The Morton Arboretum

Retrofitting Large Landscapes for Sustainability

Written for:
Condominium, Townhome, and Homeowners Association Boards
Corporate Landscape Managers
School and Park District Boards
Professional Property Managers
Other Stewards of Large Properties

Many websites and books are devoted to best practices for building a brand new landscape using the latest sustainability principles. This manual is different. It's specifically about *established* landscapes.

This manual contains hundreds of ideas for converting a resource-hungry landscape into one that is easy on the earth and on your property's budget. It is written for the landscape manager or property owner(s), whether paid or volunteer.

Collectively, existing community-managed residential developments (condos, townhomes, and single-family home communities) as well as commercial centers, park districts, school districts, corporate headquarters and office parks, cemeteries, golf courses, and hunt clubs have an enormous influence on the health of our environment. Much of this land was developed at least two decades before sustainability became the new mantra.

You may be interested in sustainable landscaping because good financial stewardship is your top priority. You may also want to protect the health of your land and people. Perhaps you value your outdoor environment greatly and regularly invest in maintenance, but you're not getting the results you are looking for. Or you care about sustainability but may not understand the inter-relationship of natural systems well enough to know how to go about retrofitting your property. It's not uncommon to feel overwhelmed by the sheer number of solutions out there.

This manual strives to educate and support you in becoming an effective steward and advocate for your landscape. It also points you to credible resources to further inform yourself, your board members, or other stakeholders.

What Is Sustainability?
What do we mean by "sustainability"? It is the idea that humans and nature can exist in productive harmony, fulfilling the social, economic, environmental and other needs of present and future generations. *Essentially, sustainable practices work with natural processes to create an environment that is both healthy and beautiful.*

Here we define sustainability using three interrelated concepts in the ***Sustainability Decision Diagram***:

Figure 1. Sustainability Decision Diagram

While there are no perfect solutions, the key is to balance these three concepts to address:

- The needs of the landscape
- Available budget
- The people who use the landscape

For example, say you've looked at your budget and decided that reducing annual chemical use on your lawn is a way to save money and improve environmental and human health. On the sustainability scale, it's a win-win-win. You could consider several options:

1. You might switch to an organic lawn service that uses mulching, composting, and core-aerating instead of fertilizers.

2. You could replace a portion of your lawn that is in view of windows or walking paths with a perennial garden that requires no fertilizers.

3. If the lawn is at the back of the property, you could replace it with large shrubs or trees that block undesirable views.

4. If your lawn is on the west or south side of a building, you might decide to plant several shade trees that will reduce building energy use, and simply apply organic mulch underneath the trees to nourish them.

5. If the lawn is adjacent to a pond, you could replace the grass with plants that stabilize the pond's shoreline and filter out pollutants from rainwater that runs into the pond.

As you can see, many approaches will reduce annual application of chemicals—they will help the land be more "environmentally sound" or healthy.

Look at the Sustainability Decisions Diagram and ask the two other questions to help you decide which approach is the right one for your property:

What fits your budget?
What do the landscape's users prefer?

By balancing the three concepts—environment, budget and people— you will arrive at the decision that's right for you.

The Benefits of Sustainable Landscaping

Many traditional landscape design and maintenance practices often work against nature. As a result, they create extra work and expense. A perfect example is the tradition of planting wide swaths of colorful annual plants. These plants must be planted each spring and dug up every fall. They arrive in containers that must be disposed of. Often, a landscape contractor must be hired to plant them. Because these plants are not adapted to hot, dry summers, they need to be watered frequently. They often require a mid-season fertilizer to keep them blooming. After they are dug up, the bare soil is left to erode over winter until new plants can be planted. All of these steps require manpower—and money.

Traditional solutions to landscape problems usually address symptoms (sprinkler systems and fertilizer applications in the case of annual flower beds), not the underlying conditions that caused the problem in the first place (planting plants that are unsuitable to the climate and conditions).

If you want to fill a prominent garden with color and beauty but avoid all the extra cost and waste, try it the sustainable way. Start by evaluating the landscape conditions and then select shrubs or perennials that are better suited to those conditions.

Say you have a five-foot by twenty-foot border that receives sun all day and little water during mid-summer. Choose plants that require less water. If your selection includes native plants—ones that have been growing in your area for thousands of years—they will provide food and shelter for desirable wildlife (think birds and butterflies) all year long. The drought-tolerant plants' deeper roots will hold the soil, protecting it from erosion.

It's possible to select a variety of plants that not only flower throughout the growing season, but also provide winter interest, such as attractive bark and seed pods. And all these benefits come without the cost of repeated planting, watering, fertilizing, digging up, and starting over next year. Nature is doing most of the work; you are harnessing natural processes to solve your problem. This is sustainability in action!

By shifting to sustainable practices, you can realize many benefits.

- Sustainable practices create a healthier environment for your community by reducing use of pesticides. About 40 chemicals serving as active ingredients in pesticides are classified by the International Agency for Research on Cancer as “known, probable, or possible human carcinogens.”
- Sustainable practices reduce the amount of rainfall that flows off your property, which improves water quality. According to the Midwest Pesticide Action Center, each year, an estimated 10 trillion gallons of stormwater runs into local waterways, picking up pesticides applied to the land.
- Sustainable practices maximize the environmental benefits of your landscape. For example, trees in the seven-county Chicago metropolitan region remove an estimated 18,080 tons of air pollution per year, according to the 2010 study *Urban Trees and Forests of the Chicago Region*, by The Morton Arboretum and the U.S. Forest Service.
- Sustainable landscaping can help you cut costs over the long term. For many homeowners associations, up to 60 percent of their annual budget is spent on landscape maintenance.
- Sustainable practices minimize urgent landscape problems and subsequent intensive treatments, thereby helping property owners manage assessments and avoid spikes in dues or taxpayer levies.
- Sustainable practices will help you protect important assets, such as ponds and large trees.
- Sustainable practices differentiate your property as being progressive and "green," which can be a selling point as sustainability grows in importance.
- Finally, by using sustainable practices, you will contribute to the overall health of your land as well as nearby land, waterways, and the trees, plants, and wildlife that live in what we call the "urban forest."

Large Landowners Have Great Influence
Owners and volunteers who manage large landscapes are influential stewards of the urban forest. While they value their outdoor environments and invest in regular maintenance, often there are gaps in their knowledge about how natural systems work and how to care for them.

Conventional landscape management segments a property into pieces. There are lawn maintenance contractors, arborists, pond specialists, and landscape contractors that tend to the shearing of hedges and the planting of annual flowers. Often, no one specialist looks at the overall picture of the landscape and how all the parts interact. Consequently, large landowners spend a lot of money perpetuating dysfunctional landscapes. In addition, heavy applications of herbicides, pesticides, and other toxins are often used to make poorly chosen plants look healthy.

Most landowners or volunteer boards receive little assistance from natural resource professionals who could promote sustainable practices and help them understand how natural systems interact.

For example, millions of acres of land have come under the management of community associations throughout the United States since the early 1960s. In the Chicago metropolitan region alone, about 160,000 acres are governed by community associations, according to the Chicago Metropolitan Agency for Planning. These subdivisions, condominium developments, and townhome complexes were designed with little thought to environmental function or long-term maintenance costs.

Community associations often have their own landscaping covenants or rules decided by residents. They don't have the benefit of a staff forester or department of environment to oversee landscape decisions and contractors. In addition, there's often pressure from residents to adhere to a traditional aesthetic (for example, annuals and wide-sweeping lawns).

Every Effort Counts
Every effort to reduce impacts to our climate, land, and water counts. We can improve our environment by focusing on local, sustainable solutions.

You may have explored and discarded earth-friendly solutions a decade ago. But it's worth taking another look. New and improved products and technologies have been developed recently, and these options may be more cost-effective than ever before.

Start small and do what's comfortable. We applaud your effort.

Remember, you have an existing site that was developed decades ago. You can improve your site, but you won't achieve perfection. In fact, even newly developed sites must accommodate less-than-perfect circumstances. There will always be trade-offs in any project.

Sustainable solutions need to remain socially viable through the years, even through changes in management or volunteer boards.

Always remember the long-term costs, especially when a sustainable landscaping solution looks more expensive than a traditional one. Moving to sustainability is a long-term process that often involves higher up-front costs, but saves money over time.

For example, according to typical costs from a pond management contractor, planting turf grass along a pond shoreline costs only $1,100, whereas planting native plants costs $10,000 (seeding) to $30,000 (installing plants). On face value, planting grass is the obvious choice. However, planting grass to the edge of a pond attracts geese and their mess, severely erodes the shoreline, encourages sediment buildup in the pond, and entails weekly mowing. In addressing these inevitable issues, over ten years,

the initially inexpensive grass solution balloons into costs of $110,000 to $160,000. On the other hand, opting for native plants results in no geese, less pond algae, and little, if any, shoreline erosion. So, over ten years, the costs for the sustainable method, including initial seeding or planting, would top out at $40,000 to $60,000—less than half of the overall cost of planting grass. (See Chapter 4 on Ponds for a chart showing these numbers from Integrated Lakes Management, Waukegan, IL.)

How to Use this Book

This book includes seven chapters, each covering a different aspect of sustainable landscape management. One of the main principles of sustainable landscaping is that in nature, everything has a bearing on something else. Consequently, concepts may be repeated from chapter to chapter. This was done intentionally so that individual chapters could be shared with stakeholders without forcing them to read the entire book.

Chapter 1 on Property Management and Chapter 2 on Site Design are the most critical. These give overviews of budgeting, contract writing, and understanding sustainable site design issues.

In each chapter, there is a section called "Challenges," which lays out the ecological, health, safety, and economic pitfalls commonly encountered in large landscapes. Most people reading this book are not landscape experts, and often they are not aware of problems. The "Challenges" section calls attention to these often-hidden issues.

Each chapter also contains an "Implementation" section, which outlines the sustainable landscaping best practices related to the chapter topic.

A sustainable landscape can look different from a traditional one. The way costs are spread out—with a large initial investment but smaller maintenance costs—also may raise eyebrows. As a result, communication becomes very important to the management of any sustainable landscape project. Each chapter touches on how to handle the criticisms or questions that inevitably pop up.

The book also points to credible resources for further reading. Keep in mind that website links, which are accurate as of the book's initial publishing, may change over time.

Finally, italicized words throughout the book indicate glossary words, which are defined at the end of each chapter.

Sustainability Perspectives

During this book's conceptual phase, the committee discovered common themes in people's perceptions of nature. In particular, people have certain ideas about the way the landscape "ought to perform" or how nature is "supposed to work."

This book aims to educate people about how natural processes really work. These new perspectives, as we call them, are woven throughout the book. They are:

- People often don't realize that what we do on our land does have an effect on the planet's health. Although we may not be chopping down the rainforests, traditional landscaping practices often have a negative impact on our environment.
- People see themselves as apart from nature, but we are very much a part of it. By working with nature, rather than managing it or controlling it, we can create healthier, more beautiful communities.
- Natural processes move slowly, but they are healthy. We can gradually and systematically transform the landscape; there are usually no quick fixes.

- Because traditional approaches to landscape maintenance often fight against natural processes, they can be costly. Sustainable landscaping is both environmentally sustainable and financially sustainable.
- While you should consider your aesthetic goals, enhance the overall function of the landscape by working with natural processes. You'll achieve a better working landscape over the long run.
- Healthy soils are a vital foundation for a sustainable landscape. Creating healthy soil is a natural process that takes time.
- Look beyond your property's borders to understand the larger ecosystem. What you do on your land affects the surrounding land.
- People tend to think of the landscape as a masterpiece painting to be viewed and admired from their windows. But the landscape is alive, dynamic, ever-changing—and fascinating up close.
- Once you step outside to explore nature's mysteries, you'll be surprised how often you return to learn what's new.

A REVIEW OF IMPORTANT INFORMATION

Why Sustainable Landscaping?

- **Reduce Maintenance Bills.** Discover budget-friendly ways to care for lawn, trees, gardens, and other elements of your landscape.
- **Avoid Landscape Catastrophes.** Address problems like pond erosion while they are less expensive and easier to fix.
- **Increase Property Values.** Protect and enhance the value of your real estate.
- **Lower Energy Costs.** Cut heating and cooling bills by strategically siting trees and shrubs near buildings.
- **Create a Healthier Environment.** Improve the health of your local environment by using fewer chemicals and making other sustainable choices.

Keep It Simply Sustainable

Favor Biodiversity Over Monoculture

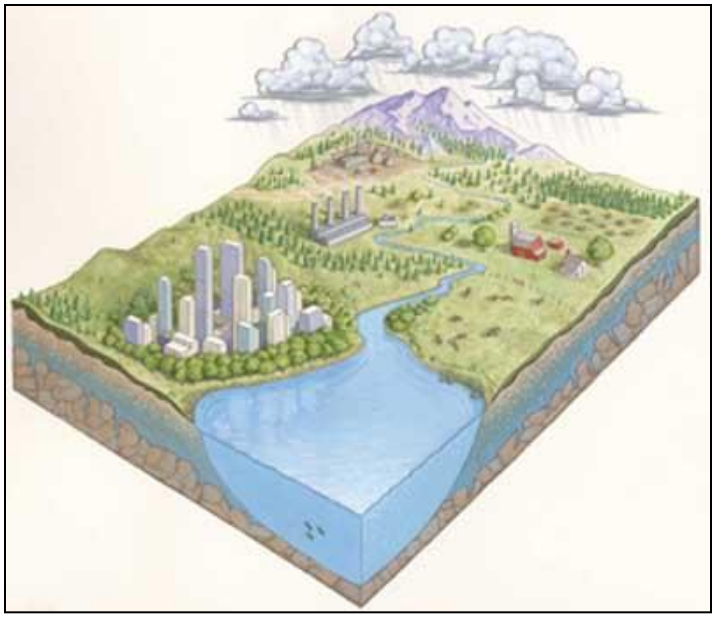
Monoculture means that one plant is planted over and over. Farms are often monocultures. Lawns are monocultures. In the 1950s and '60s, many community streets became monocultures, as they were lined with just a single type of tree such as the American elm. As you can guess, monocultures are difficult to maintain and require many resources—namely water, fertilizers, and pesticides—to keep them growing. And when a pest or disease rides in, like the emerald ash borer, the whole community goes kaput.

Biodiversity is the establishment of many kinds of plants (and wildlife). It's the holy grail of ecosystem health. When there is a high amount of biological diversity, plants and wildlife thrive. Why? The community has many more tools and resources to fight problems. For example, when a disease hits, it doesn't wipe out all the plants, so wildlife still has habitat, and plants are still there to hold the soil, protecting it from erosion.

The upshot? When deciding which plants to plant, strive for biodiversity—it's healthier and more sustainable in the long run.

A New Perspective

People often don't realize that what we do on our land has an effect on the planet's health. Although we may not be chopping down the rainforests, traditional landscaping practices often have a negative impact on our environment.



A watershed is the area of land where all of the water that is under it or drains off of it goes into the same place (USEPA).

Actions taken on individual properties add up and collectively impact the entire watershed. *Illustration courtesy of the U.S. Forest Service.*

This book reflects the work of many dedicated people whose mission is to educate, encourage, and support effective stewards and advocates of the urban environment. It is the product of four years of research and writing.

The Community Trees Program of The Morton Arboretum stewarded this book through rigorous content development and writing phases. Laurie Casey of A New Leaf in Oak Park, IL, served as lead writer.

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In addition, we thank the following people who served as content experts and reviewers for individual chapters:

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Chapter 1 Property Management:

Assess Before Acting

Managing a large piece of property sustainably requires financial sustainability as well. In particular, good planning, a clear bidding process, precise specifications, and strong contracts can ensure that the costs of maintaining your landscape stay within budget.

It's not productive to run a property by managing a series of untimely and unfortunate breakdowns. By planning ahead, you'll address problems before they become emergencies. Just as you get your boiler tuned every year, by investing in periodic maintenance, you can keep your landscape looking and functioning great.

Maintaining a property goes beyond lawn care. A sustainable landscape maintenance plan will address the entire landscape—trees, shrubs, gardens, ponds, and wildlife as well as the lawn. Many large property owners, such as residential community associations, conduct *reserve studies* that help them look at the big picture.

Shopping for the best landscape vendor entails looking at all aspects of the job, not just price. Once the project has been defined, a *bid sheet* is an important tool in demonstrating to stakeholders the value of choosing one vendor over another. A properly written bid sheet compares vendors' prices for similar services. Bid specifications should accurately define your landscape projects, clearly identify the standards to be used, and show provider licensing and training requirements. The contract should contain safeguards to protect the property and avoid surprises down the line.

The sustainability goal for this chapter is *Assess before acting.* Over the long term, your landscape—and bank account—will reflect this good planning and solid fiscal management.

THE VALUE OF SUSTAINABLE PROPERTY MANAGEMENT

By managing your landscape projects well, your landscape's users can enjoy many benefits.

Fewer Costly Emergencies

By creating planning documents that outline short- and long-term objectives and needs, you will have a clear road map in the years ahead. By planning for and funding routine maintenance, you will minimize the number of emergencies that pop up.

More Favorable Contracts

Writing strong bid specifications improve the chances that you will get the results you want. Specifications that spell out the sustainable materials and methods you want used in your landscape help vendors deliver to those specifications and help prevent uncertainties. And when accountability is built into contracts, it's more likely the vendor will fix problems or compensate you accordingly.

Increased Property Values

Sustainable landscaping offers an attractive proposition to any buyer. Prospective buyers not only look at the home or business they want to purchase, they look at the community as a whole. Keeping all elements of a landscape in top shape tells the buyer your community cares about the entire package they may be buying into.

COMMON CHALLENGES TO MANAGING A PROPERTY SUSTAINABLY

Landscape maintenance is not always seen as important as building maintenance
A leaky roof or broken HVAC system commands attention, whereas deteriorating tree health may fly under the radar. It is important to incorporate all aspects of landscape maintenance into the operating budget to ensure adequate funding. Keep residents in touch with sustainability goals, progress, and results, so they feel a part of the process. Successful property management requires managing stakeholder expectations. Remind them that the longer a problem is left unaddressed, the more expensive it will be to repair or correct later.

Landscaping is seen as a yearly project
Many people are happy if the lawn is mowed and the annual flowerbeds are planted each spring. But there's more to a sustainable landscape. *Storm water management* engineering, *shade canopy* replacement, *soil quality* improvement, and phasing out of toxic *pesticides* are multi-year projects that require more extensive planning and stewardship. Yet, in the long run, these efforts should reduce your annual maintenance costs.

Proper reserve studies appear daunting
A reserve study looks at the life expectancy of the roads, roofs, fencing, boilers, and all physical items. It extrapolates these life spans over time and compares the total costs of repair and replacement with reserve fund contributions. A reserve study helps you create an accurate budget by properly forecasting for the future. It's a good prediction of the viability of your property's financial health years from now. In addition, banks often require reserve studies for loans. While conducting such a study may sound like a huge undertaking, many companies offer this type of service to varying degrees of detail.

Reserve study recommendations may appear overwhelmingly expensive
Many line items cost hundreds of thousands of dollars. Through proper budgeting, forecasting, and contributing to the *reserve fund*, you can avoid large increases in annual budgets or assessments or the need for special assessments. If property owners cannot afford to do exactly what the reserve study suggests immediately, phase in projects over a period of time.

Sustainable landscape projects need to be supported by good public relations
For special projects that change the function of a space, such as replacing an area of lawn with a perennial garden, there can be a large up-front cost compared to maintaining what's already there. Keep your long-term goals—maintaining or improving your property's value—front and center, so that stakeholders understand where the money is going. Many sustainable landscaping projects can actually provide cost savings over the long-term. When they do, emphasize that point whenever possible. Use newsletters, email blasts, and websites to inform stakeholders of the process and intended outcome.

It may take research to find contractors well versed in sustainability
While knowledge of sustainable techniques and principles is growing within the landscaping profession, not all companies approach a project from a sustainable perspective or have the experience or skills to accomplish a sustainable landscape. By reading this book and other resources, you will learn the issues that will help you become a better consumer and know what questions to ask potential vendors.

Plans can be derailed when volunteer board members or landowners change
Some boards or landowners are receptive to new ideas and are willing to learn about sustainable solutions. But in the midst of budgeting and planning, a change in board composition or land ownership can cause the whole thought process to change overnight. This is why a reserve study done by a third party is such an important tool. The reserve study company can help explain the line of thinking from one board or owner to the next, providing much needed continuity.

During tough economic times, assessments or budget allocations may be difficult to collect
Especially if there is a foreclosure. When decreased revenues force budget cuts, landscaping is often one of the first areas considered. Addressing immediate needs of individual homeowners and common elements, such as replacing a leaky roof, trumps mulching, grub control, pruning, and other less acute needs. This is why planning is so important.

When the landscape looks less than perfect, there may be pressure to switch contractors
During a drought, trees, shrubs, and turf can suffer. When property owners see their landscaping costs increase, yet the lawn is not picture perfect, they may decide to look for cheaper landscape contractors who can "do it for less." But sometimes it can take years to rejuvenate the landscape. When the landscape is vulnerable, you want experts to nurture the landscape back to health. Less experienced contractors can make a situation worse. Conduct a strong public relations campaign to educate and inform owners as well as board members.

ASSESS BEFORE ACTING: IMPLEMENTATION

Any sustainable landscaping project starts where most other projects start: with a baseline understanding of where you are currently and a clear plan for where you want to go — and the money to make it happen.

For community associations, park districts, schools, and corporate office parks, a reserve study is a budget-planning tool that identifies the current status of the reserve fund and creates a funding plan that covers anticipated future expenditures. A thorough reserve study that includes all elements of the landscape is the key difference between a successful sustainable landscape initiative and one that fails.

1. Conduct a Comprehensive Reserve Study

The reserve study is an essential component of planning and budgeting. A well-funded reserve protects against emergency assessments, allows for unplanned capital expenditures, and maintains the fiscal health of the property. For community associations and taxing bodies such as a school or park district, a reserve study can also help you determine proper assessments or the need for future tax levies.

A reserve study assesses the level of your current reserve in combination with interest rates of current accounts and forecasts future capital expenses to determine if your current reserve portfolio will be adequate. Plan to update the reserve study every three to five years.

It's important to understand that while many companies conduct reserve studies, few firms cover landscape considerations in the scope of their work. Question potential reserve study vendors on their ability to look at all the aspects of your property, including your landscape. Your questions will signal to them a business need, and more vendors will begin to respond.

When you find an appropriate vendor, enlist them to conduct a full environmental (buildings and landscape) reserve study that projects into the next 25 to 30 years. While long-term planning is never perfect, you can develop a realistic budget and won't be surprised by large unexpected expenditures.

The reserve study should include a physical analysis and a financial analysis. The report should:

- Inventory and describe the current condition of the landscape, including trees, ponds, and wetlands; irrigation and lighting systems; and *hardscape* elements such as walkways, patios, and structures like retaining walls, pergolas, and sheds.
- Provide recommendations for maintaining the current condition and extending the life of specific elements with preventative maintenance plans.
- Include an onsite inspection.

- Consider the history of the property, including financial and relevant climate conditions.
- Include interest anticipated on the money held in reserves.
- Forecast expenditures and prioritize repair or replacement projects in both current and future costs.
- Take into account the cost of local inflation on materials and labor.

The final report will be a road map that works hand-in-hand with the *Eco-Audit* and *site analysis* recommended in Chapter 3 on Site Design. While the reserve study looks at the current landscape, the Eco-Audit and site analysis will help you envision the elements or features you'll want to add to the landscape to make it more environmentally sustainable. With these two tools, you can prioritize projects and put them out to bid to vendors or contractors.

2. Put Your Project Out to Bid
A reserve study report won't necessarily propose specific solutions to problems. For example, if the report finds that your pond shore is eroding, it won't express a preference for natural plantings versus rock. But the report will likely include potential costs for either, so be sure your vendor has included all the potential solutions, including sustainable options.

Your next step will be to call on contractors who can offer sustainable solutions. Depending on the project, these might include a *landscape architect*, *landscape designer*, *arborist*, *environmental consultant*, pond management company, *nursery*, *landscape contractor, irrigation contractor,* lighting contractor, concrete contractor, *mason,* or deck and fence contractor.

Always get more than one proposal. When getting bids, try to base all proposals on the same criteria for an accurate comparison. However, during this process, it's often helpful to request that vendors recommend additional sustainable practices. These ideas should be listed on the bid sheet as "alternatives." These ideas can help differentiate vendors from one another, as well as give you valuable ideas for future projects.

Keep in mind there may be multiple paths to solutions for some landscape issues. Certain problems may take longer to resolve than others. During the bidding process, if you determine that one solution seems attractive, make sure the other bidders have an opportunity to bid on that same solution to keep the comparisons fair.

A comparable bid sheet is a useful tool that can help stakeholders understand the difference between a landscaping proposal that offers only "mow, blow, and go" services and a more comprehensive plan that could be more expensive in the early years but would be cost-saving later. Depending on the complexity of the project, this document can be a simple piece of paper or a more complicated spreadsheet.

On the bid sheet, the project should be broken down into its components and should specify the types and quantities of materials needed and any product or installation guarantees.

Doing your due diligence is crucial. Obtain this documentation for every company you consider:

- **Certificate of insurance** for liability and workers' compensation. This type of insurance is an expense for vendors. Those who cut corners may offer a cheaper option...until someone gets injured or the property is damaged. Call the insurance carrier, not the agent; to be sure the company is actually paying its insurance premiums.
- **Business license.** Some municipalities require a business to maintain a business license. Call the vendor's city to see if it requires a business license and, if so, whether the vendor you are considering has a valid business license.

- **W-9 form.** Have the company fill out a W-9 form to obtain its tax identification number. Then call the state and be sure it is an actual company that is paying taxes to the state.
- **Better Business Bureau history.** Perform a simple online search at bbb.org to review any possible complaints submitted about a contractor and their outcomes.
- **Waiver of lien.** For projects costing more than $5,000, require a waiver of lien from the contractor upon invoicing.
- **References and similar projects completed.** From each vendor or provider, obtain at least five references and examples of similar projects completed. Verify each reference. For the strongest candidates, visit project sites that are similar to yours and talk to property owners to learn if they are satisfied and what problems they have encountered.

And remember: the low bid does not always provide the best value. Ask each vendor how they plan to carry out the work and scrutinize their pricing for each step of the project. Reputable companies train and supervise their employees, follow federal and state labor laws, carry the necessary insurance, and pay taxes. There are costs involved in all of these measures, and a low-balling company may skimp in these areas.

3. Write a Strong Contract
A good contract outlines what is expected of the contractor and the customer so there is little room for interpretation. During the contract negotiating process, the contractor may bristle and feel impatient, and you may feel embarrassed to be seen as nitpicking. But if a disagreement occurs later, you'll both be happy to be able to refer to a document that spells out clearly defined goals. It may be helpful to have your attorney review any major contract prior to approval.

Always have a vendor sign a performance contract that spells out:

Scope of Service
As much as possible, record important details discussed during your consultation with the company's owner or salesperson. Every sustainable landscape project is different, but these are the types of statements you might include:

- Recycle X percent of all green waste on site.
- Reduce green waste in the spring by mowing all debris into confetti-size pieces and spreading them on the perennial beds. In the fall, mulch X percent of leaves on site and spread on beds to reduce the need for wood chip mulch in the spring.
- Reduce herbicide use by X percent.
- Reduce potable water use for irrigation.
- Reduce fuel consumption by downsizing machines.
- Reduce fuel consumption by scheduling crews (installation crew and mowing crew, for example) on the same truck.

You may also choose to explicitly say what the workers should NOT do, such as, "Workers WILL NOT prune the magnolia trees near the entrance."

Terms
The other elements in a contract are the terms, which may include the following:

- Specific area where the work will be performed; include site maps when available.
- Term of agreement (start and finish date).

- Allowable working hours and days.
- Delays; what's considered an "excusable" delay? Weather too cold or rainy, for example.
- Payments; lump sum, monthly payment, etc. Never withhold payment on a fulfilled contract (a natunrelated service (e.g., estimating a new perennial installation). Once the service is complete, it's your obligation to pay.
- Termination; what notice is necessary to end a contract? Is there a period of time for remedy, or will the clause include "no cause" termination?
- Liability; be sure the contractor has insurance to cover any accidents related to their work.
- Assignment and subcontracting; who will be doing the actual work? This is especially important in understanding the level of training and experience the workers have had.
- Supervision; if there will be subcontractors, who will be in charge of supervising them? How often will the supervisor come to inspect the work performed on the property? Who will be the point of contact for both the vendor and customer when concerns need to be relayed?
- Liens; the vendor has an obligation to keep your property free and clear from any liens.
- Publicity; will you grant the vendor permission to advertise that they are doing work on your property?
- Correction of defects and guarantees of work; pay special attention to this issue. If you ask a contractor to weed a perennial bed, and the workers pull the plants along with the weeds, what will your recourse be? Contracts can have a simple line that says, "We shall repair or replace anything we damage," or they may be more specific. Often, landscape contractors won't guarantee existing dog fences, cable lines, or lighting systems that weren't installed according to specifications. It is typically the responsibility of the property owner to identify the location of these utilities to avoid damage. A vendor or provider will likely stipulate that should these be damaged due to lack of identification, it is the property owner’s responsibility to repair them.

Above all, read the contract and be sure you understand it before signing it. Retain a copy for your records and keep it in an accessible place.

COMMUNICATING AND ADDRESSING CONCERNS

A landscape's users often have strong opinions about the costs of maintaining the landscape, especially when those users are community residents who are footing the bill, perhaps as taxpayers, in the case of a park or school district, or as owners, in the case of a condominium association.

One of the top ways to allay fears is through communication. Use newsletters, email blasts, and websites to inform people of the process and intended outcome of your sustainability efforts. In addition, involve stakeholders in planning meetings, and when the work begins, keep them apprised of goals and progress. Inviting people to join a landscape committee can help them feel more invested in the results and more willing to write that check.

When it comes to being green, often the other green—we’re talking money—has a bigger say in the landscape. Communication is the best tool to help people understand the value of sustainability for their health, their children's future, their property values, and even their bank account.

Show them where the money is going

Analyze past landscaping costs, making sure to include emergency repairs. Have you been spending money every year to fix that patch of lawn that just won't take? Is replanting of annuals by the entrance truly the best use of money? Do you really need to continue to repair blown out retaining walls every three years? For these and other expenditures, you may as well be burying the money in the ground in hopes a money tree pops up. Rather than paying for unnecessary recurring expenses like these, implement

sustainable landscaping solutions. This book is full of sustainable ideas that can reduce maintenance costs over the long run.

Analyze costs
As bids come in, break down on paper the costs and savings over time for sustainable landscaping. Numbers speak louder than words, especially when they carry dollar signs in front of them. It is very difficult to sell people on something that is going to cost them more now...if they see no savings in the future. Emphasize those future savings. Sustainable landscaping is like eating a balanced diet every day. Sure, you could cut corners and eat cheap fast food every day, but your health will suffer for it later.

Stress that you get what you pay for
Buying unguaranteed trees from a fly-by-night nursery for a "special" price may appeal to the money-minded...until the trees die and need to be pulled out and replaced the following year. Sometimes a deal really is a deal, but ask bargain hunters offering alternative solutions to do their research: products should be guaranteed and services should be performed by a reputable and dependable company that stands behind its work.

PROPERTY MANAGEMENT RESOURCES

General

International Facility Management Association: http://www.ifma.org
Professional Grounds Management Society: http://pgms.org/
Professional Landcare Network (PLANET): https://www.landcarenetwork.org/index.cfm
Association for Professional Reserve Analysts: http://www.apra-usa.com/
Federal Trade Commission - Hiring a Contractor: http://www.consumer.ftc.gov/articles/0242-hiring-contractor
Better Business Bureau: http://www.bbb.org
NOLO - Ten Tips for Making Solid Business Agreements and Contracts: http://www.nolo.com/legal-encyclopedia/make-business-contract-agreement-30313.html

Community Association Management

Community Association Institute: http://www.caionline.org (classes on facilities management covering contracts, terms, bidding, and sustainability)

State of California - Reserve Study Guidelines for Homeowner Association Budgets: *http://*www.dre.ca.gov/files/pdf/re25.pdf

Foundation for Community Association Research - Best Practices: Reserve Studies: http://*www.cairf.org/research/bprs.pdf*

GLOSSARY

Arborist: a tree care professional. Look for an arborist who has certifications from at least one credentialing organization, such as the International Society of Arboriculture.

Bid Sheet: a simple paper or more complicated spreadsheet that compares the estimated costs of a project from different contractors. To be most effective, the bid sheet should compare the same line items across contractors.

Core Aeration: to remove small cores or plugs of soil to increase oxygen and reduce soil compaction.

Eco-Audit: a study of the natural resources on a property that includes soil, water, plants, and other elements. An eco-audit can be used as a baseline against which to compare new measures taken after sustainability improvements have been made to the property.

Environmental Consultant: a professional or company that has experience in environmental practices such as storm water management, native plantings, and soil stabilization. They may have a landscape architect, landscape designer, contractor, or engineer on staff. An environmental consultant may have
a bachelor's or master's degree in environmental science.

Hardscape: the paved features on a property, such as walkways, roads, retaining walls, gutters, patios, and other hard surfaces or infrastructure.

Irrigation Contractor: a professional or company that installs irrigation systems for lawns and flower beds. They may be regulated by the state; if not, they must use a licensed plumber for hookup to water systems.

Landscape Architect: a licensed professional or company who prepares a site analysis, design plans, and observes construction. His or her training focuses on overall site planning, plant material, hardscape elements, and the owner's site preferences. Landscape architects may have specific areas of expertise, such as municipal design, residential design, commercial/corporate design, or environmental design. Look for membership in the American Society of Landscape Architects (ASLA). A landscape architect must have a bachelor's or master's degree in landscape architecture and a license to practice in your state.

Landscape Contractor: a professional or company that installs plantings, paths, and other landscape features. May sometimes provide design help as well. Look for membership in the Illinois Landscape Contractors Association or the Professional Landcare Network (PLANET).

Landscape Designer: a professional that prepares design plans and reviews construction mainly for residential and multifamily properties. Look for membership in the Association of Professional Landscape Designers, the Illinois Landscape Contractors Association, or the American Society of Landscape Architects.

Mason: a professional who specializes in working with brick and stone for use in walls, paths, structures, and decking.

Nursery: a farm that specializes in trees and other landscape plants. May provide some design ideas.

Pesticide: a substance that kills any kind of pest, including weeds, diseases, and undesirable insects or animals.

Reserve Study: an engineering study that assesses the condition of a property's buildings and landscape and the financial condition of the property's reserve fund.

Reserve Fund: a savings account or other highly liquid asset set aside to meet future costs of upkeep as well as unexpected costs that may arise .

Shade Canopy: the large trees that provide shade for a property. An adequate shade canopy provides many benefits, including cooling buildings and paved areas, and intercepting rain and air pollution.

Site Analysis: a study of a landscape's features, including its strengths and weaknesses. See Chapter 2 on Site Design.

Soil Quality: The health of the soil, which is the basis for the health of a landscape, since the soil is the primary growing medium for grass, trees, and other plants.

Stormwater Management: A system of handling rainwater on a property.

Uniformity is the hallmark of many community developments, which often carries over into the landscape. Sustainable landscape design is about choosing options that are the most environmentally, socially and financially suited to your specific property or community.

Attractive shrubs and perennials can mask unsightly views in the landscape, such as utility boxes. *Photo courtesy of Beth Corrigan*

A pond can be an attractive feature in a landscape. However, they must be properly managed, as they can suffer from problems that become more expensive to fix as the years go by. *Photo courtesy of Beth Corrigan*

A REVIEW OF IMPORTANT INFORMATION

Case Study
Valley Lakes

Valley Lakes Community Association of Round Lake, IL, was established in 1996 as a nonprofit organization dedicated to preserving and maintaining the natural environment of their property. The community association owns about 400 acres of wooded areas and open spaces throughout the property. It enforces and maintains covenants, conditions, restrictions, easements, reservations, charges, and liens as provided in its Declaration of Covenants, By-Laws, Rules and Regulations, and Architectural Standards. See how this group did it: http://valleylakes.org/members/governing-documents/

A New Perspective

Because traditional approaches to landscape maintenance often fight against natural processes, they can be costly to maintain. Sustainable landscaping is both environmentally sustainable and financially sustainable.

Find more Sustainability Perspectives in the Introduction.

Chapter 2 Site Design:

Harness Natural Processes to Improve Quality of Life

A property's design—the way buildings, paved areas, and plants are positioned on the land—greatly influences the sustainability of its landscape. In this chapter we'll discuss issues related to enhancing or retrofitting the design of an aging landscape so it works with *natural processes*.

Here's an example of the natural process of rainwater falling on land: On natural, undisturbed land—a forest or prairie, for example—rain may puddle or occasionally stream, but mostly it stays where it falls. Leaves on trees intercept the rain and hold it where some of it may evaporate after the rain stops. The roots of trees and other plants make the soil below springy and full of air pockets that can hold rain. These roots also absorb water. A large tree can absorb as much as 50 to 100 gallons in a day and prairie plants' roots can extend many feet below the ground. As a result, much of the rain is held where it falls, and little rain actually runs off the land into streams and creeks. The rain provides an important resource for plant and animal life and recharges the *ground water*.

On the other hand, developed land is covered with pavement, buildings and *turf grass*. During construction, the topsoil was likely scraped off, leaving a base of clay that doesn't absorb rain. Many older sites have a “pipe-to-pond” design, in which rain washes off roofs, streets, and driveways into a storm sewer system where it is conveyed to culverts and detention or retention ponds and then slowly released into a stream or river. The water channeled into the stormwater system and carried away is called *runoff*. Stormwater runoff can cause water to erode soil, scour ponds and stream banks, and wash *sediment* and other pollutants into our waterways. The costs of stormwater runoff are all too apparent: flooded basements, soil erosion, costly procedures to dredge ponds, and polluted rivers and oceans.

To mitigate these problems, many new properties being developed today incorporate features that minimize stormwater runoff. Other features mimic natural processes that cool air temperatures, absorb air pollutants and enrich the soil.

For an older, existing property that does not have these features, it is possible to study its natural resources—water, soil, and plants—and retrofit the property to improve the ability of the land to absorb rainwater. The property can harness natural processes to reduce adverse impacts to the environment and improve quality of life.

In addition to addressing nature's needs, effective sustainable landscape design addresses the needs of people using the landscape. A beautiful, highly functional landscape can improve people's quality of life. Studies show that viewing, walking, or playing in a natural environment decreases people's stress levels, helps children focus better, and even helps hospital patients heal faster. Beyond these very real emotional benefits, when people work or live in a landscape designed to meet their needs, they tend to use it more often and appreciate it more. Walking paths, picnic tables and benches, shade structures, and interesting views beckon people outdoors. *Wildlife gardens* elicit delight and wonder. And the more people understand and experience the benefits from the landscape, the more willing they may be to support improvements.

The sustainability goal for this chapter is *Harness natural processes to improve quality of life*.

THE VALUE OF SUSTAINABLE SITE DESIGN

Rethinking the design of a property, even in small ways, can enhance its value, function, and environmental value.

Increased Property Values

A good landscape design plan can increase property values by as much as 5 to 12 percent, according to a study by a Virginia Tech researcher. Attractive curb appeal makes a property more marketable and may even speed the sale of a property.

Return on Investment

For people focused on the bottom line, sustainable landscaping offers great news: There can be a return on investment. For example, one condominium building harvests rainwater and pipes it under its horseshoe driveway; in the heart of winter, the 50-degree water recirculates under the pavement and eliminates the need for winter plowing. A small corporate campus decides to replace lawns and gardens with drought-tolerant native plants; after the first few years, it can turn off its irrigation system, which uses expensive city water, and significantly reduce visits by its landscape contractor. Projects like these require an upfront investment but they offer considerable paybacks. Some retrofits can be accomplished in stages to spread out the initial investment, leading to a long-term return.

Better Functionality

Sustainable design is good design and vice versa. When the landscape functions well, it means the plantings and materials are suited to the site. As a result, maintenance costs decrease. In addition, there are fewer problems to fix.

More Usable Space

Good landscape design is people-friendly. Experienced landscape designers and architects know how to maximize the land's use. Pergolas, patios, tables, chairs, and benches are placed so as to take advantage of views, sun, and breezes. Well-sized and -placed paths help people move from here to there, all the while enjoying attractive scenery.

A Healthier Environment

Sustainable design works with natural processes that help all the elements work together to keep the entire *ecosystem* healthy. Plants filter pollutants from stormwater runoff before it enters ponds. Trees and plants help more rainwater to soak into the soil, recharging underground water sources. Soils are improved, making it easier to grow beautiful trees and other plants. When trees are situated located properly, buildings and patios stay cooler and air-conditioning costs stay lower in the summer.

Learn More:

"The Effect of Landscape Plants on Perceived Home Value": pubs.ext.vt.edu/426/426-087/426-087.html
Sustainable Sites Initiative: http://www.sustainablesites.org/why/
Cornell University - Sustainable Campus Plan: http://www.sustainablecampus.cornell.edu/land
University of Delaware - Sustainable Landscape Virtual Tour: http://www.udel.edu/sustainability/doing/landscaping/

COMMON SITE CHALLENGES FOR LARGE EXISTING PROPERTIES

Many older properties were designed decades ago. Understanding of good site design has changed, particularly when it comes to environmental considerations.

Properties were often developed for quick sale.

When a newly developed property comes on the market, the landscaping may be designed for the short

term, to attract buyers. Little thought may have been put into what the landscape would look like 10 years down the line or how it would function in the long term. To impart a full, established look to potential buyers, plants may have been spaced too closely. The same plants may have been used throughout the site, regardless of conditions—sun or shade, wet or dry, winter wind, salt exposure. As the landscaping matured, trees and shrubs may have begun crowding doorways, paths, and windows. There may be drainage problems resulting in building flooding or soil erosion. These mistakes by the developer are now in the hands of the landowner or manager to address.

Trees and shrubs have a finite lifespan.
Their lives are shortened when they grow under stressful conditions. Older trees and other plants may need to be replaced if they have outlived or outgrown their aesthetic or environmental usefulness. Consider conducting a tree health assessment that includes a plan for scheduling removals and replacements. It's advantageous to replace as needed plants over time, rather than tearing them all out at once and be faced with a bare landscape.

Soil quality may be very poor.
When your property was developed, most of the topsoil was likely scraped off and sold. What was left was little more than clay with a few inches of topsoil. Some of your rehabilitation efforts will need to be directed at improving soil quality so trees and other plants can grow and rainfall can be absorbed. Simple practices such as applying organic mulch to tree and planting beds will help to move this soil repair along.

Old pipe-to-pond stormwater management methods degrade the environment.
When your property was developed 20 to 40 years ago, water was treated as waste and the goal was to remove it from the property as quickly as possible. Today, water is seen as a resource. Now it's desirable to keep as much rainwater on the property as possible, so new best practices have been developed that rely on soil and trees and other plants. Generally referred to as *green infrastructure* (as opposed to traditional pipe and concrete infrastructure), these methods minimize runoff, reduce soil erosion and pollution, take pressure off downstream waterways, recharge ground water, and conserve water by using rainwater to irrigate trees and other plants. You can address stormwater on site by taking measures such as converting enclosed culvert drains to open drainage swales, connecting water systems through rain gardens, or creating stormwater *treatment trains*.

People lack knowledge about green infrastructure.
In many parts of the United States, particularly the arid Southwest, water conservation is a big issue. Green infrastructure methods have been tried and tested there for decades. These concepts have only lately been brought to the Midwest. Although rainwater is a precious resource, many people may not think twice about sending rainwater down the sewer and then starting up the sprinklers two days later—even if they need to pay for the water. Although concerns about mosquitoes are sometimes raised, when properly constructed, bioswales, rain gardens, and treatment trains are no more likely to breed mosquitoes than more limited landscaping.

Pavement conducts water easily.
Large paved areas encourage rainwater to flow across the land. One of the solutions in stormwater management is to convert paved areas to porous areas that allow water to percolate into the ground. So-called *porous pavement* comes in many forms, including porous asphalt or concrete and permeable pavers. A good option in small, constrained spaces is to use suspended pavement so that water can be directed under the pavement into planting pits.

Heavy storms can cause chronic problems in the landscape.
Changes in climate are creating more frequent and more severe storm events. Heavy storms can stress traditional stormwater management systems, resulting in increased flooding. Traditional downspouts that aim toward a retaining wall or parking area, for example, can reduce the life of these features. In late winter and early spring, when temperatures vacillate, excess water that freezes and thaws can force

these features to bulge out and fall apart. Problems like these should be identified and addressed as part of a design plan.

Traditional landscaping methods carry a high *carbon footprint.*
The equipment used in landscape maintenance is some of the most polluting. It is important to look for ways to reduce carbon dioxide and other emissions released into the atmosphere. Work with your landscape contractor to reduce the amount of time these machines are being used on your property. Strategies include replacing resource-hungry plants with ones that require less maintenance, changing the kind of maintenance (switching from machine-shearing to hand-pruning shrubs, for example), or reducing mowing frequency. If your contractor is not willing, find a new one.

Properties aren't evaluated regularly.
Due to reasons such as expense or a lack of knowledge, some property owners or managers don't seek the advice of a good landscape design professional. Properties need to be evaluated periodically (every three to five years) to be sure the landscape is working well. Trees grow and shade out sun-loving plants. Shrubs that once fit under windows neatly may overgrow their space. Pond shorelines may be eroding. A skilled professional who understands sustainability can spot these problems and offer solutions. Find out if there is a certified landscape contractor in your community. PLANET is the national association that works with each state to certify landscape professionals (see Resources at the end of this chapter).

Stakeholders may experience sticker shock.
Large projects can be broken into smaller steps and phased in over a period of time to fit annual budgets. Some sustainable landscaping projects, such as planting large perennial beds, may have a higher price tag at installation. But costs decrease with time as the perennials get established and require much less maintenance. Work with a landscape design professional to consider alternatives and phasing of big-ticket items. It may not be financially feasible to convert a patio to porous pavers, but crushed gravel or woodchips edged in pavers might be a good alternative. Mowed pathways or trail systems may also be effective.

People don't realize that all landscapes need maintenance.
No matter how well designed a site is, if it isn't maintained well, it will eventually fail. Even sustainable landscapes require maintenance in order to be successful. Maintenance needs should be considered at the time of design to ensure that the amount of required upkeep is in line with the budget and ability of the property's users or caretakers. The annual operating budget should include costs associated with maintenance and retrofit to keep the landscape healthy and functional.

Owners may have conflicting visions for the property.
When a diverse group of people have different opinions on a project, it can require negotiating skills and education to keep the project moving forward. An experienced landscape architect or designer can provide you with examples and options to review and bring your group to consensus on a design.

Community rules prohibit certain sustainable practices.
In addition to water management and soil quality, sustainability also emphasizes utilization of native plants, local food production, and harnessing the energy of the sun and wind. Prairie plants, laundry-drying lines, vegetable gardens, honey production through beekeeping, and even the raising of chickens and other livestock are increasingly being accepted and promoted by communities and demonstrated in school and park district facilities. Healthy debate can create cohesive, purposeful policies that allow sustainable landscaping, vegetable gardening, or laundry-hanging areas, for example, to be incorporated into an attractive design plan.

HARNESS NATURAL PROCESSES TO IMPROVE QUALITY OF LIFE: IMPLEMENTATION

Retrofitting your landscape to be more sustainable will take thought, time, and money. Dollars spent at the beginning will be recovered in lower maintenance costs over the life of the landscape. Before you begin with this step, be sure you've read Chapter 2 on property management and that you've analyzed your budget.

This chapter on site design gives an overview of sustainable principles, and the chapters that follow drill down into particular elements, such as trees, gardens, lawns, ponds, and wildlife. Those chapters contain ideas and tips to help you save money and make your landscape more beautiful and functional, so be sure to read them before you make your final design plan.

There are five steps to creating a landscape that harnesses natural processes to meet people's needs: 1. Find a design professional, 2. Conduct an Eco-Audit and site analysis, 3. Evaluate options, 4. Design and document your plan, and 5. Get cost estimates for improvements and budget for future needs.

1. Find a design professional.

Good landscape design professionals know how to enhance what you already have and mitigate the undesirable qualities. These professionals have the training and vision to make the process go smoothly.

There are several types of professionals with distinct sets of qualifications and skills:

A landscape architect is a licensed professional or company who prepares a site analysis and design plans and observes construction. His or her training focuses on overall *site planning*, plant material, hardscape elements and the owner's site preferences. Landscape architects may have specific areas of expertise, such as municipal design, residential design, commercial/corporate design, environmental design. Look for membership in the American Society of Landscape Architects (ASLA). A landscape architect must have a bachelor's or master's degree in landscape architecture and a license to practice in your state.

A landscape designer is a professional who prepares, plans, and observes construction, mainly for residential and multifamily properties. Look for membership in the Association of Professional Landscape Designers, Professional Landcare Network (PLANET), your state's Landscape Contractors Association or American Society of Landscape Architects. A landscape designer may have an associate's degree or certificate in landscape design or a bachelor's degree in *horticulture*.

A landscape contractor is a professional or company that installs plantings, hardscapes, and other landscape features. Some larger firms may have a landscape designer or architect on staff. Look for membership in your state's Landscape Contractors Association or Professional Landcare Network (PLANET). Some contractors may not have any professional training; it is important to get references and examples of similar projects for you to contact or visit.

An environmental consultant is a professional or company that has experience in environmental practices such as stormwater management, native plantings, and soil stabilization. They may have a landscape architect, landscape designer, contractor or engineer on staff. An environmental consultant may have a bachelor's or master's degree in environmental science.

The ideal ultimate team to address your site concerns may be a combination of the above. It is important to get several estimates and walk your site with these professionals to get a good understanding of their skills and expertise. Always obtain references and examples of similar projects for you to contact or visit.

Check with other property owners or managers who oversee sustainable landscapes that you admire. They may have worked with a landscape professional who can help you.

2. Conduct an Eco-Audit and site analysis.
As outlined in Chapter 2, site design requires a good deal of assessment of your landscape's current condition. Here, you are drilling down even further to determine factors like the quality of your soil, kinds of plants, drainage patterns, and adjoining land use.

If you live in, work at, or manage an older property, you are starting out with certain conditions. How is water being managed? What is the soil quality? What plants already live on the property? What is the landscape's carbon footprint when it comes to maintenance? What off-site impacts are you experiencing?

To answer these questions, work with a qualified landscape design professional to conduct an Eco-Audit and site analysis. The audit and analysis will give you a sense of the current state of your landscape and the areas where you might focus to improve it.

Following are the essential measures to use. (Karla Lynch of Gardens for People in Geneva, Ill., shared her Eco-Audit, which was used as the basis for this section.)

Measure s*oil quality*, including percentage of organic matter, pH in root zone, and number of earthworms per cubic foot. Describe soil texture: sand, clay, silt, loamy.

Measure stormwater runoff by calculating square footage of roofs, driveways, walks, and patios, and identifying sump lines directed into storm sewers, as well as adjoining land use impacts. Look at how rainwater moves across the land. Does it wash down from other adjacent property? Where does it go when it leaves your property? Locate your downspouts. Are they connected to the sewer system?

Measure planted surfaces and water usage by measuring square footage of lawn surfaces, planted and mulched beds, and the estimated cubic feet of water necessary to maintain them.

Measure plant diversity by listing species of large trees, small *ornamental* trees, evergreens, shrubs, perennials, grasses, and other plants, and by estimating their volume of foliage in cubic yards. Calculate the volume of native to exotic species as a percentage.

Measure your landscape's carbon footprint by estimating the hours of operation for gas-powered equipment, including for lawnmowers, leaf blowers, weed whips, hedge shears, snow blowers, and truck travel. Your landscape maintenance contractor may be able to give you these estimates.

Measure current use of pesticides and fertilizers, including all products being used.

Review the age and condition of your infrastructure—green and gray. When do you need to repair or replace this infrastructure? Make a table that outlines the projected timeline and estimated costs for replacement or repair.

Continue with a full site analysis. In addition to the measures above, you should conduct a traditional site analysis. A *base map* showing all the major features of the landscape should be created at the end of the site analysis stage. A site analysis looks at the physical attributes of the property, such as:

- **Property dimensions:** Work from a plat of survey to determine the dimensions and shape of your property, as well as building dimensions, paved roads and paths, ponds, trees, woods and other landscape features.
- **Growing conditions:** What are the sun and wind conditions? Are there certain places on the property where conditions are markedly different? (These are called microclimates.) Where is the best southern sun? Where are the prevailing winter winds?

- **Grade:** Where is the land sloped or flat? Are there berms (steep slopes)? Are there low, wet areas?
- **Sensory issues:** What are the main sightlines and views? Locate doors and windows on buildings. Are there key views you'd like to enhance? Should certain undesirable views be screened? Are there noise or smell problems?
- **Salt spray:** In the winter, does salt spray or road salt run off into planting beds?
- **Paths:** How do automobiles move on the property? How do people move throughout the property? Are these satisfactory?
- **Utilities:** Where are utilities and easements? Are there septic tanks or overhead lines? Where are the trash cans, recycling receptacles and compost bins? Locate any storage sheds as well.
- **Ordinances:** What are your local landscape ordinances?

3. Decide goals and evaluate options.
Now that you have a basic understanding of the natural resources on your site, work with a landscape design professional to decide your goals and evaluate your options. The biggest decision you must make at this point is to decide your goals for the landscape. What are you trying to accomplish in the landscape? How can you enhance your natural resources while meeting the needs of the people who live, work, or visit here?

Each goal below is tied to a measure in the Eco-Audit or site analysis. Some best practices are listed here, but new ones are continually being developed.

Improve soil quality
By increasing organic matter, earthworm activity, and other measures. If you have a thin layer of topsoil over clay, you'll need to enrich this soil. Options might include:

- Set up a composting program for grass clippings, fallen leaves, chipped branches, shredded newspapers, and food scraps (no meat or dairy, as they attract pests). The most sustainable solution is to use material produced on the site. Doing so reduces your carbon footprint (no trucks needed to bring new material in). Families, companies, schools, and even towns are setting up such programs and using the finished product (partially decomposed *organic matter*) to improve soil and feed lawns, flower beds, and vegetable gardens. Plus, composting saves on waste disposal fees since that material doesn't need to be hauled away.
- Spread mulch, compost, compost tea (a type of liquid fertilizer produced from compost) and other products purchased from your landscape contractor or local nursery or garden center or created on site.
- If you have a shorter time frame for improvements, consider removing the clay and bringing in organically balanced soil.
- Create raised beds. This is an excellent solution for planting vegetable gardens.

Different areas of your property may require different treatments, depending on what you want to grow there.

Learn More:

Chapter 4: Turf (in this manual)
The Morton Arboretum: http://www.mortonarb.org/trees-plants/plant-clinic/horticulture-care/soil-considerations-growing-trees-and-shrubs and http://www.mortonarb.org/trees-plants/plant-clinic/horticulture-care/determining-health-your-soil

USDA Natural Resources Conservation Service:
www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/
Sustainable Sites Initiative: http://www.sustainablesites.org/soils/
US Composting Council: http://compostingcouncil.org/

Increase the amount of water that stays on site
Water is a precious resource, not waste. Evaluate how you can use it. Options might include:

- Consider directing downspout water to a *bioswale*, a *dry well*, or even an underground *cistern* (see "What do you know?" or Glossary for definitions).
- Create rain gardens around downspout areas, away from foundations.
- If you choose a cistern, decide how you'll access the saved water, as well as rig the overflow—will you need a pump, use a simple hose, or bury another tank?
- As your pavement ages, replace it with permeable pavement such as porous asphalt or concrete, permeable pavers, crushed gravel, or even turf, depending on the intended use.
- Use stored water for irrigation or a recirculating water feature. This is non-drinkable water, and should not be used where it could harm people.
- Consider piping stored water, which remains liquid in winter if buried deep enough, under paved surfaces to reduce the need for snow removal.
- If you have a very large building with a flat roof, consider building a green roof to absorb rainwater, reduce your energy costs (the building will stay cooler in the summer and warmer in the winter), build wildlife habitat, grow food, and reduce the heat island effect.

Learn More:

Chapter 4: Ponds (in this manual)
Sustainable Sites Initiative: http://www.sustainablesites.org/hydrology/
U.S. Environmental Protection Agency - Green Infrastructure:
http://water.epa.gov/infrastructure/greeninfrastructure/

Reduce the amount of drinking water used for irrigation
According to U.S. Geological Survey data from 2000, about a third of the water taken from ground water sources or bodies of water is used for irrigation. Irrigation is currently the largest use of fresh water in the United States. According to the U.S. Environmental Protection Agency, 36 states faced water shortages in 2013. Understandably, water conservation is an important priority. Options might include:

- Reduce watering frequency by not watering the lawn during the hottest months of the summer to let it go dormant (turn brown).
- Find ways to collect, store, and use rainwater or to use pond water to irrigate the lawn.
- Reduce the amount of lawn you have by replacing it with drought-tolerant native plants, ground covers or grasses, gravel, or mulch.
- Do not plant new turf (seed or sod), trees, or plants during the hottest part of the summer, roughly between July 1 and September 1.
- Mulch garden beds and under trees to conserve water in the soil.

Learn More:

Sustainable Sites Initiative: http://www.sustainablesites.org/hydrology/
U.S. Environmental Protection Agency - Water Efficient Landscaping: www.epa.gov/WaterSense/docs/water-efficient_landscaping_508.pdf

Increase plant diversity
When your landscape contains many different kinds of plants it will generally be healthier. A plant inventory provides essential information to help you face potential pest problems, such as the emerald ash borer, by making proactive treatment or replacement choices. *Native plants* provide many benefits. For example, once they are established, they are naturally able to cope with the weather conditions of your region without needing extra rain or fertilizers. They also support beneficial wildlife like butterflies and birds. While native plants are gaining in popularity, some people aren't used to them. Options include:

- Evaluate all plants on the site for their contribution to the overall goals of the site's design.
- Keep or add plants that perform *ecological functions,* such as wildlife habitat, water management, erosion prevention, *biodiversity*, etc.
- If plants are diseased or prone to pests, replace them with disease-resistant varieties or different types of plants that have better chances of staying healthy.
- If plants are healthy and attractive but in the wrong place, relocate them to a better place.
- Native plants can be incorporated into any garden, from formal to casual. Gradually increase the number of native plants you use in existing gardens.
- If you have *invasive species*—plants that are deemed unhealthy for natural areas because they choke out other plants—replace them with better behaved plants.

Learn More:

Chapters 6: Woodlands, Trees and Shrubs and Chapter 7: Herbaceous Plantings (in this manual)
Sustainable Sites Initiative: http://www.sustainablesites.org/vegetation/
The Conservation Foundation: http://www.theconservationfoundation.org/page.php?PageID=50
U.S. Environmental Protection Agency - Green Landscaping: http://www.epa.gov/greenacres/toolkit/chap2.html
Wild Ones: http://www.wildones.org/
National Wildlife Federation - Garden for Wildlife: www.nwf.org/How-to-Help/Garden-for-Wildlife.aspx

Reduce your property's carbon footprint
The environmental costs of maintaining a landscape are often overlooked. There are many ways to improve your landscape's carbon footprint. Options include:

- Plant trees, woody shrubs, and other plants with extensive root systems. These plants capture carbon dioxide from the air and store it in their leaves, stems, and roots.
- Reduce the mowing schedule during the height of summer, when your lawn grows slowly.
- Reduce the square footage of your lawn to reduce mower use.
- Replace your turfgrass with slow-growing, drought-tolerant grasses.
- Request that contractors use mulching mowers instead of leaf blowers in the fall.
- Request that walkways be broom-swept.
- Weed whips and mowers damage trees; apply a ring of mulch around trees to keep equipment away and weeds down.

- Reduce the sheared hedges, since hedge shears are overused and damage shrub health. Find a contractor who understands proper pruning techniques and switch to hand-pruning, which only needs to be done annually for the first couple of winters and then every 3 to 5 years after that.
- Ask your snow removal company to hand-shovel walking paths and use alternative de-icing agents to protect water, soil, and air quality.
- Replace traditional lighting fixtures with solar-powered or LED lighting.
- Plant shade trees near paved areas and the southwest sides of buildings. Pavement and buildings intensify summer sun and increase the heat island effect. Trees and other vegetation shade these heat-absorbing materials and reduce the need for air-conditioning on hot days.

Learn More:

Chapter 5: Woodlands, Trees and Shrubs (in this manual)
Ladybird Johnson Wildflower Center: https://www.wildflower.org/carbon/ and https://www.wildflower.org/nativelawns/

Reduce the use of pesticides and fertilizers
Improve the health of your landscape and human health by scaling back on the application of toxic substances. Options include:

- Improve soil quality to improve trees' and other plants' ability to resist disease. Just as we eat a healthy diet to help our immune system, plants need good soil to help theirs.
- When there is a problem in the landscape—a pest or disease outbreak—ask your arborist or landscape contractor to use *Integrated Pest Management (IPM)* techniques. IPM is a system of pest and disease control that uses the least harmful agents first.
- Replace disease-prone trees and plants with disease-resistant varieties.
- Tolerate some amount of disease or pests in the landscape. Don't overreact to small outbreaks. Give time for natural enemies to build up in population.
- Try an organic lawn care regimen.

Learn More:

Chapter 5: Turf (in this manual)
Midwest Pesticide Action Center: http://midwestpesticideaction.org/
U.S. Environmental Protection Agency: http://www.epa.gov/opp00001/factsheets/ipm.htm
Weed Science Society of America - Pesticide Resistance: http://wssa.net/weed/resistance/turf-crops/

Meet people's needs
A sustainable landscape is only successful if the people using it enjoy and support it. Options include:

- Create focal points using beautiful trees and other plants, art, or structures like fountains or arbors.
- Screen out undesirable views such as highways, cell towers, or unattractive neighboring property.
- Create destinations for walks and comfortable places for people to enjoy the outdoors, such as pergolas, sitting areas, piers, and gazebos.
- From inside buildings, identify sight lines from windows or doorways and use the landscape to offer an attractive view or focal point.

- Create pleasant walking paths from parking to buildings and other destinations.
- If geese are a problem around your pond, remove turf grass from the shoreline and plant native species of grasses. Add a walking path of crushed gravel and add benches to reclaim the unused real estate.
- Create a vegetable garden or tuck edible plants into ornamental gardens. Many schools and park districts create such gardens for teaching. Some newer residential developments are being built around small farms, where residents can help grow produce and enjoy the harvest.
- Consider building beehives to support honeybees and provide a source of honey for residents, employees, or visitors.
- On a residential property, set aside underused land that could be used for laundry lines. These could be attractively screened by trees or large shrubs. Decorative laundry poles could moonlight as attractive statuary the rest of the year.
- Consider setting up areas for residents or employees to raise chickens, turkeys, or other livestock. Chicago residents are raising chickens and goats; why can't suburban properties do the same?

Learn More:

The Morton Arboretum: http://www.mortonarb.org/trees-plants/plant-clinic/horticulture-care/landscape-design/getting-started-landscape-design
Rosalind Creasy - Edible Landscaping: http://www.rosalindcreasy.com/edible-landscaping-basics/
American Beekeeping Federation: http://www.abfnet.org/
National Public Radio: http://www.npr.org/blogs/thesalt/2013/12/17/251713829/forget-golf-courses-subdivisions-draw-residents-with-farms
Barbara Kingsolver: http://www.animalvegetablemiracle.com/
Cheney Mansion Gardens: http://www.cheneymansion.com/gardens.html

4. Design and Document Your Plan
Once you've sifted through your options and have come up with a plan that meets the goals of your landscape, prepare a document for future caretakers. This is a seemingly small step, but perhaps one of the most important. After all, sustainable landscaping needs to be just that—sustained over time.

When board members leave, the property is acquired by someone else, a new landscape contractor is hired, or a new property management company comes on board, you want to have a document that explains your intent. The document should include:

- The goals of the landscape, its services and benefits, and its aesthetic look and feel
- The tactics used to meet the goals
- If you are dividing the project into phases due to budget constraints, create a calendar showing projected dates and plans for each of the phases
- Maintenance instructions so that future board members, property owners and managers, and contractors understand how to care for the landscape.

5. Gather cost estimates and budget for future needs
Use the information gained from your reserve study or other long-term budget tool (see Chapter 2: Property Management) to help you gather costs estimates and design a budget plan. Include plant replacement and/or disease and pest treatment in the capital budget so stakeholders are prepared when a new plant pest arrives. The capital budget should also include any infrastructure conversions.

COMMUNICATING AND ADDRESSING CONCERNS

Sustainability won't necessarily be an important goal for your stakeholders. Often, people are more concerned about aesthetics than function or eco-friendliness. To be sure your site design project is successful, communicate throughout every stage and manage expectations.

When a constructed landscape doesn't work, you'll hear about it. Many problems arise due to poor design. A landscape's design impacts such aspects as snow plowing, sun exposure, the way water puddles, pedestrian access, views of other properties and plant health. Negative impacts will reduce the property's value.

Start with expectations
At the beginning of the design project, strive to understand the aesthetic priorities of the stakeholders. Do they like modern and crisp? Traditional and tidy? Sweeping and natural? Formal? Casual? Establish the project's aesthetics and be sure the designer you are working with understands stakeholders' expectations.

Show examples
Demonstrate that sustainable landscaping doesn't have to look wild or untidy. Take people on field trips. Show them photos and pictures from books. A sustainable landscape can have defined edges, distinct forms, attractive views, and eye-catching focal points. These traditional landscape concepts translate well in a sustainable landscape.

Emphasize that sustainable is smart
Sustainable landscaping is simply a smarter way of landscaping. It is more intentional and careful about using resources. It is also more beautiful and functional because it works with natural processes, not against them.

Look at the bottom line
A good landscape design professional can point out the cost saving advantages of switching to a sustainable landscape. Will there be fewer or shorter visits from the lawn company? Will you fill your flower beds with perennials instead of expensive annuals? Will you plant trees that shade the southwest side of the building—and save on cooling bills as a result? Where you can, point out these cost savings to skeptics. See "The Value of Sustainable Site Design" above.

SUSTAINABLE SITE DESIGN RESOURCES

Sustainability

U.S. Environmental Protection Agency: http://www.epa.gov/sustainability/basicinfo.htm

Water and Green Infrastructure

Center for Watershed Protection: www.cwp.org/documents/cat_view/77-better-site-design-publications.html
U.S. Environmental Protection Agency - Surf Your Watershed: http://cfpub.epa.gov/surf/locate/index.cfm
U.S. Environmental Protection Agency - Green Infrastructure: http://water.epa.gov/infrastructure/greeninfrastructure/index.cfm
Chicago Metropolitan Agency for Planning - Water2050: www.cmap.illinois.gov/livability/water/water-2050-implementation/programs
Sustainable Sites Initiative: www.sustainablesites.org
Minnesota Pollution Control Agency - Using the Treatment Train Approach:

http://stormwater.pca.state.mn.us/index.php/Using_the_treatment_train_approach_to_BMP_selection
Stormwater - Stormwater Treatment Train:
http://www.stormh2o.com/SW/Articles/Stormwater_Treatment_Train_16322.aspx

Design Professionals

Association of Professional Landscape Designers: http://apld.org/
American Society of Landscape Architects: www.asla.org/
Ecological Landscaping Association: www.ecolandscaping.org
PLANET (Professional Landcare Network): www.landcarenetwork.org/index.cfm
Midwest Ecological Landscape Allliance: www.melaweb.org

Waste and Composting

Waste Management Food Waste Pick Up Program:
Illinois Recycling Association Virtual Tours: http://illinoisrecycles.org/video/
U.S. Environmental Protection Agency GreenScapes:
www.epa.gov/waste/conserve/tools/greenscapes/howto.htm

Green Roofs

Green Roofs for Healthy Cities: http://greenroofs.org/

GLOSSARY

Aesthetic: the look of a landscape. A formal aesthetic might be characterized by shaped hedges or mowed and trimmed lawns. A natural aesthetic is looser, with broad swaths of plants growing in their natural shapes.

Base map: An accurate representation of the existing landscape, showing information such as building dimensions, distance to street, and the locations of trees, ponds, woods, driveways, and sidewalks.

Biodiversity: variation in the kinds of plants, animals, and other organisms living on the land. The higher the biodiversity, the more healthy the land is deemed to be.

Bioswale: a managed planting bed designed to remove pollution from stormwater runoff. A swale is a purposeful ditch with gently sloped sides. A bioswale is typically filled with plants that capture water temporarily and allow it to slowly be absorbed into the ground or run into another body of water.

Carbon footprint: the total greenhouse gas emissions produced by a property.

Cistern: a multi-gallon container used to hold water. It can be buried or above ground. Water can be stored for reuse in irrigating garden beds or lawns.

Compost: organic matter, such as leaves, grass clippings, newspaper, or food scraps, that is allowed to decompose and then used to fertilize the soil naturally.

Dry well: a large hole in the ground filled with gravel, topped with soil and plants. It can capture and disperse rainwater from gutters that would otherwise run into a sewer system or down the land.

Ecological function: the role of individual natural elements found in a landscape. For example, trees absorb carbon dioxide from the atmosphere, reducing global warming; plant roots hold the soil and prevent erosion during heavy rain.

Ecosystem: a community of plants, animals, and microbes, plus the surrounding air, water, and soil that all interact and influence one another.

Gray infrastructure: traditional practices for stormwater management and wastewater treatment, such as pipes and sewers.

Green infrastructure: using natural processes to manage stormwater, cool air temperatures, improve air quality, and produce other sustainable outcomes.

Green roof: a roof that is specially designed to grow plants, conserve building energy use, and reduce the *heat island effect* (see definition).

Ground water: natural caches of water deep underground that is often used for drinking, residential, and commercial use.

Heat Island Effect: on hot summer days, asphalt, concrete, and roofing materials amplify the sun's heat to create higher temperatures. According to the U.S. Environmental Protection Agency, temperatures in U.S. cities can reach up to 10 degrees Fahrenheit higher than nearby rural areas.

Horticulture: the study of plants cultivated for human use.

Invasive species: plants or animals that cause economic or environmental harm or harm to human health. Can sometimes be native, but often non-native.

Native plants: originating from local environment. Not imported from other parts of the country or other continents.

Natural processes: processes that happen naturally, not by human cause.

Organic matter: the decaying remains of plants and animals and their waste. Organic matter is a key component of healthy soil.

Ornamental tree: a smaller-statured tree with showy flowers or fruits, vibrant fall color, or decorative bark. Examples include crabapples, hawthorns, and dogwoods.

Pipe to pond: an older system of stormwater management where water collected by roof downspouts and graded land is collected by street sewer pipes that lead to a pond.

Porous pavement: pavement that is engineered to allow water to percolate through it into the ground below, rather than running over the land.

Runoff: rainwater that travels over land, as opposed to water that is absorbed into the soil or evaporates into the air. Stormwater runoff causes a lot of environmental damage through soil erosion, carrying pollutants to streams and other ways.

Sediment: particles of soil and pollution that fall to the pond or lake's bottom.

Site planning: composing how a site or property will be organized on the land.

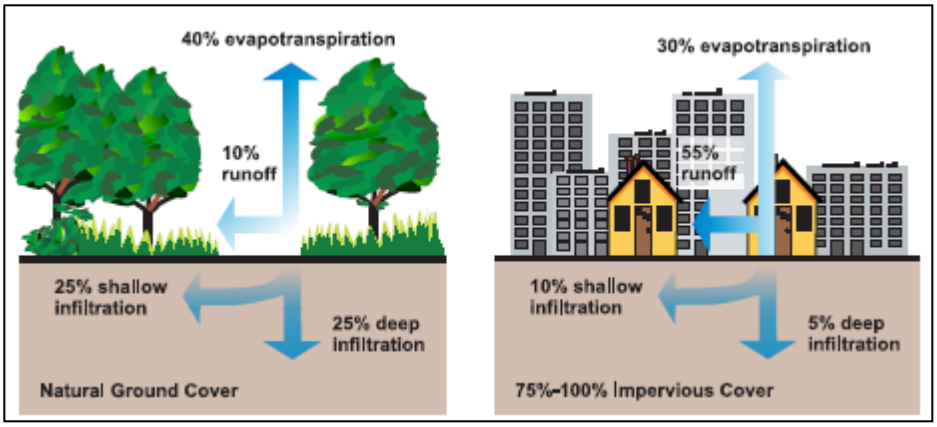
Soil quality: the health of the soil.

Sustainability: the idea that humans and nature can exist in productive harmony, fulfilling the health, social, economic, and other requirements of present and future generations.

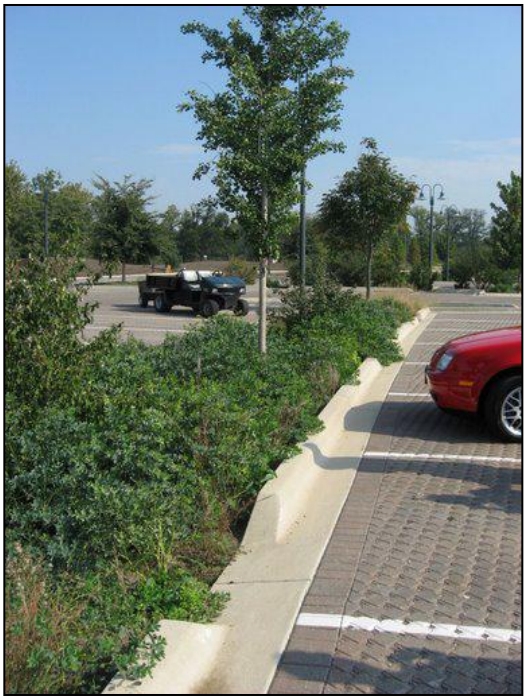
Treatment train: a sequence of water treatments designed to meet the needs of a particular environment.

Turf: what most people know as "grass."

Wildlife garden: a garden that provides food, water, cover, and places for wildlife to raise their young.



The diagram on the left shows how rainfall acts in a natural area populated by trees and plants. About 40 percent of water lands on foliage and evaporates back into the air (evapotranspiration). About 25 percent of water is absorbed by the soil and plant roots. The last 25 percent charges ground water. On the other hand, the diagram on the right shows an urban area that is 75 to 100 percent covered by pavement and buildings. Here, about 55 percent of the water runs off the surfaces into sewer systems.
Graphic courtesy of the U.S. Department of Agriculture



This parking lot at The Morton Arboretum has been resurfaced with permeable pavement. Note the indentations in the curb, which allow runoff to filter into the bioswales (planted medians where water can soak in). Water from the pavement and bioswales is cleansed by vegetation before being directed into a nearby lake.

Stormwater runoff has eroded the land around this retaining wall. *Photo courtesy of Beth Corrigan*

A pretty rain garden has been wisely planted near this storm sewer. The plants reduce the amount of water flowing into the sewer and clean out pollutants as the water runs through them. *Photo courtesy of Jim Kleinwachter*

Keep it Simply Sustainable!

Work with nature, not against it

A landscape can be beautiful to look at and functional at the same time.

One major goal of sustainable landscape design is to create landscapes that harness the power and beauty of natural processes to please and help the people who live and work there.

When it rains, allow the water to nourish water-loving plants or power a beautiful water feature.

When the sun shines, let sun-loving plants bloom in places where people can enjoy them. Remove or prune overgrown evergreens and let the sun heat south- and west-facing windows in winter.

Install planting beds in parking lots to receive run-off and to filter out pollution.

Plant trees to limit effects of heat on building facades, reducing energy usage for cooling. And plant trees along walkways and in large paved areas to reduce heat island effects. Install dense plants to screen undesirable views. Or use a stunning three-season tree as a focal point.

A Review of Important Information

What do you know?
What is...
A bioswale?
A cistern?
A dry well?
(See next page for answers)

What do you know?
A bioswale is a managed planting bed designed to transport stormwater and remove pollution from stormwater runoff. A swale is a purposeful ditch with gently sloped sides. A bioswale is planted with vegetation that captures water temporarily and allows it to slowly be absorbed into the ground or run into another body of water.
A cistern is a multi-gallon container used to hold water. It can be buried or above ground. Water can be stored for reuse in irrigating garden beds, lawns or for other purposes.
A dry well is a large hole in the ground filled with gravel, topped with soil and plants. It can capture and disperse rainwater from gutters that would otherwise run into a sewer system or down the land.

A New Perspective

Natural processes move slowly, but they are healthy. We can gradually and systematically transform the landscape; there are usually no quick fixes.

Find more sustainability perspectives in the Introduction.

Chapter 3 Ponds:

Protect Water Quality

"What happens in Vegas stays in Vegas." But a property with a *pond* works according to a different rule: "What happens on your property washes into the pond…and eventually into streams, rivers, lakes, and drinking water sources." In short, what happens on your land gets shared with everyone downstream.

It works like this: Rain runs off the landscape, collecting soil, fertilizers from lawns, motor oil off pavement, litter, and anything else in its path. Water, being fluid and subject to gravity, collects in low areas, such as ponds.

Manmade ponds, such as those in residential developments and corporate campuses, are typically built to detain storm water on the lowest, wettest spot on the property. That location likely used to be *a wetland*, such as a bog, swamp, marsh, or stream. A wetland is nature's way of storing, cleaning, and releasing water. More recent regulations aim to preserve natural wetlands while creating manmade stormwater ponds. Manmade *detention basins* or *retention ponds* are good for storing and releasing water, but they aren't as effective as wetlands in treating and cleaning the water. So much of the polluted sludge simply collects in the pond, creating odors, mucking up the water, and encouraging weed and algae growth. But, it doesn't stop there. Unfortunately, with each large rain storm, some pond water (and the stuff in it) moves to other, larger bodies of water downstream.

A *watershed* is an area of land that drains into a body of water. Small watersheds drain into larger ones, until water reaches rivers and eventually lakes and oceans. The upshot? The health of the world's oceans begins on your property. The sustainability goal for your pond is *protect water quality.*

You can address common problems such as water smell and clarity, heavy algae outbreaks, and nuisance animals like geese. But managing these problems is different from helping a pond be truly sustainable. The truth is, successfully managing a manmade pond takes a big-picture, long-term approach. And a true sustainable aquatic community may not conform to a tidy aesthetic.

THE VALUE OF MANAGING A POND SUSTAINABLY

By creating a long-term plan that minimizes pollutants washing into your pond, you can enjoy many benefits.

Increased property values

A beautiful, well-maintained pond can increase property values. In a residential community, this can be especially true for homes next to the pond.

Fewer geese and more desirable wildlife

You can decrease the number of geese, creating a more attractive *shoreline* without the unhealthy mess of droppings. Depending on your goals, you can also attract other kinds of beneficial waterfowl, as well as fish, frogs, toads, and other wildlife that are enjoyable to watch. .

Recreation and beauty
A well-maintained pond potentially offers many kinds of recreation opportunities: walking paths, fishing, and wildlife viewing. In addition, tranquil views and soothing sounds of water are have been shown to be beneficial to human health

Cost Comparison of Shoreline Options
Assuming a half-acre circular pond centered in a two-acre open space.

	Turf Grass (to edge)	6' Stone Revetment (3' in the water to 3' out of the water)	Native Plant Buffer Zone (12'' from water's edge)
Installation Cost (grading, soil prep, material)	$1,170	$65,000	$10,000 (seed) to $30,000 (live plants)
Years 1–3			
Maintenance (mow, weed, fertilize)	$600	$400	$3,600
Goose Control	$10,170	$10,100	$0
Algae Control	$6,700	$6,700	$6,700
Years 4–9			$3,000
Burn & Seed			$2,400
Maintenance (mow, weed, fertilize)	$5,200	$1,200	$0
Goose Control	$19,500	$19,500	$12,000
Algae Control	$18,400	$14,900	$3,000 Burn and seed
Year 10	$50,000 to $100,000 Shoreline repair and sediment removal	$10,000 to $30,000 Replace rock	
10 Year Cost	**$111,670 to $161,670**	**$128,300 to $148,300**	**$40,700 to $60,700**

Courtesy of Integrated Lakes Management, Inc. The cost ranges listed are given for comparison purposes and can vary widely due to many factors, including site accessibility, soil type, slope, and others. Costs are based on averages of cost range quotes given by service providers based on an existing half-acre circular pond centered in a two-acre open space.

COMMON POND CHALLENGES

Grateful acknowledgement for much of the content in this section is owed to Lake Notes, a series of publications produced by the Illinois Environmental Protection Agency about issues confronting Illinois' lake resources. Request copies by calling 217-782-3362 or download them from www.epa.state.il.us/water/conservation/lake-notes.

Manmade retention ponds were built to collect storm water runoff from the site
It's difficult to build a healthy pond that duplicates the functions and stability of a natural water body. With few exceptions, most developers never even try. They are focused on one goal: collecting storm water from the surrounding roads, lawns, and rooftops. Typically, they contour the land and use a variety of stormwater drains, *swales*, underground pipes, and channel systems to direct water to a shallow, steeply banked hole. Often, shorelines are planted with lawn grass, and water has very little circulation. Sound familiar? You may be dealing with the consequences: eroding shorelines, thick algae and *invasive*

species, green stinky water, geese droppings, and other problems. The solution is to incorporate pond management into your landscape plan.

It's expensive to remediate a manmade retention pond
Many residents, employees, and visitors expect to see a pristine, crystal-clear pond. But the unfortunate reality is that most manmade ponds are not designed to promote natural processes. In naturally occurring ponds, beneficial aquatic life (including insects, fish, and plants) clean the water. In natural ponds, their shape and depth help maintain even temperatures. If they are undisturbed by development around them, naturally occurring ponds also contain a high amount of oxygen, which is good for aquatic life. It's very expensive to set up and maintain ponds to create those conditions, and special dredging permits are difficult to obtain. But it's possible over time to gradually work toward improving the health and beauty of a pond.

Pond problems are managed, but not pond health
We intuitively understand the value of keeping grass mowed and maintaining paved surfaces, but many people don't know that ponds need maintenance, too. The fact is, manmade ponds need an ongoing, long-term management plan. When the pond was built, all of the natural systems that helped the former wetland clean the water were destroyed. Now it needs help from humans to manage the water quality and shoreline. Have your pond evaluated by a pond professional to help you understand the needs and challenges of your particular pond. For more information, see "Protect Water Quality: Implementation" later in this chapter.

Algae blooms are common in manmade ponds
When lawns are fertilized, rain or irrigation washes the nutrients into ponds. Even small amounts of phosphorus (an eyedropper-full in a tanker truck of water) can create excessive algae growth. Unfortunately, the same nutrients that lawns love are also enjoyed by aquatic plants such as algae. A pond covered over by a thick layer of green scum is not attractive, to say the least. In Illinois and many other states, the nutrient phosphorous has been banned from commercial fertilizer applications, and that is great news for ponds. However, algae are also nourished by other lawn fertilizer ingredients, as well as pet and geese droppings. Excessive algae growth can block sun from reaching the bottom of the pond, preventing beneficial water plants like lilies and other *native* rooted aquatic plants from growing. Algae can also create very low levels of oxygen in the water, which harms fish and other aquatic life. Have your lawn soil tested annually to determine which nutrients it truly needs. Simply planting a *buffer* of native plants between lawn and pond can slow and even reduce the migration of nutrients into the pond. (See "Keep It Simply Sustainable!" for more information about buffers.)

Ponds lose depth over time
Retention ponds fill with *sediment* (particles of soil and pollution that fall to the pond's bottom) as shorelines erode and storm water runs off buildings and land. As a result, the body of water loses depth, which causes the kinds of plants living there to change. You may see invasive plant species move in, such as Eurasian water milfoil, curly-leaf pondweed, cattails, and phragmites. Due to lower oxygen levels, desirable fish species may die off, leaving less desirable ones that can survive in low-oxygen environments. When water is shallow, winter *fish kills* (a large dying-off of fish) increase. Sediment in the water can clog irrigation systems as well. Stabilizing the shoreline by planting a buffer of deep-rooted *native* plants can help hold the soil and slow some forms of sedimentation.

Water appears cloudy, green, or brown instead of crystal-clear blue
Cloudy or muddy water (technically called *turbid* water) is caused by sediment, algae, and other particles floating in the water. Much of this material enters the pond through stormwater runoff from the surrounding land. Other ponds are engineered so that water collected from storm sewers is channeled into an underground pipe system, which dumps into the pond. Cloudy water can also be caused by erosion of the pond's shoreline or even the movements of fish like carp, which disturb the sediment and soil at the bottom of the pond as they look for food. The fish kick up particles and kill the roots of beneficial water plants that help anchor the soil and sediment at the bottom of the pond. The cloudy

water also hurts these plants' health, so a downward spiral occurs when they die off and more sediment is released. Encourage regular street sweeping, cleaning of storm sewer catch basins, and rerouting of roof downspouts onto lawns or gardens rather than pavement. These simple actions can help improve water quality and extend the life of your pond.

Some people think it's okay to use a pond as a dumping ground
For unwanted chemicals, trash, and lawn waste. Eliminate these obvious sources of pollution by creating and enforcing "no dumping" policies.

Once the shoreline is gone, it's gone
The sooner you address pond erosion, the better. Otherwise, you lose property and perhaps risk an accident. Sometimes *banks* were designed too steeply; these are more likely to be unstable and slough off. Beavers and muskrats may dig into the shoreline to make dens. But one of the most common causes is shallow-rooted lawn grass planted right up to the pond's edge—its roots are no match for the forces of erosion. Stabilizing a pond's shoreline may seem like an expensive proposition, but there are sustainable measures you can take that are actually less expensive and less maintenance-intensive than many traditional solutions. Consider planting a shoreline buffer (see "Keep It Sustainably Simple!") while the shoreline is still intact.

Early detection and maintenance of invasive plant species are essential
While there are many beneficial water plants, some species are nuisances. It's important to learn the difference. A qualified pond professional can show you. Invasive species such as Eurasian milfoil and curly-leaf pondweed are opportunistic and highly adaptable. Once they gain a foothold in your pond, they will take over within a short period of time. Your goal is to prevent colonization, because removing established colonies in and around your pond is difficult and very expensive. Don't be fooled by invasive plants that are attractive. Some, like purple loosestrife, may look good, but they are very bad for your pond's health!

Not everyone will agree on their objectives for the pond
What is realistic to expect from a body of water, and where do you want to be on the sustainability spectrum? Does your pond need to be clean for swimming, fishing, or other activities? Is it simply a water feature meant to be looked at? Management tools will be determined by expectations like these. Visit other ponds that are successfully managed to find models and develop a frame of reference. Talk to the land or pond managers about their management costs and strategies.

Activities on the land affect water quality
As we stated in the introduction to this chapter, ponds collect all the problems of the urban environment. When you fertilize your lawn, rain can wash those nutrients off the grass and into the pond, causing algae to bloom. Using herbicides incorrectly can kill fish in the pond. It's less expensive to keep pollutants out in the first place than to extract them from the environment. Educate residents or other stakeholders about the vital land-water connection.

Changes in boards, management, or ownership make it difficult to plan for the long term
For example, homeowners associations have a high level of turnover of residents, board members, management companies, and contractors. For any property, it's important to establish a long-term vision with a five- to ten-year plan. Include this task in your reserve study or other long-term budgeting process. Your goal should be to encourage a balanced, sustainable biological system. Establish a documentation process so future managers and owners know what's been done and why.

PROTECT WATER QUALITY: IMPLEMENTATION

A sustainably managed pond is certainly attainable, but it may take years of planned improvements. A sustainably managed pond is not maintenance-free. Build a management strategy that includes these steps to achieve a sustainable pond:

1. Work with a qualified pond professional
Have your pond evaluated by a pond professional to help you understand the needs and challenges of your particular pond. Before hiring, be sure to gather references and examples of other ponds they manage. (See Chapter 2: Property Management for tips on evaluating contractors.) Ask for a price quote for annual costs of managing the pond sustainably.

2. Establish a budget for operating expenses
Tackle long-term funding by adding pond maintenance to a reserve study or budget. It is not easy or cheap, but a sustainable pond is attainable. For the best results, educate stakeholders to get their buy-in and support.

3. Deter geese and other nuisance waterfowl
The presence of Canada Geese has a direct relationship with your pond maintenance practices. Discourage people from feeding geese. Modify your shoreline to include tall grasses, plants, and shrubs; preferring to be out in the open so they can see their predators and escape more easily, geese avoid areas with tall foliage. Allow your pond to freeze over in the winter by turning off aerators (if you're not concerned about winter *fish kills*.) You can also build physical barriers such as fences and grids.

4. Provide information to stakeholders about what is happening
Simple signage can help people understand and appreciate the work involved in creating a sustainable pond. Describe new plants, expectations about water quality, benefits to wildlife, and impacts to the watershed. Communicating about these features will go a long way toward building support for changes to the pond.

5. Manage the watershed
Take into account your pond's watershed. You will probably need to work with a pond or *lake* professional to understand how practices on your property specifically impact your water quality. Here are some key watershed management ideas from *Lake Notes*:

- Learn your pond's watershed (see "Determining Your Lake's Watershed" in *Lake Notes*). First, check if a government agency has already done this. Try your county stormwater department, regional planning commission, local Soil and Water Conservation District (SWCD), Natural Resource Conservation Service (NRCS), state EPA office, or state water survey. If not, you can obtain a U.S. Geological Survey topographic map, and then get help interpreting it from a pond professional or the SWCD or NRCS.

Learn More:

Lake County, IL, Stormwater Management Commission:
http://www.lakecountyil.gov/STORMWATER/Pages/default.aspx
Chicago Metropolitan Agency for Planning: www.cmap.org
National Association of Conservation Districts: http://www.nacdnet.org/
USDA Natural Resources Conservation Service:
http://www.nrcs.usda.gov/wps/portal/nrcs/site/national/home/
Illinois Environmental Protection Agency: http://www.epa.state.il.us/water/
Illinois State Water Survey: http://www.isws.illinois.edu/
U.S. Geological Survey: http://nationalmap.gov/

- Establish a buffer strip of native vegetation along the pond shoreline to filter pollutants and halt erosion (See "Keep It Simply Sustainable!"). Good plants to include may be bur reed, cord grass, lake sedge, and other plants that form dense colonies that hold the soil. Wildflowers can be added for color and interest.
- Have your lawn or landscape contractor test the soil to determine the nutrients your lawns and gardens really need. Only apply the treatments that are necessary.
- Reroute roof downspouts onto lawns rather than pavement so the plants and soil can filter contaminants. Similarly, encourage practices that collect rain where it lands, such as porous pavement, *bioswales,* and *rain gardens*.
- Employ soil-erosion and sedimentation controls during any construction activities within the pond's watershed. These may include silt fences and sediment ponds. Most counties regulate these activities. Talk to your county's stormwater department for more information.
- Encourage regular street sweeping, cleaning of storm sewer catch basins, and maintenance of drainage swales. Swales are contoured, planted sections of low land that collect and absorb water from downspouts.
- Discourage dumping in storm drains.

6. Stabilize eroding shorelines
Work with a qualified pond or lake professional who will take a sustainable approach. This might include planting a buffer of native grasses and flowering plants that can hold the soil. Other methods recommended by *Lake Notes* include planting cuttings or *live stakes* of willow or other water-loving shrubs along the shoreline. You can also use *fiber rolls* and other similar reinforcement to provide a protected zone along the shoreline.

7. Reduce hard surfaces
Evaluate your walkways, roads, driveways, parking areas, and other hard surfaces. When it's time to patch or replace these surfaces, consider replacing them with porous surfaces, such as pea gravel, porous pavement, or porous pavers to mitigate runoff. These alternative surfaces will allow rainwater to percolate into the ground.

8. Inspect and maintain
Most systems in nature are ever changing, and a pond is no different. Protect your investment by periodically monitoring the health and function of the pond. Ongoing maintenance might include removing debris from the pond and at the detention pond's outlet structure, inspecting the shoreline for erosion, monitoring the growth of newly installed plantings, and eradicating invasive plants.

COMMUNICATING AND ADDRESSING CONCERN

Perhaps more than any other element in a landscape, a manmade pond has the most unrealistic expectations set upon it. And due to its location on the property, its flaws are always at center stage.

Educating stakeholders is key to your pond management effort. Because restoration and management is expensive and long-term, it's important to communicate the risks and rewards of acting versus doing nothing. Here are some ways to help people understand the risks and rewards:

Address the bottom line
Your pond will be a money pit unless you address issues when they are small. Erosion and invasive plants are two great examples. The bigger and more established the problem, the bigger and more expensive it will be to resolve it.

Appeal to people's interests and desires
A healthy pond can be a true asset, especially in helping people enjoy their time outdoors. A healthy pond can increase property values. Imagine enjoying a lazy hour of skipping rocks on sparkling water,

observing frogs along the shoreline, listening to the rustle of wildflowers and grasses, and glimpsing the occasional turtle or great blue heron. Fishing, sailing, whatever it is… your vision for the pond could be a reality with the right plan and funding.

When people know better, they do better
You may start down a sustainable path, but a few vocal stakeholders may become weary and stop the whole thing dead in its tracks. Don't let that happen to your project. Manage expectations by emphasizing that this project takes patience. It may not look good in one or two years. It may take three years to see improvements. Working with natural systems takes time and is never perfect, but if you are in it for the long haul, your commitment will pay off.

Join a watershed group
Adopt a local watershed to protect. Find them at the U.S. Environmental Protection Agency's Adopt Your Watershed website (http://water.epa.gov/action/adopt/index.cfm), which offers a Watershed Stewardship Toolkit.

POND MANAGEMENT RESOURCES

General

Illinois Environmental Protection Agency - *Lake Notes* Fact Sheets:
http://www.epa.state.il.us/water/conservation/lake-notes/index.html
Michigan United Conservation Clubs: *Managing Michigan Wildlife: A Landowner's Guide* - Building and Managing Ponds
http://www.dnr.state.mi.us/publications/pdfs/huntingwildlifehabitat/landowners_guide/habitat_mgmt/Wetland/Building_Managing_Ponds.htm
Land and Water Magazine - Manicured Lawn vs. Functioning Ecosystem:
http://www.landandwater.com/features/vol50no3/vol50no3_1.html

Watershed and Conservation

Center for Watershed Protection: http://www.cwp.org/
Natural Resources Conservation Service - Technical Publications:
http://www.nrcs.usda.gov/wps/portal/nrcs/main/plantmaterials/technical/publications/
United States Geological Survey - Common Environmental Problems in Lakes and Probable Causes: http://pubs.usgs.gov/fs/fs06303/#heading127927216
DuPage County, IL, Water Commission: http://dpwc.org/AboutUs/tabid/86/Default.aspx
Salt Creek Watershed: http://www.saltcreekwatershed.org/
U.S. Environmental Protection Agency - Identifying and Protecting Healthy Watersheds:
http://water.epa.gov/polwaste/nps/watershed/hw_techdocument.cfm

GLOSSARY

Bank: the edge of land leading into a pond.

Bioswale: a managed planting bed designed to remove pollution from stormwater runoff. A swale is a purposeful ditch with gently sloped sides. A bioswale is typically filled with plants that capture water temporarily and allow it to slowly be absorbed into the ground or run into another body of water.

Buffer: carefully selected plants that live next to a pond to stabilize the *bank* (to prevent soil erosion) and filter out pollutants before they drain into the pond.

Detention Basin: usually the lowest spot on the property designed to hold water for a brief time during heavy rainfall. A small pipe or "restricter" releases the water slowly downstream.

Fiber Rolls: also called fiber logs or wattles, these are tube-shaped erosion-control devices filled with straw, flax, rice, coconut fiber material, or composted material. Each roll is wrapped in UV-degradable polypropylene netting or biodegradable materials like burlap, jute, or coir. Fiber rolls can help prevent erosion and clean the rainwater that runs into ponds.

Fish Kill: a large die-off of fish in a pond, usually caused by reduced oxygen in the water. Oxygen levels are affected by drought, algae bloom, or increase in water temperature. Fish kills can also be caused by diseases, parasites, and poisoning.

Invasive Species: plants or animals that cause economic or environmental harm or harm to human health. These species can sometimes be native but most often are non-native.

Lake: there is no set size definition of a *pond* versus a lake. The State of Illinois defines anything less than ten acres as a pond, but other states may define them differently.

Live Stakes: cuttings from a tree or shrub with the branches trimmed off. These are planted into a pond bank, and the stakes develop roots that stabilize the soil.

Native: originating from the local environment. Not imported from other parts of the country or other continents.

Pond: there is no set size definition of a pond versus a *lake*. The State of Illinois defines anything less than ten acres as a pond, but other states may define them differently.

Predator: an animal that hunts other animals.

Rain Garden: usually a depressed area in the soil that collects rainwater, either from the sky or building downspouts. A rain garden is planted with water-loving plants that absorb the excess water.

Retention Pond: a dredged low area on a property, often a former wetland, designed to hold water. Unlike a detention basin, a retention pond has no pipe to let water drain away.

Sediment: particles of soil and pollution that fall to the bottom of a pond or lake.

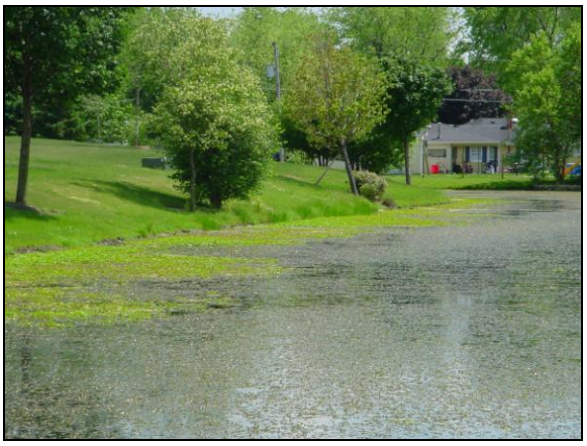
Shoreline: the edge of a pond or lake.

Swale: a natural or manmade ditch designed to slow and capture rainwater, rather than letting it run off the land. The water slowly percolates into the ground.

Turbid Water: Cloudy or muddy water that is caused by algae and other tiny floating particles.

Watershed: an area of land that drains into a body of water. In general, the larger the urban watershed, the more opportunity there is for contamination. As a result, a pond functions very differently within a natural environment compared to one in a manmade environment. It is therefore extremely important to identify the causes of problems, rather than simply addressing the symptoms.

Wetland: an area of land that is saturated with water for all or part of the year.



A lawn growing up to the edge of a pond creates many problems, including erosion, excess algae, and geese habitat. The best course of action is to tear out the grass and replace it with a buffer strip of water-loving plants. *Photo courtesy of Integrated Lakes Management*

Creeping water primrose is a highly invasive plant species. Keep on top of this and other invasive species before they overtake the pond and choke out other beneficial plants. *Photo courtesy of Integrated Lakes Management*

While a certain amount of algae growth in a pond is healthy, excess filamentous algae, as pictured above, can block light to the bottom of the pond, compromising its health. *Photo courtesy of Integrated Lakes Management*

Wetlands: Yesterday and Today
Today, 90 percent of the wetlands that used to exist in Illinois are gone, including the animals and plants that lived in them.

Many wetlands were drained with drain tiles, which channel water underground to the closet flowing body of water. These drain tile networks still exist on many agricultural properties.

Today, there are enough drain tiles in Illinois to go around the world six times!

The water-holding ability of the land has been changed drastically by the paving of roads and parking lots, and the construction of homes and other buildings.

As a result, water moves farther and faster than it did a hundred years ago. Back then, many rivers remained dry through most of the year and ran only in times of high water, such as springtime. The soil, gentle contours of the land, and special water-loving plants helped water seep slowly into the ground.

By contrast, today, as we see every spring, summer, and fall, overburdened rivers overflow their banks with devastating regularity. When rivers flood, they can cause millions of dollars in damage.

Keep It Simply Sustainable!
Build a Shoreline Buffer

Lawn grass along shorelines produces a trifecta of problems:

1. Lawn grass planted right to the edge of a pond acts like a big, green welcome mat for rain-washed chemicals, road salts, and lawn fertilizers (which encourage pond algae to grow).
2. Lawn grass also provides the perfect habitat for Canada Geese. They feel safest when there's a clear path between the pond and the shore.
3. Thin, short grass roots are no defense against shoreline erosion.

Lawn grass is a no-win situation. What to do? Ditch the grass around the pond and replace it with a shoreline buffer of native plants. It's a sustainable solution that can address all of these problems and more:

- Native plant foliage and root systems filter out pollutants before they reach the pond.
- Canada Geese fear potential predators may be lurking among the tall shoreline foliage—so they'll abandon your pond.
- These plants' extensive fibrous root systems prevent shoreline erosion by holding the soil.
- Another winning attribute: these native plants do not require weekly mowing or watering!

A REVIEW OF IMPORTANT INFORMATION

What is a Healthy Pond?

- Healthy, diverse fishery as determined by periodic sampling
- 20 to 30 percent emergent and submergent aquatic plants; normal algae density
- 25-foot buffer zone made of native plants and trees that aren't mowed; pockets of shoreline planting are better than nothing if placed close together
- Depth of at least 15 feet for every quarter-acre of surface area
- Irregular shoreline
- Slope of shoreline should have a ratio of 6-feet horizontal to 1-foot vertical
- If pond is less than 7 to 8 feet deep, it may never be a sustainable system; explore options, such as converting to a wetland
- Moving water is good; it provides oxygen

A New Perspective

Look beyond your property's borders to understand the larger ecosystem. What you do on your land affects the surrounding land.

Find more Sustainability Perspectives in the Introduction.

Chapter 4 Turf:

Build Healthy Soil to Nourish Lawns

Over the decades, a carpet of lush, green grass has evolved to be a source of pride and joy. A lawn, or *turf*, is often considered the signature feature of a well-maintained landscape. This mindset needs an update.

A lawn's beauty comes with a high price tag—in dollars, in precious resources such as water, and in potential impacts on the environment and health. On the sustainability continuum, turf is just about the most resource-intensive aspect of the landscape.

Each year, large property owners spend thousands of dollars mowing, trimming, watering, and chemically treating turf grass. Running a golf course costs significantly more. Traditionally maintained turf is dependent on supplemental water and expensive chemical cocktails to keep up its appearance.

The key to a sustainable lawn is to change your lawn care regimen to improve the health of your *soil*. Other options include reducing the area of your lawn and replacing turf with plants that are better suited to your growing conditions.

Switching from traditional to sustainable practices takes time—about three to five years—as you build up healthy soil and wean turf off the “drugs.” That is the sustainability goal for this chapter: *Build healthy soil to nourish turf.* Eventually, you will spend considerably less money, time, and resources while creating a much healthier environment. Now that’s a great return on investment!

THE VALUE OF SUSTAINABLE LAWNS

Turf grass is a valued aesthetic in our current way of thinking about what a landscape should look like. It serves as a versatile green carpet for recreation, an extension of indoor play space, outdoor cooking and entertaining, pet runs, and enjoyable pathways from here to there. Sustainably grown turf provides all of these advantages and even more, including financial savings and environmental benefits.

More Efficient Water Management

Water use is the least sustainable aspect of turf care. If you water turf three times a week from April through October, that’s 90 times a year! By comparison, a properly designed *perennial* bed may need to be watered 10 to 15 times. Sustainable turf maintenance practices allow you to water turf less often. For example, correct watering at the right time of day and in the appropriate amount encourages healthy growth, reduces disease, and saves money. Sustainable lawn care focuses on improving the soil. When soil is improved, grass plants grow stronger, and the soil holds water longer. When soil is enriched and healthy, it contains more air spaces that can store rainwater.

- *Organic matter* in the soil holds more moisture. Plus, healthy soil contains more earthworms, which create more air spaces through their tunneling activity.
- Sustainable turf is watered less frequently and more deeply, which encourages the plants to grow longer roots. Longer roots, in turn, also absorb more rainwater.
- When lawns are mowed about an inch higher than they typically are, the taller grass blades shade the soil and roots, so they retain moisture longer.

Landscape Resources Are Recycled
A large property can produce its own organic fertilizers from grass clippings and fallen leave, and best of all, it's free! Grass clippings, which contain nutrients, can be left in the lawn to break down into the soil for a free source of nitrogen—up to 50 percent of turf's total nitrogen needs. Clippings and leaves can be used as *mulch* and spread around the bases of trees and other plants to enrich the soil, conserve moisture, and minimize weed growth. You won't need to pay to haul clippings and leaves away, and you'll minimize the need for lawn and plant fertilizers.

Better Site Design
A big idea in sustainable landscaping is planting the right plants in the right places, where the growing conditions match plants' growing needs. A new generation of low-mow or no-mow drought-tolerant grasses are perfect for creating low-maintenance, beautiful vistas for everyone to enjoy. Another way to build in sustainability is to replace sun-loving grass in shady areas with better-suited plants, like ground covers, native prairie plants or other perennials, or shrubs. The result: annual cost savings on resodding, reseeding, watering, and fertilizing.

Learn More:

Sustainable Sites Initiative: http://www.sustainablesites.org/why/
Midwest Pesticide Action Network - Maintaining Healthy Parks:
http://midwestpesticideaction.org/what-we-do/maintaining-healthy-parks/
University of Illinois Extension - Lawn Talk–Common Lawn Care Mistakes:
http://urbanext.illinois.edu/lawntalk/other/common_lawn_care_mistakes.cfm

COMMON TURF CHALLENGES FOR LARGE PROPERTIES

For more solutions to these challenges, see Build Healthy Soil: Implementation, below.

Even when conditions are good, lawns are inherently needy
Compared with other kinds of plants, traditional Kentucky blue grass is one of the most resource-needy and expensive to maintain. (Fun fact: It's not even from Kentucky! It derives from Europe and parts of Asia and Africa.) Many property owners want their lawns to look like golf courses, but labor-intensive, highly managed putting greens are touched about 150 times a year by various treatments, including mowers, *aerators*, de-*thatch*ers, weed-killers, *fungicides*, *pesticides*, and irrigation systems. Making a lawn "golf-course perfect" is an expensive and unrealistic endeavor. In fact, traditional turf care practices create an "addicted" lawn—one that can't exist without its regular "fix."

Healthy-looking turf grass can be an illusion
Its root system is so shallow that it can survive in inhospitable conditions, even asphalt, providing the illusion of health. Fertilizer can make this turf look green and healthy for a few months. However, when the fertilizer treatments cease or the root system growth cannot penetrate the asphalt surface, the plant dies. Most soil conditions, though not as bad as asphalt, are equally inhospitable and prevent deep root growth and access to nutrients. To achieve a truly healthy, sustainable lawn, the soil must be nourished.

A lawn's water needs fluctuate depending on soil moisture, rainfall, and air temperature
In addition, different areas of the lawn may have vastly different water needs. As a result, overwatering is one of the most common mistakes—it can kill lawns. Watch the weather before watering, and manually regulate automatic irrigation systems that water rain or shine. Newer automatic irrigation systems have soil *tensiometers* to measure soil moisture and rain sensors that help prevent unnecessary watering. Unfortunately, these don't always do the trick. Twenty feet away, the soil could already contain sufficient moisture. Smart landscape designs situate drought or wetland plants together so their individual watering needs are met. They also calibrate the irrigation system so that the south or west side of the lawn receives more water than the north or east side.

Street salts are used liberally on driveways and walkways
Street salt is a fact of life in our cold northern climate. Every spring, in areas near plowed concrete and asphalt, salted snow and ice melts, causing the lawn to die. And every spring, these areas are reseeded or sodded. In some cases, spring rains do not wash away the salt, and the new sod fails. Rather than go to that annual expense, replace grass in heavily salted areas with salt-tolerant woody *ground covers* or other low-growing salt-tolerant perennial plants.

Poorly designed landscapes require unnecessary maintenance
A well-designed landscape takes maintenance into consideration. For example, tiny strips of lawn between two narrow walkways are difficult and inefficient to water, fertilize, and mow. Awkward lines of planting beds may complicate mowing. Many landscapes require the use of string trimmers, but these tools shred grass, inviting diseases and sometimes killing it. One solution is to phase out small patches of lawn by expanding existing beds or creating new ones with easy-to-maintain plants or other landscape elements such as porous pavers.

Lawn maintenance practices can harm other plants in your landscape
Trees and turf grass don't grow together in nature. The dense roots of turf compete with tree roots for the same water and nutrients. Practices such as frequent irrigation and mowing grass short can encourage denser and shallower roots in the grass and aggravate the competition. And weed killers used in lawns are designed for "broad leaves," or anything that isn't a narrow blade of grass. Trees, shrubs, and perennials are all susceptible to damage from *herbicides* meant to keep lawns free of weeds.

Small engines pollute
During the heat of the summer, lawnmowers, string trimmers, blowers, and other power equipment generate pollution that can exacerbate asthma and other respiratory diseases. While newer engines burn cleaner than older models, one badly adjusted, unmaintained home mower pollutes as much as 10 cars! And who can ignore the noise pollution that small engines contribute? Cleaner machines with electric, diesel, and propane engines are available, but many contractors aren't using them yet. When collecting lawn maintenance bids, ask about alternative equipment that pollutes less. When possible, work with a landscape design professional to redesign the landscape to minimize string trimming and mowing.

Weed-killers, fungicides, and insecticides are risky to environmental and human health
Chemicals in fertilizers and *pesticides* don't disappear. Rain can move chemicals across landscapes to contaminate nearby pond or the city sewer system, which eventually flow into rivers, lakes, and oceans. These chemicals also move through the soil and can enter ground water, threatening drinking water supplies. Contact with recently treated lawns can impact human health and may be especially dangerous for children. Safe use of pesticides requires special knowledge and training. Licensing is required for a reason. Contractors hired to apply pesticides should always hold pesticide applicator licenses through your state's Department of Agriculture. No exceptions!

The landscape is often designed to be an aesthetic enhancement for buildings, not for the health of plants
Many developed sites have inherited just about the worst soil imaginable. When developments were created, much of the rich topsoil was stripped away to get to the clay or rock below. Clay is great for building on, but not for growing on. Developers may have laid down a few inches of soil, but not enough to support trees and large shrubs. Principles of sustainability such as appropriate plant selection and nourishing the soil organically will improve the soil over the long term.

Property owners want a uniform look
Lawn is expected to handle all growing conditions—but that's simply not the case. Like all plants, lawn grasses have specific growing requirements. The best landscapes use the right plant for the right space. Property owners may want landscapes to look perfectly symmetrical and balanced, but it is a waste of money to plant grass where it just won't grow year after year.

BUILD HEALTHY SOIL: IMPLEMENTATION

Most likely, your lawn is an addict, hooked on supplemental water and chemical fertilizers and weed control substances. The following 10-step program doesn't work overnight, but it will create a healthier lawn in three to five years. Any of these steps will move you toward a sustainable landscape, and they can be done in any order. Over that transition period, your lawn maintenance costs may increase modestly as new tasks are added and you replace poorly performing grass with more suitable plantings. But eventually, as the soil heals, you will use less water and fewer resources.

1. Get your soil tested

It all starts with the soil. Determine its quality and health, including the percentage of *organic matter* in the soil. Healthy soil is composed of at least 3 to 5 percent organic matter. Learning the *soil pH* will help you select appropriate plants. You will also learn the nutrient strengths and deficiencies in your soil, including levels of potassium, calcium, and magnesium.

Learn More:

University of Illinois Extension - Soil Testing Labs: http://urbanext.illinois.edu/soiltest/
Illinois Soil Testing Association: http://www.soiltesting.org/
USDA Natural Resources Conservation Service - Soil Health: http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/

Phosphorous has traditionally been a key nutrient in fertilizers, but when it washes into waterways and wetlands, it harms those ecosystems. As a result, Illinois and other states have enacted phosphorous bans. By law, contractors cannot apply phosphorous to a lawn unless a soil test demonstrates a phosphorous deficiency.

Learn More:

Illinois-Indiana Sea Grant: www.iisgcp.org/catalog/downlds_09/phosphorous_public.pdf
http://www.anr.state.vt.us/dec/waterq/lakes/docs/lpseries/lp_lps-dontp.pdf

2. Learn the type of grass

And other plants in your lawn. Be sure your grass variety matches your growing conditions (amount of sunlight and soil moisture). If not, consider seeding over with more suitable grass mixes. Sustainable lawns often are grown from low-mow or no-mow seed mixes. Buffalo grass, drought-tolerant mixes of fine fescues, or combinations of dwarf perennial ryegrass, hard fescue, and microclover are some options. Many reach about six to eight inches in height, can be mowed one or two times per year, reseed themselves, and do not require fertilizers. Weeds can give you clues about what's happening in your soil. (*See Keep it Simply Sustainable: Reading the Soil.)*

Learn More:

University of Illinois Extension - Lawn Talk–Weeds and Other Problems: http://urbanext.illinois.edu/lawntalk/weeds/

3. Begin rehabilitating the turf

The Illinois Landscape Contractors Association has created a Sustainable Landscaping Maintenance Calendar that includes lawn treatments. These include:

- *Core aeration* to allow oxygen and water to penetrate into the root zone. Be sure that your landscape contractor specifies that their aeration process cuts out plugs of soil, rather than compresses holes in the soil. Compression aeration does not work as well and, in fact, may compact (compress and remove oxygen from) the soil.
- *Top dressing* with manure, compost, or other organic matter.

- Spreading organic fertilizers to increase the population of beneficial soil organisms, such as fungi and bacteria. These fertilizers break up the rock-like subsoil so that the lawn (and any other desirable plants) can grow deeper, stronger roots.
- *De-thatching* to improve the ability of water and food to get to grass roots. Chemical fertilizers incite a rapid growth cycle, which encourages outside leaves to slough and fall off; this is *thatch*. A half-inch of thatch or less is actually good. It insulates the grass, cushions its plant crown from impacts, and helps it withstand temperature fluctuations. However, too much thatch is harmful. In an organic program, plan to de-thatch every few years as your lawn needs it.

Learn More:

Illinois Landscape Contractor Association - Sustainable Landscaping Maintenance Calendar: www.ilca.net/sustainable_landscaping.aspx

4. Phase in organic fertilizers
If you've used synthetic fertilizers regularly, work with your landscape contractor to create a "bridge" program that incorporates slower-acting organic fertilizers. At first, you may notice your lawn is less green. With a sustainable regime, the goal is to increase the population of soil organisms. As organisms live and die, they release nutrients into the soil. In addition, some organic controls, such as beneficial nematodes, occur naturally in the soil and can help manage grubs and other lawn feeding insects. These may be deficient in unhealthy lawns.

The end result is a much healthier soil for grass, flowers, trees, and shrubs. Eventually, once soil health is built up, you may be able to rely solely on organic fertilizers and reduce the amount of pesticides you use. As the Midwest Pesticide Action Center points out, pesticide use has been linked to a variety of health and environmental conditions.

Learn More:

Midwest Pesticide Action Center: http://midwestpesticideaction.org/
University of Illinois Extension - Lawn Talk–Lawn Care with Minimum Chemical Use: http://urbanext.illinois.edu/lawntalk/other/lawn_care_with_minimum_chemical_use.cfm

5. Don't "set the water and forget."
Establish an irrigation management program with a knowledgeable contractor who understands which parts of your landscape need water when and how much. Water only as needed. Weekly or twice-weekly waterings are not necessary, can damage turf, and are wasteful and expensive.

Learn More:

University of Illinois Extension - Turfgrass Irrigation: http://www.turf.uiuc.edu/extension/ext-irrig.html

6. Let some diseases or problems go
Unscrupulous companies may sell unnecessary treatments for conditions that aren't real problems. Recently, the Chicago Park District stopped removing dandelions, deeming the chemicals used to remove them more harmful than the plants themselves. And, in the early years of lawns, 20 percent of grass seed mixes were clover, which provides a natural source of nitrogen in the soil and remains green even in the heat of mid-summer. Today, people spread herbicides to kill this beneficial plant. A more sustainable approach would be to accept clover in our lawns.

The best course of action is to use *Integrated Pest Management (IPM)* to monitor insects, diseases, and weeds. This kind of program focuses on keeping pests in line, as opposed to killing every last one of

them. It's a science-based, decision-making process that identifies and reduces risks from pests and pest management-related strategies. The key steps of IPM include:

- Monitoring pest populations using traps or visual inspections.
- Preventing or minimizing pest problems by maintaining plant health and using plants that tolerate pests.
- Physically managing pests by pulling weeds, smashing problem insects, and pruning off diseased branches.
- Using chemicals to kill or regulate growth of pests only as necessary. It should be a long-term goal to eliminate annual applications of pesticides.

Learn More:

Midwest Pesticide Action Center: http://midwestpesticideaction.org/

7. Move the mower height
Keep mower heights to three-and-a-half inches during the hottest part of the summer. In the spring, grass grows quickly, so it can be kept shorter—about two to three inches. Your contractor should adjust the frequency of mowing once the grass growth slows down in the summer.

Learn More:

University of Illinois Extension - Lawn Talk–Guidelines for Mowing Lawns:
http://urbanext.illinois.edu/lawntalk/guidelines_for_mowing_lawns.cfm

8. Avoid "mow, blow, and go" companies
Keep in mind that sustainable landscape management is never just about the lawn. Hire trained landscape contractors who can address the whole landscape and how the parts work together. A large landscape contractor may have design, tree care, irrigation, and other professionals on staff. Smaller contractors may subcontract out many of these services.

Either way, make sure the most knowledgeable professionals work on your landscape. Two companies can submit the exact same bid, but one may use substandard practices, plants, and people. Shop around until you are comfortable and look for industry designations such as Certified Arborist, Landscape Industry Certified, Certified Landscape Technician, among others. A landscape maintenance contract involves a significant financial commitment. If you become sufficiently informed about lawn care and health, you can get a better return on your investment and a healthier, more beautiful landscape in the long-term.

9. Evaluate your landscape as a whole
Every one to three years. As part of this effort, identify conflicts between the lawn and other landscape components, such as trees and sidewalks, and resolve them. If you have a lot of shade on your property, considering giving up on grass and choosing more suitable shade-loving ground covers or other plants, or laying down mulch. Identify thin strips of lawn between sidewalks or patches running down steep slopes, and replace them with low-maintenance plants. Rather than cutting off the lower limbs of trees so you can push a mower underneath them, leave them be and replace the lawn with mulch. Replace turf grass in hard-to-mow areas with other grasses that are naturally low-growing, such as buffalo grass.

10. Reduce the amount of lawn
Keep lawn where you have specific needs, such as walking spaces, ball fields, play areas, dog runs, etc., but begin to incorporate other kinds of plantings in lesser-used spaces. For example, at the edges of the property, consider planting low-maintenance large shrubs that will fill in the space and block undesirable views, as well as provide habitat for song birds, butterflies, and other wildlife. Other alternatives include native prairie grasses, ground covers, mulch, shrubs, and trees. If a grass look is desired, consider

sedges—grass-like plants that can grow under heavy shade trees, such as maples and oaks, and don't require mowing.

COMMUNICATING AND ADDRESSING CONCERNS

People often feel that if the lawn looks good, the landscape is beautiful and must be "working" properly. Unfortunately, the reverse is also true. You may hear more complaints about the way these two-inch tall *plants* look than you will about 60-foot-tall trees!

Some people have unrealistic expectations for where turf grass can successfully grow and a very low tolerance for benign weeds such as clover or dandelions. As a result, property owners end up spending lots of money and time making lawns match the ideal.

The pride of landowners, residents, employees, and other stakeholders may be tied up with the lawn. Tinkering with it may not be an option for some. So you have your job cut out for you in helping them see the value of a healthier, more sustainable lawn. Here are some tips:

Show them the money

As Einstein said, the definition of insanity is doing the same thing over and over again and expecting different results. If you spend enormous amounts of money reseeding or resodding your lawn, applying chemical treatments to the same areas, or repairing berms around ponds year after year, point out that you are wasting money on an impossible goal.

Educate people about turf needs

Help them understand what kinds of grass can live in which kinds of soil and sun conditions. This knowledge can help you reduce the amount of lawn on your property and replace it with more suitable, easier-to-care-for plants.

Stress the long-term

People tend to perceive a smaller, yearly investment as less expensive than a one-time, lump sum, even if the latter costs less and has better results in the long run. Bad lawn practices, such as spending $1,000 to resod in deep shade every year, are perpetuated this way. In reality, a $7,000 investment in a more sustainable alternative, such as installing dependable plants that come back year after year, is likely the better choice.

Keep communicating

After you begin your sustainable regimen, you may find that not everyone is willing to settle for less than perfection. Results will take time, and during the transition, parts of the lawn may look less than optimal. Provide ongoing education and updates to remind people of the goals and the positive changes that may not be evident just by looking at your property. Take photographs to show them how the lawn is improving. Inspire them with the ultimate objective. In a few years, new plants will fill in, the soil will improve and begin to feed the lawn, less water will be needed, and toxic the use of chemicals may be drastically reduced.

RESOURCES

Pesticides

Midwest Pesticide Action Center: http://midwestpesticideaction.org/
University of Illinois Extension - Integrated Pest Management for Turf Managers: http://www.turf.uiuc.edu/extension/ext-ipm.html
North Central Region Integrated Pest Management Center: http://www.ncipmc.org/whatisipm.cfm

Sustainable Lawns

University of Illinois Extension - Turfgrass Improvement Program: http://www.turf.uiuc.edu/extension/ext-renov.html
The Perfect Illinois Lawn: Attaining and Maintaining the Lawn You Want, by Melinda Myers (2003)
University of Illinois - Lawn Talk: http://urbanext.illinois.edu/lawntalk
Illinois Landscape Contractors Association: www.ILCA.org

GLOSSARY

Compaction: a kind of soil damage where soil particles are compressed together, pushing out air and water pockets. Heavy machines or even foot traffic can cause compaction.

Core Aeration: to remove small cores or plugs of soil to increase oxygen and reduce soil compaction.

Fungicide: a substance that kills or slows the growth of rust, fairy ring, slime mold, and other types of fungi.

Grass: a family of plants with long leaves. Turf grass is commonly used in lawns. There are many other useful and beautiful grasses, including ones native to the Midwest.

Ground Cover: a short plant that spreads through specialized stems called leaders, specialized root parts called rhizomes, or clumping. Ground covers are often used as a low-maintenance way to provide a patch of green.

Herbicide: a weedkiller; a substance that kills plants.

Integrated Pest Management: an effective and environmentally sensitive approach to pest management that relies on information on the life cycles of pests and their interaction with the environment to manage pest damage by the most economical means, and with the least possible hazard to people, property, and the environment.

Microbes: tiny, single-cell organisms. In a handful of soil live billions to hundreds of billions of microbes. These can be broken up into thousands of different species of bacteria, hundreds of species of fungi and protozoa, dozens of species of nematodes, as well as mites and other tiny organisms. Microbes break down dead plants and animals and their waste. They make these nutrients available to plants. Their activity also creates good soil structure.

Mulch: a layer of material, usually natural, that is applied over soil to retain moisture, moderate soil temperature during winter, and add nutrients to the soil.

Organic Matter: the decaying remains of plants and animals and their waste. Organic matter is a key component of healthy soil.

Perennial: a plant that lives year after year. Common perennials include black-eyed Susan, hosta, and coral bells.

Pesticide: a substance that kills any kind of pest, including weeds, diseases, and undesirable insects or animals.

Plant: any organism with leaves, including algae, flowering plants, trees, shrubs, evergreen and deciduous plants, grasses, and others. Plants are the only organisms that make food (through photosynthesis), and so are responsible for life on earth as we know it.

Soil: what most people know as "dirt," soil is the medium for most plant life. It is made up of sand, clay, and loam, as well as organic matter (decaying leaves, tiny soil organisms, etc.).

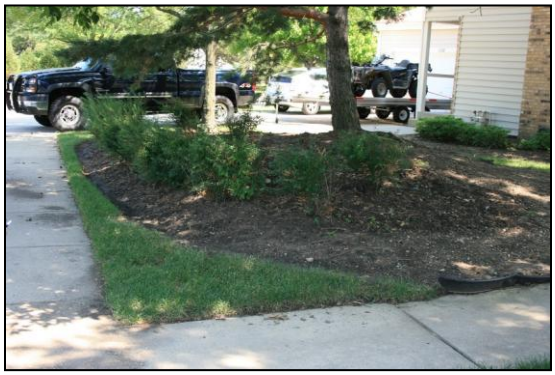
Thatch: dead grass or *turf*

Top Dressing: applying a thin layer of soil, compost, or other organic matter over the lawn's surface. Top dressing helps break down *thatch,* fills gaps in the soil, and adds nutrients to the soil for a healthier lawn.

Turf: what most people know as "grass."

It's a waste of water and money when irrigation systems kick on during rainy weather, as in this photo. Automatic sprinklers should be manually adjusted to not go off on rainy days. Newer irrigation systems have rain sensors to prevent this problem. *Courtesy of Tim Corrigan*

This shady lawn needs rehabilitation. A more sustainable option is to replace the grass with shade-loving plants. *Photo courtesy of Beth Corrigan*



Small strips of grass are inefficient to maintain. The bed should be extended to the sidewalk. *Photo courtesy of Beth Corrigan*

A REVIEW OF IMPORTANT INFORMATION

Choose the answer that best completes the sentence.

1. Healthy soil is …
   A. Just crushed rock. There's nothing living in it.
   B. More than "dirt." Soil includes minerals (rock, sand, clay, and silt), air, water, soil microbes, and soil organic matter.
   C. Made up of 50 percent living material.

2. Soil organic matter is ...
   A. Fertilizer used to grow organic food.
   B. Plants and animals living in the soil.
   C. Dead plants and animals that are in the process of decomposing in the soil.

3. Soil microbes are …
   A. Tiny organisms such as bacteria, fungi, and algae that contribute to healthy soil's structure and function.
   B. Small pieces of rock that have been ground down with water and wind.
   C. Found in the hundreds of millions in a single gram of soil.

See answers below.

1. Healthy soil is …
B. More than "dirt." Soil is made up of 45 percent minerals (sand, silt, and clay), 5 percent organic matter, 50 percent pore spaces (half filled with water and half filled with air).

2. Organic matter is…
C. Dead plants and animals that are in the process of decomposing in the soil. When fully decomposed, the matter turns into humus or compost, a dark, crumbly, earthy-smelling material that provides nutrients to help plants grow.

3. Soil microbes are…
A. and C. There are more living things in a scoop of soil than there are human beings on the planet. Still, these important creatures make up only about .05 to .25 percent of the total contents of soil!

Keep it Simply Sustainable!
Reading the Soil

Find a knowledgeable contractor who knows how to "read the soil."
The types of weeds that appear in lawns can point to soil deficiencies. The presence of creeping charlie, for example, indicates low nitrogen and poor drainage, among other things. A contractor might add nitrogen or compost and de-thatch the lawn.
Most fungus problems don't need to be treated with fungicides. Instead, they should be taken as indicators of bad soil or growing conditions, such as thatch buildup, soil *compaction*, poor watering, or high soil nitrogen.
A good contractor can help you identify the true "red alerts," such as the need to water during a severe drought or treat a grub infestation.

A New Perspective
Healthy soils are a vital foundation for a sustainable landscape. Creating healthy soil is a natural process that takes time.

Find more Sustainability Perspectives in the Introduction.

Chapter 5 Trees, Shrubs, and Woodlands:

Help Them Live Long, Healthy Lives

Trees are a key part of any sustainable landscape—in fact, they are its backbone. They are its largest elements and the most valuable. Likewise, well-chosen shrubs can be a beautiful resource in attracting beneficial wildlife, holding the *soil* and screening views.

Trees can have wonderfully positive impact on the health and beauty of a large landscape. They often define their character. The Oaks of Hidden Glen. Trees of Wheaton. Arbor Ridge. Can you imagine Whispering Woods without trees? Large, long-lived trees provide the most benefits to landscapes, so make protecting high-quality *shade trees* a priority in yours.

Unfortunately, in many landscapes, poor selection and maintenance practices set up trees and shrubs for failure. As a result, property owners end up spending far too much money and time maintaining and replacing their trees and shrubs. But, if you choose well, it's possible to plant trees once and enjoy them for a long time—with less money and work than you may be putting into your current landscape. The sustainability goal related to trees, shrubs, and woodlands is to *Help Them Live Long, Healthy Lives.*

TREES ARE AN INVESTMENT

With just a modest investment, you'll reap dividends for decades from trees. Here are just some of their benefits:

Property Value

Mature, well-maintained trees have measurable dollar values that actually add to property values. Consider them growing capital investments! In fact, some studies show as much as 10 percent of a property's value can be attributed to trees. Important trees can even be appraised for insurance and legal purposes.

Energy Savings

U.S. Forest Service studies show that the most valuable tree in the *urban forest* is a large tree shading the west wall of a home. Three healthy trees protecting a building from late afternoon summer sun can save you up to 7 percent on annual air-conditioning expenses. These savings, together with other energy savings benefits, can help you realize $6.75 in measurable benefits for every dollar you spend planting and caring for large trees.

Social Benefits

In studies conducted by the University of Illinois at Chicago, trees in housing developments improve neighbors' sense of community, personal stress levels, domestic violence prevention, and teenagers' self-esteem. Other studies show such health benefits as faster healing and improved concentration in children affected with Attention Deficit Disorder.

THE VALUE OF SHRUBS

Shrubs or bushes also have important functions in large landscapes. If they are well-chosen for their space, they are easy-to-maintain and long-lived components of a sustainable landscape.

Utility Players

Shrubs buffer noise and headlights, mark lot boundaries, and screen undesirable views such as trash collection areas and utilities. In landscape design, shrubs are planted near buildings to soften their architectural lines. Shrubs, which are not as short as grass or perennials yet not as tall as trees, provide a middle layer of interest.

Easy Maintenance
Shrubs offer desirable features similar to perennials with much less expense and effort. Shrubs that drop their leaves in winter *(deciduous)* offer seasonal color all year long. They may have flowers in the spring and summer, colorful leaves in the fall, and ornamental seed pods or berries in the winter

Evergreen Beauty
Evergreen shrubs retain their needles or leaves through the cold months, making them perfect for screening ugly views, providing privacy, and blocking winter winds near buildings to save on heating costs. Many people think of evergreens as just green, but there is variety, from silvery gray to forest green. Birds and other wildlife love them for the year-round shelter they offer.

Learn More:

U.S. Forest Service - Trees Pay Us Back, Volumes 1 & 2:
http://www.na.fs.fed.us/urban/treespayusback/
Midwest Community Tree Guide: http://www.treesearch.fs.fed.us/pubs/25927
Arbor Day Foundation - The Benefits of Trees: http://www2.arborday.org/trees/benefits.cfm

COMMON CHALLENGES FOR LANDSCAPE TREES & SHRUBS

Large landscapes often combine trees and lawn grass—and usually the lawn wins
Trees are *forest* creatures. They thrive in woodlands, in the close company of other trees. Oak trees and a few other *species* also grow in areas called savannas, which feature tall grasses and other annual and perennial plants. In these natural *ecosystems*, trees do not grow alongside thirsty lawn grasses like Kentucky blue grass. This unnatural pairing of trees and lawns is at the root of many of the stresses trees face in urban and suburban landscapes. Mowing a lawn to a short height on a regular basis requires frequent watering to keep it green. Watering frequently encourages the lawn to develop dense, shallow roots that quickly take up water and nutrients better than tree roots can. The lawn gets adequate water while the tree remains thirsty.

Landscape designs often disregard the water, sunlight, and soil needs of trees and shrubs. In nature, different trees and shrubs thrive in different settings. Some grow along flood plains where there's a lot of water and low soil oxygen. Others might live in areas where soil is rich but where water is easily absorbed and doesn't stand for long periods. Land managers and property owners should understand and respect the natural preferences of various trees and shrubs. Otherwise, you'll face a never-ending succession of planting the wrong ones in the wrong place, and then replacing them in a few years. Flood-plain trees, such as river birch, should never be planted in hot, dry street or parking medians. Likewise, pin oaks, whose roots can't "breathe" in *compacted soils* with high *alkalinity,* won't thrive in landscapes with that kind of soil.

Trees and shrubs are resilient…but fragile
Trees respond slowly to change, and the impacts are long lasting. This is true whether they are well-cared for or neglected. Poor care practices, like planting too deep, can cause irreversible damage and slowly kill a tree. Damage done to tree roots on mature oak trees during construction may not become apparent for several years, well after a developer has turned over the care of the landscape to the land manager, a homeowners association, or a property owner.

Common landscape practices often damage trees
Sometimes, trees are harmed by landscape practices that at first glance seem harmless. A ring of flowers surrounding a tree near its base may look nice, but it can damage the roots or strangle the trunk, cutting off water and nutrients and ultimately killing the tree. Many people are surprised to learn that fertilizing lawns is harmful to trees. Herbicides used to control broad-leaf weeds can also damage trees.

Property owners or developers often scrimp on new trees in the short-term but pay higher costs to fix problems later
As with so many things in life, when it comes to landscaping, you tend to get what you pay for. Land developers often use the same plants over and over, without considering the specific growing conditions of a particular building site. These common plants may be the only ones readily available from certain budget nurseries or general contractors. Ash, crabapple, honey-locust, silver maple, and willow are among the most common trees used because they are inexpensive and fast growing. Unfortunately, while cheap to buy and install, they are expensive to care for over their short lives and often need to be replaced relatively quickly.

Lack of plant diversity makes plants vulnerable. Problems can be magnified when just a few types of trees and shrubs are used throughout a property. Should a serious pest, such as the emerald ash borer or Asian longhorned beetle, come along and threaten to wipe out a tree species, a property owner faces an expensive and often gut-wrenching decision: to treat the trees with expensive pesticides, or cut them all down and replace them. This costly dilemma happens with over-planted shrubs and other types of plants, too.

Wooded areas need management to function well
Over time, an isolated area of woods, including the trees, shrubs, and wildflowers that live in them, degrades. Valuable plants die out and are usually replaced by undesirable invasive species. Over the past several decades, experts have begun developing new *ecological restoration* techniques to help land managers care for wooded areas. Keeping a special type of wooded area, such as an oak *woodland,* in shape may require hiring an experienced environmental contractor, and sometimes calls for intentionally burning the area, which may require special permits and not be palatable for some stakeholders.

Invasive trees and shrubs may overtake landscapes
Buckthorn is the most common tree in Northern Illinois, which is unfortunate, because it's an aggressive grower that can quickly colonize wooded areas and shrub beds. Eradicating buckthorn, Japanese honeysuckle, and other invasive shrubs is expensive but necessary. Otherwise, the desirable plants in the landscape will not thrive.

To save money, property owners may hire landscape contractors who lack training and knowledge
Many common practices by untrained contractors actually cause harm. String trimmers and lawnmowers can nick and scar tree trunks, inviting pests and diseases, or cause *girdling*, which strangles a tree. Other problems include *shearing ornamental trees* and piling up *mulch* around the base of the tree, a damaging practice known as "*volcano mulching*."

Landscapes often were originally designed for short-term curb appeal
Often, the purpose of a developer's original landscape plan is quick growth and instant appeal to promote sales. They create the look of an established, lush landscape by crowding together too many fast-growing trees and shrubs. While these landscapes might look good at first, they can cause long-term headaches. For example, a group of sun-loving pines looks beautiful when the trees are 20 feet high. But as they grow, they shade each other out and become spindly, weak, and more susceptible to insect attacks and diseases. Shrubs near buildings can crowd each other; begin to overtake windows, walkways, and entrances; and need regular pruning to fit their spaces. Sometimes original plantings can become safety hazards, such as large, fast-growing weeping willows, which can collapse after just 20 to 30 years.

Conventional management of shrubs is costly and ineffective
Shrubs come in all shapes and sizes, but they are often forced to conform to a one-size, one-shape cookie-cutter ideal. To soften the view of a building's foundation below a window, a 3-foot-high plant would be perfect. And there are shrubs that fit these dimensions. But commonly, shrubs that naturally grow to 10 or 12 feet tall are planted there instead. These overachievers require annual pruning to keep them short. The most common shrub maintenance practice is *shearing*, which shapes shrubs into crisp

geometric cubes or balls. Unfortunately, shearing is expensive, and gas-powered hedge shears pollute the air. Shearing also cuts off flower buds and stresses plants, ultimately shortening their lives. Many shrubs have perfectly good natural shapes.

HELP THEM LIVE LONG, HEALTHY LIVES: IMPLEMENTATION

To make your landscape more sustainable, help trees, shrubs, and woodlands live long healthy lives.

1. Choose the Right Plants

Choose a variety of trees and shrubs that thrive with minimal input, live a long time, and give you what you want, whether it be shade, beauty, spring flowers, fall color, energy savings, or a combination. It may be painful in the short-term, but consider replacing inappropriate, high-maintenance trees and shrubs.

Where possible, plant *native* trees and shrubs to support ecosystem health and *biodiversity*. Native trees and shrubs are ones that have grown here for thousands of years. By evolving over time, they have adapted to long, cold winters and hot, dry summers. They've also developed ways to protect themselves from the insects they've grown alongside. A healthy, diverse ecosystem has many different kinds of plants and animals that help one another. Diversity creates resilience in a landscape, helping it cope with problems like drought better than an ecosystem with few plants and other resources. When you look at a native landscape compared to one made of plants that have been imported, often you'll find more insects and more beneficial wildlife, such as birds, that eat insects.

Finally, consider trees and shrubs for environmental function. For example, a group of evergreens can act as windbreaks for buildings in the winter. Shrubs like cotoneasters and fragrant sumac keep soil from washing away in sloped areas. A good landscape designer can help you make the choices that best meet the needs of your landscape.

Learn More:

Wild Ones: www.wildones.org
National Arbor Day Foundation - How to Plant Trees to Conserve Energy: www.arborday.org/globalwarming/summerShade.cfm

2. Plant the Right Way

To give a new tree the best possible start in life, follow accepted planting guidelines. Be sure the contractors you hire to plant trees and other plants are properly trained.

Learn More:

The Morton Arboretum - Tree Planting Guide: www.mortonarb.org/trees-plants/plant-clinic/horticulture-care/planting-trees-and-shrubs
The Morton Arboretum - Caring for New Transplants: http://www.mortonarb.org/trees-plants/plant-clinic/horticulture-care/caring-new-transplants

3. Mimic the Forest Floor

Instead of surrounding trees with lawn, spread organic mulch (such as shredded bark, composted leaves, or chipped hardwood trees) underneath them. Mulch mimics the rich forest floor, improving the soil by adding nutrients and oxygen for trees and other plants. Mulch also retains water during dry spells, so you won't need to water as often.

Expanding mulched areas under trees is a good idea. The ideal amount of mulch around a tree is a layer that is 3 to 4 inches deep and extends out to the tree's *drip line,* or the tips of the outermost branches.

Take care not to place the mulch right up against the bark. Mulch is also healthy for shrubs and many other plants, which require only a thin layer.

Selecting plants that are compatible with specific types of trees takes some research or the guidance of a qualified landscape designer. Try planting easy-to-care-for, low-growing plants called ground covers as well as other shrubs and perennials with compatible growing needs. Whenever digging under trees, be sure to avoid damaging their roots, which you'll find in the top 10 to 18 inches of soil.

Often, the "soil" in residential subdivisions or recently developed corporate campuses is a layer of topsoil over rubble. Trees can't live in that kind of environment. The soil will need to be improved to ensure the longevity of your trees. This may take time but is well worth it in the long run.

Learn More:

The Morton Arboretum - Mulching Trees and Shrubs: www.mortonarb.org/trees-plants/plant-clinic/horticulture-care/caring-plants/mulching-trees-and-shrubs
The Morton Arboretum - Soil Considerations for Growing Trees and Shrubs: www.mortonarb.org/trees-plants/plant-clinic/horticulture-care/soil-considerations-growing-trees-and-shrubs.

4. Adjust Irrigation to Favor Tree and Shrub Health
Wherever possible, adjust watering amounts and frequency to the needs of your woody plants, rather than to needs of your lawn. Trees are the longest-lived and most valuable component of your landscape, and irrigation, if needed, should favor them. Trees should be watered during dry periods, and they prefer slow, deep soakings, while lawns require more frequent, shallow watering.

Learn More:

The Morton Arboretum - Watering Trees and Shrubs: www.mortonarb.org/trees-plants/plant-clinic/horticulture-care/watering-trees-and-shrubs

5. Plan and Budget for Pruning and Other Tree Care Costs
Pruning is the most important regular maintenance practice for trees and shrubs. Pruning techniques differ depending on the type of plant: deciduous or evergreen, tree or shrub:

- Deciduous shrub: http://www.mortonarb.org/trees-plants/plant-clinic/horticulture-care/pruning-deciduous-shrubs
- Deciduous tree: www.mortonarb.org/trees-plants/plant-clinic/horticulture-care/caring-plants/pruning/pruning-trees
- Evergreen tree or shrub: www.mortonarb.org/trees-plants/plant-clinic/horticulture-care/caring-plants/pruning/pruning-evergreens

Prune when trees and shrubs are young to properly shape their structure and ensure that branches grow strong and are well-supported. Remove diseased and damaged branches to reduce the risk of damage to cars, homes, and other structures during storms. Prune a portion of your mature trees annually on a rotating basis to keep up maintenance and spread out costs over time. Often, the needs of trees and shrubs get overlooked in annual budgets. Make sure your budget takes into account long-term sustainability goals so you won't have to resort to cheap, short-term fixes.

6. Use Integrated Pest Management
Monitor insects, diseases, and weeds through an *Integrated Pest Management* (IPM) approach. This kind of program focuses on keeping pests in line, as opposed to killing every last one of them. IPM does use limited amounts of pesticides and herbicides, but that is not the first line of defense. The key steps of IPM include:

- Monitoring pest populations using traps or visual inspections
- Preventing or minimizing pest problems by maintaining plant health
- Using plants that tolerate pests
- Physically managing them by doing things like pulling weeds, smashing problem insects, and pruning off diseased branches
- Using chemicals to kill or regulate the growth of pests. It should be a long-term goal to eliminate annual applications of pesticides.

Learn More:

U.S. Environmental Protection Agency - IPM: www.epa.gov/opp00001/factsheets/ipm.htm
The Morton Arboretum - Emerald Ash Borer Information: http://www.mortonarb.org/emerald-ash-borer-information-homeower-community-groupsgreen-industry
Society of Municipal Arborists - Emerald Ash Borer: http://www.urban-forestry.com/emerald-ash-borer

7. Hire Licensed, Trained Professionals
Always look for professional qualifications. People working on trees should be certified *arborists*. If pesticides are being applied, be sure the workers are licensed pesticide applicators. Your trees took decades to grow, but neglect or a few minutes of shoddy work at the hands of an amateur or untrained worker can disfigure them for good. Qualified professionals may cost more than others, but their services are an investment in the health of your trees that will appreciate in value over the years.

Hire a reputable company with good client references and credentials from at least one professional arborist association, such the International Society of Arboriculture (www.isa-arbor.org). Be sure they have insurance, so if workers get hurt or make a mistake that sends a branch through a roof, they—and you—are covered. Don't be afraid to get a second opinion. After the company evaluates your landscape, research any problems they find and their proposed solutions.

8. If You Have a Woodland, Seek the Advice of an Environmental Consultant
A woodland is a complex habitat, where many plants and animals interact. It's difficult to keep a small, isolated area of woodland healthy; pollution, deer browsing, and invasive species constantly threaten it. It's worth investing in a professional *environmental consultant* to determine the best course for maintaining your woodland.

Learn More:

Davey Tree - HOA Tree and Natural Resource Management: www.davey.com/arborist-advice/education/hoa-tree-natural-resource-management-manual.aspx
The Morton Arboretum - Woodland Restoration: www.mortonarb.org/science-conservation/conservation/restoration

COMMUNICATING AND ADDRESSING CONCERNS

The users of a landscape often have legitimate complaints about trees and shrubs, especially about poorly selected, oversized ones that were planted too close to buildings. But trees, shrubs, and woodlands add real value to community landscapes. If chosen and planted well, they can offer beauty, energy savings, maintenance cost savings, and many other benefits. These messages will help people understand the value of woody plants:

Promote the idea that trees are an investment

The value of trees increases over time. Trees provide many benefits like energy savings, clean air, higher property values, and social and psychological well-being. As trees grow, these benefits only increase.

Stress the need to hire professionals

Trees and shrubs have specific growing requirements, so it is important to hire professionals who know how to care for them. Whether you have, or desire, a manicured or natural look, trees and shrubs need attention. Replacing unhealthy trees and shrubs with better-suited ones is much more cost-effective (not to mention healthier for people and beneficial wildlife) than spraying them with pesticides year after year.

Naturalized areas can be beautiful

Many people equate the look of formal, sheared hedges with good maintenance. But trees and shrubs that are allowed to have a natural shape are beautiful, cost less to maintain, and improve the health of the landscape.

RESOURCES ABOUT TREES, SHRUBS, AND WOODLANDS

General

The Morton Arboretum: www.mortonarb.org
Arbor Day Foundation: http://www.arborday.org
U. S. Forest Service: http://www.fs.fed.us/
American Forests: http://www.americanforests.org/
U.S. National Arboretum: http://www.usna.usda.gov/

Urban Forest

Openlands - TreeKeepers: http://www.openlands.org/treekeepers
The Morton Arboretum - Regional Tree Census: http://www.mortonarb.org/science-conservation/regional-trees-initiative/regional-tree-census
Chicago Metropolitan Agency for Planning - Urban Forestry Strategy Summary: http://www.cmap.illinois.gov/about/2040/supporting-materials/process-archive/strategy-papers/urban-forestry

GLOSSARY

Alkalinity: expressed in pH, it is a measure of soil or water. Its opposite is acidity. Most plants thrive in average soil (around 7.0 pH), but if the soil is highly alkaline (more than 8.0 pH) or highly acidic (less than 6.5 pH), then only certain kinds of plants will thrive.

Arborist: a tree care professional. Look for an arborist who has certifications from at least one credentialing organization, such as the International Society of Arboriculture.

Biodiversity: variation in the kinds of plants, animals, and other organisms living on the land. The higher the biodiversity, the more healthy the land is deemed to be.

Compacted Soil: soil that has been compressed to reduce air pockets. Compacted soil can be caused by foot traffic, machinery, or other objects moving across the surface.

Deciduous: shedding leaves or needles each fall and growing them back in the spring.

Drip Line: the outermost circumference of a tree, extending to the tips of the branches, where water drips.

Ecological Restoration: the science-based practice of healing the landscape by addressing the health of soil, plants, animals and water.

Ecosystem: a community of plants, animals, and microbes, plus the surrounding air, water, and soil that all interact and influence one another.

Environmental Consultant: a professional or company that has experience in environmental practices such as stormwater management, native plantings, and soil stabilization. They may have a landscape architect, landscape designer, contractor, or engineer on staff. An environmental consultant may have a bachelor's or master's degree in environmental science.

Forest: an area with a high density of trees. Forests are habitats for a wide variety of other plants, animals, and insects. There are different kinds of forests, depending on the density and species of trees, as well as the climate. See "Woodland."

Girdling: restricting the flow of nutrients to a plant. Girdling can occur in several ways. One common way is by removing a section of the bark completely around a tree. Animals or string trimmers may cause this type of damage. Another ways is by blocking the flow of nutrients under the bark completely around the tree, as in the damage caused emerald ash borer. Severe girdling often leads to death of the plant.

Hardiness Zone: short for the USDA Plant Hardiness Zone—the standard by which we determine the plants that are most likely to thrive in a given location. The USDA has created a map based on the average annual minimum and maximum temperatures.

Integrated Pest Management: an effective and environmentally sensitive approach to pest management that relies on information on the life cycles of pests and their interaction with the environment to manage pest damage by the most economical means, and with the least possible hazard to people, property, and the environment.

Mulch: a layer of material, usually natural, that is applied over soil to retain moisture, moderate soil temperature during the winter, and add nutrients to the soil.

Ornamental Tree: a smaller-statured tree with showy flowers, fruits, vibrant fall color, or decorative bark. Examples include crabapples, hawthorns, and dogwoods. These are usually distinguished from shade trees (see below).

Shade Tree: a large-statured tree, such as an oak, maple, or basswood, that is used in the landscape to shade walkways, buildings, benches, and other points in a landscape.

Shearing: a landscape maintenance practice in which electric trimmers are used to chop off branches of a tree or shrub. Shearing can be used elegantly to create formal hedges, but it is generally overused, damaging plant health and creating jarring elements in a landscape.

Soil: often referred to as "dirt," soil is the medium for most plant life. It is made up of sand, clay, and loam, as well as organic matter (decaying leaves, tiny soil organisms, etc.).

Urban Forest: all the trees and other plants that live in a city, town, county, or region. "Urban" includes where people live and work, or where some type of artificial development or management takes place.

Volcano Mulching: a common but unhealthy practice of piling up mulch around the base of a tree. Mulch should be applied at a depth of 3 to 4 inches over the root zone of a tree but not touch the trunk or bark.

Woodland: a low-density forest.

Poor pruning makes these shrubs look like storks. The tops have been sheared and the bottom limbs pruned off. Better pruning techniques would improve these shrubs' health. *Photo courtesy of Beth Corrigan*

The shrubs in the foreground have been sheared into an unattractive "meatball" shape. Shrubs should be pruned so that their bottoms are wider than their tops. Doing so allows sunlight to penetrate inside the shrub, resulting in a healthier, fuller plant. *Photo courtesy of Beth Corrigan*

Roots that circle the bottom of a tree trunk may girdle—or choke—the tree, which may eventually kill it. A certified arborist should inspect trees to prevent and fix problems like these. *Photo courtesy of Beth Corrigan*

This tree could benefit from a ring of mulch to protect its large roots that extend into the grass. Mowing over these roots damages them and compromises the health of the tree. *Photo courtesy of Beth Corrigan*

Volcano mulching piles too much soil and mulch around tree trunks, keeping bark damp and vulnerable to insect damage. *Photo courtesy of Illinois Extension.*

A REVIEW OF IMPORTANT INFORMATION

Choose the answer that best completes the sentence.

1. If properly cared for, a shade tree can live ...
   A. About 25 years.
   B. About 40 years.
   C. More than 100 years.

2. Signs that your tree is healthy include ...
   A. It's growing bigger every year.
   B. A certified arborist tells you it's healthy.
   C. The bark hasn't been damaged by lawn mowers or string trimmers.
   D. All of the above.

3. To grow well, a tree needs ...
   A. Annual applications of fertilizers, pesticides, and fungicides.
   B. Adequate water and sunlight.
   C. Room for roots to grow, typically as far out as the tips of its branches when it reaches its eventual mature height.
   D. B and C

4. Planting for diversity means ...
   A. Aiming for a mix of trees and other plants so the entire landscape is not lost when a particular pest or disease comes along.
   B. When an existing plant dies, replacing it with the exact same type of plant.
   C. Planting lots of the same plant because you know it does well.

(See answers below.)

1. If properly care for . . .
C. A shade tree can live for several hundred years.

2. Signs that your tree is healthy . . .
D. The best way to tell is to have your trees evaluated by a certified arborist.

3. To grow well . . .
D. A tree needs adequate light and water as well as ample space for its roots.

4. Planting for diversity means . . .
A. Aiming for a mix of trees and other plants so the entire landscape is not lost when a particular pest or disease comes along.

FIVE THINGS TO KNOW ABOUT WOODLAND MANAGEMENT

Woodland management, based on the young science of ecological restoration, is a growing field. The Morton Arboretum recommends a series of five steps—which it follows on its own property—to improve the health of woodlands:

1. Survey the site and research the land's history to understand what practices have been used on it. Was it used as a woodlot or a farm? Were there streams running through it?

2. Remove or disable any drain tiles. Early land settlers often installed drain tiles to drain water from their property, making it more productive for farming. Allowing water to flow in its natural pattern will improve the health of the land.

3. Remove invasive species such as buckthorn, Japanese honeysuckle, and oriental bittersweet. These invasive plants can quickly take over and choke out desirable plants.

4. Plant native trees and shrubs.

5. When possible, conduct prescribed burning, which improves the soil, encourages root development on native plants, and helps to control invasive species.

Keep It Simply Sustainable!
Put the Right Plant in the Right Place

As they say with real estate, the most important consideration in planting is location, location, location. Learn your property's soil, sunlight, and moisture conditions and measure the dimensions (width, depth, and height) of available planting spaces. Knowing your USDA *hardiness growing zone*, which in Illinois is Zone 5, is also important.

Next, find trees and other plants whose mature size, growing requirements, and hardiness zone match the dimensions and conditions on your property. Some plants have been bred to resist common diseases. Always choose those over ones that haven't.

With just some initial watering during the first year, periodic pruning, annual mulching, and extra water during droughts, your plants will require fewer resources than those chosen purely for aesthetics or low initial planting cost.

Finally, say goodbye to costly pesticide sprays and twice-yearly pruning. Your plants stand a great chance of staying healthy and the right size.

Case Study
Austrian Pines and Diplodia Tip Blight
Many subdivisions and corporate campuses feature pretty groups of Austrian pines. Their height and density make them good for screening. Unfortunately, these inexpensive, fast-growing pines develop a disfiguring disease called diplodia tip blight.

Some land managers may decide to spray them year after year with a fungicide to control the disease. Others may decide to cut them down and replace them with more Austrian pines.

But the smartest approach is to cut down the Austrian pines and replace them with several different kinds of disease-resistant trees. Diversity will help protect your landscape from any one disease or pest. And well-chosen, disease-resistant plants add another level of protection.

A New Perspective
People see themselves as apart from nature, but we are very much a part of it. By working with nature, rather than managing it or controlling it, we can create healthier, more beautiful communities.

See more Sustainability Perspectives in the Introduction.

Chapter 6 Herbaceous Plants:

Think Beyond the Flower

In many landscapes, the flower reigns as the primary indication of good maintenance. Bright blooms smile at entrances, walkways, and the fronts of buildings, proudly proclaiming, “This space is well cared for.”

The plants we casually call “flowers”—those whose above-ground growth dies back in fall—are technically known as *herbaceous* plants, and there are many types in addition to those that boast colorful blooms. They include *perennials* that return year after year, *annuals* that live for only one year, slender-leaved *grasses*, and *bulb* plants whose fleshy roots produce short-lived but flashy flowers.

Herbaceous plants do not have woody parts like trees and shrubs do. Herbaceous plants are not just pretty faces. They perform many environmental functions as well. For thousands of years, our *native* herbaceous plants *evolved* together in diverse, self-sustaining plant communities. They cleaned the air and water. They created habitat and food for wildlife. Their roots enriched the *soil* and prevented erosion.

But in the last 200 years, our native flowering plants have been removed from the landscape—first due to farming, then to widespread urban development. Plus, colorful new herbaceous plants from other parts of the world have been introduced. While many are well-suited to our climate, others need fertilizers, *pesticides*, and frequent watering to keep them looking attractive. This is no small matter. For example, 20 times more pesticides are applied to lawns and gardens than to farmland. What’s more, landscape irrigation (including garden beds and lawns) consumes more than 7 billion gallons of drinking water each day, according to the Sustainable Sites Initiative.

There’s hope, though. Smart land managers can create *aesthetically* pleasing garden beds that are also eco-friendly. Just as you remodel the interior of a home or building, you can rethink plantings to achieve a better-functioning, long-lived, sustainable landscape. The sustainability goal for this chapter is *think beyond the flower to create healthy gardens*. This means putting the right plant in the right place, taking into account that your property may have many types of soil, sun, and moisture conditions. And, in addition to blooms, rely on the size, color, and texture of leaves to meet traditional aesthetic desires. This could even mean growing edible plants, which provide people an even more tactile (and tasty) connection to the landscape.

THE VALUE OF SUSTAINABLE GARDENS

So why should you make the switch to eco-friendly plants? Here are the three top reasons:

Beauty benefits

A landscape filled with well-suited flowers, grasses, and other plants provides natural beauty and enjoyment for all who see it, forging a true connection to nature. By planting the right plants in the right places, garden beds and borders remain healthy and colorful, even during the hot, dry periods of summer. By planting perennials instead of annuals, you can enjoy plants that have four seasons of interest, providing an attractive landscape all year long. And by including a high proportion of native plants, the landscape attracts beautiful songbirds, butterflies, and other beneficial insects.

Cost savings over the long-run
Landowners who invest in garden beds filled with plants well-suited for their growing conditions can enjoy cost savings over the long-run. Even by redesigning a portion of the landscape each year, you will start to enjoy the benefits of sustainable landscaping. For one thing, you'll plant once and enjoy the results for many seasons. And after the new plants are established, you'll need to water less, fertilize less, and weed less, translating to fewer visits from your landscape company and a smaller water bill.

Environmental benefits
When you look beyond the flower, you consider other qualities that provide *environmental services*. For example, *rain gardens* or *swales* reduce the impact of heavy rains and help filter out pollutants before they drain into a pond. Well-selected herbaceous plants work with nearby trees, shrubs, and adjacent natural areas to provide food and shelter for wildlife. In addition, herbaceous plants that have substantial root systems help to anchor the soil and prevent erosion.

Learn More:

American Society of Landscape Architects - Sustainable Residential Design: Maximizing the Benefits of Plants: http://www.asla.org/benefitsofplants.aspx
Sustainable Sites Initiative: http://www.sustainablesites.org/vegetation/

COMMON HERBACEOUS PLANT CHALLENGES IN LARGE LANDSCAPES

There's too much focus on the flower
After decades of planting the same impatiens and marigolds, some issues emerge. Maybe these sound familiar? You spend too much money planting *annuals* in the spring, watering them in the hot summer, digging them up in the fall, and replanting the following year. You may be maintaining (or trying to maintain) a 30-year-old, sun-loving landscape plan under the shady canopy of maturing trees. Or perhaps the desire for a consistent, uniform landscape is dictating a limited palette of high-maintenance plants. To escape these problems, begin to appreciate the other ornamental attributes of plants, such as leaf size, color, and texture. (See *Keep It Simply Sustainable!*) By incorporating attractive plants that thrive in your site's growing conditions, you can reduce the cost of maintaining your beds and borders. The horticulture industry has developed disease-resistant, hardy plants and has rediscovered native plants. Visit a local garden center and you'll find more variety than ever.

It's difficult to find a landscape contractor that understands sustainability
Even if the sales staff can "talk the talk," the crew may not "walk the walk." A good company keeps up with the best plant health care practices, prioritizes the use of native and other eco-friendly plants, knows that the best landscape practices work with nature, not against it, and trains its employees accordingly. Do your due diligence to be sure a landscaping contractor knows how to analyze and work with the landscape's conditions and has experience working with native plants. Otherwise, look elsewhere.

Invasive plants may be lurking
One hundred years ago, every school child was taught plant identification. Unfortunately, over the decades, this skill has almost gone extinct in the general population. Today, many landscapes harbor misbehaving plants, such as garlic mustard and purple loosestrife. These *invasive species* escape into natural areas and cause havoc by forming dense colonies that choke out beneficial plants and wildlife. A plant inventory is the answer. Hire a knowledgeable landscape design professional to inventory your current mix of plants and their suitability for your site's growing conditions.

In any given year, there's not enough money to do what's right
Reinventing your landscape does take an initial investment, true. But there are ways to phase the project so your budget is not overwhelmed. The most important step is the initial one of incorporating landscape replacement into your operating budget. The costs can be spread out over time so they are palatable for stakeholders. Redo a portion of the garden beds one year, then tackle another section the following year…you get the picture. Eventually, reduced annual maintenance costs will help you recoup some of your investment.

Landscape users may believe native plants are weedy
When most people think of native plants in a landscape, they envision a *prairie* with tall grasses that they'll have to wade through to get to their car every day. Actually, it's a misperception that native plants always look wild. On the contrary, they can be used to create manicured, maintained garden beds. Plus, native plants are the ultimate easy-care plants. Because they are extremely well-suited to our climate, growing conditions, and annual rain patterns they need less attention than exotic annuals to look great.

Over the years, trees grow or die, changing the sun, soil, and moisture conditions of a site
What was once a sunny area is now shady, so sun-loving plants below don't flower any longer. Or a tree came down, and the sun has burned up the hostas. Does this sound familiar? Whenever site conditions change, it's time to re-evaluate the plant mix.

Plants near driveways, roads, parking lots, or sidewalks struggle or continually die and need to be replaced
Road salt is an enemy to most plants, even so-called "salt-tolerant" plants. No plant can survive for long in that harsh environment. If possible, choose more eco-friendly treatments, such as sand, beet juice, and non-sodium chloride-based products.

Perennials die without attention
Why do all your hostas look like donuts, where the centers have died out? Because even old standbys that we think of as dependable, like hostas, need maintenance to stay healthy and attractive. In recent years, many kinds of daylilies have begun to develop diseases. This is an unfortunate consequence of overuse. Replace poorly performing daylilies with disease-resistant plants. In the case of "donut" hostas and other perennials, remove them, divide them into several plants, and replant them with plenty of space around each one.

No matter how much you water, plants die
It surprises many people, but the number one cause of plant death is…overwatering! Check your watering cycle and the condition of your irrigation equipment. Sprinkler heads may not be functioning or be situated in the wrong locations. And be sure to turn off equipment when it rains.

Your landscaping was an afterthought or designed years ago
Some property developers are good at designing buildings, but the landscaping around them? Not so much. Landscaping may be an afterthought, designed to look full and lush to sell the property but without regard for how plants would grow and change over the years. Plus, when your property was designed 20 to 40 years ago, plant knowledge and best practices were still evolving. Just as you replace outdated interior decor, it's time to freshen up your original landscape with a new design plan. The industry standard is to have a design professional evaluate your landscape every three to five years.

There's a demand for color all the time

The reasoning goes, if we are paying dues/taxes/the landscape contractor's bill, we expect something for our money. That “something” often translates to exuberantly colored beds of annual flowers, perfectly balanced and always blooming. But what happens when two sun-loving petunia beds flank a sidewalk…and one of them is in shade? Or the downspout floods one bed, while the other is perpetually parched? Dead flowers never look right, no matter how well they’re balanced. It’s time to let go of the matchy-matchy aesthetic and embrace *the right plant in the right place*. This is the concept that different site conditions demand different kinds of plants. A good landscape designer can perform a season-by-season site analysis to determine the right plant mix for your site. A garden with a variety of perennial plants can provide color and beauty throughout the growing season.

THINK BEYOND THE FLOWER: IMPLEMENTATION

Garden beds can look interesting and beautiful all year long—without draining your bank account. In a sustainable landscape, tall, elegant grasses; plants with attractive color, shape, and form; and even sculptures can create show-stopping focal points where you need them. Here are steps for revamping your gardens to include the sustainable use of herbaceous plants.

1. Start with the soil. Get a soil test to learn what yours is made of (clay, loam, sand), its pH (*acidity* or *alkalinity*), and what kinds of nutrients it contains. Soil can vary from place to place, so be sure to test many different areas of the property. Soil at the back of the property will be different from soil near a pond and different still from soil near a parking lot. With results in hand, choose appropriate plants that thrive in your kind of soil, and decide what nutrients, if any, you may need to add. If you are planning to grow edible plants, you may need to substantially improve the soil or even create *raised beds* if the soil contains toxins.

2. Analyze your site. A good *landscape designer* can give you a current inventory of your plants. They can help you learn the sun and shade conditions and understand the effects of topography and wind on plants. For example, plants with shallow roots don't do well on sloped areas.

3. Start small. Begin with small changes that will garner the biggest cost savings right away. This might mean...

- Replacing a poorly functioning patch of lawn or a flower bed near a downspout with a swale or rain garden filled with water-loving plants. They will absorb excess water, prevent soil erosion, and reduce the amount of nutrients that get washed into a pond.
- Designing a *shade garden* filled with plants that don't need a lot of sun in an area of dense shade where grass or sun-loving annuals won't grow. Gravel, a tasteful statue, or other objects can provide added interest.
- Applying *mulch* underneath trees to give them a finished look and protect them from mowers and string trimmers. (Just be sure to avoid *volcano mulching*).
- Planting a perennial *ground cover* on sloping land, where annuals tend to wash away or where mowing is difficult.

4. Allocate appropriate funding. The creation of new garden beds or remodeling of old ones could be included in your budget or reserve study process. Be sure to take into account the expected lifespan of landscape elements. Understand that you may have to spend money up front to save money over the long-term.

5. Hire the right professionals. Before you let a landscape company design a garden bed, check their sustainability "cred." Will they choose a variety of low-maintenance perennials that include natives—or do they specialize in thirsty annuals that must be replanted next spring? Will their recommended plants minimize care and watering? Can the plants cope with long droughts? Will they group together plants with common growing needs to simplify maintenance?

Learn More:

Midwest Ecological Landscape Association: http://www.melaweb.org/
Illinois Landscape Contractor Association - Sustainable Landscaping Group: https://www.ilca.net/sustainable_landscaping.aspx
Illinois Green Industry Association: http://www.ina-online.org/
Association of Professional Landscape Designers: http://apld.org/
PLANET (Professional Landcare Network): www.landcarenetwork.org/index.cfm

6. Formulate a long-term maintenance plan. Your landscape is living and dynamic—it is never "done." Conditions change over time. So plan accordingly. Have the landscape evaluated by a professional every few years and plan to make upgrades as trees cast more or less shade and new structures such as parking lots are built.

COMMUNICATING AND ADDRESSING CONCERNS

Of all the natural elements surrounding us, the flower is the one we seem to connect with the most. We delight in seeing bright beds of yellow marigolds near entrances. We lovingly plant purple petunias in containers, and bring cut flowers inside to enjoy.

But despite all the emotional attention we lavish on flowers, it's difficult to meet their growing needs. So when gardens look parched or weedy, a landscape's users may let you know about it. A sustainable landscape minimizes problems like those, but it has issues of its own. Specifically, a sustainable landscape may incorporate flowers that people aren't familiar with. Winning over the hearts and minds of your landscape's users may take some time, but you can help them appreciate eco-friendly gardens by keeping in mind these tips:

Talk about the needs of plants

When plants die because they are poorly matched to the growing conditions, help people understand that plants are like us. Just as we need water, proper nutrition, and supportive neighbors and family to thrive, so do plants. Each type of plant needs specific amounts of moisture, soil, and sunlight. When people balk at the water bill or complain about the dead flowers in the garden, it's the perfect opportunity to talk about switching to sustainable plantings that are better suited to your property's growing conditions.

Stress the need to hire knowledgeable and trained professionals
Designing successful gardens takes skill. If you have your "lawn guy"—who specializes in turf grass but not much else—try to plan a well-functioning perennial garden, you'll get what you pay for. When incorporating native plants, hire someone who has experience designing with and maintaining them.

Help people see the beauty in low-maintenance plants: cost-savings
Some people may resist an unfamiliar "natural-look" aesthetic. Promote the idea that they can save money by choosing perennials that need to be planted only once. They'll also save money on water and maintenance.

Remind them that patience is a virtue
Some people lack the patience to wait for planting beds to get established. It's hard to teach patience, but you can stress the ultimate rewards: lower maintenance bills over the long haul and year-round beauty, just to name a few. Plus, it only takes a year or two! You may find that the more educated people are, the most interest they'll develop in a sustainable approach, and the more ownership they'll take in the process.

Stress the environmental benefits
Planting the right plants can actually improve soil quality over time. Well-selected plants can halt soil erosion, clean water before it enters your pond or nearby waterways (see Chapter 4: Ponds), and help absorb water in places usually covered in puddles. In addition, deep-rooted and woody plants and the soil supporting them store carbon, which helps to fight climate change.

RESOURCES ABOUT HERBACEOUS PLANTS

Sustainable Gardening

University of Illinois Extension - Gardener's Corner: http://urbanext.illinois.edu/gardenerscorner/
The Morton Arboretum - Plant Clinic: http://www.mortonarb.org/trees-plants/plant-clinic
Chicago Botanic Garden - Plant Information Service: http://www.chicagobotanic.org/plantinfoservice/
Sustainable Sites Initiative - Landscape for Life: http://landscapeforlife.org/

Integrated Pest Management

Iowa State University - Pest Management and the Environment: http://www.extension.iastate.edu/PME/IPM.html

Native Plants

The Conservation Foundation: http://www.theconservationfoundation.org/
Lake Notes - Shoreline Buffer Strips: http://www.epa.state.il.us/water/conservation/lake-notes/shoreline-buffer.pdf
U.S. Environmental Protection Agency - Green Landscaping: Greenacres: http://www.epa.gov/greenacres/nativeplants/factsht.html

Edible Gardening

Food Tank - 10 Urban Agriculture Projects in Chicago to Explore: http://foodtank.org/news/2013/10/ten-urban-agriculture-projects-in-chicago-worth-visiting
Rosalind Creasy - Edible Landscaping: http://www.rosalindcreasy.com/

GLOSSARY

Acidity: expressed in pH, this is a measure of soil or water. Its opposite is *alkalinity* (see definition below). Most plants thrive in average soil (around 7.0 pH), but if the soil is highly alkaline (more than 8.0 pH) or highly acidic (less than 6.5 pH), then only certain kinds of plants will thrive.

Aesthetic: the look of a landscape. A formal aesthetic might be characterized by shaped hedges or mowed and trimmed lawns. A natural aesthetic is looser, with broad swaths of plants growing in their natural shapes.

Alkalinity: expressed in pH, this is a measure of soil or water. Its opposite is *acidity*. Most plants thrive in average soil (around 7.0 pH), but if the soil is highly alkaline (more than 8.0 pH) or highly acidic (less than 6.5 pH), then only certain kinds of plants will thrive.

Annual: usually refers to brightly colored flowers originating from warmer parts of the world. They are planted in the spring and die by winter.

Biodiversity: variation in the kinds of plants, animals, and other organisms living on the land. The higher the biodiversity, the more healthy the land is deemed to be.

Bulb: only certain plants have them. A bulb is the underground part of a plant that looks like a small onion and stores the plant's food. Spring-flowering bulbs are usually planted the previous fall. After flowering, the leaves should be left on the plant so they can make food, which gets stored in the bulb for the following year. Some bulbs don't re-bloom the next year.

Herbaceous: a plant whose leaves and stems die down to soil level at the end of the growing season. These include *perennial* and *annual* plants (see definitions).

Environmental Services: the beneficial, often measurable, functions by plants, animals, and other elements in nature. Trees capture and store carbon dioxide, prairie plants absorb storm water so it doesn't overwhelm our storm sewers, and other plants can filter pollutants out of water to keep a pond healthier.

Evolve: develop over time in the process of evolution by natural selection. Plants and animals adapt to the specific conditions in their environment or they die out—or sometimes move to another place that has conditions to which they are better suited.

Grass: a family of plants with long leaves. Turf grass is commonly used in lawns. There are many other useful and beautiful grasses, including ones native to the Midwest, such as the tall grasses of the *prairie* (see definition below).

Ground Cover: a short plant that spreads through specialized stems called leaders, specialized root parts called rhizomes, or clumping. Ground covers are often used as a low-maintenance way to provide a patch of green.

Invasive Species: plants or animals that cause economic or environmental harm or harm to human health. These species can sometimes be native but most often are non-native.

Landscape Designer: a professional that prepares design plans and reviews construction, mainly for residential and multifamily properties. Look for membership in the Association of Professional Landscape Designers, the Illinois Landscape Contractors Association, or the American Society of Landscape Architects.

Mulch: a layer of material, usually natural, that is applied over soil to retain moisture, moderate soil temperature during the winter, and add nutrients to the soil.

Native: originating from the local environment; not imported from other parts of the country or other continents.

Perennial: a plant that lives year after year. Its opposite is *annual* (see definition above).

Pesticide: a substance that kills any kind of pest, including weeds, diseases, and undesirable insects or animals.

pH: a measure of the *acidity* or *alkalinity* of soil or water. Interestingly, scientists argue about what the p and H stand for. Most plants thrive in average soil (around 7.0 pH), but if the soil is highly alkaline (more than 8.0 pH) or highly acidic (less than 6.5 pH), then only certain kinds of plants that like that condition will thrive.

Prairie: a large meadow in which specific types of *native* plants live. You may be familiar with some of these plants, such as tall grasses and sunflowers. Prairies covered most of Illinois and Iowa and the rest of the Midwest until European settlers plowed them up to create farmland. Their soils, created by thousands of years of fires and dead plant parts, were deep and rich.

Rain Garden: usually a depressed area in the soil that collects rainwater, either from the sky or building downspouts. A rain garden is planted with water-loving plants that absorb the excess water.

Raised Beds: garden areas that are enclosed by wood, concrete, or rock frames where the soil is built up to 3 or 4 feet high.

Shade Garden: a designed area filled with plants or other features, such as sculptures, that receives less than four hours of direct sun a day.

Soil: often referred to as "dirt," soil is the medium for most plant life. It is made up of sand, clay, and loam, as well as organic matter (decaying leaves, tiny soil organisms, etc.).

Species: a group of organisms capable of interbreeding and producing fertile offspring. A Red-tailed Hawk cannot breed with other species of hawks, such as a Red-shouldered Hawk or a Broad-winged Hawk.

Swale: a natural or manmade ditch designed to slow and capture rainwater, rather than letting it run off the land. The water slowly percolates into the ground.

Volcano Mulching: a common but unhealthy practice of piling up mulch around the base of a tree. Mulch should be applied at a depth of 3 to 4 inches over the root zone of a tree, but it should not touch the trunk or bark.

The Four Seasons Garden at The Morton Arboretum features a variety of perennial plants surrounded by permeable pavement.

A swath of low-maintenance Siberian Bugloss can look stunning in spring.

An area of lawn shaded by grown trees could be replaced by a more sustainable *shade garden*, *mulch* or *ground cover*. *Photo courtesy of Beth Corrigan*

Keep It Simply Sustainable!
Talk About Texture

Sweaters have texture. Carpets have texture. Food can have texture. But do plants have texture? They sure do!

In this case, texture, or surface quality, isn't touched or tasted; it's seen from the sidewalk or watched from a window. Plant texture is often defined by leaf size: coarse (big), medium, or fine (small).

The art of sustainable landscape design uses leaf texture and color, bloom color, and plant height.

Escaping the monotony of homogenous annual beds, sustainable design harnesses the rich diversity in nature to create harmonious and often stunning gardens.

Plants Not to Plant
Be aware of how some plant *species* can go awry.

According to the National Invasive Species Council, an invasive species is "an alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health."

In other words, invasive species are so successful that they push everything else out. Nothing else grows.

Illinois and other states, as well as the federal government, keep official lists of invasive plants. Know the ramifications of what you plant.

Planting a Prairie
If you have the space, planting a prairie can be a beautiful, rewarding alternative to lawn. A broad swath of native prairie plants attracts birds and butterflies, improves the soil, and can help control storm water.

Prairies are low-maintenance, but they're not no-maintenance. Here's what they'll generally need after the first year:

- Controlled burning or mowing
- Digging out or pulling certain weeds

- Spot treatment of certain tough weeds with herbicide

If you happen to have the space for grazing animals, like elk or bison, you can let them do some of the maintenance for you!

Edible Gardening
Sustainable landscaping can also include edible gardening. Whether you designate an area dedicated to vegetables, create a raspberry hedge, or tuck edibles into established garden beds, this form of gardening can be an enjoyable way for people to connect with nature.

Schools have long supported demonstration gardens for children to learn about the sun, soil, and plant life. Park districts, workplaces, and residential communities are also providing areas for people to work side by side and enjoy the fruits of their labor.

A REVIEW OF IMPORTANT INFORMATION

Sustainable landscaping can save you money:

- less watering
- less fertilizer
- less weeding

Native Plants have deep fibrous roots that absorb water, anchor soil and prevent erosion.

You should hire a knowledgeable professional with experience working with low maintenance plants and sustainable practices.

A New Perspective
While you should consider your aesthetic goals, enhance the overall function of the landscape by working with natural processes. You'll achieve a better working landscape over the long-run.

See more Sustainability Perspectives in the Introduction.

It's easy to think that humans dwell in the civilized realm, and that nature is somewhere "out there." But the fact of the matter is, nature includes our cities, suburbs, and neighborhoods. Living among us are often invisible but nevertheless vibrant *wildlife communities*.

As development of rural and farm land continues, you may notice more wildlife moving in. These various creatures fly, run, crawl, swim, and waddle through their "neighborhoods" or home ranges, which might encompass several square miles or be contained within a 25-square-foot area.

Large landscapes serve as unique wildlife *habitat.* You, as a property owner or land manager, actually help shape this habitat through the choices you make. You shape it through the plants you include, how you maintain (or don't maintain) buildings, and even the kinds of policies you keep about pets. These and other decisions invite or deter wildlife.

When it comes to dealing with wildlife, the sustainability goal is to *create a harmonious relationship—to be a good neighbor, in effect.* You can and should manage the wildlife on your property. The choices you make matter, and even doing nothing is doing something. These choices will have consequences for you and for wildlife. It's possible to make small changes to attract beneficial wildlife and to prevent many problems before they happen.

THE VALUE OF WILDLIFE

Through small investments that support wildlife, people can enjoy many benefits.

Health Benefits

Many studies document the health benefits of spending time outdoors. People can feel more focused and relaxed during activities such as bird-watching, fishing, and gardening. And many people enjoy observing wildlife; it's a hobby that provides great pleasure and enriches understanding of the landscape and nature overall.

Social Benefits

Birding, walking, and community gardening clubs can meet regularly to socialize and connect. Amateur photography clubs can document local *flora* and *fauna*. Volunteer habitat building and maintenance projects on your property offer unique opportunities to create strong ties among employees, visitors, or residents. People can also work together on bird, frog, and butterfly *monitoring projects* with the guidance of outside government or nonprofit groups.

Increased Property Values

Homes or office buildings with views of wildlife habitat, such as a pond or woods, can have higher property values. People appreciate the ability to regularly enjoy watching majestic great blue herons wading in a serene pond or white-tailed deer bounding across the land.

Learn More:

American Horticultural Therapy Association: http://ahta.org/
Chicago Wilderness - No Child Left Inside: http://www.chicagowilderness.org/index.php/what-we-do/leave-no-child-inside/
Chicago Wilderness - Habitat Projects: http://www.habitatproject.org/
The Conservation Foundation: http://www.theconservationfoundation.org/
The Nature Principal: Reconnecting with Nature in a Digital Age, by Richard Louv (2012)

COMMON WILDLIFE CHALLENGES FOR LARGE LANDSCAPES

Many people don't understand that human communities overlap with wildlife communities
From the smallest insects to larger mammals like deer, wildlife is born and dies on the land. Some animals, like mice and rabbits, have been raising generations on the same tiny territory. Others, such as coyotes, largely disappeared from the area but are now returning. And in the case of migratory wildlife like birds, monarch butterflies, and certain *species* of bats, we're just one stop on their amazing transcontinental journeys. It's not possible to create a wildlife-free property. This is a matter of education: the land always has been and always will be a wildlife habitat. The key is to strive for harmony with wildlife.

Animals frequently "get into" places where people don't want them
The presence of wild animals reflects their ability to *adapt*. When turf grass and gardens replaced fields and woods, rabbits adapted and began eating the gardens. When chimneys and roofs replaced trees, raccoons adapted and moved into attics. When retention ponds replaced streams, muskrats adapted and dug into banks. People should understand that these animals are behaving naturally, not acting with malicious intent.

We don't realize that our own behaviors can influence wildlife
Often, problems stem from human actions. We plant unprotected gardens or forgo roof maintenance, and our animal neighbors find ways to use garden vegetables or holes in the attic as new resources. The solutions to nuisance problems are in our hands. There are many simple, common-sense strategies for keeping animals out of homes and other buildings and for protecting valuable landscaping. (See "BE A GOOD NEIGHBOR: IMPLEMENTATION**"** below.)

Deer can decimate flower beds and any other vegetation within reach
Deer are *herbivores*, meaning they eat plants, mainly the leaves, stems, and buds of woody plants. In the spring and summer, they eat tender plants like flowers and weeds. Here's the kicker: On average, a deer eats 2 to 4 percent of its body weight each day. Selecting plants that deer don't like to eat can be a solution; however, this might be achieved through trial and error, because what one deer avoids might be another deer's breakfast. Repellents can help reduce damage, but they won't eliminate it. Plus, they are expensive and need to be reapplied after a rainfall. High fencing might be the only solution to protect prized plants in an area with a high deer population. For more ideas, see Living with White-tailed Deer in Illinois at http://web.extension.illinois.edu/deer/

Canada Geese flock to manicured lawns and retention ponds
As it happens, many residential developments, park districts, golf courses, and corporate campuses provide excellent habitat for Canada Geese. Too bad they can't pay annual dues or property taxes! Large numbers of geese leave droppings and aggressively defend their nests and young. The answer is to create a less hospitable environment so they'll decide to live elsewhere. Geese repellents aren't a long-term answer, because they offer limited relief, must be reapplied regularly, and can be costly. USDA

Wildlife Services recommends using Integrated Wildlife Damage Management techniques, such as planting a portion of a pond's edge with water-loving plants, tall grasses, and perennials. Other options may include nest removal to limit population growth, which requires a permit from your state Department of Natural Resources. See USDA's Wildlife Damage Management page at http://www.aphis.usda.gov/wildlife_damage/integrated_management.shtml

Skunks create havoc
Like most wildlife, these nocturnal animals won't be aggressive with people or pets unless the skunks or their kits (babies) are threatened. Skunks may dig holes in a lawn in order to eat grubs under the surface. Talk to your lawn contractor (who should follow *Integrated Pest Management* methods; see Chapter 5 on Turf for details) about treating the grubs. Secure garbage cans, close dumpster lids, and never leave pet food outdoors at night. Seal off all openings along the foundation to keep skunks from burrowing under buildings. If they do, be sure they are gone before sealing in the den.

When we invite wildlife, it doesn't always do what's expected
If you already have or plan to establish wildlife habitat on your property, remember this: Despite the best intentions, animals you didn't prepare for may show up, such as that Cooper's Hawk waiting on a tree limb overlooking newly installed bird feeders. Or deer might decide a butterfly garden is their new favorite dining spot. Then again, wildlife often provides delight and wonder in surprising ways. The fact is, there are limits to the amount of control humans have over wildlife. Wildlife is called "wild" for good reason. Consult with wildlife professionals to learn humane, common-sense options for coexisting with wildlife.

Some landscape practices can harm wildlife
The use of insecticides on trees, shrubs, and flower beds can reduce the number of bugs available to birds and harm bees and other pollinators. Lawn fertilizers and pesticides can be washed by rain into ponds and hurt aquatic life. Removing seed heads from plants, shearing shrubs, and planting large areas with only a few plant species also reduce wildlife habitat. An Integrated Pest Management strategy can minimize chemical use. In some cases, attracting wildlife that eat pests can be a satisfying solution.

It's hard for people to understand that nature's rules are different than ours
Animals (including humans) survive by eating other things. But it's often difficult for us to watch animals preying on one another. When we see an animal hurt or suffering, our inclination is to rescue it, like we would do a pet. However, helping nature is not about aiding individual animals. A healthy wildlife habitat will include the cycle of birth and death.

People may kill individual wild animals with kindness
Sometimes people, acting with the best of intentions, decide to feed or "adopt" a squirrel, rabbit, or even a white-tailed deer fawn. Unfortunately, wild animals make terrible and sometimes dangerous pets. They are naturally thin, like marathon runners; they don't need to be fattened up. Plus, when offered a free lunch, they may lose motivation to find their own food and begin relying on humans. Or they may become aggressive with other animals and get injured. It is illegal to feed deer in Illinois and other states, and feeding them can actually make them catch diseases. In addition, when you offer a regular food supply, more animals will congregate and could become a nuisance. Outlaw feeding wild animals on your property (bird baths and bird feeders can be exceptions). Instead, create opportunities for people to satisfy their need to connect with nature by creating wildlife habitat areas that can help whole *populations* of animals thrive in healthy and safe ways.

In parks and communities, you can't take the animal out of your pet
Whenever two animals meet, one is bound to try to establish dominance over the other. It's a misconception that pets are passive. No matter how well-fed they are, cats and dogs become extremely effective *predators* when they meet with birds, mice, and other smaller animals. Minimize pet-wildlife

interactions by keeping pets on leashes and away from bird feeders and wildlife habitat areas. Protect songbirds by not allowing cats to roam the neighborhood. Supervise cats and dogs at all times when they are outdoors.

A desire for uniformity and tidiness may inadvertently prevent creation of wildlife habitat
Some people automatically reject natural landscaping, fearing that it will look untidy. But wildlife habitat needn't look wild. In fact, if executed well, it can be lovely. Even simple changes can make a big difference to wildlife. For example, if shrubs are allowed to fruit and flower, rather than being sheared, they can provide food for birds and insects.

BE A GOOD NEIGHBOR: IMPLEMENTATION

To make your large landscape more sustainable, be a good neighbor to wildlife. There are two overarching ideas: minimizing nuisance incidents and integrating wildlife into your landscape plan.

Minimize Nuisance Incidents

1. Maintain buildings and garden areas to prevent wildlife "squatters." Good building maintenance is essential. This includes blocking access to or removing the attractive qualities of the place animals are trying to inhabit. Another benefit: when buildings are sealed up tight, you'll improve energy efficiency.

- Many buildings in a development were built simultaneously and may have similar weak points. Have animals gotten under the porches or into window wells of a row of buildings? Do buildings closest to a nearby natural area experience the most animal nuisance incidents? Determine the cause and come up with maintenance solutions for those specific problems.
- Before addressing an animal nuisance problem, be sure to correctly identify the animal causing the problem.
- Use welded wire to prevent animals from accessing openings under decks, elevated sheds, concrete slabs, and porches. Use welded wire on the inside of vents, and install and maintain chimney caps.
- Discourage the feeding of wildlife. Specify acceptable types of bird feeders and avoid letting seeds pile up on the ground.
- Manage garbage dumpsters and compost bins. Keep grills and barbecues clean. Keep garbage cans tightly covered and indoors, if necessary. Never leave pet food outside.

Learn More:

University of Illinois Extension - Living with Wildlife in Illinois:
http://web.extension.illinois.edu/wildlife/
University of Illinois Extension - Living with White-tailed Deer in Illinois:
http://web.extension.illinois.edu/deer/about.cfm
Humane Society - Keep Wildlife Out:
http://www.humanesociety.org/animals/resources/tips/keep_wildlife_out.html
DuPage County, IL - Willowbrook Wildlife Center: www.willowbrookwildlife.com or 630-942-6200
Cook County, IL - Urban Coyote Ecology and Management:
http://www.urbancoyoteresearch.com/

2. Set up an animal emergency plan. Create a protocol for dealing with animals. Your protocol may include measures such as:

- Identify the wild animal.
- Decide under what circumstances you will interfere or let nature take its course.
- Allow animals to prey on others.
- If an animal was injured accidentally (by a collision with a window or car, for example) call a licensed wildlife rehabilitator immediately. (See "Learn More" below.)
- If there is a danger to humans, call the proper authorities. Depending on your location, you may need to call the police, or the county, state, or federal control agency when dealing with an animal emergency. Some community police departments are trained to work with animals, but many are not. Determine who to call and have that number handy for when emergencies arise.
- Never allow visitors, employees, or residents to handle any wild animal. Besides being stressful to wildlife, it is illegal to live trap or kill most wild animals without appropriate state or federal permits. Trapping can be an effective management tool, but it should be used only after non-lethal abatement techniques have failed or no longer work.
- Hire an animal “control” contractor. Some companies are not concerned with sustainable approaches to wildlife. Check the company’s record with the Better Business Bureau. Find out if they have the proper, current permits to handle your situation (permits should be renewed annually), and ask them to fax you a copy of them.

Learn More:

Bird Collision Network - What To Do With Injured and Orphaned Birds:
http://bcnbirds.org/birdrehab.html
Fox Valley Wildlife Center: www.foxvalleywildlife.org/
Willowbrook Wildlife Center: www.willowbrookwildlife.com or 630-942-6200
Living with Wildlife in Illinois - FAQs: http://m.extension.illinois.edu/wildlife/faq.cfm
University of Illinois Extension - How to Solve a Problem with Wildlife at Your Home:
http://web.extension.illinois.edu/wildlife/solutions_pros.cfm
USDA Animal and Plant Health Inspection Service - Wildlife Damage Management:
www.aphis.usda.gov/wildlife_damage/

Integrate Wildlife into Your Sustainable Landscaping Plan
Even taking small steps to create wildlife habitat can make a big difference to the welfare of wildlife in your region. For people, witnessing the beauty and mystery of wildlife can be nothing short of magical.

1. Assess your site location and interest level. Consider two big questions: First, what landscape features do you already have? Do you have a retention pond or *wetland*? Is there a woodland? How large are these features? Second, how open are residents, visitors, employees, and other stakeholders to attracting more or different wildlife to your property? If they are mildly interested, start small by attracting easy, beneficial wildlife, such as butterflies and songbirds. If there is greater interest, work with a wildlife professional or environmental consulting firm to assess your property's suitability for wildlife habitat.

2. Decide which animals you'll "invite." If you build it, they don't always come, but there's a good chance they will. Start simple and learn as you go. Determine your level of tolerance for animals and insects by discussing their risks and rewards. Study the "Living with Wildlife" section in Illinois' Wildlife Directory (http://web.extension.illinois.edu/wildlife/directory.cfm)to learn about them. (Examples: A single bat can eat up to 3,000 mosquitoes in a night. Salamanders, frogs, and toads are important insect predators in ponds.) Address solutions for minimizing nuisances or animal injury problems that may come up.

If there is a lot of interest in building wildlife habitat, do more research to understand how your property might interact with existing wildlife hot spots. Locate your property on a street map. How close is the nearest natural area, corporate campus, farm, or other open space where large populations of wildlife may currently live? Check with Chicago Wilderness to locate your property in its green infrastructure resource protection areas, called Green Infrastructure Vision. Contact the Nature Conservancy or the National Audubon Society to identify important bird habitats nearby (if you are within 10,000 feet of a large airport, minimize bird habitat). Watershed maps and soil maps can indicate where your rainwater flows, the type of soil you have, and the kinds of plants that grow best in that soil. Professionals at these organizations can help you interpret the information as it relates to your property.

Learn More:

Monitoring Programs

National Wildlife Federation - Garden for Wildlife: http://www.nwf.org/Get-Outside/Outdoor-Activities/Garden-for-Wildlife.aspx
Monarch Watch: http://www.monarchwatch.org/
The Conservation Foundation - Conservation@Home Program: http://www.theconservationfoundation.org/page.php?PageID=82
National Audubon Society - Great Backyard Bird Count: http://www.birdsource.org/gbbc/
Illinois Department of Natural Resources – Critical Trends Assessment (Monitoring) Program: http://www.dnr.state.il.us/orep/ctap/

Assessing Your Property's Ecology

Chicago Wilderness - Green Infrastructure Vision: http://www.chicagowilderness.org/what-we-do/protecting-green-infrastructure/
The Nature Conservancy - Migratory Bird Program: http://my.nature.org/birds/about/
National Audubon Society - Saving Important Bird Areas: http://web4.audubon.org/bird/iba/SavingIBAs_intro.html
U.S. Geological Survey: http://www.usgs.gov/
County Cooperative Extension System Offices: http://www.csrees.usda.gov/Extension/
Wisconsin State Agricultural Experiment Station: http://www.cals.wisc.edu/waes/

3. Evaluate your resources. There are easy, low-cost ways to maintain simple wildlife habitats for butterflies and birds. If you embark on a more substantial project, aside from the initial investment, you'll need to include upkeep expenses in your budget. Generally, maintaining a wildlife habitat requires less mowing and watering but can involve more work removing invasive plants than a traditional landscape. Many government and private institutions offer grant assistance for conserving or restoring natural areas. If there is great interest by residents, employees, or visitors, they can do some of the work; look for volunteers to help you apply for available grants.

4. Connect your common areas to nature beyond your borders. Consider this option if there is great interest in attracting wildlife. If your property is surrounded by nearby habitats, such as woodlands, grasslands, or wetlands, help connect them by building a travel lane or "corridor." It's like a path, but it's made of plants. The corridor should be at your property's perimeter to channel wild animals away from buildings and people. A broad corridor of many kinds of trees, shrubs, and smaller plants will give more animal species access, but for some small animals, a row of shrubs or a strip of unmowed grass or flowers is all it takes. The idea is to allow wildlife to move through your property naturally.

5. Incorporate wildlife into your overall sustainable landscape plan. Enlist the help of a landscape design professional with experience in creating wildlife habitat. The design should be developed with an understanding of the particular survival needs of your targeted species. If not, you could get starlings instead of songbirds. Assure residents, visitors, and other users that it's possible to design wildlife areas that are aesthetically pleasing. Flowering plants that attract butterflies could be incorporated along walking paths, for example. Some other tips:

- Choose *native* plants to create the highest quality wildlife habitat. These are also the most cost-effective over time, because they demand less water and maintenance.
- Plant local, native species of trees, shrubs, and other plants, which are more likely to attract local wildlife.
- Preserve and plant oak trees, which are the most important species for wildlife habitat.
- Plant oak, elm, and hawthorn trees, which are the best trees for spring bird migration. These trees attract many kinds of insects that birds need.
- Situate bird nest boxes in quiet areas.
- To protect the safety of hummingbirds, locate plants that attract them away from streets.
- Create a pollinator garden that attracts butterflies, bees, and other insects. This can help neighboring flower and vegetable gardens thrive. It's possible to select plants deer dislike, but expect a lot of trial and error.
- Water is critical, especially in winter. Incorporate an existing pond or series of backyard birdbaths. Consider providing heated or aerated water sources to ensure a steady water supply during winter freezes.
- If you have a pond, build a plant buffer along the shoreline to provide cover and food for beneficial wildlife.
- Don't be discouraged if budget is an issue. Even small changes in the landscape can have beneficial outcomes over time. For example, add carefully selected flowering and fruiting native plants as originally planted landscape plants die.

Learn More:

Creating Habitats and Homes for Illinois Wildlife, Chapter 9, by the Illinois Department of Natural Resources (2003)
Michigan Department of Natural Resources - Backyard Wildlife Management: http://www.michigan.gov/dnr/0,1607,7-153-10370_12144-30777--,00.html
Butterfly Gardening and Conservation, by Dave Tylka (1990)
National Audubon Society - Audubon at Home: http://athome.audubon.org/
The Morton Arboretum - Animal Damage: http://www.mortonarb.org/trees-plants/plant-clinic/horticulture-care/animal-damage

COMMUNICATING AND ADDRESSING CONCERNS

A landscape's users often have legitimate complaints about wildlife. The scratching and scrambling of a squirrel running up and down inside a building's walls instills a certain respect for Mother Nature, and understandably a little anger.

There are many real advantages to having a wildlife-friendly property. However, as with any change, creating a harmonious relationship with wildlife may not be an easy sell. Some people may resist the whole idea of attracting wildlife. Others want a quick fix to animal conflicts that may not be sustainable over the long run. Here are some ways to help people become more open in their thinking toward wildlife:

Help people understand that animals are protected

If nothing else, people should understand that wildlife is protected by state and/or federal regulations. In Illinois, more than 75 state laws and regulations restrict the trapping and killing of animals.

Promote the benefits of wildlife

Bees *pollinate* flower gardens and fruit trees. A single bat can eat 3,000 pesky mosquitoes in a night. Turtles, frogs, and dragonflies also reduce pests to people. Focus on the benefits—the "what's in it for me?"— of what animals can do for their human neighbors.

Start with butterflies and migratory songbirds

Who doesn't like butterflies? Or songbirds? It doesn't hurt to plant a few appropriate plants to encourage these beautiful and useful creatures.

Point out nature's cycles

Some people may reject native plants because they don't fit their desired "look" in a landscape. Explain the special relationships between native plants and wildlife. Plants are the starting point for *food webs*. The more varied the plantings, the more kinds of insects come to eat and *pollinate* them. Then other wildlife arrive to eat the insects. In a well-planned habitat that gets lots of use, expect plants to look a little jagged around the edges. To wildlife lovers, nibbled leaves are a beautiful sign. Meanwhile, plant lovers reach for the bug spray and chicken wire. Issues like these can spur spirited conversation. A separate, dedicated wildlife area well away from buildings can be a good compromise. Additionally, wildlife is more active at certain times of the year than others, such as during breeding or nesting seasons.

Form a habitat group

The most interested stakeholders can work together to plant and care for wildlife habitat. It's a great opportunity for people of all ages and backgrounds to come together in a healthy, fulfilling, and mutually beneficial endeavor.

Appeal to people's better natures

Want to save the rain forests? Care about whales? You don't have to go to the tropics to support conservation efforts! People can "think globally and act locally" right here. Your property may be an important habitat for rare or endangered species, such as the golden-winged warbler. Frequent visitors, employees, or residents may be interested in watching or *monitoring* a particular bird, butterfly, or insect species.

Use your property as a wildlife habitat demonstration site

Some people like a goal to work toward. Others do it for the bragging rights. Get certified as a demonstration site, and then actively encourage nearby property owners to incorporate similar landscaping. This can show leadership in the community and increase the appeal, and possibly the value, of your property.

Provide interpretive signage
Highlight some of the wildlife features in your landscape and explain what the visitor, resident, or employee might expect to see and why.

WILDLIFE RESOURCES

Chicago Wilderness: http://www.chicagowilderness.org/
Nature Conservancy: http://www.nature.org/
National Audubon Society: http://www.audubon.org/
USDA Natural Resources Conservation Service: http://www.nrcs.usda.gov/wps/portal/nrcs/home
U.S. Fish & Wildlife Service: http://www.fws.gov/

GLOSSARY

Adapt: to get used to new conditions.

Conservation: protecting animals and plants and preserving or restoring their *habitats* (see definition below).

Fauna: all animal life, including mammals, amphibians, reptiles, birds, insects, and spiders.

Flora: all plant life.

Food Web: how plants, animals, and humans connect in many ways that help them survive. Like a spider's web, if one plant or animal is removed, the loss can affect other relationships in the food web. For example, acorns serve as food for many animals. If acorns are not produced, then those animals that eat acorns, along with their *predators,* won't thrive.

Habitat: the environment in which an organism lives. It includes soil, amount of rain and snow, seasonal temperatures, sunlight, food sources, shelter, and predators.

Herbivore: an animal that eats only plants.

Integrated Pest Management: an effective and environmentally sensitive approach to pest management that relies on information on the life cycles of pests and their interaction with the environment to manage pest damage by the most economical means, and with the least possible hazard to people, property, and the environment.

Monitoring Projects: activities that document the presence and movement of wildlife. Projects are often led by scientists, but much of the work can be done by volunteers who receive training and mentoring.

Native: originating from local environment. Not imported from other parts of the country or other continents.

Pollinate: to fertilize flowers to make new plant seeds. Pollination is a key way nature reproduces plants. It is carried out by birds, bees, butterflies and other insects, and bats, as well as by wind and even by animals as their hides brush against flowers, carrying with them pollen, the male plant "seeds."

Population: the number of individuals of a particular *species* in an area.

Predator: an animal that hunts other animals.

Species: a group of organisms capable of interbreeding and producing fertile offspring. A Red-tailed Hawk cannot breed with other species of hawks, suchs a Red-shouldered Hawk or a Broad-winged Hawk.

Urban Forest: all the trees and other plants that live in a city, town, county, or region. "Urban" includes where people live and work, or where some type of artificial development or management takes place.

Wetland: an area of land that is saturated with water for all or part of the year.

Wildlife Communities: groups of animal *species* that live with one other. Every animal or insect serves a role in its community.

WILDLIFE NEEDS YOUR HELP!

Illinois wildlife needs help. Like humans, wild birds, mammals, and other living creatures need space to live and propagate. Native habitats – the places where animals and plants live – are the key to wildlife's future. Unfortunately, these have changed enormously in the state and many wildlife populations have declined at alarming rates as a result.

The Illinois Department of Natural Resources (IDNR) is working to enhance habitat on state-owned lands. But, as the new Illinois Wildlife Action Plan makes clear, wildlife's future also depends on the 95% of Illinois owned by private landowners. Wildlife depends on you, the landowner, to provide essential habitat. Whether your property is small or large, you can help.

HOW CAN YOU HELP?

Take time and learn to share your land with wildlife. Your efforts will not only benefit wild animals and plants, but you, your family, and friends for years to come.

Conserving and improving habitat is the key. Help is available to do just that through IDNR's "ILLINOIS ACRES FOR WILDLIFE" program and your local IDNR wildlife biologist.

WILDLIFE RESOURCES

ILLINOIS ACRES FOR WILDLIFE

"Acres for Wildlife" is an IDNR Landowner Assistance Program. Through "Acres for Wildlife," landowners receive help in protecting, improving, or developing lasting wildlife habitat on their property.

Key provisions include:

- the program is strictly voluntary
- landowners retain complete property control (trespass for any reason is prohibited without landowner permission)
- there is no cost for IDNR services (or payments for participation).

In return for IDNR assistance, landowners pledge their willingness to protect and improve habitat on their land as they are able. Protecting a minimum of one acre of habitat for at least one year is required. *Courtesy of the Illinois Department of Natural Resources.*
http://dnr.state.il.us/orc/wildliferesources/afw

The Conservation Foundation Programs --- Conservation@Home and Conservation@Work

"Some of the largest landholders around are businesses, schools and churches whose properties offer a tremendous opportunity to impact water quality and wildlife in the region. Through Conservation@Work we educate business owners and organizational leaders on the benefits of native plants, ways to conserve rainwater, proper management of invasive species and how to reduce chemical use and watering. These practices not only help preserve and restore our natural environment, but they can drastically reduce maintenance costs while providing shelter for beneficial wildlife and beautiful outdoor space to enhance employee and customer satisfaction."
Courtesy of The Conservation Foundation

http://www.theconservationfoundation.org

Living with Wildlife
Wildlife seek basic survival needs such as food, shelter, and water.

Diets vary, but berries, seeds, nuts, pollen, and nectar are common. The type and amount of food and cover you provide influence the type of wildlife you have. The more diverse the habitat you create on your property, the more species you will attract.

Shelter may consist of nesting sites and places where animals hide when sleeping, traveling, feeding, or raising young. Shelter includes trees (and hollows in trees), shrubs, and dense areas of plants.

Water for drinking and bathing is essential *year-round* for wildlife survival. Hot, dry summer days and extended spells of below-freezing winter weather are the most crucial times to have water available. Each species has a different set of habitat requirements.

Did You Know?
Most wildlife will not threaten a human unless it or its offspring are being threatened.

Keep it Simply Sustainable!
Plant a Diversity of Plants to Create Wildlife Habitat

One reason why sustainable landscaping is so satisfying is that elements perform multiple roles. When you understand this principle and learn to harness it, you get multiple returns on a single investment.

So your trees, shrubs, and other plants are not only beautiful, they are the basis for building wildlife habitat.

Take migratory birds. Different birds prefer different levels of the landscape. By providing many kinds of plants, you can attract a variety of birds.

- Include four levels of plants: ground covers, shrubs, large shrubs, and trees.
- Choose plants that flower and fruit at different times of the year.
- Preserve oak trees. Many migratory birds depend on these rare, important trees for feeding and resting.

A REVIEW OF IMPORTANT INFORMATION

Property owners who have views of wildlife habitat have higher property values.

Our landscape is an interconnected web or environments which provide habitat for a wide range of wildlife and for people. Wildlife don't live in one small space, they move about from one landscape to the next, interacting with other wildlife and with humans.

Our land management practices can contribute to wildlife behavior. Low mowed pond edges can result in higher concentrations of geese. Sound property management practices can reduce potentially adverse human wildlife interactions.

A New Perspective

People tend to think of the landscape as a masterpiece painting to be viewed and admired from their windows. But the landscape is alive, dynamic, ever-changing—and fascinating up close. Once you step outside to explore nature's mysteries, you'll be surprised how often you return to learn what's new.

See more Sustainability Perspectives in the Introduction.

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