collection of 2-3 leaflets from one leaf is acceptable for DNA analysis to confirm or deny hybridity for the specimen. We do not take enough plant material so as to damage the trees in any way.

There are no exact dates for this work, as the field work is weather dependent, but it can take place any time from spring to autumn in which the trees have leafed out. Ideally we will be back on multiple occasions in one year at the different times of reproduction; once in the spring to look for pollen production (end of May/ early June), and once in early fall to look for nut production (September). The rest of the health assessment can be conducted at either of these times. We would like to continue this study over the next couple of years to be able to adequately track changes in the health of the butternuts, or growth of young trees. At most this will include the seasons of 2026, 2027, and 2028. We can reach out more closely to the dates of field work when we know them.

A main point for the beginning of this field season will be Kylie Roth (kyliereroth@gmail.com), after which the main point of contact should be Sean Hoban (shoban@mortonarb.org), the primary investigator on this study.