

West Virginia
Songbird
**Forest Management
Guidelines**



Scarlet Tanager



This publication had its genesis with the West Virginia Partners in Flight (WV PIF) Working Group. This organization, part of an international conservation effort, works to identify songbirds and habitats of conservation concern, facilitate collection of basic life history information of little known species, and promote dissemination of educational and informational material to help the public better understand conservation issues. We would like to thank the contributors listed below as well as the scores of researchers, naturalists and citizen scientists who, through long hours in the field, have provided us with the information to produce this document.

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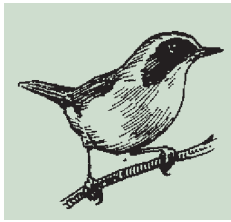
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West Virginia *Songbird* Forest Management Guidelines

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Preface and Introduction



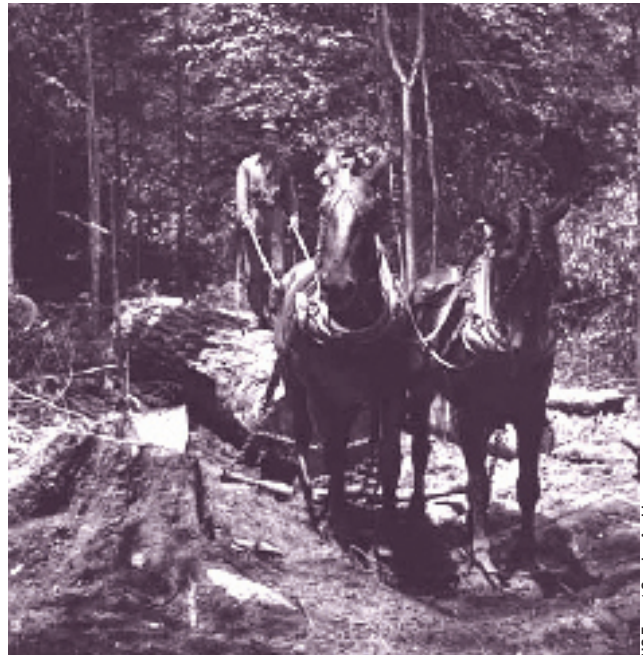
West Virginia, with 78 percent of its land area covered by forests, is the third most densely wooded state in the nation behind Maine and New Hampshire. Its timber

resources are larger in size than they have been for the past 100 years. Although West Virginia's forests and forest products have great economic importance, they also provide recreational opportunities, scenic views, fresh air and clean water. Most importantly, these forests provide invaluable habitat (for unfamiliar terms see *Glossary starting on page 33*) for thousands of plants and animals. Seeing and conserving wildlife are among the most cited reasons landowners give for owning, maintaining and managing their land.

Realizing that their woodlots are mature and have substantial value, many landowners are considering a harvest but are concerned about how the harvest will affect wildlife. This publication examines the relationship between harvesting intensity and its effect primarily on songbirds, although the impacts on other wildlife is mentioned as well. We hope that this document will give landowners and land managers the additional information they need to develop comprehensive land management plans that meet not only silvicultural and aesthetic expectations, but also provide healthy and diverse forests to be passed on to succeeding generations.



West Virginia is host to approximately 20 percent of the world's breeding population of worm-eating warblers.



Early days of logging in the Monongahela National Forest.

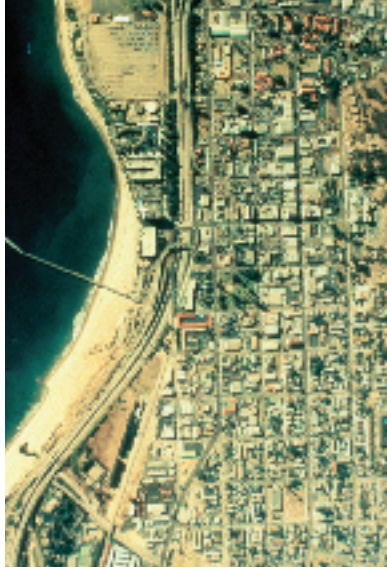
Introduction: Songbirds and Population Declines

Most people do not realize that the majority of birds in West Virginia are migratory, spending the winter in the southern United States, the Caribbean, Central and South America and raising their young here during the summer. West Virginia is important in the conservation of many species of songbirds that are declining elsewhere. Because of our extensive forest lands, those species that require large tracts of forests for breeding find habitat here. West Virginia hosts significant breeding populations of the cerulean warbler (27 percent of the world's breeding population), worm-eating warbler (20 percent) and Louisiana waterthrush (19 percent).

West Virginia also serves as a source of these species and others that, due to habitat loss, have declining populations. These other areas are termed *sinks*; breeding populations may exist there, but the production of young is so low that the populations are unable to sustain themselves without the addition of individuals from the outside, such as from West Virginia.

Population declines have been noted in many species of birds since the 1960s. Although the reasons behind the declines are numerous, several major ones stand out:

•**Permanent or longterm destruction and degradation of habitat** on breeding, stopover and wintering areas has created the most pressure on migratory birds. On breeding grounds, road construction and surface mining combined with commercial and residential development has resulted in fewer places for many species to raise their young. Slash and burn agriculture and clearing for pastures and commercial development in tropical wintering areas, especially Central America, has diminished tropical rain forests



Coastal development impacts stopover areas.

to a fraction of their former area, relegating many species of returning migrants to marginal habitat and increased competition with resident tropical species. Coastal development for resorts, second homes and industry endangers migrating birds by decreasing required stopover areas for resting and feeding during migration.

•**Fragmentation**, the breaking up of large blocks of continuous habitat into smaller ones, has made many areas unsuitable or marginal for species that require large expanses of similar habitat (area-sensitive species). Fragmentation creates *edge*, the transition zone between one habitat type and another. In West Virginia this edge is typically between a forest and a field. This transition zone may be *soft* and consist of wildflowers, shrubs and small trees, or it may be *hard* with an abrupt transition between grasslands next to large trees. Soft edge habitat is valuable for many species of birds such as song sparrows, common



Aerial view of forest fragmentation.

yellowthroats and indigo buntings. But both soft and hard edges provide rich hunting grounds for a variety of predators, such as raccoons and crows, because of the close proximity of the two habitat types. If a landscape is highly fragmented (*see photo below*), forest patch size is small. The smaller the patch, the more it is influenced by edge effects. Many interior forest species are not adapted to predators at the edge and their nests are easily found by predators, resulting in very low reproduction and eventual population decline. This increased predation is due to the *edge effect*. Species, such as the song sparrow, that are adapted to the edge have nesting strategies that hinder the edge predators enough to be in balance with them.

Increased predation isn't the only result of a fragmented landscape. Warmer and drier conditions at the edge supports the formation of a different insect community, affecting the type or amount of food available to a forest interior species. In addition, brown-headed cowbirds, which are common in agricultural areas, lay their eggs in other birds' nests to hatch and be raised by the host bird, usually at the host brood's expense. Most open land and edge species have some strategies to counter cowbirds, but interior forest birds do not.

•**Vegetative succession** is the natural growth of a field into a forest; from grasses to shrubs to saplings to mature trees. Abandoned farmland that is not maintained goes through this process, resulting in the loss of early successional habitats such as fields, old fields and scrub lands. These important habitats are short-lived, and the bird species that need them for breeding must find suitable, and sometimes very specific, habitat at other locations. Although edge habitat is common, it doesn't occur in large tracts, but typically in narrow bands. Without management, early successional habitat grows into forest - a boon for forest breeding species, but a loss to those species requiring relative large expanses of open land, such as the golden-winged warbler or prairie warbler.

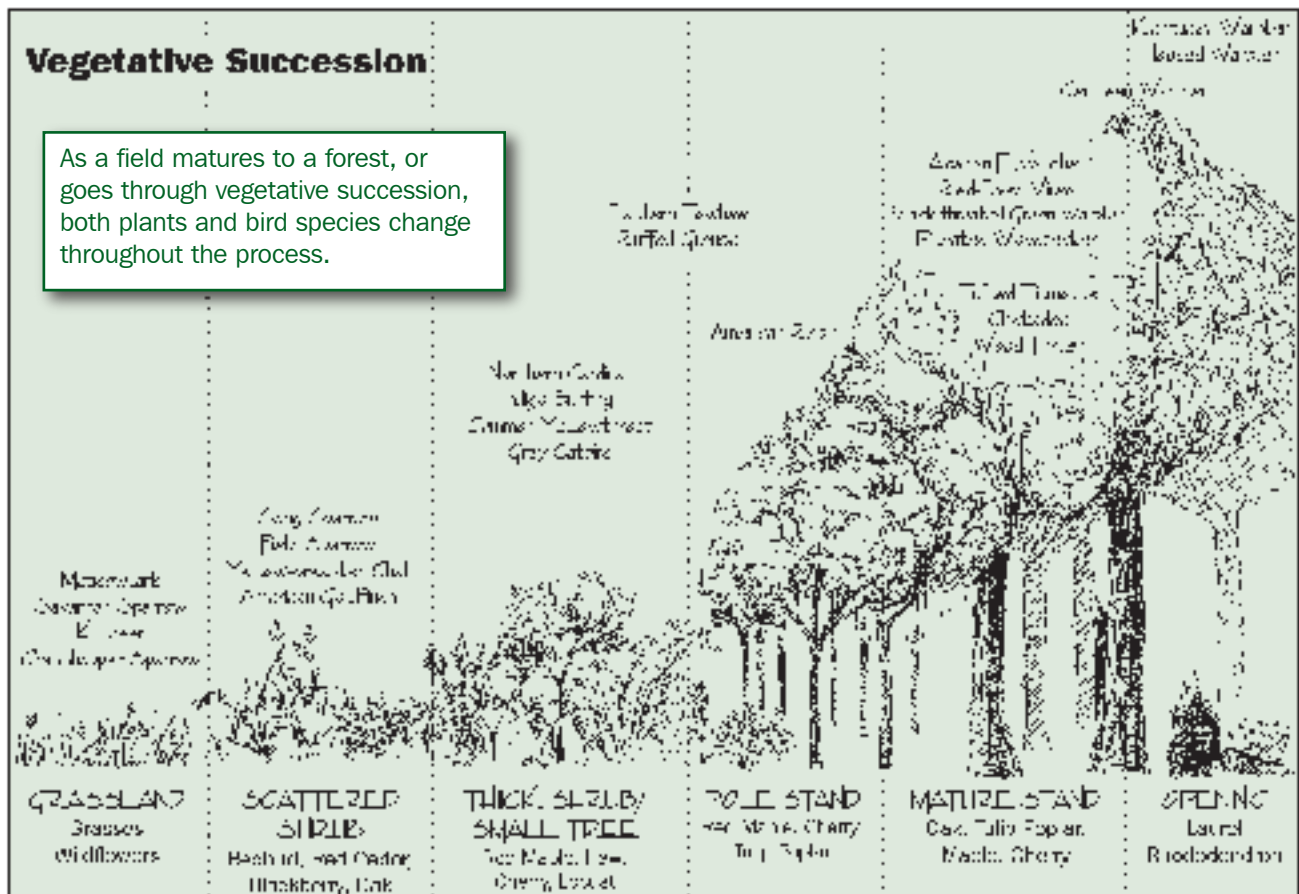


Purple loosestrife infestation

•The need for farms to maximize profits, often to stay in business, has *altered farming practices*, resulting in more intensive management of the land. The loss of hedgerows and fallow fields, earlier haying, increased pesticide use, the switch to row crops and intensive grazing have all severely affected the breeding and survival of birds that nest in open areas, such as meadowlarks, bobolinks and grasshopper sparrows.

Human induced processes (habitat loss, fragmentation and altered farming practices) coupled with succession and other natural pressures on migratory birds such as predation, high deer populations, invasive species and disease, have all contributed to the decline of several species. Not all species are declining, and those that are declining locally may not be declining throughout their range. Some, such as robins and house wrens, are increasing their populations and/or expanding their range. But appropriate management choices need to be made to slow or halt the decline of many species in West Virginia.

Those species of conservation concern in West Virginia have been identified by WV Partners in Flight (WV PIF), a state bird conservation organization, based on a combination of factors including population size, distribution, threats and population trends. These species have been identified as of concern in West Virginia, in part, because of significantly declining populations and because a significant percentage of the total global population breeds in the state.



West Virginia Bird Species of Conservation Concern*

Forest Species

Whip-poor-will
Eastern wood-pewee
Acadian flycatcher
Wood thrush
Cerulean warbler
Worm-eating warbler
Louisiana waterthrush
Kentucky warbler

Early Successional Species

Blue-winged warbler
Golden-winged warbler
Prairie warbler
Field sparrow

Other species with significantly declining populations and/or other conservation concerns also breed in West Virginia. The following species, however, have a much lower percentage of their population in the state.

Additional North American Species of Conservation Concern

Forest Species

Black-throated blue warbler
Prothonotary warbler
Swainson's warbler
Canada warbler
Scarlet tanager
Rose-breasted grosbeak

Early Successional Species

Red-headed woodpecker
Loggerhead shrike
Orchard oriole
Olive-sided flycatcher
Willow flycatcher
Chestnut-sided warbler
Hooded warbler
Grasshopper sparrow
Henslow's sparrow

Interested landowners may want to enhance habitat for these vulnerable songbirds by establishing goals for their forestlands and implementing the appropriate forest management practices. Not all practices, of course, will affect all 27 species and some can have either positive or negative impacts on species habitat.

The following management guidelines and timber harvesting information are tools for interested landowners and resource managers to aid them in making informed decisions about how their management practices may impact songbird use of forestland in West Virginia.

**The WVDNR's strategic planning document, the West Virginia Wildlife Conservation Action Plan, has identified 74 bird species of conservation concern. The lists presented here represent those species most responsive to management actions described in this publication.*



Loggerhead shrike



Louisiana waterthrush feeding young



A Primer on Habitat Alteration in West Virginia

Seventy-eight percent of West Virginia's land area is covered by trees, an immense and economically valuable resource. Products produced from West Virginia forests include everything from paper to fine furniture. It is a resource that must be managed wisely, from both a conservation and economic viewpoint. Most of the forests (83 percent) are owned by private individuals, not governmental agencies or commercial timber companies. The majority of West Virginia's forests are mature or nearing maturity and, as a commodity, have the potential to improve an individual's or family's economic resources. But when should a forest be harvested? Why or when should it not be harvested? How does harvesting fit in with forest management? How can landowners manage their property for both economic and conservation goals?



Mature West Virginia hardwood forest with complex vegetative structure

Basic Bird Ecology

Birds, like all wildlife, need four basic elements to survive: food, water, shelter and space. These are the four components of habitat. In nature, birds satisfy these needs in diverse ways. Some species are specialists that require specific habitats for survival, like the belted kingfisher which needs clean, shallow stream riffles for feeding and vertical bare soil banks for nesting. Others are generalists, like the American robin, that adapt readily to changes in the environment and use habitats from remote forests to suburban back yards. Some birds can spend their entire lifetime in a small area finding everything they need and adapting to seasonal changes, while others travel thousands of miles to escape severe weather and its hardships. Some birds in West Virginia are adapted to life in more open areas such as pastures and old fields. Most birds that live in the state, however, are forest birds with each species requiring somewhat different types of forest habitat to survive. Survival here means not only the continued life of an individual bird, but also the reproductive success of that bird — raising young to independence.

Birds select their habitat, whether for breeding, wintering or during migration stop overs, based primarily on two characteristics: vegetative structure (shelter) and food. Vegetative structure refers to the number of horizontal layers present: a forest has more vegetative structure than a grassland. Some forests, or parts of forests, have more structure than others; from dense stands of trees, shrubs and groundcovers (*see photo at left*) to park-like stands of trees with little undergrowth. Different bird species are adapted to different amounts of structure for cover, nesting and foraging.

Birds also select habitat based on the abundance and on the variety or type of food resources present in an area. For example, grassland areas will have different types and numbers of insects than a forested area. Birds prefer areas where they can find familiar types of foods they know how to forage for and in sufficient abundance to feed themselves and (if during breeding season) their



Glenn "Tink" Smith

Pileated woodpeckers use large diameter dead trees or live trees with soft, rotten hearts in which to excavate nesting cavities.

young. Virtually all songbirds in West Virginia primarily eat insects and other invertebrates during the summer. Some species specialize in certain species or groups of insects. Cuckoos specialize in hairy caterpillars, which are rarely eaten by other birds. Their numbers may increase in an area with high caterpillar density, such as the site of a gypsy moth outbreak. Many permanent residents switch to seeds and other vegetation in the winter.

Like other wildlife, different species of birds require varying amounts of space. Some species, like the common yellowthroat or American redstart, only need a fraction of an acre to successfully raise their young. Other species, like the cerulean warbler or pileated woodpecker, need tens or hundreds of acres of continuous habitat to maintain their populations.

These latter species are termed *area sensitive*. That is, they are more likely to occur in areas with large blocks of preferred habitat. But more than that, they are sensitive to and impacted by a reduction in these large blocks of habitat. The effect is marginal in some species and extreme in others. For example, although they may physically use and defend only 2 to 3 acres of mature forest, a cerulean war-

bler pair needs approximately 200 acres of continuous forest surrounding that territory to attempt to breed. Henslow's sparrows need large tracts of grasslands and prairie warblers need large tracts of shrublands. In order to successfully raise young, these and approximately 74 other species in West Virginia require large tracts of unbroken habitat.

Breeding season for forest songbirds typically lasts from mid-May through mid-August. During this time, depending on the species, birds will raise one to several broods of two to ten young. Many long-distance migrants raise only one brood of two to five young and are finished breeding by early July. If that nest is destroyed, they often will not attempt to renest. Resident species typically raise multiple broods and may continue nesting into September. Birds build nests from ground level to high in the forest canopy, again depending on the species. A large number of songbirds are ground nesters, placing their nests under sheltering overhangs of ground covers and woody debris.

Of the 172 species of breeding birds in West Virginia, 87 are long-distance migrants, traveling twice yearly between the state and wintering areas in Central and South America and the Caribbean. Another 28 species are short-distance migrants, moving only as far as the southern United States or northern Mexico for the winter. Migrants leave West Virginia from late August through October and return in April and May. Most forest breeding songbirds in the state are long-distance migrants.



Steve Maslowski/USFWS

The scarlet tanager is a neotropical migrant found in West Virginia.

Short-term Effects of a Timber Harvest

Forests are not static, but are constantly changing, sometimes gradually, other times dramatically. The mature forest that is developing old growth characteristics has old trees that die and fall, creating openings or windthrows. These openings are colonized by plants found in more open areas, such as brambles, and by young tree seedlings, creating mini-habitats within the mature forest that can be used by shrub loving birds like the hooded warbler, Carolina wren and eastern towhee. Overall, a forest that supports the greatest number of wildlife species is one that consists of a large diversity of tree species and a diversity of tree ages, from sapling to dominant canopy tree.

Timber cutting roughly mimics this dynamic aspect of a mature forest, creating openings and early successional habitat, typically benefiting early successional species. The creation of early successional habitat means, however, that birds using mature habitat are displaced. Displaced birds often abandon nesting attempts that year and are also initially more susceptible to predation and the rigors of the environment because of their unfamiliarity with their new home.

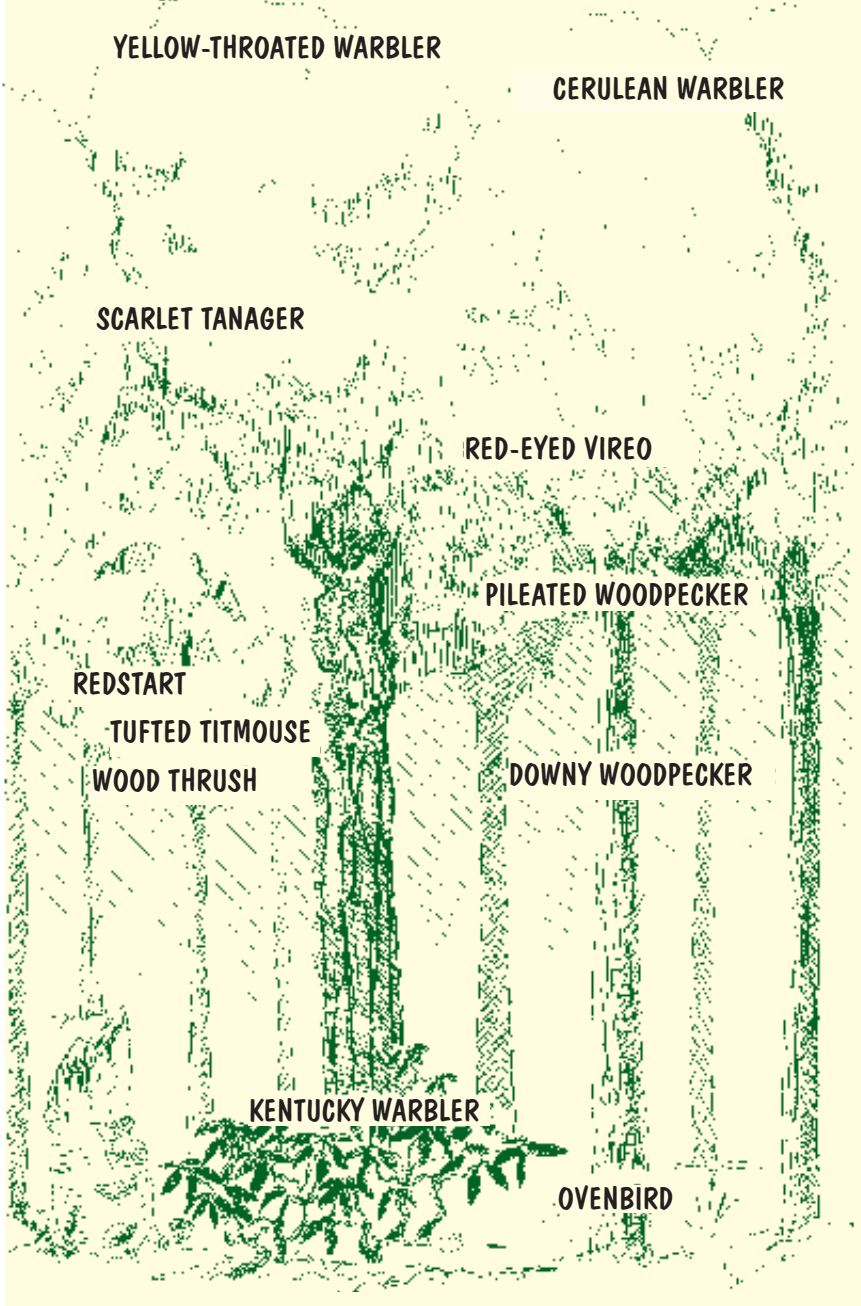
The short-term positive and negative effects of a timber harvest are complex and vary with many factors, but depend largely on two variables: the *intensity* of the harvest and the *size* of the harvest compared with the surrounding landscape.

Light intensity: For example, if a light thinning or

timber improvement cut is done, few trees are removed. There would be little change to the forest environment and, therefore, the species and total number of birds or other wildlife using the areas would likely be similar.

Small relative size: Similarly, if the tract that is cut is small when compared to the forest cover in the surrounding landscape (5-10 acres in a 100 acre landscape), even if the harvest method is more intense, the number of species will likely not

Typical Songbird Community In A Mature WV Allegheny Hardwood Forest



Artwork by Sue Olcott WVDNR

change and may even increase. Most of the same species will remain after the harvest.

High intensity and large relative size: On the other hand if a clear cut is done (all trees are harvested), and if the cut is large compared to the forest cover in the surrounding landscape (30-40 acres in a 100 acre landscape), the habitat is completely altered. The species of birds and other wildlife that will occupy the new habitat will be very different. The structure will change dramatically and the climate of the area will change from a relatively cool, moist, dim environment to warm, dry and bright. This change of climate and structure will change the insect commu-



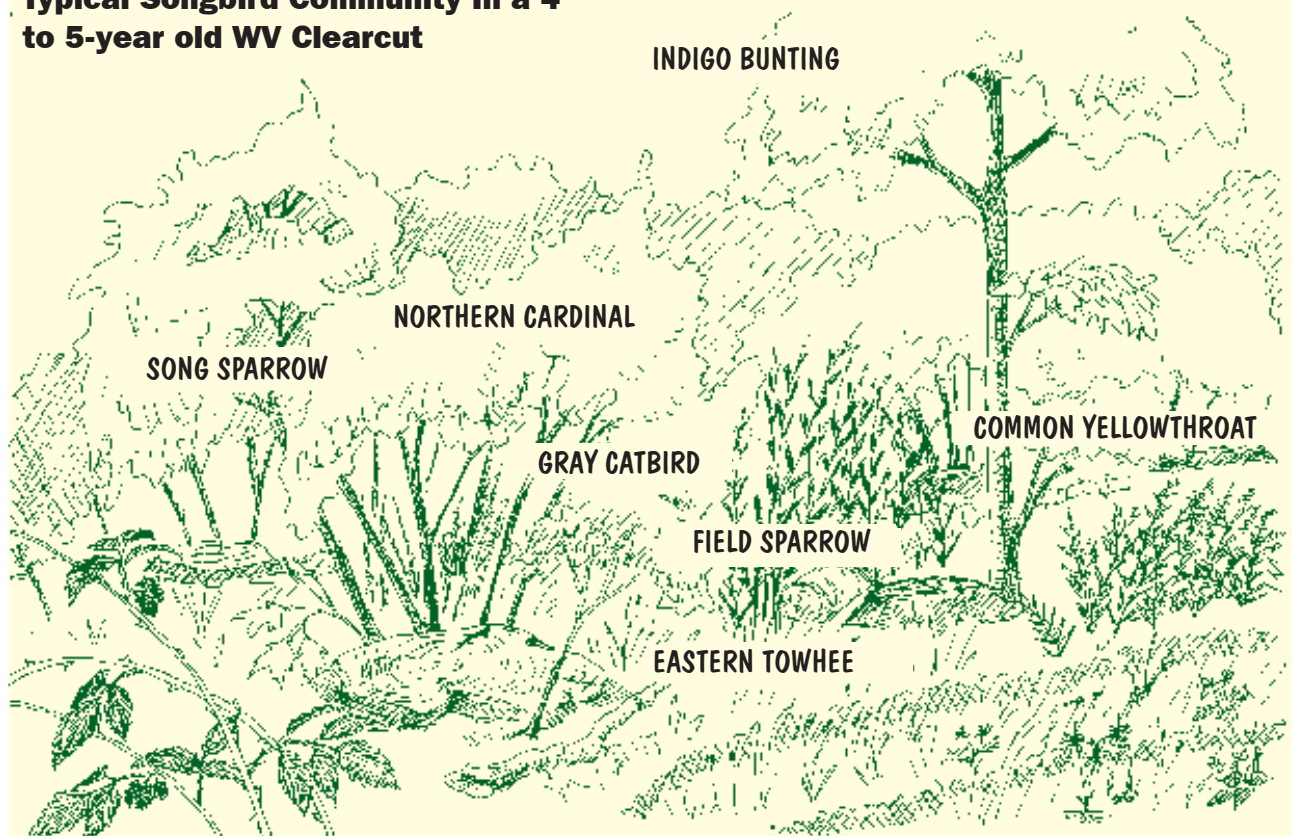
Bob Wood

Shrub loving hooded warblers prefer gaps in mature forests caused by tree falls or other disturbance.

nity to one more adapted to an open environment, and require different foraging methods from birds that feed on them. A mature forest species will not thrive in a clear cut because the habitat and its survival skills don't match.

Birds needing a mature forest habitat like the eastern wood-pewee, Acadian flycatcher and cerulean warbler will be displaced. In addition, birds that are area sensitive may be affected. The age and type of vegetation covering the landscape surrounding the proposed cutting area will influence the presence or absence of area sensitive species after the harvest. If not enough continuous habitat remains, some species like the cerulean warbler and scarlet tanager will likely abandon small remnant forested patches. Over time, as the clearcut regrows, birds needing early successional habitat,

Typical Songbird Community In a 4 to 5-year old WV Clearcut



Artwork by Sue Olcott/ WVDNR



Glenn "Tink" Smith

Turkey populations are impacted differently by different timber management practices.

- if regeneration already is established in the stand
- white-tailed deer management
- previous land use (for example, agricultural, strip mine)
- current or proposed land use (for example, livestock)

Research in West Virginia indicates that a clearcut will support forest interior species 35 to 45 years after the harvest, but that older stands (80 to 100 years old) provide significantly higher nesting success because of lower predation rates on nests. Even timbering that is done outside of

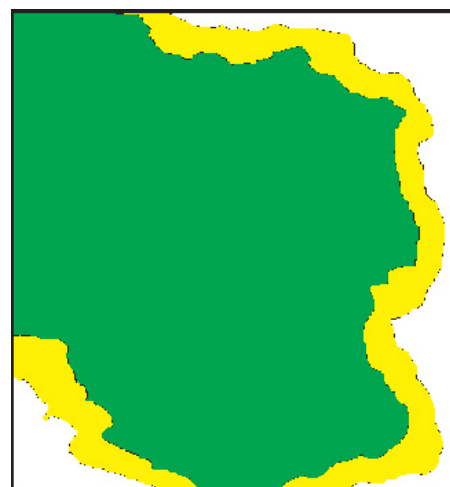
such as the prairie warbler, blue-winged warbler and field sparrow, will colonize the area. Early successional species can thrive there because they are adapted to elements of a more open habitat in terms of vegetative structure, food resources and foraging methods.

Other characteristics that will affect the use of the stand by various bird species include:

- the size of the stand being managed
- the types and areas of habitat(s) surrounding the stand (forest, agricultural, developed)
- the elevation and aspect (north-, east-, south- or west-facing) of the stand

the breeding season may disrupt and displace some migratory birds the following breeding season because some species return to the same stand year after year to breed. Most resident species, such as the tufted titmouse and wild turkey, however, are usually able to adapt to a changing environment, because they typically use a variety of habitats to survive throughout the year. They are usually affected less by an intense harvest (or catastrophic natural disturbance such as a severe winter ice storm) than the often more specialized migratory birds and will often still use the harvested area to some extent as well as the mature forest.

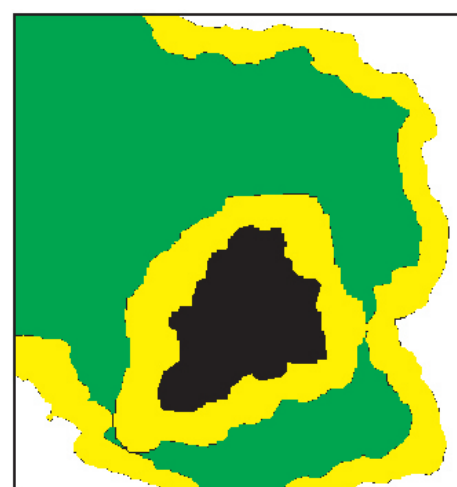
These two landscape areas show the results of fragmentation by removing a portion of the forest cover. The interior area decreases by 50 acres or 30 percent with a subsequent increase in edge area and altered habitat. A timber harvest would continue to provide habitat to a different community of birds. Development, however, would permanently remove the altered habitat from use by all but a few species.



Edge Area

Interior Area

Total area = 200 acres (100%)
Interior area = 166 acres (83%)
Edge area = 34 acres (17%)



Altered Habitat

Total area = 200 acres (100%)
Interior area = 116 acres (58%)
Edge area and opening = 84 acres (42%)

Illustration by Sue Olcott, WVDNR



Management Plans and Contracts: Protecting and Enhancing Your Woodlot

Any landowner considering any type of forestry practice should first develop a comprehensive forest management plan. Within this plan all goals and objectives are listed along with detailed information and procedures that will be used to meet these goals and objectives. A large variety of management practices and techniques are available to the landowner from professional foresters to help meet a broad array of objectives. The owner should seek the help of professional resource managers at the West Virginia Division of Forestry or Division of Natural Resources offices to develop their plan.

Consulting foresters and forest industry foresters also develop plans. All of these individuals can help develop plans that are feasible, compatible with the landowner's interests and needs and beneficial to the forest and wildlife. Once the landowner has a finished plan, he or she may be eligible for financial assistance through federally funded programs that offer cost-sharing for specific forestry and land management practices. Contact your local WV Division of Forestry, United States Department of Agriculture – Farm Services Agency or Natural Resource Conservation Service for more information. (*See Appendix III, page 28*).

A forest management plan is a written, detailed document that includes three important elements:

- A specific list of the landowner's goals and objectives,
- A thorough description of the property and the wildlife, timber, aquatic and cultural resources on it, and
- A schedule of activities to be performed on the property if needed to help meet goals and objectives.



Skidder hauling logs to a log landing.

U.S. Forest Service Photo

Examples of activities and uses that a landowner may do on their property could include:

- Recreational activities--hiking, hunting, fishing, bird watching, nature study and mountain biking
- Wildlife and botanical--fee hunting and/or fishing, medicinal plants, watchable wildlife
- Spiritual fulfillment and aesthetic enjoyment
- Harvesting wood products--firewood, saw timber, chips, posts and veneer

Several publications cited on page 19 give detailed step-by-step information for developing a forest management plan.

If a decision is made that a timber harvest is compatible with the goals and objectives of the landowner, he or she should enlist the services of a professional forester to monitor and direct the harvest. The benefits of using a forester typically include a well-planned, envi-



Taking a diameter breast height (DBH) measurement.

U.S. Forest Service Photo

ronmentally friendly harvesting operation that meets or exceeds expectations, and typically receives a higher price. The landowner should ask to see what the proposed harvest practice actually looks like. What does it really mean to remove 30 percent of the oak and 50 percent of the cherry? Ideally, the landowner should have a clear visualization of what he or she would like the land to look like and to have the opportunity to see what the same harvest practice actually looks like on the ground. Ask to see an example.

It is strongly recommended that a written timber harvesting contract be used for the sale of timber and that the contract be entered into only with the advice of an attorney and a forester. The purpose of the contract is to detail the responsibility of each party involved in the timber harvest, thus protecting both the landowner and the timber buyer/logger. These details should include but are not limited to:

- payment schedule
- description of timber being sold and how it is designated (marked, diameter, volume, etc.)
- anticipated starting and completion date and time period covered by the contract
- penalties for cutting undesignated trees
- provisions prohibiting excessive damage to undesignated trees and improved property
- assignment of liability for losses due to fire caused by buyer/logger or his agents
- provisions for protection of soil, water and recreational value (for example, suspending operations during wet weather)
- owner's right to inspect sale area during harvest operations
- right to suspend the harvest operation if the contract is violated
- provision for arbitration to resolve disagreements
- right of ingress and egress of the buyer/logger
- location of roads and landings agreed on before harvest begins
- compliance with all water quality laws and the



Riparian zones protect waterways.

Lynn Betts, USDA/ NRCS Photo

Logging Sediment Control Act (1992)

- designation of seller's agent
- severance tax liability
- protection from workers' compensation claims, liability suits and property damage for the landowner
- consideration for threatened and endangered plants and animals if present, and for historically and biologically significant sites
- stabilization and repair of logging roads and landings to a specified condition upon harvest completion
- handling of logging debris (tops and slash) in relation to roads, landings and streams
- performance of a post-harvest inspection to ensure compliance with the contract
- release of buyer/logger, through a written letter, from further obligations

Seller beware Never consider selling timber without a plan and contract or without advice from a lawyer and forester. To do so puts plans and desires at risk, could leave your land and its resources damaged and could drastically reduce present and future income and enjoyment.



Forest and Timber Harvesting Practices

Landowners should never consider managing their forest resources without the benefits of a professionally prepared, well thought out management plan that lays out specific goals and objectives. Not establishing these goals can lead to unwelcome and poor results if management practices are performed without a plan. If the forest management plan recommends a timber harvest, it can be implemented using even-aged management, uneven-aged management and/or an intermediate management practice. The choice of using one or more of these techniques depends on the landowner's goals and expectations and the characteristics of the timber and the site.

The management type a landowner chooses, or the combination of several, basically controls the amount of light reaching the forest floor, since removing trees removes canopy and allows direct light in. More light allows for growth of sun-loving tree species, like oak, black cherry, yellow poplar and pine. Less light allows for growth of species that require less light like beech, hemlock and sugar maple.

The following variables affect the potential quality, quantity and tree species composition of the future stand: presence or absence of seedlings and/or saplings of the desired species, high densities of plants that may interfere with the growth of the new stand (ferns, grass, grapevine, striped maple), site limitations such as wet or very stony soils and current deer densities and deer management. A professional forester and/or wildlife manager can evaluate these factors. Once they have this information, they can make recommendations that can deal with potential challenges that will allow the growth of a new stand composed of species that meet the forest management goals of the landowner.

Decisions as to which practices to implement in which specific situations from a timber management viewpoint are beyond the scope of this guide. However, the expected result of the following practices on songbird species of conserva-

tion concern can be found in *Appendix V, page 32*. A visual representation of what a harvest may look like at the time of the practice and 10 years post-harvest is on page 16.

Even-Aged Management

Even-aged management results in timber stands consisting of trees that are essentially the same age. This practice is best used if the landowner's goal is to maximize the economic return of the timber or to establish and/or maintain sun-loving (shade intolerant) trees such as oak, black cherry, yellow poplar, black locust or pine. These trees will not grow and thrive in the shade of other trees; they need full sunlight. Clear cutting and partial cut practices are cutting methods to establish and/or maintain even-aged stands.

Clearcutting

As the name implies, virtually all the trees are cut and removed in one operation, resulting in a future stand of one age. If sufficient numbers of seedlings of the desired species are already in place and well established, clearcutting will satisfactorily regrow a new stand with the desired species composition. Stump sprouts are also an important supplement to regrow the stand. In West Virginia, clear cuts are typically between 10 and 40 acres in size.

Partial Cuts – Seedtree and Shelterwood

The goal of both of these practices is to



Shelterwood cuts are gaining acceptance for regenerating oak and cherry as prices for these species increase.

WDNR Photo

produce seedlings of the desired species in order to regrow a new stand. This is done by partially cutting the stand one or more times, leaving good seeding trees to produce seedlings and allowing the resulting seedlings to grow in under higher light conditions into the new stand. This practice is done when not enough seedlings are currently present in the uncut stand to regrow it after harvest.

In a seed tree cut, the trees left standing may or may not become part of the permanent stand. In a shelterwood cut, more trees are initially left standing to shelter the young seedlings from extremes of direct sunlight and wind. After the seedlings become established (approximately 3 – 15 years), one or more additional cuts are made to remove mature trees.

Uneven-Aged Management

Uneven-aged management may be most appropriate when the landowner has goals other than to maximize financial return and wishes to maintain an intact tree canopy. Uneven-aged management keeps a forest canopy on the area at all times and avoids the large openings with exposed stumps, slash and possible soil disturbance that are present after even-aged cuttings. Uneven-aged management may be a good choice when site and stand conditions make even-aged management difficult such as if the stand has several age classes in it or if, in areas of the stand, seedlings can't grow because of poor site conditions such as very stony or wet areas. Stands dominated by shade tolerant species like hemlock, beech and sugar maple are well-suited to uneven-aged management.

Single tree selection is just that - selecting single trees to be cut based on criteria set up ahead of time (monetary value, species, etc.) that meet



New clearcut. Photo taken in 1970 in the Fernow Research Forest.



The same clearcut six years later. Today it contains 50% black cherry.

the landowner's goals. Group selection is choosing a group of trees, typically covering $\frac{1}{2}$ to 1 acre, based on predetermined criteria.

Seedling and stump sprout growth in uneven-aged stands must be obtained after each cut. Because considerable overstory is always present, growth will be dominated by shade tolerant species. To encourage faster growth, higher tree species diversity, the number of trees left standing in a cut area should be kept low. Small openings of $\frac{1}{2}$ to 1 acre should be created to meet landowner goals. For both timber production and the persistence of shade intolerant species, the combined use of single tree and small group selection cutting practices tends to be most successful.

Intermediate Management

The goals of intermediate management practices, instead of regeneration of young trees as in even- and uneven-aged management, concentrate on maximizing growth of young trees to produce high quality saw and veneer logs and/or healthy and diverse wildlife habitat.



Thinned oak stand.



Tolerant understory of beech that developed as a result of repeated single-tree selection cuts.

Commercial thinning

This method culls poorly formed or otherwise undesirable trees from a stand so that growth of selected trees is maximized. This is first done when the stand is old enough and the trees are large enough (usually 20 – 40 years old) to be sold commercially (often as posts, chips or pulp) to pay for the thinning. Stands can be thinned multiple times (at 15-20 year intervals). Later thinnings harvest both small and larger trees, leaving superior actively growing trees to produce seed and maintain the stand.

Crop tree management

In stands managed using the crop tree method, individual trees are chosen when approximately 20-40 years old to be released, or to have competing trees around them removed. This allows more light to reach them, and they typically grow more quickly with better form and produce more seed. These crop trees are chosen based on timber value, wildlife value and/or aesthetic value, depending on the goals of the landowner.

Diameter Limit Cutting

Diameter limit cutting is the most common method of cutting timber in West Virginia because it is easy to implement and cheap to apply. Because it is easy, fast and cheap, limiting factors (presence of established seedlings, seed sources to regrow the stand, tree species and size to be left) tend to be overlooked or ignored.

In this method, the landowner and purchaser agree on a stump diameter at or above which all trees will be cut. If the diameter

selected is high (20 or more inches), typically few trees are cut and the effect on the stand may be similar to a single tree or group selection cut. If this criteria is selected every 10 – 20 years, the resulting stand will be uneven-aged and, over time, would most likely be composed of shade tolerant trees (beech, sugar maple, hemlock). If the diameter selected is low (10-12 inches) most trees would be cut. The effect would be similar to a clear cut and a more even-aged stand would result.

Diameter limit cutting has several limitations that can, over time, negatively impact the health of the stand. It does not provide control over the number of trees or the proportion of the species of trees that remain, nor does it improve the quality of the remaining trees. Stands repeatedly harvested with this method often regrow poorly, and only marginal wildlife habitat may be produced. At its worst, diameter limit cutting amounts to high grading in which the best of the trees of the most profitable species are taken and the diseased, poorly grown and undesirable species are left.

Being able to control and manipulate tree density, species composition and potential regrowth is the heart of any good management plan. Diameter limit cutting removes this important control.



Baltimore Oriole



Group selection can have minimal negative effects on existing forest bird communities.

The Results of Different Types of Timber Harvest Practices

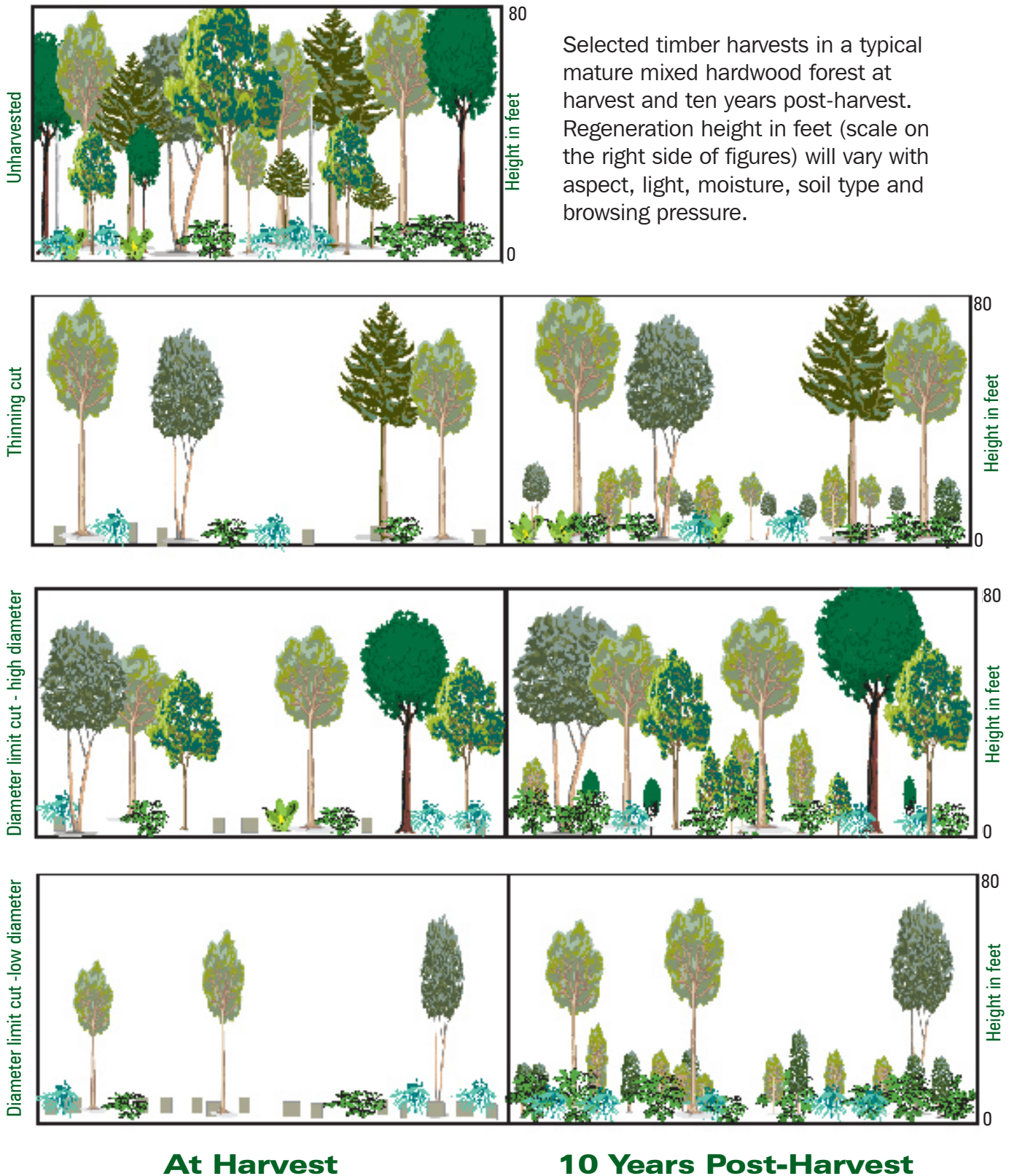
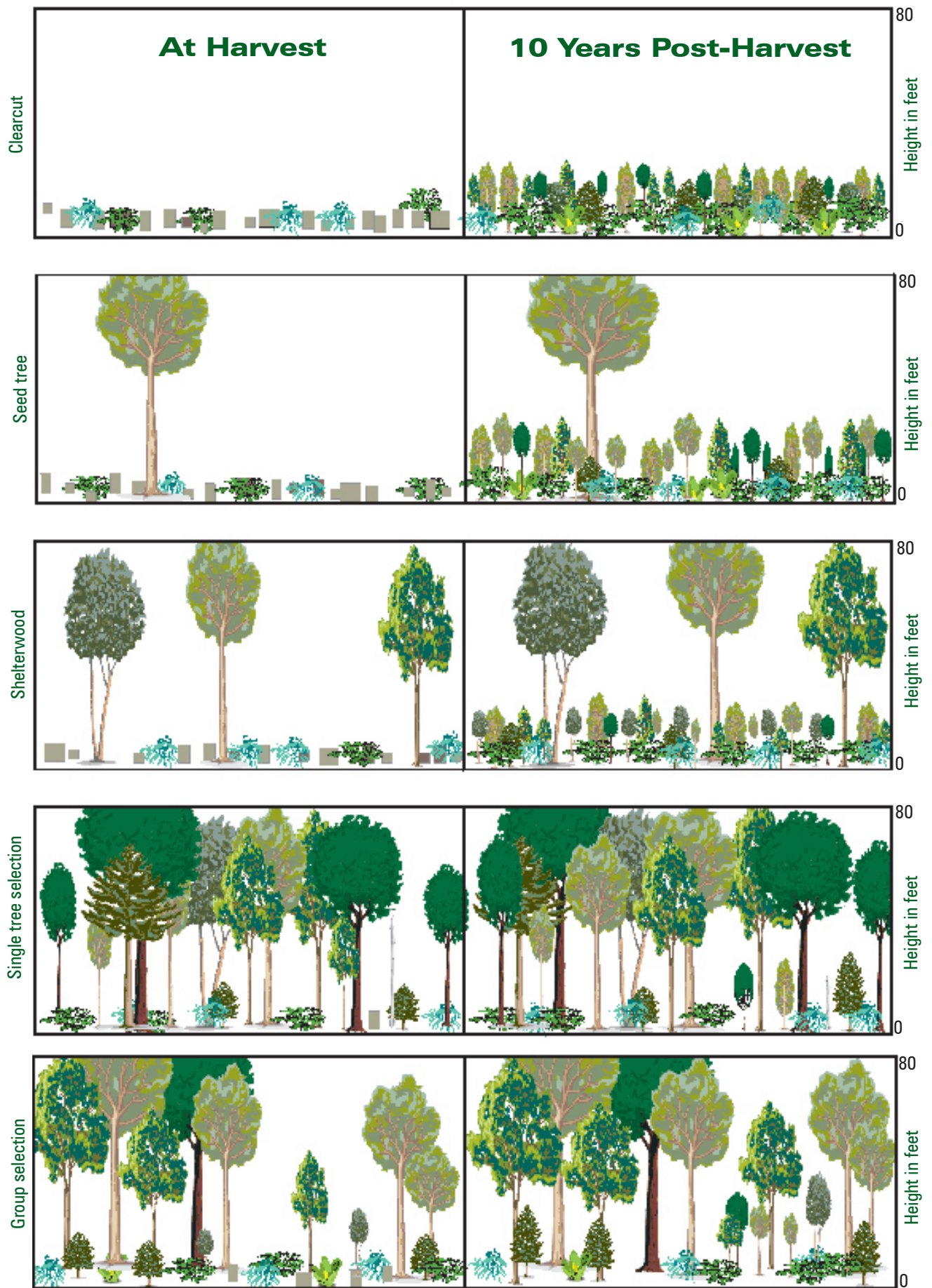


Illustration by Sue Olcott/ WVDNR



Bird-friendly Timber Harvesting Practices

1. Harvest the timber outside of the breeding season of April 15-August 1. Since many of the birds that use mature forests are either long distance migrants (the red-eyed vireo migrates all the way to the Amazon) or short distance migrants (most hermit thrushes migrate to the southern states) they or their young will not be in the area and therefore cannot be disturbed or injured.

2. Leave dead snags, cavity trees and live trees that have the potential of becoming cavity trees at the rate of at least five per acre. Standing dead trees and dead parts of live trees provide food and shelter for many kinds of wildlife. At least 35 bird species and 20 mammals use tree cavities for shelter and to raise young. Snags and rotted parts of live trees are also excellent places for birds to find insects and other invertebrates used for food. This food source is especially important in winter for local, non-migratory birds. If your forest does not have enough snags or cavity trees, create some by girdling (killing) selected low value trees throughout the forest at the rate of five per acre (see Glossary, page 33).

3. Plan on leaving 100 foot buffers on either side of permanent streams and around natural

Additional habitat enhancement practices that can be part of a forest management plan:

- Construct or leave brush piles and windrows (great for attracting sparrows and other ground dwelling birds).
- Construct and put up nesting structures.
- Preserve and plant conifers.
- Preserve, prune and release fruiting trees. (For example, apple, serviceberry, crabapple, hawthorn and others.)
- Control undesirable, non-native vegetation (Japanese knotweed, mile-a-minute weed, Japanese honeysuckle, Japanese stiltgrass, multiflora rose, tree-of-heaven) by disking, burning or judicious use of herbicides (spot treating).
- Avoid insecticides and herbicides.
- Construction of ponds or water holes if appropriate sites are available.

seeps. Buffers are areas along streams and seeps where few or no trees are cut and no roads are allowed. These riparian areas are very important to certain site sensitive birds such as the Louisiana



Creating a soft edge improves wildlife habitat.

waterthrush, Kentucky warbler, Acadian flycatcher and belted kingfisher. Leaving an adequate buffer also protects water quality in the harvest area and protects fish and other aquatic organisms in the harvest area and downstream.

4. Reclaim roads and landings with grasses, legumes, shrubs and trees that produce food and cover for wildlife. Try to use native varieties that benefit birds and wildlife in the winter and early spring, the most difficult time of the year for survival. Avoid mowed or very short growing grasses that can attract brown-headed cowbirds.

5. If the border between open land and forest is abrupt, practice forest edge cutting. This practice involves cutting and/or planting trees and shrubs along the edge of a forest, field or road in a way that improves wildlife habitat by increasing the variety of vegetation, vegetative structure and creating a soft edge. Improved structure (the layers of vegetation from the shortest herbaceous plant up to the tallest canopy tree) increases food and cover available to wildlife by providing more layers where animals can feed, hide and nest.

6. If your property supports a high deer population, consider allowing hunters on your property to harvest deer, especially antlerless deer (does), if you don't hunt yourself or if you hunt very little.

A deer management section (deer hunting) can be included in your forest management plan. Because deer are browsers (tree eaters), too many deer can eliminate small tree seedlings (potential regenera-

tion) and other understory vegetation on which many wildlife species depend. There are several recent studies suggesting that the elimination of understory vegetation by deer has had significant adverse affects on bird communities and other wildlife species. For advice on effective deer management contact your WV Division of Natural Resources district wildlife biologist. Overabundance of deer is best alleviated by harvesting does.

Forests occupy 78 percent of the total land area in West Virginia, with private landowners owning 83 percent of that total (the forest industry owns 7 percent, and federal and state agencies own 10 percent). In addition to providing valuable supplies of wood, fiber and fuel, these forests

Having a managed forest and abundant wildlife are two very compatible and achievable goals — they are not mutually exclusive.

provide the necessary and indispensable habitat for several hundred species of animals and over 2000 species of plants. Any use that alters the structure and composition of the forest has the potential to significantly alter wildlife habitat and wildlife

communities and populations. Whether these activities result in good or bad wildlife management depends on the landowner's foresight and ability to consider and plan for wildlife

needs he or she is interested in promoting. Having a managed forest and abundant wildlife are two very compatible and achievable goals — they are not mutually exclusive. Implementing the suggestions presented here will help you to enjoy better birding, abundant wildlife and the many benefits of a well managed forest.

Additional reading and websites

Maintaining Species Diversity in the Central Appalachians by G.W. Miller and J.N. Kochenderfer; Journal of Forestry, July 1998.

A Practical Alternative to Single Tree Selection? by G.W. Miller and H.C. Smith; Northern Journal of Applied Forestry, 1993.

The Land Manager's Guide to Birds of the South by P.B. Hamel, The Nature Conservancy, Chapel Hill, NC; 1992.

Habitat Area Requirements of Breeding Forest Birds of the Middle Atlantic States by C. Robbins, D.K. Dawson and B.A. Dowell; Wildlife Monographs; 1989, volume 103.

Neotropical Migratory Birds: Natural History, Distribution and Population Change by R.M. DeGraaf and J.H. Rappole; Comstock Publishing Assoc., Ithaca, NY; 1995.

The Sibley Guide to Bird Life and Behavior by D.A. Sibley; Alfred A. Knopf, NY; 2001.

The Birder's Handbook: A Field Guide to the Natural History of North American Birds by P.R. Ehrlich, D.S. Dobkin and D. Wheye; Simon and Schuster, Inc., NY; 1988.

Neotropical Migratory Birds of the Southern Appalachians by K.E. Franzeb and R.A. Phillips; General Technical Report SE-96; U.S. Department of Agriculture, Forest Service, Southern Research Station, Asheville, NC; 1995.

2004 Partners in Flight North American Landbird Conservation Plan by T.D. Rich, J. Pasdmore, H. Berlanga, P.J. Blancher, M.S.W. Bradstreet, G.S.

Butcher, D.W. Demarest, E.H. Dunn, W.C. Hunter, E.E. Inigo-Elias, J.A. Kennedy, A.M. Martell, A.O. Panjabi, N. Pasley, K.V. Rosenberg, C.M. Rustay, J.S. Wendt and T.C. Will. Cornell Lab of Ornithology, Ithaca, NY; 2004. Website: http://www.partnersinflight.org/cont_plan. (vers: March 2005)

2003 Partners in Flight Landbird Conservation Plan: Physiographic Area 12: Mid-Atlantic Ridge and Valley by K.V. Rosenberg. Cornell Lab of Ornithology, Ithaca, NY; 2004. Website: http://www.blm.gov/wildlife/plan/pl_12_10.pdf.

2004 Partners in Flight Conservation Plan: Physiographic Area 22: Ohio Hills by K.V. Rosenberg. Cornell Lab of Ornithology, Ithaca, NY; 2004. Website: http://www.blm.gov/wildlife/plan/pl_22_10.pdf.

Prescribing Silvicultural Treatments in Hardwood Stands of the Alleghenies (revised) by D.A. Marquis, R.L. Earnst, and S.L. Stout. Gen. Tech. Rep. NE-96; U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station, Radnor, PA; 1992.

Pennsylvania State University School of Forest Resources: <http://www.forestryexplorer.psu.edu/management>.

Partners in Flight-U.S., served by the USGS Patuxent Wildlife Research Center, Laurel, MD. <http://www.partnersinflight.org>.

West Virginia Wildlife Conservation Action Plan, <http://www.wvdnr.gov/Wildlife/PDFFiles/wwwcap.pdf>; 2005.



Management Guidelines for West Virginia Habitat Groupings



Bob and Peter Wood

Golden-winged warblers prefer shrub and scrub habitat.

These habitat groupings can be used to determine what group of birds might be best for the landowner to manage for depending on what habitat is present and its condition. For example, choosing to manage for species such as the scarlet tanager and cerulean warbler that require mature forests when a landowner only has open fields to work with would be frustrating and highly unproductive. Managing for species that prefer more open areas such as the prairie warbler or golden-winged warbler would be more fulfilling and effective. The following habitat groupings define the basic habitats that occur in West Virginia and give specifics on each groups' habitat management requirements. Management recommendations are those practices that will help maintain or enhance the habitat as it currently exists.

Certain bird-friendly management practices are recommended across all habitats. These include:

- managing deer and other browser populations to prevent over-browsing

- limiting major management and timber harvesting operations to the non-breeding season.

- practicing Best Management Practices (BMPs) or better during any timber harvesting operations (*see Appendix I, page 24*).

- maintaining at least 100 foot buffers on both sides of streams and around seeps during timber harvests and other management operations that disturb the habitat.

- limiting pesticide use to what is absolutely necessary.

Appendix VII (*page 36*) includes a list of West Virginia birds and the nesting and feeding habitats in which landowners may typically see them.

Closed Canopy Forest

definition: closed canopy of trees with generally sparse understory, shrub layer and ground cover (rhododendron may be thick in wet areas and the base of ledges); generally moist microclimate.

management recommendations:

- maintain closed canopy.
- maintain large tracts of continuous forest.
- limit harvest operations to single tree, group selection and small clear cuts (a total of 10 percent of the canopy) to provide habitat for species requiring a more open habitat.
- maintain at least five snags (at least 10-inch diameter at breast height or DBH) per acre by leaving dead or dying trees in place or by girdling healthy ones.



Dave Menke/USFWS

Indigo buntings nest and feed along forest edges.



Sue Olcott, WVDNR

Riparian forests promote high water quality.

Edges and Forest Gaps

definition: linear area around the perimeter of forests and the areas within small openings in forests consisting of moderate to dense shrub and/or small tree and ground cover with mature forest on one or more sides.

management recommendations:

- maintain areas of shrub growth along existing edges by mowing, cutting or light grazing every 2-4 years.
- encourage shrub growth by disturbing the soil along hard edges (sharp boundaries between fields and forest) by disking, plowing or other soil disturbance, or by planting.
- cut back portions of forest edges to encourage shrub and sapling growth.
- develop forest gaps every eight to ten years (if needed) in forest types using group selection and small clear-cuts to promote habitat diversity.

Open Canopy Forest

definition: mosaic of closed to open canopy forest with sparse to well developed understory, shrub layer and ground cover, often with pines; dry microclimate typically found on ridgetops, cedar glades and shale barrens.

management recommendations:

- maintain mature forest - especially tall trees.

- use single tree, group selection or small clear cuts for timber harvesting.
- maintain a mosaic of understory and shrub layer densities from dense to sparse.

Riparian Forest

definition: closed canopy forest along edges of permanent streams; dense understory and shrubs along permanent streams; large tracts of continuous forest in river floodplains.

management recommendations:

- maintain forest cover adjacent to streams.
- maintain well-developed shrub layer along streams, use single tree and group selection for timber harvesting - cut at least 100 feet from streams.
- promote and/or maintain high water quality.
- retain tallest trees for diversity in canopy structure.



Steve Maslowski, USFWS Photo

The wood thrush is often found in open canopy forests.

Riparian

definition: non-forested areas adjacent to rivers, larger streams and wetlands.

management recommendations:

- promote and/or maintain water quality to support a healthy aquatic community.
- maintain areas of pools and shallow riffles (avoid channelization).
- maintain stable, vertical, sandy non-vegetated banks; maintain snags and trees over riffle areas.
- fence stream banks to prevent overuse by domestic stock - develop small stabilized watering areas in streams or watering troughs away from streams.

Coniferous Forest

definition: forested stands consisting primarily of coniferous trees; spruce typically found above 2500 feet elevation; pine on dry sites at various elevations; hemlock in coves and along streams.

management recommendations:

- maintain large mature forest tracts.
- use single tree, group selection or clear cuts to regenerate stands (depending on the species) and develop patches of shrubby habitat.
- soften hard edges by cutting portions of forest edges to encourage sprouting.

Shrub/Scrub

definition: early successional areas; vegetation consisting of various herbaceous vegetation



US Forest Service Photo

Dense growth is encouraged by coppicing.

with shrubs, saplings, stump sprouts in cut areas, reclaimed surface mines, power line right-of-ways; sparse to dense vegetation.

management recommendations:

- maintain old fields and shrubby areas by selectively cutting out larger sized trees (above 4- to 6-inch DBH) and strip mowing/brush hogging every five to ten years
- encourage selected areas of dense growth by coppicing or stump sprouts
- cut back portions of forest edges to encourage shrub and sapling growth



Sue Olcott, WVDNR

Old field habitat is used by a variety of songbirds and other wildlife.

Grassland

definition: pastures, abandoned fields, reclaimed surface mines with primarily grassy vegetation of various heights; may have areas of dense herbaceous growth and/or scattered small trees or old fence posts and adjacent shrubby areas.

management recommendations:

- maintain grassy areas by grazing or mowing to discourage extensive woody vegetation.
- plant areas of mixed native warm season grasses, legumes and wildflowers. Avoid planting large areas with just one species.
- avoid haying during the breeding season - if possible do not cut until after July 15.
- allow a few shrubs or small trees in the field for song perches.
- remove roadside perches to avoid vehicle caused mortality.
- avoid overgrazing - rotate livestock through pastures.

Wetland

definition: soil saturated for most of the year; supports typical herbaceous and/or woody wetland vegetation; includes swamps, shrub swamps, marshes, fens and bogs.

management recommendations:

- develop and maintain high water quality and appropriate water quantity.
- maintain large areas of wetland.
- avoid channelization of adjoining streams.



Wetlands, including swamps, marshes and bogs, provide homes for many species of waterbirds.



Larry Sandifer, USDA/NRCS

Good backyard habitat design provides a variety of plant types.

Cliffs

definition: areas with vertical, generally linear series of cliffs; usually along ridges, rivers or larger streams; little vegetation.

management recommendations:

- avoid disturbing (typically not economically feasible for timber operations).
- avoid extensive recreational use, such as rock climbing.

Residential/Towns

definition: areas with houses and other buildings; may be densely populated with humans; various vegetation including scattered trees, shrubs and lawns.

management recommendations:

- avoid use of invasive exotic plant species for landscaping--use native species when possible.
- provide a variety of plant types: trees, shrubs, ground cover for shelter and food.
- provide water throughout the year.
- avoid pesticide use unless absolutely necessary--practice integrated pest management strategies.
- keep cats indoors--they kill very large numbers of birds.

Appendix I

Logging Sediment Control Act (LSCA)

The Logging Sediment Control Act (LSCA) law states that after September 1, 1992, anyone conducting a logging operation, buying timber or buying logs for resale is required to be licensed by the West Virginia Division of Forestry (WVDOP). Before a license can be issued the applicant must possess a business license, be registered and be in compliance with the Department of Tax and Revenue and with the Workers and Unemployment Compensation Divisions. By law, the acceptance of a logging license obligates an operator to protect soil and water quality by judicious use of Best Management Practices (BMPs).

BMPs can be defined as the proper use of any practice or device used to control soil erosion and water pollution. Since roads and landings are the biggest potential source of soil disturbance, proper location, layout, maintenance and reclamation of these features is the most important BMP a logger or landowner can use. Use of water control devices and techniques such as waterbars, using culverts or bridges for stream crossings, silt fence and sediment ponds help to control soil disturbance and water degradation. Other practices include logging in drier months, temporarily suspending operations during wet weather, keeping roads out of riparian areas, removing tops from streams and using proper felling techniques to protect both the timber cutter and remaining standing timber.

Other important elements of the LSCA include:

- Logger certification – the person directing the logging operation must be a certified logger, having satisfactorily completed courses in tree felling safety, personal safety equipment, first aid and CPR, and forest health.
- Timber Operation Notification Form – must be submitted to the WVDOP within three days of the start of a harvest operation. It supplies information about the operation and obligates the operator to declare what BMPs will be used.
- Posting the operation – a sign must be erected listing the logging operator's company name and license number in three-inch letters or larger at the primary log landing.
- Reclamation – reclamation of all landings and roads should be completed within seven days of the completion of the harvest operation. The logging operator must contact the WVDOP of any delays over seven days (for example, due to wet conditions).
- Violations – logging operators are required to keep their licenses and notifications current and to use BMPs to control soil erosion and prevent stream pollution. Violations of these or certain water quality laws can result in compliance orders, job suspensions, citations or arrest.

It should be noted that landowners also have a responsibility in preventing soil erosion and stream pollution. Under Chapter 22 of the West Virginia Code, the Office of Water Resources holds not only the logging operator responsible but can also hold the landowner responsible for allowing or contributing to stream sedimentation. For this reason alone landowners should protect themselves with a well written contract.

The above information is meant to be a brief overview of LSCA. For more information about LSCA, BMPs, contracts, etc., contact your local Division of Forestry office (*see Appendix III, page 28*).



Bridge constructed to skid logs across a stream helps maintain high water quality.

U.S. Forest Service Photo

Appendix II

Roads and Reclamation

A high quality, well-planned, limited access (gated) road system is a necessity for almost any type of comprehensive land management plan. Not only are they important for the removal of timber and for wildlife management activities, they can be used for other activities such as hiking, biking, hunting, wildlife viewing, horseback riding and bird watching. Many roads can be developed into excellent nature trails. A good road system also provides access for fire suppression activities should they be needed. A road system can be designed as part of a forest management plan.

Reclamation is the process of revegetating roads and other disturbed areas with grasses, legumes, wildflowers, shrubs and trees to prevent erosion, improve aesthetics and provide food and cover for wildlife. Reclamation of landings and specified roads and skid trails is required under the Logging Sediment Control Act and is a very important component of any forest management plan. It should receive as much consideration and thought as any other part of the plan. Reclamation provisions associated with a timber harvest should be included in the contract.

Reclamation is often not started until all trees to be harvested have been cut and hauled



Dave Powell, USDA/US Forest Service

Smooth sumac is a useful shrub to use for the reclamation of logging areas.

away. Because this practice of delayed reclamation exposes bare soil to rain and runoff, it can cause increased erosion and is discouraged. Reclamation should become part of daily operations on a timber harvest and should be completed by section as the job progresses. When the last tree in an area is removed and the skid trail or road leading to it is no longer needed, reclamation efforts should begin. First, roads and landings need to be smoothed and graded and water control devices installed (water bars, ditches, culverts, etc.). Lime and/or fertilizer (if indicated by a soil test) and seed and/or plantings are then applied at recommended rates.



Lynn Betts, USDA/NRCS Photo

Native grasses and wildflowers provide conservation buffers.

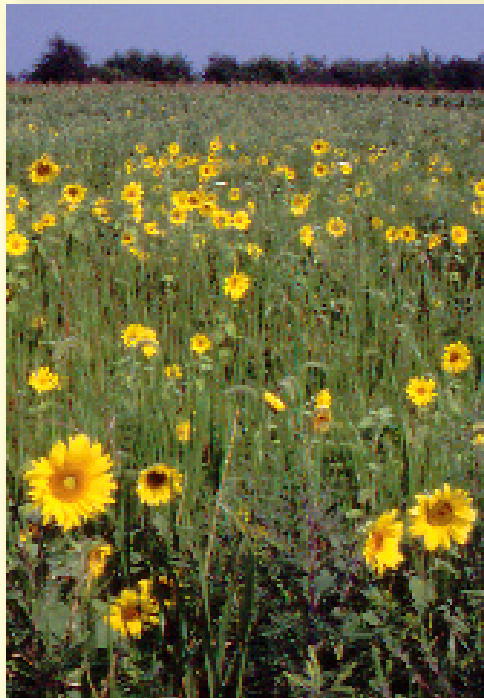


U.S. Forest Service Photo

Reclaimed roads and landings provide food and cover for wildlife.



BIG BLUESTEM GRASS/NRCS



SUNFLOWERS/Sue Olcott, WVONR



COMMON ELDERBERRY/Kenneth M. Gale, www. forestry images.org

Landings, steeper slopes (20 percent slope or greater) and critical areas at stream crossings should also receive straw mulch to help hold moisture and to help provide greater seed germination and plant survival. After an area has been reclaimed, motorized traffic should be limited using gates or other barriers to allow the new vegetation to become well established.

The choice of plant species to use for reclamation is also important. Planting the cheapest seeding blend throughout a timber harvest will likely provide erosion control, but will do little to enhance wildlife habitat or aesthetics. Recent research has implicated tall fescue (*Festuca arundinacea*), a common seeding mixture component, with decreased survival of several bird species due to endophytic fungus and by aggressively crowding out native plant species. Fescue and other quick growing plants are very important for erosion control on steep slopes. In less erosion prone areas, however, native species such as switchgrass, deertongue and Canada wild rye as well as shrubs like dogwood and willow provide superior food and cover to a variety of wildlife.

At this time, native species are not as available or economical as the traditional seeding mixtures that contain tall fescue and other non-native species. But because of concerns about non-native species, they are becoming more available. Timber harvests on national forests try to use native species for reclamation where possible. The West Virginia Division of Natural Resources and the Natural Resource Conservation Service offices can provide the landowner information on where to obtain native species. Species to be planted during reclamation can also be included in the timber harvesting contract.

Roads and landing areas are typically planted with a mixture of four to eight species depending upon the site conditions and goals of the landowner. At a minimum, the mix should include a nurse crop that will germinate rapidly for erosion control (often an annual species), two or more perennial grasses for wildlife cover and food and one (or more) legumes to help improve soil fertility. Forbs (wildflowers) and shrubs can also be planted to improve habitat. Before planting, the soil should be amended with lime and/or fertilizer if indicated by a soil test to improve germination and survival. Fertilizer may not be indicated when planting some species.

Here are short lists of species that can be used for reclamation. Many more species are available than are listed here. Contact the West Virginia Division of Natural Resources or the Natural Resource Conservation Service for information on additional species.

Shrub Species For Reclamation of Logging Areas

Silky cornel or kinnikinnik - *Cornus amomum*
 Gray or pale dogwood - *Cornus racemosa*
 Winterberry - *Ilex verticillata*
 (need male and female plants)
 Scrub or turkey oak - *Quercus ilicifolia*
 Sandbar willow - *Salix exigua*
 Dwarf or shining sumac - *Rhus copallinum*
 Smooth sumac - *Rhus glabra*
 Black elderberry - *Sambucus canadensis*
 Red elderberry - *Sambucus racemosa* or *Sambucus pubens*
 Southern arrowwood - *Viburnum dentatum*
 Black haw - *Viburnum prunifolium*
 Smooth or northern arrowwood - *Viburnum recognitum*

Plant Species For Reclamation

Nurse species

Annual rye grass – *Loium multiflorum*
 Winter wheat – *Triticum aestivum*
 Oats – *Avena sativa*

Grasses

Switchgrass – *Panicum virgatum*
 Indian grass – *Sorghastrum nutans*
 Redtop – *Agrostis alba*
 Creeping red fescue – *Festuca rubra*
 Canada wild rye – *Elymus canadensis*
 Foxtail millet – *Setaria italica*
 Orchard grass - *Dactylis glomerata*
 Deertongue (Tioga) – *Panicum clandestinum*

Legumes

Winter Austrian pea – *Pisum arvense*
 Birdsfoot trefoil – *Lotus corniculatus*
 Red clover – *Trifolium pratense*
 Lathco flat pea – *Lathyrus sylvestris*
 Perennial pea – *Lathyrus latifolius*
 Tuberosa sweet pea – *Lathyrus tuberosus*



Sandbar willow provides excellent cover for a variety of wildlife .

Paul Wray, Iowa State University/www.invasives.org

Appendix III

Technical Assistance

STATE AGENCIES

WV Division of Natural Resources

Questions on wildlife and habitat, wildlife management practices (such as hunting, fishing and trapping)

Headquarters - Charleston: (304)558-2771
Wildlife Diversity Program - Elkins: (304)637-0245
District 1 – Farmington: (304)825-6787
District 2 - Romney: (304)822-3551
District 3 - French Creek: (304)924-6211
District 4 - Beckley: (304)256-6947
District 5 - Point Pleasant: (304)675-0871
District 6 - Parkersburg: (304)420-4550

WV Division of Forestry

Questions on forest health, forest management, BMP enforcement, Forest Land Enhancement Program (FLEP)

Headquarters - Charleston: (304)558-2788
District 1 - Fairmont: (304)367-2793
District 2 - Romney: (304)822-4512
District 3 - French Creek: (304)924-6266
District 4 - Beckley: (304)256-6775
District 5 - Milton: (304)743-6186
District 6 - Parkersburg: (304)420-4515

FEDERAL AGENCIES

Natural Resource Conservation Service (NRCS - formerly Soil Conservation Service (SCS))

Works in conjunction with Farm Service agencies, technical assistance for landowners, Wildlife Habitat Incentive Program (WHIP), Conservation Reserve Program (CRP)

Most counties have a USDA Service Center and/or NRCS office (one office may serve several counties). Look in the telephone book blue pages under United States Government - Department of Agriculture.

Headquarters - Morgantown: (304)291-4351
East Teams - Philippi: (304)457-1118 or 4516
South Teams - Beckley: (304)255-9225 or 9226
West Teams - Parkersburg: (304)422-9082 or 9083
Plant Materials Center - Alderson: (304)445-3005



USDA/NRCS Photo

Use native warm season grasses to provide cover and food for wildlife.

Farm Service Agency/ USDA Service Centers

Questions on many federally funded programs for wildlife habitat enhancement or timber stand improvement.

Look in the telephone book blue pages under United States Government for local offices.

U.S. Fish and Wildlife Service

Partners for Fish and Wildlife Program for habitat conservation and enhancement for private landowners

U.S. Fish and Wildlife Service West Virginia Field Office - Elkins: (304)636-6586

BIRD SURVEY RESOURCES

These volunteer, non-profit organizations may be able to help you determine what bird species currently use your property and what species may come in after a timber harvest.



Blue-winged warbler

Brooks Bird Club

Wheeling Chapter - PO Box 4077, Wheeling, WV 26003

Handlan Chapter - 2720 Lakeview Dr., St. Albans, WV 25177

Bibbee Nature Club - 126 Fincastle Ln., Bluefield, WV 24701

Leon Wilson Bird Club - 111 Jefferson Park Dr., Huntington, WV 25705

WV Audubon Society

Mountaineer Chapter - PO Box 422, Morgantown, WV 26507

Potomac Valley Chapter - PO Box 578, Shepherdstown, WV 25443

Oglebay Good Zoo - Education Department - (304)243-4068

Schrader Environmental Education Center - (304)242-6855

WV Partners in Flight - c/o the WVDNR - (304)637-0245

Three Rivers Avian Center - (304)466-4683 or (800)721-5252

WV Raptor Rehabilitation Center - (800)540-6390

Additionally, state and federal agency personnel may be able, if time allows, to aid landowners in determining songbird use of the property. Local Division of Natural Resources, Division of Forestry or Natural Resource Conservation Service offices (*see adjacent page for contact information*), the Canaan Valley or Ohio River Island National Wildlife Refuges, or the Monongahela National Forest Ranger Stations may be able to aid landowners in finding qualified persons to conduct a bird survey. Local colleges and universities may also have personnel associated with them that could help landowners determine what bird species are on their property.

Canaan Valley NWR - HC 70, Box 200, Davis WV 26260, (304)866-3858

Ohio River Islands NWR - PO Box 1811, Parkersburg WV 26101, (304)422-0752

Monongahela National Forest

Supervisor's Office - 200 Sycamore St., Elkins, WV 26241, (304) 636-1800

Cheat Ranger District - PO Box 368, Parsons WV 26287, (304)478-3251

Marlinton Ranger District - Cemetery Rd, Marlinton WV 24954, (304)799-4334

Gauley Ranger District - Marlinton Rd., Richwood WV 26261, (304)846-2695

Potomac Ranger District - HC 59 Box 240, Petersburg WV 26847, (304)257-4488

Greenbrier Ranger District - Ranger Station, Bartow WV 24920, (304)456-3335

Appendix IV

West Virginia Partners In Flight Priority Species

This list of priority bird species is a tool for all landowners concerned about birds to make more informed decisions on land use in West Virginia.

The list was developed by WV Partners in Flight (WV PIF), a state bird conservation organization. It is divided into three parts. First are those birds which are rare in the state, such as the Henslow's sparrow, or which have an unknown status in the state, such as the great blue heron. Second are those birds of conservation concern, species whose populations have declined in West Virginia and/or elsewhere and which have a large percentage of their breeding population in our state, such as the cerulean warbler. Third are species that are relatively common in selected habitats and that function as indicators of the health of that habitat, such as the belted kingfisher for streams.

These species will be highlighted for monitoring, research, conservation and education, but the list is dynamic. WV PIF welcomes new information and changes to this list are expected over time. WV PIF can be contacted through the West Virginia DNR Elkins Operations Center: (304)637-0245 or online at www.wvdnr.gov.



Common yellow throat

Brian McDonald, WVDNR

Rare, Little Known and Status Unknown Species in West Virginia

Pied-billed Grebe	Bobolink	Cliff Swallow
American Bittern	Common Moorhen	Brown Creeper
Least Bittern	American Coot	Appalachian Bewick's Wren
Great Blue Heron	Spotted Sandpiper	Sedge Wren
Yellow-crowned Night Heron	Upland Sandpiper	Marsh Wren
Black-crowned Night Heron	Wilson's Snipe	Swainson's Thrush
Black Vulture	Black-billed Cuckoo	Golden-winged Warbler
American Black Duck	Barn Owl	Nashville Warbler
Green-winged Teal	Long-eared Owl	Yellow-rumped Warbler
Hooded Merganser	Short-eared Owl	Blackburnian Warbler
Osprey	Northern Saw-whet owl	Prothonotary Warbler
Bald Eagle	Common Nighthawk	Swainson's Warbler
Northern Harrier	Chuck-Will's-Widow	Northern Waterthrush
Northern Goshawk	Red-headed Woodpecker	Bachman's Sparrow
Cooper's Hawk	Yellow-bellied Sapsucker	Vesper Sparrow
Sharp-shinned Hawk	Olive-sided Flycatcher	Lark Sparrow
Peregrine Falcon	Yellow-bellied Flycatcher	Grasshopper Sparrow
Northern Bobwhite	Alder Flycatcher	Henslow's Sparrow
King Rail	Horned Lark	Dickcissel
Virginia Rail	Bank Swallow	
Sora	Pine Siskin	

Species of Conservation Concern

Whip-poor-will
 Eastern Wood-pewee
 Acadian Flycatcher
 Loggerhead Shrike
 Wood Thrush
 Blue-winged Warbler
 Golden-winged Warbler
 Prairie Warbler
 Cerulean Warbler
 Worm-eating Warbler
 Louisiana Waterthrush

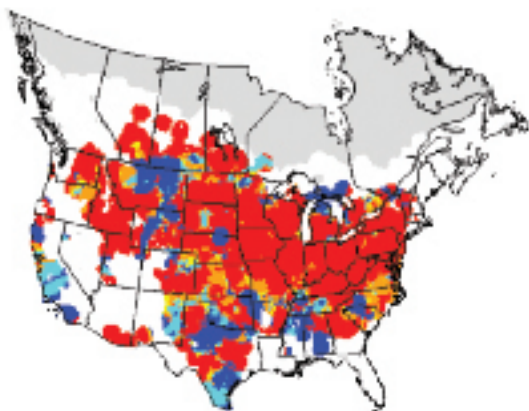
Kentucky Warbler
 Field Sparrow

Indicator Species

Belted Kingfisher
 Red-eyed Vireo
 Black-throated Blue Warbler
 Yellow-throated Warbler
 Yellow-breasted Chat
 Scarlet Tanager
 Eastern Meadowlark
 Indigo Bunting

Breeding Bird Survey (BBS) Population Trends For Selected Songbirds 1966-2003

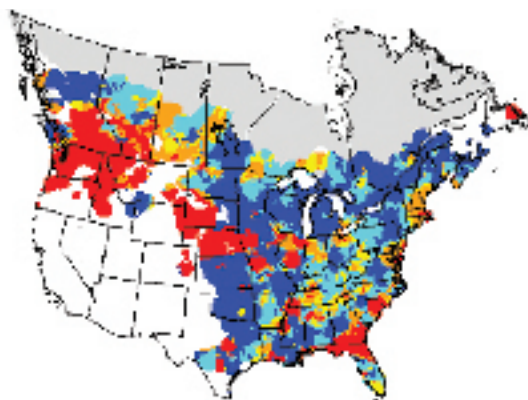
Using long-term breeding bird data, the BBS calculated trends and produced these maps to give a visual representation of what breeding bird populations are doing. Note that each species' trends may vary considerably across its range, increasing in some regions while declining in others. Predominate trends indicate, however, that while species such as the black-throated blue warbler is generally increasing across its range, the golden-winged warbler is declining. The grey areas of the maps indicate no BBS coverage.



Grasshopper Sparrow



Golden-winged Warbler



Red-eyed Vireo



Black-throated Blue Warbler

Percentage Of Change Per Year



See the USGS BBS site
www.mbr-pwrc.usgs.gov/bbs/bbs.html for
 more maps and information


Appendix V

Expected Results of Forest Management Practices on Songbird Species of Conservation Concern Habitat

Assumes cutting with subsequent forest regrowth and no human development

+ = practice enhances or produces sufficient habitat
- = practice degrades or produces insufficient habitat

- 1 = needs wooded riparian habitat
- 2 = needs agricultural landscape
- 3 = needs large rivers
- 4 = breeds above 2,000 feet in West Virginia
- 5 = needs mast producing trees in winter
- 6 = breeds above 2,000 feet in West Virginia bogs
- 7 = very short term habitat gain, if any
- 8 = effects after completion of 2- to 3-stage process



Prothonotary warbler

John and Karen Hollingsworth / JCEWS, etc.

WV PIF Management Guidelines Glossary

breeding range The total combined land area where a species of bird produces and raises young. Migratory birds usually return to this area every year. This area can be quite large, i.e., Canada, or fairly small, i.e., north-central Michigan.

breeding population The group of birds of one species in a local area that mate and raise their young.

Breeding Bird Survey (BBS) Annual bird surveys that started in 1966 and are coordinated by the U.S. Fish and Wildlife Service. The surveys are run during June by volunteers throughout the continental United States and southern Canada. Each route is 25 miles long with stops every ½ mile. The observer records every bird seen or heard during a three-minute period. West Virginia has 38 BBS routes.

brood parasitism The females of a few bird species lays eggs in the nests of a host species which raises the parasitic species as one of its own brood. Often the larger parasitic nestling pushes the host nestlings out of the nest or out-competes them for food, causing that nest to fail



Brown-headed cowbird

to produce birds of the host species. A common brood parasite in the United States is the brown-headed cowbird.

buffer zones Land where human activities are controlled or restricted to protect an adjacent sensitive area. Examples include land surrounding a bald eagle nest site or the strip of land running parallel to a stream where human activities should be minimized.

canopy The uppermost layer of foliage in a forest formed by the crowns of trees.

conifer plantation Evergreen trees usually planted in rows with predetermined spacing to encourage rapid, straight growth. In West Virginia

these are often grown for Christmas trees.

coniferous Cone-bearing trees or shrubs, mostly evergreen, with needle-shaped or scale-like leaves. Examples include: hemlock, pine, spruce, cedar and larch.

contiguous Land areas that are adjacent to one another.

continuous Land with similar vegetation that is uninterrupted in structure.

coppicing The process of encouraging the sprouting of young trees from a live stump.

In coppicing, the stump sprouts connected in a "U" shape as shown by the two outside stems are acceptable choices for crop trees; but "V" connection sprouts (center) generally should not be considered.



corridor A strip of land connecting two or more areas with similar vegetation that is used by animals and plants to move from one area to the other.

cowbird parasitism See *brood parasitism*.

DBH Forest management acronym for Diameter of a tree at Breast Height (measured at 4.5 feet from the ground).

DDT Dichlorodiphenyltrichloroethane. A persistent organochlorine insecticide that, along with its byproduct DDE, works its way up the food chain by accumulating in fatty tissues of many species of wildlife. This chemical interferes with bird reproduction by causing thin egg shells and behavior changes. DDT use was banned in the United States, but it is still manufactured in the U.S. and sold to other countries.

deciduous Plants that shed their leaves usually during autumn.

early successional The vegetation that grows on an area following significant disturbance. It usually refers to areas dominated by grasses, briars, wildflowers and/or shrubs. Example: the vegetation growing on newly cleared land, such as a road cut.

edge The transitional area where different habitats come together. An example is the area between a field and adjacent forest.

feral A cultivated plant or domestic animal that has reverted back to a wild state. For example: feral housecats.

fledgling The stage of a young bird's life after it leaves the nest and before it becomes an adult. Usually the bird does not return to the nest and receives decreasing parental care.



Robin fledgling

WV DNR PHOTO

fragmentation The long-term subdivision or isolation of once large and continuous tracts of habitat into smaller

areas surrounded by a matrix of unlike habitats. This is usually associated with loss of forested or grassland habitat to human induced changes, such as agriculture or development. The degree of fragmentation depends on the shape of the fragments and their arrangement in the landscape. Generally, the more irregular the shapes and the more isolated the fragments, the greater the effect.

girdling The practice of cutting into a tree at least one inch deep in two locations at least four inches apart completely encircling the trunk to cut off food and water transport to kill the tree. The standing dead tree serves as habitat for wildlife and provides other ecological functions.



Girdling.



Sue Olcott, WVDNR

Spotted jewelweed is an example of herbaceous vegetation that dies back in autumn.

habitat The presence and arrangement of food, water, shelter and space that an animal or plant requires for survival.

herbaceous Vegetation with soft stems that die back every autumn and are replaced by new growth in the spring. Examples are wildflowers and most ferns.

herbicide A chemical used for killing unwanted plants. They vary in their specificity; some killing a wide variety of plants, others only broad-leaved plants, and others only grasses. Many are very toxic to aquatic life.

hybridization The mating of individuals of different species that have different genetic composition, creating a hybrid offspring with characteristics of both species. An example is the mating of golden-winged and blue-winged warblers that produces individuals called Brewster's warblers.

incubation The amount of time a bird spends sitting on its eggs before the egg hatches. Some birds will begin to incubate their eggs immediately after an egg is laid (hawks and owls), while other birds wait until the last egg of the clutch is laid (ducks, most songbirds).

insecticide A chemical used for killing insects. Insecticides vary in their toxicity and specificity. Some are very general, or non-specific, and will kill a broad variety of insects and sometimes other wildlife; others are specific to a species or a small group of insects.

mature forest A descriptive term that refers mainly to forests that have attained most of their height growth and have at least some of the follow-

ing characteristics: a variety of tree species and ages from seedlings to old individuals; leaves occurring at many heights; a variety of ground covers; standing or down dead trees and other woody material; openings in the forest canopy that let in light.

migratory A descriptive term for birds and other animals that seasonally travel long distances to escape severe weather and/or food shortages and return once conditions improve.

mixed forest A forest containing a mixture of both coniferous and deciduous trees.

neotropical migrant Birds that return to breed in northern climates of North America every spring and migrate during the fall to tropical areas such as Central America, Mexico and South America to spend the winter.

nest site fidelity A descriptive term for birds that show a preference to return to the same area either where they were hatched and/or had previously raised a clutch.

pesticide A chemical used for killing unwanted pests, either animals, typically insects or fungi.

riparian The land adjacent to streams, rivers and wetlands.

shrub layer The layer in a forest consisting of woody plants having many stems rather than one main trunk and usually less than 20 feet tall.

shrub/scrub Vegetation consisting of small trees and low woody vegetation.



Thinned black cherry stand showing herbaceous understory.



Sue Olcott, WVDNR

Woodland streams provide habitat and resources for many forest nesting species.

snag A standing dead or dying tree. Snags provide habitats for a variety of birds and other animals.

stump sprouts Sprouts growing from the stump of a tree after it has been cut. *See coppicing.*

succession The gradual natural progressive change over years of one habitat into another. Example: A grassy field growing to a shrubby meadow and then into a forest.

understory The layer of vegetation growing under another higher layer of vegetation. Example: shrubs growing under trees in a forest.

upland Land located on plateaus, hills, mountains and ridgetops.

warm season grass Grass species that achieve most of their growth during the middle of summer; they typically have deep root systems and provide cover during the winter because they stay erect.

Appendix VII

Checklist of West Virginia's Breeding Bird Species

WV Breeding Bird Species	Closed Canopy Forest	Edges & Gaps	Open Canopy Forest	Coniferous Forest	Shrub and Scrub	Riparian Forest	Riparian	Wetland	Grassland	Cliff	Residential/Town
DUCKS AND GEESE											
Canada Goose							NF	NF	F		
Wood Duck	N					N	F	F			
Black Duck							NF	NF			
Mallard							NF	NF			
Blue-winged Teal							NF	NF			
Hooded Merganser						N	F	F			
GROUSE											
Ring-necked Pheasant									NF		
Ruffed Grouse		NF	NF								
Wild Turkey	NF	NF									
Northern Bobwhite		NF			NF				NF		
WADERS											
American Bittern								NF			
Least Bittern								NF			
Great Blue Heron	N					N	F	F			
Green Heron							NF	NF			
HAWKS AND ALLIES											
Black Vulture	NF	F	NF						F	N	
Turkey Vulture	NF	F	NF						F	N	
Osprey						N	NF	F	F		
Bald Eagle						N	F	F	F		
Northern Harrier								NF	NF		
Sharp-shinned Hawk	NF			NF							
Cooper's Hawk	NF	NF				NF			F		
Northern Goshawk*	NF			NF							
Red-shouldered Hawk	NF	NF				NF		F			
Broad-winged hawk	NF	NF									
Red-tailed Hawk		NF							NF		
Peregrine Falcon								F	F	N	NF
American Kestrel		N							NF		
RAILS AND ALLIES											
King Rail								NF			
Virginia Rail								NF			
Sora								NF			
Common Moorhen							NF	NF			
SHOREBIRDS											
Killdeer								NF	NF		
Spotted Sandpiper							NF	NF			
Upland Sandpiper*									NF		
Wilson's Snipe								NF			
American Woodcock		NF			NF			NF			

Key: N=nesting habitat; F=feeding habitat; NF=nesting and feeding habitat; *=typically nests at elevations above 2,000 feet in WV

WV Breeding Bird Species	Closed Canopy Forest	Edges & Gaps	Open Canopy Forest	Coniferous Forest	Shrub and Scrub	Riparian Forest	Riparian	Wetland	Grassland	Cliff	Residential/Town
DOVES											
Rock Pigeon										N	NF
Mourning Dove		N			NF	F			F		NF
CUCKOOS											
Black-billed Cuckoo	NF	NF			NF						
Yellow-billed Cuckoo		NF	NF		NF	NF					
OWLS											
Barn Owl									NF		NF
Eastern Screech Owl	NF	NF	NF			NF					NF
Great-horned Owl	NF	NF							F		NF
Barred Owl	NF					NF					
Long-eared Owl*				NF		NF					
Northern Saw-whet Owl*				NF	F						
GOATSUCKERS											
Common Nighthawk									F	N	NF
Chuck-will's-widow			NF								
Whip-poor-will		NF	NF								
SWIFTS											
Chimney Swift									F		NF
HUMMINGBIRDS											
Ruby-throated Hummingbird		NF	NF		F	NF					NF
KINGFISHERS											
Belted Kingfisher							NF				
WOODPECKERS											
Red-headed Woodpecker		NF	NF								
Red-bellied Woodpecker	NF	NF	NF								NF
Yellow-bellied Sapsucker*	NF			NF							
Downy Woodpecker	NF	NF	NF			NF					NF
Hairy Woodpecker	NF	NF		NF							
Northern Flicker		NF	NF	NF		NF					NF
Pileated Woodpecker	NF										
FLYCATCHERS											
Olive-sided Flycatcher*				NF							
Eastern Wood-Pewee	NF	NF	NF			NF					NF
Yellow-bellied Flycatcher*				NF							
Acadian Flycatcher	NF					NF					
Alder Flycatcher*								NF			
Willow Flycatcher					NF			NF			
Least Flycatcher*		NF									NF
Eastern Phoebe		NF	NF			NF					NF
Great-crested Flycatcher		NF	NF								

Key: N=nesting habitat; F=feeding habitat; NF=nesting and feeding habitat; *=typically nests at elevations above 2,000 feet in WV

WV Breeding Bird Species	Closed Canopy Forest	Edges & Gaps	Open Canopy Forest	Coniferous Forest	Shrub and Scrub	Riparian Forest	Riparian	Wetland	Grassland	Cliff	Residential/Town
Eastern Kingbird		NF					NF		F		
SHRIKES											
Loggerhead Shrike					NF				NF		
VIREOS											
White-eyed Vireo		NF			NF	NF					
Blue-headed Vireo*	NF	NF		NF							
Yellow-throated Vireo	NF		NF								
Warbling Vireo		NF				NF					
Red-eyed Vireo	NF	NF	NF			NF					NF
CORVIDS											
Blue Jay	NF	NF	F			NF					NF
American Crow	NF	NF	F	F	F	NF	F		F		NF
Fish Crow		NF					N	F			NF
Common Raven	NF			F	F	F	F	F	F	N	F
LARKS											
Horned Lark									NF		
SWALLOWS											
Purple Martin						NF			F		NF
Tree Swallow		NF				N	F	NF			NF
Northern Rough-winged Swallow							NF	F	F		F
Bank Swallow							N		F		
Cliff Swallow							N		F	N	NF
Barn Swallow								F	F		NF
PARIDS											
Black-capped Chickadee	NF	NF		NF							NF
Carolina Chickadee	NF	NF	NF			NF					NF
Tufted Titmouse	NF	NF	NF			NF					NF
NUTHATCHES											
Red-breasted Nuthatch*	NF			NF							
White-breasted Nuthatch	NF	NF				NF					
CREEPERS											
Brown Creeper	NF			NF							
WRENS											
Carolina Wren		NF	NF		NF	NF					NF
Bewick's Wren		NF			NF						
House Wren		NF	NF		NF	NF					NF
Winter Wren*	NF			NF							
Sedge Wren								NF			
THRUSHES AND KINGLETS											
Golden-crowned Kinglet*	NF			NF							
Blue-gray Gnatcatcher	NF	NF	NF		NF	NF					
Eastern Bluebird		NF			F				NF		NF

Key: N=nesting habitat; F=feeding habitat; NF=nesting and feeding habitat; *=typically nests at elevations above 2,000 feet in WV

WV Breeding Bird Species	Closed Canopy Forest	Edges & Gaps	Open Canopy Forest	Coniferous Forest	Shrub and Scrub	Riparian Forest	Riparian	Wetland	Grassland	Cliff	Residential/Town
Veery*	NF			NF							
Swainson's Thrush*				NF							
Hermit Thrush*	NF	NF	NF	NF							
Wood Thrush	NF	NF	NF			NF					
American Robin		NF	NF			NF			F		NF
MIMICS											
Gray Catbird		NF	NF		NF						NF
Northern Mockingbird		NF			NF				F		NF
Brown Thrasher		NF			NF						
STARLINGS											
European Starling			NF			NF			F		NF
WAXWINGS											
Cedar Waxwing		NF			NF	NF					NF
WARBLERS											
Blue-winged Warbler		NF			NF						
Golden-winged Warbler		NF			NF						
Nashville Warbler*			NF	NF	NF			NF			
Northern Parula	NF		NF			NF					
Yellow Warbler		NF	NF		NF	NF			NF		
Chestnut-sided Warbler*		NF	NF		NF						
Magnolia Warbler*			NF	NF	NF						
Black-throated Blue Warbler*	NF	NF		NF							
Yellow-rumped Warbler*			NF	NF	NF						
Black-throated Green Warbler	NF			NF							
Blackburnian Warbler*	NF			NF							
Yellow-throated Warbler						NF					
Pine Warbler			NF	NF							
Prairie Warbler			NF		NF						
Cerulean Warbler	NF	NF	NF								
Black-and-white Warbler	NF	F	NF								
American Redstart		NF	NF								
Prothonotary Warbler						NF					
Worm-eating Warbler	NF										
Swainson's Warbler	NF	NF									
Ovenbird	NF		NF								
Northern Waterthrush*							NF	NF			
Louisiana Waterthrush						NF					
Kentucky Warbler	NF	NF	NF								
Mourning Warbler*		NF		NF	NF						
Common Yellowthroat		NF			NF	NF		NF			
Hooded Warbler		NF	NF								

Key: N=nesting habitat; F=feeding habitat; NF=nesting and feeding habitat; *=typically nests at elevations above 2,000 feet in WV

WV Breeding Bird Species	Closed Canopy Forest	Edges & Gaps	Open Canopy Forest	Coniferous Forest	Shrub and Scrub	Riparian Forest	Riparian	Wetland	Grassland	Cliff	Residential/Town
Canada Warbler*		NF	NF	NF							
Yellow-breasted Chat		NF			NF						
TANAGERS											
Summer Tanager	NF		NF			NF					
Scarlet Tanager	NF		F								
SPARROWS											
Dickcissel									NF		
Eastern Towhee		NF	NF		NF						NF
Bachman's Sparrow			NF								
Chipping Sparrow		NF	NF								NF
Field Sparrow					NF				NF		
Vesper Sparrow									NF		
Lark Sparrow									NF		
Savannah Sparrow									NF		
Grasshopper Sparrow									NF		
Henslow's Sparrow									NF		
Song Sparrow		NF			NF						NF
Swamp Sparrow								NF			
White-throated Sparrow*				NF	NF						
Dark-eyed Junco*		NF	NF		NF						NF
GROSBEAKS/BUNTINGS											
Northern Cardinal		NF	NF		NF	NF					NF
Rose-breasted Grosbeak		NF	NF								
Blue Grosbeak		NF			NF	NF					
Indigo Bunting		NF			NF						
BLACKBIRDS											
Bobolink									NF		
Red-winged Blackbird								NF	NF		NF
Eastern Meadowlark									NF		
Common Grackle		NF									NF
Brown-headed Cowbird			NF			NF			NF		
Orchard Oriole			NF			NF					NF
Baltimore Oriole			NF			NF					NF
FINCHES											
Purple Finch*		NF		NF							
House Finch											NF
Pine Siskin*				NF							
American Goldfinch		NF			NF				F		NF
House Sparrow											NF

Key: N=nesting habitat; F=feeding habitat; NF=nesting and feeding habitat; *=typically nests at elevations above 2,000 feet in WV

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