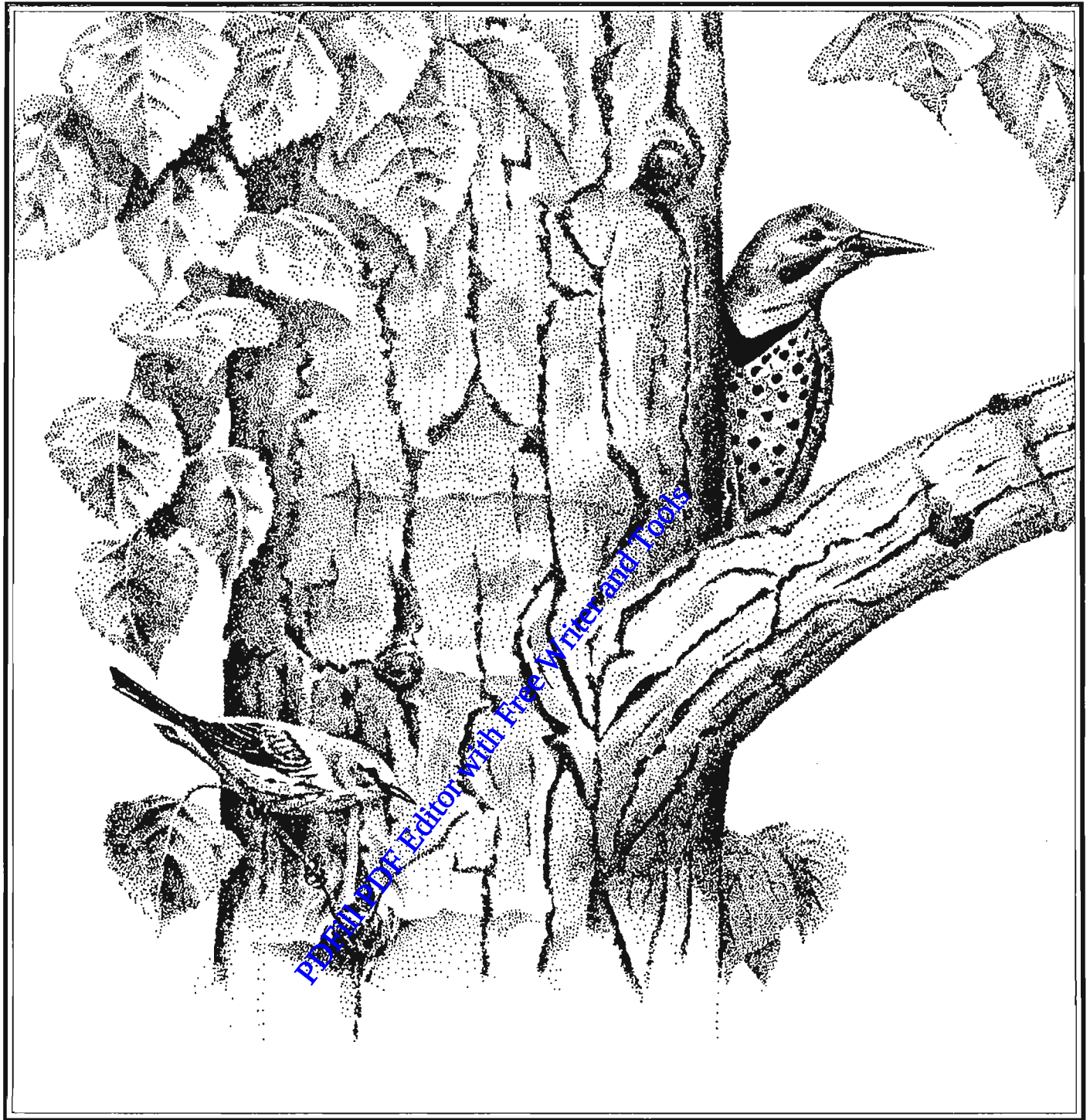




A WILDLIFE CONSERVATION MANUAL

For Urbanizing Areas In Utah

PREFACE

Humans and wildlife are bound to the environment through the air we breathe, the food we eat, the water we drink, and the ground we inhabit. Technology and urbanization in the later half of the 20th century have obscured our view of this basic relationship. We must continually remind ourselves of our dependence on the environment as we build new communities and modernize old ones. By caring for the environment in which we live we help ourselves and all other life forms. As Rene Dubos says:

The solution to the environment crisis will require a new definition of progress, based on better knowledge of nature and on a willingness to change our ways of life accordingly. We must learn to recognize the limitations and potentialities of each particular area of the earth, so that we can manipulate it creatively, thereby enhancing present and future human life.

The concept of environmental stewardship is not new in western philosophy. Rene Dubos (1972) has traced its origin back to the sixth century teachings of Saint Benedict of Nursia and the rural community building of the Benedictine Order. In his book Man and Nature, George Perkins Marsh (1874) advocated agricultural conservation practices to halt environmental degradation. Wildlife biologist Aldo Leopold was among the twentieth century's most eloquent advocates of landscape stewardship.

It is now time to put the concept of environmental stewardship to work in urban America. With such precepts guiding planning and design processes we can:

1. Build communities that provide for the needs of residents yet protect the delicate interaction between human kind and nature.
2. Minimize our use of energy, water, and other resources.
3. Maintain a diverse and dynamic environment for both humans and wildlife.

Integrating landscape patterns with city functions can make our cities productive, pleasant, and satisfying places in which to live; places that will also support wildlife species.

Wildlife is still common along rivers and streams, and in wetlands, woodlots, abandoned fields, parks, and

residential neighborhoods within many Wasatch Front communities. We can make wildlife experiences a daily occurrence in all communities if we begin planning now.

Utah's wildlife wealth was first celebrated in the myths, customs, and artwork of the the Ute Indians. Later, French and English trappers developed an economy based on many of the state's fur-bearing species. Following the trappers, Mormon immigrants recorded in their journals observations of the rich variety of wildlife they saw in the Salt Lake Valley: ducks, geese, shorebirds, songbirds, fish, and big game.

With the expansion of Mormon settlements along the Wasatch Front came the conversion of wild land to urban and agricultural uses. These changes reduced or eliminated habitat; and some wildlife species with specific habitat requirements were no longer able to survive there. At the same time, species such as the English Sparrow were attracted to the new environments.

Urbanization in Utah has been most pronounced along the Wasatch Front. Today, 75 percent of Utah's population lives in the four county Wasatch Front megalopolis. Each year hundreds of acres of land in the Salt Lake Valley are converted to urban use. Since much of the agricultural land has already been taken by urban sprawl, marginal lands such as wet meadows, wetlands, flood plains, and wooded foothills have become the sites for new development. These lands are the most critical remaining wildlife habitat along the Wasatch Front. The challenge for each community is to integrate plans for development with the habitat needs of existing wildlife.

Economic projections suggest that substantial urban growth will continue along the Wasatch Front well into the twenty-first century. Through responsible community planning which considers wildlife habitats as part of the urban ecosystem, the loss of wildlife habitat need not occur. Moreover, the habitat value of developed sites can be enhanced to support the wildlife Utahns have come to appreciate. We must commit ourselves to planning for growth while incorporating wildlife into the urban fabric if we are to continue to enjoy the benefits urban wildlife can bring. The plan must be economically sound and technically feasible if it is to be accepted by the development industry. It must appear practical to lending institutions and be politically acceptable if it is to be supported in the public arena.

This publication addresses the urgent need for urban wildlife conservation in master planning for new and existing development. It also suggests techniques for reclaiming wildlife habitat on abused sites or those neglected during urbanization. All aspects of urban wildlife conservation are discussed — from initiating an urban wildlife conservation program to long range planning for habitat management. The manual provides information to interested citizens, community leaders, and elected officials as well as technical data for developers, land planners, landscape architects, wildlife biologists, and others.

This manual has the Wasatch Front as a regional focus, but the concepts and ideas apply to all urban areas in Utah and neighboring states. It is designed to:

1. Focus public interest on wildlife and to encourage support for urban wildlife conservation programs.
2. Inform decision-makers, planners, developers, architects, engineers and landscape architects of the value of wildlife in the urban environment.
3. Explain a process of changing traditional planning, design, development, and regulatory procedures into coordinated actions that will help urban wildlife.
4. Provide the technical information necessary to establish and care for wildlife habitat preserves.

Approximately 77% of respondents to a recent questionnaire saw wildlife in their neighborhood as the sign of a healthy environment. Results from the survey indicate that over 79% of Salt Lake City residents saw the presence of wildlife around their residence as beneficial and 96.2% enjoyed seeing wildlife in their neighborhood (Pando 1990). Communities along the Wasatch Front have the continued challenge of enhancing urban wildlife. The development industry must also become a partner in meeting this challenge. Without public and private participation, urban wildlife populations will

continue to decline. If the challenge is met, the decline in urban wildlife can be reversed. Properly planned urban growth, enhancement of plantings within existing development, and restoration of disturbed sites can enhance wildlife habitat in Utah's urbanized areas and improve the health of the urban ecosystem. Support for urban wildlife programs can add to the wildlife legacy first noted in the journals of trappers and Mormon pioneers. Careful attention now can ensure that future generations will also enjoy the aesthetic, environmental, social, and economic benefits an urban wildlife conservation program can provide.

The preparation of this manual required the combined efforts of the authors and a number of dedicated people. We especially acknowledge the assistance of Tim Provan, Utah Division of Wildlife Resources (DWR), the coordinator in funding and contract administration; Randy Radant, director of the nongame program and Margy Halpin, former DWR Urban Wildlife Biologist. A special thanks to the Advisory Board Members, Dave Jensen, Jay Nielsen, Chandler St. John, and Gary Heintz, who spent countless hours reviewing draft manuscripts. Critical review of the draft by Dr. Lowell Adams, Margy Halpin, Laura Jackson, John Lyle, Dr. James MacMahon, Don Paul, Lee Nellis and Robert Wilkinson greatly enhanced the content of the final document. Also the editorial assistance of Ronald Shook and Donna Falkenberg, typing of Julie Wood, Ardith Poulsen and Malin Francis, computer graphics of Lisa Robinson, and the graphics of Kathlyn Collins and Terrall Budge enhanced the communicative quality of this publication.

Without the contributions of these individuals, this guidebook would never have become a reality.

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CHAPTER 1: INTRODUCTION

Introduction

Urban wildlife can be defined as the undomesticated animals in the urban or suburban setting (Leedy et al., 1978). What, then, is urban wildlife conservation? For purposes of this manual, we have developed the following definition:

Urban wildlife conservation is the planning, design, and management of resources on public lands in and around urban areas to maximize habitat diversity and to support the broadest array of desirable wildlife species for public benefit. Urban wildlife conservation also includes the promotion of habitat preservation and enhancement of quality wildlife habitat on private property. Urban wildlife is entirely compatible with other community planning efforts directed toward the creation of a healthy urban ecosystem.

As an agency within Utah's Department of Natural Resources, the Division of Wildlife Resources has the responsibility of managing wildlife resources in Utah. Specialists in nongame, urban wildlife, and urban fisheries are most directly responsible for wildlife management in urbanized areas. These specialists provide advice about particular urban wildlife problems and possibilities. In addition, they offer public service programs to heighten awareness of the value of urban wildlife. The Division has identified the following specific goal for its nongame urban wildlife program and developed objectives to help reach that goal.

Goal: Manage wildlife and habitats in urban environments for the conservation of their natural, educational, social, and economic values.

Objectives:

1. Assess the status of wildlife populations, habitats, land uses, plans, and ownership patterns in urban and developing environments.
2. Implement programs to enhance wildlife populations and habitats where needs are identified.

3. Increase understanding of urban wildlife resources and enhance opportunities for positive interactions with wildlife in urban environments.
4. Ensure the consideration of wildlife and habitat values in land use plans.
5. Diversify expertise, increase awareness and understanding of issues/options, encourage participation, expand coverage, and strengthen support and funding bases.
6. Coordinate programs for the rehabilitation of injured, ill, and orphaned wildlife.
7. Coordinate handling of public requests for assistance with urban wildlife problems.

Because of rapid development, the Division personnel and programs cannot solve all the problems or capitalize on all the possibilities counties and communities confront. Design professionals and developers must get involved. Indeed, planners, developers, and elected officials are often the real wildlife managers in the urban environment.

Preserving and enhancing wildlife habitat within and next to urban areas is crucial. Under Utah law, counties and cities are responsible for planning and zoning land resources, including wildlife habitats, within their jurisdiction. The law specifies that land use planning and zoning are to ensure the public health, safety, and general welfare. The documented benefits of wildlife in urban environments prove that they are important to the public welfare. Quality habitat areas also provide functions such as erosion control or storm water detention that contribute to public safety.

If an urban wildlife program is so beneficial, why don't communities get involved? Perhaps the problems with nuisance wildlife species have colored the public's image. Perhaps other community issues seem to be more important. Perhaps the task seems overwhelming. Perhaps nobody believes they know enough to get involved. However, sooner or later every community will encounter a wildlife habitat-related problem or opportunity. If the problem is seen as a chance to enhance the quality of life for community residents, the likelihood of success will increase.

Often a segment of the community organizes for wildlife in response to a single crisis. If a local wetland has been targeted for industrial development, an interest

group forms immediately, and the commitment is intense. Unfortunately, such an organization generally collapses once the crisis has passed. There is seldom any organization within the community that is concerned in a proactive way with the long term welfare of urban wildlife.

Yet in every county and community there are individuals, wildlife groups, and service clubs interested in wildlife and in improving the quality of life in their community. This rich human resource, full of ideas and enthusiasm is waiting to be tapped. Additional supporting programs and personnel—federal, state, community, and private—are available to help meet the challenge. Cooperation is the key!

A cooperative effort requires practical answers to a number of questions. How do citizens start an Urban Wildlife Conservation Program? How can a citizen's group influence the planning process and affect decisions that will benefit urban wildlife? What regulations are necessary to protect the urban wildlife resource? Can government policies and programs create incentives that will encourage the development industry to participate in urban wildlife conservation? Can government agencies work in concert to benefit urban wildlife? This manual will answer these and many other questions.

Basic Premises

This manual is based on three premises:

First, the optimum structure for a cooperative and proactive effort among citizens, government, design professionals, and developers to protect the urban ecosystem is a board (Urban Wildlife Board) appointed to advise local government. Similar boards for parks and recreation, and urban forestry departments have operated effectively for decades along the Wasatch Front. An Urban Wildlife Board could function two ways; as a separate, legally constituted body, or as a subcommittee of an existing parks and recreation, natural resource, urban forestry board, or planning and zoning commission. In Fort Collins, Colorado, wildlife habitat issues are the preview of the Natural Resource Advisory Board. Since the board is advisory, it prepares policies, programs, and plans for review by elected officials. In addition, a board member may review plans prepared by other agencies and by private developers. An advisory board must provide the continuity necessary to sustain the program over a long period of time.

Second, a planning process is needed. It should be structured to consider the habitat and behavioral needs of wildlife, as well as the recreational and educational

needs of the public. This is necessary to prepare an urban wildlife plan that is biologically, politically, and socially sound. The plan must be structured and written in a user-friendly manner since it will be used by the advisory board and volunteers with limited backgrounds in wildlife biology and planning.

Third, a manual is necessary. It will outline the entire urban wildlife planning process, discuss each phase in detail, and provide "how to" information.

Manual Organization and User's Guide

The manual has been divided into four sections, roughly corresponding to the phases in the planning process. Within each section, chapters are separated by tabbed dividers with an outline of chapter subheadings printed on them. The chapter dividers give direct access to the desired information. Think of the manual as a reference. Using it as a guide and consulting with experts from the Division of Wildlife Resources, a city or county can go a long way toward capturing the benefits associated with wildlife in the urban environment.

The general information and procedures discussed in the chapters are sequential, each phase building on the previous one. Section One, BACKGROUND (Chapters 1-5), provides basic information to the reader on urban wildlife conservation and management. The final chapter in this section describes how to establish an Urban Wildlife Conservation Program. Section Two, WILDLIFE AND HABITAT INTERACTIONS (Chapters 6-8), provides information about the relationships between wildlife and their habitat, and identifies critical habitats along the Wasatch Front.

Section Three, PLANNING PROCESS (Chapters 9-11), is the heart of the manual. It presents a logical process to start and maintain an Urban Wildlife Conservation Program. Patterned after a model developed by Johnson et al. (1982), the process includes three phases:

- Completing an Urban Wildlife Habitat Inventory and Evaluation
- Preparing an Urban Wildlife Conservation and Management Plan and Report
- Preparing an Urban Wildlife Habitat Ordinance Amendment and Other Implementation Tools

This process, together with the guidelines described in Section Four, SITE SPECIFIC RECOMMENDATIONS (Chapters 12-16), becomes the tool kit that converts interest and enthusiasm into organized action.

A number of APPENDICES have also been included. These appendices provide technical information pertaining to planning process, photographic interpretation, plan implementation, design guidelines for home owners, sources of assistance, and habitat models including plant and animal lists for project site development.

Establishing a user-friendly, logical process for an Urban Wildlife Program and integrating it into the decision making process within local government is a novel concept. The structure of the process is presented in outline form and is diagrammed in Fig. 1-1.

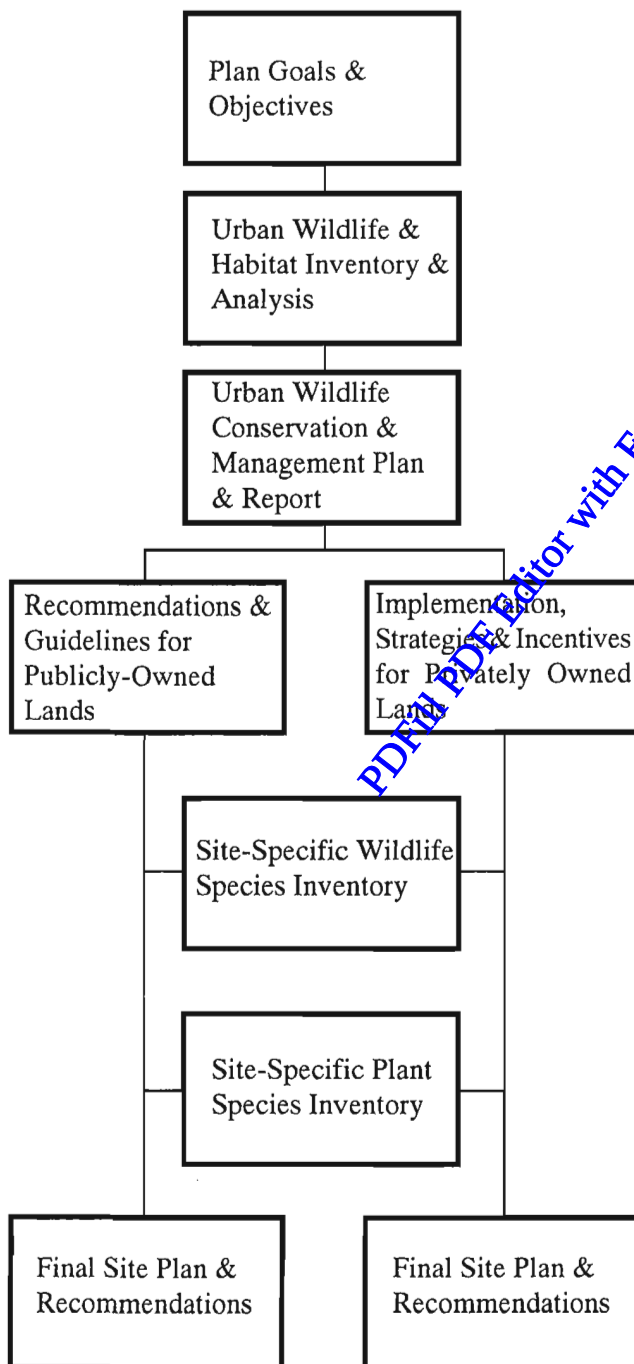


FIGURE 1-1.

1. Establishing an Urban Wildlife Conservation Program

Steps in this phase include:

1. Organizing an Urban Wildlife Board
2. Setting goals and funding an Urban Wildlife Conservation Program
3. Promoting the urban wildlife concept through awareness and education

An Urban Wildlife Conservation Program will result in an organized, proactive board that can advise city and county government on behalf of wildlife. Chapter 5 of the manual provides guidelines on how to organize and maintain an effective advisory board. It also makes recommendations for promoting an urban wildlife program, obtaining funding, and organizing consultants and volunteers to implement projects.

2. Producing an Urban Wildlife Habitat Inventory and Analysis

Steps in this phase include:

1. Preparing a base map
2. Acquiring aerial photographs
3. Mapping existing underdeveloped lands and public open space
4. Ground-truthing the habitat inventory map
5. Classifying habitat value
6. Reviewing and revising the habitat map
7. Conducting a wildlife inventory

With the completion of this phase, the Urban Wildlife Board will have an inventory map that outlines all nonagricultural open space parcels in the city or county and establishes the relative habitat value of each parcel. Guidelines for conducting a city or county habitat and wildlife species inventory are presented in Chapter 9 and Appendix B.

3. Preparing an Urban Wildlife Conservation and Management Plan and Report

Steps in this phase include:

1. Evaluating underdeveloped land and open space patterns and habitat values
2. Mapping land ownership
3. Preparing the Urban Wildlife Conservation and Management Plan and Report

In this phase the advisory board will produce a plan (the Urban Wildlife Conservation and Management Plan) in map form. Selecting from all open space

parcels shown on the inventory map, the plan will designate those parcels that best meet the biological and behavioral needs of wildlife together with the objectives of urban residents. The Urban Wildlife Conservation and Management Report is prepared to accompany the map and to document the decisions made in arriving at the Plan.

Chapter 10 describes how to evaluate the habitat inventory data and produce an Urban Wildlife Conservation and Management Plan, using principles of landscape ecology and wildlife management. Techniques for obtaining approval as part of the city or county comprehensive plan are also discussed.

4. Preparing and Selecting Implementation Tools

Steps in this phase include:

1. Reviewing existing federal, state, and local regulations with development industry representatives and city/county planning staff.
2. Determining what, if any, additional regulations or incentives are required.
3. Developing a package of educational programs, incentives, and regulation and design guidelines.
4. Lobbying community leaders for approval of the package.

Enhancing wildlife habitat existing on private property will be central to the plan objectives. The existence of an Urban Wildlife Conservation and Management Plan for the community often entices landowners and developers to participate in habitat enhancement programs. In other cases, the impetus to develop habitat on private property for the greater public good must come from the public sector. In Chapter 10 several strategies are given which can achieve maximum participation of private landowners and developers. These include education, incentive programs, regulations, and design guidelines. This chapter also provides guidelines for advisory board members, planners, and elected officials on how to develop incentive programs and realistic regulations that respect the economics of land development. In addition, Chapter 11 provides advice for all those involved in plan review. It recommends a process for evaluating plans and provides a checklist of factors to minimize impacts on wildlife habitat and see that wildlife habitat provisions of the ordinance are followed.

Implementation of the Plan—the preservation, enhancement, and reclamation of wildlife habitat—will require two different strategies depending upon land

ownership. On publicly-owned land, the plan can proceed once the plan and ordinances have been adopted and funds become available. Implementation on private property is less direct and relies more on incentives and land use controls. The unfolding of the Urban Wildlife Conservation and Management Plan on both public and private property will depend upon the development of one project site at a time.

Section Four, Site-Specific Recommendations, focuses on individual sites. Implementation begins with a site inventory and analysis; therefore, Chapter 12 presents a detailed look at how to assess a site's natural and cultural resources.

5. Evaluating a Project Site

Steps in this phase include:

1. Preparing a base map
2. Inventorying site resources
3. Synthesizing site resource information

Chapter 12 discusses how each of these resources may affect wildlife, wildlife habitat, and overall site development. It informs readers where and how the necessary information can be obtained and recorded on maps, and explains the relevance of each resource to wildlife habitat design. The final product is a map which outlines areas to be preserved because of inherent habitat values, and areas that need to be studied further, enhanced, or reclaimed. The map also delineates areas subject to erosion or other forms of degradation and those areas most suitable for facilities for human use.

6. Designing a Project Site

Steps in this phase include:

1. Preparing a design program
2. Establishing feasible goals
3. Describing objectives to achieve specified goals
4. Synthesizing program goals, objectives, and site inventory data
5. Coordinating preparation of detailed plans with consultants

Project site design, the next phase in the process on publicly owned land, typically occurs in conjunction with the project site inventory and analysis. During the design phase decisions are made about the location and shape of both the wildlife habitat and the facilities for human use. Often this requires a consultant. Chapter 13 discusses how to prepare a design program and establish goals, and it recommends ways that an advisory

board can best use a design consultant. The outcome of the project site design is a set of plan drawings, cross sections, elevations, and specifications that can be used to bid the project for construction or to guide volunteers in planting and building the project. Chapter 14 gives guidelines for the design of topography, water features, plantings, and facilities. These guidelines apply to development on private property and are presented in the manual in a way useful to the development industry.

The manual contains information for developers about the values of urban wildlife and describes the benefits of their participation in incentive programs. It also suggests ways developers can comply with federal, state, and local regulations that pertain to wildlife and wildlife habitat. The procedures and recommendations presented in Chapters 13 and 14 offer planning, planting, and site construction information that can be used by developers to benefit urban wildlife and at the same time enrich the quality of the development.

Habitat maintenance or management is the final phase in conserving and managing urban wildlife. Wildlife habitat that is integrated with urban parks and open space can reduce the overall level of park maintenance. However, minimal maintenance and monitoring are required. Maintenance and management procedures vary with each different kind of habitat. To assist those who will be responsible for maintaining wildlife habitat, the manual provides sources of assistance for management of each of the habitat types common to the urbanized areas of Utah.

The manual includes extensive appendices that provides detailed information to complete the types of studies described above. The appendices also contain models for designing and maintaining specific types of habitat—a wetland, for example—and list wildlife species typically associated with each habitat type.

Summary

Although planning and maintaining urban wildlife in productive habitats as described is presented in a linear way, many planning activities will be going on simultaneously once the program is running. Factors such as public support, funding, turnover of elected officials, community growth, and wildlife populations and habitat conditions change over time. The process outlined above should be visualized as a flexible tool that will assist the community in planning for change and setting goals for habitat conservation.

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CHAPTER 3: BENEFITS OF AN URBAN WILDLIFE CONSERVATION PROGRAM

Introduction

The urban environment is a mosaic of built and open areas. By integrating the built landscape with the natural one, we and wildlife can benefit. Some benefits may be immediate, while others may occur with time. They are not always easy to quantify, but they can strongly influence our lives. A variety of benefits can accrue:

Environmental
Social
Psychological
Educational
Aesthetic
Economic

If we recognize this array, we can then integrate wildlife conservation programs into our urban areas now and in the future.

Environmental Benefits

To incorporate wildlife into our cities, we need to provide healthy, diverse habitats. By maintaining a healthy wildlife habitat, we are providing healthier living for people. As an urban society, we need to establish criteria to ensure that we live in a clean environment which promotes our well-being and the well-being of wildlife.

The direct benefits of richly vegetated open spaces in the city are many. Plants absorb carbon dioxide and give off oxygen, renewing our air supply. Plant foliage captures dust and other pollutants, cleaning the air. Vegetation aids in erosion control: roots hold the soil in place while above-ground plant parts slow water runoff and protect the soil from the direct impact of rain. Through shading and transpiration, plants cool the air. Vegetation can offer protection from high winds or redirect air flow to encourage cooling breezes. (Johnson et al., 1982; Lyle, 1985.)

Water is another important part of nature in the city. In urban areas, water is often piped underground or diverted into concrete channels. A better alternative

would be to determine where open water can be brought into open spaces. Designing on-site water drainage and retention can supply water to plant and animal life, at the same time decreasing the demand on city disposal services. Natural areas filter and clean the water passing through them. Conservation of our water can ensure clean and safe supplies and protect downstream fisheries. All these effects make the urban environment much more liveable.

Social and Psychological Benefits

People and animals have always interacted. A spiritual relationship has persisted through time, even though many people no longer have direct connections with wildlife. The desire to maintain links to the animal world is shown in the popularity of domesticated pets, the millions of people who feed squirrels and birds in the park or visit zoos, and the continuing popularity of hunting and fishing: PEOPLE WANT WILDLIFE IN THEIR LIVES.

People enjoy wildlife in many ways. Fifty-five percent of the people surveyed in one study enjoyed wildlife near their homes through such activities as bird or animal watching or feeding, and photographing and painting wildlife (Shaw et al., 1985). Birdwatching has become a national pastime: 20 - 25% of Americans are birders (Kellert, 1985). Nearly all persons interviewed in one survey enjoyed seeing birds or having them in the vicinity (Dagg, 1974). In another survey, 90 percent of the people interviewed in the urban parks of Seattle stated that seeing wildlife enhanced their park visit, even when they didn't come to the park expressly to watch wildlife (Dick and Hendee, 1986). When the National Wildlife Federation instituted a Backyard Wildlife Program to encourage landscaping to promote wildlife, the response was phenomenal. In the first year the pamphlet was available, a quarter of a million reprint requests were received (Davis, 1974).

Wildlife-oriented activities often involve groups. The benefits of sharing an interest with others, and the person-to-person interactions that result can enrich people's lives beyond just their appreciation for wildlife and nature (Fig. 3-1). The intrinsic connection that

Educational Benefits



FIGURE 3-1. Birdwatching brings community members together.

many people feel with the environment may also be a major reason why they seek to catch a glimpse of wildlife in today's busy world.

Some studies have even proposed a mental and physical health component in people's connections to the natural environment. One study found that patients who could see trees from their hospital room stayed a significantly shorter length of time than did those whose only view was a brick wall (Ulrich, 1984). Perhaps views of wildlife in the trees would result in yet shorter hospital stays.

All this information points to one overwhelming conclusion: people want wildlife in their lives. Although we can't measure how much we need wildlife, the evidence shows that this need does exist. It is obvious that interactions with the natural world are an essential part of our human heritage. As Chief Seattle said in 1865, "if all the beasts were gone, man would die of great loneliness of spirit" (in Lyle, 1985, p. 213).

Fortunately, a plan fulfilling the needs of wildlife also provides many benefits to people. For example, paths within wildlife areas provide recreational space for walking, jogging, biking, horseback riding, and birdwatching. Linking habitat areas to form continuous systems through a city also provides people with areas for travel, recreation, and exercise.

The diversity of the natural world is astounding. A small puddle of water, an abandoned lot in a city, a utility right-of-way, or a highway right-of-way can be rich with plant and animal life, forming unique environmental systems. Regardless of size, all systems are dependent not only on their own interactions, but on their connections to the surrounding landscapes. Learning about these areas can be an unending source of wonder and discovery for people of all ages. While adding to our knowledge of nature, we can often learn more about ourselves and our ties to the environment.

Immediate and accessible wildlife habitat is an educational resource. As our population grows, our demands on the environment increase. All of us must make decisions on environmental matters of local, state, regional, and national importance. These decisions on such diverse issues as water policy, development priorities, and home landscaping all affect the environment. By discovering the intricate balances in the natural world, we become better able to make informed decisions concerning the future of our world.

In 1980, the state of Missouri passed a bill funding the program "Design for Conservation" which encouraged enhancement of wildlife habitat. The bill carried most heavily in urban areas. A look at voter response shows that those most in favor of funding the project had experienced a rural or suburban environment as children (Witter et al., 1981). Will children reared in an urban environment know the natural world and its interactions? It is important to know that we depend on a healthy environment, and urban wildlife conservation programs play an integral part in educating the public about the intricate balances of the natural world.

A recent study found that people in an urbanizing community who lived near streams had developed an interest in wildlife because they were close, and thus considered wildlife an important aspect of their life (Black et al., 1985). They knew more about the riparian area and of the animal life found there than people who lived only a few blocks away. If urban wildlife were an integral part of the urban fabric, people would learn and enjoy from it.

A large proportion of people value wildlife even when they are unable to identify different species (Kellert, 1985; Dagg, 1974; and Dick and Hendee, 1986). This indicates a large potential audience for education.

In a lecture at Utah State University, John Stilgoe of Harvard University (1985) commented upon the effect natural areas may have on children's personal growth (Fig. 3-2). He felt that this interaction of a child with the natural world is an invaluable experience that is increas-



FIGURE 3-2. Youngsters learn about wildlife and habitat by exploring the natural areas around them.

ingly being denied to the nation's urban youth. Wildlife habitat within the city can provide an exposure to the natural world. Islands of nature and greenways can serve as living classrooms. The cost of field trips to local wildlife habitats would be quite low and thus feasible in most schools' budgets. A network of wildlife habitats, would be accessible for exploration and discovery by students of all ages—to anyone who wishes to better understand the natural world and our role in it.

Many schools in Utah are landscaping areas of their schoolyards for wildlife; uses will include outdoor classroom activities; many are integrating these areas with their curriculum areas. For example, Millville Elementary students are involved with all parts of the planning and planting around the school and are responsible for its continuation.

Education can occur in many settings, from structured to unstructured. The educational opportunities that await us as individuals, neighborhoods and communities are limited only by our imaginations. Often conservation sites have untapped potential to add to the quality of life for urban residents. Sites near schools, senior citizen centers, or day-care facilities have a ready audience. The exciting aspect is that these opportunities can be a part of our own towns and cities, occurring just outside our own back doors. We are a part of this valuable natural resource—and the more we learn, the more we can enjoy it.

Aesthetic Benefits

The love of beauty is an integral part of our nature, and beauty adds immeasurably to the quality of our lives. Urban wildlife habitat can serve as a welcome contrast to urban development by showing us the beauty of nature (Fig. 3-3).

Almost everyone appreciates the loveliness of a bird preening, a butterfly hovering over an open flower, or a chipmunk enjoying a meal atop a sunny rock. There is beauty not only in seeing these activities, but also in understanding how they fit into each animal's life. Appreciation of the beauty and value of each animal species can be a primary benefit of urban wildlife enhancement.

The creation of wildlife habitat offers aesthetic advantages as well. Many parks are well-manicured spaces, with clipped turf and tall trees. Unfortunately, this type of artificial plant community often does not support a great variety of wildlife (Beissinger and Osborne, 1982). Such sites can be improved as wildlife habitat and also please the urban public. Multiple layers of vegetation, unmown grasses and different spacings between vegetation patches can provide the variety that animals need. More wildlife is likely to be present when the plant community is diverse.

In turn, this vegetative diversity offers visual diversity. Studies have shown that people prefer landscapes that offer them variety (mystery) and complexity (Kaplan and Kaplan, 1982). One researcher found that areas offering a combination of wooded and grassed areas were most preferred by the urban/suburban residents surveyed (Pudelkewicz, 1981). Pando (1990) reported similar results for Salt Lake City residents. There is still a place for the well-manicured park, but that does not



FIGURE 3-3. This scenic patch of habitat in the Ogden Native Center is only 2 miles from downtown Ogden.



FIGURE 3-4. Habitat preserved for wildlife can enhance the visual quality of urban development.

prevent having appropriate wildlife habitat. By arranging open space to offer areas for both people activity and animal activity, people can enjoy recreation opportunities, urban wildlife, and a pleasing environment (Fig. 3.4). Urban wildlife habitat is compatible with diverse land uses.

In addition to the aesthetic considerations of a local park area, including wildlife habitat can also affect the environment at a larger scale. Urban open space and greenways can support more wildlife when individual areas are linked by corridors of vegetation. Even the most aesthetically pleasing, ideal wildlife habitat will not have a great variety of species if they cannot travel to the area. A closed environment may act as a barrier to some animals.

Corridors of wildlife habitat can also offer greater coherence to the city by providing an internal structure of open space which people can use for orientation. People create their own inner maps of an area (Lynch, 1960) which help them to move through the region. Landmarks and logical sequences of spaces such as corridors of wildlife habitat provide references and reinforce people's sense of knowing where they are and how to find other areas. Such spaces help us understand the organization of urban life and, therefore, add to the quality of that life.

Opportunities exist for creating open space areas and corridors that actually enhance other land uses. Potential areas exist throughout the city: plazas or parks near large buildings, vacant lots, school yards, railroad, street and highway rights-of-way, buffers around landfills, areas surrounding industrial or manufacturing uses, stream beds, wetland areas, residential areas with yard space. These offer the opportunity for wildlife habitat development. Many of these potential sites are in public ownership and let local leaders set an example for wildlife habitat planning in the community.

People often think urban open spaces are larger than they really are (Talbot and Kaplan, 1986). If the site has diverse vegetation layers, including open grassy areas, and people can't see buildings, they overestimate the size of the area. Thus, vegetative diversity can serve several purposes. It can be beautiful and offer a rich wildlife habitat, while at the same time it can serve other purposes within a crowded city. Exciting opportunities await us. By looking at the urban environment with new eyes, we can find new ways to incorporate wildlife habitat into the fabric of our cities. The question is not "Where do we find these sites?" but "Where don't we find them?!"

Economic Benefits

The value of green open space can be measured in dollar amounts. Citizens in Columbia, Maryland, feel that having prime habitat such as ponds and wetlands near their homes increases property values (Adams et al., 1984). Property near open space increases in value as urbanization increases: people are willing to pay more to be close to these natural areas (Nelson, 1986). Loews Ventana Canyon, an exclusive resort and housing complex outside Tucson, Arizona, bases a large part of its marketing strategy on the appeal of the natural landscape and its wildlife (Fig. 3-5). Companies plan-



FIGURE 3-5. Wildlife, resident because of habitat preserved in the design of this destination resort, are marketed as a major amenity.

ning to locate or relocate their facilities often consider the quality of life when making final decisions. Those communities offering wildlife habitat can have an advantage in attracting new business.

People are willing to pay to enjoy wildlife. This is evidenced by the enormous amounts of birdseed and outdoor equipment sold to bird and animal watchers (Kellert, 1985; Shaw and Magnum, 1984) and by the increasing numbers of vacation tours that are being offered for watching birds and other wildlife, often in exotic locales (Standish, 1987). Income tax payers can donate some of their tax return to nongame development. Residents of some states are even willing to fund special programs specifically for urban wildlife. People are beginning to realize the value of urban wildlife and are willing to subsidize it.

The costs of incorporating wildlife into the city must be addressed. While we may value wildlife in urban environments, we may wonder how to pay for wildlife plans. Certainly having urban wildlife would be nice, but can a city afford it? Creating and maintaining wildlife habitat areas is not without cost, but it is important to remember that investment in wildlife habitat can be cost-effective. In addition to the benefits listed above, revenue can be generated sometimes in unexpected and indirect ways.

Including wildlife considerations in existing or planned areas does not have to be expensive: wildlife needs can be met in a variety of ways, often with vegetation already on the site. Wildlife habitat is often compatible with other uses in the urban environment, and wildlife areas may be closely tied to areas set aside for flood control, sewage treatment, erosion prevention, water quality enhancement, water supply, urban forestry, and recreation. Costs of maintaining areas for these uses may also be cut by including naturalized plantings for wildlife habitat. Maintaining manicured lawns and clipped hedges can be many times more expensive than planting native and naturalized vegetation, which requires only minimal attention. Simple techniques can be incorporated into plans to encourage wildlife, such as mowing only seasonally rather than weekly (or not mowing at all); allowing dead and downed wood to remain when it is not a safety hazard, and planting species adapted to the existing environment rather than those that require special attention. Areas such as spillway ponds and low flow channels or unsightly rights-of-way may be treated in this way at minimal cost.

Instead of expensive channelized concrete approaches, more natural retention ponds can provide the same flood control function, often at a lower cost, while also offering wildlife habitat, fishing and other recre-

ation opportunities. Examples exist of urban areas using treated sewage water in urban parks: as the water gradually moves through naturalized areas to cleanse it further, it becomes suitable for swimming, fishing, and boating (Lyle, 1985). Planting or preserving vegetated slopes with cover for wildlife will also slow water and wind movement, decrease soil erosion and help replenish ground water reserves.

The creation of urban wildlife habitat is not all expenditure. Economic benefits can be an important aspect of the whole picture and can make urban wildlife habitat a cost-effective amenity in any city.

Wildlife Related Problems

While wildlife are a source of enjoyment for most urban residents, they can be a source of frustration and even fear for others (Kellert, 1980). Rabbits dining on newly sprouted lettuce, deer browsing on expensive shrubbery, and beaver clogging canal outlets with mud and twigs are but a few examples of wildlife activity that lead to frustration for some urban residents. Many of these and other problems will persist whether a community adopts a wildlife conservation and management plan or not. The value of having a plan is twofold. First: habitats can be planned and designed to attract desirable species and to discriminate against nuisance species. Second: some existing wildlife-related problems can be eliminated or significantly reduced through habitat restoration and management. But no plan or array of management strategies can eliminate all problems. Kellert's research suggests that tolerance for small levels of inconvenience and frustration related to the consequence of wildlife activity would be considered by a majority of urban residents a tolerable price to pay for the benefits wildlife bring into their lives.

Summary

The creation of urban wildlife habitat provides many benefits to city residents. Environmental benefits include cleaner air and water, protection of natural plant and animal diversity, and the establishment of cities as healthy and comfortable places for people to live. By integrating wildlife concerns with people concerns, we can improve many of the aspects of city life. Urban residents benefit socially and psychologically from the presence of the animal world. People seek out and enjoy wildlife wherever they are. In this way, enjoyment of nature and wildlife becomes a daily activity, not something relegated to vacation times or areas far from home.

In addition, broadening our understanding and awareness of wildlife can be an enjoyable and unique educational experience, regardless of age. Having the opportunity to see wildlife in the city, citizens can choose to learn more about nature. Incorporating wildlife habitat into our urban areas can be aesthetically pleasing and establishing wildlife habitat can be a cost-effective endeavor, often paying for itself in both tangible and intangible ways. By creatively using the space we find in the city, we open our communities to the richness of wildlife.

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CHAPTER 4: ENVIRONMENTAL INFLUENCES OF URBANIZATION

Introduction

Most urban development converts agricultural or previously undisturbed lands to urban uses. Land conversion affects the characteristics of the ecosystem: the quality and quantity of food, cover, water, space, and all other components of wildlife habitat. The wildlife resource is impacted by development at all levels, on-site and off-site, and for varying lengths of time. The impacts produced by each development are unique; however, there are some impacts associated with site preparation, construction, and occupation that are common to most development. Describing these effects on wildlife habitat and populations is one way of identifying planning, design, and development practices to which a community must respond. It also suggests that proper design and planning methods can create positive habitat for wildlife.

Negative On-Site Impacts

Preliminary site preparation produces noise, dust, and vibration, associated with the operation of earth-moving equipment. These impacts intensify during the early phases of construction when vegetation is cleared from areas for roads, parking, utility corridors, and building sites. These impacts may drive out the more timid species of wildlife.

Cleared sites are often further modified by site grading: filling depressions, wetlands and swales or cutting into sloping topography. Water from springs, creeks, and wet meadows, is frequently channelized, tiled, or encased in concrete pipes and taken off the site. Cutting and filling expose the soil surface to wind and rain. Site grading increases soil erosion, decreases surface water infiltration, and increases water runoff.

In general, site clearing, grading, and in some cases, drainage disrupt nutrient cycles and reduce biological productivity. More specifically, clearing and grading may destroy nesting sites, food patches and cover, and may disrupt wildlife territorial and movement patterns.

Many species of wildlife will leave the disturbed area to more hospitable environments. Predators are often among the first to leave. Previous food chains become skewed and unstable. Increased mortality and

reduced reproduction often accompany such emigrations.

Many impacts to wildlife are altered once a development has been completed and is occupied. New impacts are produced by buildings, support facilities, landscaping materials, and activities within the development. A great deal of the site may be paved. In single family detached residential areas, pavement and concrete may cover 30% of the site. From 50 to 60% of a higher density housing site may be under hard surfaces, and 80 to 100% site coverage is not uncommon for commercial and industrial areas (Fig. 4-1). Not only is the area available for planting reduced, but the remaining areas are often scattered. Many potential planting areas are so small and isolated that even when planted with the vegetation that existed on the site before construction they are not big enough to attract the wildlife that left.



FIGURE 4-1. Roofs and pavement leave little habitat for wildlife.

The quality and pattern of vegetation that is kept undisturbed and the structural characteristics of any new plantings around buildings will also have a substantial impact upon the diversity of wildlife that will reoccupy the developed site. A survey of housing, commercial, and industrial developments almost anywhere in America suggests that the 18th Century En-

English Romantic landscape style remains the dominant design motif. Characteristics of this landscape treatment include large, well-manicured lawns, widely-spaced trees, and limited use of shrub material. In lower-budget developments, the number of trees planted is typically reduced and shrubs are eliminated, leaving large unbroken expanses of grass as the dominant vegetation (Fig. 4-2). Tree plantings are typically all of the same species, all of the same size, either on uniform centers or widely scattered. The simplified vertical and horizontal structure of these plantings does not meet the needs of many species of wildlife (Beissinger and Osborne, 1982).

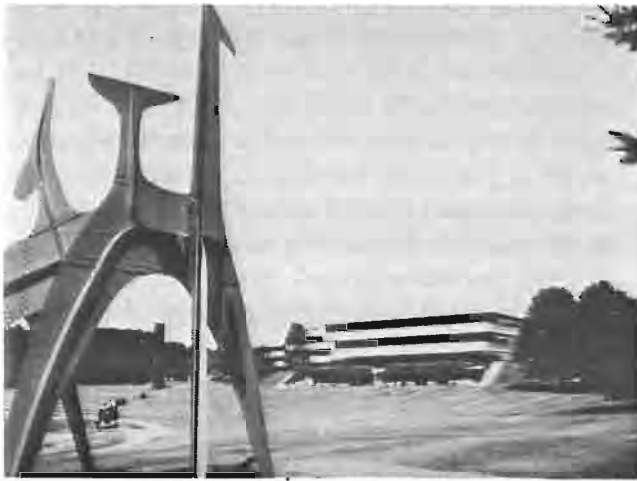


FIGURE 4-2. This landscape is of little value as habitat for wildlife because of the limited number and diversity of plant materials.

Herbicides, pesticides, and fertilizers are required to maintain these Romantic landscapes. Lawn areas are dutifully mowed, watered, and fertilized. Pesticides are regularly applied to trees and shrubs to eliminate insect pests. Herbicides are used to control undesirable grasses, broad-leaved “weeds,” and other plant species that detract from the “clean and green” look. Dead branches, leaves, seeds, and other such materials are regularly removed from the site. The result is an exotic artificial landscape.

Buildings constitute a new form of habitat structure. The architectural detailing of some buildings makes attractive sites for nesting and roosting, but often for the less desirable non-native wildlife species such as sparrows, starlings, and pigeons. Once established in a neighborhood, these exotic species may displace more desirable species. Starlings, for example, often aggressively occupy all available natural nesting cavities, forcing other cavity nesters, such as the Northern Flickers, from their territories.

Development and landscape maintenance activities have substantial impacts at the micro (site) scale. Many

species of wildlife that emigrated from the site will not return because the changes to the habitat have eliminated one or more essential components. Particularly affected are reptiles, amphibians, insect and seed-eating birds, cavity-nesting birds, raptors, and many small mammals. New species of wildlife, principally those that are generalist and can exploit the structural characteristics of the developed landscape, will reinhabit the developed area. Overall, wildlife species diversity on the site will decline although the total number of species may increase (Beissinger and Osborne, 1982).

Occupants of a development and their pets can also adversely affect wildlife. Numerous research studies have concluded that cats and dogs are a major cause of wildlife death in urban and suburban environments. BB guns and sling shots also take a toll in some neighborhoods. Cars are another cause of wildlife mortality.

Negative Off-Site Impacts

Impacts that originate at a site scale often extend beyond the property line. One of the most common off-site impacts of development is the sediment that flows into the watershed. Sedimentation can degrade water quality significantly, and damage streams and lakes. This reduces the production of insects, for example, thus decreasing the food supply of many species of song birds. Water quality often remains at risk after construction because runoff from developments typically contains fertilizers, herbicides, pesticides, petrochemicals, salts, lead, and other heavy metals that are toxic to many aquatic species.

Storm water drainage after development can be very different from predevelopment runoff. With increased paved surface area, less water returns to the ground water system, and both the rate and volume of surface runoff are increased. These changes can cause headcutting of the stream channel whether the water is handled in natural drainages or taken from the site in pipes to be dumped in natural drainages farther downstream. Dramatic fluctuations in stream flow during seasonally high runoffs or storms are also common; the impact on the aquatic environment and riparian vegetation can be substantial. Flooding, which often destroys riparian habitat, is common in urbanized watersheds during periods of high flow (Fig. 4-3). During periods of low flow much of the habitat is dry and unproductive. These conditions are stressful to many terrestrial wildlife species and can be disastrous for some; for example, waterfowl nests on or near riparian wetlands may be destroyed by floods or left high and dry during periods of low flow.



FIGURE 4-3. Channelization of the river bed has caused head cutting, bank collapse and loss of valuable riparian wildlife habitat.

Positive On-Site Impacts

Not all aspects of urban development harm wildlife. Indeed, development can result in new high quality habitat. The potential to help wildlife is far greater than present practice would indicate. Considering the needs of wildlife early in the development planning process allows these potentials to be fully realized.

The economics of development—converting land to uses that produce a higher dollar per acre return—often make it feasible to invest in site improvements that would not have been economical under other uses. For example, stabilizing a stream bank, terracing an eroded slope and implementing other land conservation practices might be entirely feasible as part of a large residential development, but were never cost effective under agricultural uses. These improvements not only help wildlife but can make the site safer and more attractive for future tenants.

Other site engineering and aesthetic improvements such as lakes, reservoirs, ponds, and creeks which introduce water into previously dry landscapes can create an environment attractive to many species of wildlife (Fig. 4-4). Debris basins, retention basins, evaporative cooling ponds, irrigation ponds and ponds created by excavation for sand and gravel have similar habitat potential (Svedarsky and Crawford, 1982). With attention to design and planting, the habitat value of these sites can be enhanced greatly.

Even the buildings within a development constitute habitat that is potentially attractive to some desirable species of wildlife. Nighthawks find the flat graveled roofs of many industrial buildings ideal nesting sites, provided there are enough insects in the area. The

window ledges of some older high-rise buildings are similar in shape to natural cliffs and have become popular nesting sites for the rare peregrine falcon. The falcons that have nested on the window ledge of the Hotel Utah have become a media phenomenon and tourist attraction in downtown Salt Lake City. Architectural structure as habitat for wildlife is a field of study with almost limitless possibilities.



FIGURE 4-4. This pond created as part of a development provides excellent habitat for wildlife.

Negative Regional Impacts

The impacts to wildlife habitat at a regional scale are actually the cumulative effect of changes on numerous small development sites. Over time continuous patches of valuable wildlife habitat become fragmented and isolated. The shapes of these patches have changed from irregular to rectilinear (Forman and Godron, 1986). Rivers and streams which are frequently wildlife movement corridors are regularly crossed by roads and utilities, often limiting wildlife access to traditional breeding or feeding areas. Riparian wetlands are filled or drained and wildlife movement corridors become narrow. The number of native plant species decreases with development while the number of exotics increases. Overall, the diversity of vegetation within the region is simplified although some new structural elements such as large trees may be introduced. Each individual development may not produce all of these impacts. However, over time the impacts described above occur within a regional watershed. In general, the diversity and stability of the regional ecosystem shrinks, leading to less diversity in wildlife species. Species that are typically displaced include those that require large continuous patches of vegetation, those that are territorial, and those that have very specific habitat requirements (MacMahon, 1983).

Summary

Continued urban growth along the Wasatch Front is inevitable but the impacts of development need not be harmful. Numerous small residential projects in the foothills east of Ogden, Utah, demonstrate that it is possible to provide an attractive environment for residents yet retain high quality patches of wildlife habitat linked by open space corridors. Larger developments, like Columbia, Maryland; The Woodlands, Texas; and Loews' Ventana Canyon, Arizona, are award-winning examples of large developments in which the welfare of wildlife was a major concern during planning, design, and construction (Fig. 4-5). Research suggests that, when properly planned, new development in the Intermountain Region can provide habitat that will actually increase the diversity of wildlife on the site (Nordstrom, 1989). We can preserve, enhance, and reclaim wildlife habitat in the urban environment: the key is the commitment to do it.



FIGURE 4-5. Residents and wildlife comfortably inhabit the same vegetation patch.

Protecting wildlife habitat need not diminish the profitability of any development. Research findings (Pando, 1990) indicate that Salt Lake City residents would be willing to pay on average an additional \$5.00 per month more to live in a development with a diversity of wildlife on site. In fact, preserving and enhancing habitat that supports a rich diversity of wildlife can and has been used successfully to market projects; Loews' Ventana Canyon resort development is an excellent example. Loews' promotion literature features, "meet our special guests," which include quail, road runners, bobcats, and coyotes.

Preserving, enhancing, and reclaiming habitat for wildlife on sites being developed will also strengthen the entire urban ecosystem. Less soil erosion, runoff, and stream flow fluctuation along with improvements in productivity, water quality, and overall ecosystem stability are a few of the benefits. The economic value of these functions has been estimated to be in the millions of dollars by some resource economists (Thibodeau and Ostro, 1981). Urban residents, as well as urban wildlife, are the beneficiaries.

Cities and counties can protect their environmental and wildlife resources with progressive but realistic ordinances and incentive programs that encourage developers to preserve and enhance habitat. The model regulations, incentive programs, and guidelines for developers provided in this manual have been designed to assist all parties in the development process—to help the environment in general and wildlife in particular. Commitment and cooperation are essential if we are to ensure that wildlife will continue to be enjoyed by future generations of Wasatch Front residents.

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