

Texas 4-H

Wildlife Habitat Education Project



Manual

*Fourth Edition
(2016 revision)*

Texas Version (revised 2022)



WHEP



The Texas 4-H Wildlife Habitat Education Project (WHEP) Texas Version

This manual has been adapted from the National WHEP Manual to be used in Texas 4-H programming only. This version is designed to better fit the Texas 4-H program and the habitats and wildlife of the state. Many portions of the National manual have been changed; others have remained the same. Pay close attention to contest rules as they are specific to Texas 4-H only. This entire manual should be used in the Texas 4-H project only.

The National WHEP manual which is posted on the National WHEP website (whep.org) should be used to prepare for the annual National WHEP Invitational.



National WHEP Manual and History of the National 4-H WHEP

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Many people have been involved in writing and preparing the National 4-H Wildlife Habitat Education Program manual over the years. This edition represents the 4th major revision. Editors of previous editions included:

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The Wildlife Habitat Education Program (WHEP) began in 1978 under the direction of Dr. James L. Byford, Extension Wildlife Specialist, and Dr. Thomas K. Hill, Extension Fisheries Specialist, at the University of Tennessee. They realized the passion many youth have for wildlife and initiated the **Tennessee 4-H Wildlife Judging Contest**, which was modeled after the popular 4-H livestock judging contests. The program was immediately accepted throughout Tennessee. A conference was held in 1985 to explore the possibility of a Southern Region Program. The first Southern Region Invitational was held in 1987. In 1988, the second Southern Region Invitational was supported by the International Association of Fish and Wildlife Agencies, and a conference was held concurrently to discuss the possibility of a National Invitational. In 1989, the program was expanded nationally and the first National Invitational was held with the support of the U.S. Fish and Wildlife Service and the International Association of Fish and Wildlife Agencies.

The first edition of this manual was produced in 1990-91 with sponsorship by Champion International Corporation and the U.S. Fish and Wildlife Service. The new national program was called the **National 4-H Wildlife Habitat Evaluation Program**. The manual was revised in 1998-99 to incorporate new information in wildlife science and management.

The Ruffed Grouse Society, Rocky Mountain Elk Foundation, and the USDA Cooperative State Research, Education and Extension Service were added as sponsors of the manual revision. The manual incorporated the basic concepts originated by Byford and Hill with the addition of ecoregions across the U.S. and a wider array of wildlife management practices and wildlife species. Since 1991, the manual has undergone three major revisions, each incorporating new information and revision of contest activities. This process is important and highlights the need to incorporate additional information as research makes it available and as interest among participants changes. This Fourth Edition incorporates a complete revision, with new species, new wildlife management practices, additional wildlife management concepts and terms, and a new activity for the contest.

Starting in 2010, FFA teams were invited to compete in WHEP. FFA teams and 4-H teams do not compete against each other, but rather against teams within each organization. Additionally, in 2010, the name **Wildlife Habitat Evaluation Program** was changed to **Wildlife Habitat Education Program** to reflect the intent of the program to provide curriculum on wildlife management in addition to the contest format. WHEP was acknowledged with the Conservation Education Award by The Wildlife Society in 1996 and earned the 4-H National Program of Distinction Award in 2011.

The National manual should be used in preparing for the National WHEP Invitational as well as state and local educational programs. It is the intent of the organizers to move the national contest to different locations each year. The National manual is designed to provide uniformity for the program and provide wildlife management information using representative species occupying less specific, major ecoregions across the U.S.

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Introduction

WHEP is designed to teach youth the fundamentals of wildlife and fisheries science and management.

In this program, youth learn how management for wildlife involves managing land, water, and populations of wildlife species. The manual and activities are focused not only on increasing knowledge in wildlife management, but also in developing skills to apply that knowledge. Additional benefits include development of life skills, such as decision-making, leadership, written and oral communication, and meeting other youth and professionals who have interests in natural resources.

It is important to understand ecological processes as well as life requirements of various wildlife species before making management recommendations. The **Concepts and Terms**, **Ecoregions**, **Wildlife Species**, and **Wildlife Management Practices** sections of this manual provide basic information related to wildlife ecology and habitat management. The **ID and Knowledge Quiz (Activity I)** allows participants to showcase their knowledge from these sections and others.

Wildlife managers must be able to inventory and evaluate land as habitat for various wildlife species. They must be able to recognize and explain the condition of the land and identify the wildlife present to landowners and others interested in managing for wildlife. Once the inventory and evaluation are completed, managers recommend the appropriate wildlife management practices to enhance habitat for certain wildlife species. **On-site Recommendation of Wildlife Management Practices (Activity I)** provides experience with this decision-making process. The **Written Wildlife Management Plan (Activity II)** and **Oral Presentation of the Wildlife Management Plan (Activity III)** should explain management recommendations so others can understand and consider them.

All 4-H age divisions (Junior, Intermediate, and Senior) are eligible to compete at the State Contest as individuals or teams.

The National Invitational is open to only one Senior division 4-H team from a state each year. The Texas 4-H Office allows the 1st place Senior team from the Texas 4-H WHEP Contest the option to register and attend. Expenses of participating in the National Invitational are the responsibility of that team.

About the Manual

This manual is divided into the following major sections.

WHEP Activities and Scoring provides information on each activity, how the activities are administered, and how the state contest is scored.

Wildlife Management Concepts and Terms introduces basic wildlife management principles. These concepts and terms are the basis for the remainder of the manual. Participants should be prepared to use the wildlife management concepts and terms in their written plan and oral presentation as appropriate.

Ecoregions identifies areas of Texas with distinctly different vegetation communities and wildlife species. This section gives a brief description of the vegetation and land use found in the ecoregions, explains typical stages of plant succession, lists wildlife species that may be considered in the contest and summarizes wildlife management practices that can be used in each ecoregion.

Wildlife Species provides information about habitat requirements and management practices used for each wildlife species.

Wildlife Management Practices explains each of the habitat and wildlife management practices discussed in the **Wildlife Species** section.

Appendix A provides definitions of food groups for various wildlife species.

Appendix B is the **Glossary**, which defines technical words used in the manual.

How to Use the Manual & Prepare for Contests or Project Study

This manual is the study resource for the Texas 4-H WHEP Contest. This manual should also be considered a good basis for guidance and study in a 4-H Wildlife and Fisheries project whether dealing with various wildlife species or habitat management or both. Other curricula and resources can and should be added to a general project study. Actual wildlife habitat management by a 4-H member on personal property can serve as an excellent 4-H project. Other educational resources for study should include properties (public and private) that are being managed for wildlife habitat and the managers of those properties.

Adult leaders and youth should first learn the **Wildlife Management Concepts and Terms**. These are the foundations of wildlife ecology and habitat management. Leaders should explain the concepts and terms and provide local examples to clarify any misunderstanding. Successful completion of the contest activities requires understanding of these concepts and terms. Contestants should use these terms and concepts in their plans and presentations during the contest.

Determine which ecoregion will be used for a particular contest or study session within the project group. Maps and ecoregion descriptions are in the Ecoregions section. The **Wetlands** and **Urban** descriptions are applicable to all ecoregions and could be studied in any ecoregion. These may also be used in conjunction with an ecoregion in a contest. Leaders and youth should review plant succession, common plants, wildlife species, and wildlife management practices within the target ecoregion.

Determine which wildlife species will be studied or used in a contest. A list of species accompanies each ecoregion. There are many field guides and websites that provide photos and additional information for these wildlife species. Be sure to use reputable sites online and do not always depend on general word searches.

Locate and mark the selected species in the **Wildlife Species** section. It is important to be able to identify species from different sources and be able to identify the male, female, adult, and juvenile of a species. Identification in a contest may involve photos or specimen (live or mounted). Identification may be required using only tracks, skins, wings, feet, tails, or other body parts or using wildlife calls. Visual ID may also involve the use of binoculars. Practice and be prepared for any situation whether in the field or at a contest. Learning life history information about a species is critical to make appropriate management decisions. Specific information about habitat requirements and recommended wildlife management practices are found in the **Wildlife Species** section. Many participants find it helpful to mark those species included in a particular ecoregion, so the information is more easily found when studying.

Locate and mark the appropriate practices in the **Wildlife Management Practices** section. Learning how various wildlife management practices affect wildlife species is critical. Note that not all wildlife management practices listed in the manual are used in every ecoregion. The **ID and Knowledge** may incorporate information from various portions of the manual, including **Wildlife Species, Wildlife Management Practices, Concepts and Terms, Food Groups, Glossary Terms,** and the ecoregion information of the contest.

Leaders can introduce participants to the activities through various exercises. Some make note cards or flash cards to help when studying. Conducting practice sessions at outdoor sites is helpful and recommended. Participants should get outside and find examples of the concepts and practices discussed in this manual. Habitat requirements available for the species selected should be identified, as well as what features are missing. Leaders may use 'quiz bowls' and question-answer sessions to measure learning. Field guides and other teaching materials may be used to further learning. The Texas Parks and Wildlife Department website (<https://tpwd.texas.gov/>), AgriLife Extension Wildlife & Fisheries websites (<https://agrilifeextension.tamu.edu/browse/featured-solutions/wildlife/>), Texas A&M Natural Resources Institute (<https://nri.tamu.edu/>), National WHEP website (www.whep.org), and local county Extension offices have additional information to enhance study and locate habitat and management facilities. Collecting pictures or specimens of the wildlife species from several different sources will help with the identification portion of the test.

4-H Wildlife Habitat Education Project

Contest Rules and Procedures

General Information:

- The 4-H Wildlife Habitat Education Project (WHEP) Contest covers information from within the Texas 4-H WHEP Manual. View and download this manual from the Texas 4-H Program website (<http://texas4-h.tamu.edu/projects/wildlife-fisheries/>). Scroll down to 'Contests' then 'Wildlife Habitat Education Project State Contest' and 'Texas 4-H WHEP Manual'.
- The contest is based on information found in the Texas 4-H WHEP Manual only. This Manual should be used for a study guide to prepare for the contest. The wildlife, habitat component, and habitat management practices identification activity are based on only the species listed in the manual. Wildlife species, habitat components, and habitat management practices photos and characteristics should be studied using various identification resources available on the internet or in hard copy form along with the written information in the Wildlife Species section in the WHEP Manual. Be sure to use reliable sources on the internet for study photos.
- Only one ecoregion from the Manual is covered in a contest. The ecoregion will match the location of the contest. This current year's contest ecoregion will be posted on the 4-H Wildlife & Fisheries webpage and sent to all County Extension Offices as soon as logistics have been confirmed. Youth interested in competing should focus their study within the Manual on this single region for wildlife species and wildlife management practices.
- The contest rules and procedures listed in this document and in the Texas 4-H WHEP Manual supersede those found in the National WHEP Manual which are designed for the National Invitational only.
- The Texas contest is open to any current enrolled Texas 4-H member and includes all age divisions.
- Any contestant who previously participated in the National WHEP Invitational is not eligible to participate at the State Contest as a Team Member but may participate as an Individual.
- Contest registration must be made through 4-H Online (<https://v2.4honline.com/>) on specific dates.
- Coaches, parents, and other family members are welcome to the contest but will not be allowed in the contest activity areas during the competition.
- Parts of this contest are held outdoors regardless of the weather and field conditions. Contestants should dress appropriately for the weather and for being in the habitat such as tall grass, brush, woods, mud, etc. Contestants should be prepared with drinking water, insect repellent, sunscreen, and other necessary outdoor items.
- Each contestant should take a clipboard, two or more sharpened or mechanical #2 pencils, a good eraser, colored map pencils, and a small ruler or straight edge to help them align rows on the answer sheets. A contestant may carry a backpack to hold these and other necessary items to be outdoors such as drinking water, sunscreen, raincoat, binoculars, etc. No electronic devices will be allowed during the contest.
- Contest activities will be conducted by each contestant as follows: ***NEW ORDER OF ACTIVITIES**

Activity I, On Site Recommendations of Wildlife Management Practices – independently

Activity II, Written Wildlife Management Plan – as a team unless registered in the contest as an Individual, then independently

Activity III, Oral Presentation of the Wildlife Management Plan – as a team unless registered in the contest as an Individual, then independently

Activity IV, Identification and Knowledge – independently

Age Divisions:

As of September 1st, of the current 4-H year (Sept. 1 – Aug. 31):

- Junior (3rd – 5th grades)
- Intermediate (6th – 8th grades)
- Senior (9th – 12th grades)

Contestants may compete in an older age division than their actual grade level but may not compete in a younger age division than their actual grade level.

Contest Participation:

• Teams

Contestants participate as part of a 3 or 4 member, age division specific team from their 4-H county. All contestants on a team must be enrolled in 4-H in the same county.

- **Individual Contestants**

Individuals will participate in all contest activities. A score will be given for each activity and used to formulate the individual score. Individuals are eligible for High Point Individual awards but not team awards.

Contest Activities:

- This contest consists of the following activities: ***NEW ORDER OF ACTIVITIES**
 - Activity I – On-site Recommendation of Wildlife Management Practices
 - Activity II – Written Wildlife Management Plan
 - Activity III – Oral **Presentation** of the Wildlife Management Plan ***REDESIGNED ACTIVITY-SEE DESCRIPTION**
 - Activity IV – Identification and Knowledge
- Activities I, II, III, and IV are further described below under each age division.
- Typically, all age divisions will participate in each activity at the same time. This may vary per contest location.
- Activities I and IV are completed individually by each contestant. No communication between team members is allowed during these activities.
- Activities II and III are team efforts except when a contestant is entered as an Individual in the contest. Individual contestants will develop the plan and orally present on their own. Team members work together to develop and orally present the management plan.
- *Landowner Objectives and Habitat Conditions* describe the habitat, the use of the habitat, and the wildlife species found within a habitat at the contest site. These are observations and outcomes desired by the ‘Landowners’ that must be considered when evaluating a habitat and prescribing habitat management practices. *Landowner Objectives and Habitat Conditions* are typically written but may also be given verbally to the contestants by contest officials.
- Activities I and II are always held outdoors in the habitat regardless of the weather. Contestants must dress appropriately for the weather and appropriately to be in tall grass, brush, woods, etc. Close toed shoes are mandatory at all times. In addition, contestants should be prepared with sunscreen, insect repellent, drinking water, and any other necessary item when outdoors. A contestant may carry a backpack with necessary items to be outdoors such as drinking water, sunscreen, raincoat, binoculars, etc. No electronics will be allowed during the contest.
- Note time allowances given for each activity in the descriptions below. These may change on contest day due to weather, facility restrictions, or other extenuating circumstances.

Contestant Requirements:

Beyond the age and eligibility requirements, the following apply to all contestants:

- Contestants must dress appropriately for the weather and appropriately to be in tall grass, brush, woods, etc. Close toed shoes are mandatory at all times. In addition, contestants should be prepared with sunscreen, insect repellent, drinking water, and any other necessary item when outdoors. A contestant may carry a backpack with necessary items to be outdoors such as drinking water, sunscreen, raincoat, binoculars, etc.
- No electronics will be allowed during the contest.
- Contestants must carry a clipboard and two or more sharpened or mechanical #2 pencils. **No extra paper is allowed.**
- Coaches or contestants should contact the State 4-H Natural Resources Program Office in advance to request any individual special needs or accommodations necessary to participate on contest day. Coaches or contestants should also inform this office in advance of any individual contestant medical needs, conditions, or pharmaceuticals necessary to be used or carried on contest day. **A reasonable amount of advance notice must be given on accommodation requests, so ample time is allowed to plan and set up the accommodation. Space for this request is available on the registration. Requests made on the day of the contest will be considered but accommodations may not be possible given the short notice.**

Junior Division Activities –

I: On Site Recommendations of Wildlife Management Practices (1 hour, in the field)

Contestants will select the Wildlife Management Practice (WMP) given in multiple choice question format for selected species named at the contest. Contestants will move around to **twelve (12)** staked stations within a habitat and answer the multiple choice WMP question pertaining to the habitat and particular species at each stake. This activity may require evaluation of the surrounding habitat in current conditions but not always. Recommendations should be to put each WMP into practice immediately and not to be recommended for a future expected need. This activity covers species and WMPs in the designated ecoregion only. (*see sample question in Appendix A of this document*)

II: Written Wildlife Management Plan (2 hours, in the field)

Contestants will use the same habitat used in Activity I and gather with their teammates unless competing as an Individual. Two of the wildlife species on the list will be chosen as focal species for a comprehensive wildlife management plan. The wildlife species will be typed on the answer sheet. Contestants will develop a wildlife management plan in outline format for the wildlife species to be managed as directed in the *Landowner Objectives and Habitat Conditions* provided at the contest and for the habitat in its current condition on the contest site. The plan must be written using short answers and bullet points not complete sentences. The entire habitat should be evaluated within the parameters given at the contest site. The management plan should cover a year or more of management practices. Some management practices may not be put into action immediately but several months after initial evaluation when conditions and climate may best fit its implementation and need. Contestants will answer the following questions in their plan for each recommended Habitat Management Practice for each of the focal species: ‘What will your practice do for the habitat?’ and ‘How will your practice help or control the wildlife species?’. Management practices must be made for each focal species independently. Answer sheets containing the plan outline will be provided (*see Appendix A for example*). No extra paper will be allowed. Refer to Judges Score Sheet to determine the criteria by which each contestant will be judged (*see Appendix A of this document*).

III: Oral Presentation of the Wildlife Management Plan (approximately 10 minutes per presentation) *REVISED PROCEDURE

Contestants will sit down with a judge and present their Written Wildlife Management Plan as a Team or as an Individual if competing as an Individual. Using their plan, contestants will informally discuss and explain their plan as the judge asks questions. Each contestant will receive points for verbally participating in the presentation and none if they do not participate. The plan will be judged during this presentation (*see Appendix A in this document for Junior Division Judges’ Score Sheet*). The judge will ask questions to guide the contestants through their plans and to ensure all contestants speak.

IV: Identification and Knowledge (2 hour; indoors or outdoors or combination)

This activity includes identification of wildlife species, habitat management practices, habitat components, and food groups. Contestants will rotate through **25** stations, each with a two part challenge; part one identification of a wildlife species, a habitat management practice or concept, a wildlife food, or a habitat feature (ex: ‘edge’) and part two answering a question related to part one. Answers to the questions will be in multiple choice (A-D), ‘true or false’, or ‘yes or no’ format (*see Appendix F for example Answer Sheet*). ID pieces may be represented as photos, physical representations of habitat, management practices, or wildlife food groups, full or partial wildlife mounts, various external body parts (wing, pelt, feet, antler, etc.), tracks, scat, or calls/sounds. Wildlife species may be shown as male or female, juvenile or adult. Some wildlife species may be set up to be viewed through binoculars for identification. The objective of the activity is to demonstrate knowledge of wildlife and habitat component identification, ecoregion specifics, biology and ecology of specific wildlife species, concepts of wildlife management, wildlife management terminology, and wildlife management practices.

Information for this activity will be taken from the following sections in the Manual:

Wildlife Management Concepts and Terms (pg. 22-31), the specific ecoregion designated for the contest, Wildlife Species information of those listed in the designated ecoregion (pg. 33-223), Wildlife Management Practices information of those listed in the designated ecoregion (pg. 224-255), *Definitions of Food Groups* (pg. 256), and *Glossary* (pg. 256).

Intermediate Division Activities –

I: On Site Recommendations of Wildlife Management Practices (1 hour, in the field) *REVISED PROCEDURE

Contestants will select the appropriate Wildlife Management Practices (WMP) for each of the species provided on the Answer Sheet (*see Appendix B for example*). Contestants should begin by reading the habitat *Landowner Objectives and Habitat Conditions* provided and evaluating the habitat in its current condition. Making recommendations for one wildlife species at a time, contestants will fill in the 'O' for each wildlife management practice they choose to recommend for a particular wildlife species. All applicable management practices for each wildlife species will be printed on the Answer Sheet. Each wildlife species should be managed independently from the others and concern for wildlife practices conflicting with another species should not be considered.

Recommendations of wildlife management practices should be made based on the *Landowner Objectives and Habitat Conditions*, the current condition of the habitat, and what may be needed to attract, retain, or remove the particular wildlife species or to improve habitat for the wildlife species' population growth. All recommendations of wildlife management practices for this activity should be put in place immediately and not recommended for any future need. This activity uses wildlife species and WMPs from the designated ecoregion only.

II: Written Wildlife Management Plan (2 hour, in the field)

Contestants will use the same habitat used in Activity I and gather with their teammates unless competing as an Individual. Four of the wildlife species on the list in Activity I will be chosen as focal species for a comprehensive wildlife management plan. The wildlife species will be typed on the answer sheet. Each contestant will have a duplicate of their answer sheet from Activity I to reference and compare with teammates' answers. Contestants will develop a wildlife management plan in outline format for the wildlife species to be managed as directed in the *Landowner Objectives and Habitat Conditions* provided at the contest and for the habitat in its current condition on the contest site. The plan must be written using bullet points not complete sentences. The entire habitat should be evaluated within the parameters given at the contest site. The management plan should cover a year or more of management practices. Some management practices may not be put into action immediately but several months after initial evaluation when conditions and climate may best fit implementation and need. Each management practice should be described with how, when, and where it will be used as directed on the answer sheet. If more than one wildlife species is to be managed, management practices must be made with each species in consideration to avoid or minimize conflict of wildlife needs. Some management practices may benefit one species and have negative effects on another. Some management practices may be recommended that will take months or years to become beneficial. Management practices may be recommended to be repeated as needed. Answer sheets containing the plan outline will be provided (*see Appendix C of this document*). Creating a sketch of the habitat will be optional and will not be scored. If a sketch helps the plan designers to visualize the process, they are free to draw one. No extra paper will be allowed. Refer to Judges' Score Sheet to determine the criteria by which the Plan will be scored (*see Appendix D of this document*).

III: Oral Presentation of the Wildlife Management Plan (10 minute maximum per total presentation) *REVISED PROCEDURE

Oral presentations are often necessary to convey information about a management plan to landowners. A plan must be properly written and then properly presented to understand and receive the full effect of the management to be applied. Contestants will demonstrate their plan by presenting it orally.

Teammates will present as a team. Individual contestants will present individually. Contestants will have their plan during presentation for reference. Judges will score the plan only on what is presented to them by each contestant. It is the responsibility of the contestants to present all the information. Plans will not be read by the judges.

Contestants will present using their own Written Wildlife Management Plan (II) to a panel of judges who will score the plan as presented based on the criteria shown in the Judges' Score Sheet (*Appendix D of this document*). Judges will also score each individual team member on their presentation technique based on the criteria shown in the Judges' Score Sheet (*Appendix E of this document*). Contestants will be able to use their Plan when presenting. All four wildlife species from the plan must be presented. On a team of four contestants, each contestant will present one of the four wildlife species from the plan to include Plan Development, Plan Implementation, and Plan Evaluation

of that species. It is up to the team to decide which member presents which wildlife species. On a team of three contestants, each contestant will present one of the four wildlife species from the plan to include Plan Development, Plan Implementation, and Plan Evaluation of that species and it will be up to the discretion of the team as to how the fourth species will be presented; by one team member or divided among the three. Contestants competing as an Individual must present all four wildlife species from the plan by themselves to include Plan Development, Plan Implementation, and Plan Evaluation. Only questions seeking clarification of a statement will be asked by judges.

IV: Identification and Knowledge (2 hour; indoors or outdoors or combination)

This activity includes identification of wildlife species, habitat management practices, habitat components, and food groups. Contestants will rotate through **25** stations, each with a two part challenge; part one identification of a wildlife species, a habitat management practice or concept, a wildlife food, or a habitat feature (ex: 'edge') and part two answering a question related to part one. Answers to the questions will be in multiple choice (A-D), 'true or false', or 'yes or no' format (*see Appendix F for example Answer Sheet*). ID pieces may be represented as photos, physical representations of habitat, management practices, or wildlife food groups, full or partial wildlife mounts, various external body parts (wing, pelt, feet, antler, etc.), tracks, scat, or calls/sounds. Wildlife species may be shown as male or female, juvenile or adult. Some wildlife species may be set up to be viewed through binoculars for identification. The objective of the activity is to demonstrate knowledge of wildlife and habitat component identification, ecoregion specifics, biology and ecology of specific wildlife species, concepts of wildlife management, wildlife management terminology, and wildlife management practices.

Information for this activity will be taken from the following sections in the Manual:

Wildlife Management Concepts and Terms (pg. 22-31), the specific ecoregion designated for the contest, Wildlife Species information of those listed in the designated ecoregion (pg. 33-223), Wildlife Management Practices information of those listed in the designated ecoregion (pg. 224-255), *Definitions of Food Groups* (pg. 256), and *Glossary* (pg. 256).

Senior Division Activities –

I: On Site Recommendations of Wildlife Management Practices (1 hour, in the field)

Contestants will select the appropriate Wildlife Management Practices (WMP) for each of the species provided on the Answer Sheet (*see Appendix B for example*). Contestants should begin by reading the habitat *Landowner Objectives and Habitat Conditions* provided and evaluating the habitat in its current condition. Making recommendations for one wildlife species at a time, contestants will fill in the 'O' for each wildlife management practice they choose to recommend for a particular wildlife species. All applicable management practices for each wildlife species will be printed on the Answer Sheet. Each wildlife species should be managed independently from the others and concern for wildlife practices conflicting with another species should not be considered.

Recommendations of wildlife management practices should be made based on the *Landowner Objectives and Habitat Conditions*, the current condition of the habitat, and what may be needed to attract, retain, or remove the particular wildlife species or to improve habitat for the wildlife species' population growth. All recommendations of wildlife management practices for this activity should be put in place immediately and not recommended for any future need. This activity uses wildlife species and WMPs from the designated ecoregion only.

II: Written Wildlife Management Plan (2 hour, in the field)

Contestants will use the same habitat used in Activity I and gather with their teammates unless competing as an Individual. Four of the wildlife species on the list in Activity I will be chosen as focal species for a comprehensive wildlife management plan. The wildlife species will be typed on the answer sheet. Each contestant will have a duplicate of their answer sheet from Activity I to reference and compare with teammates' answers. Contestants will develop a wildlife management plan in outline format for the wildlife species to be managed as directed in the *Landowner Objectives and Habitat Conditions* provided at the contest and for the habitat in its current condition on the contest site. The plan must be written using bullet points not complete sentences. The entire habitat should be evaluated within the parameters given at the contest site. The management plan should cover a year or more of management practices. Some management practices may not be put into action immediately but several months after initial evaluation when conditions and climate may best fit implementation and need. Each management practice should be described with how, when, and where it will be used as directed on the answer sheet. If more than

one wildlife species is to be managed, management practices must be made with each species in consideration to avoid or minimize conflict of wildlife needs. Some management practices may benefit one species and have negative effects on another. Some management practices may be recommended that will take months or years to become beneficial. Management practices may be recommended to be repeated as needed. Answer sheets containing the plan outline will be provided (*see Appendix C of this document*). Creating a sketch of the habitat will be optional and will not be scored. If a sketch helps the plan designers to visualize the process, they are free to draw one. No extra paper will be allowed. Refer to Judges' Score Sheet to determine the criteria by which the Plan will be scored (*see Appendix D of this document*).

III: Oral Presentation of the Wildlife Management Plan (10 minute maximum per total presentation) ***REVISED PROCEDURE**

Oral presentations are often necessary to convey information about a management plan to landowners. A plan must be properly written and then properly presented to understand and receive the full effect of the management to be applied. Contestants will demonstrate their plan by presenting it orally.

Teammates will present as a team. Individual contestants will present individually. Contestants will have their plan during presentation for reference. Judges will score the plan only on what is presented to them by each contestant. It is the responsibility of the contestants to present all the information. Plans will not be read by the judges.

Contestants will present using their own Written Wildlife Management Plan (II) to a panel of judges who will score the plan as presented based on the criteria shown in the Judges' Score Sheet (*Appendix D of this document*). Judges will also score each individual team member on their presentation technique based on the criteria shown in the Judges' Score Sheet (*Appendix E of this document*). Contestants will be able to use their Plan when presenting. All four wildlife species from the plan must be presented. On a team of four contestants, each contestant will present one of the four wildlife species from the plan to include Plan Development, Plan Implementation, and Plan Evaluation of that species. It is up to the team to decide which member presents which wildlife species. On a team of three contestants, each contestant will present one of the four wildlife species from the plan to include Plan Development, Plan Implementation, and Plan Evaluation of that species and it will be up to the discretion of the team as to how the fourth species will be presented; by one team member or divided among the three. Contestants competing as an Individual must present all four wildlife species from the plan by themselves to include Plan Development, Plan Implementation, and Plan Evaluation. Only questions seeking clarification of a statement will be asked by judges.

IV: Identification and Knowledge (2 hour; indoors or outdoors or combination)

This activity includes identification of wildlife species, habitat management practices, habitat components, and food groups. Contestants will rotate through **25** stations, each with a two part challenge; part one identification of a wildlife species, a habitat management practice or concept, a wildlife food, or a habitat feature (ex: 'edge') and part two answering a question related to part one. Answers to the questions will be in multiple choice (A-D), 'true or false', or 'yes or no' format (*see Appendix F for example Answer Sheet*). ID pieces may be represented as photos, physical representations of habitat, management practices, or wildlife food groups, full or partial wildlife mounts, various external body parts (wing, pelt, feet, antler, etc.), tracks, scat, or calls/sounds. Wildlife species may be shown as male or female, juvenile or adult. Some wildlife species may be set up to be viewed through binoculars for identification. The objective of the activity is to demonstrate knowledge of wildlife and habitat component identification, ecoregion specifics, biology and ecology of specific wildlife species, concepts of wildlife management, wildlife management terminology, and wildlife management practices.

Information for this activity will be taken from the following sections in the Manual:

Wildlife Management Concepts and Terms (pg. 22-31), the specific ecoregion designated for the contest, Wildlife Species information of those listed in the designated ecoregion (pg. 33-223), Wildlife Management Practices information of those listed in the designated ecoregion (pg. 224-255), *Definitions of Food Groups* (pg. 256), and *Glossary* (pg. 256).

Scoring and Tie Breakers:

All contestants will be scored for an overall individual placing and eligible for high point individual awards. All activities will be used for the individual score and the team score. Scores from Activity II: Written Wildlife Management Plan will be used for both individual placings and team placings.

Ties will be broken for individuals and teams by using the highest score on Activity II: Written Wildlife Management Plan for those contestants or teams in question. In the case of a tie score on Activity II, ties will be further broken using highest team/individual score from Activity I, then Activity IV, in that order. Further ties will be broken at the discretion of the contest officials.

National WHEP Invitational:

The First Place Senior Team from the annual State Contest will be eligible to represent Texas 4-H by participating in the National WHEP Invitational to be held in late summer at the location named by the National committee (contest held in a different state each year). Participation in the National WHEP Invitational is not mandatory by the First Place Senior Team.

Contestants who have previously participated in a National WHEP Invitational are not eligible to participate a second time. However, those contestants are eligible to participate in the State Contest but as Individuals only and not as members of a team.

Note: The State 4-H Office will no longer fund the registration for the National WHEP Invitational nor the team shirts. All expenses incurred in registering, outfitting, and attending the event will be the responsibility of the eligible team.

APPENDICES

- A: Junior Division Formats, Answer Sheets, and Judges' Score Sheets – Activities I, II, and III
- B: On-Site Recommendations of Wildlife Management Practices – Activity I (Int. & Sr. age divisions)
- C: Intermediate and Senior Age Divisions Answer Sheets – Activity II
- D: Intermediate and Senior Age Divisions Judges' Score Sheet – Activity II
- E: Intermediate and Senior Age Divisions Judges' Score Sheet – Activity III
- F: Identification and Knowledge Answer Sheet Example - Activity IV (all age divisions)

The appendices on the following pages should be used to understand the procedures and answer sheets of the contest. All questions and references to particular wildlife species are examples and will not necessarily be the same in a contest.

Appendix A: Junior Division Formats, Answer Sheets, and Judges' Score Sheets

Activity I

On Site Recommendations of Wildlife Management Practices Junior Division Format

This activity for the Junior Division is set up as a series of twelve (12) multiple choice questions concerning wildlife species' specific management practices related to the actual habitat in which the contestants are standing.

Example Question:

If you manage for wood ducks on this property, what practice can you identify as a need?

- A. Control Nonnative Invasive Vegetation**
- B. Create snags**
- C. Plant shrubs**
- D. Water developments for wildlife**

Each question will be posted separately within the habitat. Contestants will record their answer on the provided answer sheet.

Activity II
Written Wildlife Management Plan
Junior Division Answer Sheet and Format

Note:

This is an example of the information the Junior Division contestants will be given for this activity to use in developing a wildlife management plan and sketch in accordance with the Landowner Objectives and Habitat Conditions to be provided at the contest and the current habitat conditions. The information in the outline and in the sketch will be scored.

(More space will be allowed for each section than what is shown in this example.)

Instructions:

Complete the outline below to develop your wildlife management plan for the species listed with the landowners' objectives in the *Landowner Objectives and Habitat Conditions* below. Draw a sketch of the habitat on the back of this page to illustrate your plan. Be sure to label the sketch with your information from the outline below and develop a key.

Landowner Objectives and Habitat Conditions:

Landowner Objectives and Habitat Conditions are objectives and conditions describing the habitat, the use of the habitat, and wildlife species found within the contest habitat. These are written observations and outcomes desired by the 'Landowners' that must be considered when evaluating a habitat and prescribing wildlife management practices. These are typically written but may be given verbally to the contestants as well.

Develop a management plan for this property to be presented to the landowners as an outline and a sketch. **The information provided in the outline will be scored.**

Plan Development

Evaluate the habitat for each wildlife species. For each wildlife species, circle 'YES' or 'NO' to say whether the habitat requirements are available or not.

white-tailed deer – Food: YES NO
 Water: YES NO
 Cover: YES NO

northern bobwhite - Food: YES NO
 Water: YES NO
 Cover: YES NO

Plan Implementation

List the management practices you will use in your plan for each wildlife species. Describe how each practice will affect the habitat. Describe how each practice will affect the wildlife species.

white-tailed deer –

Management Practice:

What will your practice do for the habitat? _____

How will your practice help or control the wildlife species? _____

(continued to allow multiple management practices to be listed)

northern bobwhite -

Management Practice:

What will your practice do for the habitat? _____

How will your practice help or control the wildlife species? _____

(continued to allow multiple management practices to be listed)

Plan Evaluation

List what you will do to determine if the plan worked for each wildlife species.

Plan Sketch

Draw a sketch to illustrate your written management plan. Include each management practice recommended in your written plan. Place each management practice on the sketch to show exactly where you would implement the practice. Label each management practice using a key to identify each practice and the major parts of the habitat. You may use color pencils to define your label keys to make it easier to understand.

Activities II & III
Written Wildlife Management Plan & Oral Presentation
Junior Division Judges' Score Sheet

Activity II: Written Wildlife Management Plan

Scale for Scoring

Information provided was: 0=not provided 2=poor 4=fair 6=good 8=excellent 10=outstanding

Plan Development

The habitat was evaluated correctly for (wildlife species #1).

0 2 4 6 8 10 _____

The habitat was evaluated correctly for (wildlife species #2).

0 2 4 6 8 10 _____

Plan Implementation

Appropriate management practices for each wildlife species were included for (wildlife species #1).

0 2 4 6 8 10 _____

The effect each practice will have on the habitat was included.

0 2 4 6 8 10 _____

The effect each practice will have on (wildlife species #1) was included.

0 2 4 6 8 10 _____

Appropriate management practices for each wildlife species were included for (wildlife species #2).

0 2 4 6 8 10 _____

The effect each practice will have on the habitat was included.

0 2 4 6 8 10 _____

The effect each practice will have on (wildlife species #2) was included.

0 2 4 6 8 10 _____

Plan Evaluation

An understanding of how to evaluate a management plan for (wildlife species #1) was demonstrated.

0 2 4 6 8 10 _____

An understanding of how to evaluate a management plan for (wildlife species #2) was demonstrated.

0 2 4 6 8 10 _____

II Total (100 pts max) _____

Activity III: Oral Presentations

(0 = did not participate, 20 = participated)

Team Member 1 or Individual Contestant 0 or 20 _____

Team Member 2 0 or 20 _____

Team Member 3 0 or 20 _____

Team Member 4 0 or 20 _____

III Total (top 3 scores; 60 pts. max) _____

**Appendix B: Activity I - On-Site Recommendation of Wildlife Management Practices Answer Sheet
(Intermediate and Senior age divisions)**

Example - *Note: Do not use as a study resource. Additional wildlife species will be on an actual answer sheet.*

**Activity I – Onsite Recommendations of Wildlife Habitat Management Practices
Intermediate & Senior Divisions**

Northern bobwhite

- Develop Conservation Easement
- Control Nonnative Invasive Vegetation
- Develop Field Borders
- Conduct Forest Management
- Leave Crop Unharvested
- Conduct Livestock Management
- Plant Food Plots
- Plant Native Grasses and Forbs
- Set-back Succession
- Conduct Tillage Management
- Decrease Hunting/Fishing
- Conduct Wildlife or Fish Survey

mourning dove

- Control Nonnative Invasive Vegetation
- Leave Crop Unharvested
- Conduct Livestock Management
- Plant Food Plots
- Plant Native Grasses and Forbs
- Plant Shrubs
- Plant Trees
- Repair Spillway/Dam/Levee
- Set-back Succession
- Conduct Tillage Management
- Provide Water Developments

largemouth bass

- Conduct Livestock Management
- Repair Spillway/Dam/Levee
- Decrease Hunting/Fishing
- Increase Hunting/Fishing
- Conduct Wildlife or Fish Survey
- Construct Fish Pond
- Control Aquatic Vegetation
- Fertilize/Lime Fish Pond
- Reduce Turbidity in Fish Pond
- Renovate Fish Pond

wild pig

- Conduct Wildlife Damage Management
- Conduct Wildlife or Fish Survey

black-tailed jackrabbit

- Control Nonnative Invasive Vegetation
- Conduct Livestock Management
- Plant Shrubs
- Set-back Succession
- Decrease Hunting/Fishing
- Increase Hunting/Fishing
- Conduct Wildlife Damage Management
- Conduct Wildlife or Fish Survey

Appendix C: Activity II Intermediate and Senior Divisions Answer Sheets

Activity II: Written Wildlife Management Plan Intermediate and Senior Division Answer Sheets

Note: Additional pages will be provided with each set of answer sheets for the sketch. **No extra paper is allowed on contestants' clipboards.**

Landowner Objectives and Habitat Conditions are objectives and conditions describing the habitat and wildlife species found within a contest site. These are written observations and objectives of the 'Landowners' that must be considered when evaluating a habitat and prescribing wildlife management practices. These are typically written but may be given verbally to the contestants as well.

Activity II Written Wildlife Management Plan Intermediate and Senior Divisions Answer Sheet

EXAMPLE

Note: Space shown in this example for each section does not reflect the amount of space given during the contest. This outline will be provided to guide in developing the plan. Multiple pages will be used for this answer sheet. The plan must be written in bullet statement format within this outline.

Plan Development

Evaluate the designated habitat. For the wildlife species to be managed, list in bullet format what requirements are present and what requirements are lacking.

Wildlife Species name _____:

What is present:

What is lacking:

Plan Implementation

Evaluate the designated habitat for each of the wildlife species to be managed and list which management practices you will use for each wildlife species in this habitat at its current state to reach the landowner objectives. State **how**, **when**, and **where** each management practice will be implemented (ex., "Set Back Succession with prescribed fire in the fall on annual rotating sections of the habitat in the creek bottom"). State the effect each management practice will have on the wildlife species and the effect each management practice will have on the habitat.

Wildlife Species name _____:

- Mgmt. Practice:
 - How
 - When
 - Where
- Effect on the habitat:
- Effect on the wildlife species:

Plan Evaluation

List what will be done to determine if the plan worked for **each** wildlife species.

Plan Sketch (optional)

Draw a sketch to illustrate your written management plan. Include each management practice recommended in your written plan. Place each management practice on the sketch to show exactly where you would implement the practice. Label each management practice using a key to identify each practice and the major parts of the habitat.

Note: Refer to **Appendix D: Intermediate and Senior Divisions Judges' Score Sheet for Activity II** to understand the criteria used to judge the wildlife management plans in both age divisions.

Appendix D: Intermediate and Senior Age Divisions Judges' Score Sheet – Activity II

Activity II: Written Wildlife Management Plan Judges Score Sheet (Int./Sr.)

Scale for Scoring: Information provided was: 0=not provided 2=poor 4=fair 6=good 8=excellent 10=outstanding

<p>Part 1: Plan Development (50 points maximum)</p> <p>The plan demonstrated an understanding of the habitat needs of the wildlife species.</p> <p>The plan accurately evaluated the existing habitat (what is adequate and what is lacking) based on management objectives and the needs of (<u>mourning dove</u>).</p> <p>The plan accurately evaluated the existing habitat (what is adequate and what is lacking) based on management objectives and the needs of (<u>prairie falcon</u>).</p> <p>The plan accurately evaluated the existing habitat (what is adequate and what is lacking) based on management objectives and the needs of (<u>wild turkey</u>).</p> <p>The plan accurately evaluated the existing habitat (what is adequate and what is lacking) based on management objectives and the needs of (<u>Brazilian free-tailed bat</u>).</p>	<p>0 2 4 6 8 10</p> <p>0 2 4 6 8 10</p> <p>0 2 4 6 8 10</p> <p>0 2 4 6 8 10</p> <p>0 2 4 6 8 10</p> <p>Part 1: Plan Development Subtotal _____</p>
<p>Part 2: Plan Implementation (120 points maximum)</p> <p>For <u>mourning dove</u> the plan included the <u>appropriate management practices</u>.</p> <p>For <u>mourning dove</u> the plan fully explained <u>how, when and where</u> each practice will be implemented.</p> <p>For <u>mourning dove</u> the plan listed the <u>effects of each practice</u> on the existing habitat and the wildlife species.</p> <p>For <u>prairie falcon</u> the plan included the <u>appropriate management practices</u>.</p> <p>For <u>prairie falcon</u> the plan fully explained <u>how, when and where</u> each practice will be implemented.</p> <p>For <u>prairie falcon</u> the plan listed the <u>effects of each practice</u> on the existing habitat and the wildlife species.</p> <p>For <u>wild turkey</u> the plan included the <u>appropriate management practices</u>.</p> <p>For <u>wild turkey</u> the plan fully explained <u>how, when and where</u> each practice will be implemented.</p> <p>For <u>wild turkey</u> the plan listed the <u>effects of each practice</u> on the existing habitat and the wildlife species.</p> <p>For <u>Brazilian free-tailed bat</u> the plan included the <u>appropriate management practices</u>.</p> <p>For <u>Brazilian free-tailed bat</u> the plan fully explained <u>how, when and where</u> each practice will be implemented.</p> <p>For <u>Brazilian free-tailed bat</u> the plan listed the <u>effects of each practice</u> on the existing habitat and the wildlife species.</p>	<p>0 2 4 6 8 10</p> <p>0 2 4 6 8 10</p> <p>0 2 4 6 8 10</p> <p>0 2 4 6 8 10</p> <p>0 2 4 6 8 10</p> <p>0 2 4 6 8 10</p> <p>0 2 4 6 8 10</p> <p>0 2 4 6 8 10</p> <p>0 2 4 6 8 10</p> <p>0 2 4 6 8 10</p> <p>0 2 4 6 8 10</p> <p>0 2 4 6 8 10</p> <p>Part 2: Plan Implementation Subtotal _____</p>
<p>Part 3: Plan Evaluation (40 points maximum)</p> <p>An understanding of how to evaluate a management plan for (<u>mourning dove</u>) was demonstrated.</p> <p>An understanding of how to evaluate a management plan for (<u>prairie falcon</u>) was demonstrated.</p> <p>An understanding of how to evaluate a management plan for (<u>wild turkey</u>) was demonstrated.</p> <p>An understanding of how to evaluate a management plan for (<u>Brazilian free-tailed bat</u>) was demonstrated.</p>	<p>0 2 4 6 8 10</p> <p>0 2 4 6 8 10</p> <p>0 2 4 6 8 10</p> <p>0 2 4 6 8 10</p> <p>Part 3: Plan Evaluation Subtotal _____</p>
	<p>Activity II Total (210 pts. max.) _____</p>

Note: Each plan will be judged and scored by two separate judges. The two scores will be averaged to determine the plan score.

Appendix E: Intermediate and Senior Divisions Judges' Score Sheet for Activity III

Activity III Written Wildlife Management Plan Oral Presentation Intermediate and Senior Divisions Judges' Score Sheet

Scale for Scoring: 0 = no proper demonstration 2 = poor 4 = fair 6 = good 8 = excellent 10 = outstanding

Note: One score sheet per contestant

Contestant (50 points maximum)	
Addressed judges with a personal introduction and smile.	0 2 4 6 8 10
Poised throughout presentation (calm, confident)	0 2 4 6 8 10
Voice and speaking (appropriate volume, clear, enunciation)	0 2 4 6 8 10
Grammar	0 2 4 6 8 10
Body language and dress (eye contact, hand gestures and other movements; removed cap or hat, shirt tucked in, as neat and clean as possible for having been outdoors all day)	0 2 4 6 8 10
	Contestant Total _____

Appendix F: Identification and Knowledge Answer Sheet Example - Activity IV (all age divisions)

Note: The actual answer sheet for the activity will consist of 25 blanks for answers.

	IDENTIFICATION (please print) Be sure to write the identification name or number in the blank spaces below.	Multiple Choice Answers True False Yes No
1.		A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D <input type="checkbox"/>
2.		A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D <input type="checkbox"/>
3.		A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D <input type="checkbox"/>
4.		A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D <input type="checkbox"/>

Wildlife Management Concepts and Terms

Wildlife management is both art and science that deals with complex interactions in the environment. However, it is critical to understand basic concepts about wildlife ecology and wildlife habitat requirements before management practices can be recommended to enhance habitat and manage populations for a particular wildlife species. Some of the basic concepts are described in this section. WHEP is based on these concepts, so it is important to understand them.

Definitions of various words or terms may be found in the **Glossary** at the back of this manual. Extension Wildlife Specialists, Extension educators, and local state agency wildlife biologists can provide clarification if needed. Additionally, wildlife management textbooks offer more in-depth reading and explanation.

Concepts and terms

- From species and communities to ecosystems and landscapes
- Plant succession and its influence on wildlife
- Habitat and habitat requirements
- Species richness and diversity
- Nonnative and invasive species
- Focal species and ecosystem management
- Edge
- Arrangement and interspersions
- Area-sensitive species
- Vertical structure
- Carrying capacity
- Compensatory and additive mortality
- Home range, movements, and migration
- Food webs

From species and communities to ecosystems and landscapes

A *species* is a group of individuals that can interbreed and produce viable offspring. A *population* is a group of individuals of the same species interacting and living in a given area. Populations of various species interact to form communities. Therefore, a biotic (living) *community* includes all the plant and animal populations living in a defined area. Communities interact with the abiotic (nonliving) resources (soil, air, water, and sunlight) to form what is known as an *ecosystem*. The size of the area involved when defining communities or ecosystems can vary. For example, the interacting communities of

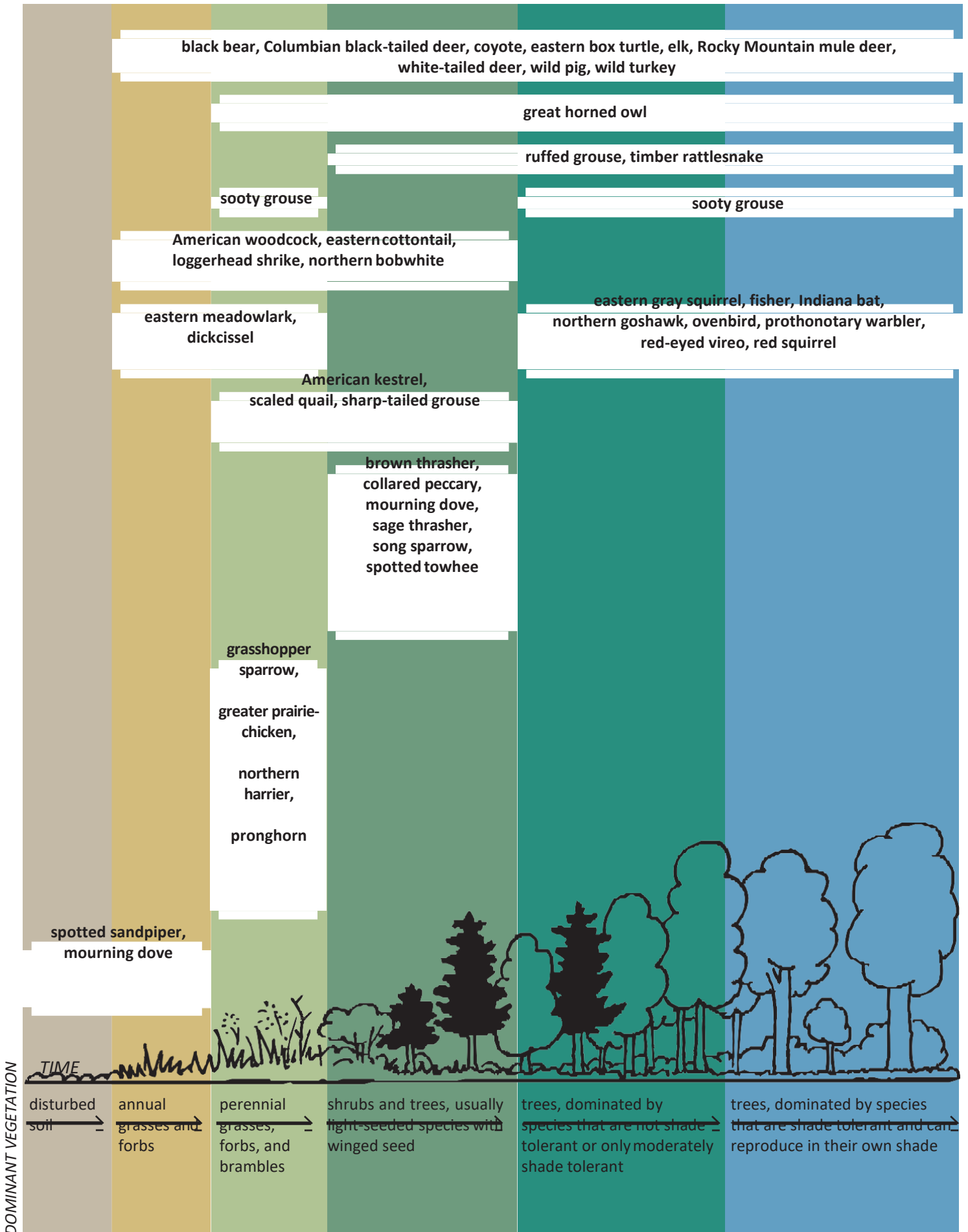
organisms associated with a decaying log or within an ephemeral pond may form an ecosystem. Likewise, this can be expanded to include all the communities associated with a forest ecosystem. The *landscape* is a larger area that composes interacting ecosystems.

Plant succession and its influence on wildlife

Plant succession represents a fairly predictable change in the species of plants that occur in a particular area over time. Various plant species that typically occur together represent plant communities, or vegetation types. The sequence of vegetation types that replace one another in progression during plant succession is called a *sere*. Various vegetation types represent various seral stages, which are also commonly called successional stages.

Climate, soils, and disturbance events determine which plant species (and therefore vegetation types) are found on a particular site. Climate, soils, and disturbance events (such as fire, wind storms, ice storms, flooding) are highly variable; thus, there are many vegetation types that can occur within any of the ecoregions represented in this manual. Examples of vegetation types include an oak-hickory forest; an emergent wetland with cattails, sedges, and smartweeds; a stand of loblolly pines; a grassland dominated by blue grama and buffalo grass; a thicket of regenerating aspen; or a fallow field of annual forbs, such as common ragweed, horseweed, and fleabane.

Depending on climate in a particular ecoregion, there may be several or only a few successional stages that compose a *sere*. For example, in the Eastern Deciduous Forest ecoregion where annual precipitation may average 40+ inches, annual grasses and forbs represent the initial successional stage following soil disturbance. Perennial grasses, forbs, and brambles dominate by year 2 or 3 after the disturbance and represent the second successional stage. Woody species, such as winged sumac, Virginia pine, winged elm, eastern redcedar, and persimmon might become prevalent within 7 or 8 years after disturbance and represent the third successional stage. Various oaks, hickories, yellow poplar, and other tree species may pioneer into the site and dominate the area within 20 years representing the fourth successional stage. Without additional disturbance, such as fire, American beech, white pine, and maples may eventually dominate the forest within 150 years and represent the fifth successional stage. Thus, approximately 5 seral stages (or successional stages) can be expected to compose a *sere* on many sites within the Eastern Deciduous Forest ecoregion.



One forest type replacing another also is observed in other ecoregions that receive considerable precipitation. For example, Douglas fir forests may be replaced over time by western hemlock in the Pacific Coastal Forest ecoregion. In portions of the Northeast Mixed Forest ecoregion, stands of aspen are eventually replaced by spruce-fir. Development of the later successional stages in a sere is continual, but slow, as one successional stage gradually develops into the next. As a result, the process can be imperceptible to many people. Full development of some seres takes longer than the average lifespan of a human.

Descriptions of the successional process in different ecoregions of the U.S. can be found in the **Ecoregions** section of this manual. Successional stages can be difficult to identify or distinguish. Plant identification skills and some knowledge of plant community ecology are helpful.

The final seral stage that a site will transition to in the absence of disturbance is often called the climax seral stage and is dominated by species that can reproduce and replace themselves without additional disturbance. In ecoregions with sufficient rainfall (such as Eastern Deciduous Forest, Southeast and Northeast Mixed Forest, and Pacific Coastal Forest), early successional plant communities ultimately succeed to forests. In drier ecoregions (such as Great Plains Grasslands, Prairie Brushland, and Hot Desert), fewer seral stages compose the sere and vegetation communities of perennial grasses, forbs, shrubs, and cacti may represent the ultimate, or climax, successional stage. Disturbance events, such as fire, grazing, ice and wind storms, and flooding, continually set-back succession and the process starts over.

Although succession is set back through natural disturbances, many natural disturbance events have been disrupted by man. For example, levees have been built to prevent natural flooding, and great effort is expended to suppress and control fire. Also, extensive plantings of nonnative sod-forming grasses have unnaturally altered or interrupted succession in nearly every ecoregion of the country. Because of their dense nature at ground level, the seedbank is suppressed and response (thus succession) is suppressed. Suppressing succession is often called *arrested succession*. There are many nonnative invasive plant species that influence succession in most ecoregions.

Plant succession is an important concept for wildlife managers because as succession takes place and vegetation composition changes, the structure (density and height of vegetation, or cover) of the vegetation

and the type of food available for wildlife change. **As vegetation structure and food availability change, the species of wildlife that use the area change because different wildlife species have different habitat requirements.** All wildlife species are associated with various plant communities or successional stages. Some species, such as wild turkey, white-tailed deer, and coyote, may use several successional stages to meet various life requirements. Others, such as grasshopper sparrow and ovenbird, may be found only in one or two successional stages. The fact that different wildlife species require different successional stages highlights the importance of having a diversity of successional stages if a diversity of wildlife species is a goal or consideration.

The compositional and structural changes of plant communities following disturbance events are fairly predictable within a given ecoregion. Thus, wildlife managers intentionally manage disturbance to provide the appropriate successional stage(s) for various wildlife species or groups of species. Wildlife management practices, such as prescribed burning, forest regeneration, selective herbicide applications, grazing, and disking, can be used in the absence or interruption of natural disturbance events. Alternatively, planting various plants (especially trees and shrubs) and lack of disturbance will advance succession.

Differentiating successional stages can be difficult where grasslands, savannas, woodlands, and forests all occur. Grasslands are areas dominated by grasses and other herbaceous plants (forbs, sedges, and brambles) and very few if any trees. Savannas and woodlands are areas with sparse to moderate tree cover and a well-developed



Plant succession involves a change in plant species composition over time. This field in east Tennessee is moving from the second successional stage (perennial grasses and forbs represented by broomsedge bluestem, goldenrod, and thoroughwort in picture) into the third successional stage (shrubs and pioneering trees, represented by winged sumac, sweetgum, and eastern redcedar in picture).



Oak or pine savannas and woodlands represent early successional vegetation with scattered trees. However, without continued fire, savannas and woodlands will succeed into forests where there is sufficient precipitation.

groundcover of herbaceous plants. Forests are dominated by tree cover. In areas with abundant precipitation, grasslands, savannas, and woodlands will succeed into forests if not continually disturbed (usually with fire). When evaluating a savanna or woodland in these areas, it is not important to define the successional stage. Instead, evaluation of the structure and composition of the plant community and whether it provides habitat for the wildlife species under consideration is most important.

Habitat and habitat requirements

Habitat represents the physical and biological resources (food, cover, water, space) required by a particular wildlife species for survival and reproduction. Habitat requirements are species specific. That is, not all species require the same resources in the same amount or distribution. If those resource requirements are provided in a particular area for a particular wildlife species, then that area represents habitat for that species. Thus, there is no such thing as “suitable habitat”—the area either is or isn’t habitat for a particular species. Habitat quality may range from excellent to poor, depending on resource availability, but if the minimum habitat requirements for a given species are not provided, then the area is not considered habitat for that species.

Habitat should not be confused with vegetation or vegetation types, such as a mature hardwood forest or a grassland. Some wildlife species may find all of their habitat requirements within one vegetation type. For example, an eastern gray squirrel may live its entire life within one mature oak-hickory stand. However, other species, such as white-tailed deer and mule deer, thrive in areas with considerable interspersed vegetation types.

Thus, habitat for these species usually includes several vegetation types and successional stages. Although the term “habitat type” is often used interchangeably with “vegetation type,” it is confusing, technically inaccurate, and should be avoided.

Differences in habitat requirements among some species are subtle, whereas differences in habitat requirements among other species are dramatic. For example, habitat requirements for northern bobwhite and American kestrel are somewhat similar. They both require cover dominated by shrubs, forbs, and grasses, but bobwhites primarily eat various plants, seed, mast, and insects, whereas kestrels’ prey on other animals, including small mammals, lizards, and insects. Thus, even though bobwhites and kestrels may use the same vegetation type or successional stage, their habitat requirements are different. Habitat requirements for eastern gray squirrel and mourning dove are not similar at all. Although they may be found in the same ecoregion, they use different vegetation types and foods and have different space requirements.

Habitat requirements for various wildlife species often change through the year or life stage. Food and cover resources needed during one season or for one age of animal may be much different than what is required or available during another. For example, wild turkey hens and their broods spend the night on the ground where there is adequate groundcover until the poults are able to fly. During summer, wild turkey broods use early successional areas with abundant forbs where they feed upon insects and are hidden from overhead predators. As young wild turkeys reach 2 to 3 weeks of age, they roost in trees and shrubs, and as mast becomes available in the fall, wild turkeys are frequently found in mature hardwood forests when available.

Species richness and diversity

Species richness refers to the total number of different species present in an area. Species richness differs from diversity in that diversity not only accounts for the number of species present in an area, but also how those species are distributed and how abundant each species is on that area. One goal in wildlife management may be to provide habitat for as many different species as possible, as contrasted to managing for a maximum number of individuals within a species or limited number of species. Generally, habitat requirements are provided for more wildlife species when a variety of vegetation types and successional stages are present in an area.

Nonnative and invasive species

Many plants and animals have been introduced, either accidentally or intentionally, into the United States from around the world. These species are commonly referred to as nonnative. Some nonnative species are most useful and have filled a need in our society. For example, wheat (native to southwest Asia) and soybeans (native to northeast China) are two nonnative plants that have provided high-quality foods for both humans and wildlife in the U.S. The domestic cow (ancestors native to Europe and Asia) and chicken (ancestors native to Asia) are examples of nonnative animal species that provide benefit for our society.

Some nonnative species have become naturalized. That is, they are able to maintain populations in the wild. Many of these species have not only become naturalized, but they have become competitive with native plants and animals, sometimes displacing native species. Some naturalized nonnative species are actively managed, such as ring-necked pheasants (native to China), brown trout (native to Europe), wild goats (western Asia), and white clover (native to Europe).

Often, nonnative species are successful because the climate is similar to that from which they originated, and they do not have many natural pests or competitors that may have limited them in their native range. Some nonnative species are so favored by the conditions where they were introduced that they spread at incredible rates and controlling them can be very difficult. These species are both nonnative and invasive. Kudzu (native to Asia), cogon grass (native to southeast Asia), and Japanese stilt grass (native to eastern Asia) are examples of nonnative invasive plants. Norway rats (native to Asia) and silver carp (native to Asia) are examples of nonnative invasive wildlife and fish.

Nonnative invasive plants contribute to loss of habitat for native wildlife and fish species and can lead to population declines of both native plants and wildlife species. Nonnative invasive wildlife and fish often outcompete native wildlife and fish and cause population declines of native species. Nonnative invasive species (both plants and animals) pose a considerable challenge for natural resource managers. Many nonnative invasive species are extremely difficult to control or eradicate. Herbicide applications, prescribed fire, mechanical removal, and biological control are commonly used to limit the impact of nonnative invasive plants on native plants and animals. Not only do nonnative invasive species impact

native wildlife and plants, they also impact agricultural production, water resources, municipal capacity, and even human health and safety. Every effort should be made to prevent the introduction of nonnative species that may become invasive.

Focal species management and ecosystem management

Wildlife management is generally practiced with a focal species approach or an ecosystem management approach. The focal species approach involves managing specifically for one or a select few wildlife species. The ecosystem management approach involves managing for a healthy and functioning ecosystem, such as the longleaf pine or shortgrass prairie ecosystems, and allowing the associated wildlife species to respond. Most landowners



The ecosystem management approach involves managing for a healthy, functioning ecosystem without focusing specifically on one or more wildlife species. This approach is most often used in an effort to restore imperiled ecosystems on large tracts of land.



Most landowners identify focal species when managing their property for wildlife because not all species benefit from the same wildlife management practices.

have specific objectives or concerns about a particular species. Once the species is determined, resources that may be limiting (such as cover, food, or water) for that species on that property can be identified and the appropriate wildlife management practices can be prescribed. Occasionally, the focal species may be totally incompatible with the area under consideration and management goals and objectives must be changed.

It is best to select wildlife management practices that provide or improve the habitat requirements most lacking and, thus, are limiting the population (limiting factors). For example, if a species requires trees for cover with water nearby, and the area being evaluated has plenty of trees but no water, a management practice that will supply water will improve the area more effectively than planting trees.

Wildlife management practices that improve habitat for some wildlife species may be detrimental to other wildlife species. It is impossible to manage an area for any one species or group of species without influencing other species in some way. For example, if a mixed hardwood stand is clearcut to benefit ruffed grouse, then wild turkey, white-tailed deer, and eastern cottontail also may benefit. However, species, such as ovenbird, wood thrush, and eastern gray squirrel, which prefer mature deciduous forest, will be forced to use another area.

Edge

An edge is formed where two or more vegetation types or successional stages meet. An obvious example is where a field meets a forest. A less obvious example is where a mature stand of aspen meets a spruce-fir forest. An even less obvious example is where a 40-year-

old mixed hardwood stand meets an 80-year-old mixed hardwood stand.

The transition in vegetation types or successional stages can be abrupt or gradual. An example of an abrupt change would be where a hayfield meets mature woods. This type of edge has high contrast and is called a *hard edge*. A more gradual change would be where a 40-year-old forest meets an 80-year-old forest. A much more gradual change is where an overgrown field with native grasses, forbs, and scattered shrubs blends into a brushy thicket or a 3-year-old regenerating hardwood stand. This type of edge has low contrast and is called a *soft edge*. Sometimes the edge or transition between two vegetation types is so gradual, characteristics of both are evident in a relatively wide zone, called an ecotone. A common example of an ecotone is where an upland hardwood stand meets a bottomland hardwood stand. Species transition occurs gradually with the elevation as the upland blends into the bottomland.

The concept of edge is important in wildlife management. If there is increased edge, then there is increased interspersion of vegetation types or successional stages. This may be beneficial for a particular wildlife species *if*:

- both vegetation types are usable by the species and provide some habitat requirement.
- the arrangement of the vegetation types is suitable for the focal species (see ***Arrangement and interspersion*** on page 23).

Increased interspersion also can lead to increased species diversity, as more vegetation types are available, and can potentially provide Habitat requirements for a larger number of species. It is important to realize the presence of edge is not always beneficial for any wildlife species. If the vegetation types or successional stages



The abrupt change in species composition and structure (left) is typical of a hard edge. Allowing native grasses, forbs, and brambles to grow into the field from a woods edge is typical of a soft edge and increases the amount of “usable space” for many wildlife species by providing suitable cover and food resources.



John Gruchy

For those wildlife species considered “edge” species, the physical edge presented where two vegetation types or successional stages meet is not as important as the actual structure presented within a vegetation type or successional stage.



Some species do not require much space to live. An eastern gray squirrel or eastern box turtle might spend their entire lives on only a few acres. Other species, however, require considerable area. Grasshopper sparrows, for example, are rarely found in grasslands smaller than 100 acres.

present do not provide any habitat requirement for the species in question, the interspersion and resulting edge is not beneficial. Thus, looking at an aerial photo and counting the number of times different vegetation types or successional stages meet is not necessarily a good measure of habitat quality for any particular species. Also, some species may actually avoid edges and seek areas that are more similar.

Further, some species often found along an edge have been relegated to use the edge because the interior of the adjacent vegetation type is unattractive or does not provide any habitat requirement. For example, wild turkey and northern bobwhite broods might be found along the edge of a field dominated by tall fescue or bermudagrass. The reason the birds are not in the field is not because they necessarily like the edge, but because there is not suitable cover or food resources in the field, or the structure of the vegetation in the field is so thick at ground level the birds cannot walk through it. Thus, if the composition and structure of the vegetation in the field was improved to provide mobility and adequate cover for quail and turkeys, there would be as many birds in the opening as along the edge. As a result, there would be additional habitat for the birds and the carrying capacity of the property would be increased (see **Carrying capacity** on page 25). In summary, the edge is not what is necessarily important, but rather the composition and structure of the vegetation.

Arrangement and interspersion

How different successional stages or vegetation types are situated in relation to each other is often referred to as horizontal arrangement or juxtaposition. Some wildlife species may obtain all of their habitat requirements from only one vegetation type or successional stage (such as crissal thrasher, eastern gray squirrel, gopher tortoise, sharp-tailed grouse, ovenbird). Other species require (or greatly benefit from) more than one successional stage to provide all their habitat requirements (bobcat, northern bobwhite, white-tailed deer, wild turkey, American woodcock). For example, ruffed grouse may forage on acorns in mature mixed hardwood stands during fall and



The arrangement of vegetation types and successional stages directly influences animal movements and home range size. Here, cover for nesting and brooding, and escape cover are arranged in close proximity (juxtaposed) to favor habitat requirements for northern bobwhite.

winter, but use young forest stands with high tree-stem densities for escape cover. Required successional stages should be close to each other to allow for safe travel to and from those areas. Proximity is especially important for species with limited movements and relatively small home ranges.

Interspersion is the frequency of occurrence of different vegetation types. Increased interspersion generally leads to increased “mixing” of vegetation types and often supports a greater diversity of wildlife. However, the vegetation types present, and the quality of cover and food resources present in those vegetation types are more important than whether or not there is much interspersion. As interspersion increases, so does the amount of edge. However, as discussed in **Edge**, increased interspersion is not necessarily beneficial to all species. Interspersion is easily viewed on aerial photos or satellite images. However, habitat quality cannot necessarily be assessed by viewing aerial photos or satellite images. It is true that where there is increased forest cover, the amount of habitat for eastern gray squirrel is likely increased, and where there is increased grassland cover, the amount of habitat for grasshopper sparrow is likely increased. However, the composition and structure of the vegetation in fields, shrubland, and forests greatly influence habitat quality for many species, and that fine-level analysis is not possible by viewing photos. Thus, walking over the property and taking a closer look is necessary when evaluating habitat for most species.

Area-sensitive species

Fragmentation is the disruption of vegetation types either by man or by natural processes. All wildlife species do not respond to fragmentation the same way. For some, the edge between a young forest and an older forest may fragment their habitat, whereas others may not respond to fragmentation except under extreme circumstances such as an interstate highway bisecting a forest or prairie or suburbia creeping into a rural area. Some species need large, unfragmented areas in a certain successional stage to provide some or all of their habitat requirements. Such species are referred to as area sensitive. For these species, large areas in one successional stage are desirable. Unfragmented habitat of at least 100 acres is considered the minimum requirement for many area-sensitive species. Some species, such as the grasshopper sparrow, may require a minimum of 1,000 acres of relatively unfragmented habitat to sustain a viable population. Others, such as the greater prairie-chicken, may require 30,000 acres of relatively unfragmented habitat.



The vertical structure in this mature oak/hickory forest provides cover and food resources for a suite of forest songbird species that otherwise would not be found here.

Vertical structure

In most vegetation types, there are distinct layers of vegetation. In a grassland, there is often a litter layer with one or two layers of grasses and forbs. In a forest or woodland, there may be three distinct layers of vegetation. The understory is composed of those plants growing near the ground, up to 4.5 feet tall. The understory may be very diverse and include grasses, forbs, ferns, sedges, brambles, vines, shrubs, and young trees. The midstory is represented primarily by shrubs and trees more than 4.5 feet tall yet below the overstory canopy. The overstory is made up of those trees in the canopy.

How the different layers of vegetation are arranged in relation to each other is important to many wildlife species. For example, some birds require more leaf litter in a grassland than others and some like taller grasses, whereas others prefer shorter grasses. Some birds may require a herbaceous understory for foraging in the forest, but nest in the overstory. Vertical structure may vary dramatically from site to site, even within a given field or forest type. For example, one mature oak-hickory forest might have a well-developed understory and midstory with visibility of no more than 30 feet, whereas another has very little understory vegetation and no midstory at all. Although they are the same forest type, these two forests would not necessarily provide habitat for the same wildlife species. The structure could be manipulated on these sites depending on the objectives. Thinning and prescribed fire are two management practices that are commonly used to influence understory and midstory structure in forests and woodlands.



Any area is only able to support a certain number of animals before available food and cover resources are depleted. Here, overabundant white-tailed deer have exceeded the carrying capacity of the area. Chronic over browsing has eliminated the forest understory and thus negatively affected many other wildlife species that require understory vegetation for nesting, feeding, roosting, or escape cover.

Carrying capacity

There are only so many animals that can live in an area. The concept of carrying capacity is related to the number of animals that can exist in an area. Biological carrying capacity refers to the maximum number of animals, within a given species, an area can support before that species or another species is negatively affected. The quantity and quality of food, cover, water, and space determines the carrying capacity. The requirement that is in shortest supply, called the limiting factor, determines carrying capacity. Increasing the requirement in shortest supply can increase the area's biological carrying capacity.

Biological carrying capacity varies from season to season and often from year to year. For most species, it is usually greatest from late spring through fall when food and cover are most abundant. This time of year is when most young are born, which helps ensure adequate nutrition and cover are available for growth and survival. With the coming of winter or summer drought, food and cover gradually diminish.

More animals are produced each year than will survive. Surplus animals are lost to predation, starvation, competition, or disease. Young wildlife and animals in poor health experience the highest mortality rates. Hunting and fishing remove some animals and may help prevent over-population for some species (see **Compensatory and additive mortality**).

In suburban areas, humans often demand the density of certain wildlife species be lower than the biological

carrying capacity because of wildlife damage issues. For example, white-tailed deer populations can thrive in suburban areas where the biological carrying capacity is relatively high because deer have adapted to feed opportunistically on ornamental plants. However, homeowners generally have low tolerance for deer feeding on expensive landscape plants. Thus, the deer population must be reduced to limit damage. In this case, the cultural carrying capacity (determined by human tolerance) is lower than the biological carrying capacity.

Compensatory and additive mortality

Annual mortality is the rate at which animals die per year. The mortality rate for a species is often estimated by biologists to help determine management efforts for that species. Animals die from many causes, including predation, diseases, malnutrition, weather, hunting, accidents, fighting, and others. All of these factors may contribute to the annual mortality rate for a particular species. For example, each of those factors contributes to the annual mortality rate of white-tailed deer in Minnesota each year. However, the number of deer that die from each of these causes of mortality is not the same, and the number of deer that die from each of these causes fluctuates somewhat from year to year.

The number of animals that die from one cause of mortality often influences the number that may die from another cause. For example, increased harvest of deer by hunters in October and November leaves fewer animals in the population that winter. Thus, more food is available per animal and the likelihood of deer dying from starvation decreases. Thus, mortality from hunting and mortality from malnutrition can act in a compensatory manner. As the mortality from one cause is increased, the mortality rate of another is decreased. To relate this to WHEP contests, **Increase Harvest** may be recommended to lower white-tailed deer populations so that food availability is increased per animal and fewer animals are susceptible to winter starvation.

Mortality can be additive. For example, rainfall commonly influences northern bobwhite populations in portions of Texas and Oklahoma. In years with little rainfall, there is less groundcover to provide cover and food and, as a result, fewer quail survive through summer and fall. Thus, the bobwhite population going into winter may be quite low because of malnutrition, predation, and heat stress through the summer. If the population is at a critically low level, additional mortality from hunting through winter may be *additive*, especially if hunting pressure is equal to that in normal years. As related to WHEP contests, if the

population of a nonmigratory game species has declined for some reason and is considered too low to sustain the level of mortality experienced recently by regulated hunting or trapping, **Decrease Harvest** may be warranted.

Hunting is not the only mortality factor that could be additive. Using the scenario above with relatively few bobwhites surviving through summer and fall, there still may be sufficient numbers of quail to replenish the population when the breeding season begins. However, a late winter storm that dumps unusually deep snow and persists for a while can limit food availability even further. Thus, more quail die. In this situation, mortality is *additive* from the snowfall. Regardless of whether the population was high or low, a significantly high percentage of the population would have been affected by the weather event.

Thus, it is important for biologists to monitor mortality rates for various species, especially those that are hunted, and be prepared to adjust regulations and management practices to better manage for a particular species. Adjusting regulations and management practices as conditions change and additional information becomes available is termed *adaptive management*.

Home range, movements, migration, and corridors

A home range encompasses the area in which an animal lives. Home range size is related to habitat quality. Daily movements include those for normal day-to-day activities. In higher-quality habitat, home ranges tend to be smaller than in lower-quality habitat because movements necessary to meet life requirements are reduced. A seasonal home range is the area an animal uses in a particular season of the year. A seasonal movement, or migration, is made when an animal moves from one seasonal home range to another. Migration may represent movements to and from wintering and nesting areas (such as waterfowl and songbirds) or wintering and calving areas (for caribou and some elk populations). Migration also can involve movements from higher elevations to lower elevations each spring and fall as food availability varies with the seasons (seen with elk and some species of grouse).

Migration distances may be short or very long, depending on the species. Long migrations for some species require habitat along the route (to stop and rest and eat). Thus, wildlife managers must consider this in landscape planning for various species, which means habitat conditions might have to be considered among states, countries, or even continents.

Corridors are areas that do not restrict movement and allow various wildlife species to move from areas within their home range or during migration. The type of vegetation within the corridor and the size (both width and length) of the corridor needed varies depending on the species. An example of a corridor might include a stream or river with trees and shrubs along both sides (the riparian zone) cutting through a large grassland. The wooded, riparian corridor facilitates movement for squirrels, deer, wild turkey, and other species that require or otherwise seek the security of wooded cover to cross a broad open area. A smaller version of such a corridor would be a hedgerow traversing a large field. Other examples of corridors might include valleys between mountain ranges for migrating mule deer, or underpasses facilitating black bear movement under interstates and major highways.

Food webs

Food chains are the step-by-step passage of material and energy (food) through an ecosystem. A network of interconnected food chains is called a food web. In terrestrial ecosystems, plants are primary producers in a food chain because they supply food at the lowest level of the food chain. In aquatic ecosystems, phytoplankton (microscopic algae) is the base of the food chain. It takes an enormous number of individual plants (or amount of phytoplankton) to support the other parts of a food web. At the next level of a food chain are primary consumers, plant-eating animals or herbivores. Primary consumers include rabbits, mice, deer, and certain other mammals; some insects and fish; and dabbling ducks, geese, and certain other birds. In aquatic ecosystems, zooplankton and aquatic insects feed on phytoplankton.



Alan Windham

Predators, such as this red-tailed hawk, are necessary to buffer populations of various prey species. For most predators, when one prey species begins to decline, other prey species become more prevalent in the diet.

Primary consumers are eaten by secondary consumers, or carnivores (meat-eaters). This group includes predators, such as birds of prey, snakes, foxes, cats, and people. In aquatic ecosystems, zooplankton and aquatic insects are eaten by small fish. Small fish are eaten by larger fish.

Secondary consumers are eaten by tertiary consumers, which may be predators or scavengers, such as turkey vultures, crabs, and sometimes people. Note these categories are very broad and general. Many animals fit into more than one group, and there are more complex levels of a food web. An example is an omnivore, which is an animal that eats both plant and animal matter.

Any of the food web components mentioned above can be broken down by decomposers—organisms such as bacteria and fungi that reduce dead plant or animal matter into smaller particles. A decaying plant, for example will be broken down into nutrients that enrich the soil. This process supports the growth of more plants and thus, more animals.

Ecoregions

Areas of the country can be separated into ecoregions having similar climate, vegetation, and wildlife. They are described in very general terms. Wetlands and urban areas are found within all ecoregions.

At the end of each ecoregion description is a list of wildlife species found within to be studied when a contest is set up for that ecoregion. Contest information will always provide which ecoregion to study in preparation. Only the wildlife species listed will be used in the event.

Each ecoregion description is followed by a table that identifies wildlife management practices for each of the wildlife species that occur in that ecoregion. An 'X' in a box in the column under a species name indicates that the corresponding management practice in that row is applicable for that species in the ecoregion. Specific information on recommended wildlife management practices can be found in the **Wildlife Species** section.

List of Ecoregions

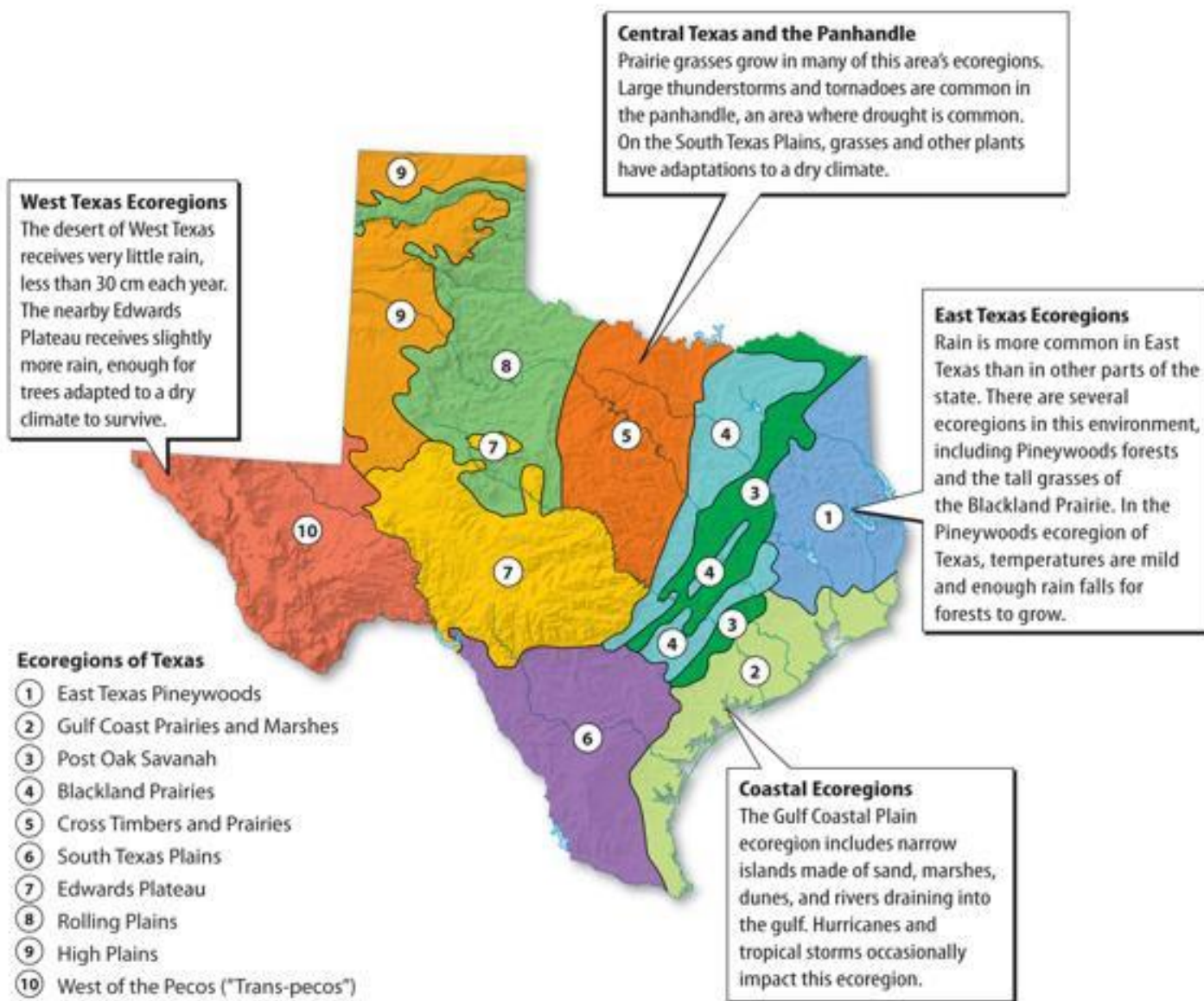
Eastern Deciduous Forest
Great Plains Grassland – Shortgrass Prairie
Great Plains Grassland – Tallgrass/Mixed Prairie
Hot Desert
Intermountain – Foothills
Intermountain – Montane
Intermountain – Sagebrush
Intermountain – Subalpine
Mediterranean
Northeast Mixed Forest
Pacific Coastal Forest
Prairie Brushland
Southeast Mixed and Outer Coastal Plain Forest
Woodland

Special area considerations within each ecoregion. These land types can be seen in any ecoregion in various forms. For contest purposes, either or both may be integrated with an ecoregion which would include the additional wildlife species.:

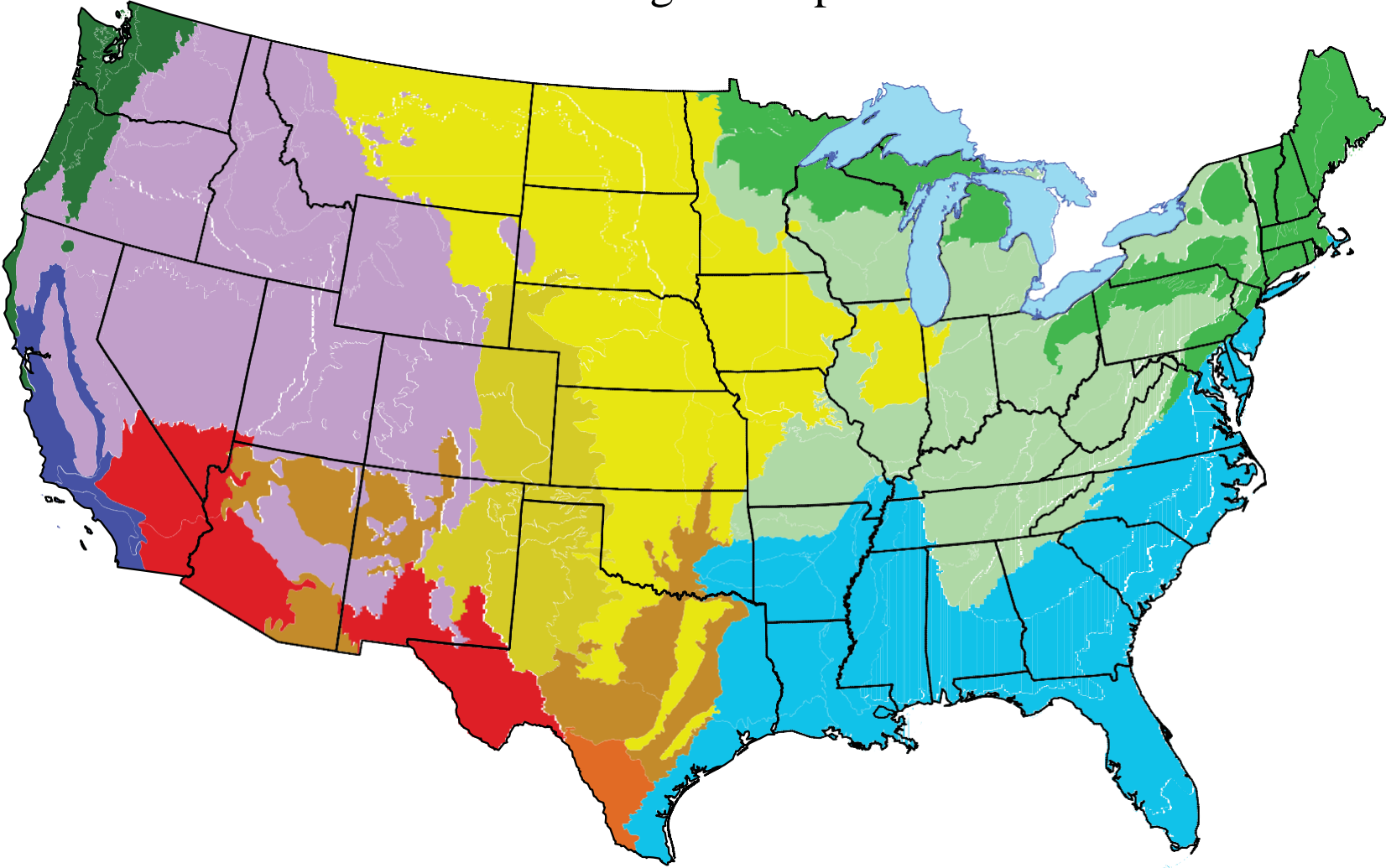
Urban
Wetlands

Texas Ecoregions

- This graphic provides the actual ecoregions found in Texas which are used in actual wildlife habitat management by land managers across the state. As you can see, many more ecoregions exist in our state in more detail in contrast with the information outlined in the contest material which is developed from a continental perspective. This graphic is provided for educational information only and will not be used at this time for a WHEP contest. For a study of wildlife and habitat management, youth should learn the actual ecoregions of our state and understand the differences and the habitat each can provide, as well as why. Additional information can be found on the Texas Parks and Wildlife Department website; <https://tpwd.texas.gov/education/hunter-education/online-course/wildlife-conservation/texas-ecoregions>

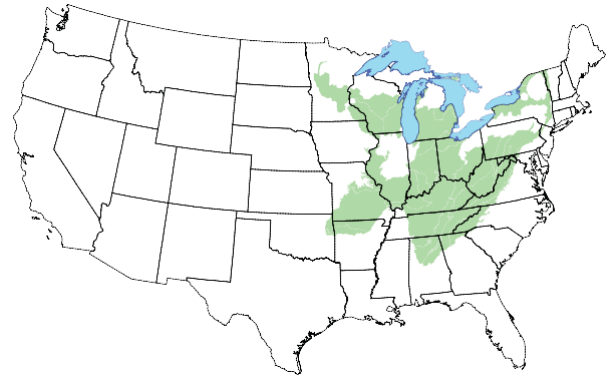


Ecoregion Map



- | | | | | | |
|---|--|---|--------------------|---|------------------------|
|  | Southeast Mixed and Outer Coastal Plain Forest |  | Shortgrass Prairie |  | Pacific Coastal Forest |
|  | Eastern Deciduous Forest |  | Intermountain |  | Hot Desert |
|  | Northeast Mixed Forest |  | Prairie Brushland |  | Mediterranean |
|  | Tallgrass/Mixed Prairie |  | Woodland | | |

Eastern Deciduous Forest



Physical description

Most of the terrain is rolling except for the Appalachian Mountains and Ozark Mountains, which can be steep. The average annual precipitation ranges from approximately 35 inches to 90 inches and is usually well-distributed throughout the year. Summers are hot; winters are cold.

Dominant vegetation

Deciduous trees dominate the landscape across the Eastern Deciduous Forest ecoregion where there is a lack of disturbance. Depending on location, trees such as oaks, hickories, maples, American beech, basswood, buckeye, yellow poplar, walnut, and birches are common in the overstory and can be indicators of a climax successional stage. Prevalent midstory trees include flowering dogwood, sassafras, sourwood, eastern redbud, hophornbeam, American hornbeam, and striped maple. Common shrubs include arrowwood, black huckleberry, blueberries, hawthorn, pawpaw, spicebush, viburnums, and witch hazel. A wide variety of ferns may be found in the understory. Common evergreen trees on many sites undergoing succession include eastern redcedar, Virginia pine, and shortleaf pine. In the Appalachians, eastern hemlock has been an important component in the Eastern Deciduous Forest. However, its decline following invasion of the Asian hemlock adelgid will surely lead to functional changes within this ecoregion.

Changes in the composition, structure, and function of the Eastern Deciduous Forest have already occurred during the past 100 years with the loss of American chestnut and the near total exclusion of fire. Prior to fire suppression, savannas and woodlands dominated by oak and shortleaf pine (depending on geographic location) were prevalent over much of this ecoregion.

Well-interspersed with forested areas in the Eastern Deciduous Forest ecoregion are agricultural fields,

pastures and hayfields, and fields undergoing succession. Virtually all of the “old-fields” were cropped in the past, and the vast majority has since been planted to nonnative grasses, especially tall fescue. Restoring old-fields and other open areas that contain nonnative sod grasses to native grasses and forbs is a major objective concerning wildlife conservation in this ecoregion. Native grasses, forbs, brambles, and shrubs occurring naturally in openings and savannas include bluestems, panic grasses, Indian grass, switchgrass, asters, lespedezas, tick-trefoils, partridge pea, pokeweed, blackberry, wild plum, and sumacs.

Commonly occurring nonnative invasive plants in the Eastern Deciduous Forest ecoregion include tall fescue, orchard grass, Bermuda grass, sericia lespedeza, royal paulownia, tree-of-heaven, calory pear, autumn and Russian olive, Japanese honeysuckle, bush honeysuckles, Chinese privet, and bicolor lespedeza.

Farming and ranching

Large areas of the Eastern Deciduous Forest ecoregion have been cleared for crop production and livestock forage. The major agriculture crops in the ecoregion are corn, soybeans, wheat, grain sorghum, and cotton. The dominant grasses grown for pasture and hayfields include tall fescue, orchard grass, bermudagrass, dallis grass, and bluegrass, all of which are nonnative. Depending on how croplands and pastures are managed, some wildlife species benefit. Unfortunately, crop-fields are usually



harvested in late summer or early fall (unless winter wheat is growing), pastures are most often overgrazed (leaving no cover for nesting or loafing), and hayfields are nonnative sod-grasses that provide poor structure for most wildlife species. The vast majority of fields that are

not in crop production are hayed (or mowed for aesthetic purposes) at least twice per year, usually once during the height of the nesting season for grassland birds, and once in late summer/early fall, which destroys any value as winter cover for wildlife.

Plant succession

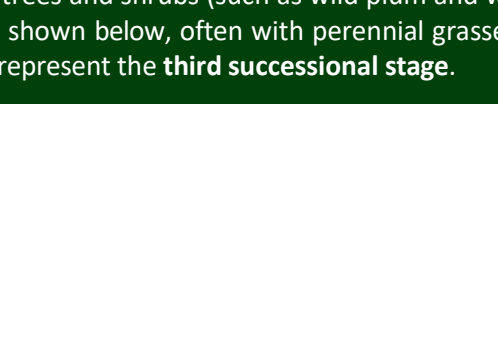
Annual forbs such as common ragweed (shown below) and grasses with a few perennial species represent the **initial successional stage**.



Perennial forbs and grasses (such as broomsedge, goldenrod, ironweed (purple flower), and thoroughwort (white flower) shown below) and brambles represent the **second successional stage**.



Young trees and shrubs (such as wild plum and winged sumac shown below, often with perennial grasses and forbs, represent the **third successional stage**.



Hardwood forests typically represent the **fourth successional stage**. In some areas of the Eastern Deciduous Forest ecoregion, pine forests represent the third or fourth successional stage. Regardless, forests are young before they are old. Young forests (below, top) provide a different structure than older forests (below, bottom). Wildlife associated with forests that are only 2- to 4-years-old are often the same species associated with brushy cover provided in the third successional stage (such as eastern cottontail, northern bobwhite, brown thrasher).



8-year old mixed hardwood forest



80-year old mixed hardwood forest

Wildlife associated with Eastern Deciduous Forest

American woodcock
brown thrasher eastern
meadowlark
golden-winged warbler
great horned owl
mourning dove northern
bobwhite ovenbird
wild turkey
wood duck
bobcat
eastern cottontail
eastern gray squirrel
gray fox
Indiana bat
white-tailed deer
eastern box turtle
timber rattlesnake
bluegill
largemouth bass

Eastern Deciduous Forest	American woodcock	brown thrasher	eastern meadowlark	golden-winged warbler	great horned owl	mourning dove	northern bobwhite	ovenbird	wild turkey	wood duck	bobcat	eastern cottontail	eastern gray squirrel	gray fox	Indiana bat	white-tailed deer	eastern box turtle	timber rattlesnake	bluegill	largemouth bass
Habitat Management Practices																				
Develop Conservation Easement			X	X			X								X					
Control Nonnative Vegetation	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		
Create Snags				X	X					X				X	X					
Develop Field Borders		X			X		X		X		X	X				X	X			
Conduct Forest Management	X	X		X	X		X	X	X	X	X	X	X	X	X	X	X	X		
Leave Crop Unharvested						X	X		X	X		X				X				
Conduct Livestock Management	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X
Provide Nesting Structures										X										
Plant Food Plots						X	X		X	X		X	X			X				
Plant Native Grasses and Forbs			X		X	X	X		X			X				X	X			
Plant Shrubs	X	X		X	X		X		X	X	X	X		X		X	X			
Plant Trees	X			X	X	X		X	X	X	X		X	X	X	X	X	X		
Repair Spillway/Dam/Levee						X				X									X	X
Set---back Succession	X	X	X	X	X	X	X		X	X	X	X		X	X	X	X			
Conduct Tillage Management					X	X	X		X	X		X				X				
Provide Water Developments for Wildlife						X			X	X						X	X			
Population Management Practices																				
Decrease Hunting/Fishing							X		X		X	X	X	X		X			X	X
Increase Hunting/Fishing									X		X	X	X	X		X			X	X
Conduct Wildlife Damage Management					X				X		X	X	X	X		X		X		
Conduct Wildlife or Fish Survey	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Fish Pond/Stream Management Practices																				
Construct Fish Pond																			X	X
Control Aquatic Vegetation																			X	X
Fertilize/Lime Fish Pond																			X	X
Reduce Turbidity in Fish Pond																			X	X
Restock Fish Pond																			X	X
Streams: Create Pools																				
Streams: Remove Fish Barriers																				

Great Plains Grasslands – Shortgrass Prairie

Physical description

The terrain is flat to rolling with occasional valleys, canyons, mesas, and buttes. Average annual precipitation ranges from 10 to 25 inches.

Dominant vegetation

In the western Great Plains (or shortgrass prairie), climax vegetation typically consists of short grasses, such as the grammas, buffalo grass, needle grasses, and wheatgrasses. In many areas, various species of shrubs, such as sagebrush, sumacs, salt bush, winter fat, and cholla, are found mixed with the grasses. Locoweed, sunflowers, ragweed, lupine, and herbaceous sage are common forbs present in this area.

Within this ecoregion, there are large areas along major rivers and drainages dominated by trees and shrubs, such as cottonwood, American elm, box elder, and various willows. These sites are very attractive to species of wildlife that require woody cover.

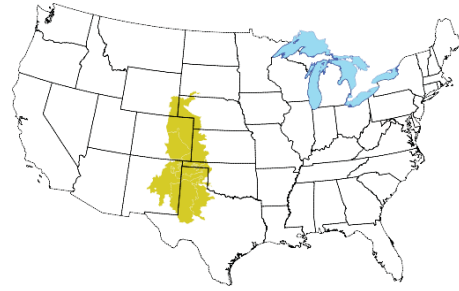
Depressions (potholes) caused by glaciation in the north and closed drainages (playas) in the south fill with water, creating numerous wetlands that are extremely valuable to wildlife. These wetlands, especially the smaller ones, are susceptible to periodic drought.

Typical nonnative invasive plants in the Shortgrass Prairie include cheatgrass, Old World bluestem, salt cedar, yellow sweet clover, knapweed, and leafy spurge.

Changes in farm machinery and management have produced large areas of cropland with little or no native vegetation available for wildlife. Recent irrigation water management techniques have reduced the amount of wetlands and riparian vegetation associated with irrigated crops.

Farming and ranching

Cultivated cropland is found in portions of this ecoregion. Where precipitation is adequate or where irrigation is possible, large areas are planted to agricultural crops, such as cereal grains, grain sorghum, flax, sunflowers,



In the past, large areas of wetlands were drained or altered in some manner so crops could be grown, and this practice continues. Much of this area is native rangelands, most of which is grazed by livestock, except for a few locations where terrain is too rugged, or water is unavailable. Many acres of rangeland and former cropland have been converted to nonnative grasses, such as Old-World bluestem and smooth brome, which have limited wildlife value.

Special: Planting trees for wildlife in this ecoregion is only recommended in areas where trees would have occurred historically, such as in riparian areas or major drainages. The historic occurrence of these trees was influenced by soils, moisture, and fire. Eastern redcedar and ashe juniper are very invasive in this ecoregion and control is important where they occur.

Plant succession

Annual forbs and grasses represent the initial successional stage. Perennial forbs and grasses represent the second successional stage. Shrub cover occurs in some areas and represents a third successional stage. Perennial grasses and forbs with scattered shrubs is the final stage of succession over most of the Shortgrass Prairie. Shrubs and trees are common along riparian areas.

Wildlife associated with Shortgrass Prairie

American Kestrel
blue-winged teal
lark bunting
mallard
mourning dove
northern harrier
scaled quail
sharp-tailed grouse

black-tailed prairie dog
coyote
pronghorn
Rocky Mountain mule deer
plains hog-nosed snake
bluegill
largemouth bass

Great Plains Grassland: Shortgrass Prairie	American kestrel	blue-winged teal	lark bunting	mallard	mourning dove	northern harrier	scaled quail	sharp-tailed grouse	black-tailed prairie dog	coyote	pronghorn	Rocky Mountain mule deer	plains hog-nosed snake	bluegill	largemouth bass
Habitat Management Practices															
Develop Conservation Easement															
Control Nonnative Vegetation	X	X	X	X	X	X	X	X	X	X	X	X	X		
Create Snags	X														
Develop Field Borders	X						X	X		X		X			
Conduct Forest Management										X		X			
Leave Crop Unharvested		X		X	X	X	X	X				X			
Conduct Livestock Management	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Provide Nesting Structures	X														
Plant Food Plots		X		X	X			X			X	X			
Plant Native Grasses and Forbs	X	X	X	X	X	X	X	X		X	X	X	X		
Plant Shrubs	X				X		X	X	X	X		X			
Plant Trees	X				X							X			
Repair Spillway/Dam/Levee		X		X	X									X	X
Set-back Succession	X	X	X	X	X	X	X	X	X	X	X	X	X		
Conduct Tillage Management	X	X		X	X	X	X	X				X			
Provide Water Developments for Wildlife		X		X	X		X				X	X			
Population Management Practices															
Decrease Hunting/Fishing							X	X	X	X	X	X		X	X
Increase Hunting/Fishing									X	X	X	X		X	X
Conduct Wildlife Damage Management									X	X		X			
Conduct Wildlife or Fish Survey	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Fish Pond/Stream Management Practices															
Construct Fish Pond														X	X
Control Aquatic Vegetation														X	X
Fertilize/Lime Fish Pond														X	X
Reduce Turbidity in Fish Pond														X	X
Restock Fish Pond														X	X
Streams: Create Pools															
Streams: Remove Fish Barriers															

Great Plains Grasslands – Tallgrass/ Mixed Prairie

Physical description

The terrain is characterized by flat to rolling plains. Average annual precipitation ranges from 20 to 40 inches. Precipitation increases from west to east and is received primarily as spring and summer rain and winter snow. Winters are cold; summers are hot.

Dominant vegetation

Tall grasses, such as various bluestems, Indian grass, and switchgrass, represent the dominant vegetation in the eastern Great Plains (or tallgrass prairie). Commonly occurring forbs include sunflowers, broomweed, western ragweed, and lespedezas. Tall grasses dominate moist sites with soil depth greater than 20 inches, such as floodplains and valleys. Dry sites, such as hilltops and south-facing slopes, are dominated by shortgrass species. Transition sites (in-between areas) consist of a mixture of tall, mixed, and short grasses, including bluegrasses, prairie sand reed, grama grasses, and various drop seeds are found in this area.

Drainages and other moist areas may have shrubs and trees, such as native plum, buttonbush, and cottonwood. Trees and shrubs, such as cottonwood, green ash, bur oak, American elm, box elder, eastern redcedar and various willows, occur along riparian areas. These sites are very attractive to various wildlife species that are adapted to woody vegetation cover.

Woodlands dominated by post oak and blackjack oak occur on upland sites in the southeast portion of the tallgrass prairie. This area is known as the Cross Timbers. It extends from northern Texas through central Oklahoma

into Kansas. All of these vegetation types were historically maintained by a combination of grazing and fire. The lack of fire is a major cause of rangeland deterioration throughout this ecoregion. Depressions (potholes) caused by glaciation in the north and closed drainages (playas) in the south fill with water, creating numerous lakes, ponds, and other wetlands that are extremely valuable to wildlife. These wetlands, especially the smaller ones, are susceptible to periodic droughts.

Farming and ranching

Cultivated cropland is found in portions of this ecoregion where precipitation is adequate, or irrigation is possible. Large areas are planted to agricultural crops, such as barley, wheat, millet, flax, oats, corn, sunflowers, and alfalfa. In the eastern part of the Great Plains and other areas where soil is fertile, the main crops include wheat, sugar beets, corn, soybeans, grain sorghum, and alfalfa.

Changes in farm machinery and management have produced large areas of cropland with little or no other types of vegetation available for use by wildlife. Recent irrigation water management techniques have reduced the amount of wetlands and riparian vegetation associated with irrigated crops.

Most of the native range is grazed by livestock except for a few locations where terrain is too rugged, or water is unavailable. Many acres of native rangelands in this ecoregion are being invaded by juniper (eastern redcedar) because of fire suppression. Fire is a critical component to rangeland health. The current lack of fire is the greatest threat to wildlife in this ecoregion.

Plant succession

Annual forbs and grasses represent the initial successional stage. Perennial grasses and forbs dominate the second successional stage. The climax community or third stage consists of woody species, such as juniper, osage orange, and elms. Shrubs and trees dominate riparian areas and other sufficiently moist areas that can support woody vegetation. Typical nonnative invasive plants in the Tallgrass ecoregion include sericea lespedeza, bermudagrass, Canada thistle, smooth brome, musk thistle, and tall fescue.

Wildlife associated with Tallgrass/Mixed Prairie

blue-winged teal
dickcissel
grasshopper sparrow
greater prairie-chicken
mourning dove
northern bobwhite
northern harrier
ring-necked pheasant

wild turkey
coyote
eastern cottontail
red fox
white-tailed deer
plains hog-nosed snake
bluegill
largemouth bass

Great Plains Grassland: Tallgrass/Mixed Prairie	blue---winged teal	dickcissel	grasshopper sparrow	greater prairie---chicken	mourning dove	northern bobwhite	northern harrier	ring---necked pheasant	wild turkey	coyote	eastern cottontail	red fox	white---tailed deer	plains hog---nosed snake	bluegill	largemouth bass
Habitat Management Practices																
Develop Conservation Easement			X	X												
Control Nonnative Vegetation	X	X	X	X	X	X	X	X	X	X	X	X	X	X		
Create Snags																
Develop Field Borders		X		X		X		X	X	X	X	X	X			
Conduct Forest Management						X			X				X			
Leave Crop Unharvested	X	X		X	X	X	X	X	X		X		X			
Conduct Livestock Management	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Provide Nesting Structures																
Plant Food Plots	X			X	X	X		X	X		X		X			
Plant Native Grasses and Forbs	X	X	X	X	X	X	X	X	X	X	X	X	X	X		
Plant Shrubs					X	X		X	X	X	X	X	X			
Plant Trees					X			X	X				X			
Repair Spillway/Dam/Levee	X				X										X	X
Set---back Succession	X	X	X	X	X	X	X	X	X	X	X	X	X	X		
Conduct Tillage Management	X	X		X	X	X	X	X	X		X		X			
Provide Water Developments for Wildlife	X				X				X				X			
Population Management Practices																
Decrease Hunting/Fishing				X		X		X	X	X	X	X	X		X	X
Increase Hunting/Fishing								X	X	X	X	X	X		X	X
Conduct Wildlife Damage Management									X	X	X	X	X			
Conduct Wildlife or Fish Survey	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Fish Pond/Stream Management Practices																
Construct Fish Pond															X	X
Control Aquatic Vegetation															X	X
Fertilize/Lime Fish Pond															X	X
Reduce Turbidity in Fish Pond															X	X
Restock Fish Pond															X	X
Streams: Create Pools																
Streams: Remove Fish Barriers																

Dwayne Elmore



Prairie is not only composed of grasses, but forbs are equally important. This recently burned prairie (left) has abundant forbs and bare ground. Large expanses of prairie (right) are critical to grassland species, such as the greater prairie-chicken.

Hot Desert

Physical description

The terrain is relatively flat to rolling with isolated buttes and mountains. Annual precipitation varies from 2 to 25 inches, depending on elevation, but seldom exceeds 7 inches over most of the ecoregion. Moisture is usually received in the form of short, violent storms or cloudbursts in summer and fall. Summers are hot; winters are cool. Extreme differences in the daily high and low temperatures encourage nightly dew formation. Dew formation is an important water source for wildlife where precipitation is low.

Dominant vegetation

Vegetation is sparse and dominated by cacti and thorny shrubs over most of the ecoregion. Depending on geographic location, the most common plants are creosote bush, bur sage, chamise, paloverde, ocotillo, saguaro, and cholla. Shrubs are often widely spaced with a few short annual grasses growing among them. After rains, many flowers and grasses appear, quickly go to seed, and disappear until the next rain.

Vegetation associated with river and stream courses is more diverse and abundant than in the surrounding areas. Cottonwoods, willows, tamarisk, mesquite, and a variety of grasses and forbs dominate riparian areas. The abundance and variety of vegetation and presence of water compared to the surrounding desert makes riparian areas very attractive to wildlife.



Typical nonnative invasive plants in the Hot Desert ecoregion include African rue, Malta star thistle, Russian knapweed, medusa head, buffleggrass, and salt cedar (tamarisk).

Farming and ranching

Water is diverted from large rivers, such as the Colorado, to irrigate orchards, grain, hay, and vegetable crops. Irrigation water is expensive, which encourages the use of modern irrigation systems that do not waste much water. When wastewater is present, it supports a wide variety of vegetation and wetlands not common to this ecoregion. Wildlife species not normally associated with the desert are found in these areas.

Livestock grazing is common where water is available or can be developed. Riparian and wetland areas are attractive for livestock grazing, which must be managed to avoid damaging wildlife habitat.

Plant succession

Plant succession is not conspicuous in the desert. When vegetation is disturbed, it is often replaced by the same type without intervening stages. Replacement of disturbed vegetation can take a long time because of the harsh environment. Annual and perennial grasses and forbs may be found, with a lot of bare ground in between. Shrubs and cacti also are common and represent the final successional stage, except along riparian areas where shrubs and trees are common.

Wildlife associated with Hot Desert

American kestrel	black-tailed prairie dog
black-throated sparrow	coyote
blue-winged teal	desert cottontail
crissal thrasher	mountain lion
Gambel's quail	pronghorn
golden eagle	Rocky Mountain mule deer
ladder-backed woodpecker	Texas horned lizard
southwest willow flycatcher	bluegill
white-winged dove	largemouth bass



Plants in the Hot Desert are adapted for high temperatures and low rainfall. Many species of cacti, grasses, and shrubs dominate.



Although deserts may appear barren, there are many species that occur here.

Hot Desert	American kestrel	black-throated sparrow	blue-winged teal	crissal thrasher	Gambel's quail	golden eagle	ladder-backed woodpecker	southwest willow flycatcher	white-winged dove	black-tailed prairie dog	coyote	desert cottontail	mountain lion	pronghorn	Rocky Mountain mule deer	Texas horned lizard	bluegill	largemouth bass
Habitat Management Practices																		
Develop Conservation Easement						X		X										
Control Nonnative Vegetation	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		
Create Snags	X						X		X									
Develop Field Borders	X										X	X			X			
Conduct Forest Management																		
Leave Crop Unharvested			X		X				X			X			X			
Conduct Livestock Management	X	X	X	X	X	X	X	X	X	X	X	X		X	X		X	X
Provide Nesting Structures	X																	
Plant Food Plots			X		X				X			X		X	X			
Plant Native Grasses and Forbs	X		X						X	X	X	X		X	X			
Plant Shrubs	X			X	X			X	X		X	X	X		X	X		
Plant Trees	X						X	X	X									
Repair Spillway/Dam/Levee			X														X	X
Set-back Succession	X	X	X	X		X		X	X	X	X	X	X	X	X	X		
Conduct Tillage Management	X		X						X			X			X			
Provide Water Developments for Wildlife		X	X	X	X				X				X	X	X			
Population Management Practices																		
Decrease Hunting/Fishing					X					X	X	X	X	X	X		X	X
Increase Hunting/Fishing										X	X	X	X	X	X		X	X
Conduct Wildlife Damage Management						X	X			X	X	X	X	X	X			
Conduct Wildlife or Fish Survey	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Fish Pond/Stream Management Practices																		
Construct Fish Pond																	X	X
Control Aquatic Vegetation																	X	X
Fertilize/Lime Fish Pond																	X	X
Reduce Turbidity in Fish Pond																	X	X
Renovate Fish Pond																	X	X
Streams: Create Pools																		
Streams: Remove Fish Barriers																		

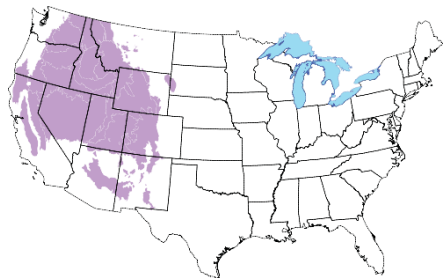
Intermountain – Foothills Zone

Physical description

The terrain varies from steep hills at the base of large mountains, to dissected plateaus and flat valleys. Average annual precipitation is between 10 and 25 inches. Most of the moisture is received in winter at higher elevations and in late summer at lower elevations. The summers are warm, and the winters are moderately cold.

Dominant vegetation

The Foothills zone is found directly below the Montane zone (in elevation) and is associated with most major mountain ranges in the western U.S. The upper reaches of this ecoregion have many of the characteristics of the Montane zone, whereas the lower reaches have similarities with the Sagebrush zone. Typically, shrubs such as scrub oaks, mountain mahogany, serviceberry, bitterbrush, manzanita, buckbrush, and sagebrush, dominate the ecoregion. Perennial grasses and many different forbs also are common. Occasionally, aspen and ponderosa pine are found on moist sites. In the southern areas of this ecoregion, pinyon and juniper trees are found on drier sites. As with most of the ecoregions in the arid West, vegetation associated with rivers and streams is more diverse and abundant than in surrounding areas. Riparian areas are usually dominated by cottonwood,



willow, tamarisk, Russian olive, sumac, silver buffaloberry, and a variety of grasses and forbs. The abundance and alfalfa, and oats are the most common crops. The terrain often makes managing irrigation water difficult. Water that runs off irrigated fields and leaks out of earthen delivery ditches often creates wetlands and/or supports vegetation similar to that found in riparian areas. In some areas, non-irrigated crops, such as wheat and barley, are grown. Most of the ecoregion is used for livestock grazing except where slopes are extremely steep. Cattle and sheep are the most common grazers.

Farming and ranching

Water is often diverted to irrigate crops in the valleys and other areas where slopes are gentle. Hay,

Plant succession

Annual forbs and grasses represent the initial successional stage. Perennial forbs and grasses follow, and shrubs represent the third successional stage. Fire has historically maintained perennial grasses and forbs and shrubs. However, fire does not always revert shrubland to perennial grasses and forbs because many of these shrubs resprout following fire. Shrubs and trees are dominant along riparian areas. Typical nonnative invasive plants in the Foothills include cheatgrass, salt cedar, yellow star thistle, knapweed, halogeton, Dyer's woad, and Canada thistle. variety of vegetation and the availability of water make these areas very attractive to wildlife.

Wildlife associated with Intermountain Foothill

American kestrel	mountain cottontail
dusky grouse	Rocky Mountain mule deer
mallard	rainbow trout
mourning dove	
northern flicker	
red-tailed hawk	
spotted towhee	
wild turkey	
coyote	
elk	

Intermountain Foothills	American kestrel	dusky grouse	mallard	mourning dove	northern flicker	red---tailed hawk	spotted towhee	wild turkey	coyote	elk	mountain cottontail	Rocky mountain mule deer	rainbow trout
Habitat Management Practices													
Develop Conservation Easement													
Control Nonnative Vegetation	X	X	X	X	X	X	X	X	X	X	X	X	
Create Snags	X				X	X							
Develop Field Borders	X	X				X		X	X			X	
Conduct Forest Management		X	X		X	X	X	X	X	X	X	X	
Leave Crop Unharvested			X	X				X				X	
Conduct Livestock Management	X	X	X	X			X	X	X	X	X	X	X
Provide Nesting Structures	X												
Plant Food Plots			X	X				X		X	X	X	
Plant Native Grasses and Forbs	X	X	X	X		X		X	X	X	X	X	
Plant Shrubs	X	X		X	X	X	X	X	X		X	X	
Plant Trees	X	X		X	X	X		X		X		X	
Repair Spillway/Dam/Levee			X	X									X
Set---back Succession	X	X	X	X	X	X	X	X	X	X	X	X	
Conduct Tillage Management	X		X	X		X		X				X	
Provide Water Developments for Wildlife			X	X				X		X		X	
Population Management Practices													
Decrease Hunting/Fishing		X						X	X	X	X	X	X
Increase Hunting/Fishing								X	X	X	X	X	X
Conduct Wildlife Damage Management					X	X		X	X	X	X	X	
Conduct Wildlife or Fish Survey	X	X	X	X	X	X	X	X	X	X	X	X	X
Fish Pond/Stream Management Practices													
Construct Fish Pond													X
Control Aquatic Vegetation													X
Fertilize/Lime Fish Pond													X
Reduce Turbidity in Fish Pond													X
Restock Fish Pond													X
Streams: Create Pools													X
Streams: Remove Fish Barriers													X

Intermountain – Montane Zone

Physical description

The terrain includes high rugged mountains of volcanic origin. Average annual precipitation is highly variable, ranging from 10 to 100 inches, depending on the site. The majority of the moisture comes in winter and early spring, except for areas in the southwestern U.S., which also receive monsoon rains in late summer.

Dominant vegetation

Dense coniferous forests of western hemlock, Sitka spruce, redwood, Douglas fir, incense cedar, and ponderosa pine are trees usually associated with the final successional stage. Aspen and lodgepole pine dominate large areas for long periods of time in the Rocky Mountains at the higher elevations. In the northern reaches of this ecoregion, silver fir, Sitka spruce, and Alaskan cedar are common.

In mature forests, shrub, and herbaceous layers are poorly developed. Dense shrub cover of salal, vine maple, salmon berry and devil’s club may be found in openings of the northwest and northern Rocky Mountains.

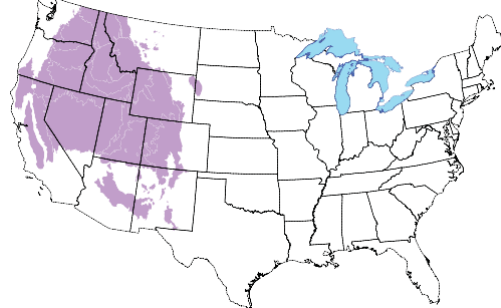
Serviceberry, chokecherry, scrub oak, mountain mahogany, ceanothus, and snowberry are found in the central and southern Rocky Mountains. Manzanita, sticky laurel, currant, waxberry, and buckthorn commonly grow. Typical nonnative invasive plants in the Intermountain Montane include cheatgrass, salt cedar, yellow star thistle, knapweed, halogeton, Dyer’s woad, and Canada thistle.



Dwayne Elmore

Aspen is an important plant in the montane zone. There are many bird species, such as dusky grouse and ruffed

in the Sierra Nevada Mountains. Perennial grasses and a variety of forbs also are common in open areas.



Farming and ranching

Water is diverted from nearby streams and rivers in the larger valleys to irrigate crops. Livestock grazing is common in this ecoregion where slopes are not too steep. Open areas dominated by shrubs and grasses, as well as areas adjacent to rivers and streams, are used most often for grazing. In some areas, crops such as small grains and alfalfa are grown in the valleys and other areas cleared of native vegetation.

Plant succession

Annual forbs and grasses represent the initial successional stage. Perennial grasses and forbs represent the second successional stage. Shrubs and aspen follow as the third successional stage, and coniferous forest represents the final successional stage.

Wildlife associated with Intermountain Montane

- | | |
|-----------------------|--------------------------|
| dusky grouse | American marten |
| hairy woodpecker | black bear |
| mountain bluebird | elk |
| northern goshawk | Rocky Mountain mule deer |
| ruffed grouse | snowshoe hare |
| spotted towhee | cutthroat trout |
| yellow-rumped warbler | rainbow trout |
| American beaver | |

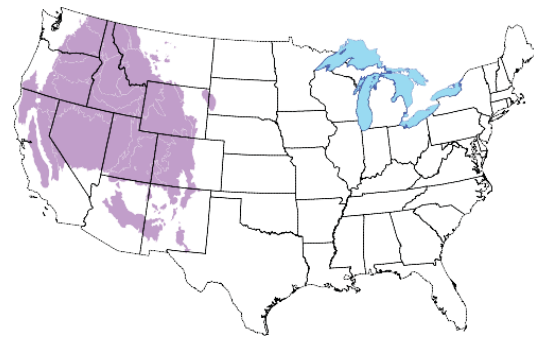


Dwayne Elmore

Open stands of ponderosa pine are maintained by frequent fire in the montane zone.

Intermountain Montane	dusky grouse	hairy woodpecker	mountain bluebird	northern goshawk	ruffed grouse	spotted towhee	yellow-rumped warbler	American beaver	American marten	black bear	elk	Rocky mountain mule deer	snowshoe hare	cutthroat trout	rainbow trout
Habitat Management Practices															
Develop Conservation Easement															
Control Nonnative Vegetation	X	X	X	X	X	X	X	X	X	X	X	X	X		
Create Snags		X	X	X	X										
Develop Field Borders	X		X									X			
Conduct Forest Management	X			X	X	X	X		X	X		X	X		
Leave Crop Unharvested										X		X			
Conduct Livestock Management	X	X	X		X	X	X	X			X	X	X	X	X
Provide Nesting Structures			X												
Plant Food Plots										X	X	X	X		
Plant Native Grasses and Forbs	X		X								X	X			
Plant Shrubs	X		X		X	X	X	X		X		X	X		
Plant Trees	X	X	X	X	X		X	X	X	X	X	X	X		
Repair Spillway/Dam/Levee															X
Set-back Succession	X		X		X	X	X			X	X	X			
Conduct Tillage Management										X		X			
Provide Water Developments for Wildlife											X	X			
Population Management Practices															
Decrease Hunting/Fishing	X				X			X	X	X	X	X	X	X	X
Increase Hunting/Fishing								X	X	X	X	X	X	X	X
Conduct Wildlife Damage Management		X						X		X	X	X	X		
Conduct Wildlife or Fish Survey	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Fish Pond/Stream Management Practices															
Construct Fish Pond															X
Control Aquatic Vegetation															X
Fertilize/Lime Fish Pond															X
Reduce Turbidity in Fish Pond															X
Restock Fish Pond															X
Streams: Create Pools														X	X
Streams: Remove Fish Barriers														X	X

Intermountain – Sagebrush Zone



Physical description

The terrain includes large, undulating hills within small interior basins that are often surrounded by mountains. Annual precipitation averages 5 to 20 inches and occurs most often in winter and spring. Summers are hot and winters are moderately cold.

Dominant vegetation

Sagebrush dominates the lower elevations along with other shrubs, such as shad-scale, bitterbrush, fourwing saltbush, rabbitbrush, and horse brush. Perennial grasses, such as wheatgrasses, needlegrasses, and bluegrasses, are common and intermixed with the shrubs. Forbs, such as lupines, buckwheat's and mallows, also are present.

Riparian vegetation is usually much different than the surrounding vegetation and is dominated by cottonwoods, willows, tamarisk, Russian olive, silver buffaloberry, and a variety of grasses and forbs. The abundance and variety of vegetation and the availability of water makes riparian zones very attractive to wildlife. Typical nonnative invasive plants in the Intermountain Sagebrush include cheatgrass, salt cedar, yellow starthistle, knapweed, halogeton, Dyer's woad, and Canada thistle.

Farming and Ranching

Water is diverted from nearby streams and rivers to irrigate crops, such as corn, barley, wheat, and alfalfa, in the lower elevations, and to irrigate grass hayland at higher elevations. The terrain often makes management of irrigation water difficult. Water that runs off irrigated fields and leaks out of earthen delivery ditches often creates wetlands or supports vegetation similar to that found in riparian areas, which is attractive to a variety of wildlife species.

In areas where irrigation water is not available and terrain and climate permit, native rangeland has been converted to non-irrigated cropland. Small grains, such as barley and wheat, are the most common crops. Near croplands are areas not cultivated and remain in native vegetation. This mix of dry cropland and rangeland is important to many wildlife species.

There are large areas of shrubs and grasslands in this ecoregion that are primarily used for livestock grazing. In winter, large herds of domestic sheep often use rangelands within this ecoregion.

Wildlife associated with the Intermountain Sagebrush

American kestrel
Brewer's sparrow
ferruginous hawk
greater sage-grouse
mallard
mourning dove
northern flicker

sage thrasher
coyote
desert cottontail
pronghorn
Rocky Mountain mule deer
rainbow trout



Dwayne Elmore

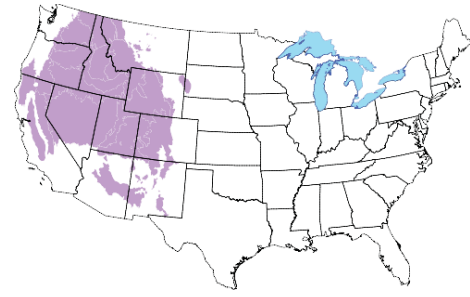
Sagebrush is the dominant plant in the sagebrush zone. Some species, such as greater sage-grouse, depend on this plant to

Plant succession

Annual forbs and grasses represent the initial stage of succession. Perennial grasses and forbs represent the second stage. Shrubs, along with perennial grasses and forbs are the third successional stage. Shrubs dominate the fourth successional stage. Continued overgrazing of perennial grasses will lead to the grass disappearing and shrubs will dominate.

Intermountain Sagebrush	American kestrel	Brewer's sparrow	ferruginous hawk	greater sage---grouse	mallard	mourning dove	northern flicker	sage thrasher	coyote	desert cottontail	pronghorn	Rocky Mountain mule deer	rainbow trout
Habitat Management Practices													
Develop Conservation Easement				X									
Control Nonnative Vegetation	X	X	X	X	X	X	X	X	X	X	X	X	
Create Snags	X						X						
Develop Field Borders	X								X	X		X	
Conduct Forest Management							X						
Leave Crop Unharvested					X	X				X		X	
Conduct Livestock Management	X	X	X	X	X	X			X	X	X	X	X
Provide Nesting Structures	X												
Plant Food Plots					X	X				X	X	X	
Plant Native Grasses and Forbs	X		X		X	X			X	X	X	X	
Plant Shrubs	X	X		X		X	X	X	X	X		X	
Plant Trees	X		X			X	X						
Repair Spillway/Dam/Levee					X	X							X
Set---back Succession	X	X	X		X	X	X	X	X	X	X	X	
Conduct Tillage Management	X		X		X	X				X		X	
Provide Water Developments for Wildlife					X	X					X	X	
Population Management Practices													
Decrease Hunting/Fishing				X					X	X	X	X	X
Increase Hunting/Fishing									X	X	X	X	X
Conduct Wildlife Damage Management							X		X	X	X	X	
Conduct Wildlife or Fish Survey	X	X	X	X	X	X	X	X	X	X	X	X	X
Fish Pond/Stream Management Practices													
Construct Fish Pond													X
Control Aquatic Vegetation													X
Fertilize/Lime Fish Pond													X
Reduce Turbidity in Fish Pond													X
Restock Fish Pond													X
Streams: Create Pools													X
Streams: Remove Fish Barriers													X

Intermountain – Subalpine zone



Physical description

The terrain is steeply sloping mountains crossed by many valleys. Average annual precipitation is highly variable, typically ranging from 30 to 60 inches with some areas receiving more than 100 inches. The majority of the moisture comes in the winter and early spring as snow.

Dominant vegetation

Subalpine is directly above the Montane zone in elevation and is associated with most major mountain ranges in the western U.S. The lower reaches have many of the characteristics of the Montane zone. In the Sierra Nevada Mountains, coniferous forests of mountain hemlock, California red fir, western white pine, and white bark pine occur. In the Rocky Mountains, subalpine fir and Engelmann spruce are the dominant tree species. In the Gila Mountains, Engelmann spruce, and cork bark fir dominate.

Understory vegetation usually consists of sedges, a variety of forbs, and low-growing shrubs, such as vaccinium, elderberry, bearberry, currant, and willow. Understory plants are sparse where the forest canopy is dense.

Subalpine meadows dominated by grasses, sedges, and forbs, are scattered throughout this ecoregion. Common species include purple reed grass, alpine fescue, slender wheatgrass, falsebulrush sedge, whiproot clover, and bistort. In high mountain valleys, streams and bogs are surrounded by thick stands of willow and subalpine meadow vegetation. Aspen occurs in the middle stages of plant succession.

Farming and ranching

An extremely short growing season, rocky soils, and steep slopes prohibit crop production in the subalpine. In some areas, water is diverted from streams to irrigate high mountain meadows for grass and sedge-hay production. Livestock grazing occurs in localized areas and is usually restricted to the mountain meadows and aspen stands where slopes are less steep.

Plant succession

Annual forbs and grasses represent the initial successional stage. Perennial grasses and forbs represent the second successional stage. Various shrubs and aspen represent the third successional stage, which may be the climax stage on dry, steep slopes with southern exposures. Various conifer trees represent the fourth successional stage in Subalpine. It should be noted that succession takes much longer in Subalpine than in most other ecoregions because of the harsh conditions.

Wildlife associated with the Intermountain Subalpine

- black-capped chickadee
- dusky grouse
- hairy woodpecker
- northern goshawk
- white-tailed ptarmigan
- yellow-rumped warbler
- American marten
- elk
- red squirrel
- Rocky Mountain mule deer
- snowshoe hare
- cutthroat trout
- rainbow trout

Intermountain Subalpine	black-capped chickadee	dusky grouse	hairy woodpecker	northern goshawk	white-tailed ptarmigan	yellow-rumped warbler	American marten	elk	red squirrel	Rocky Mountain mule deer	snowshoe hare	cutthroat trout	rainbow trout
Habitat Management Practices													
Develop Conservation Easement													
Control Nonnative Vegetation	X	X	X	X	X	X	X	X	X	X	X		
Create Snags	X		X	X									
Develop Field Borders													
Conduct Forest Management	X	X		X		X	X	X	X	X	X		
Leave Crop Unharvested													
Conduct Livestock Management	X	X	X		X	X		X	X	X	X	X	X
Provide Nesting Structures	X												
Plant Food Plots													
Plant Native Grasses and Forbs		X						X		X			
Plant Shrubs	X	X			X	X				X	X		
Plant Trees	X	X	X	X		X	X	X	X	X	X		
Repair Spillway/Dam/Levee													X
Set-back Succession	X	X				X		X		X			
Conduct Tillage Management										X			
Provide Water Developments for Wildlife								X		X			
Population Management Practices													
Decrease Hunting/Fishing		X			X		X	X	X	X	X	X	X
Increase Hunting/Fishing							X	X	X	X	X	X	X
Conduct Wildlife Damage Management			X					X		X	X		
Conduct Wildlife or Fish Survey	X	X	X	X	X	X	X	X	X	X	X	X	X
Fish Pond/Stream Management Practices													
Construct Fish Pond													X
Control Aquatic Vegetation													X
Fertilize/Lime Fish Pond													X
Reduce Turbidity in Fish Pond													X
Restock Fish Pond													X
Streams: Create Pools												X	X
Streams: Remove Fish Barriers												X	X

Mediterranean

Physical description

Mediterranean climates are found in only five places on Earth: California and Baja California, the basin of the Mediterranean Sea, southwestern Australia, the western cape of South Africa, and the central coast of Chile. The geologic history of California has produced a complex landscape with variations in topography and climate. The Mediterranean climate ecoregion lies west of the Sierra Nevada and includes a portion of coastal Baja California. The terrain includes gently to steeply sloping mountains, coastal plains, and interior valleys. Average annual precipitation ranges from 12 to 40 inches with most of it occurring in winter as rain. Summers are hot and dry, whereas winters are mild and rainy.

Rocky or shallow soils have evergreen shrublands called chaparral. Oak woodlands occur where soils are deeper, or moisture is more available. Drier areas along the coast and inland at the transition to deserts support coastal sage scrub. Chaparral is the most abundant vegetation type. Mediterranean vegetation is dominated by evergreen trees and trees with short, hard, dense leaves (schlerophyllous). These plants are adapted to fire, summer drought, and cool, moist winters.

Dominant vegetation

Three common but different vegetation types are found in this ecoregion: chaparral, oak woodlands, and coastal sage. The chaparral is dominated by chamise, ceanothus, mountain mahogany, and manzanita. The southern oak woodlands are dominated by Engelmann oak, coast live oak, interior live oak, and California walnut. The coastal sage, also called soft chaparral, is dominated by California sagebrush and black sage, as well as California buckwheat. Each vegetation type is summarized below.

Chaparral or Hard Chaparral: Found from 1,000 to 5,000 feet in elevation. At its lower limits, annual grasslands and coastal sage blend in. Most shrubs are 3 to 10 feet tall, with small leathery leaves adapted to hot dry summers. This vegetation type is adapted to a 20-year fire-return interval. Many plants such as creosote contain flammable oils.

Southern Oak Woodlands: Found throughout the Sierra Nevada and Coast Range foothills and lower montane elevations from 1,800 to 4,850 feet, often on steep rocky slopes where snow and cold temperatures occur. Trees are highly variable, growing from 15 to 70 feet tall,

depending on the oak species, elevation, and soil type. With frequent annual burning (at lower elevations and on warmer sites), woodlands with large oaks and well-developed grassy understories of native perennial bunchgrasses are common.



Coastal Sage or Soft Chaparral: The coastal sage plant community of California exists along the coast from about San Francisco and Lafayette down through San Diego and inland as far as Riverside in southern California. These shrubs are generally less than 6 feet tall with multiple woody stems. Leaves are often aromatic, gray, woolly, or sticky. Leaves are pliable and thin (malacophyllous), which is why it also called the soft chaparral. Typical nonnative invasive plants in the Mediterranean ecoregion include red brome, yellow starthistle, leafy spurge, scotch thistle, and medusahead.

Farming and ranching

Agriculture is widespread and diverse within this ecoregion. Stream valleys, coastal plains, and interior valleys are planted in a wide variety of vegetable crops, grain crops, orchards, vineyards, cotton, and hay.

In the drier areas of the ecoregion, water must be diverted from rivers and streams to irrigate orchards, vineyards, citrus, hay, and grain crops. Irrigation water is expensive, which encourages the use of modern irrigation systems that do not waste much water. Waste water, when present, often supports a wide variety of riparian vegetation and wetlands. In the moister areas, crops such as lemons, avocados, vegetables, and flowers are grown.

Ranching operations are present in areas where slopes are not too steep or rocky. Grass for grazing is available for a few years when the oak woodlands burn. Caution must be taken when ranching. Overgrazing can create long-term damage to the vegetation. Overgrazing weakens the native vegetation, allowing aggressive nonnative species to establish.

Plant succession

Oak Woodland: Annual forbs and grasses represent the initial successional stage. Young oaks with open grassland or shrubby understory represent the second successional stage. Mature oaks with an open grassland or shrubby understory represent the final stage of succession.

Coastal Sage Scrub: Annual forbs and grasses, especially mustard, filaree, soft chess, represent the initial successional stage. Perennial grasses and forbs may occur afterward, but shrubs, such as chamise and manzanita, often pioneer in following the annual grasses and forbs. These shrubs often resprout following fire so succession does not always revert to an earlier stage after fire.

Chaparral: annual forbs and grasses represent the initial stage of succession and are usually present immediately after a fire. Shrubs, such as shrub oak, dominate within 2 to 5 years following fire and represent the final successional stage.

Wildlife associated with Mediterranean

All species listed are not found in all of the vegetation types described.

American kestrel
California quail
California thrasher
Lawrence's goldfinch
mallard
mourning dove
Nuttall's woodpecker
western kingbird
desert cottontail
raccoon
Rocky Mountain mule deer
wild pig
Monterey salamander
bluegill
largemouth bass



The Mediterranean-like climate found in California creates a grassland that is maintained by fire.

Dwayne Elmore

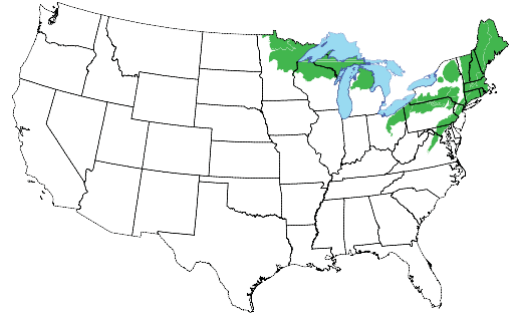


Many species of shrubs and small trees exist within the grasslands of central California. Periodic fire reduces their structure, but they quickly return after fire.

Dwayne Elmore

Mediterranean	American kestrel	California quail	California thrasher	Lawrence's goldfinch	mallard	mourning dove	Nuttall's woodpecker	western kingbird	desert cottontail	raccoon	Rocky Mountain mule deer	wild pig	Monterey salamander	bluegill	largemouth bass
Habitat Management Practices															
Develop Conservation Easement				X											
Control Nonnative Vegetation	X	X	X	X	X	X	X	X	X	X	X				
Create Snags	X						X	X		X					
Develop Field Borders	X	X						X	X	X	X				
Conduct Forest Management			X	X	X		X		X	X	X		X		
Leave Crop Unharvested		X			X	X			X	X	X				
Conduct Livestock Management	X	X	X		X	X			X	X	X			X	X
Provide Nesting Structures	X														
Plant Food Plots		X			X	X			X	X	X				
Plant Native Grasses and Forbs	X	X			X	X		X	X		X				
Plant Shrubs	X	X	X			X		X	X	X	X		X		
Plant Trees	X	X		X		X	X			X	X		X		
Repair Spillway/Dam/Levee					X	X				X				X	X
Set---back Succession	X	X	X	X	X	X		X	X	X	X				
Conduct Tillage Management	X	X		X	X	X			X	X	X				
Provide Water Developments for Wildlife		X		X	X	X				X	X				
Population Management Practices															
Decrease Hunting/Fishing		X							X	X	X			X	X
Increase Hunting/Fishing									X	X	X	X		X	X
Conduct Wildlife Damage Management							X		X	X	X	X			
Conduct Wildlife or Fish Survey	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Fish Pond/Stream Management Practices															
Construct Fish Pond														X	X
Control Aquatic Vegetation														X	X
Fertilize/Lime Fish Pond														X	X
Reduce Turbidity in Fish Pond														X	X
Restock Fish Pond														X	X
Streams: Create Pools															
Streams: Remove Fish Barriers															

Northeast Mixed Forest



Physical description

The terrain is flat with some rolling hills and low mountains. The average annual precipitation ranges from 24 to 45 inches. Most of the precipitation is received in the summer, but snow is usually on the ground all winter. Summers are warm and winters are very cold.

Dominant vegetation

This ecoregion is transitional between the evergreen-dominated forests to the north and the broadleaf-dominated forests to the south. The final stage of succession can be dominated by both tall broadleaf (deciduous) and evergreen (coniferous) trees. They can be mixed together or in separate stands adjacent to each other. The dominant conifers are white pine, red spruce, subalpine fir, eastern hemlock, and eastern redcedar. American beech, sugar maple, and basswood are the most common deciduous trees. Common shrubs are rhododendron, dogwood, cranberry, and hobblebush. A wide variety of forbs and grasses are found on the forest floor. Typical invasive plants in the Northeast Mixed Forest include Japanese stiltgrass, Canada thistle, garlic mustard, Russian olive, and tree-of-Heaven.

Farming and ranching

Very large areas of this ecoregion have been cleared of native vegetation for industrial use, urban sprawl, and production of crops and livestock forage. In some areas, extremely poor soils and short growing seasons put limitations on agriculture. Depending on how the pastures and croplands are managed, some species of wildlife may benefit from farming, especially if trees and shrubs are nearby.

Plant succession



Kip Adams

Annual forbs and grasses with a few perennial species represent the initial successional stage. Perennial forbs and grasses and brambles, such as goldenrods, wildryes, and blackberry, represent the second successional stage.

Young trees and shrubs, such as alder and aspen, along with perennial grasses and forbs, represent the third successional stage.



Kip Adams



Kip Adams

Without disturbance, especially fire, aspen gives way to the fourth successional stage, which is usually represented by various hardwoods, such as maples, northern red oak, American beech, and birches.

The fifth successional stage is dominated by more shade-tolerant species, such as eastern hemlock, American beech, sugar maple, white pine, and red spruce.



Kip Adams

Wildlife associated with Northeast Mixed Forest

American black duck	ovenbird	New England cottontail	bluegill
American woodcock	ruffed grouse	red squirrel	largemouth bass
black-backed woodpecker	wild turkey	snowshoe hare	
brown thrasher	fisher	white-tailed deer	
northern goshawk	moose	wood frog	

Northeast Mixed Forest	American black duck	American woodcock	black---backed woodpecker	brown thrasher	northern goshawk	ovenbird	ruffed grouse	wild turkey	fisher	moose	New England cottontail	red squirrel	snowshoe hare	white---tailed deer	wood frog	bluegill	largemouth bass
Habitat Management Practices																	
Develop Conservation Easement											X						
Control Nonnative Vegetation	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		
Create Snags					X		X		X								
Develop Field Borders				X				X			X			X			
Conduct Forest Management		X		X	X	X	X	X	X	X	X	X	X	X			
Leave Crop Unharvested	X							X						X			
Conduct Livestock Management	X	X		X		X	X	X			X	X	X	X	X	X	X
Provide Nesting Structures																	
Plant Food Plots	X							X					X	X			
Plant Native Grasses and Forbs	X							X			X			X			
Plant Shrubs		X		X			X	X		X	X		X	X			
Plant Trees		X	X		X	X	X	X	X	X	X	X	X	X	X		
Repair Spillway/Dam/Levee	X									X						X	X
Set---back Succession	X	X	X	X			X	X		X	X			X			
Conduct Tillage Management	X							X						X			
Provide Water Developments for Wildlife	X							X		X				X	X		
Population Management Practices																	
Decrease Hunting/Fishing							X	X	X	X	X	X	X	X		X	X
Increase Hunting/Fishing								X	X	X		X	X	X		X	X
Conduct Wildlife Damage Management								X	X				X	X			
Conduct Wildlife or Fish Survey	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Fish Pond/Stream Management Practices																	
Construct Fish Pond																X	X
Control Aquatic Vegetation																X	X
Fertilize/Lime Fish Pond																X	X
Reduce Turbidity in Fish Pond																X	X
Restock Fish Pond																X	X
Streams: Create Pools																	
Streams: Remove Fish Barriers																	

Pacific Coastal Forest



Physical description

The terrain includes coastal plains and broad interior lowland plains and valleys associated with the Puget Sound and Willamette Valley. It also includes ridge and valley zones associated with Coast Ranges and temperate forest zones extending up the western slopes of the Cascade Mountains, as well as those on all sides of the Olympic Mountains. Many narrow river valleys and adjacent steep slopes are associated with these forests. Average annual precipitation ranges from under 30 inches to 180 inches, most in the form of winter rainfall.

Dominant vegetation

Final stage of plant succession is typically dense coniferous forests. Depending on the location and elevation, western hemlock, Sitka spruce, Douglas fir and western redcedar are species associated with the climax stage. Grand fir also may be found in the climax stage, and Pacific silver fir and noble fir are often found dominating in the higher mountain zones within the Pacific Coastal Forest. Red alder, either in pure stands or intermixed with earlier stages of plant succession, are found throughout the Pacific Coastal Forest. Big-leaf maple can be found through all stages of plant succession, but seldom in pure stands. In older, managed, even-aged forests, shrub and herbaceous layers are poorly developed. Dense and diverse shrub layers may be found in forest openings, early successional areas and in mature forests.

Some dominant shrub species include salal, vine maple, salmonberry, devil's club, vaccinium, elderberries, and swordfern, depending on site conditions. Serviceberry, chokecherry, Oregon white oak, snowberry, Oregon grape, oceanspray, hazel, scrub oaks, and ceanothus may dominate on some of the drier sites within this ecoregion. Perennial grasses and a variety of forbs are also common in open areas. Typical invasive plants in the Pacific Coastal Forest include Scotch broom, gorse, English ivy, knapweeds, reed canarygrass, butterfly bush, and purple loosestrife.

A major portion of the area consists of managed forest, owned or operated by state agencies, industrial landowners, and nonindustrial private landowners. Many of these managed forests are characterized by even-aged stands of few species, usually Douglas fir or western hemlock. These forests are often managed for wood-fiber production by occasional thinning and clearcut harvest, usually by 70 years of age.

Farming and ranching

In larger valleys, some water is diverted from nearby streams and rivers to irrigate grass hay. Crops such as corn, small grains, fruits, and alfalfa are grown in the lower valley floodplains. Livestock grazing is common and widespread on both the original prairies and pastures converted from forests and wetlands. Dairy farming is common throughout the ecoregion, especially along the coastal corridor.

Plant succession

Annual forbs and grasses represent the initial successional stage. Perennial grasses and forbs represent the second successional stage. Various shrubs, alder, and vine maple follow as the third successional stage. Coniferous forests, especially Douglas fir, represent the fourth successional stage. Western Hemlock often replaces Douglas fir as a fifth successional stage.



Livestock grazing, especially cattle and sheep, is common along the coastal corridor.

Wildlife associated with Pacific Coastal Forest

great horned owl
 hairy woodpecker
 marbled murrelet
 red-tailed hawk
 ruffed grouse

sooty grouse
 spotted towhee
 wood duck
 American beaver
 bobcat

Columbian black-tailed deer
 coyote
 elk
 red squirrel
 northern red-legged frog

rough-skinned newt
 Coho salmon

Pacific Coastal Forest	great horned owl	hairy woodpecker	marbled murrelet	red---tailed hawk	ruffed grouse	sooty grouse	spotted towhee	wood duck	American beaver	bobcat	Columbian black---tailed deer	coyote	elk	red squirrel	northern red---legged frog	rough---skinned newt	Coho salmon
Habitat Management Practices																	
Develop Conservation Easement			X														
Control Nonnative Vegetation	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Create Snags	X	X		X	X			X									
Develop Field Borders	X			X						X	X	X					
Conduct Forest Management	X		X	X	X	X	X	X		X	X	X	X	X	X		
Leave Crop Unharvested								X			X						
Conduct Livestock Management	X	X			X	X	X	X	X	X	X	X	X	X	X	X	
Provide Nesting Structures								X									
Plant Food Plots								X			X		X				
Plant Native Grasses and Forbs	X			X		X					X	X	X				
Plant Shrubs	X			X	X	X	X	X	X	X	X	X					
Plant Trees	X	X	X	X	X	X		X	X	X	X		X	X	X		
Repair Spillway/Dam/Levee								X								X	
Set---back Succession	X		X	X	X	X	X	X		X	X	X	X				
Conduct Tillage Management	X			X				X			X						
Provide Water Developments for Wildlife								X			X		X		X	X	
Population Management Practices																	
Decrease Hunting/Fishing					X	X			X	X	X	X	X	X			
Increase Hunting/Fishing									X	X	X	X	X	X			
Conduct Wildlife Damage Management	X	X		X					X	X	X	X	X				
Conduct Wildlife or Fish Survey	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Fish Pond/Stream Management Practices																	
Construct Fish Pond																	
Control Aquatic Vegetation																	
Fertilize/Lime Fish Pond																	
Reduce Turbidity in Fish Pond																	
Restock Fish Pond																	
Streams: Create Pools																	
Streams: Remove Fish Barriers																	X

Prairie Brushland



Physical description

The terrain is level to rolling hills. Average annual precipitation is between 17 and 32 inches, increasing from southwest to northeast. Most of the moisture is received in the fall and spring. The summers are hot, and winters are warm.

Dominant vegetation

Climax vegetation is characterized by dense shrubland, often with more open stands of shrubs with grasses and forbs forming a shrub savanna. Depending on the area, shrubs such as mesquite, black brush, catclaw, huisache, and guajillo are common in the final successional stage. Other species that contribute to the shrub layer include white brush, bluewood, lotebush, coyotillo, live oak, cenizo, prickly pear, and chollas. Some of the more common grasses associated with climax vegetation include various species of bluestem and paspalum, Arizona cottontop, buffalograss, burgrass, dropseed, windmillgrass, slender grama, hairy grama, common sandbur, and various species of bristlegrass.

Vegetation associated with riparian areas is different than the surrounding vegetation. Trees, such as live oak and hackberry, are common in riparian areas. Mesquite grows much larger, looking more like a tree than a shrub, and the vegetation is generally more robust along rivers and streams where moisture is abundant. The abundance and variety of vegetation combined with the availability of water make these areas attractive for wildlife.

Typical nonnative invasive plants in the Prairie Brushland include old world bluestem, buffelgrass, Lehmann lovegrass, and Chinese tallow tree.



Brush country in south Texas. Mesquite and prickly pear are prevalent with cottonwood in the drainages. This landscape provides habitat for wild turkey, northern bobwhite, American kestrel, coyote, white-tailed deer, and many other species.

Farming and ranching

There is very little farming in this ecoregion. The large areas of shrubs and grasslands are used primarily for livestock grazing. Continual heavy grazing of perennial grasses will reduce perennial grasses and lead to near complete shrub cover, which directly impacts habitat for wildlife and graze-able acreage for livestock.

Plant succession

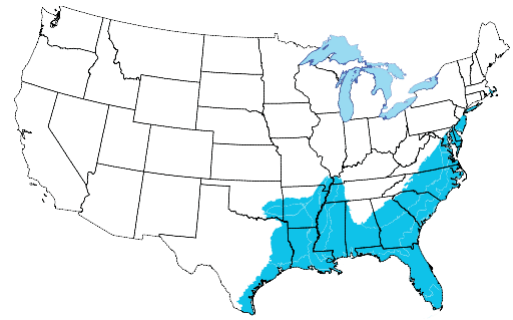
Annual forbs and grasses represent the initial successional stage. Perennial forbs and grasses follow and represent the second successional stage. Shrubs with perennial grasses represent the third and final successional stage, except along drainages where trees may be found.

Wildlife associated with Prairie Brushland

black-bellied whistling duck
crested caracara
golden-fronted woodpecker
long-billed thrasher
northern bobwhite
pyrrhuloxia
western kingbird
white-winged dove
wild turkey
collared peccary
coyote
white-tailed deer
wild pig
Texas horned lizard
bluegill
largemouth bass

Prairie Brushland	black---bellied whistling duck	crested caracara	golden---fronted woodpecker	long---billed thrasher	northern bobwhite	pyrrhuloxia	western kingbird	white---winged dove	wild turkey	collared peccary	coyote	white---tailed deer	wild pig	Texas horned lizard	bluegill	largemouth bass
Habitat Management Practices																
Develop Conservation Easement																
Control Nonnative Vegetation	X	X	X	X	X	X	X	X	X	X	X	X		X		
Create Snags	X		X				X	X								
Develop Field Borders				X	X	X	X		X		X	X				
Conduct Forest Management																
Leave Crop Unharvested	X				X			X	X			X				
Conduct Livestock Management	X	X			X			X	X		X	X			X	X
Provide Nesting Structures	X															
Plant Food Plots	X				X			X	X			X				
Plant Native Grasses and Forbs					X			X	X		X	X				
Plant Shrubs		X		X	X	X	X	X	X	X	X	X		X		
Plant Trees	X	X	X	X				X	X							
Repair Spillway/Dam/Levee	X														X	X
Set---back Succession		X	X		X	X	X	X	X	X	X	X		X		
Conduct Tillage Management	X				X			X	X			X				
Provide Water Developments for Wildlife	X			X		X		X	X	X		X				
Population Management Practices																
Decrease Hunting/Fishing	X				X				X	X	X	X			X	X
Increase Hunting/Fishing									X	X	X	X	X		X	X
Conduct Wildlife Damage Management			X						X		X	X	X			
Conduct Wildlife or Fish Survey	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Fish Pond/Stream Management Practices																
Construct Fish Pond															X	X
Control Aquatic Vegetation															X	X
Fertilize/Lime Fish Pond															X	X
Reduce Turbidity in Fish Pond															X	X
Restock Fish Pond															X	X
Streams: Create Pools																
Streams: Remove Fish Barriers																

Southeast Mixed and Outer Coastal Plain Forest



Physical description

The terrain is rolling hills to mostly flat. Marshes, lakes, and swamps are numerous along the Coastal Plain. The average annual precipitation ranges from 40 to 60 inches. Precipitation is received throughout the year. Summers are hot and winters are mild.

Dominant vegetation

The final stage of succession usually consists of deciduous trees, such as oaks, hickories, American beech, blackgum, red maple, redbay, Southern magnolia, laurel oak, American holly, and winged elm. However, on many upland sites, especially where prescribed fire is used, longleaf or loblolly pine are often the principal overstory species. Fire suppression has decimated the longleaf pine ecosystem to a fraction of its former range throughout the ecoregion. Planted loblolly pine is widespread over much of the ecoregion, but without fire and judicious thinning, the value of loblolly plantings for wildlife is low. Gum and cypress are dominant on moist areas along the Atlantic and Gulf coasts and along major river drainages. Midstory trees throughout much of the ecoregion include dogwoods, American hornbeam, redbud, sweetbay, titi, and shadbush. Native forbs and grasses commonly found include lespedezas, partridge pea, ragweed, pokeweed, bluestems, paspalums, wiregrass, povertygrass, and many others. Vines, such as Virginia creeper, trumpet creeper,

grapes, yellow jessamine, and greenbriar, are common. Shrubs include sumacs, viburnums, elderberry, wild plum, blueberry, blackberry, hawthorns, and wax myrtle.

Typical nonnative invasive plants in the Southeast Mixed Forest include bermudagrass, bahiagrass, cogongrass, kudzu, Japanese honeysuckle, privets, Japanese climbing fern, chinaberry, tree-of-heaven, mimosa, and popcorn tree.

Farming and ranching

Many wetlands along major rivers have been drained and forests cleared to grow crops such as cotton, tobacco, soybeans, corn, and other grain crops. Large areas of forests have also been cleared and planted to nonnative grasses, especially bermudagrass and bahiagrass, for livestock. Unfortunately, most of these are not beneficial for wildlife.

Southeast Mixed and Outer Coastal Plain Forest	barred owl	loggerhead shrike	mourning dove	northern bobwhite	prothonotary warbler	red-cockaded woodpecker	red-eyed vireo	wild turkey	wood duck	coyote	eastern cottontail	eastern fox squirrel	raccoon	white-tailed deer	wild pig	eastern indigo snake	gopher tortoise	bluegill	channel catfish	largemouth bass
	Habitat Management Practices																			
Develop Conservation Easement		X		X		X										X	X			
Control Nonnative Vegetation	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X			
Create Snags	X				X				X				X							
Develop Field Borders		X		X				X		X	X		X	X						
Conduct Forest Management	X			X	X	X	X	X	X	X	X	X	X	X		X	X			
Leave Crop Unharvested			X	X				X	X		X	X	X	X						
Conduct Livestock Management	X	X	X	X	X			X	X	X	X	X	X	X				X	X	X
Provide Nesting Structures	X				X	X			X											
Plant Food Plots			X	X				X	X		X	X	X	X						
Plant Native Grasses and Forbs		X	X	X				X		X	X			X		X	X			
Plant Shrubs		X	X	X				X	X	X	X		X	X						
Plant Trees	X	X	X		X	X	X	X	X			X	X	X		X	X			
Repair Spillway/Dam/Levee			X		X				X				X					X	X	X
Set-back Succession	X	X	X	X		X		X	X	X	X	X	X	X		X	X			
Conduct Tillage Management			X	X				X	X		X	X	X	X						
Provide Water Developments for Wildlife			X		X			X	X			X	X	X		X				
Population Management Practices																				
Decrease Hunting/Fishing				X				X		X	X	X	X	X				X	X	X
Increase Hunting/Fishing								X		X	X	X	X	X	X			X	X	X
Conduct Wildlife Damage Management	X							X		X	X	X	X	X	X					
Conduct Wildlife or Fish Survey	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Fish Pond/Stream Management Practices																				
Construct Fish Pond																		X	X	X
Control Aquatic Vegetation																		X	X	X
Fertilize/Lime Fish Pond																		X	X	X
Reduce Turbidity in Fish Pond																		X	X	X
Restock Fish Pond																		X	X	X
Streams: Create Pools																				
Streams: Remove Fish Barriers																				

Plant succession



John Gruchy

Annual forbs and grasses represent the initial successional stage. Here, a strip was disked in a field dominated by perennial native warm-season grasses to enhance brooding cover for northern bobwhite. Note the common ragweed and bare ground in the disked strip (center) as compared to the relatively dense native grass on the right.

Perennial forbs and grasses represent the second successional stage.



Mike Hansbrough

The second successional stage slowly gives way to the third. Broomsedge bluestem, blackberry, goldenrod, and other forbs commonly succeed to sweetgum, red maple, and eastern redcedar. This transition provides excellent cover for northern bobwhite, loggerhead shrike, and eastern cottontail.

Various shrubs (such as wild plum) and trees (such as eastern redcedar, sweetgum, and winged elm) represent the third successional stage. Planted loblolly pine stands often represent a third successional stage. Longleaf pine also represents a third successional stage. Longleaf pine is maintained with frequent prescribed fire, which prohibits succession from advancing further.



Mixed hardwood forest dominated by various oaks, hickories, maples, and sweetgum represent the fourth successional stage. Loblolly, shortleaf, and Virginia pine are often a component in these forests. More shade-tolerant species, especially American beech and American holly become more prevalent in stands that are not disturbed with prescribed fire. Unmanaged forests often lack a developed understory, such as seen in this picture.

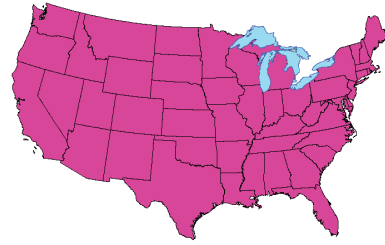


Planted pines, especially loblolly, are common across the Southeast. Early successional vegetation is provided for a few years until the canopy of the pine's closes. These pictures show the same loblolly pine stand 4 years after planting and 8 years after planting. Although it is the same loblolly pine stand, the wildlife species found in this stand 4 years apart are quite different because the structure of the stand has changed dramatically.

Wildlife associated with Southeast Mixed and Outer Coastal Plain Forest

barred owl
loggerhead shrike
mourning dove
northern bobwhite
prothonotary warbler
red-cockaded woodpecker
red-eyed vireo
wild turkey
wood duck
coyote
eastern cottontail
eastern fox squirrel
raccoon
white-tailed deer
wild pig
eastern indigo snake
gopher tortoise
bluegill
channel catfish
largemouth bass

Urban



Physical Description

According to the U.S. Census Bureau in 2010, more than 80 percent of the American population lived in or near an urban area. The Census Bureau defines an urban area as a large central place with a total population of at least 50,000. In addition to a large human population, urban areas are characterized by residential and commercial development connected and crisscrossed by infrastructure, such as roads, train tracks, and utilities. Areas such as neighborhood parks offer the best possibility for wildlife habitat within an urban environment.

Dominant vegetation

It is not possible to identify dominant vegetation common in urban areas because urban areas are found in all ecoregions of the U.S. However, urban ecoregions typically contain gravel and paved areas, annual plantings, perennial grasses and forbs, shrubs, and young and mature trees. The vegetation is as likely to be an introduced species as a native species. Additionally, vegetated areas are typically manipulated in a landscaped manner versus “letting nature take over” as in rural areas. Interspersion is an important concept to understand in urban areas because of the fragmented landscape from residential and commercial development.

Urban areas are often dominated by non-native, invasive vegetation because of the disturbed and fragmented landscape and because many varieties of nonnative ornamentals are planted for aesthetic purposes. Educating the public about native versus nonnative cultivars and monitoring should be implemented in all urban areas.

Wildlife associated with Urban areas

- American robin
- bluebird¹
- common nighthawk
- European starling
- house finch
- house sparrow
- house wren
- northern flicker
- peregrine falcon
- rock pigeon
- ruby-throated hummingbird
- song sparrow
- big brown bat
- cottontail
- coyote
- eastern gray squirrel
- raccoon
- white-tailed deer

Although there are several active management practices that can be implemented, such as artificial feeders, mowing, planting flowers, and rooftop/balcony gardens, there are also some common-sense considerations that should always be given. For example, when nests of desirable species are found, care should be taken not to disturb them.

NOTE: Urban areas vary considerably in the amount of open space available, number of buildings, population density, etc. Thus, there are several wildlife management practices that are applicable in some urban or suburban areas and not in others. Some WMPs, such as those related to livestock and row crops, are not considered applicable for Urban ecoregion. Forages, such as clovers, may be sown in open areas to attract species such as cottontails and white-tailed deer, but grain plots are not applicable.

Considerations for Urban Wildlife management practices

Attracting wildlife for viewing is popular among people in urban and suburban areas. However, many wildlife species can quickly become a nuisance, especially when they find protective shelter in unintended areas (under houses in attics) or begin to damage property (chewing/drilling holes in wooden siding, defecating on property). Care must be exercised when attracting wildlife in urban and suburban areas, especially when using artificial feeders, which can also attract unwanted species, such as mice and rats and make desirable species more susceptible to unnatural predators (house cats). If you care about small wildlife, keep your cat indoors!

Urban	American robin	bluebird	common nighthawk	European starling	house finch	house sparrow	house wren	northern flicker	peregrine falcon	rock pigeon	ruby---throated hummingbird	song sparrow	big brown bat	cottontail	coyote	eastern gray squirrel	raccoon	white---tailed deer
Habitat Management Practices																		
Develop Conservation Easement																		
Control Nonnative Vegetation	X	X					X	X			X	X		X	X	X	X	X
Create Snags		X						X					X				X	
Develop Field Borders		X												X	X		X	X
Conduct Forest Management								X				X		X	X	X	X	X
Leave Crop Unharvested																		
Conduct Livestock Management																		
Provide Nesting Structures		X					X		X				X					
Plant Food Plots														X				X
Plant Native Grasses and Forbs		X			X							X		X	X			X
Plant Shrubs	X	X			X		X	X			X	X		X	X		X	X
Plant Trees	X	X			X		X	X			X		X			X	X	X
Repair Spillway/Dam/Levee																	X	
Set---back Succession	X	X	X		X			X				X	X	X	X		X	X
Conduct Tillage Management																		
Provide Water Developments for	X				X							X	X				X	X
Population Management Practices																		
Decrease Hunting/Fishing														X	X	X	X	X
Increase Hunting/Fishing														X	X	X	X	X
Conduct Wildlife Damage Management				X		X		X	X	X			X	X	X	X	X	X
Conduct Wildlife or Fish Survey	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Fish Pond/Stream Mgmt. Practices																		
Construct Fish Pond																		
Control Aquatic Vegetation																		
Fertilize/Lime Fish Pond																		
Reduce Turbidity in Fish Pond																		
Restock Fish Pond																		
Streams: Create Pools																		
Streams: Remove Fish Barriers																		
Additional Urban Practices																		
Artificial Feeders					X			X			X	X				X		
Plant Flowers											X							
Rooftop/Balcony Gardens											X							

Wetlands

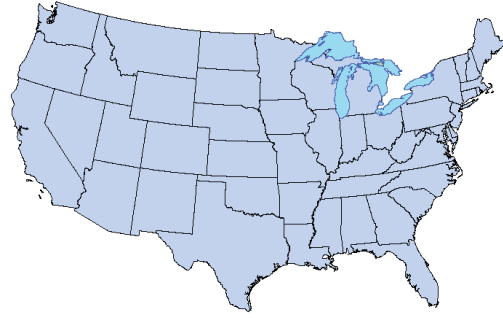
Physical description

Wetlands can be described as the zone between deep water and upland areas. They are characterized by various amounts of open water and vegetation with soil that is often wet or covered with shallow water. There are many types of wetlands, including beaver ponds, potholes, playas, ephemeral (temporary) ponds, small lakes, marshes, rivers, streams, swamps, and others. They are found in all of the ecoregions described in this manual.

Dominant vegetation

Aquatic vegetation can survive in the water or on lands flooded or saturated with water for extended periods. Upland vegetation cannot tolerate saturation for long periods. The vegetation found in association with wetlands varies with permanence of the water, depth of water, salinity, and substrate (bottom). Wetlands with deep, permanent water typically have less emergent (above the water surface) vegetation and more floating or submerged (below the water surface) aquatic vegetation. As the water depth decreases, emergent aquatic vegetation becomes more prevalent. Less vegetation is found on rock and gravel bottoms than on bottoms with more silt, clay, and organic material (dead plants and animals that are decomposed). Emergent aquatic vegetation may include trees, shrubs, grasses, forbs, sedges, and rushes. Examples of trees often found in wetlands include willows, cottonwood, various oaks, tupelo gum, tamarack, cypress, mangroves, red bay, black spruce, Atlantic white cedar, and pond pine. Shrubs commonly found in and adjacent to wetlands include willows, alders, bog birch, bog laurel, Labrador tea, coastal sweetbells, inkberry, sea myrtle, and marsh elder. Emergent grasses and grass-like vegetation commonly found in wetlands include cattails, bulrushes, saltgrass, cordgrass, saw grass, sedges, arrow grass, shoal grass, eel grass, and wild rice. Water lilies, pondweeds, wild celery, water milfoil, duckweeds, and coontails are examples of floating and submerged aquatic vegetation. Typical invasive plants found in wetlands include purple loosestrife, hydrilla, Eurasian watermilfoil, reed canarygrass, water hyacinth, alligatorweed, and phragmites.

The amount of open water and vegetation is important in determining how suitable the wetland is for different wildlife species. For example, young ducks need open water and emergent vegetation for hiding. Floating and submerged vegetation supports large amounts of food high in protein, such as snails, mollusks, and crustaceans, which young ducks need for fast growth.



Emergent vegetation may supply nesting areas, such as trees for wood ducks, grass for mallards, and cattails for red-winged blackbirds and muskrats. Exposed mudflats are another critical habitat component for some wildlife species, especially shorebirds, which rely on these areas to search for invertebrates in the mud.

Wetlands with stable, nonflowing water levels go through succession similar to the process in uplands. Open-water areas fill with silt and dead vegetation, which allows emergent aquatic vegetation to become dominant. As the wetland continues to fill, it becomes drier, allowing upland vegetation to become dominant.

Plant succession

Wetland succession typically proceeds in the following stages:

- Stage 1:** deep water with little vegetation
- Stage 2:** shallow water dominated by submerged and floating aquatic vegetation
- Stage 3:** very shallow water or wet ground dominated by any variety of emergent aquatic vegetation
- Stage 4:** ground becomes drier and upland vegetation similar to the surrounding area becomes dominant.

Succession proceeds slowly in wetlands with large amounts of deep water or a rocky bottom. Fluctuations in water levels can cause the final stage of succession to regress to an earlier stage. For example, if a wetland in Stage 3 succession is flooded with deep water for a period of time, the aquatic emergent vegetation may die, reverting a wetland to an earlier successional stage. The extent of this regression depends on the length of time the wetland is flooded with deep water, how much the water level changes, and the extent (length of time) the present vegetation can survive in the changed water level.

Management of water levels is an important tool in managing wetlands for wildlife. The succession process described above is often not applicable to wetlands with constantly moving water, such as rivers, streams, and tidal areas.

Wetlands	American bittern	Canada goose	mallard	northern pintail	redhead	spotted sandpiper	Virginia rail	Wilson's snipe	American beaver	common muskrat	mink	raccoon	river otter	eastern snapping turtle	American bullfrog	crawfish frog	tiger salamander	bluegill	largemouth bass
Habitat Management Practices																			
Develop Conservation Easement																X			
Control Nonnative Vegetation	X	X	X	X	X	X	X	X	X	X	X	X	X			X			
Create Snags												X							
Develop Field Borders												X							
Conduct Forest Management			X									X							
Leave Crop Unharvested		X	X	X								X							
Conduct Livestock Management	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Provide Nesting Structures																			
Plant Food Plots		X	X	X								X							
Plant Native Grasses and Forbs		X	X	X		X										X	X		
Plant Shrubs									X			X				X	X		
Plant Trees									X			X					X		
Repair Spillway/Dam/Levee	X	X	X	X	X	X	X			X	X	X	X	X	X			X	X
Set--back Succession	X	X	X	X	X	X	X	X		X	X	X							
Conduct Tillage Management		X	X	X								X							
Provide Water Developments for Wildlife	X	X	X	X	X	X	X			X	X	X	X	X	X	X	X		
Population Management Practices																			
Decrease Hunting/Fishing									X	X	X	X	X	X	X			X	X
Increase Hunting/Fishing									X	X	X	X	X	X	X			X	X
Conduct Wildlife Damage Management		X							X	X	X	X	X	X					
Conduct Wildlife or Fish Survey	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Fish Pond/Stream Management Practices																			
Construct Fish Pond																		X	X
Control Aquatic Vegetation																		X	X
Fertilize/Lime Fish Pond																		X	X
Reduce Turbidity in Fish Pond																		X	X
Restock Fish Pond																		X	X
Streams: Create Pools																			
Streams: Remove Fish Barriers																			



Stage 1 wetland—characterized by open water and limited vegetation.



Stage 2 wetland—this beaver-influenced wetland provides a mosaic of open water with submerged vegetation, as well as floating islands of debris and emergent vegetation.



Over time, Stage 2 wetlands dominated by floating and submerged aquatic vegetation succeed into Stage 3 wetlands with more emergent vegetation, including sedges, rushes, grasses, and shrubs.



Stage 3 wetland—this natural emergent freshwater marsh is covered with several species of native grasses and sedges. Over time, these freshwater wetlands become more similar to the adjacent uplands as they slowly fill in.



Stage 3 wetland – Forested bottomland swamps, such as this cypress swamp in the Lowcountry of South Carolina, often are relatively stable wetlands because of their proximity to major river systems.



Stage 4 wetland — these wetlands are rarely flooded. Here, a riparian area along the Missouri River has recently flooded and sediment is deposited along the river. However, most of the time, this area is dry.

Dwayne Elmore

Wildlife associated with Wetlands

American bittern
Canada goose
mallard northern
pintail redhead

spotted sandpiper
Virginia rail
Wilson’s snipe
American beaver
common muskrat

mink
raccoon
river otter
eastern snapping turtle
American bullfrog

crawfish frog
tiger salamander
bluegill
largemouth bass

Woodland

Physical description

The Woodland ecoregion is dominated by various types of woodlands. There are woodlands in other ecoregions, but the Woodland ecoregion is distinguished by species composition and structure of the vegetation community. Terrain in the Woodland ecoregion is irregular with large hills and mesas that are often dissected by narrow drainages. The average annual precipitation ranges from 10 to 25 inches. Most of the precipitation is received in winter and late summer. Summers have hot days and cool nights. Winters are cold.

Dominant vegetation

In the Woodland ecoregion, pinyon pine and juniper are most often associated with the final stage of plant succession. In the southern areas of this ecoregion, species of oaks such as live oak, Spanish oak, and shin oak represent the final stage of plant succession. Woodland shrubs include bitterbrush, mountain mahogany, scrub oak, and sumac. In addition, in areas where there has been a disturbance, mesquite may dominate. Areas dominated by sagebrush may be interspersed with tree-dominated areas similar to those described in the Intermountain Sagebrush ecoregion.

A variety of perennial and annual grasses and forbs can be found in the herbaceous layer. The amount of grass, forbs, and shrubs depends on the amount of trees in the area. Canopy cover is one of the primary factors influencing understory vegetation in forest and woodland vegetation. Usually the herbaceous layers decrease as the amount of trees increase.

The vegetation associated with riparian areas is often much different than the surrounding vegetation. The vegetation in riparian areas is more abundant and is represented by different species. Riparian areas are



Dwayne Elmore

In the absence of fire, juniper often is the dominant plant, which hosts an entirely different set of wildlife species than those in more open woodland.

dominated by cottonwoods, willows, tamarisk, silver buffaloberry, boxelder, and a variety of grasses and forbs. Russian olive is a common nonnative invasive shrub along riparian areas. In the southern part of the Woodland ecoregion, hackberry, Spanish oak, and live oak occur. The variety and abundance of vegetation compared to the surrounding areas makes riparian areas very attractive to wildlife. Typical invasive plants in the Woodland ecoregion include leafy spurge cheatgrass, Canada thistle, dalmation toadflax, and yellow toadflax.

Farming and ranching

Water for irrigation is limited and necessary to grow crops in this ecoregion. Where available, water is diverted from rivers and streams to grow crops such as corn, wheat, barley, alfalfa, and grass pasture and hay. Farming is important only in small, localized areas in valleys and on flat terrain. Livestock grazing is common in the ecoregion. Conduct Livestock Management may be used to exclude livestock from sensitive areas or may be used to benefit wildlife by adjusting stocking rate, season of use, or grazing system.

Plant Succession

Annual forbs and grasses represent the initial stage of succession. Perennial grasses and forbs represent the second stage. Shrubs, along with perennial grasses and forbs are the third successional stage. Oak and/or juniper woodland dominate the fourth successional stage.



Wildlife associated with Woodlands

American wigeon
golden-cheeked warbler
greater roadrunner
ladder-backed woodpecker
mourning dove

northern bobwhite
prairie falcon
red-tailed hawk
western bluebird
wild turkey

black-tailed jackrabbit
Brazilian free-tailed bat
coyote
white-tailed deer
wild pig

western diamond-backed
rattlesnake
bluegill
largemouth bass

Woodland	American wigeon	golden-cheeked warbler	greater roadrunner	ladder-backed woodpecker	mourning dove	northern bobwhite	prairie falcon	red-tailed hawk	western bluebird	wild turkey	black-tailed jackrabbit	Brazilian free-tailed bat	coyote	white-tailed deer	wild pig	western diamond-backed rattlesnake	bluegill	largemouth bass
Habitat Management Practices																		
Develop Conservation Easement		X				X												
Control Nonnative Vegetation	X	X	X	X	X	X		X	X	X	X		X	X		X		
Create Snags				X				X	X									
Develop Field Borders						X		X	X	X			X	X				
Conduct Forest Management		X	X			X		X	X	X			X	X				
Leave Crop Unharvested					X	X				X				X				
Conduct Livestock Management	X			X	X	X			X	X	X		X	X			X	X
Provide Nesting Structures							X		X			X						
Plant Food Plots					X	X				X				X				
Plant Native Grasses and Forbs	X				X	X		X	X	X			X	X		X		
Plant Shrubs	X		X		X	X		X	X	X	X		X	X		X		
Plant Trees		X		X	X			X	X	X				X				
Repair Spillway/Dam/Levee	X				X												X	X
Set-back Succession	X	X	X		X	X	X	X	X	X	X		X	X		X		
Conduct Tillage Management	X				X	X		X		X				X				
Provide Water Developments for Wildlife	X				X					X				X				
Population Management Practices																		
Decrease Hunting/Fishing						X				X	X		X	X			X	X
Increase Hunting/Fishing										X	X		X	X	X		X	X
Conduct Wildlife Damage Management				X				X		X	X	X	X	X	X	X		
Conduct Wildlife or Fish Survey	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Fish Pond/Stream Management Practices																		
Construct Fish Pond																	X	X
Control Aquatic Vegetation																	X	X
Fertilize/Lime Fish Pond																	X	X
Reduce Turbidity in Fish Pond																	X	X
Restock Fish Pond																	X	X
Streams: Create Pools																		
Streams: Remove Fish Barriers																		

Wildlife Species

This chapter contains information on species featured in each of the ecoregions. Species are grouped by Birds, Mammals, Reptiles, Amphibians, and Fish. Species are listed alphabetically within each group. A general description, habitat requirements, and possible wildlife management practices are provided for each species. Wildlife management practices for a particular species may vary among ecoregions, so not all of the wildlife management practices listed for a species may be applicable for that species in all ecoregions. Refer to the WMP charts within a particular ecoregion to determine which practices are appropriate for species included in that ecoregion.

The species descriptions contain all the information needed about a particular species for the WHEP contest. However, additional reading should be encouraged for participants that want more detailed information. Field guides to North American wildlife and fish are good sources for information and pictures of the species listed. There also are many Web sites available for wildlife species identification by sight and sound.

Information from this section will be used in the Wildlife Challenge at the National Invitational. Participants should be familiar with the information presented within the species accounts for those species included within the ecoregions used at the Invitational.

It is important to understand that when assessing habitat for a particular wildlife species and considering various WMPs for recommendation, current conditions should be evaluated. That is, WMPs should be recommended based on the current habitat conditions within the year. Also, it is important to realize the benefit of a WMP may not be realized soon. For example, trees or shrubs planted for mast may not provide cover or bear fruit for several years.

Index to Wildlife Species

Note: Refer to this list for the correct spelling and capitalization of species for Activity I (Wildlife Challenge).

Birds (86)

American bittern	golden-cheeked warbler	prairie falcon
American black duck	golden-fronted woodpecker	prothonotary warbler
American kestrel	golden-winged warbler	pyrrhuloxia
American robin	grasshopper sparrow	red-cockaded woodpecker
American wigeon	great horned owl	red-eyed vireo
American woodcock	greater prairie-chicken	red-tailed hawk
barred owl	greater roadrunner	redhead
black-backed woodpecker	greater sage-grouse	ring-necked pheasant
black-bellied whistling duck	hairy woodpecker	rock pigeon
black-capped chickadee	house finch	ruby-throated hummingbird
black-throated sparrow	house sparrow	ruffed grouse
blue-winged teal	house wren	sage thrasher
Brewer's sparrow	ladder-backed woodpecker	scaled quail
broad-winged hawk	lark bunting	sharp-tailed grouse
brown thrasher	Lawrence's goldfinch	song sparrow
California quail	loggerhead shrike	sooty grouse
California thrasher	long-billed thrasher	southwest willow flycatcher
Canada goose	mallard	spotted sandpiper
common nighthawk	marbled murrelet	spotted towhee
crested caracara	mountain bluebird	Virginia rail
crissal thrasher	mourning dove	western bluebird
dickcissel	northern bobwhite	western kingbird
dusky grouse	northern flicker	white-tailed ptarmigan
eastern bluebird	northern goshawk	white-winged dove
eastern meadowlark	northern harrier	wild turkey
European starling	northern pintail	Wilson's snipe
ferruginous hawk	Nuttall's woodpecker	wood duck
Gambel's quail	ovenbird	yellow-rumped warbler
golden eagle	peregrine falcon	

Mammals (34)

American beaver
 American marten
 big brown bat
 black bear
 black-tailed jackrabbit
 black-tailed prairie dog
 bobcat
 Brazilian free-tailed bat
 collared peccary
 Columbian black-tailed deer
 common muskrat
 coyote

desert cottontail
 eastern cottontail
 eastern fox squirrel
 eastern gray squirrel
 elk
 fisher
 gray fox
 Indiana bat
 mink
 moose
 mountain cottontail
 mountain lion

New England cottontail
 pronghorn
 raccoon
 red fox
 red squirrel
 river otter
 Rocky Mountain mule deer
 snowshoe hare
 white-tailed deer
 wild pig

Reptiles (9)

eastern box turtle
 eastern indigo snake
 eastern snapping turtle

Gila monster
 gopher tortoise
 plains hog-nosed snake

Texas horned lizard
 timber rattlesnake
 western diamond-backed rattlesnake

Amphibians (7)

American bullfrog
 crawfish frog
 Monterey salamander
 northern red-legged frog

rough-skinned newt
 tiger salamander
 wood frog

Fish (6)

bluegill
 channel catfish
 Coho salmon

cutthroat trout
 largemouth bass
 rainbow trout

Range map keys for wildlife species

Range map key for birds:



Range map key for mammals, reptiles, and amphibians:

Native
 Range
 Introduce
 d Range

Range map key for fish



Year Round
 migratory



Birds

American bittern

General information

The American bittern is a medium-sized heron typically found in dense emergent vegetation in moderately shallow freshwater wetlands. This migratory bird may be found near the coasts during winter. It is rarely seen except when flying. It moves slowly through vegetation stalking food and is well camouflaged with brown and white streaks. American bitterns occasionally use adjacent upland grasslands for nesting and foraging. Larger semi-permanent wetland complexes are favored over small, isolated wetlands.

Habitat requirements

Diet: fish, amphibians, snakes, insects, and crustaceans

Water: obtained from food

Cover: dense emergent wetland vegetation, such as reeds, cattails, or sedges; nest is built in dense cover a few inches above shallow water; water depth should be maintained at less than 2 inches throughout the year

Wildlife management practices

Control Nonnative Vegetation: is necessary when nonnative invasive vegetation begins to outcompete native vegetation, limit food abundance, or alter the hydrology of a wetland favoring dryer land.

Conduct Livestock Management: livestock should be excluded from wetlands managed for bitterns

Repair Spillway/Dam/Levee: if not functioning properly

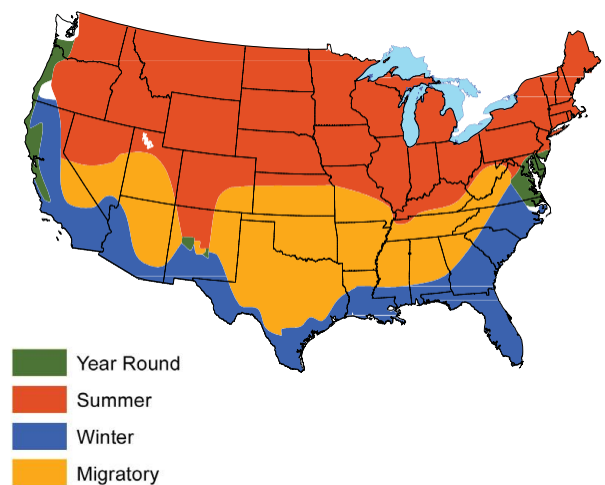
Set-back Succession: *Periodic Prescribed Fire, Disking,* and *Herbicides* may be used to maintain appropriate vegetation structure. However, disturbance should be infrequent (2-5 years) because bitterns prefer dense cover.

Provide Water Developments for Wildlife: shallow wetlands can be constructed if habitat is not present

Conduct Wildlife or Fish Survey: bitterns are typically surveyed by listening for calls. Also, ropes can be dragged across the vegetation between two or more observers to flush the birds.



Sallie Gentry



American black duck

General information

The American black duck is a large dabbling duck similar in size to mallards, ranging from 19 to 25 inches in length. They resemble the female mallard in color, though their plumage appears darker. The male and female black duck are similar in appearance. They have orange legs and feet and violet wing patches. The male black duck has a yellow to green bill, whereas hens have olive bills. Black ducks interbreed regularly and extensively with mallards. American black ducks frequent forested wetlands, tidewater areas, and coastal marshes of the eastern United States. They feed in a variety of shallow wetlands and agricultural fields. Their nests are built of vegetation and lined with down, found most often on the ground along edges of heavy cover, and generally close to water.

Habitat requirements

Diet: aquatic plants, invertebrates, waste corn, and grain are primary diet items

Water: obtains water through diet

Cover: forested and emergent wetlands for loafing; they also will feed in flooded grain fields

Wildlife management practices

Control Nonnative Vegetation: when nonnative invasive vegetation begins to degrade loafing or foraging cover in wetlands or nesting cover in uplands

Leave Crop Unharvested: to provide a winter food source

Conduct Livestock Management: livestock should be excluded from wetlands managed for waterfowl

Plant Food Plots: shallowly flooded grain plots can provide a beneficial food source for migrating and wintering black ducks

Plant Native Grasses and Forbs: where nesting cover is lacking

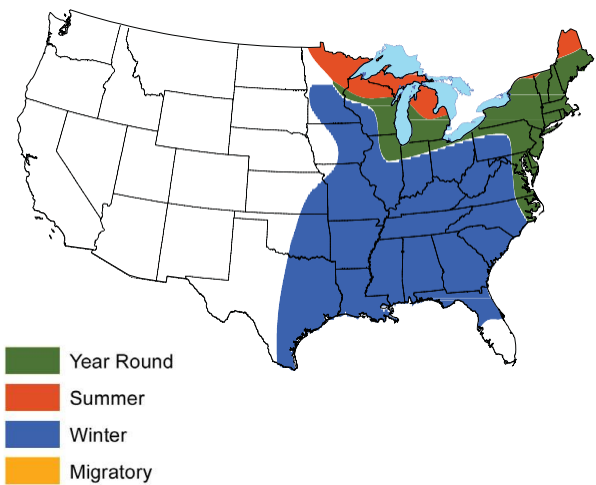
Repair Spillway/Dam/Levee: if not functioning properly

Set-back Succession: Prescribed Fire to rejuvenate vegetation in nesting areas and to maintain proper water and vegetation interspersions in wetlands

Conduct Tillage Management: eliminating fall tillage can provide waste grain in the winter

Water Control Structure: control water level in wetlands managed for waterfowl

Provide Water Developments for Wildlife: shallow impoundments can be important for migrating and wintering waterfowl; flooding grain fields and planting food plots in winter makes food more available



Conduct Wildlife or Fish Survey: black ducks are secretive and are often in woody emergent wetlands where accurate surveys are difficult. Nonetheless, flush counts and aerial surveys are most often used to estimate black duck populations.

American kestrel

General information

The American kestrel is a common, widespread, small raptor resembling the size and shape of a mourning dove. The males are a colorful slate-blue on the top of the head and on the wings, with a reddish colored back and tail. Females have reddish brown wings, but both sexes have characteristic black slashes on the sides of their face. They can be found in a variety of open environments, including deserts and grasslands. Often spotted perching on power lines or other tall structures searching for prey, they swiftly move their tail to keep balanced in the wind. Because of their small size, American kestrels are preyed upon by larger raptors, such as northern goshawks and red-tailed hawks, and even snakes. They nest in cavities (often old woodpecker cavities or natural tree hollows) with loose material on the floor and have been noted to readily use man-made nesting boxes. Males search out and sometimes even defend a cavity, and later present it to a potential mate. Clutches usually contain 4 to 5 eggs. Chicks are altricial, meaning they are helpless for a couple weeks after hatching and must be fed and cared for. The American kestrel is declining in some areas of North America, including the Pacific Coast and Florida, where it is listed as threatened. The decline in these areas can be attributed to poor habitat quality with a lack of nesting cavities, early successional cover, and food resources.

Habitat requirements

Diet: primarily insects and small mammals associated with open areas

Water: obtain necessary water from diet and do not need water for drinking

Cover: nest in tree cavities and other sites including holes in cliffs, canyon walls, and artificial nest boxes

Wildlife management practices

Control Nonnative Vegetation: when nonnative invasive vegetation competes with native plant species and reduces habitat quality for kestrels or their prey

Create Snags: where needed for perches and increase potential nest cavities

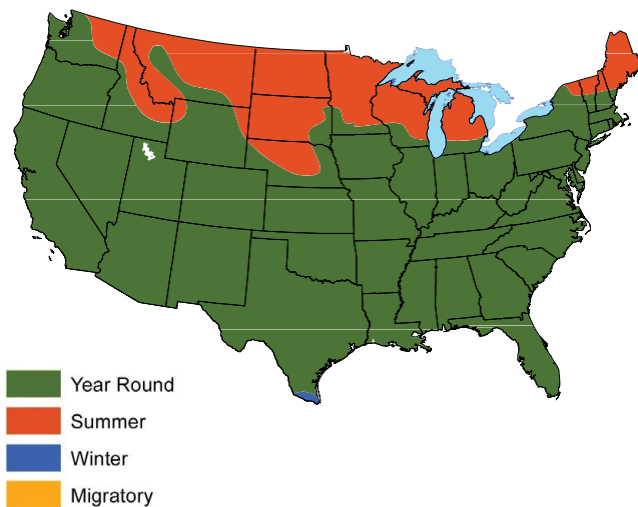
Develop Field Borders: to increase cover for prey around row crop fields

Conduct Livestock Management: to prevent overgrazing and maintain sufficient cover for prey and maintain early successional vegetation with scattered shrub cover

Provide Nesting Structures: can be used where a lack of natural nesting cavities is limiting the population; nest boxes can be placed on fence posts in open areas, and even on the back of road-side signs in open landscapes



Robert Burton



Plant Native Grasses and Forbs: where necessary to provide desirable cover for prey

Plant Shrubs: in large open areas where shrub cover is limiting

Plant Trees: where trees are lacking for future perching sites and cavities for nesting

Set-back Succession: *Prescribed Fire, Chaining, Drum-chopping, and Herbicide Applications* can maintain shrub cover and stimulate herbaceous cover; *Dozer-clearing and Root-plowing* can be used to convert forest to early succession

Conduct Tillage Management: will facilitate hunting prey when waste grain is available

Conduct Wildlife or Fish Survey: observation counts, point counts, and nest box usage rates may be used to estimate trends in populations

American robin

General information

American robins use a wide assortment of vegetation types, from mowed grassy areas to forested areas. In urban areas, robins use large open areas and nearby trees and shrubs. Parks, golf courses, and lawns in residential areas are attractive to robins. They are found throughout North America, though they may migrate out of northern latitudes during winters with sustained cold and snow. Robins build a nest of grass and mud on a tree or shrub limb but will occasionally nest on building ledges. Robins spend considerable time on the ground feeding on earthworms, but also will perch on branches to eat berries, fruit, and insects.



Lee Karney

Habitat requirements

Diet: insects and worms during spring and summer; soft mast from shrubs and trees in winter; seldom use artificial feeders

Water: require water daily in warm seasons; obtain water from low-lying areas, ponds, and rain-filled gutters

Cover: shrubs, evergreen trees, and deciduous trees used for nesting and escape; evergreen trees often used for early nests

Wildlife management practices

Control Nonnative Vegetation: when nonnative invasive vegetation begins to reduce habitat quality for American robins

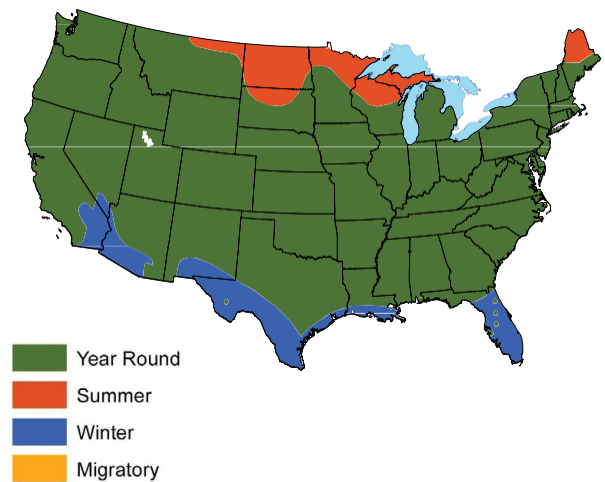
Plant Shrubs: where soft mast is lacking; examples might include dogwoods, hollies, golden currant, and winterberry

Plant Trees: both deciduous and evergreen, where nesting sites may be limiting

Set-back Succession: *Prescribed Fire*, *Disking*, and *Mowing* can be used to set-back succession and provide suitable structure for robins; *Mowing* may be used to maintain foraging and loafing cover for robins in **Urban** areas

Provide Water Developments for Wildlife: birdbaths and pans of water can be provided in urban areas; do not place water in areas where cats can catch the birds; cats should be removed

Conduct Wildlife or Fish Survey: observation counts, and point counts are used to estimate trends in populations



American wigeon

General information

The American wigeon is a medium-sized dabbling duck. It is easily distinguished from other dabbling ducks by its round head, short neck, and small bill. The American wigeon's body ranges from 17 to 23 inches long. The male (drake) has a mask of green feathers around its eyes and a cream-colored cap that runs from its bill to the crown of its head. This cap gives this bird its other common name, baldpate, which means bald head. Drakes also can be identified in flight by a large white shoulder patch on each wing. Hens have primarily gray and brown plumage. Both sexes have bluish-gray black tipped bills and gray legs and feet. The American wigeon has a very distinctive call with the drake producing a three-note whistle and the hens a low growl quack. They nest in areas of tall grass or shrubs, often far from water. The nest is constructed on the ground in a depression lined with grasses and down.

Habitat requirements

Diet: mostly aquatic plants and a few insects, and mollusks

Water: obtains water through diet

Cover: shallow freshwater wetlands, ponds, marshes, and rivers

Wildlife management practices

Control Nonnative Vegetation: when nonnative invasive vegetation begins to reduce habitat quality for American wigeon

Conduct Livestock Management: livestock should be excluded from wetlands managed for waterfowl

Plant Native Grasses and Forbs: where nesting cover is limited

Plant Shrubs: where nesting cover is limited

Repair Spillway/Dam/Levee: if not functioning properly

Set-back Succession: Prescribed Fire can be used to rejuvenate vegetation in nesting areas and to maintain proper water and vegetation interspersions in wetlands

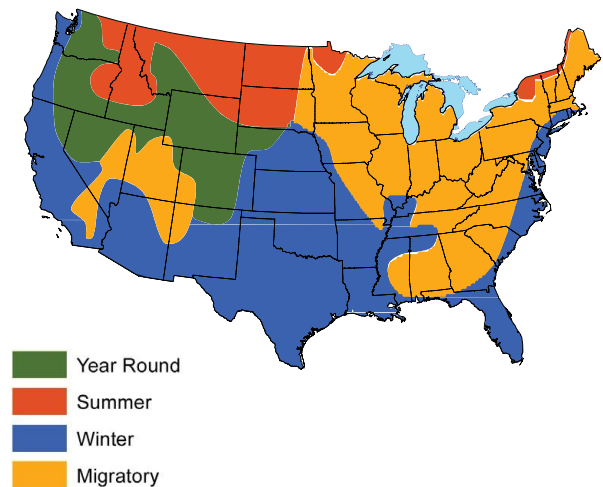
Conduct Tillage Management: eliminate fall tillage to encourage vegetation in agricultural fields for grazing opportunities

Provide Water Developments for Wildlife: shallow impoundments can be important for migrating and wintering waterfowl; flooding grain fields and planting food plots in winter makes food more available

Conduct Wildlife or Fish Survey: flush counts and aerial surveys are used to estimate populations in fall and winter



Donna Dewhurst



American woodcock

General information

The American woodcock is a ground-dwelling, migratory shorebird of the eastern United States and southeastern Canada that primarily inhabits moist, young forest and shrubland. They breed, nest, and raise their broods from March to June in their northern range. Nests are located in slight depressions among dead leaves on the forest floor. They migrate to their southern range in the fall through winter. This gamebird has declined steadily over the past 25 years as a result of land-use changes that have resulted in forest maturation, fire suppression, and increased human development. High-quality woodcock habitat has a diverse arrangement of dense, young forest (and must include some moist sites) on 80 percent of the area, interspersed with large fields and small openings in close proximity.

Habitat requirements

Diet: invertebrates (earthworms represent 60 percent of diet)

Water: obtained through diet

Cover: openings with sparse herbaceous groundcover and scattered shrubs and/or young trees; for courtship and roosting; young hardwood forest 2- to 25-year-old, for foraging, nesting and brood rearing or shrub cover on moist sites

Wildlife management practices

Control Nonnative Vegetation: may be necessary if habitat quality is degrading and the native plant community is being outcompeted

Conduct Forest Management: Forest Regeneration, especially clear cut and Group Selection, can provide dense structure in young stands that woodcock select for several years, especially when a mosaic of openings and young forest is well-interspersed

Conduct Livestock Management: exclude livestock from areas managed for American woodcock

Plant Shrubs: where there is a lack of interspersed shrubs for foraging, nesting, courtship, or roosting cover

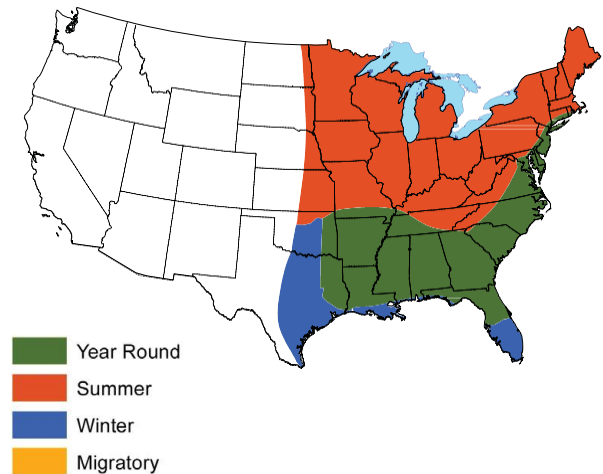
Plant Trees: where there is a lack of forest cover

Set-back Succession: *Prescribed Fire, Chainsawing, Drum-chopping, and Herbicide Applications* can be used to maintain young tree/shrub cover; *Chainsawing, Root-plowing, and Dozer-clearing* can be used to create forest openings

Conduct Wildlife or Fish Survey: surveys on singing grounds can be used to estimate the relative size of the woodcock breeding population



Richard Baetsen



Barred owl

General information

Barred owls are found in mature forests, often near water, throughout eastern North America and the Pacific Northwest. They roost on limbs and cavities during the day. They nest in cavities of large trees and snags and will readily use man-made nesting structures for nesting and roosting. They also may nest on old platform nests built by other owls, hawks, crows, and squirrels. They hunt primarily at night, scanning for prey with keen vision and hearing and flying silently from tall perches. Their hooting call of “*Who cooks for you? Who cooks for you all?*” can be heard all year and is a common night sound where they occur. Barred owl populations have increased and spread since the mid-1960s.



Mark Musselman

Habitat requirements

Diet: primarily small mammals, birds, amphibians, reptiles, fish, and invertebrates.

Water: requirements largely unknown. They likely obtain their water needs from the foods they consume.

Cover: mature forests with an abundance of relatively large trees and cavities, often near water. They also may use artificial cavities (nest boxes) when placed in mature forests where these birds are found.

Wildlife management practices

Control Nonnative Vegetation: where nonnative invasive vegetation is competing with native vegetation and reducing habitat quality

Create Snags: where cavities are lacking for adequate reproduction

Conduct Forest Management: *Forest Regeneration (Shelterwood)* harvests can result in a more open, park-like forest resulting in a more open understory to favor prey

Conduct Livestock Management: livestock should be excluded from forests to maintain understory for prey

Provide Nesting Structures: nest boxes may be installed in areas where nesting cavities are limiting barred owls. However, a lack of natural cavities is uncommon in mature forests that represent habitat for barred owls.

Plant Trees: in large open areas to create future habitat

Set-back Succession: low-intensity *Prescribed Fire* can be used in forests and woodlands to enhance cover for prey

Conduct Wildlife Damage Management: barred owls can prey upon small pets and domestic poultry. Exclusion practices should be used to discourage damage.

Conduct Wildlife or Fish Survey: call counts are used to monitor populations



Black-backed woodpecker

General information

Black-backed woodpeckers are primarily found in recently burned forests, specifically coniferous forests, where they eat bark beetles and other wood-boring beetles. Abundance of black-backed woodpeckers declines with time since fire. Habitat generally remains for 7-8 years post fire.

Habitat requirements

Diet: bark beetles and wood-boring beetles in recently burned, old-growth coniferous forests

Water: water is obtained from food

Cover: nest in the sapwood of relatively hard, dead trees with little decay that have been recently burned with high concentrations of beetle larvae.

Wildlife management practices

Control Nonnative Vegetation: when nonnative invasive species begin to reduce habitat quality for black-backed woodpeckers

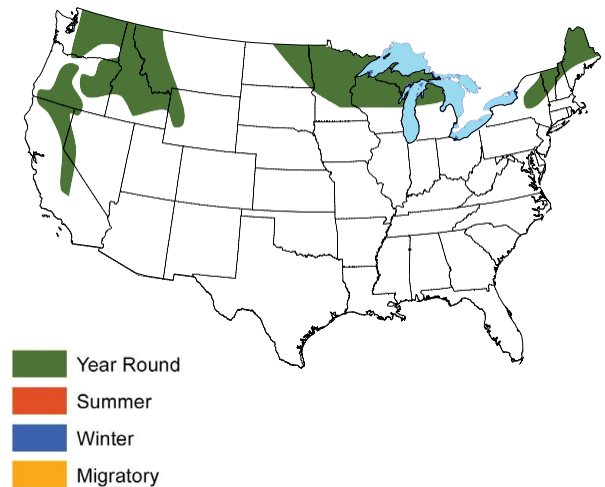
Plant Trees: in areas where forest regeneration is not occurring, trees may be planted to provide future habitat for the black-backed woodpecker. However, it will be many decades before these trees are of sufficient size to provide habitat for this woodpecker.

Set-back Succession: relatively intense *Prescribed Fire* in old-growth coniferous forests is necessary for the occurrence of black-backed woodpeckers. However, logging post-fire significantly decreases their occurrence.

Conduct Wildlife or Fish Survey: point counts can be conducted to listen for the distinctive drumming of the black-backed woodpeckers during the mating season



Glen Tepke



Black-bellied whistling duck

General information

The black-bellied whistling duck is a medium-sized duck that ranges in body length from 19 to 22 inches. The males and females look alike. They have a long red bill, long gray head with a gray face and long pink legs. The belly and tail are black, and the body, back of neck and cap are chestnut brown. The black-bellied whistling duck has a distinctive white wing bar that is unique among whistling ducks. Their call is a high-pitched, soft wheezy whistle of four to six notes, accented on the second or third syllable. Black-bellied whistling ducks are primarily cavity nesters and will use nesting boxes, but may nest on the ground if no cavities are present. The black-bellied whistling duck is unique among ducks in that they exhibit a strong bond between pairs, often staying together for many years. This duck is mainly non-migratory with only birds living in the extreme northern portion of their range moving south in winter.

Habitat requirements

Diet: aquatic plants, grass, grain, insects, and mollusks

Water: obtains water through diet

Cover: tree-lined bodies of water, prefer shallow freshwater ponds, lakes, marshes, cultivated fields, and reservoirs with plentiful vegetation; prefer to nest in tree cavities

Wildlife management practices

Control Nonnative Vegetation: where nonnative invasive vegetation is competing with native vegetation and reducing habitat quality

Create Snags: to provide potential cavity nesting sites

Leave Crop Unharvested: to provide grain food source

Conduct Livestock Management: livestock should be excluded from wetlands managed for waterfowl to maintain water quality and prevent sedimentation

Provide Nesting Structures: nest boxes should be erected where there is a lack of nesting cavities

Plant Food Plots: grain plots can provide food source

Plant Trees: trees planted adjacent to wetlands can provide perching and nest cavity opportunities

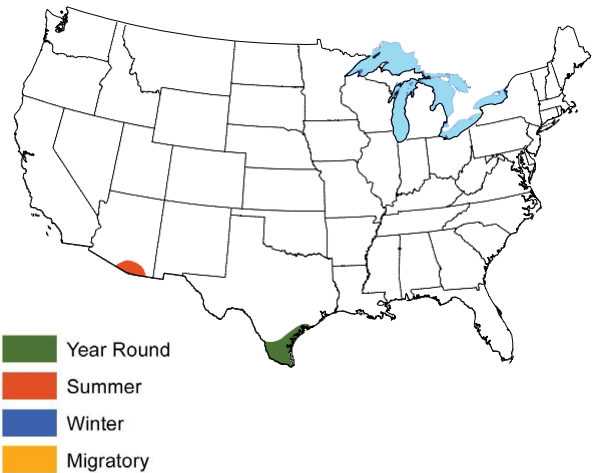
Repair Spillway/Dam/Levee: if not functioning properly

Conduct Tillage Management: eliminate tillage in the fall to provide additional waste grain during winter, especially fields that can be shallowly flooded

Provide Water Developments for Wildlife: shallow impoundments can be important for migrating and wintering waterfowl; flooding grain fields and planting



Robert Burton



food plots in winter makes food more available

Decrease Hunting/Fishing: although black-bellied whistling ducks are considered migratory waterfowl, many local populations do not migrate and thus, landowners can influence populations; harvest may be decreased when local populations is declining, habitat quality is good, and data suggest mortality rate from hunting is additive

Conduct Wildlife or Fish Survey: flush counts and aerial surveys are used in fall and winter to estimate populations; nest box usage in summer can provide an index to population

Black-capped chickadee

General information

Black-capped chickadees occur throughout the upper two-thirds of the U.S. They are found in shrublands and forests. They nest in cavities in dead or hollow trees. Black-capped chickadees eat insects and spiders from the branches and bark of trees and shrubs. They also will visit bird feeders. They are often seen on the edges of forested areas.

Habitat requirements

Diet: ants, caterpillars and spiders from branches, leaves and bark of trees and shrubs; also seeds from bird feeders and soft mast from shrubs

Water: obtain necessary water from snow and surface water

Cover: nest in cavities, usually in a dead or hollow tree; they can excavate a cavity only in soft wood or rotted wood and will use woodpecker holes, natural cavities, and man-made boxes; thick shrub and tree canopies provide necessary cover

Wildlife management practices

Control Nonnative Vegetation: when nonnative invasive vegetation begins to reduce habitat quality for black-capped chickadee

Create Snags: trees may be killed where nesting cavities are limited to stimulate creation of additional cavities

Conduct Forest Management: *Timber Stand Improvement* practices can improve understory structure by increasing shrub cover within a stand when canopy cover exceeds 80 percent

Conduct Livestock Management: should prevent livestock from degrading shrub cover

Provide Nesting Structures: can be provided in areas where nesting cavities are limiting

Plant Shrubs: in large open areas to provide shrub cover

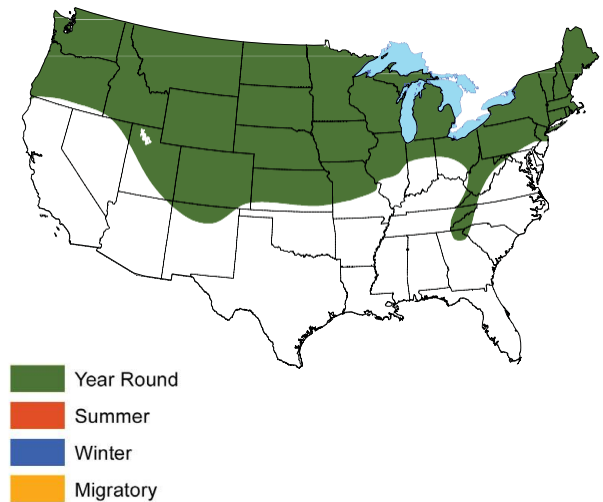
Plant Trees: where additional forest cover is needed

Set-back Succession: *Prescribed Fire* can maintain shrubby areas and thick understory cover in woods

Conduct Wildlife or Fish Survey: point counts are used to estimate population trends



Donna Dewhurst



Black-throated sparrow

General information

Black-throated sparrows are associated with shrublands, specifically sparsely vegetated desert shrubland, including mesquite, cacti, chaparral, and juniper in the southwest U.S. Their diet is mainly seeds and insects. Black-throated sparrows nest near the ground in small shrubs.

Habitat requirements

Diet: insects, seeds and green herbaceous vegetation

Water: require water frequently during dry and cool seasons, especially when green herbaceous vegetation and insects are not available

Cover: nests are made from small twigs, grass, and stems placed in small shrubs near the ground; shrubs and cacti are used for hiding cover

Wildlife management practices

Control Nonnative Vegetation: when nonnative invasive species begin to compete with native species and degrade habitat quality

Conduct Livestock Management: should prevent overgrazing within shrub cover

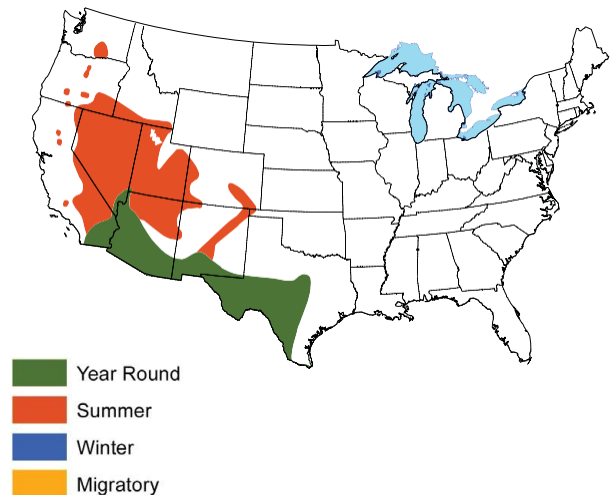
Set-back Succession: *Prescribed Fire, Chaining, and Drum-chopping* can be used to rejuvenate shrublands when they become overgrown and limit herbaceous groundcover

Provide Water Developments for Wildlife: can be beneficial where water is limiting

Conduct Wildlife or Fish Survey: point counts are used to estimate population trends



James W. Arterburn



Blue-winged teal

General information

The blue-winged teal is a relatively small dabbling duck associated with ephemeral wetlands, inland marshes, lakes and ponds. They inhabit shorelines more than open water and primarily nest within a few hundred feet of wetlands in the prairie pothole ecoregion of the northern Great Plains. Nests are found primarily in dense grassland cover. Hayfields sometimes will be used for nesting if adequate grass stubble remains. Blue-winged teal are surface feeders and prefer to feed on mud flats or in shallow water where floating and shallowly submerged vegetation is available, along with abundant small aquatic animal life. Shallow wetlands with both emergent vegetation and open water are required for brooding cover. During spring and fall migration, shallow wetlands and flooded fields are used for loafing and feeding. Blue-winged teal begin fall migration before any other waterfowl. They winter along the Gulf Coast in the Deep South and in Central and South America.

Habitat requirements

Diet: aquatic vegetation, seeds and aquatic insects; feeding primarily confined to wetlands

Water: relatively shallow wetlands required for brood rearing, feeding, and loafing

Cover: dense native grass cover used for nesting; brooding cover consists of a mix of open water and emergent vegetation

Wildlife management practices

Control Nonnative Vegetation: when nonnative invasive vegetation begins to compete with native vegetation and degrade habitat quality

Leave Crop Unharvested: to provide additional food if the grain can be shallowly flooded

Conduct Livestock Management: livestock should be excluded from nesting areas and from wetlands managed for waterfowl

Plant Food Plots: can provide additional food resources during migration and winter if the area is shallowly flooded when the ducks arrive

Plant Native Grasses and Forbs: for nesting cover where suitable cover is lacking

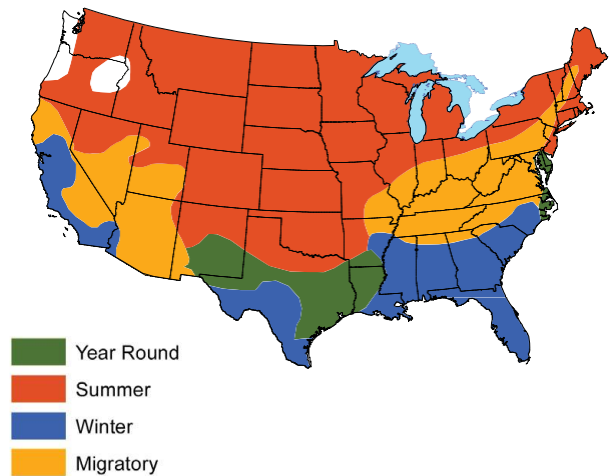
Repair Spillway/Dam/Levee: if not functioning properly

Set-back Succession: Prescribed Fire, Disking, and Herbicide Applications can be used to maintain wetlands and associated upland nesting cover in the desired structure and composition

Conduct Tillage Management: delaying cropland tillage, especially wheat, in spring may allow nesting in standing stubble



Dave Menke



Provide Water Developments for Wildlife: flooded fields provide important areas for teal during migration; constructing small dikes for temporary flooding provides shallow sheet-water teal prefer for feeding and loafing

Conduct Wildlife or Fish Survey: flush counts can provide estimates of nesting teal

Brewer's sparrow

General information

Brewer's sparrows are found in the Great Basin south to southern California and New Mexico and in the northern Rocky Mountains of the Yukon and British Columbia. Their habitat contains sagebrush in the Great Basin and alpine meadows in the Rocky Mountains. They are associated with relatively large areas of shrubland; shrub-dominated areas less than one-half acre are not usually used.

Habitat requirements

Diet: a variety of insects and spiders from leaves and branches of shrubs; seeds of forbs and grasses

Water: necessary water is obtained from diet, but will use other water sources when available

Cover: dense sagebrush 20 inches to 30 inches tall for nesting and escape; amount and height of shrub cover is important



Dave Menke

Wildlife management practices

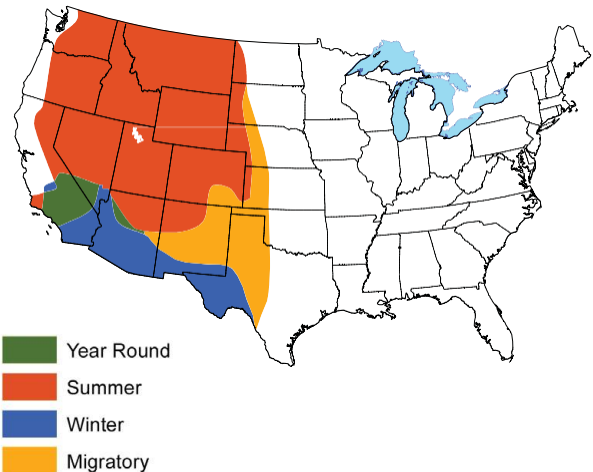
Control Nonnative Vegetation: when nonnative invasive vegetation begins to compete with native vegetation and degrade habitat quality

Conduct Livestock Management: grazing regimes should promote shrub growth

Plant Shrubs: in large open areas where shrub cover is limiting

Set-back Succession: Herbicide Applications may be used to adjust species composition of the plant community

Conduct Wildlife or Fish Survey: point counts can be used to estimate population trends



Broad-winged hawk

General information

Broad-winged hawks use mixed upland hardwood forest and woodlands (oaks, hickories, maples, beech) and mixed conifer-hardwoods. Broad-winged hawks are normally solitary and inconspicuous. They hunt within the forest near small openings in the canopy.

Habitat requirements

Diet: rodents and other small mammals (such as mice, chipmunks, squirrels, shrews, moles) but also snakes, lizards, caterpillars, grasshoppers, beetles, crickets, crawdads, and some small birds

Water: obtain necessary water from diet

Cover: nest among tall trees in the woods with openings and water nearby; will sometimes nest in old crow, hawk, or squirrel nests; they hunt throughout the forest, especially where small canopy gaps occur

Wildlife management practices

Control Nonnative Vegetation: when nonnative invasive species begin to compete with native species and degrade habitat for prey and broad-winged hawks

Conduct Forest Management: *Group Selection* harvest and *Timber Stand Improvement* should encourage understory development and enhance habitat for a variety of prey species

Conduct Livestock Management: should exclude cattle from forested areas to retain an understory that provides cover for a variety of small prey mammals

Plant Shrubs: in areas where tree cover is lacking, such as large open fields

Plant Trees: in relatively large open areas where additional forest cover is needed

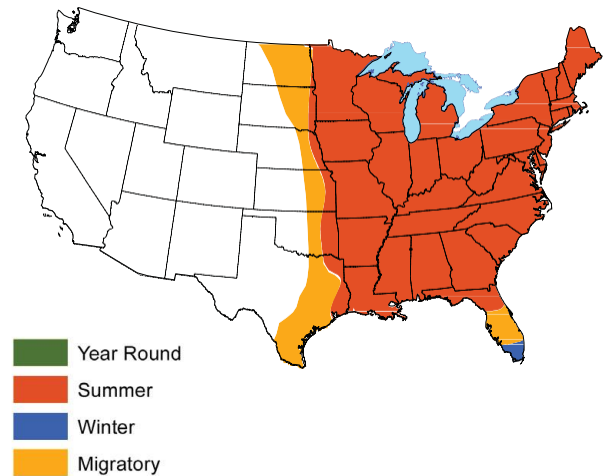
Set-back Succession: *Prescribed Fire* may be used to maintain diverse understory structure in forests with broken canopies that allow sufficient sunlight

Provide Water Developments for Wildlife: will enhance habitat for a variety of prey species

Conduct Wildlife or Fish Survey: observation surveys are commonly used to estimate population trends



Greg Lavaty



Brown thrasher

General information

Brown thrashers occur in the eastern two-thirds of the U.S. They are normally found in shrub and bramble thickets, hedgerows, shelterbelts, young forests, forest edges, and brushy riparian areas. Brown thrashers forage primarily on the ground, using their beaks to turn over leaves and debris looking for food. More food is available when there is substantial ground litter (leaves and debris). Nests are usually found in bushes or small trees 1 to 10 feet aboveground.



Dan Sudia

Habitat requirements

Diet: invertebrates and plant seeds are main items in diet, but soft and hard mast are also eaten

Water: water requirements are not known

Cover: dense shrubs and brambles interspersed with some trees are used for nesting and escape cover; will use areas that have only shrubs; need a minimum of 2.5 acres of habitat to support a breeding population

Wildlife management practices

Control Nonnative Invasive Species: when nonnative invasive species begin to compete with native species and degrade habitat for brown thrashers

Develop Field Borders: of brambles and shrubs will provide additional nesting and foraging cover

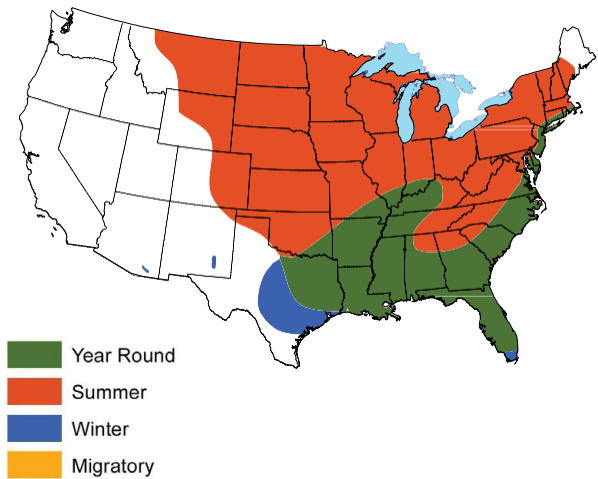
Conduct Forest Management: *Forest Regeneration*, especially *Clearcut*, *Shelterwood*, and *Seedtree* will improve vegetation structure for nesting and foraging; *Timber Stand Improvement* can improve habitat by stimulating understory development

Conduct Livestock Management: should exclude livestock from riparian areas, shrublands, and forests to allow shrubs and trees to regenerate

Plant Shrubs: in open areas of at least 2.5 acres to create additional cover for nesting/foraging

Set-back Succession: *Prescribed Fire*, *Chaining*, and *Herbicide Applications* can be used to maintain and rejuvenate shrub cover when habitat quality begins to decline; *Chainsawing* and *Dozer-clearing* can be used to clear woods and create additional brushy cover

Conduct Wildlife or Fish Survey: point counts can be used to survey populations



California quail

General information

California quail are found most commonly in chaparral, sagebrush, and oak savannas and woodlands. They require shrubby cover for roosting, escape cover, loafing, and foraging. Ideal California quail habitat is a mixture of shrub cover well interspersed with annual and perennial forbs and grasses. Adult California quail eat mostly seeds, leaves, and flowers from grasses, shrubs, and trees. The diet of juveniles, however, consists largely of invertebrates.

Habitat requirements

Diet: about 70 percent of diet consists of seeds and green foliage from forbs and grasses, particularly annual grasses; diet supplemented with soft mast and seeds from a variety of shrubs; juveniles less than 3 weeks old eat insects; by 12 weeks of age, diet is same as adults

Water: obtain necessary water through diet except during periods of heat and drought when freestanding water is required for drinking

Cover: require cover near feeding areas or habitat quality declines dramatically; shrubby cover used for roosting, escape cover, and loafing; nest on the ground in grasses and forbs

Wildlife management practices

Control Nonnative Vegetation: when nonnative invasive vegetation begins to compete with native vegetation and reduce habitat quality; nonnative sod grasses are particularly problematic

Develop Field Borders: to increase usable space around crop fields

Leave Crop Unharvested: to provide additional food through fall and winter, especially grain crops

Conduct Livestock Management: proper grazing can be used to maintain adequate groundcover for nesting and forage, and prevent livestock from destroying cover near water sources

Plant Food Plots: grain will be eaten by quail when available

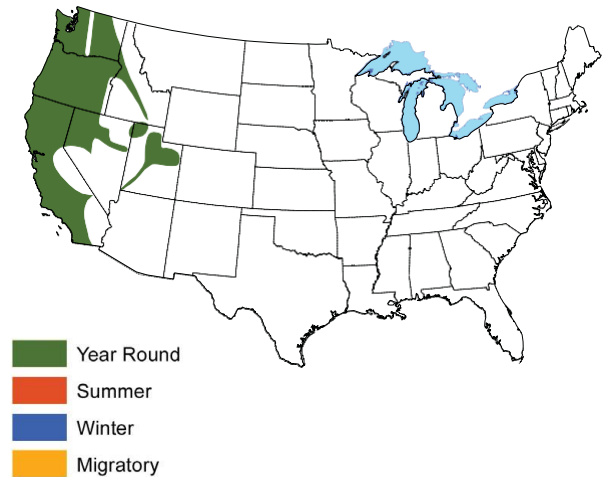
Plant Native Grasses and Forbs: to improve nesting cover and food availability in areas where groundcover is lacking or needs to be improved

Plant Shrubs: in relatively large open areas where shrub cover is lacking

Plant Trees: where woody cover is lacking, species such as oaks may be planted



Gary Kramer



Set-back Succession: Prescribed Fire and Disking are recommended to maintain herbaceous cover and enhance food plants; Prescribed Fire, Chaining, Drum-chopping, and Herbicide Applications can maintain and rejuvenate shrubby areas

Conduct Tillage Management: eliminate fall tillage to provide waste grain

Provide Water Developments for Wildlife: guzzlers, catchment ponds, windmills, and spring developments can be beneficial to California quail where water may be limiting

Decrease Hunting/Fishing: may be necessary when surveys show a decline in the local population and current data suggest mortality from hunting harvest is additive or limiting population growth

Conduct Wildlife or Fish Survey: call counts and flush counts may be used to estimate population density

California thrasher

General information

California thrashers are found in shrubby chaparral cover in the Mediterranean ecoregion. The shrub cover they use requires fire for maintenance, but thrashers are not typically found in recently burned areas until desirable shrub structure develops following fire.

Habitat requirements

Diet: spiders, beetles, Jerusalem crickets, and other insects may constitute more than 90 percent of diet during breeding season; during the rest of the year, a variety of seeds and hard and soft mast from shrubs are eaten

Water: exact water requirements are unknown, but because California thrashers occur throughout arid ecoregions, it is unlikely they require freestanding water; they will, however, drink freestanding water when available

Cover: dense shrubby cover is required for nesting

Wildlife management practices

Control Nonnative Vegetation: when nonnative invasive vegetation begins to compete with native vegetation and habitat quality begins to decline

Conduct Forest Management: *Forest Regeneration*, particularly *Clearcut*, *Shelterwood*, and *Seed-Tree*, provides dense shrub cover for nesting and foraging

Conduct Livestock Management: should prevent livestock from damaging or limiting shrub cover

Plant Shrubs: in relatively large open areas where shrub cover is lacking

Set-back Succession: *Prescribed Fire*, *Drum-chopping*, and *Chaining* can maintain and rejuvenate shrub cover

Conduct Wildlife or Fish Survey: point counts may be used to estimate population trends



Glen Tepke



Canada goose

General information

The breeding range of the Canada goose extends across the northern half of the U.S. across Canada and Alaska. Although an increasing number of Canada geese winter in Canada, the majority fly south to southern areas of the U.S. and Mexico. Many southern areas of the U.S. have year-round resident populations of Canada geese, which is not reflected on the map below. Canada geese nest and rear young in wetlands with relatively sparse to dense emergent aquatic vegetation. Riparian areas and wetlands containing 20 percent tall emergent aquatic vegetation and 80 percent open water are usually preferred areas for Canada geese.

Habitat requirements

Diet: variety of forbs and grasses, grains, and some aquatic insects

Water: relatively open water wetlands, ponds, and lakes are used for brood rearing, feeding, and loafing

Cover: nest in a variety of places, such as mats of bulrushes, tops of muskrat houses, and most of all, in relatively thick cover on islands, usually within 200 feet of the water's edge

Wildlife management practices

Control Nonnative Vegetation: applies to both uplands and wetlands; nonnative invasive vegetation can degrade nesting cover in uplands and make wetlands unattractive to Canada geese

Leave Crop Unharvested: to provide additional food during winter

Conduct Livestock Management: proper grazing can maintain lush vegetation for foraging Canada geese; restricting livestock grazing from areas where geese may nest can increase nesting success

Plant Food Plots: both forage (green growing wheat) and grain (corn) food plots can provide additional food where food is limited

Plant Native Grasses and Forbs: to provide nesting cover where limiting

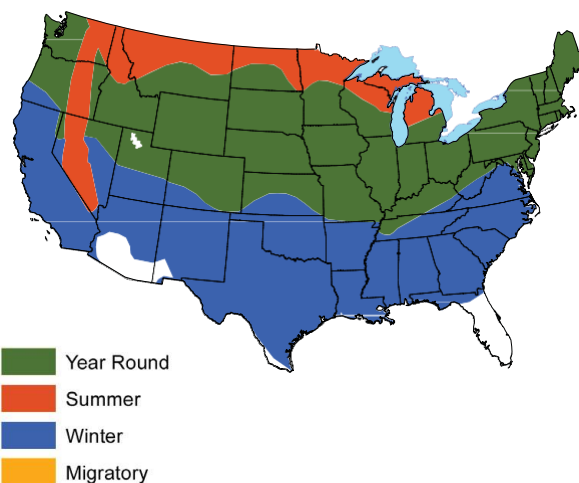
Repair Spillway/Dam/Levee: if not functioning properly

Set-back Succession: *Prescribed Fire* and *Herbicide Applications* set back succession in cattail-choked wetlands and stimulate lush vegetation in uplands where geese may feed; *Chainsawing* and *Dozer-clearing* can create more early succession for nesting cover near wetlands

Conduct Tillage Management: fall tillage in grain crops can be delayed until spring to provide supplemental food source



Ryan Hagerly



Provide Water Developments for Wildlife: can be used to temporarily flood fields for feeding and raising broods

Conduct Wildlife Damage Management: may be needed where Canada geese damage lawns, golf courses, and crop fields, and other areas in cities and suburban areas

Conduct Wildlife or Fish Survey: broods count, and visual surveys can provide estimates of goose abundance

Common nighthawk

General information

Common nighthawks are found throughout the U.S. during summer but migrate to South America during winter. Common nighthawks are found in grasslands, open woodlands, cities, and towns. In cities and towns, they are often seen flying over city parks and other open areas in late evening and early morning. Common nighthawks' nest on bare soil or gravel areas common in fields or on rooftops. They use open fields for foraging. They are nocturnal and feed "on-the-wing" on flying insects.

Habitat requirements

Diet: flying insects, including flying ants, mosquitoes, moths, and June bugs

Water: obtain ample water from diet, but water sources attract insects, which provide food for nighthawks

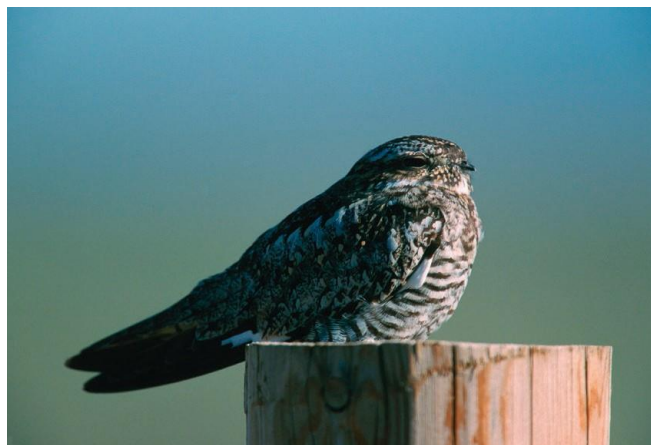
Cover: riparian areas, ridge tops, flat rooftops, and other places with numerous sand and gravel areas are favorite nesting locations

Wildlife management practices

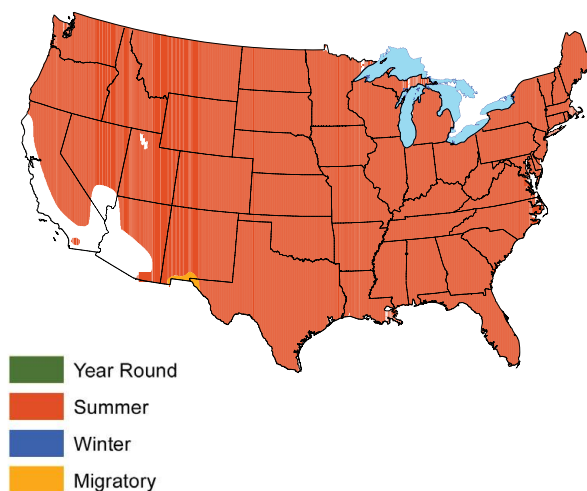
Conduct Livestock Management: grazing regimes that maintain open herbaceous areas provide foraging sites for common nighthawks

Set-back Succession: *Prescribed Fire, Disking,* and *Mowing* can maintain early successional areas for foraging; *Disking* and *Herbicide Applications* can promote bare ground for nesting; *Chainsawing, Dozer-clearing,* and *Root-plowing* can convert wooded areas to open, early successional areas; *Mowing* may be used to maintain foraging and loafing cover for common nighthawks in **Urban** areas

Conduct Wildlife or Fish Survey: observation counts can be used to estimate trends in populations



Gary Kramer



Crested caracara

General information

The crested caracara is a falcon sometimes referred to as the “Mexican eagle,” as it is Mexico’s national bird. They are often seen with vultures, eating carrion in open country, such as grasslands, pastures, croplands, and semi-deserts. Crested caracaras may prefer open areas but are often adjacent to shrublands or areas with trees. Caracaras have long, featherless, and yellow legs. The body is mostly black, a black cap on its head with a small crest, red skin on the face, and a white and black tail. Their wide wingspan is used for soaring and for flying low while hunting for prey or carrion. They nest in trees and have clutch sizes of 1 to 4 eggs. They breed from January to September and fledge from mid-March to early May. They nest in trees or shrubs with average heights around 19 feet. Breeding pairs will defend their territory year-round and may even re-use or re-build a nest from the previous year. Both sexes contribute to building the nest out of sticks and finer vegetation. The female typically lays 2 eggs and both parents care for the fledglings. At one time, crested caracaras were declining, but currently the population is stable or slightly increasing. Florida is the only state that currently has the crested caracara listed as threatened and Texas has the largest breeding population. There is future concern for the species as more and more of its habitat is being developed for human or agricultural use.

Habitat requirements

Diet: mostly carrion, but also insects, small vertebrates (fish, reptiles, amphibians, birds, and mammals), and eggs

Water: freestanding water is used, but watering sites are not typically limiting because of the crested caracara’s ability to fly long distances and some water needs may be met through the diet

Cover: open grasslands for hunting/scavenging; nests in trees or shrubs, often in the top of cabbage palms

Wildlife management practices

Control Nonnative Vegetation: when nonnative invasive vegetation begins to compete with native vegetation and degrade habitat

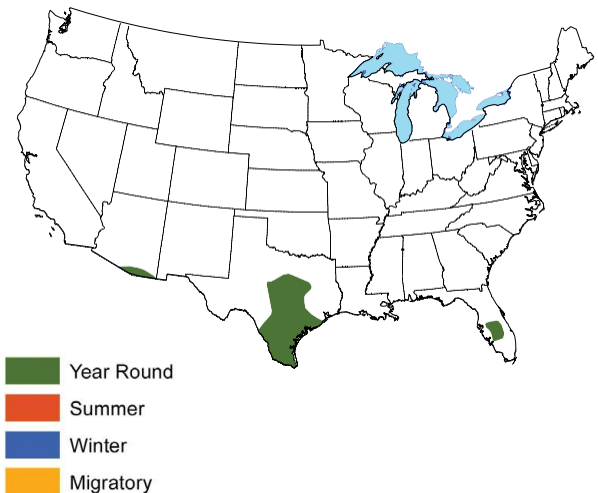
Conduct Livestock Management: grazing pressure should be reduced when overgrazing begins to degrade habitat for prey

Plant Shrubs: where trees and shrubs are lacking to provide nesting cover

Plant Trees: where trees are lacking to provide nesting cover



Robert Burton



Set-back Succession: Disking, Prescribed Fire, Herbicide Applications, and Mowing are options for maintaining grasslands and early successional areas; Prescribed Fire, Herbicide Applications, Chaining and Root-plowing are used to reduce shrub cover and stimulate more herbaceous groundcover

Conduct Wildlife or Fish Survey: observation counts are commonly used to estimate trends in populations

Crissal thrasher

General information

Crissal thrashers are found in the southwestern ecoregion of the U.S. south to Mexico. They prefer dense, low shrub cover in desert, foothill, and riparian areas. Crissal thrashers nest in shrubs 2 to 8 feet above ground. Nest is constructed of twigs.

Habitat requirements

Diet: forage on the ground and eat a variety of insects, spiders, seeds, and soft mast

Water: freestanding water is essential and needed daily

Cover: thick shrub cover for nesting and loafing

Wildlife management practices

Control Nonnative Vegetation: when nonnative invasive species begin to reduce habitat quality for crissal thrashers

Conduct Livestock Management: should restrict overgrazing and ensure shrub cover is present to provide food and cover; this is particularly important in riparian areas where thick shrub cover is found adjacent to drainage ways (arroyos); livestock water facilities should be placed in upland areas to discourage congregation of livestock and over-use in riparian areas

Plant Shrubs: especially around agricultural and riparian areas where needed

Set-back Succession: *Chaining* and *Drum-chopping* can rejuvenate shrub cover where it has grown too tall

Provide Water Developments for Wildlife: catchment ponds, windmills, spring developments, and guzzlers can benefit crissal thrashers

Conduct Wildlife or Fish Survey: point counts are used to estimate population trends



Greg Lavaty



Dickcissel

General information

Dickcissels are songbirds that occur primarily in native grasslands and savanna in the central one-third of the U.S. Relatively large open areas of grasses, forbs, and scattered shrubs are favored. Dickcissels use agricultural areas heavily during winter in Central America where they may form huge flocks. Nests are placed above ground in tall grasses, forbs, or shrubs.

Habitat requirements

Diet: insects and grass seeds are eaten year-round; agricultural crops are eaten more during migration and on wintering grounds

Water: water obtained from food

Cover: early successional areas with a mixture of grasses and forbs and scattered shrubs; grain fields frequented during winter

Wildlife management practices:

Control Nonnative Vegetation: when nonnative invasive species begin to compete with native vegetation and reduce habitat quality for dickcissel

Develop Field Borders: to increase usable space around crop fields

Leave Crop Unharvested: will provide additional food during migration

Conduct Livestock Management: should prevent overgrazing to maintain a minimum grass/forb height of 12 – 18 inches

Plant Native Grasses and Forbs: in relatively large open areas where there is insufficient groundcover; forb component is important

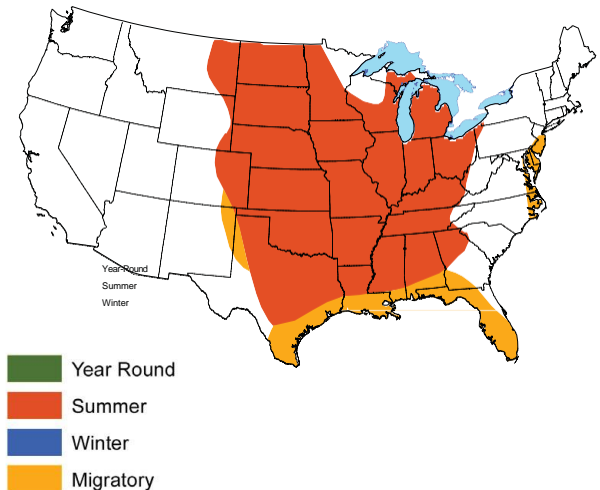
Set-back Succession: *Prescribed Fire* is recommended to maintain grasslands and other early successional areas; *Herbicide Applications* may be used to kill undesirable plants and adjust species composition in early successional areas; *Chainsawing*, *Dozer-clearing*, and *Root-plowing* may be used to reduce forested cover and increase early successional cover

Conduct Tillage Management: may provide additional food during migration

Conduct Wildlife or Fish Survey: point-count surveys can be used to monitor dickcissel abundance



James W. Arterburn



Dusky grouse

General information

Dusky grouse occur predominantly in mountainous areas in the western U.S. and Canada. They require forested cover, interspersed with herbaceous openings and shrub cover. Their nests are usually on the ground, often under shrubs or near fallen logs. Dusky grouse roost in forest edges near shrub vegetation where they forage.

Habitat requirements

Diet: soft mast, seeds, buds, forbs, and insects from spring to fall; needles of coniferous trees may be eaten in winter

Water: obtain necessary water from dew and diet

Cover: nest on the ground near forest edges, often under shrubs or next to fallen logs; roost and loaf in trees

Wildlife management practices

Control Nonnative Vegetation: when nonnative invasive vegetation begins to reduce habitat quality for dusky grouse

Develop Field Borders: (in some ecoregions) may increase nesting and foraging cover if shrub cover is allowed to develop

Conduct Forest Management: *Forest Regeneration*, particularly *Group Selection* and *Single-tree Selection*, will increase herbaceous and shrubby cover for foraging near nesting and roosting areas; *Timber Stand Improvement* can be used in stands not ready for regeneration to increase herbaceous groundcover and shrubby structure

Conduct Livestock Management: should prevent areas from being grazed where dusky grouse nest

Plant Native Grasses and Forbs: particularly in agricultural fields going out of production

Plant Shrubs: to provide soft mast, buds, and nesting cover, especially near forest edges where lacking

Plant Trees: in relatively large open areas, coniferous trees may be planted to provide cover and a winter food source where needed

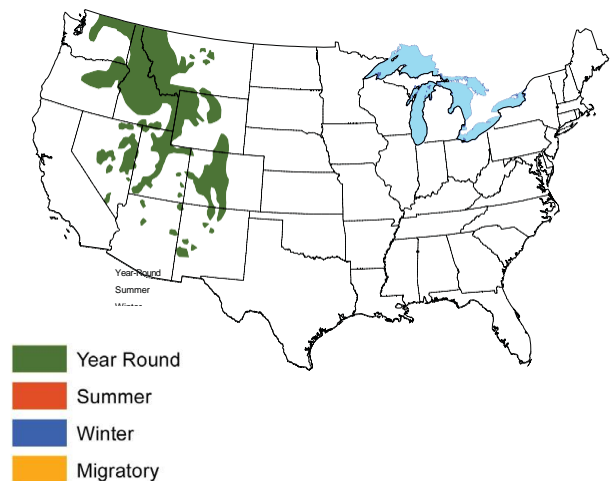
Set-back Succession: *Prescribed Fire*, *Chainsawing*, and *Herbicide Applications* can maintain herbaceous openings and shrub cover

Decrease Hunting/Fishing: may be necessary when mortality from hunting harvest is additive or limiting population growth surveys show a decline in the local population

Conduct Wildlife or Fish Survey: call counts can be used to monitor dusky grouse populations



Todd Black



Eastern bluebird

General information

Eastern bluebirds are found across the eastern U.S. They use herbaceous openings, savannas, pastures, parks, backyards, edges of hayfields and crop fields, and other early successional communities well-interspersed with trees and shrubs, for perching, foraging and nesting (where cavities are available). Large open areas without interspersed hedgerows, fencerows, and scattered trees may not receive as much use by bluebirds as those areas with more structural diversity. Bluebirds forage in open areas, but typically near trees, shrubs, or a fence that provide perches. Insects dominate the diet during spring and summer, whereas various fruits are most prevalent during fall and winter. Eastern bluebirds' nest in cavities, especially old woodpecker cavities, as well as nest boxes. Clutches are normally 3-6 eggs. Eastern bluebirds may have 1-3 broods per year. Nest box programs have had a major impact in restoring eastern bluebird populations.

Habitat requirements

Diet: insects, especially grasshoppers, crickets, adult beetles and larvae, as well as other invertebrates, such as spiders; various fruits, such as black cherry, sumac, blueberry, blackberry, blackgum, hollies, dogwoods, pokeweed, and hackberry

Water: necessary water obtained from diet, but may use free-standing water when available

Cover: nest in cavities of trees and fence posts

Wildlife management practices

Control Nonnative Vegetation: when nonnative invasive vegetation begins to compete with native vegetation and reduces habitat quality for eastern bluebirds

Create Snags: where cavities are limited to provide potential nest sites and perching sites in open areas (not in forests because eastern bluebirds do not use forests)

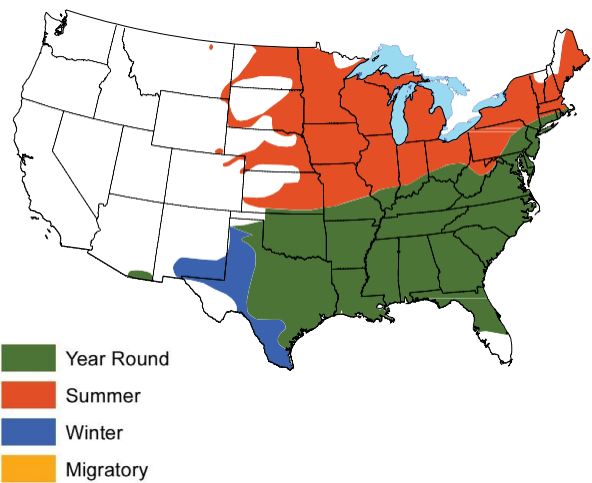
Develop Field Borders: to increase foraging opportunities around crop fields

Conduct Livestock Management: livestock must be excluded from recently planted trees and shrubs

Provide Nesting Structures: should be erected where a scarcity of natural cavities may be limiting the population; nest boxes should be approximately 5 feet high with an entrance hole 1½ inches in diameter; nest boxes should be placed no closer than 80 yards apart to limit territorial fighting among males



Dave Wenke



Plant Native Grasses and Forbs: to aid in establishing herbaceous groundcover where planting is necessary; forb component is important to attract insects

Plant Shrubs: in relatively large open areas where perching sites or winter foods may be limiting

Plant Trees: in relatively large open areas where perching sites are limiting; may provide potential nest sites in distant future

Set-back Succession: *Prescribed Fire, Disking, Herbicide Applications, Mowing, Chaining, and Drum-chopping* can be used to maintain and rejuvenate early successional areas and prevent them from becoming dominated by young trees and shrubs; *Chainsawing and Root-plowing* can be used to convert forested areas to savannas and early successional communities; *Mowing* may be used to maintain foraging and loafing cover for eastern bluebirds in **Urban** areas

Conduct Wildlife or Fish Survey: point counts can be used to monitor bluebird populations; nest boxes should be checked to monitor use and nest success

Eastern meadowlark

General information

Eastern meadowlarks are medium-sized songbirds that live in grasslands throughout the eastern U.S. They have a bright yellow breast with a black chevron marking on the chest. They are often seen singing from fencepost, power lines, or hay bale perches during spring. Eastern meadowlarks are grassland obligates; that is, they require and are only found in grasslands. Males require grassy fields of at least 6 acres to establish territories and, even then, they may not be present if the surrounding landscape is forested. They may prefer native grasslands but will use pastures and hayfields of nonnative grasses if the vegetation structure is suitable. Eastern meadowlarks nest on the ground and the female builds the nest of dead grass leaves. Nests contain 2-7 eggs and eastern meadowlarks may have 2 broods per year. Females will usually abandon their nests if they are disturbed off the nest while they are incubating. Although males boldly sing in the spring, eastern meadowlarks are relatively shy, slinking away from intruders within the grass cover. Eastern meadowlarks primarily eat insects, but also consume various seed during winter. They forage while walking on the ground. Haying, overgrazing, and conversion of grasslands to row-crop agriculture or human development are major problems for reproductive success and population maintenance. Eastern meadowlark populations have declined 70 percent since 1970.

Habitat requirements

Diet: insects, especially grasshoppers, crickets, and caterpillars (moth larvae) and grubs (beetle larvae); various seed and grain in winter

Water: obtained in diet

Cover: grasslands at least 6 acres in size

Wildlife management practices

Develop Conservation Easement: may protect relatively large tracts of native grasslands in the eastern U.S. where habitat for eastern meadowlark is declining

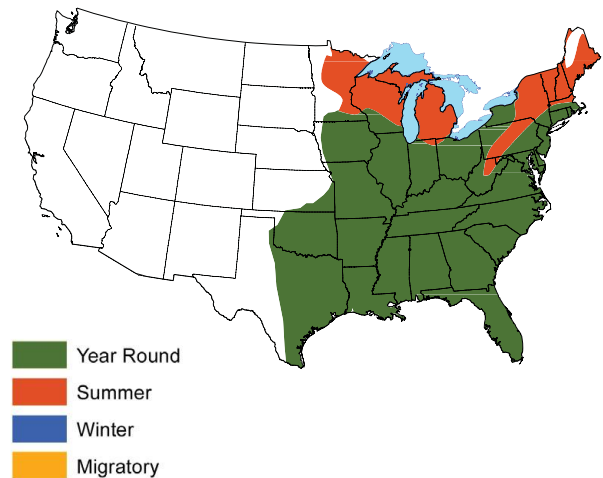
Control Nonnative Vegetation: when nonnative invasive vegetation begins to degrade habitat for eastern meadowlark

Conduct Livestock Management: grazing pressure should be managed to maintain an average grass height of at least 18 inches

Plant Native Grasses and Forbs: when grassland cover is limiting; little bluestem, broomsedge bluestem, and sideoats grama provide excellent nesting structure; native grasses and forbs should be planted when converting agricultural fields or forested areas to eastern



James W. Arterburn



meadowlark habitat to ensure optimum grass coverage and structure

Set-back Succession: Prescribed Fire is strongly recommended to maintain and rejuvenate grasslands; Prescribed Fire and Herbicide Applications can be used to reduce unwanted encroachment of woody species; Chaining can be used to reduce shrub cover; Chainsawing, Dozer-clearing, and Root-plowing can be used to convert forests to grasslands

Conduct Wildlife or Fish Survey: point counts are used to estimate trends in populations

European starling

General information

European starlings are found throughout North America. They were introduced to the U.S. from Europe and are considered pests. They commonly cause damage to crop and in urban areas. They exclude native species from cavities and deplete food resources for native wildlife. As a consequence, wildlife damage management is necessary to reduce starling populations and exclude them from areas where they are causing damage. Starlings prefer older suburban and urban residential areas with large trees and shrubs interspersed with open areas, but also are abundant in agricultural areas. Starlings are cavity nesters and nest in large trees or old buildings. Starlings feed on the ground and eat a variety of insects, seeds, grain, and soft mast. Practices to attract or benefit starlings should not occur in any situation.

Habitat requirements

Diet: insects, soft mast, seeds, earthworms, grain, human garbage, and even dog and cat food

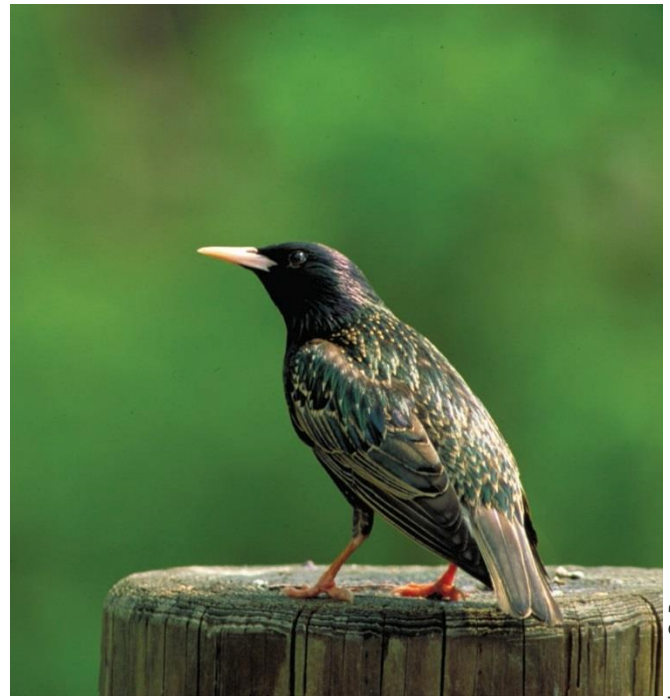
Water: require freestanding water during warm seasons

Cover: nest in tree cavities, old buildings

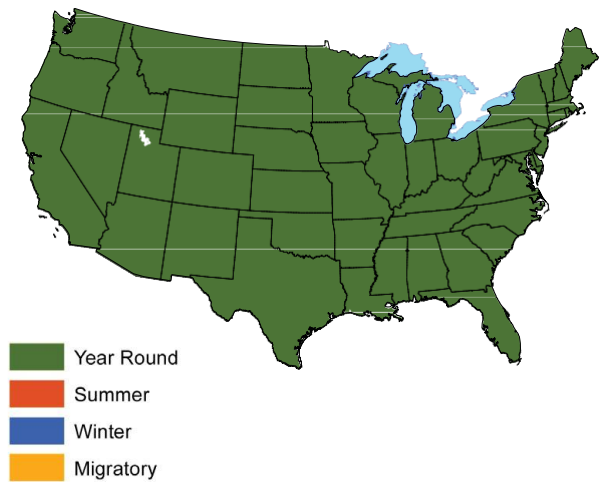
Wildlife management practices

Conduct Wildlife Damage Management : exclusion practices to prevent access to buildings and other areas where they are not wanted; food, water, and cover available to starlings around buildings should be removed; various harassment practices may be effective; trap and euthanasia are appropriate to reduce starling populations

Conduct Wildlife or Fish Survey: observation counts, point counts, and wildlife damage management questionnaires are used to monitor starling populations



Thomas G. Barnes



Ferruginous hawk

General information

The ferruginous hawk is the largest hawk in North America. There are 2 common color phases of ferruginous hawks. Some display a light phase with mostly white heads, rufous shoulders, backs, and legs, and pale underparts. Dark-phased individuals are dark brown with a whitish tail and wing tips. Ferruginous hawks' legs are feathered to the toes. Ferruginous hawks are found in open country. They nest in trees, usually along riparian areas or on steep slopes. They primarily prey upon small mammals.



John Cholorod

Habitat requirements

Diet: rabbits, ground squirrels, prairie dogs

Water: necessary water obtained from diet

Cover: open plains and shrublands; nest in trees

Wildlife management practices

Control Nonnative Vegetation: when nonnative invasive vegetation begins to reduce habitat quality for ferruginous hawks or their prey

Conduct Livestock Management: when overgrazing begins to degrade habitat for prey

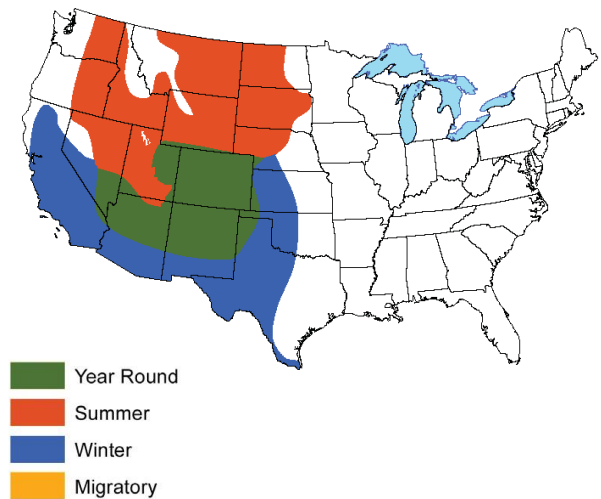
Plant Native Grasses and Forbs: where groundcover is limited, and planting is necessary

Plant Trees: along riparian areas where trees are not present to create nest sites

Set-back Succession: *Prescribed Fire* and *Herbicide Applications* can be used to maintain early successional communities that support prey; *Chaining*, *Root-raking*, and *Drum-chopping* may be used to set-back succession in areas dominated by shrubs where more open space is needed

Conduct Tillage Management: to facilitate hunting prey when waste grain is available

Conduct Wildlife or Fish Survey: observation counts are used to estimate trends in populations



Gambel's quail

General information

Gambel's quail are upland gamebirds found in arid regions of Arizona, New Mexico, southern Colorado, Utah, southern Nevada and California. Gambel's quail are usually found in brushy and thorny vegetation with scattered grasses and forbs, typical of southwestern deserts. Gambel's quail are also found along the edge of agricultural fields, especially those adjacent to arroyos and irrigation ditches. Dense shrubs and cacti intermingled with small open areas also are used. The amount of late winter and early spring precipitation largely determines the quality and quantity of spring foods. In essence, more rain equals more quail.

Habitat requirements

Diet: succulent green plants; seeds of forbs (especially legumes), grasses, shrubs and trees; saguaro, cholla and prickly pear cacti fruits; a variety of soft mast and insects

Water: require freestanding water during warm seasons if succulent green plants are not available for food; will usually not travel more than one-third mile for water

Cover: nest in the thickest shrub and/or herbaceous vegetation available; roost in tall shrubs and trees, such as mesquite, scrub oak, desert hackberry, cholla, one- seed juniper, little leaf sumac, catclaw acacia, and various yuccas; shrubs provide important cover for loafing during the day

Wildlife management practices

Control Nonnative Vegetation: when nonnative invasive vegetation begins to reduce habitat quality for Gambel's quail

Leave Crop Unharvested: to provide additional food resource in fall/winter

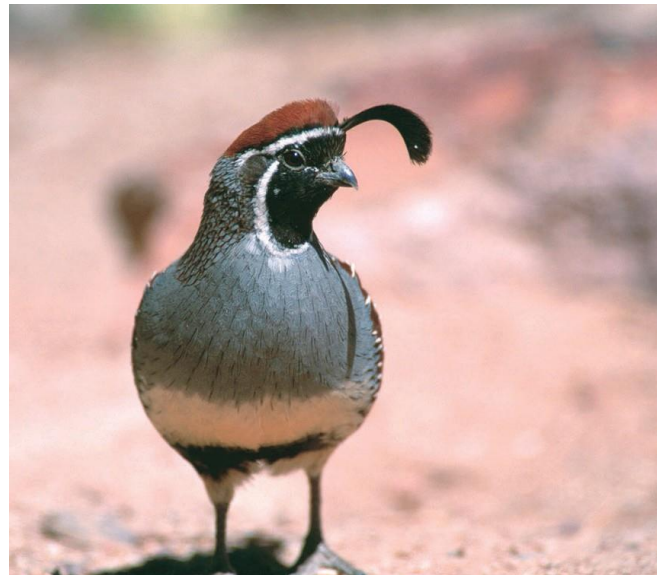
Conduct Livestock Management: over much of the area where Gambel's quail are found, there are few wildlife management practices considered practical for improving food other than proper livestock grazing management; grazing management is important to ensure enough residual herbaceous vegetation is available for nesting cover

Plant Food Plots: grain plots can provide additional food and cover; best when located next to high-quality cover

Plant Shrubs: where shrubby cover is lacking

Provide Water Developments for Wildlife: guzzlers, catchment ponds, windmills, and spring developments can be beneficial where water is limiting

Decrease Hunting/Fishing: may be necessary when surveys show a decline in the local population and mortality from hunting harvest is additive or limiting population growth



Gary Kramer



Conduct Wildlife or Fish Survey: call counts and flush counts are used to estimate trends in Gambel's quail populations

Golden eagle

General information

The golden eagle is one of the largest birds of prey in North America. Its agility and speed coupled with a strong beak and talons allow it to capture a variety of prey items and fiercely protect its kills from other, often larger predators. In North America, golden eagle occurs almost exclusively in the western half of the United States, primarily in the mountain and inter-mountain regions from Canada southward into Mexico. They occupy tundra, shrublands, grasslands, coniferous forests, farmlands, and riparian areas along rivers and streams. Adults are dark brown with gold feathers on the back of their head and neck. Adults weigh 7 to 13 pounds with a wingspan of 6 ½ to 7 feet. Females are about one-third larger than males. They prefer partially open country, especially open lands adjacent to rough terrain, such as hills, mountains, and cliffs. A pair of adult golden eagles can be monogamous (stay together as a pair) for several years and in some cases remain together for life. Golden eagles are protected by federal legislation. It is against the law to harass, harm, pursue, trap, or capture them. Only the United States Department of Interior can grant exceptions for killing golden eagles (for specific purposes, such as scientific studies, Native American religious ceremonies, and livestock depredation).



Dave Menke

Habitat requirements

Diet: birds and small mammals, including jackrabbits, cottontails, prairie dogs, and ground squirrels; sometimes larger animals, such as deer and pronghorns and occasionally livestock (especially lambs, kid goats, and calves), are attacked and consumed

Water: water requirements are met through consumption of prey

Cover: roost and nest in large, tall trees, rock formations in mountainous regions and on tall cliffs; they may use the same nest for several years, adding additional structure (such as sticks, limbs) every year

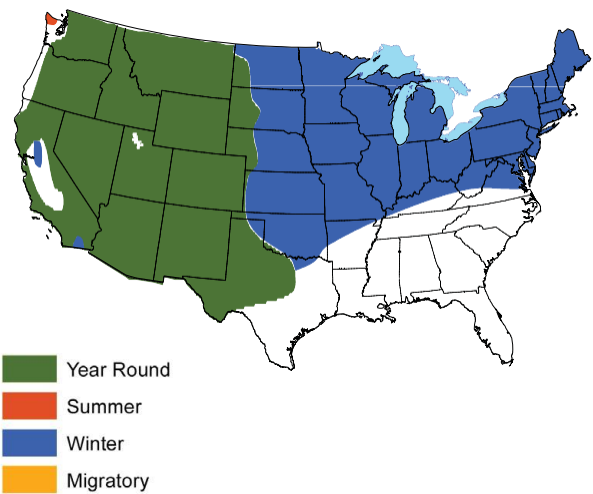
Wildlife management practices

Develop Conservation Easement: may protect habitat for golden eagle and prey, especially where urban development is encroaching

Control Nonnative Vegetation: when nonnative invasive species begin to degrade habitat for prey

Conduct Livestock Management: when overgrazing begins to degrade habitat for prey

Set-back Succession: *Prescribed Fire* and *Herbicide Applications* can be used to maintain early successional communities that support prey



Conduct Wildlife Damage Management: livestock depredation permits may be issued in severe cases with control activities carried out by federal agency personnel

Conduct Wildlife or Fish Survey: observation counts are used to estimate trends in populations

Golden-cheeked warbler

General information

The golden-cheeked warbler has been listed as a federally endangered species since May 1990. It is a songbird about 5 inches long and is mainly black with a bright yellow face divided by a black eye stripe. Golden-cheeked warblers are found exclusively in central Texas during the breeding seasons. They nest in mature Ashe juniper (commonly referred to as “cedar”) and oak woodlands. Nests contain 3 to 4 eggs and are made of shredded Ashe juniper bark (usually from mature trees that are 20+ years old) and spider webs. Nesting is more successful within mature forest stands of 250 acres or more.

Mating pairs are monogamous, and a male will typically defend a territory of about 10 acres. By July, these birds migrate south to southern Mexico, Honduras, Nicaragua, and Guatemala to spend the winter. Urbanization and agricultural practices have reduced the amount of tall juniper and oak woodlands golden-cheeked warblers rely on for nesting cover. In addition, the development of large man-made lakes has caused flooding in areas traditionally used by these warblers. Nest parasitism by brown-headed cowbirds also contributes to a decrease in reproductive success, but the extent is unknown. Within Texas, the golden-cheeked warbler traditionally inhabited more than 40 counties, but this area has shrunk to 25 counties or fewer. The largest contiguous habitat is maintained on Fort Hood by the U.S. Army.

Habitat requirements

Diet: primarily feed upon insects and spiders on trees; caterpillars (moth larvae) are an important food source for young warblers

Water: although usually found near creeks or intermittent streams, water requirements are met through the diet

Cover: mature (17-20 feet) Ashe juniper for nesting and oak woodlands for foraging insect larvae in the canopy; mixed deciduous and evergreen forest, often dominated by pines during winter

Wildlife management practices

Develop Conservation Easement: can protect critical habitat from development

Control Nonnative Vegetation: when nonnative invasive species begin to compete with native vegetation and degrade habitat

Conduct Forest Management: in pure stands of juniper, selective thinning is a *Timber Stand Improvement* practice that can be useful for encourage oak regeneration

Plant Trees: Ashe juniper and oak may be planted in suitable areas where trees are lacking



Steve Maslowski



Set-back Succession: *Herbicide Applications* may be used to prevent encroachment of undesirable woody species or to remove some trees in solid juniper stands. *Chainsawing* may be used when converting areas to Ashe juniper and oak woodlands

Conduct Wildlife or Fish Survey: point counts are used to estimate populations

Golden-fronted woodpecker

General information

Golden-fronted woodpeckers occur in central Texas, into southwest Oklahoma, and the Texas panhandle. They are most commonly found in mesquite woodlands, but also occur in cottonwood, willow, and cypress riparian areas, as well as mixed oak-juniper-mesquite woodlands. Golden-fronted woodpeckers also take advantage of urban sprawl, using fence posts, utility poles, and various ornamental tree species.

Habitat requirements

Diet: an omnivore that eats large numbers of grasshoppers, as well as corn, acorns, wild fruits, and berries

Water: obtains water from food

Cover: nests in mesquite woodlands as well as utility poles, fence posts, and ornamental tree species; nests generally constructed near the ground up to about 30 feet; golden-fronted woodpeckers build cavities and will use existing cavities

Wildlife management practices

Control Nonnative Vegetation: when nonnative invasive vegetation is competing with native vegetation and reducing habitat quality

Create Snags: in areas lacking sufficient snags, for both foraging and nesting

Plant Trees: in large open areas lacking sufficient woody cover to create future habitat

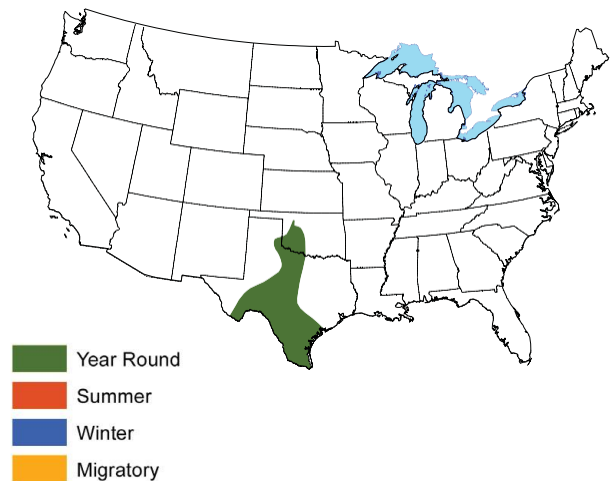
Set-back Succession: *Prescribed Fire* and *Herbicide Applications* can be used to create scattered snags for foraging and nesting

Conduct Wildlife Damage Management: woodpeckers occasionally damage wooden homes, fences, and other structures. Harassment techniques may be used to limit damage.

Conduct Wildlife or Fish Survey: point counts can be conducted to listen for the distinctive drumming or for vocalizations during the mating season



Thomas G. Barnes



Golden-winged warbler

General information

The golden-winged warbler is a ground-nesting songbird that requires herbaceous groundcover with scattered shrubs and young trees. They breed during summer in the Appalachian Mountains from north Georgia to southern New York and their winter range is in Central America and northern South America. Golden-winged warbler populations have been declining 2.3 percent per year since the 1960s, which can be attributed to loss of habitat through forest maturation and competition and hybridization with the blue-winged warbler. The USDA-NRCS included golden-winged warblers in its Working Lands for Wildlife Initiative in 2012. Successful recruitment is dependent on habitat above 2,000 feet elevation to avoid areas where blue-winged warblers occur. During the breeding season, golden-winged warblers are found in relatively small areas (1-12 acres) of young regenerating forest, reclaimed mine land, emergent wetlands, and old-fields within a landscape of contiguous forest (>70 percent of the landscape).

Habitat requirements

Diet: insects

Water: necessary water obtained from diet

Cover: forest openings with scattered shrubs and young trees with herbaceous groundcover for nesting and foraging; nests usually located at the base of forbs and brambles (such as goldenrod and blackberry) near thickets of shrubs and young trees; perches are important for males to establish territories through song displays

Wildlife management practices

Develop Conservation Easement: can protect critical habitat from development

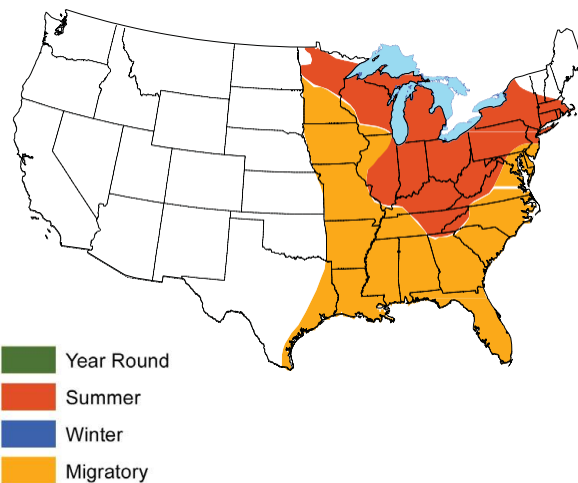
Control Nonnative Vegetation: sod-forming grasses, such as tall fescue, and other invasive species may limit coverage of more desirable forbs

Create Snags: creating snags around an opening may be desirable for temporary song perches, especially if perches are not present in the opening

Conduct Forest Management: *Forest Regeneration*, especially *Clearcut*, provides young forest (approximately 3-10 years old) structure desired by golden-winged warblers. Retaining single trees or groups of trees (10-15 trees per acre) for song perches is desirable. The more interspersed the retained trees are, the more breeding territories can be established in the recently harvested stand.



Laurie Smaglick Johnson



Conduct Livestock Management: may be necessary where livestock are present to prevent grazing nesting and shrub cover

Plant Shrubs: may be needed where there is a lack of interspersed shrub cover (or developing shrub cover) in an opening

Plant Trees: may be needed where there is a lack of interspersed trees (or young trees developing naturally) in an opening for song perches, or in large open areas where trees are lacking

Set-back Succession: *Prescribed Fire, Herbicide Applications, Chainsawing, and Dozer-clearing* can be used to maintain herbaceous groundcover and scattered shrubs and young trees in openings

Conduct Wildlife or Fish Survey: point-count surveys can be used to monitor populations

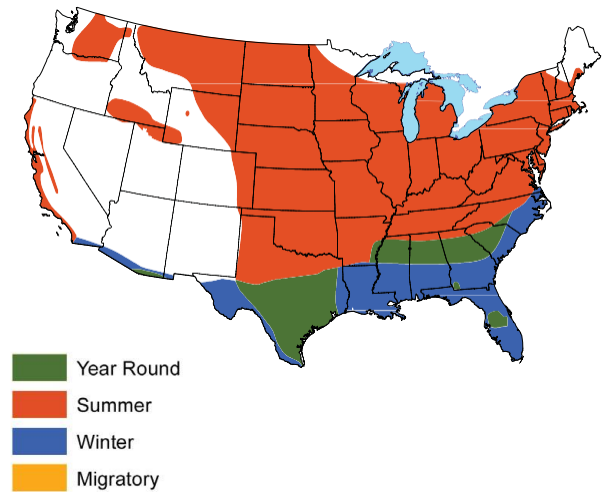
Grasshopper sparrow

General information

Grasshopper sparrows are migratory songbirds that prefer grasslands that may contain scattered shrubs and bare ground interspersed throughout the area. Areas with more than 35 percent shrubby cover constitute poor habitat for grasshopper sparrows. Nests are well concealed on the ground with overhanging grasses and a side entrance. Nests are constructed of dead grass leaves in the shape of a cup and contain 3-6 eggs. Grasshopper sparrows forage on the ground, making bare ground within native grass cover important for mobility and searching for prey (grasshoppers). Grasshopper sparrows are found throughout the Great Plains, Midwest, and Mid-South during the breeding season. They winter in the Deep South, Mexico, and Caribbean. Grasshopper sparrows are declining throughout their range because of habitat loss and fragmentation of once-contiguous grasslands. Grasshopper sparrows are aptly named with their insect-like song and a diet dominated by grasshoppers.



James W. Arterburn



Habitat requirements

Diet: diet shifts dramatically through the year; in spring and summer (breeding season) insects comprise 60 percent of the diet; not surprisingly, given the bird's name, grasshoppers account for 30 to 40 percent of the diet during this time; during fall and winter, diet shifts to 70 percent seeds

Water: water requirements are unknown but probably obtained through diet

Cover: Perennial grasses and forbs are used for escape and nesting cover; nest on the ground, usually in overhanging native warm-season grasses

Wildlife management practices

Develop Conservation Easement: can protect critical habitat from development

Control Nonnative Vegetation: although grasshopper sparrows may successfully nest in a variety of grassland types, sod grasses, such as tall fescue and bermudagrass, may limit mobility and bare ground.

Nonnative invasive vegetation should be controlled when it begins to compete with native vegetation and degrade habitat.

Conduct Livestock Management: is crucial to prevent overgrazing; overall average grass height should not be grazed below 18 inches

Plant Native Grasses and Forbs: where necessary to provide habitat, especially when converting agricultural fields previously row-cropped and wooded areas to grassland

Set-back Succession: Prescribed Fire can enhance habitat by rejuvenating grasslands, controlling woody cover, and creating patches of bare ground; **Herbicide Applications** may be used to control unwanted encroachment of woody species; **Chainsawing, Dozer-clearing, and Root-plowing** can be used to convert wooded areas to grassland

Conduct Wildlife or Fish Survey: point counts are used to estimate trends in populations

Great horned owl

General information

The great horned owl is a large, thick-bodied gray-brown bird with a white patch on the throat and characteristic ear-like tufts on its head. It is found throughout North America in a wide variety of environments, including forests, woodlands, farm woodlots, orchards, deserts, rocky canyons, grasslands, wetlands, and city parks. The great horned owl is mostly nocturnal, evident by its large eyes, and roosts during the day in trees or on sheltered rocky ledges. As a large raptor, it has large talons used to capture prey during a dive. The great horned owl's call is a familiar, and deep, 4 to 5 hoots. These owls' nest in larger trees where they find cavities or previously used nests, laying 1 to 4 eggs. They are monogamous breeders and usually establish a territory near a nest site before laying eggs. The great horned owl remains abundant and widespread, most likely because of its ability to live in a wide range of environments.

Habitat requirements

Diet: extremely varied, but commonly includes small- to medium-sized mammals including rabbits, skunks, squirrels and others, as well as reptiles, amphibians, large insects, and fish

Water: water obtained from diet

Cover: nest in abandoned nests of hawks, crows, or herons, and in large tree cavities, stumps, caves, and ledges

Wildlife management practices

Control Nonnative Vegetation: when nonnative invasive species begin to compete with native species and degrade habitat for prey

Create Snags: where large snags (>12 inches diameter) are limiting to provide possible nesting and roosting sites

Develop Field Borders: to increase usable space for prey around fields

Conduct Forest Management: *Forest Regeneration* in large areas of mature forest may provide additional cover for a variety of prey species; *Timber Stand Improvement* will encourage understory development and enhance habitat for a variety of prey species

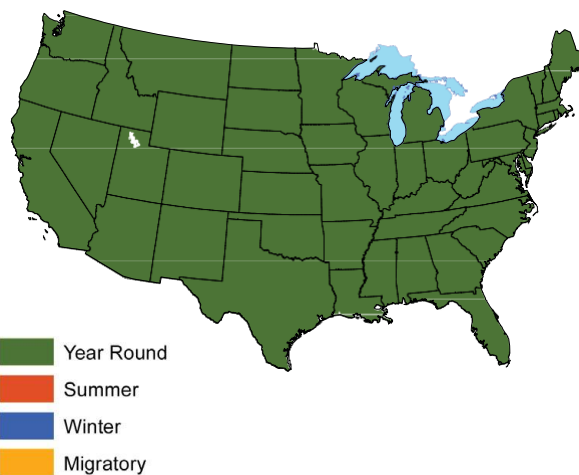
Conduct Livestock Management: where overgrazing may be limiting cover for prey

Plant Native Grasses and Forbs: where necessary to provide cover for prey

Plant Shrubs: where shrub cover is lacking and needed to enhance habitat for prey, especially cottontails



Dave Menke



Plant Trees: where perching sites are limited and where nesting cover does not exist

Set-back Succession: *Prescribed Fire, Disking, Herbicide Applications, Chaining, Root-plowing, Drum-chopping,* and *Mowing* may be used to maintain early successional communities that provide habitat for a variety of prey species; *Chainsawing* can be used to create small forest openings and enhance habitat for several prey species

Conduct Tillage Management: will facilitate hunting prey when waste grain is available

Conduct Wildlife Damage Management: may be necessary where an owl is killing poultry

Conduct Wildlife or Fish Survey: call counts are most often used to estimate trends in populations

Greater prairie-chicken

General information

Greater prairie-chickens require very large tracts of native rangeland containing diverse grass and forb communities free of tall vertical structures (including trees). They prefer flat to gently rolling terrain with some cropland, which can provide seasonal foods. Less than 25 percent of the landscape should be composed of crops. Low areas with dense vegetation of grasses, forbs, and low-growing shrubs are used for roosting year-round. Prairie-chickens require sites with short vegetation that offer good visibility for breeding displays. They gather on these sites in the spring, and the males display in front of females to win a mate. These areas are called “booming grounds.”

Habitat requirements

Diet: seeds, grains, insects and herbaceous greens; during the first few weeks after hatching, the young eat insects

Water: water is obtained from diet

Cover: thick, tall grass cover is used for nesting and winter cover; if not periodically disturbed, grasses often become too thick and are less valuable for nesting cover

Wildlife management practices

Develop Conservation Easement: can protect critical habitat from development

Control Nonnative Vegetation: sod grasses and other nonnative invasive vegetation should be controlled when habitat quality begins to decline

Develop Field Borders: to increase usable space around row crop fields

Leave Crop Unharvested: unharvested grain can provide a supplemental food source for prairie-chickens

Conduct Livestock Management: should ensure the entire prairie or grassland is not uniform in structure or plant composition; areas of dense nesting cover adjacent to insect-rich areas with forbs are ideal; some areas should be left ungrazed during the nesting season (May through June)

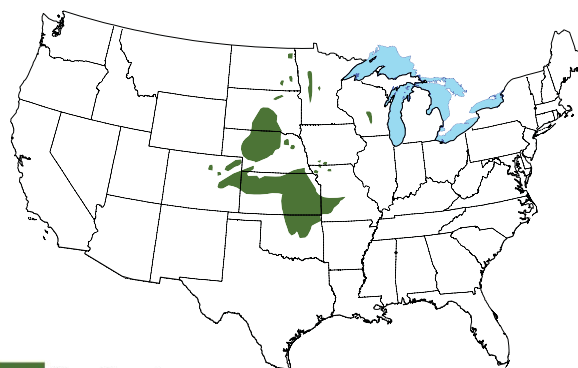
Plant Food Plots: grain food plots can provide a supplemental food source for prairie-chickens, especially when native foods may be lacking

Plant Native Grasses and Forbs: needed where large expanses of high-quality grassland are not available, and planting is necessary

Set-back Succession: fire is an essential aspect of prairie ecology and must be applied to the landscape for long-term stability of prairie-chickens; *Prescribed Fire* every 3 to 5 years improves plant vigor and reduces excessive buildup of old vegetation in areas not grazed; *Chaining*,



Dave Menke



Prescribed Fire, and *Herbicide Applications* can revert shrubland to grassland; *Chainsawing* can be used to remove trees

Conduct Tillage Management: to leave grain stubble in fall where croplands are adjacent to grasslands

Decrease Hunting/Fishing: may be necessary if population is declining and data suggest mortality from hunting is additive or limiting population growth

Conduct Wildlife or Fish Survey: observation counts on booming grounds are commonly used to estimate trends in prairie-chicken populations

Greater roadrunner

General information

The greater roadrunner is a long-legged bird, 20 to 24 inches in length, with a wingspan of 17 to 24 inches. Adults have a bushy crest on their heads and a long, thick, dark bill. They are called roadrunners because of their habit of running down the road and darting to safety within brush and trees adjacent to the road. They can run up to 20 mph to chase down prey. They will beat larger captured prey items against the ground or a rock to kill them. Although they are capable of flying, roadrunners spend most of their time on the ground. Threats to roadrunners include predation by feral cats, urbanization, and habitat loss.



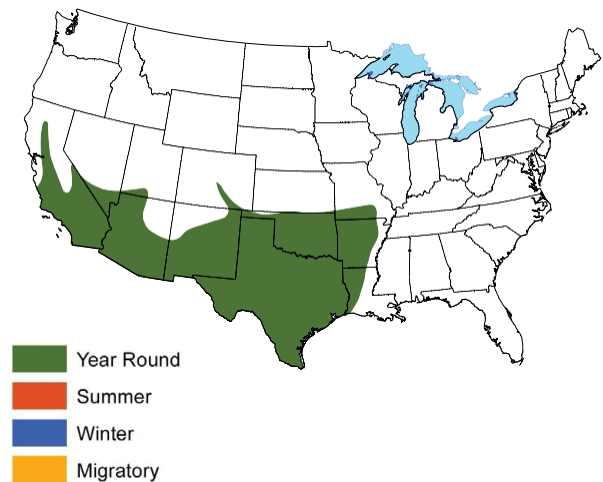
Robert Burton

Habitat requirements

Diet: omnivorous; principal food items include insects, fruits, and seeds, but small reptiles, mammals and birds, bird eggs, and carrion is also eaten; some quail hunters believe roadrunners kill and eat recently hatched quail chicks, but that has never been documented

Water: water is largely obtained from diet, but roadrunners will drink freestanding water if available

Cover: arid deserts to semi-arid shrubby areas; open or disturbed areas adjacent to shrubland; in the eastern portion of their range, roadrunners inhabit dry sandy upland sites with patches of bare ground interspersed with low-growing shrubs and trees.



Wildlife management practices

Control Nonnative Vegetation: when invasive nonnative grasses and shrubs begin to compete with native plant cover and degrade habitat

Conduct Forest Management: in the eastern forested portion of the greater roadrunner's range, *Timber Stand Improvement* can encourage shrub cover can enhance cover and support food where understory vegetation have been shaded out

Plant Shrubs: low-growing shrubs can provide cover and food where lacking

Set-back Succession: *Prescribed Fire, Disking, Herbicide Applications, Chainsawing, Chaining, and Drum-chopping* can be used to renovate or maintain shrubby cover when trees begin to dominate or where additional bare ground is needed

Conduct Wildlife or Fish Survey: roadside counts are used to estimate roadrunner populations

Greater sage-grouse

General information

The greater sage-grouse is a ground-dwelling gamebird of the American West that uses very large tracts of sagebrush-dominated rangeland. Sage-grouse populations have declined over many areas as a result of habitat loss and fragmentation related to land conversion, energy development, conifer encroachment, and invasive species (particularly cheat grass). Sage-grouse currently occur throughout much of the **Intermountain** ecoregion. A diverse plant community of native grasses, forbs, and especially sagebrush are critical for sage-grouse. Male sage-grouse display and compete for females on leks, which are small open areas surrounded by sagebrush. The USDA-NRCS included greater sage-grouse in its Working Lands for Wildlife initiative.

Habitat requirements

Diet: spring and summer – insects and green forbs; late fall and winter – sagebrush

Water: water requirements are obtained through diet, but sage grouse will use free-standing water if available

Cover: nests are constructed on the ground, often under sagebrush; sagebrush is critical for thermal and escape cover during winter

Wildlife management practices

Develop Conservation Easement: can protect critical habitat from development

Control Nonnative Vegetation: when nonnative invasive species begin to compete with the native plant community and reduce habitat for sage-grouse

Conduct Livestock Management: grazing should be prescribed at a level that maintains an adequate grass and forb component for nesting and brood-rearing cover. Improper grazing can increase the sagebrush canopy to the point there is inadequate understory and shift the plant community to species of lesser value, which removes important cover for sage-grouse and decreases forage for livestock.

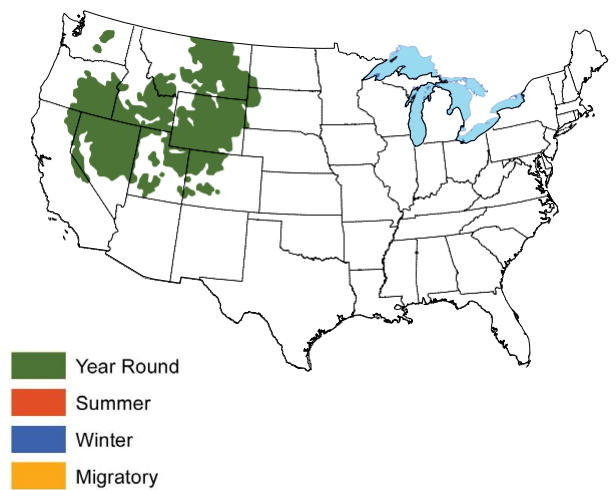
Plant Shrubs: in areas with less than 15 percent sagebrush cover that are used for nesting or winter cover

Decrease Hunting/Fishing: may be necessary if the local population is declining and data suggest mortality from hunting is additive or limiting population growth

Conduct Wildlife or Fish Survey: lek counts are conducted to monitor populations and evaluate management effectiveness, especially since sage-grouse are in decline.



Stephen Ting



Special: identify and mark fences where sage-grouse collisions are likely, such as near leks (open areas surrounded by sagebrush for courtship displays) to reduce accidental mortality caused by fence strikes. Sage-grouse typically use the same leks every spring. Leks are maintained in herbaceous groundcover for long periods of time because of gravelly or wet soils or because of feeding and watering activities of livestock.

Hairy woodpecker

General information

Hairy woodpeckers are medium-sized woodpeckers with a bill almost as long as their head. They forage primarily on tree trunks, but also on stumps, snags, downed logs, and on the ground. Hairy woodpeckers are most commonly found in mature forest, but also may frequent younger developing forests, wooded riparian areas, woodlands, backyards, and parks. They nest in cavities, which are usually in dead trees or in dead limbs of live trees. Nests contain 3-6 eggs.

Habitat requirements

Diet: insects such as ants, beetle larvae, caterpillars, and adult beetles; diet is supplemented with hard and soft mast, as well as various seeds, including sunflower seeds

Water: obtained from diet

Cover: cavity nesters; holes are excavated in mature and dying trees and snags; management efforts should focus on maintaining or creating areas with large mature and dying trees, especially in open areas; within wooded areas, at least one large snag per acre should be available

Wildlife management practices

Control Nonnative Invasive Species: when nonnative invasive species begin to negatively impact tree regeneration or reduce the ability of hairy woodpeckers from foraging along tree trunks

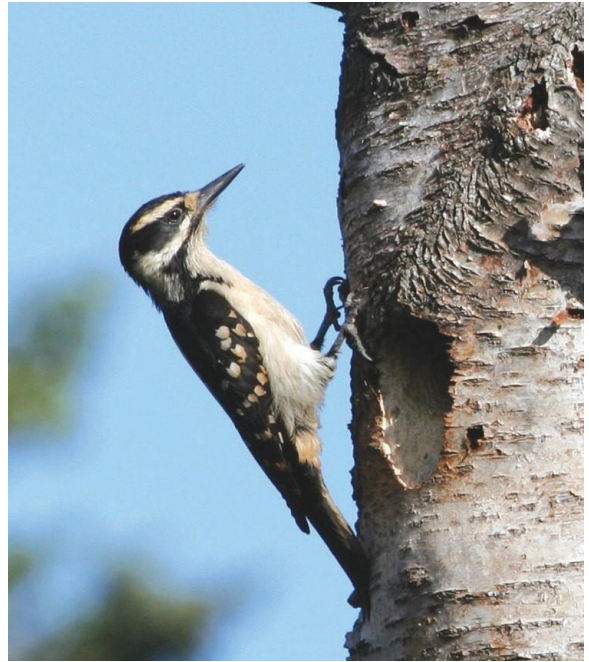
Create Snags: for a food source and potential nest cavities where snag availability is limiting

Conduct Livestock Management: livestock either should be excluded from forests and riparian areas or managed so that grazing pressure is not limiting tree regeneration

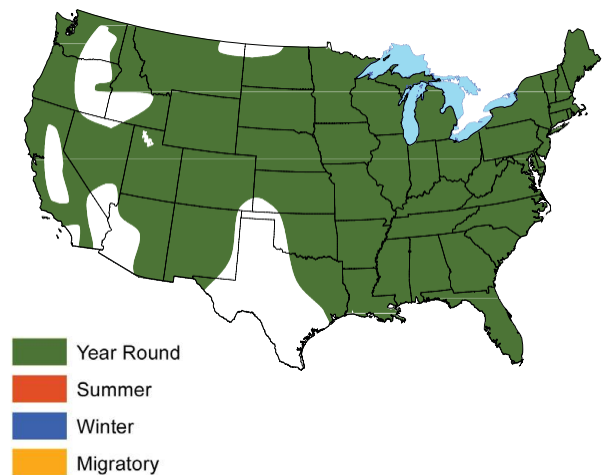
Plant Trees: especially softwood deciduous trees where trees are lacking for potential nesting cavities

Conduct Wildlife Damage Management: when woodpeckers are causing damage to human structures

Conduct Wildlife or Fish Survey: call counts and point counts are used to estimate population trends



Donna Dewhurst



House finch

General information

House finches are native to the western U.S. but were introduced in the eastern U.S. in 1940. Since, they have spread throughout the eastern U.S. and have become one of the most common birds in the U.S. They are found in a wide variety of urban, suburban, and agricultural areas that have trees, shrubs, and some herbaceous openings. They also are found in canyons and semi-arid regions in the western part of the country. House finches' nest in a variety of locations and make a nest from weed stems, small branches, and leaves. House finches are vegetarians and eat a variety of seeds, soft mast, and buds, both from the ground and in trees.



Gary Kramer

Habitat requirements

Diet: soft mast, buds, and weed seeds; in the warm season, house finches eat some insects

Water: free-standing water is needed daily in the warm season

Cover: nest 5 feet to 7 feet aboveground on low branches of trees, branches of bushes, in natural cavities, old holes excavated by woodpeckers, and any projection or ledge they can find on houses and buildings

Wildlife management practices

Plant Native Grasses and Forbs: to provide forb seed in rural areas where forbs are lacking

Plant Shrubs: for nesting and hiding cover adjacent to open areas where shrubs are lacking

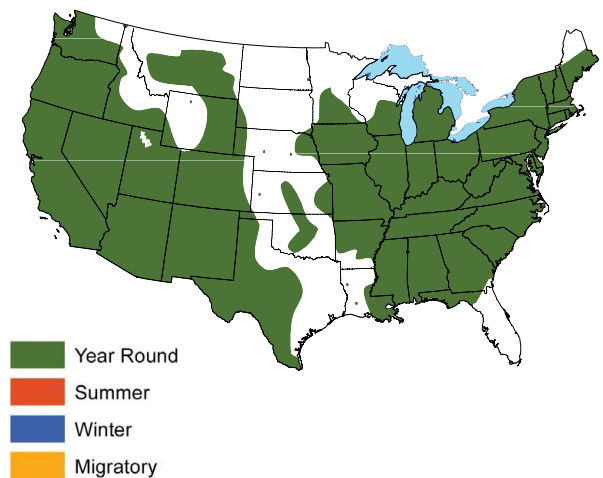
Plant Trees: for nesting cover in areas where trees are lacking

Set-back Succession: *Mowing* may be used to maintain foraging and loafing cover for house finches in **Urban** areas

Provide Water Developments for Wildlife: birdbaths and pans of water can be provided, or a low area in the yard can be filled with water; do not place water in areas where cats can catch birds; cats should be removed

Conduct Wildlife or Fish Survey: point counts are used to estimate trends in populations

Artificial Feeders: may be used to attract finches in **Urban** areas: millet and sunflower seeds are favorites



House sparrow

General information

House sparrows are found throughout the U.S. They are an introduced species from England (they are also called English sparrows) and are found throughout the U.S. and are very common in urban areas. House sparrows also are very common in and around buildings in agricultural areas where grain is available. Because they are a nuisance, management objectives are often needed to reduce the quality and quantity of food and cover. *Conduct Wildlife Damage Management* is often needed and commonly implemented. House sparrows are cavity nesters and will frequently occupy buildings and houses to nest within the eaves or other areas with a cavity or opening. House sparrows feed on the ground and in woody vegetation for seeds, insects, and soft mast. House sparrows outcompete bluebirds for cavity nesting space and compete with several other native birds for food and space.

Habitat requirements

Diet: variety of insects, soft mast, buds, forbs, weed seeds, and waste grain

Water: free-standing water is required daily in warm seasons

Cover: nest in natural cavities, low branches of trees, and bushes 5 feet to 7 feet aboveground, and on any projection or ledge they can find on buildings or other structures

Wildlife management practices

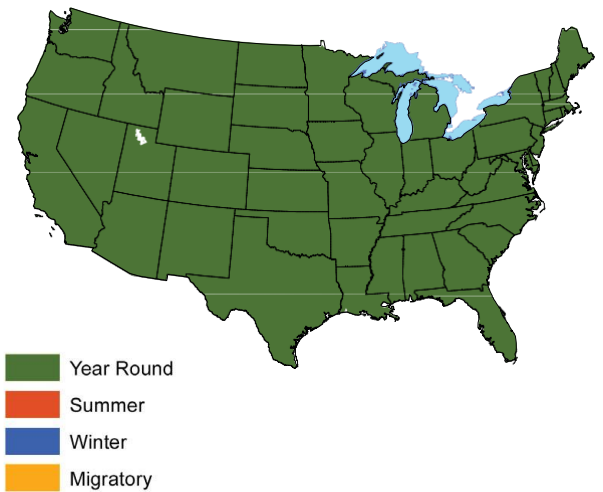
House sparrow populations often grow to levels where they cause wildlife damage or will cause detrimental conditions for native wildlife by out competing native species for habitat requirements; therefore, wildlife damage management most likely will be necessary in all situations, especially in suburban/urban and agricultural areas. Habitat management to attract house sparrows should never occur.

Conduct Wildlife Damage Management: trap and euthanasia are often appropriate to reduce house sparrow populations; exclusion practices may prevent house sparrows from accessing an area; remove food, water, and cover available to house sparrows; various harassment practices may be effective

Conduct Wildlife or Fish Survey: observation counts, call counts, and questionnaires related to wildlife damage management are useful in estimating trends in populations



James W. Arterburn



House wren

General information

House wrens are found throughout the U.S. during the breeding season and migrate to the Deep South during winter months. In **Urban** areas, house wrens prefer older residential areas with large shrubs and trees. House wrens also are found in forests with herbaceous openings at higher elevations, as well as in aspen stands. House wrens' nest in a variety of elevated cavities, as high as 30 feet aboveground. They forage both on the ground and aboveground.

Habitat requirements

Diet: spiders, grasshoppers, crickets, beetles, caterpillars, ants, bees, ticks, earthworms, and millipedes; artificial feeders are usually not used

Water: necessary water is obtained from the diet

Cover: nest in natural cavities in trees old buildings and other structures

Wildlife management practices

Control Nonnative Vegetation: when nonnative species begin to compete with native vegetation and degrade habitat for house wrens

Provide Nesting Structures: nest boxes may be provided where adequate nesting sites are lacking; boxes should be placed high on a tree trunk or under the eaves of a house; the hole should be < 1.5 inches in diameter to prevent house sparrows and starlings from entering and excluding house wrens; for specifics on nest box design and placement, visit your local Extension office or state wildlife agency website

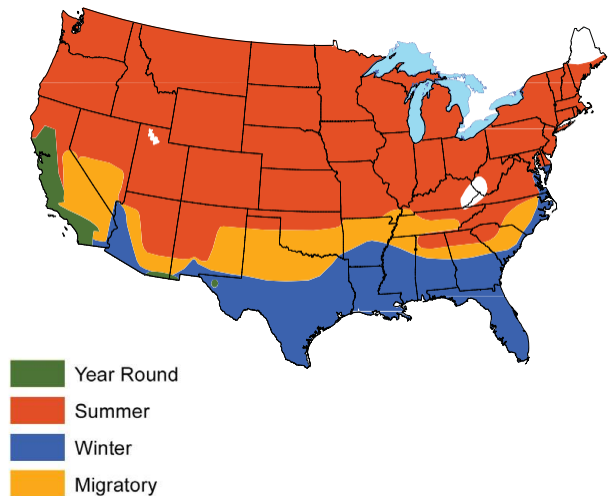
Plant Shrubs: where lacking for cover while feeding and for nesting

Plant Trees: where trees are lacking for cover and nesting

Conduct Wildlife or Fish Survey: point counts are used to estimate trends in populations



Dave Menke



Ladder-backed woodpecker

General information

Ladder-backed woodpeckers are small woodpeckers of the southwestern U.S. and Mexico. They get their name from the black and white barring on their backs that resemble a ladder. Ladder-backed woodpeckers are found in wooded canyons, cottonwood groves, pine and pine oak woodlands, and desert grasslands and shrublands dominated by mesquite throughout the southwestern U.S. south to British Honduras. They also are found in riparian areas and other areas with trees. In the Hot Desert and Prairie Brushland ecoregions, they use areas with large mesquite, palo verde, agave, cholla cactus, and yuccas. They are sometimes called the cactus woodpecker as they commonly nest in various cacti where they occur.

Habitat requirements

Diet: insects including ants, beetle larvae, caterpillars, and cotton worms found on small trees, shrubs, and various cacti

Water: necessary water obtained from diet

Cover: nest in cavities in trees, shrubs, and stalks of agave and yucca cactus

Wildlife management practices

Control Nonnative Vegetation: when nonnative invasive species begin to compete with native vegetation and degrade habitat for ladder-backed woodpeckers

Create Snags: to increase potential nesting sites where limiting

Conduct Livestock Management: grazing management should maintain vigor of existing trees; in riparian areas, grazing in spring and summer when herbaceous vegetation is actively growing results in less use of woody vegetation than at other times of year; grazing management in dry regions often includes development of livestock watering facilities in upland areas to discourage over-use of riparian areas

Plant Trees: in riparian areas for cover and a future food source where trees are lacking

Conduct Wildlife Damage Management: when woodpeckers are causing damage to human structures

Conduct Wildlife or Fish Survey: point counts may be used to monitor populations



Robert Burton



Lark bunting

General information

Lark buntings are found in the Great Plains and the arid Southwest. They prefer shortgrass prairies during the breeding season, but also are found in mixed grass prairies. They nest on the ground, usually under a shrub. Nests contain 2-6 eggs. Lark buntings feed on the ground in open areas and avoid foraging under cover. Lark buntings migrate into the southern Great Plains and Mexico during winter where they frequent grasslands, deserts, shrublands, and cultivated fields.

Habitat requirements

Diet: insects are the primary item in the diet, but seeds, soft mast, and grain are consumed as well, especially during winter

Water: necessary water is obtained from food

Cover: adequate grass cover is necessary, particularly during the nesting season

Wildlife management practices

Control Nonnative Vegetation: when nonnative vegetation begins to compete with native vegetation and reduce habitat quality for lark buntings; sod grasses are problematic because they can limit mobility of lark buntings while foraging

Conduct Livestock Management: grazing should be managed so that adequate nesting cover is available

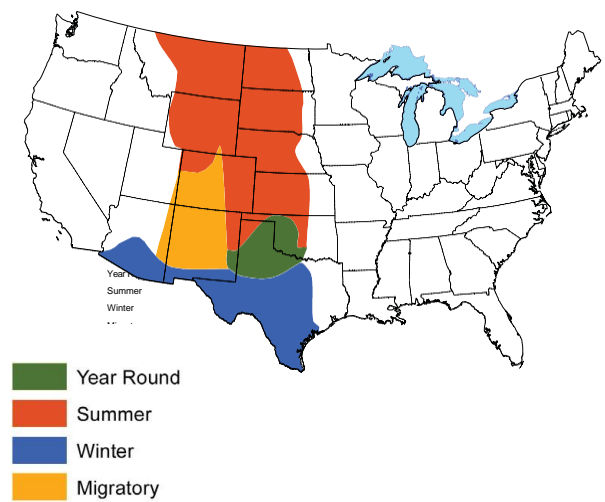
Plant Native Grasses and Forbs: may be necessary to restore native cover where native grasslands have been converted to nonnative species

Set-back Succession: *Prescribed Fire* is critical for maintaining native prairie for this and many other grassland birds; *Chainsawing* may be used to clear trees; *Herbicide Applications* may be used to kill trees; *Prescribed Fire, Chaining, Root-plowing, and Drum-chopping* may be used to set-back shrub cover and stimulate herbaceous groundcover

Conduct Wildlife or Fish Survey: point counts are used to monitor populations



James W. Arterburn



Lawrence's goldfinch

General information

Lawrence's goldfinch is a small and rather uncommon finch that spends the breeding season in the oak woodlands of California and Baja California and winters in southern Arizona and northern Mexico. Thus, unlike most other migratory birds, it migrates east and west, rather than north and south, between seasons. It is a nomadic species within seasons, moving about from place to place, with little predictability or loyalty in which location it will spend the breeding season from year to year. Erratic movements of the species make it difficult to monitor. Its nomadic nature is considered a response to water and food availability, which is largely seed of native annual plants that the goldfinch gleans while perching on the plant. They nest about mid-way up trees; nests contain 3-6 eggs.



Glen Tepke

Habitat requirements

Diet: seeds of annual plants, such as fiddleneck, chamise, red-stem filaree, shepherd's-purse, and peppergrass

Water: freestanding water is required; Lawrence's goldfinch may drink from creeks, water tanks, dripping faucets

Cover: blue oak savannas, digger pine-oak woodlands, wooded riparian areas

Wildlife management practices

Develop Conservation Easement: can protect critical habitat for this declining species

Control Nonnative Vegetation: when nonnative invasive species compete with native vegetation and reduce habitat quality for Lawrence's goldfinch

Conduct Forest Management: *Timber Stand Improvement* can promote open-canopy conditions where closed-canopy conditions occur

Plant Trees: in large open areas where oak woodlands are lacking

Set-back Succession: *Disking* can promote annual plants for foraging; *Prescribed Fire* should be used to maintain and promote oak woodlands and savannas; *Herbicide Applications* may be used to reduce tree density where needed

Conduct Tillage Management: will allow annual forbs to remain standing through winter for foraging

Provide Water Developments for Wildlife: may be useful where freestanding water is limiting

Conduct Wildlife or Fish Survey: point counts may be used in an effort to monitor population trends



Loggerhead shrike

General information

The loggerhead shrike is a migratory bird of prey that requires relatively large openings or fields to hunt prey. Some shrikes remain in the southern tier of the U.S. all year, whereas others migrate from as far south as northern Mexico to southern Canada to breed. The loggerhead shrike population is declining because of habitat degradation and loss from conversion of grasslands and shrublands to row-crop agriculture or overgrazed, nonnative grass pastures, and aesthetic mowing. The most important vegetation component is nesting cover (dense, thorny shrubs, and trees), but open areas with herbaceous vegetation and some bare ground are also critical for hunting prey. Shrikes will readily build nests and perch in shrubby areas less than 16 feet tall but prefer taller trees where available. Scattered, thorny tree and shrub species, such as honey locust, are selected over non-thorny species. Taller trees are selected for perching during courtship displays and while hunting. Loggerhead shrikes uniquely utilize thorns, barbs, and barbed wire fences to impale prey.

Habitat requirements

Diet: insects and spiders, small mammals, small birds, reptiles, and amphibians

Water: water requirements are obtained through diet

Cover: nest in dense shrubs and trees; taller, thorny species are preferred; courtship and foraging sites are elevated, exposed perches over open areas with herbaceous vegetation and some bare ground; evergreens may be used in winter when available

Wildlife management practices

Develop Conservation Easement: can protect critical habitat for this declining species

Control Nonnative Vegetation: when nonnative species are beginning to compete with native vegetation and reduce habitat quality for loggerhead shrike

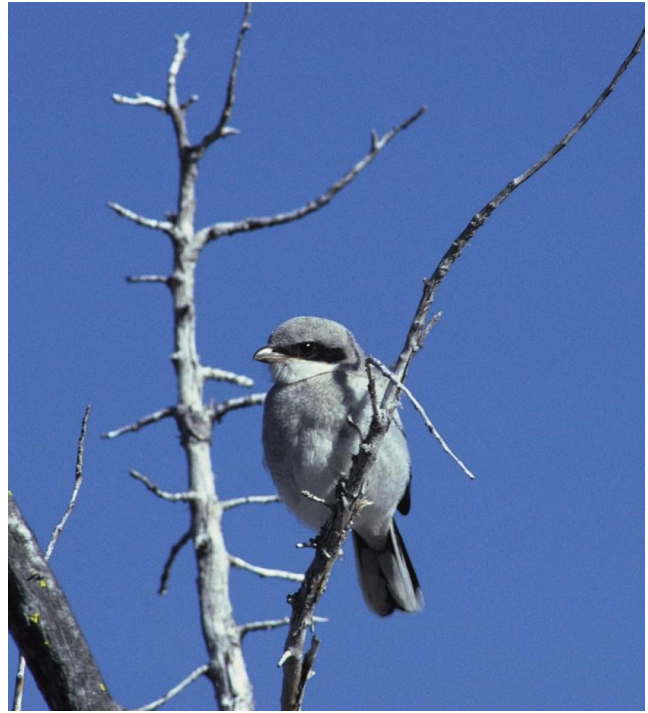
Develop Field Borders: to increase usable space around row-crop fields

Conduct Livestock Management: grazing should be managed to provide lush herbaceous groundcover and shrub cover

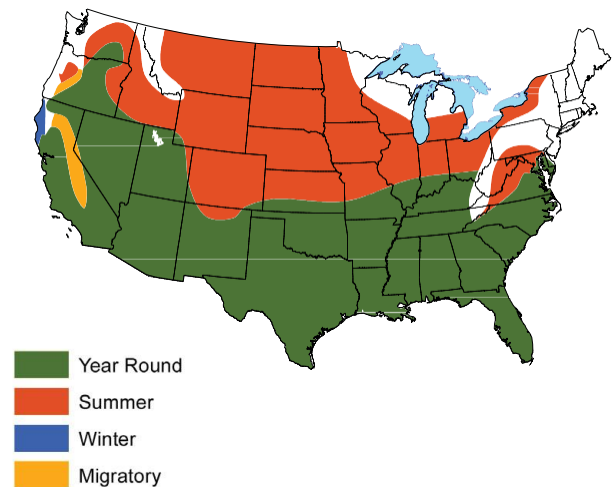
Plant Native Grasses and Forbs: when necessary to provide herbaceous vegetation in proximity to shrub cover

Plant Shrubs: where there is a lack of shrubs for nesting/perching sites

Plant Trees: where there is a lack of trees for nesting/perching sites



Dave Menke



Set-back Succession: *Disking* and *Prescribed Fire* are recommended to maintain early successional openings; *Chainsawing*, *Dozer-clearing*, and *Root-plowing* can reduce tree cover in forests to promote savanna conditions; *Herbicide Applications* may be used to reduce tree cover; *Chaining* and *Drum-chopping* may be used to maintain shrub cover

Conduct Wildlife or Fish Survey: walking transects to find nests, point counts, and breeding bird surveys can monitor population trends

Long-billed thrasher

General information

The long-billed thrasher is only found in southern Texas and eastern Mexico where it prefers dense, brushy areas, such as riparian woodlands and mesquite thickets. Long-billed thrashers construct nests in big trees within thick brush, making nests difficult to find. Nests resemble a big cup made of thorny twigs. Long-billed thrashers are grayish brown on top with white below, characteristically streaked with black dashes. As the name implies, it has a longer bill than its close relative, the brown thrasher, which can be found in the same ecoregion. Interestingly, there are other thrashers with even longer bills. The long bill is used to forage or “thrash” in leaf litter on the ground for insects, spiders, snails, or berries. Although the long-billed thrasher is not threatened, parts of south Texas have seen a decline over the last century as a result of clearing brush for agriculture. Long-billed thrashers are most commonly seen along the Rio Grande River and have been noted to move to the more northern areas of south Texas during winter.

Habitat requirements

Diet: insects and berries, but also spiders and snails

Water: water needs are likely met through their diet

Cover: areas of dense brush; nest in larger trees within areas of dense, thorny brush

Wildlife management practices

Control Nonnative Vegetation: when nonnative invasive vegetation begins to reduce habitat quality for long-billed thrasher

Develop Field Borders: of primarily shrubs can provide nesting and escape cover in areas lacking patches of dense brush

Plant Shrubs: in open areas where shrub cover is limiting, and planting is necessary for shrub establishment

Plant Trees: can provide nesting structures where taller trees are lacking

Provide Water Developments for Wildlife: water sources could be developed to provide free water, especially during winter months

Conduct Wildlife or Fish Survey: point counts are used to estimate population trends



Robert Burton



Mallard

General information

The mallard is a migratory waterfowl with one of the most extensive breeding ranges of any duck in North America, extending across the northern one-third of the U.S., and up to the Bering Sea. Mallards winter south of Canada, throughout the U.S. and south to Central America. Mallards nest in tall grasses and forbs or in shrubby cover. They need open water with associated emergent aquatic vegetation to raise young. They may be found in any type of wetland with standing water and also use various upland vegetation types for foraging, especially harvested grain fields. Mallards are dabbling ducks, which means they feed at or near the surface of the water by filtering food items, such as invertebrates, seeds, and other plant material. Dabbling ducks are often seen tipping upside down in the water to reach food at the bottom of a wetland. Unlike diving ducks, they feed in much shallower water and do not dive to obtain food. Mallards have become a nuisance in some areas, particularly urban and suburban parks with ponds where they are fed. Mallards may breed with domestic ducks and with other wild duck species, especially the American black duck.

Habitat requirements

Diet: aquatic plants, insects and other invertebrates, hard mast (especially acorns), grains and other seed are primary components in the diet; ducklings eat mostly aquatic insects

Water: see cover requirements below

Cover: nest in grass and forbs and sometimes in shrub cover, preferably within one-half mile of a wetland that provides open water with some emergent aquatic vegetation: brooding cover is open water with considerable emergent aquatic vegetation for protection from predators; ideally, wetlands have a minimum of 50 percent open water and 10 to 20 percent emergent vegetation; in wintering areas, mallards often loaf on more open water, such as warm-water sloughs, streams, rivers, and flooded fields

Wildlife management practices

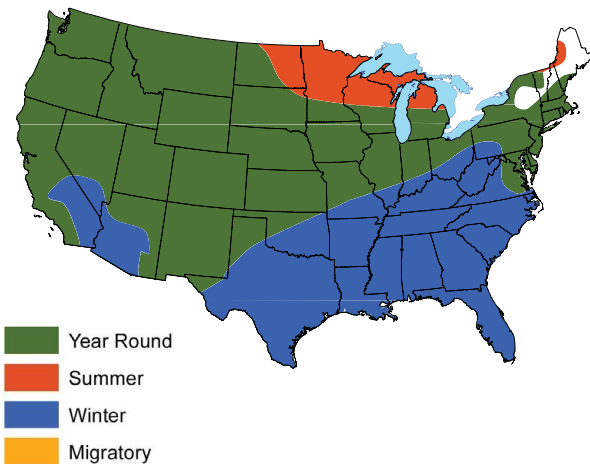
Control Nonnative Vegetation: when nonnative invasive species, such as purple loosestrife, water hyacinth, parrotfeather, hydrilla, and reed canarygrass, begin to reduce habitat quality for mallards

Conduct Forest Management: (in some ecoregions) *Timber Stand Improvement* can favor mast-producing species, especially oaks, in bottomland hardwoods that can be flooded to increase mast production

Leave Crop Unharvested: unharvested grains, such as corn, to provide a winter food source; this does not apply



Donna Dewhurst



to hay forages or soybeans

Conduct Livestock Management: livestock should be excluded from nesting areas

Plant Food Plots: shallowly flooded grain plots can provide an important food source for migrating and wintering mallards

Plant Native Grasses and Forbs: (in some ecoregions) where nesting cover is limiting, and planting is necessary to increase coverage of native grasses and forbs

Repair Spillway/Dam/Levee: if not functioning properly

Set-back Succession: *Prescribed Fire* should be used to rejuvenate dense vegetation in nesting areas and to increase or maintain proper water and vegetation interspersions in emergent wetlands that become dry in summer; *Disking* emergent wetlands and fields that will be flooded later will stimulate annual grasses and forbs that are important food plants; *Herbicide Applications* can be used to control unwanted woody species; *Chainsawing* can be used to create openings in bottomland forests that can be flooded

Conduct Tillage Management: eliminating fall tillage can provide waste grain in the winter

Provide Water Developments for Wildlife: shallow impoundments can be used to flood grain fields and bottomland hardwoods in winter to provide a valuable food source and loafing areas

Conduct Wildlife or Fish Survey: aerial surveys are commonly used to estimate trends in the mallard population

Marbled murrelet

General information

The marbled murrelet is a small seabird that spends most of its life within a few miles of the coastline in the Pacific Northwest. Marbled murrelets nest in large expanses of old-growth (180 years old or more) coniferous forests. Nests are located on horizontal branches in large coniferous trees up to 50 miles from the coast. The nest is not concealed, but merely positioned in a depression of moss on the limb. Marbled murrelets have low reproductive potential as a female produces only one egg per nesting attempt. The females and the males share incubation duties. Historically, logging old-growth coastal coniferous forests eliminated large tracts of nesting cover for marbled murrelets. As old growth forests have become more fragmented, nest predation is thought to have increased, primarily from ravens and jays. The murrelet also is at risk from coastal oil spills and depletion of forage fish stocks.

Habitat requirements

Diet: small fish, such as anchovies, herring, and smelt, from the ocean within 1-2 miles of the coastline; small crustaceans also are eaten occasionally

Water: obtains most water from food

Cover: open ocean for most of the year; when threatened, murrelets dive or fly to avoid capture; horizontal limbs on large conifer trees for nesting

Wildlife management practices

Develop Conservation Easement: can protect critical habitat for this declining species

Control Nonnative Vegetation: if nonnative invasive vegetation is reducing habitat quality for marbled murrelet

Conduct Forest Management: long timber rotations that favor old growth forest should be prescribed; *Timber Stand Improvement*, such as selective thinning that increases growth rates of remaining trees, can be used when a forest stand is not of sufficient age and structure for nesting cover

Plant Trees: conifers can be planted in areas that are not forested, but have the potential to provide future nesting cover

Set-back Succession: *Prescribed Fire* may be used in some situations to consume built-up fuels and reduce chance of wildfire, which could kill trees valuable for nesting

Conduct Wildlife or Fish Survey: transects conducted via boat parallel to the coastline counting murrelets on the water are useful to determine estimates of abundance.



R. Lowe



Mountain bluebird

General information

Mountain bluebirds are found across the western U.S. They use open savannas, pastures, parks, backyards, edges of hayfields and crop fields, and other herbaceous openings with scattered trees, which are used for perching and nesting (where cavities are available). Mountain bluebirds forage in open areas with short vegetation, but typically near trees or a fence that provide perches. Insects dominate the diet during spring and summer, whereas various fruits are most prevalent during fall and winter. Mountain bluebirds' nest in cavities, especially old woodpecker cavities, as well as nest boxes. Clutches normally consist of 4-8 eggs.

Habitat requirements

Diet: invertebrates, especially grasshoppers, crickets, beetles, and spiders; various fruits in fall and winter

Water: necessary water obtained from diet

Cover: nest in cavities of trees and fence posts

Wildlife management practices

Control Nonnative Vegetation: when nonnative invasive vegetation begins to compete with native vegetation and reduces habitat quality for mountain bluebirds

Create Snags: where cavities are limited to provide potential nest sites and to provide perching sites in open areas (not in forests)

Develop Field Borders: to increase foraging opportunities around crop fields

Conduct Livestock Management: livestock must be excluded from recently planted trees and shrubs

Provide Nesting Structures: may be placed where a scarcity of natural cavities may be limiting the population; nest boxes should be approximately 5 feet high with an entrance hole 1½ inches in diameter; nest boxes should be placed no closer than 80 yards apart to limit territorial fighting among males

Plant Native Grasses and Forbs: to aid in establishing herbaceous groundcover where planting is necessary

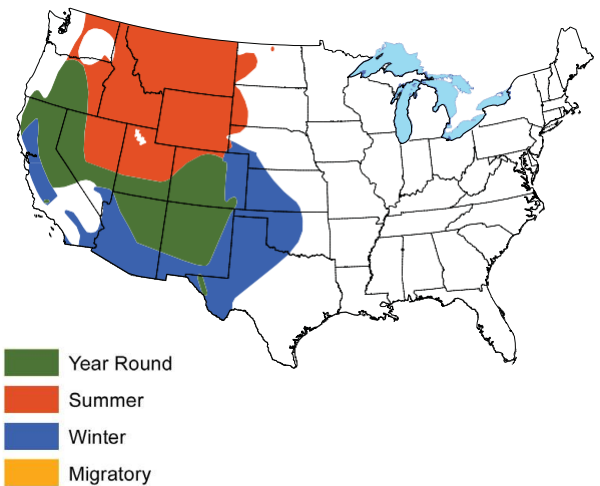
Plant Shrubs: in large open areas where perching sites or winter foods may be limiting

Plant Trees: in large open areas where perching sites are limiting; may provide potential nest sites in future

Set-back Succession: *Prescribed Fire, Disking, Herbicide Applications, Mowing, Chaining, and Drum-chopping* can be used to maintain and rejuvenate grasslands and reduce shrub cover where necessary; *Chainsawing,*



Dave Menke



Dozer-clearing, and Root-plowing can be used to convert forested or shrub-dominated areas to savannas and early successional communities; *Mowing* may be used to maintain foraging and loafing cover for mountain bluebirds in **Urban** areas

Conduct Wildlife or Fish Survey: point counts can be used to monitor bluebird populations; nest boxes should be checked to monitor use and nest success

Mourning dove

General information

Mourning doves may be found throughout much of the lower 48 states. They prefer areas of annual and perennial grasses and forbs for feeding with some shrubs and trees nearby for perching, nesting, and roosting. Interspersed bare ground is an important component of foraging sites because mourning doves do not scratch in the litter to find seed. Bare ground is also beneficial for doves to obtain grit (small gravel) to help in digesting food. Nests are made of twigs and placed on branches of shrubs or trees. Nests also may be placed on the ground in areas where trees are generally lacking. Mourning doves often use agricultural areas for feeding on a variety of grass and forb seeds. They also forage on waste grain from cropland and livestock feedlots. Mourning doves prefer shallowly sloping or flat shorelines without vegetation for drinking.

Habitat requirements

Diet: a variety of grass and forb seeds, as well as several agricultural grains; small areas of bare ground are beneficial for obtaining grit (small gravel) to help digest food

Water: freestanding water required daily

Cover: shrubs and trees are used for nesting and loafing

Wildlife management practices

Control Nonnative Vegetation: when nonnative invasive vegetation begins to compete with native vegetation and reduce habitat quality for mourning dove; sod grasses, such as tall fescue and bermudagrass, are particularly problematic because they have no food value and their structure at ground level limits mobility of ground-feeding doves and their ability to search for seed

Leave Crop Unharvested: for a variety of small grain crops, such as wheat, millets, grain sorghum, corn, and oats, to provide additional food resource

Conduct Livestock Management: should prevent overgrazing, which can eliminate preferred forbs that produce seed for mourning dove; in some cases, livestock can be used to reduce vegetation height and increase bare ground; livestock should be excluded from food plots

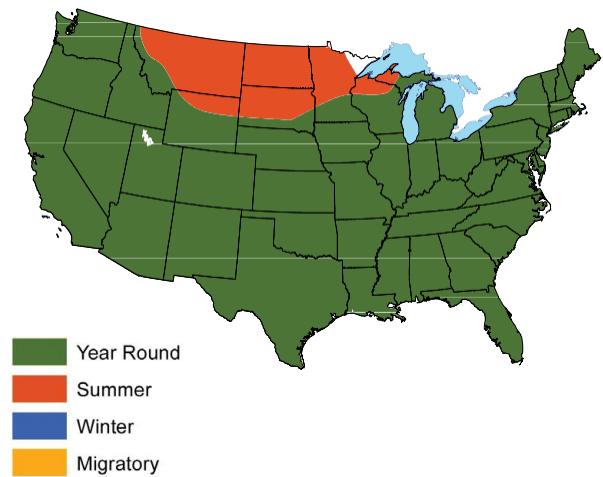
Plant Food Plots: grain plots may be planted in areas where food is lacking and to facilitate recreational hunting

Plant Native Grasses and Forbs: where food may be limiting, especially to increase some of the many native forbs that are extremely important sources of seed for mourning dove

Plant Shrubs: (in some ecoregions) to provide nesting, roosting, and loafing sites in areas where shrub/tree cover is limiting



Dave Menke



Plant Trees: (in some ecoregions) to provide nesting, roosting, and loafing sites in areas where shrub/tree cover is limiting

Repair Spillway/Dam/Levee: if not functioning properly

Set-back Succession: *Disking, Prescribed Fire, and Herbicide Applications* can be used to maintain annual forbs and grasses and provide bare ground; *Chaining, Drum-chopping, Root-plowing, Herbicide Applications, and Prescribed Fire* may be used to reduce shrub cover; *Chainsawing, Dozer-clearing, and Root-plowing* may be used to remove trees and clear forests and promote early successional plant communities

Conduct Tillage Management: tillage may be eliminated in the fall to allow access to waste grain; tillage may be delayed in spring (in some ecoregions) to allow nesting in standing stubble (especially wheat)

Provide Water Developments for Wildlife: where water is limiting, small ponds, shallow impoundments, guzzlers, and windmills may be created or installed to provide freestanding water

Conduct Wildlife or Fish Survey: point counts and observation counts are commonly conducted to estimate trends in populations