Wildlife Management Practices (WMPs)

In this section, various practices used to manage habitat are described in further detail. They are listed in alphabetical order. The descriptions are brief and general and are not meant to be comprehensive.

Identify and learn the practices that are recommended for the species listed in the Regions section(Section B). Study only the appropriate practices that are listed on the chart found for the region that you are studying. It is always wise to learn as much as possible about any practice before implementing it. Additional reading, research, and guidance from other wildlife resources and wildlife management professionals is suggested.

Some of the practices may seem contradictory. For example, Practice 13 - Ponds, Deepen Edges discourages the growth of emergent aquatic vegetation, while Practice 25 - Water Level Manipulation Techniques encourages growth. **Landowner objectives will determine which practices you recommend.** Note that some practices may not be applied in all regions, even though you may be dealing with the same species. For example, Forest Management is not appropriate for Mourning dove in the shortgrass prairie, but it is in other regions. **Remember, when assessing whether or not to recommend a wildlife management practice, you must determine if it needs to be applied within the next year.**

At times, the best habitat management is maintaining an area in its current condition. This can include protecting the area from development and applying various management practices that will help maintain the area in the desired condition.

In this handbook, costs and budgets are not considered when recommending practices. However, in actual situations, wildlife managers must consider economics when planning and recommending management practices.

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Urban Wildlife Management Practices

1. Decrease Harvest

Note: The wildlife specialist will provide clues as to whether or not this practice is necessary.

General Description:

Bass:
Needed when seine samples and fishing records of the pond reveal these situations:

- No recent bluegill hatch.
- Many medium-sized bluegill in poor condition.
- Bass are few in number but large and in good condition.

Bluegill:
Needed when seine samples and fishing records of pond reveal these situations:

- Many recently hatched bluegill.
- Very few medium-sized bluegill.
- Bass less than one pound and in condition.
- No young bass.

Trout:
Needed when seine and fishing records reveal these situations:

- Fish in good condition.
- Few medium and large sized fish.
- Many small fish.

Game birds and mammals:
Regulated hunting is the primary tool used to keep game species within the carrying capacity of the habitat. However, when harvest data, observation data and animal health indicates species populations are low, it is sometimes necessary to decrease harvest levels. Used when surveys show a continual population decline or when hunting success has continued to decline over a long period of time.

Refer to Concept 10, Biological Carrying Capacity.

2. Increase Harvest

Note: The wildlife specialist will provide clues as to whether or not this practice is necessary.

Bass:
Needed when seine samples and fishing records of pond reveal these situations:

- Many recently hatched bluegill.
- Very few medium-sized bluegill.
- Bass less than one pound and in poor condition.
- Few or no young bass.

Increase bass harvest cautiously. Target the bass less than one pound. Spread the harvest over the entire summer.

Bluegill:
Needed when seine samples and fishing records of pond reveals these situations:

- No recent bluegill hatch.
- Many medium-sized bluegill in poor condition.
- Bass few, large, and in good condition.
- Target medium-sized bluegill, using seine harvest or shoreline rotenone.

Trout:
Needed when seine or fish records reveal these situations:

- Many fish, small and in poor condition. In many areas extremely cold water reduces trout growth. In these situations harvesting more may not be of significant benefit.

Game birds and mammals:
Needed when animals show signs of stress and overpopulation, such as any of the following:

- Increase in prevalence of diseases and parasites.
- Destruction of habitat by overgrazing or overbrowsing.
- Poor body condition and weight loss.
- Poor reproduction.
- Few young animals in bag
- Higher percentage of older animals than young in fall population

Regulated hunting is the most effective and efficient practice to remove surplus animals and keep wildlife populations in balance with their habitat. When scientific data indicates animals are above carrying capacity, it is often necessary to increase harvest.

Refer to Concept 10, Biological Carrying Capacity.

3. Establish Native Grasses and Forbs

General Description:
Native grasses and forbs are recommended primarily to provide nesting and escape cover for small game, especially quail and rabbits. They also serve as bedding cover for white-tailed deer, nesting cover for wild turkeys and several songbirds, and as a haven for many small mammals. Warm-season grasses grow during the

warm growing season. Cool-season grasses make primary growth in the spring and fall and often go dormant during the summer.
Introduced grasses (e.g., tall fescue, orchardgrass, bermudagrass) are not recommended because they do not provide suitable habitat structure, and their competitive nature keeps native grasses and forbs from becoming established. Native grasses may be planted, or can be established, by killing existing non-native cover — especially tall fescue, johnsongrass, and crabgrass — with selective herbicides (e.g., imazapic) and allowing seeds lying dormant in the seedbank to germinate. If planted, native legumes (e.g., partridge pea, roundhead lespedeza, and Illinois bundleflower) may be sown with the native grasses. Seed from these legumes are relished by quail and other birds during fall and winter. These plantings should be burned or disked occasionally (every two-to-five years) to prevent deterioration of the vegetative structure through litter buildup and excessive woody plant succession. It is good to have fields or sections of fields that are burned/disked each year to provide a diversity of habitat types to serve the different needs of wildlife. Usually burning/disking are conducted just prior to spring green-up, so that nests and young wildlife are not disturbed. Ideally, native grasses should not be mowed. If used for grazing or haying, paddocks of native grasses should be rotated and not clipped below 6 to 8 inches.

Effect on Habitat :

- Fields of native grasses are particularly useful for wildlife in areas with little acreage in stages 2 and 3 and in areas where the majority of early successional habitat is in hayfields or pastures of non-native forages (e.g., tall fescue, orchardgrass, etc.).
- Fields of native grasses enhance habitat for many wildlife species (e.g., rabbits and quail) by providing winter, nesting and/or roosting cover. Ground-nesting birds usually build their nests at the base of a native grass bunch/clump.
- Fields of native grasses also provide food, through the various forbs present, for many species.
- Fields of native grasses that are burned provide an open structure at ground level, which is excellent brooding habitat for young quail and turkeys, who can walk about easily between the bunches of grasses, picking invertebrates off the vegetation and seed from various forbs off the ground.
- Fields of native grasses that are burned or disked on a two-to-five year rotation provide dead, dry vegetative material that birds use for building nests.
- Grasses and forbs can be established to help develop a riparian buffer

4. Fish or Wildlife Survey

General description:
Note: While fish/wildlife surveys are always important, they should not be recommended if it is stated or the field condition sheet indicates that a survey has recently been completed.

Fish surveys
Population balance is first established in ponds by stocking the correct number of fish. After the first year, check pond balance during early summer by seining at intervals around the pond. Four to five seine sweeps in an average pond is usually enough.

Balance is determined by comparing age groups, condition, and numbers of bass and bluegill caught in the seine and from fishing records. Recent reproduction of both bass and bluegill in the seine indicate that the fish population is balanced. Fish caught by hook-and-line can be evaluated on body condition (fat, skinny, size of head in relation to body, etc.). Trout do not often reproduce in ponds, so overall health of the fish is used as an indicator of pond balance. Unwanted species (bullheads, crappie, etc.) may also be caught in the seine or when fishing, indicating that the pond needs to be poisoned (with Rotenone) or drained.

Seining is usually not effective for collecting fish in streams. Fish in streams are usually collected by fishing or are electro shocked. Electro shocking involves running a small electrical current between two conducting rods which are moved up and down the stream. Fish that are stunned float to the surface and the age, condition, and numbers are recorded to determine the stream balance. The fish are then revived and returned to the stream.

Wildlife surveys
Monitoring wildlife for trends of increasing or decreasing populations or body weights of animals is important for wildlife managers. Data on white-tailed deer, black bear, wild turkeys, ruffed grouse, bobwhite quail, mourning doves and many songbirds are routinely collected by wildlife

biologists using infrared triggered cameras, roadside counts, call counts, check stations, transects and questionnaires. These data are then used to prescribe future harvesting or land management strategies.

5. Grain: Leave Unharvested

General description:
Strips or blocks of grain or other crops (e.g., soybeans) can be left unharvested. This is especially valuable if the strips are left adjacent to cover. This practice should be recommended only if there is an unharvested crop present. It is not applicable to grain food plots.

6. Harvest Timing of Crops

General description:
When wildlife is the primary objective, it is often necessary to avoid harvesting crops or hay during nesting and fawning seasons to reduce nest destruction and mortality.

7. Manipulation of Succession - Mechanical, Fire, Livestock, Chemical

General description
Succession is the orderly predictable series of changes in plant species composition through time and occurs in all natural communities. Wildlife habitat is most often managed by setting back succession in an effort to retain successional stages beneficial for the intended wildlife species. Each of these techniques is applicable for manipulating succession in different habitats for various species.

I. Succession Management - Mechanical

A. Mowing/Mulching – Mowing is most often done with a large rotary mower mounted behind a tractor. Sometimes, a mulching machine is used to mow large shrubs and small trees. To avoid disrupting nesting birds and destroying cover, mowing should not be conducted until late winter/early spring. When used to manage fields, mowing should be prescribed only when it is apparent that woody species are encroaching in the field. In other words, mowing grassy fields is unnecessary. When possible, prescribed burning and disking should be implemented instead of mowing.

Effect on Habitat:
- Helps keep vegetative succession in stages 2 or 3.
- Sometimes reverts succession from stage 4 to stage 3. Helps remove competition from some kinds of shrubs, allowing grasses and forbs to grow better. Sometimes helps keep vegetative succession in stage 4. Maintains low shrub growth with certain species of shrubs by encouraging resprouting. In stages 2, 3 and 4, helps rejuvenate grasses, forbs and shrubs, which improves nesting habitat for many species of birds.
- May be used to reduce weed competition in forage food plots.
- May be used in wetlands to increase interspersion by reducing vegetative cover.
- Causes thatch build-up, which reduces availability of invertebrates and seed to young quail, grouse and turkeys and other ground feeding birds. Thatch build-up also reduces the ability of these animals to move through the field and suppresses the seedbank.

B. Chaining/Roller Beating - Chaining utilizes a large chain strung between two bulldozers running parallel to each other (50 to 100 feet apart) to knock down shrubs and small trees. Roller beating utilizes bulldozers pulling a roller with large, sharp metal blades to knock down and chop up large shrubs and small trees. Roller beating is an alternative to chaining and has almost the same effect on vegetation. Both techniques are used where rugged terrain, rocks, or large shrubs prevent the use of a mower or mulcher. This practice is not used to manipulate understory vegetation in woodlands. Prescribed fire is the preferred method to maintain the desired vegetative composition and structure within woodlands.

Effect on Habitat:

- Helps remove competition of 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 stage 5 causes succession to revert back to stage 4.

C. Disking - Disking mixes the upper soil layer and incorporates organic material into the soil, facilitating decomposition and stimulating the seedbank. Disking is a highly preferred, relatively inexpensive and effective management practice for releasing grass-bound fields, creating bare ground, and encouraging germination and growth of forbs. Areas in successional stages 2, 3 and 4 can be disked to maintain/promote growth of annual and perennial forbs and grasses. Disking should be performed on a rotational basis, usually in winter. In planted pines, disking can be used in stages 5 and 6 to reduce unwanted woody stems and encourage herbaceous growth. Similar to controlled burning, timing of disking and disking intensity strongly influence vegetation composition and structure. Disking should be used instead of mowing when and where possible and should be used where burning is not possible. While disking is often used to create firebreaks to facilitate controlled burning, it should not be recommended in order to burn. Disking should not be prescribed for fields of perennial non-native grasses (i.e. tall fescue, orchardgrasses, bermudagrass). Fields with these grasses should be converted to native grasses and forbs using herbicides.

Effect on Habitat:

- In stages 2 and 3, maintains herbaceous vegetation.
- Promotes fresh herbaceous growth and enhances foraging habitat for many wildlife species.
- In stage 3, causes succession to revert to stage 2.
- In stage 4, causes succession to revert to stage 2 or 3.

D. Chainsawing, feller-bunchering, clipping and other mechanical methods of tree removal such as lop-and-scattering may be used to kill and / or remove trees in forests, savannahs, and woodlands where trees are not needed or additional areas of early succession are needed by the species to be managed.

Effect on Habitat:

- Implementing this practice implies that once the trees are removed, the area is to be maintained indefinitely in the earlier successional stages.
- Note: Do not recommend forest management techniques such as clearcut to achieve this management goal.

II. Succession Management - Fire (Prescribed Burning)

Prescribed burning can be the most effective and efficient practice for managing one or more habitat types for most wildlife species. Prescribed fire is encouraged to maintain stages 2 – 4 and to influence understory composition and structure within stages 5 and 6 of the Southeast Mixed and Outer Coastal Plain and Eastern Deciduous Forests. Timing of burning and frequency of burning strongly influence vegetation composition and structure. Prescribed fire should be used in fields instead of mowing/mulching whenever burning is possible.

Although a very beneficial practice, prescribed burning may not be applicable in all locations. Sites in close proximity to urban areas, hospitals or busy roadways may not be suitable for burning due to safety and smoke management concerns.

Burning should be conducted only when danger of wildfire is low (i.e., when the wind, temperature and humidity allow a controlled burn) and should be conducted under the close supervision of forestry or wildlife professionals experienced with prescribed fire.

Effect on Habitat:

- Reduces litter layer (e.g., dead leaves and grass), which reduces chance of wildfire and enables the seedbank to germinate.
- Improves seed and invertebrate availability for many species.
- Scarifies (breaks down outside coating) some seeds so they can germinate.
- Releases nutrients into the soil.
- Burning during the dormant season does not significantly alter vegetation composition. Small woody stems may be top-killed, but usually resprout.
- Burning during the late growing season more effectively kills woody stems and may reduce density of native warm-season grasses and encourage additional forb cover.

III. Succession Management - Grazing Mgmt. JJJ.
This practice is for managing the use of vegetation by livestock to enhance wildlife habitat. Only recommend this practice when evidence of livestock use is present or information on livestock usage is provided. Grazing management may be used to exclude livestock from sensitive areas or to manipulate successional stages to benefit wildlife by adjusting stocking rate, season of use, or grazing system. Livestock may be used to manipulate the height and structure of native warm-season grasses providing excellent wildlife habitat. Grazing should not be used to manipulate non-native forage pasture (e.g. tall fescue, orchardgrass, bermudagrass) for wildlife because these grasses are detrimental to wildlife, displacing otherwise suitable habitat. Livestock distribution can be controlled with fencing, herding or fire. Regardless of pasture type, proper stocking rate must be practiced to prevent improper grazing. The term, improper grazing, is used to describe livestock grazing that fails to meet land objectives such as soil conservation, plant species diversity, maintenance of wildlife habitat and adequate livestock nutrition.

Effect on habitat:

- Stocking rate, which is the amount of land allotted to each animal for the entire grazable portion of the year, is the MOST important consideration concerning livestock grazing management.
- Proper stocking rate and/or rotational grazing can be used to alter the vegetation structure and composition to favor wildlife.
- Reducing livestock use of riparian areas may improve the habitat for many wildlife species. Fencing can help reduce siltation, turbidity and stream bank erosion, while reducing stream and pond pollution from livestock wastes.

IV. Succession Management – Chemical

Herbicides are often applied to control unwanted vegetation and encourage plants that are more desirable for wildlife

Effect on Habitat:

- In many habitats, hardwood brush reduces vegetative diversity and limits many plants that are important for wildlife.
- Mowing/mulching and chaining/roller beating stimulate resprouting.
- Proper herbicide applications control unwanted woody growth and encourage more herbaceous groundcover.
- Many areas are covered with non-native grasses and forbs that provide little food or cover for wildlife and exhibit a growth pattern that prevents many wildlife species from using the area. These areas can be sprayed to eradicate the undesirable species and promote desirable native species from the seedbank or desirable species can be seeded if not present in the seedbank.
- Each succession manipulation technique is applicable for manipulating succession in different habitats for various wildlife species. In some instances, more than one technique may be applied. Refer to Concepts 4, 5, 6 and 7.

For the written and oral segments of the contest, you should specify which practice(s) should be used and why that practice is applicable.

8. Nesting Structures

General description:
Some species den, nest and/or roost in cavities they don't excavate themselves (e.g., bluebirds, wood ducks, screech owls). If natural cavities are not available, artificial cavities (nest boxes) can be used. Many species need a certain kind of cavity (e.g., diameter of hole, depth, area) in a certain location (field, woods or water) and at a certain distance above the ground (height in feet). The particular design and placement of nest boxes often determines which wildlife species will use the structures. Contact your county Extension office for specific designs of nest boxes and other artificial nesting/ roosting structures.

Note: Nesting structures for Canada geese or mallards are not recommended in many areas because resident Canada geese have become too numerous and are a nuisance. In addition, nesting structures are not recommended for mallards; instead, creation of quality nesting habitat (native warm-season grasses) is required to impact population recruitment. Nest boxes should be monitored to ensure use by targeted species.

Effect on habitat:

- In open areas (stages 2, 3 and 4) nest boxes are useful for bluebirds unless an abundance of nesting cavities in trees or fence posts are present. Nest boxes for bluebirds should not be placed any closer than 80 yards apart to prevent excessive territorial fighting between males.
- Near water sources, nesting structures provide secure nesting sites for wood ducks where trees with cavities suitable for nesting are absent. Nest boxes for wood ducks should not be placed any closer than 100 yards apart and ideally, should not be visible from one box to another, to prevent dump-nesting by females not incubating a particular nest.

9. Plant Food Plots

General description:
Planting grain and forage food plots can be beneficial for many wildlife species (game and non-game, birds and mammals) primarily by providing supplemental food, but also by providing additional cover in some circumstances. **Grain food plots** are annual warm-season plantings that include corn, grain sorghum, and millet, as well as other seed, such as buckwheat, sunflowers, soybeans and cowpeas. **Forage food plots** may be annual or perennial, warm- or cool-season plots. Popular forage plantings include clovers, wheat, oats, rape, chicory, winter peas, soybeans, cowpeas and lablab. Food plots should be well dispersed throughout the property being managed.

Generally, 1 to 5 percent of a property being managed for wildlife may be in food plots. Food plots may be long and narrow (300 to 400 feet long and 15 to 20 feet wide) or blocky in shape (depending on wildlife species managed for and the type of food plot planted), preferably located at an edge between two or more habitat types (e.g., between a woodlot and an old-field, perhaps near a creek). If possible, food plots should be located adjacent to natural cover (e.g., brushy fencerows, hedgerows and other thicket-type areas). Exclusion cages should be erected in all forage plots to monitor planting success and amount of grazing pressure. Food plots are not planted for upland wildlife only (e.g., rabbits, quail, turkeys and deer), but also for waterfowl. Canada geese often feed in warm-season grain food plots and in winter wheat. Plots of millets, corn, rice, or grain sorghum may be flooded a few inches deep during the fall to provide an additional food source for ducks through the winter. For information on recommended plant species, seeding rates, seeding depth and soil type, visit your county Extension office.

It is important to note, food plots should be considered supplemental to the existing natural habitat. The primary objective for food plots should be to provide nutrition for various wildlife species during periods when naturally occurring foods are limited (e.g., late summer and winter). In addition, food plots are often used to facilitate harvest of some wildlife species. Plots should not be placed within view of property lines or public roads.

Effect on Habitat:

- In areas where row-cropping (corn, grain sorghum, soybeans, etc.) is scarce, grain food plots can supply high-energy foods through fall and into late winter.
- In areas where little herbaceous vegetation is present (e.g., large areas of stages 4, 5 and/or 6) and/or where herbaceous vegetation is of no value to wildlife (e.g., fields of tall fescue, orchardgrass, bermudagrass, etc.), forage plots can supply high-protein foods, especially during late summer and through winter and spring.

10. Plant Trees

General Description:
Trees are planted to benefit many species of wildlife and can provide food (hard or soft mast) and/or cover. Trees should be planted in winter while they are still dormant. For specifics about what, when, and how to plant mast trees, contact your county Extension office.

Effect on Habitat :

- A wide variety of tree species may be planted; species used depend on many factors, such as landowner objectives, region, and site.
- A diversity of hard and soft mast producers is recommended where mast is limited.
- Provides additional nesting, perching, denning and roosting cover for many wildlife species.
- Used to help develop riparian buffers

11. Plant Shrubs

General Description:
When properly located, various shrubs can benefit many species of wildlife. In large open areas, planting multiple rows of shrubs is beneficial for those species requiring additional shrub cover. Fruiting shrubs are especially good when planted in fencerows, hedgerows, field/woods borders, odd areas (e.g., field corners and gullies) and any other areas where soft mast may be lacking. Establishing hedgerows of shrubs to break-up fields is very beneficial, especially when planted adjacent to native grasses and/or a good food source. Plant shrubs in winter while they are still dormant.

Effect on Habitat :

- Can provide additional food and cover for many wildlife species in areas where specific species of shrubs are lacking.
- Shrubs are an important component of travel lanes, which allow wildlife to move safely across open fields between two areas of cover.
- Establishing hedgerows by planting shrubs may be used to increase interspersion of cover types.
- Shrub plantings may be useful in some urban settings where desirable cover and/or soft mast are lacking.
- Hedgerows allow animals to find suitable habitat for feeding, nesting or cover.
- Establishing hedgerows increases the amount of edge and creates smaller fields in close proximity that can be managed differently to meet the various food and cover requirements for different wildlife species.
- Used to help develop riparian buffers

12. Pond: Construction

General Description:
Ponds can be created using dams, dikes, and levees to provide permanent water for fish and wildlife. The design varies, depending on the purpose for constructing the pond and the region where it is constructed. For example, steep sloping sides benefit fish and gentle sloping banks benefit several wildlife species, such as wading birds. Contact your local Cooperative Extension Service or Natural Resource Conservation Service office for design details.

This practice should be recommended for creating **new** ponds with permanent water.

Effect on Habitat:

- Suitable habitat for fish is created by constructing a new pond.
- Although many wildlife species may use ponds for various reasons, this practice is intended primarily for fish habitat. When additional water or wetland habitat is needed for various wildlife species, water developments for wildlife should be marked. Refer to Concept 11.

13. Ponds: Deepen Edges

General Description:
In ponds with excessive aquatic vegetation along the margins of a pond, the edges should be deepened to a minimum of two to three feet with steep side slopes. If the ponds can be drained, this can be accomplished with a bulldozer or tractor with a rear blade. If the pond can not be drained, a backhoe can be operated from the top of the pond bank. Soil can be removed from the site or piled around the bank and then smoothed out and planted to native grasses and forbs. Refer to Concept 11.

Effect on Habitat:

- Reduces rooted aquatic vegetation around the edge of a pond, making prey more easily available to predator fish.

14. Ponds: Fertilize

General description:
Ponds can be fertilized to increase available natural food organisms and prevent rooted aquatic weeds from becoming established. However, not every pond should be fertilized. Fertilization should **not** be used in ponds infested with weeds, ponds with excessive water flow, turbid (muddy) ponds, or ponds that will not be fished heavily. Fertilization is needed in fish ponds with water clear enough that you can see your hand clearly with your arm underwater at elbow depth (18”).
Before beginning a fertilization program, have the total alkalinity and pH of the pond water tested. Ponds that are below 20 mg/l total alkalinity will need liming in order for fertilizers to be effective.

Fish ponds should be fertilized in the spring when the water temperature reaches 60 degrees Fahrenheit. For ponds with moderate hardness (50 – 100 mg/l calcium hardness) apply at the rate of 15 pounds of 12-52-4 (or its equivalent) powder, one gallon of 11-37-0 liquid fertilizer , or 15 pounds of granular (0-46-0) per acre at two-week intervals, or until a good green color (phytoplankton bloom) develops in the pond. Make additional applications of fertilizer (at the same rate per surface acre) every three to four weeks, or when the water clears (becomes less green). Fertilization may be continued until water temperatures drop below 60 degrees Fahrenheit in the fall.

Methods for applying fertilizers vary with the type of fertilizer selected. Granular fertilizer must be distributed from a fertilizer platform. Liquid fertilizer should be mixed with pond water and broadcast from a boat for large ponds or from the bank of small ponds. Water soluble powdered fertilizers can be broadcast from a boat or from the bank.

Effect on Habitat:

- Pond fertilization stimulates phytoplankton production, which is the first step in the food chain of a fish pond.
- Refer to Concept 11.

15. Ponds: Reduce Turbidity/Reseed Watershed

General Description:
Turbid or muddy water limits fish production because natural food organisms need sunlight to grow. Turbidity can be caused by sediment being washed in from the pond banks or watershed, activities of cattle watering in the pond, feeding activities of bottom-dwelling fish such as carp or buffalo fish, or negatively charged clay particles suspended in the water column.

Most events of turbidity are caused by temporary introductions of sediments from the watershed (erosion) or the pond bottom (cattle or fish) and will usually clear in a relatively short period of time. Reducing erosion in the watershed is best accomplished by reseeding the watershed immediately around the watershed where there is evidence of erosion. Turbidity due to pond sediments can be controlled by restricting cattle to a small area of the pond and eliminating bottom-dwelling fishes.

Turbidity from suspension of negatively charged clay particles is a more difficult problem. The addition of positively charged compounds such as limestone, gypsum, or alum crystals can cause the clay particles to settle. However, the choice of which product and how much to use has to be based on effectiveness, availability, cost, and the ability of the pond owner to apply the product correctly. Refer to Concept 11.

Effect on Habitat:

- Removes/settles silt in the water and allows sunlight to stimulate phytoplankton.
- Improves water quality and provides nesting, brooding, and winter cover for some wildlife.

16. Ponds: Repair Spillway

General Description:
Needed if the spillway in an existing dam or dike is eroding or otherwise damaged, keeping the pond level too low and increasing the chance of the dam washing away during heavy rains. In special cases, leaks around the spillway or levee structure can be stopped with the addition of special clays or plastic liners (this is expensive). Refer to concept 11.

Effect on Habitat:

- Enables pond to fill to appropriate level and precludes vegetation from establishing around the inside perimeter of the pond.

17. Ponds: Restock

General Description:
Restocking a pond is a drastic measure and should only be considered after other management approaches have been attempted. Ponds containing wild fish species such as carp, shad, green sunfish, or bullhead catfish should be restocked with a balanced predator / prey combination. Restocking should be done only after all fish in the pond have been removed, either by draining or applying a fish toxicant. In warmwater ponds, bluegill fingerlings should be stocked in the late fall, and bass fingerlings are stocked the following June. Although various states have different stocking recommendations, typical

stocking rates are 1000 bluegill and 100 bass per surface acre if the pond is to be fertilized or 500 bluegill and 50 bass per surface acre if the pond will not be fertilized. Refer to Concept 11.

Effect on Habitat:

- Draining ponds and using fish toxicants remove unbalanced fish populations and allow establishment of desirable balanced populations.

18. Retain/Create Snags and Down Woody Material

General Description:
Snags are standing dead trees. They provide cavities used by many birds and mammals. In forested habitat, snags and down logs of various species with remaining limbs, bark and stumps should be retained for habitat diversity. In the absence of any snags and when managing for species that use snags and down woody material, it may be necessary to create snags by killing some existing trees by girdling the tree with a hatchet or chainsaw and applying herbicide to the wound. In streams, woody material creates stream diversity and structure that may be used as cover.

Effect on Habitat:

- Snags provide roosting and perching sites for many bird species.
- Snags provide woodpeckers with sites for cavity construction. Later, other species (e.g., bluebirds, owls, gray squirrels, and wood ducks) may use these cavities for nesting and roosting.
- Snags provide foraging sites for many species.
- Down woody material provides sites for feeding, reproducing, hiding and resting that are important to numerous species of terrestrial wildlife.
- Down logs provide denning sites for bobcats.
- Down logs provide a rich food source for insect and fungi-eating animals, which may increase available prey for bobcats.
- As down logs decompose, they can hold more moisture, providing an essential cool, moist microhabitat for many species of reptiles, amphibians and small mammals.
- Down logs provide drumming sites that are important for the mating rituals of ruffed grouse.
- Dead and down material provides sites for regeneration of some tree and shrub species.
- Dead and decaying logs serve as sites for nitrogen fixation by some bacteria.
- Logs, large limbs and smaller branches in and near water provide shade, cover and food for aquatic organisms, some of which are food for young fish.

19. Riparian Buffers

This practice has been moved to concept 14 (A14) in the "*Introduction*" and "*Concepts*" section of the manual.

20. Streams: Dams, Boulders, or Logs

General Description:
Small (less than 1.5 feet high) dams are built across streams to raise the water level and create pools. Large boulders or logs are placed in streams (with hard bottoms) to improve fish habitat. The rocks need to be large enough so that small floods will not move them.

Any structures put in a stream have the potential to alter stream currents in an undesirable manner. The placement and design of such structures should be done with advice from experts in the field.

Effect on Habitat:

- Used to create pools for fish to hide and rest. If designed properly, can be used to reduce some kinds of stream erosion.
- Used in areas with considerably more riffles than pools.

21. Tillage Management

General Description:
Tillage of cropland may be delayed in spring to allow the use of standing stubble for nesting. Tillage may be eliminated in the fall to allow wildlife access to waste grain. When fall tillage is necessary, avoid inversion tillage (soil is turned over and covers up crop residue), such as moldboard plowing or disking. Instead, till with implements such as chisel plows that can be used without turning the soil over.
Note: Recommend this practice only if a grain crop

is present.

Effect on Habitat :

- Increases supply of waste grain, which is a food source used by rabbits, squirrels, quail, turkeys, deer and many other wildlife species.

22. Forest Management Techniques

Timber Harvest
General Description:
Timber management and wildlife management are inseparable partners in forested habitats. Harvesting timber is one method of enhancing wildlife habitat. Several silvicultural methods are used to regenerate forest stands. The method recommended for a given stand varies greatly depending on forest type and composition and the objectives of the landowner.

Note: Harvesting timber should be recommended as a silvicultural tool to regenerate stands — not merely to create "openings." Regenerated forests result in new forests, not fields. Where additional fields of native grasses and forbs are needed, 'Forest Management: Timber Harvest' should NOT be recommended automatically. 'Manipulation of Succession' should be considered to reach this management objective.

- **Clearcut** regeneration method harvests all the trees on a given site. More sunlight is allowed in to the forest floor with this method than with any other. Clearcutting generally releases shade intolerant species (e.g., yellow poplar, black cherry, basswood) when present.
- **Shelterwood** regeneration method removes a pre-determined number of trees from the stand to allow development of seedlings (regeneration) from beneath. Later (6 to 8 years), the remaining overstory (shelterwood) is removed as the regeneration becomes developed.
- **Seed-tree** regeneration method leaves a few good seed-producing stems per acre to regenerate a new stand. This method is often used in pines and other species with light-weight, wind-carried seeds. The seed trees are usually harvested after the crop of new trees becomes established.

Pines are often planted after harvest to establish a new stand. Hardwood stands are almost always regenerated naturally and are not planted. Whatever the method used, forested land to be harvested should be chosen so that food and cover for wildlife are in close proximity. Tracts harvested should have adjacent unharvested stands to provide travel corridors and space for wildlife that do not use young stands.

Effect on Habitat :

- Harvesting timber generally sets back succession and produces new forest growth with a greater stem density. According to the site and regeneration method, timber harvest reverts stage 6 forest to stages 3 and 4, which will grow into stage 5 within a few years.
- Enhances cover for many prey species, which provides food for predators.
- According to the site and regeneration method, harvesting timber can stimulate forb growth, providing additional food (forage, seeds and insects) and cover many species.
- Retaining snags and cavity trees when harvesting timber provides nesting, roosting, denning and perching sites for those species that use them.

Timber Stand Improvement (TSI)
General Description:
Timber Stand Improvement (TSI) may involve any of several techniques used to improve the quality and composition of forest stands by shifting resources (sunlight and nutrients) toward production of desired products, which include timber and/or wildlife. TSI most often involves some type of **thinning**, which reduces stand density to influence stand growth. Thinnings may be pre-commercial or commercial. Pre-commercial thinnings are conducted before the trees have sale value. Commercial thinnings involve removing at least part of the trees for a useful product. Removing trees increases the amount of sunlight entering the forest canopy and is used to promote increased growth of the remaining trees through changes in stand composition and structure (cover) in the understory and midstory to favor food producing plants, both woody and herbaceous.

Effect on Habitat :

- Increased herbaceous growth in the understory improves brooding habitat cover and provides additional forage.
- Increased woody stem density in the mid story

improves cover for certain species, such as ruffed grouse.

23. Water Level Manipulation Techniques

Water Control Structures
General Description:
Various structures made out of concrete, pipes, wood, etc., are used 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 or no structures are present on an existing dam or dike.

Small Dikes for temporary flooding
General Description:
In the fall and winter, small dikes are used to temporarily flood potential feeding areas for waterfowl by holding rainwater on a field or woods. Grain fields (e.g., corn, millets and grain sorghum), in stage 6 hardwood stands are examples of feeding areas that can be flooded to attract waterfowl. In spring and summer, existing wetlands and forested areas can be flooded to provide nesting and brooding habitat for various waterfowl, such as redheads and wood ducks. This practice is recommended in areas where there are potential sites for waterfowl feeding and nesting. A water-control device in the dike allows the water level to be manipulated. The water is removed from the field prior to spring (similar to letting the water out of a bathtub) so the field can be planted again.
Note: When this practice is recommended, it is assumed that adequate water control structures are included and should not be an additional recommendation.

Effect on Habitat :

- Water level manipulation techniques are used to create or improve habitat for wildlife whereas water developments for wildlife are constructed to provide a source of drinking water for wildlife
- Temporary flooding can improve existing wetlands for nesting and brooding for some waterfowl species, such as redheaded ducks , and can improve existing forested areas for nesting and brooding wood ducks.
- Allows management of water levels to increase or decrease the amount and type of aquatic vegetation. Useful for creating a desirable mix (interspersion) of open water and emergent aquatic vegetation.
- Can be used to create shallow water areas.
- Can be used to manage the quality of water and for control of unwanted fish.
- Can be used to control water levels in flooded timber, drawing water down to prevent tree mortality.

24. Water Developments for Wildlife

General Description:
Creating a source of drinking water for wildlife is critical consideration when little or no water source is available. Many different types of water sources are possible, depending on the area and local needs of wildlife.

- **Guzzlers:** Built by covering an area with an apron of fiberglass or some other material that sheds rain. The water is collected in a storage tank and slowly released into a trough from which wildlife can drink.
- **Dugouts:** Basins (dug out with bulldozers or backhoes) designed to collect water from run-off and/or precipitation. Side slopes should be gentle to provide easy access for wildlife.
- **Shallow Impoundments:** Earthen dikes are constructed to retain water (usually run-off water from precipitation) in natural drainage areas. Placement of the dike is critical to avoid damage from floods and also to collect sufficient water. These impoundments are also used by waterfowl for nesting and brood habitat when flooding occurs in spring and summer. Crop fields (e.g., corn, millets, grain sorghum) can be flooded in the fall and winter to provide areas for waterfowl and other wetland species to feed and rest. A water-control device in the dike allows the water level to be manipulated. When this practice is recommended, it is assumed that adequate water control structures are included and should not be an additional recommendation.
- **Birdbaths and Backyard Ponds:** Small ponds can be constructed in backyards and other urban areas to provide water for a variety of wildlife. Birdbaths are also useful for providing water in urban settings.

Effect on Habitat :

- Provides drinking water for wildlife.

- Provide winter food resources if flooding occurs
- Provides a source of prey for many predators

25. Wildlife Damage Management Techniques

General Description:
Wildlife managers often have to exclude, trap, relocate, frighten, repel, poison, shoot or otherwise kill individual animals in order to reduce or eliminate damaging behaviors and/or health hazards presented by some wildlife species. Examples of wildlife damage include woodpeckers hammering on the side of the house, squirrels nesting in the attic, deer eating ornamental plants in the yard or feeding in soybean fields, bobcats/ coyotes/owls preying on livestock, rabbits/ raccoons eating vegetable gardens, beavers killing trees, red-winged blackbirds eating crops, and Canada geese loitering on lawns and golf courses. In additions, starlings roosting in urban trees and defecating on sidewalks can create a health hazard. Wildlife damage management may be recommended in addition to the practice of increasing harvests if special problems exist on the area being evaluated.

- Direct control techniques like shooting, trapping and the use of toxicants to reduce problem animals are commonly used and effective.
- Non-lethal methods of predator control including habitat modification, repellents and the use of exclusion fences or guard dogs are also commonly used.
- Methods of controlling herbivores (deer, rabbits, etc.) include shooting, exclusion fences, taste and area repellents, and scare tactics (such as propane cannons).
- Methods of bird control include frightening devices, exclusion devices and shooting. Refer to concept 12, Wildlife Damage Management.

URBAN WILDLIFE MANAGEMENT PRACTICES

U1. Artificial Feeders

General description:
Artificial feeders are used primarily to feed songbirds and butterflies and should not be used for terrestrial species. A wide variety of feeder designs, methods, and foods are available. Most bird species prefer black-oil sunflower seeds and white proso millet. Species like the hairy woodpecker prefer to eat suet (fat) rather than seeds. Species like the mourning dove prefer to eat on the ground rather than in a tree or on a balcony.

For many people in urban areas, bird feeders are often their only opportunity to view wildlife. This interaction is good; however, it may also be hazardous for birds. Since feeders draw birds close together, disease transmission becomes more problematic. Feeders that are not cleaned properly can regularly promote the spread of various diseases. In addition, feeders can aid predators such as housecats and may lure birds into close proximity with houses and automobiles, which often proves fatal for birds. It is essential that bird feeders be properly maintained and placed in a suitable location.

U2. Do Not Disturb Nesting Sites

General Description:
All wildlife must procreate to sustain their species. Because of this fact and the fact that one or both parents invest a great amount of energy and time in breeding and rearing young, it is important that nest sites not be disturbed. In urban areas increased nest disturbance may be realized due to greater human density. The more a nest site is disturbed, the greater chance the parent will abandon the site and young. Additionally, predators' acute sense of smell can easily pick up human scent left at or near the nest site and can use that as a guide to finding and depredating the nest.

- Keep all cats indoors
- Do not approach or handle nest, eggs, or

young

U3. Mowing

General Description:
Mowing is a mechanical method, usually involving a push or riding lawn mower, for maintaining early successional habitat in urban areas. Lawns and park-like settings are the most often mowed areas. Mowing is usually the only practice for managing early successional habitat in urban areas as burning is typically not allowed due to human safety, and chaining/roller beating, disking and grazing are not aesthetically appealing or practical. Chemical application may be appropriate, but is not as cost-effective as mowing. Many wildlife species inhabiting urban areas require early successional habitat interspersed with shrub and forest for foraging purposes and easy travel corridors.

Effect on Habitat:

- Mowing keeps vegetative succession in stages 2 or 3
- Wide expanses of mowed areas may not provide adequate cover for wildlife, so leave some areas unmowed or provide cover using islands of vegetation like shrubs and flowers.
- Periodic de-thatching and aerating of grass and soil, respectively, may be needed to maintain good growing conditions

U4. Plant Flowers

General Description:
Planting annual and perennial flowers provides food and cover for many wildlife species. Additionally, flowers improve the general beauty of an area.

Effect on Habitat:

- Planting annual and perennial flowers can provide stage 2 and 3 vegetation. This can benefit wildlife requiring food and cover in stages 2 and 3
- Plant only native flowers
- Plant a variety of flowers that will provide food and cover in all 4 seasons
- Plantings should be arranged in proximity to other cover so they are accessible to wildlife

U5. Plant Food Plot

General Description:
Planting food plots in urban areas can serve the same purpose as in rural areas (primarily as a food source but also cover provision). Planting food plots in urban areas, however, are not typically done in the same fashion. For example, it would look out of place in an urban setting to plant rows of corn. Instead, food plots in urban areas should serve an aesthetic purpose in addition to providing food and cover and can be thought of as vegetable gardens, flower beds, rooftop gardens, or other landscaped areas.

Effect on Habitat:

- Provides or supplements food sources for a variety of wildlife in urban areas
- Food plots may be most beneficial during times of year when food is less abundant (for example in winter months in northern latitudes or during periods of drought) or in urban areas where green space is not present

U6. Rooftop / Balcony Gardens

General Description:
In urban areas, residential green space may be limited. Instead of creating sprawling planting areas as is done in suburban and rural areas, urbanites create rooftop or balcony gardens. Although limited in space, the goal of rooftop or balcony gardens is to create wildlife habitat, and as such, rooftop or balcony gardens should provide food, water, and cover.

Effect on Habitat:

- An opportunity to provide food, water, and shelter in urban environments to attract wildlife and provide positive opportunities for human-wildlife interactions
- Stages 2, 3, 4, and 5 may be provided through a rooftop or balcony garden, although none in large quantities
- Plant only native species
- Plant vegetation that will provide food and cover year round
- Moving water like a small waterfall or stream

will attract more wildlife than water that is stationary

U7. Use Pesticides Carefully

General Description:
No one likes ants invading their picnic or mosquitoes biting when enjoying outdoor activities. But, insects are part of the ecosystem and provide a great benefit to a wide range of wildlife species, primarily as a food source. As insectivores, most bat species rely on insects for their sole food source. Many bird species feed insects to their chicks. Insects are a great source of protein and provide nutritional benefits to wildlife that consume them.

When using pesticides:

- Follow all directions on manufacturer's label
- Use a pesticide that is species-specific so you only target the problem pest and not beneficial invertebrates
- Wear protective clothing when applying pesticides