

# Improving Public Health through Public Parks and Trails: EIGHT COMMON MEASURES





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The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention or National Park Service.

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## Introduction

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This summary presents eight common measures that connect park and trail planning to public health goals. The data collected using these measures can be employed to evaluate, plan, and promote public parks and trails at the national, state, regional, and local levels. By using these measures, park and trail system planners, public health professionals, community leaders, and researchers can identify and quantify some of the public health impacts of parks and trails and compare those results across time and geographic levels.

This summary is intended to provide a starting point to develop improved methods for evaluating, monitoring, and managing park and trail systems as they relate to community health goals. The summary is based upon research conducted in 2014 and 2015 by North Carolina State University's (NCSU) Parks, Recreation and Tourism Management Department in collaboration with the National Park Service (NPS) and the Centers for Disease Control and Prevention (CDC).

The 2014 NCSU, NPS, and CDC project investigated measures that address the connection between park and trail system planning and public health and well-being. This project consisted of (1) conducting a systematic literature review focused on peer-reviewed research examining park and trail system planning for health, the health impacts of parks and trails, and related data collection methodologies; (2) compiling a table of measures and their corresponding health outcomes within five categories: physical, psychological, social, ecosystem, and built environment; and, (3) developing common measures that link park and trail system access and use to public health outcomes for parks and recreation planners and public health practitioners to use. NCSU summarized the collaborative project in a published article in the *Journal of Park and Recreation Administration* (Schultz and Layton 2016).

## The Link Between Parks, Trails, and Public Health

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Parks and trail corridors have been important for public health in the United States for more than 100 years. The provision of urban parks for general public use became common in the mid-1800s. During that period, New York City's Central Park was promoted as a way of providing access to healthy outdoor space for the city's growing population. Fredrick Law Olmsted, the superintendent of Central Park in 1857, put forth the idea "That great public parks, such as his proposed Greensward, would function as the 'lungs of the city'—green open spaces where city dwellers could breathe in clean air" (Fisher 2010). Dr. John Henry Rauch (1828–94), who served as the Chicago sanitary superintendent after the Civil War, successfully advocated land use policies favoring the establishment of large urban parks (Frumkin, Frank, and Jackson 2004). Since that time governments across the country, and at every level, have provided parks to protect the health, safety, and welfare of their residents.

The public health benefits of parks and trails are broad and cross-cutting. For individuals, benefits include providing places for physical activity, improving mental health, reducing stress, providing connections to nature, and increasing social interactions. Parks and trails can simultaneously provide venues for community events, activities, and public health programs and improve the environment. Parks and trails that contain tree canopy can protect and improve public health by mitigating urban heat islands. Parks can reduce flooding risks by capturing and detaining floodwaters in wetlands or other park facilities such as playing fields. Parks can also protect human health and property loss by deterring development in areas prone to events like mudslides, wildfires, and flooding.

**Parks** are defined as "areas of public open space, typically designed for or able to cater for, a range of different leisure or recreational activities—both active and passive" (Edwards, Hooper, Knuiman, Foster & Giles-Corti, 2015).

**Trails** refer to linear or loop routes managed for transportation, leisure, historic, or heritage values including pathways, multiple-use trails, greenways, and blueways (water-based trails).

## Project Purpose & Description

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To improve the health and lives of all Americans, community leaders, decision makers, researchers, public health professionals, and park and recreation professionals have been working together to promote the public health benefits of parks and trails. Active Living Research, funded in part by the Robert Wood Johnson Foundation, has been a national leader in validating the positive public health benefits of parks and trails, and has been awarding research grants in this area since 2001. Reports based on those grants can be found on their website ([www.activelivingresearch.org](http://www.activelivingresearch.org)) and provide guidance that might be helpful in applying the measures in this summary.

The focus of this summary is the further development and promotion of common measures typically associated with park and trail infrastructure and that provide ways to systematically evaluate and enhance their health benefits. The measures grew out of the NCSU/NPS/CDC collaborative research project mentioned at the beginning of this summary.

Common measures are needed for many reasons. The “Bicycling and Walking in the United States: 2010 Benchmarking Report” states “What isn’t counted, doesn’t count” and that “In order to improve something, there must be a means to measure it” (Alliance for Biking and Walking 2010). The Benchmarking Report was created to give biking and pedestrian advocates a framework to plan, set goals, and track progress. It also helps coordinate efforts by diverse partners. Common measures are just as important for parks and trails. Without the data the measures generate it is impossible to learn what does and does not work well; set goals, plan strategies, and evaluate results; make data-based decisions; or make a strong case for needed changes in infrastructure and funding.

The purpose of this project is to suggest common measures for park and trail systems that are grounded in public health goals such as easier access to parks or trails and increased physical activity. Common measures can highlight the positive impact that park access and use have on community health which, in turn, emphasizes the importance of local parks and trails to community decision makers and funders. At a local level, data from common measures can help agencies make strategic decisions about park and trail facilities that can increase the public health benefits of facilities. These data can be used to identify trends and compare different approaches to park and trail design and management.

Most local park and recreation agencies lack resources, time, and internal analytical skills to conduct proper data analysis (NRPA 2016). To help address the potential lack of resources, park and recreation agencies could collaborate with public health professionals to collect and analyze park access and use data so that park planning, design, and management can better address community health outcomes and achieve shared goals.

## Measures Overview

Based upon information collected through the NCSU project, CDC and NPS staff identified useful measures for linking public health goals to park and trail system planning. These measures were then vetted with park and recreation professionals, public health practitioners, and academic researchers and refined to the eight common measures suggested in this paper. The measures have been organized into three categories: access, acreage, and facility areas.

The measures are recommended for specific geographic scales that range from national to local park facilities. It is important to be consistent in the geographic level of measurement. For example, data from a single park facility are different than data from a park that contains several facilities. For facility area measures, it is also important to consider daily, weekly, and seasonal variation in park use. The suggested measures are listed in Table 1 along with the recommended geographic level of measurement for data collection and interpretation.

**Facility Area** refers to a functional area of a park or a trail system such as: a sports complex, campground, garden, trail segment, or open field. Most parks will contain multiple facility areas. Likewise, most trail systems can be broken down into multiple trail segments.

Table 1. Suggested measures for public parks and trails and recommended geographic level of measurement for data collection

GEOGRAPHIC LEVEL OF MEASUREMENT					
SUGGESTED MEASURES		FACILITY AREA	SITE	CITY / COUNTY	STATE / NATIONAL
ACCESS MEASURES	1. <b>Proximity</b> - Percentage of the population (city/county/state/ national) living within a half mile of a public park or trail corridor boundary.			✓	✓
	2. <b>Walking Access</b> - Percentage of the population (city/ county) with less than a half-mile walk route to a public park or trail entrance.			✓	
	3. <b>Park Connectivity</b> - Ratio of the number of people with less than a half-mile walk route to a public park or trail entrance to the number of people living within a half mile of that specific park or trail corridor boundary.		✓		
ACREAGE MEASURE	4. <b>Land Area</b> - Percentage of land area designated as public parks or trails.			✓	✓
FACILITY AREA MEASURES	5. <b>Physical Activity</b> - Percentage of users engaged in sedentary, moderate, or vigorous physical activity at a specific facility area.	✓			
	6. <b>Visitation</b> - Annual number of visits to a specific facility area.	✓			
	7. <b>Frequency</b> – Average number of visits to a specific facility area by an individual during a period of time.	✓			
	8. <b>Duration</b> - Average time spent at a specific facility area by an individual.	✓			



The acreage and access measures assess the availability of parks within a community and whether community residents can easily access them. A 2015 Active Living Research literature review found good-to-strong evidence that the presence and proximity of parks had positive impacts on physical and mental health, social interactions, environmental sustainability, and safety/injury prevention (Sallis and Spoon 2015).

These measures can be used to inform where park land and trails are needed and to ensure equitable access for everyone, especially those with limited access to vehicles. These measures can also guide the park and trail access portion of community comprehensive plans and the creation of development regulations, incentives, and reviews designed to build parks and trails to which most people can walk.

The access measures are based on evidence that park proximity and pedestrian access are important to public health. The CDC-recommended minimum amount of physical activity is 150 minutes of moderate-intensity activity per week for adults and 420 minutes per week for children (CDC 2008). A half-mile distance was used in the first three measures because it has been used by national organizations, and studies have found that having a park within a half mile is associated with higher levels of moderate-to-vigorous physical activity (APA 2015; CDC 2012; Harnik and Martin 2015; Mowen 2010; NRPA 2016b).

A study of 12 DeKalb County, Georgia, parks found that nearly 80% of park visitors who walked to the park had walk routes of less than a half mile (Giarrusso 2011). Regular walking trips to a park or trail can provide much of an individual's recommended physical activity each week. Evidence also shows that people who walk or bike to parks or trails go to these places more often and are more physically active (Mackett and Paskins 2008; Mowen 2010; Grow et al. 2008).

The facility area measures provide data about the use of specific facility areas within a park. Collecting this information can provide insights about the kinds of facilities that promote park visitation, physical activity, and longer frequency and/or duration of visits. Data about the facility areas within a park or trail can be aggregated to provide information about the site as a whole. In addition, data from multiple facility areas with similar characteristics can be evaluated as a facility type. For example a community might gather and report data on all the "swimming areas" located in parks within the park system or across a geographic area.

## Suggested Measures and Methods

### 1. PROXIMITY – Percentage of the population (city/county/state/national) living within a half mile of a public park or trail corridor boundary.

#### Method

- Step 1.** Define the service area by creating a half-mile buffer around the boundaries of all parks or trail corridors within the jurisdiction.
- Step 2.** Merge buffers to eliminate double counting overlapping areas.
- Step 3.** Calculate population within the service area. See area proportional weighting call-out box for recommended method. (Your GIS specialist can help.)
- Step 4.** Divide the population within the service area by the total population in the jurisdiction.

To determine the population within the service area, sum the values found for all census blocks that overlap the service area.

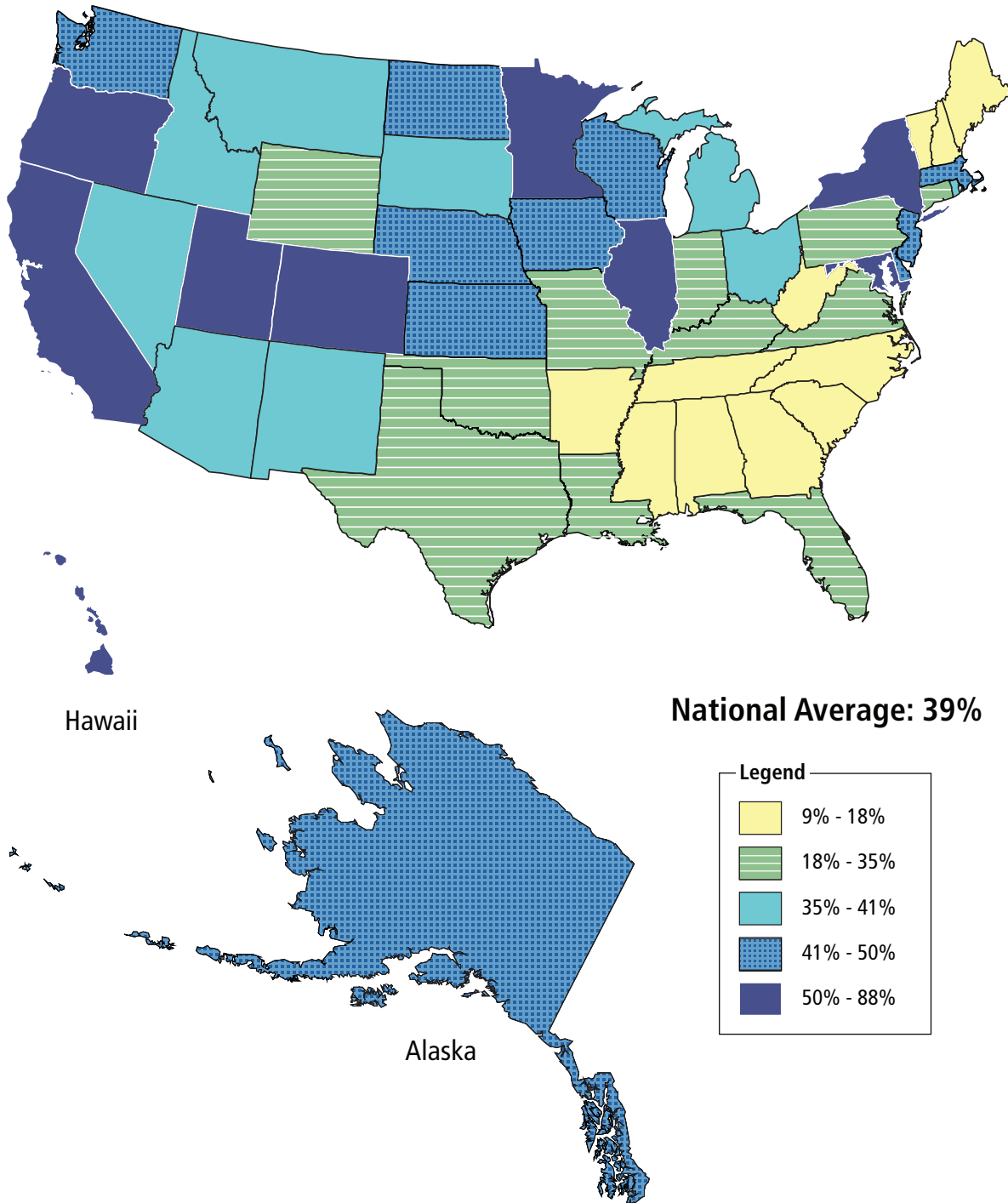
Measure 1 quantifies the population that lives near parks or trails. It is based on the concept that proximity supports regular park use. Just living near a park can provide a wide range of additional benefits, such as scenic views, less light pollution, and reduction of urban sounds.

This measure provides high-level data useful at national and state scales. It can be used to identify where people live in relation to parks and trails. This measure references US Census data, so it is possible to determine population subgroups (such as gender, age, or race) that are more or less likely to live near a park or trail. Measure 1 is generally recommended for use in broad national and state reports such as State Comprehensive Outdoor Recreation Plans (SCORPs). It may also be used at the city or county levels to broadly evaluate park distribution. Measure 1 data are currently available for US counties and states through the National Environmental Public Health Tracking Network (CDC 2012).

#### Area Proportional Weighting:

Calculate population within the service area by overlaying the service area with census blocks and assigning population to the service area using area proportional weighting. For each census block that overlaps the service area, determine the proportion of the census block's area that is within the service area and assign that proportion of the census block's population to the service area. If the census block is completely contained within the service area 100% of its population is assigned to the service area. If 50% of the census block is in the service area assign 50% of the population to the service areas. This approach assumes an equal population distribution within census blocks.

**Graphic 1. Percentage of Americans Living Within a Half Mile of a Park by State.** National Environmental Public Health Tracking Network map includes national, state, regional, and local public parks. <https://ephtracking.cdc.gov/DataExplorer/?query=8fd8aa1c-2f5d-4377-bf33-dd6a652ec2ca>



## 2. WALKING ACCESS – Percentage of the population (city/county) with less than a half-mile walk route to a public park or trail entrance.

### Method

- Step 1.** Locate park and trail entry points and follow walking access routes (e.g., sidewalks or neighborhood trails) for a half mile or until encountering a barrier, whichever occurs first. Barriers can include things such as major roads or railroads with no pedestrian crossing.
- Step 2.** Create 300-foot buffers around access routes to establish the service area for all park or trail entrances. Merge the buffers to create one service area for the entire city or county.
- Step 3.** Calculate population within the service area. See area proportional weighting call-out box for recommended method. (Your GIS specialist can help.)
- Step 4.** Divide the population within the network service area by the total population in the city or county.

Walking to parks and trails supports public health goals, such as physical activity, stress reduction, and social interactions. Yet some parks and trails are designed with only one entry point, which can restrict access. By identifying park and trail entrances and the walking routes to them, Measure 2 estimates the percentage of the population that might be able to walk to parks and trails regularly. This measure is dependent upon inventories that contain the location of park and trail entry points and potential walk routes (streets, trails, paths, etc.); such inventories become practical at the city and county levels.

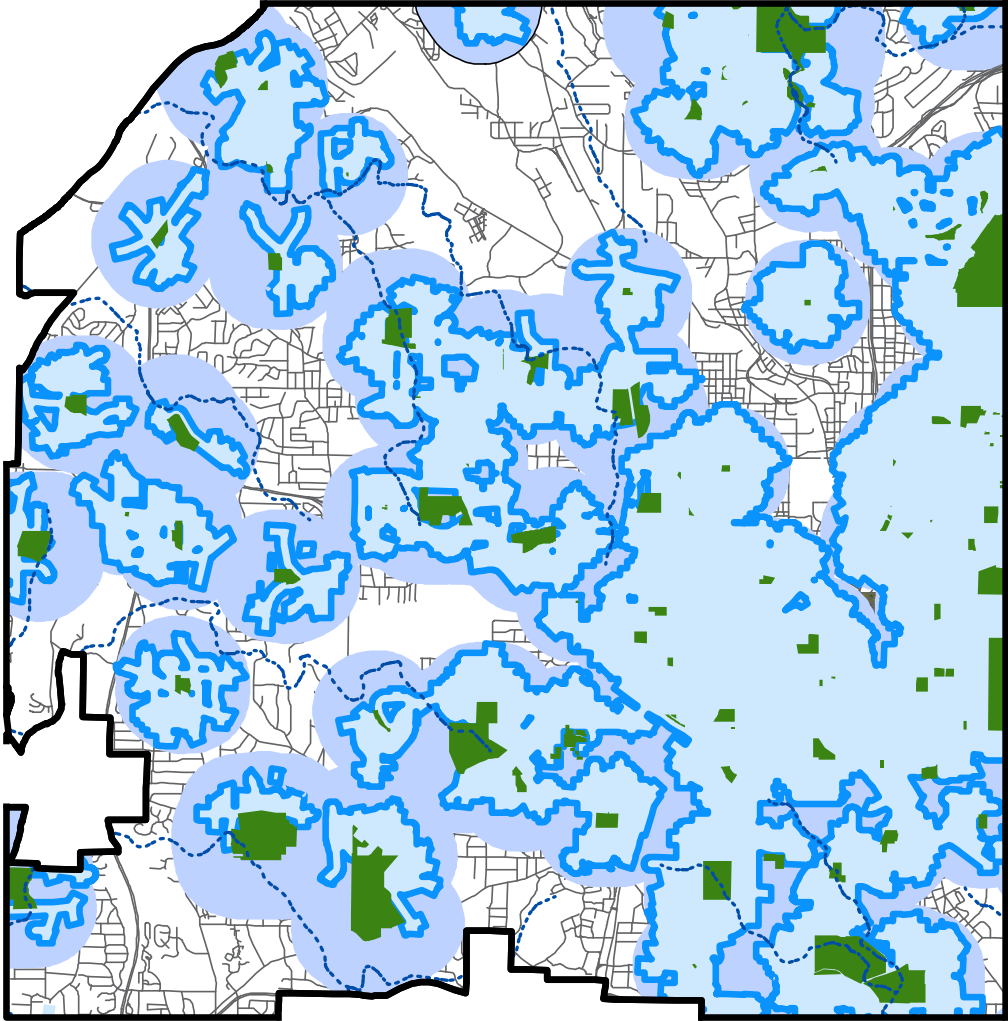
Measure 2 could overestimate access because streets are typically used for this analysis and some streets are not conducive for walking because of heavy traffic, lack of pedestrian infrastructure, or other deterrents. Conversely, informal routes or paths used for walking to parks and trails that are not captured on street maps might be missed.

When this measure was applied to a large city, nearly 80% of the population lived within a half mile of a park boundary, but barely 50% of the population had less than half-mile walk routes to park entrances. In addition to creating a value that can be used to establish policy, track progress, and support advocacy, visually displaying Measure 2 on a map can help identify underserved areas. Measure 2 is recommended at the city or county levels to estimate access and identify system gaps.

**Graphic 2. Measures 1 and 2 Mapped**

Measure 1 - proximity

Measure 2 - walking access



0 1 2 Kilometers  
0 1 2 Miles



**Legend**

City Limits	Streams
Parks	Streets
Half-Mile Network Buffer	
Half-Mile Radial Buffer	

**3. PARK CONNECTIVITY – The ratio of the number of people with less than a half-mile walk route to a public park or trail entrance to the number of people living within a half mile of that specific park or trail corridor boundary.**

**Method**

**Step 1.** For a specific park or trail, calculate the number of people with less than a half-mile walk route to entry points using the methodology outlined for Measure 2.

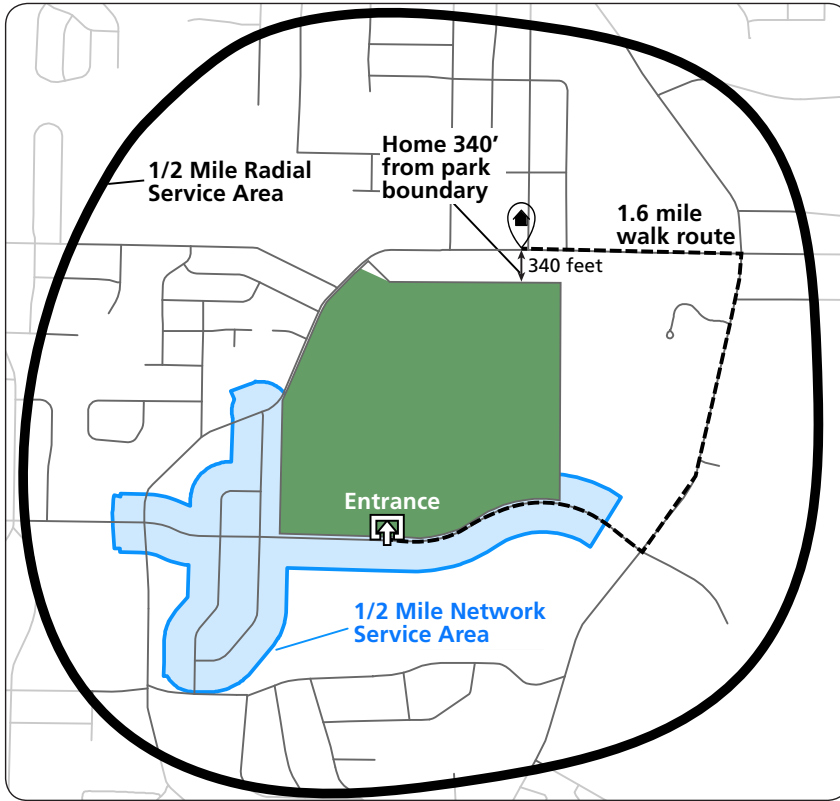
**Step 2.** Divide by the total number of people living within a half mile of that park or trail using the methodology outlined for Measure 1.

Measure 3 is a more detailed measure of access and documents how well specific park and trail sites are connected to nearby residential areas. This measure is the ratio created by dividing of the number of people who have walk routes of less than a half mile to park or trail entry points by the total number of people living within a half mile of the park or trail corridor boundary.

As shown in the example graphic 3, it was estimated that 4,022 people live within a half mile of the park boundary, but only 392 people have less than a half-mile walk route to the single park entry point for a walking access ratio of 9.7% ( $392/4,022 = 0.097$ ). The low ratio indicates that additional entrances or more connected walk routes could increase the number of nearby residents that have walking access to the park.

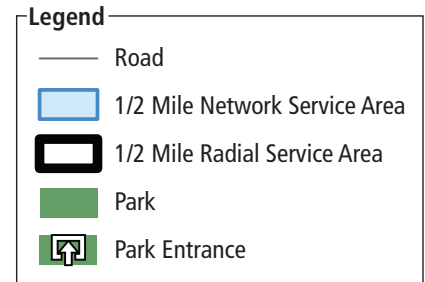
Measure 3 can be used to target sites where residents live nearby, but walk routes are too long for easy access. As a community sees opportunities to improve walking access to parks and trails, they can establish design guidelines, collaborative planning activities, and policies that enhance walking infrastructure in those areas. This measure can also be used to proactively identify key land parcels for acquisition. Graphic 4 illustrates how Measure 3 is mapped and shows potential strategies for improving access, such as adding a new entrance point, an adjacent street, or a path linking disconnected streets. By making these changes people with less than half-mile walk routes grows from 392 to 1,955.

Graphic 3. Measure 3, Park Connectivity

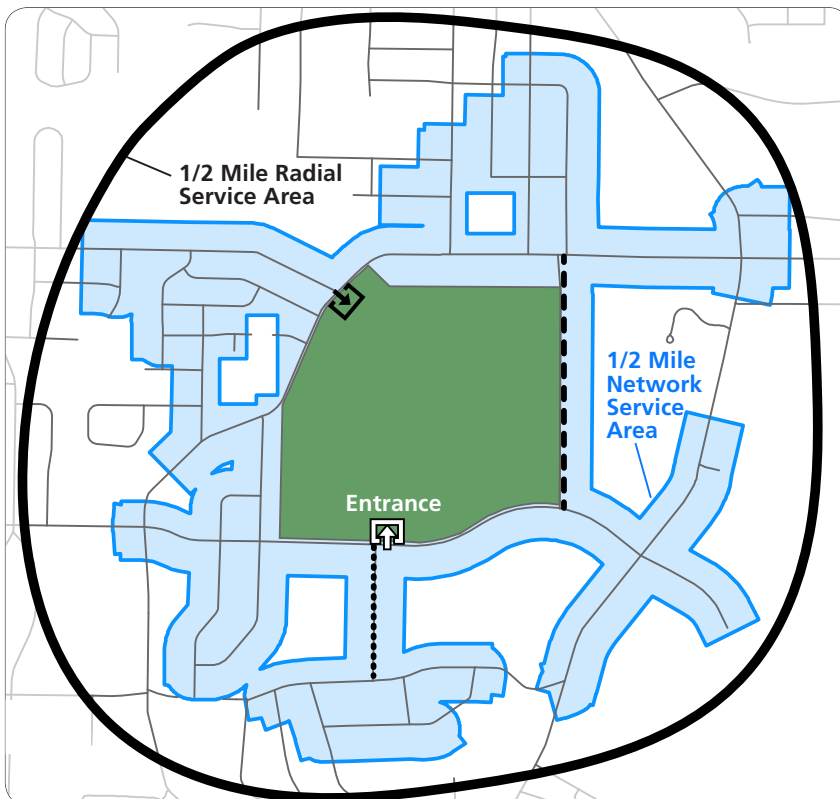


**POPULATION ESTIMATES:**  
 Radial service area = 4,022  
 Network service area = 392

**Network/Radial x 100 = 9.7%**  
 <10% of population LIVING within 1/2 mile of the park boundary have a 1/2 mile or less WALK ROUTE to the park entrance.

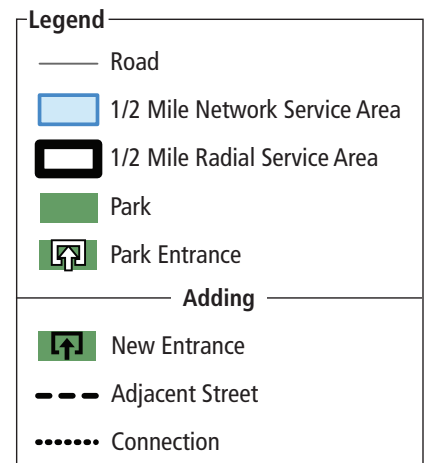


Graphic 4. Measure 3, Park Connectivity Used to Identify Additional Access



**POPULATION ESTIMATES:**  
 Radial service area = 4,022  
 Network service area = 1,955

**Network/Radial x 100 = 49%** of population LIVING within 1/2 mile of the park boundary have a 1/2 mile or less WALK ROUTE to the park entrance.



#### 4. LAND AREA – Percentage of land area designated as public parks or trails.

**Method:**

Divide the total acres of public parks and trail corridors by the total acres of land within the city or county.

Measure 4 provides data about how much of a community's land has been designated for parks and trail corridors. It is independent of population and, therefore, allows for comparisons between large and small communities and for monitoring change over time within a single community. Measure 4 can be used to identify potential "green deserts" within a community (Schultz and Layton 2015).

Because it is much easier to create parks during the subdivision planning process than after an area has been developed, this measure can be proactively used to ensure that sufficient land is protected for parks or trails early in a community's development. This measure does not address proximity and access to parks and trails, and therefore does not ensure that people will be able to get to the lands that are designated as parks and trails. As such, this measure should be used in combination with the previous measures.

Measure 4 can support the protection of resource-based land with inherent values, such as water management, habitat, or cultural sites that a community might want to preserve as part of a larger system (Schultz and Layton 2015). Communities can use this measure to set general park acreage goals in their comprehensive plans, support those goals through development regulation, and monitor their progress toward that goal over time.



## 5. PHYSICAL ACTIVITY – Percentage of users engaged in sedentary, moderate, or vigorous physical activity at a specific facility area.

### Method:

Direct observation using validated protocols is recommended to collect data for this measure. Direct observation is likely to provide more accurate data than surveys and interviews, which tend to be more subjective. Surveys and interviews are acceptable if direct observation is not a feasible option.

Measure 5 assesses physical activity levels among people at different facility areas. Facility areas are spaces within a park designated for specific purposes. Examples of typical facilities areas include trails, sports fields and courts, playgrounds, picnic areas, swimming pools, and camp sites.

A facility area that could be critical to improving multiple components of public health, but that might be overlooked, is an open field area that supports unstructured outdoor activities. Unstructured outdoor activities, particularly running games like tag, Frisbee, and catch, can increase physical activity in children and adults. Unstructured outdoor activities have also been shown to improve cognitive, emotional, and social functions in children (Ginsburg et al. 2007).

Data collected from facility areas that support similar activities can provide insights about the impact of a facility type on physical activity. It is useful to know which facility types have the greatest potential to foster higher levels of activity (Floyd et al. 2011; Besenyi et al. 2012). These data can guide decisions about how to allocate parks and recreation resources. For example, a parks and recreation planner can use data from Measure 5 to answer the following question: “How does the amount of physical activity that occurs at a bike riding complex compare to the amount of physical activity that occurs at a baseball complex?” Such information might influence how to allocate limited resources.

## 6. VISITATION – Annual number of visits to a specific facility area.

### Method:

This data can be collected using mechanical counters such as inductive loops and infrared counters. On-site, telephone, or mail surveys can also provide information on annual number of visits to a facility area. Data for this measure can also be collected via technology, such as mobile phone applications.

Measure 6 quantifies the total number of visits to a particular facility area during the course of a year. It tracks things such as how many people visit an aquatics center or a picnic area each year. These data should be collected at the facility area level.

Geocoding and mapping this data could help identify service gaps within the jurisdiction or the need to assess the condition and appropriateness of a facility area. Data can also be evaluated for a city or county by facility type and used to assess the performance and contribution of specific types of facilities based on visitation. In addition, data from this measure could help inform plans for re-purposing a particular facility area.

Collecting data over the course of a year is recommended in order to better understand weekly, seasonal, and annual use patterns. For example, a community swimming pool might be heavily used on several hot summer days, while a trail might receive many more users spread out over the course of a year.

When evaluating facility area visitation, the primary goals for the facility area should be considered. Drive-to facility areas with staffed programs that draw people from a large area have a different purpose than facility areas intended for regular use by nearby neighbors. Unstaffed, informal facility areas may not be intended to draw large crowds. Instead they may be walkable neighborhood destinations that can be easily reached by pedestrians, especially children and seniors, on a regular basis.

- 7. FREQUENCY** – Average number of visits to a specific facility area by an individual during a period of time.
- 8. DURATION** – Average time spent at a specific facility area by an individual.

**Method:**

Data for Measures 7 and 8 can be obtained via surveys that ask people how often they visit specific park facility areas and how long they stay at each facility area. Telephone and mail surveys can be conducted among individuals living within a specified area or a targeted sample can be obtained using on-site intercept surveys of individuals using the facility area.

Knowing how often and how long people use certain park facility areas can be useful in understanding public health impacts. Measures 7 and 8 can provide insights about how different facility types are used and their overall value to the park and community. Popular and well-used facilities can be an excellent indicator that a park or trail is meeting the needs of the community. Facilities identified as underused might need amenities such as water fountains, shade, seating, restrooms, or additional maintenance.

Additionally a neighborhood's demographics and health needs may change over time and the park's facilities may no longer be appropriate. Data from these measures can be used to guide park master planning, new programming, and promotion of underused facilities and facility improvements (Schultz and Layton 2015). The National Recreation and Park Association collects frequency of annual visits to local parks and recreation facilities data through their annual NRPA Americans' Engagement with Parks Survey ([www.nrpa.org](http://www.nrpa.org)).

## Data Collection

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Data for Measures 1 through 4 can be generated using GIS combined with park and trail inventories. When collecting data for Measures 5 through 8, try to consult a social scientist for guidance on protocols and best practices. The data collection and sampling methodology should ensure targeted user groups are represented and account for temporal variability in facility area use over the course of a day, week, and year. It is important to create and follow protocols for survey administration (e.g., random sampling protocols) to reduce bias during data collection.

## Conclusion

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This summary builds on the findings from a study done by a collaboration of NCSU, NPS, and CDC. A systematic literature review was followed by the development of potential measures and extensive subject-matter expert review. Please refer to the study titled “Potential Measures for Linking Park and Trail Systems to Public Health” (Schultz and Layton 2015) for an in-depth discussion on that study’s limitations, challenges, and future steps.

Parks and trails promote holistic health by providing opportunities for physical activity, stress reduction, social interaction, and environmental sustainability. The eight measures presented in this summary are designed to connect park and trail system planning to public health goals. They focus on park access and use and do not address programming, neighborhood character, maintenance, or community knowledge.

Over time, the makeup and preferences of park and trail users in a geographic area will change. In order for parks and trails to effectively engage users and enhance their overall health, parks and trails will need to change along with communities. Parks and the facility areas within them should reflect the unique social and cultural makeup of a park’s service area at a point in time. This will require park managers to undertake periodic assessments of park facilities in relation to shifting demographics, community health needs, and community recreation preferences.

Using these common measures, park and trail system planners, facility managers, public health professionals, community leaders, and researchers can gather park access and use data that can be analyzed, aggregated, and compared. These data can inform plans for specific facility areas, facility types, individual parks and trails, and park and trail systems. They can also be used in comprehensive parks and trails master planning efforts. Finally, these measures can provide information for decision makers, planners, and practitioners to position parks and trails as critical infrastructure for improving public health.

## From the Authors

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Please keep us informed as to how you use these measures as they relate to park and trail system planning and public health. If you have any suggestions, successes, challenges, case studies, or photos to share, please send them to the authors:

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