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Characterizing Healthy Urban Systems: Implications for Urban Environmental Education

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Characterizing Healthy Urban Systems: Implications for Urban Environmental Education

A growing number of environmental educators have become interested in *urban* environmental education practice – in practice that is specifically tailored to the unique needs and characteristics of urban social-ecological systems. A clear conceptualization of the defining characteristics of healthy urban social-ecological systems can make an important contribution to urban environmental education programs. We synthesized urban environmental educators' perspectives about the nature of healthy urban social-ecological systems and assessed the implications of those system characteristics for urban environmental education practice. We identified 14 different characteristics needed for urban environments to be healthy. These characteristics demonstrate that, from the perspective of urban environmental educators, the social components of healthy urban systems are equally important to the biophysical components, and these components have profound effects on each other. Through their practice, urban environmental educators cultivate awareness, appreciation, and willingness to act on behalf of both the social and biophysical components of urban systems.

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INTRODUCTION

Cities are part of most people's experience. It is well known that more than half of the world's population (Brunn et al. 2003) and nearly 80% of the population of the United States (Parlange 1998) live in urban areas. Many who do not live in cities work in or visit them. Cities also have a profound impact on the environment (Secretariat of the Convention on Biological Diversity 2012).

When considering the quality of the environment, urban ecosystems typically have been viewed from a deficit-based perspective with a focus on what is lacking rather than what is valuable (Tidball and Stedman 2013). Urban systems often perpetuate unsustainable notions of human exemptionalism and exceptionalism that reinforce facile dichotomies about "people" being separate from "nature" and create additional alienation of people from their ecological homes in the biosphere (Dunlap 1980; Dunlap and Catton 1994; Vitousek et al. 1997; Williams 2007). But Light (2001) and others have questioned whether urban landscapes must be seen as the "source of all environmental ills." Indeed, many ecologists have come to recognize the pitfalls in trying to understand ecosystems as something separate from people. Rather, the tendency to view ecosystems, including urban ecosystems, as linked social-ecological systems has been increasing (Elmqvist et al. 2004; Alberti 2008; Elmqvist et al. 2013). Seen from this perspective, cities are not places where people live and work with patches of nature mixed in. They are yet another place in which people and the rest of nature are inextricably interwoven, continually influencing each other – sometimes for the worse, but many times for the better.

Because human interaction with ecosystem elements in cities can lead to positive and negative effects, the question of what makes a *healthy* urban social-ecological system – a system in which both people and the rest of nature can thrive – is important. Conservationist Aldo Leopold was one of our most articulate spokesperson's about the need to view the land on which we live as an entity with which we need to strive to maintain a harmonious relationship. He articulated this concept in his statement of the "land ethic" – "A thing is right if it tends to preserve the stability, integrity, and beauty of the biotic community. It is wrong if it tends otherwise" (Leopold 1949).

Leopold's land ethic has had a profound influence on modern environmental thinking (Callicott 1987; Leopold 2004) in which the health of ecosystems is a critical concern. More specifically, Leopold's thinking has influenced the philosophy and practice of environmental education (Pembleton et al. 2006; Reckard and Kobylecky 2006; Stevenson 2007). Many environmental education programs attempt to promote understanding of and appreciation for the natural environment and the myriad of interrelationships that exist within it as a way to promote healthier systems and more harmonious relationships (for a discussion on the implications of Leopold's thinking specifically on environmental education, see Goralnik and Nelson 2011).

But how well does an environmental education practice rooted in an appreciation of biotic communities and ecosystems apply to *urban* social-ecological systems? To systems in which biotic communities have been so heavily altered by people? What are the characteristics that contribute to the health, and resilience, of *urban* systems? Some of these characteristics, species diversity, healthy populations of species, etc., might be very similar to those considered

in discussions of any ecosystems. Others, however, would extend beyond biotic components and relationships to capture some of the characteristics of the social systems with which they interrelate.

A growing number of environmental educators have become interested in *urban* environmental education practice – in practice that is specifically tailored to the unique needs and characteristics of urban social-ecological systems (Howard 1980; Krasny and Tidball 2009; Tidball and Krasny 2010). A clear conceptualization of the defining characteristics of healthy urban social-ecological systems can make an important contribution to urban environmental education programs, and so we wanted to assess how urban environmental educators thought about urban systems. We synthesized urban environmental educators’ perspectives about the nature of healthy urban social-ecological systems and assessed the implications of those system characteristics for urban environmental education practice.

METHODS

We conducted 20 in-depth, semi-structured telephone interviews of urban environmental educators. These educators were drawn from three groups: (1) educators from programs that define themselves as environmental education programs, and which target high school-aged urban youth in New York State; (2) educators from programs targeting high school-aged urban youth in New York State that do not define themselves exclusively as environmental education programs but which consider a focus on the environment an important part of their education programs; and (3) state coordinators from the Leopold Education Project (a conservation and environmental education curriculum based on Aldo Leopold’s work) with at least some interest and experience in urban areas. Fourteen interview respondents were selected from the first two groups; in practice, we found it impossible to clearly distinguish between environmental education programs and programs that do not define themselves as environmental education programs but consider the environment an important part of their programming. Eleven out of these 14 respondents were selected from New York City through a “snowball sampling” process (Seidman 1998), choosing an initial set of respondents based on the recommendations of key informants and then asking each respondent to recommend others. Three educators were selected from other urban areas in New York State so that we could assess whether results held true outside of New York City. Six interview respondents came from the Leopold Education Project; we chose to include these respondents in our sample because of our interest in considering whether and how Leopold’s thinking applied in urban areas.

Interview questions were open-ended and explored respondents’ perceptions of the characteristics of healthy urban communities, including:

- Physical environment (air, water, and land);
- Green space and plants and animals;
- Social characteristics;
- Built environment (parts constructed by people);
- How people relate to green space and plants and animals;
- Characteristics that affect people’s abilities to meet their needs;
- Beauty; and

- Vulnerability to stressors (ecological, physical, economic, and social).

We audiorecorded and transcribed the interviews. The transcripts were coded (Miles and Huberman 1994), broken into meaningful segments (sentences or paragraphs) and assigned to descriptive categories; each category included segments pertaining to a particular characteristic of healthy urban social-ecological systems. We quantified:

- The number of times each characteristic of healthy urban social-ecological systems was mentioned (as an indicator of the perceived importance of each characteristic); and
- The number of times each pair of characteristics were discussed during the same segment of an interview (as an indicator of the perceived strength of the relationship between these characteristics).

Results of this research were presented to a group of 10 urban environmental educators in a 1-day workshop organized by the authors and funded by the Cornell University Agricultural Experiment Station federal formula funds and Smith Lever funds (the same sources which funded the research). This workshop was not conducted as part of any other meeting or conference. Participants in the workshop were individuals who had been interviewed as part of this project and who were particularly interested in the project. Participants reviewed and helped to refine our interpretation of the results and assessed the implications of these results for urban environmental education practice.

RESULTS

Through the interview analysis, we identified 14 different characteristics that educators believed were needed for urban environments to be healthy (Table 1). We grouped these characteristics into 5 basic categories:

- Characteristics of the Environment – features of the biophysical and built environment, such as land, water, air, and buildings.
- Environmental Influences on People – ways that people are affected by their environment.
- People’s Relationship to the Environment – how people understand or interact with their environment.
- Characteristics of People – features of human communities and interactions therein.
- Human Assets – resources or capacities that people have.

These characteristics demonstrate that our respondents thought of both social and biophysical components as contributing to healthy cities. We define each of these categories below using interview excerpts to characterize them.

Table 1. Characteristics of healthy urban social-ecological systems.

Characteristic	Definition	Number of Times Mentioned in Interviews
Characteristics of the Environment		
Green Space	Land that is partly or completely covered with vegetation (USEPA 2013) and species therein.	77
Aesthetics	Characteristics of the social-ecological system that are aesthetically appealing.	18
Environmental Influences on People		
Health and Safety	Conditions within the social and built components of the social-ecological system that promote the health and safety of people.	71
Clean Air and Water	Absence of pollution within the physical components of the social-ecological system	18
People's Relationship to the Environment		
Environmental Activities	Exposure to social-ecological system components or participation in activities involving engagement with those components	68
Community Ownership	A sense of responsibility toward the local social-ecological system and a belief that one has the ability to influence its quality, including advocacy on behalf of the social-ecological system	38
Environmental Awareness	Awareness of and appreciation for the local social-ecological system and recognition of one's connections to it.	35
Environmentally Friendly Lifestyles	Taking actions to protect the social-ecological system by minimizing resource use and waste and relying more on local resources.	12
Planning Process	Efforts to consider how human actions will influence the quality of the environment in advance	9
Characteristics of People		
Social Support	Positive social interactions with other people or fostering the conditions that lead to those interactions	62
Community Organizations	Organizations that improve the quality of the social-ecological system	33
Social Diversity	Engagement of diverse individuals and groups with the social-ecological system	20
Human Assets		
Resources	Economic, human, and other resources available to support desirable activities and processes in the social-ecological system	33
Community Infrastructure	Characteristics of the built environment that support desirable activities and processes in the social-ecological system	33

Characteristics of the Environment

Our interview respondents believed that healthy urban systems depend in part on the biophysical and built environment. This includes the things people normally think about when they think about ecosystems – plants and animals and the land and water on which they depend. It also includes the built environment – the environmental structures created by people. Educators identified two key characteristics of the biophysical and built environment – green space and aesthetics.

Green Space

Green space (land partly or completely covered with vegetation and the species therein) was one of the characteristics of urban systems educators mentioned most frequently as being important.

In my ideal urban community ... a big green space would be in the center of it, and it would be ... surrounded by green space. (UEE-K-3¹)

Natural green spaces with native plants and animals were considered important in cities:

I would like to see urban communities that have urban forests. A lot of trees that are planted and the chance for wildlife to move ... is really important... I don't like to see just a bunch of concrete. If they can find some way to plant more plants – and native plants ... then that encourages a lot of the native wildlife... People get a lot more birds that way and butterflies and things like that. (LEP-2)

Highly managed green spaces, such as parks and community gardens, were considered equally important.

I think an ideal urban community needs to have community gardens. (LEP-2)

Educators frequently mentioned the benefits that green space could provide people:

I think it all comes down to ... green spaces and the benefits of green spaces for the community... I've seen that firsthand. (UEE-K-7)

Green spaces were perceived to provide opportunities for outdoor activities and places for people to gather:

Local parks with different types of activities ... Playgrounds and sports facilities. (UEE-K-5)

Green spaces are places for people to ... gather. (UEE-K-4)

Educators believed that green space was necessary for the physical and mental health of urban residents:

¹ Each interview excerpt is labeled with a code indicating the source interview.

Access to green space is really important in urban areas for mental health. There were some interesting studies I saw at a Chicago project that looked at violence among people in housing projects that could see trees from their window and people that couldn't, and it was drastically different. (UEE-5)

But for green space to provide these benefits, our respondents argued that it had to be accessible:

I guess the perfect community would have plenty of green space and pocket parks within a reasonable walking distance from people's homes. So they don't have to get in the car and drive there. (LEP-3)

It also had to be safe enough for people to feel comfortable using it:

The communities that I've worked with ... it's been most problematic ... when they have not had outdoor spaces that they could feel safe in. That's a problem for the parents... It's a problem for the kids who start getting completely disconnected with the outdoors. (UEE-K-7)

Aesthetics

Although less tangible than green space, some educators also argued that the “beauty” of urban communities was important. One reason they believed that the beauty of urban communities was important is that it encouraged people to spend time outside:

It just makes the area prettier and more inviting to ... be there. (UEE-6)

They believed that beauty was interrelated with the investment of energy residents make in their community:

I was ... walking on my street the other day and I saw that ... somebody was ... either evicted or had to move out really suddenly. And there were all these books that were ... spilling out from their stoop onto the sidewalk... Then I walked by it today and ... it's all cleaned up. And what it made me think was ... I wonder if somebody ... in the community ... enforced that ... knocked on the door and said: “Hey this is looking quite disgraceful... You really need to clean this up.” (UEE-K-4)

Environmental Influences on People

One reason that educators thought that the biophysical and built environment was important was because people are affected by that environment in tangible ways. They frequently mentioned residents' health and safety as a key part of healthy urban systems and mentioned a clean environment as one particular influence on health and safety.

Health and Safety

Having an urban environment in which people could live safe and healthy lives was one of the topics that was discussed most frequently during our interviews. This discussion related to the more general concern that urban residents should be able to meet their basic needs in the cities in which they lived:

What I learned is that other priorities will always come first. And they are home, shelter, food, safety for family and children, education, and employment. (UEE-3)

The parents want a safe environment. A safe place and safe activities and a better future for their kids. (UEE-K-7)

Health and safety were viewed as closely connected with other characteristics of urban areas. As discussed previously, respondents maintained that both physical and mental health benefitted from the presence of green space:

I think there's a study showing that people who are near trees or ... can see trees out of their windows have lower heart rates ... So on the physical level I think that's really important. (UEE-K-3)

Clean Air and Water

The educators we interviewed believed that clean air and water were specific urban influences on health and safety.

Air quality, water quality inside cities is a huge deal... You run into serious issues when you start concentrating people ... You've got some major ecological issues with waste disposal, with keeping everybody supplied with good clean water. And you've got sewer systems... You know [it] has to all go somewhere... Around here ... [it] ends up in the river. (UEE-K-2)

Respondents pointed out that pollution can directly affect human health.

We see big pockets of asthma and other things that are air quality-related. (UEE-5)

They also maintained, however, that the presence of green space can ameliorate pollution and some of its effects on people.

The [high] air pollution areas I think definitely could use more trees ... to help clean some of the air... Using the natural ability of trees to clean some of the air ... will be helpful, especially in the areas with ... high child asthma rates. (UEE-6)

People's Relationship to the Environment

It was not simply how the environment influences people that interview respondents thought was important in cities. Educators discussed the ways that people perceived and related to their environment as essential to healthy urban systems. Five specific characteristics were discussed: environmental activities, community ownership, environmental awareness, environmentally friendly lifestyles, and planning processes.

Environmental Activities

Educators believed that people are actively engaged with their environment in healthy urban systems. People need to get outside, they argued. The necessity of green space to environmental activities is apparent:

Green space is, I think, extremely important... In the Bronx on Pelham Parkway (which is an old divided highway) ... in between the two directions of traffic you have a nice swath of green, which is probably the width of two or three traffic lanes... On a nice summer day everyone is out there using that area, whether they're having picnics, big family gatherings or it's just ... a single person lying in the sun. Or it's a group of kids playing ball or Frisbee. They use those green spaces astonishingly and routinely. (UEE-6)

Gardening is one particular important type of environmental activity that was mentioned:

If everybody had a rooftop garden... it might be a different environment. (UEE-K-3)

But respondents argued that simply engaging with nature is also valuable:

I think that when people are, first of all, able to observe and appreciate and benefit from nature, that their quality of life is simply higher... Just the shade that's provided by large trees or the ... benefit of interacting with a squirrel in your street. (LEP-2)

These ideas connected back to the importance of "health and safety," which we already discussed. Health and safety considerations were described as having a direct effect on environmental activities. People will not use green space unless it is safe:

There have been communities that I've visited where the green spaces aren't used because of danger. And then it doesn't become what it should be. (UEE-K-7)

In other cases, people may use green spaces, but if that space is polluted, it can be unsafe:

It's very polluted and dangerous... You can't swim in the Bronx River. We still do see some people swimming in the Bronx River, and we tell them to stop. We can't always get them to stop, but we try to educate people about the dangers of swimming. It is simply not safe to swim in. (UEE-1)

Community Ownership

Urban residents must not only participate in environmental activities, but interview respondents believed they also should feel a sense of responsibility toward the local environment.

The local community would be really involved in what happens in the community. So the parks, for instance, would really be taken care of by the community. Right now it's taken care of by the Parks Department and that's fine. The Parks Department does a fine job at it, but we come in on a Monday morning after a busy weekend and the park gets trashed. So the community would really take care of the resources that they have here in terms of parks and the river. (UEE-1)

When urban residents feel a sense of responsibility toward their environment, respondents maintained, they are more likely to act on its behalf.

A community ... would value [the environment] and come out to support anything that adds to that and come out and oppose anything that takes away from that... We had an attempt to have some kind of coal-fired energy plant west of town, and our community came out two years ago and stopped it. That was considered a success... A community that is proactive for all those things... clean water, clean air. (LEP-1)
If you respect [nature] and understand it, you want to take care of it. (UEE-K-5)

Environmental Awareness

The educators we interviewed argued that residents' awareness and appreciation of their environment provides a foundation for a healthy relationship to it and advocacy on its behalf. A lack of awareness, therefore, is a problem:

Many community members who come here don't know about the Bronx River at all. They've never thought about it. They may have lived in the Bronx their whole life but never once thought about the river. Maybe they know it's there but their ideas about it are very negative. (UEE-1)

One aspect of environmental awareness mentioned during interviews is an understanding of how one is connected to the environment:

Where does my food come from?...Where do my kids go?...How does that energy get into my house and how is it generated?...Those are equally important, ultimately, for someone living in a randomly chosen spot in New York State, whether it be urban or rural... That idea of the importance of sense of place and community and ... ecological literacy. (UEE-4)

One reason green spaces were considered so important in urban areas by our interview respondents is that they provide the opportunity for residents to develop this awareness and appreciation:

I think those have an immense value to the mindset of the community... their ties to the land, their respect for the land, their conservation ethics... Because they have those places that they can see and feel and touch and in so doing they develop that respect for it. (UEE-K-2)

Environmentally Friendly Lifestyles

The concentration of people in cities was argued to have an enormous impact on the environment.

We are just creating such waste... Our whole environment is just completely altered by our use of energy and everything else. (UEE-K-3)

For that reason, residents' lifestyle choices were considered particularly important in healthy urban systems. People's individual decisions, respondents pointed out, can reduce negative environmental effects.

An ability to get everywhere on foot or on a bike or with mass transit to me would be ideal ... less driving. (LEP-3)

I would say as much ... green technology as possible... [It has] huge impacts on urban communities. If more homes had ... solar panels on the rooftops ... they're not as dependent on a grid. (UEE-K-2)

In fact, some respondents believed that urban communities have some advantages when it comes to individuals minimizing their impacts on the environment.

Our kids tend to have much lower carbon footprints, for example, than kids in suburban areas. Most of them don't even have cars. When we're talking about climate change and energy, we ... talk to them about the benefits of living in urban areas. Urban areas aren't new. The Roman Empire had cities. There are benefits of living in dense populations ... such as the fact that kids who live in a lot of the high rises ... when you look at the heating ... there are smaller abodes than some of the suburban things. (UEE-5)

Planning Process

A few educators noted the importance of proactive community thinking about the environment – or environmental planning – to healthy urban communities. These individuals argued that planning was necessary to prevent human activities from damaging the environment:

I think every community needs to be thinking about what's our community going to look like in 100 years... The ideal community [has] sustainability on the mind when they ... do their planning. They're not just looking to add another subdivision... It goes back to ... sustainability. (UEE-K-1)

My ideal urban area would be one that is utilizing the land wisely ... doing what we call conservation-based planning ... where instead of taking a whole farm and putting 100 units, taking a farm and putting 10 units on it and keeping some as a nature preserve. (LEP-4)

Characteristics of People

Environmental educators with whom we spoke argued that other characteristics of people are important to healthy urban systems, too – even those characteristics without a direct connection to the natural environment.

Social Support

Many educators argued that social support was important in cities – people supporting each other.

When I think of a healthy community I think about neighbors knowing each other and supporting each other and bartering things and doing things for each other ... so having a strong network of people and relationships. (UEE-8)

These positive interactions were seen as providing a variety of benefits. They directly contributed to urban residents' health and safety:

Having your neighbors watching your house when you're gone or ... when ... something's amiss... If something happens ... or somebody gets sick or injured or there's an accident ... somebody's there to step up and address the situation. And there's huge benefits there as far as safety, and I think that helps play into people's psychological health, knowing that they're safe, that there are people watching out for them. (UEE-K-2)

But social support was viewed as interconnected with environmental activities, too. Environmental activities can build connections between people. And connections between people can create opportunities for environmental activities.

There are communities that come together and create art and create green spaces where they feel happy and together and can farm or ... create beautiful gardens based on both food and beauty. Where they're coming together to teach each other about gardening, about birds, about the environment. To teach each other about their expertise. To teach each other about art and come together for events where there's food and fun and a lot of support. (UEE-K-7)

Community Organizations

Closely connected to social support is the idea that healthy urban systems need strong community organizations. A number respondents maintained that strong community organizations were important.

I think that having strong community-based institutions like social institutions, churches and [the] business community are really important. (UEE-5)

These organizations were seen as providing a variety of concrete benefits for urban residents, which can do much to strengthen their communities. These benefits were argued to be closely linked to the health and safety of urban residents.

Many of the communities ... were fighting against crime, against street gangs, and losing their kids to street gangs. They were fighting ... against poverty. The majority of the households ... were [earning] \$5,000 or less a year... [with] undocumented parents and the fear of being deported. And fear of police sometimes, fear of safety for their children, etc... and also illiteracy... [A difficulty for these families] was navigating the system. Really feeling at a complete loss in terms of how to get the kids to school, how to send them to college – how do you know if that was even a possibility? How to navigate the legal system, how to navigate the social service system. And when they had an advocacy organization that they could completely trust and work with, an advocacy organization that was helping them as individuals, as parents, but also helping their children and keeping them safe and organizing them in activities, where they felt that their kids were really receiving a great education or at least learning. Parents felt very, very comforted by this. (UEE-K-7)

Social Diversity

In addition to being characterized by strong relationships and organizations, healthy communities were perceived as needing a diversity of people.

Diversity ... an ecosystem is only successful if there's lots of different types of organisms on all different types of levels. And that's the same for an urban community, and the more diverse it is the richer it is. (UEE-K-5)

Diversity in communities was argued to strengthen communities by enriching ideas under discussion:

What would strengthen community [is] an intergenerational appreciation of work... Little people are important... Really old people are important. Everybody's got ideas. (UEE-4)

Human Assets

The ability of people to support each other and the environment in urban communities depends in part on the assets they have at their disposal. Two types of assets were noted by the educators we interviewed – resources and community infrastructure.

Resources

Some of the key resources in urban systems mentioned by respondents were economic.

I guess I would say a healthy urban environment shouldn't have pockets of extreme poverty in the best of all possible worlds. I know that's a hard one. I think that as much as possible ... eliminating intense large pockets of extreme poverty make for a healthier urban environment. (UEE-5)

Economics is a huge part of it. I would say the driving force is economics. (UEE-2)

The availability of resources was mentioned as having a direct bearing on people's abilities to meet their basic needs. Communities with limited resources are much less likely to be able to promote the health and safety of their residents:

For some of our disenfranchised urban poor neighborhoods, it's very hard to say that your needs regarding health are being met when you have disproportionately placed waste facilities nearby. When you have higher numbers of fast food chains near you, how do you eat healthy?... When you have a park that's within walking distance of you, or when you get air that's filtered through the trees ... you're going to have a much better chance of saying, "My needs are being met" than in some of our poorer neighborhoods where you ... disproportionately find higher levels of obesity ... but much less access to healthy foods ... and higher rates of asthma because the pollution rates are so much higher ... and because there are fewer trees and parks. I think a lot of it comes down to access and economics. (UEE-2)

Resources also influence how much attention can be devoted to protecting the environment:

Without [basic needs met] ... you can't talk about ... the environment. I've got to get from here to the subway. I've got to drop my kid off at school first. I need to somehow get home and make dinner... It's things like that that help me understand that we can't pretend to think that this is important for families and individuals having limited resources and living in very challenging homes and neighborhoods. (UEE-3)

Community Infrastructure

A specific type of resource is the infrastructure, or built environment, of urban communities. Educators frequently discussed the importance of transportation systems and recreational facilities to urban communities:

I think having a good infrastructure like we talked about ... having your community laid out so things are accessible, so traffic isn't a nightmare. (UEE-K-1)

We also have some indoor facilities that other smaller towns might not. We have wonderful soccer facilities. And when you build those fields you also build buildings to have meetings in and you build picnic shelters with bathrooms. (LEP-3)

Healthy Urban Environments

The complete set of characteristics of healthy urban social-ecological systems that interview respondents identified is provided in Table 1. One measure of the perceived importance of these characteristics to healthy urban environments is how frequently they were mentioned during the interviews. Four characteristics were mentioned particularly frequently – green space, health and safety, environmental activities, and social support.

Our research indicates that from the perspective of urban environmental educators, the social components are equally as important as the biophysical components. Social characteristics were mentioned as frequently as biophysical characteristics. In fact, although biotic components of urban systems were discussed as part of green space, they were discussed in much less detail than they would have been in evaluations of the health of other types of systems, such as forest or lake ecosystems. Rather, the respondents tended to speak in more general terms about the value of having plants and wildlife as part of green space.

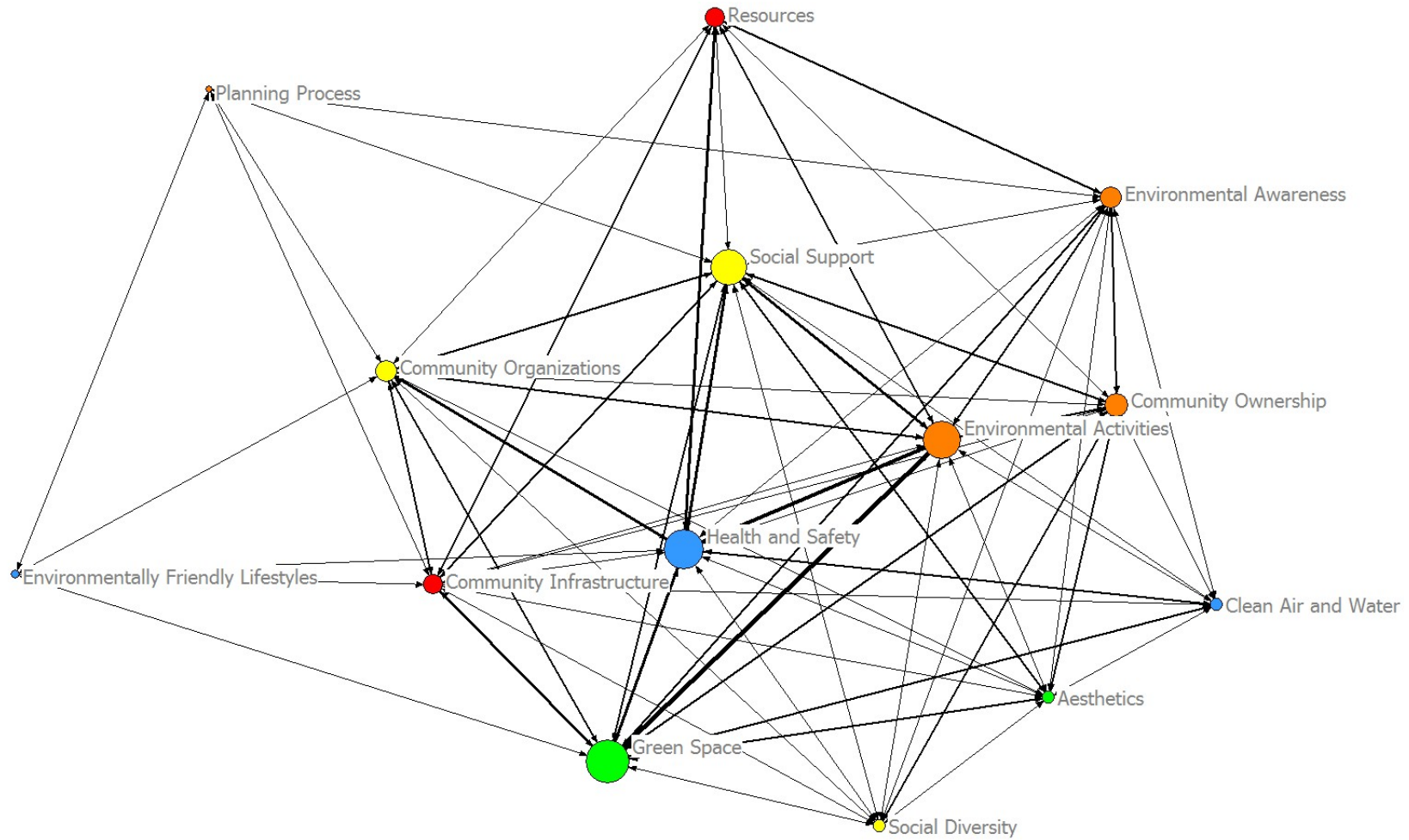
Conversely, the educators spoke in great detail about people. Characteristics of systems like social support and health and safety are not discussed very frequently when talking about ecosystems, but they are important in urban social-ecological systems. The educators we interviewed believed that people should be able to meet their needs in urban environments – needs for shelter, food, safety, education, and employment. They recognized that eliminating extreme poverty was essential for healthy urban environments. Again, this type of discussion would not be typical for many non-urban ecosystems.

The social and the biophysical components of urban social-ecological systems were seen as interrelated. As the interview excerpts attest, the social and the biophysical can have profound effects on each other. Figure 1 provides a visual synthesis of the relationship between components. Each component is depicted in the figure. The size of the symbol indicates the perceived relative importance of the component (as indicated by the number of times it was mentioned during the interviews), and the color of the symbol corresponds to our categorization of the components. The thickness of the lines between components indicates the perceived strength of relationship between the components (as indicated by the number of times those components were discussed in the same segment of an interview).

The strongest relationships depicted are between green space and environmental activities and between health and safety and environmental activities and community organizations. These relationships correspond to many themes discussed during the interviews. For example, the presence of green space makes it more possible for people to engage in activities outdoors.

These outdoor activities can improve urban residents' health. Urban residents are more likely to use green spaces for outdoor activities if they perceive these areas as safe. Community organizations contribute to the safety of these areas and contribute to residents' health and safety in other ways, too. Other examples of such interrelationships in urban systems abound. The figure depicts the degree to which social and biophysical components of healthy urban systems are interwoven. Consequently, managing for healthy urban environments simply cannot be done

Figure 1. Relationships between characteristics of healthy urban social-ecological systems with size of symbols representing relative importance and thickness of lines indicating strength of relationship between characteristics.



by focusing on one component to the exclusion of others; all components and their interrelationships must be considered.

Implications for Urban Environmental Education Practice

Our results identify characteristics that educators thought that healthy urban systems should have. Ultimately, urban environmental education programs work to improve these characteristics of cities, but they tend to focus on some more than others. Following a discussion of these findings at our practitioner workshop, participants identified a series of outcomes they believed it was important to try to achieve in urban environmental education programs. These outcomes were consistent with their thinking about the characteristics of healthy urban systems and placed an emphasis on understanding and improving the social components of cities as well as the biophysical components.

The shortest-term outcomes were generally those that environmental education programs try to achieve with program participants during the period in which they are involved in the program. These outcomes focused primarily on three areas:

- Instilling in urban residents an understanding that their environment has both biophysical and social components and recognition and appreciation of their connections to that environment.
- Cultivating a sense of responsibility toward and a willingness to act to improve both the biophysical and social components of the environment.
- Building the capacity of urban youth by improving their social and communication skills, helping them to build relationships, and contributing to their academic and professional development.

Urban environmental education programs also hope to achieve outcomes that may not become apparent until after participants' involvement with their program ends. These outcomes were generally concerned with five areas:

- Providing a foundation for continued outdoor and nature-focused recreation and experiences (e.g., birding or vacationing in natural areas).
- Decreasing environmentally destructive behaviors (littering, excessive use of cars, etc.) and increasing environmentally friendly behaviors (biking, earth-friendly consumerism, etc.).
- Cultivating the beauty of both the natural and build components of urban systems.
- Improving human health and well-being by encouraging healthy environmental activities.
- Increasing the safety of communities by encouraging people to invest in and take care of their environment.

Through their programs, educators also hope to contribute to long-term outcomes that may not be apparent for years. These outcomes were generally concerned with the decisions communities make about how to invest their resources and the consequences of those decisions. Educators hope that their work will result in policies by government agencies and nongovernmental organizations that lead to such outcomes as:

- The creation, restoration, stewardship, and use of healthy green spaces offering a variety of ecosystem services.
- An urban infrastructure that is designed to lessen the impact of people on the environment and enhance human health.

CONCLUSIONS

We synthesized urban environmental educators' perspectives on the characteristics of healthy urban social-ecological systems and evaluated the implications of their thinking for environmental education programming in urban areas. While these educators recognized the importance of biotic communities, they did not elaborate on particular desirable characteristics of biotic communities in great detail, as they might have done in describing non-urban ecosystems; rather, they emphasized a much wider array of components of healthy systems, including the social as well as the biophysical. They argued that healthy urban systems had to be good places for people to live – places in which their basic needs could be met. They recognized and articulated how the social and biophysical components of ecosystems were intertwined. If people's needs are met, they will be able to contribute to healthier urban environments. If urban environments have ample green space, it will improve the quality of life of urban residents.

Indeed, there is a large body of literature on how green space and nature-based recreation can improve people's lives. Among the outcomes that have been attributed to green space are improvements in mood (Hull and Michael 1995), attentional functioning (Wells 2000; Kuo 2001; Taylor et al. 2001; Cimprich and Ronis 2003; Hartig et al. 2003; Berman et al. 2008), coping abilities (Otto and Grahn 2008), disaster resilience (Tidball and Krasny 2013), and overall well-being (Kaplan 2001).

Although this work was focused on urban social-ecological systems, it can help to expand thinking about healthy social-ecological systems in general. All social-ecological systems include and are influenced by humans to some degree; because the impacts of humans on *urban* social-ecological systems are so profound, however, the roles that humans play in these systems is easier to detect. However, we caution against overgeneralizing from these findings at this point. The conclusions we reached about healthy urban social-ecological systems and the desired outcomes of urban environmental education programs were based on the perspectives of a group of people with one type of expertise: environmental educators with interest and experience in urban areas. Perspectives about healthy urban systems could usefully be expanded by incorporating the insights of others: ecologists, sociologists, city planners, students enrolled in urban environmental education programs, and more. Future work could explore how a model of social-ecological systems such as ours would need to be expanded to incorporate the insights of others. Similarities between such models could help to confirm our understanding of the critical components and linkages in healthy systems. Differences could point to areas in which such models could be refined and expanded.

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