EAB from Crisis to Opportunity:

Managing & Growing a Resilient Urban Forest in Minneapolis, MN

PHILIP POTYONDY

Smart Tree Management Practice Lead

DAVEY® Resource Group

MULTIGENERATIONAL
OPPORTUNITY & OBLIGATION

URBAN FORESTRY

GENERATION

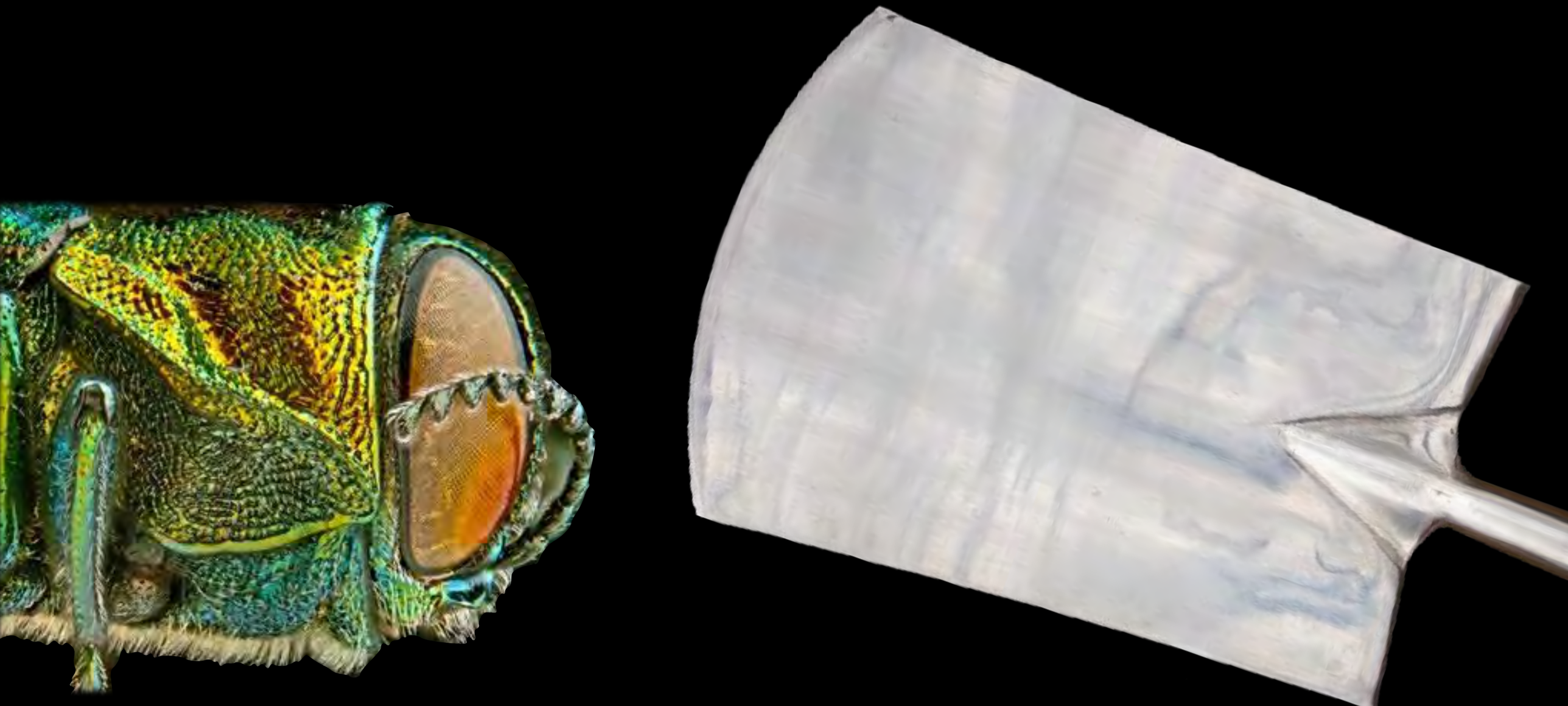
OBLIGATION

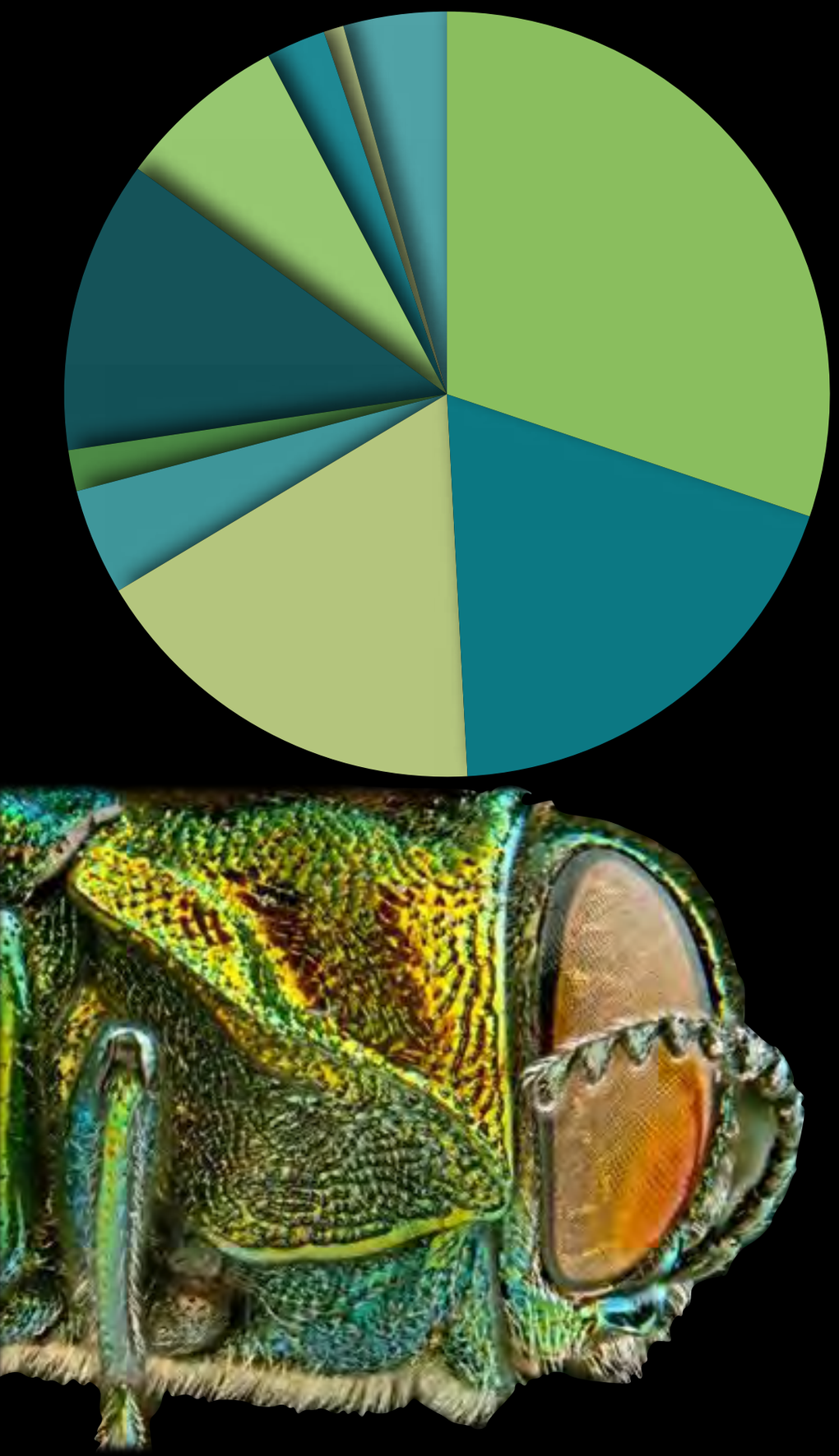
IMPROVE

STREET

WOODLAND

PARKLAND





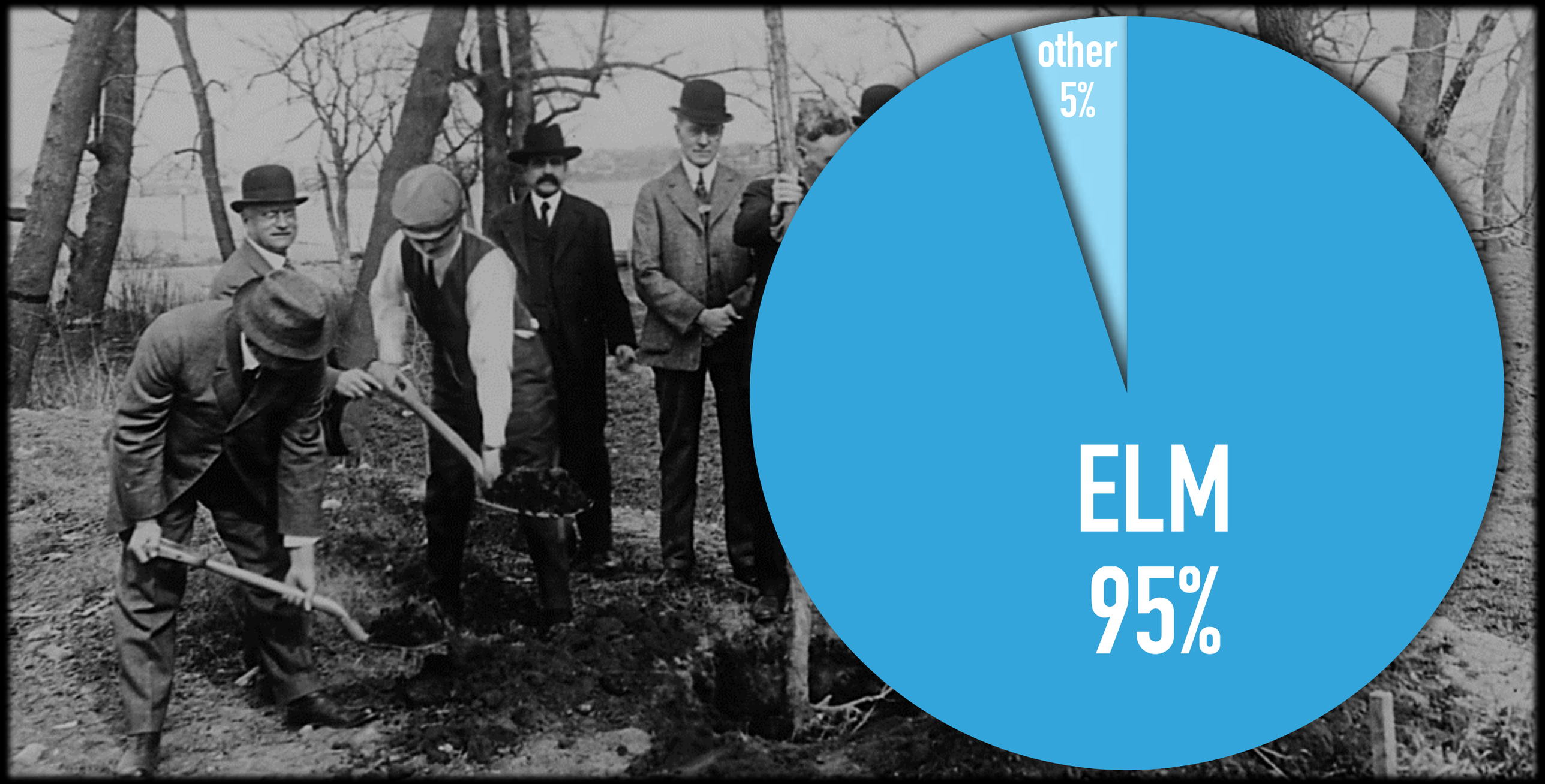
genera >1%

?x

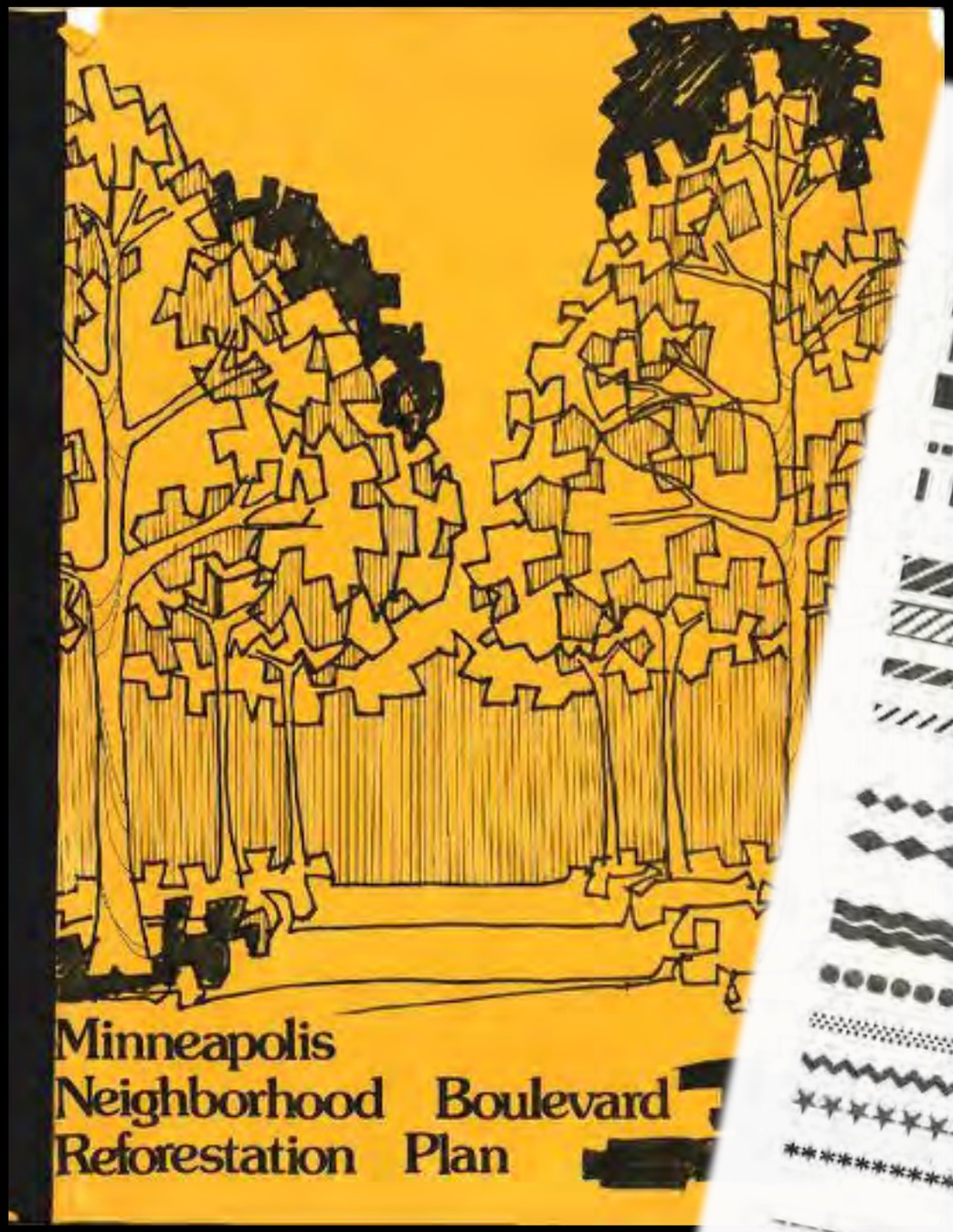

POLICE PUBLIC BOX

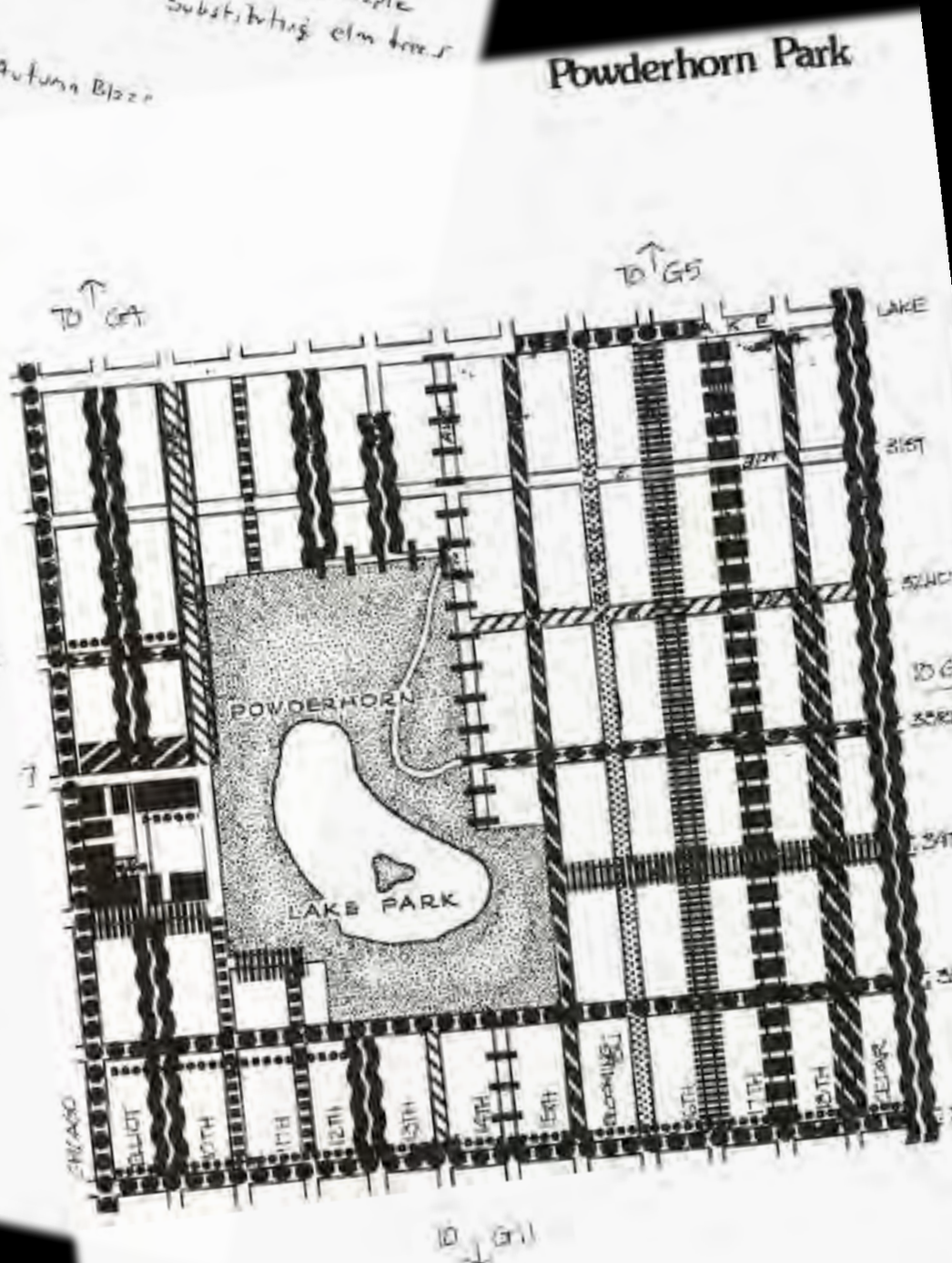
OVER 90%

ELMS!!!



DIVERSITY BY BLOCK 1978





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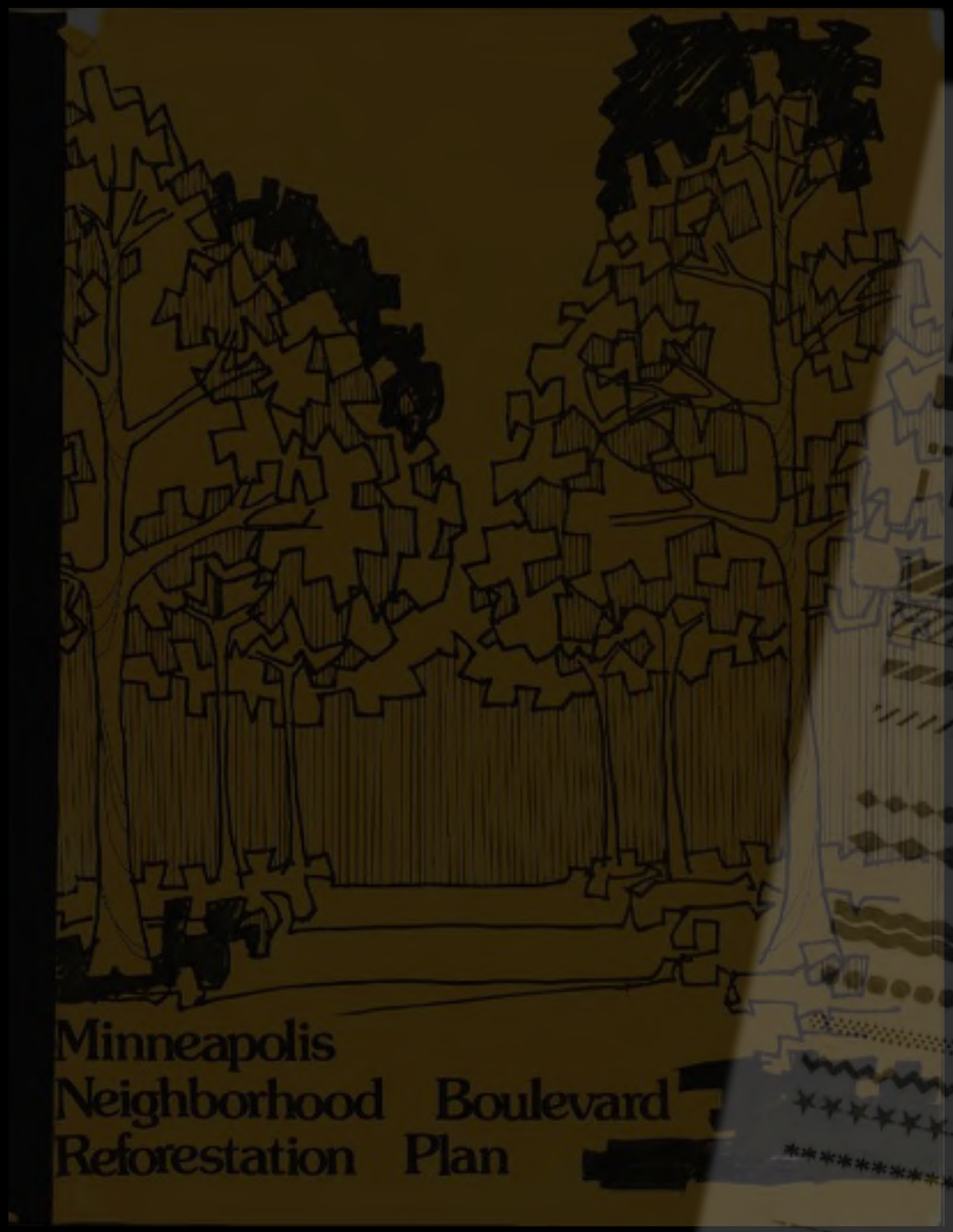

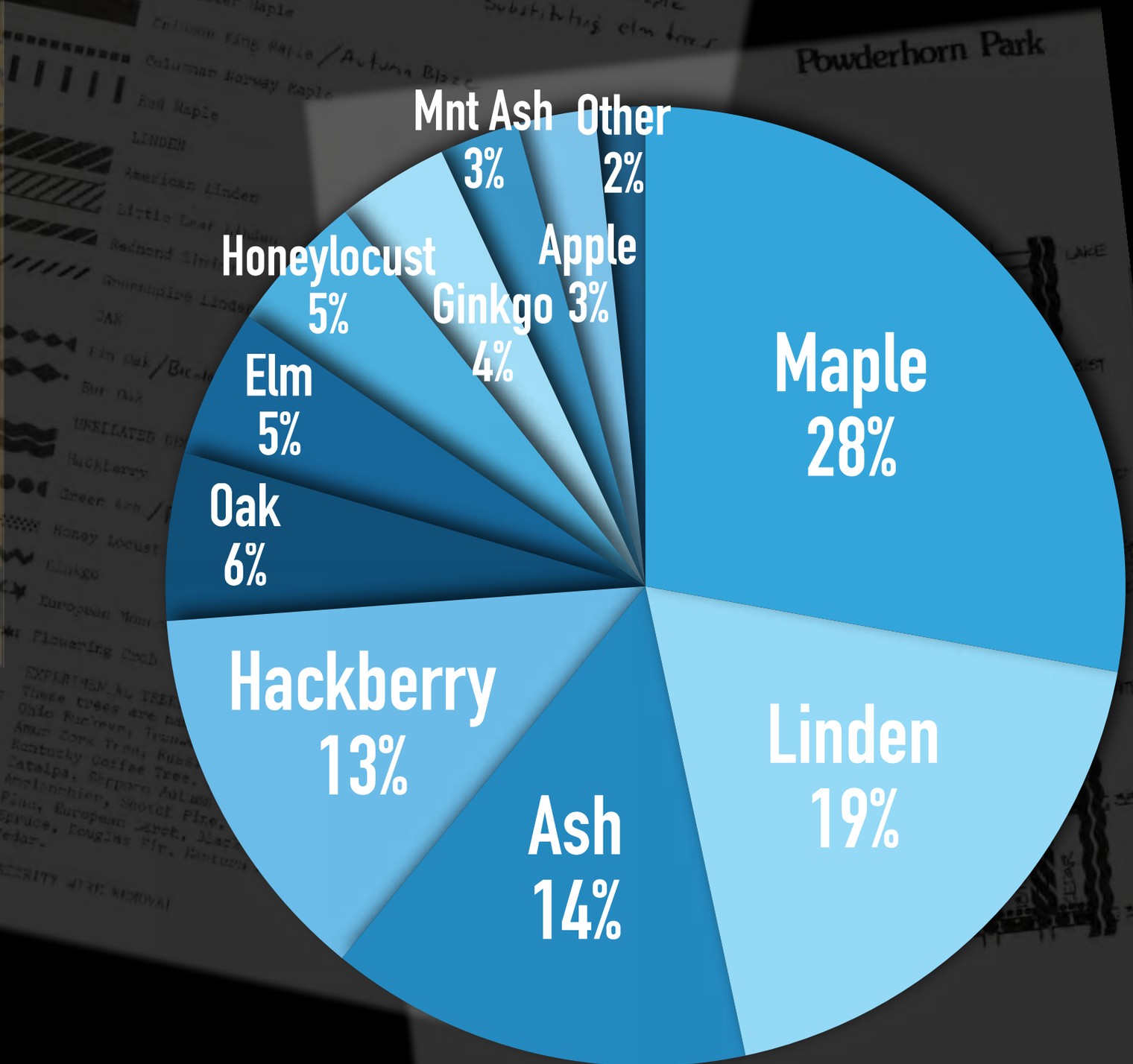

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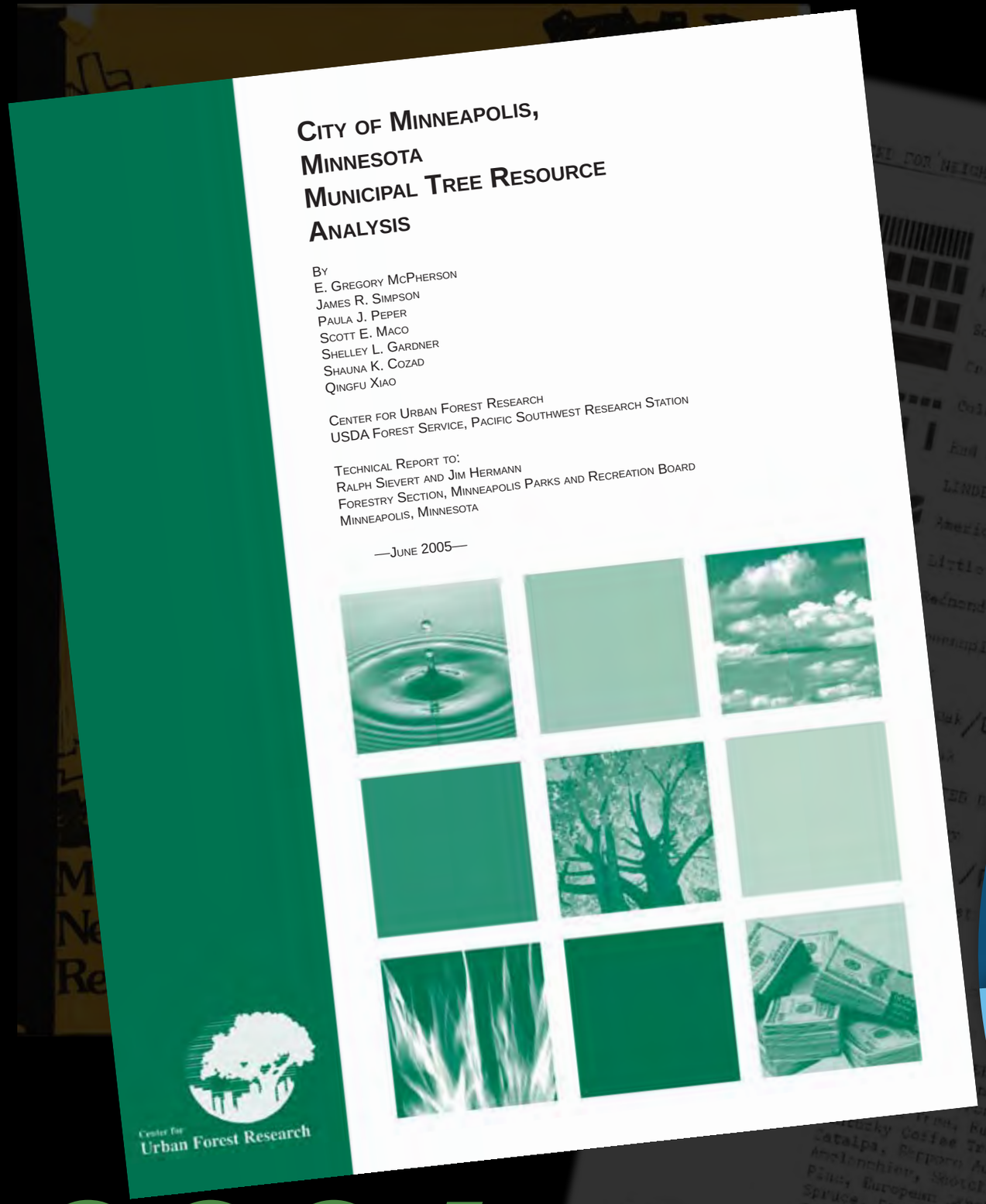
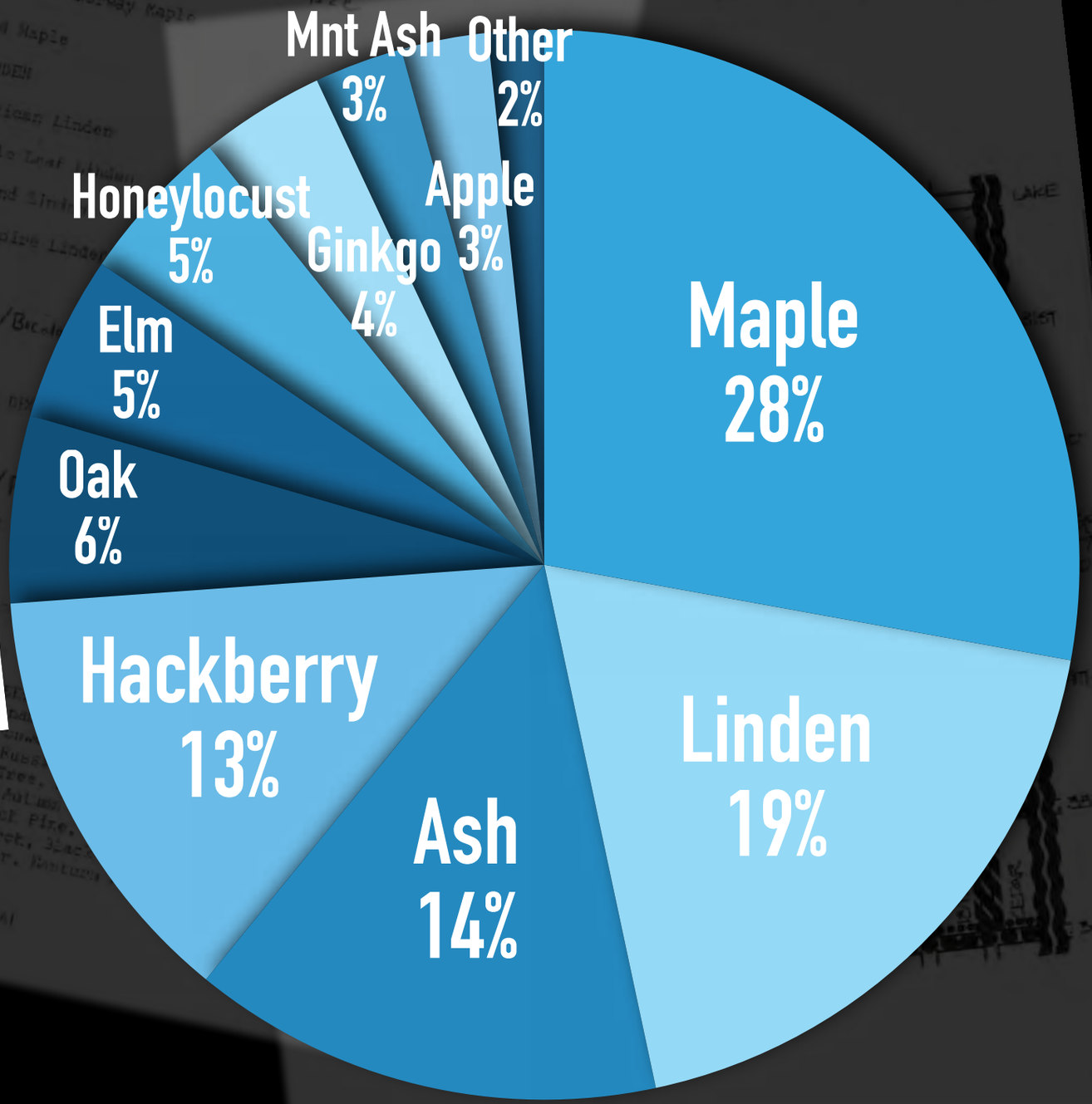
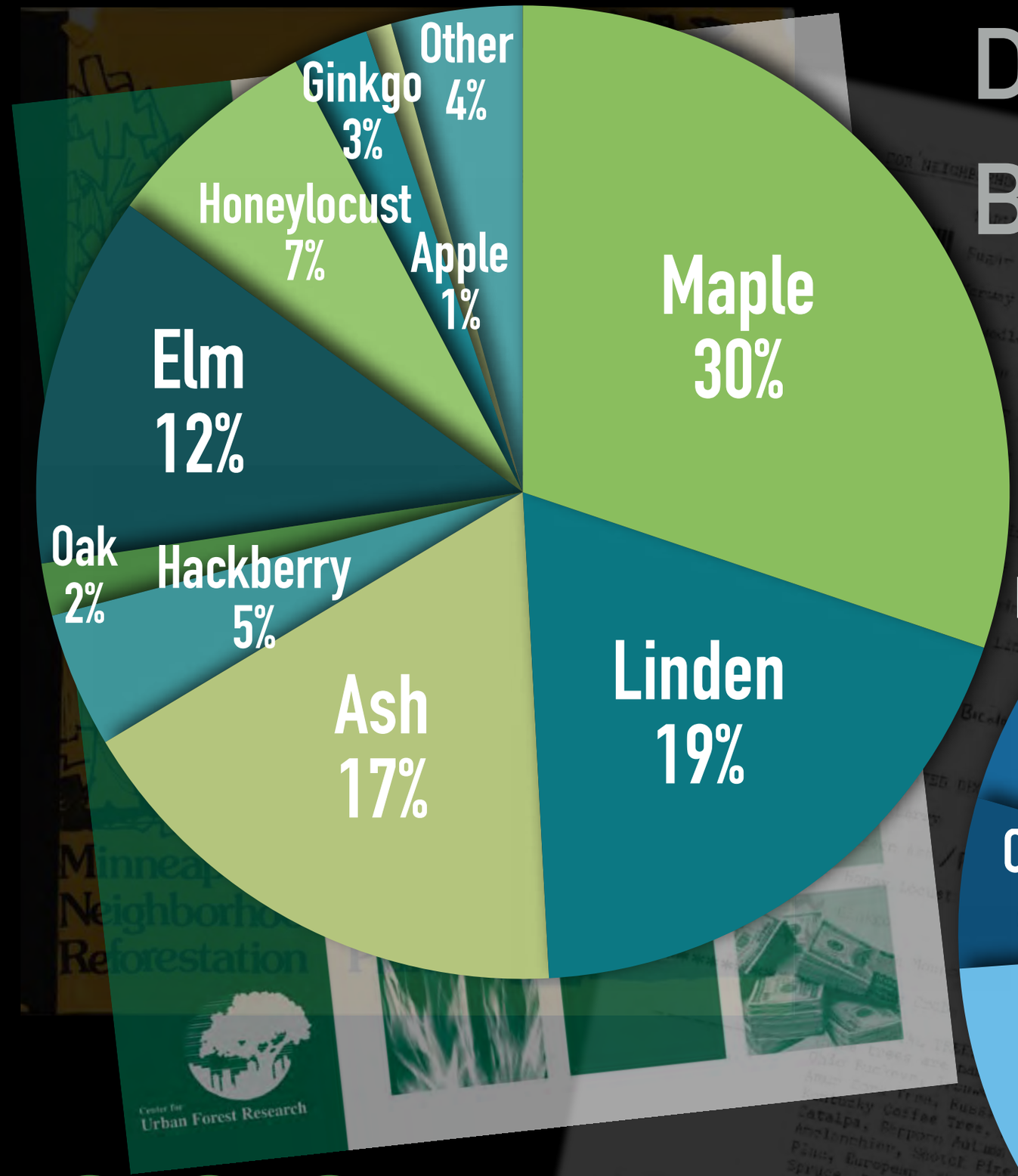
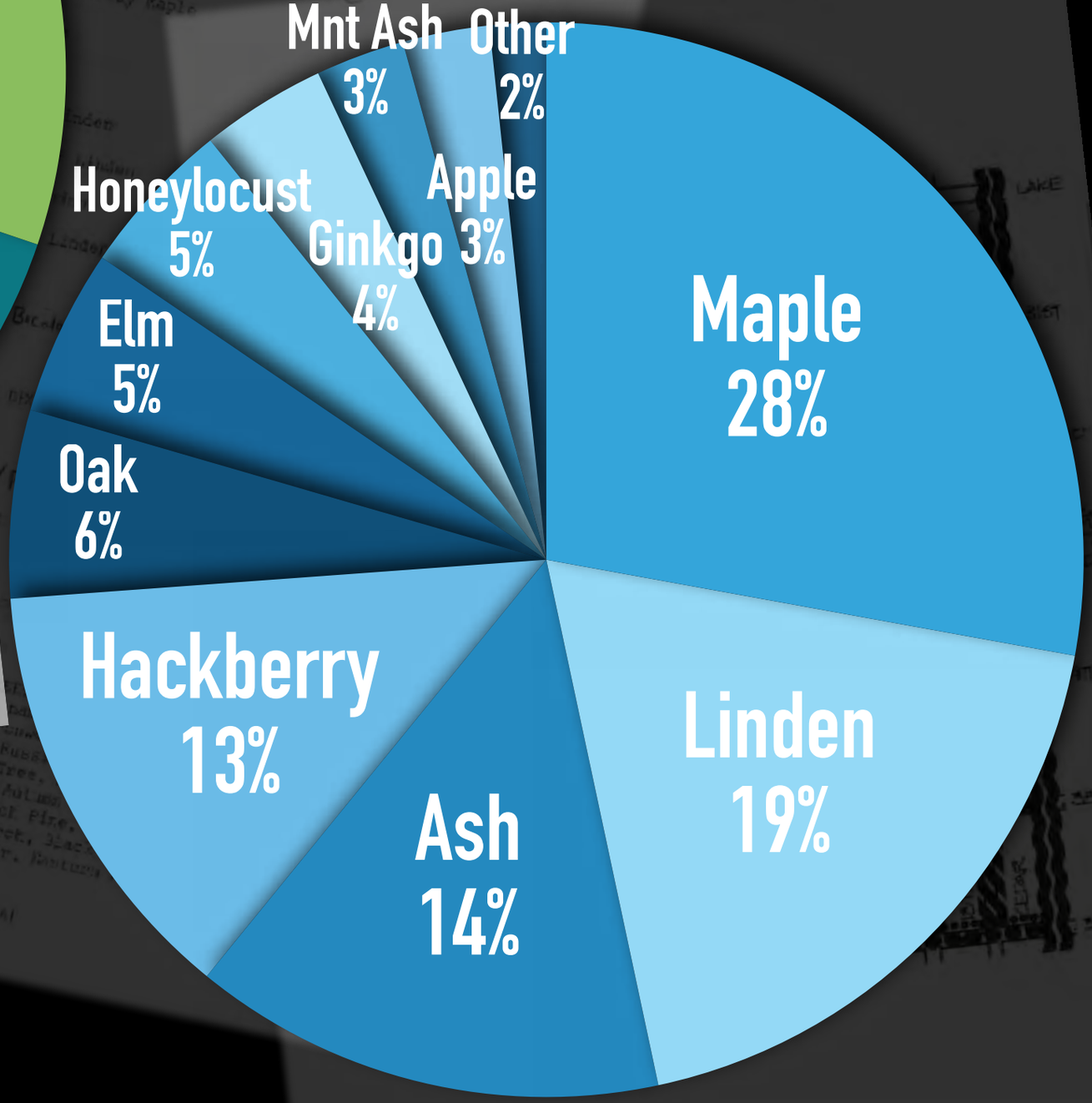




2004 ITREE STREETS

DIVERSITY BY BLOCK 1978





2004 ITREE STREETS

SUCCESS

Planning Works!

MINNEAPOLIS

TREE SELECTION

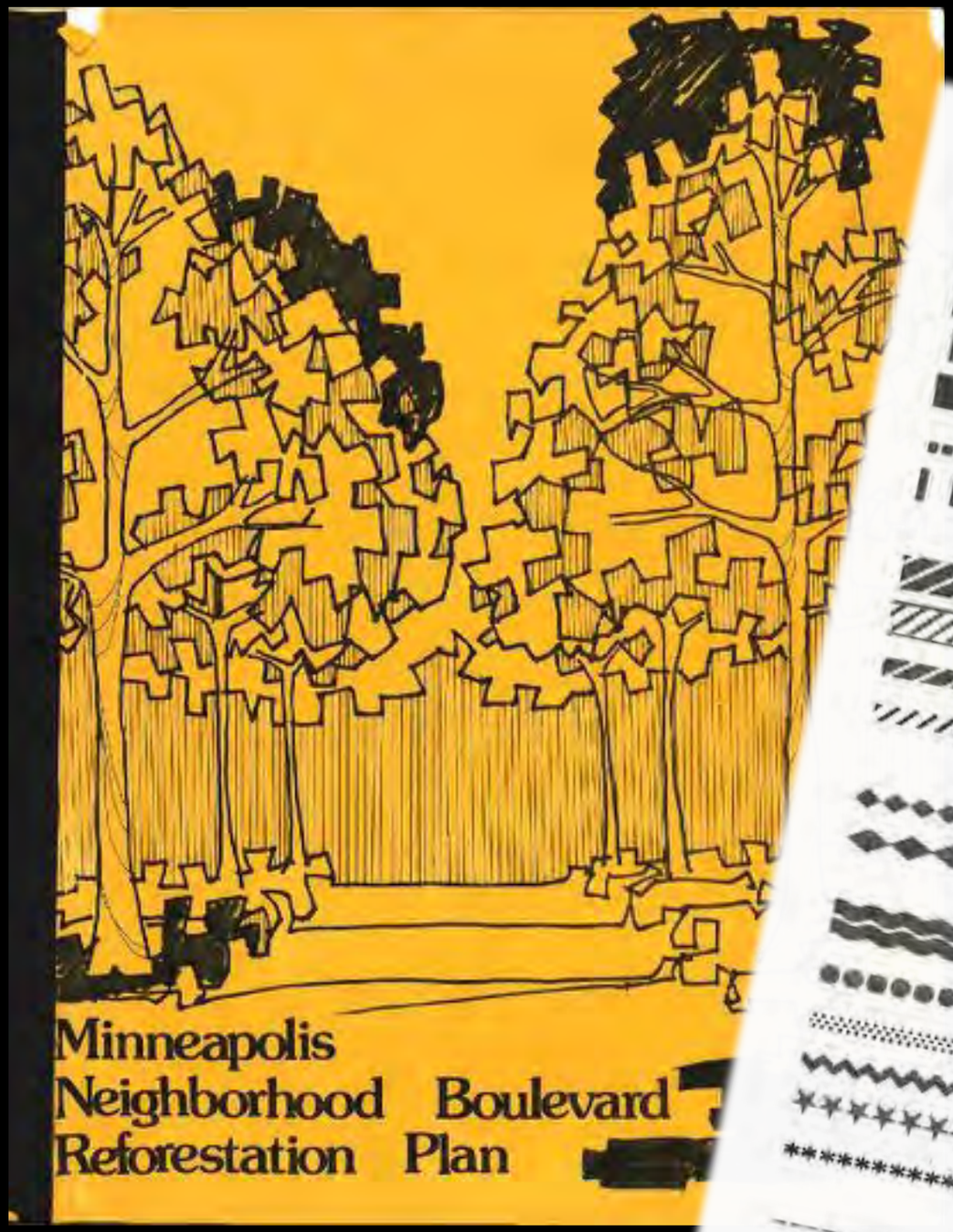
OVER 90%

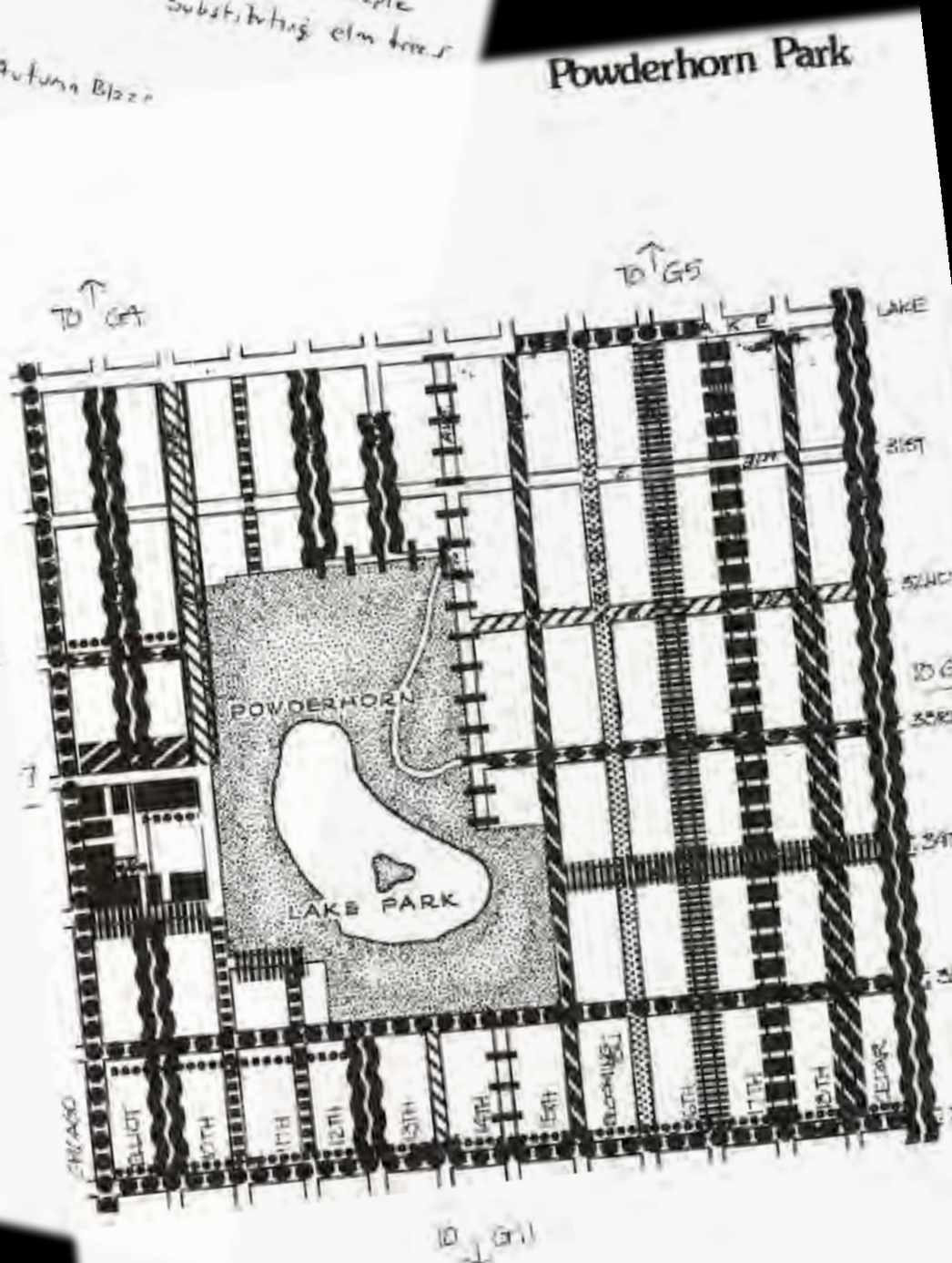
ELMS!!!

OVER 90%

ELMS!!!

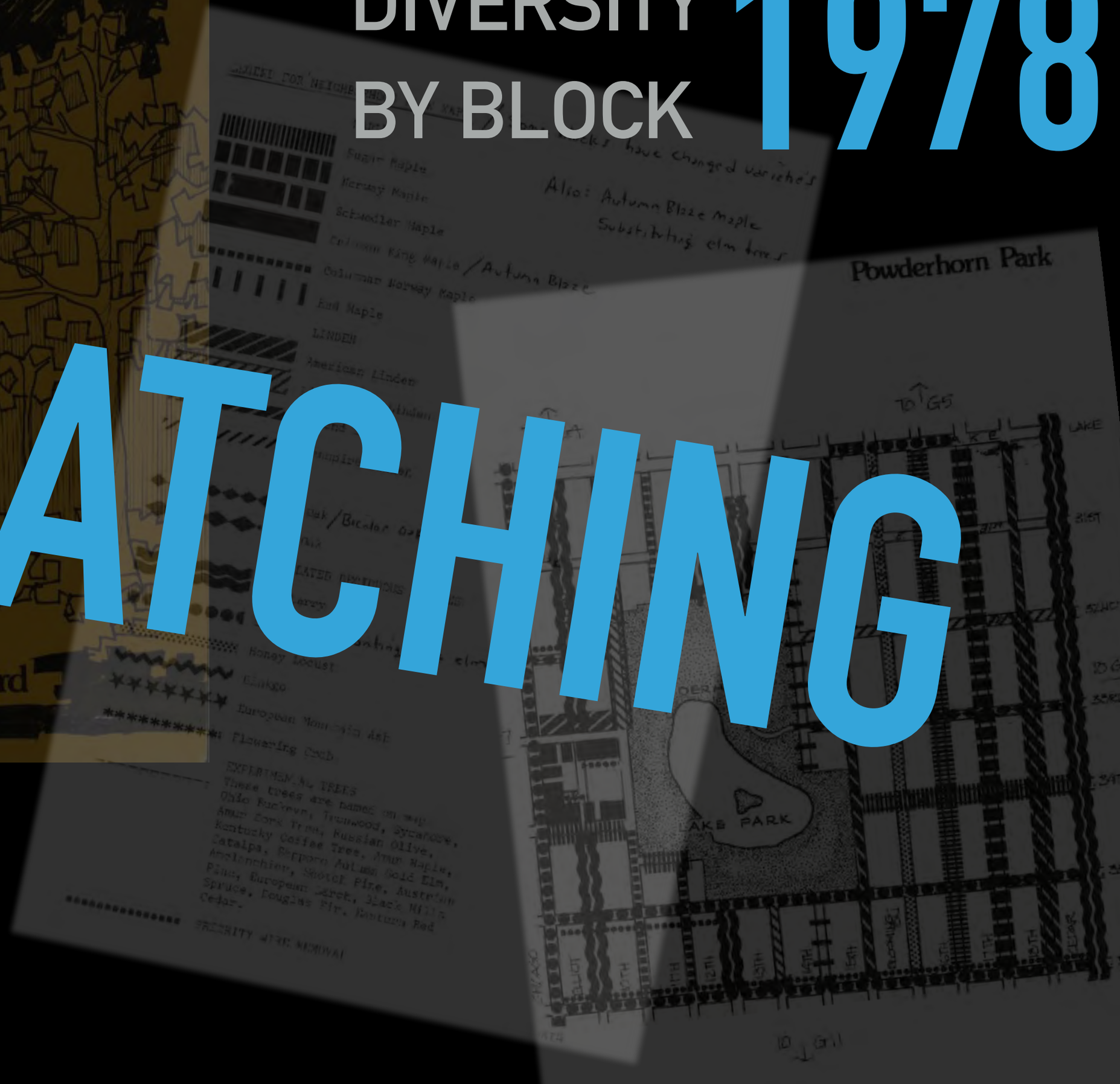
DIVERSITY BY BLOCK 1978





DIVERSITY BY BLOCK 1978

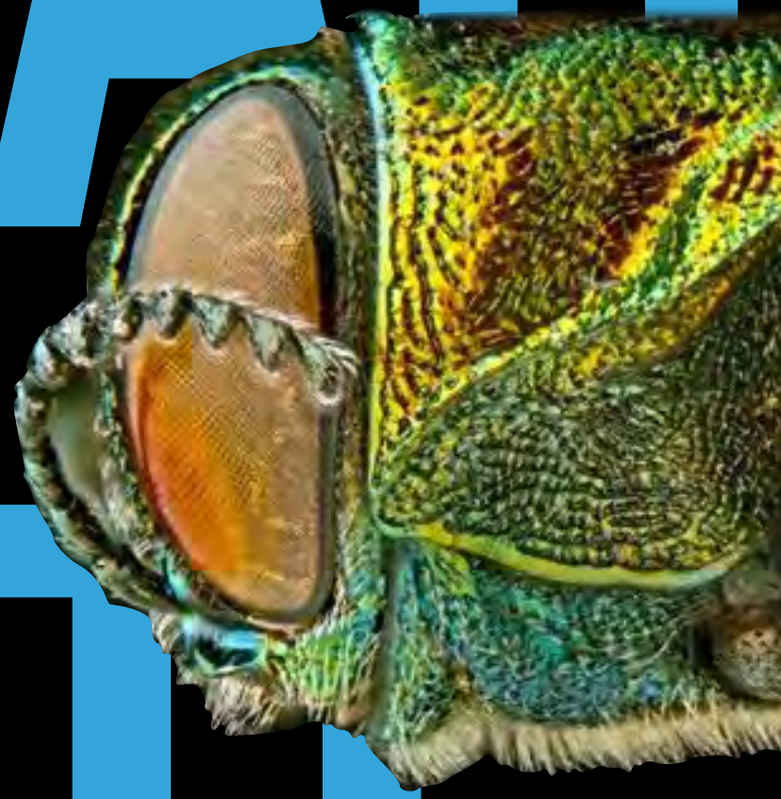
MATCHING



DED EAB

ALB ETC

DED EAR



ALB ETC

ASH CANOPY REPLACEMENT PLAN 2014

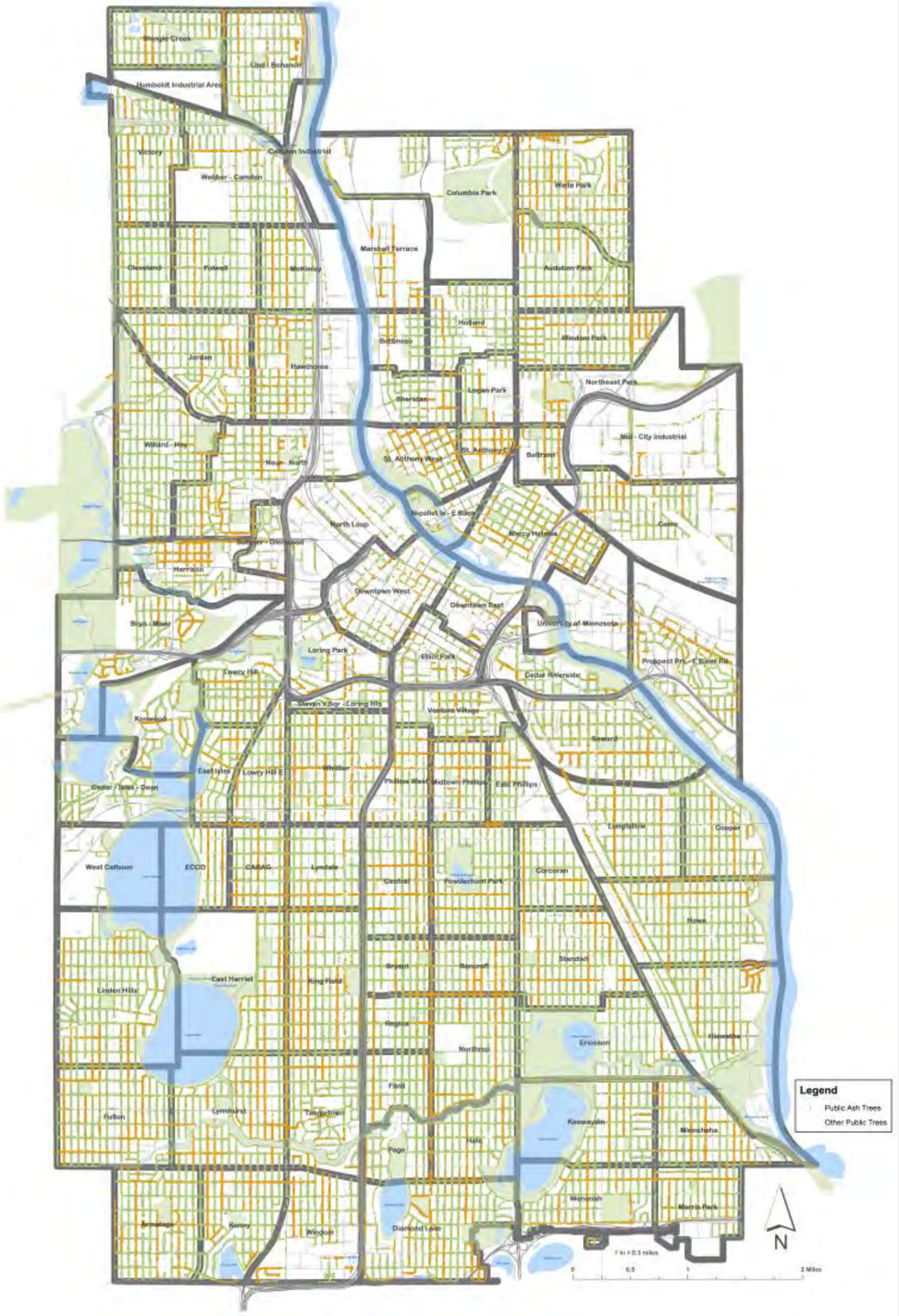
40,000

8 YEARS

5,000/YR

Ash Canopy Replacement Plan

Citywide

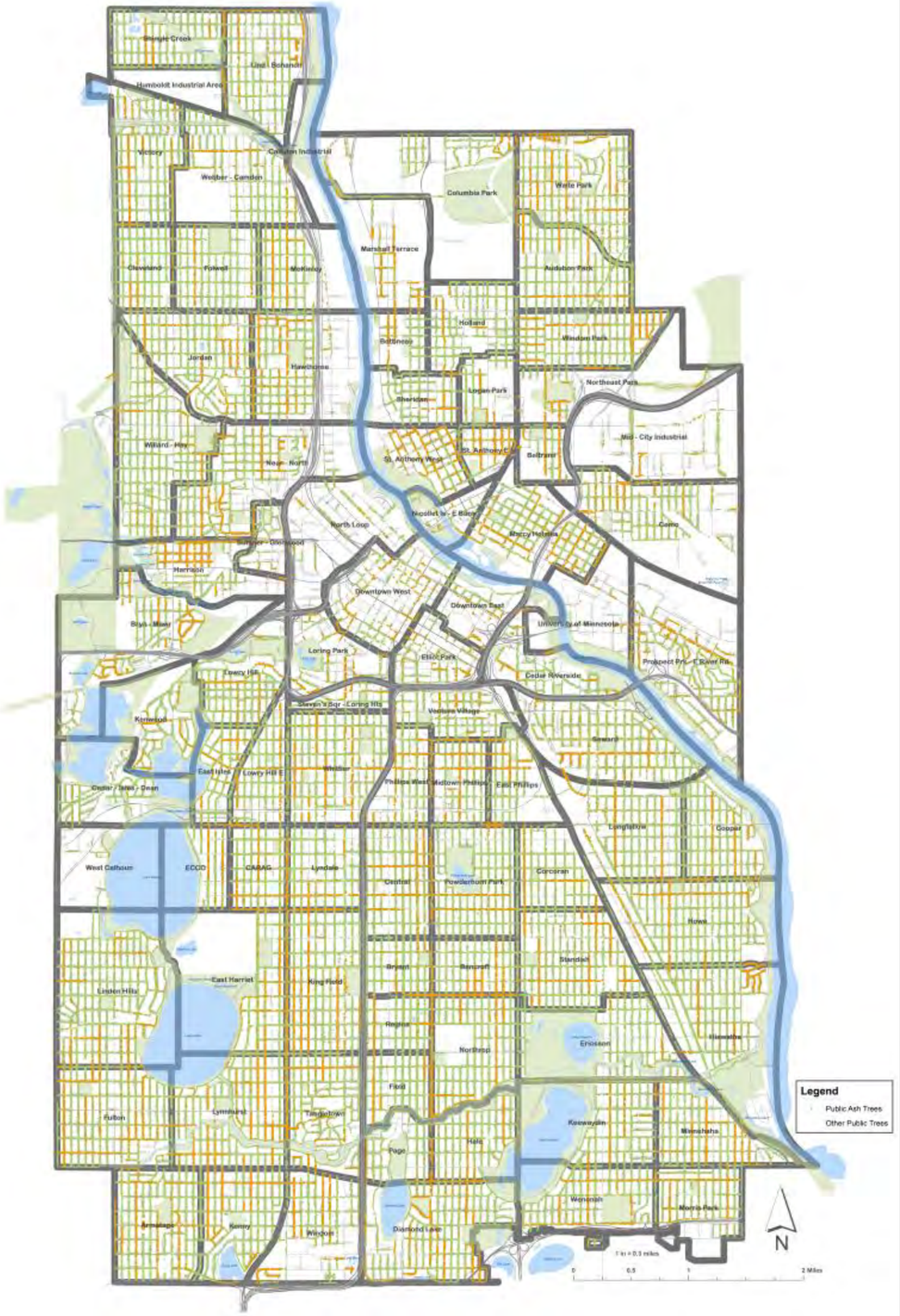


Ash Canopy Replacement Plan

Citywide

↓

Neighborhood



Ash Canopy Replacement Plan

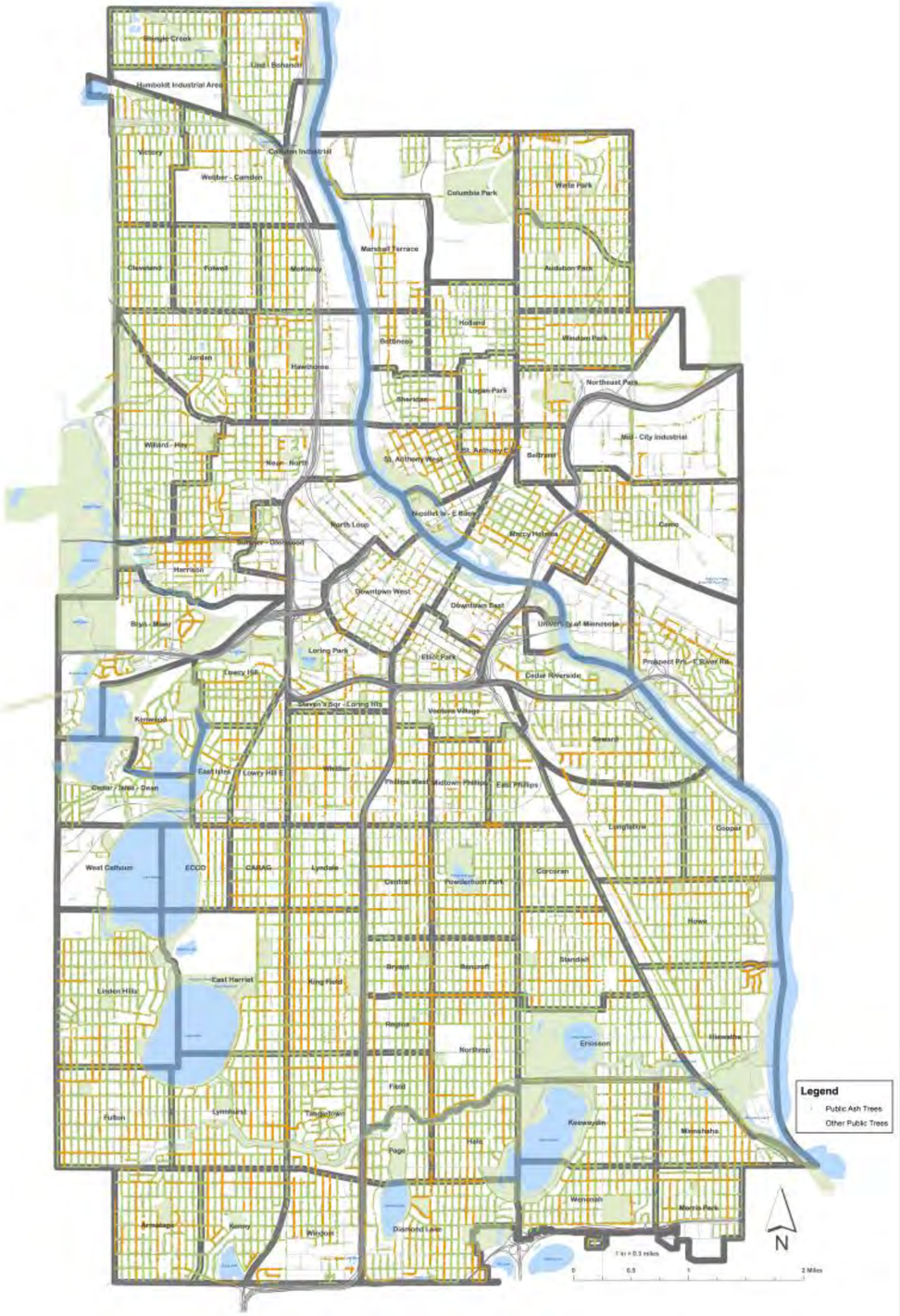
Citywide

↓

Neighborhood

↓

Street / Park

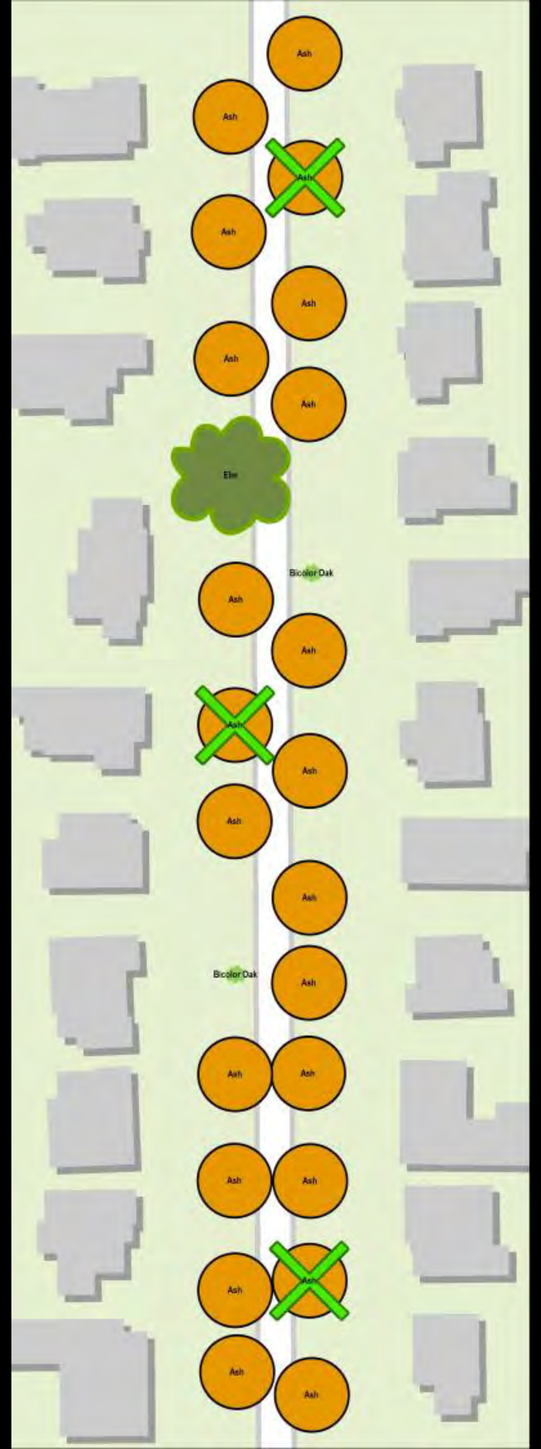


Ash Canopy Replacement Plan

Neighborhood

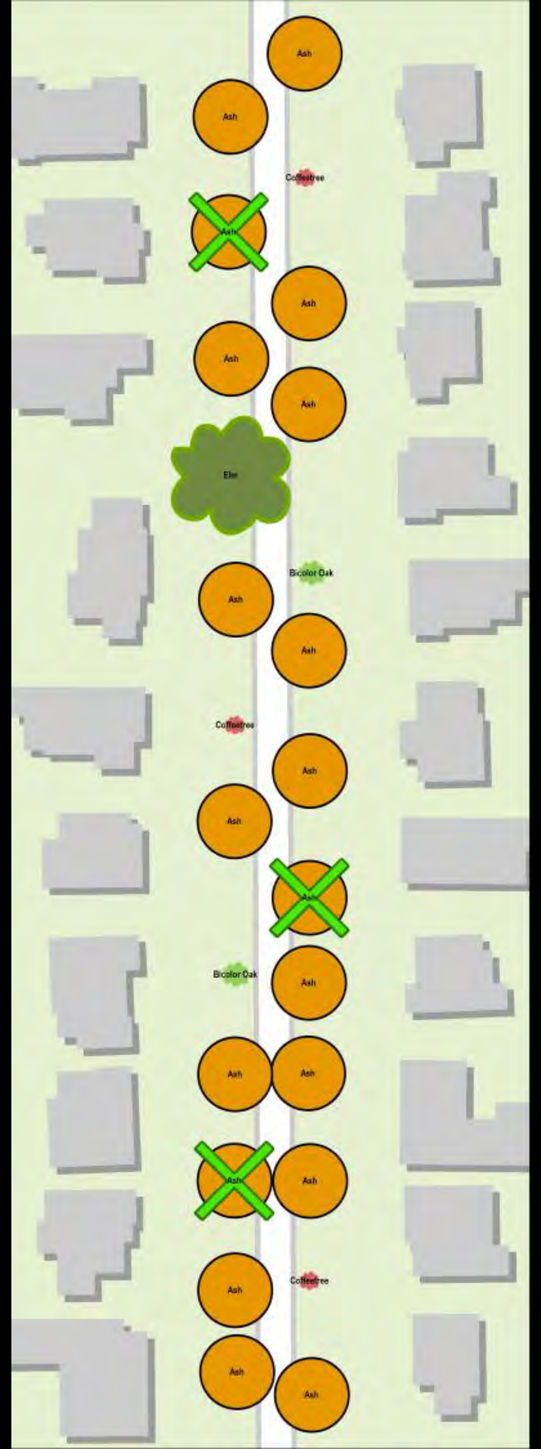
Ash Canopy Replacement Plan

2014



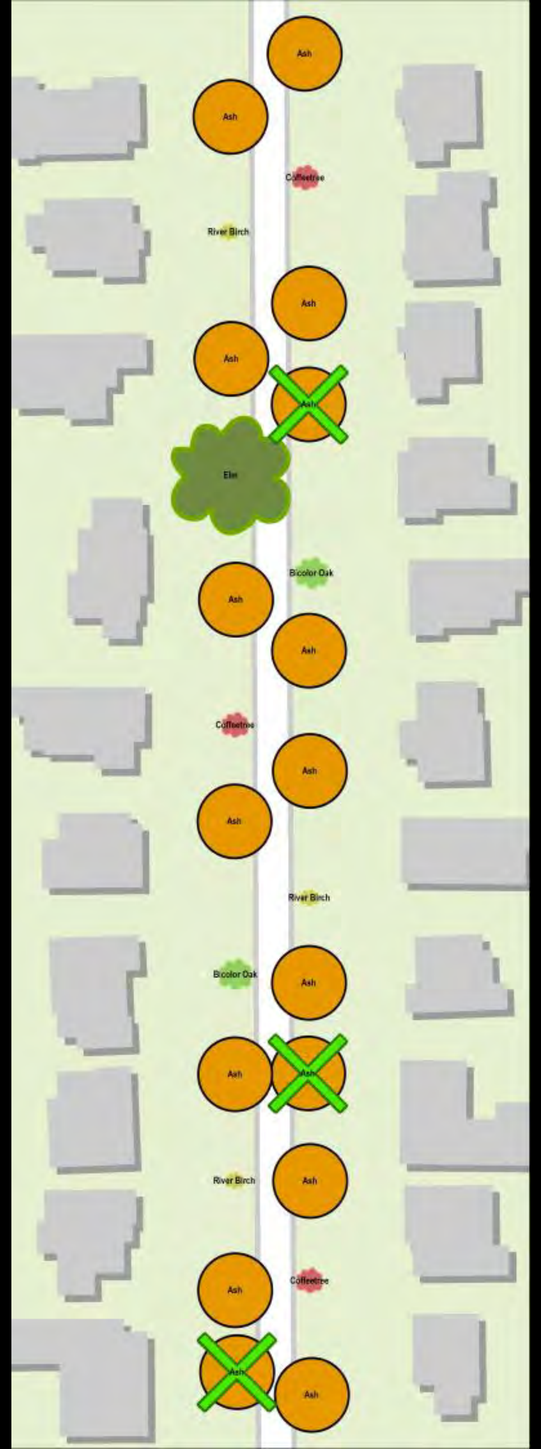
Ash Canopy Replacement Plan

2015



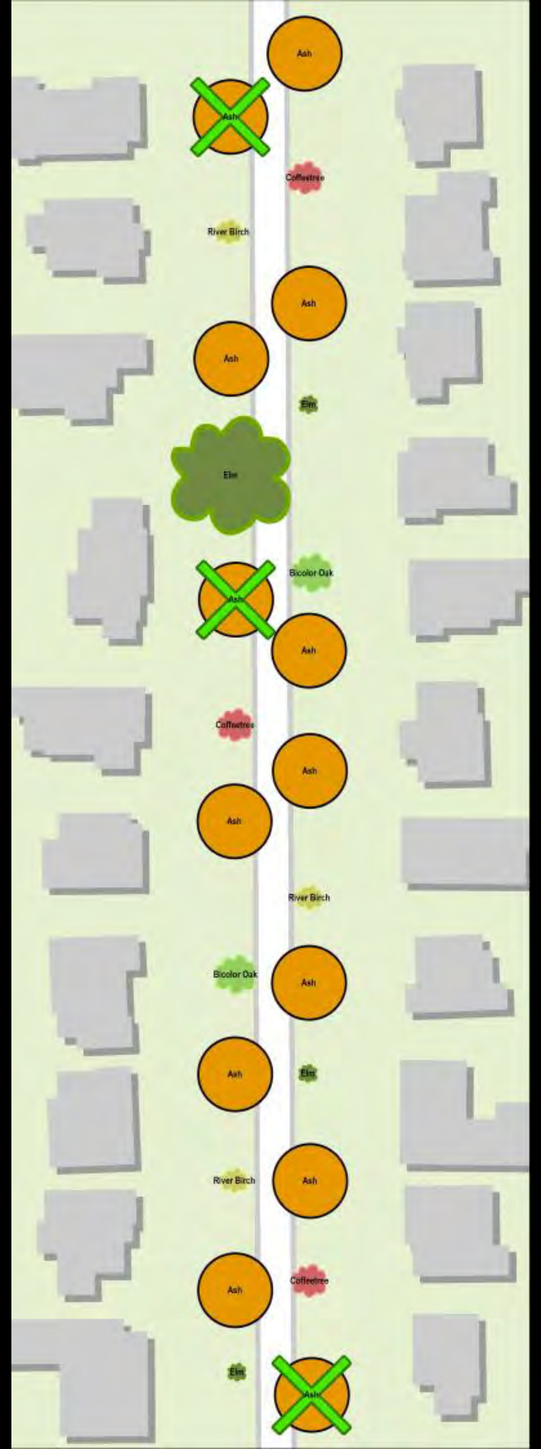
Ash Canopy Replacement Plan

2016



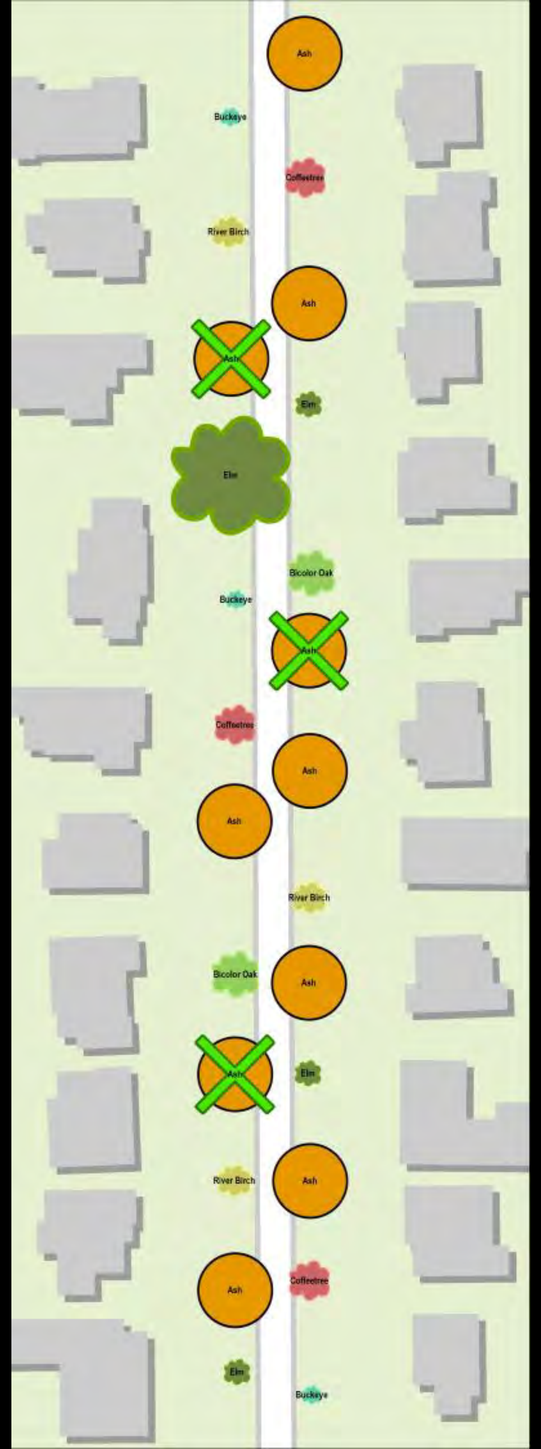
Ash Canopy Replacement Plan

2017



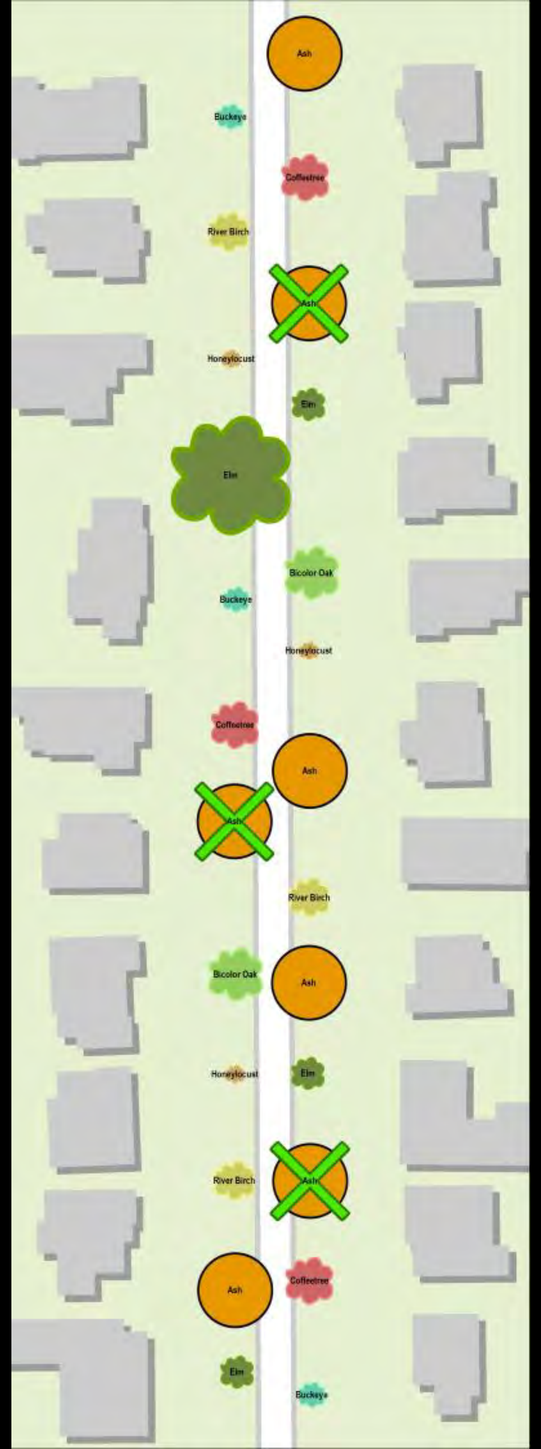
Ash Canopy Replacement Plan

2018



Ash Canopy Replacement Plan

2019

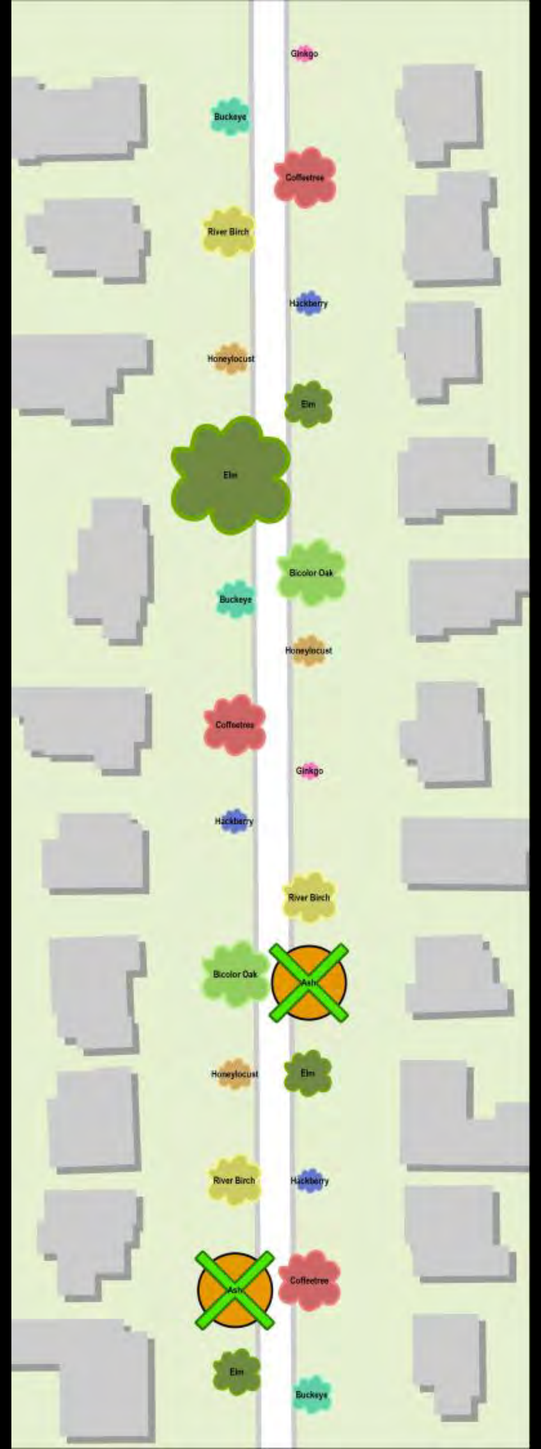


Ash Canopy Replacement Plan

2020

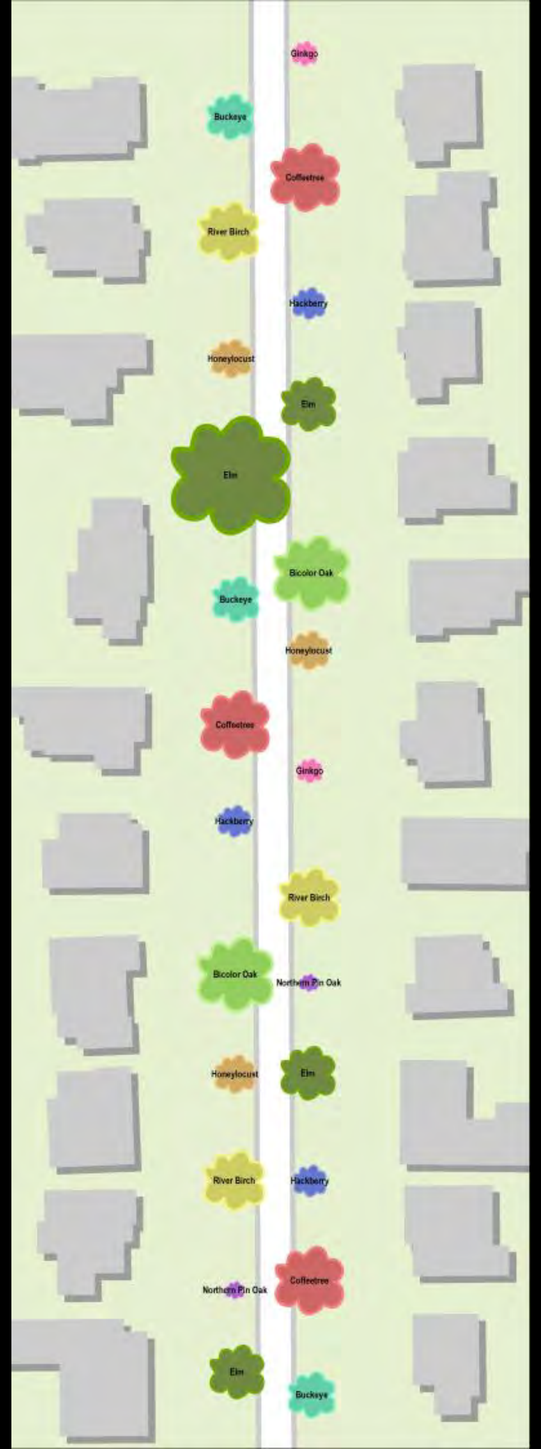
Ash Canopy Replacement Plan

2021



Ash Canopy Replacement Plan

2022



8k-10k/yr

plant

CANOPY

DIVERSITY

CANOPY

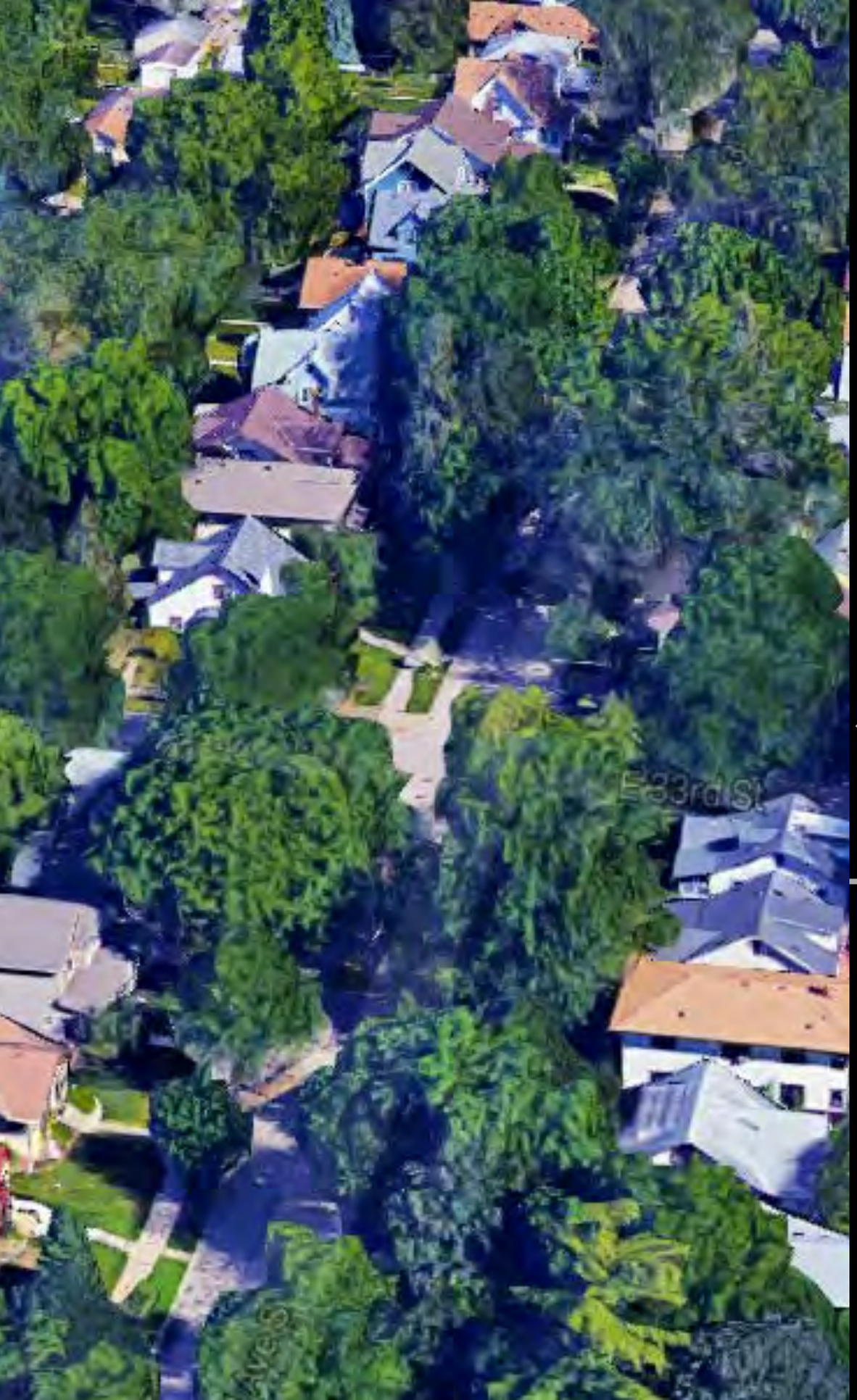
CANOPY

SIZE

LARGEST

SPACE ABOVE & BELOW GROUND

DIVERSITY



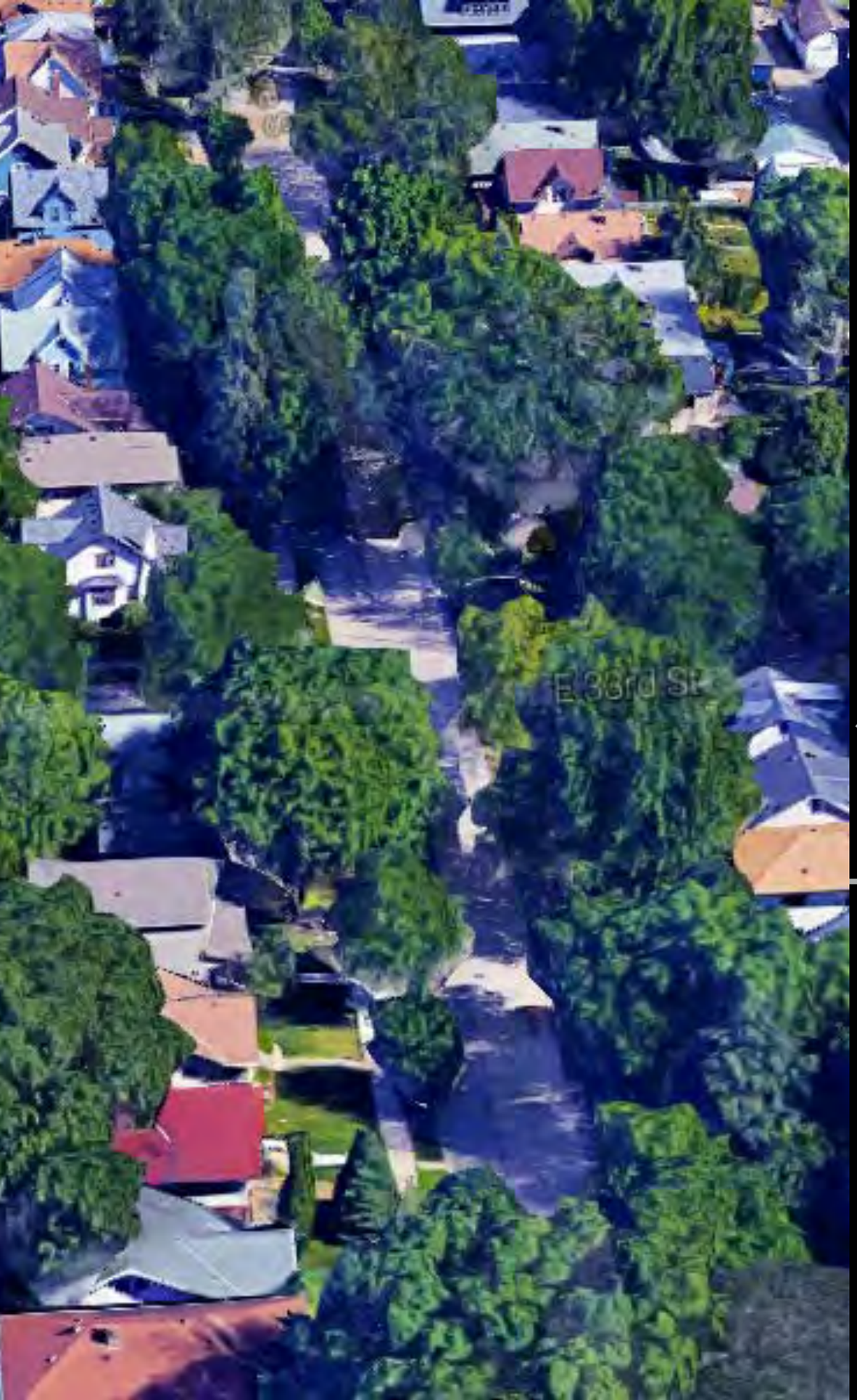
DIVERSITY

STREET TREES

NEIGHBORHOOD

INVENTORY

WHAT'S OUT THERE



DIVERSITY

STREET TREES

NEIGHBORHOOD

10% RULE

LIMIT NOT GOAL

RSITY

ES

10% RULE

LIMIT NOT GOAL

DIVERSITY

STREET TREES

BLOCK

DIVERSITY

STREET TREES

BLOCK

5 / GENUS

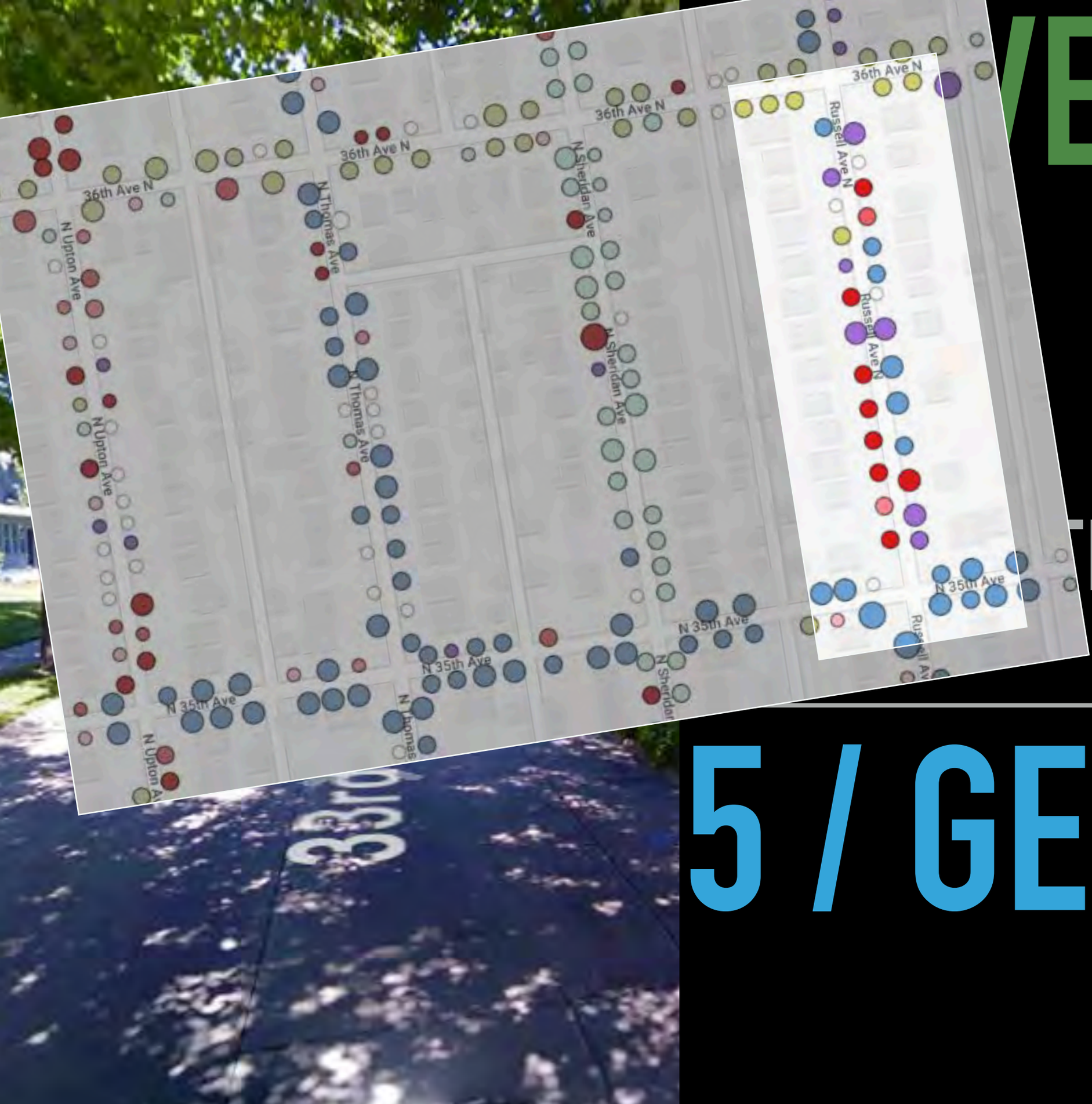
LIMIT

VERSITY

TREES

5 / GENUS

LIMIT



VERSITY

TREES

5 / GENUS

LIMIT

VERSITY

TREES

5 / GENUS

LIMIT

DIVERSITY

STREET TREES

BLOCK

5 ALB

LIMIT

VERSITY

TREES

5 ALB

LIMIT

VERSITY

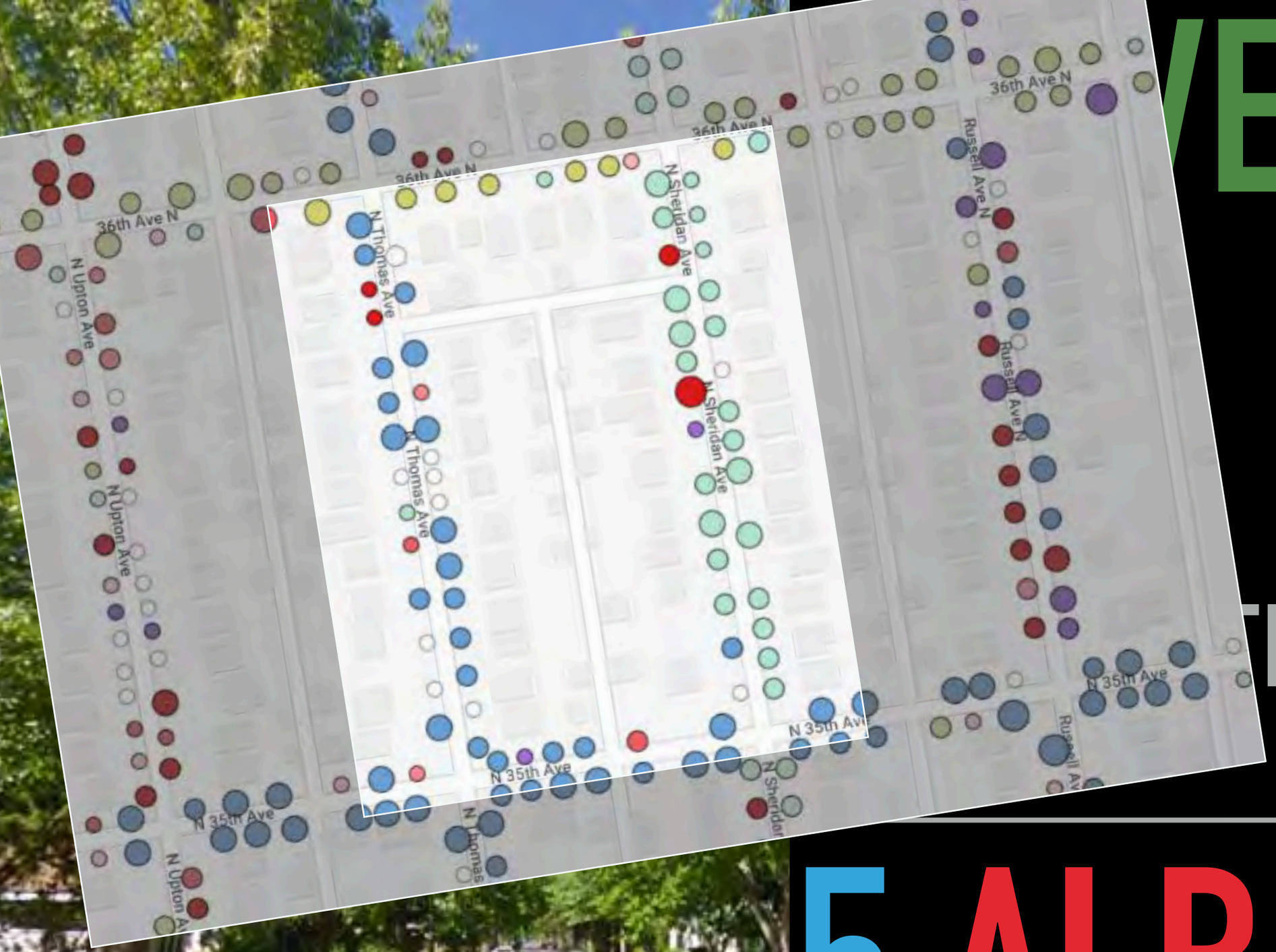
Maple
Linden
Oak
Elm
Birch
Buckeye
Honeylocust
Hackberry
Others

TREES

5 ALB

LIMIT

VERSITY



- Maple
- Linden
- Oak
- Elm
- Birch
- Buckeye
- Honeylocust
- Hackberry
- Others

REES

5 ALB

LIMIT

STREET

PARKLAND

EET

STR

STREET

LAND

WOODLAND

PARK

WOODLAND

CANOPY GAPS

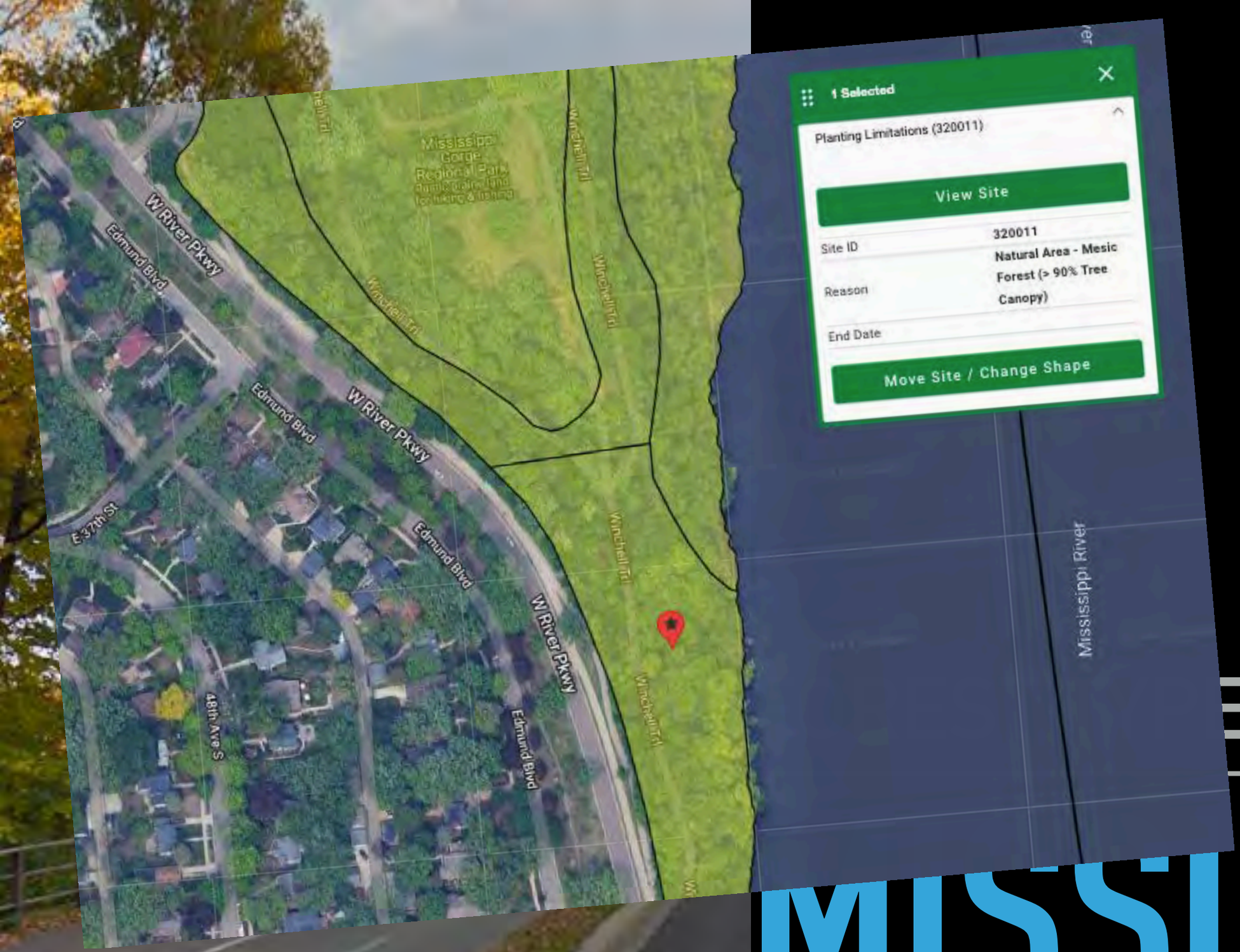
CANOPY GAPS

REGENERATION

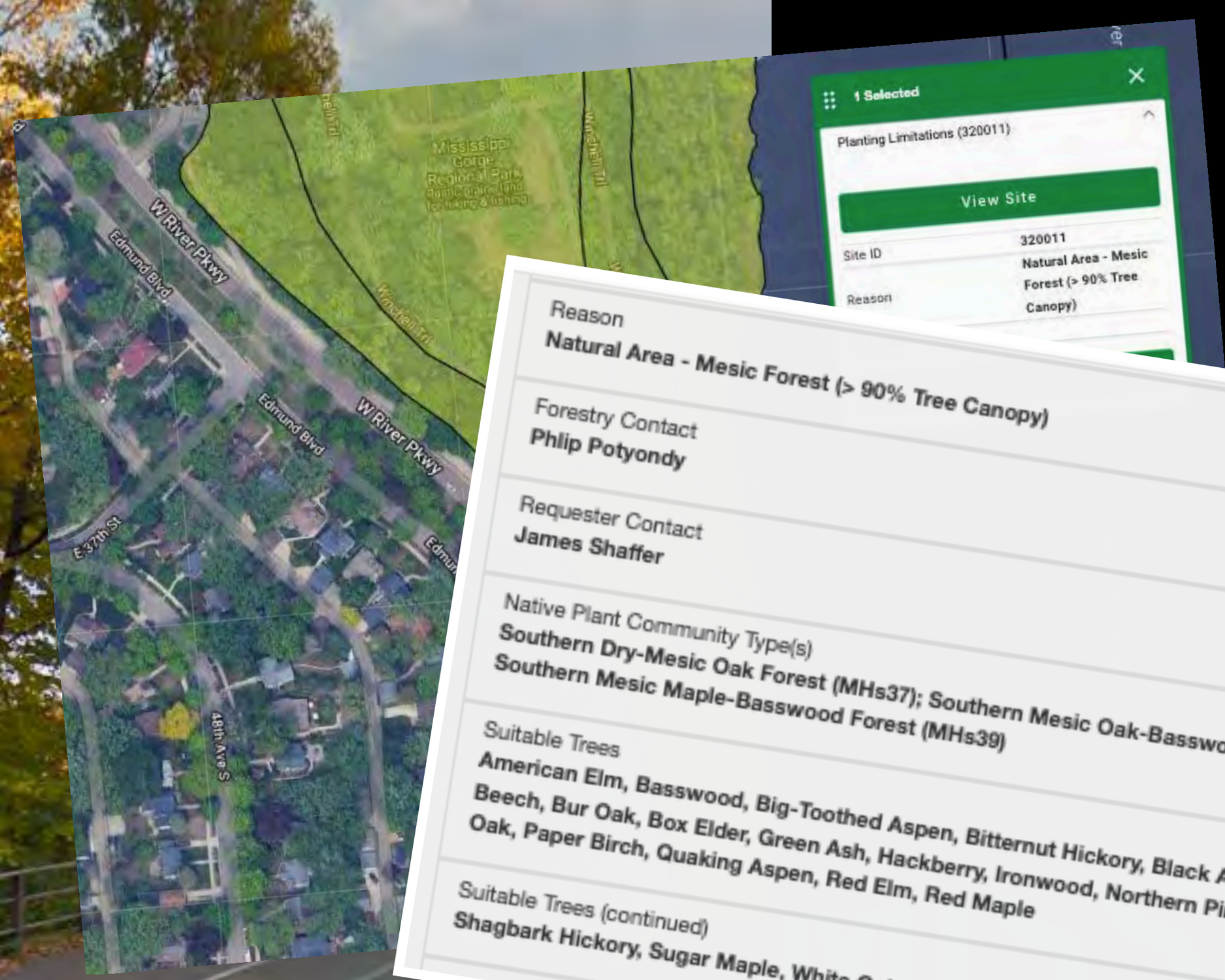
FOREST TYPE

FOREST TYPE

MISSING


1 Selected
Planting Limitations (320011)
View Site
Site ID
320011
Reason
Natural Area - Mesic Forest (> 90% Tree Canopy)
End Date
Move Site / Change Shape
W River Pkwy
Edmund Blvd
Winchell Trl
Mississippi Gorge Regional Park
E 37th St
48th Ave S
Mississippi River

MISSING



Reason

Natural Area - Mesic Forest (> 90% Tree Canopy)

Forestry Contact

Phlip Potyondy

Requester Contact

James Shaffer

Native Plant Community Type(s)

Southern Dry-Mesic Oak Forest (MHs37); Southern Mesic Oak-Basswood Forest (MHs38); Southern Mesic Maple-Basswood Forest (MHs39)

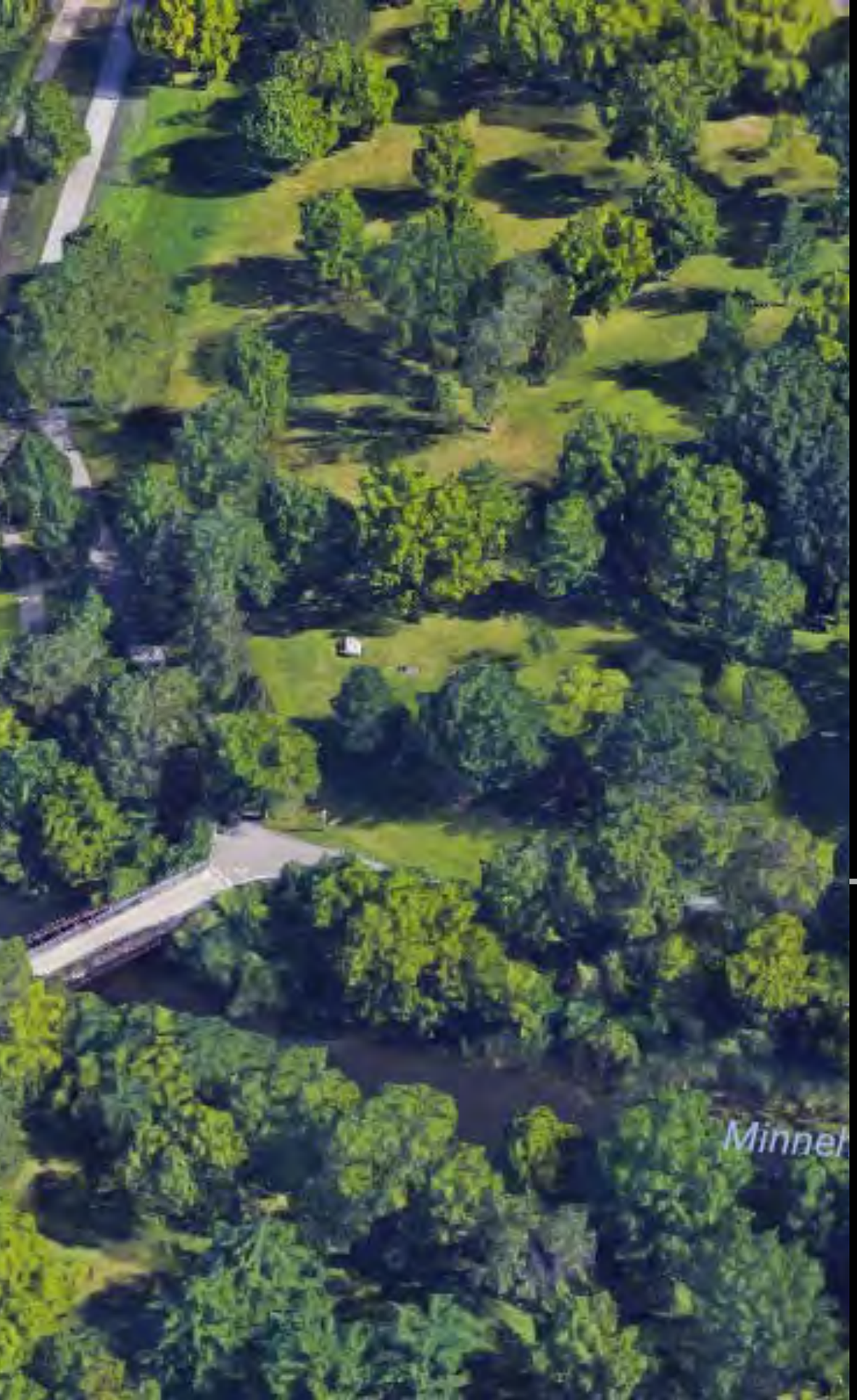
Suitable Trees

American Elm, Basswood, Big-Toothed Aspen, Bitternut Hickory, Black Ash, Black Cherry, Blue Beech, Bur Oak, Box Elder, Green Ash, Hackberry, Ironwood, Northern Pin Oak, Northern Red Oak, Paper Birch, Quaking Aspen, Red Elm, Red Maple

Suitable Trees (continued)

Shagbark Hickory, Sugar Maple, White Oak, White Pine

PARKLAND



HIGHEST DIVERSITY

POTENTIAL

WOODLAND CHARACTER

EMULATE REFERENCE

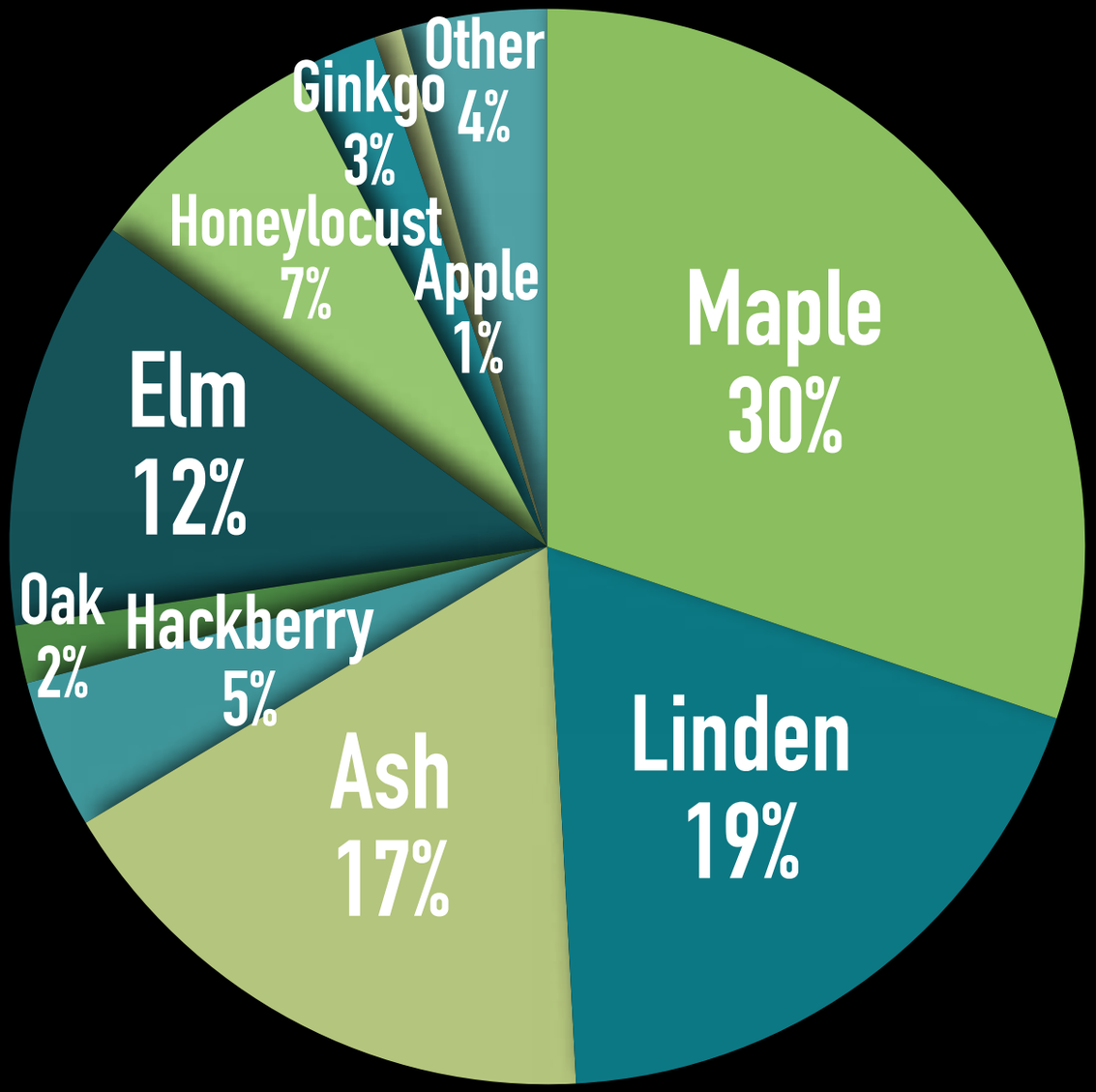
DISTURBANCE

TOUGH TREES RESEARCH

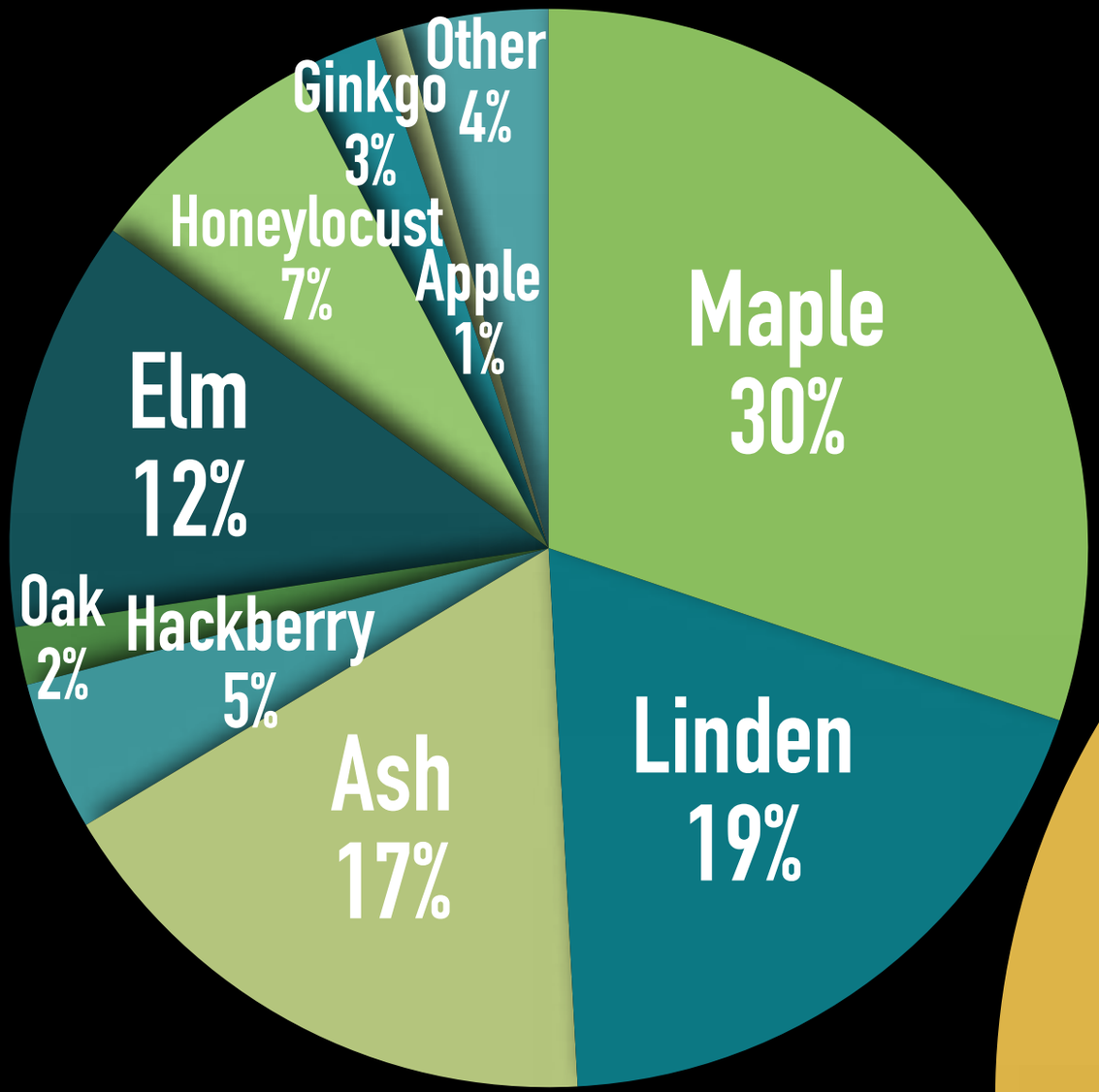
STREET

WOODLAND

PARKLAND


Maple
30%
Linden
19%
Ash
17%
Hackberry
5%
Oak
2%
Elm
12%
Honeylocust
7%
Ginkgo
3%
Other
4%
Apple
1%

2004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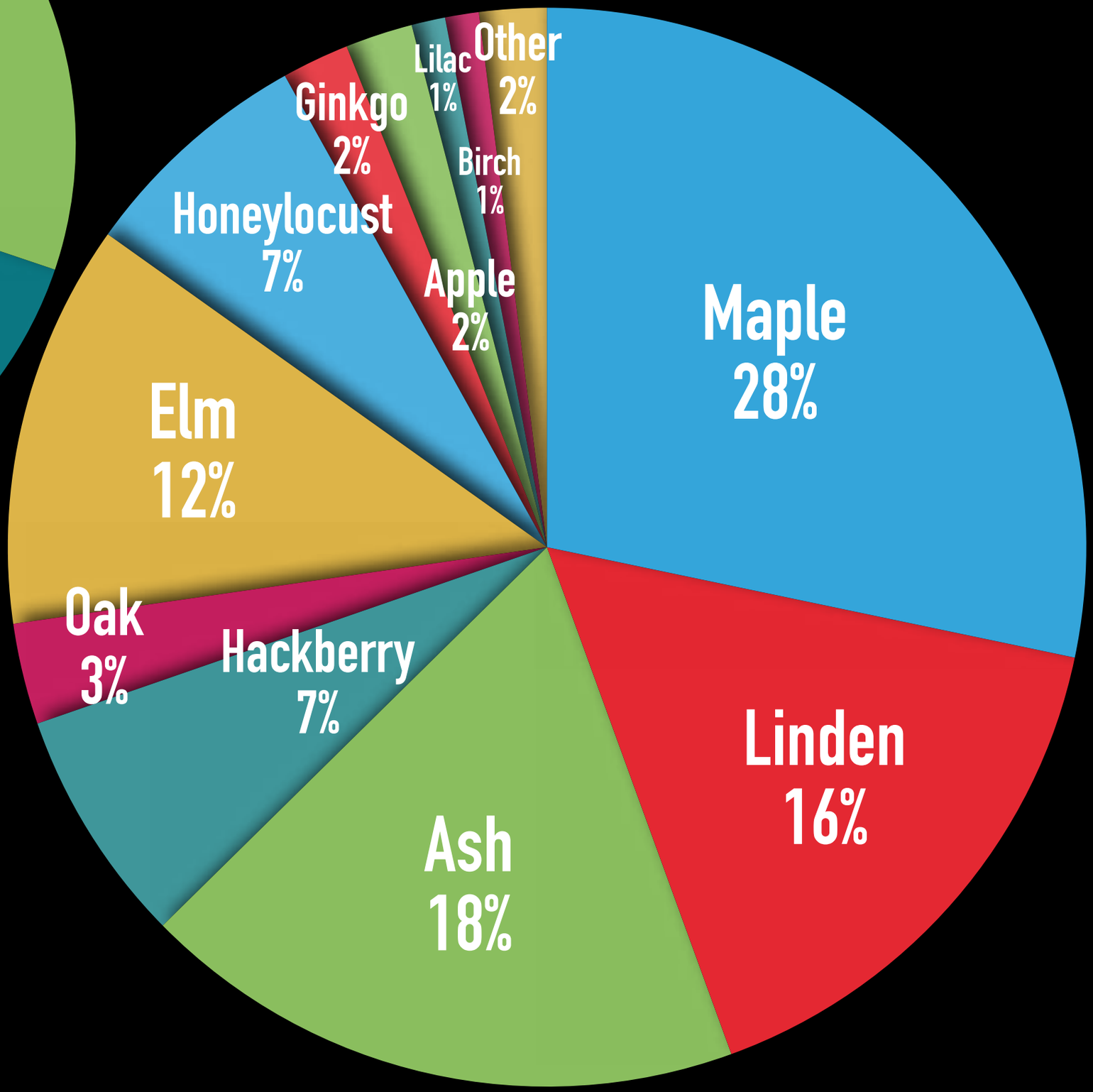
2004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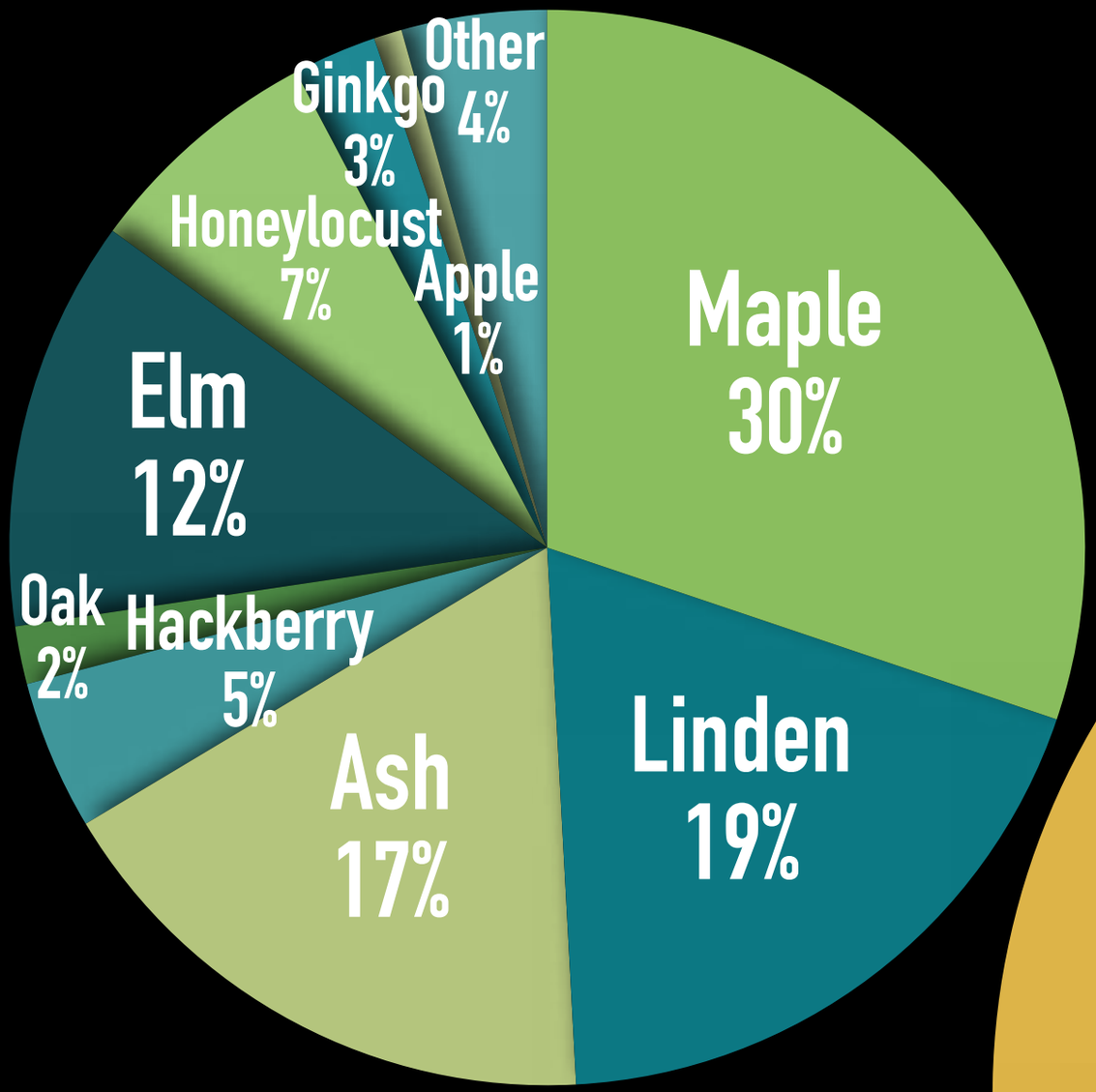
Ginkgo
2%
Lilac
1%
Other
2%
Birch
1%
Apple
2%

2010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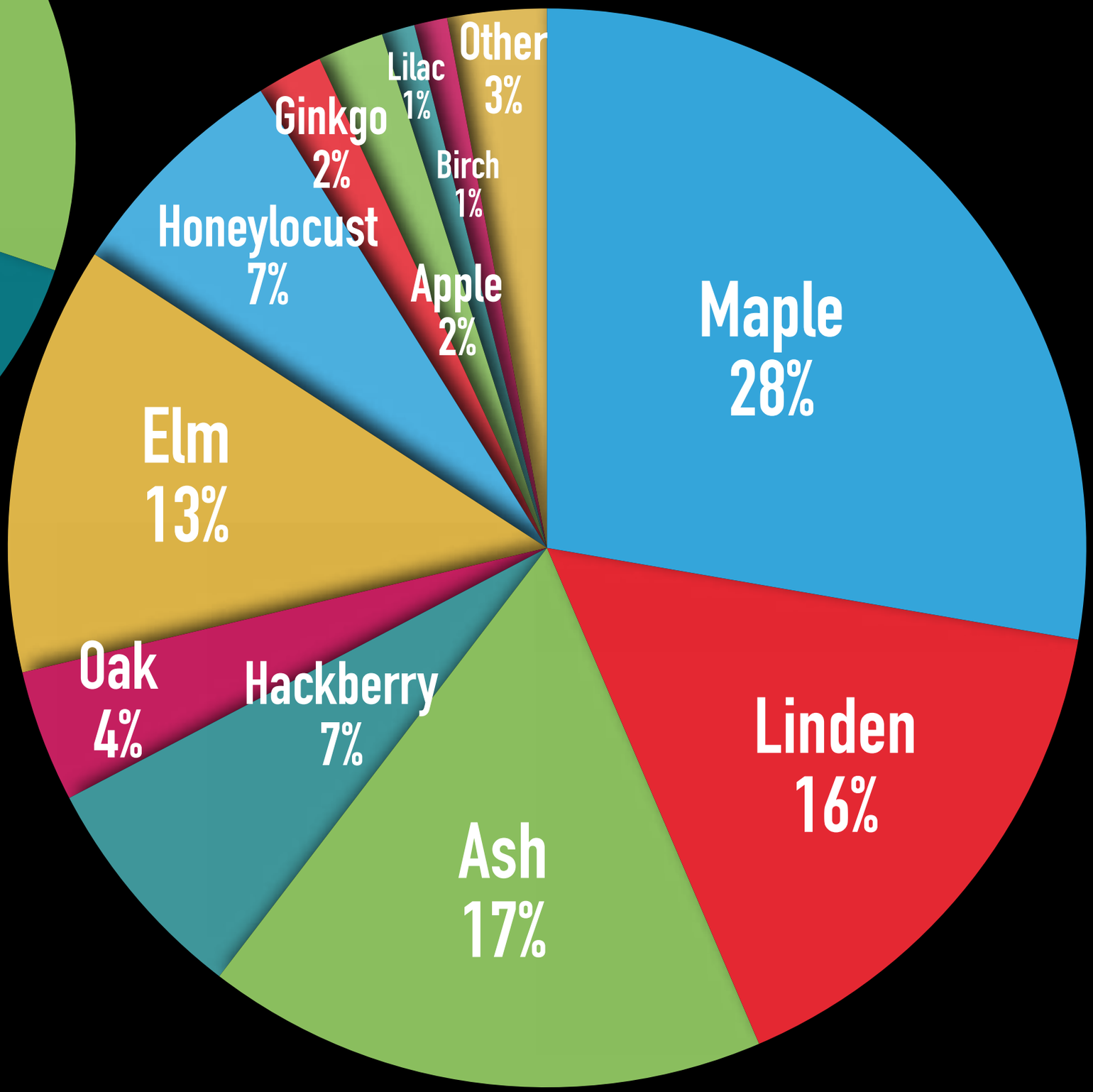
2004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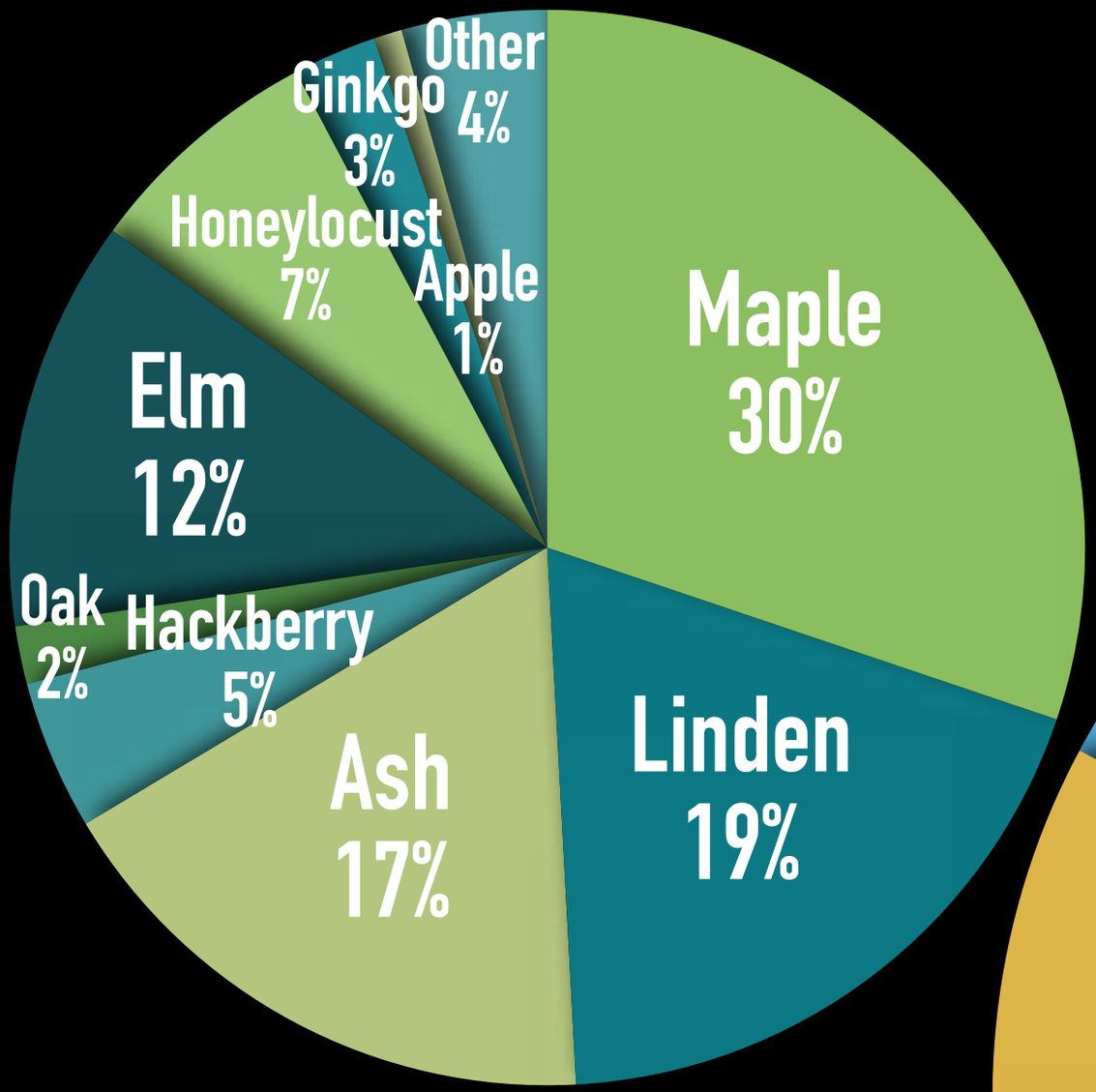
2011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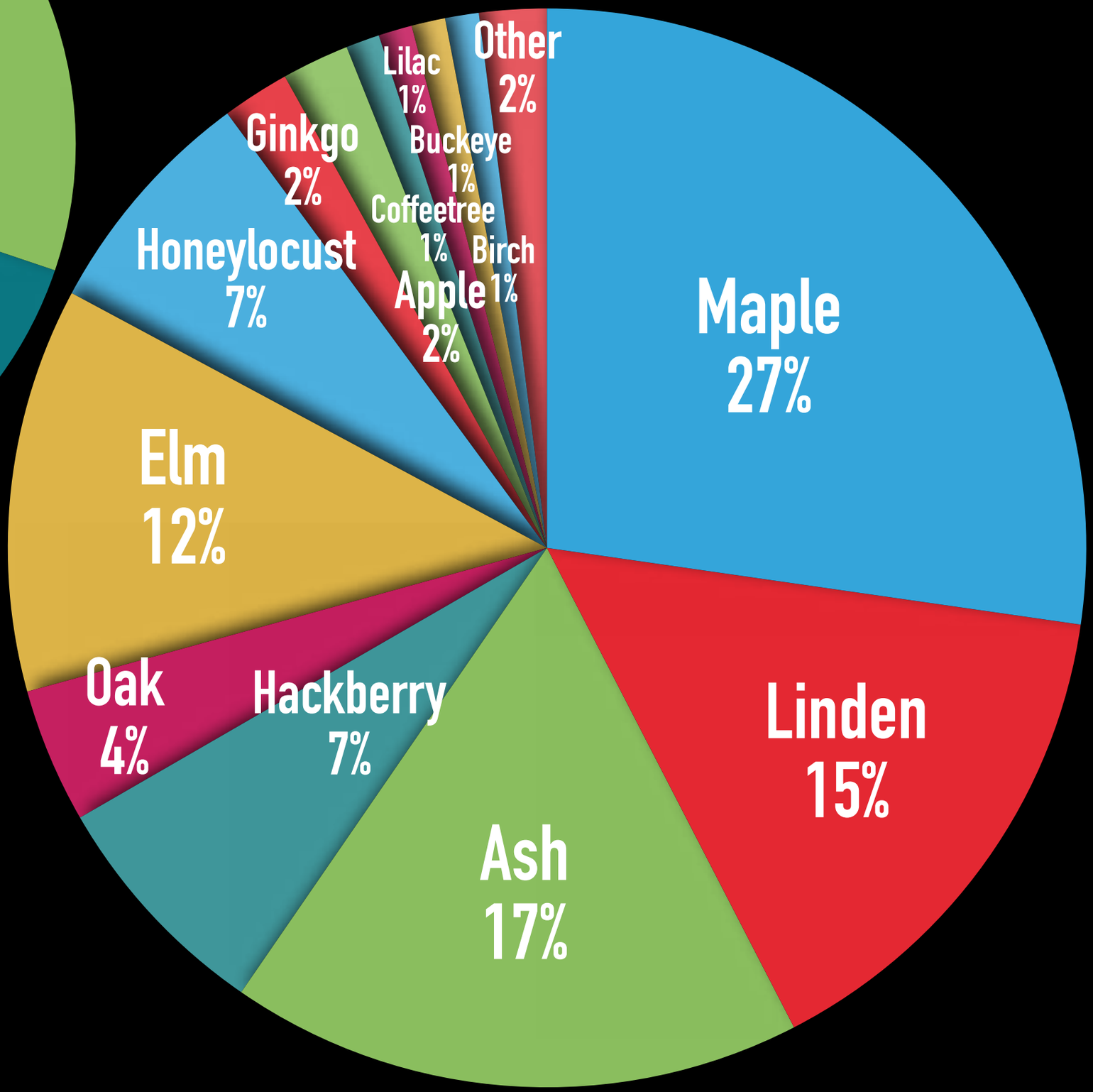
2004

2012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Coffeetree
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Birch
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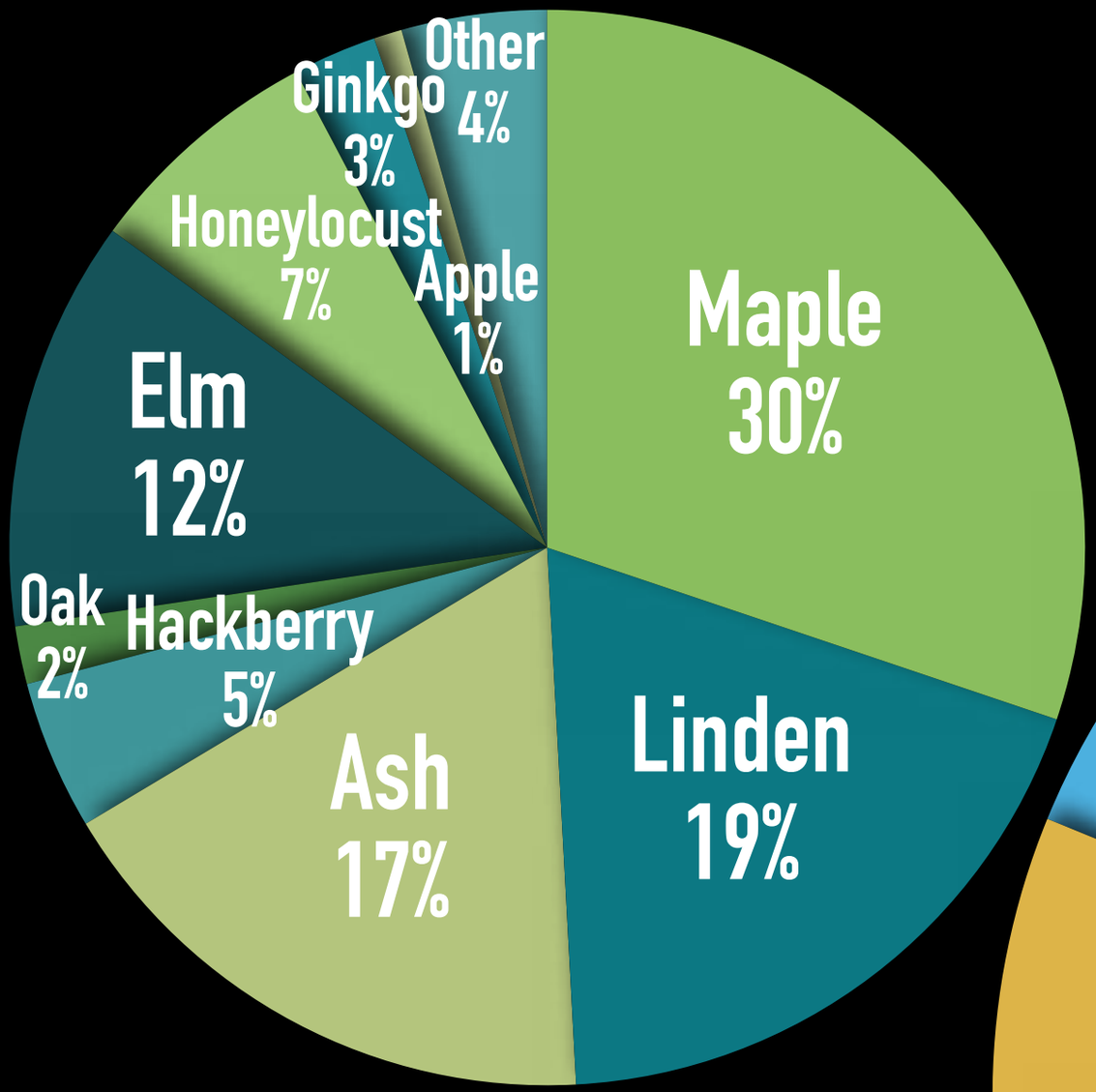
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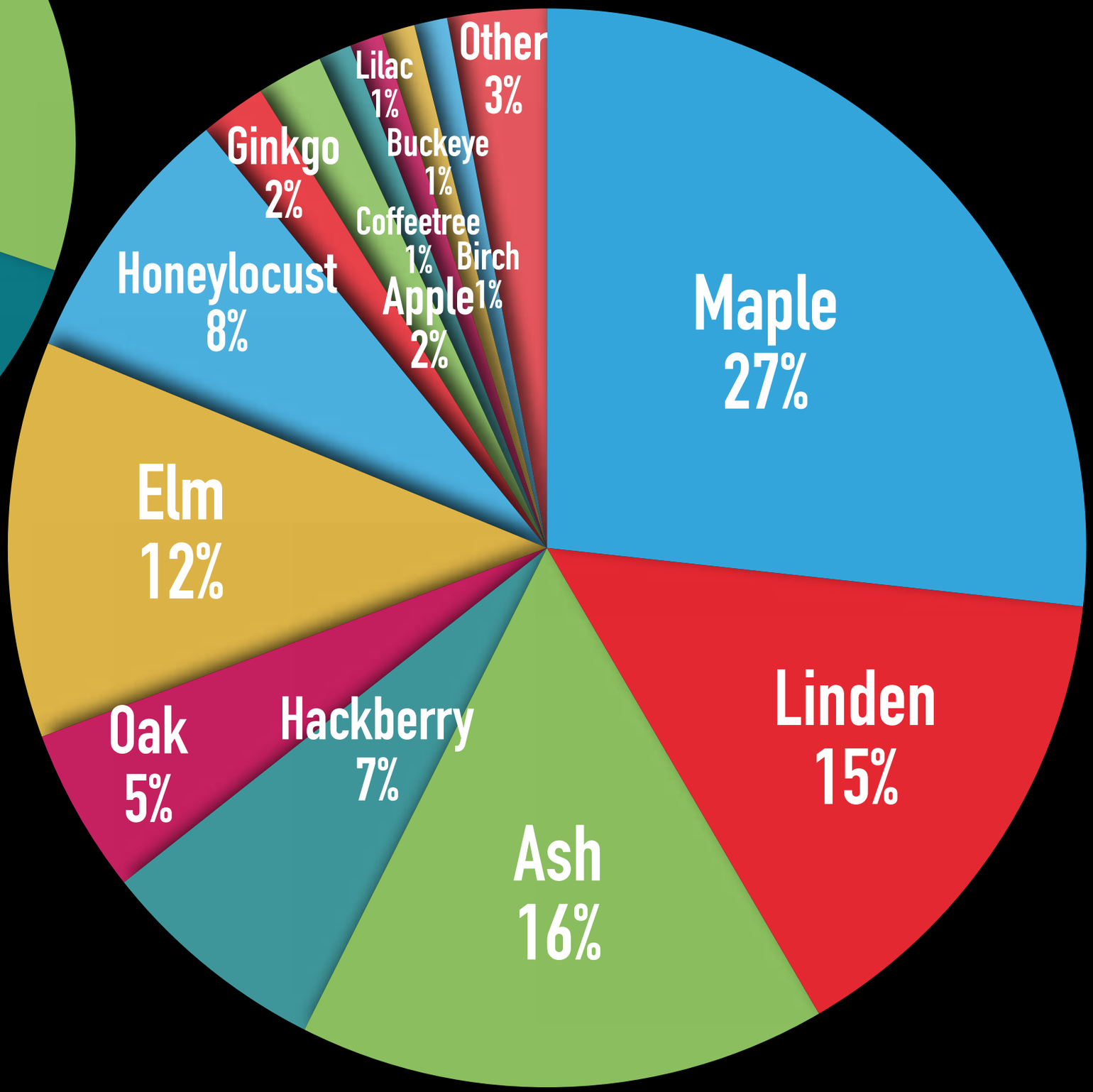
2004

2013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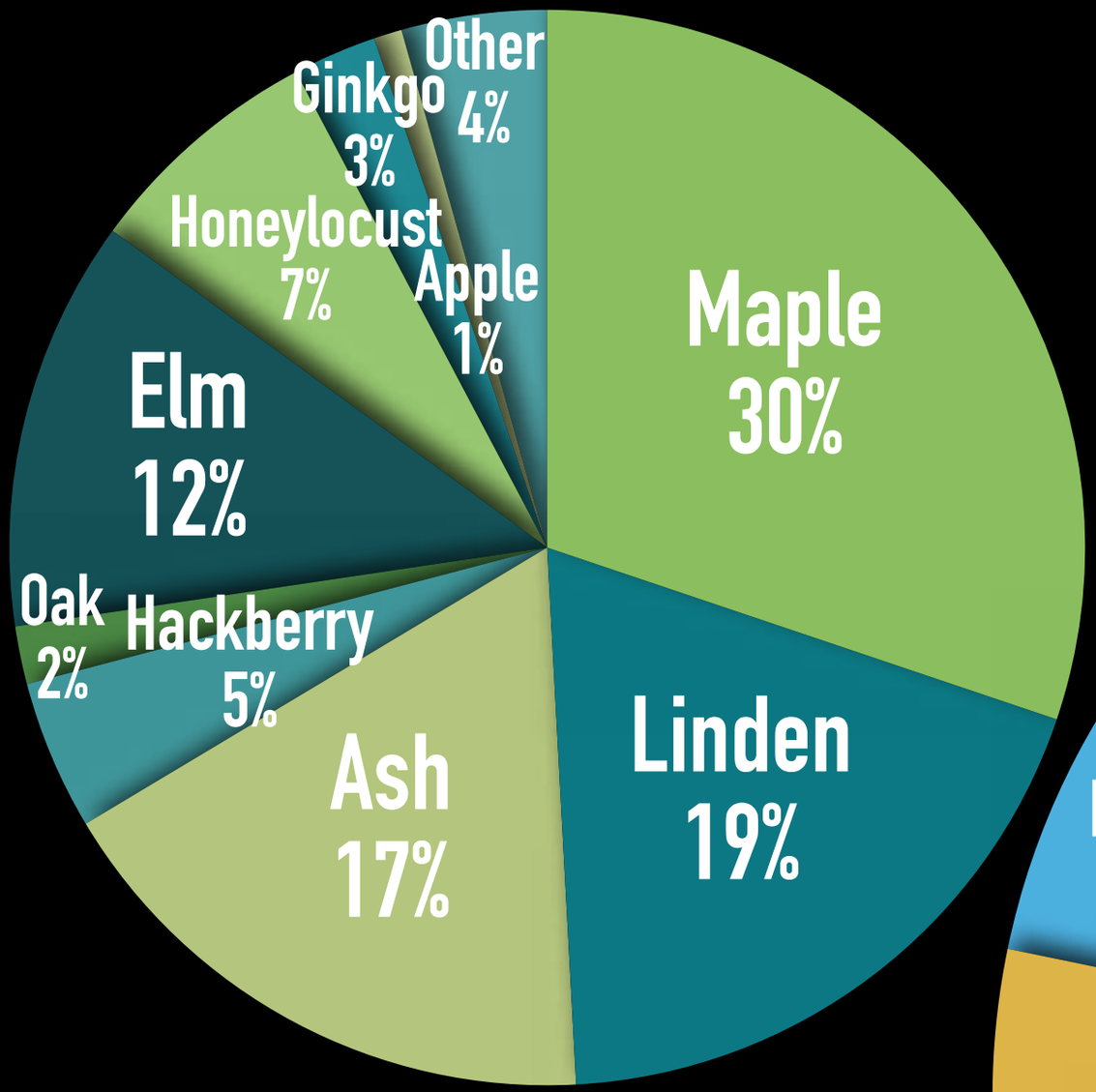
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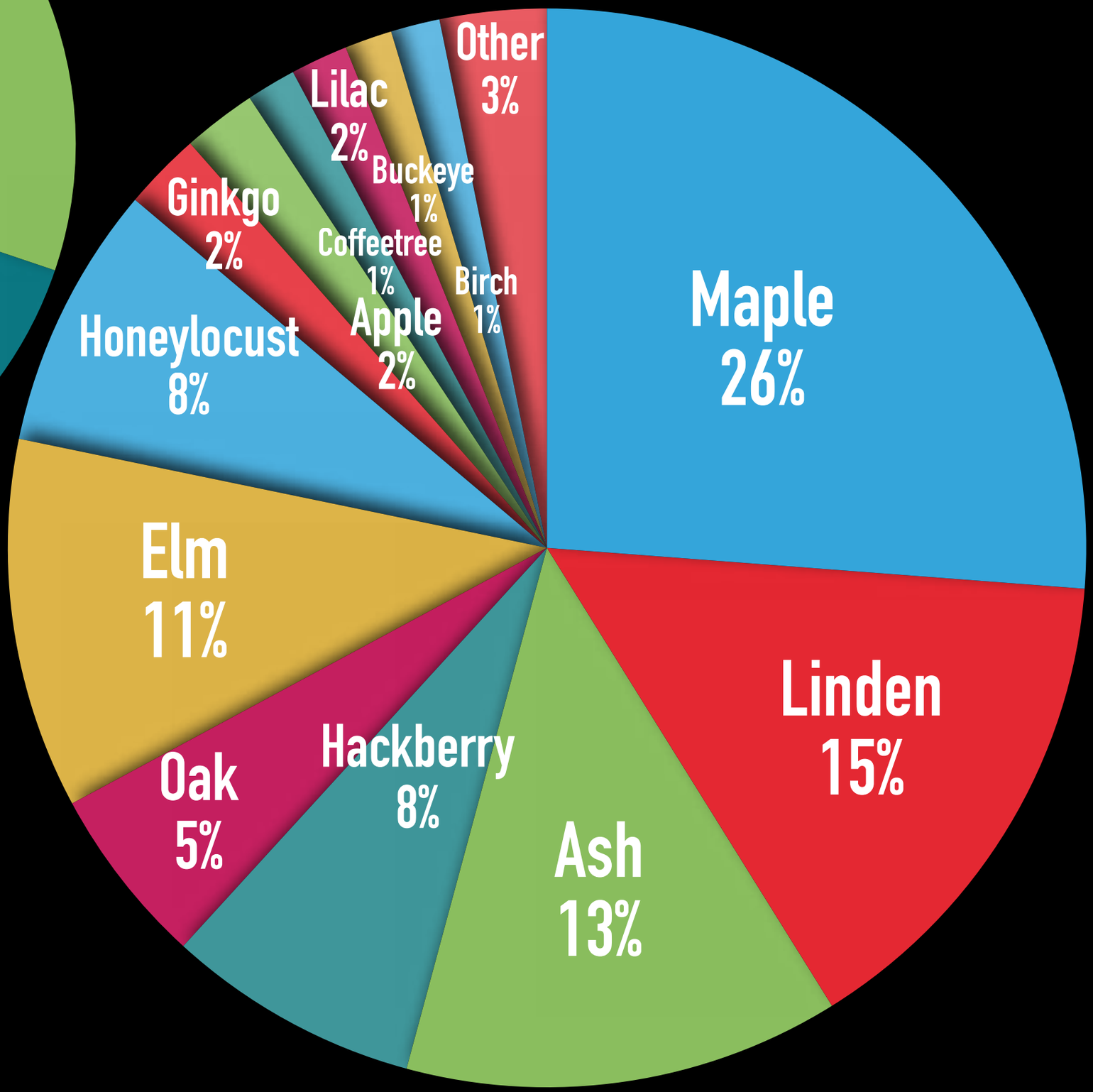
2004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Apple
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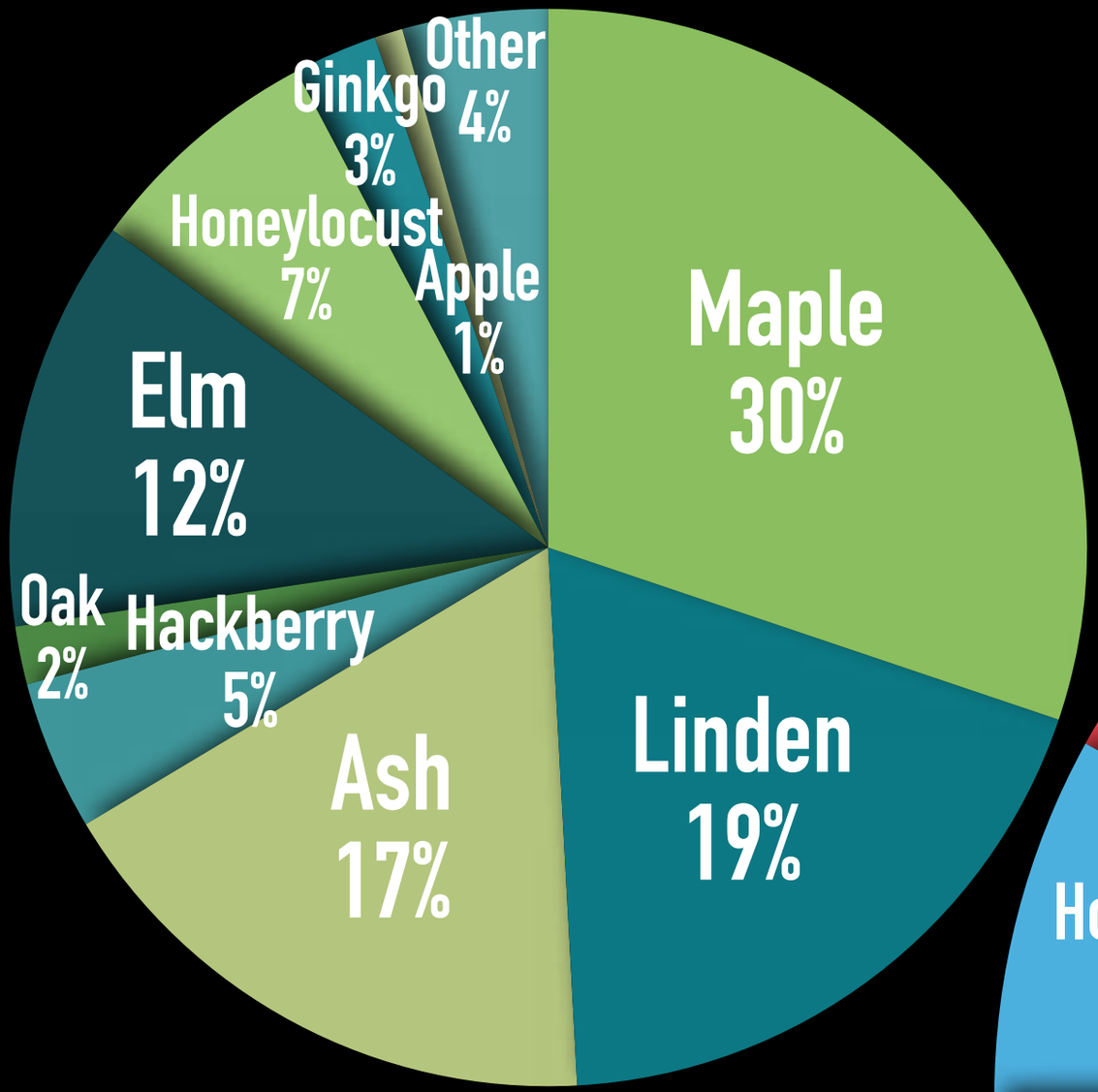
2014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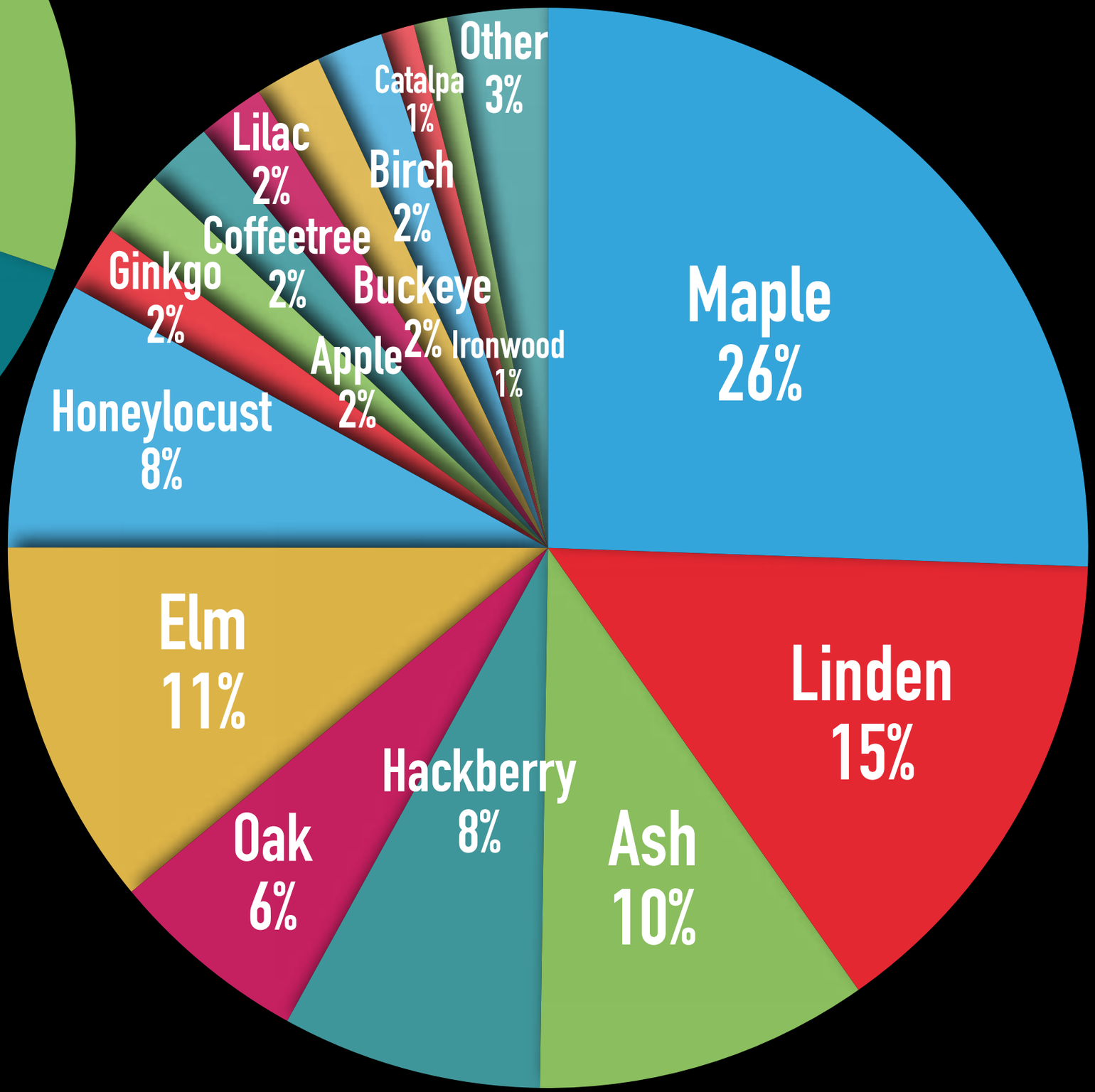
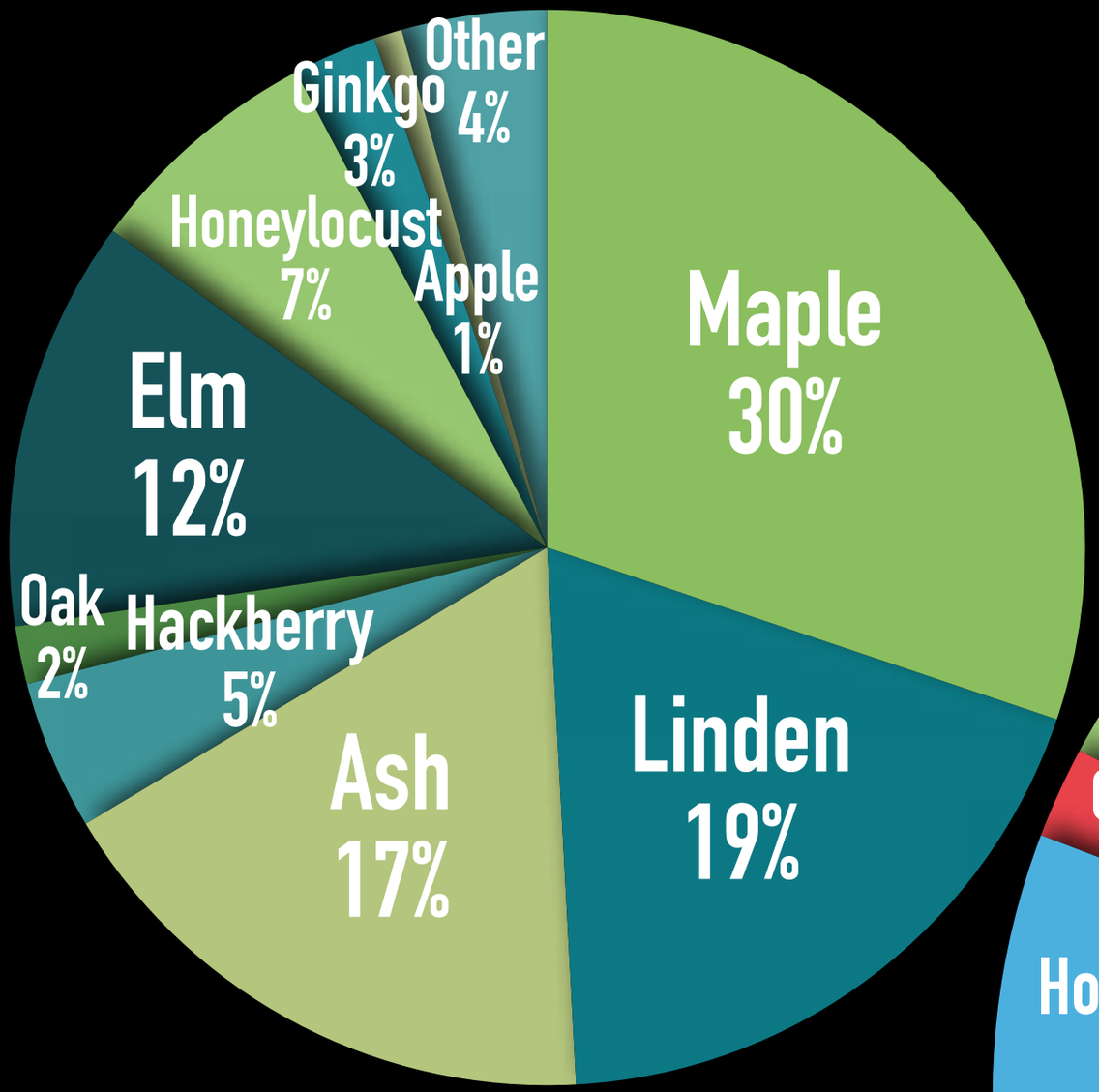
12%
Honeylocust
7%
Ginkgo
3%
Other
4%
Apple
1%

2004

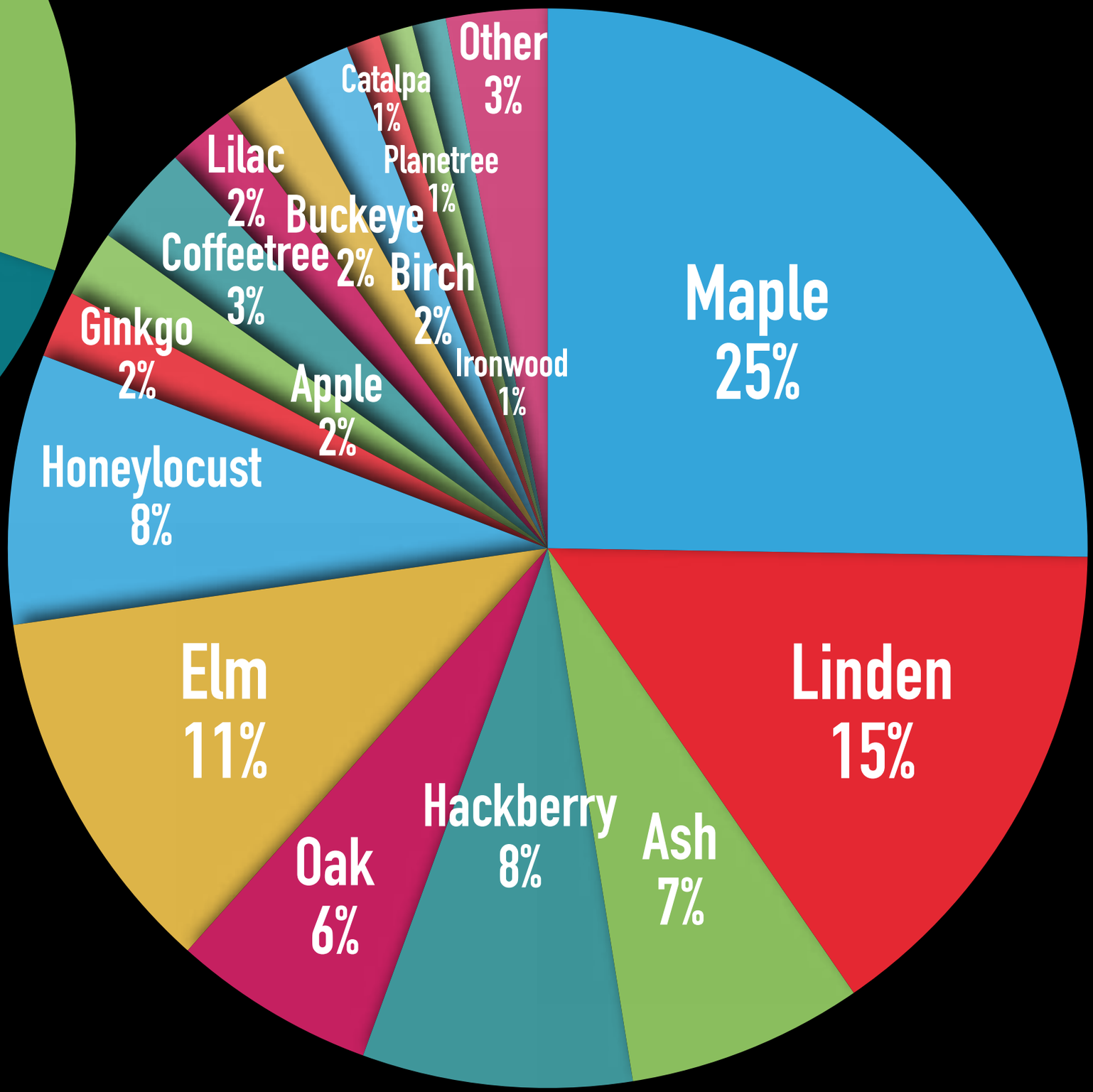

Maple
26%
Linden
15%
Ash
10%
Hackberry
8%
Oak
6%
Elm
11%
Honeylocust
8%
Ginkgo
2%
Coffeetree
2%
Lilac
2%
Apple
2%
Buckeye
2%
Birch
2%
Catalpa
1%
Ironwood
1%
Other
3%

2015


Maple
30%
Linden
19%
Ash
17%
Hackberry
5%
Oak
2%
Elm
12%
Honeylocust
7%
Ginkgo
3%
Other
4%
Apple
1%

2004

2016


Maple
25%
Linden
15%
Ash
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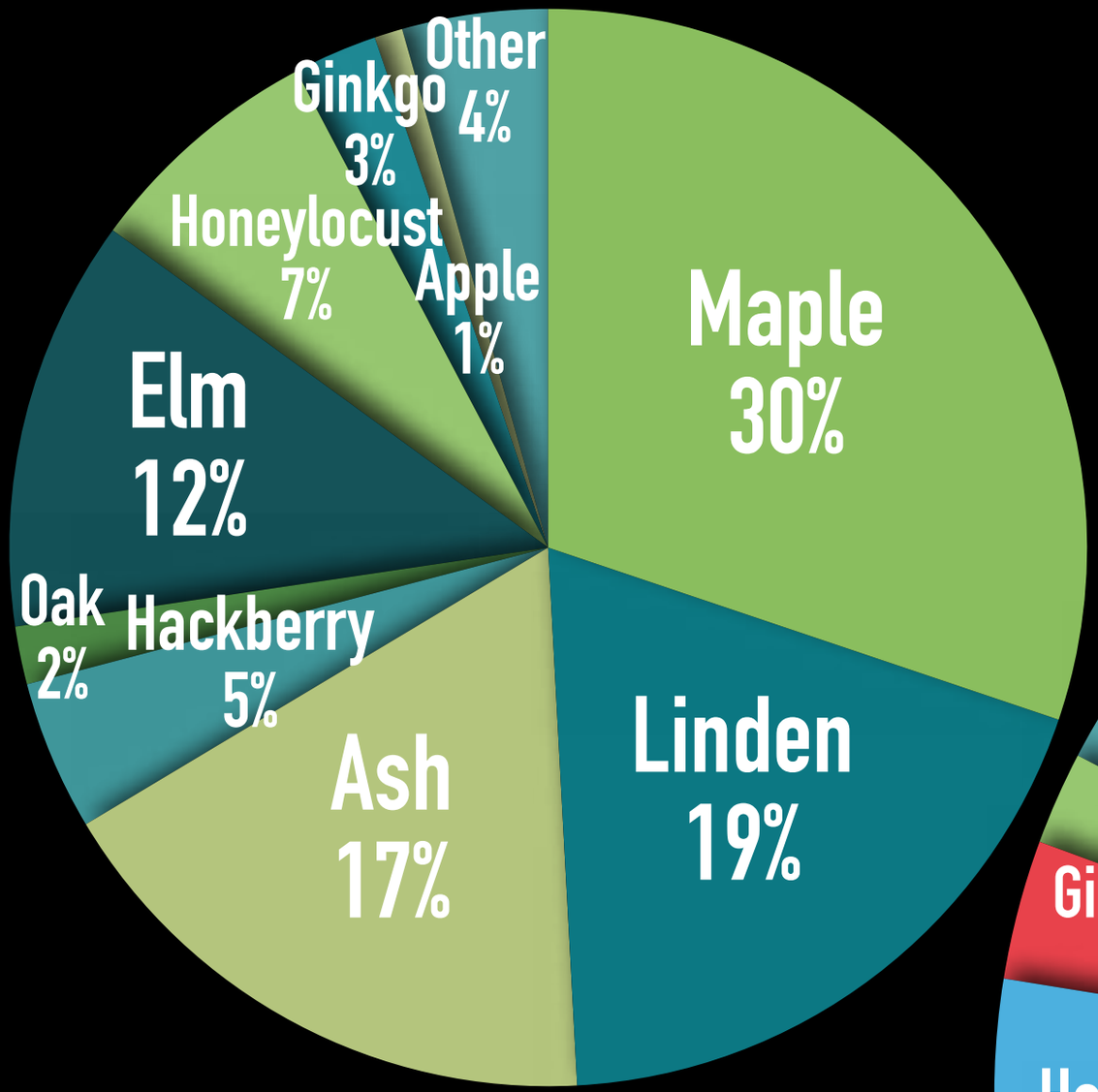
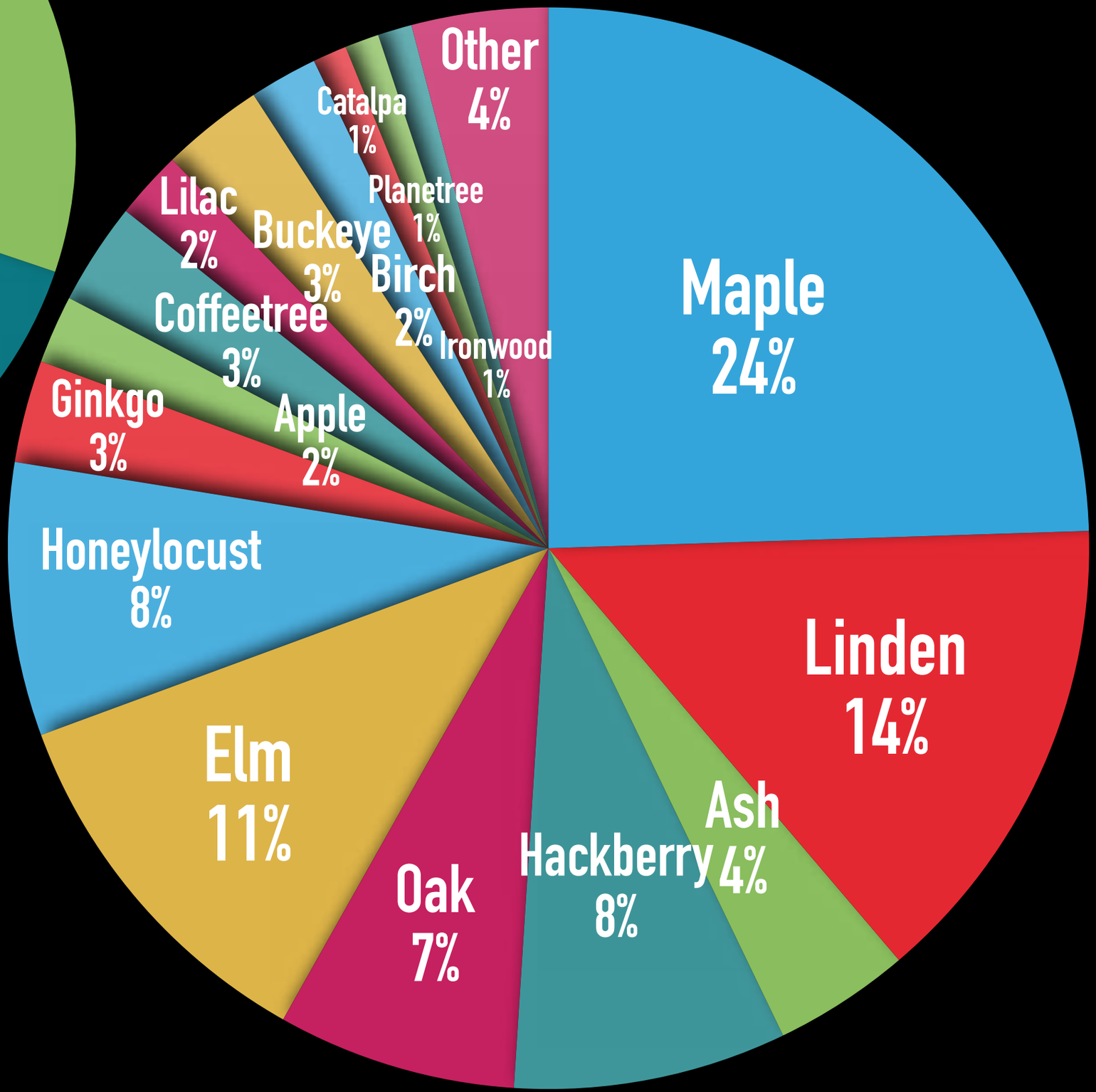
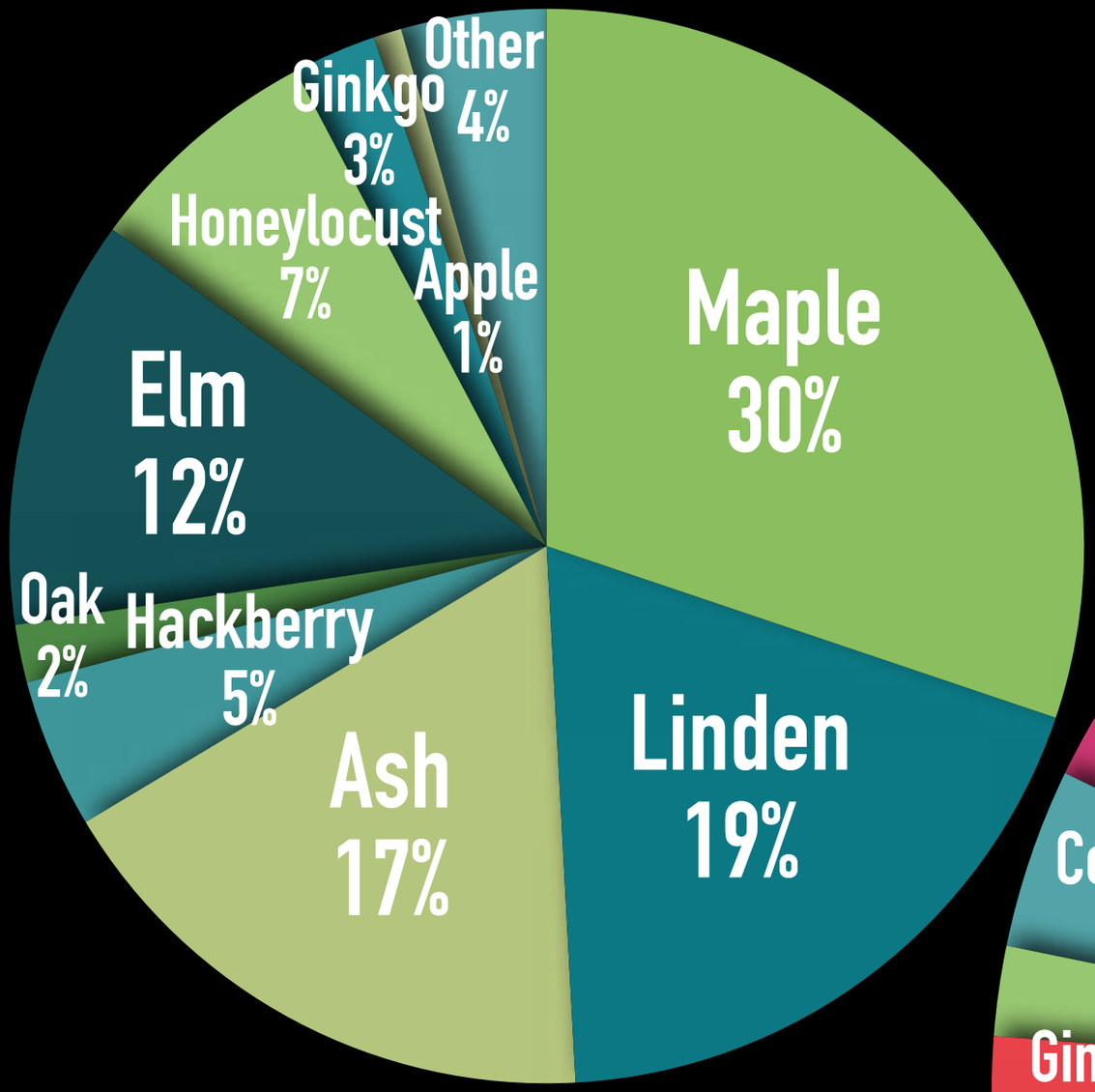
Hackberry
8%
Oak
6%
Elm
11%
Honeylocust
8%
Ginkgo
2%
Coffeetree
3%
Lilac
2%
Buckeye
2%
Apple
2%
Birch
2%
Catalpa
1%
Planetree
1%
Ironwood
1%
Other
3%


Other
4%
Ginkgo
3%
Honeylocust
7%
Apple
1%
Maple
30%
Elm
12%
Oak
2%
Hackberry
5%
Linden
19%
Ash
17%

2004


2017
Other
4%
Catalpa
1%
Planetree
1%
Lilac
2%
Buckeye
3%
Birch
2%
Coffeetree
3%
Ironwood
1%
Ginkgo
3%
Apple
2%
Maple
24%
Honeylocust
8%
Linden
14%
Elm
11%
Ash
4%
Oak
7%
Hackberry
8%


Maple
30%
Linden
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Ash
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Hackberry
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Oak
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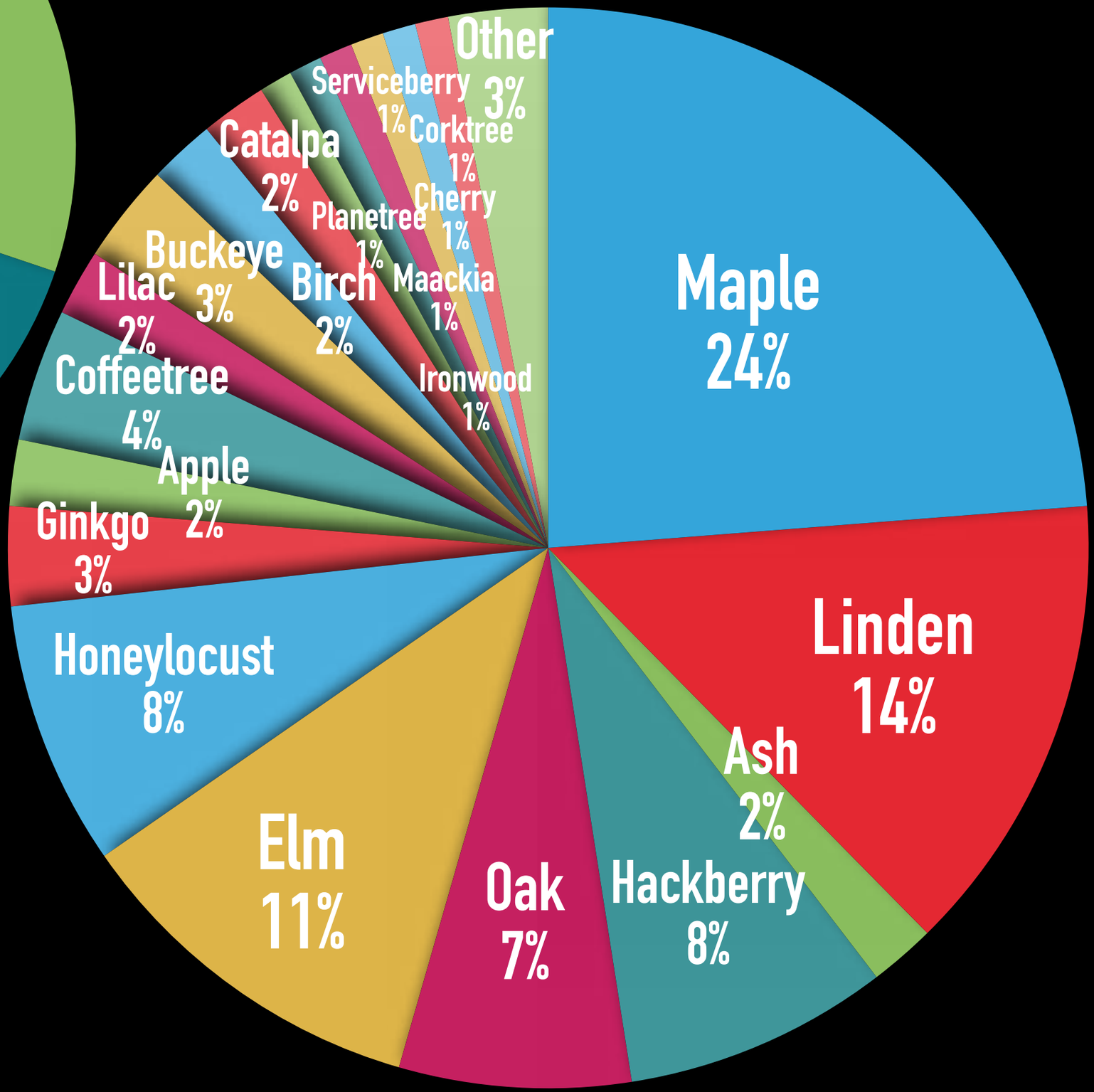
Elm
12%
Honeylocust
7%
Ginkgo
3%
Other
4%
Apple
1%

2004

2018


Maple
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Linden
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Ash
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Hackberry
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Oak
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Elm
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Honeylocust
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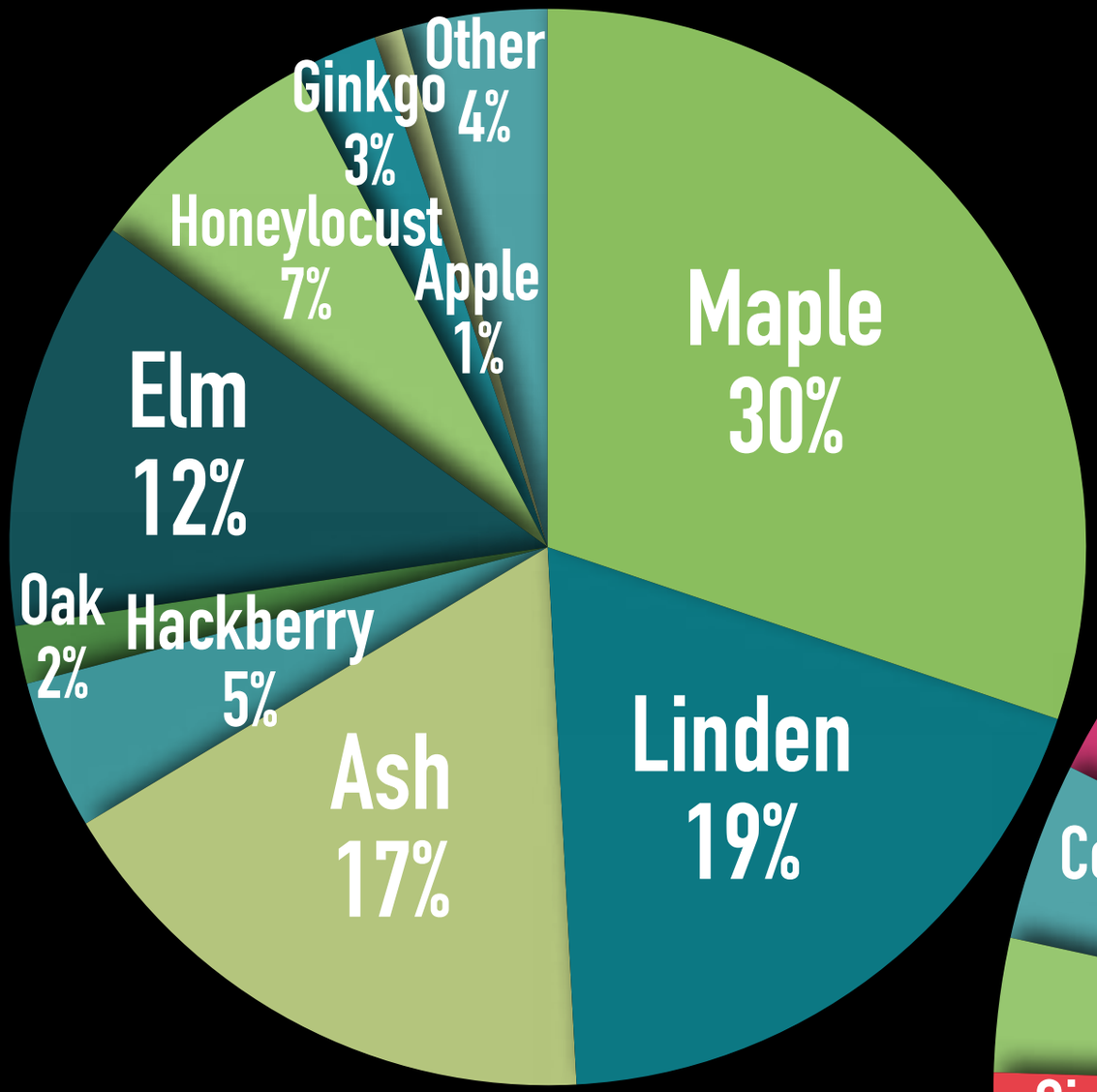
Ginkgo
3%
Apple
2%
Coffeetree
4%
Lilac
2%
Buckeye
3%
Catalpa
2%
Birch
2%
Planetree
1%
Serviceberry
1%
Other
3%
Corktree
1%
Cherry
1%
Maackia
1%
Ironwood
1%


Maple
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Linden
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Ash
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Hackberry
5%
Oak
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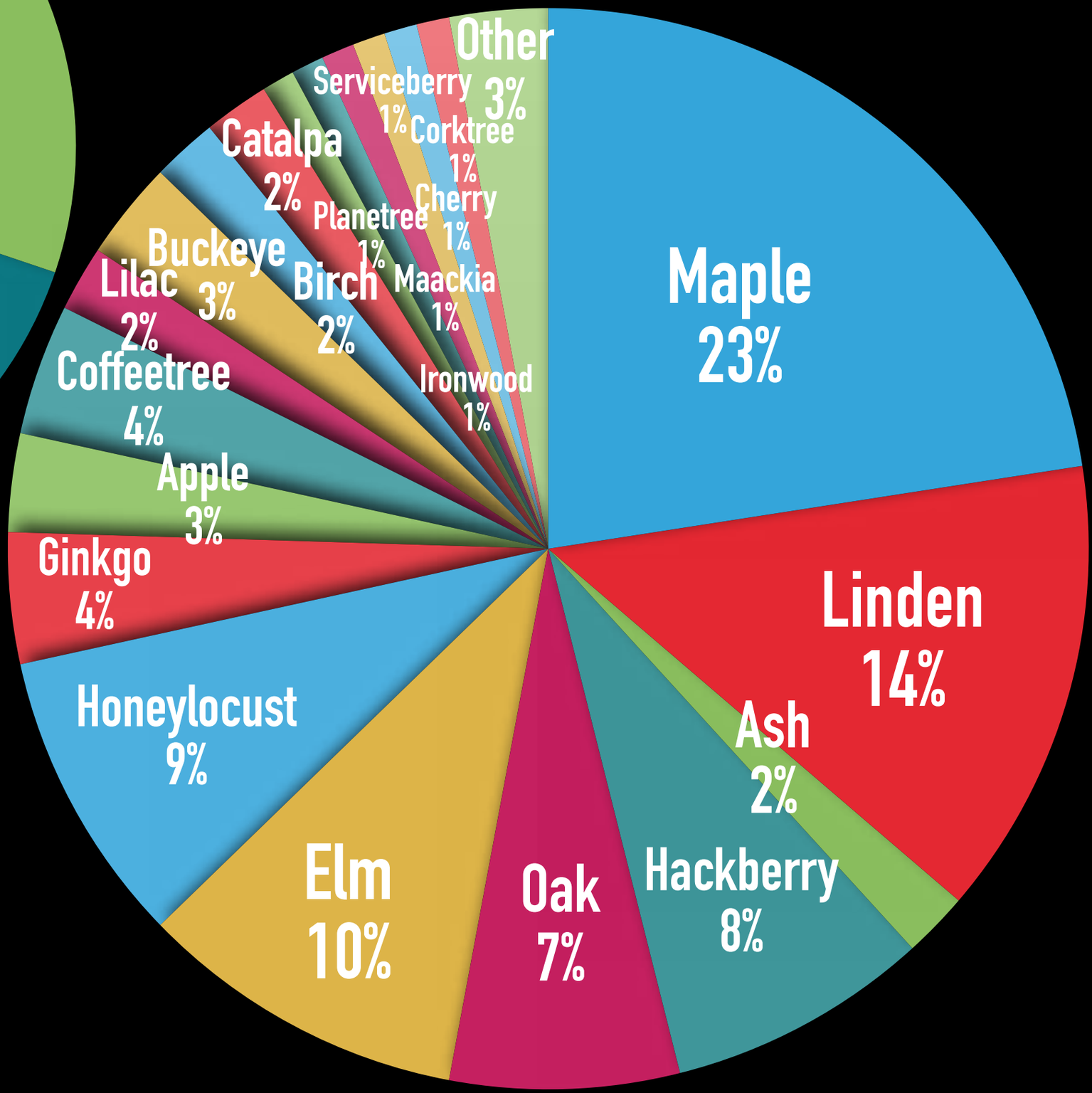
Elm
12%
Honeylocust
7%
Ginkgo
3%
Other
4%
Apple
1%

2004


Maple
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Linden
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Ash
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Hackberry
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Oak
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Elm
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Honeylocust
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Ginkgo
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Apple
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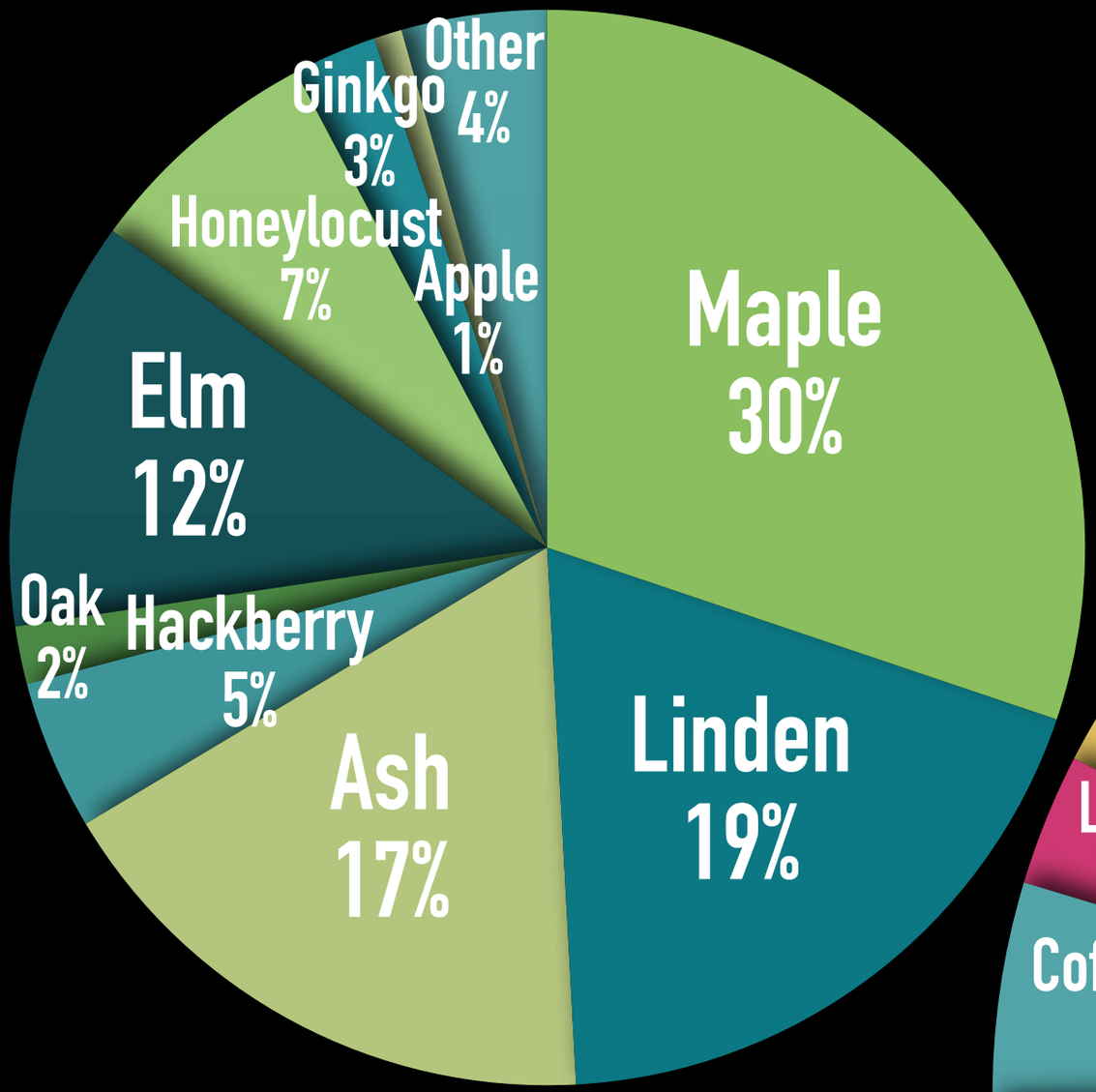
Coffeetree
4%
Lilac
2%
Buckeye
3%
Catalpa
2%
Planetree
1%
Birch
2%
Maackia
1%
Ironwood
1%
Cherry
1%
Corktree
1%
Serviceberry
1%
Other
3%

2019


Maple
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Linden
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Ash
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Hackberry
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Oak
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Elm
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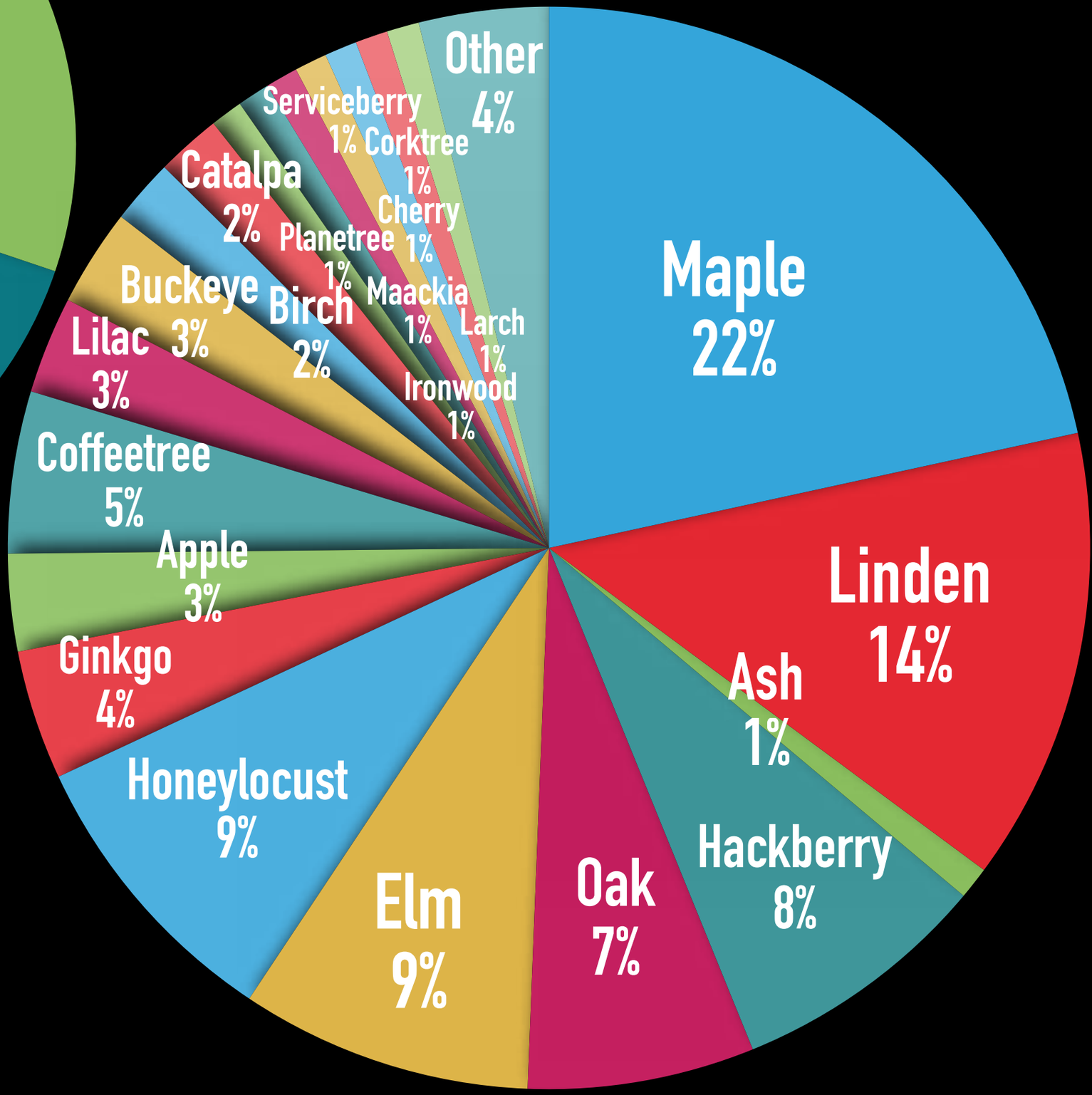
Honeylocust
7%
Ginkgo
3%
Other
4%
Apple
1%

2004


Maple
22%
Linden
14%
Ash
1%
Hackberry
8%
Oak
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Elm
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Honeylocust
9%
Ginkgo
4%
Apple
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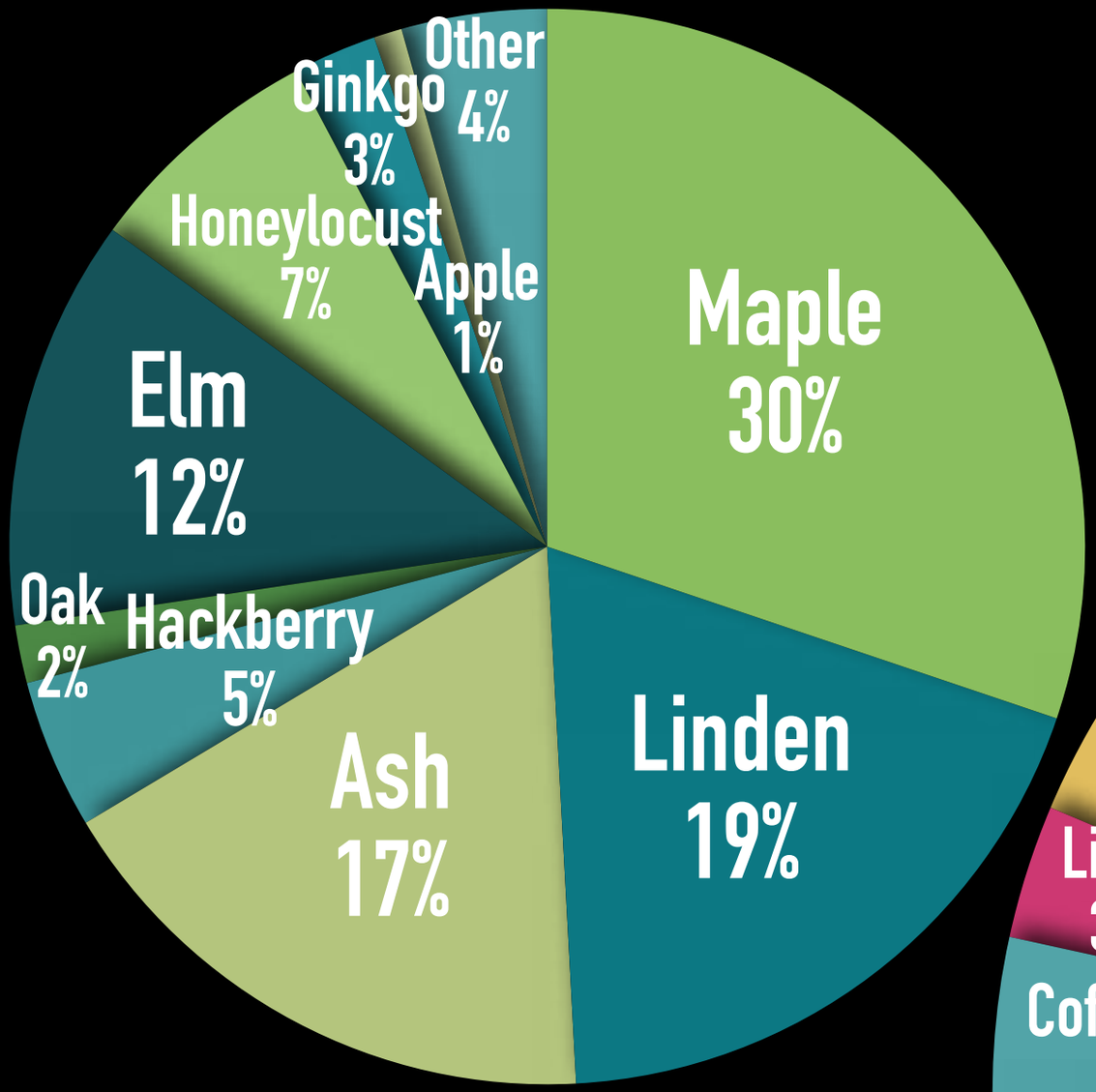
Coffeetree
5%
Lilac
3%
Buckeye
3%
Catalpa
2%
Birch
2%
Planetree
1%
Serviceberry
1%
Corktree
1%
Cherry
1%
Maackia
1%
Larch
1%
Ironwood
1%
Other
4%

2020


Maple
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Linden
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Ash
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Hackberry
5%
Oak
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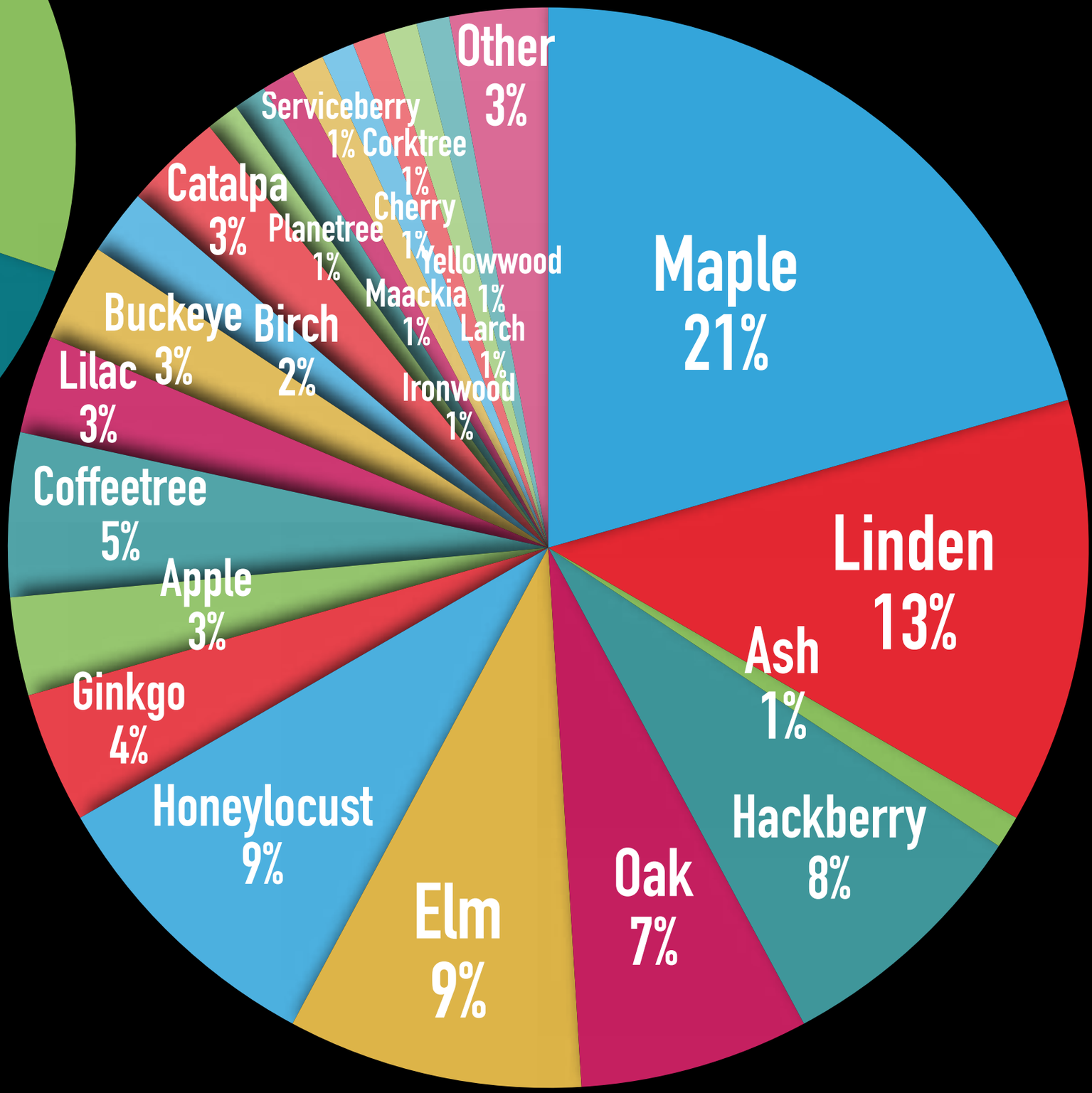
Elm
12%
Honeylocust
7%
Ginkgo
3%
Other
4%
Apple
1%

2004


Maple
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Linden
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Ash
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Hackberry
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Oak
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Ginkgo
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Apple
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Coffeetree
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Buckeye
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Birch
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Catalpa
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Planetree
1%
Serviceberry
1%
Corktree
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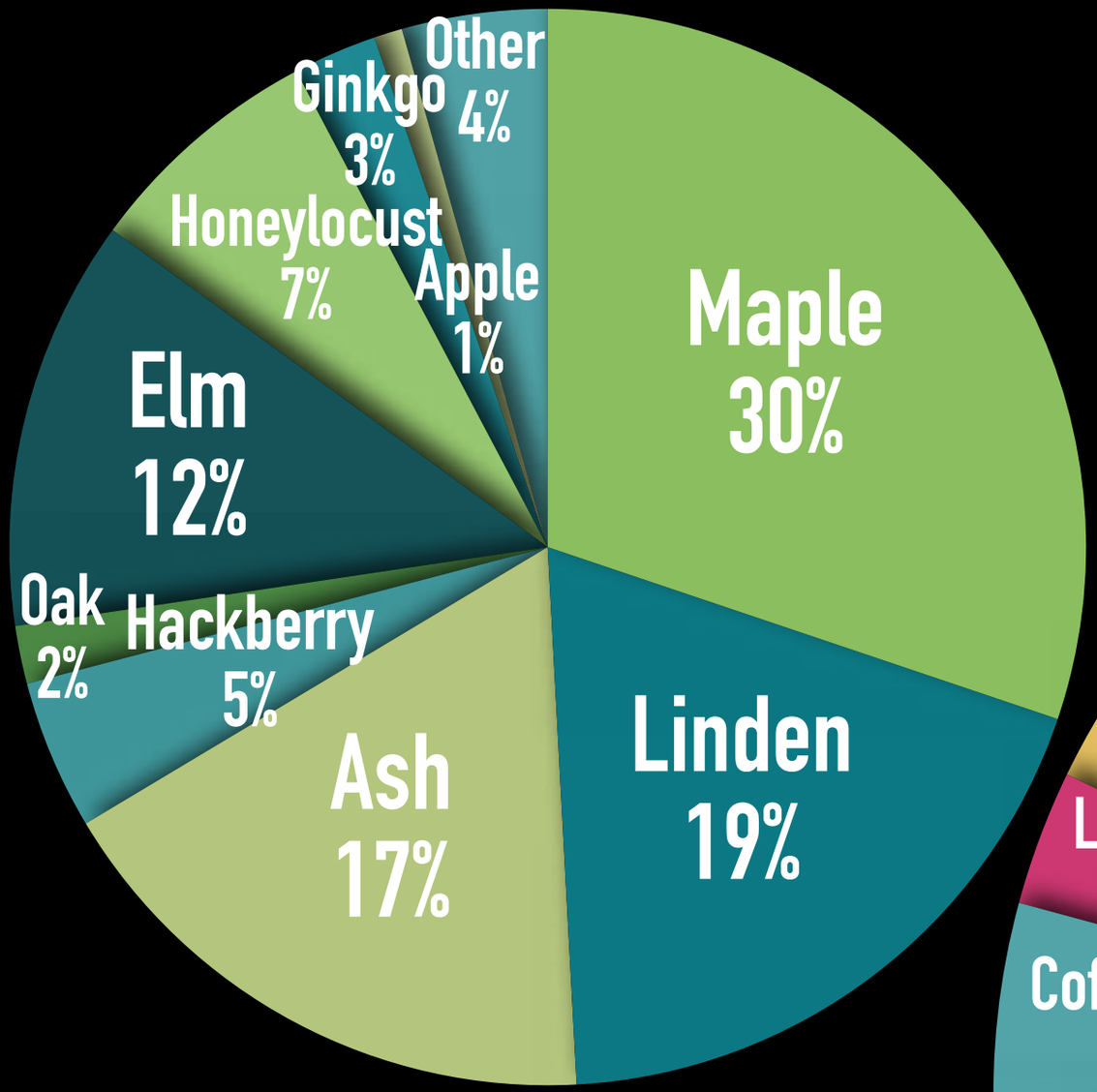
Cherry
1%
Maackia
1%
Ironwood
1%
Larch
1%
Yellowwood
1%
Other
3%

2021


Maple
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Hackberry
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Oak
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Elm
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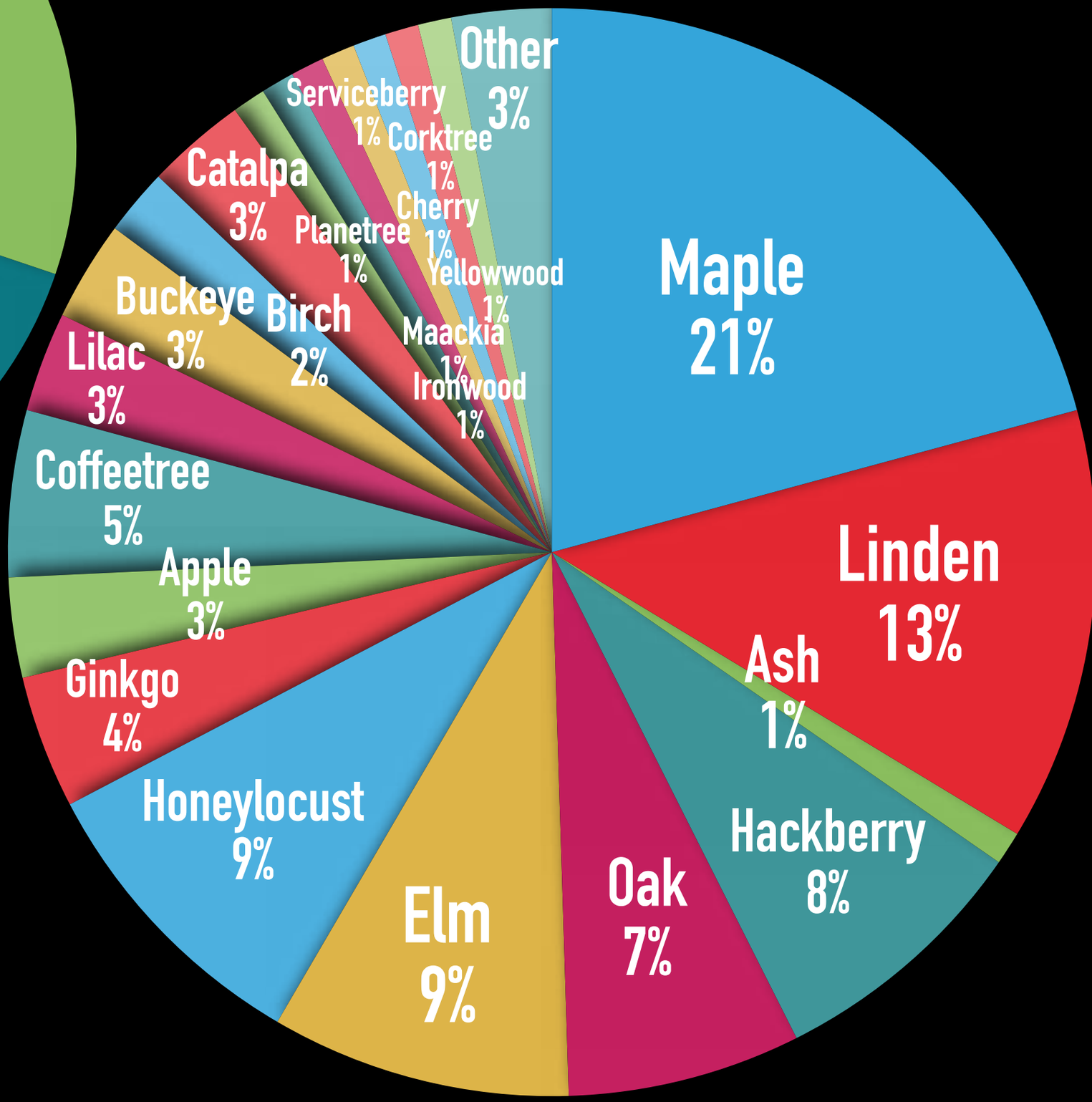
Honeylocust
7%
Ginkgo
3%
Other
4%
Apple
1%

2004


Maple
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Honeylocust
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Coffeetree
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Lilac
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Buckeye
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Catalpa
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Planetree
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Birch
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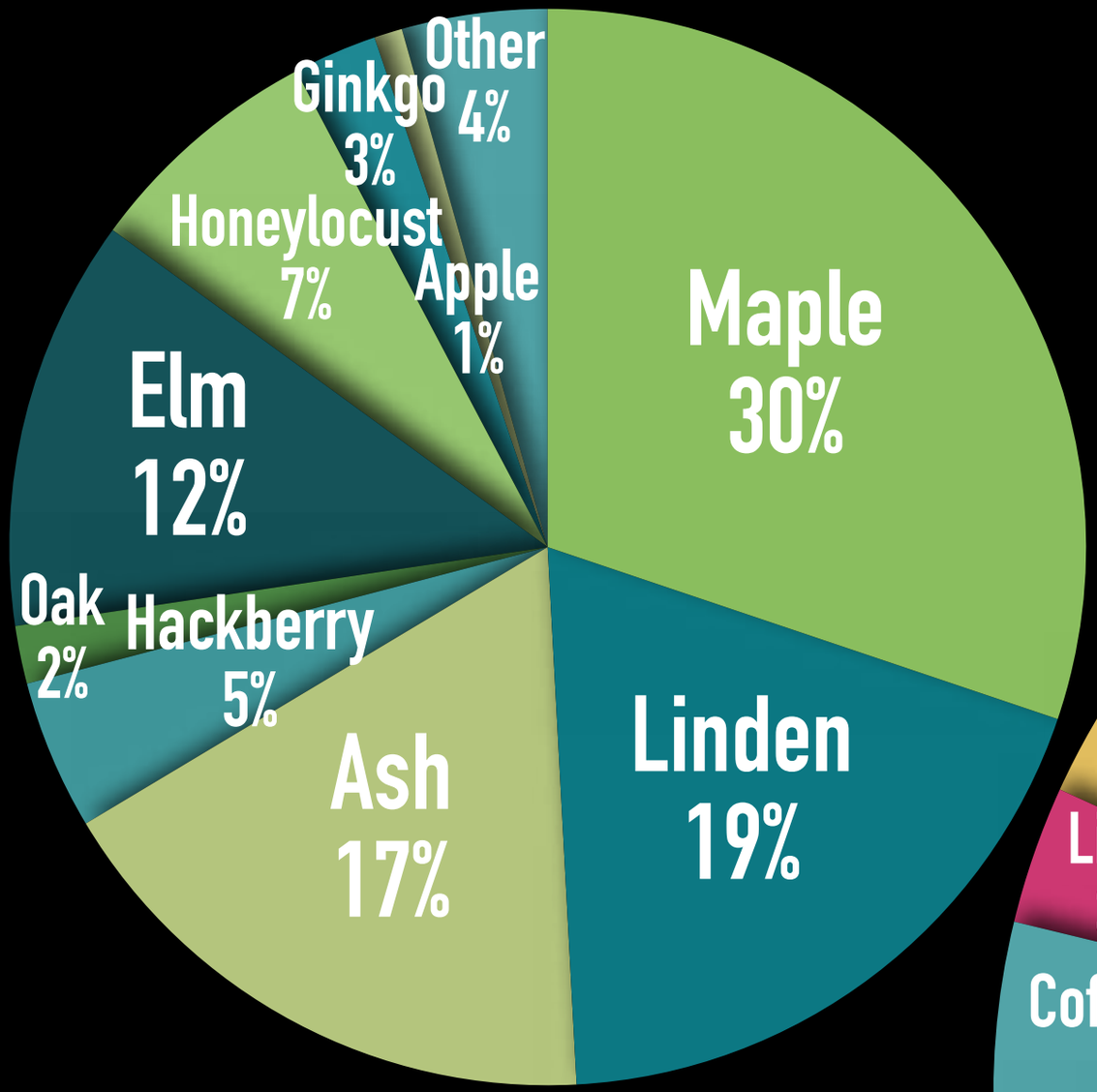
Serviceberry
1%
Corktree
1%
Cherry
1%
Yellowwood
1%
Maackia
1%
Ironwood
1%
Other
3%

2022


Maple
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Hackberry
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Oak
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Elm
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Honeylocust
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Ginkgo
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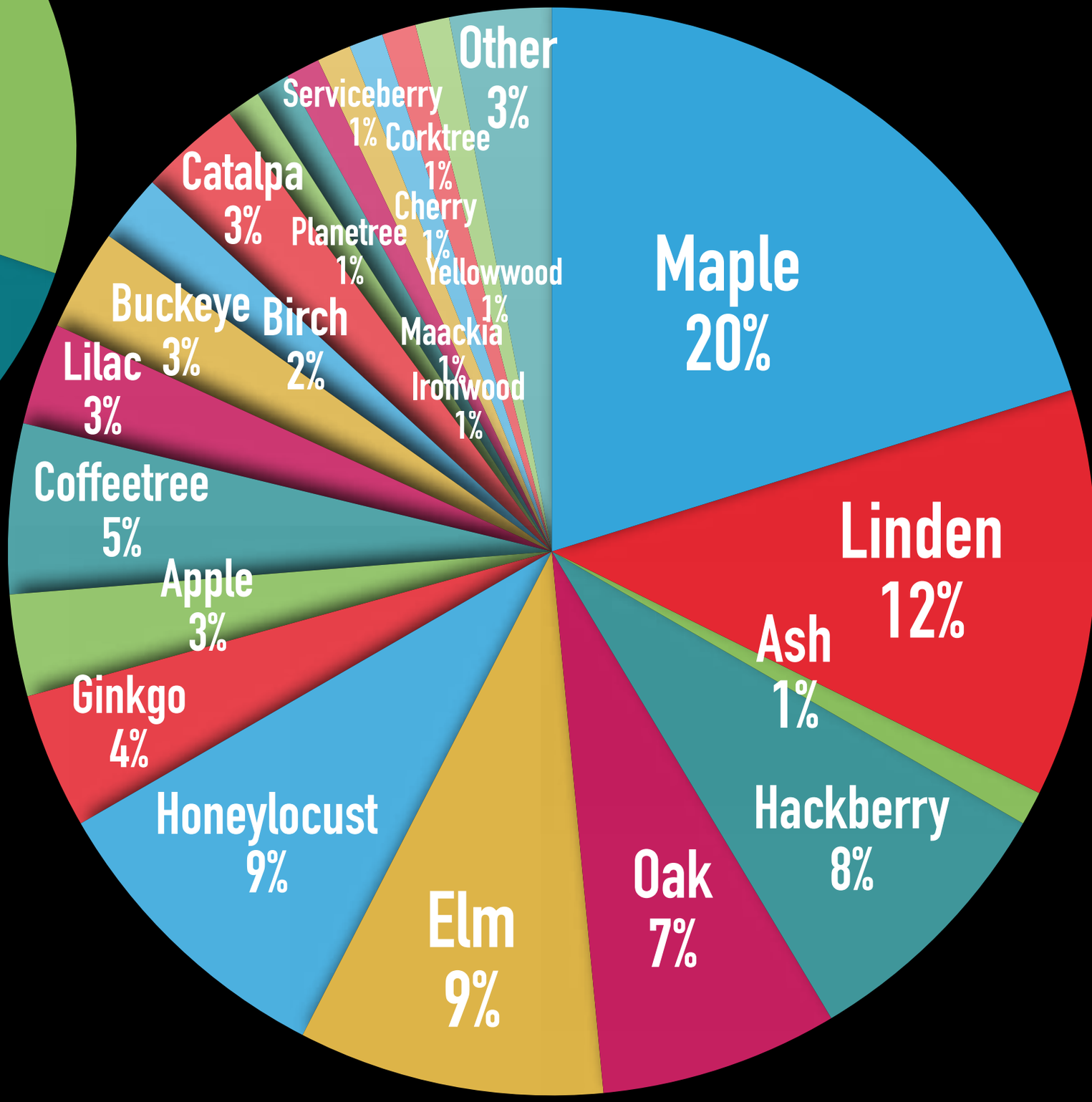
Other
4%
Apple
1%

2004


Maple
20%
Linden
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Ash
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Hackberry
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Oak
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Elm
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Honeylocust
9%
Ginkgo
4%
Apple
3%
Coffeetree
5%
Lilac
3%
Buckeye
3%
Catalpa
3%
Planetree
1%
Birch
2%
Serviceberry
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Corktree
1%
Cherry
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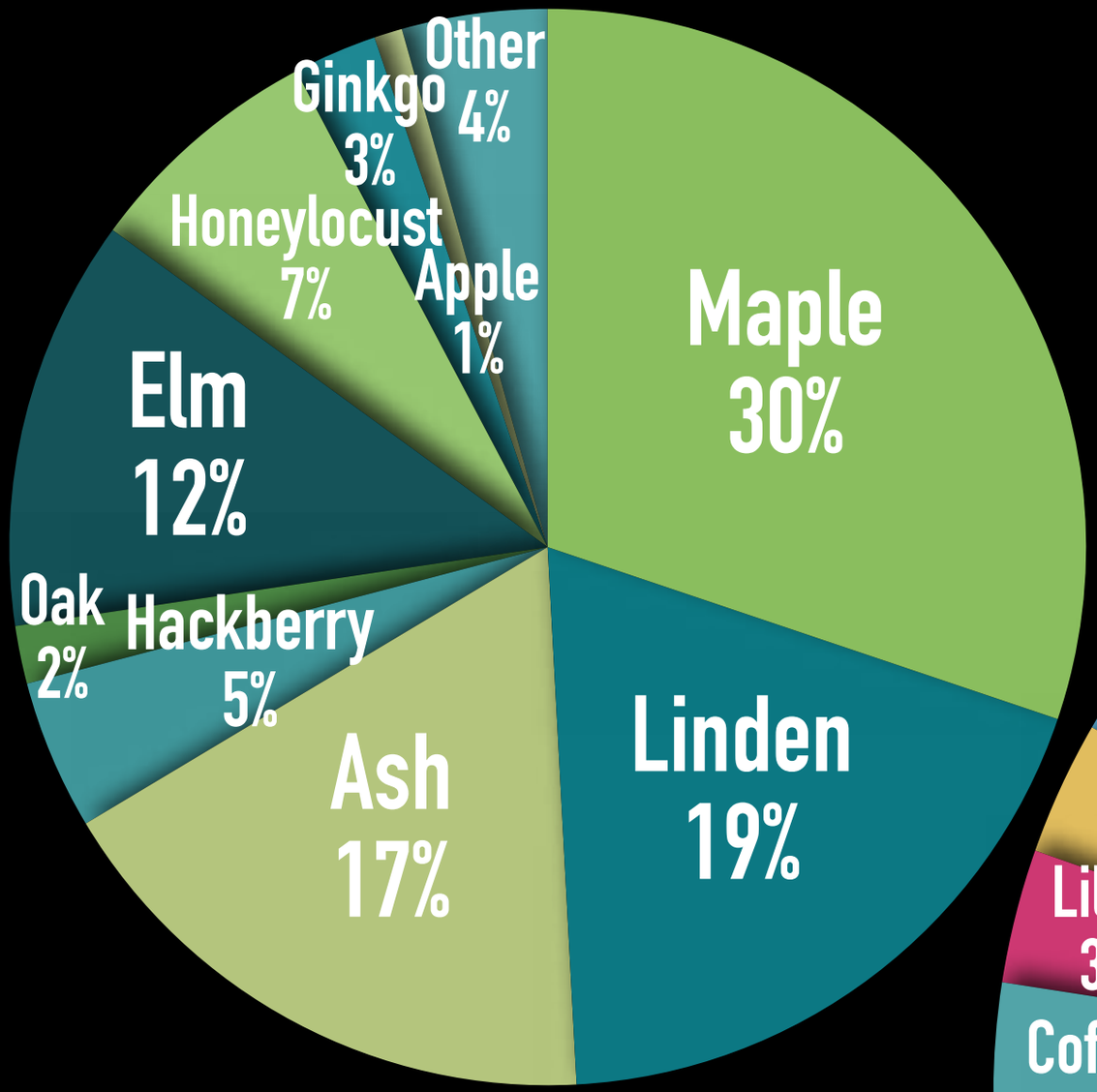
Yellowwood
1%
Maackia
1%
Ironwood
1%
Other
3%

2023


Maple
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Linden
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Ash
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Elm
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Hackberry
5%
Oak
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Honeylocust
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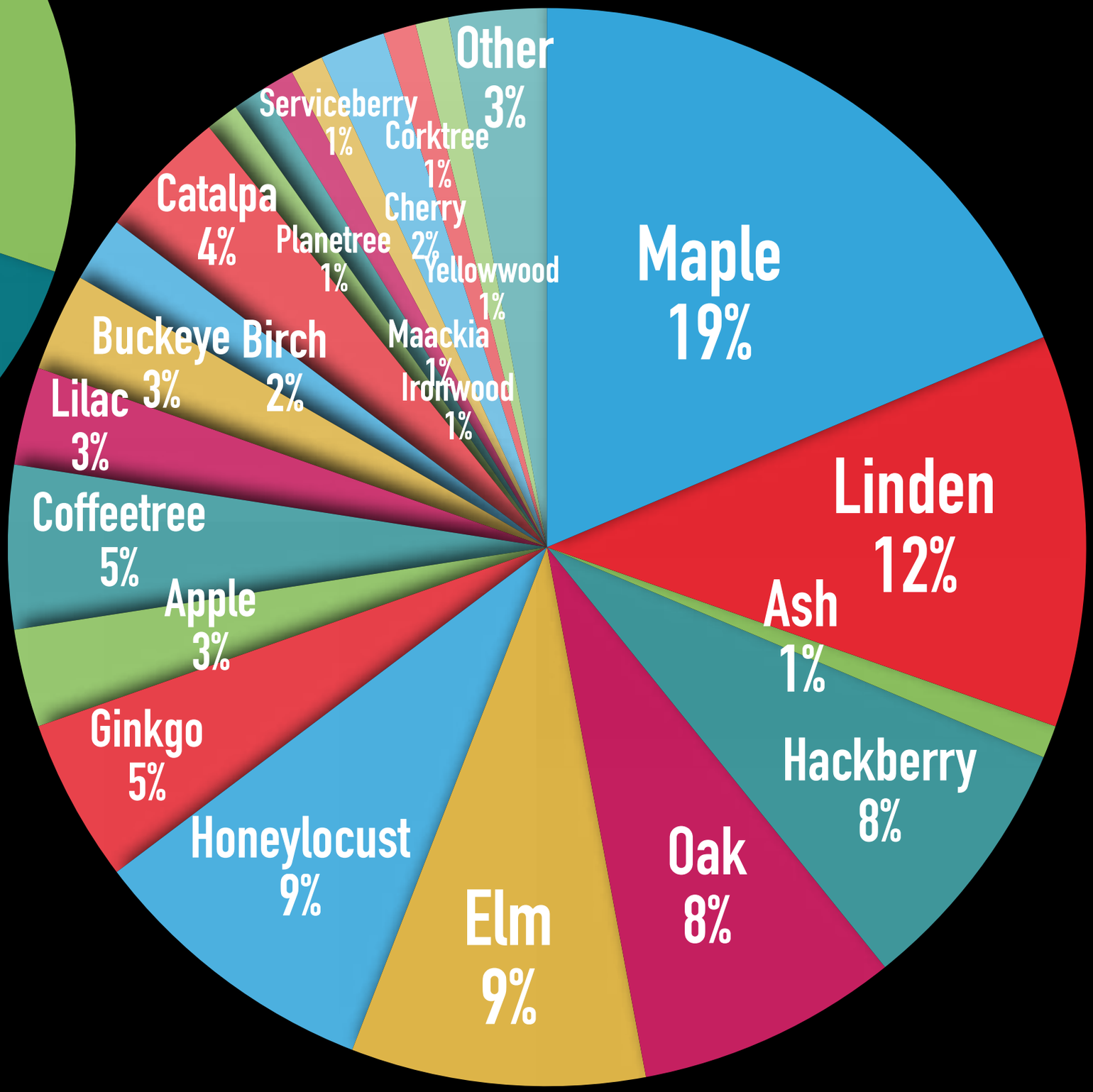
Ginkgo
3%
Other
4%
Apple
1%

2004


Maple
19%
Linden
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Ash
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Hackberry
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Oak
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Elm
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Honeylocust
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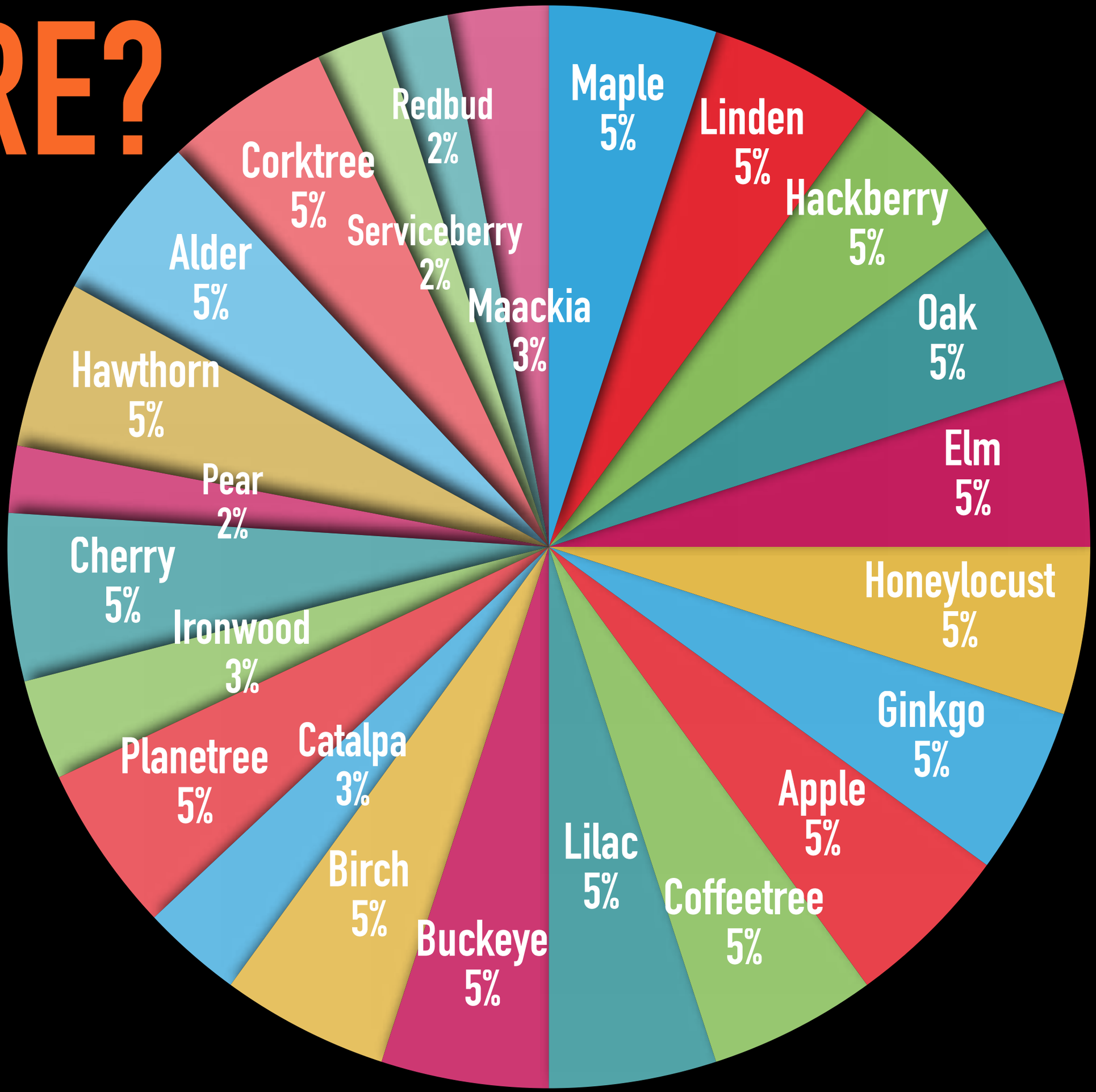
Ginkgo
5%
Apple
3%
Coffeetree
5%
Lilac
3%
Buckeye
3%
Birch
2%
Catalpa
4%
Planetree
1%
Serviceberry
1%
Corktree
1%
Cherry
2%
Yellowwood
1%
Maackia
1%
Ironwood
1%
Other
3%

2024

FUTURE?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5%
Linden
5%
Hackberry
5%
Oak
5%
Elm
5%
Honeylocust
5%
Ginkgo
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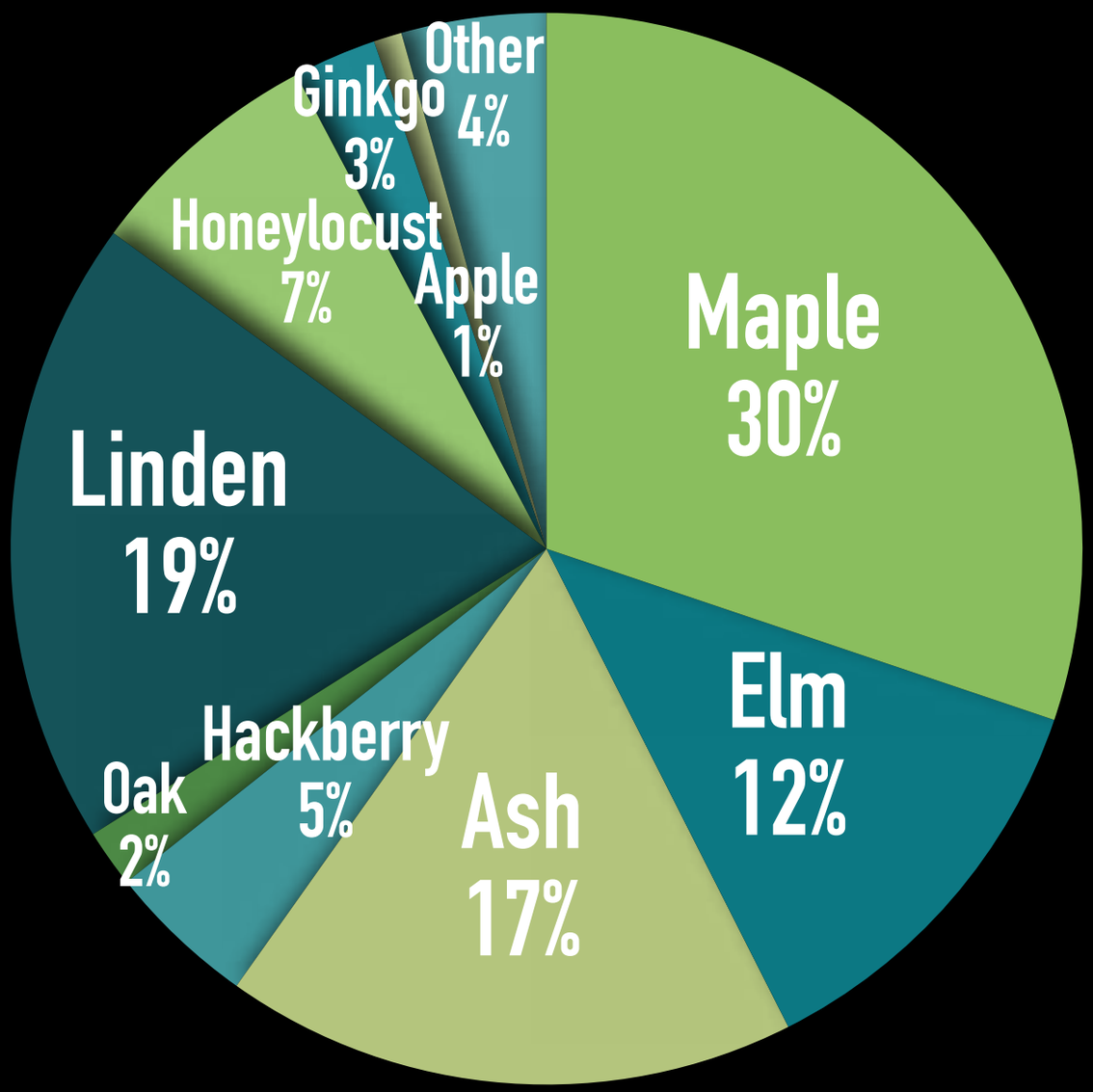
Apple
5%
Coffeetree
5%
Lilac
5%
Buckeye
5%
Birch
5%
Catalpa
3%
Planetree
5%
Ironwood
3%
Cherry
5%
Pear
2%
Hawthorn
5%
Alder
5%
Corktree
5%
Redbud
2%
Serviceberry
2%
Maackia
3%

EAB

ALB

2004


Maple
30%
Elm
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Ash
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Hackberry
5%
Oak
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Linden
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Honeylocust
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Ginkgo
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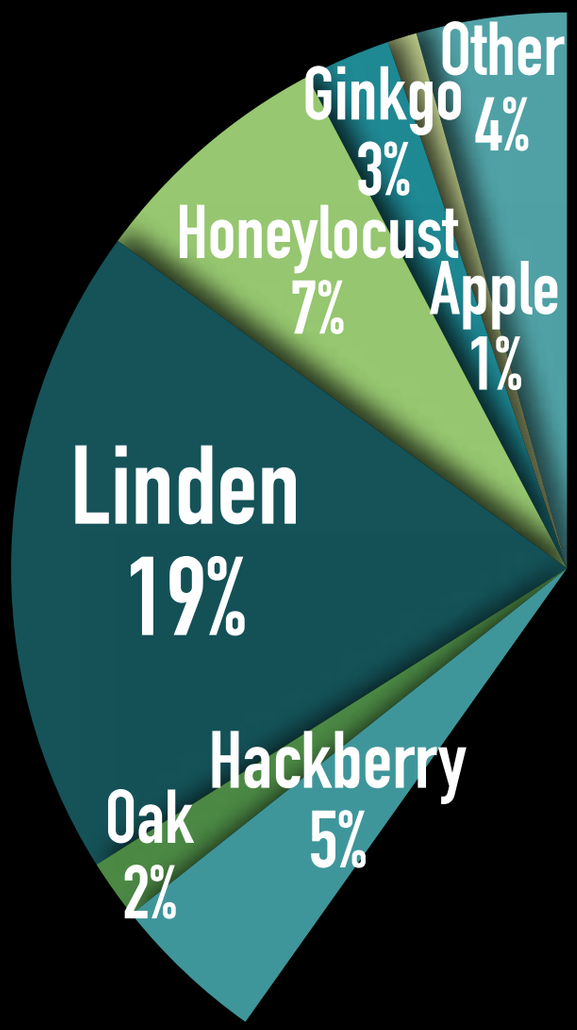
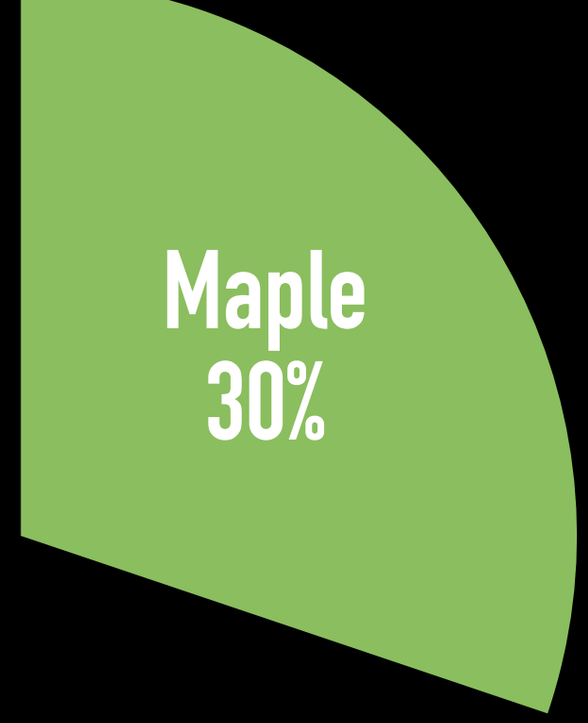
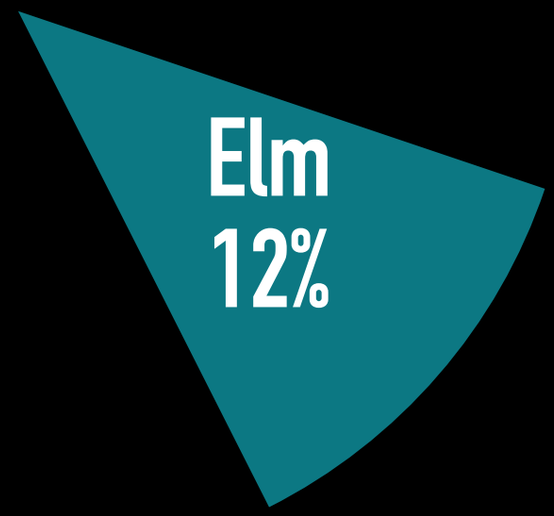
Other
4%
Apple
1%

2004

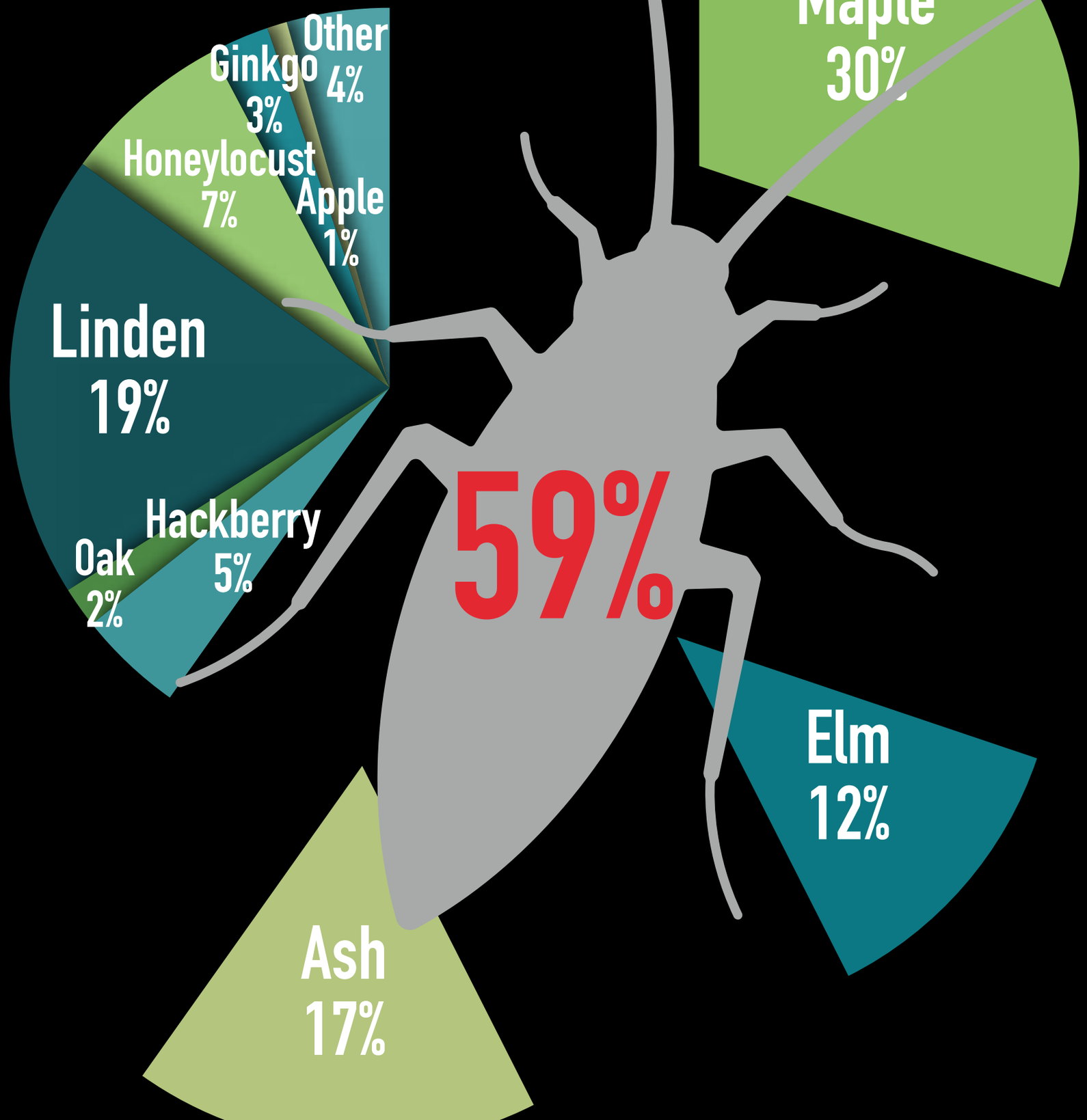

Other
4%
Ginkgo
3%
Honeylocust
7%
Apple
1%
Linden
19%
Hackberry
5%
Oak
2%


Maple
30%


Ash
17%


Elm
12%

2004


Maple
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Other
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Ginkgo
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Honeylocust
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Apple
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Linden
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Hackberry
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Oak
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Elm
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Ash
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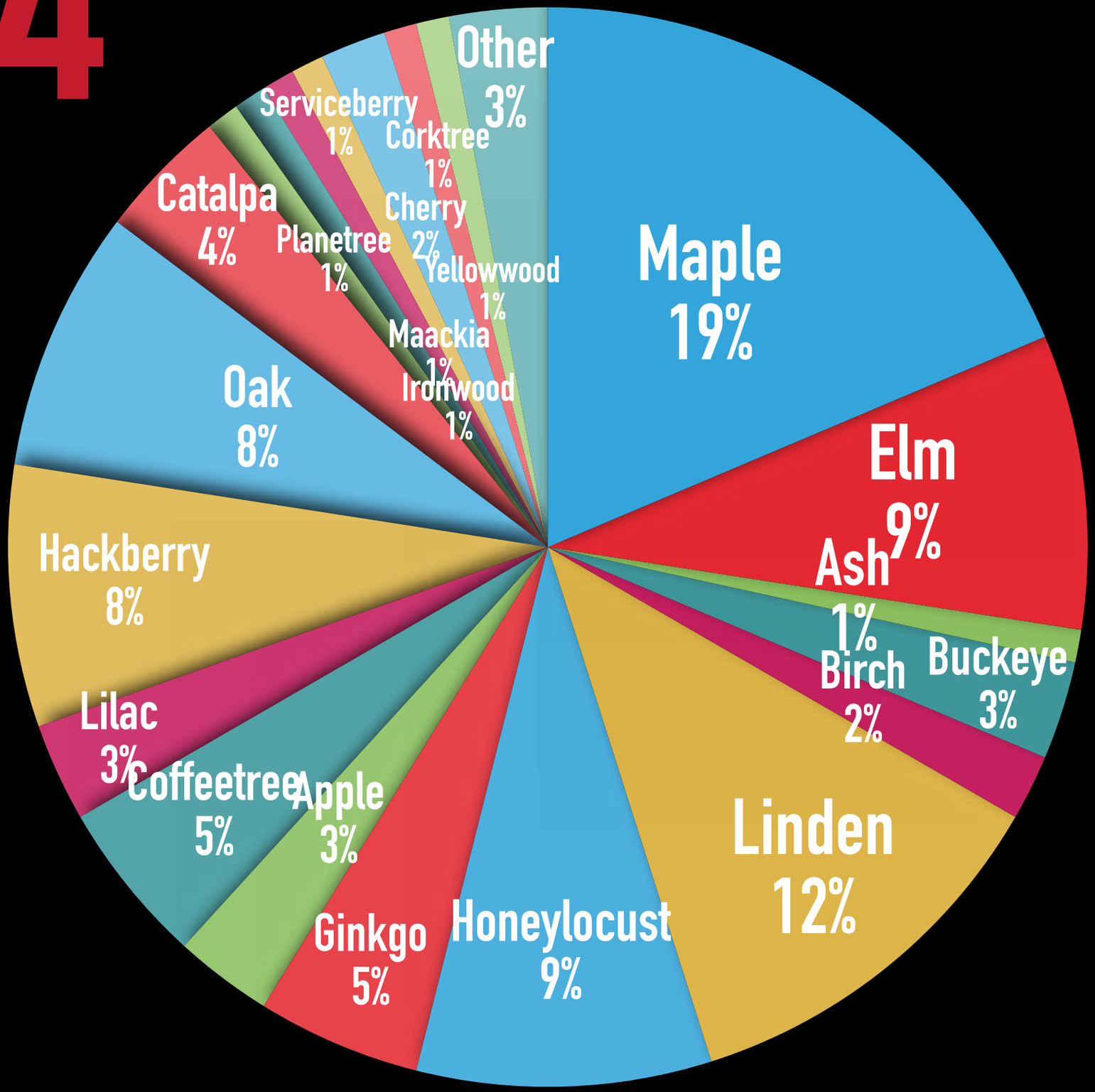
2024


Maple
19%
Elm
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Ash
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Birch
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Buckeye
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Linden
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Honeylocust
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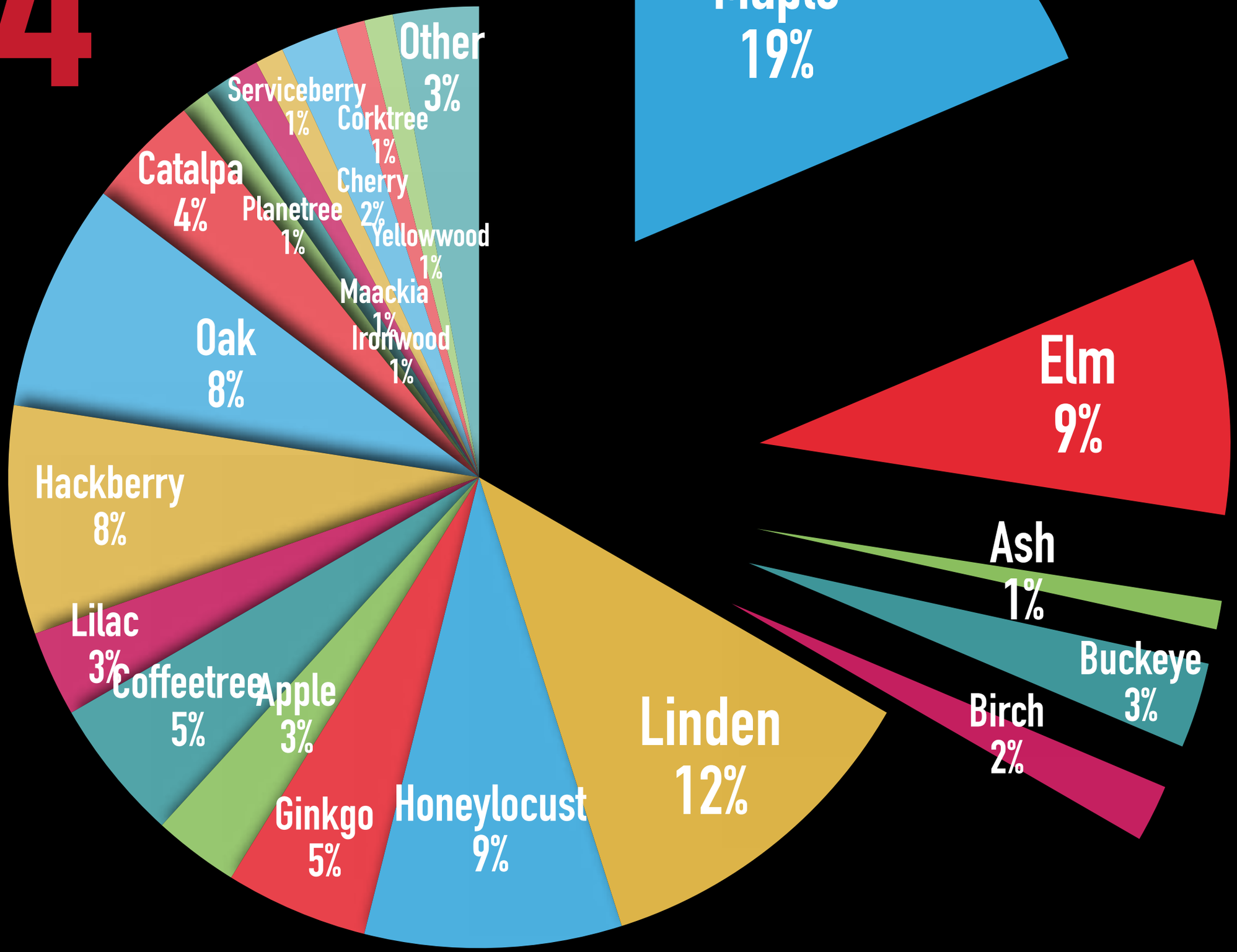
Ginkgo
5%
Apple
3%
Coffeetree
5%
Lilac
3%
Hackberry
8%
Oak
8%
Catalpa
4%
Planetree
1%
Serviceberry
1%
Corktree
1%
Cherry
2%
Yellowwood
1%
Maackia
1%
Ironwood
1%
Other
3%

2024


Maple
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Elm
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Ash
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Buckeye
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Birch
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Linden
12%
Honeylocust
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Ginkgo
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Apple
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Coffeetree
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Lilac
3%
Hackberry
8%
Oak
8%
Catalpa
4%
Serviceberry
1%
Other
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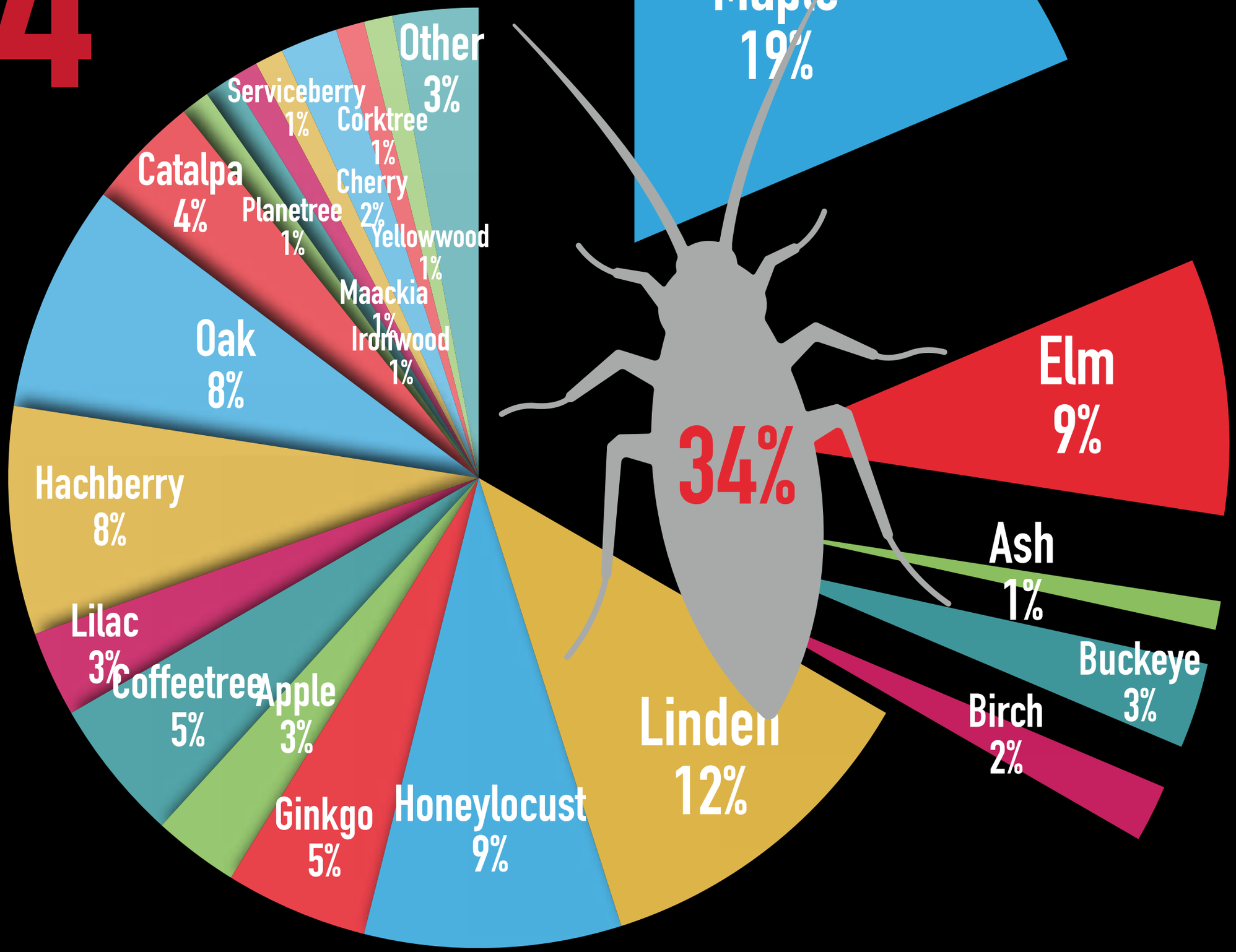
Corktree
1%
Cherry
2%
Planetree
1%
Yellowwood
1%
Maackia
1%
Ironwood
1%

2024


Maple
19%
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Ash
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Buckeye
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Birch
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Linden
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Honeylocust
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Ginkgo
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Apple
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Coffeetree
5%
Lilac
3%
Hachberry
8%
Oak
8%
Catalpa
4%
Serviceberry
1%
Other
3%
Corktree
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Cherry
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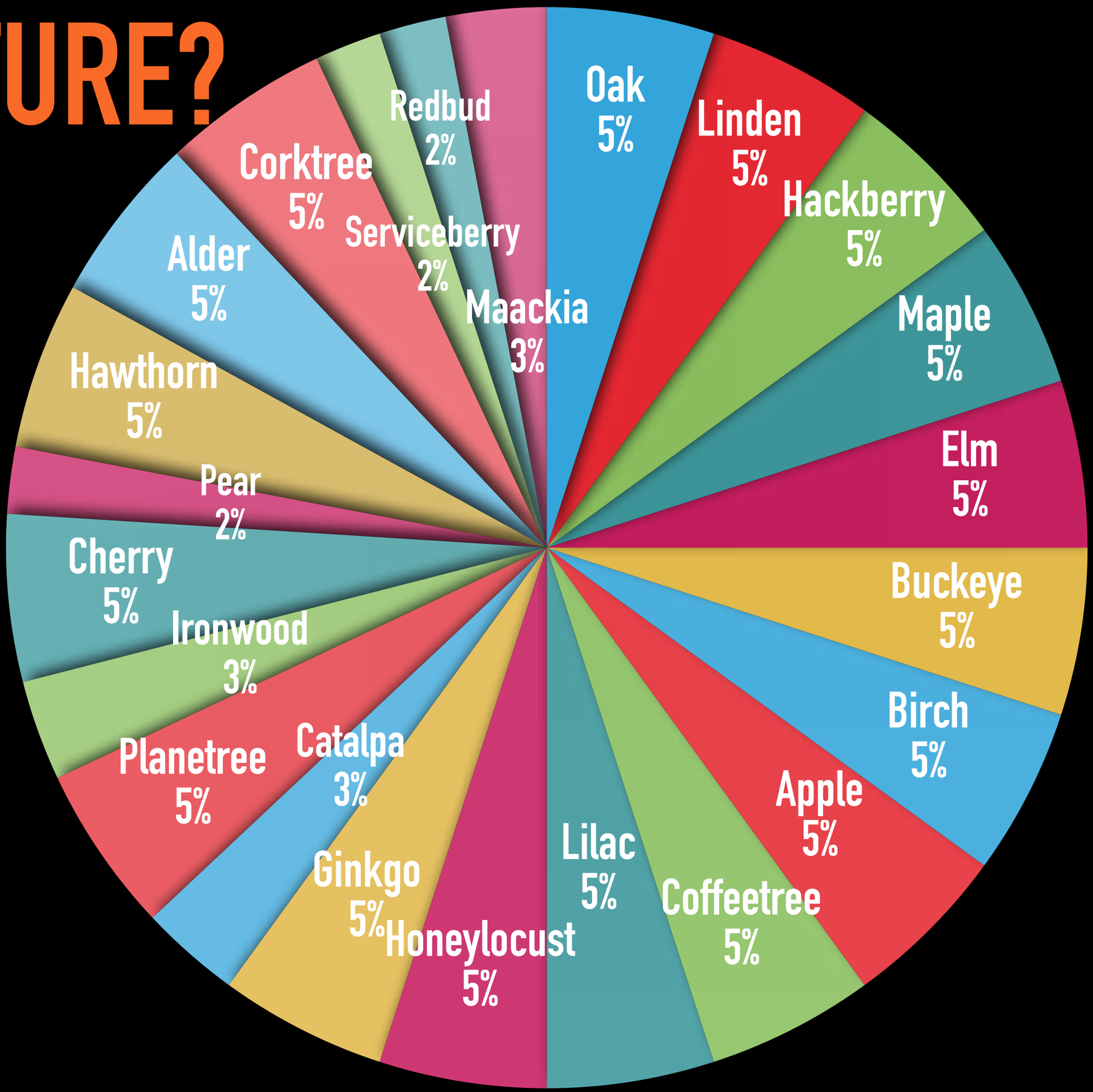
Planetree
1%
Yellowwood
1%
Maackia
1%
Ironwood
1%
34%

FUTURE?


Oak
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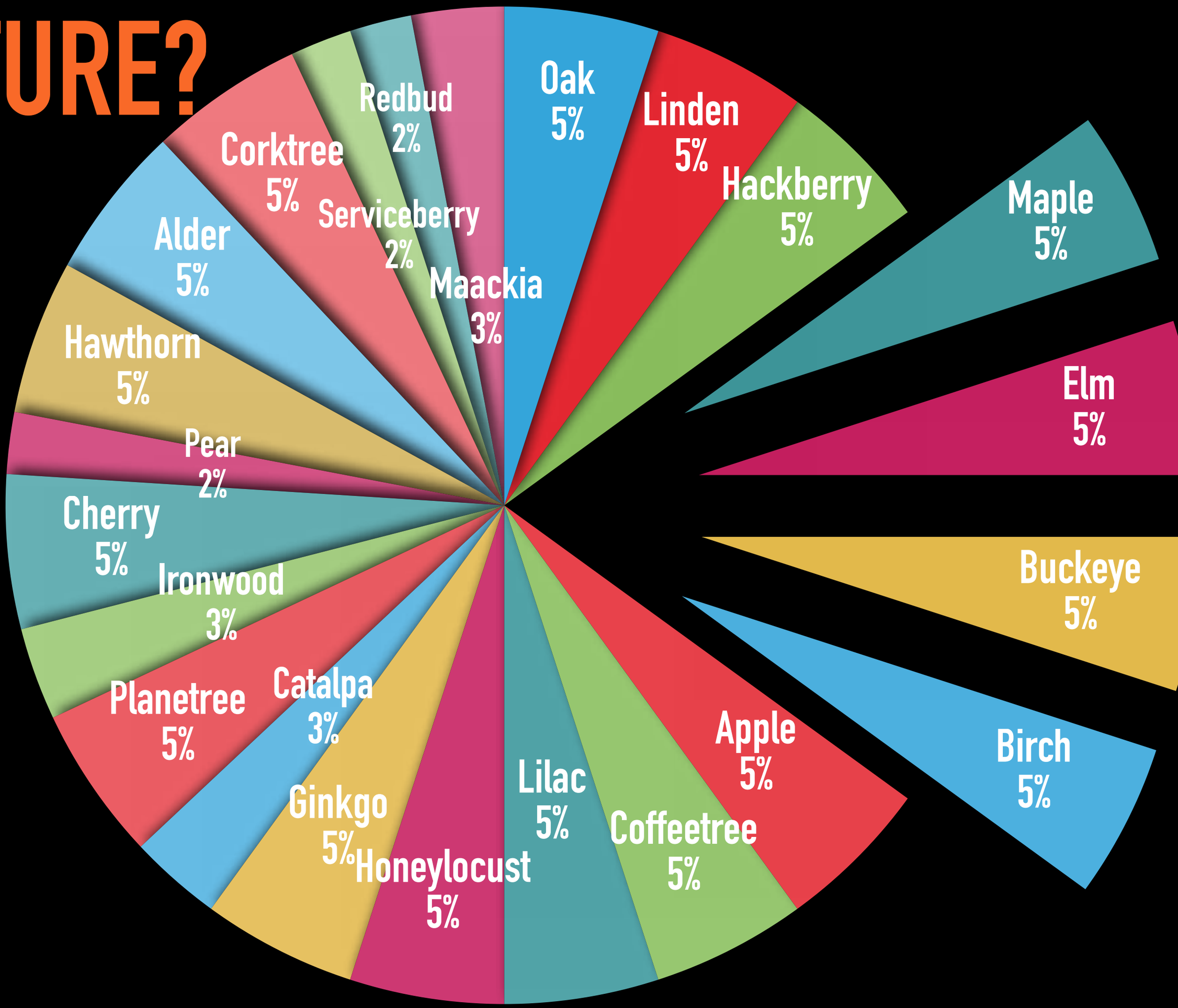
Linden
5%
Hackberry
5%
Maple
5%
Elm
5%
Buckeye
5%
Birch
5%
Apple
5%
Coffeetree
5%
Lilac
5%
Honeylocust
5%
Ginkgo
5%
Catalpa
3%
Planetree
5%
Ironwood
3%
Cherry
5%
Pear
2%
Hawthorn
5%
Alder
5%
Corktree
5%
Redbud
2%
Serviceberry
2%
Maackia
3%

FUTURE?


Oak
5%
Linden
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Hackberry
5%
Maple
5%
Elm
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Buckeye
5%
Birch
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Apple
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Coffeetree
5%
Lilac
5%
Honeylocust
5%
Ginkgo
5%
Catalpa
3%
Planetree
5%
Ironwood
3%
Cherry
5%
Pear
2%
Hawthorn
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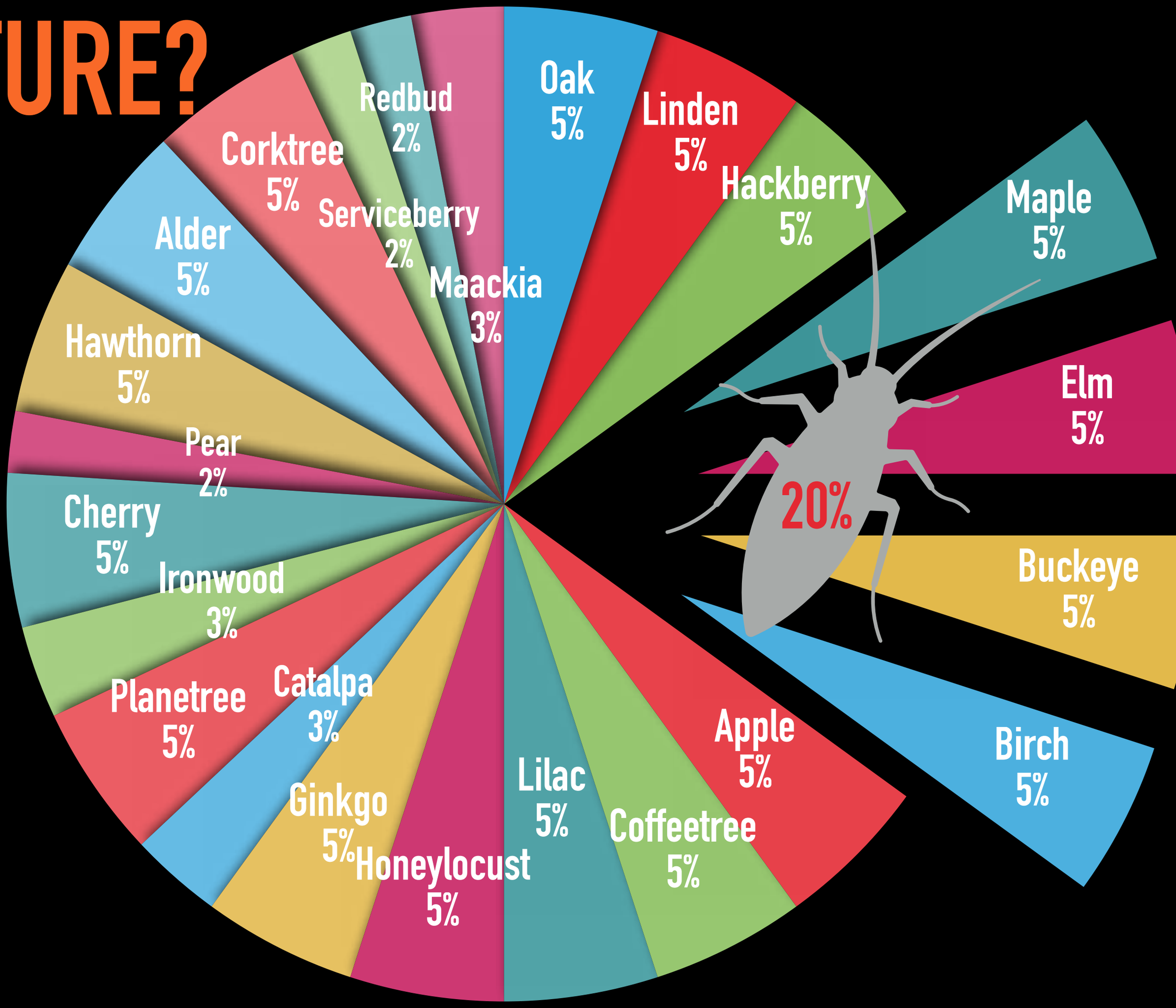
Alder
5%
Corktree
5%
Redbud
2%
Serviceberry
2%
Maackia
3%

FUTURE?


Oak
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Hackberry
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Maple
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Elm
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Buckeye
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Birch
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Apple
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Coffeetree
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Honeylocust
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Ginkgo
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Catalpa
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Planetree
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Ironwood
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Pear
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Hawthorn
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Alder
5%
Corktree
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Redbud
2%
Serviceberry
2%
Maackia
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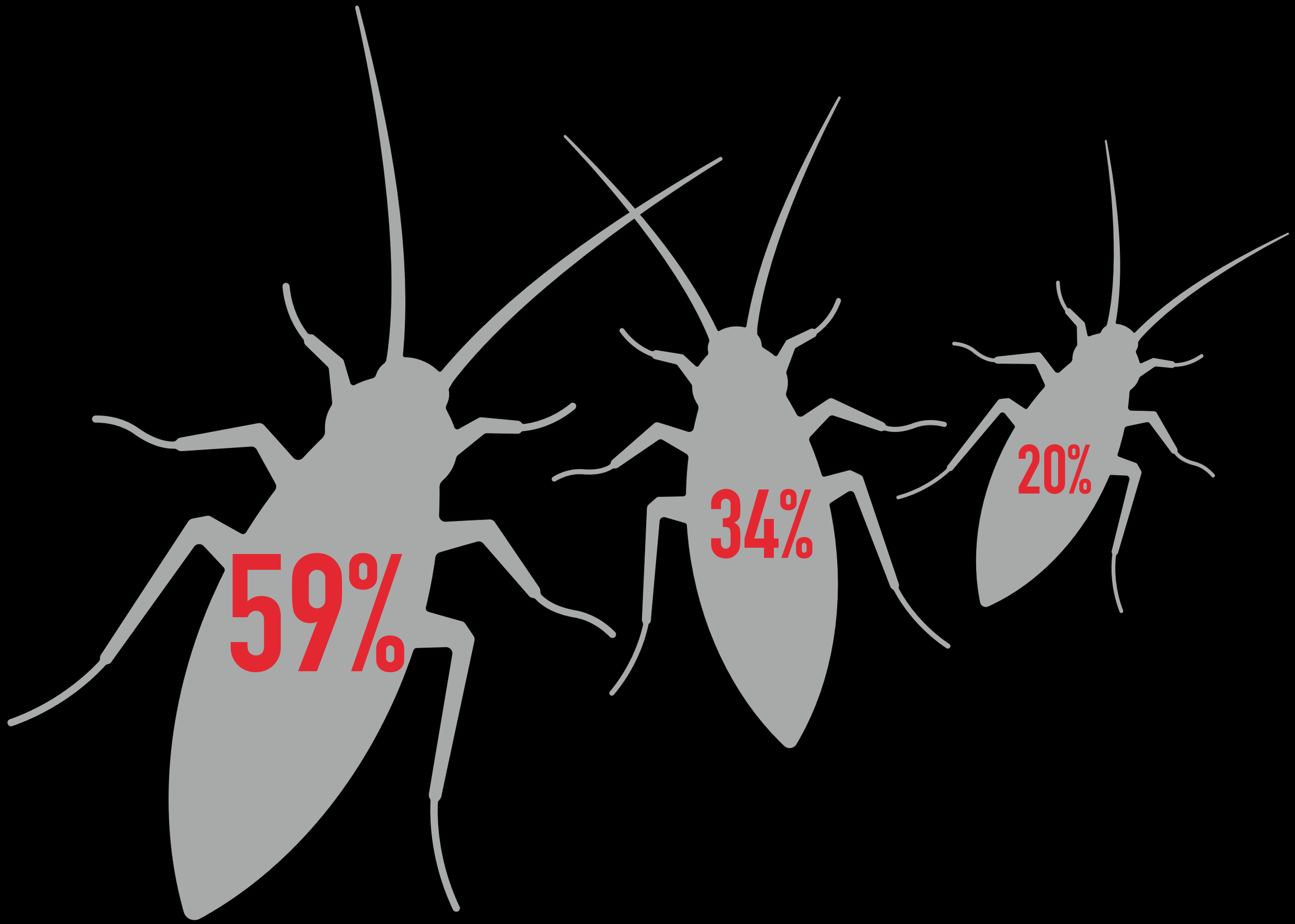
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Shaping the Plan

MDA Branch Sampling

Shaping the Plan

Could it be Too Cold?

Research Findings

Urban Forestry & Urban Greening

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In Press, Accepted Manuscript — Note to users

Strategic removal of host trees in isolated, satellite infestations of emerald ash borer can reduce population growth

Samuel J. Fahrner[a], , , Mark Abrahamson[b], , Robert C. Venette[c], , Brian H. Aukema[a],

Show more

http://dx.doi.org/10.1016/j.ufug.2017.03.017

Highlights

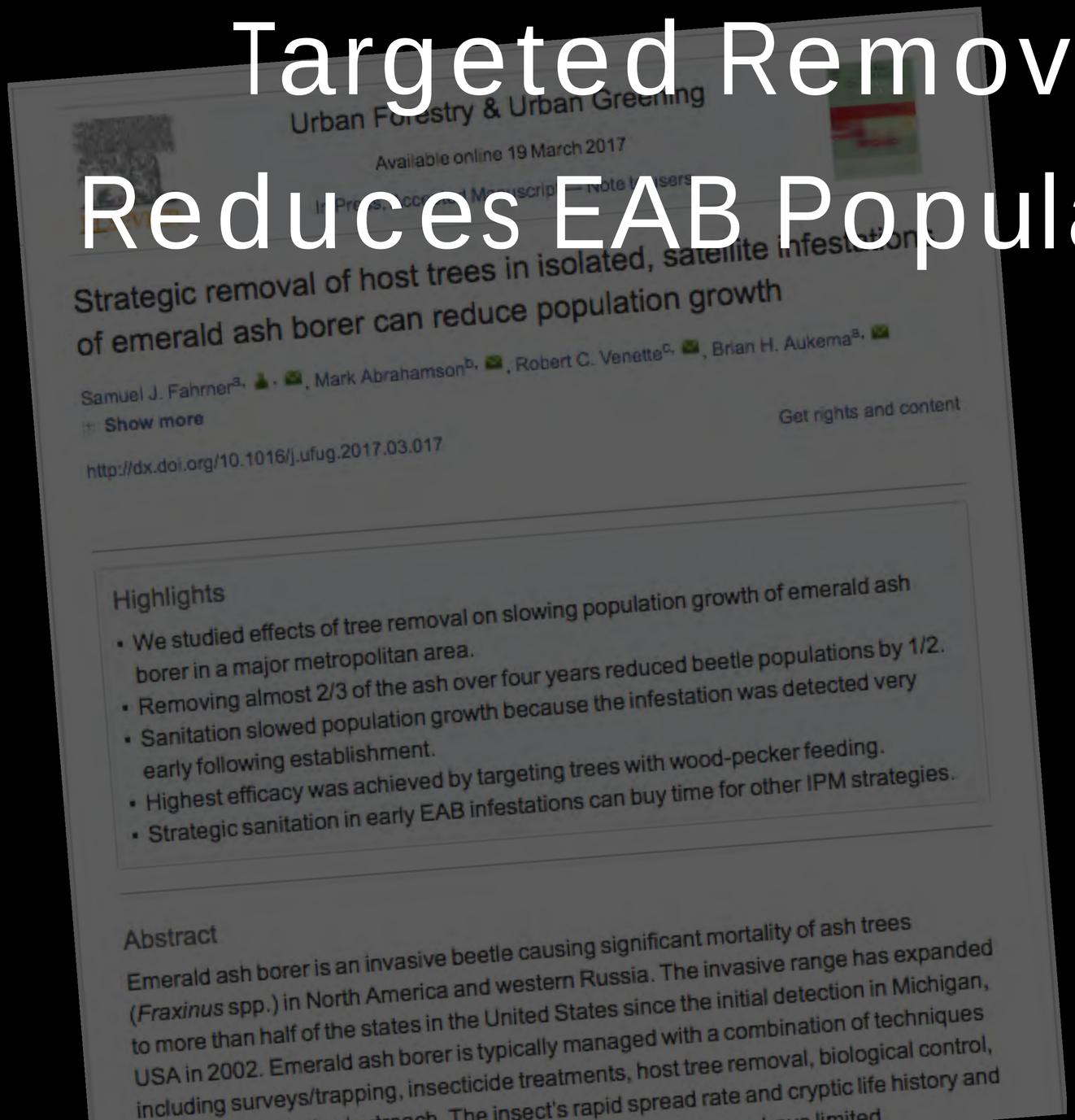
- We studied effects of tree removal on slowing population growth of emerald ash borer in a major metropolitan area.
- Removing almost 2/3 of the ash over four years reduced beetle populations by 1/2.
- Sanitation slowed population growth because the infestation was detected very early following establishment.
- Highest efficacy was achieved by targeting trees with wood-pecker feeding.
- Strategic sanitation in early EAB infestations can buy time for other IPM strategies.

Abstract

Emerald ash borer is an invasive beetle causing significant mortality of ash trees (*Fraxinus* spp.) in North America and western Russia. The invasive range has expanded to more than half of the states in the United States since the initial detection in Michigan, USA in 2002. Emerald ash borer is typically managed with a combination of techniques including surveys/trapping, insecticide treatments, host tree removal, biological control, [illegible] The insect's rapid spread rate and cryptic life history and [illegible] limited

Research Findings

Targeted Removal Reduces EAB Population



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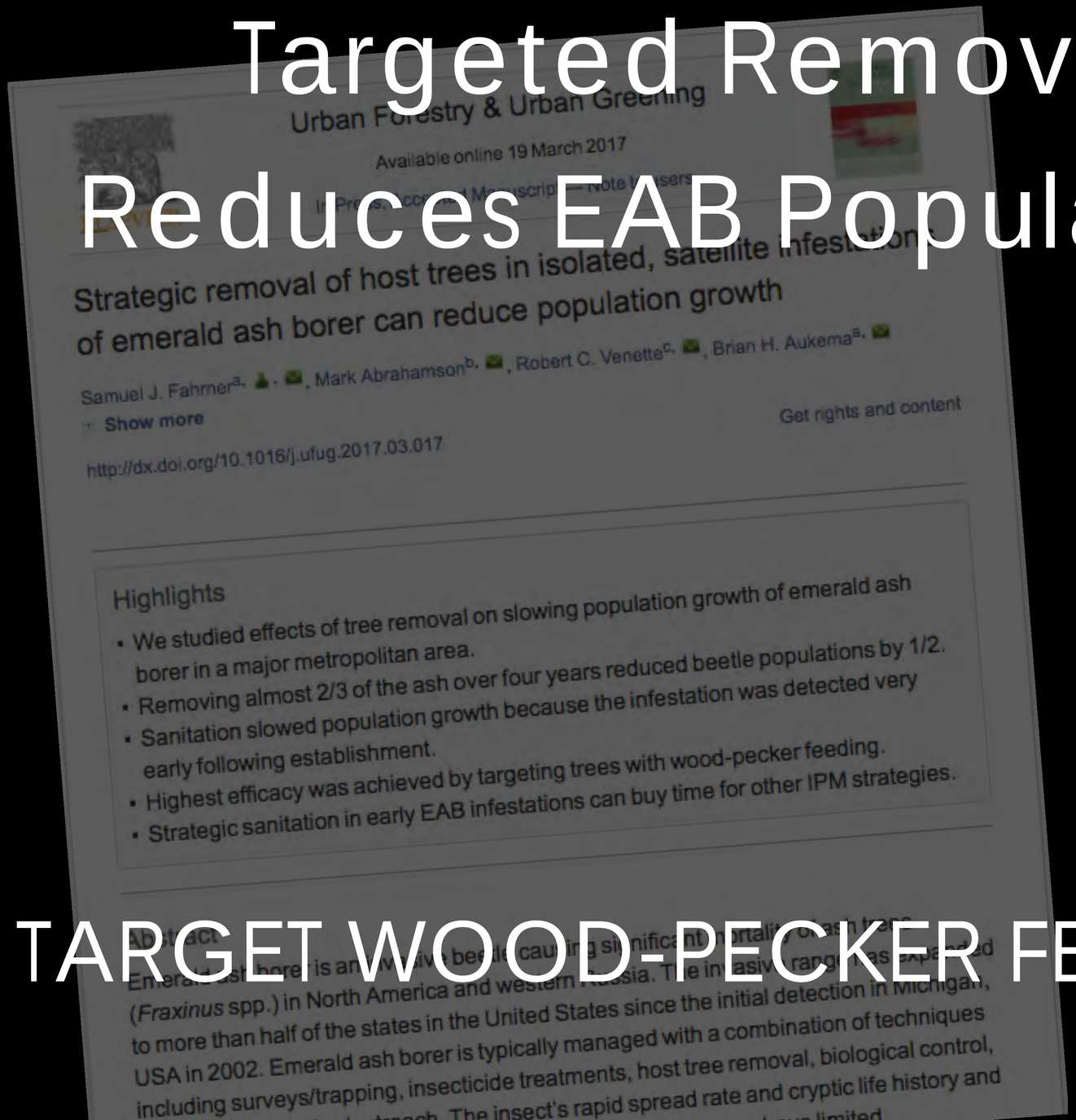

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TARGET WOOD-PECKER FEEDING

Research Findings

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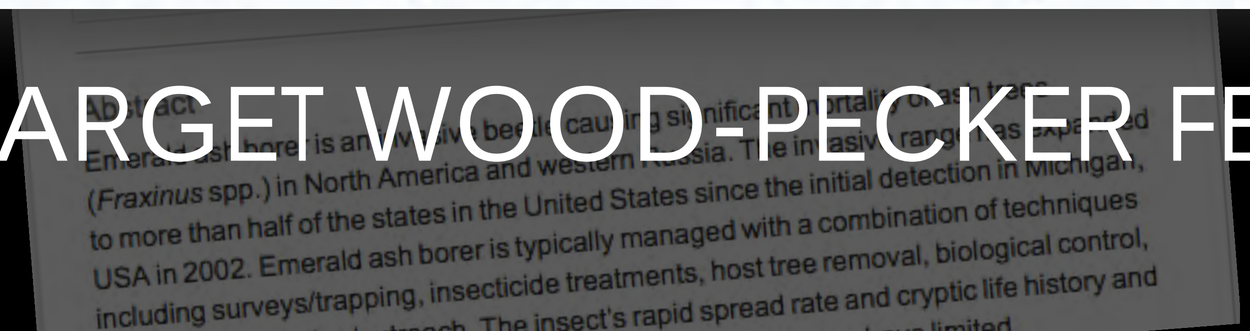
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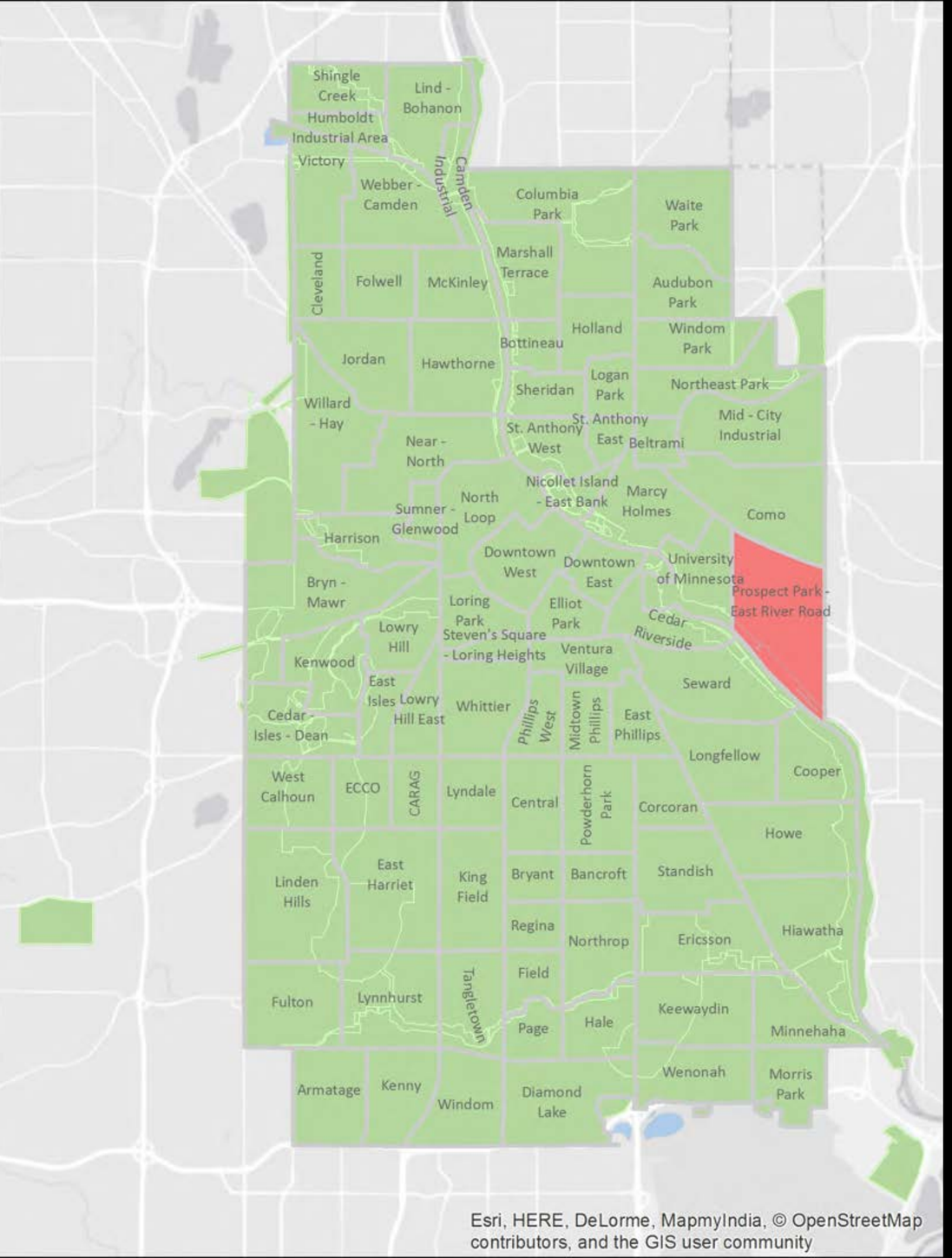
TARGET WOOD-PECKER FEEDING

Research Findings

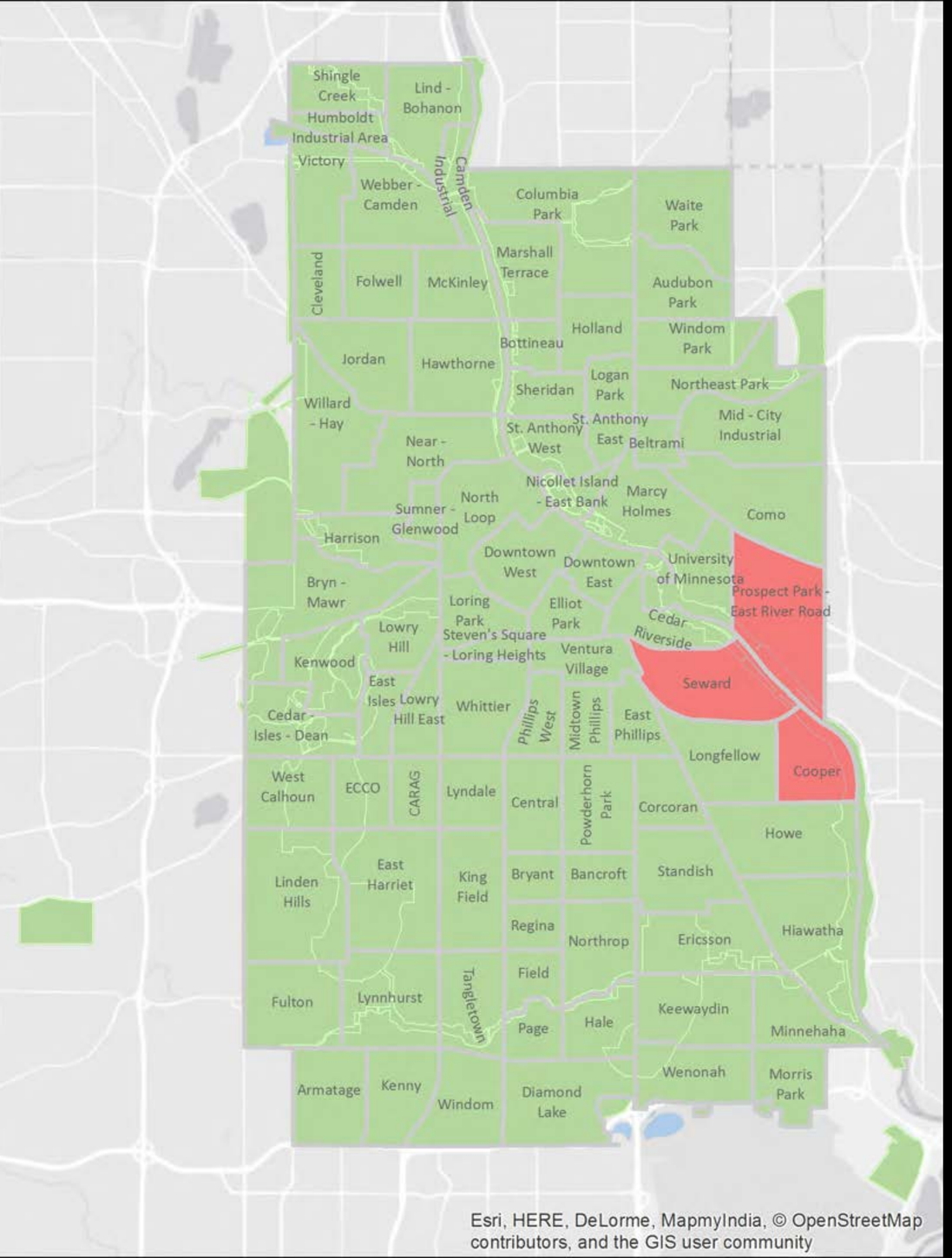
Visual Survey

REMOVE
INFESTED



TOWER HILL

2010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Loring Park
Elliot Park
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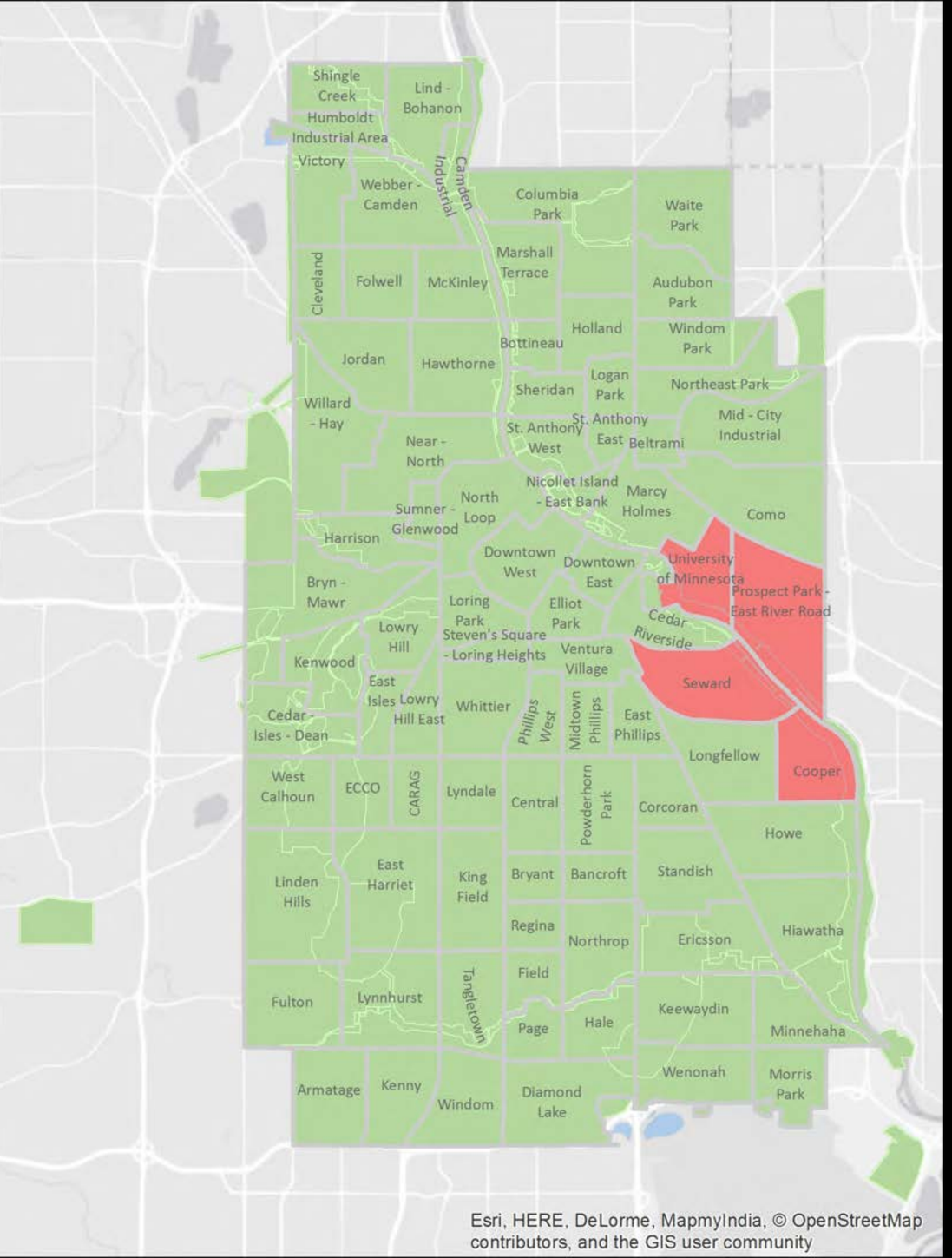
2011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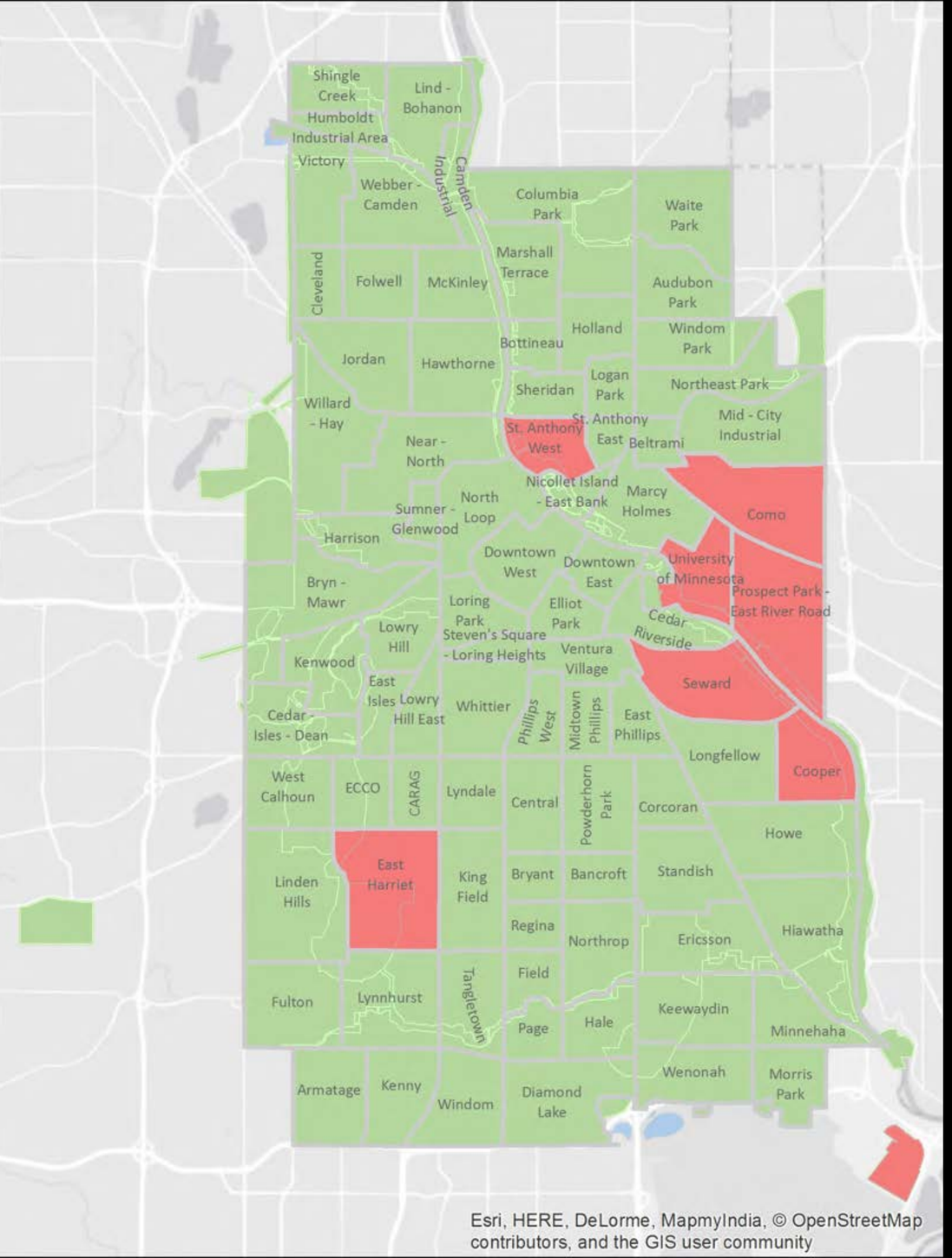
2012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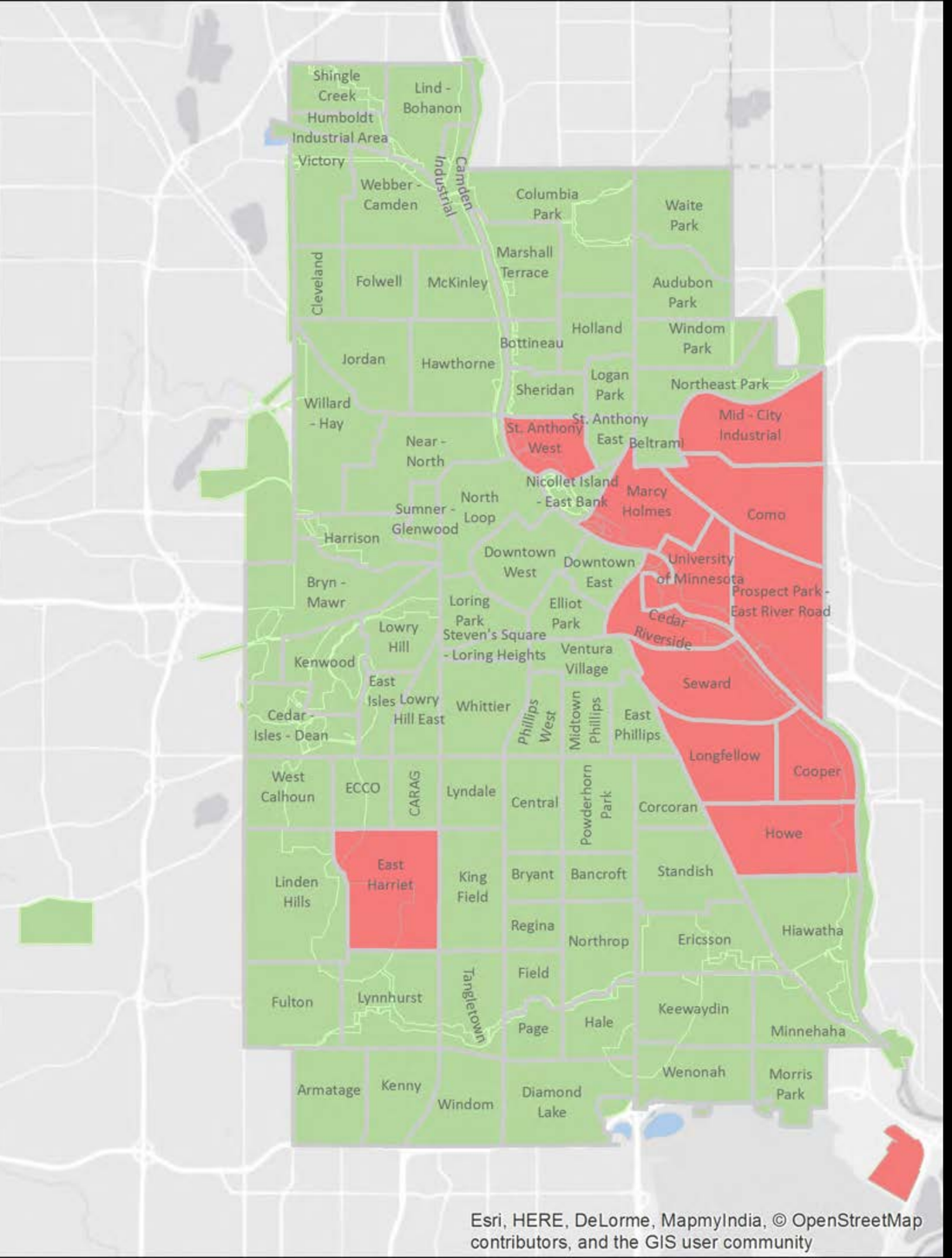

ASH CANOPY REPLACEMENT PLAN

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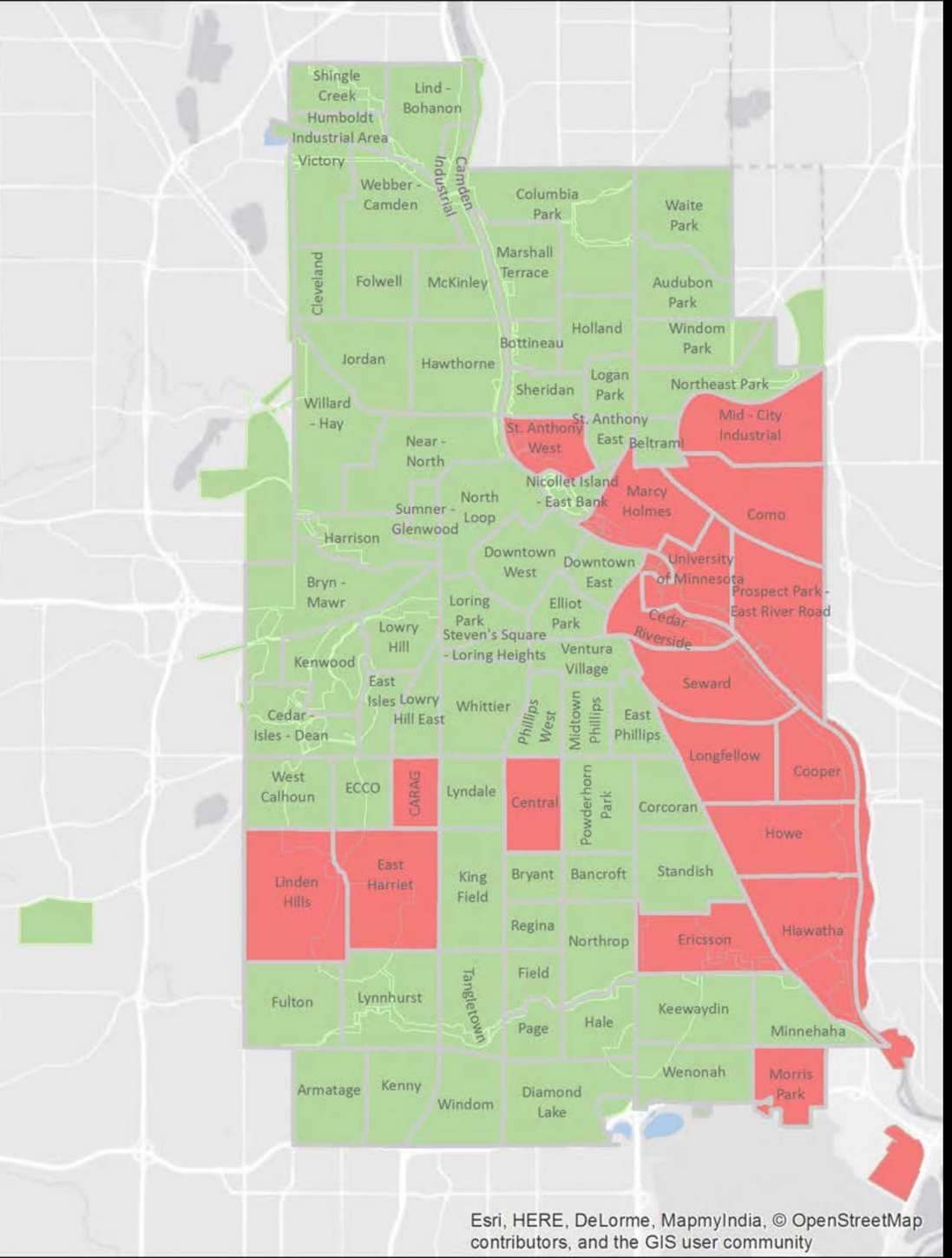
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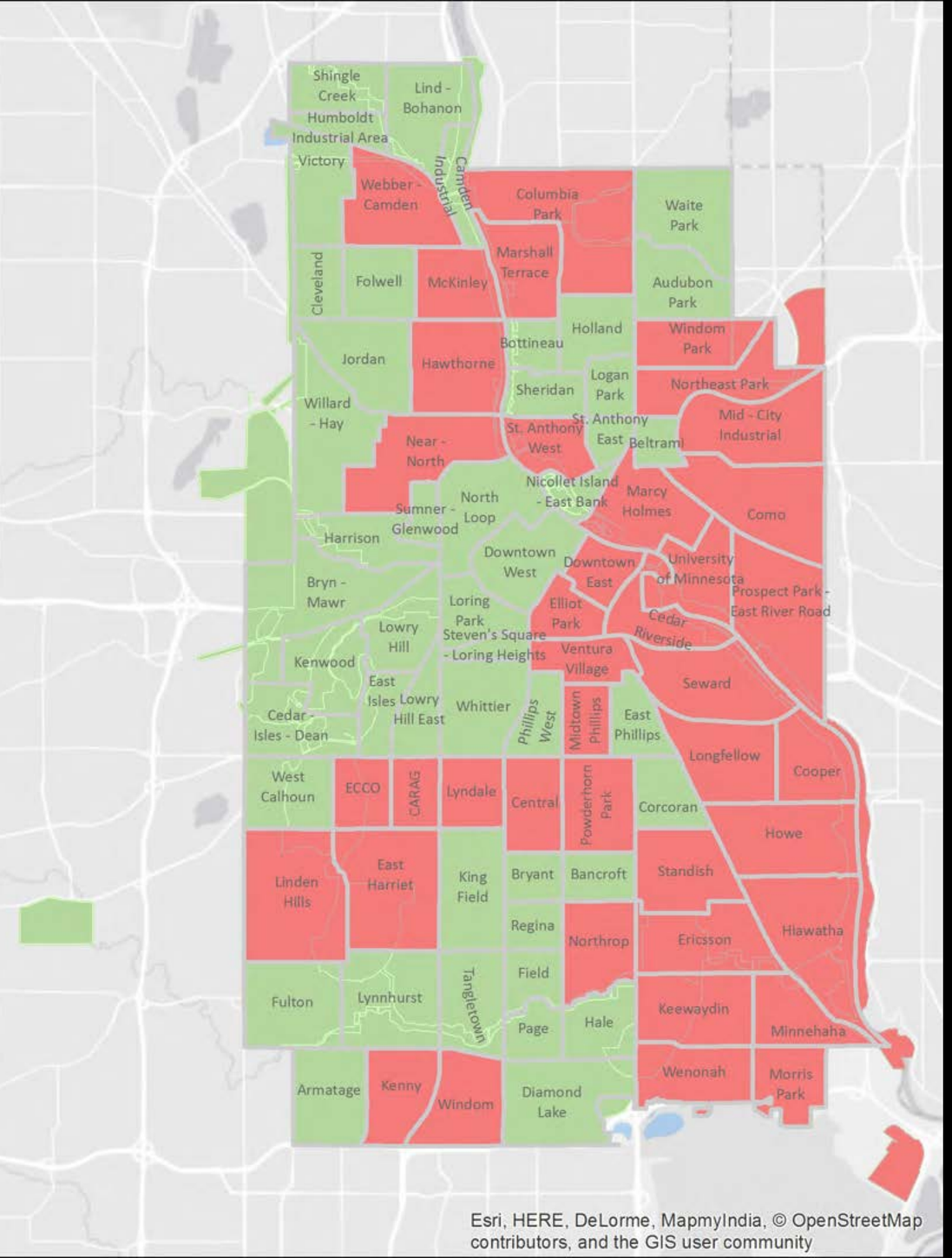
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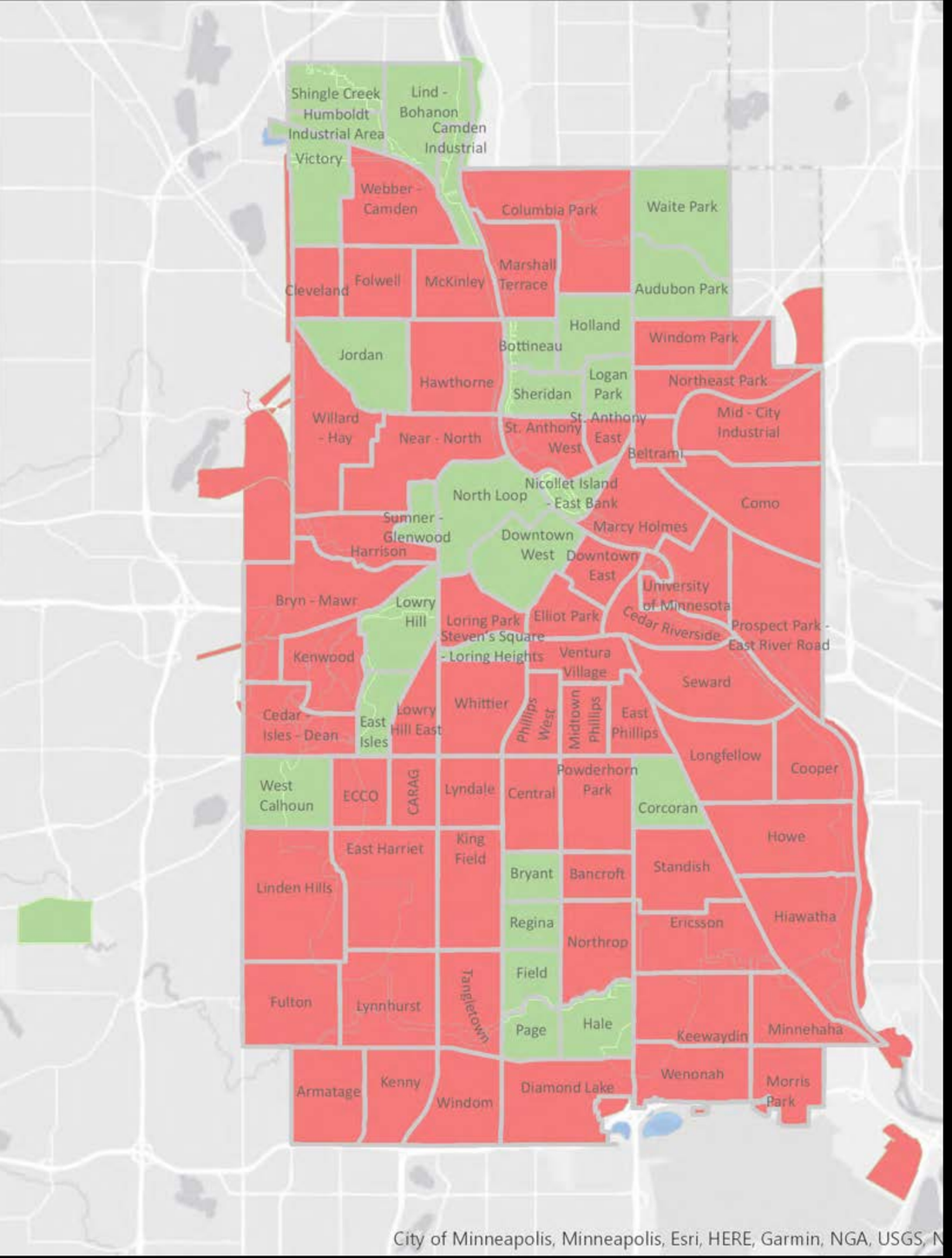
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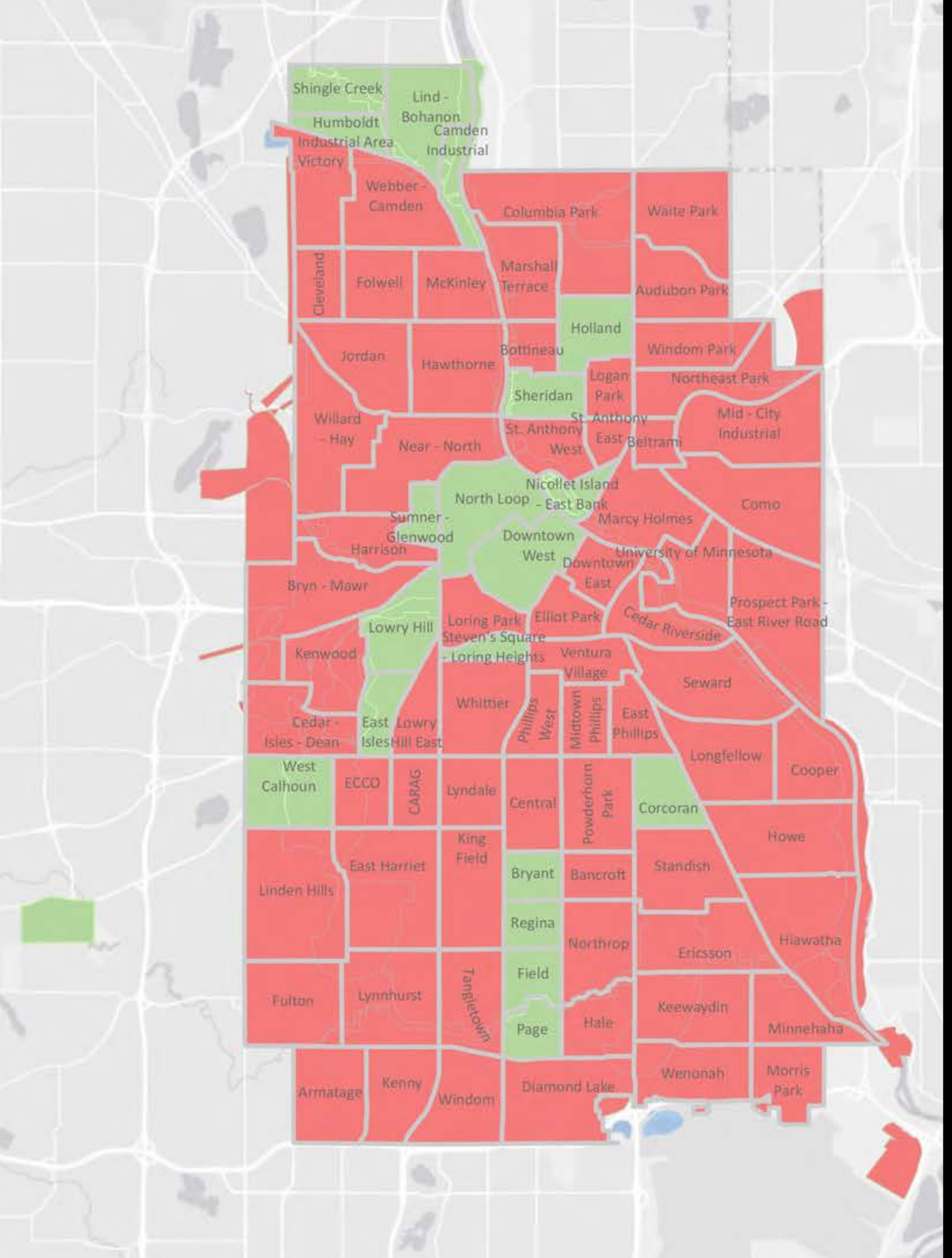
2017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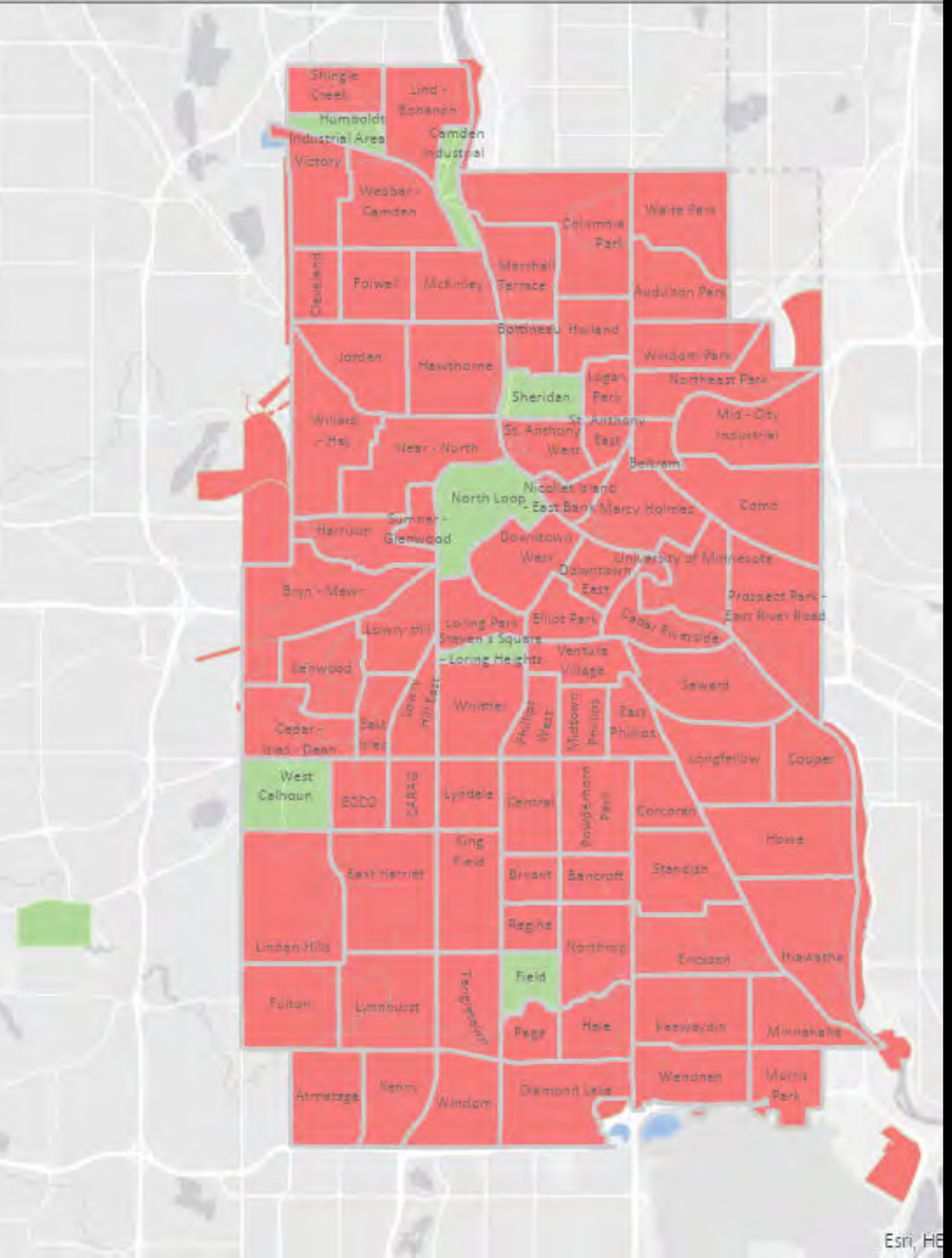
2018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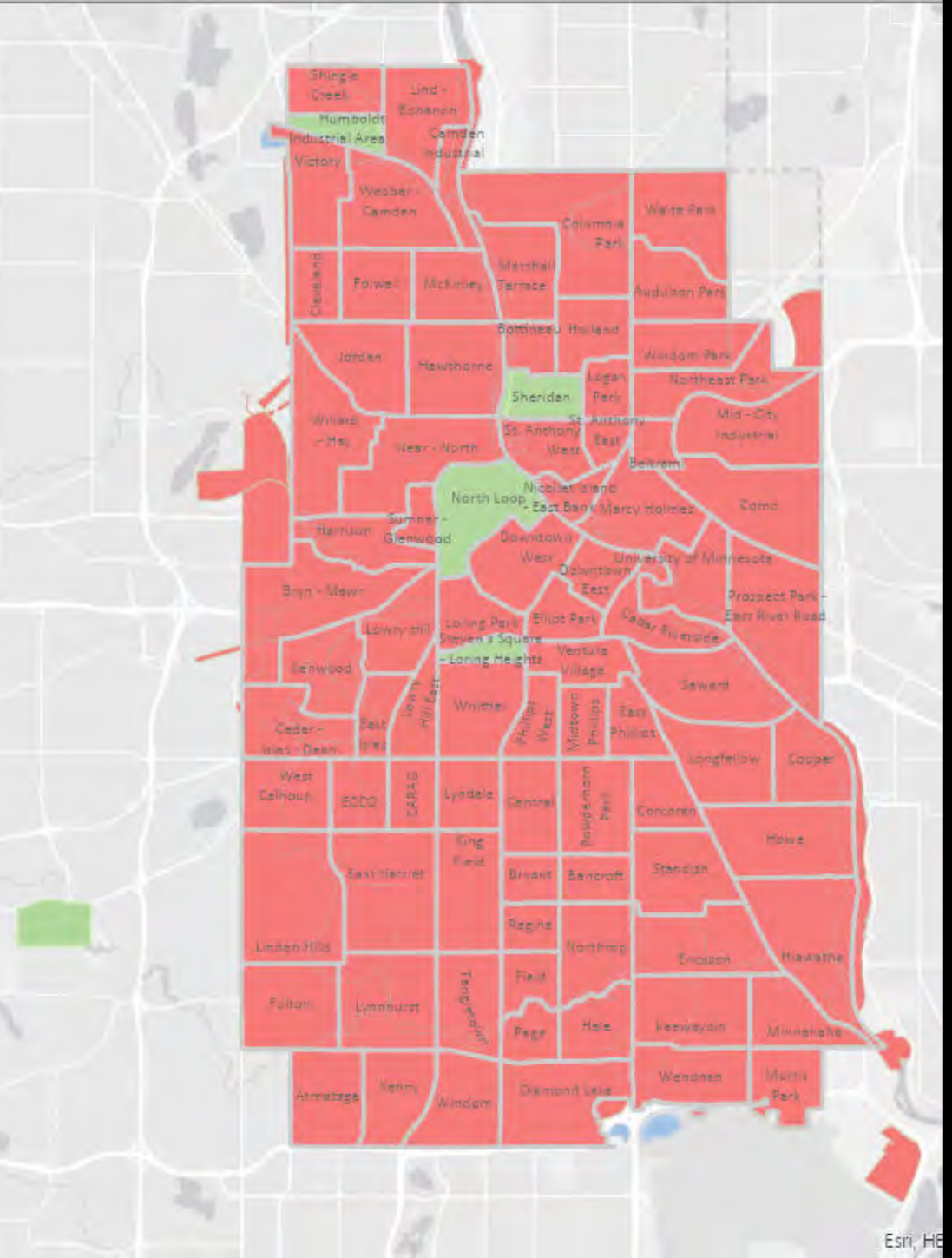
2019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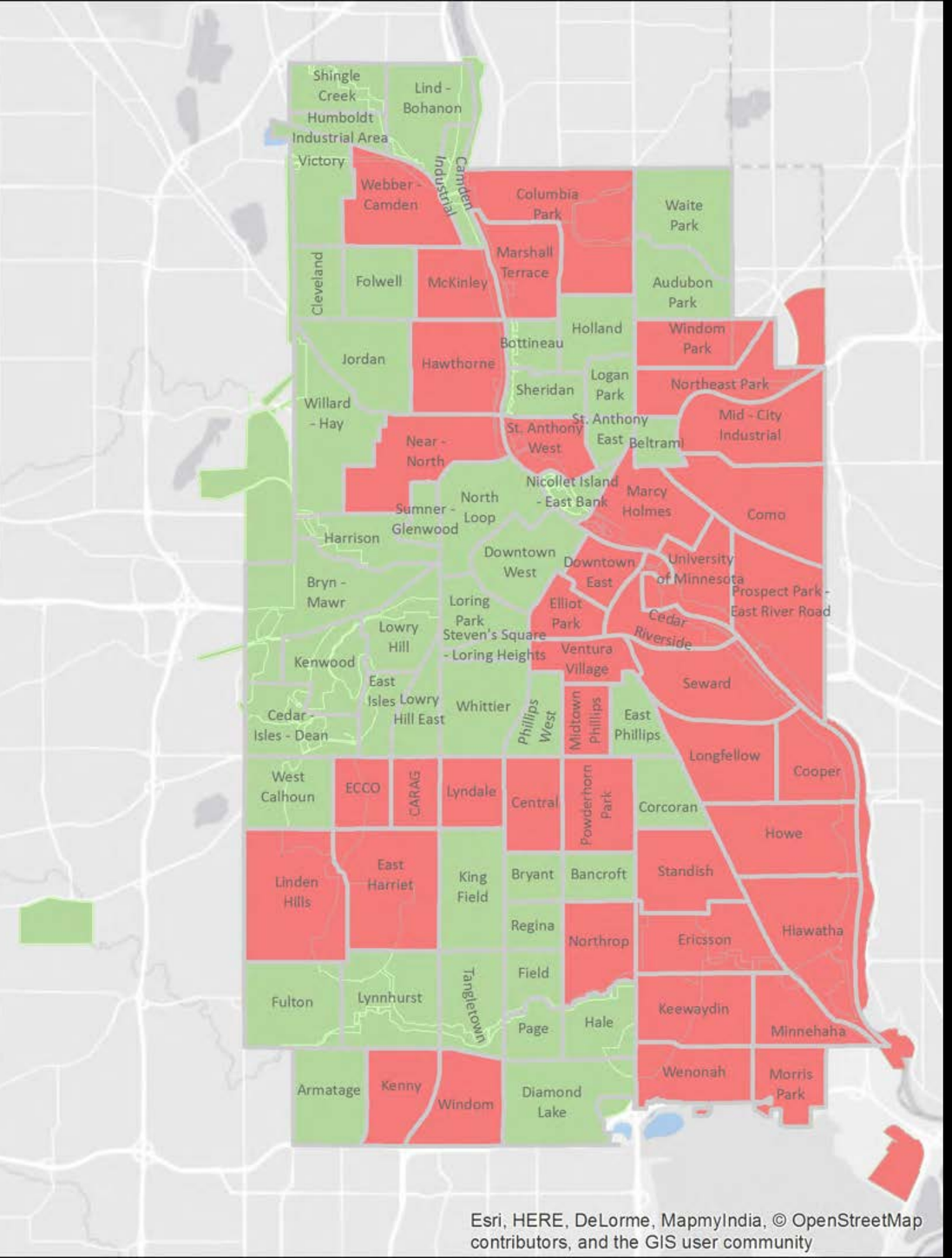
2020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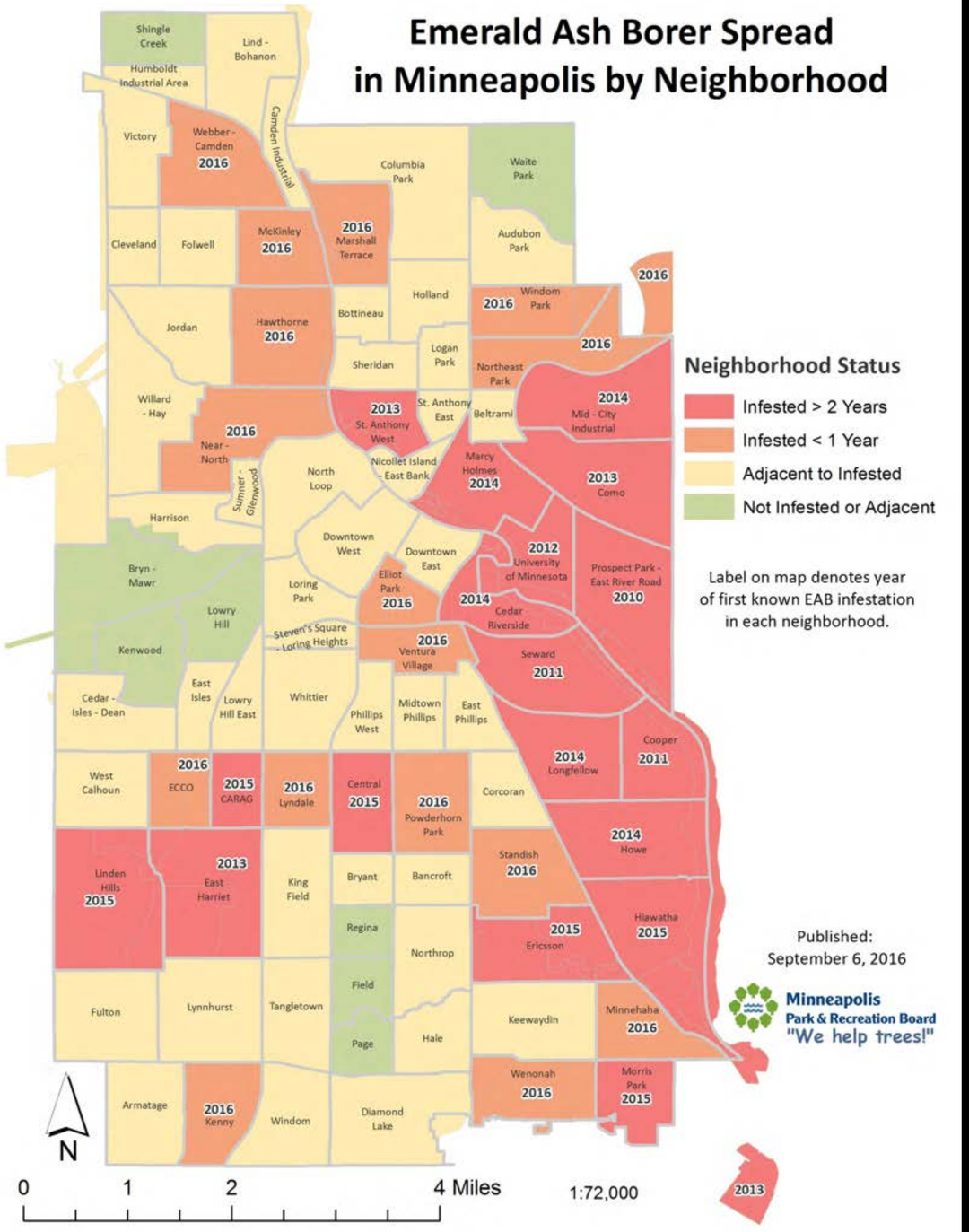
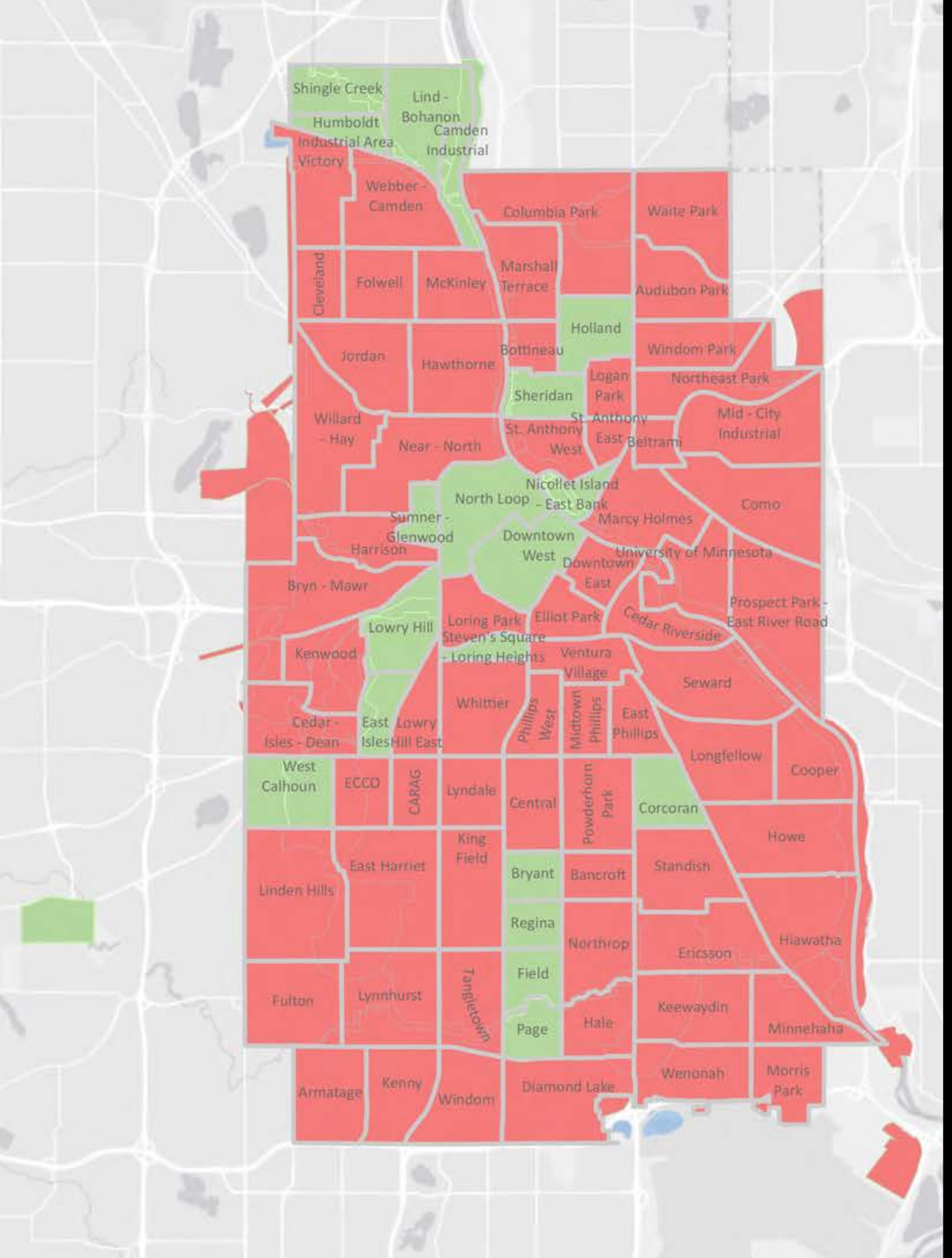
2016


Emerald Ash Borer Spread
in Minneapolis by Neighborhood
Shingle Creek
Lind - Bohanon
Humboldt Industrial Area
Victory
Webber - Camden 2016
Camden Industrial
Columbia Park
Waite Park
Audubon Park
Cleveland
Folwell
McKinley 2016
2016 Marshall Terrace
Holland
2016 Windom Park
2016
Jordan
Hawthorne 2016
Bottineau
Sheridan
Logan Park
Northeast Park
2016
Willard - Hay
2013 St. Anthony West
St. Anthony East
Beltrami
2014 Mid - City Industrial
2016 Near - North
Nicollet Island - East Bank
Marcy Holmes 2014
2013 Como
Sumner - Glenwood
North Loop
Harrison
Downtown West
Downtown East
2012 University of Minnesota
Prospect Park - East River Road 2010
Bryn - Mawr
Loring Park
Elliot Park 2016
2014 Cedar Riverside
Lowry Hill
Steven's Square - Loring Heights
2016 Ventura Village
Seward 2011
Kenwood
East Isles
Lowry Hill East
Whittier
Phillips West
Midtown Phillips
East Phillips
Cooper 2011
Cedar - Isles - Dean
2014 Longfellow
West Calhoun
2016 ECCO
2015 CARAG
2016 Lyndale
Central 2015
2016 Powderhorn Park
Corcoran
2014 Howe
Standish 2016
Linden Hills 2015
2013 East Harriet
King Field
Bryant
Bancroft
Hiawatha 2015
Regina
2015 Ericsson
Northrop
Field
Fulton
Lynnhurst
Tangletown
Keewaydin
Minnehaha 2016
Page
Hale
Wenonah 2016
Morris Park 2015
Armatage
2016 Kenny
Windom
Diamond Lake
2013
Neighborhood Status
Infested > 2 Years
Infested < 1 Year
Adjacent to Infested
Not Infested or Adjacent
Label on map denotes year of first known EAB infestation in each neighborhood.
Published: September 6, 2016
Minneapolis Park & Recreation Board
"We help trees!"
N
0 1 2 4 Miles
1:72,000

2016


Shingle Creek
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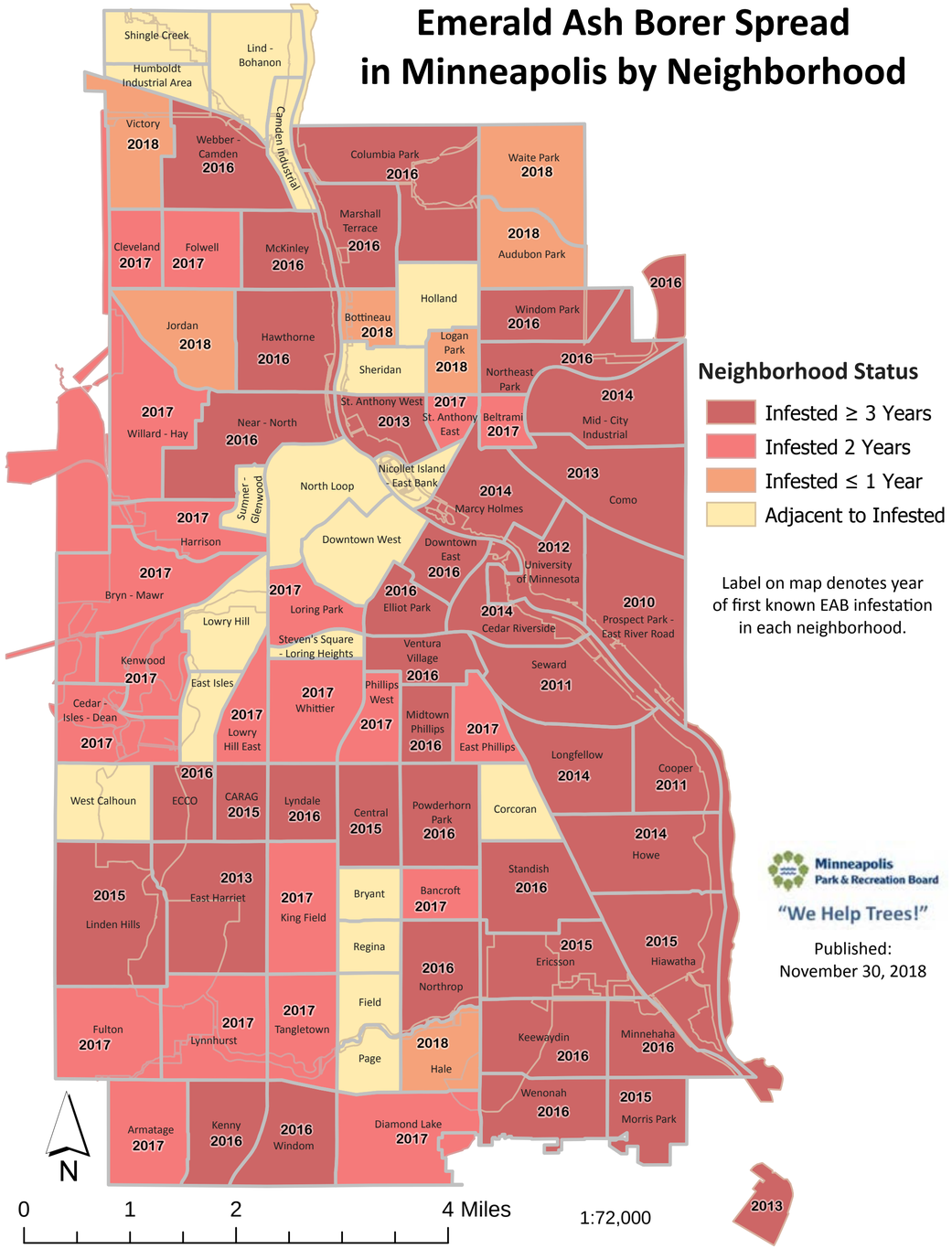
Armatage
Kenny
Windom
Diamond Lake
Wenonah
Morris Park

2018

Emerald Ash Borer Spread in Minneapolis by Neighborhood



Neighborhood Status

- Infested ≥ 3 Years
- Infested 2 Years
- Infested ≤ 1 Year
- Adjacent to Infested

Label on map denotes year of first known EAB infestation in each neighborhood.

Minneapolis Park & Recreation Board

"We Help Trees!"

Published:
November 30, 2018

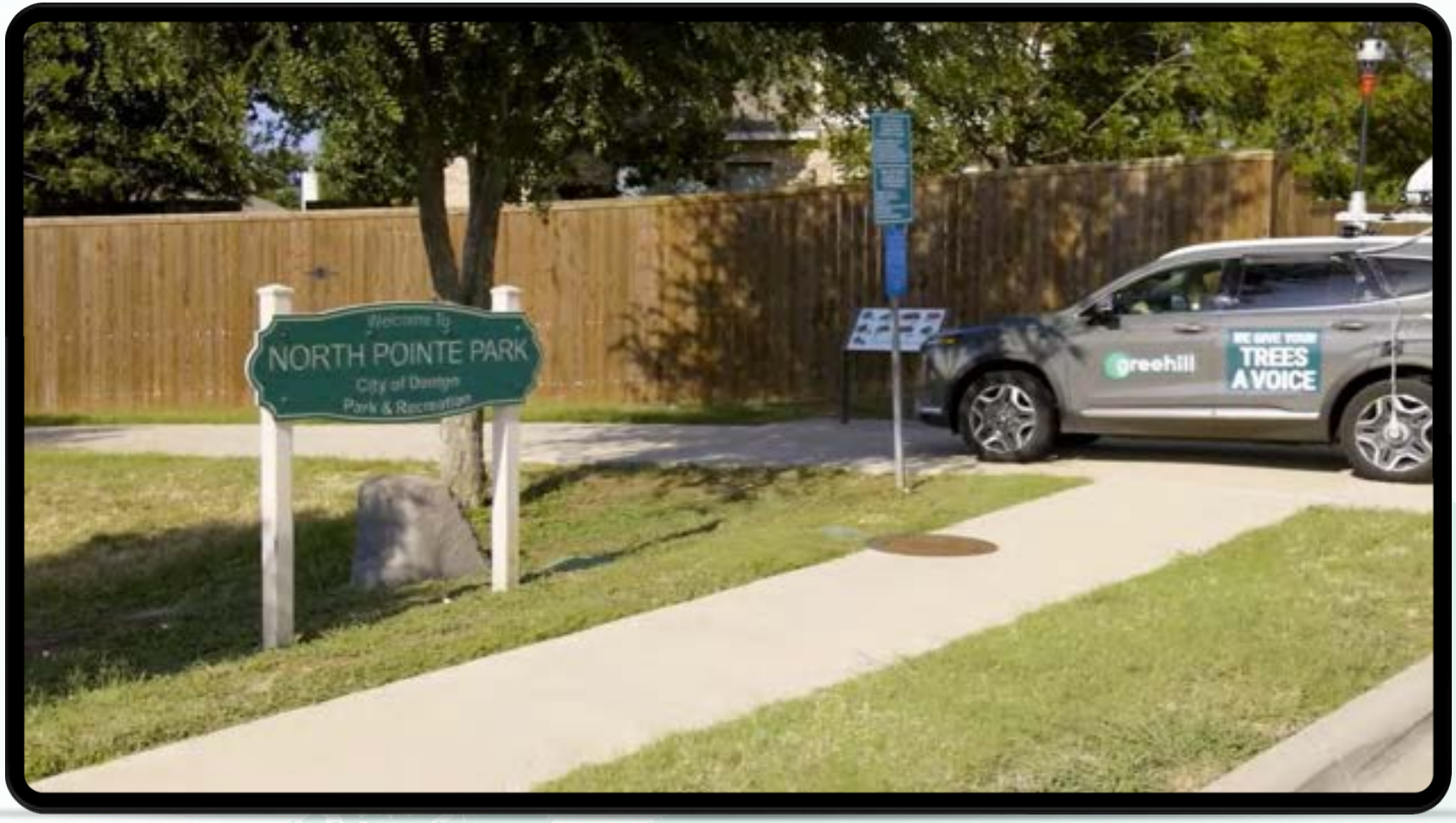
2018

Smart Tree Inventories:

The Right Decision, on the Right Tree, at the Right Time


Technicians gather data
using a mobile laser scanner
and 360° camera.
0:30 / 1:30
1x

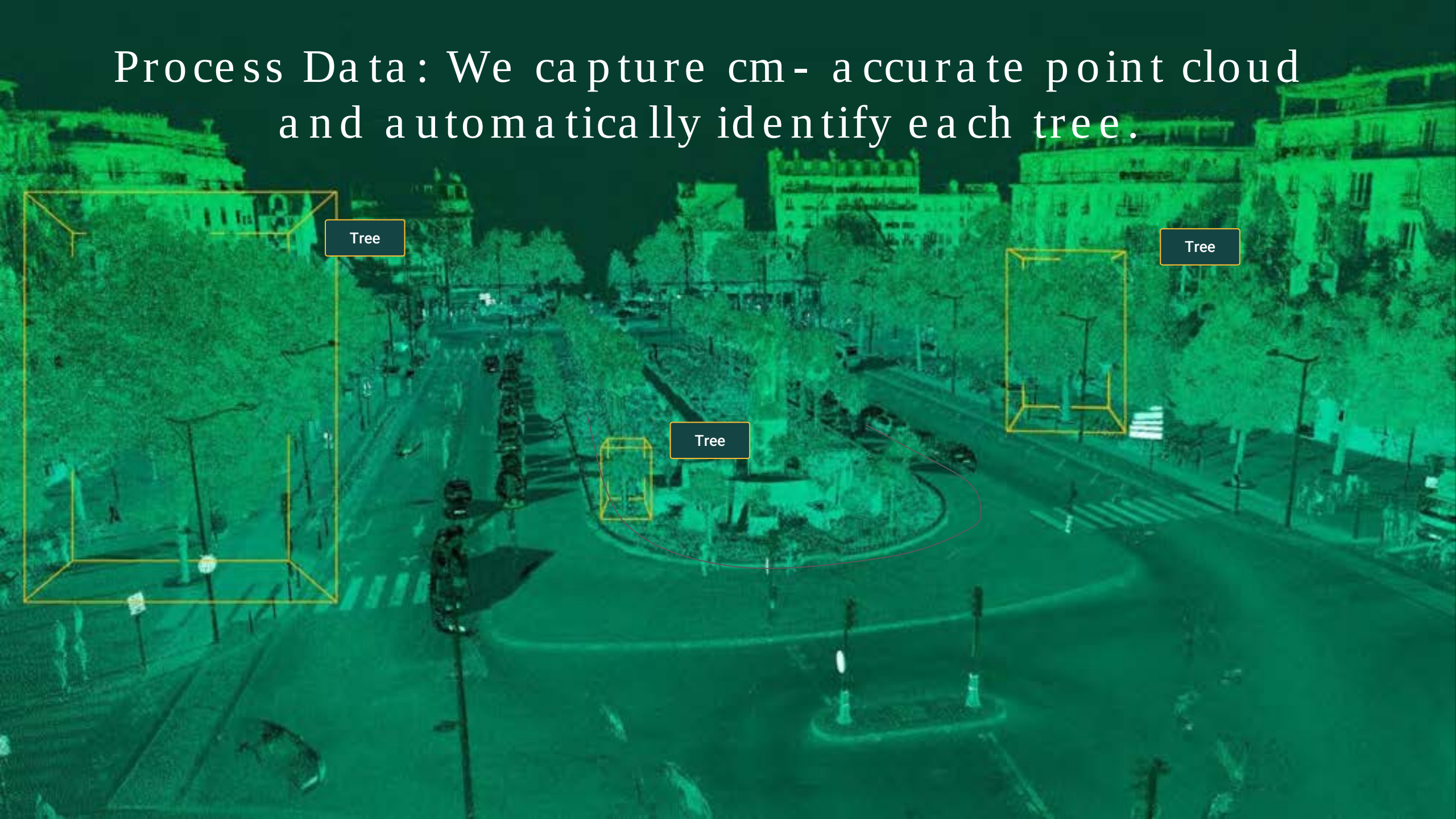
Data Collection




greehill
greehill
Map, Preserve, and Grow Your Urban Forest

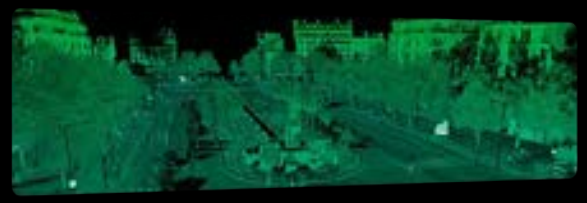

greehill
Map, Preserve, and Grow Your Urban Forest

Process Data: We capture cm- accurate point cloud and automatically identify each tree.



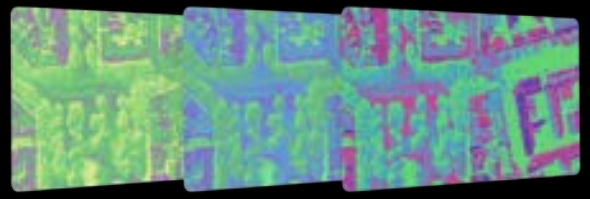
Step 2: Create a **4D Digital Tree Twin** of each tree

Point Cloud



Panoramic Images

Multispectral Satellite Images

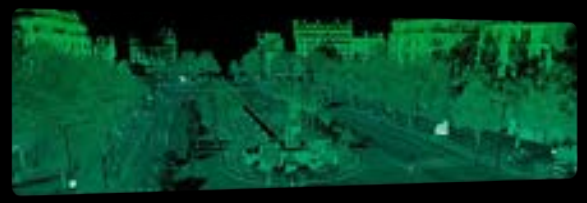


AI

4D DIGITAL TWIN

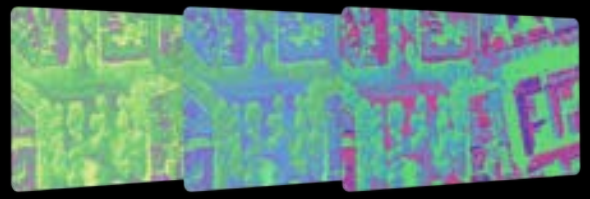
Step 2: Create a **4D Digital Tree Twin** of each tree

Point Cloud



Panoramic Images

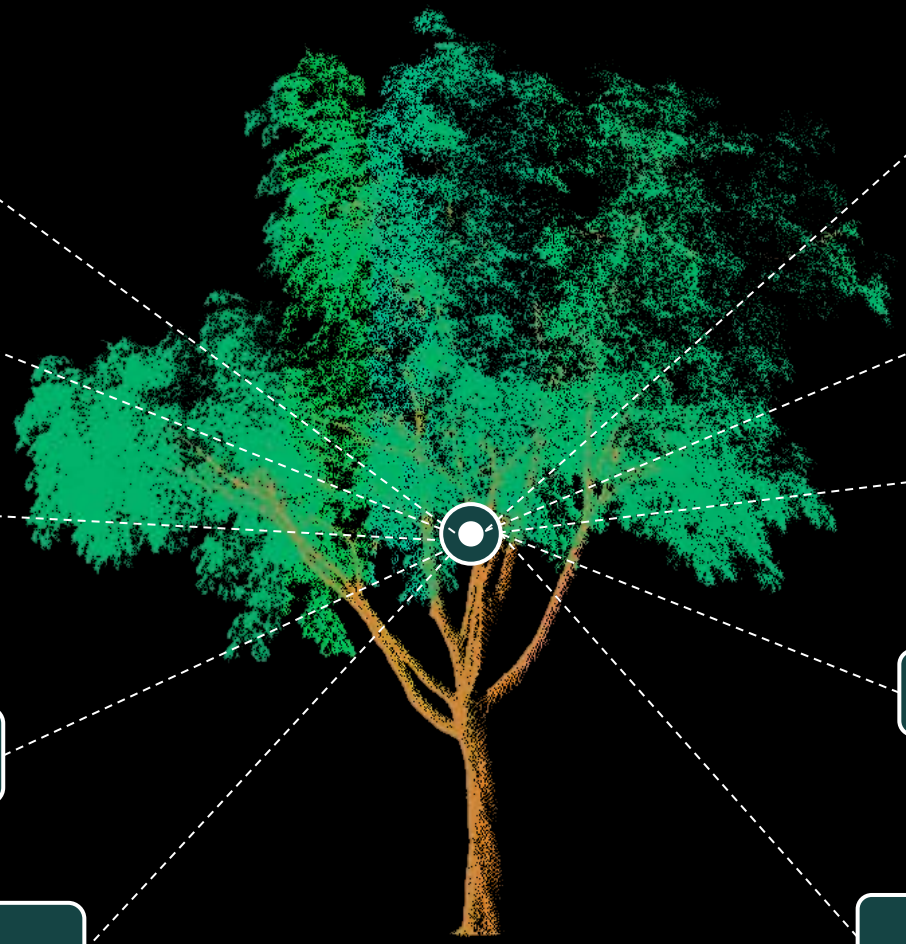
Multispectral Satellite Images



AI

4D DIGITAL TWIN

We analyze each tree and extract information



Species

Ecological Benefits

% Dieback

Clearance Issues

Leaning Angle

Size (DBH, Height, etc)

Leaf Area Index

Live Crown Ratio

Cohort Analysis

Change Over Time

Digital Tree Twin

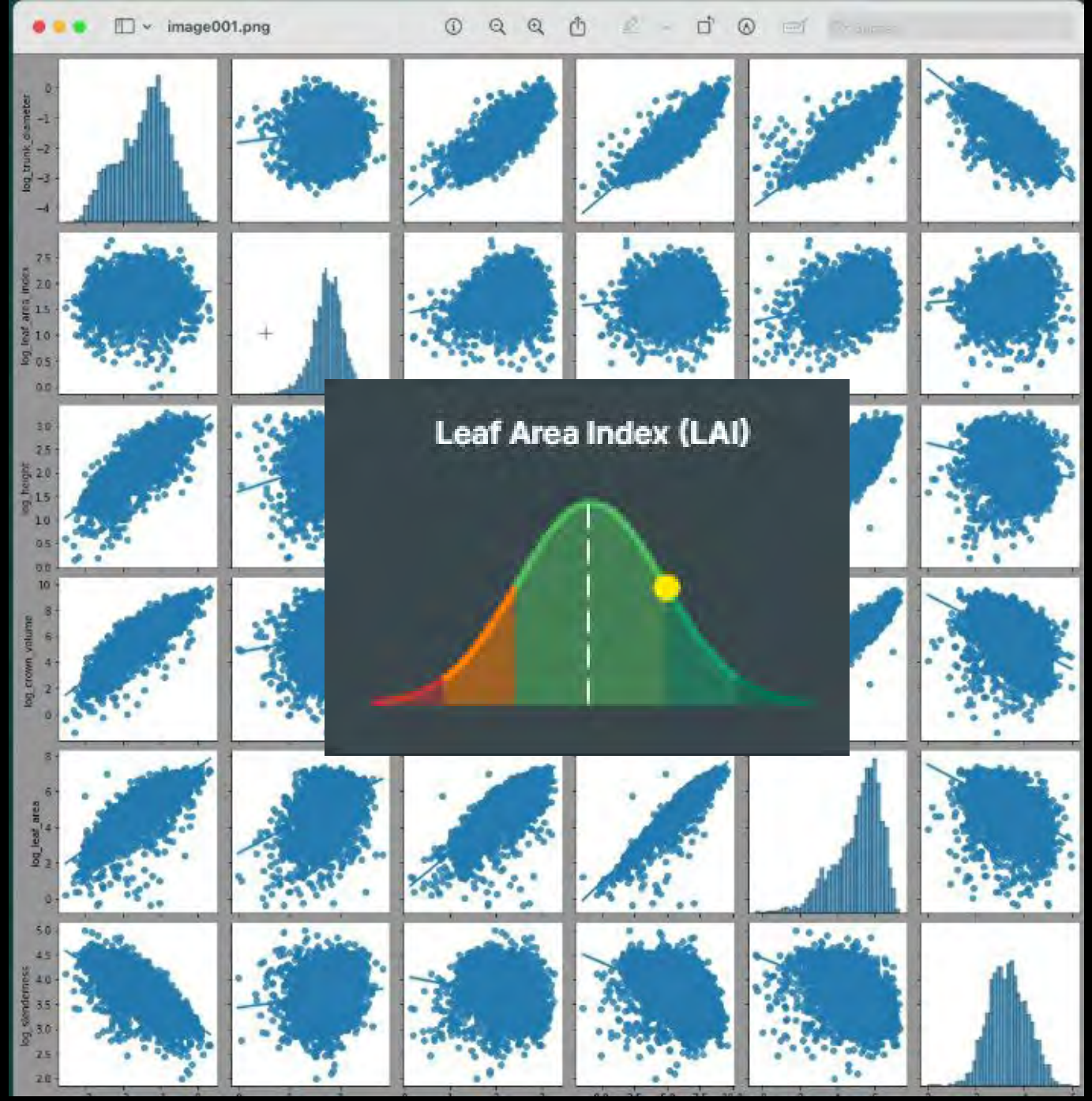
Defining Outliers

Absolute Outliers (cohorts)

- Dead trees
- Too much lean
- Leaf Area compared to Size
- Canopy Width vs Tree Height

Relative Outliers (filtering)

- Trees > x”
- Trees in certain neighborhoods
- Certain species of trees
- Trees >40% dieback

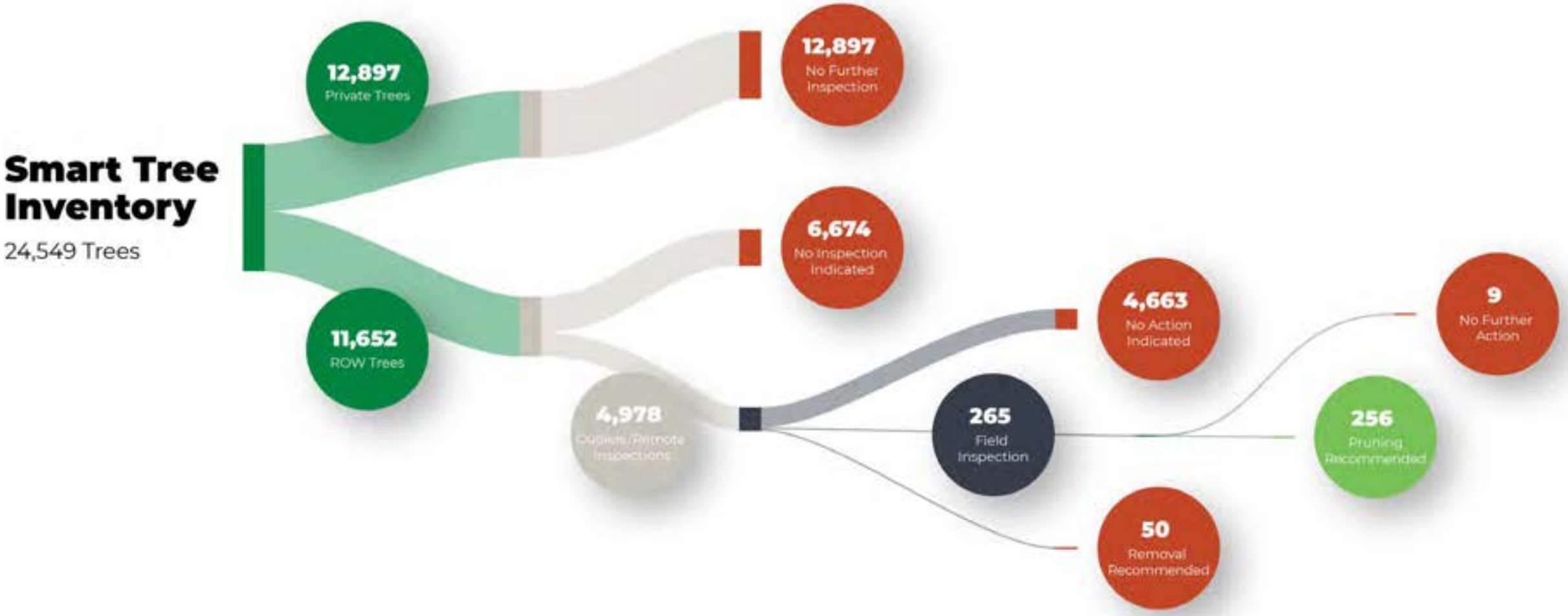


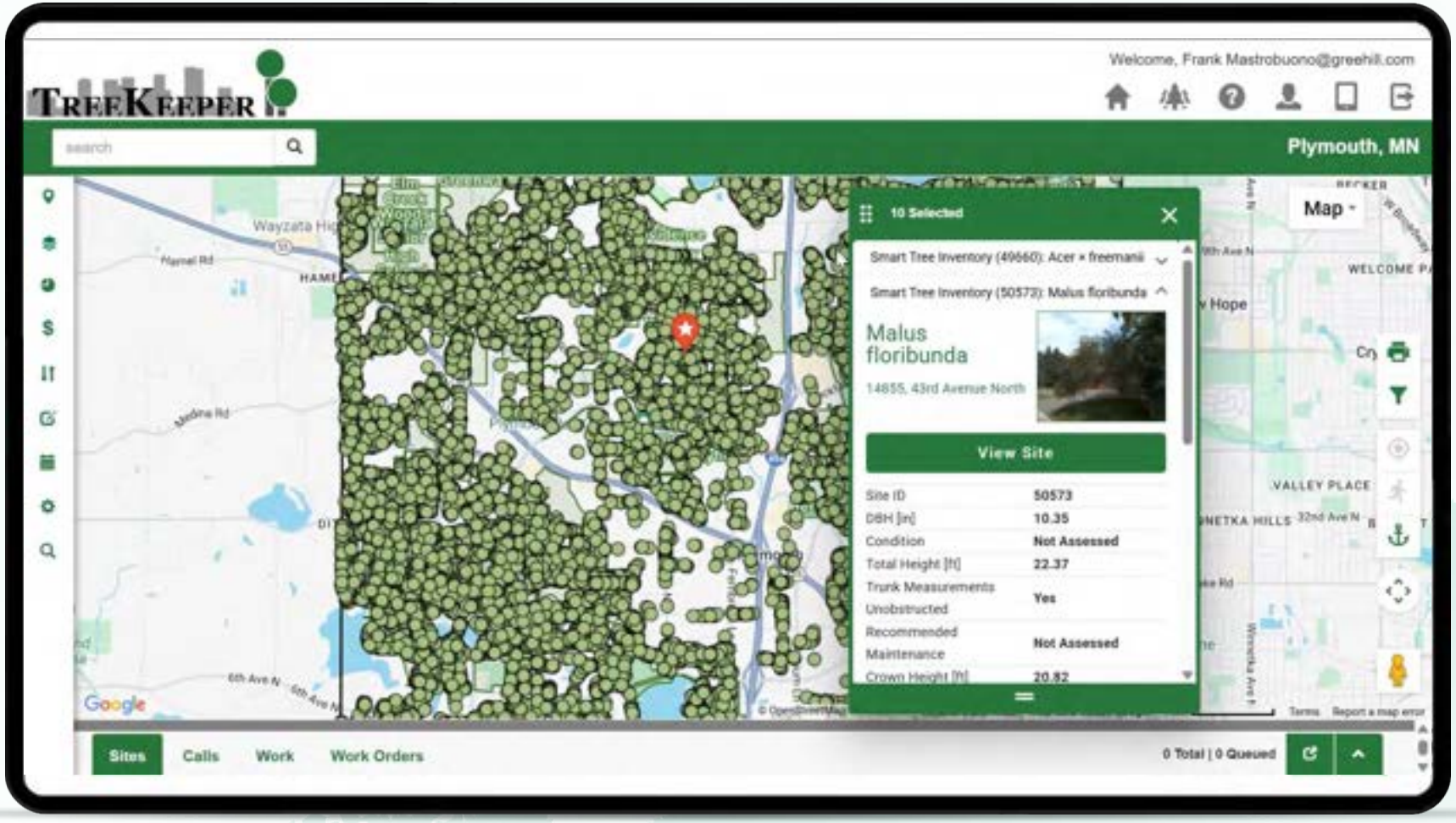
Step 5: Davey Arborists assess outliers

Remotely
0 - 20%

In Field
25 - 100%

Step 5: Davey Arborists assess outliers




TreeKeeper
Welcome, Frank Mastrobuono@greehill.com
search
Plymouth, MN
Map
10 Selected
Smart Tree Inventory (49660): Acer × freemanii
Smart Tree Inventory (50573): Malus floribunda
Malus floribunda
14855, 43rd Avenue North
View Site
Site ID 50573
DBH [in] 10.35
Condition Not Assessed
Total Height [ft] 22.37
Trunk Measurements Unobstructed Yes
Recommended Maintenance Not Assessed
Crown Height [ft] 20.82
Sites
Calls
Work
Work Orders
0 Total | 0 Queued


Crown height 67.68 ft
Total Height 75.41 ft
Crown Spread 62.52 ft
Trunk Height 19.10 ft
DBH 38.77 in

TreeKeeper

search

Welcome, Philip Potyondy (DRG)

City of Minneapolis, MN

Map

Latvian Evangelical Lutheran Church of...

E 32nd St

Jubilee Community Church

?

TreeKeeper

Welcome, Philip Potyondy (DRG)

search

City of Minneapolis, MN

Map

E 31st

E 31st

E 31st St

E 31st St

E 31st St

E 30th St

Powderhorn Lake

E 35th St

35th St

25th Ave

EAB from Crisis to Opportunity:

Managing & Growing a Resilient Urban Forest in Minneapolis, MN

?

PHILIP POTYONDY

philip.potyondy@davey.com

DAVEY Resource Group