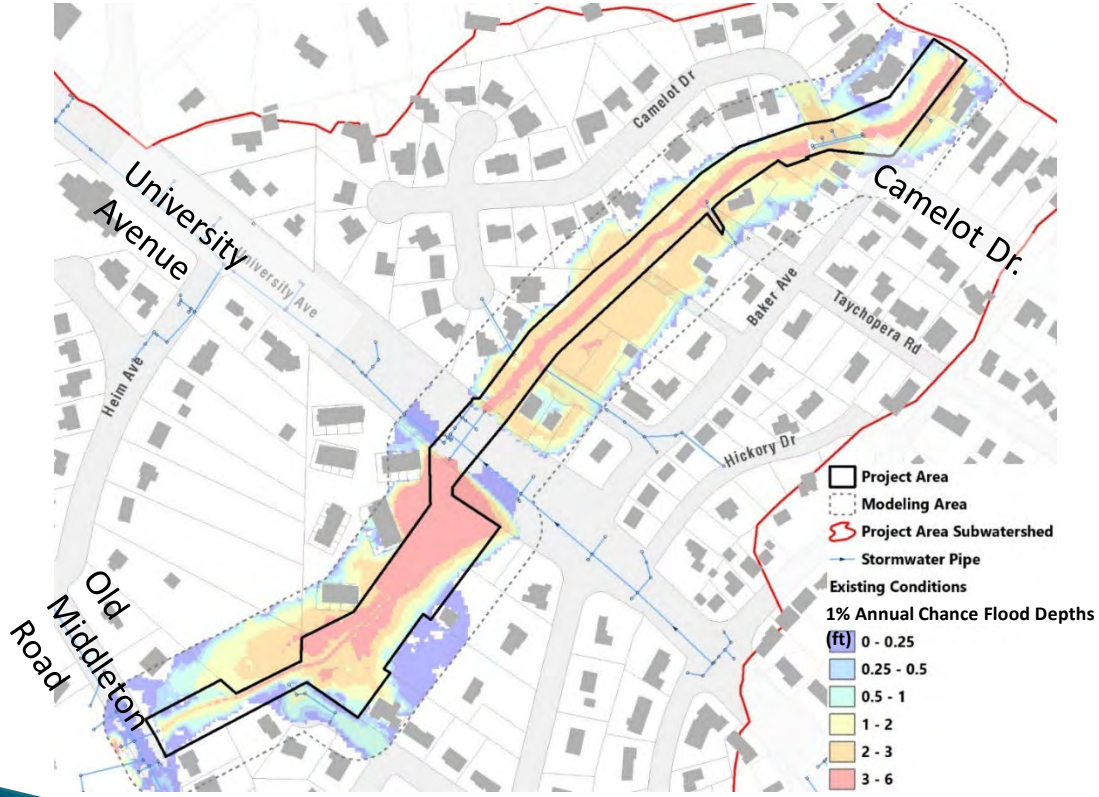
Mendota-Grassman Greenway

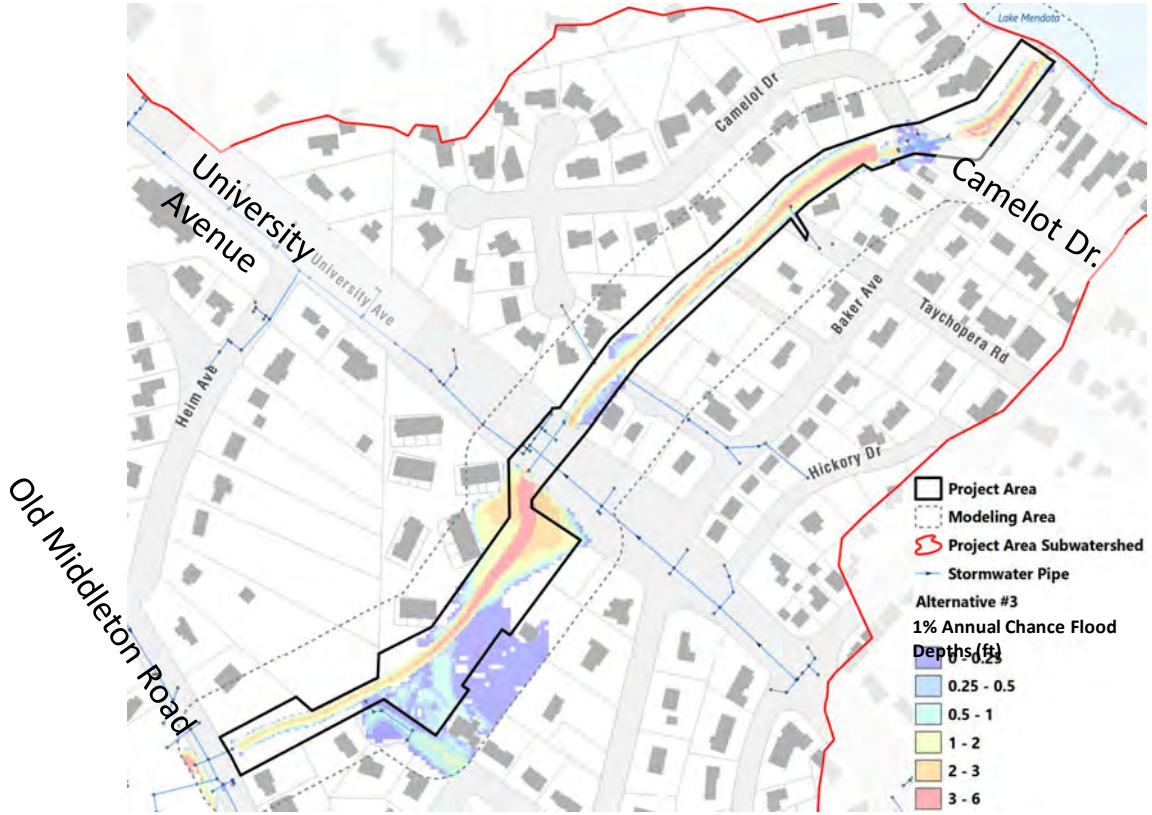
Habitat Stewardship Subcommittee
by City of Madison Engineering Division
November 7, 2022

Goal of project- Reduce 1% Annual Chance Flooding

EXISTING



PROPOSED



Average Inundation Elevation Reduction = 2.2 feet

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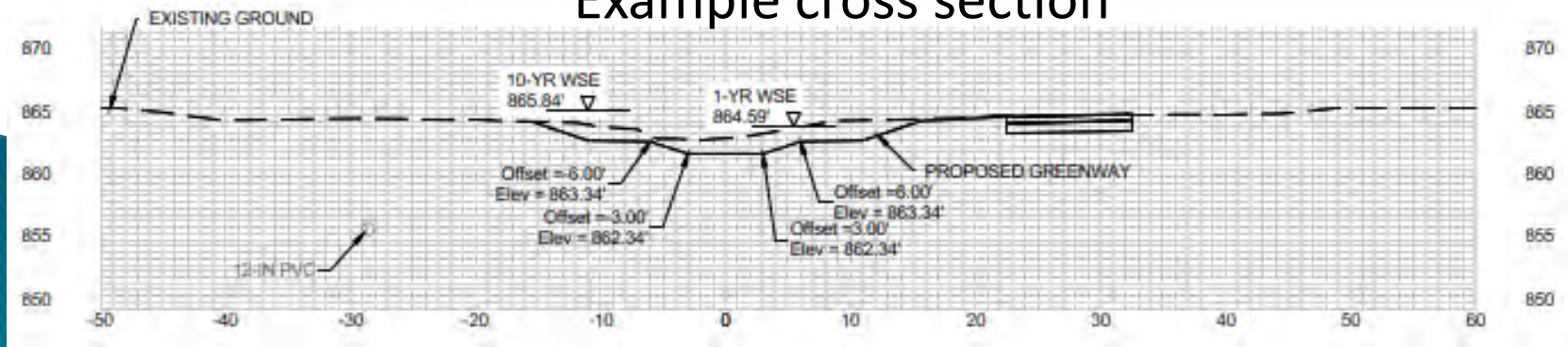
Channel Work

Existing Width ~ 20 feet

Evaluated three alternatives consisting of different widths and side-slopes with intent to minimize impacts to desirable trees

Recommendation ~ 39-foot <u>average</u> width

Example cross section



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Ecological Restoration

Remove Invasive Plants

- density to replicate wetland and sedge meadow ecological conditions that support fluctuating water.

Install native shrubs, forbs and grasses

- within areas of higher velocity to quickly establish root structure to stabilize soil.
- Native forbs and grasses have the root structure necessary to stabilize soil and increase infiltration in wet conditions.

Seed with aggressive native seed

- mixes based on flood tolerances, sun, and soil moisture to create quick forming native understory that is less susceptible to invasive species takeover.

Ongoing removals of invasives

- Include in multi-year ecological restoration contract to get native understory started
- Manage with minimal mowing, prescribed burn, targeted invasive treatment

Ecological Restoration

- Benefits
  - Biodiversity
    - Insects– Specialist species that need specific habitat plants are particularly helped by ecological restoration (e.g. monarch butterfly)
      - "Ninety percent of the insects that eat plants can develop and reproduce only on the plants with which they share an evolutionary history," Doug Tallamy
    - Habitat
  - Soil Health
    - Reducing erosion and nutrients runoff that enter our lake and impair our waters
  - Carbon Impact
    - Studies are finding that native grasslands act as carbon sinks

Plummeting insect numbers 'threaten collapse of nature'

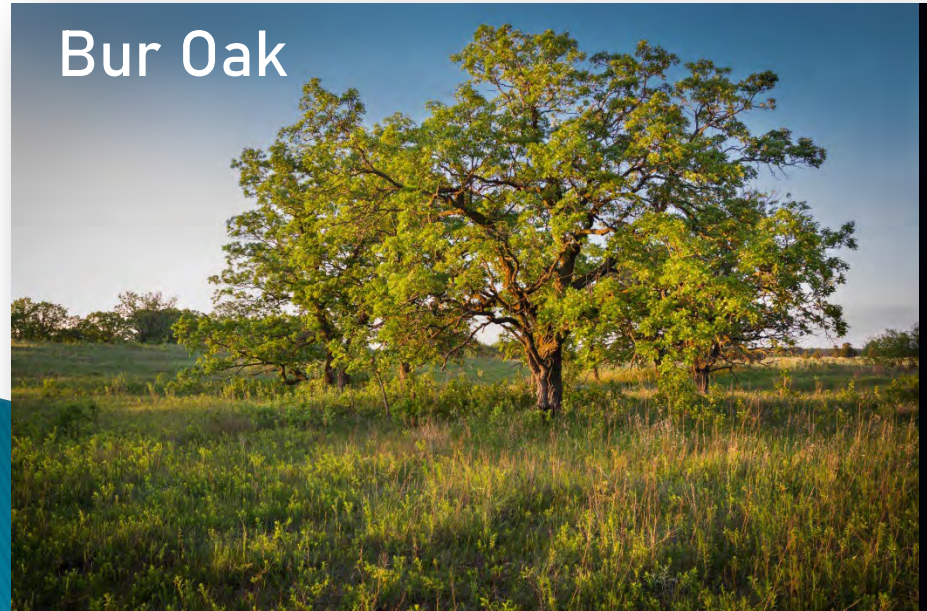
The Guardian, Feb 10, 2019

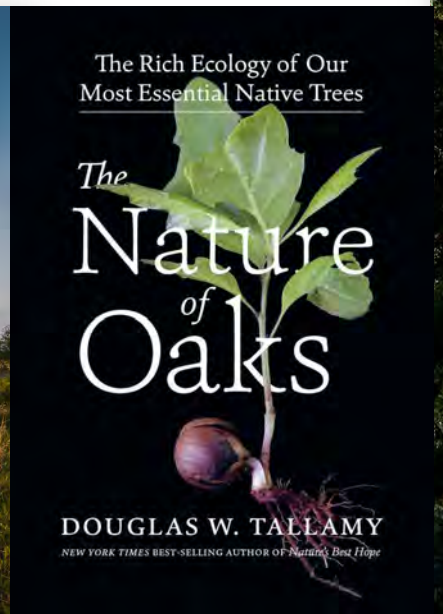
How Non-Native Plants Are Contributing to a Global Insect Decline

Yale School of the Environment
E360, December 8, 2020

Ecological Restoration

- Trees
  - Bur Oak (Quercus macrocarpa)
  - White Oak (Quercus alba)
  - Swamp White Oak (Quercus bicolor)
  - Shagbark Hickory (Carya ovata)
  - Bitternut Hickory (Carya cordiformis)





Ecological Restoration

- Shrubs
  - Black Chokecherry (Aronia melanocarpa)
  - Witchhazel (Hamamelis virginiana)
  - Swamp Rose (Rosa palustris)
  - Elderberry (Sambucus canadensis)
  - Meadowsweet (Spirea alba)
  - Buttonbush (Cephalanthus occidentalis)
  - Bladdernut (Staphlea trifolia)
  - Dogwood (Cornus sericea)
  - Nannyberry viburnum (Viburnum lentago)

Ecological Restoration

- Live Plugs
  - Sneezeweed
  - Blue lobelia
  - Northern blue flag iris
  - Swamp milkweed
  - Porcupine sedge
  - Bebb's sedge
  - Brown fox sedge
  - Canada blue joint grass
  - Ostrich fern
  - Canada mayapple
  - Solomon's plume

Ecological Restoration

- Native Seed

WOODLAND SEED MIX	
Blue cohosh	Caulophyllum thalictroides
Wild geranium	Geranium maculatum
Elm-leaved goldenrod	Solidago ulmifolia
Virginia wild rye	Elymus virginicus
Bottlebrush grass	Hystrix patula
Common wood sedge	Carex blanda

Blue cohosh and Solomon's plume (L); Wild geranium (R)

MESIC SUNNY SEED MIX
City of Madison Standard Specifications for "Infiltration Basin Side Slopes and Tallgrass Prairie Seed Mix" section 207.2(a) 3

MESIC AGGRESSIVE SEED MIX
Agrecol's "CITY OF MADISON WET-MESIC UNDERSTORY CUSTOM MIX"

GRASSES, SEDGES & RUSHES	COMMON NAME
Andropogon gerardii	Big Bluestem
Bouteloua curtipendula	Side Oats Grama
Carex vulpinoidea	Brown Fox Sedge
Poa palustris	Fowl Bluegrass
Elymus virginicus	Virginia Wild Rye
Bromus ciliatus	Fringed Brome
Sorghastrum nutans	Indian Grass
Scirpus atrovirens	Dark-Green Bulrush
Glyceria striata	Fowl Manna Grass
	GRASSES, SEDGES & RUSHES TOTAL

WILDFLOWERS	COMMON NAME
Heliopsis helianthoides	Early Sunflower
Achillea millefolium	Native Yarrow
Agastache scrophulariaefolia	Purple Giant Hyssop
Allium cernuum	Nodding Onion
Cassia hebecarpa	Wild Senna
Monarda fistulosa	Wild Bergamot
Napaea dioica	Glade Mallow
Oenothera biennis	Common Evening Primrose
Helenium autumnale	Sneezeweed
Echinacea purpurea	Purple Coneflower
Rudbeckia hirta	Black-Eyed Susan
Silphium perfoliatum	Cup Plant
Solidago ohioensis	Ohio Goldenrod
Vernonia fasciculata	Ironweed
Verbena hastata	Blue Vervain
Asclepias incarnata	Marsh (Red) Milkweed
Liatris spicata	Marsh Blazing Star
Eupatorium perfoliatum	Boneset
Hypericum pyramidatum	Great St. John's Wort
Lobelia siphilitica	Great Blue Lobelia

WET AGGRESSIVE SEED MIX	
Dark green bulrush	Scirpus atrovirens
Virginia wild rye	Elymus virginicus

Potential Future Conditions (Woodland)

Desirable woodland vegetation: mayapple and ostrich fern (L); bottlebrush grass and Virginia wild rye (R)

Potential Future Conditions (Partial Shade/Channel)

Greenway two years into restoration

Potential Future Conditions (Partial Shade/Channel)

Monarch butterfly on dark green bulrush with native sedge, boneset etc. (L); early sunflower, cup plant, Indian grass (R)

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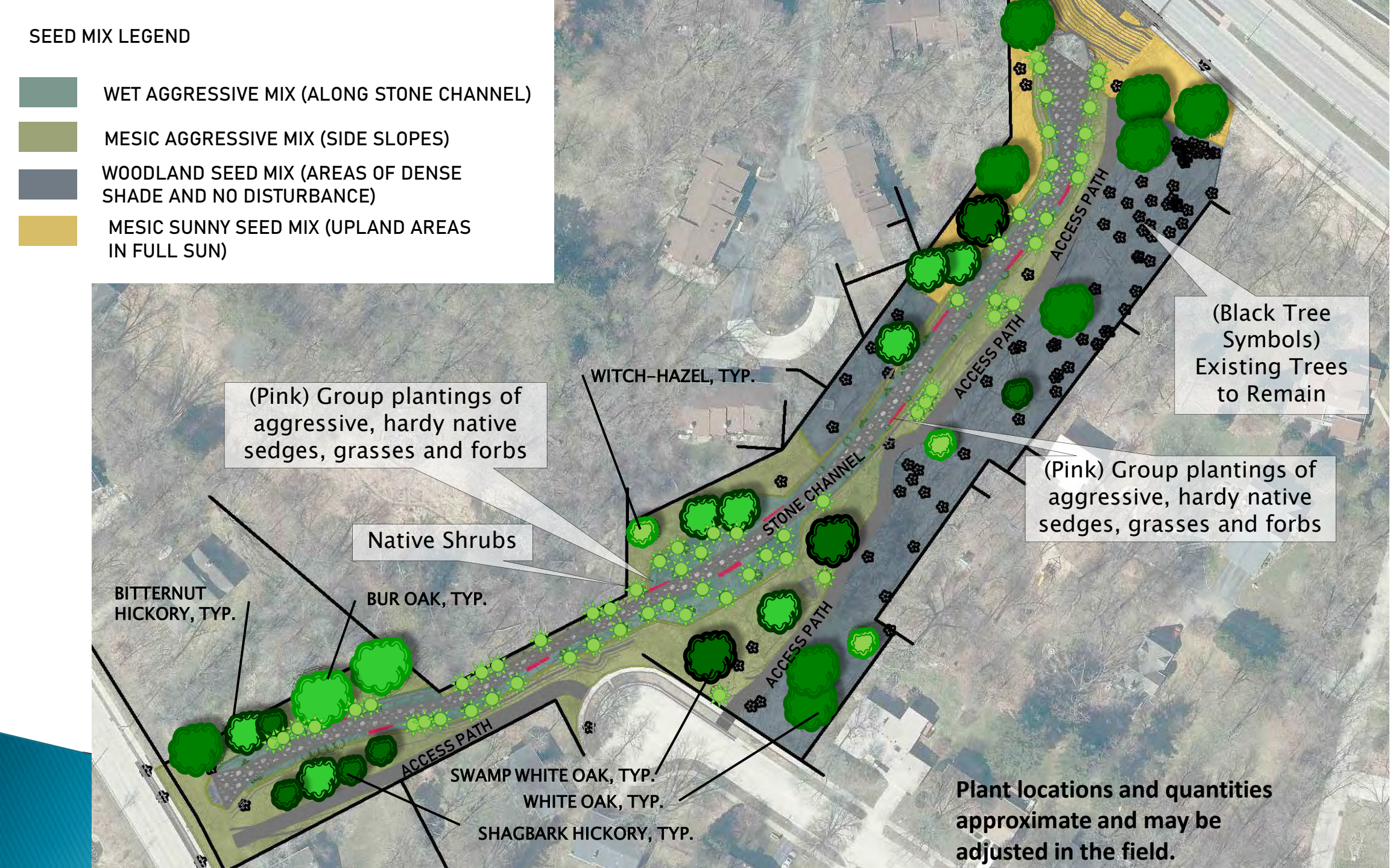
Current Vegetation

Woody volunteers: ash, buckthorn, box elder, honeysuckle. Little to no oak regeneration. Low herbaceous veg. diversity: Virginia stickseed, Virginia creeper, burdock, curly dock, jewelweed, garlic mustard.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WOODLAND SEED MIX (AREAS OF DENSE SHADE AND NO DISTURBANCE)
MESIC SUNNY SEED MIX (UPLAND AREAS IN FULL SUN)
(Black Tree Symbols) Existing Trees to Remain
(Pink) Group plantings of aggressive, hardy native sedges, grasses and forbs
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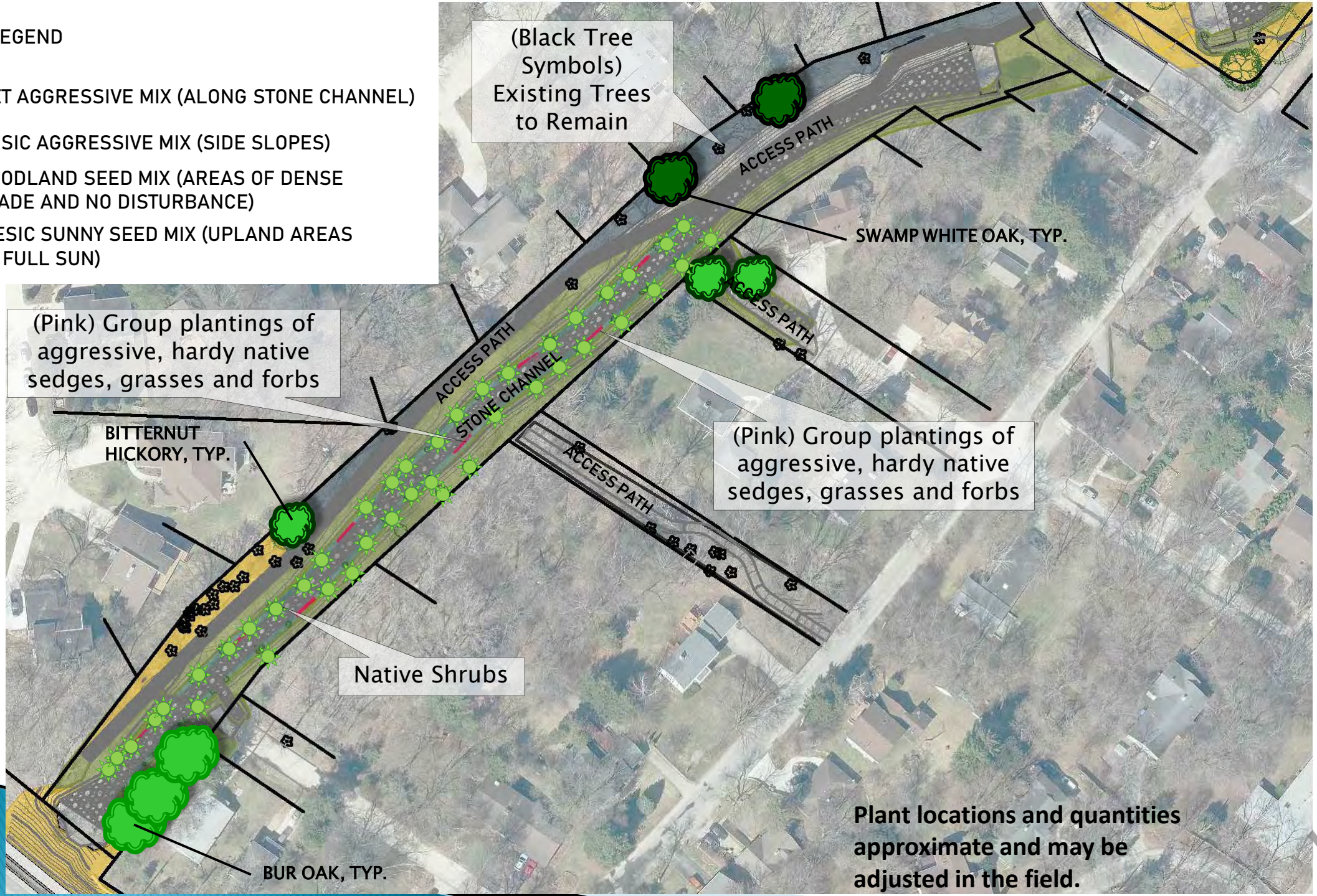

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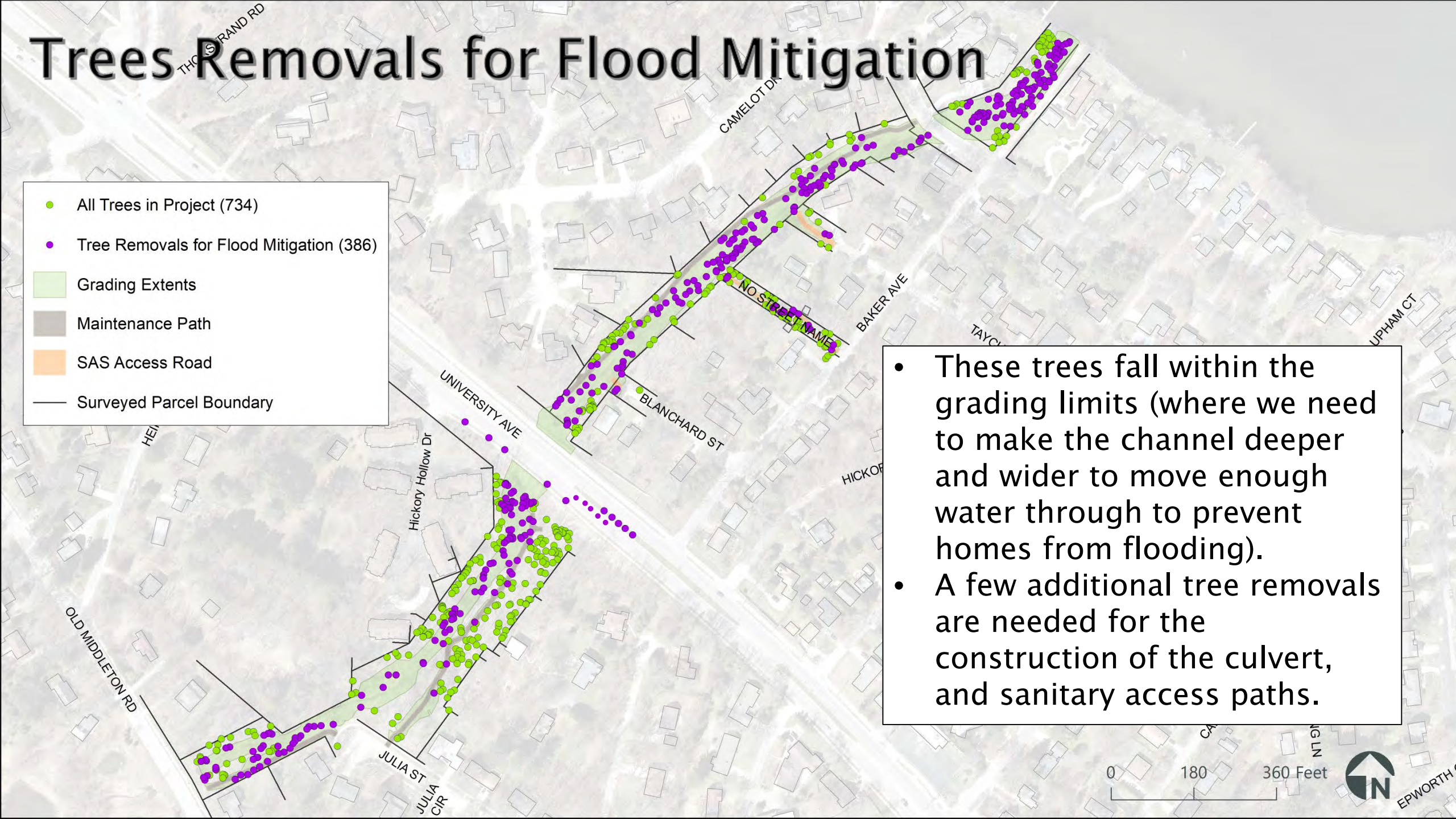
All Trees

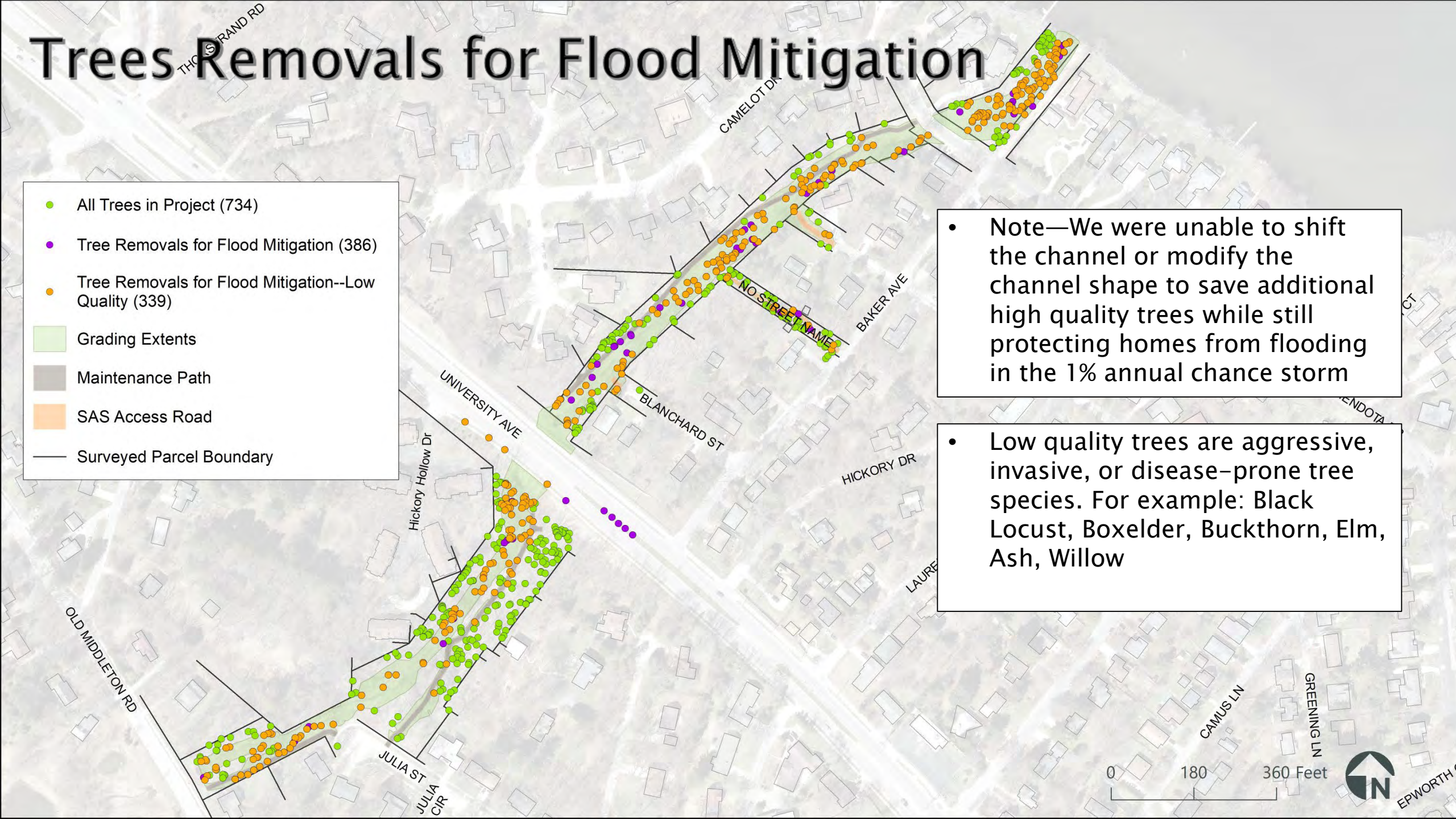
Trees with a diameter of 3 inches or greater were surveyed

Trees Removals for Flood Mitigation



- These trees fall within the grading limits (where we need to make the channel deeper and wider to move enough water through to prevent homes from flooding).
- A few additional tree removals are needed for the construction of the culvert, and sanitary access paths.

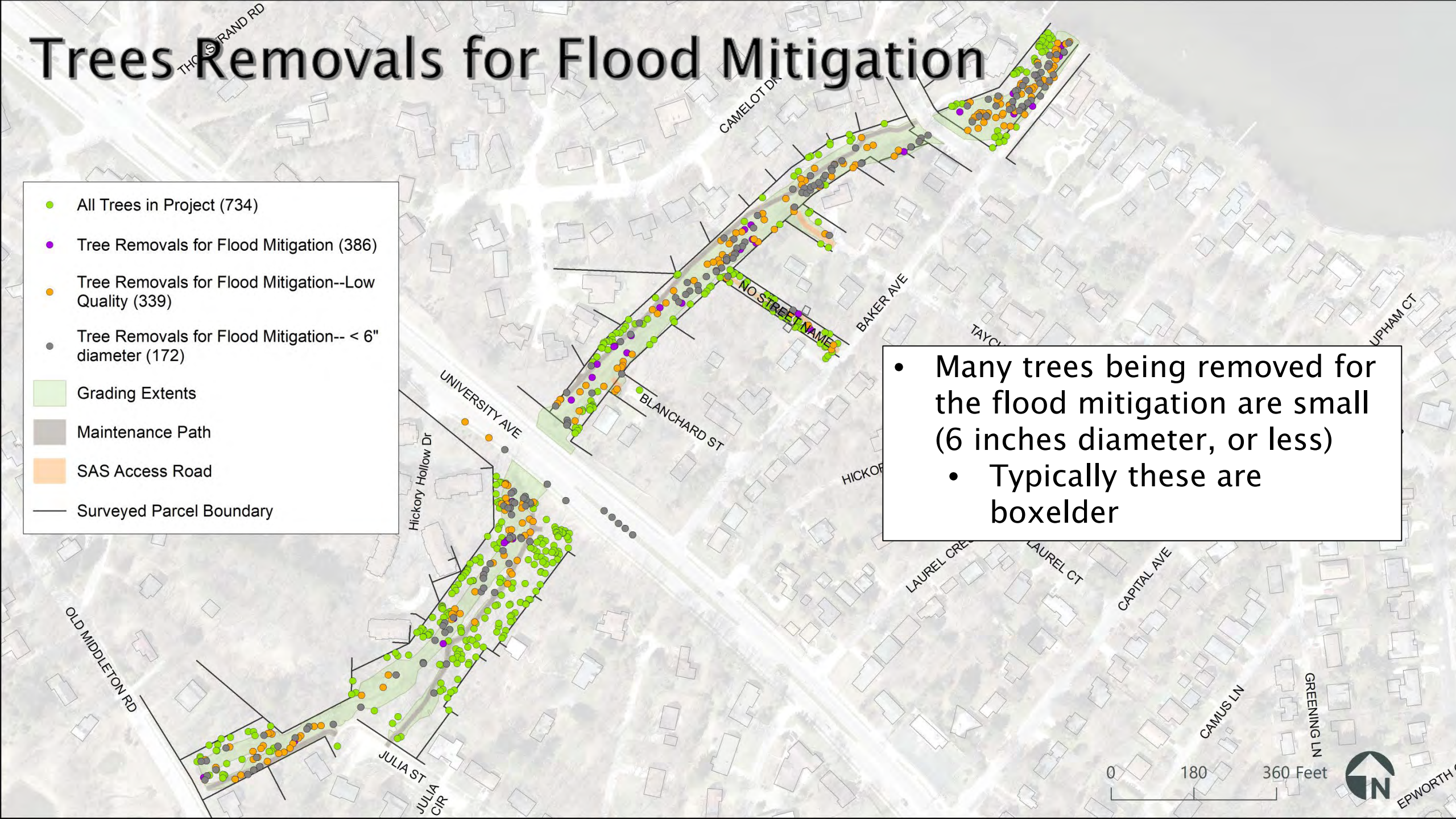
Trees Removals for Flood Mitigation



- Note—We were unable to shift the channel or modify the channel shape to save additional high quality trees while still protecting homes from flooding in the 1% annual chance storm

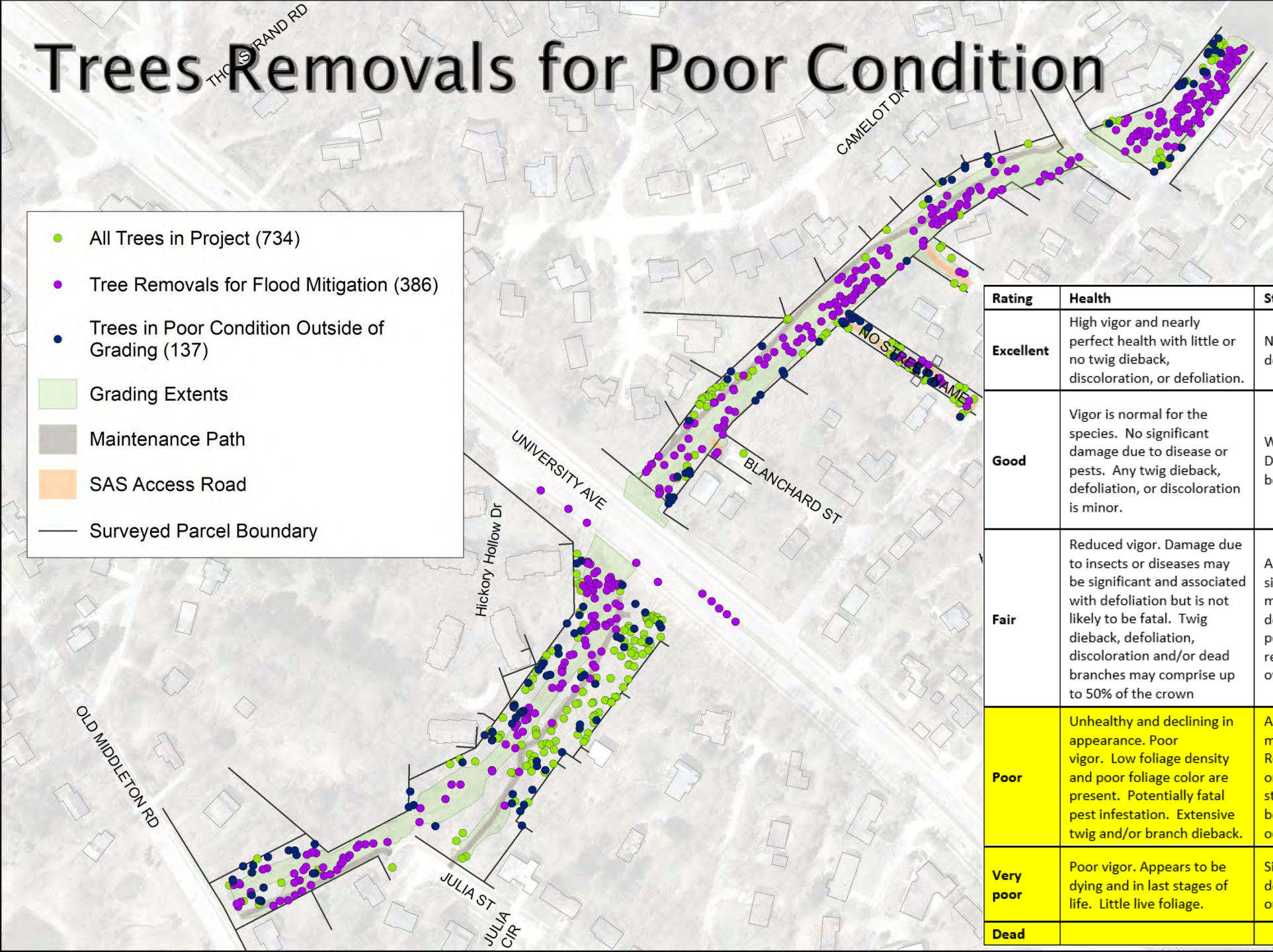
- Low quality trees are aggressive, invasive, or disease-prone tree species. For example: Black Locust, Boxelder, Buckthorn, Elm, Ash, Willow

Trees Removals for Flood Mitigation



- Many trees being removed for the flood mitigation are small (6 inches diameter, or less)
  - Typically these are boxelder

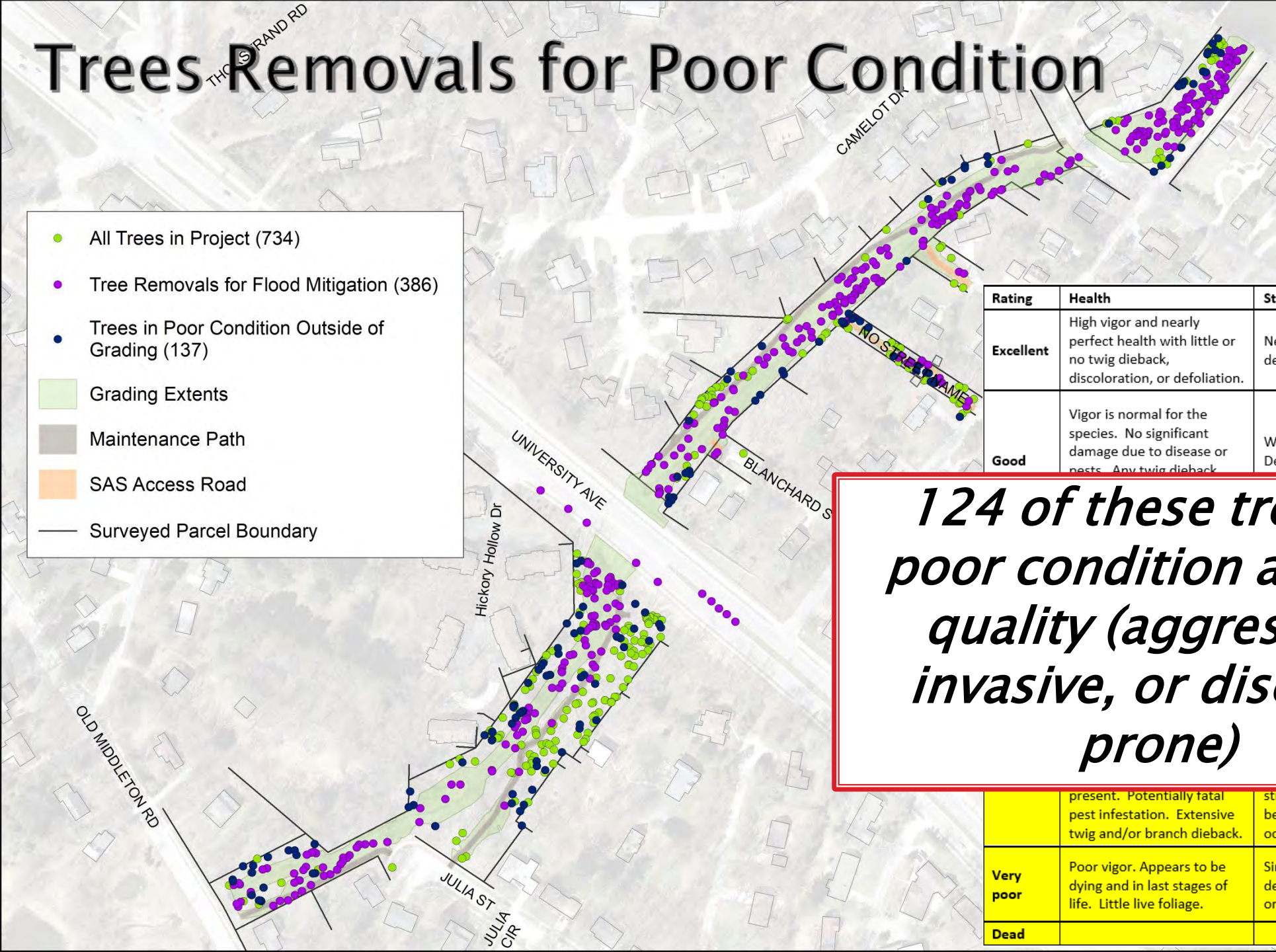
Trees Removals for Poor Condition



Each tree was assessed and given a rating by a certified arborist

Rating	Health	Structure	Form	% Rating
Excellent	High vigor and nearly perfect health with little or no twig dieback, discoloration, or defoliation.	Nearly ideal and free of defects.	Nearly ideal for the species. Generally symmetric. Consistent with the intended use.	81% to 100%
Good	Vigor is normal for the species. No significant damage due to disease or pests. Any twig dieback, defoliation, or discoloration is minor.	Well-developed structure. Defects are minor and can be corrected.	Minor asymmetries/deviations from species norm. Mostly consistent with the intended use. Function and aesthetics are not compromised.	61% to 80%
Fair	Reduced vigor. Damage due to insects or diseases may be significant and associated with defoliation but is not likely to be fatal. Twig dieback, defoliation, discoloration and/or dead branches may comprise up to 50% of the crown	A single defect of a significant nature or multiple moderate defects. Defects are not possible to correct or would require multiple treatments over several years.	Major asymmetries/ deviations from species norm and/or intended use. Function and/or aesthetics are compromised.	41% to 60%
Poor	Unhealthy and declining in appearance. Poor vigor. Low foliage density and poor foliage color are present. Potentially fatal pest infestation. Extensive twig and/or branch dieback.	A single serious defect or multiple significant defects. Recent change in tree orientation. Observed structural problems cannot be corrected. Failure may occur at any time.	Largely asymmetric/abnormal. Detracts from intended use and/or aesthetics to a significant degree.	21% to 40%
Very poor	Poor vigor. Appears to be dying and in last stages of life. Little live foliage.	Single or multiple severe defects. Failure is probable or imminent.	Visually unappealing. Provides little or no function in the landscape.	6% to 20%
Dead				0% to 5%

Trees Removals for Poor Condition



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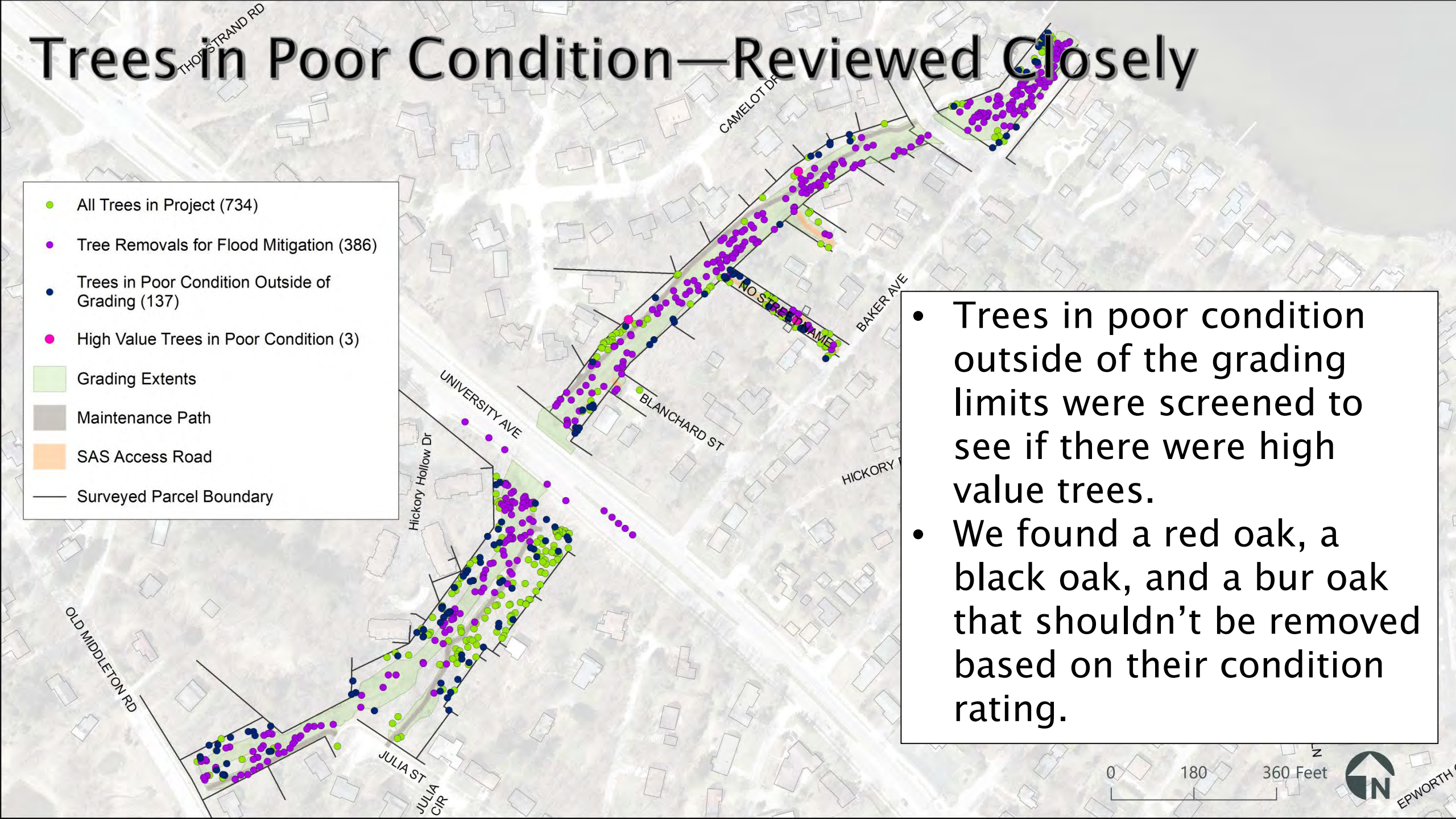
124 of these trees in poor condition are low quality (aggressive, invasive, or disease-prone)

Trees in Poor Condition—Reviewed Closely



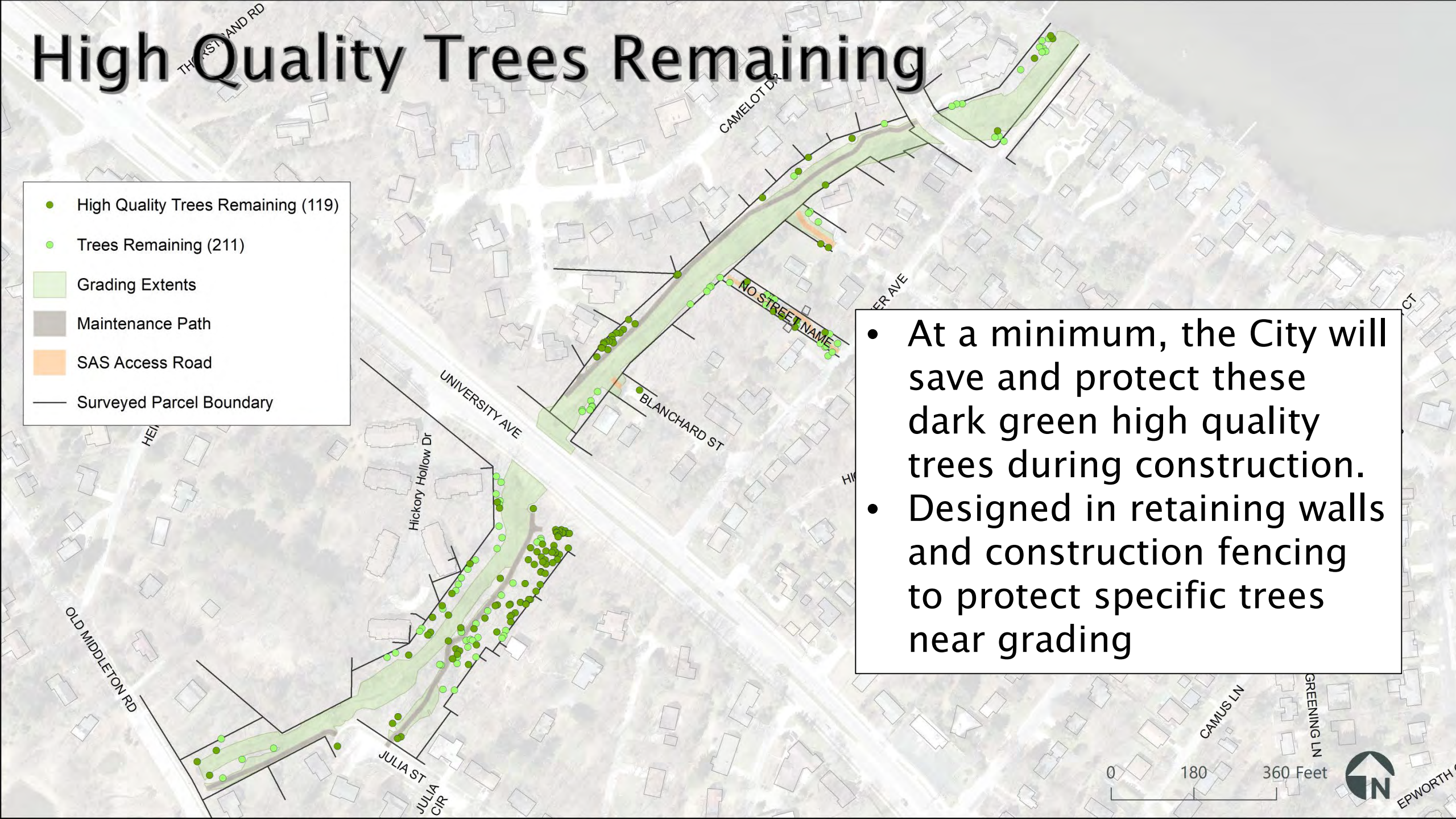
- Trees in poor condition outside of the grading limits were screened to see if there were high value trees.
- We found a red oak, a black oak, and a bur oak that shouldn't be removed based on their condition rating.

Trees Remaining

Trees remaining include:

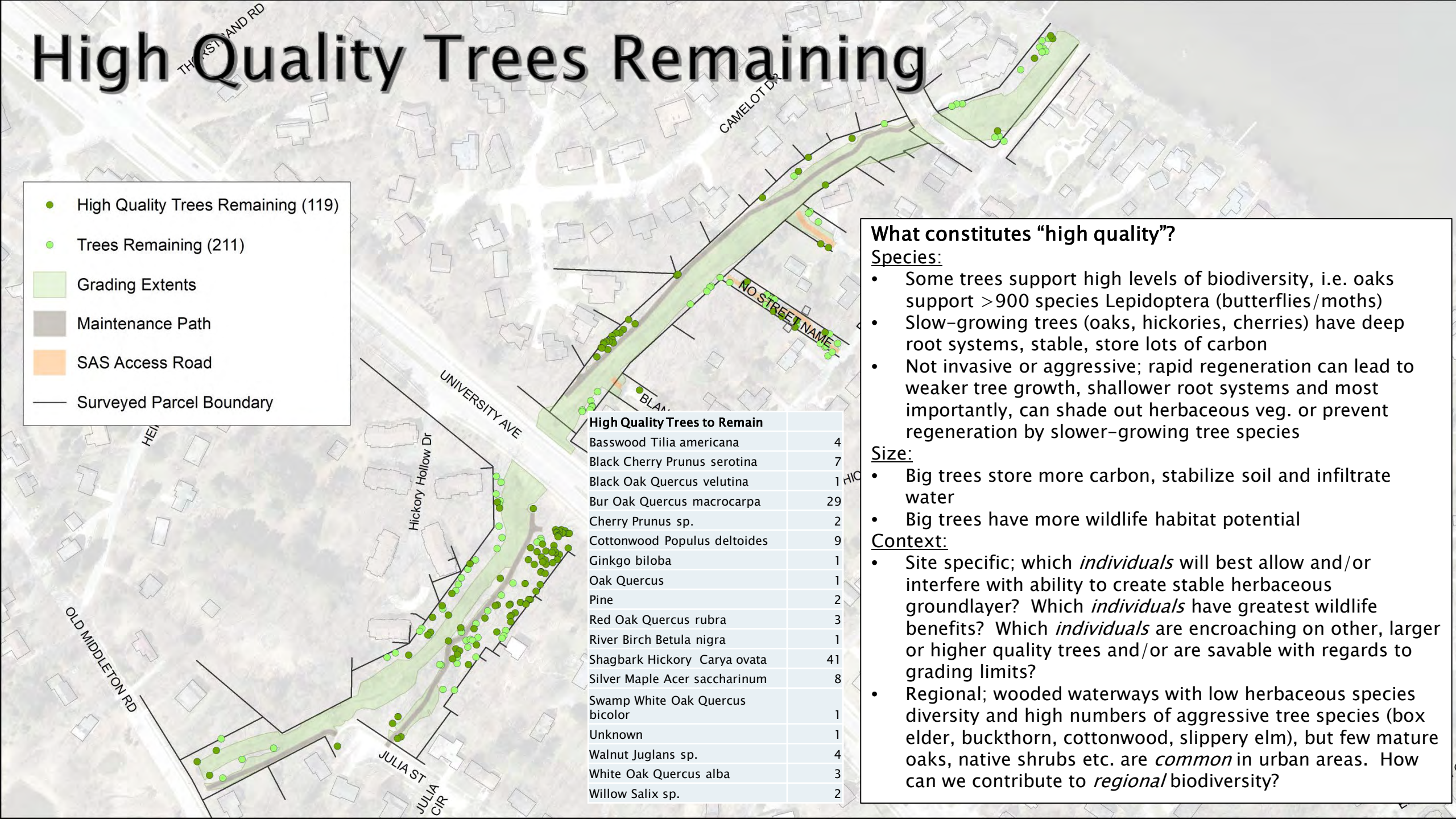
- Trees outside of the grading limits and traffic control impacts
- Trees in fair, or better, condition
- Select high value trees in poor condition

High Quality Trees Remaining



- At a minimum, the City will save and protect these dark green high quality trees during construction.
- Designed in retaining walls and construction fencing to protect specific trees near grading

High Quality Trees Remaining



High Quality Trees to Remain	
Basswood Tilia americana	4
Black Cherry Prunus serotina	7
Black Oak Quercus velutina	1
Bur Oak Quercus macrocarpa	29
Cherry Prunus sp.	2
Cottonwood Populus deltoides	9
Ginkgo biloba	1
Oak Quercus	1
Pine	2
Red Oak Quercus rubra	3
River Birch Betula nigra	1
Shagbark Hickory Carya ovata	41
Silver Maple Acer saccharinum	8
Swamp White Oak Quercus bicolor	1
Unknown	1
Walnut Juglans sp.	4
White Oak Quercus alba	3
Willow Salix sp.	2

What constitutes "high quality"?

Species:

- Some trees support high levels of biodiversity, i.e. oaks support >900 species Lepidoptera (butterflies/moths)
- Slow-growing trees (oaks, hickories, cherries) have deep root systems, stable, store lots of carbon
- Not invasive or aggressive; rapid regeneration can lead to weaker tree growth, shallower root systems and most importantly, can shade out herbaceous veg. or prevent regeneration by slower-growing tree species

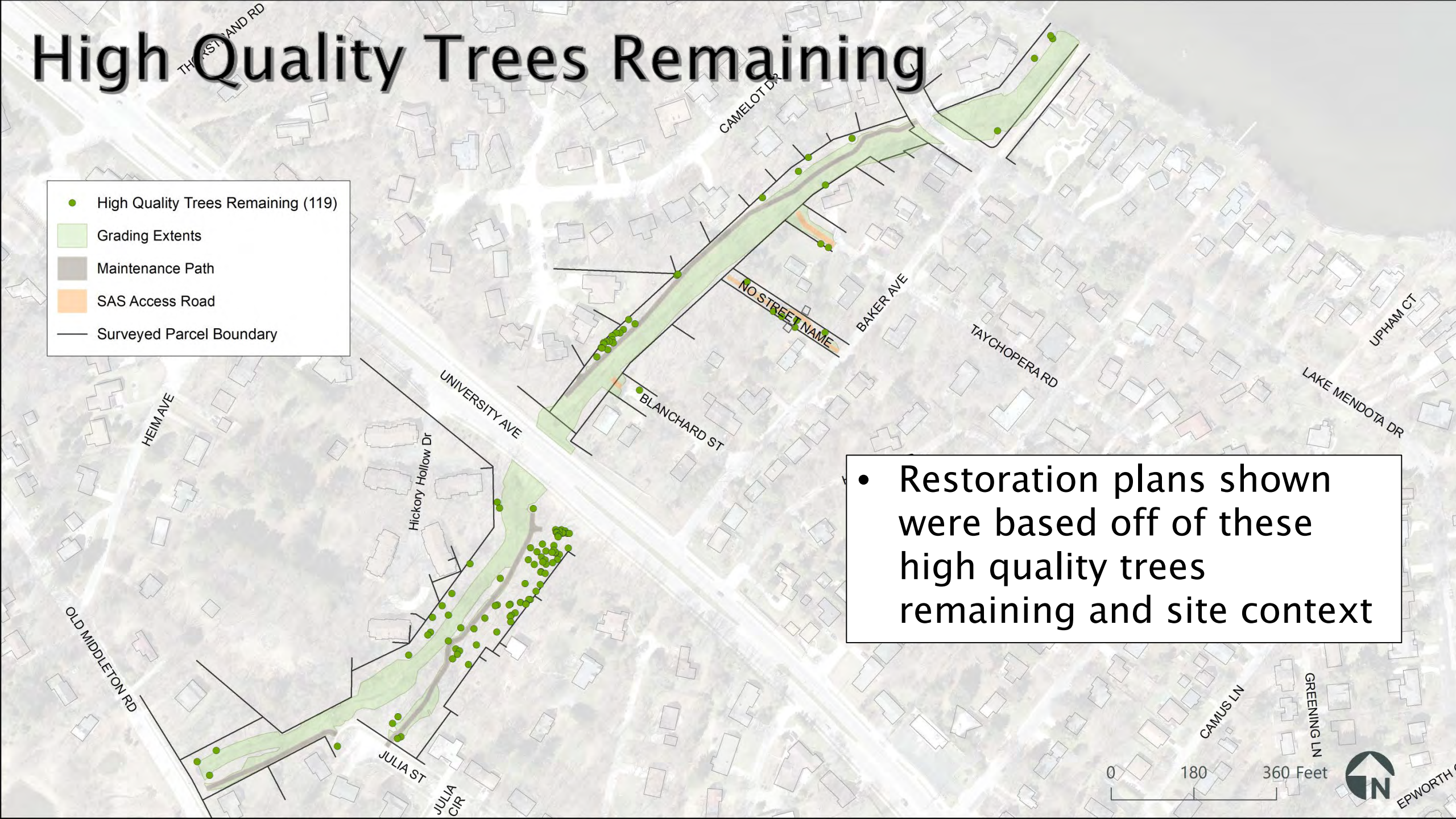
Size:

- Big trees store more carbon, stabilize soil and infiltrate water
- Big trees have more wildlife habitat potential

Context:

- Site specific; which *individuals* will best allow and/or interfere with ability to create stable herbaceous groundlayer? Which *individuals* have greatest wildlife benefits? Which *individuals* are encroaching on other, larger or higher quality trees and/or are savable with regards to grading limits?
- Regional; wooded waterways with low herbaceous species diversity and high numbers of aggressive tree species (box elder, buckthorn, cottonwood, slippery elm), but few mature oaks, native shrubs etc. are *common* in urban areas. How can we contribute to *regional* biodiversity?

High Quality Trees Remaining



- Restoration plans shown were based off of these high quality trees remaining and site context

Trees that will Impede Restoration

- Restoration work begins immediately following construction
- A main goal is to quickly establish vegetation to hold the soil in place and help infiltrate water. All vegetation added back to site is native.
- The trees in red make this work more challenging:
  - Box elder, buckthorn, black locust, mulberry: spread and grow rapidly, shade out groundlayer exposing bare soil
  - Elm and ash: disease prone and if not removed during construction may require later removal and further disturbance later
  - Cottonwood, silver maple: grow rapidly, weaker growth drop limbs and more prone to windfall, particularly in absence of trees removed due to grading work, also shade out groundlayer

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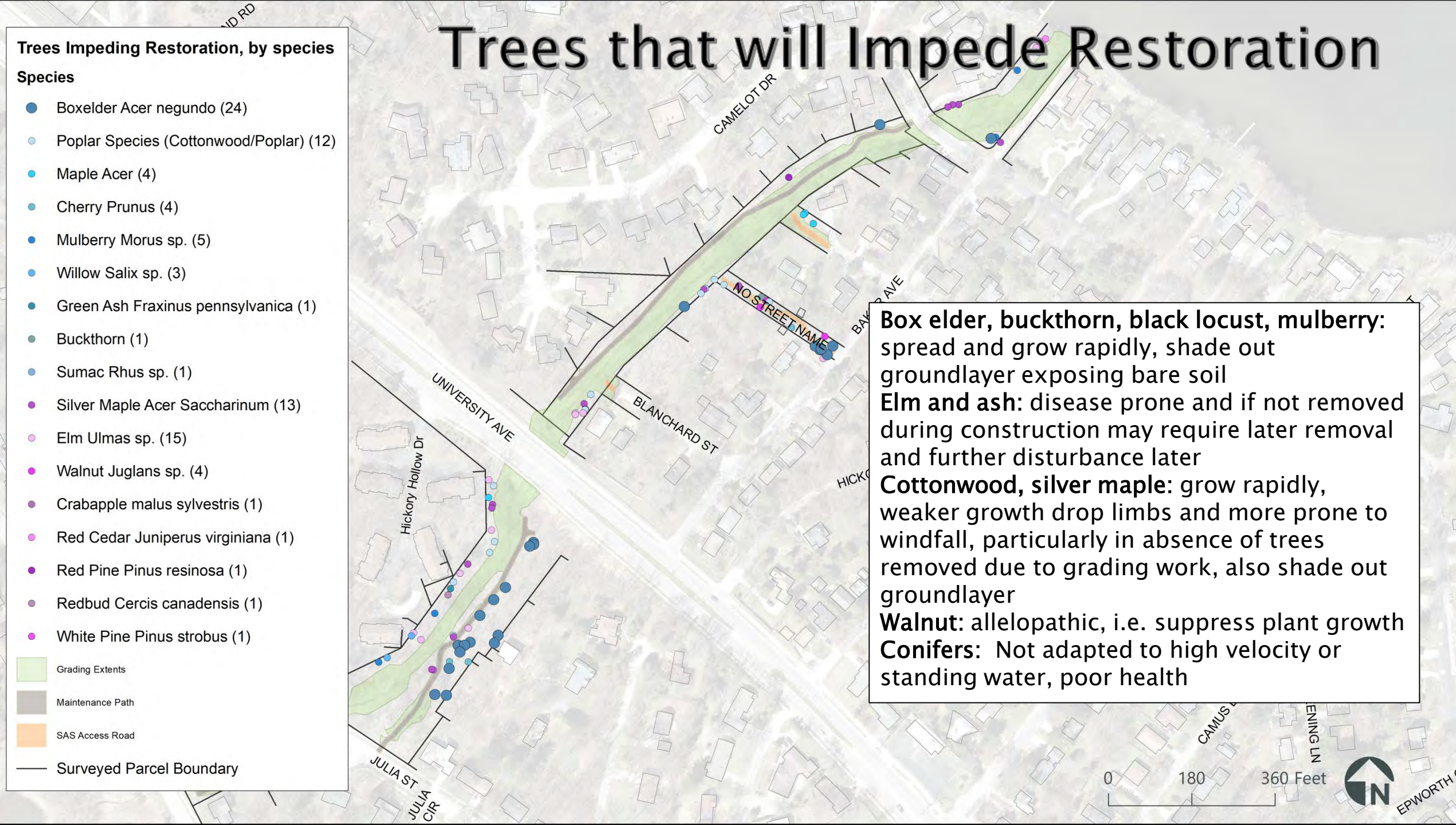

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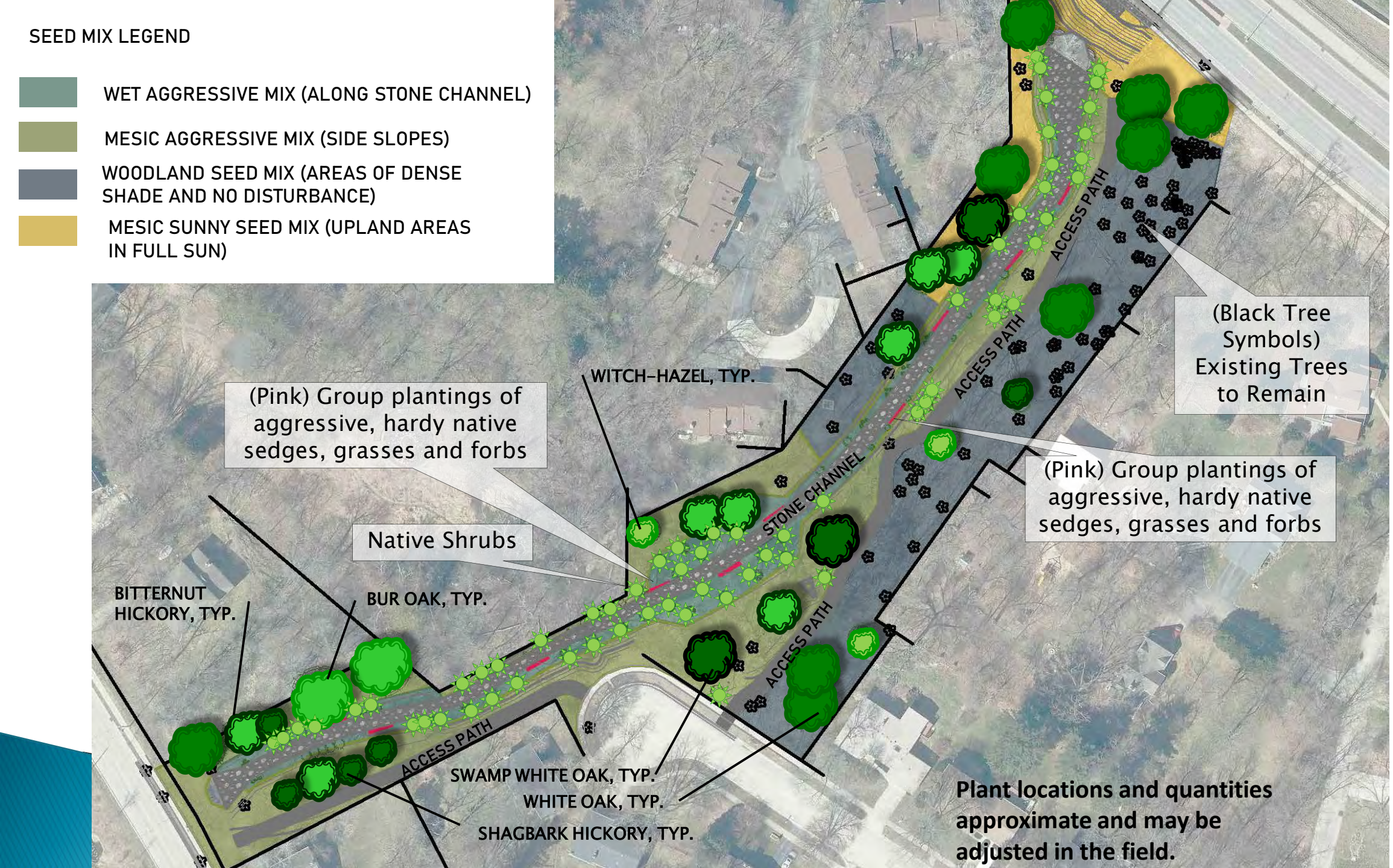
Walnut: allelopathic, i.e. suppress plant growth

Conifers: Not adapted to high velocity or standing water, poor health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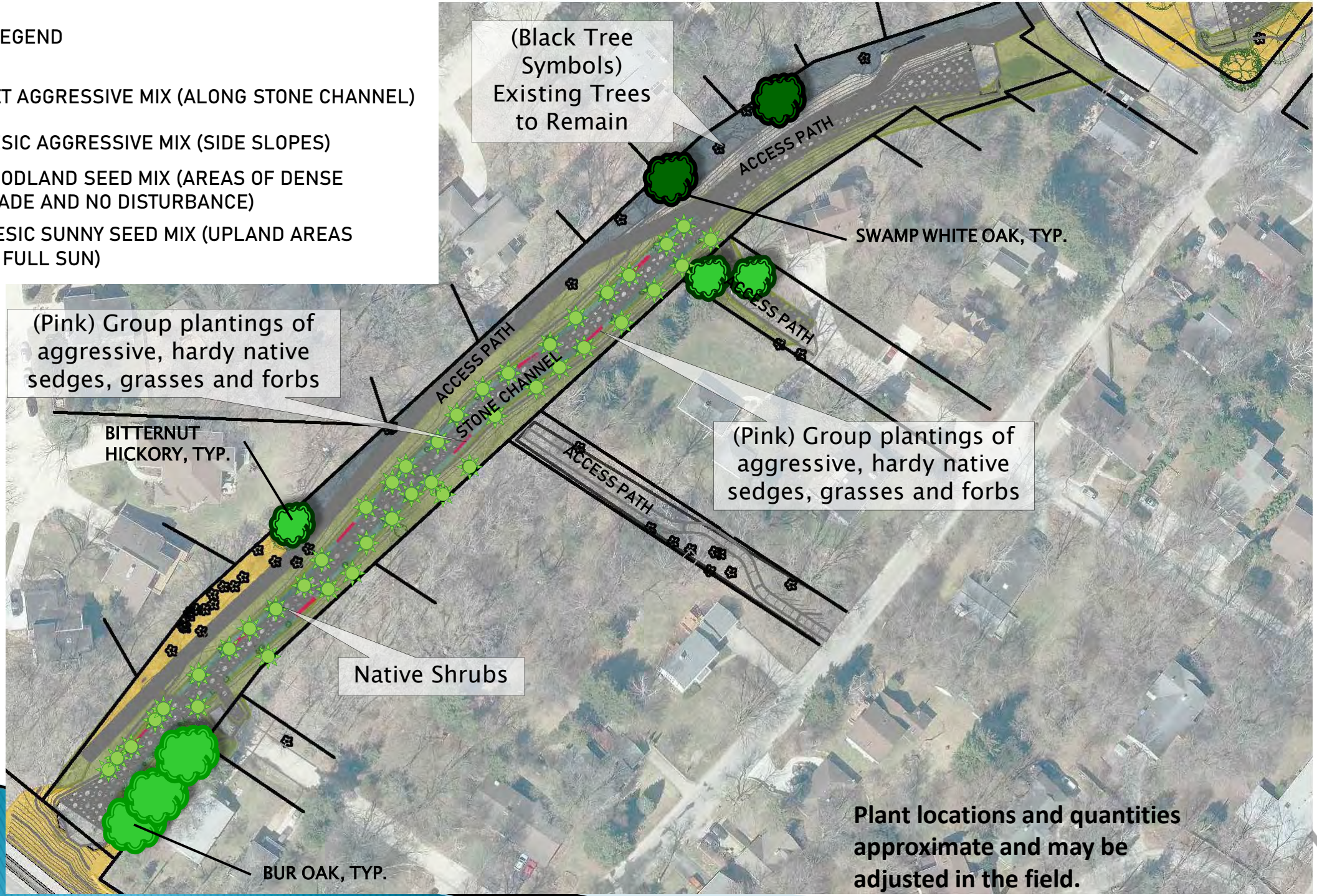

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Contact Information & Resources

- Project Website:

cityofmadison.com/engineering/projects/mendota-grassman-greenway-flood-mitigation-and-restoration-design

  - Sign-up for project email updates on the website
  - Updates on work progress will be posted to the project website

- Facebook – City of Madison Engineering
- Twitter – @MadisonEngr
- Engineering Podcast: Everyday Engineering on iTunes, GooglePlay

Summary of changes from Public Meeting 2

- Forestry inspection revealed:
  - 5 oaks near Julia street have died or are too storm damaged to keep (conditions were updated)—restoration plan adds back in 5 additional oaks in this area
  - 6 trees in the “No Street Name” off of Baker Ave between Blanchard St and Taychopera Rd were storm damaged and need to be removed – their conditions were updated
- At-risk tree removals occurring in late-October:
  - 6 trees near Hickory Hollow condos are at risk to damage the buildings and are going to be removed this fall—these were removed from maps: 5624, 5625, 5626, 5629, 5630, 1000