Community-Based UV Risk Education

The SunWise Program Handbook

EMPACT

Environmental Monitoring for Public Access & Community Tracking

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Community-Based Ultraviolet Radiation (UV) Risk Education

The SunWise Program Handbook

United States Environmental Protection Agency
National Risk Management Research Laboratory
Office of Research and Development
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1.0 INTRODUCTION

The sun is necessary for life, and while some exposure to sunlight is enjoyable, too much can be dangerous. There is increased concern that, due to the depletion of the ozone layer, more of the sun's rays are reaching Earth than ever before. Overexposure to ultraviolet (UV) radiation can lead to adverse health effects, such as blistering sunburns, skin cancer, eye problems, and premature aging of the skin. More than 1 million people in the United States are diagnosed with skin cancer each year, making it the most common form of cancer in the country. In fact, 90 percent of skin cancers are linked to sun exposure.[1]

Skin cancer and other health risks are largely preventable, however. Communities have access to a host of tools to help understand the risks from overexposure to the sun and how to protect themselves from harmful UV radiation. One of the most useful tools is the UV Index, which is a daily forecast of the level of UV exposure for a particular area of the country.

This handbook is designed to provide you with instruction and guidance on how to inform your community about the risks posed by overexposure to UV radiation and the steps that residents can take to reduce these risks. You will also learn more about the UV Index and how it can be incorporated into a successful sun protection education program. This handbook was developed by the U.S. Environmental Protection Agency's (EPA's) Environmental Monitoring for Public Access and Community Tracking (EMPACT) program. EPA created EMPACT in 1996 to take advantage of new technologies that make it possible to provide environmental information to the public in near-real time. EPA partnered with the National Oceanic and Atmospheric Administration (NOAA) and the U.S. Geological Survey (USGS) to help achieve nationwide consistency in measuring environmental data, managing the information, and delivering it to the public.

EMPACT projects have been initiated in 156 metropolitan areas. (See table at the end of this chapter.) These projects cover a wide range of environmental issues,

[1]American Cancer Society, "Cancer Facts and Figures 1999."

such as groundwater contamination, ocean pollution, smog, and overall ecosystem quality.

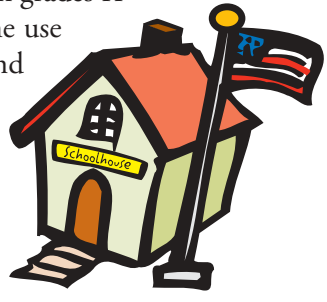
EMPACT projects aim to help communities:

- Collect, manage, and distribute time-relevant environmental information.
- Provide their residents with easy-to-understand, practical information they can use to make informed, day-to-day decisions.

Some projects have been initiated directly by EPA; others have been launched by communities with the help of EPA-funded Metro Grants. EMPACT projects have helped local governments build monitoring infrastructures and disseminate environmental information to millions of people.

1.1 What Is EPA's SunWise Program?

The SunWise School Program is an EMPACT project that raises awareness of the health risks of overexposure to the sun and aims to change behaviors to reduce these risks. This national program reaches out to children in grades K through 8, their teachers, and their caregivers. Through the use of classroom-, school-, and community-based lessons and activities, SunWise helps children:



- Follow action steps to reduce their exposure to UV radiation (see Chapter 4).
- Develop skills for sustained SunWise behavior and appreciate the environment around them.

SunWise activities and publications discuss the causes and effects of UV radiation, as well as how to monitor local and national UV levels using the UV Index.

The SunWise Web site (www.epa.gov/sunwise) provides detailed information on the program and is a comprehensive online resource for sun safety information. In addition, NOAA's Climate Prediction Center (www.cpc.ncep.noaa.gov) provides daily updates of the UV forecast for U.S. and international cities.

SunWise
a school program that **radiates** good ideas

1.2 What Is the Purpose of This Handbook?

This handbook provides information your community will need to develop a UV risk education program. The handbook is organized as follows:

- **Chapter 2** describes the health and environmental concerns of UV radiation, including detailed information on skin cancer, skin aging, cataracts, and immune system suppression. It describes the different types of UV radiation and discusses the relationship between ozone depletion and increased UV radiation, including the science of ozone depletion.
- **Chapter 3** includes detailed information on the UV Index, including when and why it was established, what it measures, what UV monitoring systems exist, and how the UV Index is influenced by factors such as elevation, cloud cover, time of day, and latitude.
- **Chapter 4** discusses how to communicate sun protection and public health information to residents. A UV/sun protection outreach project can take many forms, from a sustained, multi-year, community-wide effort to a seasonal campaign at parks and recreation centers. This chapter of the handbook explains the steps involved in developing a sun protection outreach program for a community and provides profiles of successful initiatives in the United States and internationally. It also describes a variety of successful tools and strategies that can be used in schools and communities, and it provides guidance for communicating information about sun protection and health risks to the community.

  This handbook is designed for decision-makers and public health officials who may be considering whether to implement a UV risk communication or outreach program in their community, and for outreach coordinators or other individuals who are in charge of implementing community-based programs.

  This handbook references supplementary sources of information, such as Web sites, publications, organizations, and contacts, that can help the user find more-detailed guidance. Interspersed throughout the handbook are success stories and lessons learned from communities and organizations that have already implemented UV outreach programs.

1.3 EMPACT Metropolitan Areas

Albany-Schenectady-Troy, NY
Albuquerque, NM
Allentown-Bethlehem-Easton, PA
Anchorage, AK
Appleton-Oshkosh-Neenah, WI
Atlanta, GA
Augusta-Aiken, GA-SC
Austin-San Marcos, TX

Bakersfield, CA
Baton Rouge, LA
Beaumont-Port Arthur, TX
Billings, MT
Biloxi-Gulfport-Pascagoula, MS
Binghamton, NY
Birmingham, AL
Boise City, ID
Boston-Worcester-Lawrence, MA-NH-ME-CT
Brownsville-Harlingen-San Benito, TX
Buffalo-Niagara, NY
Burlington, VT

Canton-Massillon, OH
Charleston-North Charleston, SC
Charleston, WV
Charlotte-Gastonia-Rock Hill, NC-SC
Chattanooga, TN-GA
Cheyenne, WY
Chicago-Gary-Kenosha, IL-IN-WI
Cincinnati-Hamilton, OH-KY-IN
Cleveland-Akron, OH
Colorado Springs, CO
Columbia, SC
Columbus, SC
Columbus, GA-AL
Columbus, OH
Corpus Christi, TX

Dallas-Fort Worth, TX
Davenport-Moline-Rock Island, IA-IL
Dayton-Springfield, OH
Daytona Beach, FL
Denver-Boulder-Greeley, CO
Des Moines, IA
Detroit-Ann Arbor-Flint, MI
Duluth-Superior, MN-WI

El Paso, TX
Erie, PA
Eugene-Springfield, OR
Evansville-Henderson, IN-KY

Fargo-Moorhead, ND-MN
Fayetteville, NC
Fayetteville-Springfield-Rogers, AR
Fort Collins-Loveland, CO
Fort Myers-Cape Coral, FL
Fort Pierce-Port St. Lucie, FL
Fort Wayne, IN
Fresno, CA

Grand Rapids-Muskegon-Holland, MI
Greensboro-Winston-Salem-High Point, NC
Greenville-Spartanburg-Anderson, SC

Harrisburg-Lebanon-Carlisle, PA
Hartford, CT
Hickory-Morgantown-Lenoir, NC
Honolulu, HI
Houston-Galveston-Brazoria, TX
Huntington-Ashland, WV-KY-OH
Huntsville, AL

Indianapolis, IN

Jackson, MS
Jacksonville, FL
Johnson City-Kingsport-Bristol, TN-VA
Johnston, PA

Kalamazoo-Battle Creek, MI
Kansas City, MO-KS
Killeen-Temple, TX
Knoxville, TN

Lafayette, LA
Lakeland-Winter Haven, FL
Lancaster, PA
Lansing-East Lansing, MI
Las Vegas, NV
Lexington, KY
Lincoln, NE

Little Rock-North Little Rock, AR
Los Angeles-Riverside-Orange County, CA
Louisville, KY
Lubbock, TX

Macon, GA
Madison, WI
McAllen-Edinburg-Mission, TX
Melbourne-Titusville-Palm Bay, FL
Memphis, TN-AR-MS
Miami-Fort Lauderdale, FL
Milwaukee-Racine, WI
Minneapolis-St. Paul, MN-WI
Mobile, AL
Modesto, CA
Montgomery, AL

Nashville, TN
New London-Norwich, CT-RI
New Orleans, LA
New York-Northern New Jersey-Long Island, NY-NJ-CT-PA
Norfolk-Virginia Beach-Newport News, VA-NC

Ocala, FL
Odessa-Midland, TX
Oklahoma City, OK
Omaha, NE-IA
Orlando, FL

Pensacola, FL
Peoria-Pekin, IL
Philadelphia-Wilmington-Atlantic City, PA-NJ-DE-MD
Phoenix-Mesa, AZ
Pittsburgh, PA
Portland, ME
Portland-Salem, OR
Providence-Fall River-Warwick, RI-MA
Provo-Orem, UT

Raleigh-Durham-Chapel Hill, NC
Reading, PA
Reno, NV
Richmond-Petersburg, VA
Roanoke, VA
Rochester, NY
Rockford, IL

Sacramento-Yolo, CA
Saginaw-Bay City-Midland, MI
St. Louis, MO-IL
Salinas, CA
Salt Lake City-Ogden, UT
San Antonio, TX
San Diego, CA
San Francisco-Oakland-San Jose, CA
San Juan-Caguas-Arecibo, PR
San Luis Obispo-Atascadero-Paso Robles, CA
Santa Barbara-Santa Maria-Lompoc, CA
Sarasota-Bradenton, FL
Savannah, GA
Scranton-Wilkes-Barre-Hazleton, PA
Seattle-Tacoma-Bremerton, WA
Shreveport-Bossier City, LA
Sioux Falls, SD
Sound Bend, IN
Spokane, WA
Springfield, MA
Springfield, MO
Stockton-Lodi, CA
Syracuse, NY

Tallahassee, FL
Tampa-St. Petersburg-Clearwater, FL
Toledo, OH
Tucson, AZ
Tulsa, OK

Utica-Rome, NY

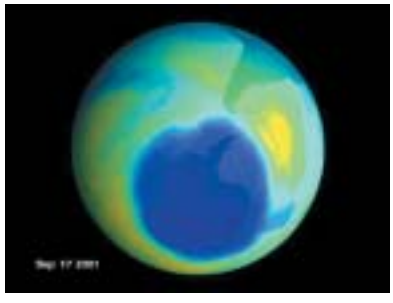
Visalia-Tulare-Porterville, CA

Washington-Baltimore, DC-MD-VA-WV
West Palm Beach-Boca Raton, FL
Wichita, KS

York, PA
Youngstown-Warren, OH

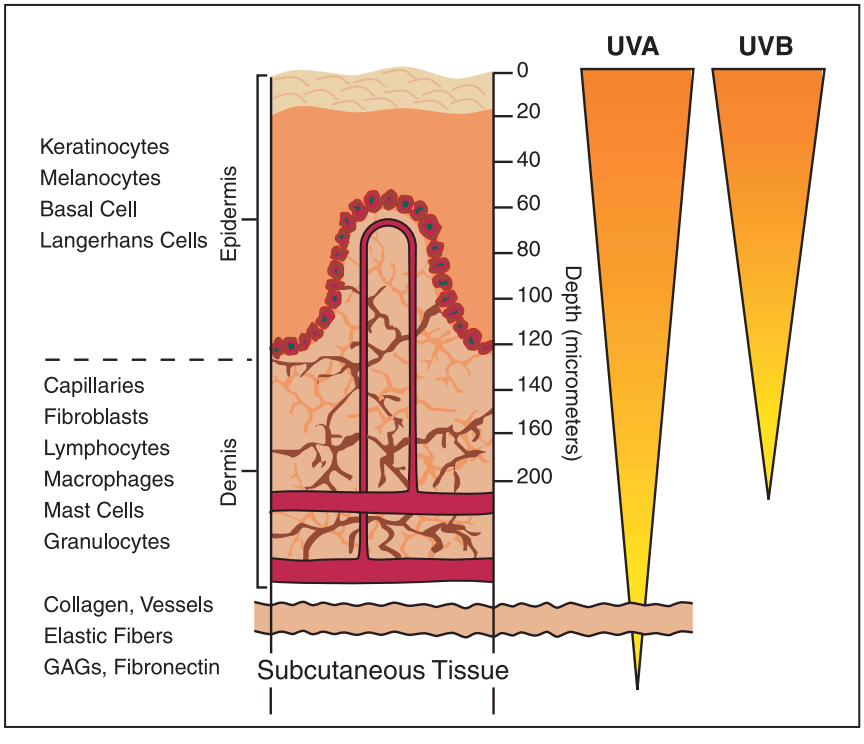
2.0 HEALTH AND ENVIRONMENTAL CONCERNS OF UV RADIATION

Ultraviolet (UV) radiation is a natural but dangerous part of the sun's energy. The ozone layer, located between 6 and 30 miles above the Earth in the stratosphere, blocks most of this radiation from reaching the Earth's surface and makes our planet livable. A dramatic loss of stratospheric ozone was first noticed in the mid-1980s above Antarctica. Since then, scientists have confirmed significant seasonal losses of stratospheric ozone over Antarctica and the Arctic region, and less dramatic losses in mid-latitude regions such as North America. The depletion of the ozone layer has created heightened concern about the health and environmental effects of increased UV radiation. UV radiation is known to cause a number of different health effects, including skin cancer and cataracts, and increased UV radiation is suspected to be contributing to a number of environmental problems, including the worldwide decline in frog populations and the bleaching of coral reefs.



2.1 What Is UV Radiation?

UV radiation is an invisible form of energy that has a shorter wavelength than either blue or violet light. UV radiation is made up of three components: UV-A, UV-B, and UV-C rays. Although the ozone layer does not absorb UV-A rays, it does absorb most UV-B rays and virtually all UV-C rays. UV-A rays penetrate deep into the skin and heavily contribute to premature aging, while UV-B rays mostly impact the surface of the skin and are the primary cause of sunburn. Both UV-A and UV-B have been linked to a number of other health effects, including skin cancer, and UV-B rays have been implicated in environmental effects from UV radiation. The main threat resulting from the depletion of the ozone layer is increased UV-B effects, even though UV radiation is only about 2 percent UV-B.



2.2 How Does the Ozone Layer Block UV Radiation?

The ozone layer is very important because it absorbs most UV-B rays and virtually all UV-C rays. The ozone molecules that make up the stratospheric ozone layer are each made up of three oxygen atoms. When ozone absorbs UV radiation, it creates heat as it splits into a pair of oxygen atoms and a lone oxygen atom, which eventually recombine to form ozone again. The molecular structure of ozone can be altered by human-made chemicals that are emitted into the air. When this happens, the stratospheric ozone layer can be depleted.

Chlorofluorocarbons (CFCs) are the principal cause of ozone depletion, although a number of synthetic halocarbon chemicals also are known to reduce stratospheric ozone. CFCs were once widely used as propellants in spray cans, as refrigerants and electronics cleaning agents, and in foam and insulating products. Other ozone-depleting substances include pesticides such as methyl bromide, halons used in fire extinguishers, and methyl chloroform used in industrial processes. CFCs now are banned from production in the United States and many other countries, but they still are found in certain products. CFCs can escape into the air during CFC manufacturing, from leaks in air conditioners and refrigerators, and when used appliances are disposed before recovering the remaining CFCs within them.

When CFCs are released into the air, they do not break down. Instead, they are mixed and dispersed by atmospheric currents. This process can continue for 2 to 5 years, until the CFCs eventually reach the stratosphere. In the stratosphere, CFCs break down and release chlorine atoms when exposed to UV radiation. The chlorine atoms destroy ozone, but are not destroyed themselves. As a result, each chlorine atom can destroy a large amount of ozone (up to 100,000 ozone molecules) before it is eventually removed from the stratosphere by other atmospheric processes.

Ozone depletion is heightened above the North Pole and especially the South Pole. The very cold, dark winters of the polar regions cause stratospheric ice clouds to form, and this promotes the breakdown of CFCs. Each spring above Antarctica, up to 60 percent of the ozone layer disappears and does not return to normal until the summer. The Arctic loses up to 25 percent of its ozone layer each spring, while mid-latitude regions, such as North America, lose up to 5 percent. Global warming, which occurs when greenhouse gases prevent heat from escaping from the lower atmosphere into the stratosphere, can set the stage for increased ozone depletion by creating a colder environment in the stratosphere.

In 1987, countries from around the world recognized the threat to the ozone layer and signed a treaty—the Montreal Protocol on Substances that Deplete the Ozone Layer—to reduce the global production of ozone-depleting substances. Amendments in 1990, 1992, 1995, and 1997 strengthened the treaty to promote the earliest possible restoration of the ozone layer. Scientists predict that ozone depletion will peak between 2000 and 2010. With full compliance from participating countries, the ozone layer is expected to be restored by the middle of this

century. Until that time, however, increased levels of UV radiation will reach the Earth's surface.

2.3 How Does UV Radiation Affect Your Skin, Eyes, and Immune System?

Overexposure to UV radiation can cause a number of health effects, including skin cancer, accelerated skin aging, cataracts, and a suppressed immune system.

Skin Cancer

Everyone knows the short-term discomfort of too much sun—redness, tenderness, swelling, and even blistering. However, overexposure to the sun and repeated sunburns can lead to a much worse condition—skin cancer. More than 1 million Americans are diagnosed with skin cancer every year, representing nearly half of all cancers diagnosed annually. One in every five Americans will get some type of skin cancer in his or her lifetime. There are three main types of skin cancer: melanoma, basal cell carcinomas, and squamous cell carcinomas. (See Section 2.5 for descriptions of the different types of skin cancer and how to recognize them.)

Skin Aging

Repeated overexposure to the sun causes changes in the skin called actinic (solar) degeneration. Over time, the skin becomes thick, wrinkled, and leathery. This condition occurs gradually, often appearing many years after the majority of a person's exposure to the sun. Up to 90 percent of the visible skin changes commonly attributed to aging are caused by sun exposure.[2] Many people believe that photoaging is a normal, but unavoidable, part of growing older. However, with proper protection from UV radiation, photoaging can be substantially avoided.

Cataracts

Research has shown that UV radiation increases the chances of developing cataracts, a form of eye damage that involves a loss of transparency in the lens of the eye. Although curable with modern eye surgery, cataracts affect millions of Americans each year. If left untreated, cataracts can cause cloudy vision and lead to total blindness.

Exposure to UV radiation may also increase the chances of other types of eye damage, including pterygium, a tissue growth on the white of the eye that can block vision, and macular degeneration. The macula is the part of the retina near the center, where your vision is most sensitive. Macular degeneration may include development of spots that can result in blindness.

[2]Taylor, C.R. et al, Photoaging/Photodamage and Photoprotection, J Am Acad Dermotol, 1990: 22: 1-15.

Immune System Suppression

Scientists have found that sunburn can affect disease-fighting white blood cells for up to 24 hours after exposure to the sun, making your body more prone to infections and cancers. Sun exposure can aggravate diseases such as herpes simplex (cold sores), chicken pox, and lupus. Repeated exposure to UV radiation might cause more long-lasting damage to the body's immune system. Mild sunburns can directly suppress the immune functions of human skin where the sunburn occurred, even in people with dark skin.

2.4 Are Some People More Prone to the Effects of UV Radiation?

Skin Type

Everyone, regardless of race or ethnicity, is subject to the potential adverse effects of overexposure to the sun. However, skin type affects the degree to which some people burn and the time it takes them to burn. The Food and Drug Administration classifies skin type on a scale from 1 to 6. The lower the number, the lighter the skin color. Individuals with fair skin, skin types 1 and 2, tend to burn more rapidly and more severely. Individuals with darker skin, skin types 5 and 6, do not burn as easily.

The same individuals who are most likely to burn are also most vulnerable to skin cancer. Studies have shown that individuals with large numbers of freckles and moles also have a higher risk of developing skin cancer. Although individuals with higher-number skin types are less likely to develop skin cancer, they should still take action to protect their skin and eyes from overexposure to the sun. Dark-skinned individuals can and do get skin cancer.

Other factors

Factors other than skin type may affect a person's vulnerability to the sun's rays. Some medications, such as antibiotics and antihistamines and even certain herbal remedies, can cause extra sensitivity to the sun's rays. People taking medications should contact their physician to learn about potential risks resulting from sun exposure.

2.5 Recognizing the Signs of Skin Cancer

Skin cancer is one of the most treatable forms of cancer. Early detection of skin cancer can decrease chances of the cancer spreading to other parts of the body and increase chances of survival. The survival rate for patients with early stages of melanoma has increased from about 50 percent in the 1950s to about 90 percent today. Nonmelanoma skin cancers have an even higher cure rate—95 percent or higher if detected early.

Skin cancer occurs most commonly on areas of the body most exposed to the sun, such as the face, neck, ears, forearms, and hands.

Different Types of Skin Cancer

Melanoma is the most deadly form of skin cancer and one of the fastest-growing types of cancer in the United States, according to the American Cancer Society. New cases of melanoma in this country have more than doubled in the past 2 decades, with more than 53,000 cases expected in 2002. An estimated 7,400 people will die from melanoma in 2002, almost 4 times as many deaths as nonmelanoma skin cancers. Melanoma can spread to other parts of the body quickly, but when detected in its earliest stages, it is usually curable.

Melanomas often start as small, mole-like growths. The growth, an uncontrolled development of pigment-producing cells in the skin, leads to the formation of dark-pigmented malignant moles or tumors, called melanomas. Melanomas can appear suddenly without warning but also can develop from or near a mole. For this reason, people should know the location and appearance of moles on their bodies so they will notice any changes. Melanomas are most frequently found on the upper backs of men and women, and the legs of women, but they can occur anywhere on the body. To recognize potential problems, conduct periodic self examinations and watch for changes that meet the ABCDs of melanoma:

Asymmetry: One half of the growth does not match the other half.

Border irregularity: The edges of the growth are ragged, notched, or blurred.

Color: The pigmentation of the growth is not uniform. Shades of tan, brown, and black are present. Dashes of red, white, and blue also may appear.

Diameter: Any growth greater than the size of a pencil eraser should be examined by a doctor immediately.

The two types of **nonmelanoma skin cancers**—basal cell carcinomas and squamous cell carcinomas—are not as fatal as melanoma. An estimated 1 million Americans will develop nonmelanoma skin cancers in 2002, while approximately 2,200 will die from the disease.[3] Nonmelanoma skin cancers are the most common skin cancer found in fair-skinned people.

Basal cell carcinomas are tumors that usually appear as small, fleshy bumps or nodules on sun-exposed areas such as the face, lips, neck, ears, and hands, but may appear anywhere. This cancer does not grow quickly and rarely spreads to other parts of the body. It can, however, penetrate below the skin to the bone and cause considerable local damage.

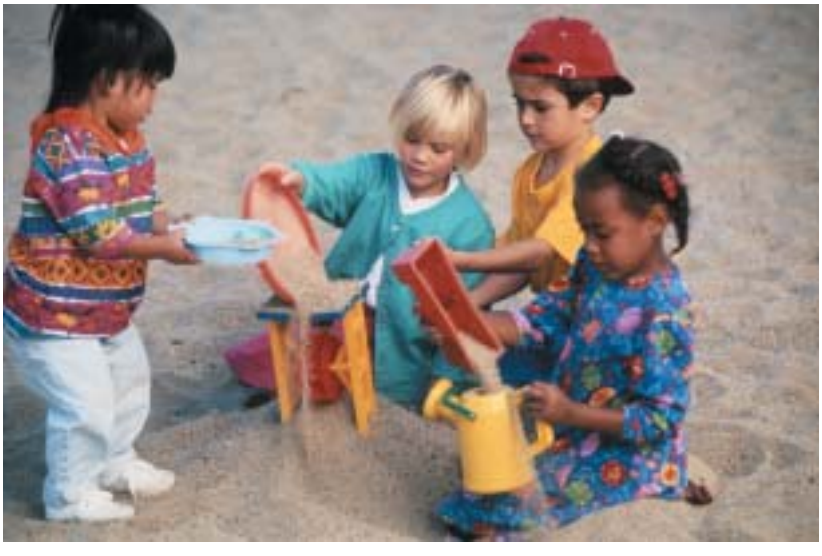
Squamous cell carcinomas are tumors that might appear as nodules or as red, scaly patches. This cancer can develop into large masses, and unlike basal cell carcinoma, it can spread to other parts of the body. It is the most destructive type of skin cancer.

[3]American Cancer Society, "Cancer Facts and Figures 2002."

Going to the Doctor

A person should see a doctor or dermatologist if he or she sees any of the signs of skin cancer. To identify the warning signs, individuals can periodically examine their skin, especially after prolonged periods in the sun. Skin self-examinations consist of regularly looking over the entire body, including the back, scalp, soles of feet, between the toes, and on the palms of the hands. If there are any changes in the size, color, shape or texture of a mole, the development of a new mole, or any other unusual changes in the skin, a person should see his or her dermatologist immediately.

As part of its screening program, the American Academy of Dermatology (AAD) can inform individuals annually when it is time to schedule their yearly visit for a skin cancer screening. AAD's Web site allows an individual to locate a skin cancer screening location in his or her community and sign up for annual notification. Volunteer dermatologists provide free skin cancer screenings as part of the program. See <www.aad.org>.



2.6 Why Are Children and Teenagers Most Vulnerable to Overexposure?

School-aged children spend a lot of time outdoors. They usually have the summer off and often spend many days swimming at beaches and community pools, playing team sports such as baseball and soccer, and attending summer camp. These outdoor activities mean more sun exposure. In fact, an estimated 80 percent of a person's sun exposure occurs before age 18.[4] Many dermatologists believe there might be a link between childhood sunburns and malignant melanoma later in life. Therefore, it is especially important for parents and caregivers to ensure that children consistently use sunscreen and take other protective measures. In addition, parents must remember to be good role models for children; parents who get a sunburn are more likely to have kids who get a sunburn.

[4]Stern RS, Weinstein MC, Baker SG. Risk reduction for nonmelanoma skin cancer with childhood sunscreen use. Arch Dermatol. 1986: 122: 537-545

2.7 What Are the Environmental Threats from UV Radiation?

In the regions of the world where ozone depletion has occurred, increased UV radiation threatens plants and wildlife on land and in the sea. These areas include Antarctica, the Arctic, and mid-latitude regions such as North America.

On land, increased UV radiation is suspected of contributing to population declines and limb deformities in frogs and other amphibians. It also is known to be damaging to some plants, particularly agricultural crops. UV damage to crops can affect growth and food quality, as well as the ability of plants to withstand pests and diseases. Crops, plants, and trees also provide food and shelter for many animals, so if these resources are damaged, other species and even entire ecosystems also can be affected.

In the sea, increased UV radiation damages sea grasses, sea urchins, corals, krill, and microscopic plants and animals known as plankton. Many of these organisms are important food resources. Plankton and krill are at the bottom of the marine food chain and feed a multitude of creatures, from starfish to whales. UV radiation also is suspected to be one of the reasons why some colorful corals are turning white and dying.

In addition, in areas with high levels of air pollution, an increase in UV radiation can worsen air quality. Increased UV-B radiation causes an increase in the reaction of nitrogen oxides with volatile organic compounds (byproducts of vehicle

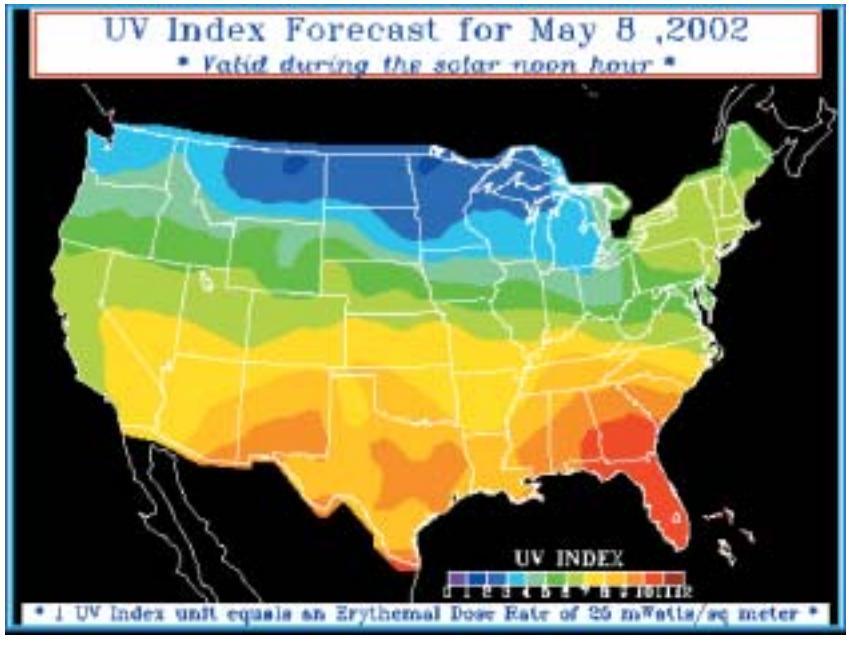
exhaust, industrial emissions, and chemical solvents), producing increased amounts of ground-level ozone. Exposure to ground-level ozone causes many health problems.

Although UV radiation has negative impacts on plants and wildlife, not all species are affected equally. Some agricultural crops are more tolerant of UV radiation than others, and some marine creatures are able to repair some UV damage at night. On the other hand, in areas affected by additional environmental impacts, such as pollution, UV affects might be more damaging.

3.0 WHAT IS THE UV INDEX?

Developed by the National Weather Service (NWS), the UV Index forecasts the next day's ultraviolet (UV) radiation intensity at different locations on the Earth's surface for "solar noon," which is when the sun is at its highest point in the sky.

NWS first began testing an "Experimental UV Index" for 58 U.S. cities on June 28, 1994, in cooperation with EPA and the Centers for Disease Control and Prevention (CDC). Scientists at the NWS Climate Prediction Center developed the forecasting tool and its supporting science. In April 1995, NWS deleted the "experimental" and made the UV Index an official product. NWS subsequently has encouraged meteorologists to make similar UV Indices widely available across the country. In addition, it has worked with EPA and CDC, meteorologists, health and medical professionals, and the World Meteorological Organization to ensure there is consistency among different UV Indices. As a result, these groups, as well as the general public, use the UV Index and accept its widespread dissemination.



3.1 How Is the UV Index Calculated?

To derive the UV Index, scientists collect ozone data from satellite observations and atmospheric pressure and temperature forecasts and scale the information to produce an index with a range of 0 to 15. The UV Index is adjusted to account for the potential presence of clouds and the elevation of the location. The lower the number, the less UV radiation is reaching the surface. Low numbers occur when the sun is low in the sky (i.e., during winter) and during overcast conditions. A higher number is forecasted when the sun is higher in the sky (i.e., during summer) and during clear or only partly cloudy conditions.

NWS uses a computer model to calculate the UV Index. The model takes into account a number of factors, including the amount of stratospheric ozone and clouds overhead, latitude, elevation, and time of year. The model first calculates a UV "dose" rate, or the amount of UV radiation to which a person will be exposed at the next day's solar noon under "clear sky" (no clouds) conditions. Higher elevations will increase the UV dose rate because there is less atmosphere to absorb and scatter UV rays. Greater cloud cover will tend to reduce the UV dose rate because clouds screen out some—but not all—UV rays. The UV dose rates are then adjusted for the effects of elevation and cloud cover at specific locations.

Quick changes in cloud conditions can alter the predicted UV Index forecast. The UV Index is applicable to a 30-mile radius around the city for which it is forecasted. Because the UV Index does not take into account differences in surface reflectivity, individuals must make adjustments based on these factors. You get much more UV on snow, sand, water, and concrete, since these surfaces reflect the sun's rays back onto your skin, just like a mirror. The brighter the surface, the more UV is reflected—fresh snow and dry sand reflect the most.

The resulting value is the next day's UV Index forecast. The UV forecasts for select locations are provided daily using a 0 to 10+ scale, where 0 indicates a minimal likely level of exposure to UV rays and 10+ means a very high level of exposure. EPA's SunWise Web site (www.epa.gov/sunwise) includes a feature that allows the user to enter his or her ZIP code and receive the UV Index forecast for that location for the current day. (See Chapter 4 to determine what steps you can take to protect yourself from the sun under different UV Index situations.)

For more information on how the UV index is calculated and validated, see Appendix D: How is the UV Index Calculated?

4.0 RAISING AWARENESS IN THE COMMUNITY

As a person begins to gather information about ultraviolet (UV) exposure and its risks, he or she will want to consider how to effectively communicate this information to others in the community. A UV risk education project can take many forms, from a sustained, multi-year community-wide effort to a short-duration or seasonal campaign at selected venues, such as schools, recreation centers, or parks. This chapter of the handbook is designed to help the user determine the kind of project that is right for his or her community by providing:

- Examples of UV risk education projects.
- Steps involved with outreach planning.
- Educational tools and resources that can be used in your schools and community.
- Messages that every UV risk education program should convey.
- Guidelines and sample language for successfully communicating information about sun protection and health risks to the community.

4.1 Developing an Effective Outreach Program

Community outreach programs can take many forms, depending on issues such as the groups most at risk, the scope of the effort, the available resources, and the commitment of key leaders. Across the United States, different UV risk education programs have been developed and conducted with varying levels of effectiveness. In general, community-wide programs with a strong mass media component have been most effective, and sustained activities have proven more effectual than shorter or one-time projects. Additionally, sun protection and health risk messages have more resonance when they are consistent and repeated. People also tend to trust the "messenger," so consider credible sources within the community (e.g, schoolteachers, pediatricians, dermatologists) to deliver your messages.

Many communities will want to build on existing UV risk education programs, such as SunWise, PoolCool, and the SunWise Stampede. Schools can join EPA's SunWise School program to receive free educational materials for classes and assistance with developing school policies that promote sun safety. In addition, the Centers for Disease Control and Prevention have recently issued guidelines urging schools to try to protect children from excess sunlight by implementing policies designed to minimize students' midday sun exposure. Be aware that sunscreen technically is considered an over-the-counter drug, similar to aspirin or cough drops, and in most state school districts, it is prohibited from student use without doctors' and parents' permission to allow nurses or aides to administer it. However, this is a barrier that can be overcome, as students in the Rockwood, Missouri, school district successfully demonstrated (see

Appendix B: Case Studies of UV Risk Education Programs). Swimming pool managers can contact the PoolCool program for free sun-safety signs and technical support to promote sun protection during pool activities. Local zoos can participate in SunWise Stampede, a program designed to promote sun safety to zoo visitors. (See Appendix A: List of Resources for more information on these and other UV/sun protection programs.)

Other communities will want to develop their own UV risk education programs or modify educational materials from existing programs. Throughout this chapter, a wide variety of ideas are presented for UV risk education projects. Regardless of the type of program you ultimately choose to implement, it is important to first think through issues such as your goals, audiences, messages, resources, available tools, and measurement options before committing to a plan of action.

Lastly, it can help to work with others who are also interested in promoting sun safety in your community. For example, you can contact your local chapter of the American Cancer Society (ACS) (see the "In My Community" section of the ACS Web site <www.cancer.org>) to ask about working with volunteers or ACS staff. Another option is to inspire others in your community to become sun safety advocates. For example, parents especially can be strong advocates for sun safety. They can inspire others by giving informal presentations on sun safety at the local library or at a parent-teacher association, by setting up a table and distributing sun safety brochures at a community festival or sporting event, or by working with the local media to broadcast messages on sun safety. By working with other like-minded individuals, you can have more of an impact on UV risk education efforts by expanding the reach of your effort, by having more resources available, and by having a stronger voice to advocate for policies and programs in your community that promote sun safety.

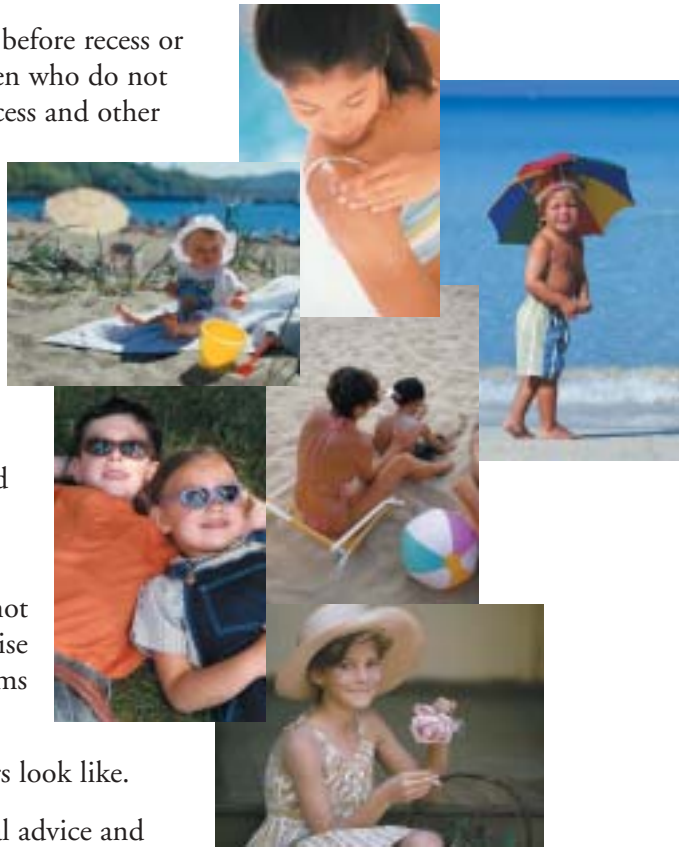
Step 1: What Are You Trying To Accomplish?

The first step in any outreach effort is to define what you want to accomplish. In general, UV risk education programs aim to:

- Increase awareness of sun exposure, UV radiation health risks, and sun safety measures.
- Change behaviors and attitudes to ensure sun safety.
- Change policies to reduce sun exposure and encourage sun safety.

Getting your community's residents to change the way they view sun exposure and tanning and to always practice sun-safe behaviors is ultimately the best way to prevent skin cancer and the other adverse health effects of UV overexposure. It can, however, be difficult to effect permanent attitude and behavior change. For this reason, many communities will begin or also seek to make changes at the policy level. Policy changes have proven effective because they don't rely on individuals to take voluntary actions. Additionally, policies can serve as reminders to people of the importance of a particular behavior. Examples of community policies to encourage sun safety and reduce sun exposure include:

- Providing shade infrastructure at community parks, recreational areas, or school grounds.
- Requiring the posting of signs at recreational sites, such as parks, beaches, and pools, that encourage sunscreen and hat use and limiting time spent in the sun.
- Requiring parents to provide their children with hats and sunscreen at community outdoor camps.
- Requiring teachers to apply sunscreen to children before recess or enforcing a no hat, no play rule at schools: children who do not wear a hat must sit or play in the shade during recess and other outdoor breaks.
- Requiring very brief sunscreen breaks for children at outdoor pools, camps, and recreation sites.
- Passing legislation that encourages sun safety and education. For example, California introduced a sun safety law that specifies skin cancer as a type of employment "injury" for lifeguards. Under the bill, affected lifeguards could potentially receive payment through the workers' compensation system.



Some communities also craft their programs to not only encourage sun safety, but also to specifically raise awareness of skin cancer. Goals for these programs can include:

- Increasing people's knowledge of what skin cancers look like.
- Increasing the number of people who seek medical advice and early screening.
- Encouraging medical practitioners to educate patients and adults about skin cancer and check all adult patients.

Keep in mind that, with the right tools, many outreach programs (both short- and long-term) can be effective in raising a community's knowledge of sun exposure, skin cancer and other health risks, and sun-safe practices, but more sustained and intense programs are generally more successful in effecting permanent behavior change and attitudes.

As you begin to define your goals, keep in mind how you will measure achievement of them. For example, if one of your aims is to change behaviors of elementary school-age children at recess, how will you make sure this goal is achieved? Or if you seek to have the UV Index broadcast on your local television channel daily, how will you track these broadcasts? Whenever possible, define your goals in concrete, measurable terms and consider how you will follow up. You might also consider seeking the help of someone experienced in measurement as you define your goals—consider hiring or recruiting a volunteer with a back-

Developing a Sun Protection Policy for Schools

To ensure the success of sun protection policies at schools, it is important to work with parents, students, and school staff to help them understand the purpose of the policy and to encourage them to implement it. Adjust the policy based on the recommendations of the school community. Consider the following suggestions:

- Form a committee that includes representatives from the school community affected by the policy.
- Conduct information sessions to explain the purpose of the policy.
- Consider sun protection measures that might already be in place at the school.
- Prepare a draft policy and ask for comments.
- Request endorsement of the final policy from the school council or other appropriate organization.
- After implementing the policy, publicize it to ensure everyone is aware of the policy and its purpose.
- Monitor and evaluate the success of the policy.

(This information was adapted from Australia's SunSmart program. For more information, go to <www.sunsmart.com.au>.)

ground in statistics or market research. (See "Step 6: How Will You Measure Success?")

Step 2: Who Are You Trying To Reach?

Successful outreach hinges on defining and understanding the target audiences you are trying to reach within the community. Outreach can be targeted at a variety of audiences, including:

- Children/young adults
- Parents and adult caregivers
- Outdoor occupational workers and recreational users
- Health care community
- Community leaders and activists
- Older adults and senior citizens

An outreach project can be directed at one or more primary audiences, such as children, or focus more specifically on a particular subset within an audience, such as elementary school-age children. A broad, community-based effort will most likely target multiple audiences, including children and their parents or adult caregivers, businesses and workers, the health community, community group leaders, the school district, and community and recreational directors.

When considering the audiences at which to direct your program, look at your community and determine the groups of people most at risk and the places where people are likely to be sun-exposed. In many communities, children are a primary target audience program, given that the majority of a person's lifetime exposure takes place before age 18. Other individuals most at risk from adverse health effects due to overexposure to the sun include people who:

- Spend a large amount of time outdoors (e.g., construction workers, people at the beach).
- Have lighter skin types.
- Have certain diseases such as lupus.
- Are taking certain medications such as antibiotics, antihistamines, or some herbal remedies.

However, anyone who spends time outdoors, regardless of their risk level, are subject to the potential adverse effects of overexposure to the sun.

Keep in mind that often a more in-depth educational message can be delivered to a smaller group of people, while a more simple message can be delivered to many people. Audiences that receive a more in-depth message are probably more likely to change their behavior than those receiving a more simple message.

Children and Young Adults

Many successful programs have been developed that reach out to children and young people directly, most frequently in schools, but also in childcare organizations, recreational centers and sites, service programs (e.g., 4-H, girl and boy scouts), and other community organizations that serve large numbers of children.

Within the school system, teachers, administrators, superintendents, nurses, and parent/teacher organizations can all be effective partners in changing behaviors, instituting policies, and generally spreading the sun protection word. An easy step for your community would be to find an elementary school teacher who is interested in joining EPA's SunWise Program. The teacher would then receive free teaching materials and classroom activities. Once this teacher's class has implemented the program, results and messages can be shared with other classrooms, schools, and even the community at large through activities and events such as sports matches, parents' nights, presentations in the auditorium, and exhibitions in school halls or community libraries. Teachers can also work with parent-teacher associations to encourage school sun protection policies or with school nurses who also can promote sun protection to students.

Older children can be effective messengers in delivering the sun protection message to their peers and younger classmates and siblings. Children look up to older peers, and the message may resonate more for teenagers if they hear it from someone their own age. Parental influence also can be beneficial, especially if used in

Effective Messages: Having a SunWise Field Day

As participants in a SunWise pilot, students in 6th and 7th grade health classes at Brownstown Middle School in Brownstown, Michigan, successfully reached out to the rest of the school in sending a SunWise message. Prior to one of the school's annual field days, when students compete in outdoor events, the students in the health classes launched a sun-safe campaign, encouraging their schoolmates to use sunscreen, hats, and sunglasses during the event. To help spread the safety message, the classes made posters to hang in the school's hallways and asked local businesses to donate sunscreen for the students to use on the field day. Teachers noted no incidences of sunburn as a result.

SunWise students at the same school also have planted oak saplings on the school grounds to eventually provide protective shade for students participating in outdoor activities.

For examples of other successful SunWise schools, see Appendix C.

concert with other factors, such as opportunities for children to self-select types of personal sun protection (e.g., hats, sunscreen, clothing).

Parents and Adult Caregivers

Parents, child-care workers, and other adult caregivers are important target audiences because they often are role models and can be instrumental in encouraging children to practice sun-safe behaviors. Additionally, parents often influence the organizational policies within schools and the community that can promote sun protection for children, and can be effective champions in changing practices or policies. Parents and caregivers can be reached though a variety of ways, such as through health events conducted at schools and community recreational sites; through educational materials distributed at schools, recreational centers, and community sites; through radio, print, and television announcements; and through the health care system.

Outdoor Occupational Workers and Recreational Users

Don't overlook other people who might be at particular risk of sun overexposure in your community, including those who work outside (e.g., lifeguards, farmers, fishers, landscapers, construction workers) and those who spend a lot of time engaged in outdoor recreational activities, including both children and adults. Occupational UV risk education programs should look at targeting the workers themselves, as well as the businesses that employ them. Trade organizations and unions are other potential audiences. Recreational UV risk education programs could reach out to individuals and groups such as zoo workers, park rangers, golf course and tennis court managers, fitness centers, marinas, sports and bicycle shops, and community garden clubs. You might consider a training program to help community workers, such as lifeguards, parks and recreational directors, or camp leaders, incorporate sun protection messages and practices into their pro-

grams. With these audiences, it is especially important to communicate the potential health effects of UV overexposure and the importance of medical consultations, screening, and early detection.

Health Care Community

Maternity nurses, school nurses, dermatologists, pediatricians, and other medical practitioners can all play key roles in communicating sun protection and health risk messages to their patients. Many of these individuals are already working with their patients to communicate this information; others, like school nurses, can receive training and encouragement to do so. Some communities have found that reaching out to new parents in maternity wards and through well child visits is particularly effective; not only does this encourage parents to protect babies and toddlers from sun exposure, it can also instill these behaviors in children as they grow older. The health care community can be important allies in not only encouraging sun safety, but also in raising awareness of skin cancer signs and stressing the importance of screening.

Community Leaders and Activists

Outreach efforts are most successful when there are champions behind the cause, volunteering to help with whatever needs to be done—from stuffing envelopes to rallying community support. Look to those individuals in your community who have the ear of your residents for help in spearheading your efforts and spreading the word. Community activists, such as those already working on health or children's issues, also can be effective partners.

Older Adults and Senior Citizens

Older adults and senior citizens are still at risk of overexposure to the sun, particularly those who spend large amounts of times outdoors. This audience, in particular, requires education and awareness-building concerning the health effects of sun overexposure, such as skin cancer, which could now be manifesting. The health community, senior citizen centers, assisted living centers, and organizations directed at retired individuals are all potential avenues for reaching these individuals and encouraging early screening and detection of sun-related health issues.

Step 3: What Do You Want To Communicate?

Think about the key points or messages you want to communicate through your effort. While the messages will vary depending on the audience you are targeting, they should be consistent, repeated, and delivered by credible sources or role models. It is also important to think through the potential barriers you might encounter, such as people's desire for a suntan or enjoyment of sports and other outdoor activities, in attempting to reach out to different target audiences.

Section 4.3, "Communicating UV Risk Information to the Community," presents some basic communication guidelines to consider when reaching out to the public about UV radiation and sun exposure. It also provides sample text and sun protection messages that can be incorporated into your actual outreach products.

If you are considering a large media component in your outreach, it is useful to pretest the chosen messages and slogans with your targeted audiences (through means such as surveys or focus groups) before executing the actual campaign. Testing will help you determine if your messages are appropriate and effective. Depending on the scope of your effort, you might hire a professional or find a volunteer who has market research experience. But don't forget that a number of community and national campaigns on sun protection and skin cancer have already been successfully launched, and you can also learn from the formative research and testing that these programs have already conducted when developing your own messages (see Appendix B: Case Studies of UV Risk Education Programs).

Step 4: Who Will Lead the Effort?

Within a community, various individuals and government offices share responsibility for communicating public health information to residents. Consider building a coalition with these and other individuals who will commit to and help execute your mission. For a short-duration or limited effort, you may need to simply identify a handful of committed people who can work with you to reach your targeted audience. These may be people within your organization, your school system, or the community at large.

For a school-based program, such as SunWise, an individual teacher might initially take the lead role, incorporating lessons focusing on sun protection in the classroom and encouraging sun-safe behaviors at recess and after school. This individual and the class can also become "champions" for spreading these messages to other classrooms and schools. Within the school system, a group of parents from a parent-teacher organization can also be effective leaders in encouraging policy changes, such as planting trees around the playground or requiring children to wear hats and sunscreen at recess.

Leadership for a program can also come from unexpected sources. In Dayton, Ohio, a group of dermatologists were the impetus behind the Raising Awareness About Your Skin (RAYS) program; however, the program's development and leadership were carried out by the Montgomery County Ohio Medical Alliance, a volunteer group made up of doctors' spouses. (See Appendix C: Successful SunWise Programs for more information on RAYS.)

For a broad-based community effort, such as the Safe Skin Project conducted in Falmouth, Massachusetts, (see Appendix B: Case Studies of UV Risk Education Programs) you might want to set up a town-wide advisory board made up of community leaders, organization representatives, and select community members. The advisory board would be instrumental in planning and implementing the program, as well as for gaining recognition and support in the community. Members of such a board could include:

- Elected officials
- Local health department officials
- Pediatricians and physicians
- Dermatologists
- Maternity nurses
- Child-care directors
- Recreational program directors
- School superintendents, teachers, and nurses
- Parents
- Teenagers

In some communities, advisory boards are made up of people with a history of working together. The advantages to this approach are that people know and feel comfortable working with each other. In other communities, there is an intentional effort to build a board of "unlikely partners"—people that might view sun protection from quite different experiences and perspectives. While establishing this kind of advisory board may require more up-front effort, it can also yield more positive results.

Finally, you might want to team up with other communities in your area to develop a regional campaign. The advantages of a regional campaign are many, including the ability to pool resources, share responsibilities, reach out to more people, and deliver consistent and repeated messages in a larger geographic area.

Step 5: How Will You Fund Your Outreach Program?

Resources are essential to any outreach effort. While the resources required for an outreach effort will vary depending on the scale and goals of your program, it's important to consider early on what type of resources (e.g., personnel, facilities, research, publicity) are required, if they are readily available, and how will they be managed, as these decisions can impact your effort. Consider local sources of funding, such as from the city or county government, as well as state and even national sources, such as grants from government agencies or organizations that fund health-based research or work on children's health issues (see Appendix A: List of Resources for more information).

Sponsors or partnering organizations also can be recruited to lend their resources and credibility to the program. Think of the various sectors of your community, and of the organizations and agencies that could help carry out your objective, particularly those that are already working with your targeted audiences. For example, Australia's SunSmart campaign partnered with several recreational organizations, including tennis and cricket associations. When considering sponsors, think in terms of your community's variety of racial and ethnic groups, income levels, occupations, and political views. Once you have recruited sponsors, solidify their commitment. Consider a pledge of participation to help sponsors understand their role and make explicit their commitment to the program.

Donations, bartering agreements, and volunteer support can also be useful in stretching your outreach dollar. The RAYS program, for example, received funding from the Children's Medical Center in Dayton, Ohio, in exchange for printing the center's name on the program's risk education CD-ROM. In addition, consider asking a local printer or copier to print your sun protection flyer at no cost; in return, provide a credit thanking the printer on the cover, which also serves to advertise the business.

Step 6: How Will You Measure Success?

Measuring the impacts of your program provides many benefits. It is always useful to know if your outreach is having an effect and if you are accomplishing what you set out to do. Additionally, having concrete measures of the results you have achieved might help you improve your program, consider ways to redirect your resources for future efforts, and even solicit additional funding.

You can measure success in a variety of ways, depending on the goals you establish. For this reason, it is important to think about measurement when you are establishing goals. (See Step 1: What are You Trying to Accomplish?) In many cases, it is useful to have baseline knowledge and information to evaluate trends in your community and predict what is in store in the near future. Many groups and communities that have instituted UV risk education programs make use of surveys, which are conducted before and after the launch of a program to measure attitude and behavior change. Some programs also have conducted follow-up surveys at different intervals (e.g., 3 months, 6 months, or 1 year) to gauge long-term behavior change regarding sun safety.

Communities interested in conducting attitudinal/behavior surveys might consider looking at those that have already been done (see the text box, "Sample Survey Questions," and Appendix A: List of Resources) for ideas on the types of questions to ask. Many surveys ask respondents to check the sun protection measures currently in place; after a program is implemented, the surveys are repeated and then cross-checked to see if improvements have been made. Some surveys also attempt to gauge respondents' awareness and attitudes regarding sun exposure before and after a program is implemented. Others also include questions designed to gather information to determine if policy, education, and training goals have been met. Any survey you develop should be closely linked to the goals you establish.

Sample Survey Questions

The following questions are from the community surveys given during the Falmouth Safe Skin Project (see section 4.2, Successful UV Risk Education Programs, for more information).

- Has your child ever had a painful sunburn? (Y/N)
- During a typical week this past summer, how often did your child go to the beach? (Never, 1-2, 3-5, every day)
- In the past 5 years, has your child intentionally worked on getting a suntan? (Y/N)
- Have your child's sunbathing habits changed compared to last year? (More, less, same, never)
- When going to the beach on a hot, sunny day, does your child wear a shirt or hat? (All, most, rarely, never)
- How often does your child use sunscreen at the beach? (Always, often, sometimes, rarely, never)
- How often does your child use sunscreen when outside in the summer but not at the beach? (Always, often, sometimes, rarely, never)
- During the past summer, if your child was outside for 6 hours on a hot day, how much of the time did he or she have on sunscreen? (6 hours, 3-5, 1-2, never)
- Compared with last year, how likely is your child this year to use sunscreen? (More, same, less)
- In the past 5 years, have you (as a parent) intentionally worked on getting a suntan? (Y/N)
- How often do you use sunscreen when you are sunbathing? (Always, often, sometimes, rarely, never)
- Do you find it difficult to protect your children from the sun? (Y/N)
- During the past summer, on hot days, how often did you insist that your child use sunscreen? (Every day, most days, half the time, less than half the time, rarely, never)
- Do you (as a parent) think that people look more healthy when they have a suntan? (Y/N)
- Does your child really enjoy getting a suntan? (Y/N)
- Compared with last year, has your child's interest in getting a tan __? (increased, stayed the same, decreased)
- This summer, my child told me that sunscreen prevents skin cancer. (Y/N)
- Have you (as a parent) ever heard of the disease malignant melanoma? (Y/N)

Given the technical nature of developing and administering scientific surveys, you might consider recruiting or hiring a statistician or market research expert (possibly as a member of your advisory board) to help you define goals and measure outcomes, particularly if the media is a major component of your program.

Step 7: What Outreach Tools and Community Events Will You Need To Communicate Your Messages?

Many organizations, including EPA, have already developed free tools that are available to the public. You may be able to use or modify these tools to meet your needs, especially those developed as part of EPA's SunWise School Program. (See Appendix A: List of Resources.) Be aware that most government-produced materials are typically in the public domain, which means they are available for public use and dissemination; programs developed by the private sector or other organizations may, however, be copyrighted. If you have doubts about the legality of using existing materials, contact the organization for more information.

There are many benefits to using existing materials, including saving money and resources, and accessing pretested messages. Some communities, however, might want to launch their own targeted campaigns, with their own slogans and artwork. Even if you develop your own materials, however, you might get useful ideas and save some time by looking at some existing tools.

The topics of sun safety and UV awareness can be explored through community events and a variety of outreach products spanning print, multimedia, electronic, and event formats. The table on the following page provides some examples.

The community events and products you choose should be based on the audience profile information you assembled in "Step 2: Who Are You Trying to Reach?" Think about which communication mediums are used most frequently and are most credible to your targeted audience. Then consider how you can use them as a vehicle for your message. A communications professional can provide valuable guidance in selecting the outreach products that will best meet your goals within your resource and time constraints. Questions to consider when choosing your products include:

- How much information does your audience need to have? How much does your audience know now?
- Is the product likely to appeal to the target audience? How much time will it take to interact with the product? Is the audience likely to make that time?
- How easy and cost-effective will the product be to distribute, or, in the case of an event, organize?

Print

Fact sheets, brochures

Checklists

Health screening reminders

Newspaper articles, editorials by health professionals or elected officials

Articles in health, school, recreation department newsletters

Articles in children- and parent-oriented magazines

Public service announcements in health or community publications

Bill stuffers, postcards

Press releases, media kits

Curricula and other educational materials for children

Electronic

Web pages

E-mail messages

Computer-based or animated presentations at events or libraries

Multimedia

Posters

Radio public service announcements

Cable TV programs

Exhibits

Kiosks

Videos

Signs

Events

Community days or fairs

National Skin Cancer Awareness Month

School events

School field days

Sports events

Health fairs

Small group meetings

One-on-one meetings

Public meetings

Press conferences

Media interviews

Novelty Items

Cups

Hats

Frisbees

UV-sensitive beads

T-shirts

Banners

Bumper stickers

Mouse pads

Buttons

Magnets

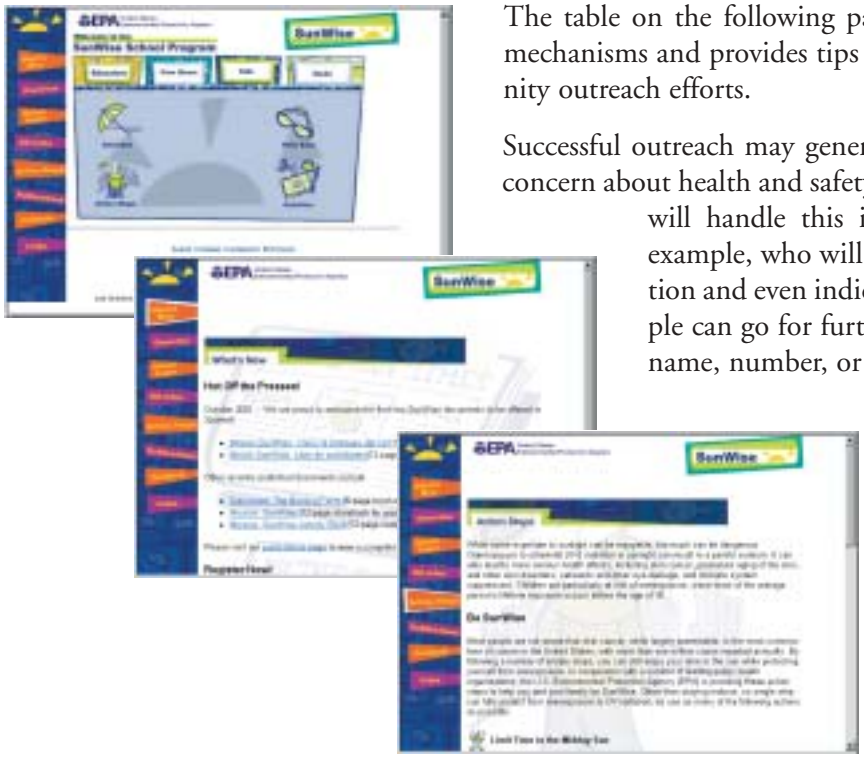
- How many people is the product likely to reach? For an event, how many people are likely to attend?
- What time frame is needed to develop and distribute the product?
- How much will it cost to develop the product? Do you have access to the talent and resources needed for development?
- When will the material be out of date? (You probably will want to spend fewer resources on products with shorter lifetimes.)

- Would it be effective to have distinct phases of products over time? For example, a first phase of products designed to raise awareness, followed at a later date by a second phase of products to encourage changes in behavior.
- How newsworthy is the information? Information with inherent news value may be rapidly and widely disseminated by the media.

Step 8: How Will You Distribute Your Products?

Effective distribution is essential to the success of any outreach effort. There are many avenues for distribution. Before choosing your route, consider the following questions:

- How does the audience typically receive information?
- What distribution mechanisms has your organization used in the past for this audience? Were these mechanisms effective?
- Can you identify any partner organizations that might be willing to assist in the distribution?
- Can the media play a role in distribution?
- Will the mechanism you are considering really reach the intended audience? For example, the Internet can be an effective distribution mechanism, but certain groups may have limited access to it.
- Are sufficient resources available to fund and implement distribution via the mechanisms of interest?



The table on the following page lists some examples of distribution mechanisms and provides tips and ideas for their use in your community outreach efforts.

Successful outreach may generate requests for further information or concern about health and safety issues. Consider whether and how you will handle this interest. You may want to define, for example, who will handle requests for additional information and even indicate on the outreach product where people can go for further information (e.g., provide a contact name, number, or address.) In planning a follow-up strategy, also consider directing people to EPA for further information about SunWise and the UV Index. EPA's SunWise Web site at <www.epa.gov/sunwise> is an excellent resource, linking to a wealth of sun safety materials and resources.

Medium	Characteristics	SunWise-Specific Ideas
Mailing lists	Highly focused on a target audience of your choice. You can tailor the message included in different mailings.	–Identify mailing lists from partner organizations or community organizations that include decision-makers, parents, educators, environmental groups, and health professionals. –Use existing SunWise informational materials in your mailings.
Phone/Fax	More time-intensive and personal communication.	–Conduct a phone survey on sun safety awareness in your community. Use the opportunity to speak to people one-on-one about SunWise.
E-mail	Effective, economical way of reaching community members in the workplace.	–Target the e-mail lists of partner organizations, corporations, schools, healthcare, and child-care facilities. –Use existing SunWise materials to create and send out an e-mail detailing the action steps for protection, and how people can find out more about the UV Index and sun-safe behavior.
Internet	Reaches diverse audience, but site might need promotion to attract initial attention. Also, make sure your target audience is Web-savvy and has ready access to the Internet.	–Create a community portal site about sun safety. Link to EPA's SunWise Web site.
Journals or newsletter	More in-depth treatment of your message, may use direct quotes from press releases; requires advance planning.	–See <www.epa.gov/sunwise/presskit.html> for example press releases that you can send to local journals and newsletters to promote sun safety and encourage schools to join SunWise. –Write your own press release on a SunWise news story of local interest in your community, such as a school project or community partnership, to attract media attention. –Develop and track media contacts, such as meteorologists, to get them involved in a UV Index story for your community.

Medium	Characteristics	SunWise-Specific Ideas
Television	Highly visible media designed to visually portray your message.	–Work with weather departments at your local station to work in segments on UV Index and sun safety. –Contact an assignment editor with an idea to profile a skin cancer survivor in your community. Include a sun safety message. –Prepare a SunWise media kit for your local station, include existing materials from the SunWise Program, such as brochures and fact sheets. Also, include a press release giving the information a local spin—such as a school's SunWise project or a company's UV awareness efforts.
Radio	Brief sound bites in which tone and delivery are important.	–Prepare a public service announcement on the importance of SunWise behavior. –Arrange for a respected health professional or community leader to participate in a talk show, delivering a sun safety message.
Hotline	Sustained effort, requires external promotion.	–Participate in a local health hotline by providing staff with sun safety information.
Meeting, events, or locations	One-time, high-profile opportunities to deliver your message to a target audience.	–Create a SunWise event of your own. Involve schools, companies, and organizations. Consider having a radio or TV station co-sponsor the event. –Look for ways to tie in with local events, such as fairs, parades, conferences, or sports events, to house a SunWise exhibit or distribute SunWise materials.

4.2 Successful UV Risk Education Programs

A number of UV/sun protection education programs have been successfully implemented in communities nationwide, as well as internationally. These programs educate youth and communities about sun protection through activities inside and outside of school. As a result, these concentrated efforts have had numerous positive effects on people's behaviors. For example, a community in Massachusetts reduced sunburn rates of children under 6 years old by more than 75 percent. In addition, a pilot project in Georgia improved the sun-safe behaviors of a youth soccer organization, while an in-school program in Australia focused on teaching teenagers proper sun-safe behavior by exploring myths about

Working With the Media

In a growing number of communities, media institutions are key players, even partners, in community-wide education programs. Some communities have relied primarily on media-based campaigns to deliver sun protection messages through newspapers, radio stations, television stations, and outdoor or transit advertising. The media has the advantage of reaching large numbers of people and can inspire people to become sun safety advocates. Long-term media coverage (periodically over at least 1 year) is most effective at raising people's awareness. Meteorologists who work for the media can play a particularly important role in broadcasting the UV Index daily and explaining what this measurement means in terms of sun protection. Newspapers also can print the UV Index daily. In general, media messages should be based upon an understanding of the prevailing culture and the level of community awareness of the issue.

If you are new to media work, it is important to realize that you don't need special training or experience to effectively promote your story. Take advantage of free media coverage by sending press releases or public service announcements (see the Centers for Disease Control and Prevention's Choose Your Cover campaign at <www.cdc.gov/ChooseYourCover/preview.htm>) to local media outlets or by asking newspapers and television stations to cover a local sun safety presentation, meeting, or start of a new SunWise Program at a nearby school. What you do need is the readily available information on basic methods for communicating with the media. You can find this information in books and "how-to" guides published by nonprofit organizations. Also, see Appendix A: List of Resources for more information to help you get started.

sun exposure and the pressures of tanning. For detailed information on many of these programs, see Appendix B: Case Studies of UV Risk Education Programs.

4.3 Communicating UV Risk Education Information to the Community

Communicating information on environmental and health risk topics can be challenging. Frequently, this information can be technical, full of unfamiliar terms and jargon. In addition, talking to people about health issues can be frightening, particularly when you are dealing with potentially life-threatening health effects, such as cancer. As you begin to implement your outreach and develop or tailor existing products, you will want to make sure that these products present your messages and information as clearly, accurately, and sensitively as possible.

Writing for the Public

Information should be conveyed in simple, clear terms. Principles of effective writing for the public include:

- Avoid using scientific jargon and acronyms. Where possible, translate technical terms into everyday language the public can easily understand. For example, use "skin" instead of "dermal." If you need to use technical terms or acronyms, make sure you define them.
- Use the active voice. Active voice means putting the subject of your sentence before the verb rather than after. For example, "Overexposure

to UV radiation can cause skin cancer" is written in active voice. "Skin cancer can be caused by overexposure to UV radiation" is not.

- Keep sentences short.
- In written materials, use headings and other format devices to provide a very clear, well-organized structure.

The Web site <www.plainlanguage.gov> provides many useful guidelines and examples for writing in clear, plain English.

Know Your Audience

As you develop communication materials for a specific audience, remember to consider what the audience members are likely to know, what you want them to know, and what they are likely to understand. Then tailor your information accordingly. Provide only information that will be valuable or interesting to the target audience. In addition, when developing outreach products, be sure to consider any special needs of the target audience. For example, if your community has a substantial number of people who speak little or no English, you will need to prepare communication materials in their native language.

Clinical Information and Photographs

Many programs have made use of testimonials and clinical pictures of actual skin cancer cases to communicate the importance of sun protection in reducing health risks. These tools can send a memorable message, and make an impression on children and adults alike. "Scary" messages and tools need to be used with sensitivity, however, when directed at younger children.

Essential UV Risk and Sun Protection Messages: Sample Text for Outreach Products

The rest of this section contains the messages that every UV risk education program should convey and sample text for outreach products. These examples, presented in a question-and-answer format, are written in a plain-English style designed to be easily understood by the public. You can use this text as a model to stimulate ideas for your own outreach materials or you can incorporate any of this text directly into your products. You also can use fact sheets, brochures, or other materials developed by the SunWise Program. These materials are available from <www.epa.gov/sunwise>.

What Are the Risks From Overexposure to Sunlight?

- We are all at risk from exposure to too much sun. This is because the sun contains harmful ultraviolet (UV) rays, called UV-A and UV-B, which can penetrate into the skin and eyes. Everybody, regardless of race or ethnicity, may be affected by overexposure to sunlight.
- Overexposure to UV radiation can cause a painful sunburn. Over time, it can also lead to skin cancer, early aging of the skin, and other skin

disorders; cataracts and other eye damage; and suppression of the immune system.

- More UV radiation is reaching the Earth's surface than ever before because pollution has thinned the ozone layer, which is high in the Earth's atmosphere and shields us from the sun's UV rays. There has been a continued increase in the reporting of skin cancer in the United States—1.3 million cases annually. In fact, one in five Americans will develop skin cancer in their lifetime.
- There is no such thing as a healthy suntan. Any change in your natural skin color is a sign of skin damage. Every time your skin color changes after sun exposure, your risk of developing sun-related ailments increases.

Who Is Most at Risk?

- You may be at greater risk of contracting skin cancer if your skin always burns or burns easily, and if you have fair skin, blond or red hair, or blue, green, or gray eyes.
- You may also be at increased risk of skin cancer if you have a history of blistering sunburns in early childhood, many moles, or a family history of skin cancer.
- People who spend a lot of time outdoors may be at higher risk for health effects from UV radiation.
- Children are particularly at risk of overexposure because they tend to spend a lot of time outdoors and can burn more easily. An estimated 80 percent of a person's sun exposure occurs before age 18. Blistering sunburns during childhood can significantly increase the risk of developing skin cancer later in life.
- Certain diseases, such as lupus, and certain medications, such as antibiotics, antihistamines, and even some herbal remedies, can make you more sensitive to the sun's harmful rays.
- Everyone is equally at risk for eye damage.

When and Where Is the Sun Strongest?

- The intensity of the sun's UV rays reaching the Earth's surface varies and should be considered when you plan outdoor activities. You can obtain a daily forecast of UV intensity for your area from the Internet (see "What Is the UV Index?" below).
- UV radiation is strongest at midday (from 10 a.m. to 4 p.m.) and during the summer. Also, exposure to UV radiation is greater at lower latitudes (i.e., the further south you are in the U.S.) and at higher altitudes.

- Up to 80 percent of the sun's UV rays pass through clouds. This means that you can burn on a cloudy day even if it doesn't feel warm.
- Snow, water, and sand reflect the sun's rays, so skiers, swimmers, boaters, and beachcombers are exposed from both direct and reflected sunlight.

How Can I Protect Myself and My Family?

Always Use Sunscreen

- Sunscreens protect your skin in two ways: by reflecting UV radiation away from your skin and by absorbing UV radiation before it can penetrate your skin.
- All sunscreens sold in the United States contain a Sun Protection Factor (SPF) label to indicate how much protection the sunscreen will provide when used properly. The higher the SPF, the greater the protection from UV-B rays. An SPF of 30 blocks out 96 percent of harmful UV-B rays (the primary cause of sunburn). An SPF of 15 offers 93 percent protection from UV-B. Many sunscreens—called "broad-spectrum" sunscreens—also protect the skin from UV-A rays (the primary cause of premature skin aging). **For these reasons, use of a broad-spectrum sunscreen with an SPF of at least 15 is recommended.**
- Apply about 1 ounce of sunscreen 20 minutes before going out into the sun (or as directed by the manufacturer) to give it time to absorb into your skin. Reapply sunscreen—about 1 ounce—every 2 hours or more if you are swimming or perspiring.
- Apply sunscreen to all areas of your body that are not covered by clothing or a hat and that might be exposed to the sun, including ears, feet, hands, back, bald spots, and the back of the neck, as well as areas under bathing suit straps, necklaces, bracelets, and sunglasses. To protect your lips, use a lip balm of at least SPF 15.
- Discard sunscreen after the expiration date or after 3 years, because the ingredients can become less effective over time.
- Sunscreens labeled "water resistant" should maintain their protection level for 40 minutes of water immersion. Sunscreens labeled "very water resistant" should maintain their protection level for 80 minutes of water immersion. Reapply these sunscreens regularly because heavy perspiration, water, and towel drying diminish their effectiveness.
- Occasionally, sunscreen ingredients cause skin irritation or reactions. If this happens, try using sensitive skin formulas or brands made for children.
- Using sunscreens does not mean that it is safe to spend more time in the sun, because they don't block all of the sun's damaging rays. In fact, there is no evidence that sunscreens protect you from malignant

melanoma—the deadliest form of skin cancer. So when you use sunscreen, be sure to use other protective measures as well, including limiting your time in the sun and wearing protective clothing, hats, and sunglasses.

Limit Your Time in the Sun

- The sun's UV rays are strongest between 10 a.m. and 4 p.m. Whenever possible, limit your exposure to the sun during these hours.
- When you are outside, stay in the shade as much as possible. Staying under cover is one the best ways to protect yourself from the sun.
- Remember that incidental time in the sun can add up to long-term sun damage. This includes, for example, time spent walking the dog, window shopping, performing outdoor chores, or jogging at lunch.
- Sun exposure is not required to get a sufficient amount of vitamin D. Most people get sufficient vitamin D in their diets. If you are concerned about getting enough vitamin D, you can drink vitamin D-fortified milk daily or take a multivitamin.

Wear Protective Sunglasses

- Sunglasses that provide 99 to 100 percent UV-A and UV-B protection will greatly reduce sun exposure that can lead to cataracts and other eye damage. Check the label when buying sunglasses. Be aware that dark, polarizing, or mirror lenses by themselves do not offer effective protection. Protective wrap-around frames provide the best protection
- If you wear corrective lenses, you should add UV-protective coating or obtain prescription sunglasses if you spend significant periods outside.

Wear a Wide Brimmed Hat

- Whenever possible, wear a hat with a wide brim. This offers good sun protection to your eyes, ears, face, and the back of your neck—areas particularly prone to overexposure from the sun. Be aware that baseball caps, visors, and narrow-brimmed hats provide less protection, particularly for the ears and nape of the neck.
- Choose a hat made from a close-weave fiber. If you can see through the hat, then sunlight will also get through.

Wear Protective Clothing

- Clothing that is tightly woven, loose-fitting, and full-length (in other words, with a collar, long sleeves, and long pants or skirts) provides good protection from the sun's harmful rays.
- UV rays can pass through the holes and spaces of loosely knit fabrics. Also, wet, faded, or older clothing provides less protection.

Avoid Sunlamps, Tanning Parlors, and Suntan Products

- Sunbeds and sunlamps emit UV light that can damage the skin and unprotected eyes.
- Suntan products do not contain a sunscreen and do not provide any protection against sun exposure.

Protect Children and Babies

- Children typically spend so much time outdoors that they are at high risk for overexposure to sunlight. Studies increasingly suggest a link between early sun exposure and skin cancer as an adult. Encourage your children to take all the safety steps listed above whenever they go outside. Started early and followed consistently, each of these steps will become an accepted habit, as easy as fastening seatbelts every time you drive the car.
- Keep babies out of direct sunlight. The American Academy of Pediatrics recommends using sunscreen on infants for small areas such as the face and back of the hands where protection from clothing is inadequate. For infants younger than 6 months, consult your physician.
- EPA has been working with schools and communities across the nation to launch the SunWise School Program. SunWise teaches children in elementary schools and their caregivers about how to protect themselves from overexposure to the sun. Educating children about sun safety is the key to reducing the risk of future UV-related health problems. For more information about SunWise, visit the program's Web site at <www.epa.gov/sunwise>.

Check the UV Index

- The UV Index forecasts the next day's likely intensity of UV rays. This is a useful tool for planning your outdoor activities to protect yourself from overexposure to sunlight. See below for more information on where to find the UV Index and how to use it.

What Is the UV Index and How Can I Use It?

- The UV Index is reported daily for localities across the United States. It forecasts the next day's likely intensity of UV rays.
- Calculated by the National Weather Service, the UV Index takes into account many factors, including the amount of ozone and clouds overhead, latitude, elevation, and time of year.

- UV Index forecasts are reported on a scale of 1 through 10+ as follows:

INDEX NUMBER	INTENSITY LEVEL
0 to 2	Minimal
3 to 4	Low
5 to 6	Moderate
7 to 9	High
10+	Very High

The higher the UV Index, the stronger the sun and the greater the need to follow all the sun protection measures. When a UV intensity of 5 or more is predicted for your area, it is especially important to protect yourself against sun exposure. The UV Index should not be used to determine the best time to go out and get a tan.

- You can obtain your local UV Index forecast daily from local weather stations or newspapers. EPA's Web site provides the UV Index forecast for your ZIP code. The address is <www.epa.gov/sunwise/uvindex.html>.
- Because the UV Index is a forecast, it won't always be exactly correct, but it is very reliable. The UV Index is 84 percent accurate to within ±2.
- Remember that snow, water, and sand reflect the sun's light, so you can get a double dose of UV exposure in these environments. The UV Index does not take these factors into account. If you are outdoors in these environments, your actual exposure will be higher than the UV Index value indicates.
- Some medications and diseases (e.g., lupus erythematosus) cause serious sun sensitivity. The UV Index is not intended for use by seriously sun-sensitive individuals. Consult your doctor about additional precautions you may need to take.

Appendix A: List of Resources

The following list of Web sites, contact information, and additional suggestions can help you get started with your UV risk education project. This list includes examples of existing UV risk outreach tools, information on successful UV risk education strategies, financial assistance resources, volunteer groups that might be able to provide assistance, measurement resources, and information on working with the media.

Examples of Existing UV Risk Outreach Tools

- **SunWise <www.epa.gov/sunwise>.** Teachers and schools can join EPA's SunWise Program and receive a number of educational and outreach products. These include the SunWise Tool Kit (which includes a UV-sensitive frisbee), the SunWise Internet Learning Site, and UV Database. Students and teachers can use the SunWise Internet Learning Site and UV Database to report and interpret daily measurements of UV radiation, explore interactive Web-based games and activities, and link to other educational activities and resources. Go to <www.epa.gov/sunwise/join.html> to join the SunWise Program.
- **SunSmart <www.sunsmart.com.au>.** Australia's SunSmart Internet site provides comprehensive educational material, technical assistance tools, and sample sun-safe policies for primary and secondary schools, child-care facilities, community health service organizations, local government, medical specialists, workplaces, community groups, sport and recreation clubs, and the tourism industry.
- **Choose Your Cover <www.cdc.gov/ChooseYourCover>.** The Choose Your Cover Web site includes facts and statistics about skin cancer, information about the program, and access to all campaign and educational materials, some of which can be ordered online.
- **PoolCool <http://splash.hawaii.edu/sbsp/projects/poolcool/home.html>.** PoolCool is a sun safety program especially designed for use at swimming pools. Swimming pools that join PoolCool receive an educational toolkit, sun safety signs, and technical support to promote sun safety during swimming lessons and other pool activities. For more information, contact Tom Elliot, Project Coordinator, at <poolcool@crch.hawaii.edu> or 808 586-3076, extension 69916.
- **Sunwise Stampede <www.foundation.sdsu.edu/sunwisestampede/index.html>.** Sunwise Stampede is a sun safety program that encourages zoo visitors to protect themselves from UV radiation. The program consists of a tip sheet for parents, coupons for sunscreen and hats, art activities for children, and sun protection signs and reminders. The Sunwise Stampede Web site includes fun

educational games for children. For more information, contact Sunwise Stampede at <blewis@projects.sdsu.edu> or 619 594-8745.

- **Raising Awareness About Your Skin (RAYS).** The RAYS program is a skin cancer and sun awareness program for middle and high school students developed by the RAYS Task Force of the Montgomery County Ohio Medical Alliance. Contact RAYS at <RAYSTaskforce@aol.com> to receive a CD-ROM with slide presentations, study guides, and tests.

Successful UV Risk Education Strategies

- **Guide to Community Preventive Services <www.thecommunityguide.org/guide_basics/guide_basics_f.html>.** The Guide to Community Preventive Services is a federally-sponsored initiative that will help communities develop effective skin cancer (and other disease) prevention education programs. The cancer chapter, which will provide recommendations on successful skin cancer prevention strategies, should be complete by summer 2002.

- **Plain English Network <www.plainlanguage.gov>.** This Web site is dedicated to helping make all communication materials more user-friendly through the use of plain English, which means to organize and write information with the reader's needs in mind. For tips on writing user-friendly documents, go to <www.blm.gov/nhp/NPR/pe_toc.html>.

Financial Assistance

- **EPA Grants Administration Division <www.epa.gov/ogd/index.htm>.** EPA and other government agencies provide grants to organizations that address a variety of environmental issues. To access funding opportunities, go to <www.epa.gov/ogd/funding_opportunities.htm>. For information on how to apply for a government grant, go to <www.epa.gov/ogd/grants/how_to_apply.htm>.

- **The Foundation Center <www.foundationcenter.org>.** As the most authoritative source of up-to-date information on private philanthropy in the United States, the Foundation Center provides print, CD-ROM, and online resources to help individuals and organizations identify appropriate grant sources and develop targeted proposals. To get started, visit <www.fdncenter.org/about/fchelp.html> for easy access to Foundation Center services. Note that some grants are available only to nonprofit organizations.

Volunteer Groups that Could Provide Assistance

- **Environmental Alliance for Senior Involvement <www.easi.org/about.html>.** The Environmental Alliance for Senior Involvement (EASI) seeks to increase opportunities for older adults to play an active, visible role in protecting and improving the environment in their communities. Contact EASI to learn more about the availability of senior volunteers at <easi@easi.org> or 540 788-3274.

- **Experience Corps® <www.experiencecorps.org/index.html>.** Experience Corps® provides schools and youth-serving organizations with older adults who serve as volunteers to improve the academic performance and development of young people. Go to <www.experiencecorps.org/site/sites/map.html> to find an Experience Corps® in your area.

Measurement Resources

- **Surveys Developed by Other UV Risk Education Programs.** Many UV risk education programs use surveys to measure their effectiveness in changing sun protection attitudes and behavior. Contact any of the programs listed above or mentioned in this handbook's case studies. (See Appendix B: Case Studies of UV Risk Education Programs to request sample surveys.)

- **InnoNet Evaluation Resources <www.innonet.org/workstation/about.cfm>.** InnoNet helps organizations improve their effectiveness. Go to <www.innonet.org/resources/eval_resources.cfm> for answers to frequently asked questions on how to evaluate programs and for background information on a number of evaluation topics.

Working With the Media

- **It All Adds Up to Cleaner Air Campaign, Effective Media Relations <www.epa.gov/oms/transp/traqpedo/italladd/media.htm>.** This Web page provides good descriptions of different media types and instructions on successfully working with the media to get your message out to the public.

- **Buckle Up America Campaign, Working With the Media <www.nhtsa.dot.gov/people/injury/airbags/buckleplan/buckleup/media.html>.** Although focused on increasing seat belt use, this Web page provides helpful suggestions on generating media attention and creating newsworthy information.

Appendix B: Glossary of Terms

Air Terms

Acid rain: Air pollution produced when acid compounds formed in the atmosphere are incorporated into rain, snow, fog, or mist. The acid compounds come from sulfur oxides and nitrogen oxides, products of burning coal and other fuels and from certain industrial processes. Acid rain can impact the environment and human health and damage property.

Atmosphere: A thin layer of gases surrounding the Earth, composed of 78 percent nitrogen, 21 percent oxygen, 0.9 percent argon, 0.03 percent carbon dioxide, and trace amounts of other gases. There is no exact place where the atmosphere ends; it just gets thinner and thinner, until it merges with outer space.

Basal cell carcinoma: Skin cancer tumors that might appear as slow-growing, translucent, pearly nodules, which might crust, discharge pus, or even bleed. These tumors typically develop where you are most exposed to the sun—on the face, lips, tops of ears, and hands.

Carbon monoxide (CO): A colorless, odorless, poisonous gas produced by the incomplete burning of solid, liquid, and gaseous fuels. Appliances fueled with natural gas, liquified petroleum (LP gas), oil, kerosene, coal, or wood may produce CO. Burning charcoal produces CO and car exhaust contains CO.

Chlorofluorocarbons (CFCs): Stable, low toxic, and inexpensive chemicals that were most commonly used as refrigerants, solvents, and aerosol propellants. CFCs and their relatives, when released into the air, rise into the stratosphere and take part in chemical reactions that result in reduction or depletion of the stratospheric ozone layer. The 1990 Clean Air Act includes provisions for reducing releases (emissions) and eliminating production and use of these ozone-destroying chemicals.

Clean Air Act: The original Clean Air Act was passed in 1963, but our national air pollution control program is actually based on the 1970 version of the law. The 1990 Clean Air Act Amendments are the most far-reaching revisions of the 1970 law.

Criteria air pollutants: A group of very common air pollutants regulated by EPA on the basis of criteria (information on health and/or environmental effects of pollution).

Emission: Release of pollutants into the air from a source. Continuous emission monitoring systems (CEMS) are machines that some large sources are required to install, to make continuous measurements of pollutant release.

EMPACT: Environmental Monitoring for Public Access and Community Tracking, a program begun by EPA in 1997, helps communities collect, manage, and distribute environmental information, providing residents with up-to-

date and easy-to-understand information they can use to make informed, day-to-day decisions.

Greenhouse effect: A natural phenomenon whereby clouds and greenhouse gases, such as water vapor and carbon dioxide, trap some of the Sun's heat in the atmosphere. The greenhouse effect helps regulate the temperature of the Earth. Human activities are adding greenhouse gases to the natural mix.

Greenhouse gases: Human activities, such as fuel burning, are adding greenhouse gases to the atmosphere. Because these gases remain in the atmosphere for decades to centuries (depending on the gas) global temperatures will rise.

Melanoma: The most fatal form of skin cancer. Malignant melanomas may appear suddenly without warning as a dark mole or other dark spot on the skin and can spread quickly.

Monitoring (monitor): Measurement of air pollution is referred to as monitoring. Continuous emission monitoring systems (CEMS) will measure, on a continuous basis, how much pollution is being released into the air. The 1990 Clean Air Act requires states to monitor community air in polluted areas to check on whether the areas are being cleaned up according to schedules set out in the law.

Nitrogen oxides (NOx): A criteria air pollutant. Nitrogen oxides are produced from burning fuels, including gasoline and coal, and react with volatile organic compounds to form smog. Nitrogen oxides are also major components of acid rain.

Ozone (O3): An ozone molecule consists of three oxygen atoms. Stratospheric ozone shields the Earth against harmful rays from the sun, particularly ultraviolet B. Ground-level ozone contributes to smog.

Ozone depletion: The ozone layer is damaged when substances such as chlorofluorocarbons accelerate the natural process of destroying and regenerating stratospheric ozone. As the ozone layer breaks down, it absorbs smaller amounts of UV radiation, allowing more of it to reach the earth.

Particulates, particulate matter: A criteria air pollutant. Particulate matter includes dust, soot, and other tiny bits of solid materials that are released into and move around in the air.

Pollutants (pollution): Unwanted chemicals or other materials found in the air.

Smog: A mixture of pollutants, principally ground-level ozone, produced by chemical reactions in the air involving smog-forming chemicals. A major portion of smog-formers come from burning of petroleum- based fuels such as gasoline. Major smog occurrences are often linked to heavy motor vehicle traffic, sunshine, high temperatures, and calm winds or temperature inversion (weather condition in which warm air is trapped close to the ground instead of rising).

Source: Any place or object from which pollutants are released.

Spectrophotometer: An instrument for measuring the relative intensities of light in different parts of the spectrum used to measure the amount of UV radiation reaching the earth.

Squamous cell carcinoma: Skin cancer tumors that might appear as nodules or red, scaly patches, which can develop into large masses and spread to other parts of the body.

Stratosphere: The stratosphere starts just above the troposphere and extends to 50 kilometers (31 miles) high. The temperature in this region increases gradually to -3 degrees Celsius, due to the absorption of ultraviolet radiation. The ozone layer, which absorbs and scatters the solar ultraviolet radiation, is in this layer. Ninety-nine percent of air is located in the troposphere and stratosphere.

Stratospheric ozone: A bluish gas composed of three oxygen atoms. Natural processes destroy and regenerate ozone in the atmosphere. When ozone-depleting substances such as chlorofluorocarbons accelerate the destruction of ozone, there is less ozone to block UV radiation from the sun, allowing more UV radiation to reach the earth.

Sulfur dioxide: A criteria air pollutant. Sulfur dioxide is a gas produced by burning coal, most notably in power plants. Sulfur dioxide plays an important role in the production of acid rain.

Sunscreen: A substance, usually a lotion, that you can apply to protect your skin from UV radiation. It works by reflecting UV radiation away from your skin in addition to absorbing UV radiation before it can penetrate your skin.

SunWise School Program: EMPACT program that aims to teach grades K-8 school children and their caregivers how to protect themselves from overexposure to the sun. The program raises children's awareness of stratospheric ozone depletion and ultraviolet radiation and encourages simple sun safety practices.

Troposphere: The troposphere is the lowest region in the Earth's (or any planet's) atmosphere, starting at ground (or water) level up and reaching up to about 11 miles (17 kilometers) high. The weather and clouds occur in the troposphere.

Ultraviolet B (UVB): A type of sunlight. Ultraviolet B exposure has been associated with skin cancer, eye cataracts, and damage to the environment. The ozone in the stratosphere, high above the Earth, filters out ultraviolet B rays and keeps them from reaching the Earth. Thinning of the ozone layer in the stratosphere results in increased amounts of ultraviolet B reaching the Earth.

UV Index: A tool developed by the National Weather Service that predicts the next day's UV intensity on a scale from 0 to 10+, helping people determine appropriate sun-protective behaviors.

UV radiation: A portion of the electromagnetic spectrum with wavelengths shorter than visible light. UV radiation produced by the sun is responsible for sunburn and other adverse health effects. Scientists classify UV radiation into three types: UVA, UVB, and UVC.

Volatile organic compounds (VOCs): Chemicals that produce vapors readily at room temperature and normal atmospheric pressure, so that vapors escape

easily from volatile liquid chemicals. Organic chemicals all contain the element carbon and are the basic chemicals found both in living things and in products derived from living things, such as coal, petroleum and refined petroleum products. Many volatile organic chemicals are also hazardous air pollutants.

Water Terms

Abiotic: Not alive; non-biological. For example, temperature and mixing are abiotic factors that influence the oxygen content of lake water, whereas photosynthesis and respiration are biotic factors that affect oxygen solubility.

Acid: A solution that is a proton (H+) donor and has a pH less than 7 on a scale of 0-14. The lower the pH the greater the acidity of the solution.

Acidity: A measure of how acidic a solution may be. A solution with a pH of less than 7.0 is considered acidic. Solutions with a pH of less than 4.5 contain mineral acidity (due to strong inorganic acids), while a solution having a pH greater than 8.3 contains no acidity.

Acid rain: Precipitation having a pH lower than the natural range of ~5.2 - 5.6; caused by sulfur and nitrogen acids derived from human-produced emissions.

Acidification: The process by which acids are added to a water body, causing a decrease in its buffering capacity (also referred to as alkalinity or acid neutralizing capacity), and ultimately a significant decrease in pH that may lead to the water body becoming acidic (pH < 7).

Algae: Simple single-celled, colonial, or multi-celled aquatic plants. Aquatic algae are (mostly) microscopic plants that contain chlorophyll and grow by photosynthesis and lack roots, stems (non- vascular), and leaves.

Alkalinity: Acid neutralizing or buffering capacity of water; a measure of the ability of water to resist changes in pH caused by the addition of acids or bases. Therefore, it is the main indicator of susceptibility to acid rain. A solution having a pH below about 5 contains no alkalinity.

Anoxia: Condition of being without dissolved oxygen.

Anthropogenic: A condition resulting from human activities.

Aquatic respiration: Refers to the use of oxygen in an aquatic system, including the decomposition of organic matter and the use of oxygen by fish, algae, zooplankton, aquatic macrophytes, and microorganisms for metabolism.

Base: A substance which accepts protons (H+) and has a pH greater than 7 on a scale of 0-14; also referred to as an alkaline substance.

Basin: Geographic land area draining into a lake or river; also referred to as drainage basin or watershed.

Benthic: Refers to being on the bottom of a lake.

Bioaccumulation: The increase of a chemical's concentration in organisms that reside in environments contaminated with low concentrations of various organic compounds. Also used to describe the progressive increase in the amount of a

chemical in an organism resulting from rates of absorption of a substance in excess of its metabolism and excretion. Certain chemicals, such as PCBs, mercury, and some pesticides, can be concentrated from very low levels in the water to toxic levels in animals through this process.

Biochemical oxygen demand (BOD): Sometimes referred to as Biological Oxygen Demand (BOD). A measure of the amount of oxygen removed (respired) from aquatic environments by aerobic microorganisms either in the water column or in the sediments. Primarily of concern in wastewater "streams" or systems impacted by organic pollution.

Biomass: The weight of a living organism or group of organisms.

Biotic: Referring to a live organism; see abiotic.

Buffer: A substance that tends to keep pH levels fairly constant when acids or bases are added.

Chlorophyll: Green pigment in plants that transforms light energy into chemical energy during photosynthesis.

Clarity: Transparency; routinely estimated by the depth at which you can no longer see a Secchi disk. The Secchi disk, an 8-inch diameter, weighted metal plate, is lowered into water until it disappears from view. It is then raised until just visible. An average of the two depths, taken from the shaded side of the boat, is recorded as the Secchi depth.

Conductivity (electrical conductivity and specific conductance): Measures water's ability to conduct an electric current and is directly related to the total dissolved salts (ions) in the water. Called EC for electrical conductivity, it is temperature-sensitive and increases with higher temperature.

Dissolved oxygen (DO or O2): The concentration of free (not chemically combined) molecular oxygen (a gas) dissolved in water, usually expressed in milligrams per liter, parts per million, or percent of saturation. Adequate concentrations of dissolved oxygen are necessary for the life of fish and other aquatic organisms.

Dissolved solids concentration: The total mass of dissolved mineral constituents or chemical compounds in water; they form the residue that remains after evaporation and drying.

Ecosystem: All of the interacting organisms in a defined space in association with their interrelated physical and chemical environment.

Epilimnion: The upper, wind-mixed layer of a thermally stratified lake. This water is turbulently mixed at some point during the day, and, because of its exposure, can freely exchange dissolved gases (such as O2 and CO2) with the atmosphere.

Eutrophication: Unhealthy increases in the growth of phytoplankton. Symptoms of eutrophication include algal blooms, reduced water clarity, periods of hypoxia, and a shift toward species adapted toward these conditions.

Evaporation: The process of converting liquid to vapor.

Food chain: The transfer of food energy from plants through herbivores to carnivores. For example, algae are eaten by zooplankton, which in turn are eaten by small fish, which are then eaten by larger fish, and eventually by people or other predators.

Food web: Food chains connected into a complex web.

Hydrogen: Colorless, odorless, and tasteless gas; combines with oxygen to form water.

Hydrology: The study of water's properties, distribution, and circulation on Earth.

Hypolimnion: The bottom and most dense layer of a stratified lake. It is typically the coldest layer in the summer and warmest in the winter. It is isolated from wind mixing and typically too dark for much plant photosynthesis to occur.

Hypoxia: A deficiency of oxygen reaching the tissues of the body.

Isothermal: Constant in temperature.

Leach: To remove soluble or other constituents from a medium by the action of a percolating liquid, as in leaching salts from the soil by the application of water.

Metalimnion: The middle or transitional zone between the well-mixed epilimnion and the colder hypolimnion layers in a stratified lake.

Nonpoint source: Diffuse source of pollutant(s); not discharged from a pipe; associated with land use such as agriculture, contaminated groundwater flow, or onsite septic systems.

Nutrient loading: Discharging of nutrients from the watershed (basin) into a receiving water body (lake, stream, wetland).

Oxygen: An odorless, colorless gas; combines with hydrogen to form water; essential for aerobic respiration. See respiration.

Oxygen solubility: The ability of oxygen gas to dissolve into water.

Parameter: Whatever it is you measure; a particular physical, chemical, or biological property that is being measured.

pH: A measure of the concentration of hydrogen ions.

Phosphorus: Key nutrient influencing plant growth in lakes.

Photosynthesis: The process by which green plants convert carbon dioxide (CO2) dissolved in water to sugars and oxygen using sunlight for energy. Photosynthesis is essential in producing a lake's food base and is an important source of oxygen for many lakes.

Phytoplankton: Microscopic floating plants, mainly algae, that live suspended in bodies of water and that drift about because they cannot move by themselves or because they are too small or too weak to swim effectively against a current.

Respiration: The metabolic process by which organic carbon molecules are oxidized to carbon dioxide and water with a net release of energy.

Solubility: The ability of a substance to dissolve into another.

Solution: A homogenous mixture of two substances.

Solvent: A substance that has the ability to dissolve another.

Stormwater discharge: Precipitation and snowmelt runoff (e.g., from roadways, parking lots, roof drains) that is collected in gutters and drains; a major source of nonpoint source pollution to water bodies.

Temperature: A measure of whether a substance is hot or cold.

Total Dissolved Solids (TDS): The amount of dissolved substances, such as salts or minerals, in water remaining after evaporating the water and weighing the residue.

Turbidity: Degree to which light is blocked because water is muddy or cloudy.

Turnover: Fall cooling and spring warming of surface water make density uniform throughout the water column, allowing wind and wave action to mix the entire lake. As a result, bottom waters contact the atmosphere, raising the water's oxygen content.

Water Column: A conceptual column of water from lake surface to bottom sediments.

Watershed: All land and water areas that drain toward a river or lake; also called a drainage basin or water basin.

Soil Terms

Bedrock: Consolidated rock.

Brownfields: Abandoned, idled, or underused industrial and commercial facilities where expansion or redevelopment is complicated by real or perceived environmental contamination.

Clay: Soil composed mainly of fine particles of hydrous aluminum silicates and other minerals. Soil composed chiefly of this material has particles less than a specified size.

Erosion: The wearing away of the land surface by running water, wind, ice, other geological agents, or human activity.

Infiltration: The downward entry of water through the soil surface.

Limestone: A white to gray, fine-grained rock made of calcium carbonate.

Percolation: Water that moves through the soil at a depth below the root zone.

Sand: A loose granular material that results from the disintegration of rocks. It consists of particles smaller than gravel but coarser than silt

Sandstone: A very grainy rock that comes in many colors, including gray, red, or tan.

Sedimentary rock: Rock that has formed from compressed sediment, like sand, mud, and small pieces of rocks.

Shale: Dark-colored rock that is usually black, deep red, or gray-green. It has a fine grain and is usually found below sandstone, not on the surface. Shale was formed from fine silt and clay.

Silt: Predominantly quartz mineral particles that are between the size of sand and clay in diameter. Silt, like clay and sand, is a product of the weathering and decomposition of preexisting rock.

Soil: Soil is made up of minerals (rock, sand, clay, silt), air, water, and organic (plant and animal) material. There are many different types of soils, and each one has unique characteristics, like color, texture, structure, and mineral content.

Soil contamination: Pollution caused by a number of activities, including the dumping of hazardous substances, pesticide and fertilizer use, and industrial or chemical processes. Pollutants in soils can also be transported to groundwater sources and into the air. Contaminated soils are often a major concern at brownfield and Superfund sites. Common soil contaminants include arsenic, benzene, cyanide, lead, and mercury.

Soil formation: Soil is formed slowly as rock erodes into tiny pieces near the Earth's surface. Organic matter decays and mixes with rock particles, minerals, and water to form soil.

Soil texture: Distribution of individual particles of soil.

Soil washing: A technology that uses liquids (usually water, sometimes combined with chemical additives) and a mechanical process to scrub soils of contaminants.

Superfund: The Federal government's program to clean up the nation's uncontrolled hazardous waste sites.

Topsoil: Soil consisting of a mixture of sand, silt, clay, and organic matter. Topsoil is rich in nutrients and supports plant growth.

Urban sprawl: The unplanned, unlimited extension of neighborhoods outside of a city's limits, usually associated with low density residential and commercial settlements, dominance of transportation by automobiles, and widespread strip commercial development.

Appendix C: Activities by Grade Level

Curriculum	Grade K	1	2	3	4	5	6	7	8	9	10	11	12	12+
Airbeat					X	X	X	X	X	X	X	X	X	
Air Currents							X	X	X	X	X	X	X	
Air Info Now: Environmental Monitoring for Public Access and Community Tracking					X	X	X	X	X	X	X	X	X	
AIRNow			X	X	X	X								
Boulder Area Sustainability Information Network					X	X	X	X	X	X	X	X	X	
Burlington Eco-Info								X	X	X	X	X	X	
Community Accessible Air Quality Monitoring Assessment (Northeast Ohio)					X	X	X	X	X					
ECOPLEX	X	X	X	X	X	X	X	X	X					
Lake Access (WOW)												X	X	X
Monitoring Your Sound									X	X	X	X	X	
Online Dynamic Watershed Atlas (Seminole County, FL)						X	X	X	X	X	X	X	X	
Onondaga Lake/Seneca River	X	X	X	X	X	X	X	X	X	X	X	X	X	
Northeast Ohio Urban Growth Simulator					X	X	X	X	X					

Appendix D: Activities by Subject

Curriculum	Subject: Math	Language Arts	Science	Social Studies	Art
Airbeat	X	X	X		
Air CURRENTS	X	X	X	X	X
Air Info Now: Environmental Monitoring for Public Access and Community Tracking		X	X		
AIRNow	X		X		X
Boulder Area Sustainability Information Network			X	X	
Burlington Eco-Info			X		
Community Accessible Air Quality Monitoring Assessment (Northeast Ohio)		X	X		X
ECOPLEX	X		X		X
Lake Access	X		X		
Monitoring Your Sound	X		X		
Online Dynamic Watershed Atlas (Seminole County, FL)	X		X	X	
Onondaga Lake/Seneca River			X		
Northeast Ohio Urban Growth Simulator			X	X	

Appendix E: Selected Lesson Plans and Activities

AirInfo Now

- Group Details – Blue Group: Weather (PDF)
  Data Sheet – Blue Group: Weather (Excel)
- Group Details – Brown Group: Visibility (PDF)
  Data Sheet – Brown Group: Visibility (Excel)
- A Guide to CO-City (PDF)
- So What's Making it Look Brown Outside? Collecting and Measuring Particulate Matter (PDF)
- What's the Connection Between Convection and Inversion? Convection Currents and Temperature Inversion (PDF)
- Getting a Handle on Greenhouse Gases: Your Family's Impact on the Greenhouse Effect (PDF)
- Helping to Find a Solution to Air Pollution! (PDF)
- Green Group: Location (PDF)
  Green Group: Location (Excel)
- Real-Time Air Quality Activity: Groups (PDF)
- Practice Data Sheet (Excel)
- Group Details – Red Group: Time (PDF)
  Data Sheet – Red Group: Time (Excel)
- Real-Time Air Quality Activity: Student Sheets(PDF)
  Real-Time Air Quality Activity: Teacher Sheets(PDF)
- Group Details – Yellow Group: Health (PDF)
  Data Sheet – Yellow Group: Health (Excel)

Airnow

- Air Quality Index Poster: Are you breathing clean air? (PDF)
- Air Quality Index: A Guide to Air Quality and Your Health (PDF)
- Air Quality Index Kids Website: Teacher's Reference (PDF)
- Green Day Poster (PDF)
- Orange Day Poster (PDF)
- Air Quality Index Posters (PDF)
- Purple Day Poster (PDF)
- Red Day Poster (PDF)
- Yellow Day Poster (PDF)

ECOPLEX

- **UV**
  - UV/7-2: Spotlight the Sun Data Table (PDF)
  - Ozone Chemistry: Formation & Depletion(PDF)
  - 8th Grade Lesson Plan – UV: Chemistry of Ozone Depletion(PDF)
  - 5th Grade Lesson Plan – UV: Check It Out! (PDF)
  - First Grade UV: Catching and Counting UV Rays! (PDF)
  - 4th Grade UV Lesson: What Depletes Our Ozone? Me and My Zone! (PDF)
  - Kindergarten UV: UV and Me! (PDF)
  - Second Grade UV: The Air Out There – UV and Ozone (PDF)

- UV/7-1: Distribution of the Sun's Rays (PDF)
- 6th Grade UV: Friend or Foe (PDF)
- 3rd Grade UV Lesson: When Good Ozone Goes Bad (PDF)

- **Water Quality**
  - Third Grade Water Quality: Test, Test, Is This Water Safe? (PDF)
  - Fourth Grade Water Quality: Chain, Chain, Chain, Chain of Food (PDF)
  - Fifth Grade Water Quality: Tick Tock Toxins (PDF)
  - 6th Grade Water Quality Lesson: Water O2 and You! (PDF)
  - 7th Grade Water Quality Lesson: Taxa-Rich and Taxa-Poor! (PDF)
  - Water Quality 1-1 Record Sheet (PDF)
  - Water Quality 2-1 Record Sheet (PDF)
  - Water Quality 4-1 Datasheet (PDF)
  - Water Quality 5-1 Datasheet (PDF)
  - First Grade Water Quality: Water – It's a Gas…Sometimes! (PDF)
  - Kindergarten Water Quality: Water in Me (PDF)
  - Second Grade Water Quality: Amazing Water (PDF)

- **Water Quantity**
  - 7th Grade Water Quantity: Water Use and Abuse (PDF)
  - 3rd Grade Water Quantity: Name That Surface Water (PDF)
  - 4th Grade Water Quantity: H2O is Underground Too! (PDF)
  - 5th Grade Water Quantity: What-A-Shed (PDF)
  - WQT/6-1: Water vs. Land and Sea (PDF)
  - WQT/6-2: Diagram for Stream Table (PDF)
  - 6th Grade Water Quantity: The Ups and Downs of Your Watershed (PDF)
  - 8th Grade Water Quantity: Water to Supply an Ever-growing Population (PDF)
  - First Grade Water Quantity Lesson: Here I Go 'Round My Watershed! (PDF)
  - Water Quantity Letter (PDF)
  - Kindergarten Water Quantity Lesson: Drip! Drop! Water Does Not Stop! (PDF)
  - Second Grade Water Quantity Lesson: Now You See It – Now You Don't! (PDF)
  - Water Quantity: What to Do and How to Do It (PDF)
  - WQT/7-1: Water Use Chart (PDF)

MY Sound

- The Impact of Atmospheric Nitrogen Deposition on Long Island Sound (PDF)
- Alternative Strategies for Hypoxia Management: Creative Ideas to Complement Advanced Treatment (PDF)
- Fact Sheet #1: Hypoxia in Long Island Sound (PDF)
- Toxic Contamination in Long Island Sound (PDF)
- Nutrient Reduction: New Solutions to Old Problems (PDF)
- Pathogens (PDF)
- The Impact of Septic Systems on the Environment (PDF)
- Water Conservation and Marine Water Quality (PDF)
- Wastewater Treatment (PDF)
- Supporting the Sound (PDF)
- Floatable Debris (PDF)
- How Low Dissolved Oxygen Conditions Affect Marine Life in Long Island Sound(PDF)
- Puttting the Plan in Motion (PDF)

SunWise

- SunWise Monitor, November 1999 (PDF)
  SunWise Monitor, April 2000 (PDF)
  SunWise Monitor, April 2001 (PDF)
- Mission: SunWise – Activity Book (PDF)
  Mission: SunWise – Activity Book (Spanish) (PDF)
- Sun Safety for Kids: The SunWise School Program (PDF)|
  The SunWise School Program Guide (PDF)
- Mission: SunWise (PDF)
  Mission: SunWise (Spanish) (PDF)
- Summertime Safety: Keeping Kids Safe from Sun and Smog (PDF)
- Action Steps for Sun Protection (PDF)
- Sunscreen: The Burning Facts (PDF)
- The Sun, UV, and You: A Guide to SunWise Behavior (PDF)
- What Is the UV Index? (PDF)
- UV Radiation (PDF)
- Ozone Depletion (PDF)

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Appendix F: Frequently Asked Questions

Q: Why is overexposure to the sun dangerous?

A: The sun emits powerful ultraviolet (UV) radiation that can cause a number of health problems as a result of overexposure. In addition to causing sunburn, UV radiation can cause health problems that might not become apparent until many years after sun exposure. These problems include skin cancer, premature aging of the skin, cataracts, and suppression of the immune system.

Q: Is skin cancer a significant problem in the United States?

A: Skin cancer is the most common form of cancer in the United States. In addition, the incidence of malignant melanoma, the most dangerous form of skin cancer, is increasing more quickly in the United States than for any other form of cancer. Although skin cancer can usually be cured if detected and treated early, if detected late or left untreated, skin cancer can cause considerable damage, disfigurement, and even death.

Q: If I have darker skin, do I still need to be concerned about skin cancer?

A: Although the incidence of skin cancer is lower in people with darker skin, the disease can still occur and often is not detected until it has reached a later, more dangerous stage. In addition to skin cancer, overexposure to the sun can cause other health problems in all populations, regardless of skin type. These include cataracts, premature aging of the skin, and immune suppression.

Q: How is the ozone layer related to UV radiation and skin cancer?

A: The ozone layer serves as a shield in the upper reaches of the atmosphere to protect the Earth from most of the UV radiation emitted by the sun. In recent years, scientists have documented seasonal depletions of the ozone layer over Antarctica, the Arctic, and mid-latitude regions such as North America. Because the depletion of the ozone layer allows more UV radiation to reach the Earth's surface, scientists are concerned that this phenomenon might create an increased threat to human health.

Q: What's causing ozone layer depletion and how can it be fixed?

A: Scientists have determined that a variety of synthetic halocarbon chemicals, such as chlorofluorocarbons, are responsible for depleting the ozone layer. Countries around the world have recognized this threat and signed a treaty—the Montreal Protocol on Substances that Deplete the Ozone Layer—to reduce the global production of ozone-depleting substances. With full compliance from participating countries, the ozone layer should be restored by the middle of the 21st century. Until that time, increased levels of UV radiation will reach the Earth's surface.

Q: How can I prevent the health problems associated with overexposure to UV radiation?

A: A number of sun-safe behaviors can help reduce the risks associated with overexposure to UV radiation. These include:

- Limiting your time in the sun between 10 a.m. and 4 p.m.
- Seeking shade whenever possible.
- Using a broad-spectrum sunscreen with a SPF of at least 15.
- Wearing a wide-brimmed hat and if possible, tightly woven, full-length clothing.
- Wearing UV-protective sunglasses.
- Avoiding sunlamps and tanning salons.
- Watching for the UV Index daily and taking appropriate precautions based on the Index level.

In addition, by educating children and others in your community, you can help them understand the risks of overexposure to UV radiation and can encourage them to adopt sun-safe behaviors as well.

Q. When I go out in the sun, my skin tends to tan, not burn. I like the way a tan looks, but is this safe for my skin?

A: There is no such thing as a healthy suntan. Any change in your natural skin color is a sign of skin damage. Every time your skin color changes after sun exposure, your risk of developing sun-related ailments increases.

Q: What is the UV Index and where can I find it?

A: Developed by the National Weather Service and EPA, the UV Index provides a daily forecast (on a 0 to 10+ scale) of the expected intensity of UV radiation from the sun and helps people determine appropriate sun-safe behaviors. The lower the number, the less UV radiation is reaching the Earth's surface. Lower numbers occur during overcast conditions or early and later in the day, while higher numbers occur during clear or partly cloudy conditions and in the middle of the day. The Index considers many factors, including latitude, day of the year, time of day, ozone, elevation, and predicted cloud conditions at solar noon. You can determine the UV Index for your ZIP code by accessing the following Web site at <www.epa.gov/sunwise/uvindex.html>.

Q: What is SunWise?

A: SunWise is a UV risk education program created by EPA to teach elementary and middle school students about the science of UV radiation and sun-safe behaviors. Schools participating in SunWise receive a variety of ready-made educational materials and gain access to the SunWise Internet database where students can enter and view UV measurement data. In addition to sponsoring classroom and schoolwide activities, SunWise schools are encouraged to form community partnerships and organize sun-safe events. For more information, visit <www.epa.gov/sunwise>.

Q: How do I get SunWise educational materials?

A: Join SunWise by signing up through the SunWise Web site at <www.epa.gov/sunwise/join.html>.

Q: Why does SunWise focus on children and schools?

A: Children spend many hours outdoors during recess, physical education classes, after-school activities, and sports programs. As a result, most of the average person's lifetime sun exposure occurs before the age of 18. Schools and teachers can play a major role in protecting children from overexposure to UV radiation by teaching sun-safe behaviors.

Q: In addition to SunWise, are there any other UV risk education programs that I could join?

A: In addition to SunWise, a number of local, state, and national UV risk education programs exist. See Appendix B: Case Studies of UV Risk Education Programs, for information on some of these programs. You can also contact your local or state health department for more information.

Appendix G
Glossary

Basal Cell Carcinoma: Skin cancer tumors that might appear as slow-growing, translucent, pearly nodules, which can crust, discharge pus, or even bleed. These tumors typically develop where you are most exposed to the sun—on the face, lips, tops of ears, and hands.

Chlorofluorocarbons (CFCs): Stable, low-toxic, and inexpensive chemicals that were most commonly used as refrigerants, solvents, and aerosol propellants until scientists discovered their destructive power. When strong UV radiation breaks down CFCs, they release atomic chlorine, which accelerates the natural destruction of ozone and contributes to ozone depletion. Nations around the world have agreed to reduce and eventually eliminate production of CFCs.

EMPACT: Environmental Monitoring for Public Access and Community Tracking, a program begun by EPA in 1996, helps communities collect, manage, and distribute environmental information, providing residents with up-to-date and easy-to-understand information they can use to make informed, day-to-day decisions.

Melanoma: The most fatal form of skin cancer. Malignant melanomas can appear suddenly without warning as a dark mole or other dark spot on the skin and can spread quickly.

Montreal Protocol: The Montreal Protocol on Substances that Deplete the Ozone Layer is an agreement adopted by international governments in 1987 to reduce and eventually eliminate the emissions of human-made ozone-depleting substances such as chlorofluorocarbons. The agreement has since been strengthened four times as scientists discovered the severity of ozone depletion.

National Weather Service (NWS): Government agency that provides weather, hydrologic, and climate forecasts and warnings for the United States. NWS issues the UV Index daily.

Ozone Depletion: Acceleration of the natural process of destroying and regenerating stratospheric ozone caused by human-made chemicals such as chlorofluorocarbons. The ozone found in the upper atmosphere (stratosphere) is destroyed and regenerated naturally, but certain human-made chemicals accelerate this process and damage the protective ozone layer. As this ozone layer breaks down, it absorbs smaller amounts of UV radiation, allowing the UV radiation to reach the Earth.

Spectrophotometer: An instrument for measuring the relative intensities of light in different parts of the spectrum. Scientists use spectrophotometers to measure the amount of UV radiation reaching the Earth.

Squamous Cell Carcinoma: Skin cancer tumors that might appear as nodules or red, scaly patches, which can develop into large masses and spread to other parts of the body.

Stratosphere: Portion of the atmosphere extending from about 10 km to about 50 km above the Earth. The stratosphere includes the stratospheric ozone layer, which absorbs most of the sun's harmful rays.

Stratospheric Ozone: A bluish gas composed of three oxygen atoms. Found in the upper atmosphere, it helps shield the Earth from the sun's UV radiation. Natural processes destroy and regenerate ozone in the atmosphere. When ozone-depleting substances such as chlorofluorocarbons accelerate the destruction of ozone, there is less ozone to block UV radiation from the sun, allowing more UV radiation to reach the Earth.

Sunscreen: A substance, usually a lotion, that is applied to skin to protect it from UV radiation. Sunscreen protects by reflecting UV radiation away from skin and by absorbing UV radiation before it can penetrate your skin.

SunWise School Program: EPA program that aims to teach grades K-8 school children and their caregivers how to protect themselves from overexposure to the sun. The program raises children's awareness of stratospheric ozone depletion and ultraviolet radiation, and encourages simple sun-safety practices.

SunWise Partner Schools: Participants in the SunWise School Program receive materials and tools for students to actively learn about the health and environmental effects of the sun. Schools sponsor cross-curricular classroom lessons, including measuring and posting UV Index measurements on the Internet.

UV Index: A tool developed by the National Weather Service that predicts the next day's UV intensity on a scale from 0 to 10+, helping people determine appropriate sun-protective behaviors. The lower the number, the less amount of radiation is reaching the Earth's surface. Based on this number, people should take appropriate sun-safe precautions.

UV Monitoring Networks: Combination of ground-based and satellite data monitoring stations that track changes in the ozone layer around the world and help validate the UV index. Using scientific data gathered by monitoring networks, scientists study a wide variety of health and environmental effects of UV radiation on humans, crops, forests, and ecological processes on land and in water.

UV Radiation: A portion of the electromagnetic spectrum with wavelengths shorter than visible light. UV radiation produced by the sun is responsible for sunburn and other adverse health effects. Scientists classify UV radiation into three types: UV-A, UV-B, and UV-C.