Shade Guidelines

The role of supportive environment becomes increasingly important as a potential trigger of healthy behaviour in everyday life, particularly in children.

- OTTAWA CHARTER FOR HEALTH PROMOTION, 1986.

July 2010

Toronto **Cancer Prevention** Coalition

Contents

Section Eight

About this report:

The Shade Guidelines (2010) has been recreated to meet *the Accessibility for Ontarians with Disabilities Act, 2005* (AODA).

In 2019, this report was updated to reflect more recent evidence pertaining to some of the sections as well as to address the role of shade especially through its natural form of trees as the most effective form of urban climate action. However, much of the technical information as it appears throughout the report, is still valid.

Background

The Toronto Cancer Prevention Coalition (TCPC) was established in 1998 by Toronto Public Health and its community partners. The TCPC's mission is to strengthen cancer prevention efforts in the City of Toronto. Within the TCPC, the Ultraviolet Radiation Working Group has been successful in a number of initiatives to promote awareness of the harmful effects of overexposure to ultraviolet radiation (UVR) and the increased risk of skin cancer. The UVR Working Group's 2000 Report, A Survey and Recommendations of Current Sun Safety Policies and Programs called for a Sun Safety Action Plan for the City, including the establishment, monitoring and enforcement of shade provision via municipal by-laws, urban design and planning.

In November 2002, Toronto City Council endorsed the Toronto Cancer Prevention Coalition's Action Plan as the cornerstone for cancer prevention in the City of Toronto.

The Toronto Board of Health (BOH) endorsed the efforts of the Coalition and its Working Groups to implement the strategies embodied in their Action Plan. Subsequently, City Council indicated its support for the initiatives of the Coalition and directed that action be taken by the relevant City divisions and departments on three priority areas. One of these priority areas was to produce a comprehensive policy and related guidelines for Shade. More specifically, the directive stated:

> The Medical Officer of Health convene a multidisciplinary team, in consultation with the Ultraviolet Radiation Working Group of the Toronto Cancer Prevention Coalition, to produce a comprehensive policy and related guidelines aimed at providing and maintaining adequate shade (in both built and natural form) within the City's jurisdiction.

The Shade Policy Committee, an expansion of the UVR Working Group, was formed in 2002. Members include Toronto Public Health, Parks, Forestry and Recreation, City Planning including Urban Design, Children's Services, Facilities and Real Estate, representatives of the Toronto Food Policy Council and a broad group of external partners including Ryerson University Department of Architectural Science, Toronto Atmospheric Fund, the Toronto District School Board, the Clean Air Partnership, Cancer Care Ontario, Evergreen, Environment Canada, Ontario Sun Safety Workgroup, architectural and design firms, dermatologists from Women's College Hospital and Toronto Western Hospital, environmentalists and urban foresters.

In response to City Council's direction, a multidisciplinary seminar, Designing for Shade, was convened by Ryerson University, Department of Architectural Science and the Toronto Cancer Prevention Coalition in June 2003. This event brought together urban planners, academics, landscape architects, architects, dermatologists, health agencies, concerned citizens, advocates, city staff and special guest, John Greenwood, Australian Architect and Founder and Managing Director of WebShade, to discuss the issue of shade, UVR reduction strategies, the dangers of skin cancer and how to make the City of Toronto a greener and shadier place.

In October 2004, the Board of Health (BOH) endorsed the Shade Policy and Technical Considerations for the City of Toronto report. On May 4, 2005, the Shade Policy was debated but not approved by City Council.

To advance the work, and with the continued support of the Board of Health, the Shade Policy Committee embarked on key activities as well as pilot strategies to increase shade, especially where children are in attendance. These include a shade sail canopy demonstration project in Dovercourt Park; the preparation of a report, How to Conduct a Shade Audit, (Ambrosii Bardekjian A., Campbell H., 2005) based on the pilot study and shade audit of two Toronto parks, Christie Pits and Charles G. Williams. The Committee was able to influence the insertion of key recommendations to increase shade provision in the redesign of Nathan Phillips Square. The Shade for Good Health and a Green City a conference in May 2007, was a pivotal opportunity for the City of Toronto to share its shade development strategies and learnings.

Since the Shade Policy Committee's establishment, there has been a growing environmental awareness which has resulted in the City's commitment to a Climate Change and Clean Air agenda. The Shade Policy Committee has capitalized on the efforts of City divisions to encourage greening and green standards and a stronger commitment to the environment. Consequently, the Shade Policy was reframed to include these issues. The revised document was endorsed by the Board of Health in September 2007 www.toronto.ca/legdocs/mmis/2007/hl/bgrd/backgroundfile-6600.pdf and forwarded to the City Manager for implementation. In addition, the report was forwarded to all agencies, boards, commissions and divisions (ABCDs) of the City.

In July 2008, City Council adopted a series of motions based on the report from Parks, Forestry and Recreation entitled Undertaking Shade Audits at Parks, Forestry and Recreation Playgrounds and Waterplay Facilities. The motions directed Parks, Forestry and Recreation and the Shade Policy Committee (led by Toronto Public Health) to jointly develop shade guidelines for the Parks, Forestry and Recreation Division for existing playgrounds and waterplay facilities to inform decisions on possible shade enhancement. These Shade Guidelines have been prepared to address the above directives and to encourage the City's ABCDs to implement the guidelines and principles in their design and development plans in order to provide safer and more comfortable environments for their users.

The Shade Policy for the City of Toronto approved by the Board of Health in 2007 states:

The provision of shade can be an effective means of reducing exposure to ultraviolet radiation (UVR) and its associated health risks such as skin cancer. Furthermore, the presence of shade can encourage physical activity, reduce greenhouse gas and air pollutant emissions, mitigate the urban heat island effect, and reduce energy costs.

The provision of shade, either natural or constructed, should be an essential element when planning for and developing new City facilities such as parks or public spaces, and in refurbishing existing City-owned and operated facilities and sites. Increasing shade in Toronto contributes to a healthier and more sustainable City.

Acknowledgements

The Shade Policy Committee is a reflection of the remarkable partnership and vigilance of a multidisciplinary group both internal and external to the City. This group has provided significant knowledge and expertise to this initiative and given generously of their time since 2002 in providing expert advice and feedback as required throughout the development of the Shade Guidelines.

Special Acknowledgement of Internal Partners:

Alex Shevchuk - Supervisor, Area Landscape and Planning Initiatives, Parks, Forestry and Recreation (PF&R), City of Toronto, assisted with every aspect of the document and in particular, was the lead for the development of the Planning and Design Guidelines Sections.

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Erin Pichora - Epidemiologist, Cancer Care Ontario. (Prepared the material for the National Sun Survey Report, July 2008).

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We would like to take this opportunity to thank the past members on the Shade Policy Committee of the Toronto Cancer Prevention Coalition Ultraviolet Radiation Working Group who contributed to the development of the Shade Policy.

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Executive Summary

Solar radiation and more particularly, the ultraviolet portion of solar radiation is a human carcinogen for skin cancer. The provision of shade in City-owned and operated outdoor venues, in particular where children are in attendance, is an important measure for the primary prevention of skin cancer and its associated health and economic burden.

Children are at a higher risk of overexposure to ultraviolet radiation (UVR) since they tend to be outdoors in the sun more than adults. Their skin is also thinner and more sensitive and therefore more susceptible to serious burns. Subsequently, exposure to the harmful effects of UVR during the early years of life is a major determinant of lifetime risk of skin cancer.

Southern Ontario has the strongest UVR in Canada. Sun protection is required from spring through fall, especially during the Critical Protection Time (CPT) which is from 11 a.m. to 4 p.m. Eastern Daylight Time (EDT) and when the UV index reading is 3 or higher. In Toronto, unprotected skin can burn in as little as a few minutes when the UV index is 6 or higher.

The Shade Guidelines have been created by the Shade Policy Committee of the Toronto Cancer Prevention Coalition in collaboration with Parks, Forestry and Recreation and with the support of Toronto Public Health, as directed by the Board of Health and City Council. The Shade Guidelines are intended to complement the Shade Policy for the City of Toronto and to assist all City agencies, boards, commissions and divisions (ABCDs) to provide UVR protection and Sun Safety measures for their outdoor environments.

The guidelines contain recommendations and principles for increasing shade at facilities operated by the City of Toronto. These facilities are used primarily during the summer when direct UVR levels are at their highest, when high levels of indirect UVR reflect from surfaces and when users typically wear minimal clothing. Some sites clearly have a greater need for shade and UVR protection than others and municipalities with limited staff resources and budgets must be able to establish priorities for the development of shade protection.

Sites and Facilities include:

- Waterplay and Swimming Pools
- Playgrounds
- Special Activity Areas in Parks
- Beaches
- Pathways and Trails
- Sportsfields
- Childcare Centres
- Paved Activity and Play Areas
- Public Squares
- Streetscapes
- Parking Lots

There is a description of each type of site, followed by the application of the four steps of the Shade Audit for each site.

They are:

- understanding site users and activities
- conducting an inventory of site conditions and existing shade
- identifying the potential risks and
- making recommendations to improve shade in those areas.

Improvements can be through plantings or constructed structures, appropriate events scheduling and any other measures that would create a Sun Safe and comfortable environment.

The City of Toronto, through its Official Plan and other adopted policies and action plans such as the Toronto Green Standard (TGS) and Climate Change agenda support and complement the Shade Policy of the co-benefits of shade provision namely reducing pollution, mitigating the urban heat island and climate change as well as increasing physical activity at a time when obesity has become a public health concern. This factor provides added incentive for municipalities to address shade more proactively.

A preliminary assessment of Toronto Parks, Forestry and Recreation playgrounds and waterplay facilities in 2008 revealed that most of the facilities required significant improvements in the level of shade provided.

A Shade Audit of eight Toronto playground and waterplay sites in 2008-2009 was funded by a grant from the Cancer Care Ontario GTA Cancer Prevention and Screening Network which was awarded to Ryerson University in partnership with Toronto Public Health and Parks, Forestry and Recreation.

The project's objective was to provide City of Toronto staff with information on the cost-effectiveness of conducting shade audits. In addition, the project offered the opportunity to develop a consistent shade audit process, a set of standards for shade and the knowledge to implement and maintain additional plantings and development of shade structures on Toronto sites. The knowledge gained from the City of Toronto Public Playgrounds and Waterplay Facilities Shade Audit Pilot has been instrumental in the development of the Shade Guidelines.

Part I, provides an overview related to UVR and skin cancer and its economic burden and individual suffering. In addition, the importance of protecting children, related municipal policies that support the Shade Policy and the numerous co-benefits of shade ranging from mitigating climate change to encouraging physical activity among children and adults are addressed.

Part II, covers the shade guidelines themselves for the eleven types of sites. The information for each site is presented separately to enable ready access for planners and other users who want facility site-specific information. Sun Safe

practices including protective measures of the skin and eyes when outdoors during the summer months are included.

Guiding Principles are also established to assist with all aspects of planning and design for shade. Information about types of shade, municipal plans and planning for shade, the importance of the Shade Audit process and details about Webshade, an interactive software application, are included.

Toronto Public Health, Parks, Forestry and Recreation and the Shade Policy Committee will continue to collaborate to refine the Shade Guidelines as appropriate. The Shade Guidelines include a user feedback form in both Parts I and II of the document to facilitate future improvements to the Guidelines.

Part I - Overview

Section One

1. 0 INTRODUCTION

SECTION SUMMARY

The Shade Guidelines have been created by the Shade Policy Committee of the Toronto Cancer Prevention Coalition (TCPC) in collaboration with Parks, Forestry and Recreation and with the support of Toronto Public Health, as directed by the Board of Health and City Council. The Shade Guidelines are intended to complement the Shade Policy for the City of Toronto and to assist all City agencies and corporations (formerly agencies, boards, commissions and divisions, ABCD's) to provide ultraviolet radiation (UVR) protection and Sun Safety measures for their outdoor environments. They provide recommendations for the planning and design of a range of facilities and sites to promote increased shade and protection from overexposure to UVR which is the main risk factor for skin cancer, eye cataracts, skin aging and wrinkling. The information for each site is presented separately to enable easy access for planners and other users who want facility site-specific information. This document can also be of value to other groups and individuals. A shade feedback form has been developed to give users of the Shade Guidelines the opportunity to provide input on the usefulness of the material in both parts Part I (Overview) and Part II (Shade Guidelines).

1.1 Shade Policy Statement and Direction to Prepare Shade Guidelines

The Shade Guidelines have been created by the Shade Policy Committee of the Toronto Cancer Prevention Coalition in collaboration with Parks, Forestry and Recreation and with the support of Toronto Public Health, as directed by the Board of Health and City Council. The Shade Guidelines are intended to complement the Shade Policy for the City of Toronto and to assist all City agencies and corporations to provide UVR protection and Sun Safety measures for their outdoor environments, in particular where children are in attendance.

The Board of Health in September 2007:

1. Endorsed the following Policy Statement for Shade and forwarded a copy of the Statement to the City Manager for implementation:

The provision of shade can be an effective means of reducing exposure to UVR and its associated health risks such as skin cancer. Furthermore, the presence of shade can encourage physical activity, reduce greenhouse gas and air pollutant emissions, mitigate the urban heat island effect, and reduce energy costs. The provision of shade, either natural or constructed, should be an essential element when planning for and developing new City facilities such as parks or public spaces, and in refurbishing existing City-owned and operated facilities. Increasing shade in Toronto contributes to a healthier and a more sustainable City.

2. Requested the Medical Officer of Health to direct the Shade Policy Committee to develop specific guidelines, by Summer 2008, to assist City agencies and corporations to operationalize the Shade Policy; and

3. Requested the Medical Officer of Health to forward this report to City agencies and corporations. See:
www.toronto.ca/legdocs/mmis/2007/hl/decisions/2007-09-19-hl07-dd.pdf

1.2 Scope of This Document

This document focuses on providing a series of guidelines for use by a variety of professionals and City staff who are responsible for the planning and design of a range of facilities and sites that are exposed to intense solar UVR, especially during the summer months.

In this document the word 'shade' refers to 'ultraviolet radiation protection'. This is an enhancement of the more traditional meaning of shade as blocking direct sunlight by a roof, tree, umbrella, overhang or other structure or plant. While the health risks associated with UVR overexposure, mainly skin cancer, are the key drivers leading to the planning and design guidelines presented in this document, the co-benefits of providing shade are also stressed (i.e. heat reduction, mitigating climate change, providing energy savings and the provision of comfortable outdoor environments that encourage increased physical activity).

In this document, Planning Guidelines (Section 7) and Site-Specific Guidelines (Section 8) are presented for the following City-owned and operated facilities and sites:

- Waterplay and Swimming Pools
- Playgrounds
- Beaches
- Special Activity Areas in Parks
- Pathways and Trails
- Sportsfields
- Childcare Centres
- Paved Activity and Play Areas
- Public Squares
- Streetscapes
- Parking Lots

Every effort has been made to provide this information in a comprehensive and user-friendly format. However, depending on the project and the complexity of specific sites and their uses, additional professional and technical advice from architects, landscape architects, engineers, safety officers, product suppliers and arborists and more detailed site investigation and analysis might be required.

Even though this document does not identify specific targets, technical guidelines or standards for safe shade, it is intended to encourage City agencies and corporations to develop more detailed design and technical guidelines to

incorporate shade into the facilities and sites within their jurisdiction. For example, Parks, Forestry and Recreation has undertaken a set of pilot shade audit projects for a number of playground and water play facilities across the City during 2008-2009. This project will yield a better understanding of how to use a standardized Shade Audit process, determine standards for shade provision and UVR protection at these types of sites, and provide some recommendations for improvement at each site.

Toronto Public Health will continue to collaborate with Parks, Forestry and Recreation and the Shade Policy Committee on Shade Audit pilot projects and work towards developing standards for the provision of optimal shade at designated City venues, in particular, water play facilities and playground.

1.3 Who is this Document for and How can it be Used?

In addition to encouraging City of Toronto agencies and corporations to operationalize the Shade Policy by implementing these guidelines proactively, this document can also be of value to other individuals and organizations that are involved in the planning and design of effective shade for outdoor environments to protect against the damaging effects of excess UVR. (see 1.3a)

The Shade Guidelines are presented as Part I and Part II. Part I includes sections on UVR and its health effects, policy frameworks and co-benefits of shade. Part II includes the shade guidelines themselves for specific sites and information on Sun Safety measures, types of shade and planning for shade.

The information for each specific site in Section 8 should be used in conjunction with the Appendices (A, B, C and D) which include specific support information.

For each specific site, there is a description of the site, followed by recommendations and considerations for shade provision through the application of the 4 steps of the Shade Audit (Section 7) for each site.

These guidelines when combined with eye and skin protection and appropriate events scheduling, are intended to give City staff and other users a set of decision-making tools to apply to specific projects and sites. However, depending on the shade project, additional professional and technical advice from architects, landscape architects, engineers, safety officers and arborists is recommended to ensure that the desired shade effectively falls in the right place for maximum protection.

1.3a Who is this document for and how can it be used?

- Strategic and Policy Planners
    - Incorporate shade into strategic vision and departmental policy
    - Understand and confirm Public Health responsibilities
    - Incorporate in the Official Plan, Secondary Plans of the City of Toronto

- City Planners
    - Ensure shade is addressed within specific planning initiatives (i.e. Avenue and Areas Studies) and within specific development applications
- Parks Planners
    - Ensure that shade is addressed in park Master Plans and studies for parkland and facilities
- Landscape Architects
    - Incorporate into park designs and specific projects (i.e. playgrounds, waterplays) done in-house by staff or consultants
- Architects
    - Incorporate into the design of outdoor areas or building edges that are part of building and facility designs
- Urban Designers
    - Address shade within the public realm (i.e. streetscapes, public squares) in studies and specific projects
- Managers and Operators of Parks, Open Spaces and Facilities
    - Understand municipal responsibilities for providing safe public environments to meet the needs of users
    - Incorporate into operational plans for parks and facilities
- Programmers and Event Planners
    - Incorporate into event planning, programming of public spaces and issuing permits for use
    - Promote shade and Sun Safety in public communications and promotion of events
- Public Health Planners
    - Promote shade and UVR protection within communities
    - Advocate for Sun Safety and UVR protection to other municipal departments as part of an overall program of Public Health objectives
- Urban Forestry Planners
    - Incorporate into annual planting objectives; meeting tree canopy targets
    - Understand specific location of plantings and species to create useful shade
- Partnership Development Officers
    - Include shade projects in partnerships with foundations, businesses, not-for-profit organizations, community groups, residents' associations and individuals
- Product Suppliers
    - Understand Public Health objectives and opportunities to develop and supply structures and portable shade devices
- Community Groups
    - Understand Public Health objectives as part of advocacy for shade and UVR protection
    - Promote shade in specific community projects.

1.4 An Evolving Document

The Shade Guidelines include a user feedback form to facilitate future improvements to the Guidelines. This form can be found on page 129.

Section Two

2.0 ULTRAVIOLET RADIATION (UVR) AND ITS HEALTH EFFECTS

SECTION SUMMARY

The International Agency for Research on Cancer (IARC) has determined that solar radiation and more particularly, the ultraviolet portion of solar radiation is a human carcinogen for skin cancer. Each time skin is exposed to sun and becomes tanned or burned, damage is done to individual cells, including their DNA. Exposure to UVR also increases the risk of lip cancer, some types of eye melanoma and cataracts as well as premature skin aging and wrinkling. Children require special protection as they are at a higher risk of overexposure to UVR. The two types of UVR that reach the earth's surface are UVA and UVB and both penetrate the skin and can cause DNA damage. There are many factors that affect UVR levels namely sun height, latitude, cloud cover, altitude, stratospheric ozone and season. UVR that is scattered or reflected is known as indirect UVR. For maximum protection, shade trees and structures should be able to block both direct and indirect UVR.

2.1 Ultraviolet Radiation (UVR) as a Human Carcinogen for Skin Cancer

Although present in sunlight, UVR can neither be seen nor felt (Gies, Roy, Elliott, 1992). UVR is part of the electromagnetic spectrum emitted by the sun. Both UVA and UVB are of major importance to human health as they penetrate the skin and can cause DNA damage. UVA wavelengths are longer and penetrate deeper into the skin. UVB wavelengths are shorter and more energetic and are the primary cause of sunburn. Both UVA and UVB are involved in causing skin cancer and skin aging. Although most UVR exposure is from the sun, tanning equipment also emits UVA and UVB radiation. UVR exposure can also occur in some specialized occupational settings where electrical welding equipment, black lights, germicidal lamps, UV curing lamps or UV lasers are used. See www.who.int/entity/uv/uv_and_health/en

2.2 Indirect Ultraviolet Radiation (UVR)

Shade designs based on an intuitive understanding of sunlight and shadow may overestimate the degree of sun protection afforded by certain structures and arrangements of trees, thereby, increasing the risk of sunburn and skin damage. The visible light from the sun follows a direct path from the sun to the surface of the earth. It casts discrete shadows with sharp edges between areas of light and shade.

However, a substantial portion of incoming UVR (especially the UVB kind) is scattered by water droplets, dust and other particles as it travels through the atmosphere. UVR that is scattered or reflected is referred to as indirect UVR. When the sun is high in the sky about 50% of the sunburning UVR follows a scattered path to earth. The percentage is even higher on cloudy days or when the sun is low in the sky (Diffey, 2003).

Indirect UVR may reach a person from any direction. As a rule, when a person is under shade but can see much of the sky, scattered UVR is reaching them. Therefore, when designing shade structures or selecting and positioning trees to reduce UVR exposure, it is important that the structures or trees effectively block both the direct sunlight and the view of much of the sky.

The shade under a lone beach umbrella blocks direct UVR but does a poor job of blocking scattered UVR. The shade under a single tree can block a fair amount of UVR: a dense canopy offers very good UVR protection near the trunk but the level of screening diminishes markedly near the periphery of the shaded area. The overlapping shade pattern from a healthy, mature stand of trees blocks a substantial amount of the view of the sky and provides solid UVR protection.

Reflection of UVR off of fresh snow nearly doubles UVR exposure. UVR is moderately increased by reflection off other bright surfaces such as white sand or concrete. Less UVR is reflected off uneven or darker surfaces such as grass, other ground covers or asphalt. See https://www.who.int/uv/uv_and_health/en/

As the ozone layer becomes thinner, the population is less protected from the effects of sun exposure. UVR in Canada has historically been strong enough to cause skin damage and Southern Ontario has the strongest UVR in Canada. Sun protection is required from spring through fall, especially during the Critical Protection Time (CPT) which is between 11 a.m. and 4 p.m. Eastern Daylight Time (EDT).

2.3 Environmental Factors that Influence the UV Level

- **Sun Height** – the higher the sun in the sky, the higher the UV radiation level. Thus, UV radiation varies with time of day and time of year, with maximum levels occurring when the sun is at its maximum elevation, at around midday (solar noon) during the summer months.
- **Latitude** – the closer the equator, the higher the UV radiation levels.
- **Cloud Cover** – UV radiation levels are highest under cloudless skies. Even with cloud cover, UV radiation levels can be high due to the scattering of UV radiation by water molecules and fine particles in the atmosphere (indirect UVR).
- **Altitude** – at higher altitudes, a thinner atmosphere filters less UV radiation. With every 1000 metres increase in altitude, UV levels increase by 10% to 12%.
- **Ozone** – ozone absorbs some of the UV radiation that would otherwise reach the Earth's surface. Ozone levels vary over the year and even over the course of the day.
- **Ground Reflection** – UV radiation is reflected or scattered to varying extents by different surfaces (i.e. snow can reflect as much as 80% of UV radiation, dry beach sand about 15%, and sea foam about 25%).
- **Season** – The sun is most directly overhead in May, June and July, dropping slowly to its lowest elevation in December and January. UVR intensity generally follows this pattern with some additional influence by the seasonal cycle in atmospheric ozone.

2.4 UVR Trends in Toronto and Ontario

In the Toronto area, the sun reaches its peak around 1:20 p.m. Eastern Daylight Time (EDT) and UV levels generally follow suit. In May through August, UV levels are generally high or very high from 11 a.m. to 4 p.m. This "high UV" window can be slightly wider in June and July.

The months of the year that present the highest UVR in Ontario are as follows:

- April – Moderate to High
- May – High
- June/July – Very High
- August – High
- September – Moderate to High

The stratospheric ozone layer over Ontario is on average about 5% thinner than in the early 1980s. This corresponds to roughly a 6% increase in clear sky UVR. Stratospheric ozone varies from day to day in response to changing weather patterns resulting in short-term swings in clear sky UVR of about 10%. In late spring, ozone thickness may be reduced by up to 20% for brief periods of time.

Elevation, although not a significant factor in Ontario, can also increase the risk of overexposure to UVR. The atmosphere becomes thinner and less polluted as altitude increases. As a result, with every kilometre rise in elevation, UVR increases by 9%. UVR will generally be reduced by several percent on days with high smog concentrations. They peak around 1:20 p.m. EDT and UV levels generally follow suit. UV levels are generally high or very high from May through August.

2.5 The UV Index

The UV Index is a measure of how intense the UVR is at any time. The higher the UV Index, the more intense the UVR.

UV Index: 0 – 2
Description: LOW
Sun Protection Actions: Minimal sun protection - required for normal activity. Wear sunglasses on bright days. If outside for more than one hour, cover up and use sunscreen. Reflection off snow can nearly double UV strength. Wear sunglasses and apply sunscreen.

UV Index: 3 – 5
Description: MODERATE
Sun Protection Actions: Take precautions - cover up, wear a hat, sunglasses and sunscreen, especially if you will be outside for 30 minutes or more.
Look for shade near midday when the sun is strongest.

UV Index: 6 – 7
Description: HIGH
Sun Protection Actions: Protection required - UV damages unprotected skin and can cause sunburn. Reduce time in the sun between 11 a.m. and 4 p.m. and take full precautions. Seek shade, cover up, wear a hat, sunglasses and sunscreen.

UV Index: 8 – 10
Description: VERY HIGH
Sun Protection Actions: Extra precautions required - unprotected skin will be damaged and can burn quickly. Avoid the sun between 11 a.m. and 4 p.m. and take full precautions. Seek shade, cover up, wear a hat, sunglasses and sunscreen.

UV Index 11 or higher
Description: EXTREME
Sun Protection Actions: Take full precautions - unprotected skin will be damaged and can burn in minutes. Avoid the sun between 11 a.m. and 4 p.m. cover up, wear a hat, sunglasses and sunscreen.

Values of 11 or more are very rare in Canada. However, the UV Index can reach 14 or more in the tropics and southern U.S. White sand and other bright surfaces reflect UV and increase UV exposure (Environment Canada, no date).

2.6 About Skin Cancer

The three main forms of skin cancer are basal cell carcinoma, squamous cell carcinoma and malignant melanoma and all are caused by sun exposure. Basal cell carcinoma and squamous cell carcinoma, together referred to as “non-melanoma skin cancer,” comprise about 94% of skin cancers diagnosed each year (Canadian Cancer Statistics, 2008). Since most cancer registries do not record non-melanoma skin cancers, high quality local statistics are not generally available and extrapolations from areas where such data are collected must be used.

- Basal Cell Carcinoma (BCC) is the most common form of skin cancer but it does not spread to other organs, so only very rarely results in death. Its treatment can, however, be very mutilating if it occurs on the face. It affects more men than women and occurs most often on the face and neck (including scalp and ears in men). Multiple basal cell carcinomas in the same person are not uncommon. Although basal cell carcinoma most commonly occurs in older people, it can occur at younger ages.

- Squamous Cell Carcinoma (SCC) is less common than basal cell carcinoma. It has the potential to metastasize (spread to other organs) and cause death, but does so infrequently. It also is more common in men than women. Even more so than basal cell carcinoma, squamous cell carcinoma has a very strong preference for the face and neck, forearms and backs of hands. Squamous cell carcinoma is very rare in young people and increases steadily in incidence with increasing age.

- Malignant Melanoma is the least common form of skin cancer but can be fatal if not diagnosed in its early stages. It accounts for the vast majority of skin cancer deaths. It is equally common in men and women and typically occurs on the face, neck, shoulders, or trunk (back and chest). It is one of the more common cancers in young adults up to age 45. After age 50, it is relatively less common.

2.7 How Does Ultraviolet Radiation (UVR) Cause Skin Cancer?

UVR works in many different ways to cause skin cancer. Each time skin is exposed to sun and becomes tanned or burned, damage is done to individual cells, including their DNA. It is important to realize that skin cells can be damaged even if exposure to UVR does not result in either burning or tanning. There are repair systems in the skin, but they are not foolproof. Some cells in the skin die, because they are so badly damaged,

while some cells are able to repair the sun-damaged DNA. However, some of the DNA damage may not be repaired, resulting in defective cells in the skin. UVR decreases the body's immune system, making it difficult to destroy the defective cells. The defective cells that are not destroyed may slowly grow over time and produce a tumour.
The cells involved in the three different forms of skin cancer all lie in the outer layer of the skin, the epidermis. Squamous cells are closest to the surface and melanocytes farthest away. This is relevant because, as noted earlier, UVA penetrates deeper into the skin than UVB so that different amounts of the two types of UV rays reach different types of cells. It is therefore not surprising that the relationships between UVR exposure and the three forms of skin cancer differ.

When the skin is exposed to UVR, the pigment-producing process or melanocytes, make more melanin. This brown pigment protects the skin by absorbing UVR and prevents it from penetrating deeper in the skin. The skin becomes darker or tanned. Unfortunately, the melanin in a tan does not block out enough of the radiation to prevent skin damage. A tan is a sign that the skin has been damaged. The pigment cells produce pigment all the time, which gives people their skin colour. People with darker skin who tend to tan rather than burn, have more protection against UVR. Nonetheless, all skin types should follow Sun Safety measures.

Sunburn is the skin's visible reaction to acute overexposure to UVR. Sunburn (redness, swelling, pain and blistering) increases the risk of skin cancer. Chronic exposure to UVR is widely recognized as a major cause of skin cancer and signs of aging, including wrinkles.

Outdoor workers receive significant exposure to solar UVR and are at increased risk of the adverse consequences associated with UVR exposure of the eyes and skin. The magnitude of the risk for the skin depends greatly upon climatological factors and personal sensitivity to UVR, the latter incorporating both the color of the skin (referred to as the "skin phototype") and degree of acclimatization or adaptation, to UVR (Vecchia, Hietanen, Stuck, van Deventer, & Niu, 2007).

Melanoma is more closely related to how much intense intermittent exposure one receives or the kind of exposure that can result in sunburn to skin that is not usually exposed. This is consistent with melanomas being relatively common on the trunk, which is not normally exposed. Intermittent exposure early in life appears to be particularly important, as evidenced by the relatively early age at which melanoma occurs. Basal cell carcinoma seems to be somewhere in the middle, related to both amount and type of exposure.

It is important to note that all forms of skin cancer are related to the amount of sun exposure accumulated over a lifetime. As with all adult forms of cancer, there is a substantial lag time between exposure and evidence of skin cancer.

2.8 Overexposure to UVR and the Burden to Society

According to the Canadian Dermatology Association (CDA), Canadians should avoid increasing their sun exposure since there is strong evidence that UVR from the sun is the primary cause of skin cancer. The importance of skin cancer should not be

minimized. Melanoma caused the death of 940 people in Canada in 2009 and figures are on the rise. Basal cell and squamous cell carcinomas are rarely fatal. They do require timely treatment, which can cause pain and much human suffering. In addition, the treatment may leave a disfiguring scar or mutilation. These skin cancers are so common that they represent an enormous cost to the health care system. According to a newly released report, the total estimated economic burden of skin cancer in Canada for 2004 was $532 million. The majority of this cost is attributable to melanoma (83.4%), with the balance distributed between basal cell carcinoma (9.1%) and squamous cell carcinoma (7.5%). The report projects that by 2031, the total estimated economic burden of skin cancer in Canada will rise to $922 million annually. The distribution across the three cancer types is predicted to shift as follows: melanoma (75.5%); basal cell carcinoma (13.3%); and squamous cell carcinoma (11.2%) (Krueger, Williams, Chomiak, & Trenaman, 2010).

2.9 Skin Cancer Prevention

Skin cancer is a largely preventable disease that is related to overexposure to solar UVR throughout the year and in particular, during the summer months. Skin cancer is the most common cancer diagnosed in Canadians. More than 75,500 new cases and 280 deaths from non-melanoma skin cancers (basal and squamous) are expected in 2010. Approximately 5,300 Canadians will be diagnosed with melanoma in 2010 and 920 will die of it (Canadian Cancer Society, 2010). In Ontario, skin cancer represents 1/3 of all new cancer cases.

Children and adolescents tend to be outdoors more than adults and overexposure to the carcinogenic effects of UVR during the early years of life is a major determinant of lifetime risk of skin cancer. According to the National Sun Survey Highlights report, (July 10, 2008), sun exposure on a typical summer day is greater for children than for adults, with over 50% of children spending at least two hours in the sun. Older children (ages 6-12) are more likely to spend at least two hours in the sun on a typical summer day than younger children (ages 1-5). Compared to younger children, older children not only spend more time in the sun but are also less likely to be protected from the sun. Over 50% of children also get their worst sunburn while watching or participating in outdoor recreational activities (Marrett, Rosen, Rhainds, Northrup, Purcell, & Leatherdale, 2008).

In addition, certain physical characteristics such as having fair skin, freckles, red hair, the tendency to burn easily and tan poorly, also predispose some people to a higher risk of developing skin cancer.

2.10 Why Children Require Special Protection

Children require special protection as they are at a higher risk of damage from overexposure to UVR than adults, in particular:

- A child's skin is thinner and more sensitive and even a short time outdoors in the midday sun can result in serious burns.
- Epidemiological studies demonstrate that frequent sun exposure and sunburn in childhood set the stage for high rates of melanoma later in life.
- Children have more time to develop diseases with long latency, more years of life to lose and more suffering as a result of impaired health. Increased life

expectancy further adds to people's risk of developing skin cancers and cataracts.

- Children are more exposed to the sun. Estimates suggest that up to 80 per cent of a person's lifetime exposure to UVR is received before the age of 18.
- Children love playing outdoors but usually are not aware of the harmful effects of UVR.

2.11 Vitamin D

Vitamin D is known to benefit bone and musculoskeletal health and emerging research is pointing to a possible protective effect offered against some cancers (such as colon) by maintaining adequate levels of this vitamin.

Solar radiation and fortified foods are sources of vitamin D. Health Canada recommends the use of vitamin D supplements for individuals over 50 years of age and breastfeeding infants. There is no need to seek increased or prolonged sun exposure or resort to indoor tanning. The risks of increased unprotected sun exposure or indoor tanning outweigh the benefits as a source of vitamin D.

Section Three

3. 0 THE POLICY FRAMEWORK

SECTION SUMMARY

The City of Toronto, through the adoption of various policies and action plans that complement the Shade Policy, has confirmed a direction and a policy basis for providing shade and UVR protection at municipal sites and facilities. The recognition by municipalities of the co-benefits of shade provision, namely reducing the heat island effect, reducing air pollution, addressing climate change, providing energy savings and encouraging physical activity, should provide the added incentive to address shade more proactively because of these value-added benefits which contribute to a healthier, safer and more comfortable environment.

3.1 Municipal Responsibility for Action

An increasing number of organizations are recognizing the need for shade. As knowledge about the dangers of ultraviolet radiation (UVR) to human health increases, so does demand for public facilities with adequate shade and UVR protection. Municipalities have to strive for a reasonable standard of care in providing programs, services and facilities to their citizens, especially to more vulnerable groups such as children.

The City of Toronto, through some of the adopted policies and action plans identified in this section, has confirmed a direction and a policy basis for providing shade and UVR protection at municipal sites and facilities. Ongoing strategic and policy planning will have to address an enhanced policy framework for the future, if a culture of Sun Safety is to be promoted and safe outdoor environments are to be provided.

If achieving City goals such as recreation for all citizens, active living and community health are to be encouraged through the use of outdoor spaces and facilities, during the hot summer months, then the adoption of policies to promote shade effectively have to be developed concurrently.

The recognition by municipalities of the co-benefits of shade provision, that is, reducing the heat island effect and air pollution, addressing climate change, providing energy savings and encouraging physical activity, should provide the added incentive to address shade more proactively because of these value-added benefits.

3.2 Existing Policy Frameworks that Support Shade

A. The Official Plan (Consolidated, 2007)

The vision of the Official Plan is about creating an attractive and safe City that evokes pride, passion and a sense of belonging - a City where people of all ages and abilities can enjoy a good quality of life. Parts of the Official Plan that relate to the provision of shade include:

A City with:

- vibrant neighbourhoods that are part of complete communities;
- attractive, tree-lined streets with shops and housing that are made for walking;
- clean air, land and water;
- green spaces of all sizes and public squares that bring people together;
- a wealth of recreational opportunities that promote health and wellness;
- cultural facilities that celebrate the best of city living; and
- beautiful architecture and excellent urban design that astonish and inspire.

The City's Official Plan provides clear policy direction for providing safe and comfortable public environments and thus, supports the development of policy, strategic planning and specific action plans and projects to provide shade and UVR protection to Torontonians as follows:

- Section 1.2.0: A City of Diversity and Opportunity: To be successful, our future must also be diverse, inclusive and equitable. Our future is one where:
  - innovative implementation solutions are embraced.
  - children and youth find their surroundings safe, stimulating and inviting.

- Section 2.3.1.5: Community and neighbourhood amenities will be enhanced where needed by:
  - creating new community facilities and adapting existing services to changes in the social, health and recreational needs of the neighbourhood.

- Section 3.1.16: Quality architectural, landscape and urban design and construction: Sidewalks and boulevards will be designed to provide safe, attractive, interesting and comfortable spaces for pedestrians by:
  - providing well designed and co-ordinated tree planting and landscaping, pedestrian-scale lighting, and quality street furnishings and decorative paving as part of street improvements.

- Section 3.1.1.17: The Public Realm (New Parks): New parks and open spaces will be located and designed to:
  - provide a comfortable setting for community events as well as individual use.

- Section 3.2.3.1: City Building: Toronto's system of parks and open spaces will continue to be a necessary element of City-building as the City grows and changes. Maintaining, enhancing and expanding the system requires the following actions:
  - designing high quality parks and their amenities to promote user comfort, safety, accessibility and year round use and to enhance the experience of "place", providing experiential and education opportunities to interact with the natural world.

- Section 4.3.6: Any development implemented in Parks and Open Spaces will:
  - provide comfortable and safe pedestrian conditions.

B. City of Toronto Sun Protection Policy for City Employees (2002, revised 2008)
A significant step forward was made by the City through the development of a Sun Protection Policy for City Employees who have outdoor work assignments and receive significant exposure to solar UVR and therefore are at increased risk of skin cancer and other adverse health effects. This policy was adopted by City Council in January 2002 and revised in 2008 when Toronto Public Health advised the Occupational Health and Safety Coordinating Committee (OHSCC) of changes to Environment Canada's UV Index and changes to Health Canada recommendations regarding the application of sunscreen.

The changes to the UV index were as follows:
- Increased sub-categorization of the index with information provided on precautions to be taken at each level (low, moderate, high, very high and extreme).
- Increased reference to the potential for reflection off snow, sand and other bright surfaces to contribute to increased UV exposure.

Health Canada amended its recommendation regarding the application of sunscreen by recommending that a second application occur 20 minutes after the first to maximize the sunscreen's protection.

C. Policy for the Provision of Shade at Parks, Forestry and Recreation Sites (2007)
After the circulation of the Shade Policy endorsed by the Board of Health, in 2007, Parks, Forestry and Recreation prepared a divisional operational policy to provide direction for its own division. This policy was adapted from the initial report to the Board of Health entitled, Shade Policy and Technical Considerations for the City of Toronto, (October 2004) and was intended to provide Parks, Forestry and Recreation staff with guidance in the planning and retrofitting of sites and facilities wherever possible; recognizing that shade (both natural and constructed) can be an effective way to reduce overexposure to UVR.

The Parks Forestry and Recreation Policy identified the following Policy Objectives:

Shade provision at Parks, Forestry and Recreation sites and facilities will be increased wherever feasible, as part of the division's approach to designing and retrofitting its assets.
- Short-term:
  - To increase the opportunities for UVR protection at Parks, Forestry and Recreation sites and facilities through education and promotion of shade strategies to appropriate staff members and to the general public where possible.

- To ensure that the provision of UVR protection is a consideration in the planning process with respect to the development of all Parks, Forestry and Recreation sites and facilities.
- To seek community advice and input to assist with planning of future shade creation activities as part of the division's regular capital program activities.

- Long-term:
  - To provide City staff and the public with greater opportunities to access shade at all Parks, Forestry and Recreation sites and facilities.
  - To implement, wherever possible, the UVR reduction strategies contained in this document with respect to the future development or redevelopment of all Parks, Forestry and Recreation sites and facilities.
  - To achieve continued and measurable growth in the number of UVR protection elements available at Parks, Forestry and Recreation sites and facilities.
  - To ensure UVR protection initiatives become an integral part of any new Parks, Forestry and Recreation development project.

D. Climate Change, Clean Air and Sustainable Energy Action Plans (March 2007)

Toronto's Commitment to an Environmentally Sustainable Future, Change is in the Air, was unanimously approved by Council in July 2007. This is the City's framework to engage the public on the issue of climate change and determine how the City will meet its greenhouse gas and air pollution reduction targets. The framework provides ideas on the strategies, policies, programs and projects needed to meet the City's ambitious reduction targets and identifies 27 potential actions that the municipal government, residents, businesses and industry can take to tackle climate change and improve air quality. One of the potential actions is to double the tree canopy to 34%, which will benefit overall shade provision. See www.toronto.ca/legdocs/mmis/2007/ex/bgrd/backgroundfile-2428.pdf

In 2007, the Climate Change Plan directed the Toronto Environment Office, in consultation with the Medical Officer of Health, to complete a process that engages all relevant City agencies, boards, commissions and divisions (ABCDs) and community partners in order to prepare a report to the Executive Committee that:

- identified the components of a climate change adaptation strategy for City operations and the community;
- Included the actions required to develop a climate change adaptation strategy. (See www.toronto.ca/changeisintheair/pdf/clean_air_action_plan.pdf).

At its meeting of July 2008, City Council adopted unanimously the proposed approach to developing a Climate Change Adaptation Strategy. The report is

entitled, Ahead of the Storm. See
www.toronto.ca/teo/pdf/ahead_of_the_storm_highlights.pdf

In February 2009, a staff information report was received by the City's Executive Committee entitled, Implementing the Climate Change, Clean Air and Sustainable Energy Action Plan. See
www.toronto.ca/legdocs/mmis/2009/ex/bgrd/backgroundfile-18575.pdf

This report provided an update on outcomes of policies, programs and activities in connection with the Climate Change plan. It reported that standards were being developed for shade for the City's playgrounds and waterplay facilities and that specific guidelines to assist City agencies and corporations to implement the Shade Policy would be forthcoming.

E. Toronto Green Standard (TGS)
The Toronto Green Standard (TGS) is a set of environmental performance measures that promote sustainable site and building design for new development. See www.toronto.ca/greendevelopment

All new City-owned development and all planning applications in Toronto are required to meet Tier 1, minimum standards of the TGS. The TGS also has a second tier, which is a voluntary higher level of environmental performance that could make an applicant eligible for a 20% refund on development charges.

The TGS addresses shade provision directly and indirectly in several areas. Under Pedestrian Infrastructure, it requires provision of weather protection (including shade) for outdoor waiting areas. Under Urban Heat Island Reduction: At Grade, it encourages shading of hardscape, including surface parking areas, walkways and other hard surfaces.

The TGS also places considerable emphasis on the important role of trees, It has high standards for tree planting conditions, maintenance and protection. There is also a requirement to plant a minimum of one tree on site for every 30m2 of post development site area covered by soft landscaping. The TGS and the Shade Guidelines are compatible, and when used together in the design and development of new sites, will ensure shadier and more comfortable environments for users.

F. City's Private Tree, Street Tree, Ravine and Natural Feature Protection By-laws

The City of Toronto's Private Tree By-law has been in effect City-wide since September 30, 2004 and it is intended to protect trees that are situated on private property from being damaged or unnecessarily cut down. The By-law regulates trees that have a diameter of 30 cm or greater measured at 1.4 metres above ground level on the main stem of the tree. The Private Tree By-law supports the City's Official Plan which recognizes the importance of trees to the quality of life of all Torontonians. (See: www.toronto.ca/trees/private_trees.htm)

The City of Toronto's Street Tree By-law protects all trees located on a common or public highway, road, street, lane or any road allowance or portion thereof under the jurisdiction of the City (See:www.toronto.ca/trees/bylaws_policies.htm).

Both the Private Tree By-law and the Street Tree By-law have proven to be an effective strategy in the protection, renewal and public awareness of Toronto's urban forest.

The City of Toronto's Ravine and Natural Feature Protection By-law provides for better management of public and private natural areas within the City. Specifically, the purpose of the By-law is to promote the management, protection and conservation of ravines, slopes, and natural features, and to prohibit and regulate the injury and destruction of trees, filling, grading and dumping in the Protected Areas.

G. Achieving Tree Canopy Enhancement

The City urban forest has an estimated tree canopy of 20% and is comprised of approximately 4 million trees on public land and 6 million on private property. In order to determine what will be required to double the tree canopy by 2050, a forestry study was undertaken to inform a strategy for growing the urban forest and identifying tree canopy potential for public and private land that will achieve the above objective.

The Official Plan recognizes the importance of the urban forest and investing in trees and recommends protection and enhancement of the existing urban forest and increasing the City's tree population which will also be an effective strategy to mitigate climate change and provide many other environmental, social and economic benefits. See www.toronto.ca/legdocs/mmis/2007/pe/bgrd/backgroundfile-4049.pdf

Section Four

4.0 CO-BENEFITS OF SHADE

SECTION SUMMARY

The Shade Policy provides numerous co-benefits in many areas that are important to human health. Most notably, they are mitigating the urban heat island effect, air pollution, climate change, and providing energy savings. The Toronto Green Standard (TGS) https://www.toronto.ca/city-government/planning-development/official-plan-guidelines/toronto-green-standard/ sets out specific measures relating to tree maintenance and planting as well as reducing ambient surface temperatures. In a time when obesity has become a major public health concern, the need for physical activity is becoming more and more important for both children and adults. Creating shade gives the public the opportunity and added incentive to participate in physical activity in their local parks, playgrounds and sportsfields in relative comfort. The TGS also promotes physical activity through setting out measures for an improved pedestrian, cycling and transit oriented environment. A comfortable outdoor setting for play also creates cognitive and psychological benefits to children.
The Shade Policy can assist in providing co-benefits in many areas that are important to human health. Most notably, they are as follows:

4.1 Mitigating the Urban Heat Island Effect

Heat islands develop in heavily urbanized areas as naturally vegetated surfaces are replaced with asphalt, concrete, rooftops and other hard-surfaced materials. Artificial materials store much of the sun's energy and remain hot long after sunset. This produces a dome of elevated temperatures over urban areas that are significantly higher than air temperatures over adjacent rural or suburban areas. A higher ambient air temperature in heavily urbanized areas increases the negative health impacts of heat waves. Heat is the major weather related killer within temperate climate cities and during extreme heat waves in vulnerable urban areas. Hundreds of people can die, as they did in Chicago during the 1995 heat wave.

Cities can be cooled by strategically planting vegetated areas throughout new and existing developments and parks. Trees and other vegetation can shade buildings, pavement, parking lots and roofs, and naturally cool urbanized areas by releasing moisture into the air through evapotranspiration (the discharge of water from the earth's surface to the atmosphere by evaporation from lakes, streams, soil surfaces, and transpiration from plants).

Constructed shade structures, such as awnings and gazebos, also provide cooling benefits through the reduction of direct impact ultraviolet light heating hard surfaces. Through direct shading and evaporative cooling, shade trees, vegetation and constructed shade structures can contribute to reductions in air conditioning use in summer.

Reducing ambient surface temperatures and providing shade for human health and comfort are other requirements of the TGS. For example, where surface parking is permitted and provided, internal shade trees must be planted at a minimum ratio of one tree for every five spaces.

4.2 Reducing Air Pollution

The onset of summer signals the beginning of an unfortunate cycle of environmental degradation. Heat turns summertime into smog season by "cooking" pollution and sunlight and accelerating the formation of smog. Smog is a photochemical reaction of nitrogen oxides (NOXs) and volatile organic compounds (VOCs). NOXs and VOCs react in sunlight and produce smog. The reaction rate is highly temperature sensitive. The 2004 Burden of Illness study estimates that air pollution in our City contributes to about 1,700 premature deaths and 6000 hospitalizations on an annual basis (Toronto Public Health, 2004).

Shade trees and shading structures, by lowering ambient air temperature, can help to slow the process of smog formation and improve local air quality. Trees provide the dual function of lowering ambient air temperature and increasing evapotranspiration and absorption of harmful airborne pollutants such as carbon dioxide (CO2).

Toronto Public Health has been encouraging Torontonians to use the Air Quality Health Index (AQHI) instead of smog alerts. The Air Quality Health Index measures air quality in relation to health on a scale from 1 to 10. The higher the reading, the greater the health risk and hence the greater the need to take precautions. (See www.toronto.ca/health/airquality/aqhi/about.htm)

4.3 Mitigating Climate Change

Climate change is expected to exacerbate heat stress mortality significantly. In Toronto, the average number of days that exceed the heat-stress threshold of 32ºC is currently 5, and is projected to double by the 2020s, and surpass 30 by the 2080's (Chiotti & Mills, 2002).

Air pollution and climate change are two different problems with one common source. They are both caused when fossil fuels are burned for energy. Shade can play a significant role in the reduction of emissions from the burning of fossil fuels for energy. Not only will this help to reduce local air pollution and help mitigate global climate change, but it can also have the added benefit of financial savings. The use of trees as a shade device also has the benefit of acting as a carbon sink and thereby reducing CO2 in the atmosphere.

As an adaption strategy to climate change, TGS sets out specific measures relating to tree maintenance and planting. For example, measures are provided that require developers to retain all trees that are 30 cm in base diameter or to plant a minimum of one tree on-site for every 30m2 of site area covered by soft

landscaping, for example. These elements of the TGS will aid in maintaining a mature, healthy and long-term natural shade canopy for the City of Toronto.

4.4 Providing Energy Savings

The costs of planting shade trees or erecting shade structures to protect humans from the carcinogenic effects of overexposure to UVR can be partially offset through strategic placement of shade trees or structures to reduce energy costs. These energy costs will be reduced through reduced ambient air temperature surrounding buildings, homes and offices which may, in turn, reduce demands for air conditioning.

A study undertaken in 2002 by the Lawrence Berkeley National Laboratory for the Toronto Atmospheric Fund, determined that potential peak-power avoidance through the implementation of urban heat island mitigation strategies was about 250MW (about a 20% reduction in peak power use). Shade trees planted strategically, accounted for 51% of that potential energy savings (Akbari & Konopacki, 2001).

4.5 Increasing Physical Activity

In a time when obesity has become a major public health concern, the need for physical activity has become more and more important for both children and adults. It is hypothesized that the level of physical activity as part of a lifestyle may be established as early as in preschool age (National Centre for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention, 1997: License, 2004). A lack of space and attractive opportunities for outdoor play involving physical activity is, along with unhealthy diets, a major cause of overweight that has befallen 10% - 40% of the children in developed countries (Blair et al., 1994).

According to the Heart and Stroke Foundation of Ontario 2009 Annual Report, at present, 28% of Ontario's children are overweight or obese, putting them at risk of developing high blood pressure, heart disease and Type 2 diabetes (Heart & Stroke Foundation 2009). The Foundation, in an earlier report put the rate for Canadian adults at 60% (Heart & Stroke Foundation 2004). Thus, creating shade provides an environment that protects the public from the harm of UVR exposure while at the same time offers a cool and comfortable environment that fosters participation in physical activity. This promotes better active and passive use of parks and open spaces by the public.

4.6 Providing Cognitive and Psychological Values to Children

When outdoor environments are easily accessible, safe and comfortably designed to provide shade during the summer, they will encourage more use and contribute to healthier behaviour among children.

Where children have the opportunity for free play in the outdoor environment they will be better able to get along with others, healthier and happier. A well-

documented article by two physicians builds a strong case for the importance of unstructured free play in the outdoors for all age groups, and especially young children. While concerned about the “obesity epidemic” in young children, the authors say that the health benefits from outdoor play are only one aspect of the overall benefits. They suggest that the concept of “play” is more compelling and inviting to most adult caregivers, parents and guardians than “exercise.” The authors state there are cognitive benefits from play in nature, including creativity, problem-solving, focus and self-discipline. Social benefits include cooperation, flexibility, and self-awareness. Emotional benefits include stress reduction, reduced aggression and increased happiness (Burdette & Whitaker, 2005).

Furthermore, a study published in the August 2008 Journal of Attention Disorders finds that for children with Attention Deficit and Hyperactivity Disorder (ADHD), a 20-minute walk in a park may improve the ability to concentrate. The study was conducted at the University of Illinois by child environment and behavior researchers Andrea Faber Taylor and Frances E. Kuo. “From our previous research, we knew there might be a link between spending time in nature and reduced ADHD symptoms” (Faber Taylor, & Kuo, 2009).

Part II – Shade Guidelines

Section Five

5.0 A CULTURE OF SUN SAFETY

SECTION SUMMARY

The promotion of a culture of Sun Safety not only includes public education about personal skin and eye protection measures but it also builds awareness about where and when to use outdoor environments. Similarly, the planning and design guidelines presented in this document, which typically focus on physical interventions of structures and trees to create shade include, as part of an overall Sun Safety strategy, recommendations about site programming, events scheduling and personal protection measures.

5.1 Sun Safety Recommendations

All levels of government including municipalities have a responsibility to promote public health objectives and a culture of Sun Safety. In temperate climate countries such as Canada, for many people, the use and enjoyment of outdoor facilities and spaces is restricted to the warmer months. However, there is not always a thorough understanding of the potential risks of overexposure to UVR. Public education and awareness building will have to be key components of developing a culture of Sun Safety, especially among young people who are at the highest risk of overexposure to UVR during the summer months.

Guidelines for the Sun Safe use of outdoor environments are presented in the following section: Sun Safety Recommendations and include recommendations for protective clothing, hats, sunscreen and sunglasses, as well as seeking shade and the appropriate planning and scheduling of events.

The promotion of a culture of Sun Safety not only includes personal skin and eye protection measures but also builds an awareness about where and when to use outdoor environments. Thus, the planning and design guidelines presented in this document, which typically focus on physical interventions of structures and trees include, as part of an overall Sun Safety strategy recommendations about site programming, events scheduling and personal protection measures. It is important to stress that solutions need to address a full spectrum of potential solutions and preventive measures.

Sun Safety Recommendations:

- Limit time in the sun between 11 a.m. to 4 p.m. or whenever the UV Index is 3 or more.
    - When possible, plan outdoor activities before or after this time to avoid being outside when the sun’s rays are the strongest
    - Keep babies under one year of age out of direct sunlight

- Look for shaded areas to do outdoor activities

    - Do outdoor activities in shady spots (i.e. under a tree or in the shade of a building)
    - Create shade by using an umbrella, awning, or canopy.

- Wear a hat with a wide brim or with a visor and back flap
    - A hat with a wide brim (7.5 cm or 3 inches wide) or with a back flap will help shade the head, face, eyes

- Wear clothing to protect as much skin as possible
    - Long-sleeved shirts and long pants (or at least knee-length shorts) are recommended even on cloudy days
    - Tightly woven fabrics block the sun's rays best. Fabrics that block out the light when held up to a light bulb will help block UV rays
    - T-shirts (in addition to sunscreen) can be worn when in water

- Wear UVA and UVB protective sunglasses
    - Sunglasses that wrap around the face offer better protection
    - Children's sunglasses should be unbreakable

- Use a sunscreen with SPF 15 or higher that gives protection from both UVA and UVB rays
    - Sunscreen should be applied about 30 minutes before sun exposure. Apply a second time 20 minutes later
    - Reapply every 2 hours or after swimming, towelling or exercising
    - Sunscreen should be used even on cloudy, hazy or foggy days
    - Sunscreen is not recommended for infants under six months of age
    - No sunscreen protects 100%. Use it with the other Sun Safety Recommendations

- Avoid indoor tanning

Section Six

6.0 TYPES OF SHADE

SECTION SUMMARY

Shaded areas that are well designed and incorporate structures and plantings that create a pleasant and comfortable environment are more attractive to the user than poorly designed areas. Shade can be provided through a palette of options ranging from ‘natural shade’ solutions which use trees, large shrubs, vines and ground covers to block direct UVR and absorb indirect UVR to ‘constructed shade’ that is designed and configured to meet specific needs and uses manufactured components. Trees with dense, wide canopies and low foliage create the most shade and shield humans from overexposure to UVR and the risk of skin cancer. Precise location and selection of trees are critical for best results. Another option, portable shade devices can provide a quick solution for individuals or small groups, yet they are not effective for larger groups and generally do not provide effective protection for indirect UVR. A combination of natural and constructed shade is often the best UVR protective solution as structures can be installed until trees planted for shade provision are able to mature over an estimated 10 year period.

6.1 The Role of Shade

It is important to become familiar with the climatic elements of a location in order to design UVR protective shade which is comfortable for human use at the right time of the day and at the right time of the year. If a shelter does not address human comfort, it will not be an effective control against overexposure to UVR, because it will not attract use (Greenwood, Soulos, & Thomas, 2003).

There are several elements that make up the contextual environment of outdoor spaces and which affect human comfort. These include:

- air temperature
- air movement (breeze)
- humidity or water content of the air
- light, either as direct sunlight or reflected from surfaces
- heat radiated from the sun and from the surroundings

Shade offers the sensation of a change of temperature by providing shelter from both direct and indirect UVR. Shady areas are perceived as being cooler.

Users do not typically respond to UVR levels when outdoors but become uncomfortable from high air temperature, hot surfaces, lack of air movement and bright light. Hopefully, through public education and building awareness about the dangers of UVR overexposure, people will adopt a culture of Sun Safety and associate the uncomfortable feeling of being in hot, sunlit environments with the

potential for UVR overexposure and skin and eye damage, and seek shade for health as well as comfort reasons.

Shaded areas that are well designed and incorporate structures and plantings that create a pleasant and safe environment are more attractive to the user than poorly designed areas that do not invite use. Shade can be provided through a palette of options ranging from ‘natural shade’ solutions which use trees, large shrubs, vines and ground covers to block direct UVR and absorb indirect UVR to ‘constructed shade’ that is designed and configured to meet specific needs and uses manufactured components. There are also options for providing shade quickly on a temporary basis through ‘portable shade’ solutions.

6.2 Natural Shade

Natural shade options, including vegetation such as trees, shrubs, vines and ground covers are an essential part of shade planning and site design and possess many qualities that can enhance outdoor facilities and sites. As people intuitively associate trees with shade when seeking relief from the heat of the sun, it makes sense to place a high priority on the strategic use of trees and plantings in the design of outdoor spaces.

One of the principal means of providing natural shade in public places is through the planting and nurturing of trees. Trees can be planted and with appropriate care can provide significant and long-term benefits to the health of a community. More trees mean more protection from UVR. Trees with dense, wide canopies and low foliage create the most shade and shield humans from overexposure to UVR and the resulting risk of skin cancer. In order to be most effective, trees should be planted to provide coverage where people of all ages, especially children, congregate. In the City of Toronto, Urban Forestry’s mandate to increase the City’s tree canopy will result in more trees in public spaces that will maximize the tree canopy. When integrated with the site programmatically, trees can provide shade effectively where it is most needed.

When choosing trees to plant for shade provision, tall deciduous trees with wide canopies of dense leaves will provide maximum shade in the summer, while allowing the warming rays of the sun to come through in the winter (See Appendix A: Types of Trees).

Trees generally need to be located to the south and southwest of the site or facility requiring shade. Several factors should be considered for the use of natural shade and the selection of tree species at sites:

- Site environment (climate, soil)
- Size and shape of tree at maturity – avoid trees with invasive roots and those that will grow too large for the area
- Tree care requirements – watering, fertilizing, pruning

Precise location and selection of trees should be established through careful investigation of site conditions and confirmation of the degree and location of shade required for site activities (See Section 7 – Planning for Shade).

Tree Canopy Density Guide

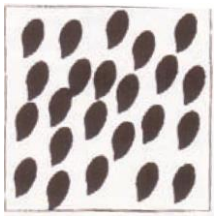
The Canopy Density Guide will help you to assess the level of UVR protection provided by different trees.
View the tree canopy against sky and compare with illustrated leaf/canopy patterns. Estimate which pattern of sky
and leaves most closely approximates the observed canopy.

Heavy – Over 90% UVR Protection

Good protection from direct UVR. Protection from indirect UVR will depend on canopy size and where a person is positioned under the canopy. Suitable for long-stay use if personal sun protection measures are also used.

Medium – Around 60% UVR Protection

Filtered shade provides low levels of protection from direct and indirect UVR. Suitable for short-stay use only. Personal sun protection measures should also be used.



Light – Less than 30% UVR Protection

Poor protection from direct and indirect UVR. Suitable for transit shade only.

(Greenwood, Soulos, & Thomas, Under cover: Guidelines for shade planning and design NSW Cancer Council and NSW Health Department Sydney, 2003).

6.3 Constructed Shade

When considering constructed shade, the key is to make sure the right structure is in the right place and that it accommodates changing sun angles. New technologies – for example, structures that fold or move – make it possible to vary the interaction of the structure and the user for the most effective protection from sun as well as inclement weather.

Constructed shade structures can be permanent or portable. Portable or temporary structures can include umbrellas, awnings and tent-like structures (See 6.4 – Portable Shade). Permanent structures such as pavilions or gazebos are usually sturdier and they provide a permanent shade solution. At some sites, the risk of vandalism may need to be considered in the design, location and selection of materials for the structure that will provide the shade.

One advantage of using constructed shade systems, especially permanent systems, is that they can often be used for purposes other than providing shade. For example, an overhead shade structure could be used to provide protection from rain, it could collect rainwater for irrigation and it could support solar panels.

Natural and constructed systems of shade can be combined in strategies for UVR protection. Short-term structures can be installed until trees planted for shade provision are able to mature. These types of structures should have a life span of up to 10 years to allow for a reasonable amount of growth of the shade trees.

Structures can be combined with natural vegetation to provide a hybrid type of shade producing solution. For example, a vine covered overhead pergola or a lattice screen, interwoven with climbing plants, can be effective to block overhead sunlight as well as reflection and absorption of indirect UVR.

Constructed (non-natural) shade elements can be classified into a number of types, including:

- Permanent – designed to last more than 10 years, (i.e. pavilions, gazebos, overhangs)
- Demountable – needs to resist wear and tear from installation/demounting process, (i.e. large tents, marquees, lightweight tension structures)
- Adjustable – flexible and easy to operate, typically attached to a building or structure, (i.e. awning, louvered roof or wall). Adjustable devices can adapt to year-round use, to allow better sunlight penetration in winter months when sun and warmth are desirable
- Tensile – visually striking, can span large areas with few support structures, permanent or demountable (i.e. shade sails).

A well-constructed shade structure will result in shade that falls in the right places and at the right times of the day throughout the year, creates an outdoor space that is comfortable to use in all seasons, minimizes the impact of indirect UVR on the space, and is attractive, practical and environmentally friendly. Materials used should reduce reflectivity. The structures should be adequately sized, using barriers for side and overhead protection. Overhead barriers should be extended past the actual use area to provide optimal shade.

Example of constructed (gazebo) and natural shade working together. Photo: ©Parks, Forestry and Recreation.

Recent advances with tensile structures have resulted in some exciting new structures that can span outdoor areas and be positioned to strategically provide shade. Often known as 'shade sails', these structures can enhance a site with an interesting and iconic type of design form. As well, shade sails and similar tensile structures can be demounted at the end of the season and stored, thus, increasing their life span. This is especially appropriate in the typical Canadian climate where excessive UVR levels and exposure is not a concern year-round (See Appendix B: Constructed Shade Materials).

6.4 Portable Shade

Portable shade should be seen as an appropriate and inexpensive solution to provide some UVR protection when and where needed especially where other shade options are not available, such as on the beach.

Examples of portable shade are:

- umbrellas for personal use, including those that can be rented or provided on-site
- umbrellas for supervisory staff (i.e. lifeguards)
- beach cabanas
- small marquees, tents and shelters that can be dismantled easily for markets, displays, special events.

Source of photo: Dave Broadhurst, Solar UV in Ontario, Presentation, May 2007.

While portable shade devices can provide a quick solution for individuals or small groups, they are not effective for larger groups and generally do not provide effective protection for indirect UVR (See Appendix C: Comparing the Types of Shade).

Section Seven

7.0 PLANNING FOR SHADE

SECTION SUMMARY

The Shade Audit is an effective evaluative tool available to those planning for shade provision at sites and facilities and for subsequently developing design solutions. It outlines a comprehensive process that will allow managers of sites as well as designers to understand where there are sun exposure risks and what steps can be taken to minimize those risks. A Shade Plan should be prepared after a Shade Audit is conducted. The Shade Inventory is an important planning tool that can be used to prioritize the need for shade and as such provides a framework for decision-making and allocation of funds to the sites with the greatest needs. Furthermore, the use of computer software for shade should be considered when sites are complex and resources are available. The most comprehensive and relevant tool is WebShade, an interactive software application developed by Australian architect and consultant, John Greenwood. WebShade allows users to assess UVR risks of outdoor activity areas and prepare shade projection models. The software has recently been used to assist with the assessment of playground and waterplay facilities at eight City of Toronto Parks on a trial basis.

7.1 The Shade Audit

Background

The Shade Audit is an effective evaluative tool available to those planning for shade provision at sites and facilities and for subsequently developing design solutions. It outlines a comprehensive process that will allow managers of sites as well as designers to understand where there are sun exposure risks and what steps can be taken to mitigate those risks.

The Shade Audit was developed in Australia by architect John Greenwood who along with G.P. Soulos and N.D. Thomas developed the document Undercover: Guidelines for Shade Planning and Design in 1998 and revised in 2003.

This document, has become a seminal work in promoting awareness about shade provision and providing tools for its evaluation and implementation. John Greenwood subsequently developed the WebShade software that has refined the Shade Audit process into an interactive computer based tool. To date, this software has been tested but not been applied comprehensively in a Canadian context. However, it holds promise as an accessible tool to expedite the Shade Audit process.

The Shade Audit Process

The Shade Audit process as outlined in Appendix D, has been developed from the Australian model and is the recommended approach to be followed to properly evaluate a site and propose solutions for shade provision and UVR protection for users. Key steps are summarized below:

A. Understanding Site Users and Activities
B. Conducting an Inventory of Site Conditions and Existing Shade
C. Identifying Potential Risks
D. Making Recommendations

It is recommended that a proper Shade Audit be carried out for specific sites, to allow a thorough understanding of the site and users and to allow thoughtful solutions to be recommended for a subsequent design stage.

When time and resources are available, especially for individual complex sites, the Shade Audit should be carried out at a detailed level, including the use of software where possible for evaluating and modelling shade (See 7.5 – Shade Software).

It is recommended that even when time and resources do not allow, that an initial screening or review of the site be carried out by following the steps of the Shade Audit process to gain an appreciation of the challenges and complexities at each site and the range of possible solutions. Staff face enormous challenges in managing large numbers of facilities and sites (i.e. over 1000 playgrounds and waterplay facilities used by young children in the City of Toronto), so the ability to effectively evaluate specific sites through a Shade Audit process is a critical tool that can be made available to staff and enhanced where possible through the use of computer software.

Even when a summary evaluation of a number of sites is undertaken to determine priorities for UVR protection (See 7.4 – Shade Inventory), the Shade Audit process, undertaken at a higher level following the four steps, can provide good results to inform future work.

7.2 Applying the Shade Audit Tools

Investigating Specific Sites

Appendix D: The Shade Audit provides a comprehensive process checklist for evaluating specific sites and facilities and for establishing with recommendations for shade provision. The four key steps or tools that make up the Shade Audit process are summarized below. Please refer to Appendix D for details.

A. Understanding Site Users and Activities

This stage focuses on identifying the primary users of the site and documenting usage patterns, including time of day and season when the site is busiest and how use correlates to the Critical Protection Time (CPT). It is important to

distinguish which activities are discretionary (allow users to attend a site when and for how long they choose) vs. non-discretionary activities (i.e. scheduled performances, sporting events, waiting in lines). This will assist in establishing clear program requirements for shade in a particular location, including user needs, activity patterns, and facility requirements. Information is gathered primarily by observation at the site and interviews with site users and managers or supervisors at the site or facility.

The important questions to ask and observations to be made as part of this step include:

1. What are the main activities on the site? Who are the users of the site, both individuals and groups?
2. When do activities occur? What time of year or time of day is the site used?
3. What is the duration of each type of activity?
4. What are the ages of the users?
5. How well-used is the site?
6. Are there activities on the site which are discretionary vs. non-discretionary?
7. What is the likelihood of risk behaviour?

B. Conducting an Inventory of Site Conditions and Existing Shade

This stage focuses on assessing the physical site conditions and the quantity and usability of existing shade on the site. It involves observation, interviews with site managers, and the collection and documentation of field data related to the major areas of activity, trees and structures on the site. Software programs that can project shade patterns are useful at this stage to understand available shade at times of year and times of day when direct observation has not been possible during the inventory stage. An understanding of future plans for the site is also important at this stage.

The important questions to ask, observations to be made and data collected as part of this step include:

1. How does the site accommodate existing uses? Where on the site do the main activities and site uses occur?

2. Identify the existing shade (quantity and quality) provided on the site by trees? Determine the effect that future tree growth will have on the amount of shade provided at the site.
3. Where is the existing shade (quantity and quality) provided on the site by buildings and structures?
4. Does the nature of the site or facility place constraints on shade provision?
5. Do site users and activities on the site take advantage of available shade?
6. What are the potential effects of indirect UVR at the site?
7. Would a structure be useful for other things besides shade protection?
8. What are the future plans for the site?

C. Identifying Potential Risks

Identifying potential risks is an important stage of the Shade Audit process. The questions to ask and assessments to be made as part of identifying potential risks include:

1. How adequate is the existing shade at the site, particularly during summer?
2. Is the amount of shade adequate for the number of people using the site?
3. Is adequate shade provided for each type of user?
4. In areas of non-discretionary use, is adequate shade and UVR protection available?
5. Are there areas where indirect UVR is a problem and needs to be mitigated?

D. Making Recommendations

Once the use of the site is understood, the physical nature of the site has been documented, data collected about existing shade and the potential risks have been identified, the actions required to reduce the risk can be decided. These can take the form of specific design recommendations or implementation strategies for how to implement shade within a larger project and meet other project objectives. Some modeling of shade using software is useful at this stage to establish the feasibility of different solutions that are proposed at this stage.

Not all recommendations need to focus on design interventions on the site – there are strategies for scheduling and programming activities and promoting Sun Safety that can help to reduce the risk at any site.

The key strategies to develop and recommendations to consider include:

1. Establish an overall shade provision and UVR reduction goal for the site or facility.
2. Consider whether there are options to relocate the activity or facility to better access available shade.
3. Change the time of the event relative to the Critical Protection Time (CPT).
4. Develop a strategy for the addition of natural, constructed or portable shade to reduce the risk.
5. As part of the overall strategy, develop plans for natural shade.
6. As part of the overall strategy, develop plans for constructed shade.
7. Specify portable shade if appropriate to the site and activity.
8. Develop a strategy to deal with indirect UVR.
9. Incorporate planning principles and design standards that complement shade planning.
10. Promote Sun Safety and personal protection measures.

7.3 Preparing a Shade Plan

A Shade Plan should be prepared after a Shade Audit is conducted and there is a clear indication from the Audit Process that there are UVR risks on the site and recommendations to mitigate the UVR risks have been identified. The Shade Plan provides the opportunity to associate the recommendations with the specific areas of the site and identify them on a site plan.

The recommendations from the Shade Audit process and the site plan drawing can then be incorporated with specifications or performance standards for the required shade. Software can be used to model proposed shade and determine feasibility of proposals. Other recommendations not related to design such as event programming and the promotion of Sun Safety at the site can be added as well to create a complete Shade Plan package for a site. This can guide future decision-making and assist in the funding of projects. It can also act as a 'design brief' that is provided to design professionals such as landscape architects and architects and the suppliers of shade structures.

A Shade Plan should include:

- The completed Shade Audit including summaries from the four stages and how information was collected and analyzed;
- The Shade Plan Drawing that identifies in detail the key areas of the site and the recommendations for improving shade and providing UVR protection;
- A Design Brief that identifies the performance standards for the shade structures or tree plantings proposed, so the designer or supplier knows the parameters to work within;
- Estimated costs for implementing the shade improvements, if known. These can be useful to assist fundraising, securing partner funding or make submissions for Capital funding within the municipality.

7.4 The Shade Inventory

Shade provision is an important consideration at all sites where people gather and spend time outdoors, especially during peak times of UVR exposure. Some sites clearly have a greater need for shade and UVR protection than others and municipalities with limited staff resources and budgets must be able to establish priorities for the development of shade protection.

The Shade Inventory is an important planning tool that can be used to prioritize the need for shade, especially for municipalities and other organizations that are responsible for a large number of facilities and sites. The Shade Inventory provides a framework for decision-making and allocation of funds to the sites with the greatest needs.

The Shade Inventory is also a useful tool as well for large sites that are in themselves a collection of individual elements and situations for

which shade provision can be evaluated, for example large parks and campus settings.

The four stages in preparing a Shade Inventory are the same as those for a Shade Audit, but are done at a higher level and with less detail. To recap, the four stages that make up the Shade Audit process are:

A. Understanding Site Users and Activities
B. Conducting an Inventory of Site Conditions and Existing Shade
C. Identifying Potential Risks
D. Making Recommendations

See 7.2 Applying the Shade Audit Tools for a list of basic questions to be asked to quickly assess and prioritize sites. For additional details See Appendix D: Shade Audit Process Checklist.

The Shade Plan that is typically developed for the Shade Audit can also be developed in a more general way for the Shade Inventory and provide direction at a larger scale for a number of sites and identify priorities for further action.

Appendix D provides a complete checklist of steps needed to complete both a Shade Inventory and the more detailed Shade Audit. As noted, the factors to be considered and sequence of steps to be taken is similar for both, only one is more detailed, reflecting the time and resources available once a commitment is made to auditing a specific site in more depth. In fact, the findings of the Shade Inventory can trigger the need for more detailed investigation and analysis of sites using a full Shade Audit.

7.5 Shade Software

The use of computer software to document site data, prepare accurate site plans and model existing and proposed shade should be considered when sites are complex and resources are available.

Most computer drafting (CAD) and graphic design programs can now perform shade projection and modeling functions, allowing the user to see where existing shade is falling at any time of the year or any hour of the day. An investment of time and resources is required before the benefits of these programs can be realized. For example, software needs to be acquired, staff need to be trained, site measurements need to be taken and data has to be carefully entered into a 3D site plan.

When existing trees on a site are measured, for example, the height, width and shape of the canopy and other structures on the site are similarly documented in three dimensions, the information can be embedded in the base plan of the site and used to project shade patterns during the Site Inventory stage. Tree growth

over a number of years can be simulated to anticipate future shade projection of trees that have matured.

The management of tree data within a municipality has been enhanced by the popularization of Geographic Information System (GIS) and various web-based applications. Software tools have been developed in the field of urban forestry to conduct and monitor tree inventories (i.e. Neighbourwoods, CityGreen, iTree tools, etc.). These tools are used to manage trees and determine their benefits such as carbon sequestration (the long-term storage of carbon dioxide and other forms of carbon to mitigate global warming, and provide energy savings and shade provision).

At the subsequent stage when recommendations are being made, software can be employed to quickly model shade solutions. For instance, planting of new trees of a certain size or the addition of structures at a conceptual basis, can test the feasibility of proposed solutions. As part of the Shade Plan, this modeling can inform a design brief that outlines shade requirements to be met in detailed design and project implementation stages (See 7.3 – Preparing a Shade Plan).

WebShade

The most comprehensive and relevant tool to the development of the *Shade Guidelines is WebShade,* a software application developed by Australian architect and consultant, John Greenwood. This program incorporates the accuracy available in CAD and graphics programs with a comprehensive Shade Audit process to provide an effective tool for shade analysis at specific sites.

WebShade is an interactive software package that can assist municipalities and consultants to prepare strategic plans for public open space using a Shade Audit tool to objectively determine solar protection needs and solutions. WebShade allows users to assess UV risks of outdoor activity areas and prepare shade projection models.

The Use of WebShade in Toronto on a Trial Basis

The software was used to assist with the assessment of eight Toronto playground and waterplay facilities as a Shade Audit pilot project. The results of the pilot project will assist the City of Toronto's Parks, Forestry and Recreation division to plan and develop a methodology for auditing numerous other sites (including over a thousand other playground and waterplay facilities) in the City's system of parks and recreation facilities. As part of the pilot project, City staff worked in partnership with a study team led by George Thomas Kapelos, Associate Professor at Ryerson University, Department of Architectural Science. The team were able to use *WebShade* on a trial basis and came up with the

following findings in their 2010 report entitled, *City of Toronto Public Playgrounds and Waterplay Facilities Shade Audit Pilot Study.*

1. WebShade demonstrates its effectiveness and centrality to the goals of the project, as an essential and important tool in the auditing of sites, for the production of comprehensible results, and in the concomitant determination of risk on a site, user and activity basis.
2. As WebShade is configured for the Southern Hemisphere (notably in settings for locational and atmospheric data and vegetation types), operational adjustments and basic assumptions regarding vegetation are required to carry out the pilot project and achieve correct results.
3. To be effective as a tool, WebShade will need to be configured for use in Toronto.
4. Competencies for using WebShade include understanding the operation of the software, capacity to manipulate and format data for efficient and accurate input, and basic level word processing/report writing skills.
5. The basic information required by *WebShade* with regard to trees and tree data, that is, tree height, type and size of canopy was readily ascertained by on-site determinations, ideally carried out when trees are in leaf.
6. WebShade's report output allows for quick and comprehensible translation of results.
7. WebShade contains within it essential tools to determine risk, which are not available in any other software.

Section Eight

8.0 SHADE GUIDELINES FOR SPECIFIC SITES

SECTION SUMMARY

These site specific guidelines have been prepared in collaboration with Parks, Forestry and Recreation (in the lead), City Planning, Urban Design and Children's Services on the Shade Policy Committee who provided information that was used to complete a very comprehensive template for each of the 11 site types below.

The information for each specific site should be used in conjunction with the Appendices (A, B, C and D). There is a description of each site, followed by the application of the 4 steps of the Shade Audit for each site; they are: A. Understanding site users and activities, B. Conducting an inventory of site conditions and existing shade, C. Identifying the potential risks and D. Making recommendations based on the outcome of the assessments with respect to improving shade in those areas (whether by plantings or constructed structures, appropriate events scheduling and any other measures that would create a Sun Safe and comfortable environment).

Most of the facilities covered in this section enjoy their greatest use during the summer months and at many of them users are mainly children who are at the highest risk of overexposure to UVR. Some sites clearly have a greater need for shade and UVR protection than others and municipalities with limited staff resources and budgets must be able to establish priorities for the development of shade protection.

Southern Ontario has the strongest UVR in Canada. Sun protection is required from spring through fall, especially during the Critical Protection Time (CPT) which is from 11 a.m. - 4 p.m. Eastern Daylight Time (EDT) and when the UV index reading is 3 or higher. Even though a maximum window of 10-15 minutes of exposure to UVR is cited when skin is unprotected, nevertheless, in Toronto, unprotected skin can burn in as little as just a few minutes during high UVR level days.

The outdoor facilities and sites covered in this section are:

- Waterplay and Swimming Pools
- Special Activity Areas in Parks
- Childcare Centres
- Playgrounds

- Pathways and Trails
- Paved Activity and Play Areas
- Beaches
- Sportsfields
- Public Squares
- Streetscapes
- Parking Lots

8.1 Waterplay and Swimming Pools


Description

Facilities include outdoor swimming pools that have a controlled or paid access, are supervised and have set hours of operation, wading pools that are open to the public and are staffed and operated at set times during the day, and splash pads (also known as spray pads) that are user activated and generally not supervised. Although these facilities attract all ages of users, there is a focus on children and youth especially at waterplay facilities and wading pools. These facilities enjoy their greatest use during the summer months and users are minimally clothed, in bathing suits. These facilities should be a priority for UVR protection and the promotion of Sun Safe practices.

Each subsection in the chart focuses on the application of the Shade Audit and its individual steps (See Section 7 – Planning for Shade). This information provides guidelines on how to look at, evaluate, investigate each facility and site type and provides a palette of design solutions. For large or complex sites, the execution of the complete Shade Audit is recommended. These guidelines will help staff in evaluating the sites within their jurisdiction and alert them to potential UVR risks and possible next steps to improve shade, provide UVR protection and promote Sun Safe public environments.

A. Understanding Site Activities and Users

- Distinguish between the active participants and users of the site and spectators and caregivers who are observing the activity. Pools, splash pads and wading pools will have active participants who come out of the water and active play area to rest on the edges of the area. These different users will have specific shade protection needs to address.

- Recognize that lifeguards and other staff supervising the facility have special needs, especially since they are typically at the site for long periods of time without the ability to change locations to avoid UVR exposure. Note: Employees might be subject to special consideration and protection as part of their terms of employment or union contract.

- Identify activities (i.e. swimming pools) where a fee is charged for entry. The City should take responsibility, if charging admission, to advise these users of personal sun protection measures and make best efforts to provide shaded areas for the activity.

- Identify typical times when activities occur. Pool and waterplay facilities are typically at their highest level of use during the Critical Protection Time (CPT): The CPT is the period of greatest daily UVR intensity and occurs between 11 a.m. - 4 p.m. Eastern Daylight Time (EDT) between April and September, especially during June and July. Sites that are well-used during these times have an increased need for UVR protection and shade.

- If people are required to wait in line, (i.e. for entry to a pool), they might be at risk of harmful sun exposure if waiting period exceeds 10-15 minutes, especially during CPT. The duration of use at these facilities typically lasts longer than 15 minutes during the CPT.

- Distinguish among the various age groups who use the site and understand that sun protection strategies have to address the needs of each age group.

- Identify specifically the number/proportion of children and adolescents using the site. The characteristics of the age group are important in determining the risk of UVR-related skin damage. Children and adolescents exposed to large amounts of solar UVR have a significantly greater chance of developing skin cancer later in life. Sites where children and adolescents are the main users should be a higher priority for UVR protection and shade.

- Sites that are well-used should generally take priority over less used sites. Larger numbers of people at swimming pools and waterplay areas may overwhelm limited amounts of existing shade and force some users out into unprotected areas.

- Will there be increased use and demand at these facilities in the future? Remember that even though a site is not well-used, it might be a reflection of poor shade protection and overall user comfort, which make the site unattractive for use.

- Unprogrammed uses at pools and waterplay facilities generally allow discretion on the part of the user, that is, they have some degree of choice or flexibility on when to visit the site and access available shade. A reasonable amount of shade needs to be available, though, to meet these needs.

- Activities at these facilities generally involve less protective clothing and can lead to higher levels of UVR exposure. Users with minimal clothing have exposed skin which can lead to higher risks of sunburn and UVR damage, especially among children and adolescents.

- Children at play at these facilities may be more likely to engage in risk behaviour than adults, who more typically seek out shade for protection or comfort. Even in situations where children may be supervised by adults at pools or waterplay facilities,

their behaviour might still be a risk, as the supervising adult may not be aware of Sun Safe practices or enforce solar protection strategies.

B. Conducting an Inventory of Site Conditions and Existing Shade

- For each activity area or zone of use, observe the level and quality of shade provided by trees and structures, especially during the CPT. General assessments (See 7.4 – The Shade Inventory) can focus on the observed shade throughout the site, which can identify priorities for future detailed assessments. Trees might be difficult to place and maintain around pools and waterplay facilities, considering the extra maintenance required by leaf and branch litter and paved surfaces typical of these sites.

- Detailed Assessments: When a detailed and accurate assessment is needed, for each activity area or zone of use project the shade patterns using appropriate software. CAD programs and specialized software (i.e. WebShade) can be used to accurately identify shade patterns (See 7.5 – Shade Software).

- Identify opportunities to attach structures or modify the building structure to provide needed shade. Pool buildings and surrounding high fences might provide opportunities to attach structures (i.e. shade sails).

- The open nature and hard surfacing typical of pools and waterplay facilities are challenging for planting trees or placing shade structures. Adjacency of trees might be problematic for pools and wading pools because of branch and leaf litter.

- Make a note of the ground surface and wall materials within each outdoor zone (i.e. concrete, grass). Pools typically have reflective surfaces (pool deck, building walls and water) that can contribute to overall UVR levels, heat and glare, all of which reduce the comfort level of users.

- Identify other needs at the site or other uses of a structure that could be beneficial (i.e. gathering place, iconic design structure). Co-benefits can help to justify the need for a structure. For wading pools and splashpad sites within park settings, structures can be useful for other adjacent park functions.

C. Identifying Potential Risks

- How adequate is existing shade (both quantity and quality) during the summer at each of the major areas of use identified? For large or complex sites, divide the pool or waterplay site into zones and then consider the adequacy of shade for each zone and type of use there.

- Consider the amount of existing shade at the CPT and compare this with the need for shade for the particular type of activity and user, especially for facilities that become crowded.

• Identify specific unshaded areas where exposure to UVR during the CPT is typically over 10 to 15 minutes. Sunburn and skin damage can occur in as little as a few minutes during high UVR level days.

• For each activity area or zone of use, identify whether the level or quality of shade provided, especially during the CPT, is adequate for anticipated numbers. Pools especially can become very crowded during the summer and large numbers of users minimize the ability of all users to have reasonable access to available shade.

• Children and adolescents exposed to large amounts of solar UVR have a significantly greater chance of developing skin cancer later in life. Waterplay sites and outdoor pools where children and adolescents are a major user group and minimal amount of clothing is worn to provide skin coverage should be a higher priority for UVR protection and shade.

• For swimming pools where pool deck and wall materials might reflect undesirable amounts of UVR, identify the potential risk to users at that site. Wading pools and waterplay (splash pads) have fewer reflecting surfaces but should be assessed for potential of reflected UVR contributing to an overall unsafe level of exposure.

• Certain materials are more reflective of UVR, (i.e. sand and concrete) and can also create uncomfortable glare that lessens the use and enjoyment of these outdoor sites.

D. Making Recommendations

• Develop an overall strategy to reduce UVR at the site and goals for specific parts of the site, such as the zones of use identified. Different zones of the pool, (i.e. areas where children are involved) spectator and caregiver areas at the edges of pools and waterplay facilities as well as lifeguard stations should be recognized and specific goals identified.

• Develop goals for the site that also address overall user comfort and improved site use, as a co-benefit of shade provision. A strategy to minimize UVR levels should include as well the reduction of heat and uncomfortable glare from the sun. Structures that provide shade can also be considered to provide rain protection or act as focal meeting places. When pools and waterplay facilities are more comfortable for users and attendant caregivers, these public recreation facilities get better use. Shade goals for the site should address light penetration and visibility to avoid dark, uninviting and unsafe environments.

• Identify specific site adjustments that can be made to accommodate the relocation of activities to SunSafe areas. That is, areas around waterplay facilities in parks parts of the site can be regraded and surfaced appropriately to allow access to shade. In addition, low branches can be removed from trees to allow access under them and mulch can be placed under trees to allow use and lessen the impact on tree roots.

- Where feasible, specify moveable furniture (i.e. benches, chairs, picnic tables), at existing waterplay sites and as part of new plans for these facilities, to allow spectators and caregivers to move into shade as needed.

- Identify the amount of additional shade that is needed and where it should be located. Allow options for users of pools and waterplay facilities to be in the sun for warmth and comfort during cool summer days and early morning and late afternoon hours outside of the CPT.

- Identify preferred solutions for each zone of shade using Natural Shade (plantings), Constructed Shade (structures) and Portable Shade, and combinations of the three to meet the performance characteristics identified above and the project budget. Consider the cost efficiency and feasibility of solutions (i.e. small structures are more affordable for smaller spaces while large open spaces might require a natural shade approach).

- Consider the rate of growth of new trees and existing trees on site. Consider augmenting with structures to provide shade until trees develop to provide better shade.

- Determine how interim solutions can address short-term needs and available budgets vs. long-term investment in significant structures and plantings. Interim and temporary solutions can be provided by demountable structures (i.e. shade sails and awnings over portions of swimming pools) and portable shade (i.e. large umbrellas, marquees).

- Specify vines on arbours, trellises, lattice screens, pergolas and existing fences if they are appropriate solutions. This might be an appropriate solution for caregiver and resting areas adjacent to waterplay facilities in parks as well as edges of pool decks where vines can also be trained on existing pool fences.

- Determine requirements for new structures, including height, width, depth, overhangs, etc. to provide needed shade. The larger the shaded area, the greater the opportunity to avoid indirect and direct UVR as levels of UVR will be greater towards the edges of any shaded area. Make sure to extend overhead shade structures at least one metre past actual areas of use.

- Identify the preferred type of structure: permanent, demountable, adjustable or tensile structure. (See Appendix B: Constructed Shade). Tensile structures (i.e. overhead sails) lend themselves to sites such as wading pools and waterplay sites and can be strung over areas of swimming pools, where more permanent, heavy structures are not feasible. Consider the feasibility of staff mounting/demounting these structures on a daily and seasonal basis, so they are not left out overnight or during the off-season and result in damage to the structure.

- Consider possible add-ons to existing structures and buildings. Existing buildings provide some shade and provide opportunities to attach structures or modify the building structure to provide needed shade. Pool buildings and fences typically around

all swimming pools provide opportunities to anchor temporary or demountable sail structures to provide shade coverage.

- During the summer, early morning and evening sun, outside of the CPT can be beneficial to comfort at swimming pools and waterplay areas. Wading pools can benefit from solar heat in the morning to heat pool water, so overhead structures should be designed to allow solar penetration. Adjustable devices can allow solar penetration when needed and exclude at other times.

- There might be options to provide portable shade at swimming pools (i.e. moveable umbrellas and small portable marquees and shelters) that could be made available as needed.

- Consider the impact of indirect UVR and determine the measures needed to mitigate it. Swimming and wading pools typically have paved surfaces that can reflect UVR.

8.2 Playgrounds

Description

These facilities typically include different types of equipment and specialized areas, including play structures, climbers, swings, slides, sandboxes and areas at the edges for caregivers. Different areas, equipment and activities can have different levels of risk for harmful exposure to UVR and should be assessed accordingly.

Activity at these facilities is unprogrammed and children and caregivers are able to attend freely at different times of the day - the time and duration of use is not dictated. There is a trend to providing more fully accessible playgrounds for children of all abilities so the needs of these special user groups should be considered. As playgrounds are used primarily by children and adolescents and enjoy a high level of use during the summer months when users are minimally clothed, these facilities should be a priority for UVR protection and the promotion of Sun Safe practices.

Each subsection in the chart focuses on the application of the Shade Audit and its individual steps (See Section 7 – Planning for Shade). This information provides guidelines on how to look at, evaluate, investigate each facility and site type and provides a palette of design solutions. For large or complex sites, the execution of the complete Shade Audit is recommended. These guidelines will help staff in evaluating the sites within their jurisdiction and alert them to potential UVR risks and possible next steps to improve shade, provide UVR protection and promote Sun Safe public environments.

A. Understanding Site Activities and Users

Distinguish between the active participants and users of the site and spectators and caregivers who are observing the activity. Playgrounds will have children involved in play who come to rest at the edges of the area with caregivers. As well, there will be

increasing numbers of inclusive playgrounds that will have to meet the needs of disabled and special needs groups. These different users will have specific shade protection needs to address.

- Playground use is typically an unstructured and unprogrammed activity, so children and caregivers have some discretion as to when they visit the site and how they use the site, so peak UVR times and solar exposure can be avoided, unlike scheduled and programmed events.

- Playgrounds typically have high use in the summer months and use can coincide with the Critical Protection Time (CPT): The CPT is the period of greatest daily UVR intensity and occurs between 11 a.m. - 4 p.m. Eastern Daylight Time (EDT) between April and September, especially during June and July. Sites that are well-used during these times have an increased need for UVR protection and shade.

- A child's visit to a playground typically can last longer than 15 minutes during the CPT. The longer the period of exposure to solar UVR, the greater the risk of harm. It should be noted that in summer in Toronto, sunburn and skin damage can occur in as little as a few minutes during high UVR level days.

- Distinguish among the various age groups who use the site and understand that sun-protection strategies have to address the needs of each age group. It is useful to organize according to: Babies/toddlers (0-2 yrs), Children (3-11 yrs), Adolescents (12-18 yrs), Adults (19-59 years), and Seniors (60+ years).

- Playground use is dominated by children and adolescents. The characteristics of the age group are important in determining the risk of UVR-related skin damage. Children and adolescents exposed to large amounts of solar UVR have a significantly greater chance of developing skin cancer later in life. Sites where children and adolescents are the main users should be a higher priority for UVR protection and shade.

- Playgrounds that are well-used should generally take priority over less used sites. Larger numbers of active users and caregivers may overwhelm limited amounts of existing shade and force some users out into unprotected areas.

- Will there be increased use and demand at playground sites in the future? Remember, that even though a site is not well- used, it might be a reflection of poor shade protection and overall user comfort, which make the site unattractive for use.

- Activities at playgrounds generally involve less protective clothing during the summer months and can lead to higher levels of UVR exposure. Users that have minimal clothing have exposed skin which can lead to higher risks of sunburn and UVR damage, especially among children and adolescents.

B. Conducting an Inventory of Site Conditions and Existing Shade

- To better understand how each playground site is being used, organize the site into major areas of use according to the site characteristics and types of play activities

and equipment. Determine which activities should be featured in any sun protection strategies.

- Observe the level and quality of shade provided by trees and existing structures, especially during the CPT. General assessments can focus on the observed shade throughout the site, which can identify priorities for future detailed assessments. When a detailed and accurate assessment is needed, for each activity area or zone of use, shade patterns can be projected using appropriate software.

- Identify opportunities to attach structures or modify existing playground structures to provide needed shade.

- Observe the specific activities in each area of play and at the edges to determine how well site users make use of existing shade, especially during the CPT. Are there opportunities to make better use of shade or access existing shade on the site by making some modifications?

- Identify other needs at the site or other uses of a structure that could be beneficial (i.e. gathering place, iconic design structure). Co-benefits can help to justify the need for a structure. For playgrounds within park settings, structures can be useful for other adjacent park functions.

C. Identifying Potential Risks

- How adequate is existing shade (both quantity and quality) during the summer at each of the play areas and caregiver zones identified? Compare this with the need for shade for the particular area, especially for playgrounds that become crowded.

- Identify specific unshaded areas where exposure to UVR during the CPT is typically over 10 to 15 minutes. Sunburn and skin damage can occur in as little as a few minutes during high UVR level days.in Toronto during high UVR level days.

- Identify whether the level or quality of shade provided, especially during the CPT, is adequate for anticipated numbers. Large numbers of children and caregivers minimize the ability of all users to have reasonable access to available shade.

- Children and adolescents exposed to large amounts of solar UVR have a significantly greater chance of developing skin cancer later in life. Playgrounds where children and adolescents are the major user group should be a higher priority for UVR protection and shade.

D. Making Recommendations

- Develop an overall strategy to reduce UVR at each playground site and establish goals for specific parts of the site, (i.e. the play areas and equipment identified). Different zones, that is, areas where children are mobile and don’t stay long (i.e. swings and slides), areas where children stay in one place (i.e. sand play), caregiver areas

at the edges of the playground and areas that cater to disabled needs should be recognized and specific goals identified.

- A strategy to minimize UVR levels should include as well the reduction of heat and uncomfortable glare from the sun. Structures that provide shade can also be considered to provide rain protection or act as focal meeting places. When playgrounds and parks are more comfortable for users and caregivers these public recreation facilities get better use.

- Facilities such as playgrounds, if they are due for renovation or replacement, can be shifted strategically as part of the Capital improvements to better access existing shade from trees or adjacent structures.

- Identify specific site adjustments that can be made to accommodate the relocation of activities to Sun Safe areas. For spaces around playgrounds in parks parts of the site can be regraded and surfaced appropriately to allow access to shade, low branches can be removed from trees to allow access under them and mulch can be placed under trees to allow use and lessen the impact on tree roots.

- Identify the amount of additional shade that is needed and where it should be located. Allow options for users of playgrounds to be in the sun for warmth and comfort during cool summer days and early morning and late afternoon hours outside of the CPT.

- Identify preferred solutions for each zone of shade using Natural Shade (plantings) and Constructed Shade (structures), and combinations of the two to meet the performance characteristics identified above and the project budget.

- Consider the rate of growth of new trees and existing trees on site. Consider augmenting with structures to provide shade until trees develop to provide more shade.
- Determine how interim solutions can address short-term needs and available budgets vs. long-term investment in significant structures and plantings. Interim and temporary solutions can be provided by demountable structures (i.e. shade sails).

- Specify vines on arbours, trellises, lattice screens, pergolas, and existing fences if they are appropriate solutions. This might be an appropriate solution for caregiver and resting areas adjacent to playgrounds in parks.

- Determine requirements for new structures, including height, width, depth, overhangs, etc. to provide needed shade. The larger the shaded area, the greater the opportunity to avoid indirect and direct UVR as levels of UVR will be greater towards the edges of any shaded area. Make sure to extend overhead shade structures at least one metre past actual areas of use.

- Consider possible add-ons to existing structures including playground equipment.

- Determine how structures can address other site needs and provide co-benefits in addition to meeting shade/UVR needs. Structures can provide rain protection, be a focal point for gathering, and be iconic design statements and landmarks within the site.

8.3 Beaches

Description

Beaches are becoming increasingly popular as recreation destinations, especially as water quality improves, Blue Flag beaches are established, and access to open space and water become increasingly important to City residents with minimal or no yard space at their residences. Since these sites enjoy a high level of use during the summer months for extended periods of time and users are minimally clothed, these public facilities should be a priority for UVR protection and the promotion of Sun Safe practices. Beach areas are typically open with no natural shade available and high levels of indirect (reflected and scattered) UVR.

Each subsection in the chart focuses on the application of the Shade Audit and its individual steps (See Section 7 – Planning for Shade). This information provides guidelines on how to look at, evaluate, investigate each facility and site type and provides a palette of design solutions. For large or complex sites, the execution of the complete Shade Audit is recommended. These guidelines will help staff in evaluating the sites within their jurisdiction and alert them to potential UVR risks and possible next steps to improve shade, provide UVR protection and promote Sun Safe public environments.

A. Understanding Site Activities and Users

Blue Flag is a highly respected and recognized international eco-label.
Blue Flag beaches meet strict criteria that cover everything from water quality to environmental program.

- Use at beaches is typically divided into in-water activity, lounging and resting on the open sand and transitory, resting areas to retreat from the sun and heat and at the backshore edges. Concessions and vendors are typically part of beach activity as well. Different responses are needed for these different situations.

- Recognize that lifeguards and other staff are supervising activities at beaches and have special needs, especially since they are typically at the site for long periods of time without the ability to change locations to avoid UVR exposure. Note: Employees might be subject to special consideration and protection as part of their terms of employment or union contract.

- Activity at beaches is typically unstructured and unprogrammed, so users have discretion as to when they come to the beach and how long they stay. However, beaches generally attract use for extended periods of time during peak summer hours.

- For group events on beaches where a permit is issued, the City should advise these users of personal sun protection measures and make best efforts to provide shaded areas for the activity.

- Identify specialized activities that involve vendors at the backshore areas where people might be required to wait in line without solar protection (i.e. food concessions, boat rentals).

- Beaches are typically at their highest level of use during the Critical Protection Time (CPT): The CPT is the period of greatest daily UVR intensity and occurs between 11 a.m. - 4 p.m. Eastern Daylight Time (EDT) between April and September, especially during June and July. Sites that are well-used during these times have an increased need for UVR protection and shade.

- The duration use at beaches is typically longer than 15 minutes during the CPT. The longer the period of exposure to solar UVR, the greater the risk of harm. It should be noted that in summer in Toronto, sunburn and skin damage can occur in as little as a few minutes during high UVR level days.

- Identify beach areas that are used primarily by children and adolescents. The characteristics of the age group are important in determining the risk of UVR-related skin damage. Children and adolescents exposed to large amounts of solar UVR have a significantly greater chance of developing skin cancer later in life. Sites where children and adolescents are the main users should be a higher priority for UVR protection and shade.

- Beaches that are well-used should generally take priority for provision of shade over less used sites. Larger numbers of people at beaches may overwhelm limited amounts of existing shade provided by trees on the backshore area, shade structures and portable shade structures available on-site and force some users out into unprotected areas.

- Activities at beaches generally involve less protective clothing and can lead to higher levels of UVR exposure. Users that have minimal clothing have exposed skin which can lead to higher risks of sunburn and UVR damage, especially among youth and adolescents.

- Children playing at beaches may be more likely to engage in risk behaviour than adults, who more typically employ personal protection measures (clothing and sunscreen) and seek out shade for protection or comfort. Even in situations where children may be supervised by adults at beaches, their behaviour might still be a risk, as the supervising adult may not be aware of Sun Safe practices or enforce solar protection strategies.

B. Conducting an Inventory of Site Conditions and Existing Shade

- To better understand how each beach is being used, organize the site into major areas of use according to the site characteristics and types of activities. Determine which activities should be featured in any sun protection strategies.

- Observe the level and quality of shade provided by trees, existing structures and any portable shade devices (i.e. umbrellas) available at the beach, especially during the CPT. General assessments can focus on the observed shade throughout the site, which can identify priorities for future detailed assessments. When a detailed and accurate assessment is needed, for each activity area or zone of use, shade patterns can be projected using appropriate software.

- The open nature, sand environment, potentially high water levels and unstable subsurface conditions associated with the main areas of beaches preclude or make difficult the planting of trees or the placing of some shade structures.

- Observe the specific activities in each area of the beach, especially backshore areas to determine how well site users make use of existing shade, especially during the CPT. Are there opportunities to make better use of shade or access existing shade by making some modifications?

- Beaches typically have reflective surfaces (i.e. sand and water) that can contribute to overall UVR levels, heat and glare, all of which reduce the comfort level of users. As well, the openness of these sites to the sky means that more indirect UVR scattered by the atmosphere will reach the site.

- Identify other needs at the site or other uses of a structure that could be beneficial (i.e. rain protection, gathering place, iconic design structure). Co-benefits can help to justify the need for a structure.

C. Identifying Potential Risks

- How adequate is existing shade (both quantity and quality) during the summer at each of the major areas of use identified? Divide the beach into zones and then consider the adequacy of shade for each zone and type of use there.

- Remember that at beaches, exposure to UVR during the CPT is typically well over 10 to 15 minutes. Sunburn and skin damage can occur in as little as a few minutes during high UVR level days.

- For each activity area or zone of use, identify whether the level or quality of shade provided is adequate for anticipated numbers. Beaches can become very crowded during the summer and large numbers of users minimize the ability of all users to have reasonable access to available shade, whether natural, constructed or portable shade.

- Surfaces at beaches are more reflective of UVR, (i.e. sand and water) and can also create uncomfortable glare that lessens the use and enjoyment of outdoor sites.

- Beach areas are largely open to the sky, thus, allowing more scattered UVR to reach the ground.

D. Making Recommendations

- Develop an overall strategy to reduce UVR at each beach site and establish goals for specific parts of the site. Different zones should be recognized and specific goals identified for foreshore beach sand areas, backshore areas that provide a retreat from the heat and sun of the foreshore, provide access to the beach and support trees for natural shade, and the areas around concession and vendor buildings.

- Identify the amount of additional shade that is needed and where it should be located. Allow options for users of beaches to be in the sun for warmth and comfort during cool summer days and early morning and late afternoon hours outside of the CPT.

- Identify preferred solutions for each zone of shade using Natural Shade (plantings) and Constructed Shade (structures), and Portable Shade (i.e. umbrellas) and combinations of the three to meet the performance characteristics identified above and the project budget.

- Consider the rate of growth of new trees and existing trees on site. Consider augmenting with structures to provide shade until trees develop to provide better shade.

- Determine how interim solutions can address short-term needs and available budgets vs. long-term investment in significant structures and plantings. Interim and temporary solutions can be provided by demountable structures (i.e. shade sails) and portable shade (i.e. umbrellas).

- Determine requirements for new structures, including height, width, depth, overhangs, etc. to provide needed shade. Permanent shelter buildings might be appropriate for backshore areas and shade sails that are removed seasonally or even daily can be strategically placed. Permanent umbrella type structures can be placed in the foreshore sand area.

- The larger the shaded area, the greater the opportunity to avoid indirect and direct UVR as levels of UVR will be greater towards the edges of any shaded area. Make sure to extend overhead shade structures at least one metre past actual areas of use.

- Determine how beach structures can address other site needs and provide co-benefits in addition to meeting shade/UVR needs. Structures can provide rain protection, be a focal point for gathering, be iconic design statements and landmarks within the site.

- Determine options to provide portable shade at beaches, including umbrellas, beach cabanas, and small marquees, tents and shelters, some or all of which could be available on a rental basis.

- To mitigate indirect UVR, consider wall materials and the use of barriers for side as well as overhead solar protection. Provide generous overhangs to block skylight and scattered UVR.

- At every beach, encourage users and caregivers to use personal sun protection measures (i.e. clothing, hats, sunglasses, and sunscreen).

- Promote Sun Safety at beaches as part of public education programs and communications to the public about facilities, programs and events. See 5.1 Sun Safety, in conjunction with the Toronto Public Health Guide: Planning for Events.

8.4 Special Activity Areas in Parks

Description

Apart from specific facilities in parks like sportsfields, playgrounds and waterplay areas, versatile areas in parks that support a number of special types of activities. These are typically open passive landscape areas within the park, (that include trees, turf and plantings) sometimes with paving to accommodate heavier use. Included in these uses are picnicking, dog walking (including dog-off-leash areas), gardens, farmers' and craft markets, special community gatherings, performance as well as casual, unstructured play that can occur in multi-use commons or greens. Since these areas have to be open to a certain extent to accommodate these activities they are distinguished from other passive treed and natural areas within parks and have special concerns related to solar exposure.

Each subsection in the chart focuses on the application of the Shade Audit and its individual steps (See Section 7 – Planning for Shade). This information provides guidelines on how to look at, evaluate, investigate each facility and site type and provides a palette of design solutions. For large or complex sites, the execution of the complete Shade Audit is recommended. These guidelines will help staff in evaluating the sites within their jurisdiction and alert them to potential UVR risks and possible next steps to improve shade, provide UVR protection and promote Sun Safe public environments.

A. Understanding Site Activities and Users

- Distinguish between the active participants and users of these special park areas and spectators and caregivers (including dog owners) who are observing the activity. Identify groups such as vendors, performers and audience members involved in special events, performance and market days within the park. It is useful as well to identify people who are transient and do not stay very long at the site. Different users will have different needs.

- Most activities are typically unstructured and unprogrammed, so users have discretion as to when they come to the park and how long they stay. They are able to avoid peak UVR times and move about the site to seek shade as part of their activity. Some activities like performance and vending at markets involves stationary locations for long periods of time, which can be a priority for shade provision.

- Typical times when activities occur should be highlighted, especially activities that occur during the Critical Protection Time (CPT): The CPT is the period of greatest daily UVR intensity and occurs between 11 a.m. - 4 p.m. Eastern Daylight Time (EDT) between April and September, and especially during June and July. Sites that are well-used during these times have an increased need for UVR protection and shade.

- The duration use at these park areas can typically be longer than 15 minutes during the CPT. The longer the period of exposure to solar UVR, the greater the risk of harm. It should be noted that in summer in Toronto, sunburn and skin damage can occur in as little as a few minutes during high UVR level days.

- Identify areas that are used primarily by children and adolescents (i.e. play areas, picnic areas, children's performance events and special school gatherings). The characteristics of the age group are important in determining the risk of UVR-related skin damage. Children and adolescents exposed to large amounts of solar UVR have a significantly greater chance of developing skin cancer later in life. Sites where children and adolescents are the main users should be a higher priority for UVR protection and shade.

- Larger numbers of people at park events such as picnics and farmers' markets may overwhelm limited amounts of existing shade provided by trees and shade structures and force some users out into unprotected areas.

B. Conducting an Inventory of Site Conditions and Existing Shade

- To better understand how these park areas are being used, organize the site into major areas of use according to the site characteristics and type of activity. Determine which activities should be featured in sun protection strategies.

- Observe the level and quality of shade provided by trees, and any existing structures, especially during the CPT. General assessments can focus on the observed shade throughout the site, which can identify priorities for future detailed assessments. When a detailed and accurate assessment is needed, for each activity area or zone of use, shade patterns can be projected using appropriate software.

- As trees play a large role in these natural park settings, calculate the projected size of existing trees and resulting shade pattern in the future. Existing shade patterns, especially for young trees are likely not indicative of future shade provision and might not warrant further tree planting.

- Observe the specific activities in each area site, especially areas at the edges of these park areas where shade is more prevalent and accessible, to determine how well

site users make use of existing shade, especially during the CPT. Are there opportunities to make better use of shade or access existing shade by making some modifications?

- Identify other needs at the site or other uses of a structure (i.e. picnic shelter, performance stage) and could be beneficial (i.e. rain protection, gathering place, iconic design structure) that could also support use of adjacent park areas. Co-benefits can help to justify the need for a structure.

- Are there plans for tree planting, naturalization, tree canopy enhancement already at this park? Shade planning can piggyback onto other funded programs for planting.

C. Identifying Potential Risks

- How adequate is existing shade (both quantity and quality) during the summer at each of the major areas of use identified? Divide the park area into zones and then consider the adequacy of shade for each zone and type of use there.

- Consider the amount of existing shade at the CPT and compare this with the need for shade for the particular type of activity and user, especially when these park areas can become crowded. Sunburn and skin damage can occur in as little as a few minutes during high UVR level days.

- Where children and adolescents are the main users (i.e. day camps using these park spaces, school gatherings), there should be a higher priority for UVR protection and shade. Children and adolescents exposed to large amounts of solar UVR have a significantly greater chance of developing skin cancer later in life.

- In non-discretionary use areas, (i.e. farmers' and craft markets and audience areas for performance), there can be a greater risk of UVR exposure since the location, time and duration of activity are predetermined and users are not given the flexibility or choice of moving to seek shade or avoid UVR exposure.

D. Making Recommendations

- Develop an overall strategy to reduce UVR at the park site and establish goals for specific parts of the site. Different zones should be recognized and specific goals identified for open areas and spectator and resting areas at the edges.

- A strategy to minimize UVR levels should include as well the reduction of heat and uncomfortable glare from the sun. When park areas are more comfortable for users, spectators and caregivers, these public open spaces get better use.

- Identify whether the activity can be relocated to a Sun Safe area. Some of the uses typical of these park areas do not involve significant structures, so adjustments can be made relatively easily.

- Identify specific site adjustments that can be made to accommodate the relocation of activities to Sun Safe areas. For example, parts of the site can be regraded and surfaced appropriately to allow access to shade, low branches can be removed from trees to allow access under them and mulch can be placed under trees to allow use and lessen the impact on tree roots.

- Where feasible, specify moveable furniture, to allow users to move into shade as needed (i.e. benches, chairs, picnic tables).

- When issuing permits for activities (i.e. picnics, markets, performance, gatherings) advise applicants of options to schedule activities outside of the CPT, especially activities with risk of high UVR exposure.

- Identify the amount of additional shade that is needed and where it should be located.

- Identify preferred solutions for each zone of shade using Natural Shade (plantings), Constructed Shade (structures) and Portable Shade, and combinations of the three to meet performance characteristics identified above and the project budget.

- Consider the rate of growth of new trees and existing trees on site. Consider augmenting with structures to provide shade until trees develop to provide better shade.

- Determine requirements for new structures, including height, width, depth, overhangs, etc. to provide needed shade. The larger the shaded area, the greater the opportunity to avoid indirect and direct UVR as levels of UVR will be greater towards the edges of any shaded area. Make sure to extend overhead shade structures at least one metre past actual areas of use.

- Shade structures should not block solar penetration in the winter and shoulder seasons (i.e. at seating areas).

- Portable and temporary shade in the form of umbrellas, small marquees, tents, shelters and overhead sail structures can provide cost-effective solutions at the places they are needed.

- Determine how park structures can address other site needs and provide co-benefits in addition to meeting shade/UVR needs. Structures can provide rain protection, be a focal point for gathering, and be iconic design statements and landmarks within the site.

- Promote Sun Safety at park activities as part of public education programs and communications to the public about facilities, programs and events. See 5.1 Sun Safety, in conjunction with the Toronto Public Health Guide: Planning for Events.

- When issuing permits for activities (i.e. picnics) advise applicants of sun protection measures especially for activities with risk of high UVR exposure during the CPT.

8.5 Pathways and Trails

Description

Pathways and trails are linear facilities within parkland which are used for recreational (exercise, enjoyment) as well as utilitarian purposes (commuting, transportation). Because of their popularity, environmental and health benefits and increasing use by a variety of people, it is important that they are planned as comfortable and safe environments. Pathways present a special challenge to the assessment of shade needs since the user is typically in motion and not stationary for longer than 15 minutes. Rest areas or trailheads at intervals are spots where trail users can rest and require care to provide sun protection and comfort. Many trails pass through treed and wooded areas so often they have some degree of shade already provided.

Each subsection in the chart focuses on the application of the Shade Audit and its individual steps (See Section 7 – Planning for Shade). This information provides guidelines on how to look at, evaluate, investigate each facility and site type and provides a palette of design solutions. For large or complex sites, the execution of the complete Shade Audit is recommended. These guidelines will help staff in evaluating the sites within their jurisdiction and alert them to potential UVR risks and possible next steps to improve shade, provide UVR protection and promote Sun Safe public environments.

A. Understanding Site Activities and Users

- Distinguish between the different types of trail users as they can have different needs related to sun protection. Trails are used by hikers, joggers, cyclists and rollerbladers of all ages and abilities and include people with mobility devices.

- Trail use is typically an unstructured and unprogrammed activity. Most users have discretion as to when they come to the trail or pathway, how long they use it and

when they choose to rest. They are able to avoid peak UVR times and seek shade when needed. Some trail users such as commuters tend to use trails in more regular and scheduled ways.

- Trails and Pathways are used year round but enjoy their high levels of use in summer months and during the Critical Protection Time (CPT): The CPT is the period of greatest daily UVR intensity and occurs between 11 a.m. - 4 p.m. Eastern Daylight Time (EDT) between April and September, and especially during June and July. Sites that are well-used during these times have an increased need for UVR protection and shade.

- Although trail users are in generally in motion, duration of use is typically longer than 15 minutes during the CPT, and users can be exposed for long periods of time along segments of the trail or pathway. The longer the period of exposure to solar UVR, the greater the risk of harm. It should be noted that in summer in Toronto, sunburn and skin damage can occur in as little as a few minutes during high UVR level days.

B. Conducting an Inventory of Site Conditions and Existing Shade

- Observe the level and quality of shade provided along the trail and at rest areas by trees, and any existing structures, especially during the CPT. General assessments can focus on the observed shade throughout the site, which can identify priorities for future detailed assessments. When a detailed and accurate assessment is needed, for each activity area or zone of use, shade patterns can be projected using appropriate software.

- As trees play a large role in shading trail corridors, it is important to calculate the projected size of existing trees and the resulting shade pattern in the future. Existing shade patterns, especially for young trees are likely not indicative of future shade provision and might not warrant further tree planting.

- Although trees should not be located too close to the pathway edge, there are typically few constraints to tree planting and trails are ideally suited to the planting of shade trees along their edges.

- In terms of indirect UVR, pathway surfaces do not typically reflect much UVR but trails out in the open can be exposed to high levels of UVR scattered by the atmosphere. The amount of scattered UVR reaching a person is proportional to the amount of sky visible.

- Identify other needs at the site or other uses of a structure (i.e. trailhead shelter) that could be beneficial (i.e. rain protection, location for information and interpretive signage, landmark along the trail). Co-benefits can help to justify the need for a structure.

- Are there already plans for tree planting, naturalization, tree canopy enhancement in the park near the trail? Shade planning can piggyback onto other funded programs for planting.

C. Identifying Potential Risks

- Along sections of the trail in question and at rest areas, assess how adequate existing shade is (both quantity and quality).

- Consider the amount of existing shade at the CPT and compare this with the need for shade for trail use. Sunburn and skin damage can occur in as little as a few minutes during high UVR level days.

- Pathways where children and adolescents are the significant users, should be a higher priority for UVR protection and shade.

- Pathways and trail corridors are defined routes that leave little discretion for users to choose another route or seek shade that is not available on or adjacent to the pathway itself, so best efforts should be made to shade pathways if there is a risk identified.

D. Making Recommendations

- Develop an overall strategy to reduce UVR along the pathway or trail in question and establish goals for specific parts of the site. Different zones should be recognized and specific goals identified for the pathway or trail itself, areas adjacent to the pathway surface and rest areas.

- A strategy to minimize UVR levels should include as well the reduction of heat and uncomfortable glare from the sun. When trails are more comfortable for the range of users and all age groups and levels of ability, including cyclists, walkers, runners, rollerblades and people with mobility devices, these public facilities get better use.

- Identify specific site adjustments that can be made to accommodate the relocation of rest areas or areas adjacent to the trail to be more Sun Safe. For example, parts of the site can be regraded and surfaced appropriately to allow access to shade, low branches can be removed from trees to allow access under them and mulch can be placed under trees to allow use and lessen the impact on tree roots.

- Develop a strategy for UVR protection that identifies the amount of additional shade that is needed and where it should be located (i.e. performance characteristics).

- Identify preferred solutions for each zone of shade using Natural Shade (trees) and Constructed Shade (structures), and combinations of the two to meet performance characteristics identified above and the project budget.

- Consider the rate of growth of new trees and existing trees on site. Consider augmenting with structures to provide shade until trees develop to provide better shade.

- Trees planted along trails and pathways should be located properly. That is, to provide good shade, avoid creating unsafe obstructions at the side of the pathway and minimize future root damage and heaving of the pathway as the tree matures.

Overhead branches can become a problem, especially for cyclists, if they are not pruned regularly.

- Determine requirements for new structures, including height, width, depth, overhangs, etc. to provide needed shade. The larger the shaded area, the greater the opportunity to avoid indirect and direct UVR as levels of UVR will be greater towards the edges of any shaded area. Make sure to extend overhead shade structures at least one metre past actual areas of use.

- Consider possible add-ons to existing structures such as washroom buildings along the trail.

- Shade structures should not block solar penetration in the winter and shoulder seasons (i.e. at seating areas).

- Determine how structures at rest areas can address other site needs and provide co-benefits in addition to meeting shade/UVR needs. Structures can provide rain protection, be a focal point for gathering, provide directional and interpretive information and be iconic design statements and landmarks along the trail.

- Promote Sun Safety on trails and pathways as part of public education programs and communications to the public about facilities, programs and events. See 5.1 Sun Safety, in conjunction with the Toronto Public Health Guide: Planning for Events.

8.6 Sportsfields

Description

Sportsfields are prominent and popular public recreation facilities used primarily by organized sports groups who take out permits to use the fields, but are also used on a casual basis for informal play. These facilities include baseball diamonds, soccer fields, cricket pitches, rugby and football fields and field hockey facilities. Sportsfields present a special challenge to the provision of shade as the active user is typically in motion and it is not feasible to provide sun protection over large areas of open sportsfield without interfering with the play.

Accordingly, the focus of UVR protection at sportsfields should be on the spectator, team and resting areas as well as on the general promotion of personal protection measures for all users of sportsfields during peak summer months.

Each subsection in the chart focuses on the application of the Shade Audit and its individual steps (See Section 7 – Planning for Shade). This information provides guidelines on how to look at, evaluate, investigate each facility and site type and provides a palette of design solutions. For large or complex sites, the execution of the complete Shade Audit is recommended. These guidelines will help staff in evaluating the sites within their jurisdiction and alert them to potential UVR risks and possible next steps to improve shade, provide UVR protection and promote Sun Safe public environments.

A. Understanding Site Users and Activities

• Distinguish between the active participants and users of the site and spectators, sports coaches, officials and parents who are observing the activity. Remember as well that sports teams have players who rest on the sidelines (i.e. dugouts and team benches).

- Organized activities such as team sports mean that users and spectators are required to use a specified site at a certain time and duration without much discretion to avoid the sun exposure at the time.

- The City should take responsibility, if issuing a permit, to advise users of sportsfields of personal sun protection measures and make best efforts to provide protected, shaded areas for the activity.

- Sportsfields are used in spring and fall and during evening hours in summer but enjoy high levels of use during the Critical Protection Time (CPT): The CPT is the period of greatest daily UVR intensity and occurs between 11 a.m. - 4 p.m. Eastern Daylight Time (EDT) between April and September, and especially during June and July. Sites that are well-used during these times have an increased need for UVR protection and shade.

- Sportsfield use typically lasts longer than 15 minutes during the CPT, and users and spectators can be exposed for long periods of time while a game is in progress. The longer the period of exposure to solar UVR, the greater the risk of harm. It should be noted that in summer in Toronto, sunburn and skin damage can occur in as little as a few minutes during high UVR level days.

- Children and adolescents exposed to large amounts of solar UVR have a significantly greater chance of developing skin cancer later in life. Sportsfields where children and adolescents are the main users should be a higher priority for UVR protection and shade.

- Sportsfields that are well attended should generally take priority over less used sites. While team numbers on the field are regulated, large numbers of spectators may overwhelm limited amounts of existing shade and force some users out into unprotected areas.

- Sports use is increasing and fields are in demand. Will there be increased use and demand for these sites in the future? This should be considered in planning for shade provision.

B. Conducting an Inventory of Site Conditions and Existing Shade

- Observe the level and quality of shade provided around sportsfields by trees and any existing structures, especially during the CPT. General assessments can focus on the observed shade throughout the site, which can identify priorities for future detailed assessments. When a detailed and accurate assessment is needed, for each activity area or zone of use, shade patterns can be projected using appropriate software.

- It is important to calculate the projected size of existing trees and the resulting shade pattern in the future. Existing shade patterns, especially for young trees are likely not indicative of future shade provision.

- The nature of sportsfield sites preclude or make difficult the planting of trees and placing of shade structures. The fields themselves need to remain unobstructed and open and any trees and structures need to be set back appropriately. Also, parks on top of water reservoirs that typically accommodate sportsfields cannot be planted with trees and the placement of structures is difficult.

- In terms of indirect UVR, sportsfields reflect very little UVR. Facilities such as these out in the open can be exposed to high levels of UVR scattered by the atmosphere. The amount of scattered UVR reaching a person is proportional to the amount of sky visible.

- Identify other needs at the site or other uses of a structure (i.e. washroom building, covered space for special events related to the sports use, bleachers for spectators) that could be beneficial and also provide rain protection, information and signage, and act as a landmark. Co-benefits can help to justify the need for a structure and assist in building a business case for funding.

- Are there already plans for tree planting, naturalization, tree canopy enhancement in the park near the sportsfield. Shade planning can piggyback onto other funded programs for planting.

C. Identifying Potential Risks

- Around the sportsfield in question, assess how adequate existing shade is (both quantity and quality).

- Consider the amount of existing shade at the CPT and compare this with the need for shade. Sunburn and skin damage can occur in as little as a few minutes during high UVR level days.

- Identify whether the level or quality of shade provided, especially during the CPT is adequate for anticipated numbers of spectators and people along the sidelines of the play area. Large numbers of users minimize the ability of all participants and spectators to have reasonable access to available shade.

- Identify whether the level of shade and UVR protection is adequate for the type of user, especially for children and adolescents. Children and adolescents exposed to large amounts of solar UVR have a significantly greater chance of developing skin cancer later in life. Sportsfields where children and adolescents are the significant users should be a higher priority for UVR protection and shade.

- Sportsfields are defined areas that accommodate scheduled and organized sports events. This leaves little discretion for users to choose to attend at another time or to seek shade that is not available on or adjacent to the field itself. Best efforts should be made to shade areas adjacent to sportsfields if there is a risk identified.

D. Making Recommendations

- Develop an overall strategy to reduce UVR at the sportsfield in question and establish goals for specific parts of the site. Different zones should be recognized and specific goals identified for the areas adjacent to the sportsfield.

- A strategy to minimize UVR levels should include as well the reduction of heat and uncomfortable glare from the sun. When sportsfields are more comfortable for team members and spectators of all age groups and levels of ability, then these public facilities get better use and participation in active sports is supported.

- Identify specific site adjustments that can be made to areas adjacent to sportsfields to be more Sun Safe. For example, parts of the site can be regraded and surfaced appropriately to allow access to shade, low branches can be removed from trees to allow access under them and mulch can be placed under trees to allow use and lessen the impact on tree roots.

- Develop a strategy for UVR protection that identifies the amount of additional shade that is needed and where it should be located (i.e. performance characteristics).

- Identify preferred solutions for each zone of shade using Natural Shade (trees), Constructed Shade (structures), and Portable Shade and combinations of the three to meet performance characteristics identified above and the project budget.

- Consider the rate of growth of new trees and existing trees on site. Consider augmenting with structures to provide shade until trees develop to provide better shade.

- Determine how interim solutions can address short-term needs and available budgets vs. long-term investment in significant structures and plantings. Temporary solutions can be provided by demountable structures and Portable Shade (i.e. umbrellas, marquees) for seasonal use or for specific events.

- Determine requirements for new structures, including height, width, depth, overhangs, etc. to provide needed shade. The larger the shaded area, the greater the opportunity to avoid indirect and direct UVR as levels of UVR will be greater towards the edges of any shaded area. Make sure to extend overhead shade structures at least one metre past actual areas of use.

- Consider possible add-ons to existing structures such as baseball backstops and existing bleachers.

- Determine how structures can address other site needs (i.e. washroom building, covered space for special events related to the sports use, bleachers for spectators). Structures can also provide rain protection, information and signage, and act as a landmark. Incorporate these into the planning and design of shade structures.

- Investigate options to provide Portable Shade at the site. Umbrellas, and small marquees and shelters can provide cost-effective solutions at the places they are needed.
- Promote Sun Safety at sportsfields as part of public education programs and communications to the public about facilities, programs and events. See 5.1 See Sun Safety Recommendations in conjunction with the Toronto Public Health Guide: Planning for Events.

- When issuing permits for sportsfields, advise applicants of sun protection measures especially for activities with risk of high UVR exposure during the CPT.

8.7 Childcare Centres

Description

A variety of childcare centres can be found in the City of Toronto. These extend over a range of scales and as part of other facilities. Childcare centres are mainly indoor facilities but will have an outdoor play space. Since these facilities are primarily concerned with the care of children they should be a priority for UVR protection and shade planning. It should be noted that childcare centres already shift program time outside to earlier in the morning and later in the afternoon to reduce the risk of UVR overexposure. Consideration is also given at City of Toronto childcare facilities to plan field trips and outings with solar protection and rain protection in mind when planning the events. Childcare centres are subject to the Day Nurseries Act (Province of Ontario) and also the City of Toronto Children's Services Operating Criteria (www.toronto.ca/children).

Each subsection in the chart focuses on the application of the Shade Audit and its individual steps (See Section 7 – Planning for Shade). This information provides guidelines on how to look at, evaluate, investigate each facility and site type and provides a palette of design solutions. For large or complex sites, the execution of the complete Shade Audit is recommended. These guidelines will help staff in evaluating the sites within their jurisdiction and alert them to potential UVR risks and possible next steps to improve shade, provide UVR protection and promote Sun Safe public environments.

A. Understanding Site Users and Activities

- Outdoor spaces at centre-based services usually have a number of distinct play areas, including an open area for running, a quiet area for focussed play, (i.e. a

sandbox) a formal quiet area for contained play (i.e. finger painting, and an active area for busy physical play).

- Identify employees and staff who are providing supervision and support to activities in the outdoor play space. Sun protection needs to be identified for staff as well.

- Children attend these facilities up to five days a week and may spend considerable time outside when UVR levels are at their peak, during the Critical Protection Time (CPT): The CPT is the period of greatest daily UVR intensity and occurs between 11 a.m. - 4 p.m. Eastern Daylight Time (EDT) between April and September, and especially during June and July. Sites that are well-used during these times have an increased need for UVR protection and shade.

- Outdoor use at childcare play areas typically lasts longer than 15 minutes and can occur during the CPT. Scheduling of outdoor use can be shifted outside of the CPT might not always be possible. The longer the period of exposure to solar UVR, the greater the risk of harm. It should be noted that in summer in Toronto, sunburn and skin damage can occur in as little as a few minutes during high UVR level days.

- Children exposed to large amounts of solar UVR have a significantly greater chance of developing skin cancer later in life. As children are primary users at these facilities, there should be a high priority for UVR protection and shade.

- Childcare centres are typically busy, well-attended facilities. Large numbers of children using outdoor play areas may overwhelm limited amounts of existing shade and force some children and supervising staff out into unprotected areas.

- Will there be increased demand and enrolment at any specific facility in the future? This should be considered in planning for shade provision.

B. Conducting an Inventory of Site Conditions and Existing Shade

- Observe the level and quality of shade provided in the outdoor play area by trees, existing structures and adjacent childcare building, especially during the CPT. General assessments can focus on the observed shade throughout the site, which can identify priorities for future detailed assessments. When a detailed and accurate assessment is needed, for each activity area or zone of use, shade patterns can be projected using appropriate software.

- It is important to calculate the projected size of existing trees and the resulting shade pattern in the future.

- Existing shade patterns, especially for young trees are likely not indicative of future shade provision.

- There might be opportunities to attach structures or modify the building structure to provide needed shade at the outdoor play space if it is immediately adjacent to the main childcare building.

- Observe how children and staff make use of existing shade, especially during the CPT. Are there opportunities to make better use of shade or access existing shade around the play area by reorganizing the site? Is access to available shade obstructed thus preventing use?

C. Identifying Potential Risks

- Assess how adequate existing shade is (both quantity and quality) at the play area.

- Consider the amount of existing shade at the CPT and compare this with the need for shade. Remember that sunburn and skin damage can occur in as little as a few minutes during high UVR level days.

- Shade planning and design for each site will be influenced by the number of children in care and the size of the outdoor play space.

D. Making Recommendations

- A strategy to minimize UVR levels should include as well the reduction of heat and uncomfortable glare from the sun. When play areas are more comfortable for children and staff, the play experience is more rewarding as part of the daily routine.

- Design should aim to create shade that complements and reinforces the flow of traffic in different play areas and along paths. Shade provision should focus on fixed play equipment, particularly over sandboxes, and areas where children play for extended periods. Shade should not create dark and uninviting environments.

- Identify specific site adjustments that can be made to provide more available shade. For example, parts of the site can be regraded and surfaced appropriately to allow access to shade, low branches can be removed from trees to allow access under them and mulch can be placed under trees to allow use and lessen the impact on tree roots.

- Where feasible, specify moveable furniture, in existing sites and as part of new plans for sites and facilities, to allow children and staff to move into shade as needed (i.e. benches, chairs, picnic tables).

- Reschedule, where possible, play times to occur outside of the CPT and organize indoor activities on high UVR days.

- Identify preferred solutions for shade using Natural Shade (trees), Constructed Shade (structures), and Portable Shade and combinations of the three to meet performance characteristics identified above and the project budget.

- Consider the rate of growth of new trees and existing trees on site. Consider augmenting with structures to provide shade until trees develop to provide better shade.

- Determine how interim solutions can address short-term needs and available budgets vs. long-term investment in significant structures and plantings. Temporary solutions can be provided by demountable structures and portable shade (i.e. umbrellas, marquees) for seasonal use or for specific events.

- Consider partial shade in open areas, especially over grass, which needs some sun for growth. Natural shade is the best option. Consider planting in clusters so that groups of children can access shade. Note that deciduous trees allow for penetration of warmth and light to the play space during winter.

- Vines on arbours, trellises, lattice screens, existing fences or pergolas, can be appropriate solutions and can add natural amenity and interest to the play space.

- Determine requirements for new structures, including height, width, depth, overhangs, etc. to provide needed shade. The larger the shaded area, the greater the opportunity to avoid indirect and direct UVR as levels of UVR will be greater towards the edges of any shaded area. Make sure to extend overhead shade structures at least one metre past actual areas of use.

- Consider possible add-ons to existing structures such fences, play equipment and the adjacent childcare centre building.

- Childcare play areas are used year round, so shade structures should not block solar penetration in the winter and shoulder seasons, so children and staff can enjoy the sun’s heat when outdoors at these times.

- Investigate options to provide portable shade at the site. Umbrellas, and small marquees, small tents and shelters can provide cost-effective solutions at the places they are needed.

- Shade should not hinder supervision, for both safety reasons and teaching purposes. Unsafe options include shade structures with solid and/or opaque sides and low placement of overhead sails. Trees and shrubs, when inappropriately located, also have the potential to obstruct supervision.

- Establish a head clearance height for shade structures. Vertical barriers placed at the side of structures should allow for views through the structure at child height. The floor space underneath the structure should be sufficient to allow children to gather or play actively.

- Ensure that shade structures over fixed play equipment do not have footholds or grip surfaces that could allow for climbing, as safety is a major consideration for shade provision over fixed play equipment.

- Promote Sun Safety at childcare centres as part of public education programs and communications to the parents and the public.

8.8 Paved Activity and Play Areas

Description

These facilities include skateboard parks (also known as skateparks), tennis courts, basketball courts and multi- purpose skills courts that accommodate mainly casual, unstructured play. These facilities are paved so they have special considerations for user comfort due to reflected sunlight and UVR as well as heat build-up on paved surfaces. Paved activity areas present a special challenge to the provision of shade as the active user is typically in motion and it is not always feasible to provide sun protection over large areas economically and without interfering with the play. Accordingly, the focus of UVR protection should be on the spectator, team and resting areas as well as on the general promotion of personal protection measures for all users of these facilities during peak summer months.

Each subsection in the chart focuses on the application of the Shade Audit and its individual steps (See Section 7 – Planning for Shade). This information provides guidelines on how to look at, evaluate, investigate each facility and site type and provides a palette of design solutions. For large or complex sites, the execution of the complete Shade Audit is recommended. These guidelines will help staff in evaluating the sites within their jurisdiction and alert them to potential UVR risks and possible next steps to improve shade, provide UVR protection and promote Sun Safe public environments.

A. Understanding Site Users and Activities

- Distinguish between the active participants and users of the site and spectators, parents and caregivers who are observing the activity on the sidelines. Remember as well that players will need to rest on the sidelines where they can retreat from summer heat and sunlight.

- Activities at these facilities are generally unprogrammed and unscheduled so users and spectators have discretion to use the site when they choose and for how long, and can avoid peak UVR times if they choose.

- Paved activity areas are used in spring and fall and during evening hours in summer but can be used during the Critical Protection Time (CPT): The CPT is the period of greatest daily UVR intensity and occurs between 11 a.m. - 4 p.m. Eastern Daylight Time (EDT) between April and September, and especially during June and July. Sites that are well-used during these times have an increased need for UVR protection and shade.

- Play at these facilities can last longer than 15 minutes during the CPT, and players and spectators can be exposed to harmful UVR. The longer the period of exposure to solar UVR, the greater the risk of harm. It should be noted that in summer in Toronto, sunburn and skin damage can occur in as little as a few minutes during high UVR level days.

- Children and adolescents exposed to large amounts of solar UVR have a significantly greater chance of developing skin cancer later in life. Paved play areas that are primarily used by children and adolescents and should be a higher priority for UVR protection and shade.

- Will there be increased use and demand for specific sites in the future? This should be considered in planning for shade provision. Remember that even though a site is not well-used, it might be a reflection of poor shade protection and overall user comfort, which make the site unattractive for use.

- Children and adolescents at play at these facilities may be more likely to engage in risk behaviour than adults, who more typically seek out shade for protection or comfort and are properly clothed for protection. Even in situations where children may be supervised by adults, their behaviour might still be a risk, as the supervising adult may not be aware of Sun Safe practices or enforce solar protection strategies.

B. Conducting an Inventory of Site Conditions and Existing Shade

- Organize the site into major areas of use according to the site characteristics and types of activities.

- Observe the level and quality of shade provided around paved activity areas by trees and any existing structures, especially during the CPT. General assessments can focus on the observed shade throughout the site, which can identify priorities for future detailed assessments. When a detailed and accurate assessment is needed, for each activity area or zone of use, shade patterns can be projected using appropriate software.

- It is important to calculate the projected size of existing trees and the resulting shade pattern in the future.

Existing shade patterns, especially for young trees are likely not indicative of future shade provision.

- Identify opportunities to attach structures or modify an existing structure to provide needed shade. Tennis and basketball court fences, adjacent buildings such as community centres, skateboard park structures and existing bleachers provide opportunities to provide support for add-on shade structures.

- The nature of paved play and activity areas can make the planting of trees and placing of shade structures difficult. The play areas themselves need to remain unobstructed and open and any trees and structures need to be set back appropriately. Trees can be undesirable adjacent to skateparks because of litter from branches and leaves that can make skating difficult and unsafe and require extra maintenance.

- Observe how spectators and players make use of existing shade, especially during the CPT. Are there opportunities to make better use of shade or access existing shade around the sportsfields by reorganizing the site? Is access to available shade obstructed thus preventing use?

- In terms of indirect UVR, paved activity areas can reflect significant amounts of UVR depending on the paving material. Facilities out in the open can be exposed to high levels of UVR scattered by the atmosphere. The amount of scattered UVR reaching a person is proportional to the amount of sky visible. Existing ground covers and ground surface materials should be assessed to determine if they meet acceptable standards to reduce the effects of UVR, heat and light reflectance.

- Are there already plans for tree planting, naturalization, tree canopy enhancement in the park near the play area? Shade planning can piggyback onto other funded programs for planting.

C. Identifying Potential Risks

- Around the facility in question, assess how adequate existing shade is (both quantity and quality) to protect players and spectators and provide a comfortable environment.

- Consider the amount of existing shade at the CPT and compare this with the need for shade. Sunburn and skin damage can occur in as little as a few minutes during high UVR level days.

- Identify whether the level or quality of shade provided, especially during the CPT, is adequate for anticipated numbers of spectators and people along the sidelines of the play area. Large numbers of users minimize the ability of all participants and spectators to have reasonable access to available shade.

- Identify whether the level of shade and UVR protection is adequate for the type of user, especially for children and adolescents. Children and adolescents exposed to large amounts of solar UVR have a significantly greater chance of developing skin

cancer later in life. Paved play areas where children and adolescents are the significant users should be a higher priority for UVR protection and shade.

- Paved activity and play areas have large areas of paved surface that can reflect UVR. For areas where ground surface and wall materials might reflect undesirable amounts of UVR (i.e. concrete skate parks), identify the potential risk from reflected UVR to users at that site.

- For sites that are open assess the amount of scattered UVR reaching areas. The amount of scattered UVR reaching a person is proportional to the amount of sky visible.

116 D. Making Recommendations

- Develop an overall strategy to reduce UVR at the paved play area and establish goals for specific parts of the site. Different zones should be recognized and specific goals identified for each area.

- A strategy to minimize UVR levels should include as well the reduction of heat and uncomfortable glare from the sun. When these facilities are more comfortable for players and spectators, then these public facilities get better use and participation in active sports is supported.

- Identify specific site adjustments that can be made to areas adjacent to the play surface to be more Sun Safe. For example, parts of the site can be regraded and surfaced appropriately to allow access to shade, low branches can be removed from trees to allow access under them and mulch can be placed under trees to allow use and lessen the impact on tree roots.

- Develop a strategy for UVR protection that identifies the amount of additional shade that is needed and where it should be located (i.e. performance characteristics). Allow options for people to be in the sun for warmth and comfort, especially during non-summer months and early morning and late afternoon hours outside of the CPT.

- Identify preferred solutions for each zone of shade using Natural Shade (trees) and Constructed Shade (structures), and combinations of the two to meet performance characteristics identified above and the project budget.

- Consider the rate of growth of new trees and existing trees on site. Consider augmenting with structures to provide shade until trees develop to provide better shade.

- Vines on arbours, trellises, existing fences or pergolas, can be appropriate solutions for spectator areas.

- Determine requirements for new structures, including height, width, depth, overhangs, etc. to provide needed shade. The larger the shaded area, the greater the opportunity to avoid indirect and direct UVR as levels of UVR will be greater towards the edges of any shaded area.

- If determined to be feasible, incorporate possible add-ons to existing structures and buildings in plans for shade structures (i.e. fences, adjacent buildings such as community centres, bleachers and skatepark elements).

- Determine how structures can address other site needs. Structures can also provide rain protection, information and signage, and act as a landmark. Incorporate these into the planning and design of shade structures.

- To deal with indirect UVR, consider wall materials and the use of barriers for side as well as overhead solar protection. Vertical screening with plants and trellises can provide a barrier to indirect UVR.

- Specify paving materials that reduce the reflectivity of UVR. Determine if smooth, reflective walls (i.e. concrete) can be modified to reduce the likelihood of indirect UVR. Soft surfaces and those with uneven finishes will reflect smaller amounts of UVR. Vegetation absorbs and scatters UVR which decreases its intensity.

- At every site and facility, encourage users and caregivers to use personal sun protection measures (i.e. clothing, hats, sunglasses, sunscreen).

- Promote Sun Safety at paved activity and play areas as part of public education programs and communications to the public about facilities, programs and events.

8.9 Public Squares

Description

Public squares are large scale civic gathering spaces normally designed to accommodate a diversity of events and activities - both programmed and spontaneous. A public square is most often characterized by a large open gathering area. Shade trees or other permanent structures are typically kept to the perimeter or other discrete locations on the site. Public squares include: Open Gathering Areas that are typically open-air, hard surfaced spaces designed to be clear of permanent structures or furnishings to accommodate large crowds and a diversity of temporary events and civic activities; Seating Areas that may be formal (i.e. benches, chairs, tables - permanent and temporary) or informal (i.e. low walls, curbs, steps, boulders, lawns); and amphitheatres and stages, both permanent and temporary. Because the use and users of these spaces vary widely, temporary and flexible shade elements, such as umbrellas, tents, and sails are effective additions to mitigate UVR risks. Because of extensive open paved areas, indirect UVR also has to be addressed at these sites.

Each subsection in the chart focuses on the application of the Shade Audit and its individual steps (See Section 7 – Planning for Shade). This information provides guidelines on how to look at, evaluate, investigate each facility and site type and provides a palette of design solutions. For large or complex sites, the execution of the complete Shade Audit is recommended. These guidelines will help staff in evaluating the sites within their jurisdiction and alert them to potential UVR risks and possible next steps to improve shade, provide UVR protection and promote Sun Safe public environments.

A. Understanding Site Users and Activities

- Activities include programmed and unprogrammed events and gatherings of all scales, civic events, passive recreation, marketing (i.e. farmers' markets, food

concession) and passive, unstructured activities such as relaxing, eating, people watching, and waiting. Typical users include citizens, staff, tourists, vendors, and passersby as well as performers and audience at stages and amphitheatres.

- It is useful to distinguish between users who come to stay for a period at these sites and transient, mobile users.

- Activities at these sites are both unprogrammed and also programmed and scheduled. Some users have discretion to use the site when they choose and for how long, and can avoid peak UVR times if they choose. Others (i.e. farmers' market or performance) do not have that discretion and shade planning has to respond accordingly.

- Programmed activities can bring large numbers of people to these sites and strain the capacity of the site to provide shade to all.

- The City should take responsibility, if issuing a permit or charging admission to events at these sites, to advise these users of personal sun protection measures and make best efforts to provide protected, shaded areas for the activity.

- Food vending, farmers' markets and craft fairs can require people to wait in line for periods of time, potentially in areas without solar protection.

- Performances or special events for which there is an audience gathered in one place and performers or speakers on a stage require both to remain in place for the duration of the event, with few or no options to relocate to seek shade.

- Public squares are used year-round but the majority of use occurs in summer and during the Critical Protection Time (CPT): The CPT is the greatest daily UVR intensity is usually between 11a.m. - 4p.m. Eastern Daylight Time (EDT) between April and September, and especially during June and July. Sites that are well-used during these times have an increased need for UVR protection and shade.

- Activities at public squares can last longer than 15 minutes during the CPT, and users can be exposed to harmful UVR. The longer the period of exposure to solar UVR, the greater the risk of harm. It should be noted that in summer in Toronto, sunburn and skin damage can occur in as little as a few minutes during high UVR level days.

- Public squares enjoy use by all ages. Where children and adolescents are significant regular users or at special events for this age group special consideration should be given to solar protection. Children and adolescents who are exposed to large amounts of solar UVR have a significantly greater chance of developing skin cancer later in life.

- Programmed activities or even popular casual use (i.e. lunch time traffic) can bring large numbers of people to these sites and strain the capacity of the site to provide shade to all. Large numbers of people may overwhelm limited amounts of existing shade and force some users out into unprotected areas.

- Will there be increased use and demand for specific sites in the future? This should be considered in planning for shade provision. Remember that even though a public square is not well-used, it might be a reflection of poor shade protection and overall user comfort, which make the site unattractive for use.

B. Conducting an Inventory of Site Conditions and Existing Shade

- Organize the public square into major areas of use according to the site characteristics and types of activities.

- Observe the level and quality of shade provided at the square by trees and any existing structures, especially during the CPT. General assessments can focus on the observed shade throughout the site, which can identify priorities for future detailed assessments. When a detailed and accurate assessment is needed, for each activity area or zone of use, shade patterns can be projected using appropriate software.

- Identify opportunities to attach structures or modify an existing structure to provide needed shade. Public squares have many structural elements and adjacent buildings that could lend themselves to modification or attachment of shade structures.

- The nature of these open and primarily paved areas can make the planting of trees and placing of structures difficult. Public squares play need to remain unobstructed and open and any trees and structures need to be set back appropriately.

- Observe how people attending any specific site make use of existing shade, especially during the CPT. Are there opportunities to make better use of shade or access existing shade at the public square?

- In terms of indirect UVR, the paved surfaces of public squares can reflect significant amounts of UVR depending on the paving material. Since they are largely open to the sky they also can be exposed to high levels of UVR scattered by the atmosphere. The amount of scattered UVR reaching a person is proportional to the amount of sky visible. Existing ground covers and ground surface materials should be assessed to determine if they meet acceptable standards to reduce the effects of UVR, heat and light reflectance.

- Identify any plans for site development including new buildings, renovation of existing buildings and structures and landscape projects. Are there plans for tree planting, naturalization, tree canopy enhancement already? Shade planning can piggyback onto other funded programs for site development. Understanding what long-term plans are can help guide short-term plans.

C. Identifying Potential Risks

- Around the public square in question, assess how adequate existing shade is (both quantity and quality) to protect users and provide a comfortable environment.

- Consider the amount of existing shade at the CPT and compare this with the need for shade. Sunburn and skin damage can occur in as little as a few minutes during high UVR level days.

- Identify whether the level or quality of shade provided, especially during the CPT, is adequate for anticipated numbers of people. Large numbers of users minimize the ability of all participants and spectators to have reasonable access to available shade.

- In non-discretionary use areas (i.e. vending, market and performance areas), there can be a greater risk of UVR exposure since users are not given the flexibility or choice of moving to seek shade or avoid UVR exposure.

- Public squares have large areas of paved surface that can reflect UVR. For areas where ground surface and wall materials might reflect undesirable amounts of UVR (i.e. concrete), identify the potential risk from reflected UVR to users at that site.

- For sites that are open assess the amount of scattered UVR reaching areas. The amount of scattered UVR reaching a person is proportional to the amount of sky visible.

D. Making Recommendations

- Develop an overall strategy to reduce UVR at the public square in question and establish goals for specific parts of the site. Different zones should be recognized and specific goals identified for each area.

- A strategy to minimize UVR levels should include as well the reduction of heat and uncomfortable glare from the sun. When public squares are more comfortable for use, then these public facilities get better use and better attendance at events.

- Shade goals for the site should address light penetration and visibility to avoid dark, uninviting and unsafe environments.

- Identify whether certain activities and events including structures and equipment that support the activity can be relocated to a Sun Safe area.

- Where feasible, specify moveable furniture, in existing sites and as part of new plans for sites and facilities, to allow users to move into shade as needed (i.e. benches, chairs, picnic tables).

- When issuing permits for events at public squares, advise the applicants of options to schedule activities outside of the CPT, especially activities with a risk of high UVR exposure.

- Develop a strategy for UVR protection that identifies the amount of additional shade that is needed and where it should be located (i.e. performance characteristics). Allow options for people to be in the sun for warmth and comfort, especially during non-summer months and early morning and late afternoon hours outside of the CPT.

- Identify preferred solutions for each zone of shade using Natural Shade (trees), Constructed Shade (structures), and Portable Shade and combinations of the three to meet performance characteristics identified above and the project budget.

- Plant trees and provide permanent shade structures around the perimeter of the square for relief from the sun. Consider the rate of growth of new trees and existing trees on site. Consider augmenting with structures to provide shade until trees develop to provide better shade.

- Ensure a good balance of formal seating is located to benefit from existing shade trees and permanent shade structures. Plant trees and/or install permanent or temporary shade structures adjacent to formal seating where more shade is needed. Equip tables with adjustable umbrellas.

- Provide tents, umbrellas, sails or other temporary structures within the open gathering area as appropriate to activities and events taking place.

- Vines on arbours, trellises, existing fences or pergolas, can be appropriate solutions to shade seating areas and can provide an attractive, green amenity to the square.

- Determine requirements for new structures, including height, width, depth, overhangs, etc. to provide needed shade. The larger the shaded area, the greater the opportunity to avoid indirect and direct UVR as levels of UVR will be greater towards the edges of any shaded area.

- Shade spectator seating with a permanent roof structure or adjustable temporary shade sails, includes the co-benefits of weather protection.

- If determined to be feasible, incorporate add-ons to existing structures and buildings in plans for shade structures.

- Determine how structures can address other site needs. Structures can also provide rain protection, information and signage, and act as a landmark. Incorporate these into the planning and design of shade structures.

- Portable and temporary umbrellas, small marquees, tents and shelters can provide cost-effective solutions at the places they are needed.

- To deal with indirect UVR, consider wall materials and the use of barriers for side as well as overhead solar protection. Vertical screening with plants and trellises can provide a barrier to indirect UVR.

- Specify paving materials that reduce the reflectivity of UVR. Determine if smooth, reflective walls (i.e. concrete) can be modified to reduce the likelihood of indirect UVR. Soft surfaces and those with uneven finishes will reflect smaller amounts of UVR. Vegetation absorbs and scatters UVR which decreases its intensity.

- At every site, encourage users to use personal sun protection measures (i.e. clothing, hats, sunglasses, and sunscreen).

- Promote Sun Safety at public squares as part of public education programs and communications to the public about facilities, programs and events.

8.10 Streetscapes

Description
Streetscape design is generally concerned with the function and appearance of the public right-of-way with a focus on improving the quality of the pedestrian realm. The City of Toronto Urban Design Streetscape Manual identifies the key enhancement area as the space between the curb and property line, also called the sidewalk zone. On local, neighbourhood streets, the sidewalk zone is usually very simple, characterized by trees planted in soft landscapes and a pedestrian clearway on a paved sidewalk or even sharing the roadway in less urban locales. On busier arterials and commercial main streets, the sidewalk zone is much more complex, with planting and furnishing zones containing trees, benches, transit stops, waste bins, signs, etc., generous clearways to accommodate pedestrian traffic, and even marketing zones to support cafés and commerce.

For all streetscapes, natural shade is a high priority, but can be challenging to achieve in dense urban areas. Therefore, canopies, awnings, umbrellas, overhangs and other built/portable structures are encouraged to increase available protection.
Each subsection in the chart focuses on the application of the Shade Audit and its individual steps (See Section 7 – Planning for Shade). This information provides guidelines on how to look at, evaluate,
investigate each facility and site type and provides a palette of design solutions. For large or complex sites, the execution of the complete Shade Audit is recommended. These guidelines will help staff in evaluating the sites within their jurisdiction and alert them to potential UVR risks and possible next steps to improve shade, provide UVR protection and promote Sun Safe public environments.

A. Understanding Site Users and Activities

• Activities generally include passive, unstructured activities such as pedestrian movement of all types, relaxing, eating, people watching, shopping, dining and waiting. Typical users include local residents, tourists, vendors, and workers.

• Activities within streetscapes are generally unprogrammed. Users come and go as they choose and decide how long to stay, and can avoid peak UVR times if they choose. Some street events can be programmed and scheduled.

• Scheduled events and programmed activities can bring large numbers of people to these sites and strain the capacity of the site to provide shade to all.

• The City should take responsibility, if issuing a permit or staging a street event, to advise users of personal sun protection measures and make best efforts to provide protected, shaded areas for the activity.

• Street events such as performances for which there is an audience gathered in one place and performers or speakers on a stage require both to remain in place for the duration of the event, with few or no options to relocate to seek shade.

• Streetscapes are active year-round but people will spend more time in that environment when the weather is better, especially in the summer months, and this use can coincide with the Critical Protection Time (CPT): The CPT is the period of greatest daily UVR intensity and occurs between 11 a.m. - 4 p.m. Eastern Daylight Time (EDT) between April and September, and especially during June and July. Sites that are well-used during these times have an increased need for UVR protection and shade.

• Many activities within streetscapes are transient and result in short stays in any one location. However, many activities typical of streetscapes can last longer than 15 minutes, including continuous walking or strolling along long stretches of streets that can result in an accumulated exposure to UVR. The longer the period of exposure to solar UVR, especially during the CPT the greater the risk of harm. It should be noted that in summer in Toronto, sunburn and skin damage can occur in as little as a few minutes during high UVR level days.

• Special street events or even daily use (i.e. lunch time traffic) can bring large numbers of people into the street environment and strain the capacity of the site to provide shade to all. Large numbers of people may overwhelm limited amounts of existing shade and force some users out into unprotected areas.

B. Conducting an Inventory of Site Conditions and Existing Shade

• Streetscapes can be organized into the following areas of use: a Planting and Furnishing Zone that contains benches, transit stops, loading/unloading zones and waiting areas; a Pedestrian Clearway; a Marketing Zone and the Roadway itself.

- Observe the level and quality of shade provided along the street by trees and any existing structures, especially during the CPT. General assessments can focus on the observed shade throughout the site, which can identify priorities for future detailed assessments. When a detailed and accurate assessment is needed, for each activity area or zone of use project shade patterns using appropriate software.

- Trees are important parts of the streetscape and provide shade and amenity value. It is important to calculate the projected size of existing trees and anticipate the resulting shade pattern in the future.

- As part of the inventory, identify opportunities to attach structures or modify an existing structure to provide needed shade. Streets have many structural elements (i.e. utility poles and street furniture) and adjacent buildings that could lend themselves to modification or attachment of shade structures.

- The nature of these dense urban spaces that are primarily paved and carry utilities underground can make the planting of trees and placing of structures difficult.

- Observe how people make use of existing shade, especially during the CPT. Are there opportunities to make better use of shade or access existing shade in the streetscape?

- Paved surfaces in streetscapes can reflect significant amounts of UVR depending on the paving material. Existing ground covers and ground surface materials should be assessed to determine if they meet acceptable standards to reduce the effects of UVR, heat and light reflectance.

C. Identifying Potential Risks

- At the streetscape site in question, assess how adequate existing shade is (both quantity and quality) to protect users and provide a comfortable environment.

- Consider the amount of existing shade at the CPT and compare this with the need for shade. Sunburn and skin damage can occur in as little as a few minutes during high UVR level days.

- Identify whether the level or quality of shade provided, especially during the CPT, is adequate for anticipated numbers of people. Large numbers of users minimize the ability of all participants and spectators to have reasonable access to available shade.

- In non-discretionary use areas (i.e. performance or vending areas) there can be a greater risk of UVR exposure since users are not given the flexibility or choice of moving to seek shade or avoid UVR exposure.

- Streetscapes have areas of paved surface that can reflect UVR. For areas where ground surface and wall materials might reflect undesirable amounts of UVR (i.e. concrete), identify the potential risk from reflected UVR to users at that site. Paved

surfaces can also create reflected glare and heat that lessens the enjoyment of outdoor sites.

D. Making Recommendations

- Develop an overall strategy to reduce UVR at the streetscape site in question and establish goals for specific parts of the site. Different zones should be recognized and specific goals identified for each area.

- A strategy to minimize UVR levels should include as well the reduction of heat and uncomfortable glare from the sun. When streets are more comfortable for use, then the streetscape becomes a more active part of the community and businesses benefit from increased street traffic.

- Shade goals for the site should address light penetration and visibility to avoid dark, uninviting and unsafe environments. Note: shaded space is different from shadowed space, which may be cold, dark and uninviting for pedestrians.

- Where feasible, specify moveable furniture, in existing sites and as part of new plans for sites and facilities, to allow users to move into shade as needed (i.e. benches, chairs, picnic tables).

- When issuing permits for street events, advise the applicants of options to schedule activities outside of the CPT, especially activities with a risk of high UVR exposure.

- Develop a strategy for UVR protection that identifies the amount of additional shade that is needed and where it should be located (i.e. performance characteristics). Allow options for people to be in the sun for warmth and comfort, especially during non-summer months and early morning and late afternoon hours outside of the CPT.

- Identify preferred solutions for each zone of shade using Natural Shade (trees), Constructed Shade (structures), and Portable Shade and combinations of the three to meet performance characteristics identified above and the project budget.

- Position benches, transit stops and waiting areas adjacent to sources of natural and constructed shade or install new shade elements and shelters to provide protection options for users.

- Plant trees at 5-10m intervals (7-8m spacing recommended) wherever possible to provide continuous natural shade for streetscapes and pedestrian routes (co-benefit of urban heat island reduction).

- Review the Urban Forestry Tree Planting standards in the City of Toronto Urban Design Streetscape Manual (See References).

- Determine requirements for new structures, including height, width, depth, overhangs, etc. to provide needed shade. The larger the shaded area, the greater the

opportunity to avoid indirect and direct UVR as levels of UVR will be greater towards the edges of any shaded area.

- Augment natural shade with canopies, building overhangs and other permanent and temporary fixtures as seasonally appropriate.

- Shade patrons of commerce and café activities with awnings, umbrellas, canopies, building overhangs, colonnades, trees, or other permanent and temporary fixtures. Pay special attention to entrances and seating/ vending areas. Consider access to natural light for building interiors, especially during winter months with use of portable/adjustable shade elements (co-benefit of weather protection).

- Consider including shade provisions in boulevard licensing requirements.

- Incorporate add-ons to existing structures and buildings to provide shade. On busy, constrained urban streets with regularly occurring events with roadway closures, install permanent poles or grommets on existing poles, buildings or light standards to suspend temporary shade sails (co-benefit of weather protection).
- Shade structures should not block solar penetration in the winter and shoulder seasons, (i.e. at seating areas).

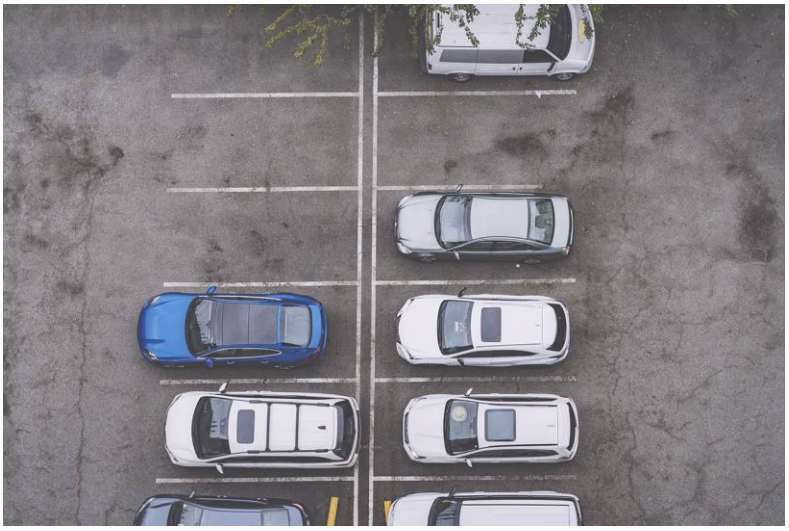
- To deal with indirect UVR, consider wall materials and the use of barriers for side as well as overhead solar protection. Vertical screening with plants and trellises can provide a barrier to indirect UVR.

- Specify paving materials that reduce the reflectivity of UVR. Determine if smooth, reflective walls (i.e. concrete) can be modified to reduce the likelihood of indirect UVR. Soft surfaces and those with uneven finishes will reflect smaller amounts of UVR. Vegetation absorbs and scatters UVR which decreases its intensity.

- At every site, encourage users to use personal sun protection measures (i.e. clothing, hats, sunglasses, sunscreen).

- Promote Sun Safety within streetscapes as part of public education programs and communications to the public about facilities, programs and events.

8.11 Parking Lots



Description

Parking lots, regardless of size, often have limited shade. The City of Toronto Design Guidelines for ‘Greening’ Surface Parking Lots address the importance of increased natural and built shade within parking areas and provide detailed targets for pedestrian routes and the environment. In terms of mitigating UVR risk, pedestrian routes, street frontages, and waiting areas require the most design attention and should incorporate permanent shade elements such as trees and structures.

Although parking areas are most often used to store vehicles, seasonal or temporary activities, such as farmers’ markets, festivals, car washes and other community gatherings may occur particularly during warmer months when UVR risk is high. Both permanent and temporary shade strategies are therefore recommended.

Each subsection in the chart focuses on the application of the Shade Audit and its individual steps. (See Section 7 – Planning for Shade). This information provides guidelines on how to look at, evaluate, investigate each facility and site type and provides a palette of design solutions. For large or complex sites, the execution of the complete Shade Audit is recommended. These guidelines will help staff in evaluating the sites within their and alert them to potential UVR risks and possible next steps to improve shade, provide UVR protection and promote Sun Safe public environments.

A. Understanding Site Users and Activities

- Activities generally include loading and unloading from vehicles, pedestrian movement through and past parking areas, sitting, standing and waiting and participating in a special event in the closed parking lot. Typical users include patrons, employees, vendors and passersby.

- Staff working on site need to have adequate protection from solar UVR during the workday.

• The City should take responsibility, if charging admission to a City-run facility, to make best efforts to provide comfortable, Sun Safe areas for patrons.

• Special events can be held in parking lots (i.e. community festivals, farmers' markets).

• People required to wait in line to get a ticket or pay for parking should be provided with shade.

• Parking lots are active year-round including the summer months, and this use can coincide with the Critical Protection Time (CPT): The CPT is the period of greatest daily UVR intensity and occurs between 11 a.m. -
4 p.m. Eastern Daylight Time (EDT) between April and September, and especially during June and July. Sites that are well-used during these times have an increased need for UVR protection and shade.

• Most activities within parking lots are short in duration and less than 15 minutes. Special events in parking lots can lead to longer stays. The longer the period of exposure to solar UVR, especially during the CPT the greater the risk of harm. It should be noted that in summer in Toronto, sunburn and skin damage can occur in as little as a few minutes during high UVR level days.

B. Conducting an Inventory of Site Conditions and Existing Shade

• Parking lots can be organized into different areas of use. These are: Pedestrian Routes and Street Frontages (circulating through and past the parking area), Waiting Areas (pick-up/drop-off, taxi stand), Parking Areas (loading/unloading from vehicle or participating in event if part of a seasonal or temporary activity).

• Observe the level and quality of shade provided within and adjacent to the parking lot by trees and any existing structures, especially during the CPT. General assessments can focus on the observed shade throughout the site, which can identify priorities for future detailed assessments. When a detailed and accurate assessment is needed, for each activity area or zone of use, shade patterns can be projected using appropriate software.

• Trees are important for providing shade at parking lots and as a landscape amenity. It is important to calculate the projected size of existing trees and anticipate the resulting shade pattern in the future.

• The need to maintain circulation routes and overhead clearances for vehicular traffic make the planting of trees and placing of structures difficult.

• The paved surfaces of public squares can reflect significant amounts of UVR depending on the paving material. Since they are largely open to the sky they also can be exposed to high levels of UVR scattered by the atmosphere. The amount of scattered UVR reaching a person is proportional to the amount of sky visible. Existing

ground covers and ground surface materials should be assessed to determine if they meet acceptable standards to reduce the effects of UVR, heat and light reflectance.

C. Identifying Potential Risks

- At the parking lot in question, assess how adequate existing shade is (both quantity and quality) to protect users and provide a comfortable environment.

- Consider the amount of existing shade at the CPT and compare this with the need for shade. Sunburn and skin damage can occur in as little as a few minutes during high UVR level days.

- Parking Lots have extensive areas of paved surface that can reflect UVR. For areas where ground surface and wall materials might reflect undesirable amounts of UVR (i.e. concrete), identify the potential risk from reflected UVR to users at that site. Paved surfaces can also create reflected glare and heat that lessens the enjoyment of outdoor sites.

- Assess as well the risk from scattered UVR at these open sites. When the sun is high in the sky approximately 50% of sunburning UVR follows an indirect (scattered) path to the user. The amount of scattered UVR reaching a person is proportional to the amount of sky visible.

134 D. Making Recommendations

- Develop an overall strategy to reduce UVR at the parking lot in question and establish goals for specific parts of the site. Different zones should be recognized and specific goals identified for each area.

- A strategy to minimize UVR levels should include as well the reduction of heat and uncomfortable glare from the sun, making these spaces safer and more comfortable for use.

- Develop a strategy for UVR protection that identifies the amount of additional shade that is needed and where it should be located (i.e. performance characteristics).

- Identify preferred solutions for each zone of shade using Natural Shade (trees) and Constructed Shade (structures), and combinations of the two to meet performance characteristics identified above and the project budget.

- Consider the rate of growth of new trees and existing trees on site to anticipate shade coverage.

- When using the parking area for seasonal or temporary activities, bring in tents or other portable shade structures. For regularly occurring activities, install permanent poles or grommets on existing poles, buildings, light standards to suspend temporary shade sails.

- Refer to the City of Toronto Design Guidelines for ‘Greening’ Surface Parking Lots for recommended shade measures and tree planting targets along pedestrian routes and street frontages (See References).

- Determine requirements for new structures, including height, width, depth, overhangs, etc. to provide needed shade. The larger the shaded area, the greater the opportunity to avoid indirect and direct UVR as levels of UVR will be greater towards the edges of any shaded area.

- Locate waiting areas for pick-up and drop-off zones within adjacent buildings, under building overhangs or weather protective canopies or shelters.
- To deal with indirect UVR, consider wall materials and the use of barriers for side as well as overhead solar protection. Vertical screening with plants and trellises can provide a barrier to indirect UVR.

- Specify paving materials that reduce the reflectivity of UVR. Determine if smooth, reflective walls (i.e. concrete) can be modified to reduce the likelihood of indirect UVR. Soft surfaces and those with uneven finishes will reflect smaller amounts of UVR. Vegetation absorbs and scatters UVR which decreases its intensity.

- At every site, encourage users to use personal sun protection measures (i.e. clothing, hats, sunglasses, and sunscreen).

- Promote Sun Safety at City parking lots as part of public education programs and communications to the public about facilities, programs and events.

Appendix A

List of Types of Trees

Common Name	Scientific Name	Favoured Moisture	Favoured Soil Type	Favoured Light Regime	Maximum Height	Species Attributes
Black Maple	Acer nigrum	Moist	Loam, silt-loam	Partial shade to full shade	35m	Tolerant of urban conditions
Red Maple	Acer rubrum	Moist-Wet	Sand, loam	Full sun to partial shade	25m	Orange to bright red fall colour
Silver Maple	Acer sacharinum	Moist-Wet	Sand, loam, clay	Full sun to partial shade	35m	Fast growing and tolerant
Sugar Maple	Acer sacharum	Dry-Moist	Loam, clay	Partial shade to full shade	35m	Yellow to Orange-red fall colour
Speckled Alder	Alnus rugosa	Moist-Wet	Sand, loam, clay	Full sun	8m	Provides wildlife habitat
Yellow Birch	Betula alleghaniensis	Moist	Loam, sandy-loam	Full sun to partial shade	25m	Attracts wildlife
White Birch	Betula papyrifera	Dry-Moist-Wet	Sand, loam, gravel-loam	Full sun	25m	Fast growing and attractive bark
Blue Beech	Carpinus caroliniana	Moist	Loam, sandy-loam	Full shade to partial sun	8m	Interesting bark – looks like muscle
Bitternut Hickory	Carya cordiformis	Moist	Sand, loam	Full sun to partial shade	25m	Fast growing
Shagbark Hickory	Carya ovata	Dry-Moist	Loam, clay	Full sun to partial shade	25m	Interesting bark, attracts squirrels
Hackberry	Celtis occidentalis	Dry-Wet	Loam, clay	Full sun to partial shade	15m	Fast growing, tolerant
Hawthorn	Crataegus spp.	Moist	Loam, clay	Full sun to partial shade	12m	Provides wildlife habitat
American Beech	Fagus grandifolia	Moist	Loam	Partial shade to full shade	25m	Flowers eaten by birds
White Ash	Fraxinus Americana	Moist	Sand, loam, clay	Full sun to partial shade	30m	Purple fall colour
Black Ash	Fraxinus nigra	Wet-Moist	Peat, wet sandy tills	Full sun to partial shade	20m	Dark red fall colour

Common Name	Scientific Name	Favoured Moisture	Favoured Soil Type	Favoured Light Regime	Maximum Height	Species Attributes
Green Ash	Fraxinus pennsylvanica	Moist-Wet	Loam, clay, gravel-loam	Full sun to partial shade	25m	Yellow fall colour
Butternut	Juglans cinerea	Moist	Loams	Full sun	25m	Seeds provide food for wildlife
Black Walnut	Juglans nigra	Moist	Loam, clay	Full sun	30m	Seeds provide food for wildlife
Red Cedar	Juniperus virginiana	Dry-Moist	Sand, loam	Full sun	4m	Provides food & shelter for wildlife
Tamarack	Larix laracina	Moist	Peat, wet sandy-loam	Full sun	25m	Interesting shape
Tulip Tree	Liriodendron tulipifera	Moist	Sand, loam	Full sun to partial shade	35m	Pyramidal shape, interesting leaves
Ironwood	Ostrya virginiana	Dry-Moist	Loam, clay	Full sun to full shade	12m	Interesting bark
White Spruce	Picea glauca	Moist	Sand, loam, clay	Full sun to partial shade	25m	Provides wildlife habitat
Red Pine	Pinus resinosa	Dry-Moist	Sand, sandy-loam	Full sun	25m	Stabilizes soil
White Pine	Pinus strobes	Dry-Moist	Sand, loam Full	sun to partial shade	30m	Provides wildlife habitat
Sycamore	Platanoides occidentalis	Moist-Wet	Sand, loam, clay	Full sun to partial shade	30m	Interesting, peeling bark
Eastern Cottonwood	Pupulus deltoids	Moist-Wet	Sand, loam, clay	Full sun to partial shade	30m	Fast growing
Largetooth Aspen	Populus grandidentata	Dry-moist	Sand, loam	Full sun	20m	Fast growing
Trembling Aspen	Pupulus tremuloides	Moist	Sand, loam, clay	Full sun	25m	Fast growing, tolerant
Pin Cherry	Prunus pensylvanica	Dry	Sand, loam	Full sun	12m	Seeds provide food for wildlife
Black Cherry	Prunus serotina	Dry-Moist	Sand, loam	Full sun to partial shade	22m	Interesting bark, provides habitat

Common Name	Scientific Name	Favoured Moisture	Favoured Soil Type	Favoured Light Regime	Maximum Height	Species Attributes
White Oak	Quercus alba	Dry-Moist	Sand, sandy-loam	Full sun to partial shade	35m	Provides food & shelter for wildlife
Bur Oak	Quercus macrocarpa	Dry-Wet	Loam, clay	Full sun to partial shade	15m	Provides food & shelter for wildlife
Red Oak	Quercus rubra	Dry-Moist	Sand to loamy-clay	Full sun to partial shade	25m	Fast growing, wildlife value
Black Oak	Quercus velutina	Dry-Moist	Sand	Full sun to partial shade	20m	Seeds provide food for wildlife
White Cedar	Thuja occidentalis	Dry-Wet 15m	Sand, loam, clay	Full sun to partial shade	15m	Provides wildlife habitat
Basswood Tilia	Americana	Dry-Wet	Sand, loam, clay	Full sun to partial shade	35m	Tall stately tree
Hemlock	Tsuga Canadensis	Moist-Wet	Sand, loam	Full shade	30m	Provides food & shelter for wildlife

(City of Toronto Urban Forestry Services www.toronto.ca/trees)

Appendix B.

Table 2.Guidelines for Selecting Constructed Shade Materials

	Glass	Poly carbonate and fiberglass sheeting	Canvas or other tightly woven fabric	Knitted polyethylene or woven PVC shade cloth	Timber	Steel roof sheeting
Suitability	Good windbreak where visibility and light are required	Roofing, walling, louver, awnings, skylights, canopies	Good for small low budget jobs	Canopies and other proprietary products	Pergolas, trellis, screens	Roofing, walling, steep or low pitches
Approximate ultraviolet protection factor	Depends on thickness. Ordinary window glass is not highly protective	Very high	Very high	Shade cloth rating of 90% gives only medium UV radiation protection. Double knits or double layers may give higher protection.		
Waterproof	Yes	Yes	Yes, watertight up to saturation point	Porous, lacks rain protection	Depends on detailing and use	Yes
Light Transmission	High, depending on tint	High, but varies according to thickness profile and colour	Light colours allow more light	Light colours allow more light but reflect and scatter more UV radiation	Depends on detailing	No light transmission
Solar heat gain	Less heat gain if tinted; hotter but reflects less UV radiation	High	Dark colours hotter	Darker colours are hotter but reflect less UV radiation	Conducts heat	High if not insulated
Structural implications	Need to select glass appropriate to site	Need to incorporate wind into design	Guy ropes (if present) cause obstruction	Wind drags through porous material	Need to incorporate wind uplift consideration into design	

	Glass	Poly carbonate and fiberglass sheeting	Canvas or other tightly woven fabric	Knitted polyethylene or woven PVC shade cloth	Timber	Steel roof sheeting
Ease of replacement	Usually readily available	Readily available	Readily available	Readily available. Cost is directly proportional to quality	Readily available	Readily available
Life span	Long if does not sustain impact	About 10 years; discolouration may occur sooner	Limited. Susceptible to breakdown due to UV radiation exposure	5-10 years	Long life if well maintained	Long life if well maintained
Particular properties	Safety glass available	Long lengths and range of colours and profiles available	Range of colours	Easier to fabricate than solid fabrics. High-stretch. Curved surfaces easily formed	Available in wide range of sizes and strengths	Strongest of roofing and walling available Economic for small to large structures
Maintenance needs	Needs regular cleaning	Low maintenance impact resistance	Without specific treatment is not mould resistant	Susceptible to mould growth and dirt accumulation	Guard against termites	Subject to moisture and condensation conditions

Appendix C

Table 3. Comparing Types of Shade

Types of Shade	Examples	Benefits	Drawback	Where to obtain
Natural	Trees, shrubs, vines	-Can be very effective, depending on the density of the foliage -Can offer seasonal variations in scent and colour -Aesthetically pleasing -Environmentally friendly	-If newly planted, may take years to reach maturity and provide adequate shade -Requires maintenance especially for new trees -Some plants may be poisonous or attract bees/insects	-Local nurseries and tree farms
Constructed (portable)	Umbrella, awnings, tent-like structures	-Can be found at very reasonable prices -Ideal for some locations such as the beach -Can be adapted for use in a variety of situations -Readily available	-Provides a temporary shade solution -Usually suitable for only one or a few people -Requires maintenance	-Local businesses such as hardware stores and home stores -Shade manufacturers
Constructed (permanent)	-Awnings, pavilions, gazebos, constructed structures	-Provide a permanent shade solution -Can provide shade to a large number of people	-Can be expensive -Requires more extensive planning to implement -Requires maintenance	-Local businesses such as hardware stores and home stores -Shade manufacturers

(From: Shade: A Planning Guide, York Region 2002)

Appendix D

Shade Audit Process Checklist

I. USERS AND ACTIVITIES

Primary Questions/General Observations and Guide to Answering the Question

1.0 What are the main activities on the site? Who are the users of the site, both individuals and groups?

1.1 Distinguish between the active participants and users of the site and spectators, sports coaches, officials and caregivers who are observing the activity. Are there special user groups that need special attention (i.e. disabled)? (Guide to answering the question: Remember as well that many activities have participants who rest on the sidelines and edges of the area such as swimming pools, waterplay & sports fields).

1.2 Distinguish between users who come to stay for a period at the site and transient, mobile users.

1.3 Identify employees and staff who are providing support to activities on the site and maintaining facilities and grounds. (**Guide to answering the questions** - Note: Employees might be subject to special consideration and protection as part of their terms of employment or union contract.

1.4 Distinguish between programmed and organized activity and spontaneous, unorganized activities. (**Guide to answering the questions**: Organized activities such as picnics, team sports, and performances mean that users are required to use a site at a certain time and duration without much discretion to avoid possible sun exposure).

1.5 For programmed activities, identify group sizes, such as large events vs. small groups and gatherings.

1.6 Identify activities permitted by the City such as permit issued and where a fee is charged for entry. (**Guide to answering question**: The City should take responsibility, if issuing a permit or charging admission, to advise these users of personal sun protection measures and make best efforts to provide protected, shaded areas for the activity).

1.7 Identify specialized activities that involve vendors such as farm markets and food concessions.

1.8 Are people required to wait in line or queue such as for food, tickets or entry to a facility?

1.9 Are there performances or special events for which there is an audience gathered in one place and performers or speakers on a stage?

2.0 When do activities occur? What time of year or time of day is the site used?

2.1 Identify typical times when activities occur. Highlight activities that occur during the Critical Protection Time (CPT): CPT is the period of greatest daily UVR intensity is usually between 11 a.m. - 4 p.m. Eastern Daylight Time (EDT) between April and September, and especially during June and July. Sites that are well-used during these times have an increased need for UVR protection and shade.

3.0 What is the duration of each type of activity?

3.1 Note the duration of individual uses and activities, especially those that last longer than 15 minutes during the CPT. The length of time over which an activity takes place is an important factor. The longer the period of exposure to solar UVR, the greater the risk of harm. It should be noted that in summer in Toronto, sunburn and skin damage can occur in as little as 15 minutes.

4.0 What are the ages of the users?

4.1 Distinguish among the various age groups who use the site and understand that sun protection strategies have to address the needs of each age group per the following:

-Babies/toddlers (0-2 yrs.) _____%
-Children (3-11 yrs.) _____%
-Adolescents (12-18 yrs.) _____%
-Adults (19-59 years) _____%
-Seniors (60+ years) _____%

4.2 Identify specifically the number/proportion of children and adolescents using the site. The characteristics of the age group are important in determining the risk of UVR-related skin damage. Children and adolescents exposed to large amounts of solar UVR have a significantly greater chance of developing skin cancer later in life. Sites where children and adolescents are the main users should be a higher priority for UVR protection and shade.

5.0 How well-used is the site?

5.1 Identify sites and facilities and the activities and events at these locations which have a high level of use. Sites that are well-used should generally take priority over less-used sites. Larger numbers of people may overwhelm limited amounts of existing shade and force some users out into unprotected areas.

5.2 For more detailed assessments identify potential numbers of users. Detailed shade assessment during the Shade Audit process will require specific numbers of users to properly evaluate existing shade, identify potential risks, and quantify additional shade required.

5.3 Will there be increased use and demand at this site in the future? This should be considered in planning for shade provision. Even though a site is not well-used, it might be a reflection of poor shade protection and overall user comfort, which make the site unattractive for use.

6.0 Are there activities on the site which are discretionary vs. non-discretionary?

6.1 Identify uses that are not discretionary (i.e. do not give users the flexibility or choice of moving to seek shade or avoid UVR exposure). In non-discretionary use areas, such as numbered seating in grandstands at sports events, waiting lines for tickets and audience areas for performance, there can be a greater risk of UVR exposure.

6.2 Identify uses that are discretionary, (i.e. allow some degree of choice or flexibility to the user to access shade). In discretionary use areas such as grassed spectator areas at sports events, picnic areas, beaches and public squares, users are able to access available shade.

7.0 What is the likelihood of risk behaviour?

7.1 Identify uses that generally involve less protective clothing and can lead to higher levels of UVR exposure. For example, beaches, waterplay and swimming pools and some sports typically involve users that have minimal clothing and have exposed skin. Minimal clothing and young users can lead to higher risks of sunburn and UVR damage.

7.2 Identify uses that involve children, understanding that they might not be supervised or be old enough to understand Sun Safe practices. Children and adolescents at play may be more likely to engage in risk behaviour than adults, who more typically seek out shade for protection or comfort. Even in situations where children may be supervised by adults, their behaviour might still be a risk, as the supervising adult may not be aware of Sun Safe practices or enforce solar protection strategies.

II. CONDUCTING AN INVENTORY OF SITE CONDITIONS AND EXISTING SHADE

Primary Questions/General Observations and Guide to Answering the Question

1.0 How does the site accommodate existing uses? Where on the site do the main activities and site uses occur?

1.1 To better understand how the site is being used, organize the site into major areas of use according to the site characteristics and types of activities.

2.0 Identify the existing shade (quantity and quality) provided on the site by trees?

2.1 General Assessments: For each activity area or zone of use, observe the level and quality of shade provided by trees, especially during the CPT. Assess existing shade before planning and designing for additional shade at a site. Determine amount and extend of existing shade. Note and map this information. Note: CPT is the period of greatest daily UVR intensity is usually between 11 a.m. - 4 p.m. Eastern Daylight Time (EDT) between April and September, and especially during June and July. Sites that are well-used during these times have an increased need. General assessments (See 7.4 - Shade Inventory) can focus on the observed shade throughout the site, which can identify priorities for future detailed assessments.

2.2 Detailed Assessments: When a detailed and accurate assessment is needed, for each activity area or zone of use the shade patterns from trees can be projected using appropriate software. Detailed assessments should note height, age, species, condition, canopy size, canopy density of trees and calculate projected size and shade pattern in the future. CAD programs and specialized software (i.e. WebShade) can be used to accurately identify shade patterns (See 7.5 - Software and Appendix D).

3.0 Determine the effect that future tree growth will have on the amount of shade provided at the site.

3.1 Calculate the projected size of existing trees and anticipate the resulting shade pattern in the future. Assess future tree shade before planning and designing for additional shade at a site. Note and map this information. Existing shade patterns, especially for young trees are likely not indicative of future shade provision.

4.0 Where is the existing shade (quantity and quality) provided on the site by buildings and structures?

4.1 General Assessments: For each activity area or zone of use, observe the level and quality of shade provided by buildings and structures, especially during the CPT. General assessments (i.e. Shade Inventory) can focus on the observed shade throughout the site, which can identify priorities for future detailed assessments.

4.2 Detailed Assessments: When a detailed and accurate assessment is needed, for each activity area or zone of use the shade patterns from buildings and structures can be projected using appropriate software. Measure height, length and width of existing site structures and note materials. Make a note of the roof overhangs. For adjacent buildings note the height of

building walls and roof projections that provide shade to the adjacent site. CAD programs and specialized software (i.e. WebShade) can be used to accurately identify shade patterns.

5.0 Does the nature of the site or facility place constraints on shade provision?

5.1 Does the nature of the site or facility preclude or make difficult the planting of trees and placing of shade structures? For example sportsfields, swimming pools, public squares need to remain open and unobstructed. Also, parks on top of water reservoirs where trees cannot be planted and structures are constrained are challenged. Trees are sometimes undesirable because of roots and litter from branches and leaves requiring extra maintenance.

6.0 Do site users and activities on the site take advantage of available shade?

6.1 Observe the specific activities in each zone of use to determine how well site users make use of existing shade, especially during the CPT.

6.2 Are there opportunities to make better use of shade or access existing shade on the site by reorganizing the site? Is access to available shade obstructed thus preventing use?

7.0 What are the potential effects of Indirect UVR at the site?

7.1 Make a note of the ground surface and wall materials within each outdoor zone such as concrete and grass. Assess existing ground covers and ground surface materials to determine if they meet acceptable standards to reduce the effects of UVR, heat and light reflectance. Note conditions and materials that may not be acceptable.

7.2 Make a note of how much open sky is visible at each activity area, since these are areas where indirect UVR scattered by the atmosphere can reach the site. When the sun is high in the sky approximately 50% of sunburning UVR follows an indirect (scattered) path to the user. The amount of scattered UVR reaching a person is proportional to the amount of sky visible.

8.0 Would a structure be useful for other things besides shade protection?

8.1 Identify other needs at the site or other uses of a structure that could be beneficial such as rain protection, gathering place, iconic design structure or landmark. Co-benefits can help to justify the need for a structure and assist in building a business case for funding.

9.0 What are the future plans for the site?

9.1 Identify any existing plans for site development including new buildings, renovation of existing buildings and structures and landscape projects. Shade planning can piggyback onto other funded programs for site development. Understanding what long-term plans are can help guide short-term initiatives.

9.2 Are there plans for tree planting, naturalization, tree canopy enhancement already at this site? Shade planning can piggyback onto other funded programs for planting.

III. IDENTIFYING POTENTIAL RISKS

Primary Questions/General Observations and Guide to Answering the Question

1.0 How adequate is the existing shade at the site, particularly during summer?

1.1 How adequate is existing shade (both quantity and quality) during the summer at each of the major areas of use identified? For large or complex sites, it is helpful to divide the site into zones and then consider the adequacy of shade for each zone. Consider the amount of existing shade at the Critical Protection Time (CPT) and compare this with the need for shade for the particular type of activity and user, especially for facilities that become crowded. CPT is the period of greatest daily UVR intensity usually between 11 a.m. - 4 p.m. Eastern Daylight Time (EDT) between April and September, and especially during June and July. Sites that are well-used during these times have an increased need.

1.2 Identify specific unshaded areas where exposure to UVR during the CPT is typically over 10 to 15 minutes. Sunburn and skin damage can occur in as little as a few minutes in Toronto during high UVR level days.

2.0 Is the amount of shade adequate for the number of people using the site?

2.1 For each activity area or zone of use, identify whether the level or quality of shade provided, especially during the CPT, is adequate for anticipated numbers. Large numbers of users minimize the ability of all users to have reasonable access to available shade.

2.2 Estimate the amount of additional shade likely to be required to mitigate the risk, (i.e. provide an adequate amount of shade) for the number of people using the Site. Specialized software (i.e. WebShade) can provide estimates of extra shade required based on use and site capacity.

3.0 Is adequate shade provided for each type of user?

3.1 For each area of use and activity, identify whether the level of shade and UVR protection is adequate for the type of user, especially for children and youth. The characteristics of the age group are important in determining the risk of UVR-related skin damage. Children and adolescents exposed to large amounts of solar UVR have a significantly greater chance of developing skin cancer later in life. Sites where children and adolescents are the main users should be a higher priority for UVR protection and shade. The amount of clothing worn for certain activities can allow significant amounts of skin exposure such as at beaches, pools and waterplays.

4.0 In areas of non-discretionary use, is adequate shade and UVR protection available?

4.1 For each area of use and activity where the use is non-discretionary, identify whether the level of shade and UVR protection is adequate for the type of user. In non-discretionary use areas (i.e. numbered seating in grandstands at sports events waiting lines for tickets, audience areas for performance, and defined pathways) there can be a greater risk of UVR exposure since users are not given the flexibility of moving to seek shade or avoid UVR exposure.

III. IDENTIFYING POTENTIAL RISKS

5.0 Are there areas where indirect UVR is a problem and needs to be mitigated?

5.1 For areas where ground surface and wall materials might reflect undesirable amounts of UVR, identify the potential risk from reflected UVR to users at that site.Certain materials are more reflective of UVR, (i.e. sand and concrete) and can also create uncomfortable glare that lessens the use and enjoyment of outdoor sites.

5.2 Assess the amount of scattered UVR reaching areas. When the sun is high in the sky approximately 50% of sunburning UVR follows an indirect (scattered) path to the user. The amount of scattered UVR reaching a person is proportional to the amount of sky visible.

MAKING RECOMMENDATIONS

1.0 Establish an overall shade provision and UVR reduction goal for the site or facility.

1.1 Develop an overall strategy to reduce UVR at the site and establish goals for specific parts of the site (i.e. the zones of use identified in A. Users & Activities and B. Site Inventory).

1.2 Develop goals for the site that also address overall user comfort and improved site use, as a co-benefit of shade provision. Develop goals for the site that also address overall user comfort and improved site use, as a co-benefit of UVR protection. A strategy to minimize UVR levels should include as well the reduction of heat and uncomfortable glare from the sun. Structures that provide shade can also be considered to provide rain protection or act as focal meeting places. When sites and facilities are more comfortable for users, spectators and attendant caregivers, these public recreation facilities get better use and these activities, including active and passive recreation of all types are supported. Shade goals for the site should address light penetration and visibility to avoid dark, uninviting and unsafe environments. Before making commitments to Capital investment for new plantings and structures, it is wise to consider simpler and cheaper options.

2.0 Consider whether there are options to relocate the activity or facility to better access available shade.

2.1 Identify whether the activity including structures and equipment that support the activity can be relocated to a Sun Safe area. If not feasible to change immediately, include relocation options into future planning for the site. Facilities that are due for renovation or replacement, can be shifted strategically as part of Capital improvements to better access existing shade from trees or adjacent structures.

2.2. Where possible, identify specific site adjustments that can be made to accommodate the relocation of activities to Sun Safe areas. Parts of the site can be regraded and surfaced appropriately to allow access to shade, low branches can be removed from trees to allow access under them and mulch can be placed under trees to allow use and lessen the impact on tree roots.

2.3 Where feasible, specify moveable furniture, in existing sites and as part of new plans for sites and facilities, to allow users to move into shade as needed. (For example benches, chairs, picnic tables).

3.0 Change the time of the event relative to the Critical Protection Time (CPT).

3.1 For each activity and identified zone of use identify opportunities to reschedule events and activities to a time outside of the CPT. (Before making commitments to Capital investment for new plantings and structures, it is wise to consider simpler and cheaper options.

3.2 When issuing permits for activities (i.e. in parks) advise applicants of options to schedule activities outside of CPT, especially activities with risk of high UVR exposure.

4.0 Develop a strategy for the addition of natural, constructed or portable shade to mitigate the risk. (Investment in Capital improvements to include plantings and structures should be seen as one solution to be considered in combination with strategies to relocate activities, change the time of use and generally promote personal Sun Safety measures.)

4.1 To refine the overall shade provision strategy identified above, provide performance characteristics for the proposed shade, to allow the design to properly meet the need. Identify the amount of additional shade that is needed and where it should be located. Allow options for people to be in the sun for warmth and comfort, especially during non-summer months and early morning and late afternoon hours outside of the CPT.

4.2 Identify preferred solutions for each zone of shade using Natural Shade (plantings), Constructed Shade (structures) and Portable Shade, and combinations of the three to meet the performance characteristics identified above and the project budget. Identify the range of shade options (natural, constructed and portable) that may be appropriate and their likely costs); identify budget for project. Consider the cost efficiency and feasibility of solutions, (i.e. small structures are more affordable for smaller spaces while large open spaces might require a natural shade approach). Consider the rate of growth of new trees and existing trees on site. Consider augmenting with structures to provide shade until trees develop to provide better shade. See Section 6.0 Types of Shade and Appendices A, B and C for specific guidelines and details on n natural, constructed and portable shade.

4.3 As part of the strategy, determine how interim solutions can address short-term needs and available budgets vs. long-term investment in significant structures and plantings. Interim and temporary solutions can be provided by demountable structures and portable shade (i.e. umbrellas, marquees) for seasonal use or for specific events.

5.0 As part of the overall strategy, develop plans for natural shade.

5.1 Where trees have been identified as the preferred solution, specify tree species, spacing, and sizes to meet performance requirements. See Appendix A: Types of Trees. Consider the rate of growth of new trees and existing trees on site. Consider augmenting with structures to provide shade until trees mature.

5.2 Specify vines on arbours, trellises, lattice screens or pergola’s, if they are appropriate solutions. Proposed tree placement and size can be tested using software to model the effectiveness of providing the required shade coverage. Tree growth over time can be simulated as well.

6.0 As part of the overall strategy, develop plans for constructed shade.

6.1 Where structures have been identified as the preferred solution, determine requirements for new structures, including height, width, depth, overhangs, etc. to provide needed shade. See Appendix B: Constructed Shade – Materials. The larger the shaded area, the greater the opportunity to avoid indirect and direct UVR as levels of UVR will be greater towards the edges of any shaded area. Make sure to extend overhead shade structures at least one metre past actual areas of use. Proposed structure placement and size can be tested using software to model the effectiveness of providing the required shade coverage.

6.2 Identify the preferred type of structure: permanent, demountable, adjustable, or tensile structures. See 6.0 Types of Shade: Constructed Shade for details of types. Consider the feasibility of staff mounting/demounting these structures on a daily and seasonal basis, so they are not left out overnight or during the off-season and result in damage to the structure.

6.3 If determined to be feasible, incorporate add ons to existing structures and buildings in plans for shade structures. Existing buildings provide some shade and provide opportunities to attach structures or modify the building structure to provide needed shade.

6.4 Consider if solar penetration for user comfort and warmth is important, both during the summer months and in the winter and shoulder seasons and design structures accordingly. Shade structures should not block solar penetration in the winter and shoulder seasons (i.e. at seating areas). During the summer, early morning and evening sun, outside of the CPT can be beneficial to comfort. Wading pools can benefit from solar heat in the morning to heat pool water. Adjustable devices can allow solar penetration when needed and exclude at other times.

6.5 Determine how structures can address other site needs and provide co-benefits in addition to meeting shade/ UVR needs. Incorporate these into the planning and design of shade structures. Structures can provide rain protection, be a focal point for gathering, provide opportunities for directional and interpretive signage, and be iconic design statements and landmarks within the site.

7.0 Specify portable shade if appropriate to the site and activity.

7.1 Determine options to provide portable shade at the site. For example, umbrellas, beach cabanas, and small marquees, tents and shelters can provide cost-effective solutions at the places they are needed.

8.0 Develop a strategy to deal with indirect UVR.

8.1 Consider the impact of indirect UVR on the site and determine the measures needed to mitigate it.

8.2 On structures, consider wall materials and the use of barriers for side as well as overhead solar protection. Indirect UVR can be reflected off surfaces or scattered in the atmosphere by water vapour and particles. Vertical screening with plants and trellises or a system of louvers can provide a barrier to indirect UVR, while not blocking needed ventilation.

8.3 Specify paving materials that reduce the reflectivity of UVR. Can smooth, reflective walls be modified to reduce the likelihood of indirect UVR? Soft surfaces and those with uneven finishes will reflect smaller amounts of UVR. Vegetation absorbs and scatters UVR which decreases its intensity. Plant ground covers or grass in preference to the use of concrete paving.

9.0 Incorporate planning principles and design standards that complement shade planning. The application of standards for shade provision and protection from harmful UVR should complement other planning principles and design standards as part of a comprehensive approach to the design of sites).

9.1 Adhere to Crime Prevention Through Environmental Design (CPTED) principles to address safety and user comfort. Plantings and structures can affect sightlines and feelings of comfort and safety in a site. New facilities should be located properly. If existing activities are relocated consider safety/ visibility factors addressed by CPTED criteria.

9.2 Adhere to guidelines for universal accessibility and ensure compliance with relevant legislation. See especially standards and compliance required under the Accessibility for Ontarians with Disabilities Act (AODA).

10.0 Promote Sun Safety and personal protection measures.

10.1 At every site and facility, encourage users and caregivers to use personal sun protection measures (i.e. clothing, hats, sunglasses, sunscreen). Promotion of personal Sun Safety measures should be seen as one solution to be considered in combination with investment in Capital improvements (plantings and structures), strategies to relocate activities and change the time of use.

10.2 Promote Sun Safety as part of public education programs and communications to the public about facilities, programs and events.

10.3 When issuing permits for activities such as in parks, advise applicants of sun protection measures especially for activities with risk of high UVR exposure during the CPT. See 5.1 Sun Safety, including the Toronto Public Health Guide: Planning for Events. https://www.toronto.ca/community-people/health-wellness-care/health-programs-advice/cancer-prevention-and-screening/sun-safe-outdoor-events/

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Shade Guidelines Feedback Form

This form has been prepared for users of this document.

The feedback will be instrumental in the improvement of the document.

Kindly return the completed form to: Safoura Moazami, Health Promotion Specialist, Healthy Public Policy, Toronto Public Health, 277 Victoria Street, 7th Floor, Toronto, Ontario M5B 1W2. safoura.moazami@toronto.ca

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Apart from clothes and planning of outdoor activities, tree shade is supreme protection.

WORLD HEALTH ORGANIZATION, 1995.

Solar radiation and more particularly, the ultraviolet portion of solar radiation is a human carcinogen for skin cancer. The provision of shade in City-owned and operated outdoor venues, in particular where children are in attendance, is an important measure for the primary prevention of skin cancer and its associated health and economic burden.

The Shade Guidelines have been created by the Shade Policy Committee of the Toronto Cancer Prevention Coalition Ultraviolet Radiation Working Group in collaboration with Parks, Forestry and Recreation and with the support of Toronto Public Health, as directed by the Board of Health and City Council. The Shade Guidelines are intended to complement the Shade Policy for the City of Toronto and to assist all City agencies, boards, commissions and divisions (ABCDs) to provide UVR protection and sun safety measures for their outdoor environments.

Part I of the Shade Guidelines contains important information related to solar UVR and its health effects, City policies in support of shade and the co-benefits of shade.

Part II includes information on sun safety measures, types of shade and finally recommendations and principles for increasing shade at facilities operated by the City of Toronto such as waterplay and swimming pools, playgrounds, beaches, and public squares. These facilities are used primarily during the summer when direct UVR levels are at their highest, when high levels of indirect UVR reflect from surfaces and when users typically wear minimal clothing.

Toronto **Cancer Prevention** Coalition