Promoting Sustainable Building and Development Practices in Lake County
Sample Ordinances and Information Sources

December 2011

This material is based upon work supported, in whole or in part, by the Department of Energy - Office of Energy Efficiency and Renewable Energy under Grant Award Number DE-EE0000758 from the Energy Efficiency and Conservation Block Grant Program made available pursuant to the American Recovery and Reinvestment Act (RECOVERY ACT) of 2009.

EXECUTIVE SUMMARY V

Funding v
Project Timeline v
Purpose and Intent v
Overview vi
Incentive-Based Approaches viii

INTRODUCTION 1

ENERGY CONSERVATION AND RENEWABLES 3

Solar Collectors and Solar Panels 3
Solar Access 5
Building (Solar) Orientation 6
Solar Shading 7
Light Shelves 8
Wind Energy 10
Geothermal Energy 11
Cool Roofs and Pavements 12
Exterior Insulation 14
Energy Specifications for Water Features 15

LAND USE, TRANSPORTATION AND MOBILITY 17

Mixed-Use 17
Home Occupations 18
Accessory Dwelling Units 19
Infill Development 20
Transit-Oriented Development 21
Travel Demand Management 22
Transit-Supportive Development 23
Connectivity 24
Walkability 26
Safe Routes to Schools 27
On-Site Facilities for Cyclists 28
Low-Emission and Fuel-efficient Vehicles 30
Electric Vehicle Charging Stations 31
Idling Restrictions 33

OPEN SPACE AND NATURAL RESOURCES 35

Riparian Buffers 35
Hillside and Steep Slope Protection 36
Tree Planting and Preservation 37
Conservation Subdivisions 38
Native Plants 39

WATER QUALITY AND QUANTITY 41

Rainwater Harvesting/Reuse 41
High-efficiency Plumbing Fixtures 42
Low Water Use Landscaping 43
Efficient Irrigation Systems 45
Turf Area Management 46
Individual Metering 47

STORMWATER MANAGEMENT 49

Predevelopment Hydrology 49
Stormwater Runoff Treatment/Quality 50
Bioretention (Bioswales and Rain Gardens) 51
Permeable Pavement 52
Green Roofs 53
Off-street Parking Requirements 55
Modified Curb and Gutter Systems 56
Modified Cul-de-sac Design 57
Reduced Street/Pavement Widths 58

REDEVELOPMENT, WASTE MINIMIZATION AND MATERIAL REUSE 61

Brownfield Sites 61
Building Reuse 62
Material Reuse 63
Material Recycled Content 64
Construction Materials Management 65
Rapidly Renewable Materials 66
Composting 67

CONSTRUCTION-PHASE POLLUTION CONTROL 69

Land Clearing and Grading 69
Dust Management 70

OUTDOOR LIGHTING 73

Energy-efficient Lighting 73
Light Pollution 74

INDOOR ENVIRONMENTAL QUALITY (IEQ) 76

Indoor Air Quality and Pollutant Source Controls 76
Low-emitting Materials 78
Thermal Comfort 79
Lighting Controllability 80
Daylight and Views 80

FOOD SUPPLY 83

Local Food Production 83

INCENTIVE-BASED APPROACHES TO PROMOTING SUSTAINABILITY 87

Development Incentives 87
Financial Incentives 90
Using Incentives to Encourage Sustainable Practices in Lake County 90
Local Certification and Green Builder Recognition Programs 91

APPENDIX A: PROJECT SUMMARY AND ACTIVITIES 93

Project Summary 93
Community Outreach 93
Project Timeline 93
County Staff Focus Groups—July 16, 2010 94
Stakeholder Focus Groups—August 11, 2010 94
Stakeholder Focus Group—February 25, 2011 95

APPENDIX B: SUSTAINABLE PROJECTS IN LAKE COUNTY 97

LEED CERTIFIED PROJECTS 97
LEED REGISTERED PROJECTS 97
NON-LEED PROJECTS 98

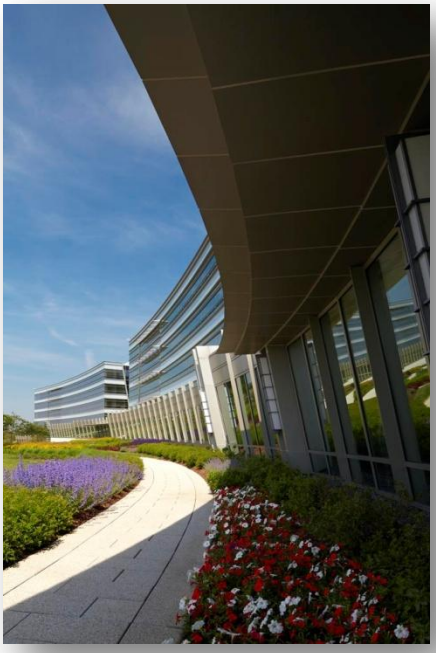
INDEX 99

Executive Summary

In 2009, the Lake County Board adopted the goal of "promoting a sustainable environment" in its Strategic Plan and the *Strategy for a Sustainable Lake County*, the purpose of which is to "make Lake County more sustainable and environmentally sensitive." In adopting the *Strategy*, the County Board endorsed a broad definition of "sustainability," similar to the widely accepted definition first endorsed by the United Nations' World Commission on Environment and Development in 1987. "Being 'sustainable' means the County is achieving economic prosperity while protecting the planet's natural systems; and meeting the needs of the present generation without compromising the ability of future generations to meet their own needs."

Funding

Building on the momentum established by the Strategy for a Sustainable Lake County, the County received nearly $5.6 million of funds through the American Recovery and Reinvestment Act (ARRA) for energy efficiency and energy conservation projects. A portion of this money was obtained by the Planning, Building & Development Department through the Department of Energy's (DOE) Energy Efficiency and Conservation Block Grant Program for the design and approval of a set of Lake County-specific Building and Development Standards. The County retained The Lakota Group, Duncan Associates and Primera to assist Planning, Building and Development Department staff in identifying sustainable development practices that can be promoted through building codes and land development regulations.



Takeda Pharmaceuticals' North America Headquarters is certified LEED Gold by the U.S. Green Building Council (USGBC). The use of native plants helps reduce water consumption by 50%.

Project Timeline

The first phase of work included an assessment of Lake County's building and development regulations and an examination of best practices for accommodating and promoting sustainable building and development practices. Local stakeholders including municipal officials, industry professionals and County staff were invited to participate in three focus group sessions to provide input and comments on the various draft documents. This level of involvement throughout all stages of the project proved crucial to ensure the County achieved the best possible standards.

Purpose and Intent

The purpose for the Sustainable Building and Development Practices is twofold: to provide a basis for Lake County to re-evaluate regulations in the Uni-

fied Development Ordinance, and also to serve as a resource for the incorporated municipalities. These standards were developed as a locally based model for sustainability and contain practices which will be most beneficial and applicable to communities in Lake County. Project outcomes include provisions that will remove barriers, identify new standards and procedures, and create incentives for builders and developers that further support sustainability goals.

Overview

This report highlights dozens of sustainable building and development practices that can be promoted by Lake County and other local governments. The ordinances and studies identified in the report are intended to serve as a guide for how the County and area municipalities can update zoning, subdivision and building regulations to promote sustainability. Several of the sample code and ordinance provisions work by removing unintended regulatory barriers to sustainable building and development practices. Others offer flexibility and incentives that encourage builders and developers to use sustainable building and development practices. A few of the sample approaches suggest ways in which regulations can be amended to require more sustainable building and development measures. The following practices are covered in the full text document:

Hyacinth Place in Highland Park – USGBC-certified LEED Gold.

ENERGY CONSERVATION AND RENEWABLES

This section focuses on the role of building and development regulations in accommodating the use of renewable energy sources and conserving energy use associated with buildings, lighting and mechanical equipment. Improving energy conservation practices and promoting greater use of renewable energy resources can help reduce pollution and greenhouse gases, foster a more energy-independent and sustainable Lake County, and save money.

Solar Array on the Prairie Crossing Charter School – USBC-certified LEED Gold.

LAND USE, TRANSPORTATION & MOBILITY

The important linkage between land use patterns and transportation is reflected in one of the Regional Framework Plan's nine vision statements:

In the year 2020, Lake County will have… A development pattern and transportation system that provides a variety of living and transportation choices, meets the mobility needs of all residents, and minimizes adverse environmental impacts.

Bioswales in parking lots help filter stormwater runoff. This one is at the Ryerson Woods welcome center – USGBC-certified LEED Platinum.

Realization of Lake County long-term planning and sustainability goals requires an integrated approach to land use and transportation planning. This section focuses on practices that will promote a vibrant, connected, multi-modal future for Lake County.

OPEN SPACE & NATURAL RESOURCES

This section includes a description of regulatory measures aimed at the conservation of open space and natural resources, many of which have been in place in Lake County for years.

WATER QUALITY & QUANTITY

Ensuring a reliable supply of clean water is one of the key drivers of the Strategy for Sustainable Lake County. This section explores several sustainable building and development practices that can help in realization of the County's water-related sustainability goals.

STORMWATER MANAGEMENT

The intent of stormwater management is to reduce the impacts associated with the runoff from developed (and undeveloped) sites by reducing runoff volumes and contaminants, primarily through on-site infiltration and by mimicking predevelopment hydrology.

REDEVELOPMENT, WASTE MINIMIZATION & MATERIALS REUSE

This section focuses on building and development practices that focus on redevelopment of land and the minimization of waste and, in turn, the need for virgin materials. Existing sites, buildings, and materials have inherent "embodied energy" created during their development or production. If discarded, that energy is wasted and creates the demand for virgin materials which are more costly and have a greater impact on the environment to produce.

CONSTRUCTION PHASE POLLUTION CONTROLS

When creating sustainable buildings or developments, it is important to look at not only what sustainable elements and features are included in the final development, but also how these structures are built. Construction activities can produce significant amounts of air and water pollution and solid waste. Because of this, responsible management of construction activities is an important early step that sets the tone for the ultimate development in terms of environmental sustainability.

OUTDOOR LIGHTING

This section focuses on practices that reduce the energy spent and the light pollution created by outdoor lighting. Such practices can result in energy and cost savings and an improved nighttime environment.

INDOOR ENVIRONMENTAL QUALITY (IEQ)

IEQ addresses the elements of our indoor environment that may not have an obvious impact on occupant well-being, but have been proven to increase occupant productivity and comfort with lower employee turnover rates, fewer sick days and higher productivity. IEQ can enhance occupant well-being when buildings permit adequate ventilation, maintain clean air, comfortable temperatures, and allow individuals to have a sense of control over their own spaces.

FOOD SUPPLY

Ensuring that people have access to healthy, safe and affordable food is a basic tenet of sustainability. This section describes current and possible future efforts aimed at increasing access to local food sources.

Incentive-Based Approaches

There are several economic benefits to green building and sustainable development strategies for property owners and developers, including reduced operating costs, increased return on investment, increased productivity and human health, and enhanced image and marketability.

Apart from regulations, local governments can also establish incentive measures to stimulate property owners and developers further to consider creative, sustainable solutions to building and development challenges. Local governments can encourage green building is through procedural and financial incentives in the permitting process. Official green recognition programs are a common method to offer incentives, by offering plaques to designate achievement levels and local governmental recognition and promotion of the project's green attributes. Rewarding builders, developers, and homeowners who choose to employ sustainable building practices has proven to be a very popular and effective way to encourage the use of green building practices.

Introduction

In 2009, the Lake County Board adopted the goal of "promoting a sustainable environment" in its Strategic Plan and the *Strategy for a Sustainable Lake County*, the purpose of which is to "make Lake County more sustainable and environmentally sensitive." In adopting the *Strategy,* the County Board endorsed a broad definition of "sustainability," which is very similar to the widely accepted definition of sustainable development first endorsed by the United Nation's World Commission on Environment and Development in 1987. According to the *Strategy: "being 'sustainable' means the County is achieving economic prosperity while protecting the planet's natural systems; and meeting the needs of the present generation without compromising the ability of future generations to meet their own needs."*

In 2010, building on the momentum established by the *Strategy for a Sustainable Lake County,* the County retained The Lakota Group, Duncan Associates and Primera to assist Planning, Building and Development Department staff in identifying sustainable development practices that can be promoted through building codes and land development regulations. The first phase of work included an assessment of Lake County's building and development regulations and an examination of best practices for accommodating and promoting sustainable building and development practices.

This report includes the findings from the project's first phase and highlights dozens of sustainable building and development practices that are or can be promoted by Lake County and other local governments. The ordinances and studies identified in the report are intended to serve as a guide for how the county and area municipalities can update zoning, subdivision and building regulations to promote sustainability. Several of the sample code and ordinance provisions work by removing unintended regulatory barriers to sustainable building and development practices. Others offer flexibility and incentives that encourage builders and developers to use sustainable building and development practices. A few of the sample approaches suggest ways in which regulations can be amended to require more sustainable building and development approaches.

Energy Conservation and Renewables

This section focuses on the role of building and development regulations in accommodating the use of renewable energy sources and conserving energy use associated with buildings, lighting and mechanical equipment. Improving energy conservation practices and promoting greater use of renewable energy resources can help reduce pollution and greenhouse gases, foster a more energy-independent and sustainable Lake County and save money.

Solar Collectors and Solar Panels

Solar collectors and solar panels are an integral part of most active solar heating systems and solar energy production systems.

- Active solar heating systems are used to convert sunlight to heat that can be used for space heating and hot water. These types of solar systems use solar collectors, typically mounted on a south-facing roof, to directly heat fluids or air.
- Photovoltaic (PV) systems generate electricity from sunlight using solar cells. PV systems typically rely on roof-, pole-, wall- or ground-mounted solar panels, but PV technology is rapidly evolving. As a result of such advances, PV modules are now being produced that resemble traditional roof shingles and very thin coatings applied to building windows.
- Solar thermal electric systems convert the sun's heat to electricity using concentrating solar power technology (CSP). CSPs are large utility-scale facilities that use mirrors to focus sunlight onto a "receiver" or solar panel. Receivers transfer the heat to a system that generates electricity.

Building-mounted solar panels

Utility-scale solar energy

Active solar heating systems and solar energy production technologies help reduce carbon emissions associated with conventional electricity generation. On-site solar energy production reduces energy costs by decreasing reliance on fossil fuel-based energy sources. Building owners that produce more energy than needed for on-site demand can receive credit for excess energy that is fed back into the electric utility through a practice known as "net metering."

Existing Regulations/Potential Issues

Section 7.7.5.1 of the UDO (General Exceptions to Height Limits) allows solar collectors and panels to exceed maximum building height by up to 6 feet.

Possible (Further) Action

The UDO could be amended to expressly allow utility-scale solar electricity generation systems under more lenient terms than conventional electrical generation plants. Under the current UDO, electrical generation plants (Major Utility) are allowed only in the Limited Industrial (LI) and Intensive Industrial (II) districts and only if approved through the conditional use process.

Canopy-mounted solar panels

Sample Ordinances and Information Sources

Alternative Energy Task Force of Lake County Communities

The Alternative Energy Task Force of Lake County Communities has prepared a solar (and geothermal) energy model ordinance and alternative energy resource guide.

From Policy to Reality: Updated Model Ordinances for Sustainable Development (Solar)

This comprehensive model ordinance, funded by the State of Minnesota, includes several possible ideas for incentives that may promote investment in solar power technology.

Building America Best Practices Series for High-Performance Technologies: Solar Thermal and Photovoltaic Systems

This U.S. Department of Energy-funded guide is a good source of information on solar technologies, regulations and design considerations.

Solar Powering Your Community: A Guide for Local Governments

This guide (updated January 2011) was also funded by the U.S. Department of Energy (DOE). It is intended to assist local governments in designing and implementing a strategic solar plan. The guide includes a discussion of and pointers to local regulations and permitting programs.

San Francisco Solar Map

The San Francisco Department of the Environment maintains an interactive solar map showing where and how many solar panels are installed on houses in San Francisco. The site includes many features, including a search tool that can identify how much roof surface exists on existing houses and the estimated cost to maximize the solar energy potential of those roofs. This type of Google Map-based tool is relatively easy to create and would be a useful way for local governments to track solar energy installations as well as monitor solar access issues. (See "Solar Access," below)

Solar Access

Solar energy systems require direct access to sunlight to operate effectively and efficiently. While new technologies, falling prices and government incentives have significantly improved the efficacy and financial feasibility of small-scale solar power, some property owners may be reluctant to invest in solar energy systems because of the fear that a neighbor will erect a structure or grow a tree on nearby property that blocks direct access to sunlight.

Solar access controls help prevent buildings and vegetation from blocking sunlight access to abutting lots.

U.S. courts have not generally recognized access to sunlight as a right to be protected under the law. As a result, some state and local governments have stepped in to enact laws and regulations that prevent landowners from constructing buildings or installing landscaping and other improvements that unreasonably blocks sunlight access to abutting lots.

Existing Regulations/Potential Issues

There are currently no provisions in Lake County codes or ordinances that protect solar access right of property owners who have or plan to invest in solar energy technology. Moreover, Illinois is one of only 16 states that provides no form of protection for solar access.

Possible Action

Establish a procedure whereby property owners who invest in solar energy systems can register solar access rights (or privileges) with the county.

Sample Ordinances and Information Sources

Prairie du Sac, WI: Solar Access (Tile 10, Chapter 8, Code of Ordinances)
Prairie du Sac's solar access regulations authorize property owners to apply for a permit, which if granted, prohibits the installation of structures or vegetation on neighboring properties from casting shade on the permit holder's solar energy devices.

Santa Barbara, CA: Solar Access Ordinance (Ch. 28.11, Santa Barbara Municipal Code)
Santa Barbara's solar access ordinance establishes height limitations in residential zoning districts to "provide a balance between solar rights and development rights."

Clackamas County, OR: Solar Balance Point/Infill Ordinance (§1018, Zoning and Development Ordinance)
The county's zoning and development ordinance includes a "solar balance point/infill ordinance" that establishes a solar access review pro-

cedure for new structures on existing lots. Clackamas County also has an ordinance that helps to ensure that land is subdivided so that buildings can be oriented to maximize solar access. (See "Building (Solar) Orientation," below)

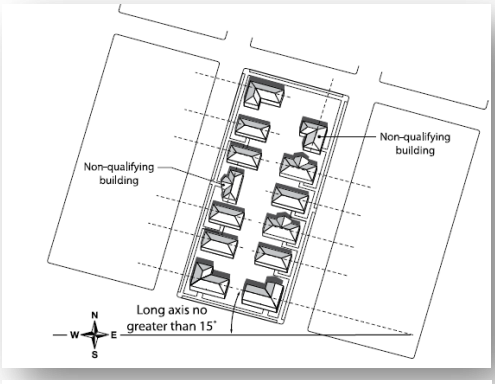
Clackamas County, OR: Solar Access Permit Ordinance (§1019, Zoning and Development Ordinance)
These provisions are similar to Prairie du Sac's, although they focus on preventing shading from vegetation. The ordinance authorizes property owners to apply for a permit, which if granted, prohibits vegetation on neighboring properties from casting shade on the permit holder's solar features.

Solar America Board for Codes and Standards
See the Solar America Board for Codes and Standards for a comprehensive review of solar access law in the United States, as well as a model solar access statute.

If mandatory solar access controls are considered too far-reaching, local governments could consider adding solar access protection as a review criterion to be used as part of "discretionary" development approval applications (e.g., for PUDs and conditional uses).

Building (Solar) Orientation

From a passive solar design standpoint, the optimal shape and orientation for buildings is generally a form that is elongated along an east/west axis, so that the longer end of the building faces the sunny south. This in turn ensures minimum exposure to the building's east and west sides, the more difficult sides to shade due to the lower angle of the sun in the morning and afternoon. The east and west sides can be protected from the sun with vegetation or solar shading.



One way to achieve LEED ND credit is to accommodate solar-oriented buildings with longer axis (at least 1.5 times length of other axis) within 15 degrees of geographic east-west.

Solar orientation can be optimized through proper orientation of lots in new subdivisions and of new buildings on existing lots. Proper building orientation can maximize opportunities for passive solar heating, natural ventilation and daylighting. In most parts of the U.S, making a building the right shape, properly placing its windows and pointing it in the right direction can help reduce the building's total energy use by 30 to 40%.

Existing Regulations/Potential Issues
There are no provisions in Lake County codes or ordinances that address (solar) building orientation.

Possible Action
Require or incentivize subdivision/development design that maximizes the solar orientation of lots and buildings.

Sample Ordinances and Information Sources
Some local governments require a minimum percentage of lots in larger subdivisions to be solar-oriented (i.e., longer east-west axis to provide more exposure to sun).

Clackamas County, OR: Solar Access Ordinance for New Development (§1017, Zoning and Development Ordinance)
The purpose of Clackamas County's solar access ordinance for new development is to ensure that land is subdivided so that buildings can be oriented to maximize solar access and to minimize shade on adjoining properties (from both structures and trees).

Multnomah County, OR: Solar Access Provisions for New Development (§11.15.6805, Zoning Ordinance)
Multnomah County's solar access provisions include building orientation requirements that are similar to Clackamas County's. The ordinance also includes a variety of other solar-related zoning and development-related provisions.

Newark, DE: Design Standards for Energy Conservation and/or Solar Access (Subdivisions, Chapter 27, Appendix XI)
This is an example of ordinance language that *promotes and encourages* (as opposed to mandating) solar-oriented subdivision design.

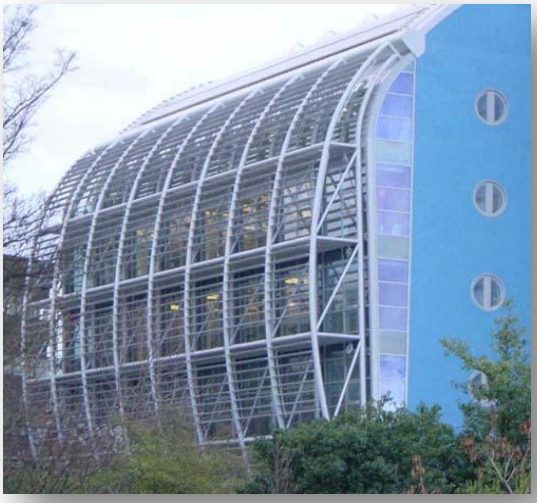
LEED 2009 for Neighborhood Development, Green Infrastructure and Buildings Credit 10: Solar Orientation
LEED contains solar orientation credit language that could be adapted to an ordinance provision.

Solar Shading

Prior to the advent of mechanical cooling, buildings were often designed to include awnings and other solar shading techniques like deep inset windows. Although these techniques fell out of fashion, new exterior sun control devices have been developed that save energy, improve user comfort in warm months and reduce glare. As the amount of glass in buildings has increased, exterior solar shading has become an increasingly important tool to combat solar heat gain, reduce glare and improve occupant comfort.

Solar shading is a passive solar design technique that presents a long-term solution to reducing energy consumption associated with the cooling of buildings. Sun shade devices can reduce peak energy loads and thus, conserve energy at times when it is most valuable, expensive and polluting.

When mounted on a building's exterior, solar shades can decrease air conditioning loads and lower room temperatures in uncoiled spaces.



Louver-type solar shades

Unlike interior curtains or shades, exterior solar shading devices do not obstruct views (from windows) or impede airflow through open windows. As a result, they permit daylighting and passive, natural ventilation.

Existing Regulations/Potential Issues

There are no provisions in Lake County codes or ordinances that address solar shading devices.

Possible Action

UDO Sec. 7.7.3.3 identifies features allowed to encroach into required setbacks. Awnings are allowed to encroach, but solar shades are not expressly addressed. The UDO could be easily amended to expressly allow such devices.

Sample Ordinances and Information Sources

Lincoln Nebraska

Lincoln, Nebraska's zoning ordinance expressly identifies solar shading devices as an allowed structural projection into required zoning yards (setbacks)

§27.71.050 Projections from Buildings

Every part of any required yard shall be open to the sky, unobstructed by a building, except:

. . .

*(c) Ordinary projection of sills, belt courses, cornices, **vertical solar screens** and ornamental features which may project [up to] twelve inches.*

Other examples of ordinances that expressly address solar shading or screening devices, are rare, probably because such devices can easily be interpreted to be allowed under typical zoning rules governing allowed exceptions.

Light Shelves

Windows and skylights provide building occupants with a connection between indoor spaces and the outdoors through the introduction of daylight and views into the occupied spaces of a building. Windows receive a large amount of energy from the sun, most of which is wasted on a single area. Although direct sunlight can be a nuisance if concentrated in one spot, it can be extremely useful if distributed throughout a room. The light from windows can be extended into the interior of larger spaces through the use of

light shelves and skylights. Modern light shelves bounce visible light upwards towards the ceiling, which helps reflect it deeper into the interior of a room.

Light shelves can be installed on the interior or exterior of a building. Exterior light shelves also serve as shading devices, preventing solar gain from entering the building. External and internal light shelves mounted on south- and west-facing windows can redistribute light, provide natural brightness to the building and reduce the need for daytime (incandescent and fluorescent) overhead lighting.

Light shelves and skylights can reduce a building's energy demands by making greater use of natural sunlight for lighting purposes. Light shelves can also help reduce solar gain associated with direct sunlight coming through a building's windows, thereby reducing summer cooling demands.

Light shelves (interior and exterior views)

Existing Regulations/Potential Issues

There are no provisions in Lake County codes or ordinances that expressly address light shelves, which is not surprising since they pose few real issues. One possible concern is that external light shelves could raise zoning setback issues for buildings situated close to lot lines.

Possible Action

UDO Sec. 7.7.3.3 identifies features allowed to encroach into required setbacks, but light shelves are not expressly addressed. The UDO could be easily amended to expressly allow such devices.

Sample Ordinances and Information Sources

Very few ordinances contain provisions addressing light shelves, probably because such devices (like solar shades) can easily be interpreted to be allowed because of their similarity to features such as canopies. One simple option would be to add light shelves to the list of allowed setback projections or obstructions. See the vertical solar screen provision from Lincoln, Nebraska in the "Solar Shading" section above.

LEED for New Construction and Major Renovations

Light shelves can contribute to LEED certification through Indoor Environmental Quality (IEQ) credit 8.1: Daylighting and Views, which addresses the connection between indoor and outdoor spaces through introduction of daylight and views into regularly occupied areas of buildings.

Whole Building Design Guide (WBDG): Daylighting

The WBDG is a web-based portal providing government and industry practitioners with one-stop access to up-to-date information on a wide range of sustainable building technology. The web site is maintained by the National Institute of Building Sciences through funding support from the Department of Defense, the Army Corps of Engineers, the U.S. Air Force, the U.S. General Services Administration, the Department of Energy and many public and private agencies.

Wind Energy

Wind Energy Systems are devices that convert wind energy into usable thermal, mechanical, or electrical energy, including windmills and wind turbines and supporting equipment such as generators, alternators, inverters and batteries. Small wind energy systems are geared generally toward producing electricity for on-site consumption. Owners of wind energy systems receive credit for any excess energy that is fed back into the electric grid through what is known as "net metering." Large, utility-scale wind turbines generally provide bulk power to the electrical grid.

Building-mounted wind turbine

The use of wind energy can reduce carbon emissions associated with conventional electric generation plants. As with all on-site renewable energy production strategies, wind energy conservation helps energy costs by decreasing reliance on fossil fuel-based energy sources.

Existing Regulations/Potential Issues

The Lake County Board recently adopted an amendment to the UDO that allows small wind energy systems in residential and nonresidential districts.

Sample Ordinances and Information Sources

Alternative Energy Task Force of Lake County Communities

The Alternative Energy Task Force of Lake County Communities has prepared a wind energy systems model ordinance addressing small and large (utility-scale) wind energy systems. The Task Force also prepared an alternative energy resource guide.

Lake County Unified Development Ordinance

The Lake County Board recently adopted an amendment to the UDO that allows small wind energy systems in residential and nonresidential districts.

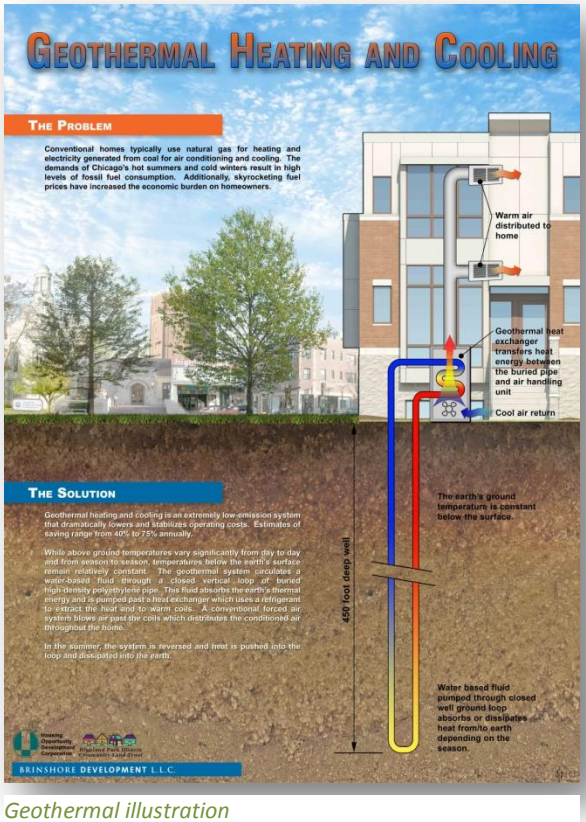
Gurnee, IL: Small Wind Energy Systems (§8.16, Zoning Ordinance)
Gurnee amended its zoning ordinance in late 2010 to allow small wind energy systems in residential and nonresidential zoning districts. The ordinance amendment addresses building-mounted systems and tower-mounted systems and expressly prohibits large (utility-scale) wind energy systems.

Geothermal Energy

Geothermal energy is derived from heat generated below the earth's crust in a layer of hot and molten rock. There is a steady supply of milder heat at depths of anywhere from 10 to a few hundred feet below the surface in most locations on earth. This milder supply of ground heat is useful for direct heating purposes through geothermal pumps, also called ground-source heat pumps. There are two types of geothermal heat pumps: open loop systems and closed loop systems. Closed loop systems circulate a heat transfer fluid through pipes or coils buried beneath the land surface, and open loop systems draw groundwater from a well and discharges the water directly in a water body or an injection well. Open loop systems are prohibited in Lake County.

Geothermal systems pump air or fluid through pipes that are buried underground or placed underwater in lakes or ponds. In the summer, the pump moves heat from the building into the pipes. In winter, the pump brings pre-warmed air or fluid into the heating system of the building. The only additional energy such systems require is the small amount of electricity needed to circulate air. As an additional benefit, geothermal systems can provide inexpensive hot water.

Geothermal heating and cooling systems use 25 to 50% less electricity than conventional systems, which means lower utility bills and greatly reduced greenhouse gas emissions because of the decreased reliance on fossil fuel-derived energy.



Geothermal illustration

Existing Regulations/Potential Issues
Geothermal energy systems are governed primarily by the health code. There are no provisions in Lake County codes or ordinances that address geothermal energy.

Possible Action
Address possible zoning issues through a UDO text amendment, based on the Alternative Energy Task Force's model ordinance.

Sample Ordinances and Information Sources

Alternative Energy Task Force of Lake County Communities
The Alternative Energy Task Force of Lake County Communities has prepared a solar and geothermal energy model ordinance and alternative energy resource guide.

Woodbury, Minnesota: Alternative Energy Systems Ordinance
Woodbury's omnibus alternative energy systems ordinance allows ground source heat pump systems as a permitted accessory use in all zoning districts. Zoning Ordinance, Chapter 24, Article VI. (Supplemental Performance Standards), Division 5 (Alternative Energy Systems).

Cool Roofs and Pavements

Cool roof and pavement technologies employ highly reflective and emissive materials to keep roof surfaces and paved areas much cooler than traditional materials, especially during peak summer weather. Such technologies represent a cost-effective way to combat high peak demand for cooling and the urban heat island effect, which is the tendency of developed areas to be hotter than less developed areas because of the abundance of dark sunlight-absorbing surfaces (e.g., rooftops, blacktop roads and parking lots) and a general lack of vegetation.

Cool roof and green roof system

Greater use of cool roof technologies can provide multiple levels of benefits. For individual buildings, installing cool roofs will lower the temperature of the roof surface and, consequently, reduce the need for air conditioning. On an area-wide level, the use of cool roofs and pavements can help mitigate the "urban heat island effect," which results from the preponderance of dark roofs and other surfaces such roads and parking lots.

A high solar reflectance—or albedo—is the most important characteristic of a cool roof. Roofs with high solar reflectance reflect sunlight and heat away from a building, reducing roof temperatures and the urban heat island effect.

Existing Regulations/Potential Issues
There are no provisions in Lake County codes or ordinances that expressly address the use of cool roofs and pavement coatings.

Possible Action

The use of cool roofs and pavement coatings could be required or incentivized.

Sample Ordinances and Information Sources

See also "green roofs," p. 53.

Chicago Energy Code

Chicago's energy code (§18-13-101.5.3) establishes minimum solar reflectance values for low-sloped roofs (0:12 pitch up to 2:12 pitch) and medium-sloped roofs (above 2:12 pitch up to 5:12 pitch). Different standards are established for new construction, rehabs, green roofs and ballasted roofs.

Austin Energy Code

Austin, Texas addresses cool roofs through a local amendment to the 2006 International Energy Code.

> *Roof surfaces with an incline of two inches or less of rise per each 12 inches of horizontal run shall incorporate a roof material having a minimum reflectance of 0.70 or a minimum solar reflective index (SRI) of 78. Roof surfaces with an incline greater than two inches of rise per each 12 inches of horizontal run shall incorporate a roof material having a minimum reflectance of 0.35 or a minimum SRI of 29.*
>
> *The reflectance measurement will correspond to ASTM E903-96 (Standard Test Method for Solar Absorptance, Reflectance, and Transmittance of Materials Using Integrating Spheres), ASTM 1918-97 (Standard Test Method for Measuring Solar Reflectance of Horizontal and Low Sloped Surfaces in the Field), or ASTM 1549-04 (Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer).*

Reducing Urban Heat Islands: Compendium of Strategies

More information is available in the "Cool Roofs" chapter of EPA's *Reducing Urban Heat Islands: Compendium of Strategies*, which covers the following topics:

- Cool roof properties that help to mitigate urban heat islands
- Types of cool roofing
- Benefits and costs of cool roofs
- Measurement and certification of cool roof products
- Installation and maintenance of cool roofs
- Tools and resources to further explore this technology

Exterior Insulation

Applying insulation on the exterior walls of an existing building is a relatively easy and effective way to substantially improve the R-value (i.e., resistance to heat flow) of existing walls without interrupting occupancy or requiring expensive building renovations. Creative techniques for application of exterior insulation are currently being developed in Canada, Europe and the United States. Some techniques can have the added value of creating an air barrier, which can help lower energy use in buildings. Exterior application of insulation to existing buildings has become commonplace in Europe and could become more prevalent in the U.S. as energy prices climb.

Insulation helps reduce the need for heating and cooling, which saves non-renewable resources and reduces carbon emissions.

Existing Regulations/Potential Issues

While there are currently no provisions in Lake County codes or ordinances that expressly address the use of exterior insulation, the UDO could pose a potential barrier to use of exterior insulation. UDO Sec. 7.7.3.3, for example, identifies features allowed to encroach into required setbacks, but the provisions make no allowance for exterior insulation. This means that if that if a building were already situated at the minimum setback line, adding exterior insulation would violate zoning setback requirements. Additionally, the floor area factor measurements section of the UDO (Sec. 7.7.8) specifies that floor area measurements are taken to exterior limits of walls, which, at least theoretically, discourages super-insulation of exterior walls.

Exterior insulation

Possible Action

Both the setback and floor area measurement provisions mentioned above could be amended to be more accommodating of double-skin facades and exterior insulation retrofits.

Sample Ordinances and Information Sources

Cambridge, Massachusetts

Cambridge has amended its zoning ordinance to exclude double-skin facades and exterior wall insulation from the calculation of building floor area and to provide a partial exemption from setback requirements. The following language comes from the city's Green Building Amendment:

22.40 EXTERIOR WALLS AND INSULATION

22.41 Purpose. The purpose of this Section is to remove potential impediments to the construction of exterior walls with additional insulation or wall-based mechanical systems that can improve the energy-efficiency of a building, by exempting the additional gross floor area created by such features from the calculation of a building's total Gross Floor Area.

22.42 Double-Skin Facades

22.42.1 A Double-Skin Façade *shall be defined as a multilayer exterior wall system comprising a solid outer wall, a solid inner wall, and a ventilated intermediate air space, intended to improve insulation and manage solar heat gain as an element of a building-wide mechanical system for heating and cooling a building.*

22.42.2 Floor Area Exemption for Double-Skin Façades. Within an exterior wall system that meets the definition of a Double-Skin Façade as defined in Section 22.42.1 above, the area occupied by the intermediate air space shall be excluded from the calculation of Gross Floor Area on a lot, up to a depth of one (1) foot, provided the space is not to be accessed except for maintenance purposes.

22.43 Exterior Insulation

22.43.1 Floor Area Exemption for Added Exterior Insulation. Where the thickness of a solid, nonremovable exterior wall of a building is greater than six (6) inches, such wall being comprised entirely of structural material, insulating material and interior and exterior finishes, any Gross Floor Area that is further than six (6) inches from the innermost solid plane of the exterior wall may be excluded from the calculation of Gross Floor Area of a building.

22.43.2 Yard Exceptions for Added Exterior Insulation. Existing conforming or pre-existing nonconforming buildings or buildings that received a building permit prior to August 2, 2010 that cannot add insulation exterior to the exterior structural wall of the building without intruding into a required setback may encroach or further encroach into the required yard setback through the addition of insulation external to the exterior structural wall of the building, provided that the additional insulation does not increase the thickness of the exterior wall by more than four (4) inches and that the resulting outermost plane of each exterior wall is no closer than seven feet, two inches (7'-2") to the nearest property line.

Energy Specifications for Water Features

Energy consumption in pools, fountains and spas mainly is due to pumping and, in the case of pools and spas, heating water. Timers or occupant controls can aid in reducing energy consumption for these features. Including energy specifications for water features, typically those associated with

pumping or heating water, can reduce the consumption of energy associated with these systems. A reduction in electrical or natural gas usage will reduce operating costs and reduce air pollutants associated with the production and generation of energy used to power pumps or heat water.

Solar thermal hot water is one of the most cost-effective and environmentally friendly energy conservation technologies. Solar thermal can supply most household hot water needs using relatively simple and increasingly inexpensive technologies.

Existing Regulations/Potential Issues

IECC Section 504.7 (Pools) states that all pool heaters shall be equipped with a readily accessible on-off switch to allow shutting off the heater without adjusting the thermostat setting. Pool heaters fired by natural gas may not have continuously burning pilot lights. Time switches that can automatically turn heaters and pumps on and off according to a preset schedule must be installed, and heated pools must be equipped with a vapor retardant pool cover except for those deriving over 60% of heating energy from site-recovered energy or solar energy source.

Solar (thermal) pool heating system

Possible Action

Encourage or require the use of energy-efficient water features related to pumping and heating water. Require solar heating of water for all pools.

Sample Ordinances and Information Sources

2008 Building Energy Efficiency Standards for Residential and Non-Residential Buildings, Section 114 – Mandatory Requirements for Pool and Spa Heating Systems and Equipment

Section 114 of the California Energy Commission (CEC) standards and regulations requires minimum thermal efficiency requirements for pumps and motors, a readily accessible on-off switch, permanently displayed instructions for the energy efficient operation of the pool or spa heater and prohibition of electric resistance heating. There are also provisions for insulating pool covers and solar thermal heating.

Aspen, CO: Renewable Energy Mitigation Program

Chapter 8.46 of Aspen's Building Code establishes energy use calculations for pools and spas based on square feet and creates additional fees for those energy costs. These additional fees can be offset by credits gained through the creation of on-site renewable energy systems.

See also the "Solar Collectors and Solar Panels" section of this report.

Land Use, Transportation and Mobility

The important linkage between land use patterns and transportation is reflected in one of the *Regional Framework Plan's* nine vision statements:

> *In the year 2020, Lake County will have… A development pattern and transportation system that provides a variety of living and transportation choices, meets the mobility needs of all residents, and minimizes adverse environmental impacts.*

There is no doubt that realization of Lake County long-term planning and sustainability goals requires an integrated approach to land use and transportation planning. This section focuses on practices that will promote a vibrant, connected, multi-modal future for Lake County.

Mixed-Use

Mixed-use development refers to the practice of including residential and nonresidential uses in a single building or within a single development site or block.

Mixed-use development is intended to offer residents the ability to work, shop and have access to entertainment, recreation and other services within walking distance of their home and employment. Mixed-use development patterns reduce the need to drive from place to place and makes other forms of transportation more viable, such as walking, biking and transit. The higher densities typically inherent in mixed-use development also reduces development pressure on natural resources and farmland.

Mixed-use building in downtown Highland Park

Existing Regulations/Potential Issues

The UDO allows attached residential (vertical or horizontal mixed-use) in all commercial zoning districts (See Sec. 6.2). UDO section 7.8.9.3 authorizes approval of residential density bonuses and non-residential intensity bonuses for mixed-use PUDs. Such bonuses may be conditioned on the provision of green or sustainable features within such developments.

Possible Action

The ordinance could be amended to encourage (or require) mixed-use development especially in denser developed and transit-served locations and as part of large PUD and as-of-right (non-PUD) projects. Density bonuses could be used as an incentive.

Sample Ordinances and Information Sources

LEED 2009 for Neighborhood Development: Neighborhood Pattern and Design Prerequisite 2 and Credits 3 and 4)
Mixed-use development is recognized as a vitally important sustainable development practice under LEED.

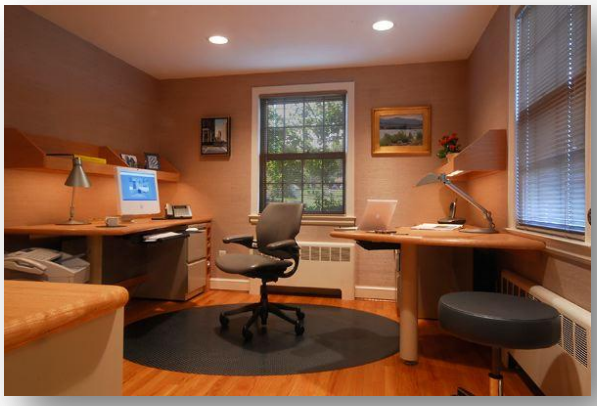
APA Model Mixed-use Zoning District
APA's model zoning district is geared toward accommodating, rather than mandating, vertical mixed-use buildings.

Oregon Commercial and Mixed-Use Development Code Handbook
The Oregon handbook is comprehensive and richly illustrated. It contains useful background information, model ordinance ideas and recommended design guidelines.

Home Occupations

The term "home occupation" refers to work or business activities carried out within a dwelling unit by one or more residents of the dwelling unit. Zoning regulations allowing individuals to work in their homes can help reduce transportation demands and CO_2 emissions, improve air quality and encourage small business growth.

Existing Regulations/Potential Issues
Section 6.4.5 of the County's UDO includes provisions allowing home-based business and work activities under specified conditions. Home occupations are limited to the residents of the dwelling plus up to one nonresident employee. No signs are allowed, and the business or work must occur within the principal dwelling, not accessory detached buildings or garages. Other restrictions also apply.


Home office

Possible Action
By allowing many types of work-at-home and business activities, the UDO's regulations are generally supportive of home occupations. No additional action is recommended at this time.

Sample Ordinances and Information Sources

Tucson, Arizona
Tucson requires administrative review of proposed home occupations. The city also requires that applicants sign an affidavit acknowledging their agreement to comply with applicable zoning regulations.

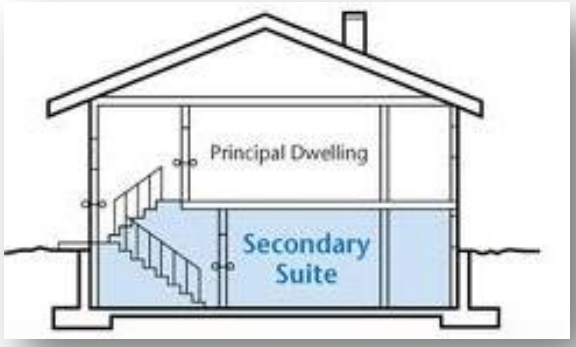
Berkeley, California

Berkeley's ordinance is noteworthy because it contains separate regulations and approval procedures for "low-impact" and "moderate-impact" home occupations. Low-impact uses are allowed upon issuance of a business license (business license application).

Accessory Dwelling Units

Accessory dwelling units (ADUs) are a second dwelling on a piece of property where a primary residence already exists. Such units, also called "mother-in-law apartments" or "accessory apartments," include separate kitchen, sleeping and bathroom facilities, and may be attached (i.e., separate living space within a primary dwelling) or detached from the primary single-family unit on a lot.

Accessory units help to concentrate development, which results in more efficient use of land, energy, water and materials. The compact size of ADUs can help promote increased energy efficiency and they can help provide lower cost housing options and promote aging in place.



Accessory dwelling units: internal to main dwelling (above) and detached (below)

Existing Regulations/Potential Issues

Attached and detached ADUs are allowed in AG, RE, E, and R-1 zoning districts on lots with a minimum area of 80,000 square feet. See UDO Sec 6.4. The existing minimum lot area requirement has the effect of severely limiting growth in the number of ADUs constructed in Lake County.

Possible Action

Consider expanding the range of ADU housing options available in Lake County by decreasing the minimum lot area requirement for lots containing an ADU.

Sample Ordinances and Information Sources

Santa Cruz, California

Santa Cruz's Accessory Dwelling Unit Manual was created to assist homeowners with the process of developing an ADU. It includes relevant zoning, design standards and building codes. It also showcases prototype ADU designs. Although not available online, the city has also produced an ADU Plan Sets Book containing seven ADU prototype concepts designed by Northern California architects. The city's actual ADU regulations can be viewed here.

Arlington, Virginia
Arlington's website includes an entire webpage of background information that will be useful for local governments considering amendments to their ordinances.

Bloomington, Minnesota
Bloomington's new home occupation allow only *attached* ADUs, which is a relatively conservative approach that may appeal to some local governments.

Lake County UDO
Lake County's Unified Development Ordinance allows attached and detached ADUs in AG, RE, E and R-1 zoning districts on lots with a minimum area of 80,000 square feet. See UDO Sec 6.4.4. Although this approach is restrictive, it does provide an example of how ADU are sometimes introduced into ordinances in a limited way until such time as the community gains a greater level of comfort that ADUs will not have an adverse impact on community character.

Infill Development

Infill development makes use of vacant or under-developed sites within built-up areas of a jurisdiction and thereby takes advantage of existing infrastructure and community amenities. Even in jurisdictions that are largely built-out, vacant and developable infill sites are common. They include older shopping centers, industrial areas, former rail-yards and other underutilized or abandoned property.

Infill development reduces the need for new water and sewer lines, roads, schools and other public facilities needed to support development. The redevelopment of urban areas reduces development pressure on natural lands and farmland and can help reduce urban sprawl. Infill development can invigorate the vitality and economy of neighboring areas, improve property values and enhance quality of life.

Existing Regulations/Potential Issues
There are no provisions in Lake County codes or ordinances that expressly address infill or redevelopment.

Possible Action
Consider creation of a sustainability relief procedure—distinct from the zoning variance process—that would allow modification of certain UDO re-

quirements when ordinance provisions are determined to pose a barrier to infill or redevelopment activities.

Sample Ordinances and Information Sources

See also "building reuse," p. 62.

Orange County, FL

The Orange County Infill Master Plan (IMP) identifies vacant and underutilized land in the county and formulates strategies for encouraging development and redevelopment of these areas. The plan's primary goal is to promote infill development, rehabilitation and reuse that contribute positively to infill and redevelopment areas. It also was developed to assist in meeting other County goals, including improving the rate of homeownership, preserving the environment and promoting good design. The county's infill and redevelopment webpage contains links and background information on infill-related initiatives.

Transit-Oriented Development

Transit-oriented development (TOD) mixes land uses and increases density around transit centers, train stations and bus stops. It is focused on facilitating transit access to boost ridership and reduce automobile traffic, while expanding housing and shopping choices. Such development also helps create a "sense of place" within a quarter to half mile around a transit facility as TODs are designed as compact, walkable neighborhoods with pedestrian access and connectivity as the highest priority.

Similar to mixed-use developments, TODs provide residents with the ability to live, work, shop and access services within walking distance of their homes as well as access the larger metropolitan area through public transit. TODs increase transportation choices and access and reduce vehicle use, traffic congestion, air pollution and energy consumption. The higher density typically allowed within TODs also reduces development pressure on natural lands and farmland and can help reduce auto-dependent urban sprawl into such areas.

Existing Regulations/Potential Issues

There are no provisions in Lake County codes or ordinances that address transit-oriented development.

Possible Action
The UDO could be amended to provide density incentives and/or design standards for development near existing or planned transit-served locations.

Sample Ordinances and Information Sources

Chicago Metropolitan Agency for Planning (CMA)
CMAP's TOD webpage contains useful information on TOD design strategies, as well as descriptions of several TODs within the region.

Prince George's County, Maryland: Mixed-use Zone
The county's new mixed-use is intended to promote the type of compact communities that embody the best principles of *Smart Growth* and transit-oriented development. The regulations represent a kind of form-based zoning toolkit for creation of different types of mixed-use, TOD centers.

Regional Transportation Authority (RTA)
RTA maintains an online list of Chicago region and national TOD resources.

Travel Demand Management

Travel demand management (TDM) focuses on reducing vehicle traffic, particularly during peak travel times, and getting the most capacity out of existing transportation infrastructure. TDM involves a variety of measures that employers can use to reduce the number of vehicle trips by employees. Travel Demand Management aims to organize employers in denser job centers to actively encourage reduction in vehicle trips by employees. This reduction in vehicle use has the benefit of reduced traffic congestion, air pollution and energy consumption.

Providing space for a car-share vehicle is a typical component of a modern TDM program

Existing Regulations/Potential Issues
There are no provisions in Lake County codes or ordinances that address travel demand management.

Possible Action
The UDO could be revised to encourage Travel Demand Management strategies through reduced parking requirements for participating nonresidential developments.

Sample Ordinances and Information Sources

Bloomington, Minnesota

The City of Bloomington's TDM ordinance requires certain large developments and redevelopments to implement programs that encourage employees to reduce single occupancy vehicle trips to help relieve traffic congestion, allow parking flexibility and reduce air pollution. Property owners subject to the TDM ordinance must submit an Annual Status Report form each year. The information is used by the city to determine if a good faith effort has been made to implement approved TDM strategies.

Cambridge, Massachusetts

Cambridge's parking and transportation demand management (PTDM) program authorizes use of several demand management measures, including:

- Employee transit pass subsidies
- Market-rate parking fees
- Shuttle buses
- Bicycle parking and showers/lockers for cyclists
- Guaranteed ride home
- Car/vanpool matching
- Bus shelters
- Transit information
- Hiring of local residents
- On-site TDM coordinator
- Priority/discounted HOV (high-occupancy vehicle) parking

Transit-Supportive Development

Transit-supportive development emphasizes land planning and site design that is supportive of existing or future transit services, whether the development is a residential subdivision, industrial or business park, commercial center or institutional/health campus. This approach addresses: locating land uses; massing buildings, parking, paths and sidewalks; and designing the streetscape, landscaping and signage to facilitate auto, bus, bicycle and pedestrian access to transit services and facilities.

Transit-supportive planning and design encourages people to use transit to reduce vehicle use, traffic congestion, air pollution and energy consumption. Such an approach also has health benefits as it increases walking and bicycling activity. This approach can be emphasized through municipal or county design guidelines or standards

Such planning/design standards are usually organized by land use and emphasize three key goals: facilitating bus movement into and within a development; minimizing travel distances to transit stops; and creating safe, direct routes to transit stops for all transportation modes. Residential standards can focus on a quarter to a half-mile area around a stop or station. Retail standards emphasize clustering retail buildings and interconnecting parking lots and driveways to minimize curb cuts on main roads that buses travel on as well as accommodate potential bus service within a development depending on its size and density. Office and industrial standards emphasize interconnected internal roads and placing buildings closer to roads with clear pedestrian paths to the front entrances.

Existing Regulations/Potential Issues
There are no provisions in Lake County codes or ordinances that expressly address transit-supportive development.

Possible Action
No action is recommended at this time.

Sample Ordinances and Information Sources

Pace Design Guidelines (Chicago Region)
Pace's guidelines, which are scheduled to be updated in 2011/2012, address basic design principles for roadways and bus stop areas, as well as transit-supportive land concepts. See Section IV: "Roadway Design," Section V: "Bus Stop Zones" and Section VI: "Land Use Considerations."

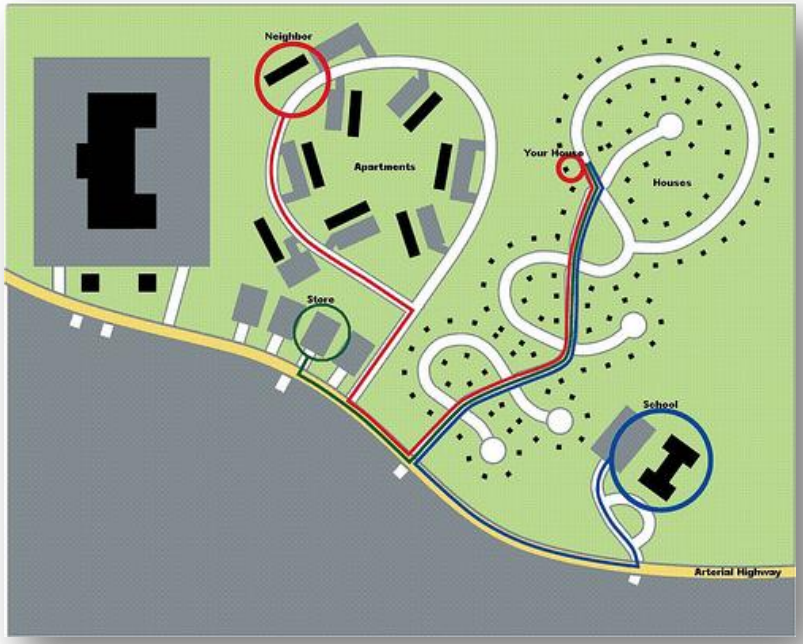
Genesee/Finger Lakes Regional Planning Council (New York): Optimizing Transportation Infrastructure Through Effective Land Use
This document includes design guidelines, as well as an overview of how land use and development patterns can better support transit use and operations (See Chapter 3, "Design Guidelines").

Connectivity

"Connectivity" refers to the connectedness of a street and roadway network. A street network that is not well connected can limit people's ability to travel in the most direct path, increase travel distances, require larger intersections to move vehicular traffic and add to congestion on major streets. Street connectivity helps advance clean air and carbon reduction goals.

Existing Regulations/Potential Issues
The UDO does not include provisions that are aimed directly at requiring a highly connected street network. It does, however, contain a provision in Sec. 10.10.14 requiring the installation of temporary turn-arounds at the terminus of all stub streets.

Possible Action
The UDO could be amended to more directly address connectivity by adding reasonable requirements for stub streets, adding "connectivity index" requirements or encouraging more connected street networks through a new green or sustainable subdivision incentive program.



Example of poor connectivity

Sample Ordinances and Information Sources

Kentucky Transportation Cabinet, Division of Planning: Street Connectivity—Zoning and Subdivision Model Ordinance
This model ordinance, prepared by the state's transportation agency, contains helpful introductory information and relevant commentary.

Virginia Department of Transportation: Secondary Street Acceptance Requirements
Virginia has state-mandated requirements for connectivity, which are codified as part of VDOT's secondary street acceptance requirements. The Virginia system uses a connectivity ratio to measure connectedness. In recognition of the various contexts in which the requirements are imposed, the regulations establish different minimum standards for "Compact," "Suburban" and "Rural" areas of the state.

LEED 2009 for Neighborhood Development: Neighborhood Pattern and Design Prerequisite 3: Connected and Open Community
Connectivity is a prerequisite for LEED, and part of the requirement is based on having at least 140 intersections of public roads and walks per square mile.

Walkability

Daily physical activity is important part of staying healthy and fit. It also reduces the risk of many chronic diseases, including high blood pressure, diabetes and cancer. Of all the types of physical activity that people have to choose from, walking is by far the easiest, most accessible and lowest-impact exercise available. Walking is safe, simple, affordable and does not require practice or equipment. The design and configuration of streets, blocks, lots, sidewalks, alleys and driveways have a direct effect on a person's ability and inclination to make some or all of the trips in their daily routine on foot rather than by car. The key is to create places where walking is a safe, convenient and appealing transportation option for as many people as possible.

The City of Los Angeles' walkability guidelines are applied to all development projects seeking discretionary approval.

Walkable environments support public health objectives by encouraging daily physical activity. They also help reduce traffic congestion, improve quality of life and in shopping areas) promote economic vitality.

Existing Regulations/Potential Issues

UDO Sec. 10.10.17 requires sidewalks on both sides of all streets. Section 10.16 contains trail construction standards and a provision that prohibits trails within deed restricted open space. The cul-de-sac standards of Sec. 10.10.14 prohibit more than 40 dwelling units to be served by a cul-de-sac or a single point of [street] access unless approved by the Planning, Building and Zoning Committee. The existing UDO regulations allow very long cul-de-sac lengths and are not very supportive of walkable subdivision design.

Possible Action

An array of zoning provisions and design requirements can be used to make places walkable or enhance the walkability of existing places. These include requiring sidewalks in new developments, and mid-block pedestrian shortcuts in long blocks; restricting the use of dead-end streets, long blocks and cul-de-sacs (thus improving street connectivity and shortening distances between origins and destinations); implementing traffic calming and complete street improvements.

The UDO could be amended to establish more pedestrian-friendly block and cul-de-sac length standards and to require pedestrian easement connections from the end of cul-de-sac streets to nearby pedestrian-generating land uses.

Sample Ordinances and Information Sources

Ferndale, MI: Complete Streets Ordinance
Ferndale's ordinance, adopted in 2010, requires that the city adopt a "non-motorized transportation network plan." According to the ordinance, until the plan is adopted:

> *...the Planning Commission shall review all street plans prior to the adoption of the nonmotorized plan, and all public street projects or public street reconstruction projects in the city shall be designed to safely accommodate all users of the right-of-way, including pedestrians, people requiring mobility aids, bicyclists and drivers and passengers of transit vehicles, trucks, automobiles and motorcycles...*

Nashville, TN: Walkable Subdivisions
Nashville adopted new subdivision regulations in 2006, including an entire chapter devoted to walkable subdivision design standards, Chapter 5.

Safe Routes to Schools

Safe Routes to School (SRTS) is an international movement to create safe, convenient and fun opportunities for children to bicycle and walk to/from schools. SRTS plays a critical role in reversing the alarming trend toward childhood obesity and inactivity. In 1969, approximately 50% of children bicycled or walked to school, with approximately 87% of children living within one mile of school walking or bicycling. Today, fewer than 15% of schoolchildren walk or bicycle to school. As a result, kids today are less active, less independent and less healthy.

Promotion of SRTS can lead to reduction in vehicle use, traffic congestion, air pollution and energy consumption. As much as 20 to 30% of morning traffic can be generated by parents driving their children to schools, and traffic-related crashes are the top cause of death and major injury for children in the U.S.

Few codes contain provisions directly addressing SRTS. In general, the principles of SRTS should be reflected in standards and ordinances that address:

- Provisions of sidewalks
- Restrictions on block lengths
- Increasing connectivity of neighborhoods to school sites
- Reduced school zone speed limits

- Efficient siting of new schools to maximize access for the majority of the population.

Existing Regulations/Potential Issues:
There are no provisions in Lake County codes or ordinances that address safe routes to school.

Possible Action
Consider incorporating requirements that streets/paths make direct connections from residential areas to nearby schools.

Sample Ordinances and Information Sources

Newton, Massachusetts' Traffic and Parking Regulations
Additionally, some codes have worked to define safe school drop off zones, such as in the City of Newton, Massachusetts' Traffic and Parking Regulations:

Sec. TPR-179. School drop off zones.

(a) No person shall park a vehicle upon any street within a school drop off zone except while engaged in dropping off or picking up passengers, which shall not be permitted for a period of time longer than one (1) minute.

(b) ...Monday through Friday on days that school is in session, during the following times:
(1) from thirty minutes prior to the scheduled start of school until the scheduled start of school; and

(2) from one hour prior to the scheduled end of school until one-half hour after the scheduled end of school.

Illinois Department of Transportation
Additional resources can be found at the Illinois Department of Transportation's (IDOT) safe routes website.

On-Site Facilities for Cyclists

The most important factors influencing an individual's decision to commute by bicycle is distance and the presence of safe cycling routes. The provision of sheltered, secure bicycle storage areas and changing/shower rooms is also very important. Providing short-term bicycle parking areas (i.e., bike racks) also provide a necessary "amenity" for cyclists.

Providing on-site facilities for cyclists promotes bicycling, thereby reducing automobile travel (VMT) and its associated adverse impacts (e.g.,

congestion, carbon emission and depletion of fossil fuel resources). Promotion of cycling and other alternative modes of transportation also supports public health objectives.

Existing Regulations/Potential Issues

The existing UDO does not include short-term or long-term bicycle parking requirements or provisions calling on large employers to provide facilities for cycling commuters.

Possible Action

Consider adding short-term and long-term bicycle parking requirements to UDO Sec. 9.1 or incentivizing the provision of such facilities through offsets in the amount of vehicle parking required. Consider expanding Sec. 9.1.5 (Off-Street Parking Alternatives) to include authorization for the director to reduce vehicle parking requirements for uses that provide employee changing rooms and shower facilities.

Sample Ordinances and Information Sources

Bicyclinginfo.org

Bicyclinginfo.org is a good starting point for local governments interested in promoting cycling and non-motorized transportation. The information clearinghouse contains a wealth of information about on-street bicycle facilities, shared use paths (trails), signs and markings, traffic calming, bicycle parking, engineering examples and case studies, engineering resources and research.

League of Illinois Bicyclists

The League of Illinois Bicyclists also maintains a website with many sources of information for those involved in non-motorized transportation planning efforts, including the League's *Guide to Municipal Bicycle and Pedestrian Planning*.

Henderson, Nevada: Parking Reductions for Bicycle Commuter Facilities (§19.7.4.F, Henderson Development Code)

In addition to requiring short-term (outdoor) bicycle parking for most land uses, the Henderson development code authorizes the planning director to approve a five percent reduction in off-street vehicle parking for projects that include special facilities for bicycle commuters, as follows:

Special Facilities for Bicycle Commuters

The Community Development Director may authorize up to a five percent reduction in the number of required off-street parking spaces for developments or uses that provide both of the following:

(1) Enclosed (indoor or locker), secure bicycle parking spaces equal to at least five percent of the number of vehicle parking spaces provided; and

(2) Employee shower and dressing areas for employees.

LEED, Smart Location and Linkage Credit 4: Bicycle Network and Storage and Neighborhood Planning and Design Credit 5: Reduced Parking Footprint

LEED-ND promotes projects that meet defined "network" and "storage" criteria. Bicycle parking and changing facilities are also encouraged under Neighborhood Planning and Design Credit 5: Reduced Parking Footprint.

LEED , Sustainable Sites Credit 4.2: Alternative Transportation-Bicycle Storage and Changing Rooms

LEED NC promotes the incorporation of bicycle storage and/or changing facilities for new buildings and major renovations.

Low-Emission and Fuel-efficient Vehicles

Through advances in technology, a wider range of "green" vehicles is available in the market. These include low-emission vehicles that produce lower levels of exhaust and fuel-efficient vehicles that have an increased ratio of mileage to the amount of fuel. The vehicles in this category currently include electric, hybrid and alternative fuel vehicles. Increased use of these types of vehicles may lead to reductions in air pollution and lower demand for fossil fuels.

Existing Regulations/Potential Issues

There are no provisions in Lake County codes or ordinances aimed at encouraging low-emission or fuel-efficient vehicles.

Possible Action

Consider offering parking incentives for developments that provide designated preferred parking spaces for low-emission and/or fuel efficient vehicles.

Sample Ordinances and Information Sources

LEED for New Construction and Major Renovations, Sustainable Sites Credit 4.3: Alternative Transportation – Low Emitting and Fuel Efficient Vehicles

This LEED credit specifies use of at least one of the following options:

Option 1
Provide low-emitting and fuel-efficient vehicles for 3% of Full-Time Equivalent (FTE) occupants AND provide preferred parking for these vehicles.

Option 2
Provide preferred parking for low-emitting and fuel-efficient vehicles for 5% of the total vehicle parking capacity of the site.

Option 3
Install alternative-fuel refueling stations for 3% of the total vehicle parking capacity of the site (liquid or gaseous fueling facilities must be separately ventilated or located outdoors).

San Jose, CA, Zoning Ordinance
In Table 20-215 of Chapter 20.90 – Parking & Loading, the city provides requirements for how many "clean air vehicle" parking spaces are needed based on the overall quantity of parking spaces required.

Ferndale, MI: Hybrid-High Mileage Vehicle Parking
Chapter 18, Article VIII of the Ferndale ordinance provides encouragement for the use of hybrid and fuel efficient vehicles in the form of free parking on all city streets and municipal parking lots. An owner needs to register their vehicle and pay an $8 registration fee. Oak Park, Illinois also recently adopted an ordinance that provides free village parking permits for electric cars.

Electric Vehicle Charging Stations

An electric vehicle charging station, also known as an electric recharging point, charging point, EVSE (Electric Vehicle Supply Equipment), or EVCE (Electric Vehicle Charging Equipment) supplies electricity for recharging electric vehicles or plug-in hybrid vehicles. While most electric vehicles can be charged through a standard wall socket, some charging stations support faster charging through higher voltages and currents, requiring specialized connections and dedicated equipment.

There is a new initiative by the federal government, automakers and power companies to establish a national network of power stations to recharge electric cars. By the end of 2011, approximately 10,000 public and commercial stations are expected to be built.

Home charging stations also need to be considered. Homes will require upgrades to at least 80 to 100 amps. A national builder, for example, is offering "pre-wiring" for vehicle charging stations. Supporting the increased use of electric

or hybrid vehicles will reduce emissions and air pollution as well as dependency on fossil fuels. See also the "Low-Emission and Fuel-efficient Vehicles" section of this report.

Existing Regulations/Potential Issues

There are no provisions in Lake County codes or ordinances pertaining to electric vehicle charging stations.

Possible Action

Consider adding provisions that expressly allow charging stations in all zoning districts. Consider encouraging provision of electric power stations in all developments, especially those with large parking lots.

Sample Ordinances and Information Sources

Puget Sound Regional Council and Washington State Department of Commerce

In 2009, the Washington State Legislature recognized that support for electric vehicles was both an economic and environmental priority and passed a new law requiring all cities and counties in the state to allow electric vehicle charging stations as a use in all zoning districts except for residential and resource preservation districts. Under the new law, cities adjacent to the state's interstates and main state highway must also allow battery exchange stations. Counties must also allow battery exchange stations in areas within 1 mile of these highway corridors.

In response to the new law, the Puget Sound Regional Council and the Washington State Department of Commerce collaborated to produce Electric Vehicle Infrastructure: A Guide for Local Governments in Washington State. This guide covers zoning, on-street and off-street parking and signage, charging station design standards, parking enforcement, accessibility for all users and more.

The following Washington municipalities were among the first to amend local zoning ordinances to expressly allow electric vehicle infrastructure (EVI):

- City of Lacey
- City of Kent
- City of SeaTac
- City of Mountlake Terrace

Idling Restrictions

Idling refers to the practice of operating a motor vehicle engine while the vehicle is stationary. While sometimes necessary, idling often produces no real benefit and can be a cause for concern, especially in commercial areas and school zones. Idling can be reduced through public awareness campaigns or actual restrictions on idling. Such restrictions can be enacted throughout a jurisdiction or focused on sensitive areas. Additionally, municipalities can create policies to restrict idling of municipal vehicles.

An idling vehicle can consume more gas than it takes to restart it, and, according to the EPA, the average car burns enough gas idling in two minutes to travel one mile. Unnecessary idling can cause health risks and reduce air quality through increased carbon dioxide emissions.

Existing Regulations/Potential Issues

There are no directly relevant provisions in Lake County codes or ordinances.

Possible Action

Consider adopting idling restrictions as part of vehicle/traffic codes. Once in place, consider amending the UDO to require that no-idling signs be posted in areas around schools, transit stations, loading docks and drive-through lanes.

Sample Ordinances and Information Sources

Cook County, Illinois

While idling of diesel vehicles is prohibited by Illinois statute, Cook County Illinois expressly restricts idling of all motor vehicles in its Environmental Control Ordinance:

9.7 IDLING OF MOTOR VEHICLES

It shall be unlawful for any person to cause or permit the operation of the main engine of any motor vehicle when parked or standing, except for the following:

(a) Whenever engaged in any rescue operations attendant to accident or other common disaster.

(b) Whenever operation of the main power train is essential to a basic function as with, but not necessarily limited to, pre-mixed cement trucks, platform lift trucks, compactor refuse trucks, certain varieties of dump trucks and the like, while function is in action.

(c) Whenever weather conditions justify the use of heating or air - conditioning systems for the welfare and safety of any occupants (or future passengers in the case of public vehicles stopped in turn around or other such waiting areas) or when such low temperatures prevail that the startup of public conveyances or service vehicles might not otherwise be feasible.

(d) Whenever the need for operation of refrigeration equipment on trailers carrying perishable contents is necessary, but which then must conform with the appropriate boundary levels involved by location and most especially so when parked overnight in any district adjacent to occupied residences. In general when parked, the use of auxiliary power sources shall be subject to the same general caution regarding applicability of other noise level restrictions for operation of the main engine and when the vehicle is in motion shall be considered simply as a component of the overall resultant sound level as specified by Section 9.9(a) or in the case of private travel trailers with auxiliary air conditioners by 9.9(c) and these latter, even while legally parked are subject to the same lot line and zone noise level restrictions described above.

(e) Whenever main or auxiliary engines are operated for emergency repairs, or when properly housed for professional maintenance (subject to appropriate boundary level restrictions) and the occasional maintenance such as cleaning and flushing of the radiator and associated circulation system and/or seasonal change of antifreeze, cleaning of the carburetor or the like of a personally owned auto by a private citizen.

EPA

The Environmental Protection Agency (EPA) has prepared a compilation of anti-idling regulations. The site contains examples of idling restrictions and guidelines from communities throughout the U.S..

Open Space and Natural Resources

This section includes a description of regulatory measures aimed at the conservation of open spaces and natural resources, many of which have been in place in Lake County for years.

Riparian Buffers

Riparian buffers are permanently preserved natural vegetative areas adjacent to streams, lakes, ponds and wetlands. Vegetated riparian buffers help improve stream health and water quality by:

- providing natural filtration of nutrients and sediments from stormwater runoff;
- stabilizing stream banks and shoreland and preventing soil erosion; and
- providing habitat and wildlife corridors.

Riparian buffers also help absorb and slow flood waters, thereby protecting human life and property.

Riparian buffers

Existing Regulations/Potential Issues

See sample ordinances and information sources, below.

Possible Action

Maintain current standards, and consider incentivizing greater buffer widths.

Sample Ordinances and Information Sources

Lake County Unified Development Ordinance and Watershed Development Ordinance

Lake County first adopted riparian buffer standards nearly two decades ago. In fact, the County is regarded as pioneer in the areas of stormwater management, natural resource preservation and water-quality protection. Both the UDO and WDO contain requirements for preservation of vegetative buffers near water bodies, including wetlands. The UDO's buffer provisions (Sec. 4.2.7) require preservation of 30 to 100 foot vegetative buffers adjacent to water bodies. Required buffer width depends on the size of the watershed and water quality of the resource. UDO Secs. 4.2.4 and 4.2.6 and WDO Art. IV.B.1.i(1)(b) and WDO Art. IV.B.1.i(1)(a).

Stormwater Manager's Resource Center (SMRC) Website

The Stormwater Manager's Resource Center website is a clearinghouse for stormwater management and watershed protection information. It was designed by the Center for Watershed Protection under a grant from EPA, Office of Wastewater Management. The primary purpose of this website is to provide NPDES (National Pollutant Discharge Elimination System) Phase II communities with the technical tools and techniques to comply with current EPA regulations.

Hillside and Steep Slope Protection

Development on hillsides and steep slopes can have adverse health, safety and environmental effects. Hillside and steep slope protection measures help prevent erosion and sedimentation and address the many challenges of development in such areas. Protecting hillsides and steep slopes also helps preserve the natural scenic beauty of the native landscape.

Hillside and steep slope protection measures are aimed at preventing or more strictly controlling development in areas containing steep slope conditions.

Existing Regulations/Potential Issues

The UDO's riparian (wetland, linear and nonlinear waterbody) buffer standards (see above) include protections for slopes exceeding 12% grade.

Possible Action

Maintain current standards.

Sample Ordinances and Information Sources

Lake County Unified Development Ordinance

The UDO's riparian (wetland, linear and nonlinear waterbody) buffer standards (see above) include protections for slopes exceeding 12% grade. The slope protections for wetland buffer areas follow:

§4.2.4 Wetland Buffers

. . .

4.2.4.4 Protected Areas

. . .

b. Areas located within 100 feet from the edge of the delineated wetlands with slopes exceeding 12 percent grade shall also be protected and maintained as permanent open space unless otherwise expressly provided in this Ordinance. The Planning, Building and Development Director shall be authorized to allow improvements such as retaining walls to prevent soil erosion and protect public safety within protected steep slope areas. Any additional Wetland Buffer required pursuant to this provision, shall not affect the site capacity calculation.

Highland Park Steep Slope Ordinance

Highland Park's steep slope establishes special regulations for demolition, grading, construction and landscaping activities in and near ravines and the lake bluff. In addition, the ordinance requires property owner maintenance of the ravine channel.

Lake Forest Steep Slope Ordinance

Lake Forest's ordinance is similar to Highland Park's. It imposes special building setbacks and limits construction, grading and site disturbance near ravines and bluffs.

Tree Planting and Preservation

Tree planting and preservation standards are aimed at establishing requirements for the preservation of existing woodland areas and the planting of trees when development occurs. Trees help clean the air and produce oxygen, improving air quality. They also help protect and improve water quality by reducing storm water runoff, flooding and erosion.

By providing shade and moderating temperatures, trees help reduce heating and cooling costs, thus saving energy and indirectly contributing to reduced smokestack emissions from energy producers. Shaded areas for walking, running, bicycling and other forms of exercise, also encourage activities that promote better health.

Trees visually enhance streets and communities, making them more desirable places to live and with correspondingly positive effects on property values and economic development.

A comprehensive landscape ordinance should address requirements for:

- Tree preservation (for existing and new developments)
- Parking lot landscape
- Building foundations
- Roadways
- Bufferyards
- General site enhancement

Existing Regulations/Potential Issues

The UDO contains requirements for preserving existing woodlands and planting new trees. Section 4.2.9 requires preservation of mature, young and

mixed woodlands, groves, and significant trees at rates of 50%–70%. Additionally, the landscaping regulations of Sec. 9.3 establish requirements for tree planting in parking lots, street yards, common open spaces, and land use transition areas. Street tree planting requirements, for example, call for the provision of at least one tree per 100 feet of street frontage.

Possible Action

Lake County's woodland preservation regulations have long been considered a model approach to natural resource protection. Consideration should be given to encouraging preservation beyond UDO minimums through density or other regulatory incentives. The existing street (yard) tree planting requirements are, however, fairly lax when compared with other ordinances. Consider amending the UDO to increase planting requirements to one tree per 50 feet of street frontage.

Sample Ordinances and Information Sources

Lake County Unified Development Ordinance

Section 4.2.9 of the UDO requires preservation of mature, young and mixed woodlands, groves, and significant trees at rates of 50%–70%. Additionally, the landscaping regulations of Sec. 9.3 establish requirements for tree planting in parking lots, street yards, common open spaces, and land use transition areas.

Orland Park, IL

Orland Park, Illinois has a comprehensive landscape ordinance that establishes both tree preservation requirements as well as landscape requirements.

Conservation Subdivisions

Conservation subdivisions are generally characterized by the provision of permanently protected common open space and clustered compact lots. The purpose of conservation subdivision regulations is to protect natural resources (including farmland) while allowing at least the same level of density allowed as part of a conventional (non-conservation) subdivision design. Conservation development regulations help preserve open space and filter stormwater runoff, reduce flooding, provide habitat and wildlife corridors, promote recreational opportunities and community health and preserve agriculture.

One of the most well-known examples of conservation development is Prairie Crossing, located in Grayslake. Prairie Crossing combines development with the preservation of open space including wetlands, prairie and farmland. Approximately 60% of the 678-acre development site is in open space.

Existing Regulations/Potential Issues

Conservation subdivisions are addressed by the "Conservation Development" provisions of UDO and encouraged by the Regional Framework Plan. The ordinance is designed to ensure that subdivisions designed in accordance with the UDO's conservation development standards and the minimum open space regulations can achieve the same density as conventional subdivisions. The density and dimensional standards of Article 7 provide a (5%–15%) density bonus for projects that provide more than the minimum required amount of open space.

Possible Action

Maintain the existing regulations.

Sample Ordinances and Information Sources

Lake County UDO

Conservation subdivisions are addressed by the "Conservation Development" provisions of the unified development ordinance and encouraged by the county's *Regional Framework Plan*. The provisions of Article 7 attempt to incentivize conservation subdivision design through density bonuses and the allowance of a broader range of housing types than in conventional subdivisions.

McHenry County, IL: Conservation Design Developments, Standards and Procedures

McHenry County adopted new conservation subdivision design regulations in 2009. The regulations are mandatory for new subdivisions that contain or abut sensitive natural resource areas. Developers may also voluntarily choose to use the new regulations. Density incentives are provided to encourage voluntary compliance.

Native Plants

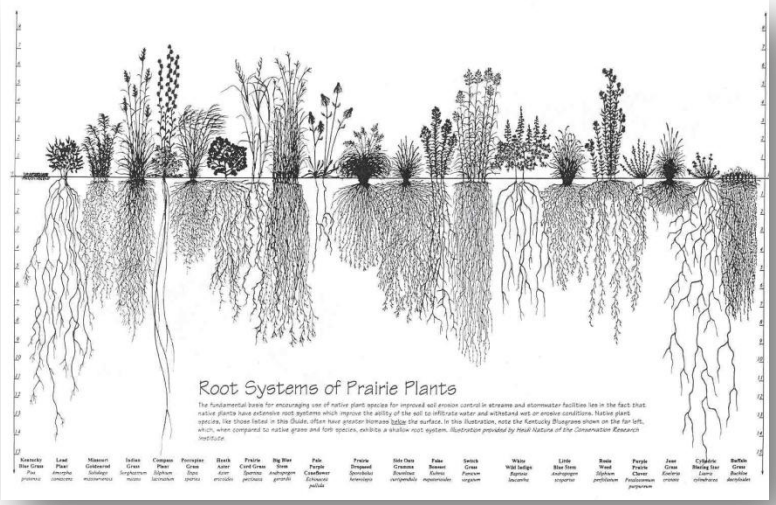
Native or indigenous plants are species that have historically developed in a local region or ecosystem. When located in their proper habitat, native plants are better suited for the local environments and require less water and maintenance than non-natives. Use of native plant species can also help stabilize soils and help limit soil erosion, while also providing food and shelter for native birds, animals and insects.

Existing Regulations/Potential Issues

The UDO requires native landscaping in planned open spaces and around stormwater ponds and in buffers. The WDO has requirements for the use of native plants around stormwater management facilities.

Possible Action

Continue to administer existing controls. Encourage the use of native plants in other landscape applications including swales, detention ponds, residential and commercial foundation plantings, parking island landscape and vegetated berms and buffers.



Sample Ordinances and Information Sources

Morton Arboretum

The Morton Arboretum maintains an online information clearinghouse of information about native plants and sustainable landscaping practices.

Florida Native Plant Society: Model Native Plant Landscape Ordinance Handbook

In addition to the model ordinance, this handbook identifies several Florida communities that have required anywhere from 30% to 75% native species in their landscape requirements. While the model ordinance is applicable specifically to Florida, the approach, structure, and methodology have universal applicability.

Water Quality and Quantity

As noted in *The State of Lake County's Water Supply*, the county has tremendous water supply sources, but they are not endless. Meeting growing water demands will require increased use of Lake Michigan water and groundwater resources. Lake Michigan water supplies are limited by state and federal regulations. Over-pumping shallow and deep aquifers can withdraw water faster than it can be replenished and increases risks of contamination.

Ensuring a reliable supply of clean water is one of the key drivers of the *Strategy for Sustainable Lake County.* This section explores several sustainable building and development- practices that can help in realization of the County's water-related sustainability goals. (See also the Lake County "Water Resources" webpage.

Rainwater Harvesting/Reuse

Rainwater harvesting uses rain barrels, cisterns and storage tanks to collect and store rainwater draining from a building roof for various uses, including irrigating plants. Rain barrels are most often used for individual residences, while cisterns have both residential and commercial applications. Initial runoff volume (first flush) is retained by rain barrels and cisterns, ranging from approximately 50 gallons to several thousand for a large cistern.

Rainwater capture decreases the volume and flow rate of rooftop generated stormwater runoff and provides a source of chemically untreated "soft water" for gardens and other non-potable needs, free of most sediment and dissolved salts. When used throughout a watershed or stormwater collection basin, rain barrels and cisterns can modestly impact the peak stormwater flow rate.

Existing Regulations/Potential Issues

There are no provisions in Lake County codes or ordinances addressing rainwater harvesting or rainwater reuse.

Possible Action

Consider expressly allowing rainwater reuse for irrigation purposes, including rain barrels.

Sample Ordinances and Information Sources

Santa Fe County, NM, Ordinance 2003-6
Santa Fe County's rainwater harvesting includes residential and commercial regulations. Residences with 2,500 square feet of heated area or less must utilize rain barrels, cisterns, or other catchment basins and residences 2,500 square feet of heated area and greater must install an active rainwater catchment system comprised of cisterns that are buried or partially buried, hold 1.15 gallons of rainwater per square foot of residential heated area (adjusted based on landscaping), and water landscaping using a pump and drip irrigation system connected to cisterns. Commercial rainwater harvesting systems must use cisterns that are buried, partially buried, or enclosed within an insulated building/structure and hold 1.5 gallons per square foot of roofed area (adjusted based on landscaping).

HarvestH_2O.com
This website is a clearinghouse for information about rainwater harvesting, water catchment water conservation. The site includes a listing of sample rainwater harvesting ordinances and regulations.

High-efficiency Plumbing Fixtures

High efficiency plumbing fixtures, such as those promoted by the EPA's WaterSense program, can be used to reduce use of potable water for residential and commercial developments. The pressures on Lake Michigan as a water source for the region continues to increase from all communities that rely on it and it cannot be assumed that this clean water source will always be abundantly available. For this reason the use of efficient water fixtures is critical. In addition, the use of efficient water fixtures not only reduces water consumption and associated costs, but it also helps save energy.

Existing Regulations/Potential Issues
There are no directly relevant provisions in Lake County codes or ordinances.

Possible Action

Consider mandating or incentivizing the use of higher efficiency plumbing fixtures based on performance characteristics or EPA WaterSense guidelines.

Sample Ordinances and Information Sources

Daly City, CA: Chapter 15.66 - Indoor Water Efficiency and Conservation Ordinance

Section 15.66.040 of the ordinance lists minimum efficiency requirements for plumbing fixtures. For example, residential and nonresidential kitchen faucets may not exceed 2.2 gallons per minute, and toilets must be less than 1.28 gallons per flush.

Lacey, WA: Residential and Commercial Water Conservation Programs

For residential uses, the city offers rebates for free indoor water saving kits, shower timers, high efficiency toilet replacement and high efficiency washing machines. Offers and rebates for commercial developments include high efficiency toilet replacement, a 75% funding program for select water saving appliances, and plumbing fixtures exceeding code requirements.

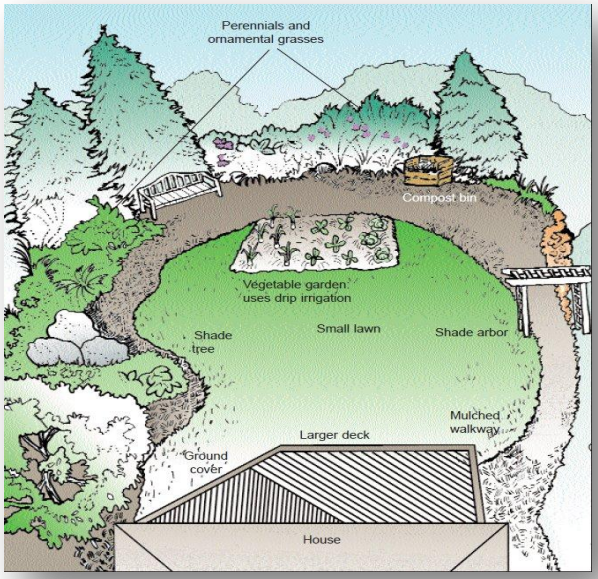
Georgia: Metropolitan North Georgia Water Planning District – Water Conservation Measures – DRAFT

The DRAFT district-wide plan is being considered for a number of water conserving measures including mandatory new residential development WaterSense Program, high-efficiency toilet retrofits and water waste policy.

Low Water Use Landscaping

Low water use landscaping utilizes plants suited to local conditions and water-efficient landscaping principles to reduce the use of potable water or natural water resources for landscape maintenance. The U.S. Environmental Protection Agency (EPA) has identified seven principles of low water use landscaping:

- Proper planning and design
- Soil analysis and improvement
- Appropriate plant selection
- Practical turf areas
- Efficient irrigation
- Use of mulches



- Appropriate maintenance

According to the U.S. Geological Survey, approximately 30 percent of the water that is consumed daily in the United States is used for landscaping. Reducing the need for irrigation reduces demand for municipal potable water supplies, reduces water waste and utility costs, reduces landscape maintenance, conserves natural resources and preserves native habitat. Low water use landscaping encourages preservation of existing trees and shrubs. The use of plants native to the region, will, once established, require very little to no additional water for irrigation beyond normal rainfall.

Existing Regulations/Potential Issues

There are no requirements in Lake County codes or ordinances. See also "Native Plants and "Efficient Irrigation Systems"

Possible Action

Encourage landscape designs and maintenance practices that follow the EPA principles for low water use landscaping.

Sample Ordinances and Information Sources

California

Water efficient ordinances are more prevalent in western states, especially in California where many communities have followed the State's Model Water Efficient Landscape Ordinance.

Chicago Metropolitan Agency for Planning (CMAP)

The Chicago Metropolitan Agency for Planning (CMAP) has produced a Model Water Use Conservation Ordinance, which recommends that the following items for efficient landscape be incorporated into local ordinance:

4.0 Vegetation

4.0.1 Turf Area and Location. *The combined size of turf (plus other high water use plants) or other water features shall be limited to no more than X% of the total developed landscape area.*

4.0.2 Soil Depth. *Areas planted with turf grass shall have a minimum of 6 inches of topsoil depth. The soil shall be blended with compost in a ratio of soil to compost appropriate to the local soil characteristics. The compost shall be incorporated in the top 2 inches of the native soil.*

4.0.3 Mulching*. All exposed soil shall be covered with a 2- to 3-inch layer of mulching material.*

4.0.4 Planting. *Residents are encouraged to use native plants and/or low water use plants.*

Efficient Irrigation Systems

Efficient irrigation systems and practices utilize low-flow drip, sub-surface drip or low-flow sprinklers in place of standard sprinkler systems for all landscape applications, encourage creating distinct irrigation zones based on soil and slope conditions and vegetation characteristics and use moisture sensors or weather-based controllers.

Up to 50% of irrigation water can be wasted as a result of evaporation, wind, improper system designs and over-watering. Selecting and installing high-efficiency irrigation systems reduce landscape water use, conserve the use of potable water and minimize weed growth.

Existing Regulations/Potential Issues

There are no provisions in Lake County codes or ordinances addressing irrigation practices.

Possible Action

Consider adding provisions to the landscaping regulations of Sec. 9.3 requiring that all permanent irrigation systems be of high-efficiency or weather-sense design.

Sample Ordinances and Information Sources

Chicago Metropolitan Agency for Planning

The Chicago Metropolitan Agency for Planning (CMAP) Model Water Use Conservation Ordinance recommends the following language for water efficient landscape irrigation:

5.0 Irrigation

5.0.1 Landscape Irrigation Equipment. *Any new system installed within the residential areas of the Municipality (for landscape areas > X acres) must be equipped with rain and soil moisture sensing devices and freeze gauges that shut off the systems and that are approved as to number and type by the Director of Public Works/Planning.*

Sprinkler heads must not spray onto or over any hardscape areas, including streets, sidewalks, driveways, decks, patios and buildings.

Strips of land less than 6 feet in width shall be irrigated by drip or micro irrigation systems. Check valves of a specified breakaway pressure rating must be installed at irrigation heads as needed to prevent low head drainage and puddling.

5.0.2 Landscape Irrigation Days*. At even numbered addresses, landscape irrigation may occur only on Wednesdays and Saturdays. Odd numbered addresses may irrigate only on Thursdays and Sundays.*

5.0.3 Landscape Irrigation Schedules. *Between the months of April through October, landscape irrigation shall not occur between 10:00 AM and 6:00 PM. Irrigation shall not continue beyond 2 hours per irrigation day nor more than ¾ inch during the allocated schedule.*

5.0.4 Irrigation Permits: *Residents may receive permits for the irrigation of new landscape to allow watering at any time of day on any day for the initial 30 days and every other day for the next 30 days for a total of one 60-day period.*

Alliance for Water Awareness and Conservation.
Additional efficient landscape irrigation standards are provided within the Model Landscape Ordinance developed by the Alliance for Water Awareness and Conservation (AWAC).

Turf Area Management

Traditional lawns (turf areas) have typically required high maintenance involving mowing and fertilizers as well as large amounts of supplemental water. Turf area management principles seek to promote wise use and management. For example, limiting use of turf to practical areas such sports fields and where it provides aesthetic balance within a site's overall landscape.

By reducing demand for potable water supplies and reducing the need for fertilizers, turf area management strategies help protect drinking water supplies, which will be more and more important in the years to come.

Existing Regulations/Potential Issues
Appendix A of the Unified Development Ordinance includes useful guidelines and Best Management Practices for the management of turf areas.

Possible Action
Consider converting some of the BMP guidelines in Appendix A into UDO requirements or further incentivizing use of BMPs.

Sample Ordinances and Information Sources

Chicago Metropolitan Agency for Planning (CMAP)
As part of the Chicago Metropolitan Agency for Planning's (CMAP) Model Water Use Conservation Ordinance, it is recommended that the overall size of turf and other high water use plants be limited within an ordinance to a set percentage of the overall landscaped area of a site.

EPA

The U.S. Environmental Protection Agency's (EPA) 2009 WaterSense Single-Family New Home Specification suggests turf areas not exceed 40% of the landscaped area with an exemption for homes equal to or less than 1,000 square feet.

Barstow, CA

In other parts of the country, such as Barstow, California, the requirement is as little as 20%.

Individual Metering

Using individual metering or submetering for multi-family residential or commercial users can provide an effective tool in educating the user on their water consumption behavior and can aid in detecting problems such as leaky fixtures and pipes. A commercial user can incorporate submetering as part of their building automation system (BAS) which can be used to monitor, track and report on water consumption to determine most effective water saving strategies.

Existing Regulations/Potential Issues

There are no provisions governing individual metering in Lake County codes or ordinances.

Possible Action

No action recommended.

Sample Ordinances and Information Sources

Denver, CO: Denver Water Utility – Sub-Meter Rebate Program

The City passed Ordinance 576 in 2004 requiring all new multi-family buildings to be individually metered. Denver Water created a rebate program in 2010 to encourage existing multi-family buildings to install sub-meters for individual units.

San Diego, CA: Water Submetering Ordinance

It focuses on multi-family residential and mixed-use buildings, which are not currently required to submeter. The proposed ordinance requires submetering of such buildings, which will allow occupants' water use billings to be based on actual water consumption. The goal of this ordinance is to supply occupants of the impacted buildings with information that will provide the financial incentive to conserve water.

Georgia: North Georgia Water Planning District – Model Sub-Metering Ordinance

The North Georgia Water Planning District has developed a model ordinance that includes language for utilities and counties. The county ordinance text reads as follows:

> *Sub-Unit Meters - No water shall be furnished to any newly constructed building or premises except through water meters and shall be charged at the established rates. Water service is billed by the utility on a master meter basis and the landlord or property owner is responsible for paying the utility for all charges contained in such bills. All new multi-family buildings shall be billed by the owner or landlord or by a third part based on sub-unit meters which will be installed at the time of construction.*
>
> *Separate Water Meters - No water shall be furnished to any newly constructed building or premises except through meters and shall be charged at the established rates. These services are billed by the utility to the tenant based on individual unit water meters which will be installed at the time of construction.*

Stormwater Management

The intent of stormwater management is to reduce the impacts associated with the runoff from developed (and undeveloped) sites by reducing runoff volumes and contaminants, primarily through on-site infiltration and by mimicking predevelopment hydrology.

Information on Lake County's four major water watersheds and 26 subwatersheds can be obtained from the Stormwater Management Commission's website. Many of the watersheds are covered by watershed plans that identify best management practices and other sustainable stormwater management tools.

Predevelopment Hydrology

Maintaining predevelopment hydrology, the ability of the natural environment to manage stormwater, either without the need for additional infrastructure or at least with a reduced role, allows stormwater runoff to be infiltrated on-site. This reduces the need and impact to the man-made stormwater conveyance system. In addition, the impact to receiving bodies of water is lessened.

By maintaining stormwater on site, the need for stormwater infrastructure, and the costs associated with it, are reduced or eliminated. Also, the degradation of the receiving waters in the watershed is minimized.

Existing Regulations/Potential Issues

The WDO contains regulations and Runoff Reduction Volume Guiding Principles.

Possible Action

Continue enforcement of existing WDO provisions, and explore possible enhancements.

Sample Ordinances and Information Sources

Lake County Watershed Development Ordinance

Over 80 WDO amendments and enhancements are currently under consideration (and available for public comment). Included are several quantity-based Runoff Volume Reduction (RVR) Program enhancements. These proposed amendments update the Runoff Volume Reduction Hierarchy section in accordance with SMC's approved Runoff Volume Reduction Guiding Principles and IEPA General NPDES Permit No. ILR40 requirements.

Stormwater Runoff Treatment/Quality

Stormwater runoff typically contains a range of pollutants, including naturally occurring (sediment, minerals) and man-made (hydrocarbons, fertilizers). As runoff volumes increase these pollutant concentrations also increase and usually become problematic for the downstream receivers. Areas known to have poor stormwater runoff quality, e.g. parking lots and service stations, usually require additional treatment due to the higher loads and likelihood of contamination. Treating on-site uses several methods which can mimic natural processes (bioretention, filter strips, etc.) or use artificial means of treatment (oil-water separators, sediment screens, etc.). By treating stormwater on-site, especially for those systems that infiltrate and recharge groundwater, stormwater infrastructure can be minimized thereby reducing the financial and environmental costs associated with the construction of such systems.

Existing Regulations/Potential Issues

Section IV.B.1.h of the WDO requires service stations and parking lots with more than 25 stalls to have a method of treating 0.5 inches of runoff by removing at least 70% of hydrocarbon contamination (oil and grease). Section IV.B.1.h. also states that the first 0.01 inches of runoff for every 1% of impervious cover, with a minimum treatment volume equal to 0.2 inches, should be treated with adequate BMPs. This requirement applies to any new development creating more than 0.5 acres of new impervious cover. The requirements related to hydrocarbons apply above and beyond this base requirement.

Possible Action

Encourage a ban on fertilizers, especially for lawns, to generate biggest impact (eliminate the source). On a secondary level, consider mandating stormwater treatment units for roadway and parking lot drainage (in-line bioretention swales, structural nutrient removal units) or institute stormwater treatment at outfalls to waterways (costly option in most cases). Require detention for impervious areas of a certain size and additional treatment for service stations and parking lots with respect to petroleum contaminants to treat polluted stormwater at source prior to discharge to receiving streams. See also "Bioretention (Bioswales and Rain Gardens)" and "Modified Curb and Gutter Systems."

Sample Ordinances and Information Sources

Minnesota: Phosphorus Fertilizer Ban

The Minnesota Commissioner of Agriculture reported in 2007 on the effectiveness of phosphorus lawn fertilizer restrictions which was instituted in 2004. That report indicated that the Minnesota Phosphorus Fertilizer Law accomplished the objective of reducing unnecessary phosphorus fertilizer applications to lawns in the state. Approximately

82 percent of fertilizer use in Minnesota in 2006, two years after adoption of the legislation, was phosphorus-free. The legislation did not cause any difficulties for retail fertilizer outlets and 97 percent of stores carried phosphorus-free fertilizers.

Preliminary data suggest that use of phosphorus-free fertilizer can reduce phosphorus runoff from residential areas by 12% to 16%. The cost of implementing fertilizer restrictions in Minnesota has been negligible for most communities. These results have provided credibility to the idea that legislation restricting the use of phosphorus lawn fertilizers can reduce the application of phosphorus to urban turf areas and reduce the phosphorus loading to water resources for minimal cost.

Bioretention (Bioswales and Rain Gardens)

Bioretention areas are a recognized best management practice (BMP) for stormwater management. They are small engineered, landscaped basins that filter stormwater runoff and may be used as a supplement to conventional stormwater detention ponds to manage stormwater runoff. Bioretention areas filter pollutants from stormwater as the water seeps through mulch, soil and gravel layers and releases the filtered water into the ground water. Bioretention areas can be sized to detain and infiltrate stormwater that would otherwise flow into the storm drainage system and into natural bodies of water. Bioretention areas are suitable for commercial and residential areas to filter run-off from roofs, driveways, roads and parking lots.

Rain garden

Existing Regulations/Potential Issues

Sections 8.2.4 and 9.3.8.5 of the UDO allow flexibility in application of landscaping requirements for projects that use BMPs and/or LID strategy, including bioretention. Section IV.B.1.d of the WDO (Runoff Reduction Hierarchy) is also relevant.

Possible Action

Encourage greater use of bioretention in new *and* existing developments, which can often be retrofitted to incorporate bioretention and other stormwater BMPs. Continue to monitor and enforce existing regulations.

Sample Ordinances and Information Sources

Lake County: Unified Development Ordinance
Section 9.3.8.5 of the UDO (Landscaping) allows staff to provide flexibility in landscape requirements if best management practices, such as bioretention, are used.

Ann Arbor, MI: Landscape Ordinance - Draft
This landscape ordinance was amended to improve stormwater quality or at least to support existing stormwater regulations. Some of the requirements added to the landscape ordinance included requiring landscape islands in parking lots be designed for bioretention, allowing variable width landscape buffers and planting more trees.

Parking lot bioswales

Bellingham, WA: Bioretention Case Study
In 2003, the City of Bellingham conducted a pilot study to determine alternative ways to manage stormwater runoff from parking lots. Rather than using a conventional control, such as an in-ground vault, which tends to be very costly, the city chose to install two bioretention areas or "rain gardens" and saved 75 to 80 percent in construction costs.

Apex, NC: Bioretention Operation and Maintenance Agreement
All approved and installed structural stormwater BMPs in the Town of Apex are required to have an agreement in place between the owner and Town. Owners are required to maintain BMPs in accordance with the Town's requirements for inspections, maintenance and monitoring. The structural BMP program is maintained by the Public Works Department and can be found at this website.

Permeable Pavement

Permeable pavement has porous openings allowing water to pass through the surface and percolate through existing subsoil. Its three main forms include permeable asphalt, permeable concrete and permeable pavers. Even in areas where soil types do not drain well, these forms of permeable pavement can be combined with subsurface drainage systems such as pipe underdrains or stormwater infiltration trench-

es, to slow runoff and reduce stress on stormwater management sytems.

The effectiveness of permeable pavement is dependent on soil conditions. Moreover, questions about long-term maintenance continue to pose a challenge to widespread use.

Existing Regulations/Potential Issues
Section 7.7.4 of the UDO expressly allows exclusion of pervious paving material from impervious surface calculations. Section 9.3.8.5 allows pervious paving for parking lot stalls and drive aisles as part of BMP/LID strategy.

Possible Action
No further action recommended at this time.

Sample Ordinances and Information Sources

Kane County, IL: Amendment to the Kane County Stormwater Ordinance (No. 09-433)
The following text was added to the existing stormwater ordinance in 2009 that gives credit for permeable pavement and its effectiveness in reducing site runoff when, among other provisions:

> *…the depth of subbase provided is at least 16 inches and the void ratio of the subbase aggregates is at least 30%, and any required underdrains are 4 inches diameter or less, then detention and retention requirements of §203 (stormwater retention requirements) shall be considered as provided for the area of the pavement so designed.*

Warrenville, IL: Sequestria Subdivision Planned Unit Development Permeable Pavement Public Street
This is a rare example of the use of permeable pavement on public streets. This 2008 PUD provided access to Landon Avenue by a 1,250 foot long public street (Garden View Court) terminating in a cul-de-sac.

Green Roofs

A "green roof" is a roof that is partially or completely covered with plants that help reduce stormwater flows through retention or bioretention and mitigate the urban heat island effect. Green roofs typically include a structurally sound roof, waterproofing and root barrier, drainage layer, permeable fabric, a growing medium/soil and vegetation. There are two types of green roof systems: lightweight "extensive" roofs feature hardy succulent plants and are appropriate retrofits to existing buildings; and a heavier "intensive" green roof system with a thicker growing medium to support deep-rooted vegetation. Green roofs can be installed on most

Green roof, Lake County Central Permit Facility

flat roofs provided that they are constructed to accommodate the structural load.

Conventional roofs absorb and retain heat and increase stormwater run-off. A green roof has numerous benefits to both the building owner and community when compared to a conventional roof, including the following:

- Reduces the rate and quantity of stormwater runoff
- Reduces the urban heat island effect
- Reduces energy costs for heating and cooling
- Increases longevity of roofing materials
- Provides habitat for birds and wildlife
- Provides opportunities for accessible garden space
- Increases rent or property value of units with views or access

Existing Regulations/Potential Issues
There are no green roof regulations in Lake County codes or ordinances.

Possible Action
Section 7.7.4 of the UDO (Impervious Surface) could be amended to expressly allow exclusion of green roofs from impervious surface calculations.

Sample Ordinances and Information Sources

Portland, OR: Ecoroof Zoning Code, Title 33, Section 33.510.10
The Portland Zoning Code gives density bonuses for those developments within the city's central district. The amount of density bonus depends on the ecoroof (green roof) coverage in relation to the building footprint and is as follows:

- 10%-30% coverage earns 1 square foot of additional floor area per square foot of ecoroof
- 30%-60% coverage earns 2 square feet per square foot of ecoroof
- 60% coverage or greater earns 3 square feet per square foot of ecoroof

Toronto, Ontario: Green Roof Bylaw, Toronto Municipal Code Chapter 492
The Toronto Bylaw applies to new residential, commercial and institutional developments made after January 31, 2010 and will apply to new industrial development as of April 30, 2012. The green roof coverage requirement depends on the size of the building. The table below shows how the green roof requirement ranges from 20-60 percent of Available Roof Space for commercial, institutional and residential de-

velopment. Available Roof Space is defined as the total roof area minus areas designated for renewable energy, private terraces and residential outdoor amenity space.

Gross Floor Area (Size of Building)	Coverage of Available Roof Space (Size of Green Roof)
2,000 - 4,999 m^2	20%
5,000-9,999 m^2	30%
10,000-14,999 m^2	40%
15,000-19,999 m^2	50%
20,000 m^2 or greater	60%

Off-street Parking Requirements

Off-street parking regulations establish minimum requirements for provision of on-site parking spaces, typically by requiring a certain number of vehicle parking stalls per dwelling unit or increment of floor space. Excessive requirements for off-street parking can lead to the over-development of parking infrastructure, which increases impervious cover and stormwater runoff and drives up the cost of development.

"Right-sized" minimum parking ratios can help reduce impervious surfaces, which reduces stormwater runoff and the heat island effect caused by the sun's heating of large paved areas.

Existing Regulations/Potential Issues

The UDO's minimum parking requirements can be found in Sec. 9.1.2. The ratios vary greatly. Offices require at least 2.5 spaces per 1,000 gross square feet (GSF). Retail uses are required to provide at least 4.0 to 5.0 spaces per 1,000 GSF. Restaurants and bars-must provide 12.0 to 14.0 spaces per 1,000 GSF. While many of the ordinance's minimum parking ratios are high compared to other jurisdictions, the UDO scores high marks for its accommodation of shared and off-site parking, as well as for its allowance to reserve land for parking but not build it for very large uses.

Pervious paving for parking stalls; conventional paving for drive aisles

Possible Action

Consider establishing lower minimum ratios for some land uses and establishing lower minimums (or even caps) for uses in close proximity to major transit investments.

Sample Ordinances and Information Sources

Austin, Texas

Austin's land development ordinance authorizes reduced parking based on adjacent on-street parking, car-sharing programs and provi-

sion of shower and locker facilities for cyclists (Title 25, Subchapter E, Sec. 2.4.2)

***2.4.2. Reduction of Minimum Off-Street Parking Requirements**. This section provides for reductions in the minimum off-street parking requirements in Chapter 25-6, Article 7, Off-Street Parking and Loading. The minimum off-street parking requirement shall be reduced as follows:*

A. By one space for each on-street parking space located adjacent to the site on a public street, including spaces on Internal Circulation Routes that meet public street standards.

B. By up to 10 percent to preserve significant stands of trees or protected trees in addition to those required to be preserved by the Code, pursuant to protection measures specified in the Environmental Criteria Manual. If the applicant provides more parking spaces than the minimum required, the additional parking spaces may not result in the removal of significant stands of trees or protected trees.

C. By 20 spaces for every car-sharing vehicle provided in a program that complies with the requirements prescribed by the Director by administrative rule.

D. By one space for each shower facility with three or more lockers provided for employees in a nonresidential building.

Unless otherwise specified, the above reductions may be applied cumulatively, and may be applied in addition to the urban core parking reduction authorized in Section 25-6-478, but in no case may the minimum off-street parking requirements for a project set forth in Chapter 25-6, Appendix A, be reduced by more than 40 percent.

Dallas, Texas

Dallas' new mixed-use form districts include special parking regulations with maximum limits on surface parking (i.e., no more than 25% over minimum ratios) and allowed reductions in required parking for uses near rail, bus and trolley transit stops. Parking reductions are also authorized for car-sharing, affordable housing and uses with an approved transportation demand management program. See Division 51A-13.400 (Parking Regulations).

Modified Curb and Gutter Systems

Modified curb and gutter systems typically involve swales and rain gardens linked to curb cuts to reduce runoff to storm sewers and treat runoff pollutants through increased infiltration. Modified curb and gutter systems designs help reduce pavement and drainage costs, filter stormwater runoff and protect natural resources through reduced runoff impacts. These systems

are usually used in conjunction with bio-retention systems (see Bioretention in this section).

Existing Regulations/Potential Issues
UDO Sec. 10.10.15 (Curbs and Gutters) requires the use of standard curb-and-gutter street designs in all subdivisions for single-family residential subdivisions containing lots that average more than 40,000 square feet in area, where allows open (ditch/swale) drainage systems are allowed. See also UDO Sec. 10.10.3 (Streets and Stormwater Conveyance) and WDO Art.IV.B.1.g (Stormwater Conveyance Systems).

Possible Action
Consider expressly allowing more widespread use alternative designs.

Sample Ordinances and Information Sources

Edmonston, MD: Greening of Decatur Street
This report by the Low Impact Development Center, Inc. and sponsored by the Chesapeake Bay Trust provides detail on design opportunities and constraints for Decatur Street, including curb cut inlets to bioretention systems. The design integrates green practices directly into the right-of-way to treat rain where it falls and reduces the flow of stormwater pollution to receiving waters. The new infrastructure practices are sized to treat 90 percent of the annual total rainfall and provide improved air quality and other environmental benefits.

Modified Cul-de-sac Design

There are numerous alternatives to the traditional 40-foot cul-de-sac bulb, most of which reduce impervious cover. One alternative is to reduce the required bulb radius. Others create hammerheads, loop roads and pervious islands in the cul-de-sac's center. Modified cul-de-sac designs help decrease impervious surface, reduce pavement and drainage costs and protect natural resources through reduced runoff impacts.

Existing Regulations/Potential Issues
The UDO allows cul-de-sac designs with a pervious island upon written approval of the Township Highway Commissioner.

Possible Action

Cul-de-sacs with islands (which could be used for stormwater, shade tree planting, etc.) require case-by case approval from the Twp. Hwy. Comm., which represents a an obstacle to widespread use. Consider incentivizing alternative designs such as "courts" or "closes" as alternatives to conventional designs.

Sample Ordinances and Information Sources

Code Reference/Issue

The cul-de-sac design standards of UDO Sec. 10.10.14.a authorize cul-de-sac designs with a pervious island under certain conditions. The use of such designs is limited in cold weather climates due to snow clearing and snow storage concerns.

University of Nevada Cooperative Extension

The University of Nevada's Cooperative Extension Service has published a guide to alternative turn-around designs.

Reduced Street/Pavement Widths

Sustainable (skinny) street designs can reduce stormwater runoff while still providing good site access and circulation. Design strategies include narrower roads, traditional roadway layout, and "open section" roadways with roadside swales. Specific strategies include:

- Minimum pavement width of 18-22 feet on low-traffic local streets in residential neighborhoods with narrower pavement widths along sections of roadway where there are no houses, buildings, or intersections and where on-street parking is not anticipated
- "Open section" roadways with roadside swales, with perforated curbs or "invisible curbs" where curbs are deemed necessary to protect the roadway edge
- Placement of utilities under the paved section of the right of way or immediately adjacent to the road edge (so that the land adjacent to the roadway can be used for swales)
- Permeable paving for sidewalks and road shoulders/parking lanes in residential neighborhoods, with use of conventional paving for travel lanes only
- Sidewalk placement on one side of the street only in low-density residential neighborhoods and flexible sidewalk layout (e.g., alternative pedestrian circulation layout that uses common areas, rather than street rights-of-way)

- Turn-around and cul-de-sac design strategies that include landscaped islands, smaller cul-de-sac radii of 30 to 40 feet and T-shaped hammerhead designs.

Existing Regulations/Potential Issues

Section 10.10.13.2 of the UDO addresses right-of-way and pavement widths requirements. The ordinance's minimum requirements for local streets are as follows:

Street Type	Detached House Lot Sizes (sq. ft.)						Multi-Dwelling		Commercial		Industrial	
	20,000 or less		20,001– 40,000		40,001+							
	ROW	PV	ROW	PV	ROW	PV	ROW	PV	ROW	PV	ROW	PV
5 or fewer lots												
Open Drainage	NA	NA	NA	NA	60[1]	22	NA	NA	NA	NA	NA	NA
Closed Drain.	60[1]	22	60[1]	22	60[1]	22	NA	NA	NA	NA	NA	NA
More than 5 lots												
Open Drainage	NA	NA	NA	NA	66	24	NA	NA	NA	NA	–	NA
Closed Drain.	60	24	60	24	60	24	60	24	60	24	60	24

[1] Right-of-way may be reduced to 50 feet based on topography if approval obtained from the Lake County Division of Transportation and the Township Highway Commissioner.

Possible Action

At a minimum of 24 feet, the County's minimum pavement width requirements are far better than many ordinances. Still, consideration should be given to accommodating additional flexibility or perhaps using the small subdivision (5 or fewer lots) standard (22-foot minimum) in more circumstances.

Sample Ordinances and Information Sources

Warrenville, IL: Sequestria Subdivision Planned Unit Development Permeable Pavement Public Street

This PUD developed in 2008 provided access to Landon Avenue by a 1,250-foot long public street (Garden View Court) terminating in a cul-de-sac. The pavement width has been reduced from the standard 27 feet to 25 feet (back-of-curb to back-of-curb). The radius of the cul-de-sac has been increased to the city's standard 50 feet at the request of the Warrenville Fire Protection District (WFPD).

Westchester County, NY: Bronx River Watershed Management Plan
Recommends reduced pavement widths for residential driveways and sidewalks, dedication up to 35% of parking lot stalls to compact cars, and reduce street widths to 22 feet where possible.

Stormwater Manager's Resource Center (SMRC)
The Stormwater Center's website contains several other examples of narrow streets used in cities and counties across the U.S.

State	Jurisdiction	Standard
Arizona	City of Phoenix	28'(parking on both sides)
California	City of Novato	24' (both sides, 2 to 4 du) 28' (both sides, 5 to 15 du)
Colorado	City of Boulder	20' (150 ADT) 20' (no parking, 350 - 1000 ADT) 22' (one side, 350 ADT) 26' (both sides, 350 ADT) 26' (one side, 500 - 1000 ADT)
Florida	City of Orlando	28' (both sides, res. lots <55' wide) 22' (both sides, res. lots >55' wide)
Michigan	City of Birming-ham	26' (both sides) 20' (one side)
Montana	City of Missoula	26' (both sides, 3 - 80 du) 32' (both sides, 81 - 200 du) 12' (alley)
New Jersey		20' (no parking, 0 -3500 ADT) 28' (one side, 0 - 3500 ADT)
Pennsylvania	Bucks County	12' (alley) 16-18' (no parking, 200 ADT) 20-22' (no parking, 200 - 1000 ADT) 26' (one side, 200 ADT) 28' (one side, 200 - 1000 ADT)
Tennessee	City of Johnson City	22' (<240 ADT) 24' - 28' (240-1500 ADT) 28' (>1500 ADT)
Wisconsin	City of Madison	27' (both sides, <3 du/ac) 28' (both sides, 3 - 10 du/ac)

Redevelopment, Waste Minimization and Material Reuse

This section focuses on building and development practices that focus on redevelopment of land and on the minimization of waste and, in turn, the need for virgin materials. Existing sites, buildings and materials have inherent "embodied energy" created during their development or production. If discarded, that energy is wasted and creates the demand for virgin materials which are more costly and have a greater impact on the environment to produce.

Brownfield Sites

Brownfield sites are contaminated building sites that require remediation and treatment of the ground before they can be safely reused. Due to the costs associated with the clean-up of brownfields, "greenfield" development typically costs less, which encourages sprawl. Redevelopment of Brownfield sites can reduce the need for new infrastructure, taking redevelopment pressure off of undisturbed natural land or farmlands (see also "Infill Development").

Waukegan, IL

Existing Regulations/Potential Issues

There are no provisions in Lake County codes or ordinances. Brownfield sites are mostly regulated by the U.S. Environmental Protection Agency.

Possible Action

Consider incentives to encourage remediation and redevelopment of brownfield sites.

Sample Ordinances and Information Sources

Chicago, IL: Department of Environment, Brownfield Redevelopment and Smart Growth

The program includes a screening process that determines whether a site is economically feasible to redevelop. When a site passes the screening criteria, principles of "smart growth" can be applied that include the use of mixed land uses, compact building design, walkable neighborhoods and attractive communities.

Wyandotte, MI: Brownfield Redevelopment Authority

The city established its Brownfield Redevelopment Authority (BRA) in 1997 pursuant to the Brownfield Redevelopment Financing Act, Public Act 381 of 1996, as amended. The Authority and the City Council are responsible for reviewing and adopting Brownfield Redevelopment

Plans to promote the revitalization of properties that are functionally obsolete, blighted or environmentally distressed throughout the city.

The BRA provides incentives to the private sector to play an active role in the revitalization of distressed real estate. These incentives allow utilization of tax increment financing for activities authorized under Act 381, including environmental site assessments, environmental remediation, building demolition, public infrastructure and site improvements. As of January 2009, the BRA and Council have approved eleven Brownfield Redevelopment Plans, that upon completion of construction, will facilitate more than $196 million in property investment, 232,300 square feet of new or renovated commercial and industrial space, 435 jobs and 163 housing units.

Building Reuse

Reuse of older buildings ranks very high as a sustainable development practice because of the energy and materials savings associated with reusing existing materials, also called "embodied energy." In fact, it is often said that the greenest building may be the one that is already built. Building rehabilitation and reuse also preserves architectural features and workmanship that may be impossible to replace.

Encouraging building rehabilitation and reuse that incorporates green and energy saving technologies will extend the useful life and reduce operating costs for older buildings. The reuse of older buildings can encourage redevelopment and reduce development pressure on natural lands and farmland. Reuse also reduces the need for new construction materials and the embodied energy associated with the production and shipment of new materials.

Existing Regulations/Potential Issues

The nonconformity regulations of the UDO (Art. 12) allow a fair amount of flexibility with regard to reuse, rehabilitation and expansion of nonconforming structures.

Possible Action

Consider revising the parking regulations of Sec. 9.1.1.2 and Sec. 9.1.1.3 to more easily accommodate reuse and expansion of existing buildings, by authorizing exemptions of partial exemptions under specified circumstances.

Sample Ordinances and Information Sources

New Jersey Rehabilitation Subcode (N.J.A.C. 5:23-6)
New Jersey's "rehabilitation code" was the nation's first comprehensive set of code requirements for existing buildings. It is codified as a stand-alone subchapter and, therefore, contains all the technical requirements that apply to a rehabilitation project.

The code won a national *Innovations in American Government Award* in the late 1990s. One year after its adoption, statistics showed that rehabilitation work in New Jersey's five largest cities increased by 60 percent, compared to an increase of less than two percent in the year before the code's implementation.

Material Reuse

This practice focuses on recycling or salvaging post-consumer building materials and reusing them in new buildings or projects. Successful application of this practice depends on allowances in the building code for reuse of salvaged materials. Increased reuse diverts construction materials from landfills and reduces the need for production of new materials, conserving natural resources and reducing greenhouse gases.

Material reuse ordinances typically mandate a percentage of the overall construction waste stream be diverted from landfills by a number of methods.

Existing Regulations/Potential Issues
There are no provisions in Lake County codes or ordinances.

Possible Action
Encourage programs that divert used construction materials from landfills into new construction projects. Consider expressly allowing commonly recycled materials for new construction.

Sample Ordinances and Information Sources

Chicago, IL: Construction and Demolition Waste Recycling, Chicago City Code Section 11-4-1905
The City of Chicago mandates that at least 50% of construction and demolition (C&D) waste, including bricks, masonry, ferrous, and non-ferrous metals, wood, gypsum drywall, glass, etc., must be diverted from landfills through on-site reuse or recycling at off-site facilities. The ordinance requires tracking of C&D waste for all permitted construc-

tion and demolition projects, with some minor exceptions. Not meeting the 50% diversion requirement results in fines for the contractor.

Madison, WI: Recycling and Reuse of Construction and Demolition Debris, Section 10.185

The Madison ordinance places different requirements depending on the type of construction. For wood frame construction projects, the contractor is required to recycle certain materials, e.g. wood, drywall, metal, shingles and cardboard. For steel and concrete construction the contractor is required to divert 70% of construction waste generated regardless of material type. The city certifies recycling facilities where construction waste can be sent by contractors.

Fort Bragg, CA: Construction and Demolition Recycling, Chapter 15.34

Fort Bragg uses a system similar to Madison's, with the diversion rate based on the type of project. Fort Bragg also specifies different diversion rates based on waste material types. Demolition projects, for example, must divert 75% of the waste tonnage of concrete and asphalt; and 15% of waste tonnage excluding concrete, asphalt and clean redwood. For reroofing projects, the diversion rate is 50% of wood, slate or stone waste by tonnage; 90% of metal roofing shingles; and fifty percent 50% of asphalt shingles.

Material Recycled Content

Materials with recycled components are typically defined by the following:

- Post-consumer material is defined as waste material generated by households or by commercial, industrial and institutional facilities in their role as end-users of the product, which can no longer be used for its intended purpose.
- Pre-consumer material is defined as material diverted from the waste stream during the manufacturing process. Reutilization of materials such as rework, regrind or scrap generated in a process and capable of being reclaimed within the same process that generated it are excluded.

The recycled content of some materials may be difficult to ascertain. However, because of growing public scrutiny and interest in sustainability, vendors and manufacturers are making these values more readily available.

Existing Regulations/Potential Issues
There are no provisions in Lake County codes or ordinances.

Possible Action
Encourage and allow recycled content in building materials.

Sample Ordinances and Information Sources

Evanston, IL: Green Building Ordinance, 124-O-09
For building projects that involve only interior renovations, Evanston's green building ordinance gives developers the option of meeting LEED for Commercial Interiors (LEED-CI) green building criteria (Silver rating or higher) or using the Evanston Sustainable Building Measures for Interior Renovations (ESBMIR). Under the ESBMIR approach, developers must employ sustainable building measures from a menu or list, which includes recycled content as one way to achieve required credits. The number of credits required varies by the size of renovation project.

San Diego County, CA: Green Building Incentive Program
The program offers incentives of reduced plan review turnaround time and a 7.5% reduction in plan review and building permit fees for projects meeting program requirements. To qualify for the incentives, the project must show that 20% or more of primary building materials being used contain, in aggregate, a minimum weighted average of 20% post-consumer recycled content materials (reused materials count as 100%) or show that at least one primary building material (such as roofing) is 50% or more post-consumer recycled content.

San Francisco, CA: Recycled Content Materials, Ordinance 53-07, Section 6.4 Amendment
The ordinance requires that bids specify recycled content materials to the maximum extent feasible (i.e., as allowed by California Building Code) for all public works contracts. It also provides language for tracking the amounts and types of recycled content materials.

Construction Materials Management

Construction Materials Management is the practice of minimizing construction waste and demolition debris that leaves construction site for landfill disposal. Implementation of construction materials management plans can help ensure reuse of materials, thereby helping reduce waste, greenhouse gas emissions and other adverse environmental impacts.

Existing Regulations/Potential Issues
The county amended the UDO in 2010 to allow construction and demolition debris recycling facilities (See UDO Sec. 6.3.14)

Section 4.4 of the Recycling Ordinance requires that at least 30% of construction and demolition debris be recycled.

Possible Action

Encourage new development projects to create a Construction Materials Management Plan.

Sample Ordinances and Information Sources

Lake County Recycling Ordinance: Construction Material Recycling

Lake County's recycling requires that at least 30% of construction and demolition debris be recycled or otherwise diverted from disposal in a landfill.

Lake County Recycling Task Force

Lake County's latest *Solid Waste Management Plan Update*, approved by the Lake County Board on April 13, 2010, recommends that Lake County and the Solid Waste Agency of Lake County (SWALCO) convene a task force to address the goal of increasing recycling rates in Lake County. A task force has since been established and the group is currently carrying out its directive to investigate, evaluate and develop recommendations on how SWALCO and Lake County can realistically achieve a 60% recycling rate by 2020. More information is available on the County's Recycling Task Force Webpage.

Rapidly Renewable Materials

Rapidly renewable materials have a replenishment rate that meets or exceeds the demand of that material and typically includes those that can be planted and harvested within ten years. Some common rapidly renewable materials used in the building industry include bamboo, cork, rubber and linoleum flooring; cotton insulation; wheatboard paneling; wool carpeting.

Many traditional building materials have high environmental and life cycle costs and are drawn from finite resources. Rapidly renewable materials typically have a smaller environmental impact due to their fast replacement rate. Substituting renewable materials over conventional materials provides environmental benefits. Economically, these materials, being mostly plant or animal based, provide a more stable manufacturing and harvesting. The use of plant-based plastics, for example, can lessen the dependence on petroleum-based plastics and the global uncertainty of petroleum supplies.

Existing Regulations/Potential Issues
There are no provisions in Lake County codes or ordinances.

Possible Action
Encourage or incentivize the use of rapidly renewable materials.

Sample Ordinances and Information Sources

Evanston, IL: Green Building Ordinance, 124-O-09
For building projects that involve only interior renovations, Evanston's green building ordinance gives developers the option of meeting LEED for Commercial Interiors (LEED-CI) green building criteria (Silver rating or higher) or using the Evanston Sustainable Building Measures for Interior Renovations (ESBMIR). Under the ESBMIR approach, developers must employ sustainable building measures from a menu or list, which includes use of rapidly renewable materials (minimum 2.5%) as one way to achieve required credits. The number of credits required varies by the size of renovation project.

San Diego, CA: Sustainable Building Policy, Policy No. 900-14
This is a formally adopted San Diego City Council policy that applies to new construction or major renovations that the city owns, occupies or leases. It includes a mixture of mandatory requirements and voluntary guidelines. One of the guidelines encourages use of rapidly renewable building materials (minimum 5%) in al new city facilities.

Composting

According to the U.S. Environmental Protection Agency, yard trimmings and food waste constitute a little over one-quarter of the U.S. municipal solid waste stream. Composting offers the benefits of resource efficiency and creating a useful product from organic waste that would otherwise have taken up space in a landfill.

Currently, there is a statewide ban in Illinois on the disposal of yard trimmings (e.g., grass clippings, leaves, etc.) in landfills. While many municipalities offer curbside pick-up of yard waste, more and more people are composting as a way to reduce their household waste stream, while also making useful mulch for their plants.

Existing Regulations/Potential Issues
Lake County, like most local governments, does not expressly regulate household or "backyard" composting.

The UDO regulates large-scale (e.g., commercial and municipal) composting operations as "waste-related uses." Special regulations exist for landscape

waste composting facilities, while other types of composting facilities are regulated in the same manner as landfills. (See the UDO's use regulations in Article 6)

Possible Action

Continue to encourage household composting.

Sample Ordinances and Information Sources

University of Illinois Extension

Information on household composting can be obtained from the University of Illinois Extension website.

Solid Waste Authority of Lake County (SWALCO)

Information about composting can also be obtained from SWALCO's website.

Construction-Phase Pollution Control

When creating sustainable buildings or developments, it is important to look at not only what sustainable elements and features are included in the final development but also how these structures are built. In the overall lifetime of a building or site development, construction is a very short duration event. However, construction activities can produce significant amounts of air and water pollution and solid waste. Because of this, responsible management of construction activities is an important early step that sets the tone for the ultimate development in terms of environmental sustainability.

Traditional construction practices tend to look at a construction site as a blank slate to be used (and abused) at the contractor's whim but within regulatory constraints. The primary focus of the regulations governing construction practices are to limit pollution from leaving the site or impacting neighboring sites. Beyond general safety and housekeeping issues, the condition of the site during construction and the lasting effects from it, such as soil compaction, are not usually addressed. Sustainable construction practices seek to limit these.

Land Clearing and Grading

When construction of an open site commences, a contractor usually clears the area salvaging anything of value and begins construction. Ideally, areas of concern should be identified on the design plans but are not always. There could potentially be many areas within a development that are environmentally significant and these areas should be identified by the designer and contractor prior to construction. By doing this in a more environmentally sensitive way, a land clearing and grading plan can be implemented that, for instance, preserves high value trees or recognizes habitat or open space that can be incorporated into the final development.

By minimizing the area disturbed by land clearing and grading, soil erosion and the water and air pollution associated with it can be reduced. The smaller disturbed construction area requiring soil erosion protection would be minimized and therefore fewer soil erosion control materials would be required. Limiting compaction of site soils also has a positive impact on post-development stormwater runoff because existing soil infiltration rates are not impacted. Maintaining open and natural existing areas ties the development back to the land and creates aesthetically pleasing environments for occupant use.

Existing Regulations/Potential Issues
Section IV.B.2.b.8 addresses soil erosion and sedimentation control plans.

Possible Action
Encourage or require practices that minimize disturbed construction areas and/or maintain open undeveloped areas within a development.

Sample Ordinances and Information Sources

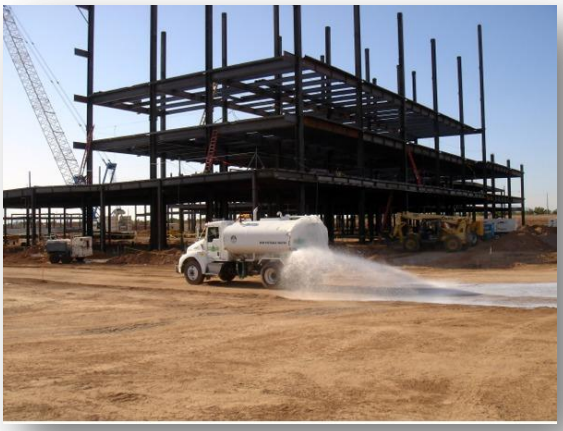
Lake County Watershed Development Ordinance
The Watershed Development Permits requirements of WDO Article IV contains many provisions governing land clearing and grading activities. See, for example, the Soil Erosion and Sedimentation Control Plan provisions of IV.B.2.b.8.

Concord, NC: Concord Development Ordinance, Section 9.11 Low Impact Development Standards
The ordinance includes provisions for submitting grading plans prior to land disturbance, minimizing grading and land clearing in erosion prone areas depending on soil types and slopes and minimizing land disturbance during construction.

Snohomish County, WA: Land Disturbing Activity (LDA) Permits, Snohomish County Code 30.63B
Snohomish County requires a grading and land clearing plan that shows the limits of land disturbance due to construction, tree preservation measures and standards for erosion control. Before development can occur, a LDA Permit must be obtained which allows for county approval and oversight on minimizing impacts due to construction.

Dust Management

Dust management or control relates to the practice of suppressing small solid particles from being emitted or migrating into the air stream, usually due construction activities. Airborne dust creates negative health impacts on the population, especially children, the elderly and those with respiratory problems. Dust also contributes to pollution of water bodies and can impact the health of nearby vegetation.



Existing Regulations/Potential Issues
Dust management is partially addressed through county erosion and sedimentation control regulations.

Possible Action

The county adequately addresses dust management as it relates to construction activities. However, consideration should be given to regulating other dust sources or industries (e.g., cement plants, quarries)

Sample Ordinances and Information Sources

USEPA: Model Ordinance Language, Erosion Control

Most dust management requirements are part of erosion control plans. This model ordinance by the USEPA includes a section on dust control.

Pennsylvania: Model Air Pollution Control Ordinance, Fugitive Dust Emissions

This is another model ordinance but taken from the broader perspective of dust emissions, not only from construction, but in daily facility operations. The model ordinance language covers regulated fugitive emissions, abatement, enforcement and penalties.

Coachella Valley, CA: Dust control Ordinance - Draft

In 2003, Coachella Valley had developed a comprehensive dust control ordinance and a Fugitive Dust Control Handbook. The 91-page handbook covers everything from dust control plans to wind monitoring to recordkeeping.

Outdoor Lighting

This section focuses on practices that reduce the energy spent and the light pollution created by outdoor lighting. Such practices can result in energy and cost savings and an improved nighttime environment.

Energy-efficient Lighting

Energy conservation in lighting relates to efficient lighting solutions that focus the use of light where and when it is needed with the level of brightness and appropriate light fixtures based on the type of place or space being lit. Efficient outdoor lighting utilizes advanced energy efficient light fixtures and lighting zones based on context, mandates dark sky technologies to preserve views and reduces wildlife impacts while minimizing energy waste. Wasted light increases light pollution, which harms wildlife, wastes energy and decreases the view of the night sky.

According to the U.S. Department of Energy's Energy Information Administration, lighting accounts for about 19% of the total electricity consumed by residential and commercial land use. Efficient lighting designed to eliminate glare, overlighting and light trespass reduces light pollution as well as energy use and operational costs.

Existing Regulations/Potential Issues

There are no relevant provisions in Lake County codes or ordinances.

Possible Action

Investigate alternative lighting strategies and systems for outdoor lighting applications. For public roadways consider energy efficient fixtures and lamps for street lighting and signals. Consider incentives for the use of LED or other high-energy efficiency streetlights or alternative energy sources (e.g., solar) or further outdoor lighting control

Sample Ordinances and Information Sources

California: Outdoor Lighting standards, Title 24, 2008 Building Energy Efficiency Standards

The California Energy Commission has developed a comprehensive, yet concise standard for outdoor lighting that includes specified lighting intensities and prescribed lighting controls that optimize energy efficiency. It describes requirements based on use and zones, and includes exceptions for safety and security reasons where applicable. 2008 Building Energy Efficiency Standards for Residential and Nonresidential Buildings (CEC-400-2008-001-CMF), effective January 1, 2010, Section 132 (p. 75): California Energy Commission.

Black Mountain, NC: Strategic Energy Management Plan, September 14, 2009
The Black Mountain Strategic Energy Management Plan (SEMP) establishes key elements and areas of focus to pursue in the areas specific to energy efficiency. The town plans on replacing all of their out-dated street lighting with LED fixtures with the help of their local utility program, Progress Energy Contract.

Downers Grove, IL: Prentiss Creek Subdivision, Hybrid Lighting
In 2009, Downers Grove, Illinois slated hybrid (wind and solar powered) LED streetlights for the Prentiss Creek subdivision. They are powered by photovoltaics, supplemented by a small wind turbine. Brooklyn, New York uses similar hybrid power streetlights.

Light Pollution

This practice involves regulating adverse impacts of artificial light. The most vocal proponent of such practices is the International Dark-Sky Association (IDA). Reduction of light trespass and sky-glow improves nighttime visibility, limits impacts on nocturnal environments and encourages energy conservation.

Existing Regulations/Potential Issues
Spillover lighting and light pollution issues are partially addressed in UDO Section 9.4 and 15.1.3.6.

Possible Action
UDO regulations are generally geared toward minimizing light trespass or spillover onto adjacent properties. Existing regulations for shielding may help reduce sky glow, but existing regulations fall short of "dark sky" goals. Consideration should be given to incentives for further outdoor lighting control.

Sample Ordinances and Information Sources

Illuminating Engineers Society of America and International Dark-Sky Association, Model Lighting Ordinance
The International Dark-Sky Association and the Illuminating Engineering Society of North America are jointly developing a model lighting ordinance to promote their ideas for strong, consistent outdoor lighting regulations.

Village of Homer Glen, Illinois

Homer Glen has adopted an outdoor lighting ordinance that advances many of the key principles of the International Dark Sky Association. The new ordinance and additional background information can be accessed from the Village's website.

Village of Barrington Hills, Illinois

Barrington Hills adopted its new Exterior Lighting Ordinance in January 2011. It mandates the use of fully shielded residential and nonresidential lighting and includes provisions for lighting controls and timers for things such as parking lots and sports fields.

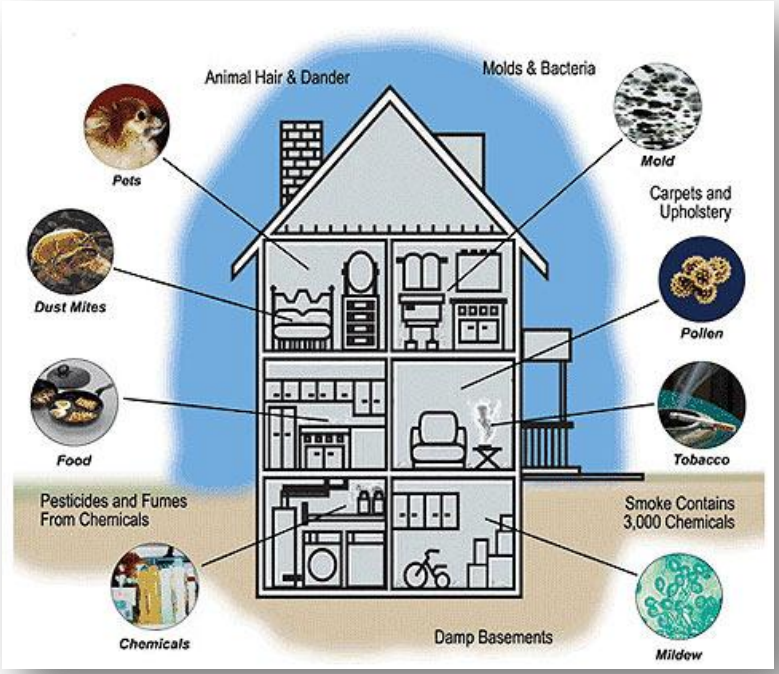
Indoor Environmental Quality (IEQ)

IEQ addresses the elements of our indoor environment that may not have an obvious impact on occupant well-being but have been proven to increase occupant productivity and comfort with lower employee turnover rates, fewer sick days and higher productivity. Schools demonstrate higher test scores, lower absenteeism and heightened academic enthusiasm among students. IEQ can enhance occupant well-being when buildings permit adequate ventilation, maintain clean air, comfortable temperatures, and allow individuals to have a sense of control over their own spaces.

IEQ best management practices can include operable windows, skylights and sliding doors and climate controls that can also promote comfort and conserve energy by allowing temperature changes only where needed. Certain building materials, such as paints, adhesives and carpeting, can emit harmful gases over long periods after installation and should be substituted with low-emitting materials. Indoor areas such as copy and chemical storage rooms can also have a negative impact on indoor air quality. Whole building ventilation systems that have dedicated monitoring devices and controls can alleviate poorly ventilated buildings as the air becomes stale throughout the day. All of these elements should be addressed for any occupied indoor environment.

Indoor Air Quality and Pollutant Source Controls

As stated in the introduction to this section, there are numerous elements that can be evaluated and considered for maintaining or improving the quality of indoor air. These may include, but are not limited to, permanent air monitoring and controls that are tied to building ventilation system, increased ventilation above code requirements, good management practices during construction, use of low emitting building materials. High-quality indoor air improved occupant well-being and employee productivity.



Existing Regulations/Potential Issues

There are no provisions in Lake County codes or ordinances.

Possible Action

Require or incentivize meeting the minimum requirements of sections 4 through 7 of ASHRAE 62.1-2004 and naturally ventilated buildings shall comply with ASHRAE 62.1-2004, paragraph 5.1. Encourage or incentivize systems or building configurations that limit exposure to indoor pollutants, similar to LEED requirements.

Sample Ordinances and Information Sources

Evanston, IL: Green Building Ordinance, 124-O-09

For building projects that involve only interior renovations, Evanston's green building ordinance gives developers the option of meeting LEED for Commercial Interiors (LEED-CI) green building criteria (Silver rating or higher) or using the Evanston Sustainable Building Measures for Interior Renovations (ESBMIR). Under the ESBMIR approach, developers must employ sustainable building measures from a menu or list, which includes use of low VOC finishes (e.g., paints, adhesives, carpet, furniture, composite wood) as one way to achieve required credits. The number of credits required varies by the size of renovation project.

Miami-Dade County, FL: Sustainable Building Program, Resolution No. R-1200-05

This resolution establishes Miami-Dade County's formal policy of incorporating sustainable development building measures (including IEQ) into the design, construction, renovation and maintenance of all County-owned, County-financed and County-operated buildings. Miami-Dade's requirements are tied to attainment of LEED ratings—"Silver" for all new construction and "Certified" for most renovations and remodels.

San Diego, CA: Sustainable Building Policy, Policy No. 900-14

This is a formally adopted San Diego City Council policy that applies to new construction or major renovations that the city owns, occupies or leases. It includes a mixture of mandatory requirements and voluntary guidelines, one of which (10.g) states that: "Newly constructed City facilities must show compliance with Federal and California IAQ standards by conforming to the latest published version of ASHRAE 62, Ventilation for Acceptable Indoor Air Quality standard."

Montgomery County, MD: Control and Prohibition of Indoor Air Pollution, County Code §3-10

Montgomery County's code prohibits "the emission of indoor air pollutants…in a manner that creates indoor air pollution." "Indoor air pollutants" and "indoor air pollution" are defined as follows:

> ***Indoor air pollutant:*** *Any substance whose indoor presence causes indoor air pollution. An indoor air pollutant may consist of particles such*

as dust, fibers, asbestos, or radon progeny; gases such as formaldehyde, carbon monoxide, mists, or bioaerosols; biological substances such as viruses, bacteria, fungi or molds; or combination of substances.

Indoor air pollution: *The indoor presence of any airborne substance, such as particles, fumes, mists, gases, or vapors or combination of substances likely to pose a health hazard to humans, plants, or animals or unreasonably interfere with the use and enjoyment of residential or non-residential property, including the ordinary conduct of business.*

Low-emitting Materials

Building materials and products (e.g., cleaning products, office equipment, etc.) used indoors are also potential sources of indoor environmental contamination. The potential for these chemicals, collectively known as volatile organic chemicals (VOCs), to cause adverse health effects depends on several factors including exposure and toxicity of the pollutant or mixture of pollutants. Formaldehyde, for example, is a common irritant found in many adhesives and carpeting. Carcinogens, such as vinyl chloride, are found in many plastics. Because of this, it is important to consider the emissions of the materials used indoors to lessen the potential impact of a product to indoor environmental quality and occupant health. Promoting the use of low-emitting materials can have positive health effects, improving occupant well-being and employee productivity.

Existing Regulations/Potential Issues

There are no provisions in Lake County codes or ordinances.

Possible Action

Encourage, require, or incentivize the use of low-emitting materials to reduce indoor air contaminants that are odorous, irritating and/or harmful to the comfort and well-being of installers and occupants.

Sample Ordinances and Information Sources

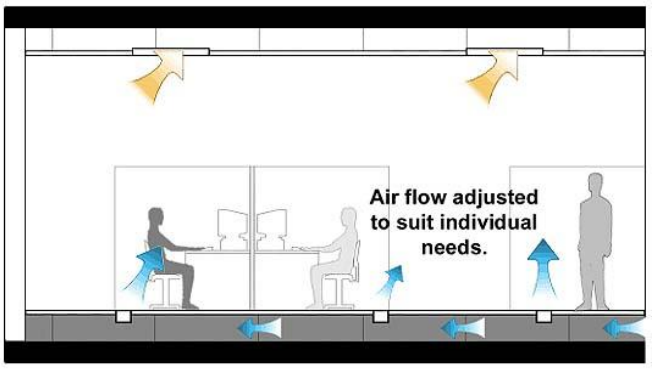
Evanston, IL: Green Building Ordinance, 124-O-09

For building projects that involve only interior renovations, Evanston's green building ordinance gives developers the option of meeting LEED for Commercial Interiors (LEED-CI) green building criteria (Silver rating or higher) or using the Evanston Sustainable Building Measures for Interior Renovations (ESBMIR). Under the ESBMIR approach, developers must employ sustainable building measures from a menu or list, which includes use of low VOC finishes (e.g., paints, adhesives, carpet, furniture, composite wood) as one way to achieve required credits. The number of credits required varies by the size of renovation project.

San Diego, CA: Sustainable Building Policy, Policy No. 900-14
This is a formally adopted San Diego City Council policy that applies to new construction or major renovations that the city owns, occupies or leases. It includes a mixture of mandatory requirements and voluntary guidelines. Guideline 10.b, for example, encourages "use of low-emitting volatile organic materials, including adhesives, paints, coatings carpet systems, composite wood and agrifiber products."

Thermal Comfort

Occupant thermal comfort can be accomplished by providing occupants with means of controlling their local air temperature, air speed or humidity using operable windows, thermostats, adjustable diffusers, or similar devices. This controllability should be provided at occupant workspaces and shared multi-occupant spaces to gain maximum benefit. In addition, thermal comfort controls should be designed to comply with ASHRAE Standard 55. Better thermal comfort through design and controllability of systems promotes improved occupant well-being and employee productivity.



Existing Regulations/Potential Issues
There are no provisions in Lake County codes or ordinances.

Possible Action
Encourage, require, or incentivize a comfortable thermal environment that supports the productivity and well-being of building occupants.

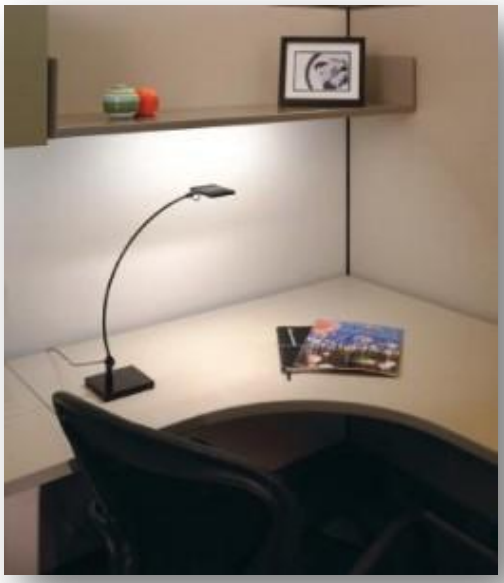
Sample Ordinances and Information Sources

Illinois: Capital Development Board, Healthy Schools
The Illinois CDB and Illinois State Board of Education prepared a resource guide for Healthy, High Performance School Building in 2006. Noting that healthy learning environments improve student performance, the CDB and SBE compiled guidance for administrators and community members to promote indoor environmental quality practices, such as thermal comfort, that are sustainable and effective. To meet the high performance standards, schools would have to meet the ASHRAE 55 Standard.

California: Thermal Comfort standards, Title 24, 2008 Building Energy Efficiency Standards
The California Energy Commission promotes the application of ASHRAE Standard 55 for buildings.

Lighting Controllability

Lighting controllability means enabling lighting adjustments that meet the individual needs and preferences of occupants, including the provision of individual task lighting. Lighting controllability promotes improved occupant well-being and employee productivity through the ability to customize individuals' work spaces to their personal preferences.



Existing Regulations/Potential Issues

There are no provisions in Lake County codes or ordinances.

Possible Action

Encourage, require, or incentivize individual lighting controls for 90% (minimum) of the building occupants to enable adjustments to suit individual task needs and preferences. Require or incentivize lighting system controllability for all shared multi-occupant spaces to enable lighting adjustment that meets group needs and preferences.

Sample Ordinances and Information Sources

Evanston, IL: Green Building Ordinance, 124-O-09

For building projects that involve only interior renovations, Evanston's green building ordinance gives developers the option of meeting LEED for Commercial Interiors (LEED-CI) green building criteria (Silver rating or higher) or using the Evanston Sustainable Building Measures for Interior Renovations (ESBMIR). Under the ESBMIR approach, developers must employ sustainable building measures from a menu or list, which includes the provision of automatic daylighting controls as one way to achieve required credits. The number of credits required varies by the size of renovation project.

San Diego, CA: Sustainable Building Policy, Policy No. 900-14

This is a formally adopted San Diego City Council policy that applies to new construction or major renovations that the city owns, occupies or leases. It includes a mixture of mandatory requirements and voluntary guidelines several of which address indoor lighting.

Daylight and Views

Improved indoor environments can be accomplished by using natural lighting and outdoor views to be made available to occupants. This can be achieved by the use of larger windows, clerestory windows, skylights and placement of occupants within the indoor space to have access to the out-

door views and daylighting strategies. The availability of natural lighting in an indoor environment has been shown to increase worker productivity. Flooding the interior spaces with natural lighting also reduces the need for artificial lighting which may help reduce a building's energy consumption.

Existing Regulations/Potential Issues

There are no provisions in Lake County codes or ordinances.

Possible Action

Encourage, require, or incentivize a connection between indoor spaces and the outdoors through the introduction of daylight and views into the regularly occupied areas of a building.

Sample Ordinances and Information Sources

San Diego, CA: Sustainable Building Policy, Policy No. 900-14

This is a formally adopted San Diego City Council policy that applies to new construction or major renovations that the city owns, occupies or leases. It includes a mixture of mandatory requirements and voluntary guidelines. Guideline 10.h, for example, calls for designs that "take maximum advantage of passive and natural sources of heat, cooling, ventilation and light." [emphasis added]

Food Supply

Ensuring that people have access to healthy, safe and affordable food is a basic tenet of sustainability. This section describes current and possible future efforts aimed at increasing access to local food sources.

Local Food Production

The Lake County Caliper reported in November 2007 that Lake County lost 8,500 acres of farmland from 2000 to 2005. The report estimates that farmland now represents slightly over 10% of Lake County's land use inventory. Moreover, the small amount of agricultural land remaining in the County is mostly devoted to the growing of corn and soybeans, primarily for national and international markets. The net result is that locally produced food is not widely available in Lake County.

Strategies aimed at increasing access to local food sources have several sustainability benefits. They help:

- increase the availability of fresh (typically healthful) foods, especially to lower income residents and underserved communities;
- reduce energy use and the negative environmental effects of industrialized food production, transportation and distribution;
- ensure that food sources are available in times of emergency or crisis; and
- support efforts to preserve open space and preservation of agricultural land.

Efforts to promote safe, secure and local food sources go beyond gardens. Increasingly, even in dense urban centers, regulations are being relaxed or put in place to allow the keeping of chickens and bees on residential lots.

Existing Regulations/Potential Issues

The UDO (Sec. 4.3.2.6) expressly allows use of common open space and deed restricted open space areas for community gardens. Additionally, the ordinance allows the "raising of crops" as a use permitted by right in all zoning districts. Farmer's markets and seasonal sales stands are the most common consumer sales and distribution outlets for locally produced food. Sales

stands are allowed as temporary uses in all Lake County zoning districts. Farmer's markets are classified as "neighborhood-oriented retail sales and service uses," which is an allowed use in all commercial and industrial zoning districts.

The UDO regulates the raising of farm animals and bees (apiaries) under the broad use classification of "agriculture." Under the existing ordinance, farm animals and apiaries are allowed in all zoning districts on lots of at least 200,000 square feet in land area.

Possible Action

Although existing regulations do not appear to pose any real barriers to gardening and food production, the County's support for sustainable agriculture could be increased by expressly allowing community gardens, market farms, community-supported agriculture farms and farmer's markets. When it comes to raising farm animals, such as chickens, and keeping bees, the existing ordinance is quite restrictive. Consideration should be given to greatly relaxing existing lot area requirements when it comes to keeping a small number of chickens and to allowing beekeeping in a greater number of districts on much smaller lots.

Sample Ordinances and Information Sources

Lake County Unified Development Ordinance

The Lake County UDO accommodates agriculture and community gardening uses. Section 4.3.2.6, for instance, expressly allows use of common open space and deed restricted open space areas for community gardens. Additionally, the ordinance allows the "raising of crops" as a use permitted by right in all zoning districts. Sales stands are allowed as temporary uses in all Lake County zoning districts. Farmer's markets are classified as "neighborhood-oriented retail sales and service uses," which is an allowed use in all commercial and industrial zoning districts.

Kansas City Zoning and Development Code: Urban Agriculture Amendments

Kansas City amended its zoning and development code in 2010 to expressly permit household gardens, community gardens, market farms and community-supported agriculture uses. The new regulations address where such uses may be located, where on-site sales are allowed and several other relevant issues.

Missoula Zoning Ordinance: Landscape Area Requirements for Multi-family Development

As in many jurisdictions, Missoula requires landscaping on the site of multi-family residential development. Missoula's zoning ordinance is unusual, however, to the extent that it expressly allows garden space to be counted toward satisfying general site landscaping requirements (§20.065.020.C)

Evanston, IL: Backyard Hens and Beekeeping

The City of Evanston has amended its code in recent years to allow both beekeeping and the raising of hens.

Salt Lake City, UT: Chicken Ordinance and Beekeeping Ordinance

Salt Lake City changed its ordinances in 2010 to relax restrictions and allow residential chicken coops and beekeeping. Residents who qualify are now permitted to raise chickens for the purpose of eggs and bees for the purpose of honey. See also the city's birds and bees webpage.

Cleveland, OH: Chickens and Bees Ordinance

Cleveland passed its chicken and beekeeping ordinance in 2009 as part of its efforts to enhance the city's urban character and make it more competitive by creating dense, mixed-use urban clusters made more desirable by proximity to such open space uses as urban gardens and urban farms.

See also, *How U.S. Cities are Using Zoning to Support Urban Agriculture* (Land Stewardship Project).

Incentive-Based Approaches to Promoting Sustainability

In addition to environmental benefits, there are several potential economic benefits to green building and sustainable development strategies, including reduced operating costs, increased return on investment, increased productivity and human health, and enhanced image and marketability. Local government incentive measures can also play an important role in stimulating property owners and developers to consider creative, sustainable solutions to building and development challenges.

The most common ways that local governments encourage green building is through development (standards or process) incentives and financial incentives. Also common are official green recognition programs often accompanied by plaques designating achievement levels and governmental assistance in marketing a project's green attributes. Rewarding builders, developers and homeowners who elect to employ sustainable building practices has proven to be a very popular and effective way to encourage use of green building practices.

The University of Wisconsin Extension's Green Building Programs Inventory includes information on 113 local government green building programs, including several that use an incentive-based approach to promoting "green."

Development Incentives

Expedited Plan/Permit Approval

Reducing the duration of development review and permitting processes can also provide great dividends to developers in the form of decreased financing costs. Through such incentive programs, qualifying green buildings are given priority reviews over other applications, often with guaranteed review times. Expedited permitting is a very common incentive used by local governments, but its potential as a development incentive is limited in those jurisdictions, such as in Lake County, where the permit and plan approval process is already highly streamlined and efficient.

> **Bellingham, WA: Expedited Permit Process for Green Buildings**
>
> In 2010 the City of Bellingham launched a pilot program to encourage and support green building projects by reducing building permit review time for certified green projects and assigning them special green project staff expeditors. The pilot program, which is locally referred to as the "Bin-Bump-Up" program, decrease standard permit review times for eligible projects by one "bump." For example, a project that typically would be eligible for 28-day review is "bumped-up" to a seven-day review. Qualified green projects are also eligible to work with the city's new Green Project Review Team, to identify potential code conflicts between the project's concepts and City building codes. See Bellingham's

Green Building & Sustainable Development Incentives Website for more information.

Chicago, IL

The City of Chicago's Green Permit Program provides developers and owners with an incentive to build green by streamlining the permit process timeline for projects that are designed to maximize indoor air quality and conserve energy and resources. Projects that have been accepted into program can receive permits in 15-30 business days. Projects that meet the most stringent sustainability guidelines can also qualify for a reduced (out-sourced, consultant) permit review fees of up to $25,000.

Acceptance into the city's Green Permit Program is contingent on meeting one of two tiers of Green Building Certification:

- Commercial projects and large residential/mixed-use projects must earn various levels of certification for their respective LEED (Leadership in Energy and Environmental Design) rating system.
- Small residential projects must earn a two-star or greater rating system under the Chicago Green Homes program.

Density Bonuses and Increased Flexibility

The other common development incentive is added project density and/or design flexibility. Thse types of incentives are typically offered in the form of additional residential density, additional nonresidential floor area, additional building height, reduced building setbacks, reduced off-street parking requirements, or expedited plan/permit approval.

Bloomington, IN: Flexible Building Setbacks and Density Bonuses

The City of Bloomington recognizes sustainability as a key component of nurturing Bloomington's long-term environmental, economic and social integrity. As one way to promote sustainability, the city's Unified Development Ordinance offers developers bonuses and flexible development allowances for projects that include sustainable features.

Under the terms of the Bloomington ordinance, development and building incentives are based on the following a three-tier system, with bonuses tied to the number of sustainable features included in the project:

Incentive Level	Sustainable Features [1]	Bonuses	
		Residential Districts	Nonresidential Districts
Level 1	2 energy and resource efficiency features	Side setback reduction	Side setback reduction

Incentive Level	Sustainable Features [1]	Bonuses	
		Residential Districts	Nonresidential Districts
	1 landscape and site design feature	Rear setback reduction	Rear setback reduction
	1 public policy feature		25% density increase
	1 public transportation feature		
Level 2	3 energy and resource efficiency features	Side setback reduction	Side setback reduction
	2 landscape and site design features	Rear setback reduction	Rear setback reduction
	2 public policy features		50% density increase
	2 public transportation features		
Level 3	At least 4 energy and resource efficiency features	Side setback reduction	Side setback reduction
	2 landscape and site design features	Rear setback reduction	Rear setback reduction
	2 public policy features		75% density increase
	2 public transportation features		
	Allocation of at least 15% affordable housing units		

[1] "Sustainable features" include:

- **Energy and resource efficiency.** Features that meet the energy and resource efficiency goal include green roof, improved building performance rating, use of non-polluting and/or renewable on-site energy sources, recycling and/or salvaging at least 50 percent of non-hazardous construction and demolition debris, or utilizing building materials and products sourced within a 500 mile radius.
- **Landscape and site design.** Qualifying designs include the use of at least 25 percent permeable pavement, utilization of natural vegetation and other techniques to convey and filter storm water, employ systems to recycle at least 50 percent of greywater and storm water, retention of 90 percent of area tree canopy, and/or conservation of land with a slope of 12 percent or greater.
- **Public policy.** Public policy commitments include incorporating mixed use development, providing 100 percent of the required long-term bicycle parking spaces, decreasing automobile parking while increasing bicycle parking, and providing subsidized Bloomington Transit passes or a private van or shuttle.
- **Public transportation.** Qualifying projects located near a transit stop, activity center, downtown, public school or park, or multi-use trail.

For a full description of Bloomington's incentive program, see Section 20.05.059 of the city's Unified Development Ordinance.

Financial Incentives

Direct financial incentives are also used by state and local governments to encourage green building.

Development Review/Permit Fee Reductions

Some local governments offer fee reductions or waivers for builders and developers who commit to employ qualifying sustainable building practices.

Other Financial Incentives

Other direct financial incentives are sometimes offered in the form of grants, tax credits, revolving funds or low-interest loans.

> **Northbrook, IL: Green Building Initiative, Permit Fee Rebate for LEED**
> Northbrook adopted its Green Building Initiative ordinance in 2008. Under the voluntary program, builders who construct new buildings or remodel an existing building to LEED standards is eligible for incentives. The incentives include permit fee rebates, expedited permitting and review over all other non-enrolled applicants, and recognition from the village. Fee rebates of 10, 20, 30 and 40% are offered to projects that obtain Certified, Silver, Gold or Platinum status, respectively.
>
> **Issaquah, WA: Sustainable Building Incentives**
> The City of Issaquah places a high priority on protecting the natural environment through sustainable development practice. To promote such practices, the city has offers several incentives and has prepared guides to residential and commercial building incentives that are available to local builders and developers. The incentives include water utility rebates, energy rebates, technical assistance and expedited permit reviews.

Using Incentives to Encourage Sustainable Practices in Lake County

Many of the sustainable building and development practices described in this report require no direct intervention by local government. Others can be encouraged by relatively straight-forward ordinance amendments that remove unintended regulatory barriers. Development and financial incentives should also be considered as a means of promoting more sustainable building and development.

The following chart illustrate some possible ways in which several of the development practices described in this report could be encouraged by Lake County and other local governments.

Development Practice	Increased Density/Floor Area	Reduced Building Setbacks	Increased Building Height	Reduced Parking Ratios	Reduced Review Fees	Expedited Approval/Processing
Cool Roofs and Pavements (p. 12)	✓		✓	✓	✓	✓
Infill Development (p. 20)				✓	✓	✓
Transit-Oriented Development (p21)	✓	✓	✓	✓	✓	✓
Travel Demand Management (p. 22)				✓	✓	✓
Transit-Supportive Development (p.23)		✓		✓	✓	✓
Connectivity (p. 24)		✓			✓	✓
Walkability (p.26)		✓			✓	✓
Tree Planting and Preservation (p. 37)		✓		✓	✓	✓
Conservation Subdivisions (p.38)					✓	✓
Low Water Use Landscaping (p. 43)					✓	✓
Efficient Irrigation Systems (p. 44)					✓	✓
Turf Area Management (p. 46)					✓	✓
Bioretention (p. 51)					✓	✓
Green Roofs (p. 53)	✓	✓	✓		✓	✓
Brownfield Sites (p. 61)	✓	✓	✓	✓	✓	✓
Building Reuse (p. 62)	✓			✓	✓	✓

Local Certification and Green Builder Recognition Programs

The most recognized organization that comprehensively addresses "certification" of green or sustainable buildings and developments is the U.S. Green Building Council and its Leadership in Energy and Environmental Design (LEED) program. Several communities around the country use LEED certification as a method to confirm that projects are sustainable, and some as noted earlier link incentives to the various LEED levels. An alternative approach is to have county and municipal planners and inspectors review and confirm that a project has incorporated sustainable features based on approved regulations and standards.

Austin, TX: Austin Energy Green Building

In 1990, The City of Austin established the nation's first green building program. Key components of the program are on-line specific rating systems that allow professionals to not only rate or rank a project's sustainable features, but also track and coordinate projects. Single and multi-family residential projects as well as commercial project have separate rating systems and guide books with detailed standards.

Appendix A: Project Summary and Activities

Project Summary

Lake County received a grant from the US Department of Energy through the Energy Efficiency and Conservation Block Grant Program in 2010. The Planning, Building & Development Department, along with a consulting team of The Lakota Group, Duncan Associates and Primera, developed model Sustainable Building and Site Development Standards for the County and its municipalities. The goal of the project was to develop sustainable construction and site development best management practices. The model guidelines and standards focus on the following major topics:

- Protection of natural resources and their functions;
- Energy conservation and renewable energy production;
- Waste minimization;
- Material reuse and recycling;
- Water conservation and water quality;
- Protection and improvement of air quality; and
- Promotion of sustainable business practices.

Community Outreach

Initial public input for the project was gathered from local municipalities and industry professionals, as these groups are the most impacted by the standards. The Sustainable Building & Site Development Standards project outreach began with a focus group of County staff to provide input on the project mission, goals and the project's evolution. This was followed by two focus groups of stakeholders representing municipalities, engineers and architects. Input from all groups helped shape the document from its earliest stages.

Project Timeline

RFP #10030 deadline	February 24, 2010
County Board resolution	April 13, 2010
Project start meeting	May 20, 2010
County Staff Focus Group	July 16, 2010
Stakeholder Focus Group	August 11, 2010
Project meetings	November 19, 2010
	December 13, 2010
	February 18, 2011
RPC Annual Meeting	January 18, 2011
Stakeholder Focus Group	February 25, 2011

Project meeting	April 29, 2011
Regional Planning Commission	June 21, 2011
Stakeholder Focus Group	September 23, 2011
Planning , Building and Zoning Committee	December 6, 2011
County Board Committee of the Whole	December 9, 2011

County Staff Focus Groups—July 16, 2010

Expertise from various county departments was sought in order for the model standards to be as comprehensive as possible. Four sessions during the day focused on: Social Media Interaction, Sustainable Concepts, Implementing Sustainability and, Regulations and Incentives. The Social Media Interaction group focused on how to market and spread the word on the Sustainable Building and Development Standards project. The Sustainable Concepts discussion revolved around what sort of sustainable strategies will work in Lake County and what is most practical for this region. The session on Sustainable Concepts focused on ways to implement sustainable building practices and barriers to practicing sustainable development. The day ended with a session on Regulations and Incentives, brainstorming different motivations to build sustainably that the County could implement.

Many topics reoccurred in staff's discussion throughout the day, especially monetary themes. For example, how to communicate that using sustainable building features can be cost-effective? The following is a summary of the broad topics and discussions from the day:

- Use of social media outlets including Facebook, Twitter, project website, press releases and e-newsletters good ways to spread message; message should be practical and clear, including how the project will benefit the public;
- Sustainable concepts to include in the final product such as building energy audits, water conservation; permeable pavement and native landscapes;
- Ideas to implement sustainable building in Lake County was promoting the adaptive re-use of historic structures and reusing infrastructure to save on cost and avoid sprawl, including reinvesting in older communities as a potential strategy;
- Regulations and incentives include recognition for using green features in a Lake County specific program similar to plaques on historic homes, promoting local job creation and retention (businesses remaining in Lake County to be sustainable) and, relax fee structures.

Stakeholder Focus Group—August 11, 2010

Industry stakeholders were invited to attend a focus group at the Ryerson Woods Welcome Center in Riverwoods, a LEED Platinum building. The first

session of the day involved municipal officials and other public agencies from across Lake County and gathered ideas on sustainable issues which can be addressed by building codes. The second session gathered industry stakeholders including architects, builders and engineers, to provide their own expertise on sustainable issues. Participants agreed it was important for Lake County to take the lead on a project of this nature and appreciated the comprehensive approach. The focus group sessions each concluded with a tour of the Ryerson Woods Welcome Center and its green features.

Overall, many discussion topics came back to the issue of education – for municipalities, developers and homeowners. Municipalities have limited funds, staff and training to enforce codes, especially if the codes will be updated to incorporate sustainability. Up-front training that proves green practices are reliable and can be cost effective are necessary to "sell" a builder or developer. Energy audits were also put forth as a means to bring houses up to EnergyStar compliance. The Illinois State Plumbing Code was identified as a huge barrier to harvesting rainwater for reuse, although some projects have collected rainwater successfully as pilot projects for the state, including the Ryerson Woods Welcome Center. The dialogue also involved different programs and efforts that the municipalities are undertaking to go green. In particular, Highland Park was able to discuss its own initiatives and lessons they have learned along the way. The Solid Waste Agency of Lake County (SWALCO) explained ways it is working to achieve a goal of 60% waste diversion from landfills, through building new facilities to changing legislation.

Stakeholder Focus Group—February 25, 2011

A second focus group session for stakeholders was convened in order to collect comments and opinions regarding a draft report. Priority discussion centered on what could be missing from the document. Participants were sent a draft report to review ahead of time. Different communities have different needs and the group felt this document is a good start toward approaching sustainability. Group members offered suggestions for several local and national examples of existing codes and resources to draw from in the report. A discussion on various incentive opportunities and exemplary national incentive programs followed. Issues of public education and fiscal concerns resurfaced as important matters to consider as the project moves forward.

Stakeholder Focus Group—September 23, 2011

A third focus group session for stakeholders was convened in order to collect comments and opinions regarding the nearly final draft report. Attendees included developers, property managers and environmental consultants. Participants were provided with a copy of the draft report in advance of the focus group meeting. Discussion at the meeting focused on what implications the sustainable practices would have on property owners, de-

velopers and property managers. The issue of whether sustainable practices would add unnecessary costs to project develop was discussed. Representatives were in general agreement that sustainable development and building practices can result in cost savings (operational costs and some construction costs), but most wanted to see more information about savings before ful implementation of the report's recommendations. Many cautioned that sustainable practices should not duplicate the required conventional practices and therefore increase the costs of development. The group discussed frustration in working under different standards from one jurisdiction to another. Participants expressed hope that many of the practices recommended in the report could be adopted across different jurisdictions to provide some consistency in regulations and permitting. The group also favored using incentives wherever possible (rather than requirements), in order to make sustainable practices more appealing.

Appendix B: Sustainable Projects in Lake County

Following is a list of developments in Lake County known to have incorporated sustainable design and building features. They include commercial, corporate, institutional and residential buildings. Many have received recognition through the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) program, which is a comprehensive set of sustainable practices and certifications.

LEED Certified Projects

Project	Location	LEED System	Level
Abbott Labs AP 34	Abbott Park	LEED EB O&M	Gold
Abbott Labs AP 32 Renovation	Abbott Park	LEED CI 2.0	Gold
Great Lakes Naval Training Center (Atlantic Fleet Drill Hall No 3)	Great Lakes	LEED NC 2.2	Gold
Great Lakes Naval Training Center (Camp Porter Barracks)	Great Lakes	LEED NC 2.2	Silver
BOA Barrington/Deer Park	Deer Park	LEED-CI v2009	Silver
Convia	Buffalo Grove	LEED CI 2.0	Gold
WW Grainger Inc., Headquarters	Lake Forest	LEED EB O&M	Gold
Lincolnshire Office Center	Lincolnshire	LEED CS 2.0	Gold
Pepper Construction Company HQ Specialty Group Office	Barrington	LEED CI 2.0	Certified
Prairie Crossing - Station Village	Grayslake	LEED ND 1.0 Pilots Only	Certified
Prairie Crossing Charter School	Grayslake	LEED NC 2.1	Gold
Takeda Pharmaceuticals Building III	Deerfield	LEED NC 2.2	Gold
Takeda Pharmaceuticals North America Headquarters	Deerfield	LEED NC 2.1	Gold
Tri-State Parkway, Lot	Gurnee	LEED CS 2.0	Silver
Two Conway Park	Lake Forest	LEED EB O&M	Silver
Verizon Wireless Store	Vernon Hills	LEED-CI v2009	Silver
Ryerson Woods Welcome Center	Riverwoods	LEED NC	Platinum
Chipotle Mexican Restaurant	Gurnee	LEED NC	Platinum

LEED Registered Projects

Project	Location	LEED System
Colliers International	Deerfield	LEED-EB:OM v2009
2150 E Lake Cook Riverwalk I	Buffalo Grove	LEED-EB:OM v2009
2100 E Lake Cook Riverwalk II	Buffalo Grove	LEED-EB:OM v2009
2121 Waukegan Road	Bannockburn	LEED-EB:OM v2009
218 S. Lake Shore	Mundelein	LEED for Homes (Single Family) 1.0
25 Tri-State International	Lincolnshire	LEED-EB:OM v2009
75 Tri-State International	Lincolnshire	LEED-EB:OM v2009
463 Central	Highland Park	LEED CS 2.0
Abbott Laboratories BUILDING AP35/36	Abbott Park	LEED NC 2.1
AP12 Visitor Center	Abbott Park	LEED-NC v2009
AP4 FP-2 Office Renovation	Abbott Park	LEED-CI v2009

Project	Location	LEED System
Adlai E Stevenson High School	Lincolnshire	LEED-EB:OM v2009
BEQ, Great Lakes Naval Training Center	Great Lakes	LEED NC 1.0
Baxter Healthcare: Fitness Center RL	Round Lake	LEED-NC v2009
Brainerd Community Center	Libertyville	LEED-NC v2009
1733 Rosemary Road	Highland Park	LEED for Homes (Single Family) 1.0
Deerbrook Corporate Center	Deerfield	LEED EB O&M
Hospice of NE IL	Barrington	LEED NC 2.2
Lake Bluff Corporate Center	Lake Bluff	LEED CS 2.0
Kohls Department Store	Lake Zurich	LEED-EB:OM v2009
Lake Forest Hospital ASTC	Grayslake	LEED NC 2.2
Central Elementary School	Lake Bluff	LEED for Schools 2.0
Perceptive Informatics	Deerfield	LEED-CI v2009
SBT Executive Briefing Center	Buffalo Grove	LEED CI 2.0
Takeda Childcare Center	Deerfield	LEED-NC v2009
USD 125 Administration Building	Lincolnshire	LEED CI 2.0
WRF Administration Building	Deerfield	LEED-NC v2009
Walgreens Executive Offices	Deerfield	LEED-CI v2009
Woodland School District 50 - Primary	Gages Lake	LEED-EB:OM v2009
YCC Green Build 1	Waukegan	LEED for Homes (Single Family) 1.0

Non-LEED Projects

Non-LEED Projects	Location
Habitat for Humanity	Waukegan
Habitat for Humanity 20th Anniversary House	Waukegan
Lake County Central Permit Facility	Libertyville

Index

A

ADU, 19, 20
alternative energy, 4, 10, 12, 73
Alternative Energy Task Force of Lake County Communities, 4, 10, 12

B

bees, 83, 84, 85
bicycle, 23, 27, 28, 29, 30, 89
bioretention, 50, 51, 52, 53, 57
BMP, 46, 51, 52, 53
brownfield, 61
building reuse, 21

C

chickens, 83, 84, 85
cistern, 41
compact car, 60
composting, 67, 68
connectivity, 21, 24, 25, 26, 27
conservation subdivision, 38, 39
construction materials management, 65
cool roof, 12, 13
cul-de-sac, 26, 53, 57, 58, 59
curb and gutter, 56

D

daylight and views, 8, 9, 81
density, 17, 21, 22, 24, 38, 39, 54, 58, 88, 89
Department of Energy, ii, 4, 10, 73, 93
dust management, 71

E

ecoroof, 54
electric vehicle charging station, 31, 32
embodied energy, 61, 62
energy conservation, 3, 10, 16, 74
exterior insulation, 14

F

fertilizer, 50, 51
filter strip, 50
financial incentive, 47, 87, 90
fuel-efficient, 30, 31

G

garden, 54, 85
geothermal energy, 11, 12
green roof, 13, 53, 54, 89
groundwater, 11, 41, 50

H

heat island, 12, 13, 53, 54, 55
hillsides, 36
home occupation, 18, 19, 20
HOV, 23

I

idling restriction, 33, 34
individual metering, 47
indoor air quality, 76, 88
indoor environmental quality, 78, 79
infill, 5, 20, 21
infiltration, 49, 52, 56, 69

L

Lake Michigan, 41, 42
land clearing and grading, 69, 70
LEED, 7, 9, 18, 25, 30, 65, 67, 77, 78, 80, 88, 90, 91, 94, 97, 98
light pollution, 73, 74
light shelves, 9
low water use landscaping, 43, 44
low-emission, 30
low-emitting materials, 76, 78

M

mixed-use, 17, 18, 21, 22, 47, 56, 85, 88

N

native plant, 39, 40, 44
natural resources, 17, 35, 38, 44, 56, 57, 63, 93
net metering, 3, 10

O

off-street parking, 30, 32, 55, 56, 88
on-site facilities for cyclists, 28
open space, 26, 35, 36, 38, 39, 40, 69, 83, 84, 85
outdoor lighting, 73, 74, 75

P

parking stall, 55
pavement width, 58, 59, 60
pedestrian, 21, 23, 24, 26, 58
permeable pavement, 52, 53, 89, 94
phosphorus fertilizer, 50
pool heater, 16
predevelopment hydrology, 49
PUD, 17, 53, 59

R

rain barrel, 41, 42
rain garden, 52, 56
rain gardens, 52, 56
rainwater harvesting, 41, 42
rainwater reuse, 41
rapidly renewable materials, 66, 67
recycling, 63, 64, 65, 66, 89, 93
redevelopment, 20, 21, 61, 62
renewable energy, 3, 10, 16, 55, 93
riparian buffer, 35

S

safe routes to school, 28
sedimentation, 36, 70
sidewalks, 23, 26, 27, 45, 58, 60
solar access, 4, 5, 6, 7
solar collector, 3
solar orientation, 7
solar panel, 3, 4
solar reflectance, 12, 13
solar shading, 6, 7, 8
solar thermal, 16
steep slope, 36, 37
stormwater management, 35, 36, 40, 49, 51, 53
stormwater runoff, 35, 38, 41, 49, 50, 51, 52, 54, 55, 56, 58, 69
street width, 60

T

thermal comfort, 79
thermal efficiency, 16
transit, 17, 21, 22, 23, 24, 27, 33, 55, 56, 89
transit-oriented development, 21, 22
transit-supportive development, 24
travel demand management, 22
tree planting, 38, 58
tree preservation, 38, 70
turf area management, 46

W

walkability, 26
walking, 17, 21, 23, 26, 27, 37
water features, 15, 16, 44
water meter, 48
water quality, 35, 37, 93
watershed, 35, 36, 41, 49
wind energy, 10, 11