

COURSE TITLE: URBAN WILDLIFE FORESTRY**COURSE CODE: FRW-712****COURSE CREDIT HOURS: 3(2-1)****COURSE INCHARGE: PROF. DR. TANVEER HUSSAIN****THEORY**

Introduction and importance of urban wildlife, Community forestry. Management and practices of social forestry. Socio-economic impact of urban forestry related definitions, wildlife of urban and forest areas of Pakistan and their current status. Factors reducing urban and forest area wildlife, Benefits of wildlife in urban areas, how to promote urban wildlife, Related rules and regulations, role of urban as well as forest areas wildlife conservation. Food chain and food web. Management problems associated with such wildlife, planning resources for urban wildlife enrichment, management of nuisance wildlife species. Role of parks, forest and recreation sites in urban wildlife. Needs for the establishment of flora and fauna of urban and forest environment.

PRACTICALS

Visit to different urban areas and identification of urban wildlife species. Studying their food and feeding habits, useful and harmful impacts of such wildlife species. Visit to local zoo and museums for wildlife identification. Specimen collection and its preservation in laboratory. Data collection on wildlife Visit to various nurseries, forests and forest farms. Identification of problems in these areas, suggestions and solutions. Preparation of survey report and presentation.

SUGGESTED READINGS

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Introduction

Urban forestry is the practice of forestry in an urbanized environment. It can be described as the science and art of growing trees in urban and peri-urban areas for obtaining various forest products as well as environmental benefits. Urban forestry deals with the role of trees as an integral part of urban infrastructure. It is practiced by municipal and commercial arborists, municipal utility foresters, environmental policy makers, city planners, consultants, educators, researchers and such other members of the civil society. Urban foresters plant and maintain trees, support appropriate tree's growth, preserve forest, conduct research and explore/promote as many benefits as trees provide (Dixon 1995; Fall 2003). So urban forestry, more precisely, can be defined as; *the establishment, management planning and design of individual trees and forest stand with some amenity values, suited in or around urban areas.*

Trees in the urban environment are often referred to as the urban forest, comprising trees in civic wood lands, parks and the streets. Earlier, urban trees were mainly regarded as aesthetic elements, whereas today these are recognized as having a positive impact on the environment as well as providing economic and social benefits. The value of urban forest is being increasingly recognized as a vital component in the maintenance of sustainable urban environment around the world as well as its high potential role in forest production. To develop a sustainable urban forestry model, trees are planted and managed along the motor ways, high ways, in streets, municipal parks, gardens and reserves, gulf courses, cantonments, schools, colleges, universities, hospitals and all other public places where there is some space available for tree planting (Grey and Deneke 1978).

Due to ever increasing human population with meagre resources we are no more able to convert any other land use into conventional forestry. It is very difficult to increase forest cover in Pakistan by conventional methods. According to an official estimate of Punjab Forest Department, to increase 1% forest area in Punjab Province we need 0.5 million acres of land, 6000 cusec water and the funds of three thousand million rupees. We cannot bear so much huge expenses. The alternate option is to apply non-conventional approach to increase tree cover in Pakistan. Among them, urban forestry is extremely suitable approach by which we can enhance number of fast growing trees and hence forest production. It is worth mentioning that two hundred mature trees in scattered form have the combined effect and production equivalent to one acre of compact forest plantation.

Quantification of Urban Forestry Services

Trees are precious gift of God which have so many benefits for human beings and ecosystem (Price 2003). It is necessary to grow trees in urban areas. There are several economical, ecological, environmental, social and cultural benefits which are provided by urban forests as well as trees planted in an urbanized environment.

Economic Benefits

Urban forests provide a number of benefits which are very important for the continued economic growth and welfare of the society. Trees provide timber and fuel wood for domestic as well as industrial use, forage for livestock, food, fruit and medicine for human beings. Planting of fruit trees in urban areas is a giant step to ensure food security which is the burning issue of the globe at present. There are several other economic aspects of urban trees. It is a common observation that the

values of properties in tree lined areas will be much greater than in similar areas without trees. People like to do business in those urban areas where sufficient numbers of trees with good landscape are present. Similarly, tree cover has a positive effect on saleability of the properties. Properties on tree lined streets are said to be in more demand and easy to sell out.

Social and Cultural Causes

Trees have a significant role in bringing peace harmony and brotherhood. Man always had a strong affinity for the trees. These are the source of spiritual replenishment. It has been proved by research that appropriate vegetation cover can lead to reduced crime rates. Areas with higher vegetation cover were found to have lower crime rates, as measured by police reports. Vegetation cover has a mitigating effect on mental fatigue and illness. Trees can help improve road safety in a number of ways. Trees lining of roads give the impression of narrowing the street and encourage slower driving. The stress reduction effect of trees has the effect of reducing road rage and improves the attention of drivers. It is universal truth that, sufficient number of trees is a guarantee of healthy and peaceful society.

Ecological and Environmental Importance

Trees are the most important feature of the environment in which we live, work, play and enjoy the blessings of nature. Trees play an important role in the provision of neat and clean air (Selmi et al. 2016). It is well known that trees absorb carbon dioxide and release oxygen during the process of photosynthesis. The carbon absorbed by trees in this process is stored in the wood. On the other hand, trees can remove a number of pollutants from the atmosphere, including ozone, nitrogen dioxide and other toxic particulates (Lackner 2003). They have highest carbon sequestration rate among all type of vegetation. They have a significant role in energy savings. Careful tree planting can reduce the amount of fuel used on both heating and cooling buildings (Lackner et al. 1995). Trees provide shelter and reduce wind speed, thus reducing heat loss from buildings during winter. These also provide shade in the summer while the evapo-transpiration of water from the leaf surface area has a general cooling effect on the atmosphere. This can significantly reduce the need for air conditioning during hot weather. Trees in the urban environment can reduce storm runoff and improve water quality. They play an important role in the mitigation of sound pollution by reflecting and absorbing the sound energy. One estimate suggests that up to 8 db noise reduction can be achieved from every 30 meterS wide shelterbelt.

To cut the long story short, the important beneficial aspects of urban forestry can be summarised by highlighting the following points.

- Production of timber, fire wood and forage
- Environmental amelioration
- Reduction of pollution and energy use
- Beautification and aesthetic sense

- Shade, recreation, amenity and pleasure
- Conservation of biological diversity
- Sustainability in urban ecosystem
- Savings in public health care and increase in economic investment
- Provision of basic needs like food, fruit, fibre and shelter
- Employment opportunities in urban areas
- Reduction of air, land, water and noise pollution
- Reduction in wind/water storm and erosion
- Reduction of pressure on state forest

Distinctive Features of Urban Forestry

Objectives of Management

Establishment of forest vegetation for environmental amelioration and beautification are the major objectives of urban forestry. Urban forestry among other things seeks to manage the trees in a city as a renewable resource that can produce a range of benefits which may include small timber and five Fs. viz., fuel wood, food, forage, fibre and fertilizer.

Due Regard to Ornamentation

Urban forestry is somewhat overlapping with landscape horticulture. In urban forestry, special consideration is given to landscape principles. The greatest contribution that urban forester can bring to a city is its skills to plan, establish and manage the urban forest in the best interest of human beings and their ecosystem. Plants having ornamental and amenity values are selected to develop an urban forest. Single stem forestry is applied here. Clear felling in urban areas is not recommended as felling on large areas can cause some social and environmental issues.

Efficient Utilization of Available Resources

All necessary resources in the form of suitable site, planting material, sewage and rain water, trained and untrained labour, funds and capitals are available in urban areas. In remote areas, sometimes labour is not available or so much costly to perform different silvicultural operations. We have no problem to face the shortage of labour in cities. Planting material is at our disposal at every time. Normally sufficient funds are allocated for the development and beautification of urbanized environment. So, the need of the time is to utilize these precious resources efficiently by adopting proper planning and applying suitable management techniques.

Less Competition for Space and Nutrients

Trees in urban forest generally face less competition for space, nutrients and water. Sufficient spaces remain available for plants because these are planted by maintaining proper distance and spacing. All types of water i.e. rainwater, canal water, underground water, domestic waste water and industrial waste water is ready to irrigate. Normally, there is no shortage of water for urban forestry trees and hence, no competition for water. Similarly, most of the nutrients which are essential for plant growth are present in urban areas which can be used to promote forest vegetation without the danger of extermination.

Protective Role of Trees is Dominant Over Productive Role

Although urban vegetation plays productive as well as protective role in the environment and ecosystem but their protective role is dominant over productive role. Urban trees are more important for their intangible benefits rather than tangible benefits. The productive potential of trees can also be enhanced by exploiting and utilizing the special favourable conditions for tree growth in urban areas.

Attractive Market

There is no difficulty in the marketing of urban forestry products. Transportation of all these products is very easy. There are minimum transportation and carriage expenditures. Availability of labour for harvesting and handling is another favourable point for urban forestry. So, all these factors make the urban forestry as most suitable practice in the urban areas of Pakistan.

Various Types of Urban Forests

Different kinds of urban forests are found in Pakistan. Some of them are briefly described here.

Road Side Plantations

Road side are distributed throughout the Pakistan along the motor ways, high ways, G.T. roads and all other inter-city and intra-city roads and avenues as mentioned below in Figure 11.1. These are owned by Govt. and generally have limited space to grow. These should face a greater extent of pollution and hardships. These plantations need regular pruning to remove the branches causing hurdle in traffic flow. The first impression about the greenery of a country can be picked by the extent and magnitude of road side plantations. So, these plantations must be managed as these have a significant role to develop the soft image of a country.

Canal Side or Drain Side Plantations

Canal side and drain side plantations perhaps grow in best conditions in an urban environment as mention below in Figure 11.2. These have to face relatively less extreme conditions due to availability of a permanent source of water. These also need continuous management. Especially our canal sides have a significant potential to support forest vegetation. Due to which, these sites are called as “Timber Mines” of Pakistan.

Fig. 11.1 Road side Plantation



Plantations along Railway Tracks

Rail side plantations have sufficient spaces to grow on both sides of railway track all over the Pakistan as mention below in Figure 11.3. But unfortunately, these plantations are not looked after and maintained properly due to negligence of the government.

Institutional Plantations

The trees grown in schools, colleges, universities and hospitals are said to be institutional plantations as mentioned below in Figure 11.4. These plantations relatively have larger spaces to grow. Their establishment, protection and management is easier than roadside plantations. Due to increased awareness among public and better availability of resources in the form of labour, water and funds, these plantations are more precisely managed for landscape purpose.

Fig. 11.2 Canal
side or Drain side
Plantation



Fig. 11.3 Plantation
along Railway Tracks



Fig. 11.4 Institutional Plantations



Airport Plantations

The plantations in and around the boundaries of airports are called airport plantations as mention below in Figure 11.5. Normally, airports have thick tree populations for security reasons. These lands can be rightly said as best sites for tree production in urban areas. Generally trees growing in these areas are not allowed to fell and human interference in these areas is kept limited.

Fig. 11.5
Airport
Plantations



Parks and Garden Plantations

The trees in parks are a source of pleasure and relaxation for people as mention below in Figure 11.6. These ameliorate the climate, provide shade in summer and add to the beauty of area. These plantations need permanent care and management, otherwise their beauty and growth is affected badly.

Fig. 11.6
Parks and
Garden
Plantation



Home Garden Plantations

Due to ever increasing human population, the magnitude of home gardens is decreasing day by day. At present limited number of homes in urban areas have gardens or parks and very limited numbers of trees have been planted in these areas. Generally home gardens are intensively cared and managed by the custodians of homes as mention below in Figure 11.7. Home gardening is a healthy and useful hobby which should be promoted to keep the people physically and mentally sound.



Fig.
11.7 Home Garden Plantations

Management of Urban Forests

- In urban forestry, more concentration is given on environmental and social benefits rather than economic benefits.
- In urban forests, trees are not cut or harvested until and unless they grow old, get diseased and expired
- Thorny species are generally avoided in roadside planting
- Flowering and foliage ornamental trees are specially selected for road side planting but one should not plant trees along the roadside having large watery flowers which shed on ground in large numbers and cause accidents.
- Plant trees, which have relatively broader leaves so that they can capture more dust
- Water loving plants should be planted along the canals and drains. For example, willow and poplar
- Remove the branches/limbs which create hurdles in smooth running of traffic.
- Fell those trees which are old or grow slowly or which have been attacked by insect pest or pathogens.
- Save the plants from lopping and pollarding by un authorized people

Table 11.1 Major urban forestry trees of Pakistan

Woody Trees

S. No	Common Name	Scientific Name
1	Sheesham	<i>Dalbergia sissoo</i>
2	Sufaida	<i>Eucalyptus camaldulensis</i>
3	Siris	<i>Albezzia lebbek</i>
4	Poplar	<i>Populus deltoides</i>
5	Neem	<i>Azadirachta indica</i>
6	Bakain	<i>Melia azedarach</i>
7	Mullberry	<i>Morus alba</i>
8	Simal	<i>Bombax ceiba</i>

Flowering Trees:

S.No	Common Name	Scientific Name
1	Gul Mohr	<i>Delonix regia</i>
2	Amaltass	<i>Cassia fistula</i>
3	Neelam	<i>Jacaranda mimosifolia</i>
4	Gul e Nishtar	<i>Erythra suberosa</i>
5	Dhak	<i>Butea frondosa</i>
6	Kachnar	<i>Bauhinia purpurea</i>
7	Paulownia	<i>Paulownia tomentosa</i>

Foliage Ornamental Trees:

S. No	Common Name	Scientific Name
1	Devil Tree	<i>Alastonia scholaris</i>
2	Toon	<i>Cedrela toona</i>
3	Pilkhan	<i>Ficus infectoria</i>
4	Silver oak	<i>Grevillea robusta</i>
5	Kangar	<i>Pistacia integerrima</i>
6	Kanak-champa	<i>Pterospermum acerifolium</i>
7	Jiaputra	<i>Putranjia roxburghii</i>
8	Baid-e-Majnoo	<i>Salix babylonica</i>
9	Baid-e-Laila	<i>Salix tetrasperma</i>
10	Arjum	<i>Terminalia arjuna</i>

Urban wildlife management is growing in importance in the U.S. and Canada. This paper describes the archetypical history of wildlife population exploitation, recovery, impact management, and the anthropogenic root-causes for management of many species in urban environments. Although urban and traditional wildlife management situations differ in many ways, in both contexts, some species are welcome to co-exist with humans, while other species are considered intolerable. Management approaches and techniques tailored to urban situations are still in early days of development. Urban wildlife management issues tend to be “wicked problems” (problems where disparate human values lead to different interpretations of desirable outcomes and acceptable means of achieving them). People sharing the same space with each other and with wildlife inevitably perceive different impacts from wildlife. Experience has amply demonstrated the difficulty of finding a management response that is accepted across all segments of an urban community.

Wildlife management in urban and suburban environments is of growing importance across the United States (U.S.) and Canada. Urban development is a leading threat to wildlife conservation and biodiversity with the concern that urban and suburban areas (hereafter simplified to urban areas, for our purposes a location characterized by high human population density, including what are referred to as suburban, peri-urban, and exurban areas) are becoming places where human-wildlife coexistence is being contested. Relevant to wildlife management today, the Earth is becoming more urbanized, a trend that is projected to continue well into this century. This trend is being played out in the U.S. and Canada, with significant effects on wildlife management. Nearly 80 percent of the population of North America resides in urban areas and associated expansive human-built features. Thus, this is where most people reside, work, and recreate, and also where many will gain first-hand experience with wildlife. Sometimes much to their surprise, such experience differs markedly from what people expect, especially if their expectations are based largely on depictions of human wildlife interactions in entertainment media. The disparity between people’s expectations and actual experience, if occurring in the context of a problem, may result in strong reactions that can reproduce rapidly (e.g., an *individual’s* problems from a food-conditioned coyote quickly expand to become a *community* issue). This leads to demands for relief from such problems. In these increasingly common situations throughout the U.S. and Canada, the normal, measured approaches to wildlife management become embedded in local political whirlwinds. Dealing with controversy and conflict among people involved, et al. 2012a). Thus, once considered simply wildlife “nuisance and damage control” and largely ignored by mainstream professional wildlife

management that was focused on “game” species and “endangered species” in “natural” or rural agricultural environments, urban wildlife management now captures a great deal of wildlife agencies’ attention (Adams et al. 2006).

Our purpose is to portray urban wildlife management, and briefly describe the historical developments that gave rise to the importance of urban wildlife management in the U.S. and Canada. An overview of wildlife management phases in the U.S. and Canada is presented to help understand the context for urban wildlife issues/concerns. Concerns are explained, in terms of wildlife impacts of interest to particular stakeholders in management, and to society overall. Further, the evolution of the approaches taken in urban wildlife management are described—the adaptive response of wildlife agencies over time to address the needs and expectations of people living in urban environments. While not presenting specific techniques to conserve wildlife in urban settings, the discussion concludes with some of the persistent challenges to human-wildlife co-existence in an urban environment. We adopt Decker et al.’s (2012a) definition of wildlife management: “The guidance of decision-making processes and implementation of practices to influence interactions among people, and between people, wildlife, and wildlife habitats, to achieve impacts valued by stakeholders.” A stakeholder is any person or group significantly affected by or significantly affecting wildlife or wildlife management decisions or actions (Decker et al. 1996, 2012a). Stakeholders are people with various kinds of interests (i.e., stakes) in wildlife, human-wildlife interactions, and management interventions. Stakeholders found in urban areas may be individuals who are well organized into formal special-interest groups; individuals joined together in *ad hoc*, situation-specific grassroots groups; or simply a set of individuals who are unaffiliated and perhaps even unknown to one another yet have a similar interest or stake in a wildlife management issue. People, however, do not need to be organized or even aware they have a stake to be stakeholders in wildlife management. Wildlife management is seldom an orderly, linear process that unfolds predictably over time (Decker et al. 2014). Urban wildlife management in practice typically is a “wicked” problem (Rittel and Webber 1973); that is, it is not only technically complex, but also has no single acceptable solution because multiple outcomes and stratmore so than dealing with the wild animals in question, then becomes the wildlife management challenge (Decker strategies of achieving those outcomes are desired by different stakeholders, based on their respective values (Leong et al. 2012). For this and other reasons, wildlife management is a multi-faceted endeavor, within which several nested sub-processes play out, often simultaneously. Wildlife management typically includes developing goals and policies, setting objectives, choosing and implementing actions, monitoring and evaluating outcomes, and then revisiting goals, policies, and objectives with new insights derived from evaluation. Involving partners (e.g., other agencies, nongovernmental organizations) and other stakeholders in the various facets of management, while necessary, contributes to the complexity of the endeavor.

Urban wildlife management takes place in an environment comprised of sociocultural, economic, political (both non-formal channels of influence as well as formal governance structure), and ecological components, referred to as a social-ecological system or as coupled human and natural systems (CHANS) (<http://chans-net.org/>). The human dimensions tend to be the prominent drivers of urban wildlife management, and they need to be well understood and integrated throughout all phases of the

management process. Wildlife management is expected to produce benefits for society (current and future generations), where benefits are the desired outcomes (i.e., positive impacts created or negative impacts reduced) experienced directly or indirectly by citizens as a result of management actions (e.g., benefits associated with citizens having improved knowledge of wildlife, preservation of biodiversity, provision of wildlife-dependent recreation opportunity, economic activity). Human experiences with wildlife and human interactions with one another about wildlife vary in intensity and duration, and can be of many kinds. These experiences typically produce a variety of effects, the most important of which (i.e., those typically generating strong stakeholder reactions and prompting management attention) are impacts (Riley et al. 2002). Impacts of concern in urban wildlife management may take numerous forms (e.g., economic benefits or costs; threats to or enhancement of human health and safety; ecological services wildlife provide; and physical, mental, and social benefits produced by recreational enjoyment of wildlife). Positive and negative impacts arise from all kinds of interactions between humans and wildlife or wildlife habitat, and among humans because of wildlife. Wildlife management attempts to enhance, regulate, or prohibit various experiences people might have with wildlife to produce net positive impacts for people and sustain acceptance of the presence of wildlife in urban environments. The diverse benefits/outcomes that citizens expect of wildlife management in urban areas, as well as preferences for management methods, can be impossible to achieve simultaneously, perhaps even mutually exclusive, and lead to conflicts between stakeholders.

Wildlife management often is interpreted as protection or manipulation of wildlife and habitats, plus regulation of wildlife use (e.g., for hunting, trapping, and wildlife viewing). These are parts of wildlife management, but not a complete picture of what wildlife managers do in practice. Wildlife management activities of these kinds often are necessary to achieve many of the outcomes desired by society, but wildlife management as a whole enterprise includes a broader array of necessary processes (e.g., informative communication, negotiation, development of strategic partnerships, and decision making). This more robust conceptualization of wildlife management is especially relevant in urban settings.