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GP RED
Research Brief

#13-B

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MEASURING PARKS, TRAILS, AND OTHER PUBLIC GREENSPACE AREAS – VOLUME II

Performance Measures for
Parks and Greenspace Areas –
The GRASP®Active Example

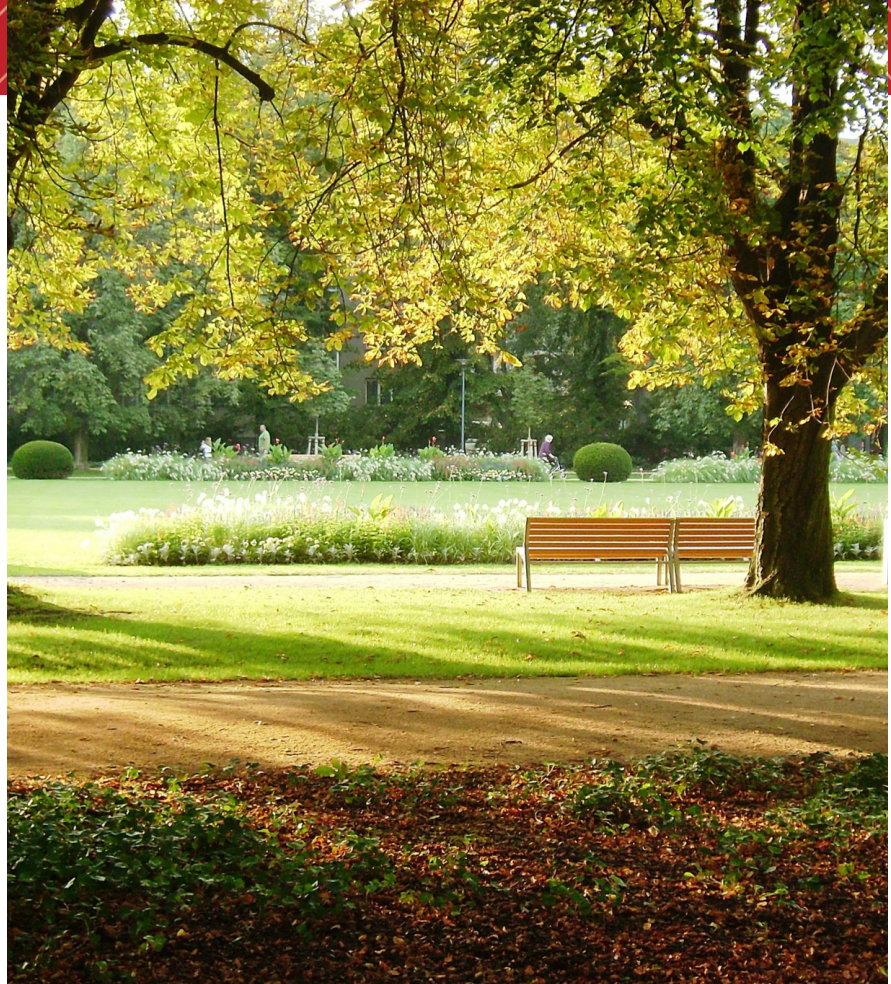


*NOTE: This volume is the second in a 3-part series on the measurement and analysis of parks and other public greenspaces. The first volume discussed a number of variables that can be used to describe, measure, and analyze individual parks and greenspaces. This second in the series illustrates how data from park audits can be applied to generate performance measures for parks and greenspace, through the example of a public health metric called **GRASP®Active**. The final volume discusses ways in which the measures for individual parks can be combined to analyze a park system and measure its performance on various indicators.*

Each volume builds on the previous one, so it is suggested that the reader begin with volume one and continue with the remaining two in sequence, but that is not completely necessary for each individual volume to be useful as an independent report.

Introduction

The first volume in this series on measuring parks and greenspace assets discussed park audits and variables that can be assessed to evaluate parks. It explained how to audit the elements of a park and assign scores to them based on quality and functionality. The scores can be used to generate an overall value for the park that can then be used to evaluate it against other parks or against a target or standard. For example, an agency might want to compare its parks to evaluate equity in one part of its territory or throughout its entire boundary. This volume illustrates how data from audits can be used to generate metrics for specific purposes. The example presented here is specifically aimed at assessing the potential for a given park or public space to stimulate healthy physical activity within its community, but any number of metrics can be derived from the audit methods described in Volume I of this GP RED Research Brief series, **Measuring Parks, Trails, and other Public Greenspace Areas - Elements of Parks and Greenspace: Using Component Based Methodology to Audit Parks and Greenspace.**



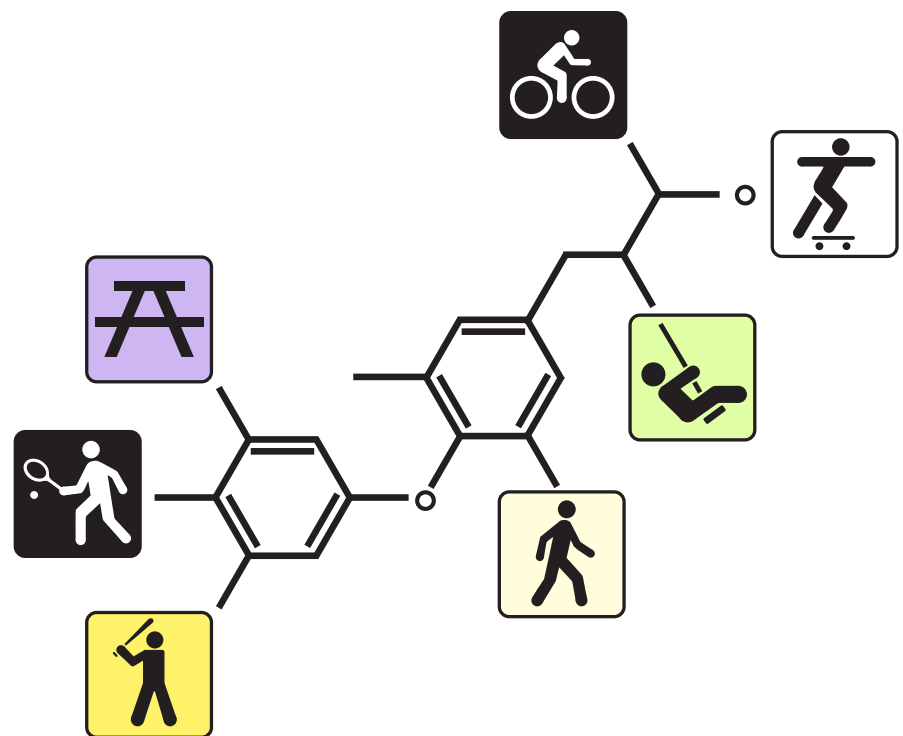
Public Greenspace and the Health Imperative

The social reform movement of the 1800s emerged in response to deteriorating living conditions in rapidly growing industrial cities. Activists of that era believed that being outdoors in a pleasant environment filled with trees, water, open vistas, and other natural elements would provide an antidote to the toxins and mental stresses of city life and promote better health. Now, almost 200 years later, scientific evidence is proving their assumptions to be true. An epidemic of chronic lifestyle-related diseases, including obesity, Type 2 diabetes, and cardiovascular ailments, has sparked renewed interest in the potential for parks and other public greenspaces to counter the effects of an unhealthy environment. Recent research has confirmed the association of parks and other greenspaces with a lower incidence of certain health issues, and physicians have begun to include visits to parks among the prescribed treatments for various ailments (Seltenrich, 2015). The onset of COVID-19 in 2020 brought the relationship between public greenspace and the general welfare into a more immediate focus as demand for safe places to exercise, socialize, and relieve stress sent masses of people outdoors and into parks, greenways and other public spaces.

Parks as Medicine – Measuring Their Strength

Now that parks are considered “good medicine”, how do we know how much a given park provides? Like medications, parks vary in their formulation and potency. And how do we assure that the benefits of parks are administered equitably and effectively across the community to treat public health issues? Can doctors, park providers, and park users know the “strength” or effectiveness of a particular park as a form of treatment? This paper describes an index designed to answer these questions.

The increase in certain chronic diseases has been attributed in part to the fact that physical activity has been largely engineered out of people’s daily lives. Fortunately, parks and other greenspace features promote higher physical activity levels among the populations they serve (Bedimo-Rung et al., 2005). Simply being exposed to nature and the outdoors provides a range of health benefits (Giles-Corti, et al., 2005). Thus, one way to measure the potential effectiveness of parks as a health treatment is to determine their propensity to encourage people to spend time in them and engage in some form of activity.



The Ingredients of a Park

The preceding volume in this series explained how a park can be thought of as a mixture of individual elements that make up a unique compound. Assessing the individual components can provide a better understanding of the whole and allow for various analyses to be performed that measure the park's performance. Such measurements can be used to compare the park to some standard or to other parks. This volume shows how the ingredients of a park can be used to provide measurements of the park's potential performance in stimulating physical activity that in turn improves public health outcomes.

Think of parks as being made up of both *active* and *inactive* ingredients. The **active ingredients** in a park are those features that draw people to it to engage in activity that produces health benefits. Physical activities increase the participant's metabolic rate and physical well-being. Passive activities such as quiet contemplation, reading a book, or observing nature can boost attention restoration and reduce stress. Other activities encourage human interaction and lead to better social and emotional health. In this report, features of a park that draw people to it to engage in activity—its active ingredients—are referred to as **components**. Examples of components include playgrounds, sports fields and courts, picnic shelters, and walking/biking paths, as well as areas for passive enjoyment—such as scenic waysides or quiet places to rest.



Modifiers→

Modifiers are elements within greenspace that support, facilitate, or enhance the comfort and convenience of using greenspace components. This includes shade, restrooms, and pleasant surroundings.

←Components

Components are elements of greenspace that support, encourage, or facilitate an activity or experience. The activity or experience can be active or passive, structured or unstructured, group or individual. The playground shown here is an example of a component.



Figure 1. Illustrative example of a component (playground) and modifiers (shade, seating, pleasant surroundings, etc.).

Inactive ingredients in a medication make it easier or more pleasant to use. The inactive ingredients in a park serve a similar purpose, providing comfort and convenience while enhancing the user's experience of the park. Pleasant surroundings and amenities such as shade, seating, and restrooms are examples of inactive ingredients of parks and are referred to here as **modifiers** (Figure 1).

Think of the formulation of a given park as the combination of its active ingredients (components) and inactive ingredients (modifiers)(Figure 2). By identifying and assessing the ingredients, it is possible to measure a park's intensity as a treatment for public health concerns. That is the purpose of the *GRASP®Active* Index presented in this research brief. *GRASP®Active* was developed by the author of this report based on research conducted by him and others at North Carolina State University, and refined by GP RED's Healthy Communities Group while using it to complete a number of planning studies in communities across the U.S.

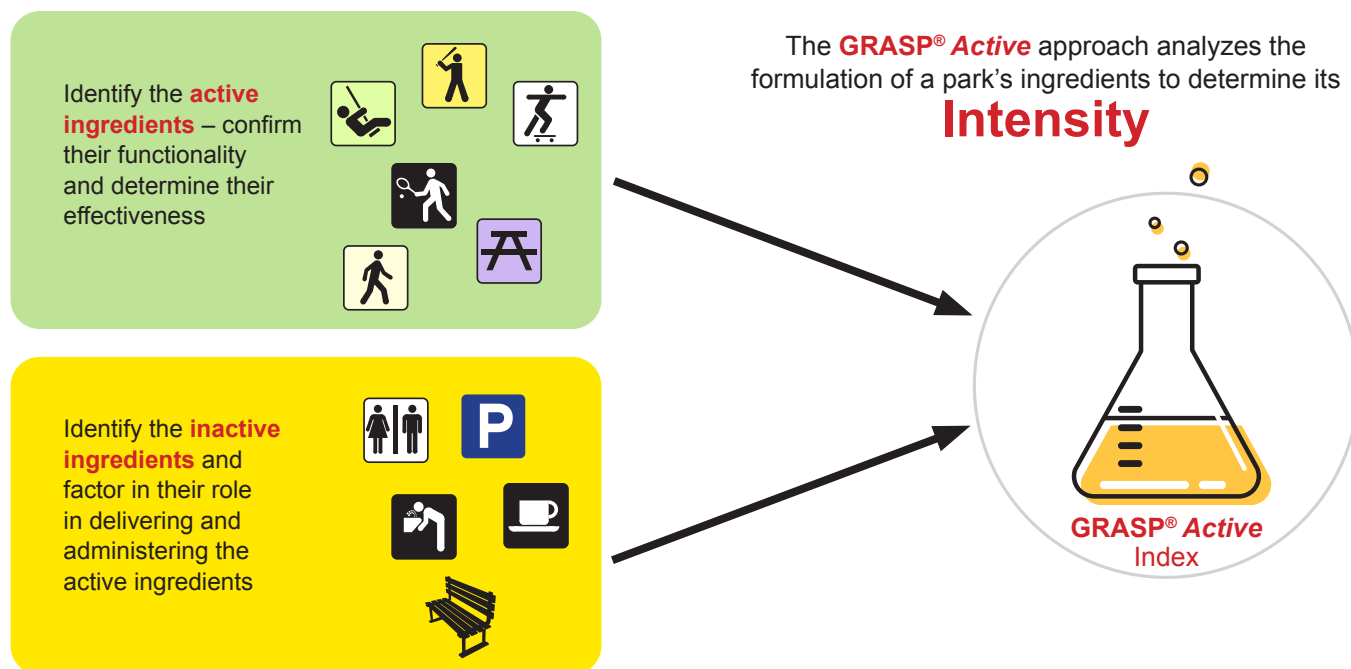


Figure 2. GRASP® Active approach

Assessing the Ingredients of a Park – Audit Tools

The ingredients of a park can be assessed using an inventory form, or audit tool, as explained in Volume I of this GP RED Research Brief series, **Measuring Parks, Trails, and other Public Greenspace Areas - Elements of Parks and Greenspace: Using Component Based Methodology to Audit Parks and Greenspace**. Audit tools vary in the amount and types of data they collect. An overly simple audit tool might not provide enough information for a particular need, while an overly complex one may be too difficult to use and could lead to data errors. Highly detailed

Scoring of Components



Score of 1: Playground is old, unsafe, obsolete, not up to expectations

Score of 2: Meets expectations for size, condition, type of equipment

Score of 3: Has unique features or qualities beyond those expected



Figure 3. Example of functionality scores for playgrounds as a component.

Scoring of Modifiers

Low Modifier Score: Poorly located, unattractive, lacks seating

Medium Modifier Score: Attractive setting, with shade and benches

High Modifier Score: Restrooms, drinking fountain, benches, shade



Figure 4. Modifier scores are assigned to 15 different features that may be present in a park. The scores can be combined into a single rating for the entire park, shown here as High, Medium, or Low.

audits can also be expensive and time consuming to conduct. The selection of the right audit tool for the intended purpose is essential. The GRASP®*Active* Index presented here makes use of the GRASP®-IT audit tool described in Volume I of this series. The tool was developed and refined on more than 100 studies across two decades for use in park system master planning. It captures both the quantitative presence or absence of park features and a qualitative assessment of how well those features serve their intended functions. Features assessed by the GRASP®-IT tool include both components and modifiers (Figures 3 & 4).



Measuring the Dosage of a Park with GRASP®*Active*

Shanahan, et al. (2016) explain that the dosage of a health treatment is a function of the exposure of an individual to the treatment, including:

- The *frequency* of exposure – how often is the individual exposed to the treatment?
- The *duration* of exposure – how long does each exposure last?
- The *intensity* of the exposure – what is the quality of the exposure?

Thus, a park that encourages people to visit more often, stay longer, and be more engaged while there provides a higher dosage than one that does not. The ingredients of a park—its formulation—are the key to accomplishing this. Once the ingredients of a park are assessed, a measure of its strength or effectiveness—the dose of benefits it provides--can be determined. The active ingredients (components) can be directly associated with drawing people to the park to engage in activity. The inactive ingredients of a park (modifiers) are important for encouraging people to visit more frequently and spend more time in the park.

Measuring how often people visit a park (frequency) and how long they stay (duration) can be readily done by direct observation or surveying people but measuring the *intensity* of an exposure to a park is more nuanced. One way to do this is to examine the degree to which visitors are engaged when they visit. A study published by the NCSU Extension Service (Floyd, et al., 2015) rated the level of physical engagement produced by various park features (components) based on the amount of energy expenditure beyond the basal metabolic rate associated with each feature. The ratings are referred to as the feature's **Active Energy Expenditure** (AEE). The results of the NCSU study were combined with data collected with the GRASP®-IT audit tool to develop the GRASP®*Active* Index.



The GRASP® Active Index

The following is a step-by-step explanation of how the GRASP® *Active* Index is derived from a park's ingredients and the AEE ratings developed by NCSU.

1) *Hypothetical Park* – Imagine a hypothetical park that is 25 acres in size. It contains various components, including a playground, two ball diamonds, four tennis courts, four basketball courts, a skateboard park, and a picnic area. The park also contains shade trees, benches, a restroom, drinking fountains, and other amenities that serve as modifiers.

2) *The Active Ingredients: Components* – Park features have been found to be associated with higher levels of physical activity (Giles-Corti et al., 2005; McCormack et al., 2010). This means that if you provide more things to do in a park, people will likely do them and be more active. Therefore, a primary measure of a park's potential to generate activity can be derived from the number of individual components it contains:







$$\begin{array}{ccccccccc}
 & \text{[Swimmer Icon]} & + & \text{[Tennis Icon]} & + & \text{[Tennis Icon]} & + & \text{[Basketball Icon]} & + & \text{[Basketball Icon]} & + & \text{[Skateboard Icon]} & + & \text{[Picnic Area Icon]} & = & \mathbf{13} \\
 \times & 1 & & 2 & & 4 & & 4 & & 1 & & 1 & & & &
 \end{array}$$

However, this measure does not take into account the quality or condition of the components. Incorporating an assessment of each component's functionality – how well it serves its intended purpose—adds another level of sophistication to the index. The GRASP®-IT audit tool rates components by assigning a score of 1, 2, or 3 (low, moderate, and high) based on their functionality. In the example, assume that the various components vary in their quality and functionality. Applying this to the metric, the total score for the park now looks like this:







		+		+		+		+		+		+		
x	1		2		4		4		1		1			(Quantity)
x	1		2		2		2		3		1			(Functionality)
<hr/>														
x	1		4		8		8		3		1			= 25



Incorporating the NCSU Extension Service AEE ratings for the level of engagement associated with each component adds a measure of the intensity of the park's components in terms of physical activity. (Note, the NCSU AEE ratings have been reverse-coded here so that a higher value indicates a higher intensity.) What we have now is a measure the propensity of the park's active ingredients to produce higher levels of physical activity. However, we still have not accounted for those ingredients that make the park more comfortable, convenient, and inviting to use – its inactive ingredients.

							
x	1	2	4	4	1	1	(Quantity)
x	1	2	2	2	3	1	(Functionality)
x	3	2	2	2	3	1	(AEE)
	4.8	19.2	38.4	38.4	14.4	4.8	= 120

3) *The Inactive Ingredients: Modifiers* – **Park quality** correlates with greater park use and physical activity (Kaczynski et al., 2016; Smiley et al., 2015). The modifiers described earlier—pleasant surroundings, shade and other amenities—can be thought of as park quality indicators. With the GRASP®-IT audit tool, amenities present in the park can be combined to generate a numeric value for the park's quality, which can then be incorporated into the metric. Assume that in our hypothetical park, the modifier value turns out to be 4.8:

							
x	1	2	4	4	1	1	(Quantity)
x	1	2	2	2	3	1	(Functionality)
x	3	2	2	2	3	1	(AEE)
	4.8	19.2	38.4	38.4	14.4	4.8	= 120
	total potential for all components						

$\left[\begin{array}{c} \text{Total Potential for all components} \\ \text{= 120} \end{array} \right] \times \left[\begin{array}{c} \text{4.8} \\ \text{modifier index} \end{array} \right] = \mathbf{576}$

We now have a measurement that includes both the active and inactive ingredients. There is one more factor we can consider, which is the amount of medication available. This is a function of the park's size.

4) *Park Size* - The total amount of greenspace available within proximity of one's home corresponds with overall higher levels of physical activity in some studies (Cohen et al., 2010), but other studies have been less conclusive (Kaczynski & Henderson, 2007). The GRASP® *Active* Index presented here incorporates the park's size as an indicator, but subsequent analysis of the index has shown park size to be a statistically non-significant variable in predicting the index's final value. This means that across a broad selection of parks it has relatively little influence on the variability of the index from one park to another. Further research may clarify the role of park size in measuring the value of parks as

medicine, but meanwhile incorporating the size of our hypothetical park provides the following value:

$$\left[\begin{array}{c} 576 \\ \text{modified} \\ \text{park} \\ \text{value} \end{array} \right] \times \left[\begin{array}{c} 25 \\ \text{acres} \end{array} \right] = 14,400$$

We now have a value for our hypothetical park that can be used to compare it with other parks in terms of its propensity to generate healthy activity. However, for parks with large acreages, this can turn out to be a rather big number, making comparisons with much smaller parks difficult to understand. To compress the scale of values and make comparisons between parks more meaningful, we have chosen in this example to use a log transformation of the value. This can be easily done within a database or spreadsheet, on a calculator, or with the internet using a site such as that found at http://www.rapidtables.com/calc/math/Log_Calculator.htm. The base 10 logarithm of our hypothetical park is 4.16. This is the GRASP® Active value for our hypothetical park.

$$\log_{10}(14,400) = 4.16$$



Using Park Scores and Indices

The GRASP® Active score demonstrated above can be used to compare a park to some identified target score, or to rank the park in relation to others in terms of its propensity to generate physical activity within the community it serves. It can also be combined with scores from other parks to measure and analyze an entire park system's performance within a particular geography. Such application is described in the next volume of this series.

Research has shown that using a community systems planning approach for parks and recreation management can also help modify preventive health for a variety of factors and determinants of health beyond physical activity (Penbrooke, 2017).

Conclusions

Evaluating parks by assessing the individual elements within them as described in this Research Brief series offers the potential to conduct many types of analyses and generate data that can be used to make better decisions in the provision and management of parks. The GRASP® Active Index shown here is one example that is useful for comparing the relative value of one park to another in terms of its propensity to support healthy activity. It does not, however, prescribe



what the value of any given park should be. Keep in mind that the measure is based on a park's characteristics without regard to its context and surroundings. Just as the effects of a medication may vary depending on the patient's characteristics (such as their age, weight, lifestyle and behaviors) the characteristics of the surrounding neighborhood and the population that a park is intended to serve play a role in its effectiveness. While a general link between the availability of greenspace and better public health has been established (Sallis et al., 2012; Kaplan, 1995; Boone et al., 2009), the "medicinal" effects of a park rely on exposure to it, which means it must be accessible. Access should be understood as a multidimensional construct that consists of geographic, social, and user characteristics (Wang, et al., 2013). Accessibility is a blend of the potential park user's awareness of the park's availability, their physical ability to get to it, and a perception that the park is inviting, welcoming, and appropriate for them. Factors such as the objective and perceived safety of the neighborhood, the nature of its transportation system, and the demographic composition of the population with proximity to the park have their effects on who has access to it.

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Appendix A: GRASP® Active AEE Values for Park Components

GRASP® Outdoor Component Type	GRASP® Active AEE
Adventure Course	2
Amusement Ride	1
Aquatics, Complex	1
Aquatics, Lap Pool	2
Aquatics, Leisure Pool	2
Aquatics, Spray Pad	2
Aquatics, Therapy Pool	2
Basketball Court	2
Basketball, Practice	2
Batting Cage	2
Bike Complex	3
Bike Course	3
Camping, Defined	1
Camping, Undefined	1
Climbing, Designated	2
Climbing, General	2
Concessions	1
Diamond Field	2
Diamond Field, Complex	1
Diamond Field, Practice	2
Disc Golf	3
Dog Park	1
Educational Experience	1
Equestrian Facility	2
Event Space	3
Fitness Area	3
Fitness Course	3
Game Court	3
Garden, Community	2
Garden, Display	1
Golf	2
Golf, Miniature	2
Golf, Practice	2
Historic Feature	1
Horseshoe Complex	1
Horseshoe Court	1
Ice Hockey	1
Inline Hockey	1

GRASP® Outdoor Component Type	GRASP® Active AEE
Loop Walk	3
Multi-Use Pad	3
Natural Area	1
Open Turf	2
Other	Varies
Passive Node	1
Pickleball Court	3
Picnic Ground	3
Playground, Destination	1
Playground, Local	2
Public Art	1
Rectangular Field, Complex	1
Rectangular Field, Large	3
Rectangular Field, Multiple	1
Rectangular Field, Overlay	3
Rectangular Field, Small	1
Shelter, Large	2
Shelter, Small	1
Skate Feature	2
Skate Park	3
Target Range	2
Tennis Complex	1
Tennis Court	2
Tennis, Practice Wall	3
Track, Athletic	1
Trail Access Point	1
Trail, Multi-Use	3
Trail, Primitive	3
Trail, Water	3
Trailhead	1
Volleyball Court	2
Wall Ball Court	2
Water Access, Developed	1
Water Access, General	1
Water Feature	1
Water, Open	1
Winter Sport	3