Urban Forestry/Urban Greening Research

Green Cities: Good Health

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Crime & Public Safety

By: Kathleen L. Wolf, Ph.D.
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There are two conflicting outlooks towards city trees and vegetation. On one hand, a natural landscape is believed to promote healing and renewal. On the other hand, the presence of vegetation is implicated as a screen for criminal activity. This article addresses the second perspective and summarizes the research findings on the relationship between urban vegetation and crimes, aggressive behavior, and safety. The science findings are not conclusive and even may appear inconsistent or conflicting, yet certain patterns and relationships appear across many studies.

Fast Facts

- There are on average about 3,800 crime victims per 100,000 population in the U.S. each year.[1]

- Among minor crimes, there is less graffiti, vandalism, and littering in outdoor spaces with natural landscapes than in comparable plant-less spaces.[4]

- Public housing residents with nearby trees and natural landscapes reported 25% fewer acts of domestic aggression and violence.[5]

- Public housing buildings with greater amounts of vegetation had 52% fewer total crimes, 48% fewer property crimes, and 56% fewer violent crimes than buildings with low amounts of vegetation.[2]

- Studies of residential neighborhoods found that property crimes were less frequent when there were trees in the right-of-way, and more abundant vegetation around a house.[6,7]

- In a study of community policing innovations, there was a 20% overall decrease in calls to police from the parts of town that received location-specific treatments. Cleaning up vacant lots was one of the most effective treatment strategies.[12]

- Vegetation can be managed to create a reassuring environment, reduce fear, and increase citizen surveillance and defensible space. Principles of Crime Prevention Through Environmental Design (CPTED) suggest how to achieve safer places.

City Green & Crime

The first section of this summary reports studies that tested the relationships of vegetation and crime in built environments. Crime behaviors can be influenced by social situations; the latter sections describe how nature affects the psychology of crime.

Just the Facts, Please . . . .

Crime is typically reported as both a quantity and the relative frequency of incidents. For example, law enforcement agencies reported 11.25 million crimes across the U.S. in 2007, of which 12.5% were violent crimes, and 87% were property crimes.[1] The number of crime victims averaged 3,730 for every 100,000 inhabitants. Nationally, crime rates have dropped since 1990, but the number of crimes remains high, and rates vary widely across states and cities.

Careful record keeping helps us to understand the relative public safety of areas by location and across time. But such reports do not address the causes and influences behind crime and violence. Law enforcement officials often have strong impressions on the negative influences of urban vegetation, seen to suppport criminal activity. Recent research has tested such claims more carefully. Below are examples.

Minor Crimes

Pilot studies have suggested a relationship between lack of vegetation and rates of "incivilities" or minor crimes.[2] A survey of 31 urban sites in a California community found that 90% of the incidents of vandalism or graffiti occurred in areas without plantings compared to 10% in landscaped areas.[3] Within Chicago public housing units during a reporting period, 90 residents reported less graffiti, vandalism, and littering in outdoor spaces containing trees and grass than in comparable, more barren spaces. Rates of social disruption and incivilities, such as the presence of noisy individuals, loitering strangers, and illegal activity, were also lower in planted areas.[4]

Aggression and Violence

The presence of nearby nature may positively influence social interactions and lessen aggressive and violent behavior. Comparing similar buildings (within Chicago public housing), 145 women were asked to recall aggressive and violent behaviors within their household.[5] Those who had trees and grass cover outside their apartments reported significantly less aggression against their partners than did those living in unlandscaped areas. Does this effect extend to acts of violence? The team found that rates of reported violence (mild and severe, during the year and across a lifetime) were significantly lower in the green areas than in the barren ones. Reductions in aggression and violence were 25% or more (Table 1). The scientists in this study noted that future research should examine the effects of natural settings on aggression by men and specific acts of violence (e.g., road rage and gang violence).

Table 1: Aggression behaviors and nearby nature, green setting vs. barren setting

Reporting Period	Behavior	
	Overall Aggression	Violence
During the past year	27% less (.76/1.04)*	33% less (.49/.73)*
Over the lifetime	28% (.32/.44)	25% less (.24/.32)

* statistically significant

Serious Crimes

What about more serious crimes? Not relying on resident surveys, a science team collected two years of police data on property and violent crimes within public housing communities of inner-city Chicago.[2] Residential buildings were architecturally similar, but the greener a building's surroundings, the fewer total crimes occurred. Comparing buildings with different levels of vegetation, those with high levels of vegetation recorded 52% fewer total crimes, 48% fewer property crimes, and 56% fewer violent crimes than buildings with low levels of vegetation (see Figure 1). Even modest amounts of greenery were associated with lower crime rates. Other crime predictors were tested (such as building height and vacancy rates), and amount of vegetation was one of the two predictors in the most accurate model of crime prediction (the other being the number of units in a building).
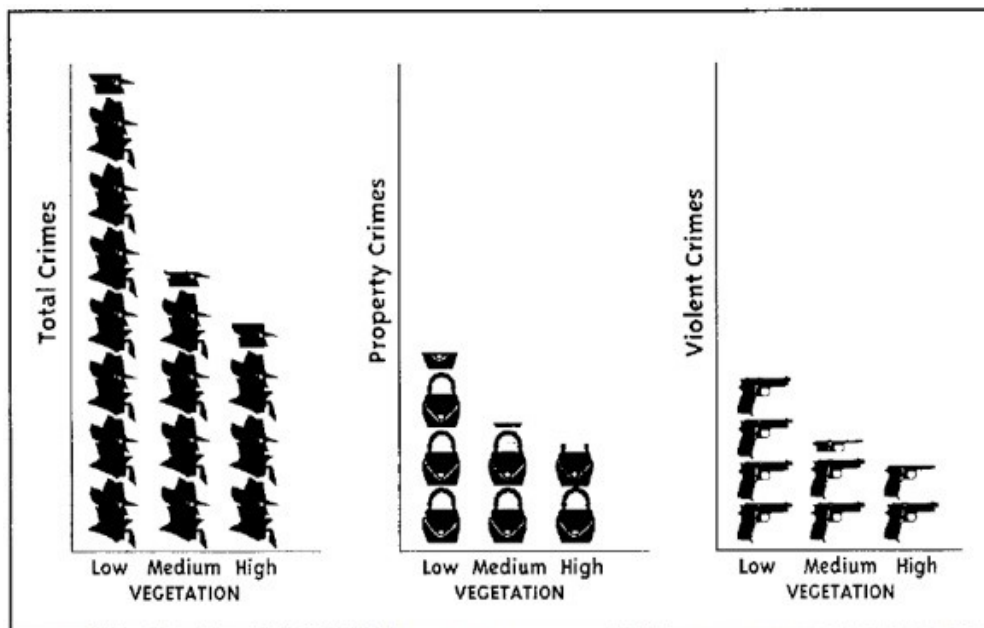

Figure 1: Mean number of crimes reported per building with different amounts of vegetation (each icon is one reported crime).

The relationship between the amount of vegetation and the level of property crime was also evaluated in Tallahassee, Florida.[6] The amount of vegetation was measured in ten subdivisions using NDVI (Normalized Difference Vegetation Index) from satellite data and compared (using GIS) to property crimes and socio-economic variables. NDVI was significantly and negatively related to the number of property crimes; that is, the more abundant the vegetation around a house, the less frequently property crimes occurred.

A recent study in Portland, Oregon, investigated effects of street trees and trees on residential lots.[7] Considering three crime aggregates (all crime, violent crime, and property crime) and two individual crimes (burglary and vandalism) it was found that trees in a public right-of-way were generally associated with a reduction in crime. The effect of trees on crime rates on house lots was mixed; smaller, view-obstructing trees tended to increase crime, whereas larger trees reduced crime. Trees may reduce crime by signaling to potential criminals that a house is better cared for and, therefore, subject to more effective policing by owners than a comparable house with fewer trees.

Community Policing

Crime behavior is the result of a complex blend of social and environmental factors. Direct interventions (such as more police patrols, or higher offender conviction rates) are common strategies for reducing crime and improving safety. But dealing with disorderly conditions and stopping minor offenses by maintaining property presentation, or "fixing broken windows," has become a key crime-prevention strategy in many American cities.[8,9] A disorderly environment sends the message that no one is in values the property or will challenge crimes against it, thus increasing residents' general fear, weakening community controls, and inviting criminal behavior.[10,11]

An experiment in Lowell, Massachusetts, tested different community policing strategies for crime reduction.[12] Sampling across the city for crime "hot spots," the researchers worked with the police department to test different responses to social disorder conditions. Crime calls were then monitored to compare treatment responses to disorder rates in control neighborhoods over one year.

Crime prevention approaches included standard and innovative practices, and the results were striking. There was a 20% decrease in calls to police from the parts of town that received specific additional treatments. Evaluating the approaches, what worked best? Cleaning up the physical environment was relatively effective, misdemeanor arrests less so, and boosting social services had no apparent impact. Cleaning up vacant lots was one of the most effective strategies; urban greening organizations could be important collaborators in reducing community crime.

More Studies

Some law enforcement officials may see vegetation as visually obstructive, attribute crime to the presence of urban natural landscapes, and overlook the role of clean and green places in preventing social disorder. Citizens may recognize the positive role of vegetation but may still have safety concerns.

In another public housing study, it was found that the more vegetation there is, the less residents expressed a fear of crime. Those residents who lived in buildings with more on-site trees and grass reported a greater sense of safety than did their counterparts living in relatively barren settings.[13] When asked about residential places in general, people report less fear of crime when looking at photographs or drawings of scenes with greater amounts of vegetation.[14,15]

Those living near a greenway may have concerns about crime. A study examined crime spill-over from a 5-mile greenway in Boston.[16] Police calls regarding personal or property crime adjacent to the trail were compared to calls from houses further away over two years. No significant increase in crime was found for those living next to the corridor. In fact, there was less crime, as compared to houses bordering quiet commercial streets, and significantly less crime than for those buildings abutting a busy arterial street.

Respondents also highlighted the role of daylight in ensuring safety; there were generally positive attitudes about of park safety by day but low impressions of night-time safety. People reported higher perceived safety when greater numbers of people were assumed to be out walking in the evening and at night.

The interplay of crime and urban nature is not straightforward, and park presence may influence property desirability in opposite directions. Generally, studies report that parks are associated with higher market values for adjacent properties (up to 20%).[17] In a Baltimore, Maryland, study crime rates affected how parks were perceived by residents and valued in the housing market.[18] Where the crime rate is relatively low, parks have a positive impact on property values. As crime rates climb above a threshold value, the direction of the relationship changes, and nearby parks negatively influence home values. Crime influence is dramatic in this city; the Baltimore robbery rate is 475% of the national average, and the valuation threshold occurred at a crime index value of between 406 and 484.

Fear Factor

Safety can be judged objectively, as measured by facts and figures, and subjectively as personal perceptions and inferences.[19] Perceptions often influence behavior and cause people to avoid places they associate with personal risk. Impressions of crime likelihood (irrespective of actual crime rates) can lead people to choose to not enter public spaces,[20,21,22] retreat within their homes, and cease on-street socializing.[23,24] The presence and character of vegetation is one element of place-based fear. This section highlights research on the role of vegetation in perceived safety.

Views and Visibility

Generally, visual preference ratings for urban settings increase with tree density, and the highest preferences are reported for the most densely planted settings.[25,26] In addition, more green space in people's living environment is associated with greater feelings of social safety except in highly urbanized areas where enclosed green spaces are felt to be less safe.[19] Although inner city residents value having trees and nature nearby, they also express concern about safety based on visibility.[27]

In urban settings, dense understory vegetation and densely wooded areas are consistently associated with fear of crime. In one study college students drew "fear-maps" that correlated fear with the presence of trees, shrubs, and walls that conceal vision and limit escape options.[28] In another on-campus study, dense understories that reduced views into areas where criminals might hide were associated with fear of crime.[29] When people assessed the relativet safety of various parking lot scenes, more vegetation cover was associated with lower perceived security.[30] People's safety ratings across 17 urban parks and recreation sites showed that they felt most vulnerable in densely forested areas and safest in open, mowed areas.[31] Across these studies, view distance seems to be an important factor; fear of crime is higher where vegetation blocks views.[12,32]

In some instances, vegetation may indeed facilitate crime. In one study, park managers and park police indicated that dense vegetation is used by criminals to conceal their activities.[33] In a second study, automobile burglars described how they used dense vegetation in a variety of ways, including to conceal their selection of a target and their escape from the scene, to shield their examination of stolen goods, and finally, in the disposal of unwanted goods.[34]

The conclusions across these studies are complex: first, that people generally indicate higher preference for settings with higher rates of tree density. Secondly, dense vegetation is seen to provide potential cover for criminal activities, potentially increasing the likelihood of crime, and certainly increasing the fear of crime. Large shrubs, underbrush, and dense woods all substantially diminish visibility and view distance, and may support criminal activity.

Manage for Crime Prevention

Too often, property managers' or law enforcement officials' response to vegetation and safety concerns is for outright vegetation removal. Vegetation can be retained and managed to reduce risk, be it perceived or actual. Generally, studies have shown that open green spaces that preserve visibility (versus 'closed green space that limits views) increase feelings of personal safety as a person is better able to detect potential nearby safety risks.[19] Greater openness is associated with less perceived danger.[35,36,37,38,39]

A site can support both trees and visibility. Residents of inner-city neighborhoods in Chicago claimed that higher tree density and grass maintenance increased both setting preference and sense of safety.[13] A follow up study of crime rates found that widely spaced, high-canopy trees and grassy areas did not experience higher rates of crime than paved areas.[2] Neither vegetation type would block views. Vegetation is likely to increase crime only when it affords opportunities for concealment, particularly in undergrowth.

Neatness counts! Urban studies relate site maintenance to higher levels of perceived security.[30,40,41] Maintenance neglect (such as litter and graffiti) decreases perceived security in urban parks.[31] Site maintenance is one of the strongest predictors of residential satisfaction for those who live in urban public housing.[42] Powerful social messages are conveyed by a well-tended setting, which indicates that it has been cared for, and under the oversight of a caring agent.[43] Such settings encourage a sense of orderliness and security. Urban research suggests a clear relationship between lack of setting care and fear of crime, though perhaps a weaker relationship between lack of care and actual victimization.[44,45]

Studies suggest how to design safe yet appealing parks and greenways. The presence of nature, including higher densities of trees, is preferred. A more open understory that provides adequate lines of sight increases perceived safety in urban park settings.[46] This does not require a landscape devoid of understory, but rather suggests that managers should be sensitive to where they place and how they manage vegetation in light of personal safety concerns.[2,13,47]

Being Mindful

Managers must consider how to integrate public safety into the planning and management of urban parks, forests, and green spaces.[48] Crime Prevention Through Environmental Design (CPTED) is widely applied by law enforcement and urban planning officials.[49] In the past, criminologists focused on the offender, but CPTED focuses on how the physical environment may influence behavior and how settings may enable or deter criminal acts.[50] Proper design and use of the built environment can reduce both fear and incidence of crime.

Defensible Space and Territoriality

Crime prevention specialists tend to think in terms of physical structures (such as windows and gates) in deterring crime; how does the presence of trees and vegetation contribute to safe spaces? Defensible Space[51] is a widely recognized principle that asserts that the architectural features and physical layout of places substantially influence patterns of informal contacts among residents. Vital, well-used residential spaces are key factors in the development of neighborhood social ties and the discouragement of potential perpetrators

because they encourage neighborliness and introduce informal surveillance. Contact among neighbors and informal surveillance are, in turn, linked to strength of community and lower crime rates.[52]

The initial idea of defensible space traditionally had nothing to do with trees and nature. CPTED practices define "territory" by the elements that establish the boundaries between public and private areas (usually structures such as sidewalks or porches). Markers of territoriality are linked to lower rates of incivilities and crime.[45,52] Well-maintained vegetation can act also as a territorial marker[53,54] and may discourage burglary.[55] A high quality landscape around a house is a cue to care,[56] suggesting that inhabitants pay attention to their home territory[7] and that an intruder would be noticed and confronted. It could be that community gardens or adopt-a-park projects send the same signals.

Social groups may come to mentally identify "their" space over time, even in the public realm. Studies suggest that the presence of trees can be a decisive factor in the extent to which residents actually use and "take ownership" of residential outdoor spaces, creating a healthier social ecology.[57] As people use space and connect with each other, criminals may feel driven to move on to neighborhoods where cues suggest weaker social organization and neighborhood involvement. Trees and plants are generally preferred in urban settings as a visual amenity, and they encourage the social interactions that may deter crime.

Surveillance

Surveillance is related to defensible space. Nearly 50 years ago, Jane Jacobs suggested that the simple presence of more "eyes on the street" would deter crime.[58] Considering built design, surveillance is achieved when the setting allows intended users to see or be seen while ensuring that intruders will be observed as well.[49] Safe zones are often found next to high-activity areas or are associated with organized functions such as an administrative office or some type of concession stand or sales booth. Visibility from windows provides an overlook of the setting, extending the surveillance potential.

Surveillance is enhanced by providing adequate lighting and landscaping that promotes unobstructed views. Landscaping can serve as a screen or buffer to define a space but should not act as a barrier to public view by police or other passers-by.

Considering social interaction, studies confirm that perpetrators avoid areas with greater surveillance and greater likelihood of intervention.[59,60,61] In addition, substantial research has shown that criminals avoid well-used residential areas where their activities might easily be observed.[62,63,64]

Plants play a role. A series of studies of Chicago inner-city neighborhoods found that outdoor spaces with trees are consistently used more often by residents of all ages than are treeless spaces, and the greater the number of trees in the space, the greater the number of simultaneous users.[65,66,67] Higher levels of vegetation can preserve visibility and encourage direct surveillance. Implied surveillance is equally important; criminals might be deterred by place cues suggesting that surveillance is likely even when no observers are present.[50,52]

Community Cohesion

From a social perspective, trees and safety are directly linked through the dynamics of defensible space, territoriality, and social ties.[68] Neighbors who have strong social ties form more effective social groups,[69,70] and become more capable of building consensus on values and norms,[71] monitoring behavior, intervening if problem behaviors occur,[52] and defending their neighborhoods against an increase in crime.[72]

Perhaps residents who know and trust each other are more effective in instituting local social control over what goes on in the spaces outside their homes.[73] Studies show that the presence of trees in residential outdoor spaces help promote ties among neighbors, and is linked with more successful territorial intervention.

Mental Health

A final perspective on crime is the mental state of the person who engages in antisocial behavior. The power of the physical environment to influence human aggression is well established and has been reviewed by Landscape and Human Health Laboratory scientists.[2] Urban conditions such as crowding, high temperatures, and high levels of noise have all been linked to aggression and violence.[74,75,76,77]

In addition to irritants of the senses, a person's capacity to cope with everyday functions can be taxed by modern lifestyles, prompting unsocial or antisocial responses. The information processing demands of everyday life—traffic, phones and texting, stresses at work, and complex critical decisions—all take their toll on mental well-being, resulting in mental fatigue, a state characterized by inattentiveness, irritability, and impulsivity. Such demands draw down the capacity to identify appropriate solutions and control personal behaviors.[78]

Mental fatigue may make some individuals prone to aggression and destructive acts. How? Mental fatigue may contribute to aggression because of its effects on cognitive processing. Information processing plays a central role in managing social situations, especially in avoiding potential conflicts.[79,80] In problematic social situations, it takes more reasoning and effort to engage in solution-oriented behavior. With mental fatigue, social behavior is likely to become increasingly thoughtless, tactless, and unstrategic, allowing conflicts to spiral out of control,[81] potentially leading to aggression.

Mental fatigue may also contribute to aggression because of its effects on emotion—specifically, heightened irritability. Irritability appears to be a frequent side effect of mentally fatiguing tasks[82,83] and is linked with aggression.[84,85] Finally, mental fatigue may also contribute to aggression because of its effects on behavior—specifically, impulsivity is associated with aggression and violence in a variety of situations.[86,87] Tests for a person's current level of impulsivity may predict future antisocial behavior, including aggression.

In summary, three psychological factors—impairments in cognitive processing, irritability, and impulsivity—has been scientifically implicated in aggression. Mental fatigue can contribute to outbursts of anger and even violence.

Attention restoration theory proposes that exposure to natural settings reduces mental fatigue - or more precisely, directed attention fatigue.[78] Natural settings and stimuli such as landscapes and animals seem effortlessly to engage our attention, allowing us to attend to them without focused effort producing a restorative effect and reduction of stress.[88] A Chicago based study found that public housing residents living in green conditions showed higher levels of attentiveness than their counterparts in barren conditions. It is possible that impulsive crimes committed out of frustration or rage can be reduced through the beneficial effects of natural settings on mental fatigue.[2]

Conclusions

Vegetation is a desired feature of public open spaces in cities. Some crime prevention specialists have advocated removal of most, if not all, vegetation in potential problem areas. However, the relationship between natural settings and crime prevention is more complicated than originally thought. More research is needed to look directly at urban greenspace, crime and causality.

Nonetheless, initial theory and evidence suggests that vegetation may be linked to lower levels of crime in residential neighborhoods, particularly poor inner-city neighborhoods. Residential vegetation has been linked to a greater sense of safety, fewer incivilities, and less aggressive and violent behavior. The link between urban forestry and urban greening with healthier social systems is surprisingly straightforward. The presence of trees and well-maintained lower understory vegetation can transform barren spaces lands into pleasant, welcoming, well-used places. Such common spaces serve to strengthen ties among residents, increase informal surveillance, and deter crime, thereby creating healthier, safer urban communities.[68]

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