Chapter 8: Agroforestry and Wildlife

In this chapter:

- **Wildlife benefits in your agroforestry operation**
- **What do I need to consider?**
- **What lives here and nearby now?**
- **Setting goals and objectives**
- **Agroforestry practices as habitat**
- **Economic opportunities presented by wildlife**
- **Resources for more information**

Wildlife benefits in your agroforestry operation

Regardless of what a landowner does on their land, including nothing, there are both positive and negative effects on wildlife. Many of our current agricultural practices, particularly those associated with larger farms and the associated increase in size of equipment, has drastically reduced the quality and quantity of available wildlife habitat. Agroforestry practices offer an opportunity to both provide benefits to wildlife as well as quality timber production. Many landowners view wildlife as an important by-product of their land management activities, particularly wood production. Agroforestry practices which include a diversity of plantings, produce structural and spatial diversity. It is this species and structural diversity that is beneficial to wildlife.

The sorts of benefits that landowners receive from wildlife are at least fourfold, including 1) aesthetics, 2) ecological, 3) economic, and 4) recreational. Migratory birds, such as wood ducks and yellow warblers provide ample pleasure to the observer. Bees and flies are important pollinators in agroforestry systems, while foxes and weasels are important predators on seed-eating mice and others. Landowners can benefit from agricultural tourism, including birders, bicyclists and families that are interested in visiting a farm to teach their children about food, or by providing lease hunting opportunities. Wildlife provide 1) endless opportunities for the amateur naturalist to learn about the interconnections among plants, animals, and their surroundings, 2) a plethora of photographic opportunities, and 3) endless entertainment at feeding stations.

Summary of benefits

Aesthetic – Wildlife provide music to our ears and beauty to our eyes

Social – Wildlife help in providing a sense of place and attract families, photographers, birdwatchers, hunters and anglers

Ecological – Wildlife, such as amphibians, indicate high-quality habitat that provides clean water and unpolluted soil. Some wildlife species provide soil aeration services, such as moles, while other wildlife species disperse seeds, such as birds and mammals.

Economic - Wildlife can provide you with an economic return when you open your land to others for birdwatching, hunting, guiding or agritourism. Indirectly, pollinators provide billions of dollars worth of pollinating services, while bats provide billions of dollars in insect "pest" control.

What do I need to consider about wildlife and agroforestry?

For wildlife to be present, their basic needs must be met, including food, water, shelter and space. A shortage of any of these elements will severely limit the numbers of a given wildlife species that are able to be supported on a given property. In addition, many wildlife species have complex needs that include 1) the need for multiple habitats during their life cycle, 2) the need for different food items based on their age, 3) the difference in behaviors of the species between the breeding and non-breeding seasons, and 4) an annual migration of many birds, as well as some mammals and insects each year to warmer climes, where someone else is managing wildlife.

Types and amounts of wildlife that will benefit from agroforestry practices are dependent on the size of the agroforestry area, surrounding land uses, types of plantings, configurations of plantings, age of plantings, and the juxtaposition of different habitat types. Some wildlife species are known as area-sensitive, needing large, contiguous areas of habitat in which to live. Other wildlife species thrive where there is a lot of edge habitat, the area where two habitat types intersect. Some wildlife species are specialists, animals that are reliant on just one or two food sources, for example. Others are generalists, animals that can either feed on a large variety of foods, live in a variety of different habitat types, or both. These characteristics of wildlife will in part, determine the feasibility of managing for them as part of your agroforestry operation.

Geographic scale, or size, of both agroforestry areas and surrounding land use is an important factor in wildlife habitat management. The scale of agroforestry practices, typically 4-8 ha, is small enough that managing for many wildlife species is impractical. This includes larger-bodied animals and area-sensitive species. If your agroforestry practice is embedded in a larger matrix of suitable habitat, it may be possible to benefit many other wildlife species. However, there are many wildlife species, particularly smaller bodies animals that can be managed on smaller areas.

Agroforestry practices embedded in some habitats can lead to negative impacts on current wildlife populations. The linear and fragmented makeup of many riparian forest sites can lead to a decrease in the different types of small mammals inhabiting an area, as well as birds, reptiles and amphibians. In some cases, the increase in habitat and reproductive success for songbirds can be negated because of an increase in nest predation. Importantly, landscape context matters when managing for wildlife. The wildlife benefit derived from agroforestry is directly related to the surrounding habitat matrix.

Fragmentation, or the isolation of habitats, poses another issue for wildlife. Whenever possible, it is preferable to restore larger fragments or more connected fragments of habitat than to restore many small and isolated fragments. One important example of this has to do with cowbirds, a bird that lays its eggs in other birds' nests. Many songbirds are naïve to this sort of "parasitic" behavior and will work to raise the larger and louder cowbird chick(s) at the expense of raising their own offspring. The rates at which cowbirds parasitize the nests of forest songbirds typically decline with distance from forest edges. Fragmentation limits dispersal in amphibians and thereby decreases

their opportunities to colonize wetlands. For wildlife to thrive, it is important to maintain or recreate, habitat connectivity, within a larger geographic area. Agroforestry practices can be used to reduce the negative consequences of fragmentation by lessening habitat isolation through the use of plantings that are well thought out and well-connected with other habitats.

A final consideration pertaining to habitat fragmentation and isolation is source and sink population dynamics. When installing agroforestry practices on the land, it may prove to be very inviting to wildlife species, and in fact, be heavily used by wildlife. However, when such practices are isolated from other suitable patches of habitat, they can serve to increase predator use of the area and thus lead to an overall reduction in the prey species. This is because as the prey species disappears from the site, it becomes open and inviting for others of its kind to recolonize, thereby increasing predator use of the area, and leading to another reduction or disappearance of the prey species from the area. This can be compounded when the site is irregularly shaped, which increases the amount of "edge" habitat which makes the prey species more vulnerable to predators.

In addition to the limits inherent in the wildlife species themselves and the land and land use of an area, wildlife benefits that can result from your agroforestry operation are also contingent upon your own goals and objectives for your property and the investment that you can and will make to integrate wildlife benefits with your timber production and agricultural production. To maximize benefits to wildlife, a landowner can slightly modify plantings and select plants that meet the needs of wildlife species with little impact to the production of wood products or field management. With careful selection of trees and shrubs, you can develop a new wildlife product and diversify your returns. However, it goes without saying that compromise is inherent when you are balancing wood production, crop income and

wildlife production. A strictly economic cost-benefit analysis is unlikely to result in favoring wildlife production. However, it's the previously mentioned benefits of wildlife that help to balance the scales. In some instances, discussed later in this chapter, it is also possible to reap some economic return on an investment in production of wildlife habitat.

What lives here and nearby now?

The first step in constructing a wildlife management plan for your agroforestry area(s) is to conduct an inventory of what wildlife species are currently using or living on your land. It is advised that you conduct an inventory prior to goal and objective setting, because your goals and objectives, should consider the wildlife that is currently on the property. Your interest and the amount of time and energy that you have available to invest, will determine the completeness of your inventory and the frequency with which you go out to observe wildlife. A good first step to take in conducting your inventory is to download an aerial map of your property or create your own map of your property on which structures, crops, standing timber, and water features are delineated. This will be the foundation for your efforts to monitor wildlife. Spending time in the field to identify trees, shrubs and important understory plants will add detail to your map and provide information regarding current food, water and cover resources available to wildlife.

Standard methods are available to inventory mammals, birds, amphibians and reptiles on your property. Some insect groups, such as butterflies and moths, are more easily observed and identified than others. Some wildlife species are active when people normally are, during the day, and are thus more easily observed than species that are night-active. Some species are year round residents, such as nuthatches and cardinals, while others are only in the area for part of the year such as yellow-rumped warblers and kingbirds. To be able to document the greatest percentage of wildlife that are currently using your property, it is necessary to get out in different seasons and at various times during the day. Citizen science programs and trainings in your area can provide you with the skills, checklists and sometimes even the equipment you need to inventory wildlife on your property. These events will also provide you with opportunities to meet with like-minded individuals and the instructors running the trainings, and perhaps garner some assistance in your inventory work.

Once you know what plants and wildlife already frequent your property, as well as the time and money you have and are willing to invest in a wildlife management plan, you're ready to define your goals and objectives.

Setting Goals and Objectives

You are more likely to meet with success in increasing wildlife on your property if you have clearly identified goals, and both short and long-term wildlife objectives. Your goals and objectives will guide you in your management activities and subsequent monitoring of wildlife populations on your land. If you do not clearly define what your goals and objectives are from the start, you may find that you divert time and financial resources with little return on your investment. The identified end goal of your wildlife management i.e. to harvest deer, will influence the sorts of agroforestry practices that you use to meet your goal.

In defining goals and objectives for wildlife, it's important to remember that as your agroforestry areas age and the structure and plant composition of these areas change, so too will the wildlife change. As your forests mature, those wildlife species that are dependent on young, or early successional forest habitat, will decline while species that are dependent on mature forests will appear and increase in number. For example, in very young stands, we can expect species such as quail and field sparrow to thrive, while in more developed stands, it is more likely that birds such as brown thrashers and northern cardinals with benefit. When the stand reaches maturity (30-60 years), species that are dependent on mast will increase, such as white-tailed deer, white-footed mice and tree squirrels. The point is to recognize that wildlife species and benefits will change as your plantings mature. Realizing this from the beginning can lead to setting realistic goals and can reduce later disappointment.

Your wildlife objectives will guide you in your choice of trees to plant, distance between plants, cover crops and even the configuration of your fields. Some options may be more economically viable than others, while some options may give rise to more wildlife viewing opportunities. Another point regarding the setting of wildlife goals and objectives is to consider some of the potential downsides of managing for wildlife.

Wildlife can and may cause considerable damage in agroforestry fields. Eastern cottontail

rabbits and white-tailed deer routinely feed on tree and crop plantings, as well as ornamental plants and even weeds. While rabbit damage is easily identified by the clean 45° cut made, white-tailed deer damage can be identified by the ragged ends they leave behind. During the summer, rabbit and deer damage to woody vegetation is minimal because of the abundance of green, leafy vegetation available, but they can do considerable damage to seedlings and saplings during the fall and winter. In addition to feeding on woody stems, male deer will rub their antlers on seedlings and saplings, sometimes knocking stems completely out of the ground; in other cases, leading to misshapen boles and decreased value of the wood.

> Rabbits can cause considerable damage in agroforestry. Dugger et al. (2003) found that damage to oaks planted in plots with natural vegetation was greater than in plots that had been planted to redtop grass (85% of the bareroot seedlings clipped and 31% of the bareroot seedlings clipped, respectively)
>
> ***– Millspaugh et al. 2009***

There are many methods available to reduce rabbit and deer herbivory in agroforestry plots. These range from fencing, which can be 100% effective but can also be quite costly, to protecting individual stems using plastic mesh tubes or shelter tubes (but note that shelter tubes affect the microclimate within them which is warmer and more humid during the day). Fall mowing may be effective in reducing rabbit herbivory because of the elimination of winter cover. Keep in mind that even a relatively small patch (< $10m^2$) may contain rabbits.

Agroforestry practices as habitat

Managing for a diversity of habitat types will also tend to promote a diversity of wildlife. Agroforestry practices such as alley cropping, windbreaks, forested riparian buffers, silvopasture, and forest farming will provide you with opportunities to manage for a diversity of habitats that may benefit wildlife. Trees and shrubs can enhance wildlife habitat as well as provide additional products on the farm.

Alley Cropping

Alley cropping systems are designed to grow an annual crop between rows of high value trees, like oak, pecan or walnut, until the trees are harvested or the alley crops are shaded out. Alley cropping diversifies plant structure for wildlife habitat. Such structure is important for birds, and the matrix of trees and crops provide travel corridors for mammals and reptiles. You can optimize benefits to wildlife by carefully choosing the agricultural crop to be planted and its configuration. Once the trees have matured to the degree that they are shading out the crop, that habitat becomes important for amphibians, which must travel from one activity area to another but that must stay moist.

Cover Crops

A native cover crop mixture that includes native warm season grasses will benefit wildlife. Previous research in such habitat has garnered observations of greater bird abundance, species richness, and reproductive success.

Riparian Forest Buffers

Riparian buffers consist of streamside plantings of a mixture of grasses, shrubs, forbs and saplings, which are attractive to wildlife. While these buffers can serve as travel corridors for wildlife, they are not necessarily a good place for birds to reproduce, unless other high quality habitat exists nearby. These buffer strips can also be valuable as habitat and travel corridors for amphibians, but need to be about 100 m wide to protect stream amphibians. The tree canopy of buffers reduces water temperature, while roots and fallen leaves provide food and hiding places for wildlife. A potential downfall of streamside buffers for wildlife is that they can lead to reduced nest success in some birds, particularly grassland birds. These areas are most used by generalist birds.

Windbreaks

Windbreaks, plantings of trees perpendicular to prevailing winds, can protect soil, crops, livestock, buildings and wildlife from harsh winds when properly designed and located. The microclimate that windbreaks create enables native insects to pollinate crops more efficiently. Size of the windbreak is often considered most important to bird diversity. However, it's important to note that birds that most benefit from windbreaks are forest-edge and generalist species. Windbreaks have been reported to have negative effects on grassland birds due to higher predation and cowbird parasitism rates. Some mammals, such as white-tailed deer and cottontail rabbits benefit from windbreaks because of the mix of food and cover available. Windbreaks are most beneficial to wildlife when they are large and provide a diversity of structure, including both deciduous and coniferous trees, shrubs and a diversity of understory grasses and forbs.

Forest Farming

High value specialty crops like ginseng and goldenseal can be cultivated under the protection of a forest canopy. This provides a harvestable product for the landowner which provides incentive to keep the land in forest habitat. The diversity created with forest farming attracts a variety of wildlife species.

Silvopasture

Silvopastures combine trees, forage and livestock in an intensively managed system. Silvopastures are typically less diverse than a natural forest understory, but incorporating clumps of native grasses and forbs can provide quality habitat for wild turkey and other animals.

Restoration of Bottomland Forests

Bottomland forests can be incredibly beneficial to wildlife because of the availability of mast from oaks and nut-producing trees, fruit from soft mass trees and the variety of structure provided by trees and shrubs. Bottomland forests are important for birds in every stage of development from grassland to mature forest.

Recently a number of federal programs have aimed to restore some of the millions of hectares of bottomland forest that were converted to agricultural use in the 19th and 20th centuries. Although trees can be difficult to establish, newer techniques, which includes the use of larger seedlings with well-developed root systems, can increase the likelihood of planting success. Once established, oak species provide mast for waterfowl and deer and are favored foraging areas for spring-migrating and breeding warblers. Faster-growing tree species can also benefit wildlife by providing needed structure to forest songbirds. During the early years of an oak planting, this habitat will be used by a number of grassland species. By planting oaks in combination with fast-growing tree species that promote quick stand development, you can more quickly benefit and attract forest songbirds. The downside to this approach is that the taller trees provide perches for cowbirds, which leads to increased rates of cowbird parasitism on forest songbirds. However, the rates of cowbird parasitism are not only varied at the local level, but are also sensitive to regional and landscape effects such as regional forest cover.

Special Applications

Many agroforestry practices have been adapted to help people and communities deal with

problems, such as wastewater and stormwater treatment, with fast growing willows and cottonwood trees. These trees provide wildlife habitat and may be a future energy source.

Elements of Wildlife Habitat and its Management Provided by Agroforestry Practices

Disturbance

Historically, fire, floods, wind, ice and wildlife browsing disturbed the land which in turn helped control invasive species and promote native plant growth. Today, vegetation can be managed by mowing, disking, thinning, prescribed burning and grazing. The extent and timing of disturbances helps create diversity and structure. Timing can also minimize impact to wildlife, such as mowing after nesting is complete.

Vertical and Horizontal Structure

Different layers of vegetation allow an assortment of wildlife to utilize the same area. Each tier creates a niche in the habitat area. Five or more layers are optimal and include the canopy, understory, shrub layer, herbaceous layer and the floor.

Connectivity

Many species of wildlife need a minimum amount of a particular habitat type; if it gets to be too small they won't use it. Vegetation can be used to connect several small isolated areas within a landscape, thus making it more viable and increasing the usable space for wildlife.

Economic Opportunities Presented by Wildlife

Agri-tourism and hunting leases are just two of the ways in which you can diversity your farm income with wildlife. Agritourism in its broadest sense involves any agriculturally-based operation or activity that brings visitors to a farm or ranch. In the United States, it includes such activities as picking your own fruit, shopping at farmstands, horseback riding, honey or wine tasting, birdwatching or learning about cheesemaking. The Whiterock Conservancy, in Coon Rapids, Iowa, provides an example of a working farm enterprise that has also embraced agritourism in its mission. Its three-part mission includes: 1) Protect & Preserve the Natural Resources of the Middle Raccoon River Watershed, 2) Demonstrate Sustainable Multipurpose Land Management, and 3) Promote Low-impact Outdoor Recreation & Provide Environmental Education. Their approach to tourism is structured around stewardship which emphasizes the diverse landscape managed with diverse methods and used by diverse audiences. Their tourism focus is on education particular as it pertains to conservation and to manage visitor impacts to the property.

A hunting lease is an agreement between a landowner and a hunter or group of hunters, where the right to trespass and hunt is granted for a particular time and fee. Hunting leases are most popular in areas where little public land is available to hunt and access to private lands is at a premium. Before you delve into the world of hunting leases, it's important to consider what is reasonable to expect. The type and quantity of game animals depends upon not only your land, but that of the surrounding area. As your trees move through different phases of the growth cycle (i.e. seedling, sapling, mature tree), the type and extent of habitat available to game animals will change. The most profitable pay-to-hunt operations usually require the greatest investment in labor and management by the landowner.

Some general considerations when contemplating lease hunting include the following. To be effective and profitable, you need to have willing participants partake of the opportunity. It is therefore, suggested, that providing such opportunities near expanding urban and suburban areas will be advantageous. Another

consideration is the "quality" of the hunting experience provided to clients. This includes cost of the lease, distance from the clients' homes, the abundance and variety of game animals, hunter safety, camping or lodging facilities and others.

Finally, you'll need to consider what sorts of leasing opportunities will be available throughout your timber rotation. Early on, it may be that mourning doves provide an opportunity, but once the stand has matured, opportunities for turkey and white-tailed deer hunting will be available which will require less intensive management on your part.

Types of hunting leases are variable. In the past, many landowners provided non-fee access with an informal verbal permission agreed to by a handshake. This may still be useful for managing nuisance populations, particularly if you don't want to invest the time or energy or simply are not interested in fee hunting. However, agreements are becoming rare. They are most often still found in rural or rural-small town areas where hunters are more aware of farm-related issues and concerns. Another non-monetary hunting lease is an exchange of services, whereby a landowner allows hunting in exchange for a service such as the monitoring of land for trespassers or helping with farming operations. These arrangements can be either formal or informal.

There are four general categories of fee hunting:

1) daily lease;
2) short-term or season lease;
3) annual or multi-year lease; and
4) broker or outfitter lease.

A daily lease is often used when there is a relatively short hunting season and when a number of hunters can be accommodated on a small parcel of land. Most commonly, game species include pen-reared birds or mourning doves. This sort of lease is intensive for a landowner to manage, requiring a greater intensity of interactions with hunters and more intensive wildlife habitat management to assure that game animals are available on the opening day of the season.

Short-term or season leases necessitate much less labor on the part of the landowner. This sort of lease works best for species such as turkey or white-tailed deer. Some considerations for short-term leases include the use of equipment, such as blinds. You need to be sure that hunters do not use any kind of screw-in type of tree stand or climbing steps, which may damage the eventual value of the trees that you're growing.

In an annual or multi-year lease, a landowner enters into an agreement with a hunt club or a group of friends willing to share the cost of having long-term access to a hunting spot. An advantage to this sort of arrangement is that be the establishment of a long-term relationship with the land, the hunters may start to develop a sense of stewardship for the property and may ask to help conduct or participate in wildlife habitat management activities.

A broker or outfitter lease involves a middle man that rents all of the hunting rights from a landowner and then subleases to individual hunters by species or season. This alleviates a lot of the work by a landowner, who then only has to interact with one individual on all hunting related issues.

Regardless of the flavor of hunting arrangement that you enter into, one of the most important concerns for most landowners has to do with liability. Most landowners fear being sued or held liable for injuries sustained by hunters or others while on the land. The degree of landowner liability differs by the status of the visitor or use, with trespassers being afforded the least protection and invited visitors, the most. A qualified lawyer and an insurance agent should be consulted before you enter into any hunting lease agreement or purchase liability insurance.

Resources for More Information

Cost share programs for wildlife exist on the federal, state and local levels. There are two federal agencies, both under jurisdiction by the United States Department of Agriculture (USDA) that provide the majority of support for conservation practices. In recent history, most of the support for conservation practices has been associated with federal farm programs. However, cost share programs that have not typically allowed for production of harvestable products can be used to develop and maintain habitat components in conjunction with farming practices.

The Farm Service Agency (FSA) administers the Conservation Reserve Program (CRP). The CRP includes many conservation practices, including windbreaks (Conservation Practice (CP) 5) and riparian buffers (CP22). The FSA also have several other programs that can be used to create or maintain wildlife habitat, including: Conservation Reserve Enhancement Program (CREP) and the Grassland Reserve Program. (http://www.fsa.usda.gov)

The Natural Resources Conservation Service (NRCS) often provides the technical support needed to design a CRP conservation practice. NRCS is also responsible for supporting and administering the following: the Conservation Security Program (CSP), Wildlife Habitat Incentive Program (WHIP), Wetlands Reserve program (WRP); and Environmental Quality Incentives Program(EQIP) (http://www.nrcs.usda.gov).

Private programs that provide support for wildlife habitat management activities on the national level include: Pheasants Forever (PF) (http://www.pheasantsforever.org/); National Wild Turkey Federal (NWTF) (www.nwtf.org/); Quail Forever (QF) (www.quailforever.org/); and Ducks Unlimited (DU) (www.ducks.org). In each case, the main thrust of the organization is to develop, maintain, and manage habitat for the wildlife species of interest. These groups are instrumental in putting private landowners in touch with professionals who will assist in designing habitat that is appropriate for the landowners' needs and desires. These private groups often have seed mixes available at reduced costs and equipment to rent for the development of local wildlife habitats.

Additional Resources

Agritourism and Lease Hunting

Agricultural Marketing Resource Center
http://www.agmrc.org/commodities__products/agritourism/agritourism-businesses/
University of Missouri Extension: http://muextension.missouri.edu/explorepdf/agguides/wildlife/G09420.pdf
Whiterock Conservancy
http://www.whiterockconservancy.org/

Wildlife Habitat Management

A Bird's Eye View: A Guide to Managing and Protecting Your Land for Neotropical Migratory Birds in the Upper Mississippi River Blufflands
http://dnr.wi.gov/topic/wildlifehabitat/documents/wcbmp.pdf
A Landowner's Guide to Woodland Wildlife Management
http://woodlandinfo.org/sites/woodlandinfo.org/files/pdf/UWEX/G3578.pdf
Agroforestry and Wildlife Management Go Together on Small Farms
http://www.ars.usda.gov/is/ar/archive/dec04/farm1204.pdf
Basics of Managing Wildlife on Agricultural Lands (IN)
http://www.extension.purdue.edu/extmedia/FNR/FNR-193-W.pdf
Best Management Practices for Woodcock and Associated Bird Species
http://dnr.wi.gov/topic/wildlifehabitat/documents/wcbmp.pdf
General Management for Wildlife (MO)
http://mdc.mo.gov/documents/landown/wild/wmml_2000.pdf
Habitat Management Guidelines for Amphibians and Reptiles of the Midwestern United States
http://www.mwparc.org/products/habitat/
Wildlife Management for Missouri Landowners
http://mdc.mo.gov/sites/default/files/resources/2010/05/5354_3245.pdf
Xerces Society (for information about providing habitat for pollinators)
http://www.xerces.org/pollinator-conservation/

References

Anonymous. 2008. Silvopasture: an agroforestry practice. USDA, National Agroforestry Center.

Anonymous. 2005. Working trees for wildlife. USDA, National Agroforestry Center.

Millspaugh, J.J., J.H. Schulz, T.W. Mong, D. Burhans, W.D. Walter, R. Bredesen, R.D. Pritchert, and D. C. Dey. 2009. Agroforestry wildlife Benefits, Chapter 11. In: Garrett, H.E. (Ed). North American Agroforestry: An Integrated Science and Practice. 2nd Edition. Agronomy Society of America, Madison, Wis.

Robinson, J. 2005. Silvopasture and eastern wild turkey. USDA National Agroforestry Center, AF Note, #28.

Notes