Tree Assessment and Recommendations
Duncan Park BMX Trail Area

Photo source: http://ninthstreetbmx.com/

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AUSTIN PARKS & RECREATION
Cultural Places, Natural Spaces

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Introduction

Duncan Park, bisected by 9th Street between Henderson St and West Ave, is just over 5 acres in size. It is a developed downtown park that is host to mainly passive recreation, with the exception of a bicycle motorcross (BMX) trail system south of 9th Street. The park flanks Shoal Creek and is located entirely within the FEMA-delineated floodplain.

Over the last 20 years, members of the BMX community have constructed trails and jumps on about 1.5 acres of the park without the direction or permission from the City of Austin Parks Department. The jumps were constructed using soil from the site and range from between a few inches to six or more feet tall. The site has become a nationally recognized BMX trail system, known as "The 9th Street Trails." The site stewards have their own website (http://www.ninthstreetbmx.com/) which includes a petition for preservation of the trails which has been signed by over 750 people.

The construction of the BMX trails has created some environmental concerns, namely soil erosion in close proximity to Shoal Creek and soil grading within the critical root zones (CRZ) of trees on the BMX site.

The construction of the BMX trail features involves the excavation, movement, and piling of soil. Because this area contains un-stable soil and because of the area's close proximity to Shoal Creek, soil erosion into the creek is a water quality concern. As shown in the photo below, taken from 9th street, the area is prone to flooding.

Flooding of BMX trails

Photo from http://www.ninthstreetbmx.com/

The photo below shows an example of the type of soil modification within the CRZ's of trees that is common in the BMX trail area.

Example of Soil Modification

Photo from http://www.ninthstreetbmx.com/

Assessment Protocol

On July 13, 2011, Austin Parks and Recreation Department (PARD) Urban Forestry Program staff performed an assessment of all trees within the BMX trail area. The assessment included an inventory of the following for each tree greater than 2" whose CRZ was at least partially within the BMX trail area:

Species

Diameter at breast height (DBH)

Condition

Based on structural and foliar health

Categories: good, fair, poor, or dead/dying

Impact

Amount of the CRZ with at least 6 inches of excavated or filled soil from original grade

Categories: 0-25%, 25-50%, 50-75%, 75-100%

Compaction

Amount of the CRZ that has been compacted by BMX trail activity

Amount of compacted area that may or may not be at original grade

Area of CRZ frequently traversed by BMX activity

Category: 0-100%, in 10% increments

Assessment Results

Species Composition

The tree assessment was performed on 115 trees within the BMX site. The four most common trees were pecan, cedar elm, hackberry, and live oak. Figure 1 illustrates the species composition of the site and Figure 2 shows a diameter distribution of the trees on site.

Figure 1

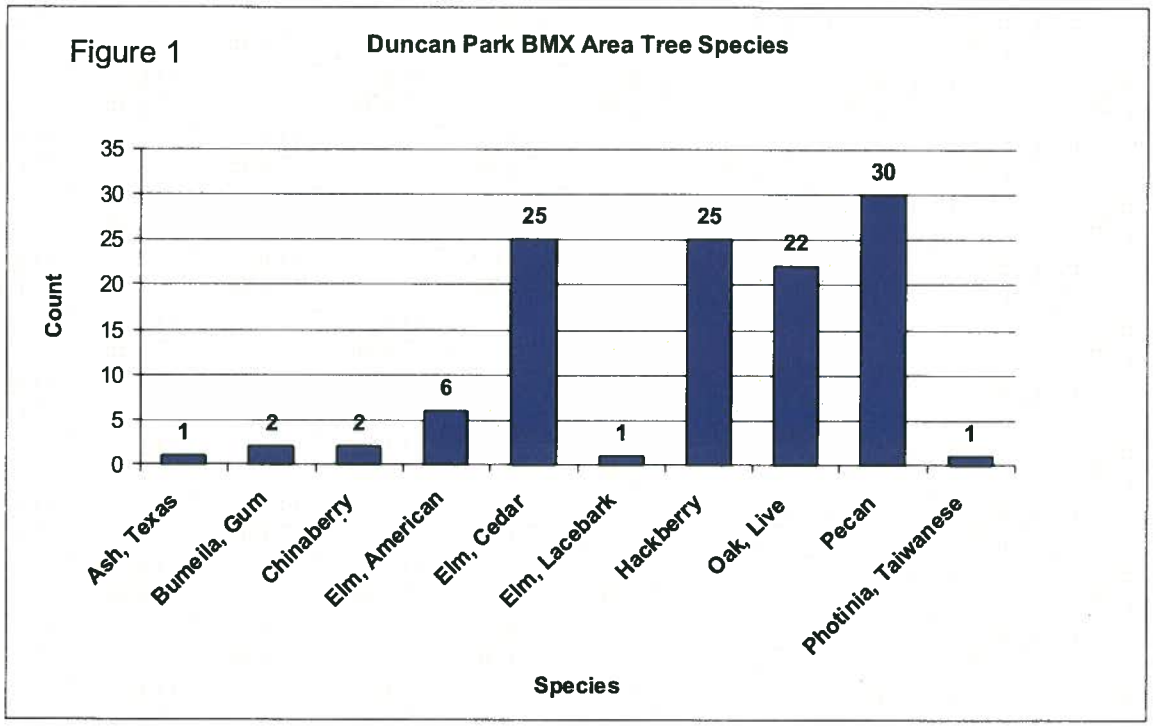
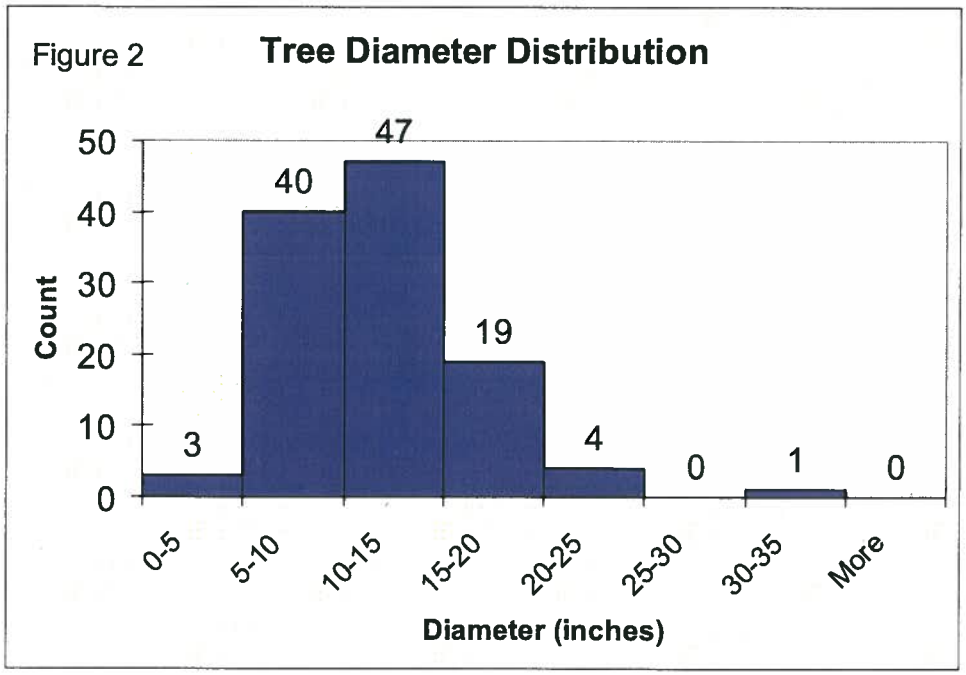


Figure 2



Tree Health

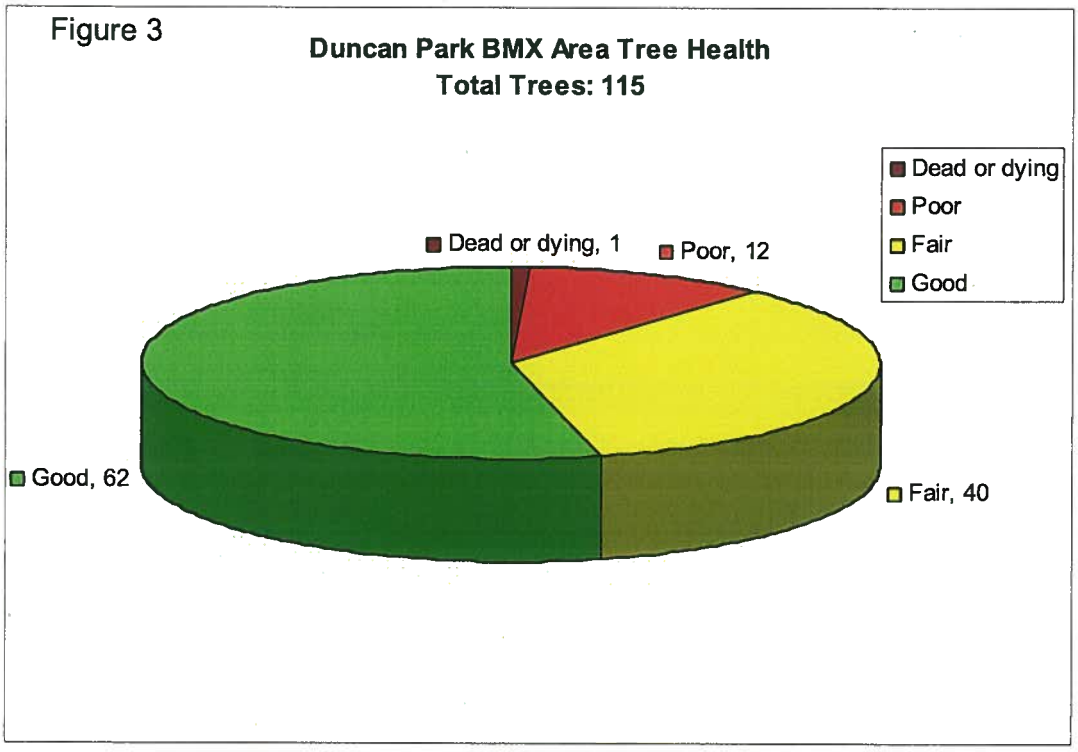
The majority of the trees on site were in good or fair health. They showed little to moderate signs of water stress, chlorosis, insects/disease, decay, and/or other signs of stress. American elm trees were in the poorest health overall.

Table 1 and Figure 3 show the health of the trees on site as well as a health rating by size class. Also see Appendix Map 1 for a spatial representation of this data.

Table 1

Tree Health	Count	Percent of Total
Dead or dying	1	0.8
Poor	12	10.4
Fair	40	34.8
Good	62	54.0
Total	**115**	**100.0**

Figure 3



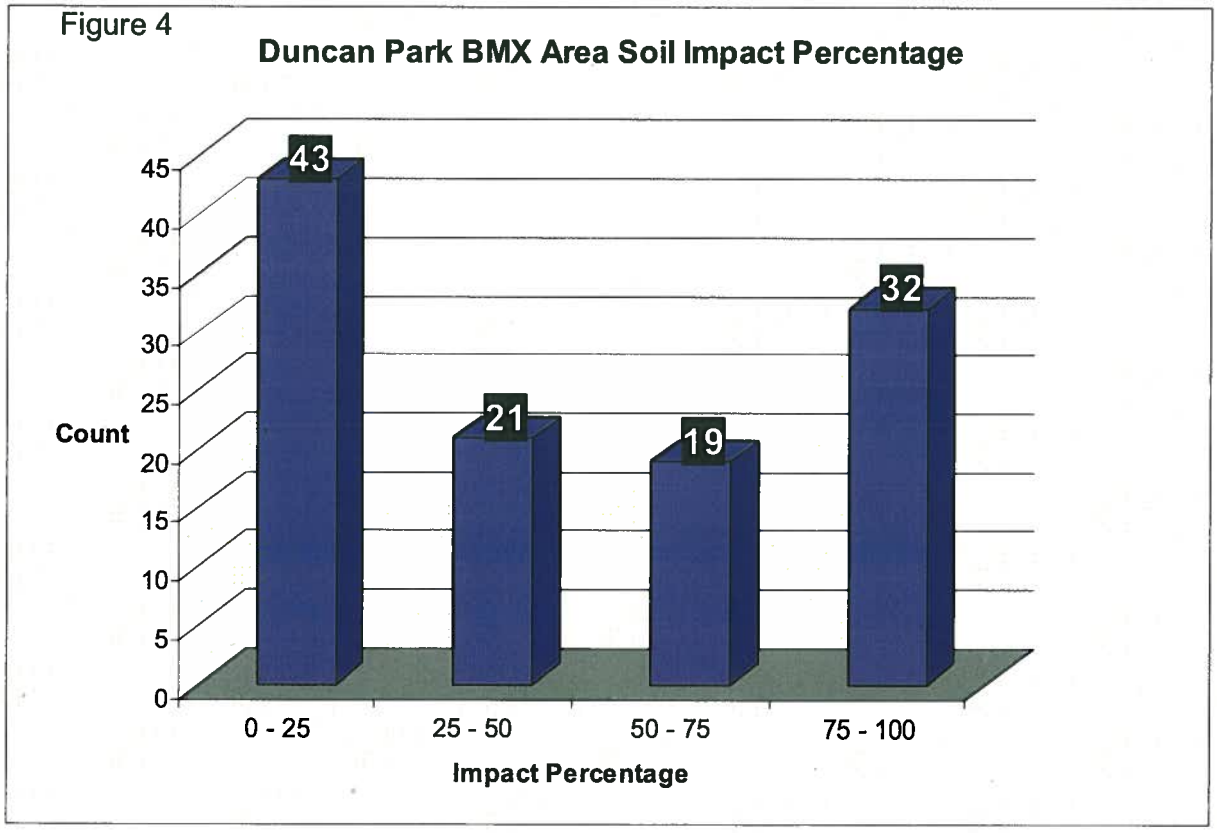
Impact of BMX Trail Construction

Each tree was assigned a value based on the amount of soil area within the CRZ that had been adjusted from original grade by BMX trail construction. There are over 100 soil mounds or holes that were created to provide "jumps" for BMX trail users. The impacts consisted of soil removal up to 5 feet deep or soil filling up to six feet high within the CRZ. In some instances, soil was mounded against the trunks of trees up to several feet from original grade. Table 2 and Figure 4 display a count of the trees whose CRZ's were impacted by BMX trail soil grading. Four categories were used to assess the amount of impact: 0-25%, 25-50%, 50-75%, 75-100% based on the amount of each tree's CRZ that contained soil modification. Also see Appendix Map 2 for a spatial representation of this data.

Table 2

Impact Percentage	Count	% of Total
0 - 25	43	37.4
25 - 50	21	18.3
50 - 75	19	16.5
75 - 100	32	27.8
Total	**115**	**100**

Figure 4



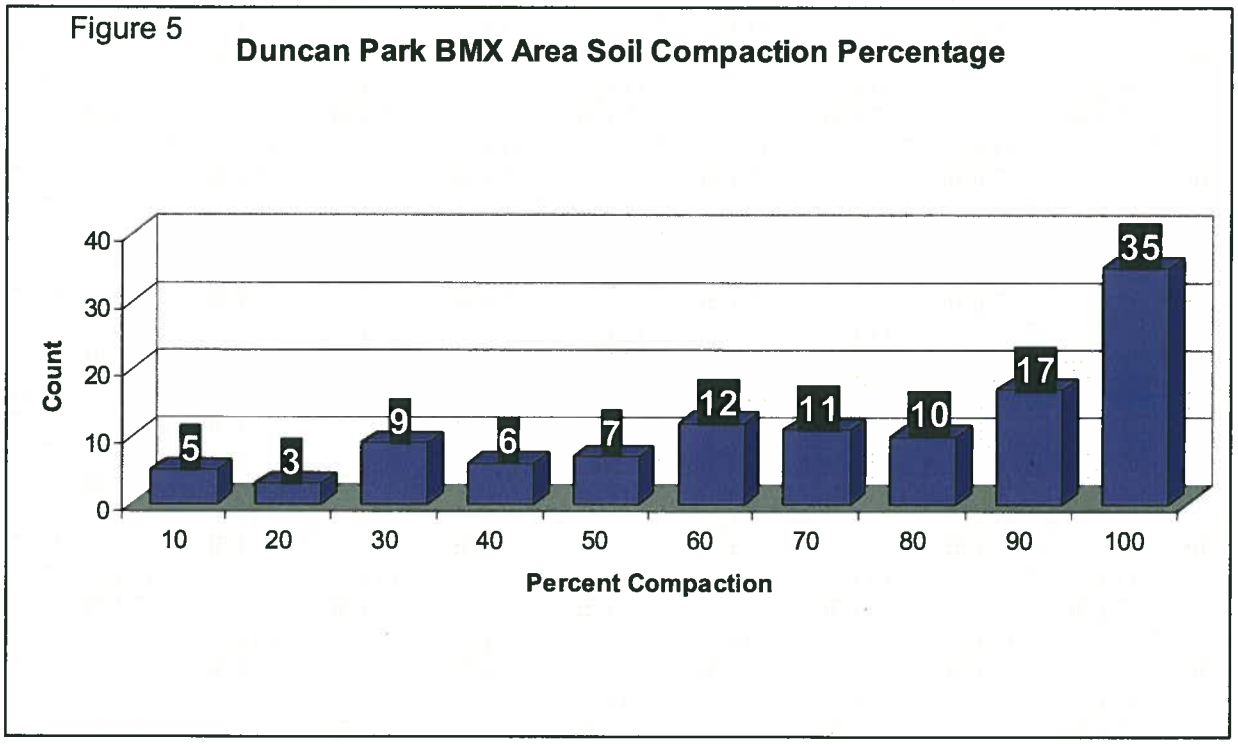
Soil Compaction from Trail Use

Each tree was also assigned a value based on the amount of its CRZ that was compacted. The intent of this category of data is to capture impacts to CRZ's that were not necessarily caused by soil excavation but by frequent use by BMX trail users. Often, areas of soil within CRZ's that remained at original grade were still impacted because a flat portion of a BMX trail crossed through the CRZ. Each tree was given a value between 0-100%, in 10% increments, based on the amount of CRZ that was compacted due to trail use. Table 3 and Figure 5 summarize the data. Also see Appendix Map 3 for a spatial representation of this data.

Table 3

Root Compaction Percentage	Count	Percent of Total
10	5	4
20	3	3
30	9	8
40	6	5
50	7	6
60	12	13
70	11	9
80	10	8
90	17	14
100	35	30
Total	**115**	**100**

Figure 5



Correlation Between Tree Health vs. Impact and Tree Health vs. Soil Compaction

Two methods of regression analyses were performed to determine the correlation, if any, between tree health and

1) Impact (the amount of soil modification within the CRZ); and

2) Compaction (within the CRZ)

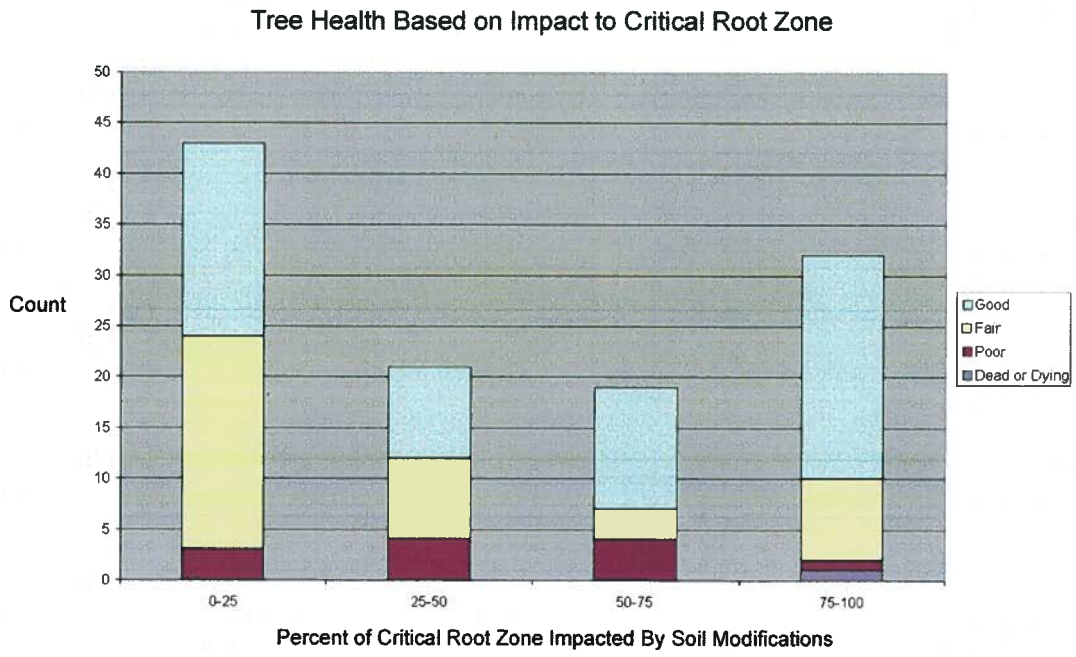
Standard regression analyses and Pearsons correlation analyses gave the following correlation coefficients for Impact and Compaction. A value of 1 shows a perfect positive correlation, a value of -1 shows a perfect negative correlation, and a value of 0 shows zero correlation.

Correlation Coefficients	
Standard regression: Tree Health vs. Impact	**0.097**
Standard regression: Tree Health vs. Compaction	**0.132**
Pearsons correlation: Tree Health vs. Impact	**0.097**
Pearsons correlation: Tree Health vs. Compaction	**0.132**

The two methods of correlating the data do not show a statistically significant correlation between Tree Health and either Impact or Compaction—the coefficient values are too close to 0 to be attributed to a correlation, they are simply due to variation in the data.

Figure 6 shows tree health based on the amount of impact within the CRZ of each tree.

Figure 6



Discussion and Recommendations

Tree Concerns

Most of a tree's fine water-absorbing roots are within the first few inches of soil. These roots are critically important for water uptake into a tree. Even minor adjustments to the soil within a CRZ of a tree can cause enough disruption to fatally impact water uptake.

Despite what we know about tree physiology and tree response to soil modifications, the trees within the Duncan Park BMX Trails area show little to no signs of stress due to the trail building activity.

A possible explanation of this is that the majority of trees that exist on the site are native, drought-adapted species (pecan, cedar elm, hackberry, live oak) that can sustain periods of water inaccessibility. However, the extent and severity of the soil modifications due to the BMX trails will very likely result in declining tree health over time. Tree biologists are familiar with similar impacts to trees on construction sites that manifest several years, even decades, after the impact occurs.

Soil adjustment results in the following:

Excavation:

- A physical removal of roots
- A reduction of the water uptake area, causing the tree to be less adaptable to changing water availability

Filling:

- Trunk rot due to soil mounding and moisture buildup against the trunk
- Trunk-girdling roots that eventually choke a tree's own trunk
- Oxygen unavailability
- Compaction of a tree's fine water-absorbing roots
- Compaction and burying a tree's fine water-absorbing roots, causing water unavailability

We expect to see a moderate to serious decline in the health of the 115 trees within the BMX trail area over time if the current soil modifications are sustained.

Recommendations

In order to preserve the health of the trees within the BMX Trail area, PARD Urban Forestry Program staff recommend one or more of the following options:

A. Restore the original grade of the soil based on the depth of each tree's root flare
B. Provide mulch and/or supplemental water to the CRZ's of trees where possible
    a. Place mulch in areas where it will not impact the use of the BMX trails
    b. Place mulch in areas where slope will not cause it to migrate
C. Continue to assess tree health, impact, and soil compaction of the 115 trees on an annual basis
D. Continue to monitor trees and remove and prune trees as they become hazardous

Appendix: Maps of Trees Within Duncan Park BMX Trail Area

Tree Health

- Dead or dying
- Poor
- Fair
- Good

Park Boundaries

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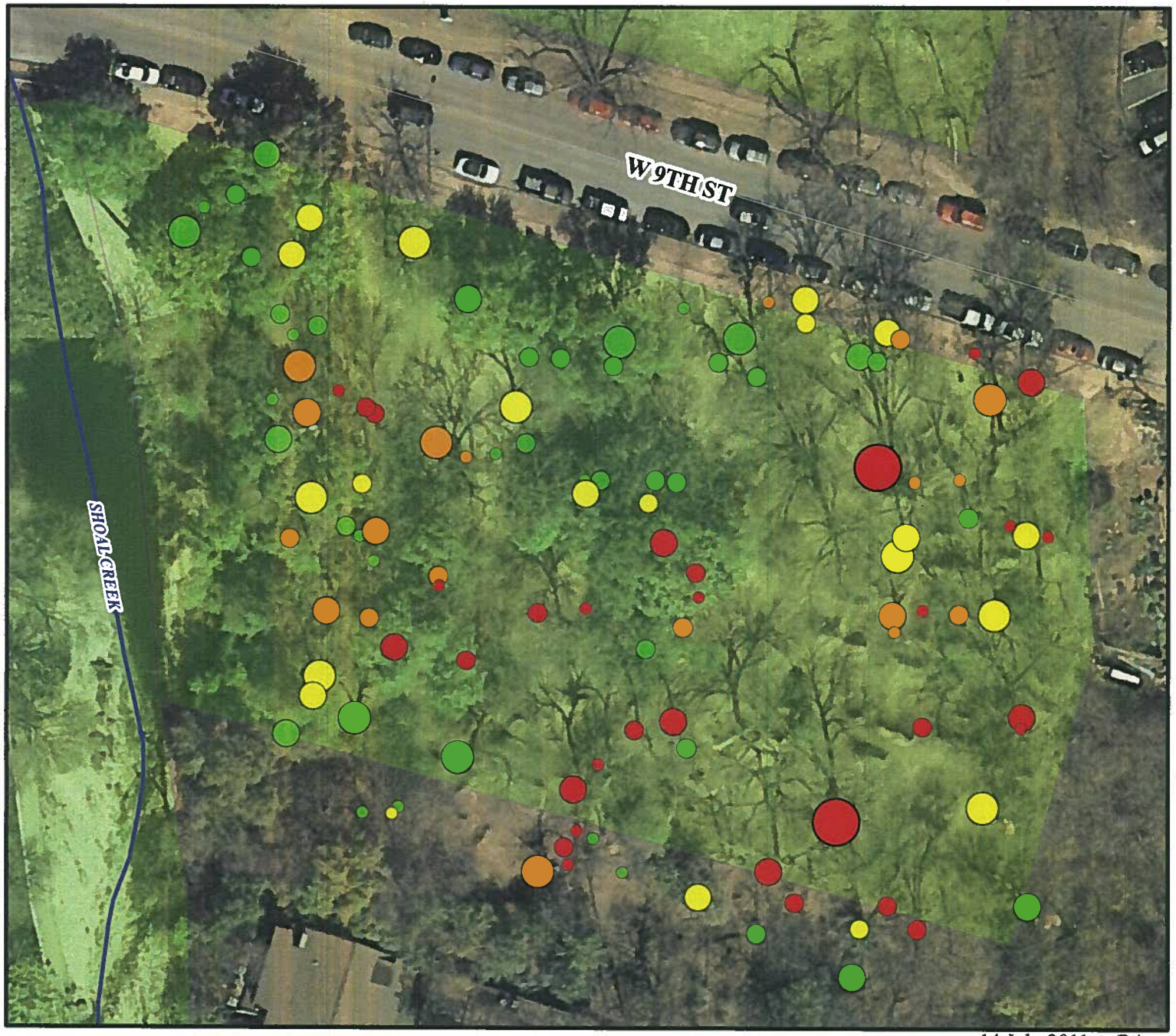
0 50 100
Feet

N

Map 1: Duncan Park BMX Area Tree Health



Soil Impact

- 0-25%
- 25-50%
- 50-75%
- 75-100%
- Park Boundaries

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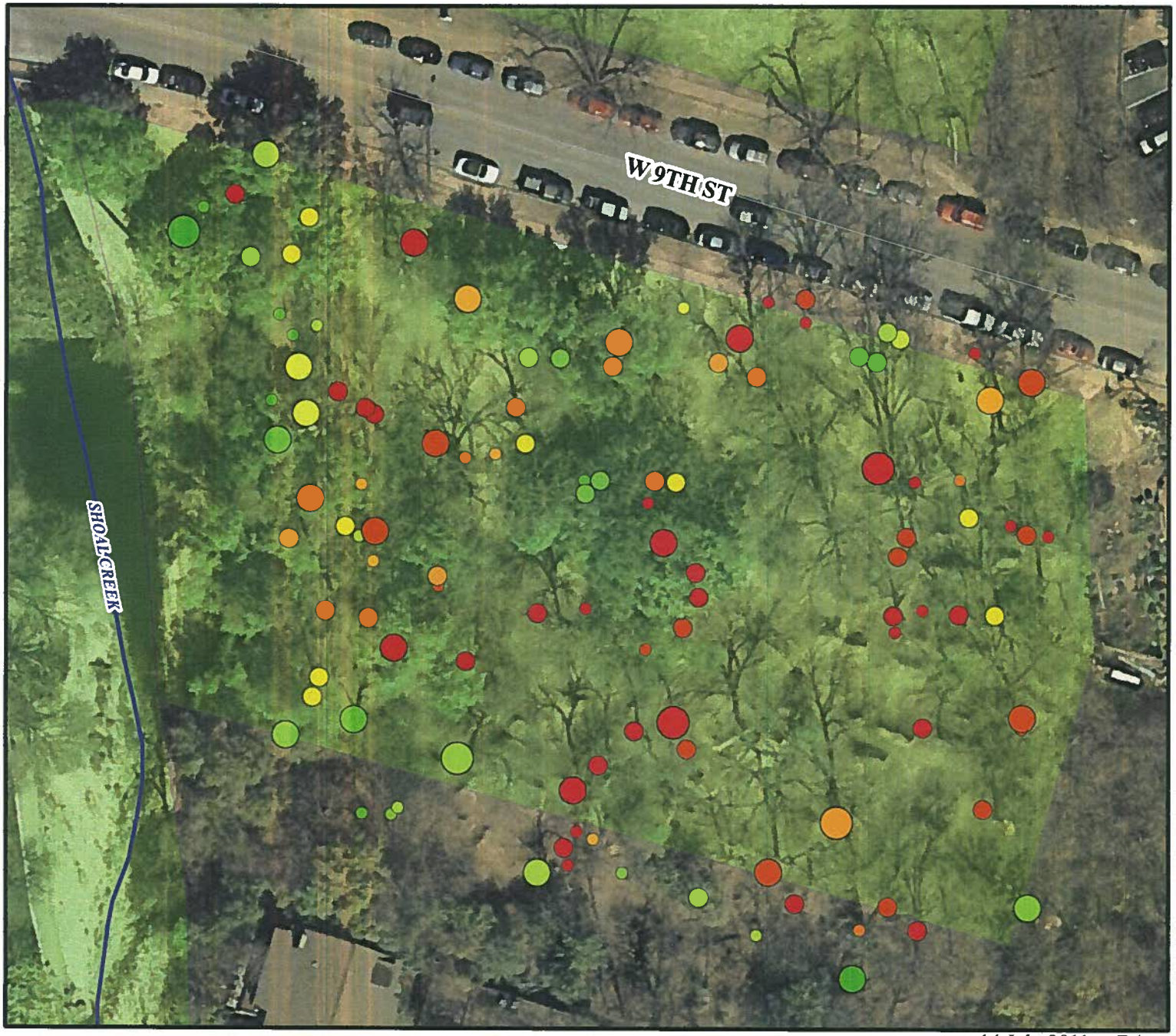
0 50 100
Feet

N

Map 2: Duncan Park BMX Area Soil Impact



Soil Compaction

- 10%
- 20%
- 30%
- 40%
- 50%
- 60%
- 70%
- 80%
- 90%
- 100%

Park Boundaries

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N

0 40 80
Feet

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Map 3: Duncan Park BMX Area Soil Compaction