Concept 1

Habitat Requirements

Wildlife have life requirements that must be supplied by the habitat to insure their well being. These are known as "habitat requirements." The four basic habitat requirements are food, water, space and cover or shelter. Each species has its own set of specific requirements. For example, the gray squirrel uses acorns for food, while the woodpecker eats insects. Mallards use thick grass and forb cover for nesting, while thrashers nest in shrubs. Habitat requirements for wildlife change during the seasons of the year. The food they eat in the winter may be much different than what is eaten in the summer. The cover they need for nesting may be much different than the cover needed to survive a winter storm.

Concept 2

Featured Species

There are two basic goals in wildlife habitat management. One is to provide the best habitat possible for specific featured wildlife species. The other, which is explained later in this handbook under the concept Species Richness, is to provide habitat for as many different wildlife species as possible in an area.

When evaluating habitat for featured species, one must first decide which species are to be favored. This can be done in several ways. Landowners may have certain objectives for specific species, or the general public may have concerns about particular game or endangered species. Once the species are selected, identify the habitat requirements for each species and evaluate the capability of the environment to provide the requirements. If the area is unable to supply or only partially provides the necessary habitat requirements, management practices may be used to improve the area's ability to supply needed requirements.

It is usually best to select management practices that provide the requirements that are in the shortest supply. For instance, if a species requires trees for cover with water nearby, and the habitat you are evaluating has plenty of trees but no water, a management practice that supplies water will improve the habitat more effectively than planting trees.

When determining which management practices to apply, remember, management practices that improve habitat for some wildlife species may be detrimental to other wildlife species. It is impossible to manage habitat for any one species without influencing other species in some manner.

Concept 3

Plant Succession and Its Effect on Wildlife

Vegetation and water are the basis of habitat management. Every acre of soil and water has a definite sequence in plant cover that occurs over time. The different stages of this sequence are called successional stages. We can usually predict the type of vegetation that will occur in each stage until a final or "climax" stage is reached. When not disturbed, the climax vegetation is stable and will remain the same for long periods of time. If humans or nature disturbs the soil or water level, succession may be set back and the cycle will continue forward from the new starting point.

In this handbook areas in different stages of plant succession are often referred to as areas with different vegetation types or habitat types. In general, the stages of plant succession that occur on land are as follows:

1. **Bare ground;**
2. **Annual forbs and/or grasses;**
3. **Perennial forbs and grasses;**
4. **Shrubs;**
5. **Young woodland or trees;**
6. **Mature woodland or trees.**

In some regions, natural factors such as the soil or the climate will prevent succession from proceeding past a certain stage. For instance, in the Great Plains Grassland Region, lack of precipitation often prevents succession from proceeding past stage 3. In this case, stage 3 would be considered the climax stage.

Descriptions of typical successional stages found in different regions of the United States can be found in the *Regions* section of this handbook. A description of the typical successional stages occurring in relation to water can be found in the Wetland Region description. The stages of plant succession are illustrated below.

A single step in this succession may take weeks, months, years, or even centuries depending on a variety of natural and human-caused factors. If vegetation is disturbed, succession will revert to an earlier stage and begin again. Disturbance can be caused by natural factors such as insect or disease outbreaks, tornadoes, hurricanes, avalanches, or naturally occurring fires.

However, succession is more frequently altered by humans through plowing (agriculture), burning, cutting of forests, grazing, and clearing shrubby areas, which may in many cases mimic natural disturbances.

Nature never gives up. Even abandoned, concrete parking lots are eventually taken over by plants. Plants first grow in the cracks and around the edges, then if left alone, a concrete parking lot will eventually become "habitat" for some wildlife species.

Concept 4

Vertical Structure (Layering)

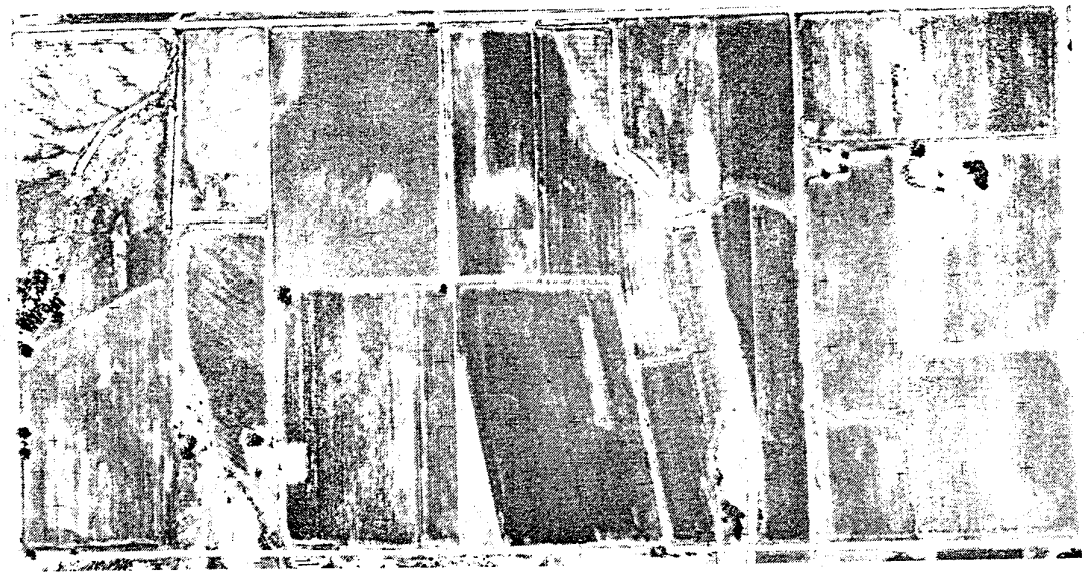
Vegetation can be classified by how it grows. Grasses and forbs generally grow close to the ground and make up the ground layer. The next highest level is usually comprised of shrubs and is called the shrub layer. The tallest stratum is made by trees and is called the tree canopy.

How different layers of vegetation are arranged in relation to each other is important to many wildlife species. For instance, some species may require a herbaceous layer for food but also need a tree canopy for cover. Not all areas in a single stage of succession are alike. One woodland in stage 6 of succession may have a variety of layers comprised of grasses, forbs, shrubs, and trees, while another stage 6 woodland may have only one distinct layer of tall trees.

Concept 5

Arrangement and Interspersion

How different successional stages or vegetation types are situated in relation to each other is often referred to as horizontal arrangement. Many wildlife species need more than one successional stage to provide all their habitat requirements. To be of value, the different successional stages must be close to each other to allow safe travel for wildlife. Some species obtain all their habitat requirements from only one successional stage. Mixing plots of different successional stages within an area is called "interspersion." Usually, more interspersion supports a greater variety of wildlife. A way to measure interspersion is explained on page 66 .



Area with low interspersion

Area with high interspersion

Concept 6

Edges and Contrast

The boundary where two or more different types of vegetation or successional stages meet is called "edge." Sometimes there is an abrupt change where one type of vegetation stops and another begins (see figure 1). Or it can be less distinct with a gradual transition from one stage to another (see figure 2). In places where a gradual change occurs, an edge looks a little like both successional stages or vegetation types. Where abrupt changes occur the edge is narrow. Edges attract many different wildlife species because the variety of food, cover, and other habitat requirements are arranged close together.

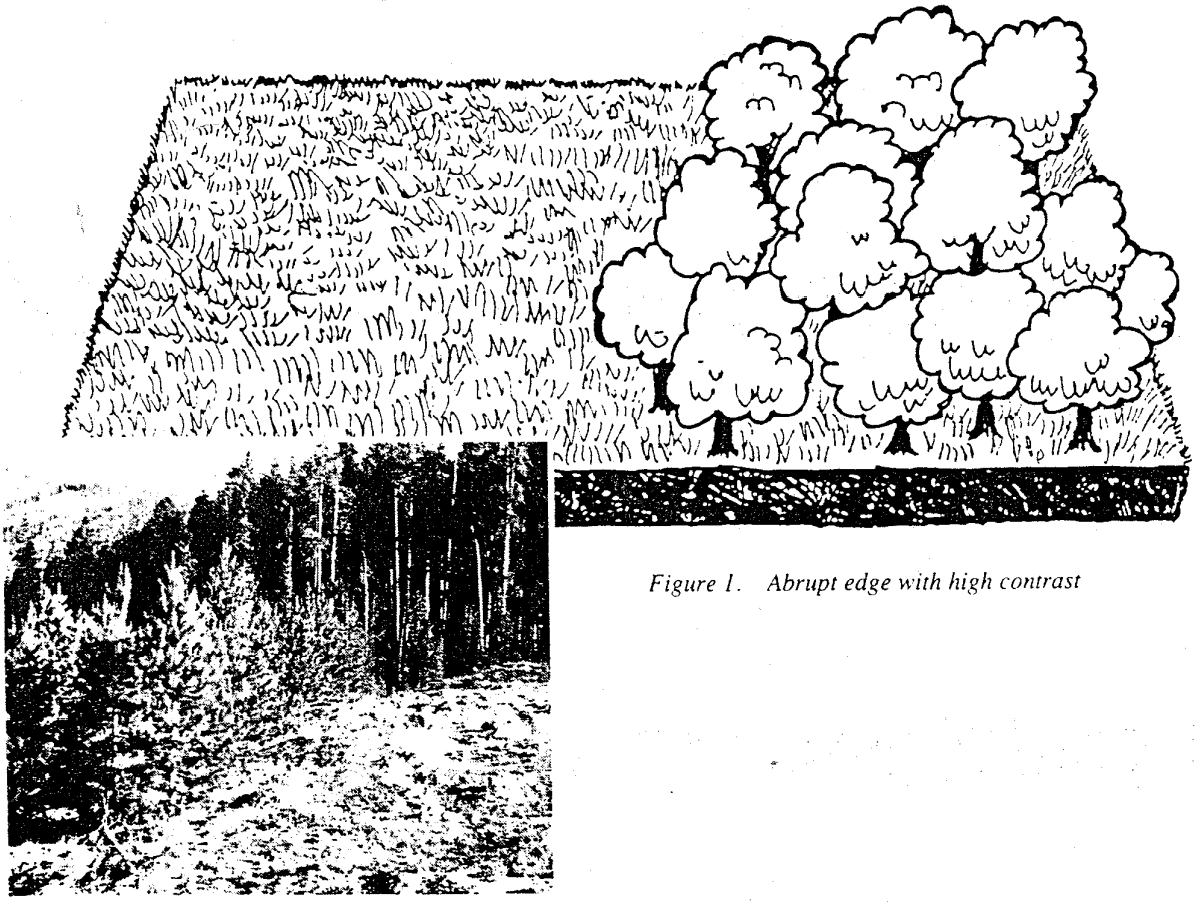


Figure 1. Abrupt edge with high contrast

Edges produced when successional stages have extremely different types of vegetation are defined as having high contrast. There is high contrast where an area in stage 2 (grass and forbs) meets an area in stage 6 (tall trees) of plant succession. A boundary between stages 2 and 3 has low contrast. Generally edges with high contrast have more species of wildlife than edges with low contrast.

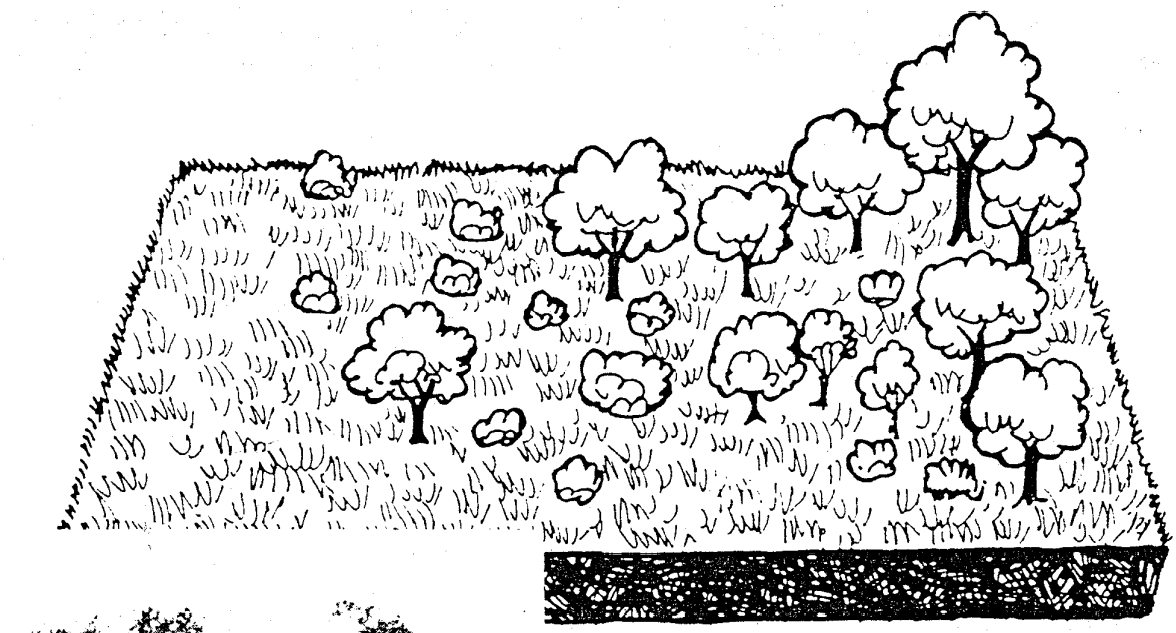


Figure 2. Gradual edge with low contrast

Concept 7

Amount of Edge and Size of Areas In One Successional Stage

Edge is not beneficial for all wildlife. Some wildlife species need unbroken areas in a certain successional stage to provide some or all of their habitat requirements. A balance of edge with blocks of vegetation in one successional stage is desirable. Areas with unbroken blocks that are 10 to 40 acres in size are considered to have a good balance of edge and unbroken blocks. In large forests, blocks of up to 100 acres may be desirable.

Concept 8

Corridors

"Corridors" are areas of continuous habitat that permit animals to travel securely from one habitat to another. As environments become more broken up (fragmented) from construction of roads, parking lots, urban areas, harvest of timber, clearing for agriculture, etc., small islands of vegetation remain.

Corridors allow animals to find and use the islands of suitable habitat. For example, in an urban area, relatively unbroken corridors found along riparian areas and ravines allow wildlife to move into parks, and other suitable habitats. Preservation, maintenance, and creation of unbroken corridors are very important in wildlife habitat management.

Concept 9

Species Richness

"Species richness" is defined as the number of different kinds of wildlife species that are found in an area. As discussed earlier, one goal in wildlife habitat management may be to provide habitat for as many species as possible.

Lands that are high in species richness usually have many of the following characteristics:

1. **A mixture of areas in different successional stages;**
2. **A balance of edges with unbroken blocks of vegetation in one successional stage;**
3. **Unbroken block sizes of 10 to 40 acres;**
4. **Edges with high contrast;**
5. **A wide variety of vegetation layers present within each area containing only one successional stage.**

These characteristics can be used to estimate the relative number of different wildlife species that may be present in separate areas. They also may be used to identify management practices that could increase species richness. For example, consider an area that is in stage 6 of plant succession. It has been proposed to harvest the trees by clear-cutting 1/2 of the area. Clear-cuts in 40-acre blocks that leave adjacent unharvested blocks 40 acres in size would be desirable. Strips or corridors of trees that link the larger unharvested blocks together could be left uncut (see Concept 5 - Corridors).

Remember, when managing habitat for species richness, it is often not possible to provide the best habitat for featured species. Instead of providing the best habitat possible for a few species, the goal is to provide some habitat for as many species as possible.

Concept 10

Migration

Some wildlife travel during different seasons of the year and times of day. This requires that necessary habitats are available along the route. The movements are called "migration." Migration distances may be short or very long depending on the species. For many species, corridors that provide areas for safe travel are very important during migration.

Here are two examples:

1. Deep snow covers the vegetation used for food by mule deer and wapiti (elk) during the winter in the Subalpine Zone. To find food they travel to lower elevations (Intermountain Foothills or Intermountain Sagebrush Regions) where the snow is not as deep.

2. Ducks that nest in the northern United States must fly south to warmer climates to find food sources and wetlands that are not frozen during winter.

Concept 11

Carrying Capacity

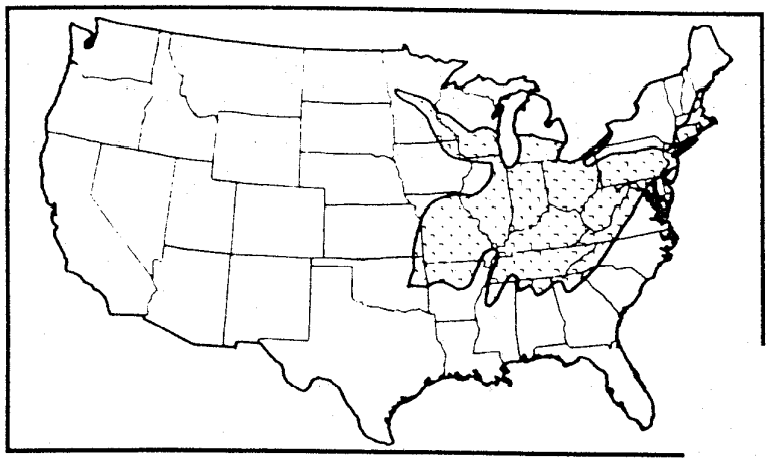
There is a limit to how many animals can live in a habitat. That limit is called the habitat's "carrying capacity." The quantity and quality of food, water, cover, and space determines the carrying capacity. If one basic requirement is in short supply the carrying capacity is lowered. By adding the missing ingredient, a manager can increase the habitat's carrying capacity.

Carrying capacity varies from year to year and from season to season. It is usually greatest from late spring through fall. This is when most young are born and grow. With the coming of winter or summer drought, food and cover gradually diminish as does the habitat's carrying capacity.

More animals are produced each year than will survive to the next. When this happens, all extra or surplus animals will be lost in an existing habitat. Young wildlife and animals in poor health experience the highest death rates. The obvious way to increase the number of animals is to increase the number born and reduce the number that die. However, if the habitat cannot support any more animals, these efforts will fail.

A long-term increase in population can only be accomplished by increasing the habitat's carrying capacity.

Eastern Deciduous Forest



Physical Description:

Most of the terrain is rolling except for the Appalachian Mountains which are steep. The average annual precipitation ranges from 35 to 60 inches and is well distributed throughout the year. Summers are hot and dry. Winters are cold.

Dominant Vegetation:

The final stage of succession is dominated by tall broadleaf trees. Depending on the geographic location, trees such as oaks, beech, basswood, buckeye, hickory, walnut, maple, and birch can be indicators of climax vegetation.

There are many lower canopy trees and deciduous shrubs that are important including American hornbeam, hophornbeam, sassafras, eastern redbud, flowering dogwood, and striped maple.

Common shrubs are pawpaw, spicebush, arrow-wood, black huckleberry, blueberry, hawthorn, witch-hazel, and viburnums. A wide variety of forbs are also found on the forest floor. Grasses and annual forbs are mostly limited to areas recently disturbed.

Farming and Ranching:

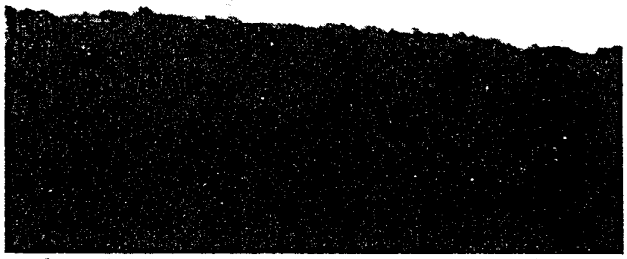
Large areas of this region have been cleared of the native vegetation for the production of crops and livestock forage.

In many areas, only steep slopes, frequent floods, or water associated with rivers and swamps have prevented the total clearing of forests.

Depending on how croplands are managed, some species of wildlife benefit from farming, especially if trees and shrubs are nearby.

Plant Succession Stages:

Stage 1 — bare ground; Stage 2 — annual forbs and grasses; Stage 3 — perennial forbs and grasses; Stage 4 — shrubs; Stage 5 — young woodland; Stage 6 — woodland.



Species Recommended for Judging:

American kestrel
Brown thrasher
Eastern bluebird
Eastern cottontail
Eastern gray squirrel
Hairy woodpecker
Mourning dove
Northern bobwhite
Ovenbird
Raccoon
Ruffed grouse
Turkey
White-tailed deer
Wood duck
Bluegill
Largemouth bass

Eastern Deciduous Forest

	American Kestrel	Brown Thrasher	Eastern Bluebird	Eastern Cottontail	Eastern Gray Squirrel	Hairy Woodpecker	Mourning Dove	Northern Bobwhite	Ovenbird	Raccoon	Ruffed Grouse	Turkey	White-tailed Deer	Wood Duck	Bluegill	Largemouth Bass
2. Brush chopping (mowing)	X	X	X	X			X	X		X		X	X			
3. Brush piles				X				X								
5. Controlled (prescribed) burning	X	X	X	X			X	X		X	X	X	X			
4. Disking							X	X				X				
6 Grain, leave unharvested					X		X	X		X		X	X			
7. Harvest less				X	X		X	X		X	X	X	X	X	X	X
8. Harvest more				X	X		X	X		X	X	X	X	X	X	X
10. Lime ponds and fields				X			X	X		X		X	X		X	X
11. Livestock grazing management	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
12. Nesting boxes/structures/platform	X		X		X		X							X		
13. Plant food plots				X			X	X		X		X	X			
14. Plant grass and legumes												X	X			
15. Plant mast trees					X							X	X	X		
16. Plant trees or shrubs	X	X	X	X	X	X		X	X	X		X	X	X		
17. Ponds/lakes artificial reefs															X	X
18. Ponds, clear muddy water															X	X
19. Pond construction							X			X				X	X	X
20. Small dikes for temporary flooding														X		
21. Ponds, deepen edges															X	X
22. Ponds, determine balance															X	X
23. Ponds, diversion ditches															X	X
24. Ponds, fertilize															X	X
25. Ponds, remove trees near dike							X			X				X	X	X
26. Ponds, repair spillway							X			X				X	X	X
27. Ponds, reseed watershed/filter strip															X	X
28. Ponds, restock															X	X
29. Ponds, stop leaks							X			X				X	X	X
30. Ponds/wetlands, shallow water										X				X		
31. Tillage, eliminate in fall					X		X	X				X				
32. Timber harvest, clear-cut	X	X	X	X			X	X		X	X	X	X			
33. Timber harvest, selective-cut		X			X			X	X	X	X	X	X	X		
34. Water control structures										X				X	X	X

Harvest Less (#7) and Harvest More (#8) are not a part of the WV Contest due to time constraints necessary to collect field data.

Wild Turkey

General Habitat Preference:

One-half to 3/4 of range in stages 5 and 6 of plant succession interspersed with areas in stages 3 and 4 of plant succession.

Habitat Requirements:

Food: Forage mostly on the ground for herbaceous plant seeds, nuts, acorns, and insects. Will use waste grain from croplands if adjacent to woodlands.

- Brush chop or disk small areas to maintain some stage 3 or 4 vegetation.
- Control (prescribed) burn every 3 to 5 years in stage 4 and 5 vegetation in eastern and southern United States.
- Clear-cut small areas (40 acres maximum, 10 to 20 acres preferred) in large expanses of stage 5 and 6 woodland.
- Selective-cut forests in large areas of stage 6 woodland.
- Plant several perennial food plots and small (1 to 10 acre) fields to grasses and legumes in large expanses of stages 4, 5, or 6 vegetation, and in any other areas where food is limited.
- Plant mast trees.
- Eliminate fall tillage of grain crops, especially adjacent to woodlands.
- Leave small areas of grain crops unharvested.
- Plant annual food plots near woodlands.
- Livestock grazing management should leave some forbs and grasses available for food. This is especially important in riparian areas and may include the development of livestock watering facilities on adjacent uplands to discourage congregation in and overuse of these areas.

Cover: Nest is shallow depression on ground lined with leaves and grass that is well concealed in thick shrubs or woodlands. Usually nest within 1/4 mile of available water. Roost in trees or tall shrubs at night.

- In some areas will use artificial roost structures.
- Maintain a significant component of vegetation in stages 5 and 6 of succession, especially near streams.
- Plant trees and shrubs where cover is sparse.
- Livestock grazing management should leave thick herbaceous cover for nesting. Spring grazing can be detrimental to nesting habitat, especially in riparian areas.

Water: Require water frequently. Usually will not travel over 1/4 to 1/2 mile for water.

- Where water is limited or absent, development of water sources is desirable.

  Catchment ponds

  Guzzlers

  Spring developments

  Windmills

Wood Duck

General Habitat Preference:

Stage 5 woodlands flooded with water, and open water adjacent to stage 5 and 6 woodlands. Or, stage 3 and 4 wetlands dominated by trees adjacent to stage 2 wetlands.

Habitat Requirements:

Food: Fruits and nuts of woody plants, some grain, seeds of water lily and other aquatic plants, and some insects. Insects are used by young wood ducks.

- During late fall and winter, temporarily flood stage 5 deciduous woodland with mast trees, such as oak, and grain crops. Natural flooding may occur, or small dikes and water control structures may be used.
- Leave small areas of cropland that are near wetlands and open water unharvested.
- Plant mast trees adjacent to wetlands or in areas that can be temporarily flooded.
- Selective cutting of woodlands that can be flooded is desirable to improve mast production.
- Construct ponds and/or wetlands and provide shallow water areas where aquatic emergent vegetation can grow.

Cover: Nest in cavities in trees of flooded woodlands or adjacent to water. Use stage 2 and 3 wetlands with an abundance of aquatic vegetation to raise young.

- Nest boxes can be provided if adequate nest sites are limited.
- Plant trees for future nesting sites.
- Construct ponds and wetlands. Provide shallow water areas where aquatic emergent vegetation can grow.
- Control water level to provide open shallow water areas (stage 2 wetlands) adjacent to areas dominated by emergent aquatic (stage 3 wetlands) vegetation.

Water: Require water as described above.

Mammals

Beaver

General Habitat Preference:

Riparian areas in stages 4 and 5 of plant succession, and wetlands that have permanent water with a variety of shrubs and trees adjacent to the water.

In some areas beaver are a nuisance. They can cut down trees that people want to save, and they can dam up ditches and streams in undesirable places.

Habitat Requirements:

Food: Primarily the bark and wood of shrubs and trees, also some forbs and grasses. Store shrub and tree cuttings in caches (piles of branches) for use during the winter.

- Plant willows, other shrubs and deciduous trees near water that can be used by beaver. If beaver are already in the area, new plantings will need protection or the beaver temporarily removed while plantings become established.
- Livestock grazing should be managed so that shrubs and trees are maintained adjacent to waters that may be used by beavers. This may include developing livestock watering facilities in upland areas to discourage congregation in and overuse of riparian areas.
- Control beaver populations. Harvest more or less. Beaver can become too numerous and eat all available shrubs and trees. To prevent this from happening it may be necessary to periodically remove some beaver.

Cover: Beaver construct lodges from sticks and mud or dig burrows in banks of streams and rivers. Beaver prefer slow-moving or still water with a constant water level. Will build dams from tree branches, shrubs, and mud to form ponds which stabilize water levels, slow water movement and provide shelter beneath the ice in winter.

Protect and maintain beaver dams. When beavers construct dams in places that cause problems for people, removal of the beaver is usually the best solution. If the dam is destroyed and the beaver remain they will usually build the dam again.

Provide dam building material such as precut logs and branches in areas where such materials are scarce.

Water: Water requirements are discussed under cover requirements. Should be of sufficient depth (5 feet) to allow free movement under the ice in winter.

Eastern Cottontail

General Habitat Preference:

Stages 3 and 4 of plant succession. Ideally, habitat components made up of 1/3 grassland, 1/3 cropland, and 1/3 shrub cover all interspersed together. Also use parks, golf courses, and stream corridors in urban areas.

Habitat Requirements:

Food: A variety of forbs and grasses are eaten from spring through fall. In winter often eat bark of shrubs and trees.

- Plant 1/8 to 1/4 acre annual food crops (grain sorghum is good) in areas with too little cropland. One plot per 15 acres maximum.
- Plant 1/8 to 1/4 acre perennial food crops (grass and clover) in areas with too little grassland. Again, 1 plot per 15 acres maximum.
- Brush chopping, chaining, roller beating and controlled (prescribed) burns can be used to maintain or rejuvenate small areas of stage 3 and 4 vegetation. In areas dominated by mesquite, root plowing combined with the seeding of grasses and legumes may be the best way to maintain small areas in stage 3 vegetation.
- Clear-cut small areas (10 acres maximum) in large expanses of stage 5 and 6 woodlands.
- Livestock grazing management should avoid use of food and cover plots, and leave ample amounts of herbaceous vegetation in other areas used by cottontails for food and cover.

Cover: Use thick shrub or herbaceous vegetation for hiding and resting cover.

- Plant shrubs in large areas of stage 2 and 3 of plant succession, or in agricultural areas having few trees or shrubs. Plant along field borders, fence rows, or other idle land areas. This is also appropriate for open areas in urban settings.
- Provide brush piles where additional cover is needed.

Water: Obtain necessary water from diet.

Eastern Fox Squirrel

General Habitat Preference:

Stages 5 and 6 of plant succession with interspersed small openings (stages 2 and 3 of plant succession). Riparian areas are important in the Midwest. They also use urban areas with lots of trees.

Habitat Requirements:

Food: Spend much time foraging on the ground. Feed on a variety of nuts, acorns, seeds, mushrooms, bird eggs, and, in places, corn.

- Selective-cut timber management in large expanses of stage 5 and 6 woodlands. Leave 3 to 4 den trees and several other mature trees per acre.
- Clear-cut small patches (less than 5 acres) in large expanses of stage 6 woodland.
- Brush chopping and controlled (prescribed) burns can be used to maintain small areas in stage 3 and 4 vegetation.
- Plant mast-producing trees along fence rows, adjacent to streams, or in other idle land areas. When possible, locate plantings adjacent to existing croplands.
- Leave some grain unharvested in croplands adjacent to trees.
- Leave some crop residue untilled in the fall, especially near woodlands.
- In urban areas, corn or sunflower seeds can be spread out on ground under trees used by squirrels.

Cover: Nest in cavities in trees or build a nest out of twigs and leaves. Nest is usually placed in the crotch of a tree over 30 feet above the ground. In areas where den sites are scarce, will use nest boxes.

- Need 3 to 4 den trees or suitable nest boxes per acre. Nest boxes are most beneficial in stage 5 woodlands and urban areas lacking den sites.
- Plant trees in large areas of stages 2, 3, and 4 vegetation (irrigate if necessary).
- Manage livestock grazing in riparian areas to maintain large deciduous trees and provide adequate herbaceous vegetation.

Water: In warm seasons need water daily.

- In urban areas provide a pool or pan of water if other sources are not available.

Eastern Gray Squirrel

General Habitat Preference:

Deciduous woodland in stages 5 and 6 of plant succession.

Habitat Requirements:

Food: Spend much time foraging on the ground. Feed on a variety of nuts, grains, acorns, seeds, mushrooms, and buds.

- Leave some grain unharvested (corn preferred) and/or eliminate fall tillage of croplands adjacent to stage 5 and 6 vegetation.
- Selective-cut timber management in large expanses of stage 5 and 6 woodlands. Leave 3 to 4 den trees and several other mature trees per acre.
- Plant mast-producing trees along fence rows, adjacent to streams, or in other idle land areas. When possible, locate plantings adjacent to existing croplands.
- Livestock grazing should be managed to maintain adequate forage on forest floor. Maintain deciduous tree corridors along streams.

Cover: Nest in cavities in trees or build nests out of twigs and leaves. Nest is usually placed in the crotch of a tree over 30 feet above the ground. In areas where den sites are scarce, will use nest boxes.

- Need 3 to 4 den trees or suitable nest boxes per acre. Nest boxes are most beneficial in stage 5 woodlands.

Water: In warm seasons require water daily.

Raccoon

General Habitat Preference:

Most abundant near water, riparian areas and lands adjacent to wetlands. Also found in urban areas. Prefer areas interspersed with different successional stages. Riparian areas in stages 5 and 6 of plant succession are ideal.

Raccoons can become pests in urban areas and in wetlands where waterfowl nesting is important. In such instances, the management objectives may be to make the habitat less suitable for raccoons.

Habitat Requirements:

Food: Eat a wide variety of foods consisting of garbage, birds, eggs, fish, small mammals, insects, crayfish, grains, seeds, fruits, and foods prepared for human and pet consumption.

- Manage livestock grazing to maintain healthy vegetation along the banks and shores of streams, rivers, and other wetlands. In some regions this may include the development of livestock watering facilities in uplands to discourage congregation and overuse of riparian areas.
- Controlled (prescribed) burns and brush chopping can be used to rejuvenate old decadent wetland vegetation. These practices along with chaining and roller beating can be used to revert succession from stages 5 and 6 vegetation to stages 2, 3, and 4.
- Control water levels with water control structures. Provide areas in wetland with water less than 2 feet deep where aquatic emergent vegetation can grow.
- Ponds and wetlands can be constructed with shallow water areas where emergent aquatic vegetation can grow.
- Provide shallow water areas in existing ponds and wetlands where emergent vegetation can grow.
- Leave small areas of grain crops adjacent to woodlands unharvested.
- Plant annual food plots to grains.
- Clear-cut small areas (40 acres maximum, 10 to 20 acres preferred) in large expanses of stage 5 and 6 vegetation.
- Selective-cut timber management.

Cover: Nest and rest during the day in natural tree cavities, dens in the ground, under brush and junk piles, in old abandoned buildings, and rocky cliffs and ledges.

- Plant and maintain large deciduous trees especially in riparian areas and areas adjacent to wetlands.

Water: Require water frequently during warm seasons.

- Build ponds or wetlands.
- Provide pools of water in urban areas.

White-tailed Deer

General Habitat Preference:

Stages 3, 4, and 5 of plant succession all interspersed together.

Habitat Requirements:

Food: A variety of shrubs, forbs, grasses, and waste grain. Acorns and nuts are favorite foods. In the northern parts of its range, conifer trees are used in the winter.

- Clear-cut small areas (40 acres maximum, 10 to 20 acres preferred) in large expanses of stage 5 and 6 woodlands.
- Selective-cut timber management of stage 5 and 6 woodlands.
- Plant several 1 acre perennial food plots of grass and clover in large expanses of stage 5 and 6 woodland.
- Plant annual food plots to grain.
- Plant mast trees.
- Leave small areas of cropland adjacent to woodlands unharvested.
- Eliminate fall tillage of grain crop residue adjacent to woodlands.
- Plant fields to grasses and legumes in large expanses of stage 4, 5, and 6 vegetation.
- Controlled burning at three-year intervals in stage 5 pine woodlands or periodically in stage 3 and 4 vegetation.
- Brush chop small areas to maintain stage 3 and 4 vegetation.
- In areas dominated by mesquite, root plowing combined with the seeding of grasses and legumes may be the best way to maintain small areas in stage 3 vegetation.
- Manage livestock grazing to leave some forbs, grasses, shrubs, and trees available for food and cover. This is particularly important in riparian areas in the Great Plains Grassland Region. May include the development of livestock watering facilities in upland areas to discourage congregation of livestock and overuse in riparian areas.

Cover: Use woodlands and tall shrubs for hiding and travel cover. Also use tall emergent aquatic vegetation for cover in the Great Plains Grassland Region.

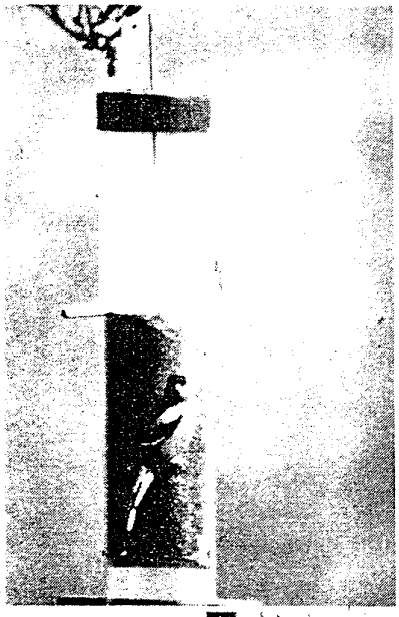
- Construct new wetlands and/or develop shallow water areas in existing ponds and wetlands where large areas of tall emergent aquatic vegetation can grow.
- Control water levels with water control structures, or use small dikes to temporarily flood areas to encourage the growth of tall emergent aquatic vegetation.
- Plant trees and shrubs in ravines, along field borders, and other idle land areas.

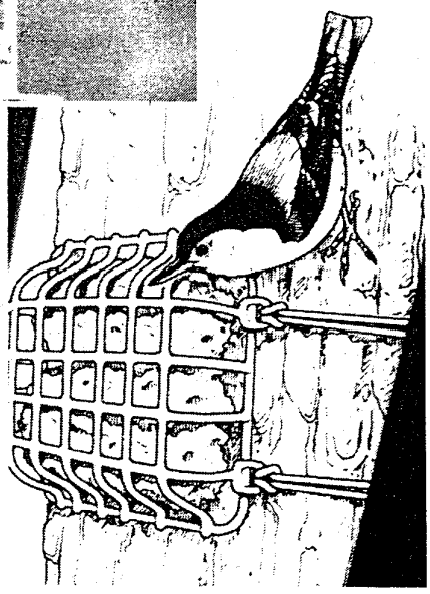
Water: Drink water when it is available, but can go for long periods without it.

1. Artificial Feeders

General Description:

Used primarily to feed wildlife in urban areas. A wide variety of feeder designs, methods, and different foods exist. Sunflower seeds and white proso millet are universal favorites. Some species prefer to eat fat rather than seeds. Some prefer to eat on the ground rather than in a tree or on a balcony. For details on different designs and placement of artificial feeders see Cooperative Extension agent or state wildlife agency.





2. Brush Chopping (Mowing)

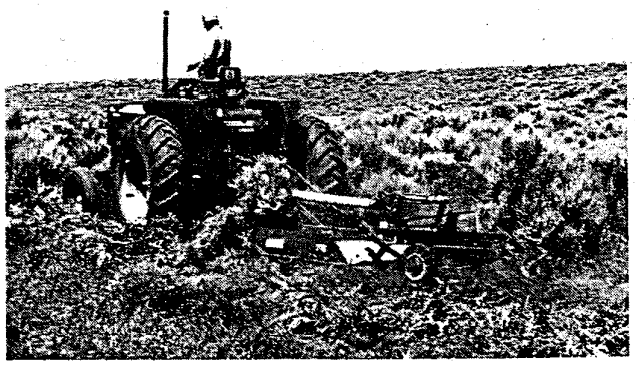
General Description:

Involves mowing dense vegetation (including fairly large shrubs) with a large rotary mower mounted behind a tractor.

Effect on Habitat:

- Helps keep vegetative succession in stage 2.
- Helps keep vegetative succession in stage 3.
- Sometimes reverts succession from stage 4 to stage 3. Helps remove competition with some kinds of shrubs allowing grasses and forbs to grow better.
- Sometimes helps keep vegetative succession in stage 4. Maintains low shrub growth with some kinds of shrubs by encouraging resprouting.
- In stages 2, 3, and 4, helps rejuvenate grasses, forbs, and shrubs which improves quality of future nesting sites.
- In stages 5 and 6, maintains dense low understory in properly thinned woodlands.
- In grass-clover plots, helps keep vegetation low enough for use by some wildlife species such as doves and turkeys.
- In wetlands can be used to increase interspersion by reducing vegetative cover.

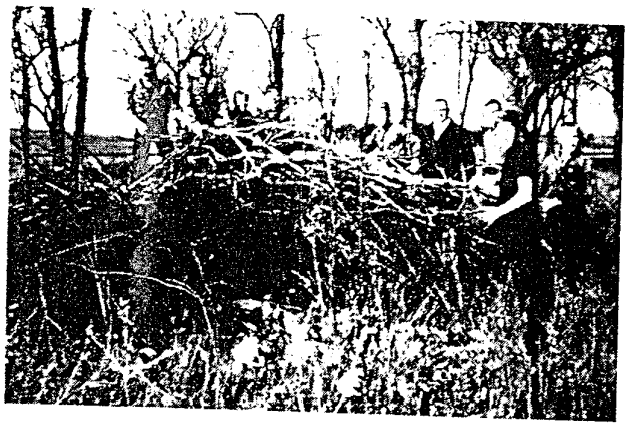
This practice is used in stage 5 and 6 vegetation in the following regions: Eastern Deciduous Forest, Northeast Mixed Forest, Southeast Mixed and Outer Coastal Plain Forest, and Woodland areas found within the Great Plains Grasslands Region.



3. Brush Piles

General Description

Brush piles can be made from saplings or tree branches available from land clearing, timber harvest operations, tree pruning, etc. For best results, piles should be 3 to 5 feet high, 15 feet in diameter and very loose. This will allow grass and forbs to grow in them, creating more food and cover for wildlife.



Effect on Habitat:

- Particularly useful for rabbits and quail in areas with little cover, especially in areas with plenty of food and little cover such as corn, soybean, grain sorghum, and small grain fields.
- Useful at the edge between fields and woodlands.

4. Disking

General Description:

Areas in successional stages 2, 3, and 4 can be disked to promote the growth of annual and perennial forbs and grasses.

Effect on Habitat:

- Keeps vegetative succession in stage 2.
- Promotes the growth of annual forbs that some wildlife prefer for food and cover.
- In stage 3, causes succession to revert to stage 2.
- In stage 4, causes succession to revert to stages 2 or 3.
- Can be used to decrease vegetative cover and increase interspersion in wetlands (during dry periods).

5. Controlled (Prescribed) Burning

General Description:

Burning should be done under cool, moist, low-wind conditions, when danger of wildfire is low. Burn as early in the spring (before April 1 if possible) as conditions permit, so ground nesting wildlife are not disturbed. Do only under close supervision of wildlife, forestry, and/or range professionals that have experience with controlled burns.

Results vary with the type of vegetation being burned, burning conditions, and the frequency of burning.

Some General Effects of Fire Are:

- Some understory shrubs sprout.
- Some shrubs are reduced which improves the vigor and quality of forbs and grasses.
- Releases nutrients in soil.
- Reduces excessive dead vegetation (leaves, old grass, etc.) so seed can reach mineral soil.
- Scarifies (breaks down outside coating) some seeds so they can germinate.
- Rejuvenates grass and herbaceous vegetation making area more productive.

Effect on Habitat:

Annual Burning:

- Stage 2 helps keep vegetative succession in stage 2.
- Stage 3 helps keep vegetative succession in stage 3.
- Stage 4 causes succession to revert to stage 3.
- Stage 5, in pines, keeps understory shrubs thinned out and stimulates grassy-weedy undergrowth if stands are properly thinned.
- Stage 6 is the same as stage 5.

Annual burning in stage 5 and 6 vegetation is a practice used most often in the following regions: Eastern Deciduous Forest, Northeast Mixed Forest, Southeast Mixed and Outer Coastal Plain Forest.

3- to 5-Year Interval Burning:

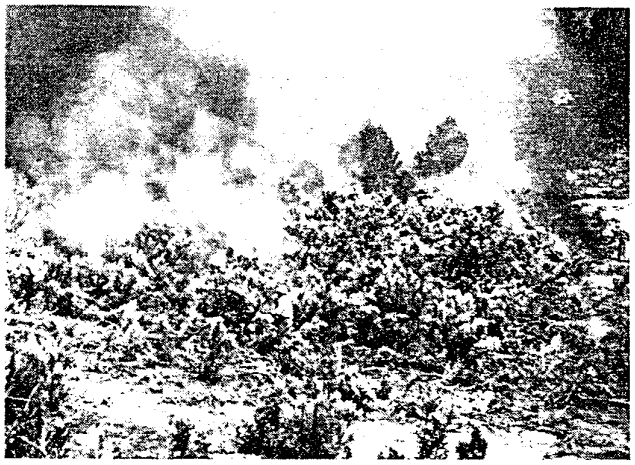
- Stage 2 allows succession to progress, but more slowly than if left alone.
- Stage 3 usually keeps vegetative succession in stage 3.
- Rejuvenates grass and grass-like vegetation in stage 3 and 4 wetlands.
- Periodic burning of vegetation-choked wetlands can improve the water and cover interspersion.
- Stage 4 makes shrub growth more dense due to abundant sprouting of shrubs.
- Stage 5, in pines, stimulates thicker understory shrubs if stands are properly thinned.
- Stage 6 is the same as stage 5.

Three to five-year interval burning in stage 5 and 6 vegetation is a practice used most often in the following regions: Eastern Deciduous Forest, Great Plains Grasslands, Northeast Mixed Forest, Southeast Mixed and Outer Coastal Plain Forest.

15- to 25-Year Interval Burning:

- Maintains vegetative succession in stage 4 in areas dominated by fire-tolerant shrubs, such as Gambel oak, mesquite, manzanita, chamise, serviceberry, and mountain mahogany.
- Rejuvenates old, decadent shrubs stimulating new growth.
- Reverts succession to stages 2 or 3 in areas dominated by fire-intolerant shrubs, such as sagebrush.

Used primarily in stage 4 of plant succession in the following regions: Mediterranean, Woodland, Intermountain Foothills, Intermountain Montane, and Intermountain Sagebrush.



12. *Nesting Boxes Structures/Platforms*

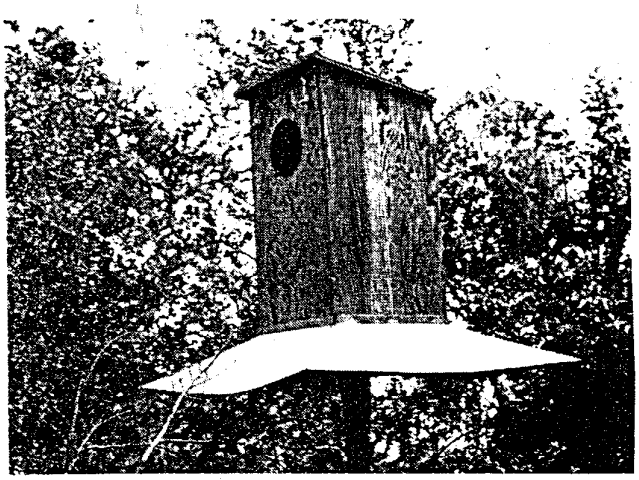
General Description:

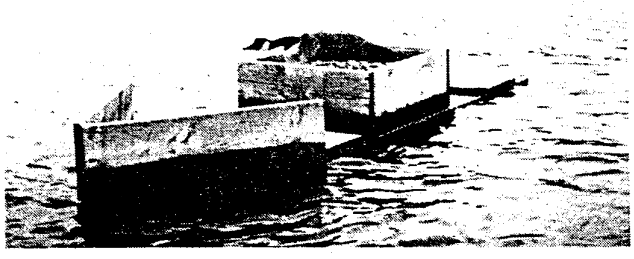
The particular design and placement of nesting structures and boxes often determines which wildlife species will use the structure. *See Cooperative Extension agent or wildlife specialist for specific designs of nest boxes and other artificial nesting structures.*

Boxes: Some species have to nest in cavities that they don't excavate themselves. If natural cavities are not available, artificial cavities (nest boxes) can be used.

Each species needs a certain kind of cavity (diameter of hole, depth, area, etc.) in a certain location (field, woods, water, etc.) and at a certain height (4 feet to 20 feet high).

Platform: Species such as the red-tailed hawk build nests in large trees or other structures above the ground. If nesting sites are scarce, artificial platforms placed on poles above the ground may be used.





Structures: Canada geese and mallards will also use platforms if they are placed near water. In wetlands dominated by open water and lacking islands or peninsulas, floating nest structures are often used by Canada geese and mallards.

Effect on Habitat:

- **In Wooded Areas:** Boxes are especially useful in woodlands in stage 5 succession, or where trees are not old enough to provide cavities.
- **In Open Areas (Stages 2, 3, and 4):** Always useful unless an abundance of nesting cavities or locations already exist, such as hollow fence posts, isolated den or nesting trees, etc.
- **In Wetlands:** Provides secure nesting sites in areas lacking islands, peninsulas, or tall, dense vegetation.

13. *Plant Food Plots (1/8 to 2 Acres)*

General Description:

Strips can be long and narrow (300 to 400 feet long and 15 to 20 feet wide) or square blocks and preferably located at the edge between two or more kinds of habitat (such as between woodland and hayfield). Best if located next to natural cover such as shrubs, etc. Should be planted prior to June 1 (except for grass-clover mixture) to ensure maturity.

Where possible and in regions with heavy and drifting snow, plots should be square (1 acre minimum) and located near cover on the downwind side. Plots should be located such that nearby shrub and tree cover does not encourage snow to drift into them. Must be protected from livestock.

Food plots include the planting and temporary flooding of Japanese millet in wetlands to provide food for waterfowl. Japanese millet plantings are often larger than 2 acres and used most often in the warmer regions of the United States.

Effect on Habitat:

- **Annual Food Plots - Usually Grains:** Useful in areas of natural plant succession where row-cropping (corn, soybeans, grain sorghum, small grains, etc.) is scarce. One small (1/8 to 1/4) acre plot per 15 acres or large (1 to 2 acres) plot per 60 acres.
- Provides food for many species of wildlife.
- **Perennials - Usually Grasses and Clover or Other Forbs:** Useful in areas of row-crop farming (corn, soybeans, grain sorghum, small grains, etc.) especially where shrub field borders are scarce. Useful in most areas with absence of stage 3 succession.
- Provides both food and cover for many species of wildlife.

14. Plant Grass and Legumes

General Description:

Plant large fields of grasses and legumes. Field size between 2 and 40 acres.

Effect on Habitat:

- Smaller fields are useful for wildlife in wooded areas with little acreage in stages 2 and 3.
- Larger fields are useful in areas with little acreage in hayfields, pastures, or small grains that are used by some wildlife species for winter survival, nesting, or roosting cover.
- These fields will be used for food as well as cover by many species.
- To increase the value for wildlife, these plantings should be grazed, burned, or mowed occasionally (once every 3 to 5 years) to prevent deterioration of the vegetation.

See Cooperative Extension agent for planting recommendations.

15. Plant Mast Trees

General Description:

Mast means seed or fruit which provides food for wildlife. For the purpose of this handbook, mast trees are defined as those trees which produce an annual crop of acorns or other nuts. Mast trees such as sawtooth oak produce an abundance of mast and they may be a desirable supplement to plant for wildlife. Plant mast trees in early spring when they are still dormant.

For specifics about what, when and how to plant, see your local Cooperative Extension agent or Soil Conservation Service office.

Effect on Habitat:

- Especially useful for deer, squirrels, turkeys, and wood ducks in areas with little available mast, such as large expanses of farmland, pine woodland, field borders, urban areas, etc.

16. Plant Trees or Shrubs

General Description:

When properly located, shrubs and trees can benefit many species of wildlife.

Fruiting shrubs and small evergreen trees are especially good for urban areas, fencerows, hedgerows, odd-areas, property boundary markers, and other idle land plantings. It may also be desirable to plant large trees and willows in some areas.

In dry regions, irrigation or water harvesting is often needed to grow shrubs and trees.

In large open areas, multi-row plantings of at least 15 rows of trees and shrubs are beneficial, especially if planted adjacent to tall herbaceous cover or a good food source. It is best to plant shrubs and trees in the early spring when they are still dormant.

For specific information on when, how, and what to plant, see your local Cooperative Extension agent or Soil Conservation Service office.

Effect on Habitat:

- Useful along fences in areas where field borders (such as fencerows) are scarce.
- They are especially useful to make travel lanes for wildlife to move safely across open fields between two areas of cover.
- Also useful along the edges between fields and woodlands, around farm homesteads, and urban areas.
- Can be a valuable practice used to restore and improve riparian areas.

31. *Tillage, Eliminate in Fall*

General Description:

When tillage is necessary, inversion tillage (soil is turned over and covers up crop residue) such as mold board or disc plowing should be avoided. Tillage implements such as chisel plows and rod weeders can be used to do tillage operations without turning the soil over.

Effect on Habitat:

- Provides waste grain as a food source used by many species of wildlife.

32. *Timber Harvest, Clear-cut*

General Description:

A type of timber management where all trees are harvested at the same time on a tract of land. Different tracts are cut each year and rotated over an area like a checker-board.

In general, tracts should not be over 40 acres in size, and often tracts as small as 10 to 20 acres are preferred. They should be long and narrow with irregular shapes. The increased sprouting of shrubs, grasses, and forbs that result from sunlight reaching the forest floor is beneficial to several wildlife species. Many wildlife species also prefer the edge between forest and openings created by such cuts.

This practice can be harmful to wildlife species that need woodlands to supply all of their welfare requirements such as red squirrels, woodpeckers, etc. But again, if harvested tracts are not too large and there are sufficient amounts of surrounding forest, these species should remain.

Effect on Habitat:

- Useful in large forested areas with very little acreage in stages 2, 3, and 4, of succession. Reverts stages 5 and 6 to 2, 3, and 4, with more emphasis on stage 4.
- At least 3 to 4 den and/or large mature trees per acre should be left in areas protected from wind which could topple trees.

33. Timber Harvest, Selective Cut

General Description:

Also called "all-aged management." Only selected trees are cut, a few at a time. Stands managed this way have trees of all ages.

This benefits many different species of wildlife. Animals preferring stages 2, 3, and 4 of succession benefit from the sprouting of shrubs, grasses, and forbs where individual trees were cut, yet mature trees are also present for species which prefer stages 5 and 6.

Effect on Habitat:

- Stimulates shrub, grass, and forb understory production in woodlands due to removal of large tree crowns which would otherwise cause shading.
- Also stimulates growth of mast-producing and other surrounding trees.
- At least 3 to 4 den, old mature, and large dead (snags) trees per acre should be maintained.

34. Water Control Structures

General Description:

Various structures made out of concrete, pipes, wood, etc., are useful to control the water level in wetlands and ponds.

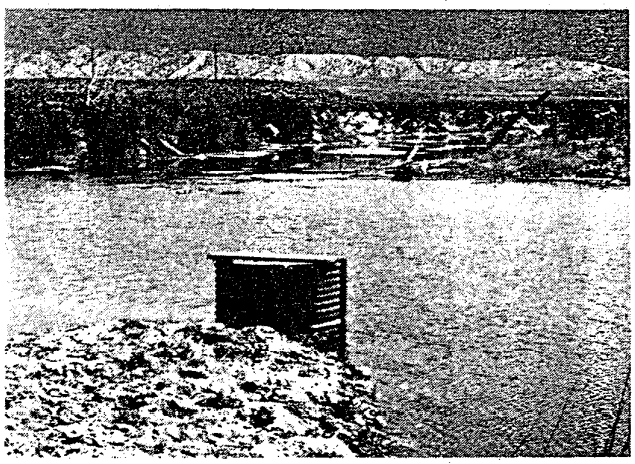
They usually are combined with dams and shallow dikes for water control.

Recommend only when inadequate structures are present on an existing dam or dike.

For specific designs on such structures see the local Soil Conservation Service office.

Effect on Habitat:

- Allows management of water levels to increase or decrease the amount of aquatic vegetation. Useful for creating a desirable mix (interspersion) of open water and aquatic vegetation.
- Can be used to manage the quality of water in the pond or wetland and for control of unwanted fish.



Wildlife Foods

(table 1)

Foods \ Wildlife	Bass	Bats	**Beaver**	Bluebirds	Bluegill	Butterflies	**Deer**	Doves	Ducks	Foxes	**Frogs**	Grouse	Hawks	Lizards	**Marten**	Mink	Moles	Otter
Aquatic Plants			X						X									
Bark			X				X											
Birds										X			X	X	X	X		X
Buds							X					X						
Carrion										X								
Centipedes and Millipedes																		
Crayfish	X								X		X		X			X		X
Earthworms	X				X				X		X						X	
Eggs														X				
Ferns							X											
Fish	X								X						X	X		X
Forbs (greens)			X				X					X						
Frogs and Salamanders	X								X		X		X		X			X
Fruit				X			X			X					X			
Grain							X	X	X									
Grass							X											
Insects	X	X		X	X				X	X	X	X	X	X	X	X	X	
Leaves and Twigs			X				X					X						
Lichens							X											
Lizards													X	X				
Mammals (small)	X									X			X	X	X	X		X
Mushrooms							X											
Mussels																		X
Nectar from flowers						X												
Nuts (including acorns)							X			X								
Scorpions															X			
Seeds				X					X	X			X					
Snails										X		X			X			X
Snakes	X											X		X	X			
Spiders	X					X						X			X			
Tubers																		
Turtles	X											X						

Wildlife Foods

(table 1 continued)

Foods \ Wildlife	Owls	Pronghorn	**Quail**	Rabbits	Salamanders	Shrews	**Snakes**	Sparrows	Squirrels	Thrashers	**Trout**	Turkeys	Turtles	Wapiti (Elk)	**Warblers**	Woodpeckers	Wrens
Aquatic Plants													X				
Bark				X										X			
Birds	X						X										
Buds		X		X				X	X			X		X			
Carrion													X				
Centipedes and Millipedes					X							X					
Crayfish											X		X				
Earthworms					X	X	X				X						
Eggs							X										
Ferns																	
Fish							X				X		X				
Forbs (greens)		X	X	X				X				X	X	X			
Frogs and Salamanders						X	X									X	
Fruit			X	X				X	X	X		X	X			X	
Grain		X	X	X					X			X				X	
Grass		X		X								X		X			
Insects	X		X		X	X	X	X		X	X	X	X		X	X	X
Leaves and Twigs		X		X										X			
Lichens																	
Lizards																X	
Mammals (small)	X						X										
Mushrooms									X				X	X			
Mussels													X				
Nectar from flowers																	
Nuts (including acorns)			X						X			X				X	
Scorpions																	
Seeds		X	X					X	X	X		X				X	
Snails					X	X					X	X					
Snakes	X						X										
Spiders			X					X		X	X	X	X		X	X	X
Tubers												X					
Turtles							X										