Perception of Nature Play in Children's Gardens: A Survey of Decision Makers from North American Public Gardens

by

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Abstract

Children's gardens have been an increasingly popular addition to North American public gardens in the last two decades. Unlike their counterparts established in healthcare facilities and early-education centers, children's gardens in public gardens are less studied and understood. A substantial body of research has indicated the wide range of cognitive, physical, and social benefits of "nearby nature" and "nature play" associated with outdoor children's spaces. In an era where children's access to and time spent in the natural world continues to diminish, we must look beyond irregular visits to parks and gardens to focus on how immediate landscapes at home can serve as nature play experiences. With the missions of many public gardens focused on educating the public about the environment and encouraging visitors to make changes in their own yards, this study explores if these institutions can also inspire families to adopt nature play closer to home. The research examines the awareness and perception of nature play in public gardens through a survey of garden managers and staff. 119 children's garden managers affiliated with the American Public Garden Association responded to a questionnaire (74% completion rate) for their views on educational goals, garden features, and implementation of nature play in children's gardens they oversee. Nature play elements like water play, utilization of loose materials, and manipulation of sand and mud with a programmatic intent to promote "free play" were the most commonly cited aspects of these spaces. Although 71% of children garden managers indicated that they were very familiar with nature play concepts and an even greater number (80%) agreeing that spaces they manage accomplish nature play goals, few felt that their spaces and programming would encourage or inspire families to translate these concepts in home landscapes. While nature play is increasingly recognized and utilized in a variety of public settings, results highlight that many public gardens may be missing an opportunity to promote nature play at home as part of a wider effort to encourage environmental stewardship.

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Introduction

Growing Disconnect with the Natural World

In an era when human society is facing mounting environmental challenges due to climate change, one does not need to look hard for evidence that the Earth's systems and processes have been severely altered by human activity in a new geologic period called the "Anthropocene" (Zalasiewicz et al., 2010). We might ask: "how did we get here? and "how can we, as communities, begin to tackle these environmental challenges?" As research suggests, the root of the answer lies in our connection to and perception of the natural world.

Time spent in nature has been studied for its many benefits for adults and children including reduction of fatigue and stress (Berg and Berg, 2007; Wells and Evans, 2003) as well as enhancing cognitive health (Barton and Pretty, 2010; Kaplan, 1992; Wells, 2000). Our innate connection to nature can be seen in an evolutionary perspective. Wilson (1993) argued that humanity has an intimate emotional attachment to nature through what he termed the "biophilia hypothesis," where humans are likely to function best when exposed to natural environments. This connection and time spent outdoors also informs how we perceive the environment, our relationship to the food we eat, air we breathe, water we drink, and what actions we take to live more sustainably (Bateson, 1979; Rees, 2002; Bixler et al., 2002; Lohr, 2007).

The amount of time adults and children spend outdoors and are exposed to nature continues to decline. This phenomenon has been noted by a number of researchers and writers. Pyle (1993) described a growing alienation of humans from the natural world with the phrase "Extinction of Experience," Wandersee and Schussler's (1999) "Plant Blindness" describes human's inability to recognize plants or their importance in the environment, while Louv's (2006) "Nature Deficit Disorder" specifically identifies a myriad of issues related to the lack of time spent outdoors for children. For many people, especially those living in urban areas, there may be fewer chances to interact with nature due to the loss of available green spaces or an increase in an indoors-centered lifestyle (Soga and Gaston, 2016). Research also argues that people with fewer opportunities to interact with nature are also less likely to appreciate and support environmental preservation (Miller, 2005; Soga and Gaston, 2016).

Time spent in nature is essential for our health and wellbeing. It's also important in the development of positive-nature experiences that motivate us to protect and steward our natural resources. Research into environmental perception and attitudes towards sustainability have even linked these motivations and actions to experiences we have as children (Asah et al., 2018; Chawla, 2007; Thompson et al., 2007; Wells and Lekies, 2006). Wells and Lekies (2006) found that adults who had regular interaction with 'wild nature' before the age of 11 were most likely to express pro-environmental attitudes and engage in pro-environmental behaviors. In a retrospective survey of over 1000 adult residents living in Tokyo, Japan, Hosaka et al. (2018) found that access to and frequent use of green spaces (parks, forests, farms, etc.) as a child was strongly correlated with the frequency and diversity of nature-based activities as an adult. This study also provides evidence that childhood nature play affects nature-based perceptions in adulthood more strongly than gender, age and income. In addition, Thompson et al. (2007) demonstrated that lack of access to and visitation of natural areas as a child had a strong correlation with lack of visitation and desire to visit natural areas as an adult. Their study and literature review also suggests that perceived distance from home over actual distance was an important factor which facilitated desire to recreate outdoors.

Nature Play and Affordances

There have been numerous studies on play and its many social, mental, and physical benefits for children. Play allows children to develop their creativity through the use of imagination, physical dexterity, cognitive problem solving, and social connections (Ginsburg, 2007). Play also creates opportunities for children to build confidence through problem-solving, collaboration with peers, as well as regulation of their own behavior, emotions, and learning (Nolan and Paatsch, 2017). Play for children is so essential for optimal development that it has been recognized by The United Nations High Commission for Human Rights as a universal right of every child (Office of the United Nations High Commissioner for Human Rights, 1989).

Play in nature is often conceived as activities centered around built playgrounds and athletic fields. Frost (1992) introduced the concept of a 'playscape' for describing different play environments that categorized these various outdoor settings. He argued that natural features like trees, logs, streams, etc. are important qualities of playgrounds and that these features allow a wide range of learning opportunities and landscape affordances. Numerous other studies have also documented that

children's preferred play environments include a predominance of natural elements (Korpela, 2002).

For the purposes of this study, a definition of 'nature play' that was developed by the *Nature Play and Learning Places* (Moore, 2014) Project Steering Committee was used to set the intent and activity in a physical environment:

> *A designed, managed area in an existing or modified outdoor environment where children of all ages and abilities play and learn by engaging with and manipulating diverse natural elements, materials, organisms, and habitats, through sensory, fine motor and gross motor experiences.*

This definition addresses the key components of free, undirected play in environments filled with natural materials such as trees, shrubs, logs, fallen leaves, stones, soil and other elements that encourage hands-on manipulation and discovery. Moore, 2014 further explains that nature play spaces are living systems that change with the seasons, creating an opportunity for children to experience, visualize, and appreciate natural processes that shape the environment.

In *Nature Play and Learning Places*, nature play is linked to childhood development in three key elements of affordance, activity setting, and territorial range. Gibson's theory of affordance (Gibson, 1986) refers to the functional properties of a place, where the world is perceived not only in terms of objects, shapes, and spatial relationships, but also in terms of object possibilities for action (affordances). This perception of the environment inevitably leads to some course of action. In a survey of children and adults at a new nature playscape in Australia, Elliot et al. (2018) noted that children's most popular perceived sites for nature play affordances included the rope swing, the muddy waterhole, the dirt pile, the leaning log, and sandpit with bones. These landscape features provided numerous scenarios for children to utilize them in their play. Over repeated visits, researchers also observed that children often found new ways to adapt the landscape and make improvements to suit their play intentions on each visit.

Oftentimes, affordances in nature include natural elements like branches, stones, and plant parts that can be collected, arranged, manipulated, and used in imaginative play scenarios in infinite ways. These natural objects and their ability to inspire and enhance creativity supports Nicholson's Theory of Loose Parts and Loose Parts Play to facilitate unstructured, child-led play (Gibson et al., 2017). Nature playscapes with loose parts and varied topographies communicate higher affordances and more creative play opportunities for children. The more

heterogeneous the landscape, the more affordances could be made - indicating a higher propensity for stimulating play. (Fjortoft and Sageie, 2000).

Actualizing nature play affordances in the landscape requires development of a child's behavior in space and time in two aspects: territorial expansion and range development (Moore, 2014). As Moore (2014) notes, range expansion occurs when children gain confidence to venture farther afield, take new risks, and discover new places. Range depth occurs when children repeatedly return to already discovered landscapes and continue to actualize affordances or loose parts play by testing new strengths or taking on new challenges. Elliot et al. (2018) argues that repeated visits to the same nature play settings help to enhance creativity, sustain engagement and create agency in their play practice.

While affordances and territorial range help shape what types of play are possible and how play changes over time, Moore's (2014) 'activity setting' helps describe how a physical space can be divided to support many different activities and those that are more predictable. As an example, water play is restricted to areas with a water source or feature, but it can provide a number of play affordances for children of all ages. In some nature play spaces, areas are designated for building and constructing with logs and branches. Laaksoharju and Rappe (2017) noted in their study that building huts from loose branches was a popular social activity that not only required social skills among groups of children, but also tested their ability to function as a team to move heavy objects and trial rudimentary engineering skills.

Improving Nature Play through Nearby Nature

While the benefits and types of nature play are continually being researched, especially in designed public spaces, studies have shown that in addition to children spending less time in nature, children's play is increasingly centered in home landscapes. Ward Thompson et al. (2007) found that most outdoor play is confined to backyards, with only a small percentage of children having frequent exposure to woodlands or natural environments. White (2004) also suggests that children's physical boundaries outdoors have been shrinking due to numerous factors, of which adult-driven fear of child safety in the outdoors is the primary reason.

Children may not need regular exposure or visits to large expanses of natural areas to benefit from the health and well-being aspects of nature play. Kaplan's, S. (1995) Attention Restoration Theory which provides guiding principles of nature's ability to restore cognitive fatigue, even with small nature experiences like views of a garden through a window or a walk down a tree-filled street. These 'Nearby Nature' experiences or small daily interactions with the natural world in any capacity can

have a positive relationship with stress reduction in adults and children (Kaplan, 1992; Kaplan et al., 1998; Wells, 2003). Kaplan et al., (1998) point out that nearby nature can be of any size and in any context. It can be as big as a “Metropolitan Park” or as small as a backyard or even a view of urban street trees. Nearby nature can be interactive and intentional (a trip to take a hike) or circumstantial (experiencing nature as you walk to the mailbox or perform an errand). Nearby nature can also be experienced by observing, whether the viewer is outside or even inside looking out a window. The effects are the same - they all hold some cognitive restorative abilities.

In the case of children and nature play, the benefits and goals of increased frequency in nature can be achieved in backyards or nearby landscapes. Indeed, growing urban areas, diminishing natural areas, and increasing pressure on children’s time increases the need for us to look to nearby nature as a place for children to recreate and be exposed to the natural world (Wells, 2003). Moss (2007) even argues that when we rediscover our backyards as places for nature play, we might find that home gardens can be some of the most biodiverse landscapes - filled with child-friendly plants and creatures. These nearby nature experiences, whether located in a family’s private backyard, a residential community’s common green space, or even a nearby neighborhood park offer infinite possibilities for nature play that can be more regular and sustained than periodic trips to common nature play-based institutions like large parks, public gardens, and zoos.

Public Gardens and their Societal Impact in Environmental Stewardship

A ‘public garden’ is an umbrella term used to describe publicly accessible green spaces that connect visitors with nature, and are commonly used for environmental education and leisure. For the purposes of this research and terminology, the researchers refer to public gardens synonymously with Western botanical gardens and arboreta. Oftentimes, these spaces include western botanical gardens, arboreta, and related entities such as zoological gardens, college and university campuses, historic homes and gardens, natural areas, as well as city, county, state, and federal parks (American Public Garden Association, 2016a). Lee and Rakow (2011) make a further clarification that public gardens are both a physical presence that includes plant collections, buildings, and infrastructure as well as an organization that manages those elements and uses them to further its mission. Public parks, community gardens, amusement parks and other publicly-accessible nature-based destinations may provide valuable green spaces, but many do not meet the essential

criteria of being a public garden without a mission dedicated to a particular area such as education, outreach, conservation or research (Lee and Rakow, 2011). A critical element is an emphasis on landscapes and plant collections that are actively used as a resource for furthering environmental stewardship. Public gardens are often associated with one or more professional networks for the promotion of public horticulture, environmental education, and plant conservation. Two of these organizations in North America include the American Public Gardens Association (APGA) and the American Horticultural Society (AHS).

The APGA is an international professional organization connecting over 600 institutions and 10,000 individuals in the field of public horticulture. For over 80 years, the Association has strived to strengthen collaboration, provide professional development, and guide on industry best practices. Their vision is “a world where public gardens are indispensable and where public gardens are leaders, advocates, and innovators in the conservation and appreciation of plants (American Public Garden Association, 2016b).

The AHS is a publicly accessible network connecting thousands of horticultural enthusiasts to educational publications, annual symposia, online resources, as well as maintaining a reciprocal membership program with over 345 gardens and arboreta across North America. In addition to print educational resources, AHS publicly demonstrates concepts such as sustainable gardening at their Virginia-based headquarters at River Farm. For nearly 30 years, the AHS has hosted the National Children & Youth Garden Symposium to connect, collaborate, and educate thousands of teachers on the benefits and importance of engaging children in gardens (American Horticultural Society, 2017).

Public gardens have existed for centuries. From the early days to the present, their purpose has always been to acquaint humans with the natural world around them - for beauty, tranquility, to heal and learn. Physic gardens maintained and operated by monasteries and places of higher education were some of the very first botanic gardens where the importance of medicinal plants was studied. Later, in the age of global colonialism, Western botanical gardens became important showcases of national wealth, expanse, and trade, unfortunately at the expense of many indigeous cultures (Rakow and Lee, 2015; Powledge, 2011). In today’s gardens, you’ll often see this historic mission paired with ongoing concerns to research and educate the public on the effects of climate change or to promote environmental stewardship and ways to live more sustainably. In a society where many people have become disconnected from the natural world, public gardens play an important role in

reconnecting people with the world of plants, educating them and showing them models of sustainable living (Rakow and Lee, 2015; Dodd and Jones, 2010).

More and more, public gardens are engaging communities where they are and encouraging people to make changes at home as part of larger conservation efforts. Public gardens as advocates for change in home landscapes is well documented. This can be seen in efforts to get people to grow their own vegetables at home, try native plants in home landscapes, and swap out invasive species with those that are less environmentally detrimental (Rakow and Lee, 2015). Shouldn't this too translate to other efforts in the garden, like nature play?

Children's Gardens and Fostering Connections with Nature

Children's gardens exist in diverse forms and organizational settings such as hospitals, daycare facilities, schools, botanic gardens, and nature centers to name a few (Miller, 2005). For the purposes of this study, children's gardens in public gardens were the primary focus. As institutions that promote human connections with nature, specifically plants, the researchers hypothesized that children's gardens in public gardens are more likely to already utilize nature play practices and goals.

Although today's contemporary approach to children's gardens loosely defines them as formally designed spaces for nature education, connecting children to the environment through garden education or public garden institutions has a long history in the United States. Considered one of the first child-oriented gardens in the U.S., the Children's Garden at the Brooklyn Botanic Garden has provided a space for children to grow and nurture plants while learning about the natural world since 1914. First developed as a way to connect an exploding Brooklyn population devoid of personal green spaces to nature through vegetable gardening, the Brooklyn Botanic Garden's education programs encouraged children to learn new skills by working collaboratively in garden plots (Peters, 2014). This effort was devised by the Botanic Garden's first youth educator who approached nature study from the philosophy of school gardens in Europe, where education was enhanced through hands-on experimentation. Children of all ages were encouraged to learn about plants, nature, and social conduct through tending vegetable gardens and cooperative projects (Peters, 2014).

Children's gardens have become popular additions to public gardens in the United States and are important sources of nature interactions for children, particularly those that live in urban areas (Wake, 2004). Many of these spaces are self-defined with titles that simply say "children's garden" or have other nature-inspired and audience-denoting names like "Family Discovery Garden." Although a precise

definition of the construct or place is hard to define because of the many places they can be found, children's gardens are often considered by the functions they perform (Miller, 2005). Wake (2004; 2007) argues that these spaces and programs commonly aspire to: i) inspire children to learn about plants and the environment through direct interaction with the landscape, ii) allow children to feel a sense of ownership of the space through child-centered design, iii) foster a greater understanding of the environment and iv) afford positive experiences in nature for children that may lead to greater sense of nature stewardship as those children become adults. As Wake (2007) also notes, children's gardens in the public garden realm are not merely playgrounds, they are places for plant-based nature experiences and opportunities to connect with the natural world for children.

What we might consider as the first of these contemporary children's gardens, the Michigan 4-H Children's Garden was established at Michigan State University in East Lansing in 1993 to teach children about the importance of plants, to induce curiosity, and to provide educational experiences (Sobaski, 2006). In a review of design features that support children and elderly visitors, Westphal (2001) noted a variety of foundational nature play criteria. The 4-H Children's Garden emphasized small scale design to necessitate ease of mobility and increase a child's sense of immersion and connectivity. Interactive elements that invited children to experience and take part in the landscape were reinforced through signs that encouraged children to touch, move, and manipulate various natural features.

Study Background and Research Questions

The impetus of this survey is part of a larger and on-going evaluation of nature play and visitor use at the Gaffield Children's Garden at the University of Michigan Matthaei Botanical Gardens. Input and perceptions of children's garden managers at other public gardens across North America is seen as being a keystone to better understand how the Gaffield Children's Garden could be evaluated.

The aim of this study was to gauge the perceptions and attitudes of garden managers, educators, and staff members who had a direct relationship with their children's garden spaces through daily observation, maintenance, and teaching. The study focused on a survey of this population as they are likely to have the most intimate view of these spaces with the greatest potential for promoting and enacting spatial or programmatic change.

A digitally-distributed questionnaire sought to answer three primary questions central to this goal:

1. *What is the awareness and perception of nature play in public gardens?*

2. *How is nature play operationalized in public gardens?*

3. *Is nature play a theme that could inspire families to adopt similar spaces in home yards and neighborhood open spaces?*

Materials and Methods

Survey Population

At the start of the study in 2016, no known list or database of public gardens with children's spaces could be identified to determine a total survey population. In order to identify this population, a list of designated children's gardens was created from three sources: i) a membership pool of institutions belonging to APGA that self-identified as having a children's garden through the Association's "Search Public Gardens" tool (APGA, 2016), ii) a list of members of the AHA (AHA, 2016), and iii) a list of example gardens included in the book: Designing Outdoor Environments for Children: Landscaping School Yards, Gardens and Playgrounds (Knight, 2010).

After a comprehensive list of 121 public gardens was created, the website or internet presence of each public garden was researched to determine the scope of each children's space and to identify a primary contact as a survey recipient. If available, images of each children's garden space, recorded history, staff contacts, and publicized features and events were recorded in notes to inform formulation of survey questions and study context. When direct contacts could be identified (i.e. children's garden manager), these were included as the primary recipients of the survey for the study. In cases where a direct contact could not be determined, other associated contacts were used (i.e. Director of Youth Education or Director of Landscape). In some limited cases, general information emails (i.e. info@publicgarden.com) were used to solicit responses from responsible staff members.

A secondary email listserv, created and managed by APGA; "Directors of Large Gardens", was also used to distribute the survey link to a broader audience of public garden directors. Since larger gardens, those with over $3 million in annual operating income, are more likely to have programmed and high maintenance areas like children's gardens, this created a safety net to ensure enough responses could be gathered. Recipients in this listserv were asked to distribute the survey to the appropriate staff members at their institutions.

For the purpose of the study, the overall email list of recipients (created by the primary researchers and defined listserv) represented the total population of decision makers for children's garden programming and management within public gardens of North America. In some cases, surveys were forwarded from originally-defined contacts to staff that had the greatest impact/decision-making abilities related to children's gardens. This list included staff with diverse job titles,

highlighting the broad array of responsibilities implicit in the operation and programming of children's gardens, including directors, educational program coordinators, horticulturalists, and facilities and operations staff.

The questionnaire was organized and distributed by Qualtrics Software, Copyright © 2016 (Qualtrics, 2016) via email. On Tuesday, August 2, 2016 an invitation to participate in the electronic survey was distributed via email to direct contacts and through an anonymous link. The online Qualtrics survey was open for a period of three business weeks and closed on Tuesday, August 23, 2016. Reminders to complete the survey were sent on Tuesday, August 9 and August 16. The survey was distributed with an introduction to the study and granted no incentive to participate. Respondents were granted an opportunity to receive study results if they so desired. Survey participants were thanked automatically for their participation and invited to contact the principal researchers for any questions or follow-up information.

Survey: Instrument Organization

In order to establish a baseline of perception of nature play in children's gardens from their gardeners and managers, a questionnaire was devised that asked questions about nature play awareness, garden features, themes, and educational goals. With the intention of reducing survey fatigue and therefore increasing response rates, the survey was designed to be completed in less than ten minutes with a total of 17 non-conditional and conditional questions. For the purposes of this study, 14 questions were used for analysis.

The questionnaire was organized to address four primary topics: awareness and perception of nature play (2 questions), garden features that enable nature play (4 questions), encouragement for families to translate nature play at home (3 questions), and garden information and user demographics (5 questions).

Question formats included nominal, open ended answer, and five-point Likert ordinal scales that have been used in similar surveys relating to: motivation for adults to bring their children to parks (Refshauge et al., 2012), public garden education goals (Gaio-Oliveira et al., 2017), status of children's gardens within public gardens (Kwon et al., 2015), and nature play preferences (Elliot et al., 2018).

Assessing Awareness of Nature Play

A foundational research question sought to better understand the level of familiarity of nature play concepts garden managers possessed in their daily interactions with their children's garden spaces. This level of familiarity could be compared to their perception of nature play opportunities their garden possessed and what activities could be considered as nature play (Table 1).

Table 1: Research Questions: Awareness and Perception of Nature Play

Research Themes	#	Public Garden Manager Survey Questions					
Theme: Awareness and Perception of Nature Play		**Nature Play:** A designed, managed area in an existing or modified outdoor environment where children of all ages and abilities play and learn by engaging with and manipulating diverse natural elements, materials, organisms, and habitats, through sensory, fine motor and gross motor experiences. (Moore, R. Nature Play and Learning Places. 2014)					
Research Question: What is the awareness and perception of nature play in public garden children's gardens?	1	**How familiar are you with the above concept of 'Nature Play'?**					
		Extremely Familiar	Very Familiar	Moderately Familiar	Slightly Familiar	Not Familiar	
	2	**Using the above definition, would you agree that your children's garden provides these nature play opportunities?**					
		Strongly Agree	Agree	Neither Agree or Disagree	Disagree	Strongly Disagree	

Garden Features that Enable Nature Play

Commonly cited programmatic and spatial features that are considered to be important and universal components of nature play were used to gauge garden manager's perceptions of their children's garden features. Two five-point Likert scales aimed to measure garden manager's perception of effectiveness of spatial features and mission importance of mission. Two additional questions inquired about the popularity of specific nature play-based elements and allowed garden managers to describe spaces and programs they perceived to be most popular with visitors (Table 2).

Table 2: Research Questions: Garden Features that Enable Nature Play

Theme: Garden Features that Enable Nature Play		**How effective do you believe your children's garden is at accomplishing these items?**					
			Extremely Effective	Very Effective	Moderately Effective	Slightly Effective	Not Effective
	1	Utilizing accessible, children-scaled items and spaces					
		Allows children to manipulate materials and spaces					
		Motivates families to become environmental stewards					
		Uses predominantly natural materials, limits plastics, etc.					
		Provides meaningful connections to the environment					
		Of these possible educational themes, how would you rate their priority in the mission of your children's garden?					
			Extremely Important	Very Important	Moderately Important	Slightly Important	Not Important
	2	Fine or Performing Arts					
		Cultural or Human History					
		Plant Biology and Horticulture					
		Wildlife and Habitats					
		Physical Activity and Health					
		Growing Food / Agriculture					
		Environmental Stewardship					
		Undirected Free Play					
		What main attributes do you believe contribute to the most popular feature or space in your children's garden? (Choose all that apply)					
	3	Loose Parts to Manipulate					
		Water					
		Dirt, Sand or Mud					
		Large Open Spaces					
		Small, Enclosed Spaces					
		Fragrant or Tactile Plants					
		Edible Plants					
		Built Structures (jungle gyms, etc.)					
		Other					
Research Question: How is nature play operationalized in public gardens?	4	**What is the space called and/or how would you describe it?**					
	Open Text Answer						

Encouragement for Families to Translate Nature Play at Home

Four questions inquired if garden managers perceived their children's gardens to promote nature play at home activities and how easily they believed their gardens could be replicated in home landscapes. An additional question inquired about what methods garden managers believed would be most successful in helping families to translate nature play at home (Table 3).

Table 3: Research Questions: Encouragement for Families to Translate Nature Play at Home

Theme: Encouragement for Families to Translate Nature Play at Home	1	**Does your children's garden or it's educational programming overtly promote building a nature play space in home landscapes?**					
		Yes					
		No					
Research Question: Is nature play a theme that could inspire families to adopt similar spaces in home yards and neighborhood open spaces?							
	2	**What methods do you think are most successful to inspire families to implement nature play at home? (choose all that apply)**					
		Static Educational Materials					
		Workshops and/or Training					
		Free Materials for Visitors					
		Informal Visitor Interactions					
		Other					
	3	**After visiting your children's garden, how likely do you believe families will build a nature play space at home or a nearby landscape?**					
		Extremely Likely	Somewhat Likely	Neither Likely nor Unlikely	Somewhat Unlikely	Extremely Unlikely	
	4	**On average, how easily do you believe the spaces or features in your children's garden can be duplicated by families in home landscapes?**					
		Extremely Familiar	Very Familiar	Moderately Familiar	Slightly Familiar	Not Familiar	

Garden Information

Five questions collected valuable garden information that was used to better understand the audience that responded to the study survey. Two questions that inquired about the opening year of the children's garden and expected age range of child visitors were also included to help create information that has not been previously reported in similar studies (Table 4).

Table 4: Research Questions: Garden Information

Theme: Garden Information	1	**What is the name of your public garden?**	
		Open Text Answer	
	2	**Does your children's garden have a specific name?**	
		Yes	
		No	
	3	**What is the name of your children's garden?**	
		Open Text Answer	
	4	**When was your children's garden opened to the public?**	
		Year Selection	
	5	**What age range(s) do you believe the children's garden most successfully attarcts? (Choose all that apply)**	
		0-1 years old	
		2-3 years old	
		4-7 years old	
		8-11 years old	
		12+ years old	

Survey Results

176 questionnaires were completed from the direct email and link via listserv distribution methodologies. 59 questionnaires were returned from the direct email solicitation to 121 contacts at public gardens with children's gardens, equaling a 48.7% response rate. 117 questionnaires were returned from the anonymous link distributed via the Directors of Large Gardens email listserv to 55 garden directors and then redistributed to other employees. With both survey methodologies, the completion rate was 74%. Of the total 176 surveys returned, 119 had more than 95% of the questions completed and were chosen for analysis (Table 5). Respondents who completed the survey upon opening in one sitting (and not returning to it later) took an average of 11 minutes to complete all 17 questions.

Table 5: Survey Results

Survey Recipients	**Distributed Surveys**	**Returned Surveys**	**Response Rate**	**Completed** >95% completed	**Completion Rate**
Direct Email (Research List)	121	59	48.7%	55	93%
Mass Link (Directors of Large Gardens Listserv)	55	117	NA	64	55%
Survey Total	176	176	NA	119	74%

In total, 87 public gardens are represented through survey responses with 18 gardens having more than one response from multiple staff members (Table 6). 11 public gardens reported having more than one garden space designed for child and family programming, with two spaces being the maximum amount reported from respondents. Since the study centered around the perceptions of children's garden managers on how nature play was represented in their gardens, multiple responses from the same garden were included in the analysis. Responses were obtained from public gardens representing 31 U.S. states , the District of Columbia and three Canadian provinces of Alberta, British Columbia, and Ontario. These public gardens were located in the following regions as defined by the U.S. Census Bureau: Northeast: 14, Midwest: 29, South: 26, West: 14, and Canada: 3 (Table 6)

Table 6: Public Garden Response Results

Survey Response Results

Total Number of Gardens Contacted	Total Number of Gardens Responding
110	86

States Represented in Survey Contact List	States Represented in Survey Responses
42 States + District of Columbia	31 States + District of Columbia
2 Canadian Provinces: Ontario + British Columbia	3 Canadian Provinces: Alberta, Ontario, BC

Gardens by State: Contact & Responses					
State	Contacts	Responses	State	Contacts	Responses
Alabama	1	1	Michigan	7	7
Alaska	1	1	Minnesota	1	1
Arizona	4	1	Missouri	1	4
Arkansas	2	0	Montana	1	0
CA: Alberta	0	1	Nebraska	1	1
CA: British Columbia	1	1	New Hampshire	1	1
CA: Ontario	1	1	New Mexico	1	0
California	8	5	New York	7	5
Colorado	3	3	North Carolina	4	2
Connecticut	1	1	Ohio	2	3
Delaware	2	1	Oklahoma	3	3
Florida	3	2	Oregon	1	1
Georgia	3	2	Pennsylvania	6	4
Hawaii	2	2	South Carolina	3	0
Illinois	6	7	South Dakota	1	0
Indiana	1	0	Tennessee	2	4
Iowa	3	3	Texas	5	4
Kansas	1	0	Utah	2	0
Kentucky	1	2	Virginia	4	4
Louisiana	1	0	Washington DC	1	1
Maine	1	1	West Virginia	1	0
Maryland	2	0	Wisconsin	3	3
Massachusetts	2	2	Wyoming	1	1
			Total	**50**	**37**

Results by Survey Theme

Table 7: Awareness and Perception of Nature Play Results

Theme: Garden Information	**N = 119**	**What is the name of your public garden?**		
		See Appendix 1: Responding Public Gardens		
	N = 119	**Does your children's garden have a specific name?**		
		Yes	**79**	**66%**
		No	**40**	**44%**
	N = 79	**What is the name of your children's garden?**		
		See Appendix 1A: Responding Public Gardens		
	N = 100	**When was your children's garden opened to the public?**		
		2006-2016	**54**	**54%**
		1996-2005	**38**	**38%**
		1986-1995	**4**	**4%**
		<1986	**4**	**4%**
		Year Selection: Answers Grouped into Three Date Ranges		
	5	**What age range(s) do you believe the children's garden most successfully attracts? (Choose all that apply)**		
		0-1 years old	**15**	
		2-3 years old	**58**	
		4-7 years old	**106**	
		8-11 years old	**39**	
		12+ years old	**5**	

Table 8: Garden Features that Enable Nature Play Results

Theme: Garden Features that Enable Nature Play		**How effective do you believe your children's garden is at accomplishing these items?**					
			Extremely Effective	Very Effective	Moderately Effective	Slightly Effective	Not Effective
Research Question: How is nature play operationalized in public gardens?	**N = 115**	Utilizing accessible, children-scaled items and spaces		**2.22**			
	N = 115	Allows children to manipulate materials and spaces		**2.36**			
	N = 114	Motivates families to become environmental stewards			**2.98**		
	N = 115	Uses predominantly natural materials, limits plastics, etc.		**2.25**			
	N = 115	Provides meaningful connections to the environment		**2.1**			
	N = 114	Inspires families to adopt a similar nature play space at home			**2.96**		
		Of these possible educational themes, how would you rate their priority in the mission of your children's garden?					
			Extremely Important	Very Important	Moderately Important	Slightly Important	Not Important
	N = 117	Fine or Performing Arts			**3.6**		
	N = 116	Cultural or Human History			**3.27**		
	N = 117	Plant Biology and Horticulture		**2.05**			
	N = 116	Wildlife and Habitats		**2.09**			
	N = 117	Physical Activity and Health		**2.3**			
	N = 116	Growing Food / Agriculture		**2.37**			
	N = 117	Environmental Stewardship	**1.16**				
	N = 117	Undirected Free Play	**1**				
		What main attributes do you believe contribute to the most popular feature or space in your children's garden? (Choose all that apply)					
	N = 119	Loose Parts to Manipulate	**52**		**46%**		
		Water	**68**		**60%**		
		Dirt, Sand or Mud	**52**		**46%**		
		Large Open Spaces	**32**		**28%**		
		Small, Enclosed Spaces	**44**		**40%**		
		Fragrant or Tactile Plants	**41**		**36%**		
		Edible Plants	**35**		**31%**		
		Built Structures (jungle gyms, etc.)	**48**		**42%**		
		Other	**25**		**22%**		
	4	**What is the space called and/or how would you describe it?**					
	Open Text Answer	**See Appendix 2: Play Space Descriptions**					

Table 9: Encouragement for Families to Translate Nature Play at Home Results

Theme: Encouragement for Families to Translate Nature Play at Home	**N = 117**	**Does your children's garden or it's educational programming overtly promote building a nature play space in home landscapes?**				
		Yes	**15**		**13%**	
		No	**102**		**87%**	
Research Question: Is nature play a theme that could inspire families to adopt similar spaces in home yards and neighborhood open spaces?	**N = 13**	**What methods do you think are most successful to inspire families to implement nature play at home? (choose all that apply)**				
		Static Educational Materials	**4**			
		Workshops and/or Training	**8**			
		Free Materials for Visitors	**8**			
		Informal Visitor Interactions	**11**			
		Other	**See Appendix 3: Methods for Nature Play at Home**			
	N = 115	**After visiting your children's garden, how likely do you believe families will build a nature play space at home or a nearby landscape?**				
			2.5			
		Extremely Likely	Somewhat Likely	Neither Likely nor Unlikely	Somewhat Unlikely	Extremely Unlikely
	N = 13	**On average, how easily do you believe the spaces or features in your children's garden can be duplicated by families in home landscapes?**				
			2.38			
		Very Easy	Easy	Neutral	Difficult	Very Difficult

Table 11: Garden Information Results

Theme: Garden Information	**N = 119**	**What is the name of your public garden?**		
		See Appendix 1: Responding Public Gardens		
	N = 119	**Does your children's garden have a specific name?**		
		Yes	**79**	**66%**
		No	**40**	**44%**
	N = 79	**What is the name of your children's garden?**		
		See Appendix 1A: Responding Public Gardens		
	N = 100	**When was your children's garden opened to the public?**		
		2006-2016	**54**	**54%**
		1996-2005	**38**	**38%**
		1986-1995	**4**	**4%**
		<1986	**4**	**4%**
		Year Selection: Answers Grouped into Three Date Ranges		
	5	**What age range(s) do you believe the children's garden most successfully atttacts? (Choose all that apply)**		
		0-1 years old	**15**	
		2-3 years old	**58**	
		4-7 years old	**106**	
		8-11 years old	**39**	
		12+ years old	**5**	

Discussion

Connecting Children's Garden Managers Through Professional Development

Results from the study shows that there is excitement and a willingness to discuss nature play in children's gardens among garden managers. This is evident by the 73% questionnaire response rate and nearly 70% (80 out of 115 respondents) of children's garden managers who volunteered to be interviewed. .

The APGA includes 26 professional sub-communities dedicated to specific topics related to public garden management that range from Plant Conservation to Education and Guest Services. Children's Gardens or Youth-themed Spaces is currently not among these communities, which made defining a total survey population for the purposes of this study a tedious task. Although members can find a plethora of childrens garden-related questions and discussion topics dispersed in various other community forums in APGA or by attending the AHS Annual Youth and Gardening Symposium, this research suggests that a community forum and professional development contact list for this topic would be well-received.

Awareness and Perception of Nature Play

Garden managers indicated that they were familiar with nature play as defined by the National Guidelines for Nature Play and Learning Places: Creating and Managing Places Where Children Engage with Nature (Moore, 2014). In addition, garden managers agreed that their institution's children's garden provides and supports nature play opportunities for visiting children and families.

Respondents perceived their gardens to effectively accomplish all of the presented nature play components. Two of these ('Motivates families to become environmental stewards' and 'Inspires families to adopt a similar nature play space at home') were perceived as slightly less effective with the lowest two scores.This could be explained by these two features being more abstract concepts and not necessarily observable in the physical garden environment. Three of the four most effective items (Provides meaningful connections to nature, Uses predominantly natural materials, and utilizes accessible, children-scaled items) could have been rated higher because they can be observed in the garden space. 'Provides meaningful connections to the environment' could also be interpreted as an observable characteristic, where garden managers may witness children interacting with plants, insects, etc. and may intuit their emotions through facial expressions or body language.

Garden Themes and Features that Enable Nature Play

The Lure of Water

Among the eight most commonly cited features of nature play spaces, children's garden managers indicated water (60% popularity) as the element that contributes to the most popular feature in their garden spaces. When asked to describe these features in an open text response (Appendix 2), water was mentioned in a variety of scenarios from large built water play spaces to natural ponds. Interactive splash pads and fountains were popular words to describe these features and were cited as being immensely popular during hot days.

"Our current most popular feature is our entry water feature or 'splash pad'. This may be attributed to the summer heat."

"The Spring Giant - a 15' cube head sculpted with a crawfish and fish cheeks. This is the source of our Stream Valley, hence "Spring Giant". A "saliva curtain" drips from the top of his mouth into a reservoir that runs "drools" over his teeth. Children use fabric buckets to catch water and use paint brushes to paint on our black slate Art Wall. The Giant can be entered from the back where there are stalactites and an oculus that casts a prism on the mosaic tile floor."

Interactive water elements were mentioned in gardens that allowed children to manipulate the flow of water or add it to sand boxes to create mud pits. Natural water features including ponds, bogs, wetlands and streams were also commonly mentioned as places for children to explore and watch for wildlife like frogs, tadpoles, and turtles. An emphasis here was connecting children to education about wetland plants, habitats and natural processes like frog metamorphosis.

"We have a large pond, called "Blueberry Pond" full of frogs, fish, turtles and other wildlife. A definite main attraction for frog catching. There are blueberry plants around the edges, hence the name. We also have a small dock with a couple lobster traps filled with plastic lobsters that kids love throwing into the pond."

"Polliwog Bog, it is a small water pool for children to play in during the hot months of the Summer. It is surrounded by plants and trees. Children are encouraged to play with the small gravel in the pool and manipulate it as they want to."

Beyond large infrastructure features like fountains and ponds, managers also identified simple water play activities like watering plants and washing sculptures from rain barrels as being some of the most popular activities within their spaces.

"Watering the plants is by far the most popular activity. We have water pumps and plenty of watering cans. We actually had to relocate the watering stations from the inside garden to the outside garden due to flooding from eager waterers."

Getting Dirty - Manipulating Small Loose Parts

Soil, sand, mud and manipulating earth was a second commonly mentioned feature (46% popularity) that children's garden managers perceived as being popular elements in their garden spaces. These features - from sand boxes to "soil laboratories" and "rock quarries" were described as places where digging, moulding, and manipulating soil in combination with imaginary play take place.

"Our "Soil Laboratory" where children are invited to simply dig and play in the dirt with loose tools, sifters, etc. and are prompted to make up games and get dirty."

"Our mud pie making area is very popular. Children can use mud to fill a small pie mold and decorate it with leaves, sticks, stones, flowers or any other natural item."

"Despite our best efforts to keep sand and dirt from an adjoining sandbox and open soil digging bed, one of the favorite things for children to do is pour these into the water feature."

Building with Branches - Manipulating Large Loose Parts

Along with the importance of dirt and sand, loose parts to manipulate was perceived as another popular quality of children's garden spaces. Children's garden managers commonly mentioned and described spaces where children were encouraged to build structures and transform the landscape with various natural elements. Natural wood parts including stumps, logs, branches and tree cookies were universally described in these scenarios.

"WoodPointe is where we add small logs, branches and other natural materials for guests to create and build."

"Our Children's Garden utilizes cut bamboo pieces that children use to construct makeshift shelters. Within these enclosed spaces children can engage in imaginary play."

"It is called the Wood Lot. It consists of log piles, stump arrangements, branch structures and loose branches."

In most descriptions of this type of play space, children's garden managers often mentioned building in tandem with physical exercise and exertion while using words like "jumping," "climbing," and "balancing." In a few responses, the phrase "acceptable risk" was used to describe how children's garden managers perceived safety in tandem with the desire for children to explore, especially when mentioning climbing elements.

“Nature's Gym - includes uneven logs, zipline, climbing net and tree structure, balance tree beam, hollow crawling stump.”

“Stumpery - it's a nice sized area with logs for kids to climb and balance on. There are large sized tree cookies for them to walk and jump across. There are also upside down juniper trunks cemented into the ground that children can climb.”

“We have a playground area where kids can climb in holes and on top of large balls. They can also run around. We also have an area where kids can move around large logs and build structures similar to nests.”

“Children using this space have taken the opportunity to build forts, test their balance, and role play with siblings and friends. Play that ultimately allows children to explore a natural setting, use their imaginations and develop problem-solving skills.”

A full list of play spaces and experiences described by garden managers is included in Appendix 2: Play Space Descriptions.

Encouraging Nature Play at Home

While an overwhelming majority of children’s garden managers were very familiar with the concept of nature play and provided detailed accounts of how nature play was accomplished in their own gardens, the idea of encouraging families to enact similar activities at home was less commonly held. When questioned whether their children’s garden or it’s educational programming “overtly promoted building a nature play space in home landscapes,” 102 (89%) of 117 managers indicated that it was not a priority or goal.

In comparison to other nature play goals like “provide a meaningful connection to nature,” children’s garden managers were less certain of the effectiveness of their gardens to inspire families to adopt nature play practices at home. While this outcome is difficult for children’s garden managers to measure, many still held a belief that families could leave their garden with motivation to build a similar nature play space closer to home.

While encouraging families to adopt nature play at home may not be a central goal or mission of most children’s gardens, children’s garden managers generally believe that their spaces do provide easy examples to inspire families to adopt nature play at home. Of the 15 managers who reported that their gardens “promoted nature play at home,” all indicated an additional question aimed at how best to accomplish this goal. While informal visitor interactions were seen as the most successful method to

encourage families to adopt nature play at home, workshops and training were mentioned in four of the five other text options.

Age of Children Visitors

The age that a children's garden is designed for is a critical element that dictates how a space is adapted to its users. Age range classifications were developed from a series of children and nature play studies that focused on learning capacities and appropriate nature play experiences (Moore, 2014). Moore (2014) links these age divisions with the concept of territorial range to help classify design parameters. As children grow-up from infancy (0-18 months) to primary school (3-7 years) and adolescence (12-17 years), their nature-based learning capacities change from sensory exposure to observable life cycles, to learning about more complex issues like conservation of threatened species. So too does their ability to explore the natural world on their own evolves, including taking risks, negotiating spatial limits with adults, and learning social play skills with others. As these learning objectives and range constraints evolve, so do children's garden design elements that help facilitate these functions.

Public garden managers were able to select a range of ages that they feel their children's garden is best designed to accommodate and attract. The majority of managers felt that their spaces best attract children in the primary school range between the ages of 4 and 7 years of age (38%), with some indicating opportunities for ages 2-3 years old toddlers (18%) and 8-11 years old middle schoolers (14%). Very few managers felt that their spaces were appropriate for children under 2 years of age (infants) and those over 12 years of age or in their adolescence.

The popularity of gardens suited to children in the primary school age range fits within Moore's (2014) list of developmental attributes for children's ability to discover and understand nature. In these early formative years, mobility greatly enhances, the ability to move and place objects spatially is informed through problem solving, and social cooperative play is formed with other children. At the older end of this range, children have a greater capacity for taking on chores and performing tasks within the gardens like watering plants as noted by garden managers and understanding life cycles of frogs and butterflies.

Garden Founding Year

When this questionnaire was distributed in 2016, 54% of garden managers indicated that the children's gardens they manage were 10 years old or less with another 38% indicating that their gardens were 20 years old or less. As indicated by press releases, fundraising campaigns, and opening celebrations in many AHS and APGA periodicals, children's gardens are a popular addition to most public gardens in North America. These sentiments have been carried over by previous studies by Wake (2008) and Miller (2005). Although these studies speak to the growing popularity of children's gardens from various perspectives, including design and use, they lack a more comprehensive survey detailing the rate and timing of these garden openings. Findings in this study confirm and expand upon the Wake (2008) and Miller (2005) studies along with another survey of children's gardens of North America conducted by Kwon et al. (2015), by identifying the time of when these gardens were established.

Conclusion

The results of this study confirm the researcher's hypothesis that children's gardens in public gardens are adept and excelling in providing nature play opportunities that authentically connect children with the environment. The awareness of the various nature play concepts by children's garden managers was illustrated by their detailed descriptions of various nature play spaces and programs. A popular garden goal of undirected free play is supported and described by managers in ways that allow children to manipulate and take ownership of their play spaces. Within these responses it was evident that key nature play criteria like loose parts was accomplished through the movement of various natural elements like logs and branches; territorial range was expanded through the process of getting dirty in interactive soil and mud play areas; and activity setting provided multifunctional spaces like water features, which provide a cool respite during a hot summer day and allow children to explore aquatic and riparian ecology.

Public gardens' long history of educating the public about nature as well as providing examples of how landscapes can be designed, adapted, or made more sustainable demonstrates their ability to inspire visitors to make change at home. Perceptions and input from children's garden managers in this study also clarifies their willingness and ability to utilize nature play principles within their children-themed spaces. Although inspiring or encouraging families to adopt nature play in landscapes closer to home was not perceived as a priority for children's garden managers at this time, a general excitement over this topic and the opportunities it creates shows potential. With many public garden missions linked to inspiring visitors to become better environmental stewards and critical research showing the importance of regular nature experiences for children, this research suggests that children's gardens can be greater advocates for nature play at home. With the right guidance, public gardens have the capacity and the experience to help create new generations of environmental stewards through advocating and demonstrating immersive nearby nature play experiences for home landscapes.

Appendix

Appendix 1: Public gardens where surveys were distributed and where responses were received from garden managers.

APPENDIX 1: PUBLIC GARDEN SURVEY DEMOGRAPHICS		
Public Garden Name	**State**	**Staff Responses**
Huntsville Botanical Garden	Alabama	2
Georgeson Botanical Garden	Alaska	1
Boyce Thompson Arboretum	Arizona	0
Desert Botanical Garden	Arizona	0
Tohono Chul Park	Arizona	1
Tucson Botanical Garden	Arizona	0
Botanical Garden of the Ozarks	Arkansas	0
Garvan Woodland Garden	Arkansas	0
Devonian Botanic Garden	CA: Alberta	1
Milner Gardens and Woodland	CA: British Columbia	1
Toronto Botanical Garden	CA: Ontario	0
Royal Botanical Gardens	CA: Ontario	1
Alta Vista Botanical Gardens	California	0
Fullerton Arboretum	California	1
Huntington Library, Art Collections, & Botanical Gardens	California	1
Kidspace Children's Museum	California	0
McConnell Arboretum and Gardens	California	0
San Diego Botanic Garden	California	1
San Francisco Botanical Garden	California	1

South Coast Botanic Garden Foundation	California	0
Santa Barbara Botanic Garden	California	1
Denver Botanic Gardens	Colorado	1
Gardens On Spring Creek	Colorado	2
Western Colorado Botanical Gardens	Colorado	0
Betty Ford Alpine Gardens	Colorado	1
Bartlett Arboretum and Gardens	Connecticut	1
The Delaware Center for Horticulture	Delaware	0
Winterthur Museum, Garden and Library	Delaware	2
Environmental Learning Center	Florida	0
Mounts Botanical Garden	Florida	0
Naples Botanical Garden	Florida	1
Bok Tower Gardens	Florida	1
Atlanta Botanical Garden	Georgia	2
State Botanical Garden of Georgia	Georgia	0
Woodlands Gardens	Georgia	1
University Of Hawaii CTAHR Urban Garden Center	Hawaii	1
Harold L. Lyon Arboretum	Hawaii	3
Chicago Botanical Garden	Illinois	2
Garfield Conservatory	Illinois	1
Klehm Arboretum and Botanic Gardens	Illinois	1
Mabery Gelvin Botanical Gardens	Illinois	1
The Morton Arboretum	Illinois	3
Oak Park Conservatory	Illinois	1
Quad City Botanical Center	Illinois	0
Franklin Park Conservatory and Botanical Gardens	Illinois	1
Foellinger-Freimann Botanical Conservatory	Indiana	0
Cedar Valley Arboretum and Botanic Gardens	Iowa	0
Iowa Arboretum Inc.	Iowa	1
Reiman Gardens, Iowa State University	Iowa	3

Seed Savers Exchange	Iowa	1
Overland Park Arboretum & Botanical Gardens	Kansas	0
The Arboretum, State Botanical Garden of Kentucky	Kentucky	1
Bernheim Arboretum and Research Forest	Kentucky	1
Longue Vue House & Gardens	Louisiana	
Coastal Maine Botanical Garden	Maine	1
Annmarie Sculpture Garden & Arts Center	Maryland	0
Brookside Gardens	Maryland	0
Berkshire Botanical Garden	Massachusetts	1
Massachusetts Horticultural Society	Massachusetts	0
The Gardens at Elm Bank	Massachusetts	1
Dow Gardens	Michigan	1
Fernwood Botanical Garden and Nature Preserve	Michigan	1
Frederik Meijer Gardens and Sculpture Park	Michigan	1
Leila Arboretum Society	Michigan	0
Michigan State University 4-H Children's Garden	Michigan	1
Otsego County Alternative Landscaping Demo Gardens and Conservation Forest	Michigan	0
Slayton Arboretum of Hillsdale College	Michigan	0
Hidden Lake Gardens - MSU	Michigan	1
Matthaei Botanical Gardens & Nichols Arboretum	Michigan	1
Windmill Island Gardens	Michigan	1
The University of Minnesota Landscape Arboretum	Minnesota	1
Missouri Botanical Garden	Missouri	1
Powell Gardens	Missouri	1
Shaw Nature Reserve of the Missouri Botanical Garden	Missouri	1
The Sophia M. Sachs Butterfly House	Missouri	1
Tizer Botanic Gardens and Arboretum	Montana	0
National Arbor Day Foundation	Nebraska	0
Lauritzen Gardens	Nebraska	2

The Fells Historic House and Gardens	New Hampshire	1
ABQ BioPark Botanic Garden	New Mexico	0
Bailey Arboretum	New York	0
Brooklyn Botanic Garden	New York	2
Buffalo and Erie County Botanical Gardens	New York	1
Ithaca Children's Garden	New York	9
New York Botanical Garden	New York	3
Queens Botanical Garden	New York	1
Sonnenberg Gardens and Mansion State Historic Park	New York	0
Cape Fear Botanical Garden	North Carolina	1
Daniel Stowe Botanical Garden	North Carolina	0
Sandhills Horticultural Gardens	North Carolina	0
Sarah P. Duke Gardens	North Carolina	0
Reynolda Gardens of Wake Forest University	North Carolina	2
Cleveland Botanical Garden	Ohio	1
Holden Arboretum	Ohio	1
Fellows Riverside Garden	Ohio	1
Myriad Botanical Gardens	Oklahoma	2
The Botanic Gardens at Oklahoma State University	Oklahoma	0
Tulsa Botanical Garden	Oklahoma	1
The Oregon Garden	Oregon	1
Awbury Arboretum Association	Pennsylvania	1
Longwood Gardens, Inc.	Pennsylvania	1
Phipps Conservatory and Botanical Gardens	Pennsylvania	2
Pittsburgh Botanic Garden	Pennsylvania	1
Tyler Arboretum	Pennsylvania	0
Charleston Parks Conservancy	South Carolina	0
Sandhills Research and Education Center	South Carolina	0
South Carolina Botanical Garden	South Carolina	0
McCrory Gardens	South Dakota	0

Cheekwood Botanical Garden	Tennessee	1
Discovery Park of America	Tennessee	1
Reflection Riding Arboretum & Nature Center	Tennessee	1
University of Tennessee Gardens	Tennessee	1
Memphis Botanic Garden	Tennessee	0
Clark Gardens Botanical Park	Texas	0
Corpus Christi Botanical Gardens and Nature Center	Texas	0
Dallas Arboretum and Botanical Garden	Texas	1
Lady Bird Johnson Wildflower Center	Texas	2
Shangrila Botanical Gardens and Nature Center	Texas	3
Texas Discovery Gardens	Texas	0
Botanical Research Institute of Texas	Texas	1
Red Butte Garden & Arboretum	Utah	0
Thanksgiving Point	Utah	0
American Horticulture Association	Virginia	0
Green Spring Gardens	Virginia	0
Lewis Ginter Botanical Garden	Virginia	2
National Botanic Garden	Virginia	0
George Washington's Mount Vernon	Virginia	1
Hahn Horticulture Garden at Virginia Tech	Virginia	1
Norfolk Botanical Garden	Virginia	1
U.S. National Arboretum	Washington D.C.	1
United States Botanic Garden	Washington DC	0
West Virginia Botanical Garden	West Virginia	0
Bookworm Gardens	Wisconsin	1
Green Bay Botanical Garden	Wisconsin	2
Rotary Botanical Gardens	Wisconsin	1
Cheyenne Botanic Gardens	Wyoming	1

Appendix 2: Play Space Descriptions

1. Nature's Gym - includes uneven logs, zipline, climbing net and tree structure, balance tree beam, hollow crawling stump.
2. Wonder Pond Stepping Stones -- a pond (man made) that is deep enough to sustain plants and wildlife on one side, though shallow enough on the opposite end to incorporate stepping stones that allow visitors to explore the habitat thoroughly.
3. Elevated boardwalks
4. Splash Pad & Balsa Build
5. Washington Youth Garden - a garden for urban children and families to learn more about growing food and positively impacting the environment.
6. Our hedge maze proves to be the most popular.
7. We have a playground area where kids can climb in holes and on top of large balls. They can also run around. We also have an area where kids can move around large logs and build structures similar to nests.
8. Our "Soil Laboratory" where children are invited to simply dig and play in the dirt with loose tools, sifters, etc. and prompted to make up games and get dirty.
9. A pond dipping station where children can dip for aquatic critters and examine them, and a hand pump with moveable water troughs are the water features. A seed play table with loose seeds that can be manipulated on scales and down slides is extremely popular with young children and features loose parts.
10. The children's garden has meandering pathways through beds of a wide variety of plantings, including edible, fragrant, tactile and Hawaiian cultural planting.
11. Sunflower forest - maze of giant sunflower plants towering over the children's head
12. Stumpery - it's a nice sized area with logs for kids to climb and balance on. There are large sized tree cookies for them to walk and jump across. There are also upside down juniper trunks cemented into the ground that children can climb.
13. As a large Historic Site with limited garden space, we have very little programming directed specifically towards children, except for a scavenger hunt and some youth directed signage.
14. Native habitats.
15. Spitting Frogs splash pad with working water pumps

16. It's where some of the portions of popular family exhibits have been pulled together, including a treehouse and g-scale train.
17. Wonder Pond, Adventure Woods
18. Water features are always a draw, but so are enclosed spaces that encourage play with loose parts, and hills and boulders for climbing.
19. Meadow - Large Open Space
20. Children's Garden - Plants to eat and engage senses, work with soil.
21. We have a treehouse and maze made from vines and pond with koi fish.
22. Dig in the dirt small planting area and vegetable garden.
23. The Children's Garden of the Five Senses is currently being developed at the Pittsburgh Botanic Garden and is not yet open.
24. The Great Lakes Garden- mini garden areas with plants that have water names, a reproduction of the Great Lakes geographical region mapped out on the concrete and depicted with connected raised water tables.
25. Sculpture Walk -go on a sculpture walk and find 6 or more sculptures along the pathway surrounded by gardens and native plants.
26. Storytelling Garden- sit at the mini amphitheater stage to watch a puppet show from the hut or observe the wetlands that surrounds it. Also a great garden area to catch a performance by local talented artists or even a story-time.
27. The Wetlands - a vernal pond that has an overlook to observe and a life-size beaver lodge with puppets to interact in.
28. Children of the World Fountain -provides water play and is surrounded by sculptures and a garden.
29. Kid-Sense garden- the five senses depicted in five mini gardens surrounded by and including pathways.
30. The Labyrinth- spiral pattern bricks that begin at the Sculpture Walk pathway and end with a depiction of the four seasons in the center of the circular path.
31. The Butterfly Maze- a living maze of ewes, sand cherries and clematis shaped like a butterfly with areas to explore large sculpture drums, educational/seasonal panels and navigate through to ring the bell.
32. Woodland Boardwalk- take the naturalist challenge with riddles and rhyming plaques along the railings, pass through winding boardwalk pathways to see new sculpture installations, ferns and native woodland and decorative trees/plants that attract pollinators.
33. Log Cabin- discover a Log Cabin made of pine that depicts pioneer life with old-fashioned toys and games.
34. Treehouse Village- explore five bi-level connected tree houses of birds, insects and spiders, make-believe, woodland wildlife, trees and birds.

35. Rock Quarry- find fossils and rock facts embedded in stone buried in the sand, create sand sculptures and look closely at large Michigan rocks surrounded by fossil plants and trees.
36. We have several areas in our childrens' garden: Giants & Minis garden; cove with raised planters and rain barrel with small watering cans; large play structure; playhouse with fairy garden; giant checkers game and our antique dutch carousel.
37. Fairy Ring: A circle of faux mushrooms that shoot out jets of mist when you step between mushrooms to go inside the circle!
38. Bernheim uses the Bernheim Children's Play Garden as a proving ground for outreach efforts that assist other regionally based organizations to understand, design, fund and implement nature based play areas. We additionally offer mini-planning grants to help them get started.
39. The Hands-on-Nature Anarchy Zone. A nature adventure playground with climbing trees, fort-making, mud, plants, and other materials for children to curate their own play experience in nature.
40. HONAZ- Hands On Nature Anarchy Zone
41. Hands-on-Nature Anarchy Zone - a nature based adventure playground. However, the entire Garden includes these features as well, just not as concentrated as in the Anarchy Zone.
42. We have a large pond, called "Blueberry Pond" full of frogs, fish, turtles and other wildlife. A definite main attraction for frog catching. There are blueberry plants around the edges, hence the name. We also have a small dock with a couple lobster traps filled with plastic lobsters that kids love throwing into the pond. As far as built structures, we have a Story Barn filled with themed books, a puppet theater and a table with puzzles and natural items to magnify. We also have a little cottage with a play kitchen that is probably our busiest space, but our tree house is also loved for its rope bridge. The tree house is the structure that most kids remember when they return to our Gardens on a field trip.
43. Space one - "spitting frogs" - splash pad area that incorporates manual hand pumps like on a farm and automatic sensor controlled "spitting" frog water features.
44. Space two - "tumble mounds" - small hills or knolls that were specifically built for kids to roll down. planted in turfgrass.
45. We actually have a couple of "sand boxes" and a "dirt" pile that are very popular. Also the climbing and crawl-through logs are popular.
46. Hands On Nature Anarchy Zone
47. Hands on Nature Anarchy Zone

48. The Hands-on-Nature Anarchy Zone is an adventure playground in Ithaca Children's Garden, founded in partnership with the U.S. Fish and Wildlife Service. This playscape is populated with loose parts including sticks, sheets, ropes, straw, pallets, logs, plants, and tires, and features natural structures including trees, mud pits, and plant-covered berms. A playwork approach encourages adults to step back and places initiative into children's hands, empowering them to lead their own nature-based play.
49. Sandbox, fireman's pump, playhouse.
50. We have a water feature that is the most popular part of the entire garden in the summer months. We also have a playground-like area of the children's garden that incorporates many structures that encourage active play. We also have two edible plant areas that are very popular, especially during the summer months.
51. The Honeycomb. It is a built structure in the style of a bee's honeycomb. Children can climb on it, crawl through it, and jump off it.
52. Our Edible Garden, a place where kids and families can take part in multi-season food gardening activities.
53. Anarchy Zone
54. It is a maze to a tree house with a slide. The bottom of the tree house is surrounded by Weeping Mulberry trees with topiaries in the shapes of monkeys hiding inside. The kids can crawl under the Mulberry trees. We also have an area called the "Wetting Zoo". There are plants in the shapes of animals that the guests can water with water from a rain barrel.
55. It is a large rock with carved channels for water. Water enters by pouring from a giant watering can operated by a manual hand pump (like on a well). Despite our best efforts to keep sand and dirt from an adjoining sandbox and open soil digging bed, one of the favorite things for children to do is pour these into the water feature.
56. The most popular feature is our digging garden; then our rain barrels for watering plants.
57. It is an indoor Children's Garden,scaled to children which is meant to inspire creativity and imaginary play.
58. Our mud pie making area is very popular. Children can use mud to fill a small pie mold and decorate it with leaves, sticks, stones, flowers or any other natural item.
59. Are most popular area for visitors is our pond area and the dance chimes
60. Every Which Way Garden
61. It's not a single space but a series of diverse child-sized, half-built structures made using logs, stumps, branches and/or vines - fort-start, throne-start,

stage-start, stumps-over-the-water (through the junipers), vehicle-start etc. Children use loose parts and their imagination to play them out as they wish.

62. Watering the plants is by far the most popular activity. We have water pumps and plenty of watering cans. We actually had to relocate the watering stations from the inside garden to the outside garden due to flooding from eager waterers. Secondly, the sandbox in both the indoor and outdoor space is very popular!
63. Dirt Bag House
64. The Children's Garden is composed of a multitude of gardens close to each other. It does take up a significant footprint on our facilities.
65. Our children's gardens feature a variety of areas focused on art, vegetable gardening, music, water play, sand play, building blocks, and physical activity. The most favorite features are our tree house (climbing, hiding, crawling, pretend adventure games), two sand play areas with sand toys, two water play areas with toys, an art garden (always in use), and a play house. We also have an extremely popular model garden railroad.
66. Our large watering can feature allows children to operate a pump that sends water out a giant watering can, landing in a rock trough with spouts that can be manipulated. The main focus seems to be sensory exploration with the young ones and science play and team play with the older kids. There are also miniature watering cans hanging nearby and the children will spend hours playing gardener watering the plants around the garden.
67. Our themes change but we've had a Smelly Garden to encourage active engagement...currently we have a Hummingbird Haven.
68. The Discovery Garden, a 4 habitat space that empowers children to engage with nature and teaches children the skills of a scientist. The space is geared to 0-12 year olds and is focused on nature discovery with a strong focus on the plants.
69. The Nature Play Garden (which is part of the Discovery Garden) was completed in the spring of 2012. This space is meant for unstructured play in an outdoor environment. The activity areas of the NPG include a digging pit, jumping logs, maze and teepee/fort building. Children using this space have taken the opportunity to build forts, test their balance, and role play with siblings and friends. Play that ultimately allows children to explore a natural setting, use their imaginations and develop problem-solving skills.
70. Polliwog Bog, it is a small water pool for children to play in during the hot months of the Summer. It is surrounded by plants and trees. Children are encouraged to play with the small gravel in the pool and manipulate it as they want to.

71. Our current most popular feature is our entry water feature or 'splash pad'. This may be attributed to the summer heat. During the fall and winter seasons, children are more likely to play in our 'Cracker Garden'. The Cracker Garden features a miniature furnished playhouse surrounded with colorful annuals that the children can water.
72. I was thinking of our Children's Garden in general and all that it offers. Living in a busy city, city kids don't have many opportunities to interact with nature. So the entire space is magical to them.
73. There are a few popular areas of interest in the garden. All of the locations that have water features are a big draw for children, and we have several. The 'Fog Grotto' which is a circular hedged room that fills up with fog (high pressure emitters) is one. The 'Rainbow Room' which is another circular space that drips down a drizzle of water similar to rain and forms rainbows on a sunny day is another. We also have several bowls that pop up or have a steady stream of water.
74. Two other popular exhibits are our Magnetic Sand bowl which utilizes magnetite to show this property, and our sound chimes which uses pebbles to make melodies in an open space of a larger stone wall (that one is more difficult to explain). All of the tactile elements in the garden, children love.
75. Small 'hiding places' as well as the mazes are loved as well.
76. According to the surveys that we gather as patrons leave, the favorite features include: a wading stream where kids can build dams and play, model train tracks built by Applied Imaginations and our log cabin where children can pretend to be pioneers and 'play house'.
77. We have two water features: 1. Bogs, Frogs and Polliwogs. It is approximately 10' in diameter, with cycling water. We have both koi and tadpoles present. One section is dedicated to regional bog plantings, there are two waterfalls, two deep sections and a shallow 'river-like' section. We use this to discuss the importance of clean water to plants and the environment, we ask and plant to keep bodies out of the water. 2. has seating (polished petrified wood) in a 10' semi-circle, with a draining ground surface. A fountain bubbles over a rock in the center, kids can play in this space.
78. The Spring Giant - a 15' cube head sculpted with a crawfish and fish cheeks. This is the source of our Stream Valley, hence "Spring Giant". A "saliva curtain" drips from the top of his mouth into a reservoir that runs "drools" over his teeth. Children use fabric buckets to catch water and use paintbrushes to paint on our black slate Art Wall. The Giant can be entered from the back where there are stalactites and an oculus that casts a prism on the mosaic tile floor.

79. Our playground has 3 pattys only 1 is currently built. It is called the Wood Lot. It consists of log piles, stump arrangements, branch structures and loose branches.
80. ECO Weave
81. In the Woodlands area of the Gardens multiple children's books are interpreted throughout the space. Learners of all ages have the opportunity to "ride" a wagon and pretend that they are Laura in Little House in the Big Woods, natural materials are available to create fairy houses and gnome homes, and three multi-sized chairs are available to sit in behind our three bears!
82. The Climbing Tree
83. It's a big Western Red Cedar that the children are allowed to climb, in a bit of a clearing. It is checked for weak/broken branches periodically and the ground beneath is kept clear of hazards, but otherwise it's a totally natural element.
84. Urban Discovery Garden for all age groups.
85. Our planting beds are very popular in this program. Kids love digging and looking for critters in the soil. We water our plants, maintain them and watch them grow.
86. We have many gardens and trails on our property. Children and families are welcome in all of them.
87. I think the most popular aspects of our current garden (we are in the process of a redesign) are the free exploration spaces, like a winding path lined with boulders to climb over and around, a maze to run through as well as small enclosed spaces that nurture creative play with props and plants.
88. This garden is called the Play and Grow Garden. It consists of places for children to climb on, a water feature for children to utilize, a tree fort structure for children to build upon, and loose parts/natural materials from our indoor garden for children to manipulate and use for imaginary play. The garden only consists on natural materials and is not built with any plastics. The only time plastics are brought in is during family programming when spray bottles and other activities are available for children.
89. There is a built structure with a bamboo xylophone and balance logs leading up to the structure.
90. The Grunsfeld Children's Growing Garden, which has been open for 3 summers now, has a water pump and children can fill watering cans/spray bottles to water the garden -- very popular. The GCGG also has places for kids to dig in the soil and they love that. We anticipate that the most popular areas of the new Nature Play Garden will be the runnel and the logs and willow tunnel that they can play around.

91. Our Children's Garden utilizes cut bamboo pieces that children use to construct makeshift shelters. Within these enclosed spaces children can engage in imagination.
92. Fireman's Pump, Sand box, Playhouse, Vegetable Garden.
93. We are at the beginning stages of establishing our children's garden.
94. Enchanted Woods is a 3 acre children's garden and is a fully planted naturalistic woodland garden with mature canopy trees, understory trees, shrubs and perennials. The built structures use all natural materials (stone, wood, thatch, branches). I don't believe there is only one favorite space so I have answered this question including several. The Faerie Cottage which is a stone cottage with thatched roof is popular to play in and features child size furniture that can be rearranged. The Bird's Nest is created out of branches and vines, is a large enclosed space that is also elevated. It contains 3 large wooden eggs the children like to sit on and roll. Our Fairy Ring is a circle of wooden mushrooms that mist when children enter the circle. Frog Hollow consists of 2 small ponds with a bridge over top as well as an old feed trough that was turned into a water feature with a handpump. Tulip Tree House is a real section of a tree that had died on the property and was turned into a play structure. It has a thatched roof and little chairs inside.
95. 3 different spaces:Hands-on-Nature Anarchy Zone (adventure playground with loose parts), the Kitchen Garden where children can sniff, pick, and taste, and Gaia, a 62' giant sod turtle sculpture that children can climb on and jump off).
96. Discovery Garden-Education department uses this area to grow plants/vegetables and incorporates these aspects into their programs. The area is also open to the public so they can sample a variety of different plants and ways of gardening.
97. Nature Build, Dirt Dig, Stumpery, and Dino Creek (are the 4 most heavily visited and utilized features in the Family Garden).
98. Creating art from nature.
99. HBG's Children's Garden has eight interactive themed loops within two fenced acres. There are thirteen water features from wading areas to bubbling rocks to misters contained within the beautifully landscaped loops. This garden directly joins our Nature Center and a 9,000 sq. ft open aired butterfly house where we grow 15 species of native butterflies, host plants, nectar plants, accent plants, pond sliders, box turtles, snakes, toads and frogs, all for educational purposes and the aesthetic enjoyment of our guests.
100. Splash Pad (although this changes in the winter)
101. Meadow (large open space)
102. Children's garden contains soil to manipulate and plants to be used.

103. Sensory exploration (touch, smell, taste)
104. This is incorporated throughout the 8-acre garden. There are also many of the other categories that are represented throughout the garden.
105. We have several smaller areas in the Children's Garden for guests to enjoy.
106. WoodPointe is where we small logs,branches and other natural material for guests to create and build.

Appendix 3: Methods for Nature Play at Home

1. We offer an indoor drop-in nature play program
2. Parent Teacher Training at regional early child care centers backed up by credit, training for teachers.
3. Connecting planned activities thematically to nature play at home, offering examples of how they can implement similar activities.
4. Free drop-in programs that model how to do it.
5. Bean Sprouts Family Program we offer on Saturdays from April- Oct. The chance to interact with plants and see what can grow possibly in their own gardens at home.
6. Offer Loose Parts.

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