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CIVIC NATURE VALUATION: ASSESSMENTS OF HUMAN FUNCTIONING AND WELL-BEING IN CITIES

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Abstract: Civic nature is the collective “constructed nature” of cities, and can include, parks, open spaces and urban forests, on public or private lands. The existence and quality of civic nature is dependent on comprehensive planning and management. Civic nature advocates are called upon to justify the public costs of amenities that are often perceived as having only aesthetic value. Urban nature provides multiple valuable services, and economic valuation of such services has been initiated. Valuation of the human services provided by urban trees and open space – physical health, mental health and functioning, community health and safety - is another opportunity for research and dialog about nature-based public goods.

Keywords: urban greening, urban planning, human services, amenity valuation, health

Many people enjoy the amenities that urban parks and open space provide. In addition, the urban forest includes the trees that grace public and quasi-public properties such as schools, commercial centers and streets. Some people consciously appreciate these urban nature amenities; others may fail to realize how “civic nature” contributes to the livability and quality of life of their community.

Civic nature differs from wild nature in the degree of intensity of management needs. Due to the human populations density and the challenging growing conditions of built environments, high quality urban nature systems require ongoing attention. Creating the parks and outdoor environments that provide positive human experiences requires planning, design, and management, and these activities incur costs. Budgets of agencies and organizations are limited, and must address many public needs. Often, local governmental environmental

expenditures are earmarked to respond to federal or state regulations regarding clean air and water, endangered species habitat, or wetlands conservation. Agencies, organizations and NGOs are often called upon to provide a full accounting of urban ecosystem benefits and costs to justify “non-essential” public investments in urban green spaces.

While costs can usually be directly tallied, the calculation of benefits returned is far less straightforward. Ecological economics can offer insights as to how to more effectively value civic nature. While nature in cities does provide ecosystem services, perhaps more significant contributions are the human services that are associated with the human experience of nature.

This paper introduces research that has been conducted by environmental psychologists, urban planners, urban foresters, geographers and others that verifies urban nature benefits. The task that remains is to ascertain the economic value of psychosocial and human services

associated with civic nature. The intent of this paper is to initiate new ideas and collaborations on economic valuation of the human dimensions of urban nature and ecosystems.

VALUATION-A STARTING POINT

The “natural resources” of urban parks, forests and open space systems rarely generate marketable goods. Most “products” of urban forests are public goods. Multiple public and private “owners” invest in a city’s natural capital, generating intangible functions and benefits that are non-rival and non-exclusive (Daly and Farley 2004). Resource economists have developed theory and methods for capturing public goods values; approaches were first developed to assess the economic value of wildland settings and recreation. More recently, ecological economists have proposed ways to measure the environmental services that are provided by the world’s forests, wetlands, oceans and other natural areas (Daily 1997). There is growing interest in applying such economic valuation approaches to urban nature systems. Urban nature is intertwined with human systems, and human response and behavior can be important components of valuation equations.

Direct Use Values

The first, and most obvious, way to measure economic value is to tally expenses and spending that parks system visitors and users incur during their visits to sites. Travel cost method was first used to assess values associated with visits to wildland parks and open spaces, but can be applied to urban settings. While neighborhood users who enter a site for a leisurely walk probably spend little, others visitors may travel some distance, and their spending on meals, fuel, accommodations and such can be prorated depending on the importance of their park visit and the amount of time dedicated to the visit as part of a total trip.

Some users also make local purchases, perhaps going beyond purchases in a gift shop to include equipment bought to participate in workshops, classes or programmed activities. This may also include plant and landscape equipment purchases made as a result of

learning about trees, wildlife or horticulture while at a park.

Such values can only be calculated if detailed information is available about the characteristics of users and how their visit to a single park or an entire park system fits into their trip or lifestyle. User surveys at national parks and state recreation areas have been used to collate such data for economic calculations.

Hedonic Pricing

A public good can also have an economic ripple effect on nearby properties and commerce. The concept of hedonic or amenity pricing acknowledges that both property values and people’s spending behaviors can be affected by the presence of parks, open spaces and other natural amenities.

Measurement of the effect of parks and open space on adjacent property values has become an accepted value measurement. Numerous studies have shown that appraised property values of homes that are adjacent to naturalistic parks and open spaces are typically about 8% to 20% more than comparable properties elsewhere (Crompton 2001). These values are capitalized when property taxes are assessed or when taxes are paid on a property sale.

Another hedonic valuation approach is to determine how consumers behave in comparable situations when trees are, and are not, present. A series of studies at the University of Washington has investigated the role of trees on shoppers’ behavior in retail business districts, finding that people claim they are willing-to-pay about 10% more for products in a shopping area with trees (Wolf 2003). Another study found that rental rates of commercial office properties were about 7% higher on sites having a quality landscape, including trees (Laverne & Winson-Geideman 2003). While nearby parks were not factored into the consumer response studies, it is possible that the observed ripple effect on residential properties may also apply to retail and commercial sites.

Infrastructure Functions

Perhaps more substantial economic contributions, though less obvious, are the infrastructure functions that urban nature provides. American Forests has conducted twenty-seven Urban Ecosystem Analyses for metropolitan areas throughout the United States, attempting to capture the value of services that trees provide in cities. Using digital satellite imagery and aerial photographs, the degree of historic and current levels of urban forest canopy cover are calculated. Using summary mathematical models of air and water quality as well as energy use, annual values of urban forest services are estimated. For example, the Puget Sound basin study (American Forests 1998) claimed that tree cover in the King County urban growth boundary area had reduced stormwater storage costs by \$910 million, and generated annual air quality savings of \$19.5 million. More fine-grained analyses can be done at the neighborhood level using the GIS software CityGreen, providing additional estimations of services provided by trees.

A research team at the Center for Urban Forest Research has also conducted micro-scale studies, focusing on street tree costs and benefits. Costs include tree planting, irrigation, pruning and other maintenance. Calculated benefits include energy savings, reduced atmospheric carbon dioxide, improved air quality, and reduced stormwater runoff. This economic data is used to generate a per tree net benefits figure. A 2002 analysis (McPherson et al.), specifically using input data from Western Washington cities, suggests that per tree average annual net benefits are \$1 to \$8 for a small tree, \$19 to \$25 for a medium tree, and \$48 to \$53 for a large tree. The range of value reflects whether trees are on public or private property and their placement with respect to building heating and cooling devices.

These urban economics models are based on the principle of deferred costs, that is, if urban nature systems were not present homeowners or municipal government would have to invest in additional engineered infrastructure or equipment to remedy environmental concerns. For instance, tree canopies intercept rainwater, thereby reducing

the amount of water falling to the ground and running off into stormwater collection systems and potentially saving a community the materials and construction costs of a stormwater system built for greater runoff capacity.

HUMAN SERVICES OF NATURE

Research of the past several decades has empirically confirmed social and psychological benefits to people, generated by nature experiences, which have been claimed for centuries. Additional economic analysis of the benefits measure would more effectively place this knowledge in governmental decision-making situations.

Human Health

There has been a dramatic rise in recent years in the percentage of people who are overweight or obese, and these conditions contribute (over the life of the average person) to increases in chronic disease, such as diabetes, and traumatic diseases, such as cancer and heart disease.

The positive economic consequences of routine, mild exercise are enormous, when aggregated across entire cities or the nation. Deferred costs are possible, as medical expenses are lower for people who do routine physical activities and exercise. For instance, a 2002 CDC study estimates that obesity-associated annual hospital costs for youths aged 6 to 17 were about \$35 million between 1979 and 1981, and nearly tripled to \$127 million during 1997-1999 (Wang & Dietz 2002).

Weight related medical expense trends for adults are equally alarming. Studies suggest that when inactive adults increase their participation in regular moderate physical activity, annual mean medical costs are reduced by \$865 per person (in 2000 dollars) (Pratt et al. 2000). The implications of rising obesity rates have been recently calculated in relationship to the work place. For instance, over the last decade the state of California has experienced one of the fastest rates of increase in adult obesity in the U.S. The combined cost of physical inactivity, obesity and overweight was estimated to total \$21.7 billion in 2000 (CDHS 2005). This health trend impacts the business sector, as costs include

direct and indirect medical care (\$10.2 billion), workers' compensation (\$338 million) and lost productivity (\$11.2 billion).

The Centers for Disease Control and various federal resources agencies are collaborating to investigate how urban form (such as street layout and the presence of sidewalks) can encourage walking and biking. The CDC is also considering how community volunteerism and outdoor programs can boost activity levels. Having nearby trees and parks may help urban-dwellers make the right choices concerning routine activity, such as walking to work or school.

Physical comfort contributes to such decisions. Urban heat islands occur where impervious surfaces dominate, resulting in ambient temperatures that are 1 to 6°C greater than surrounding landscapes (EPA 2004). Elevated temperatures contribute to heat related health problems like dehydration. Ground level heat also increases air pollution levels, causing more people to suffer from respiratory ailments. Tree planting is one of the most cost-effective means of mitigating urban heat islands. (Akbari et al. 1992). Paving under trees can be up to 19°C cooler in arid climates, and every 10 percent increase in overall urban tree canopy generates approximately 1°C reduction in ambient heat.

Mental Health and Functioning

Recent studies in the field of environmental psychology have established that the presence of trees and "nearby nature" in human communities creates numerous and powerful psychological and cognitive benefits. A series of studies conducted at the Human-Environment Research Laboratory (Kuo 2003) have determined that having trees in public housing neighborhoods lowers levels of fear, contributes to less violent and aggressive behavior, encourages better neighbor relationships and better coping skills. School-related studies show that children with ADHD show fewer symptoms (Taylor et al. 2001), and girls show more self-discipline in academics if they have access to natural settings.

Other studies confirm that hospital patients recover more quickly and require fewer pain-killing medications when having a view of nature (Ulrich 1984). Finally, studies suggest

that office workers with a view of nature are more productive, report fewer illnesses, and have higher job satisfaction (Kaplan 1993).

Underlying many of these positive responses is the theory of restorative experiences (Kaplan and Kaplan 1989). Modern work and learning demand extended periods of directed focus and attention. Such activity, particularly if sustained for long periods of time, can induce directed attention fatigue. Cognitive fatigue can bring on irritability, inability to function effectively, and physical symptoms. Nature can provide restorative experiences, particularly if the setting contains these elements: being away, fascination, extent and compatibility. It is worth noting that such conditions can be found in small parcels of well-designed urban nature, as well as the wildland areas that are typically envisioned when we plan to "get away from it all."

Investigators of urban nature benefits are now considering the issue of "dosage." What are the nature elements, and exposure times that most effectively affect psychosocial improvement? Additional knowledge about this question will have extended economic consequences, for it is possible that nature experience doses may alleviate or reduce pharmaceutical treatments.

Community Health and Safety

Healthy, livable communities provide a context that enables greater health and functioning of organizations, as well as the individuals who live in a place. There are several dimensions of how civic nature contributes to community health. Views of green space from homes are linked to greater perceptions of well-being and neighborhood satisfaction (Kaplan 2001, Kuo 2003). Active involvement in community greening and nature restoration projects can produce a range of social benefits from healthy food production to strengthening intergenerational ties, and organizational empowerment (Westphal 2003).

The presence of nature can increase perceptions of personal safety, and is associated with crime reduction. Public housing residents have reported that they would feel a greater sense of safety in their development if it had well-maintained landscaping including trees and

grass (Kuo et al. 1998). A follow-up study found that greener public housing neighborhoods tend to be safer, with fewer incivilities and reported crimes (Kuo and Sullivan 2001).

Crime Prevention Through Environmental Design (CPTED) was launched in the 1970s as an indirect way to deter crime as compared to law enforcement. In early iterations of CPTED physical conditions of public spaces were altered to deter or inhibit activities that would facilitate crime. For instance, tall dense vegetation that is located adjacent to walkways used at night could be thinned or replaced with low growing plants. The second generation of CPTED, or Situational CPTED (Saville 1998), promotes a holistic approach to community dynamics and the conditions that foster crime. Research to date suggests that urban greening programs are one way to promote community organization and the formation of social capital, important conditions for discouraging criminal activity (Saegert and Winkel 2004).

Human services consequences have been documented for urban people who have opportunities for active and passive experiences of nature in the course of their normal, everyday lives. Systematic approaches for economic valuation of such benefits present an opportunity to expand the dialog about the importance of civic nature planning and management.

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CONCLUSIONS

The economic science of city forest and park valuation is in its infancy. Compared to valuations of wildland or rural nature, city settings are much more complex, making it more difficult—but not impossible—to isolate the specific effects of nature. Some valuation approaches focus on the accrued benefits at the street or neighborhood level; then results are aggregated across an entire city or region. Others construct or access a city, state or national database, then extrapolate economic returns. With continued study, such approaches will be refined to provide greater precision in estimating the value of urban landscapes.

In the meantime, a variety of studies, conducted by multiple research units and scientists, have revealed the subtle, yet important, contributions of civic nature to local and regional human populations. These benefits, as well as the ecosystem services that are at the root of economic calculations, are important to the quality of life and human ecology of any city. Quality in landscape character and management is strongly associated with each of the benefits described here. Ongoing and strategic public investment is needed to create and sustain the functions and benefits of urban nature.

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