When one thinks of ecology or ecosystems, the first thought to come to mind may be dramatic, sweeping habitats, such as vast stands of tallgrass prairie plants, river-bottom forests of cypress and tupelo, or the rugged ecosystems associated with canyons and bluffs—all places that conjure up the sense of “somewhere else.” All three of these habitats can be found within the boundaries of Illinois—the Midewin tallgrass prairie near Joliet, to the Cache River floodplain forests of southern Illinois, to the canyons and bluffs of Apple River Canyon and the Mississippi Palisades. But ecology isn’t restricted to pristine habitats or “somewhere else.” Sometimes ecology happens in our own backyard or in places that might be unexpected—such as large urban areas.

The greater Chicago area is one such area in Illinois. Encompassing much of the six counties in the northeastern part of the state, greater than 200,000 acres of habitats are protected. Many of these habitats exist in Illinois only within the greater Chicago area, and others are well represented within that array of protected sites. The term or degradation of them due to human activities, or just the proximity of urban areas to other habitats. For example, aquatic areas near cities are home to mosquitoes that can carry diseases, such as West Nile encephalitis that occurred in New York last year. Disturbed urban forests and aquatic habitats have been ripe for invasions by exotic plants, such as garlic mustard or purple loosestrife; exotic aquatic organisms, such as round gobies and zebra mussels; or exotic insects, such as Asian longhorned beetles or gypsy moths. Invasions of urban areas are not limited solely to exotic species: our backyards, forest preserves, and other green areas have been invaded by more familiar species, such as Canada Geese and whitetailed deer.

In this issue of Illinois Natural History Survey Reports, we highlight ongoing INHS research and outreach projects that can be collected under the umbrella of “urban ecology.” Survey scientists from all disciplines are studying the interactions of plants and animals in urban and suburban habitats. The studies reported here range from particular species to habitats to entire ecosystems. The report on energy and resource use and the “ecological footprint” of urban areas illustrates a crucial concept for long-term urban planning and “smart growth” of our state. A report on the wise and perhaps paradoxical development and restoration of wild and natural areas...
Lake Calumet—The Dream of Recovery

The Lake Calumet region, located at the southwestern tip of Lake Michigan, once was one of the premier biologically diverse sites in Illinois. Presettlement habitats included extensive wetlands, dunes, swales, lakes, and some forested areas. Beginning in the mid-1800s, Great Lakes shipping increased and industrialization (manufacturing and processing of steel, brick, tile, sand, gravel, petroleum, and meat) and associated urban development began what would eventually become major modification of the area habitat. Wetlands were filled and replaced with industrial sites, homes, and landfills. In spite of this abuse, this area contains the richest remnant natural areas in the city of Chicago, and for these areas there are dreams and plans.

Fifteen significant wetlands and natural areas are listed in “An Open Space Plan for Chicago,” completed in 1997. For these sites this integrated regional plan recommends their protection and enhancement, development of a habitat management plan for each, and their promotion as an essential component of an overall economic development plan for the area. The sites are Big Marsh, Deadstick Pond, Heron Pond, Hyde Lake, Migrant Bird Trap, Turning Basin Wetland, Calumet River, William Powers Conservation Area, Eggers Woods Extension, Eggers Woods Forest Preserve, Indian Ridge Marsh, Lake Calumet, Railroad Prairie, and Van Vlissingen Prairie.

At one of these sites, Indian Ridge Marsh, the city of Chicago plans to build an environmental center that houses both interpretive exhibits as well as space for outreach personnel and research scientists. Emphasis at this site would be on rehabilitation and remediation, education, and urban environmental research. Traditional and new processes for site cleanup will be tested, including phytoremediation (the process of growing plants that biologically remove or degrade contaminants from water and soil), hydrological modifications for cleaner water, plantings on industrial fill (mostly slag), and using biological control to manage invasive exotic species like purple loosestrife.

The city of Chicago has designated an industrial corridor within the Calumet region to focus on economic development and job retention. This corridor is to be a model for environmental remediation as a partnership between the business and residential communities.

In addition, a Calumet National Heritage Area has been proposed by the Calumet Ecological Park Association for an area extending from Indiana Dunes National Lakeshore on the east to the Illinois and Michigan Canal National Heritage Corridor on the west. This designation would preserve both the natural and cultural heritage in ways that meet the economic needs of the present generation while preserving the area’s unique natural resources for future citizens. A feasibility study on this proposed National Heritage Area was conducted by the National Park Service and released in 1998.

There is enormous interest in the Calumet area and the potential it holds—if given some tender loving care rather than abuse. Involvement and support of all those with interests in the region, from industrial concerns to the local property owners, as well as recreational interests and local, state, and national governments, are critical to the eventual success of the recovery efforts. This process will not be easy because of the diverse array of interests as well as the degraded conditions of many of these remnant habitats. However, the process has begun and, with broad support, will continue to gather momentum.

One of the amazing aspects of natural systems is their resiliency; and some of the remnant habitats in the Calumet region, such as Powderhorn Lake, that have received care and attention in recent years have shown remarkable improvement. If Powderhorn Lake is an indication, there is a great deal of promise in the Calumet region, and if only some of the dreams for it come to pass, it will once again be a biologically remarkable place.

David Voegtlin, Center for Biodiversity

Lake Calumet near Chicago. Photo by David Voegtlin, INHS Center for Biodiversity

Indian Ridge Marsh. Photo by David Voegtlin, INHS Center for Biodiversity
Research and Outreach Try to Stem Tide of Exotic Invasions in Lake Michigan

Since the early 1800s, over 140 exotic species have invaded or been introduced into the waters of the Great Lakes basin. In most cases, these introductions have occurred as a result of human activities including shipping, building of canals, and deliberate releases. Several of these species have had substantial impacts on the Great Lakes resource. For example, the sea lamprey was responsible for the disappearance of Lake Michigan’s lake trout populations, which now are maintained in the lake only through stocking. Millions of dollars are required annually to manage, control, and reverse the impacts of nonindigenous aquatic nuisance species in the Great Lakes.

Many of these species first introduced into the Great Lakes have been transferred to inland lakes, rivers, and streams both near to and far from the Great Lakes. Often this transfer is a direct result of human activity such as the building of canals. The Chicago area canals built to allow reversal of the flow of the Chicago River have enabled two recent invaders, the round goby and the zebra mussel, to move downstream from Lake Michigan into the Illinois and Mississippi rivers, respectively. The Illinois Natural History Survey is working with a panel of municipal, state, and federal entities in the design of an experimental barrier intended to curtail the downstream movement of species from Lake Michigan into the Illinois River (and vice-versa). The first phase of this barrier will be installed by the Army Corps of Engineers in the summer of 2000. Subsequently, researchers at the Survey’s Lake Michigan Biological Station will begin studying the ability of fish to move across the barrier, which will provide insight into the feasibility of barriers as deterrents to the spread of exotics.

Recreational boating and fishing are other mechanisms by which exotics are spreading to inland waters. For example, six lakes in the greater Chicago area have been confirmed as infested with zebra mussels, which most likely were introduced into these lakes on boats or boat trailers used previously in infested waters (e.g., Lake Michigan). Likewise, the round goby has been introduced from the Great Lakes into two inland rivers in Michigan, most likely as a result of an angler using them as bait. These exotics can cause a myriad of problems (e.g., food web disruption, reduced biodiversity, clogging of water intakes, increased weed growth), and cannot be eliminated from a system without causing increased harm.

A statewide survey of boaters and anglers to determine their knowledge and attitudes regarding exotic species indicated that this group lacked information on the potential spread of exotics via fishing and boating activities and equipment. Therefore, with funding from the Illinois-Indiana Sea Grant College Program and the Great Lakes National Program Office of U.S. EPA, we have initiated several outreach projects targeted at boaters and anglers. Also, we have produced large metal “Exotic Species Advisory” signs for placement at boat landings around the Illinois shoreline of Lake Michigan. These signs caution boaters about the potential impacts of exotics, and encourage boaters to take the necessary steps (e.g., washing the boat before traveling to another waterway) to prevent accidental spread of these species. We have produced a brochure for boaters containing back-ground information on exotic species and steps for preventing their spread. We then made these brochures widely available to the boating public through venues such as boat shows and safe-boating classes sponsored by the Illinois Department of Natural Resources. We have also developed displays for baitshops that assist anglers in identifying the round goby. A preliminary survey of anglers in the Chicago metropolitan area indicated that 45% of anglers cannot distinguish the round goby from a common native species. This confusion could contribute to anglers unknowingly spreading the round goby. Sea Grant also has funded a project that involves providing baitshops with baitbucket stickers. These stickers will remind anglers not to release unused bait into a lake or river, because that can result in non-native species (e.g., Eurasian watermilfoil) becoming established. We hope that these outreach projects combined with the experimental dispersal barrier will advance the campaign to prevent the spread of exotic species from Lake Michigan to inland Illinois.

Patrice M. Charlebois, Center for Aquatic Ecology
Plant Stress—Its Relationship to Arthropod Pests in Urban Landscapes

Trees and shrubs are important components of urban landscapes because they increase the aesthetic value of any property. Properties that contain an assortment of trees and shrubs are more likely to sell faster than properties that contain no trees or shrubs. In addition, the presence of a diversity of trees and shrubs may provide refuge for animals such as birds, rabbits, and squirrels.

Unfortunately, trees and shrubs growing in urban landscapes are subject to a variety of stress factors that may increase their susceptibility to insects and other opportunistic arthropod pests. This generally involves plants located in residential and commercial landscapes. However, it also includes plants located along streets, walkways, and in shopping center parking lots where they are surrounded by asphalt or concrete (“hardscapes”).

Plants that are growing along streets and walkways are subject to pollutants from automobile exhausts and dust. This may not only increase plant stress, but may also reduce the abundance of natural enemies (beneficial predators and parasitoids) because dust has been shown to be detrimental to the natural enemies. The absence of natural enemies may result in plants experiencing higher populations of arthropod pests. In addition, plants growing near streets and walkways are susceptible to disturbance, especially construction such as walkway replacement and repair or the installation of new piping. This generally results in severe root injury, which can compromise the ability of plants to defend themselves and increase their susceptibility to arthropod pests.

Another factor that may lead to increased plant stress is the amount of hardscape, such as parking lots and buildings, surrounding plants. An increase in heat absorption, light reflection, or an inadequate water supply may create a microclimate that is stressful to plants. This environment may be conducive for pest development and deleterious to natural enemies. In addition, plants located in these isolated microclimates may also make it difficult for natural enemies to find pests.

Plants growing in residential or commercial landscapes are subject to stress factors from mechanical injury and improper cultural practices. Mechanical injury can occur when lawn mowers or weed-whackers are used to trim turfgrass growing along the base of trees or shrubs. Lawn mowers or weed-whackers may inadvertently remove bark (cambium) tissue and girdle plants, creating plant stress and increasing susceptibility to wood-boring insects. Proper cultural practices can reduce a plant’s susceptibility to wood-boring beetles; however, improper use of irrigation, fertilizers, or mulches may alter the host-pest balance in favor of the pest.

Over- or under watering can create a series of physiological changes that lead to plant stress and greater opportunity for insect attack. Plants stressed from overwatering may result in more resources allocated toward growth and fewer resources allocated toward defense, which makes it easier for opportunistic insects to attack plants. Underwatering may also lead to stress because plants are unable to take up enough water to maintain normal metabolic functions. Wood-boring beetles and other insects take advantage of this situation. It has been demonstrated that plants under water stress are unable to produce oleoresins, which normally act to repel beetles. Pine trees, for example, were more susceptible to pine bark beetles during periods of water stress.

The use of rapid-release fertilizers, such as those used for turfgrass, may increase a plant’s susceptibility to piercing-sucking insects such as aphids, leafhoppers, and scale. Overfertilization results in insect problems because plants may allocate more energy into growth and less into defense. The level of chemical defenses necessary for resistance to insects decreases in rapidly growing trees. For example, birch (Betula sp.) and quaking aspen (Populus tremuloides) are more susceptible to leaf-feeding insects when fertilized. In addition, this often leads to the production of soft, succulent growth that has higher amounts of protein and a thinner cuticle that is easier for aphids, mites, and leafhoppers to penetrate with their mouthparts.

Proper mulching can lead to healthy plants due to a reduction in weed competition, higher soil moisture retention, and prevention of damage to the base of trees and shrubs from lawn mowers and weed-whackers. However, too much mulch or mulch that covers the plant crown (base) can cut off oxygen and suffocate plants.

Research at the Illinois Natural History Survey, the University of Illinois, and in other midwestern states is evaluating the impact of plant stress on susceptibility to arthropod pests. This will continue to be an important research consideration as suburban expansion and development proceed at an accelerated pace.

Raymond A. Cloyd, UIUC Department of Natural Resources and Environmental Sciences
Environmentally Friendly Gardening

Gardening is a significant outdoor activity of many urban and suburban homeowners. In fact, over 67% of American households have gardens. For many urban and suburban residents, lawns and gardens may represent the closest green space available to them. But urban gardens contain more than green plants, flowers, and vegetables: home lawns and gardens also have numerous insect pests, weeds, and plant diseases, many of the same kinds that affect farmers throughout the state.

To combat these pests, most urban and suburban homeowners respond by applying pesticides. Although homeowners may feel the use of pesticides in their own yard and garden is only of minor significance, collectively homeowners spend over $11 billion per year on pesticides. Pesticide use on home lawns and gardens, on a per-acre basis, actually exceeds the use of pesticides in agricultural crops. Gardeners made aware of these facts want to replace use of chemicals in their yards and gardens with biologically based tactics. Knowing about alternatives could reduce household pesticide use dramatically, but the average gardener is unaware of alternatives or how to use them. Unfortunately, many alternative approaches have taken the form of “snake oil,” being either anecdotal or untested solutions.

We tackled this problem head-on. In a joint project between entomologists at the Illinois Natural History Survey and Purdue University, we developed a training and research program for Illinois and Indiana gardeners, teaching about alternatives to pesticides and biological control tactics to use in home yards and gardens. To date, we have taught over 250 Master Gardeners about pests, natural enemies (predators, parasites, and diseases of pests), and biological control tactics that can be used in their gardens. During workshops held in cities in both states, we surveyed gardeners to learn about their current pest management practices, use of pesticides, and awareness of alternatives. Gardeners were then re-surveyed after one year to see if they altered their practices as a result of the training.

We found that training gardeners about biological control and alternatives to pesticides greatly affected their use of pesticides and alternative tactics. Before training, 63% of all gardeners relied mostly (using them either always or usually) on using insecticides against insect pests. One season later, only 28% of gardeners relied mostly on insecticides (Fig. 1). Many gardeners totally quit using pesticides—42% of gardeners used no conventional insecticides after training, versus only 15% of gardeners who used no conventional insecticides before the training workshops. Others increased their use of alternative tactics, such as companion plantings and mulches.

Reducing pesticide use in the home garden is one benefit of the program. Still another is developing alternatives for gardeners’ pest problems. We taught gardeners about conducting research and helped them to become “volunteer researchers,” testing potential biological control tactics, using their ideas and their gardens as test plots. We wanted the experiments conducted scientifically to see if the tactics worked and we could make recommendations to other gardeners. Gardeners conducted four research projects with our guidance and support: releasing *Trichogramma* wasps weekly against larvae of cabbage butterflies; comparing the numbers and kinds of predators caught in pitfall traps situated in mulched and unmulched potato plots; testing to see if spraying sugar water onto tomato plants attracted or retained predatory ladybird beetles; and spraying beneficial nematodes onto iris plants to combat iris borer.

Two of the volunteer research projects had enough participants to yield useful results. Gardeners who released tiny (< 1/64-inch-long) *Trichogramma* wasps weekly reduced levels of cabbage worms greater than fivefold in 1998: from an average of 0.59 caterpillar larvae per cabbage plant where no wasps were released to 0.11 larvae per plant with wasp releases (Fig. 2). However, in 1999 no similar pattern was seen because numbers of cabbage worms were below pest status. Control plots had 0.12 larvae per plant, versus 0.10 larvae per plant with releases. Thus, although releasing wasps...
could reduce the cabbage worm numbers from pest to nonpest levels, the wasps could not reduce numbers of cabbage worms when they were already low. Further, weekly releases of wasps cost more than gardeners were likely to pay (about $50 per season). Further tests will be conducted to see if we can reduce the number of releases, start later in the season, or quit sooner to make the tactic less expensive. Gardeners also found that spraying their iris beds with nematodes in early May reduced the damage from an average of 24% of rhizomes with iris borer damage to 34% of rhizomes with damage in control plots. Spraying nematodes later in the summer, when soil temperatures were higher, had a greater effect. Where nematodes were applied in June, only 11% of rhizomes had evidence of boring by iris borer compared to 24% damaged rhizomes in control plots. This tactic will be pursued again in 2000 to see if the results hold true. The pitfall trap and sugar water experiments did not show any differences between treated and control plots, though small numbers of plots may have affected the results.

The real test of the project’s success will be the expansion over the next few years. We showed that gardeners trained in biological control adopted practices to reduce their use of insecticides. Simple education about biologically friendly alternatives greatly changed the gardeners’ behavior. Greater adoption of biological control and non-chemical pest management alternatives will help keep urban gardens green—and friendly to the gardeners.

Robert N. Wiedenmann, Center for Economic Entomology; Clifford S. Sadof and Robert O’Neil, Purdue University

Figure 1. Percentage of gardeners using insecticides more than once per season, before and after training in biological control.

Figure 2. Numbers of cabbageworm larvae per plant, with and without releases of Trichogramma wasps, in 1998 and 1999.
**Insect Invaders Infest Chicago Trees**

The Forest Preserve Districts of Cook and DuPage counties afford Chicago residents and visitors alike a touch of wilderness amid the towering skyline and bustling thoroughfares of the city. In fact, last year more people used Cook County’s forest preserves than visited Yellowstone National Park. But a most unwanted visitor, the Asian longhorned beetle, also finds these 90,000 acres of preserve and the 500,000 trees lining the streets of the city of Chicago quite appealing.

The first Illinois infestation of the Asian longhorned beetle was discovered in the Ravenswood neighborhood of Chicago in July 1998. Soon to follow were detections of much smaller infestations in Addison (DuPage County) and Summit (southern Cook County). Illinois’ battle with the Asian longhorned beetle had begun.

Survey crews armed with binoculars were quickly dispatched throughout the neighborhoods in search of infested trees, but authorities soon learned that ground searches alone were inadequate. The tell-tale signs of infestation, dime-sized adult exit holes or the much smaller egg-laying sites, were often well concealed and high in the tree canopies. In March 1999, bucket trucks and tree climbers (mostly U.S. Forest Service smoke jumpers) were added to the arsenal of survey tools and many more infested trees were identified. Regrettably, removal and destruction of infested trees are currently the best tools available to eliminate and control the Asian longhorned beetle. Since the damaging larval stage lives deep inside infested trees during most of the year, conventional insecticide sprays are not an option, and lures are not available to attract adults.

Tree-cutting operations began in the Ravenswood community in February 1999. Within a matter of days, 837 trees were felled, chipped, and burned. Portions of the once tree-lined streets of Ravenswood were suddenly barren and the onslaught continues. An additional 314 infested trees were discovered during intensive survey efforts in 1999, while 54 trees were felled in Addison and 24 succumbed in Summit. Although residents were not held responsible for the cost of tree removal, their losses were immeasurable. What is the value of a tree in the city? A mature city tree not only provides beauty but also offers many practical benefits such as summer shade; winter wind protection; reductions of air, water, and noise pollution; natural habitats; and increased property values. But to many, the emotional loss was perhaps the most profound; an old friend was no longer there to greet them each day.

Even so, residents agreed to these heroic measures in hope of preventing a similar fate for other neighborhoods or the beloved parks and forest preserves of the city. More than 11% of Cook County is a forest preserve and the majority of trees are acceptable hosts for Asian longhorned beetle. According to city foresters, 50% of Chicago’s trees are maples, which happen to be one of the beetle’s favorite foods, and overall 70% of the city’s trees are susceptible. Clearly, the potential for a replay of the Dutch elm disease disaster of the 1950s (which coincidentally also struck the Ravenswood neighborhood) is a possibility.

With this in mind, the selection of trees for replanting has been done with extreme care. A variety of oaks and lindens, catalpa, Kentucky coffee tree, Turkish filbert, gingko, tulip tree, and honey locust have been chosen to replace those sacrificed to the Asian longhorned beetle. Our current knowledge of the beetle’s host range suggests that these replacement trees are resistant to Asian longhorned beetle attack. City foresters began replanting operations during summer 1999 with balled and burlapped trees up to 18 feet tall, again at no cost to homeowners. Still, it will take many years of tender care before the replacements can hope to once again rise above the rooftops. Throughout this process of regrowth, landscapes may well dramatically change—an ecological succession of sorts. For instance, shade-tolerant shrubs, flowers, groundcovers, and vines that once thrived in canopied yards will face much stronger summer sun and may not survive. In some cases, this may require periodic replacement of understory plantings as the tree canopies gradually grow denser.

The city’s struggle with the Asian longhorned beetle continues. Although adult beetles were difficult to find in 1999 and far fewer infested trees were located, regulatory officials are far from saying the battle is won. Fortunately, the Asian longhorned beetle is not a particularly strong flier and does not appear to be rapidly expanding its range; however, several new spot infestations were found outside the quarantine boundaries, including four trees in a forest preserve. Intensive surveys and tree removal will likely continue for five or more years at a cost of several million dollars before we will know with certainty if eradication attempts are successful and the Asian longhorned beetle becomes a distant memory. But residents of affected neighborhoods will get a daily reminder of the impact of this conflict for many years to come—just by looking out their windows.

Charles Helm, Center for Economic Entomology
A basic ecological problem of cities (as opposed to problems in cities) is their dependence beyond their borders for energy, water, minerals, food, and other necessities, and for assimilation of their wastes. The “sustainable city unit” therefore should include not just the acreage of cities and their suburbs but also the ecologically productive land anywhere on the globe that support it. “Ecological Footprint,” developed by planners Mathis Wackernagel and William Rees at the University of British Columbia, is a vivid descriptor of this dependence.

Such footprint calculations, though based on many arguable assumptions, indicate that at urban, national, and global scales, humans have ecological footprints exceeding available land. The ratio of footprint to actual area is of order 100 for industrialized cities, 10 for developed countries (notable exceptions: Canada and Australia, which, though rich, are sparsely populated), and 2–3 for the entire human race.

Unless wildly incorrect, these results imply that present activity is unsustainable and that we are likely in an overshoot period preceding a decline in productive life-support. Given that there are now worldwide 345 cities of more than a million inhabitants, with 527 projected in 2015, this growth is dire. Yet it also offers impetus to design and execute more sustainable societies, and the details offer points of improvement (particularly in water and energy). Typically the issue of dependence in a finite world is the last bastion of denial about human impacts. Acting locally to address the larger problem is difficult, as planners will admit. If dependence were a serious factor in urban planning, cities could have smaller footprints, and the sizes and distribution of urban concentrations would be different. In economic terms, city life would cost more than it does today, and the urbanization trend would not be as rapid.

Dependence, along with depletion (of resources) and disturbance (of natural flows and cycles) comprise the 3 Ds, a set of indicators Todd Wildermuth and I use to evaluate the environmental sustainability of agricultural practices and agriculture-based communities in Illinois and Kansas. In Chase County, KS, we find, not surprisingly, that in terms of energy and nitrogen, land used for raising range-fed beef has lower dependence than land in row crops, as shown in Table 1. In addition, Chase County exports crude oil and natural gas, yet imports all the refined petroleum and natural and bottled gas it burns, and hence has both high depletion and dependence for energy.

I am now designing research with planning faculty members to calculate, and to use in actual planning practice, these indicators for smaller Illinois cities. The typical question is how more efficient use within the city will reduce beyond-boundary requirements. This includes use of water and energy, recycling of packaging, design of buildings and transportation systems, promotion of local agriculture, and provision of green space.

Robert A. Herendeen, Center for Aquatic Ecology

Table 1. Summary chart of indicators for Chase County, KS soil, water, energy, and nitrogen resources. Depletion is the ratio of the drawdown rate divided by the stock and has the units of 1/time. The inverse is the static lifetime: how long nonrenewable resources will last at today’s depletion rate. Disturbance is (today’s flow)/(“natural” flow) - 1. Dependence is import/internal use. All three D’s are thus 0 for the nondepleting, undisturbed, independent (“self-sufficient”) case.

A. Soil includes only the A horizon, which is treated as a homogeneous unit.
B. Grazed land includes range, pasture, and grazed forest. Ungrazed land includes row-cropland and towns.
C. Given as a range due to the uncertainty in rates of soil formation.
D. Given as a range due to the uncertainty in fixation by prairie vegetation.
E. Details of long-term nitrogen cycling are unknown.
F. Assumes the same stock of nitrogen as grazed lands.
In spite of the loss of many northeastern Illinois' presettlement wetlands, a large number of wetlands remain in this highly urbanized and rapidly developing region. These wetlands are home to significant populations of wetland birds. These include colonial species, such as Great Blue Herons, American Egrets, Double-crested Cormorants, Black Terns (Illinois endangered), and Black-crowned Night Herons (Illinois endangered), as well as species with dispersed distributions, such as Pied-billed Grebes (Illinois threatened), Common Moorhens (Illinois threatened), Least Bitterns (Illinois endangered), and Yellow-headed Blackbirds (Illinois endangered). A major impediment to the conservation of these species and their wetland habitat is a general lack of information regarding the population dynamics and habitat requirements of these species in urban environments. This paucity of information makes long-term planning for conservation, development, habitat mitigation, and habitat restoration extremely difficult.

Our research is currently focused on one species, the Yellow-headed Blackbird. This species was an abundant resident in the southwestern Great Lakes region a century ago. Since that time, however, its population has declined precipitously and Yellow-headed Blackbirds currently persist in small numbers in only a few populations east of the Mississippi. One of the largest of these populations is in northeastern Illinois, in the marshes of Cook, Lake, and McHenry counties. However, these marshes are under constant development pressure, and the Illinois Yellow-headed Blackbird population has continued to decreased at an alarming rate over the past 20 years (approximately 8% per year; Illinois Department of Natural Resources data).

We have been studying the northeastern Illinois population of Yellow-headed Blackbirds for the past two years in order to identify factors contributing to its decline, document whether individuals from this population return to the area annually, describe the movements of individuals among the marshes of the region, and describe the population trend and age structure. Our long-range goal is to gather the information required to develop a conservation plan that will ensure the survival of the Yellow-headed Blackbird in northeastern Illinois and in the southern Great Lakes area.

To date we have marked over 200 individual birds, establishing that adults breeding in one year are very likely to return to the area to breed again. We also found that these birds can and do successfully breed in close proximity to human development, provided that their marsh habitat remains intact. In addition, we found that nesting and fledgling success over the two-year period was relatively high, suggesting that the population is producing enough young to remain stable.

So why is this population declining, and why has this population, isolated by hundreds of miles from the large western populations, persisted? A longer period of investigation will be required to answer these questions. Declines may be solely due to the loss of habitat, in which case protection of sufficient marsh habitat may be all that is required to ensure the persistence of the species in Illinois. On the other hand, large-scale demographic factors may be partially responsible for the decline. As is the case with many migratory songbirds, young produced in one location seldom return to breed in the same area. Because the Illinois population lies hundreds of miles from the center of the species' range, it is possible that young birds looking for a place to settle seldom find the area. Like humans in a small rural town, the young that are produced tend to move to the larger (bird) population centers and the population dwindles for lack of new recruits.

Clearly, this species is capable of co-existing with humans in urban and suburban Illinois. We are continuing to monitor the population of eastern Yellow-headed Blackbirds of northeastern Illinois in the hope of understanding what will be required to safeguard the remnant of this species.

David A. Enstrom and Michael P. Ward, Center for Biodiversity; James Herkert, Illinois Endangered Species Protection Board
Cost and Controversy in Managing Urban Deer

Unlike deer in rural Illinois and other parts of the country, urban deer are not regulated by large predators or hunting, thus they often reach extreme population levels in remnant urban natural areas. Deer-vehicle collisions in urban areas are an index of population trends for urban deer. From 1981 to 1992 the number of deer-vehicle collisions increased from 266 to 1,300, respectively, in the three Chicago metro counties (Cook, DuPage, and Lake). Roads adjacent to natural areas also may show unacceptable levels of dangerous car-deer collisions. In addition, intense herbivory associated with high populations threatens the biodiversity of palatable native plants and causes costly damage to ornamentals. To address these problems, managers are faced with the unhappy task of reducing deer populations.

In urban forest preserves, culling deer (using trained sharpshooters in highly controlled situations) is usually the only way to safely and efficiently reduce a deer population. Other methods (sterilization, contraception, trap and transfer) are being researched actively but will not work currently because of prohibitively high costs and severe logistical problems.

An additional complication in urban deer management is that per capita reproduction is density-dependent, meaning that the average number of fawns produced and reared by each doe increases as the total population decreases. This is analogous to having a bank account where the interest rate (reproduction) is a declining function of the account balance (population size). Maximum return (number of new recruits in the next breeding season) is thus achieved at some intermediate account balance where a declining balance and increasing interest rate is optimized. Similarly, deer reproduction increases as managers begin to remove deer, thus requiring managers to work ever harder to reduce the deer population to offset the population’s increasing reproductive effort.

For several years, the DuPage County Forest Preserve District has had a progressive deer management program that is beginning to enhance conservation efforts on the native vegetation of preserves where culling is done. Culled deer are processed, inspected, and donated to Chicago area charities. We have been examining the reproductive tracts of culled deer and with other field data we have been identifying the life history mechanisms behind density-dependent reproduction.

Examination of over 550 reproductive tracts from a period of six years of intensive removal effort suggested that pregnancy rates for adults and yearlings remained high (89%). Pregnancy among fawns (indicating conception during the first breeding season) varied from 0 to 25% as population density decreased. Fawn mothers always gave birth to single young whereas older does tended to have twins. In addition, the fecundity of older does increased slightly with decreasing density, and we recorded several mothers with triplets. The most dramatic effect was seen in the number of female fawns that showed up six months later during the population’s breeding season. This measure, known as recruitment, increased dramatically with decreasing density. Taken together, the reproduction and recruitment data suggest that the principal mechanism behind density dependence is the fact that cost increases rapidly as deer density declines, may determine the real-world limits to maintaining deer at reduced population levels. In remnant urban natural areas, conservationists concerned with the negative effects of herbivory may need to accept sustained intensive management of resident deer populations.

For several years, the DuPage County Forest Preserve District has had a progressive deer management program that is beginning to enhance conservation efforts on the native vegetation of preserves where culling is done. Culled deer are processed, inspected, and donated to Chicago area charities. We have been examining the reproductive tracts of culled deer and with other field data we have been identifying the life history mechanisms behind density-dependent reproduction.

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Urban Ecology
continued from front page
in the Calumet area of southeast-
ern Chicago illustrates how once-
maligned and abused habitats can
remain vital and even be restored,
as long as they are not paved and
fragmented.

Northeastern Illinois is the
remaining stronghold in the state
for the endangered Yellow-headed
Blackbird. Suburban housing and
office-park developments with
appropriate wetlands may provide
significant habitat for this color-
ful avian marsh dweller. Other
wildlife, such as white-tailed deer,
have benefited from the extensive
urban forest preserve systems,
vastly increasing deer popula-
tions. As reported here, deer can
cause habitat degradation and
even harm to humans by colliding
with autos and by hosting the tick
vectors of Lyme and other human
diseases. Yet, controlling deer
populations in an ecologically
sustainable manner brings habitat
managers into conflict with urban
humans.

The extensive aquatic areas
near urban habitats — many ur-
ban areas are situated on lakes
or rivers due to trade — provide
environmental recreation, but also
potential environmental night-
mares due to exotic invaders.

The invaders also threaten the
extensive urban forest, as the article
about Asian longhorned beetles
attests. Even landscape plantings
and home gardens are subjects of
ecological studies and out-
reach — studies that can enhance
the health of landscape plants that
provide shade and other benefits
to homeowners and outreach that
teaches gardeners about ways to
reduce use of pesticides in their
own backyards.

While this issue may seem to
vary from the usual presentation
of studies of wild and natural
places in Illinois, we hope you
recognize that these ongoing
research and outreach efforts are
valuable additions to the understand-
ing of an increasingly
significant part of the
Illinois landscape. Far
from oxymoronic, the
issue of urban ecol-
ogy is alive and an
important part of the
Survey’s mission, and
crucial to the wise use
of the state’s natural
resources.

Robert N. Wiedenmann,
Center for Economic
Entomology

Illinois Wilds Institute for Nature

A small group of people huddle
with their faces close to the
ground, diligently using field
guides in an attempt to identify a
species of alpine wildflower. The
botanist instructor assists with
subtle hints and suggestions. The
backdrop is the soaring peaks of
the Grand Tetons.

Nearby in Yellowstone Na-
tional Park, another group threads
its way single file through a back-
county geiser basin. Their guide,
a geologist, speaks of the marvels
and intricacies of the unique ther-
mal features.

Rising from still water car-
peted with several species of
duckweed, ancient cypress trees
stand as silent sentinels. Frogs
leap from floating logs, Protho-
notary Warblers flit overhead while
a black rat snake makes its way
slowly down a massive cypress.

The group is spread out along
the boardwalk, observing, writing,
photographing, and slowly unrav-
elling the ecology of this unique
area.

Do any of these scenarios
sound interesting? What are they?,
you may ask. The first two are
long-standing courses offered to
the general public at institutes
housed at two of the most charis-
matic national parks; the third is
based, believe it or not, in Illinois
and will be one of the courses
offered by a new program of the
Illinois Natural History Survey
and the University of Illinois
Department of Natural Resources
and Environmental Sciences
(NRES). Called the Illinois Wilds
Institute for Nature (IWIN), the
newly formed organization will
offer classes on a variety of topics
associated with Illinois ecology,
natural history, and natural re-
sources. Occasional course offer-
ings may venture from the state’s
boundaries, but the main focus
will be Illinois. IWIN began its
official operation on February 1,
2000, and its first course offerings
will be during late spring/sum-
mer, 2000.

General Information on IWIN

IWIN will be similar in struc-
ture to the outreach programs of-
ered by the Yellowstone, Teton,
and Great Smoky Mountain
Institutes. Natural History Survey
biologists and NRES faculty will
offer short courses for the general
public, teachers, professional
individuals, and students of all
ages. Each course will have an
associated fee that covers the cost
of materials, lodging and meals
(for residential courses), and
other expenses. For some of the
courses, college credit will be an
option.

Individual courses may in-
clude classroom work, field trips,
field projects, or other skill-
building activities. For many
courses, in- or out-of-state field
trips will be included. Courses
will be offered in a variety of
venues, including evening, 1/2
day, 1 day, 2 day, 4 day, or longer.

Shorter courses will deal with a
specific topic (e.g., butterflies),
while longer courses may take an
integrated approach to a topic or
issue (e.g., Ecology of Southern
Illinois). Longer courses may be
residential at sites in Champaign,
across the state (e.g., Dixon
Springs Agricultural Experiment
Station), or at selected out-of-
state sites.

Separate offerings of IWIN
courses will be targeted toward
(but not limited to) teachers, stu-
dents, resource professionals, and
the general public. Course offer-
ings will occur at times when au-
diences are most available — even-
ings, summer, the break between
Christmas and New Year, spring
break, etc., or on a periodic basis
throughout the year.

Each year, a number of
courses will be of-
tered and will vary
from year to year,
depending on interest
and demand.

For more informa-
tion on the Illinois
Wilds Institute for Na-
ture and for course of-
ferrings for the coming
year, please contact
the registrar, Susan L.
Post, at (217) 493-
9959, phone; (217)
333-4949, fax; e-mail:
spost@mail. inhs.uiuc.
.edu.; or fill out the
form on the back page
of this newsletter. Also
contact the registrar
with suggestions for
courses you would
like to see offered.

Join us and learn
about “The Nature of
Illinois.”

Michael Jeffords, Office of
the Chief

Continued on back page
IWIN
continued from page 11

Course Topics
(Check with registrar for current course offerings)

- Biology of Lake Michigan/Great Lakes
- Biodiversity: What Is It and Why Is It Important?
- Habitat Fragmentation in the Illinois Landscape
- The Natural Divisions of Illinois: What Are They?
- Birds, Beasts, and Bugs: How to Identify the
  Denizens of Field, Forest, and Stream
- The Aesthetic Landscape: Forest, Field, and Stream
- The Life and Lore of Medicinal Plants
- Field Entomology: The Insects of Illinois
- The Ecology of Birds
- Wildflowers of Illinois
- Natural History of Southern Illinois
- Natural History Photography

If you are interested in being on the IWIN mailing list for courses offered, please fill out and return this card to Illinois Natural History Survey, Attn. Susan Post, Registrar, 607 East Peabody Drive, Champaign, IL 61820

Name______________________________________________
Address____________________________________________
__________________________________________________
__________________________________________________
Phone and/or Fax _________________________________
E-mail ___________________________________________
Please keep me notified of all IWIN course offerings